

COMMUNITY BASED APPROACHES TO ADDRESS AFFORDABLE HOUSING FOR LOW-INCOME  
RENTERS THROUGH BUILT ENVIRONMENTS IN DURHAM COUNTY, NORTH CAROLINA

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## ABSTRACT

Kali Cannon, Karina Gonzalez, Josefina Labra Escudero, Ariana Pitcher, Abhishek Shankar, and Alexa Stachowski:  
Addressing Affordable Housing For Low-Income Renters Through Built Environments in Durham County:  
Community-Based Approaches  
(Under the direction of Seema Agarwal, Elizabeth Tomlinson, and W. Oscar Fleming)

Low-income renters in Durham County experience significant cost burden and reduced access to quality nutritional options. Consequently, worse health outcomes can be perpetuated through lack of financial bandwidth or availability of nutritious food options. This proposal presents two key avenues to address these issues: a nutrition community garden program and zoning policy reform. In order to address nutritional options for low-income residents of Durham County, Durham Housing Authority properties should implement a community garden and nutrition education program. To help alleviate cost burden, Durham County should lift Minimum Parking Standards (MPS) to reduce property rent and enhance efficient land use and affordable housing options.

Keywords: Parking reform, community gardens, Durham County, affordable housing, community engagement

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## COMMON PROPOSAL

### Social Determinants of Health (SDOH) Analysis

Housing, as a social determinant of health (SDOH), is an indicator of both health and well-being, and directly tied to numerous physical and mental health outcomes (Taylor, 2018). When families experience a high-cost burden as defined by 30% or more of income going towards housing, families lack financial access to affordable food and nutrition and health promoting resources and are likely to delay seeking healthcare for medical conditions or incidents due to cost (Taylor, 2018). Durham County has a unique history of housing defined by segregation, redlining, displacement, and inequities that have led to racially disparate accumulation of wealth (Durham County Department of Public Health, 2021). Within North Carolina, cost burdened homes are more prevalent in families of lower socioeconomic status, and among renters rather than homeowners (Census.gov, 2021; Office of Disease Prevention and Health Promotion, 2020).

Within Durham County, 47.5% of renters are cost burdened and have rent constitute 30% or more of their income (U.S. Census, 2021). Alleviating cost burden amongst low-income renters in Durham County, North Carolina, as defined by individuals with less than 30% AMI<sup>1</sup>, is imperative in improving affordable housing and equity. These individuals are considered extremely low-income, thus they're the focus of this intervention as they are the most vulnerable and would be the best use of scarce county resources.

Incorporating housing affordability as a county priority, in conjunction with existing community-centered organizations, has the potential address the historic inequities of redlining and segregation that still manifest themselves within the county's poverty rate and health rates by neighborhood (DCDPH, 2021). County Commissioners and Public Health Leaders alike would benefit from addressing cost burdened homes within Durham County, as it could alleviate disparities and elevate quality of life for Durham County's residents (North Carolina Institute of Medicine, 2020).

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<sup>1</sup>AMI is defined as the Area Median Income. It is defined as "the midpoint of a specific area's income distribution and is calculated on an annual basis by the Department of Housing and Urban Development". This is an important benchmark used to identify eligibility for housing assistance by federal and state governments, as well as private parties. Households earning under 30% of AMI are considered extremely low-income. <https://www.hud.loans/hud-loans-blog/what-is-area-median-income-ami/>

## **Policies and Programs to Promote Affordable Housing**

### *Nutrition Community Garden Program*

Low-income families that need housing assistance could benefit from nutrition services, as housing issues and food insecurity<sup>2</sup> often have a bidirectional relationship (Lee et al., 2021). To support financial stability of low-income renters in Durham, a community garden and nutrition education program should be implemented for families living at selected Durham Housing Authority (DHA) properties. This program would fund the creation and management of three community gardens on DHA properties. The residents of the properties receiving the gardens will also be invited to participate in recurrent and on-site nutrition education lessons, taught by Durham's Innovative Nutrition Education (DINE) employees. Similar programs from other communities have been successful in increasing fruit and vegetable consumption, increasing physical activity, and reducing food insecurity by increasing food resource skills among participants (Gregis et al., 2021; Rivera et al., 2019). Support for this program would encourage healthy habits among low-income families, enhance neighborhood aesthetics and community engagement opportunities for residents, and showcase the efforts of Durham County to invest in the health of the community. Potential public health impacts of this program may include a reduction in food insecurity, which has been associated with many poor health outcomes including diabetes, obesity, mental stress, depression, and stunted development in children (Seo & Park, 2021).

### *Zoning Policy Reform*

Many cities across the U.S, including 13 in North Carolina, have implemented reforms to reduce parking requirements for more efficient land use and to promote affordable housing (Parking Reform Network, n.d). Minimum parking requirements (MPR) are specified in local zoning codes and mandate a minimum number of off-street or within-building parking spaces for residential development (Local Housing Solutions (LHS), n.d). Currently, Durham has eliminated parking minimums in the downtown core area and brookside business district area (Parking Reform Network, n.d). However, removing these requirements countywide for all new residential developments within one-quarter mile of public transit is a logical next step. One important reason is because MPR are extremely expensive. Developers experience costs anywhere between \$25,000 to \$65,000 per parking space, increasing total housing development costs by 12.5% to 25% per housing unit (LHS, n.d; Litman, 2004).

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<sup>2</sup>Food insecurity is defined as not having consistent access to enough food for all individuals in the household to live an active and healthy lifestyle (Feeding America, n.d).

Consequently, these costs are passed on to renters. Off-street parking and garage parking have been found to increase rents by 12% and 17%, respectively (Jia and Wachs, 1999; Gabbe and Pierce, 2016). Another analysis indicated that low-end rent in one building with no parking costs \$800 per month, but the same building unit with parking increases rent to \$1,200- \$1,300 (City of Portland, 2012). Another reason to support this policy is due to high adherence. Eliminating MPR in Seattle was successful in that developers unbundled parking costs from rent, built 40% less parking, and 34% of developments hit the exact amount of minimum parking (Gabbe et al, 2020). Third, evidence shows MPR to influence the quantity of affordable housing. Removing MPR in Los Angeles allowed developers to provide more housing, including lower-priced housing and in underserved areas (Manville and Shoup, 2010). Lastly, more than half of cost-burdened renters delayed medical care due to costs (Enterprise Community Partners, 2019), thus lifting MPR is likely to reduce rent costs and influence health as more income is available for health resources.

### **Community Partners**

Implementing community gardens and educational programming at Durham Housing Authority affordable housing units would require the collaboration and leadership of many responsible community partners. Such partners include the Durham Housing Authority who manages many affordable housing properties, Durham's Innovative Nutrition Education (DINE) program who will lead nutrition education, and organizations where governmental safety net programs are respectively housed. As one of the partner's responsible, Durham Housing Authority would be a responsible community partner for facilitating and leading the community garden project due to their role in affordable housing management, facilitation, and investment in promoting quality living for Durham County families. With access and purview over the built environment of affordable housing locations, and values in promoting the well-being of community that generate organizational buy-in, the Durham Housing Authority would be ideal in facilitating community engagement and leading the community garden initiative. The investment of the Durham Housing Authority is paramount as due to their management of locations and as deeply invested in the issue of affordable housing, their opposition could prevent the community garden initiative from being implemented.

### **Budget**

A Lead Policy Analyst was hired to revise the parking zoning ordinance, coordinate with other parties for implementation, and reform the policy overtime. After zoning changes occur the first year, another Administrative Assistant can be onboarded to triage housing applications, especially in the event of an increase due to new

developer incentives for building affordable housing units. A Community Outreach Coordinator (COC) will build awareness of the policy change and engage the public in the hearing processes after proposed zoning amendments. The COC may plan two luncheon events accommodating 60 people during the first year. Other non-personnel expenses include legal consultant fees to advise on preventing litigation given zoning changes. Additionally, technological support and resources may be needed. These include a geospatial mapping tool to identify eligible areas close to public transit and track changes in parking spaces and rents over time; a qualtrics subscription for the attestation process and continuous feedback; a canvas subscription for outreach materials with associated printing costs; and, laptops for the new employees. The policy would need to be funded by revenues from the county budget equal to total personnel plus non-personnel costs. Though, there is potential for additional revenues that may offset some of these costs, including the “Yes in My Backyard (YIMB)” Grant Program that rewards land use reforms eliminating parking requirements and donating vacant land for affordable housing, as well as revenue from penalties for failure to comply with unbundling parking. Recommended policy costs are \$353,164.70, and net income would be \$540,750 if including potential revenues from penalty fees and the county fund (or YIMB). Please see the appendix for more assumptions and calculations.

#### **Engagement and Improvement Plan**

An engagement plan is necessary for the creation of the community gardens due to its role in facilitating understanding, accountability, and trust between community partners. Various tools should be leveraged for community partner engagement, including the Six Conversations tool, a team charter, and the 30/30 tool, while metrics to measure engagement should be simultaneously leveraged.

Six Conversations is an engagement tool where an interview will be used between an array of community partners to discuss opportunity, possibilities, responsibility, potentials who may dissent or support, strengths that individuals and organizations bring to the conversation, and agreements and commitments the group collectively pledges to. During the design phase, this interview process will lay the groundwork for subsequent tools to note tangible actions and steps for community partners.

A Team Charter would be created by all partners, which will handle the creation of the document and policies to ensure accountability and agreement between partners. The creation of such will outline responsibility of partners and will serve to document the tangible agreement and plans resulting from Six Conversations.

Thirdly, a 30/30 tool will serve as a check in with a broader group and will continue to generate buy in and encourage any individuals who may have any hesitations to further generate their buy in through the implementation phase of the project.

Performance measures and indicators are vital to ensure that outlined efforts are leading to intended results. The Six Conversations measure will track the percentage of community participants who engage in the Six Questions interview and commit to participate in the project regardless of level of Responsible, Accountable, Supportive, Consulted, or Informed (RASCI). The team charter performance measure will track the percentage of community partners responsible, accountable, and supportive for different aspects of the project who sign and commit to the finalized team charter. The 30/30 measure will track the number of months with completed task per 30/30 tool over the one-year course of the implementation stage. The measures will indicate if there is sufficient engagement with which to move forward, and if there is not will inform the need to pivot to alternative tools or strategies, or to rework community partner selection.

#### **Program Evaluation**

The success of the Community Garden Programs implemented on Durham Housing Authority (DHA) properties will be defined by achieving our primary objective that by November 1, 2025, vegetable intake of “several times a day” will increase by 65% from baseline for residents that are involved in these community gardens. Baseline will be taken from the first pre-garden season<sup>3</sup> survey, when the families first enter the program.

The sampling strategy used to assess the short-term outcome objective will be through an observational community-based participatory research approach and our evaluation tool will include options for both written or verbal surveys during the pre- and post-garden<sup>4</sup> season. The project manager will conduct these questionnaires verbally to the participants either over the phone or in person and should not take longer than 15 minutes. Questions on these surveys will be developed from those used in the community-based participatory research study (Carney et al., 2012). After the data is collected, the data will be sent to a biostatistician that works for non-profits and does statistics and data analytics review. The data will be analyzed and coded to note any differences pre- and post-intervention of vegetable consumption within the community.

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<sup>3</sup>Pre-Garden Season: Occurs two weeks prior to the last frost. Last Frost typically occurs during the first week of April in Durham County, North Carolina (NC Cooperative Extension, N.d).

<sup>4</sup>Post-Garden Season: Occurs up to the week of the first frost. First frost typically occurs during the first week of November in Durham County, North Carolina (NC Cooperative Extension, N.d).

Qualitative data will also be collected from pre- and post- garden season surveys through open ended questions. Survey questions will come from the study and the information collected from the qualitative data will be gathered and assessed on overlapping themes and most common answers (Carney et, al, 2012).

Vegetable consumption via survey will be reported from participants based on frequency of intake: several times a day, once a day, a few times a week, almost never. Several times a day will be defined as 3-5 times a day and a few times a week will be defined as 2-3 times per week. Participants will be followed for three growing seasons. Progress over these six months is defined by the reported intake of vegetable consumption gathered from the surveys.

From a public health standpoint, community gardens provide an opportunity to expand nutritional awareness, provide a chance for communities to come together to collaborate on enhancing their environment, and lastly, provide and promote equitability with the idea that community gardens will increase affordability and accessibility to healthy food options. As a result, this may improve health outcomes amongst cost burden areas within Durham, North Carolina.

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**APPENDIX A: COMMON PROPOSAL**

**APPENDIX A.1: COMMON PROPOSAL FIGURES AND TABLES**

**Table A.1: Parking Reform Budget**

Personnel Expenses		Total Personnel Cost
<i>Position</i>	<i>Base Salary</i>	<i>3 Year Salary Total</i>
Lead Policy Analyst	\$58,000	\$230,754.16
Community Outreach Coordinator	\$29,000	\$57,688.54
Administrative Assistant	\$42,000	\$55,146.00
		\$343,588.70

Note. The Durham City-County Planning Department has around 53 FTEs, including 7 for Policy and Urban Design, 5 for Land Use Workers, and 1 Administrative Assistant . There are already staff with the needed requirements. However, the department notes staffing concerns, including “unexpected demands on the work program [from UDO requirements]” (City of Durham FY 2023 Budget, 2022). Thus, extra staff is encouraged.

Non-Personnel/Other-Programmatic Expenses			
Year 1			
FTE	Salary	Fringe Benefit (30%)	Personnel Cost
1	\$58,000	\$17,400.0	\$75,400.0
0.5	\$14,500	\$4,350.0	\$18,850.0
-	-	-	-
Year 2			
FTE	Salary	Fringe Benefit (30%)	Personnel Cost
1	\$59,160	\$17,748.0	\$76,908.0
0.5	\$14,790	\$4,437.0	\$19,227.0
0.5	\$21,000	\$6,300.0	\$27,300.0
Year 3			
FTE	Salary	Fringe Benefit (30%)	Personnel Cost
1	\$60,343	\$18,103.0	\$78,446.2
0.5	\$15,086	\$4,525.7	\$19,611.5
0.5	\$21,420.0	\$6,426.0	\$27,846.0

Note. Staffing costs are estimated to increase by 2% each year, which would be salary x 1.02.

Non-Personnel/Other-Programmatic Expenses			
Item	Cost per unit	Number	Total Cost
Land Use Attorney Consulting Fee	\$200	5	\$1,000
ArcGIS Analytic Software	\$550	3	\$1,650
Luncheon Venue	\$75	4	\$300
Luncheon Catering	\$107	6	\$642
Laptops	\$129	3	\$387
Qualtrics Data Collection	\$1,500	3	\$4,500
Canva Pro Subscription	\$120	3	\$360
Printer	\$300	1	\$300
Paper	\$8	4	\$32
Ink	\$27	15	\$405
Total Non-Personnel Costs			\$9,576

Potential Revenues	
Item	Amount
County Fund or Yes In My Backyard Grant	\$353,164.70
Penalties for Zoning Violations	\$540,750
Estimated Total Policy Costs (Personnel + Non-Personnel Costs)	
	\$353,164.70
Potential Net Income (if including revenue from penalties)	
	\$540,750

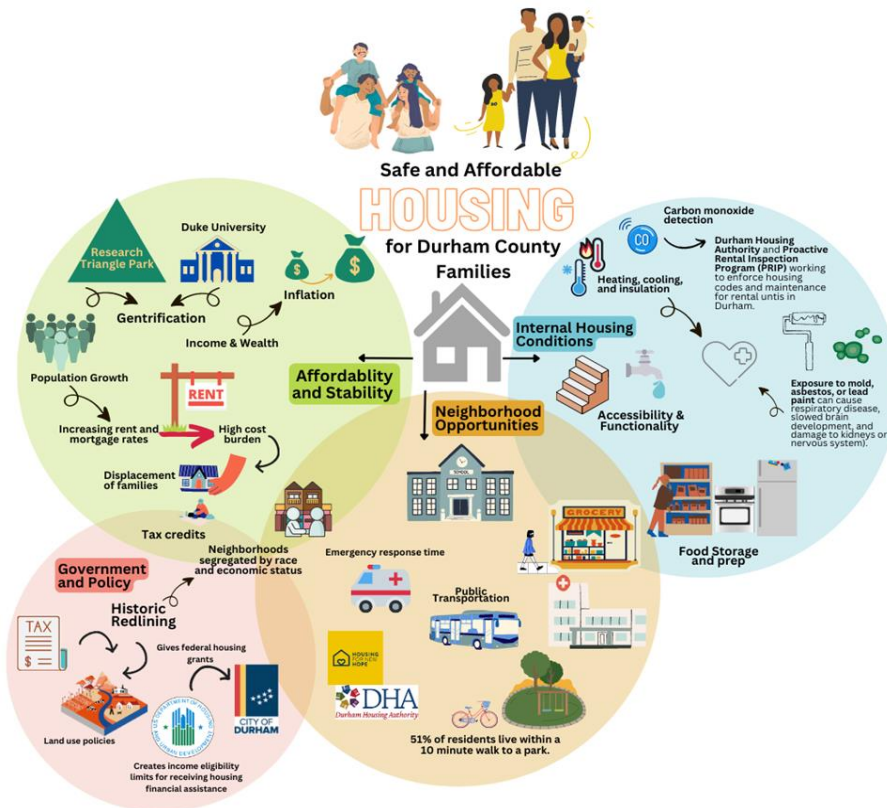
Note. Penalty Fee Calculations: Last year, Durham County reported 35 notices of violation (NOV) of zoning codes that received formal enforcement action (City of Durham FY 2023 Budget, 2022). The City of Seattle in enforcing rental agreements, including for unbundling parking, penalizes property owners “up to \$150 per day for each violation for the first ten days of noncompliance; and up to \$500 per day for each day beyond ten days of noncompliance” (*Seattle Municipal Code, Chapter 7.24*). DC parking zoning changes is expected to go into effect the second year. It is assumed that it will take the first quarter to conduct audits and identify violators, and up to a month to send out NOV’s and give violators time to react. After, the first penalties will occur 120 days into the year. Based on Seattle’s methodology and if assuming the NOV are also 35, then 1) For the first ten days:  $35 \times 10d \times \$150 = \$52,500$ ; 2) Assuming 50% start to comply after 10 days for the next 30 days:  $35 \times .50 \times 30d \times \$500 = \$262,500$ ; 3) Assuming half of the previous month (25%) still don’t comply:  $35 \times .25 \times 30d \times \$500 = \$131,250$ ; 4) Assuming most start to comply afterwards (99%) for the remainder of the year (as this policy is actually favorable to house owners):  $35 \times .01 \times 175d \times \$500 = \$30,625$ ; 5) For the second year, still assuming most comply with possibility some still don’t:  $35 \times .01 \times 365d \times \$500 = \$63,875$ ; 6) Total (shown above):  $\$52,500 + \$262,500 + \$131,250 + \$30,625 + \$63,875$

Item	Link
Lead Policy Analyst Salary	<a href="https://www.indeed.com/career/policy-analyst/salaries/NC">https://www.indeed.com/career/policy-analyst/salaries/NC</a>
Community Outreach Coordinatory Salary	<a href="https://www.ziprecruiter.com/Salaries/Community-Outreach-Coordinator-Salary--in-North-Carolina#:~:text=How%20much%20does%20a%20Community,be%20approximately%20%2414.10%20an%20hour.">https://www.ziprecruiter.com/Salaries/Community-Outreach-Coordinator-Salary--in-North-Carolina#:~:text=How%20much%20does%20a%20Community,be%20approximately%20%2414.10%20an%20hour.</a>
Administrative Assistant Salary	<a href="https://www.indeed.com/career/administrative-assistant/salaries/NC">https://www.indeed.com/career/administrative-assistant/salaries/NC</a>
Land Use Attorney Fee	<a href="https://www.crestrealestate.com/land-use-attorney/">https://www.crestrealestate.com/land-use-attorney/</a>
ArcGIS Analytic Software	<a href="https://www.esri.com/en-us/arcgis/products/arcgis-online/buy">https://www.esri.com/en-us/arcgis/products/arcgis-online/buy</a>
Luncheon Venue	<a href="https://bluehilleventcenter.com/venue-spaces/">https://bluehilleventcenter.com/venue-spaces/</a>
Catering from Potbelly	<a href="https://www.grubhub.com/restaurant/potbelly-sandwich-works-catering-210-ids-center-80-8th-s-minneapolis/2534021/catering">https://www.grubhub.com/restaurant/potbelly-sandwich-works-catering-210-ids-center-80-8th-s-minneapolis/2534021/catering</a>
Laptop	<a href="https://www.walmart.com/ip/Lenovo-Ideapad-11-14-0-Laptop-Intel-Pentium-N5030-4GB-RAM-128GB-eMMC-Storage-Cloud-Grey-Windows-11-in-S-Mode-82V6001DUS/218677627?wmlspartner=wmlspartner=wlpa&amp;selectedSellerId=0">https://www.walmart.com/ip/Lenovo-Ideapad-11-14-0-Laptop-Intel-Pentium-N5030-4GB-RAM-128GB-eMMC-Storage-Cloud-Grey-Windows-11-in-S-Mode-82V6001DUS/218677627?wmlspartner=wmlspartner=wlpa&amp;selectedSellerId=0</a>
Yes in my backyard grant	<a href="https://www.planning.org/blog/9262900/congress-funds-new-yimby-grants-for-zoning-reform/">https://www.planning.org/blog/9262900/congress-funds-new-yimby-grants-for-zoning-reform/</a>
Penalties for Bundling	
Parking	See City of Seattle, 7.24.140 - Notice of violation <a href="https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT7COPR_CH7.24REAGRE_7.24.030REAGRE">https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT7COPR_CH7.24REAGRE_7.24.030REAGRE</a>
Qualtrics	<a href="https://www.getcloudapp.com/management-collaboration/what-is-qualtrics/#:~:text=Plans%20start%20at%20%241%2C500%20a,plan%20that%20works%20for%20you.">https://www.getcloudapp.com/management-collaboration/what-is-qualtrics/#:~:text=Plans%20start%20at%20%241%2C500%20a,plan%20that%20works%20for%20you.</a>
City of Durham Budget	<a href="https://www.durhamnc.gov/DocumentCenter/View/46235/Final-FY23-Budget-Book">https://www.durhamnc.gov/DocumentCenter/View/46235/Final-FY23-Budget-Book</a>
Canva Pro Subscription	<a href="https://www.canva.com/pricing/">https://www.canva.com/pricing/</a>
Printer cost	<a href="https://www.bestbuy.com/site/brother-hl-b3270cdw-wireless-color-laser-printer-white/6265819.p?skuId=6265819">https://www.bestbuy.com/site/brother-hl-b3270cdw-wireless-color-laser-printer-white/6265819.p?skuId=6265819</a>
Paper cost	<a href="https://www.walmart.com/ip/Pen-Gear-Copy-Paper-White-8-5-x-11-20-lb-92-Bright-750-Sheets/107773975?athbdg=L1102">https://www.walmart.com/ip/Pen-Gear-Copy-Paper-White-8-5-x-11-20-lb-92-Bright-750-Sheets/107773975?athbdg=L1102</a>
Ink cost	<a href="https://www.bestbuy.com/site/hp-57xl-high-yield-ink-cartridge-tri-color/6404828.p?skuId=6404828">https://www.bestbuy.com/site/hp-57xl-high-yield-ink-cartridge-tri-color/6404828.p?skuId=6404828</a>

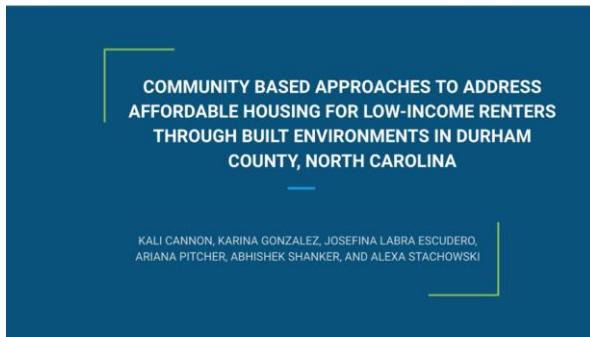
**Table A.2: Evaluation Plan Timeline**

TASK NAME	YEAR ONE												YEAR TWO											
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Project Initiation																								
Grant Writing & Local Fundraisng																								
Collaborate with DHA and determine garden locations																								
Collaborate with DINE to initiate/plan on-site education sessions at three DHA properties																								
First community meetings to schedule garden building days and gather interests for the first nutrition education session																								
Purchase and distribute building supplies for each garden																								
Hire & orient long term garden keepers for each site																								
Build gardens on scheduled "build days"																								
Project Upkeep																								
Garden meetings to schedule garden work days for upcoming season. May vary based on communities preferences.																								
Quarterly nutrition education classes at each participating DHA property. Hosted by DINE																								
Monitoring & Evaluation																								
Pre-seasonal survey for sample population																								
Post-seasonal survey for sample population																								
Follow-up open-ended question interviews*																								

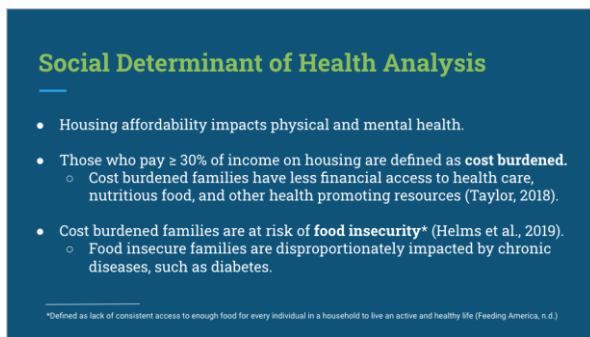
Figure A.1: Rich Picture



## APPENDIX A.2: PRESENTATION SLIDES AND SCRIPT



**Slide 1 (Speaker: Kali):** “Hi everyone! My name is Kali, and my group members are Karina, Josefina, Ariana, Abhishek, and Alexa. Today we’ll be presenting our proposal for improving housing affordability and relieving financial strain for low-income renters in Durham County, NC.”



**Slide 2 (Speaker: Kali):** “Housing falls within the build environment sector of the social determinants of health, and access to affordable housing was noted as a top priority of Durham residents according to the 2020 County Health Assessment. Access to safe and affordable housing is important because it influences both physical and mental health through a variety of avenues. Families who are forced to pay extreme housing costs may be described as cost burden, where 30% or more of their household income is spent on housing. These cost burdened families have less financial access to health care, nutritious foods, and other health promoting resources. Due to financial the

strain, many cost burdened families are at risk of food insecurity, which is defined as a lack of consistent access to enough food for every individual to live an active and healthy life.”

### Durham County: Priority Population

- In North Carolina, cost burden is more prevalent among renters than among homeowners.
  - Within Durham County, **47.5% of renters are cost burdened**, paying rent which constitutes  $\geq 30\%$  of their income (Census.gov, 2021).
- The focus of the following interventions are to relive financial strain and improve health equity among low-income renters in Durham County, NC through changes in the build environment.
  - Low income renters are defined as households making less than 30% of the Area Median Income (AMI) of Durham County.

**Slide 3 (Speaker: Kali):** “To determine the priority population, we considered that in North Carolina, renters are more likely to be cost burden than homeowners, and in Durham County, 47.5% of renters are facing cost burden. Therefore, the following interventions are designed to relive financial strain and improve health equity among low-income renters within Durham. In this case, low-income is defined as households who make less than 30% of the Area Median Income of Durham County. The AMI is calculated on an annual basis by the Department of Housing and Urban Development.

### Policy Issue: The Hidden Housing Costs of Parking

**Table A. Cost of Parking**

Parking Type	Parking Costs Per Space
Surface	\$3,000
Podium/Structured (above ground)	\$20,000
Underground	\$50,000
Internal (Tuck Under or Sandwich)	\$20,000
Mechanical	\$45,000

Building Development Prototype	# of Units	# of Parking Spaces	Parking Spaces per Unit	7% RDP* Monthly Rent	10% RDP* Monthly Rent
No Parking	50	0	0	\$800	\$1150
Tuck Under	45	9	0.25	\$850	\$1200
Surface	30	30	1.0	\$1,200	\$1800
Podium	42	22	0.5	\$950	\$1350
Mechanical	46	23	0.5	\$1,175	\$1660
Underground	44	33	0.75	\$1,900	\$2700

\*Note: RDP= Return on Investment

- High parking costs are passed on to renters in rent costs
- More parking spaces mean less land to build affordable housing units (AHU)

Two sources on left: Portland Bureau of Planning and Sustainability (2012)  
Source on top right: Oliver J. (2004)


**Slide 4 (Speaker: Ariana):** “Nationwide, many cities have implemented reforms to reduce parking requirements to promote affordable housing. Minimum parking requirements (MPR)s are local zoning codes that mandate a minimum number of parking spaces based on the number of bedrooms or units for residential development. However, MPRs are very expensive. Developers experience costs anywhere between \$25 to \$65K per parking space, increasing total housing development costs by 12.5 to 25% per housing unit. Ultimately, these costs are



passed on to renters. Off-street and garage parking have been found to increase rents by 12% and 17%. The analysis in the table shows that low-end rent in one building with no parking costs \$800 per month, but the same building unit with parking increases rent up to \$1,300. Studies have proved MPRs to reduce a developer’s incentive to provide affordable housing since there is less land to make housing units and fewer housing units must be put at a high price to cover parking costs.”

### Policy Solution: Eliminating Minimum Parking Requirements (MPR) in Durham County



- 1) Eliminate MPR county-wide for all new residential developments within one-quarter mile of public transit
- 2) Mandate parking to be unbundled from the cost of rent
- 3) Provide incentives to housing developers who reduce parking to offer affordable housing to cost-burdened renters



**Slide 5 (Speaker: Ariana):** “Durham County (DC) should establish a reform that will: 1) eliminate MPRs for all new residential developments within one-quarter mile of public transit that runs regularly 2) mandate parking to be unbundled from the cost of rent with the option to pay separately for parking 3) prioritize housing applications and allow more units per acre for developers who attest extra land from parking will be used for affordable housing units for cost-burdened renters below 30% of the area median income.”

### Policy Benefits

- High adherence amongst developers
- Evidence of removing MPR and building AHUs in underserved areas
- Promotes equity as parking costs are regressive
- More money for renters to spend on health resources
- Politically Feasible: Instituted in 12 NC cities, including localities in downtown Durham and in Raleigh

**Slide 6 (Speaker: Ariana):** “This policy has a proven successful track record. In Seattle, eliminating MPRs was associated with unbundled parking costs from rent, 40% less parking, \$537 million in savings, and 34% of developments hitting the exact amount of minimum parking. Los Angeles provided more housing units, including

lower-priced housing and more units in underserved areas. Additionally, parking is a fixed expense, meaning MPRs are inequitable and regressive since low-income households pay a greater proportion of rent towards parking than high-income households. More than half of cost-burdened renters delayed medical care due to costs, so this policy may allow more income to be spent on health resources. Lastly, 12 NC cities have already made these types of reforms, including Durham that has eliminated parking minimums in the downtown core area and brookside business district area, but not countywide. So, a precedent has already been established.”

### MPR Policy Budget

- MPR program will employ 3 core staff
- Outreach strategy will require mailers and flyers, presentations
- Policy will include potential revenues

Potential Revenues	
Item	Amount
County Fund or Yes in My Backyard Grant	\$352,097.70
Penalties for Zoning Violations	\$540,750
<b>Budget Summary</b>	
Estimated Total Policy Costs (Personnel + Non-Personnel Costs)	\$353,164.70
Potential Net Income (if including revenue from penalties)	\$540,750

Personnel Expenses		Total Personnel Cost	
Position	Base Salary	3 Year	Salary Total
Lead Policy Analyst	\$68,000	\$204,000	\$236,754.16
Community Outreach Coordinator	\$29,000	\$87,000	\$57,688.54
Administrative Assistant	\$42,000	\$126,000	\$35,148.00
			<b>\$343,588.70</b>


**Slide 7 (Speaker: Abhishek):** “The Minimum Parking Requirements policy budget will have an estimated total cost of \$353,164.70 and potential net income of \$540,750. The majority of this cost will come from the staffing of 3 employees to the program with varying levels of involvement over those 3 years. A lead policy analyst will work full time all 3 years and a community outreach coordinator will work half FTE while an administrative assistant will support the project at half FTE over the last 2 years to support application and outreach work.

To execute the strategy appropriately, a variety of technical subscription services will need to be purchased to appropriately analyze location and impact data and ultimately translate the work into flyers, including ArcGIS analytic software, Qualtrics data collection, and Canva Pro.

Several potential revenue sources will help offset the various costs of this program. If Durham County qualifies for the Department of Housing and Urban Development’s Yes in My Backyard grant, it will receive grant funding by year 3. Additionally, based on other city models for failure to unbundle parking, Durham County could make create a model that institutes penalty fees in case developers don’t unbundle parking.”

## Nutrition Program

- Community Garden and Nutrition Education Program
  - Funding and creation of gardens amongst Durham Housing Authority (DHA) properties
  - Nutrition education sessions taught by Durham's Innovative Nutrition Education (DINE) employees will be offered to participants
- Similar programs have had success in increasing vegetable consumption, increasing physical activity and reducing food insecurity (Gregis et al., 2021; Rival et al., 2019).
- Positive impacts of supporting this program (Seo & Park, 2021).
  - Encourage healthy habits among low-income families
  - Beautify neighborhoods and increase community engagement opportunities
  - Showcase the efforts of Durham County to invest in the health of the community
  - Possible reduction in food insecurity.



**Slide 8 (Speaker: Josefina):** “To further support the financial stability of low-income renters seen amongst this population, we have created a community garden and nutrition education program. This program will be implemented amongst three selected Durham Housing Authority properties. This will include the funding and creation of the community gardens. In addition, community garden participants will have the opportunity to attend educational lessons about nutrition that will be taught by Durham’s Innovative Nutrition Education (DINE) employees. These will be monthly sessions held on-site of the community gardens.

Similar programs from other communities have increased availability of food resources and nutritional education and skills and have successfully increased vegetable consumption, increased physical activity and reduced food insecurity amongst their population.

Support for this program would encourage healthy habits among low-income families, enhance neighborhood aesthetics and community engagement opportunities for residents, and showcase the efforts of Durham County to invest in the health of the community. Potential public health impacts of this program may include a reduction in food insecurity, which has been associated with many poor health outcomes including diabetes, obesity, mental stress, depression, and stunted development in children.”

## Nutrition Evaluation

Our primary main objective for our evaluation plan will be that by November 1, 2025, vegetable intake of "several times of a day" will increase by 65% from baseline for residents that are involved in these community gardens

- Baseline will be taken from the first pre-garden season survey, when the families first enter the program
- Progress will be defined as the reported intake of vegetable consumption gathered from the surveys
- Vegetable consumption via survey will be reported based on frequency of intake
- The project manager will conduct the questionnaires
- The data will be sent to a biostatistician



**Slide 9 (Speaker: Alexa):** "Our primary or main objective is that by November 1, 2025, vegetable intake of

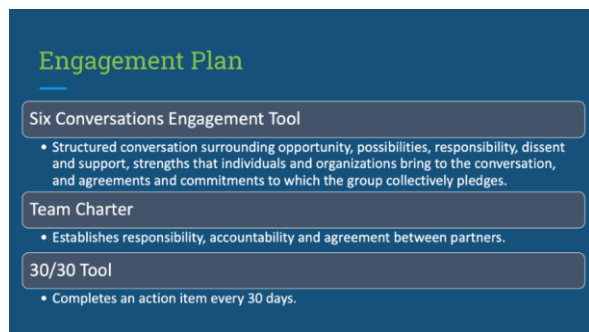
"several times a day" will increase by 65% from baseline for residents that are involved in these community gardens. Baseline will be taken from the first pre-garden season<sup>2</sup> survey, when the families first enter the program.

Pre-Garden Season: Occurs two weeks prior to the last frost, which typically occurs during the first week of April in Durham. A post-Garden Season survey will be given as well and that occurs up to the week of the first frost, which in Durham occurs during the first week of November. Progress over the six months of the growing season is defined by the reported intake of vegetable consumption gathered from the surveys. Vegetable consumption via survey will be reported from participants based on frequency of intake: several times a day, once a day, a few times a week, almost never. Several times a day will be defined as 3-5 times a day and a few times a week will be defined as 2-3 times per week. The project manager will conduct these questionnaires verbally to the participants either over the phone or in person and should not take longer than 15 minutes (Carney et al., 2012). After the data is collected, the data will be sent to a bio-statistician that works for non-profits and does statistics and data analytics review."

## Key Community Partners

- Durham County individuals and families with 30% or less AMI
- Durham Housing Authority
- Durham's Innovative Nutrition Education (DINE)
- Habitat for Humanity

**Slide 10 (Speaker: Karina):** “Implementing community gardens and educational programming at Durham Housing Authority affordable housing units would require the collaboration and leadership of many responsible community partners. Such partners include the Durham Housing Authority who manages many affordable housing properties, Durham’s Innovative Nutrition Education (DINE) program who will lead nutrition education, and organizations where governmental safety net programs are respectively housed. As one of the partner’s responsible, Durham Housing Authority would be a responsible community partner for facilitating and leading the community garden project due to their role in affordable housing management, facilitation, and investment in promoting quality living for Durham County families. With access and purview over the built environment of affordable housing locations, and values in promoting the well being of community that generate organizational buy-in, the Durham Housing Authority would be ideal in facilitating community engagement and leading the community garden initiative. The investment of the Durham Housing Authority is paramount due to their management of locations and as deeply invested in the issue of affordable housing, their opposition could prevent the community garden initiative from being implemented.”

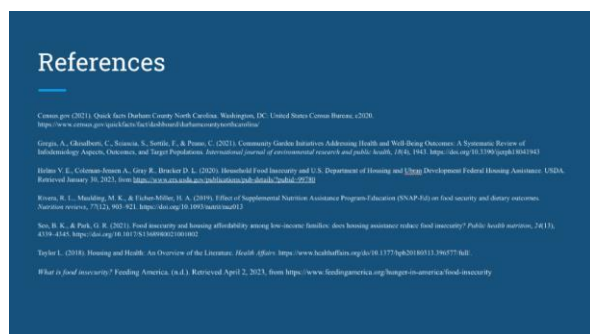
A blue rectangular graphic with the title "Engagement Plan" in yellow. Below the title are three rounded rectangular boxes, each containing a tool name and a bullet point description. The first box is "Six Conversations Engagement Tool" with a bullet point: "Structured conversation surrounding opportunity, possibilities, responsibility, dissent and support, strengths that individuals and organizations bring to the conversation, and agreements and commitments to which the group collectively pledges." The second box is "Team Charter" with a bullet point: "Establishes responsibility, accountability and agreement between partners." The third box is "30/30 Tool" with a bullet point: "Completes an action item every 30 days."

**Engagement Plan**

- Six Conversations Engagement Tool**
  - Structured conversation surrounding opportunity, possibilities, responsibility, dissent and support, strengths that individuals and organizations bring to the conversation, and agreements and commitments to which the group collectively pledges.
- Team Charter**
  - Establishes responsibility, accountability and agreement between partners.
- 30/30 Tool**
  - Completes an action item every 30 days.

**Slide 11 (Speaker: Karina):** “An engagement plan is necessary to the creation of the community gardens and would help facilitate understanding, accountability, and trust between community partners. Community partner engagement, including the Six Conversation tool, a team charter, and the 30/30 tool, would be helpful in preventing some potential challenges surrounding communication, accountability, and responsibility among community partners and the community garden program Six Conversations is an engagement tool where community partners meet to discuss a set of topics. They discuss opportunity, possibilities, responsibility, potentials who may dissent or support, strengths that individuals and organizations bring to the conversation, and agreements and commitments the group collectively pledges to. The themes and agreements that result from the conversation process will lay the

groundwork for a team charter to document responsibility, accountability, tangible actions and steps for community partners. The Team Charter would be created by all partners and would outline responsibility of partners to document the tangible agreement and plans resulting from Six Questions. Thirdly, a 30/30 tool is a system where each month community partners meet and reflect on steps completed, and outline a next step or tangible outcome to be completed within the upcoming 30 days. This tool would serve as a check-in with a broader group and would continue to engage community partners in monthly tasks.”

A slide with a dark blue background and white text. The title "References" is at the top left. Below it are five lines of small white text, each representing a reference. The references include: 1. Census.gov (2021) Quick Facts Durham County North Carolina. Washington, DC: United States Census Bureau. 2020. 2. Georgia, A., Choudhury, C., Srinivas, S., Smith, F., & Paine, C. (2021). Community Garden Initiatives Addressing Health and Well-Being Outcomes: A Systematic Review of Bibliography, Attributes, Outcomes, and Target Populations. *Assessment: Journal of Environmental Research and Public Health*, 18(6), 1943. 3. Holmes, V. E., Coleman-Jensen, A., Gray, R., Brucker, D. L. (2020). Household Food Insecurity and U.S. Department of Housing and Urban Development Federal Housing Assistance. *USDA, Research Report* RR-2021. 4. Hovari, R. L., Moshling, M. K., & Fisher-Miller, H. A. (2019). Effect of Supplemental Nutrition Assistance Program Education (SNAP-Ed) on Food Security and Dietary Outcomes. *Nutrition Reviews*, 77(12), 903–921. 5. Son, H. K., & Park, O. H. (2021). Food insecurity and housing affordability among low-income families: does housing assistance reduce food insecurity? *Public Health Nutrition*, 24(11), 4318–4345.

Slide 12 (Speaker: Karina): “Here are our references. Thank you for your time and consideration.”

## **APPENDIX B: KALI CANNON INDIVIDUAL DELIVERABLES**

### **APPENDIX B.1: SOCIAL DETERMINANT OF HEALTH ANALYSIS**

#### **Social Determinant of Health: Neighborhood and Built Environment**

Social determinants of health are non-medical factors that influence a person's health and wellbeing (Healthy People 2030, n.d.). These determinants fall into five domains: economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context. This analysis will highlight the neighborhood and the built environment sector of Durham County, North Carolina, with a specific focus on housing. The home can influence many health outcomes for individuals and families through four housing factors: affordability, housing quality, residential stability, and neighborhood opportunity (D'Alessandro & Appolloni, 2020; Swope & Hernández 2019). According to the State of Healthy Housing report, 45% of metropolitan homes in the United States had one or more health and safety hazards based on data from 2011 to 2015 (National Center for Healthy Housing, 2020).

Short term health implications of housing factors include sleep quality, exposure to physical or chemical hazards, ability to obtain and cook nutritious foods, access to safe water and air, temperature regulation, the ability and motivation to engage in physical activity, exposure to crime and violence, and the feeling of security inside the home. Long term impacts of poor housing factors may include malnutrition status, poor mental health, onset of disease (such as diabetes, cardiovascular disease, respiratory disease, or cancer), and stagnant or worsening socio-economic status (D'Alessandro & Appolloni, 2020; Jacobs et al., 2009). While these examples are not all encompassing, they do suggest a strong connection between housing quality and health.

#### **Geographic and Historical Context**

Durham County is centered in the Piedmont region of North Carolina, situated between the Appalachian Mountains and the Atlantic coast. The area was originally home to the Eno and Occaneechee Native American tribes, who established the first villages and transportation routes. An invasion of European settlers resulted in a colonization and theft of the land in the 1700s (Durham County Department of Public Health, 2021). This analysis acknowledges and honors the ancestral natives who stewarded the region's land.

Durham has a rich history in the tobacco industry, education, medicine, and Black leadership. After the Civil War, the Black citizens of Durham established thriving communities. In fact, Parrish Street in downtown Durham was once known as the "Black Wall Street," because of the notable success of Black owned businesses.

Black institutions of the time included the North Carolina Mutual Life Insurance Company, the Lincoln Hospital, Trinity College (now known as North Carolina Central University), a library, theater, hotels, and more. Despite the successes, Durham's Black community did not go unscathed by racism and systemic oppression (Durham County Department of Public Health, 2021).

Government policy enforced redlining, which prevented Black citizens from taking out mortgages and buying homes in certain neighborhoods. This resulted in segregated communities and disinvestments in Black neighborhoods. Urban developments in the 1950s and 60s displaced many Durham families, the majority of which were people of color. One example of this was the construction of highway 147, which demolished a thriving Black community known as Hayti (City and County of Durham, 2018).

Past policies have shaped the built environment and racial disparities in Durham today. One effect of redlining can be seen in the proportion of homeownership by race, with 72.7% of Whites owning homes compared to 45.8% of Blacks, and 42.9% of Hispanic residents (De Marco & Hunt, 2018). Similar disparities exist when looking at median household incomes by race in 2019, displayed in Table B.1 (DataWorksNC, 2019). This trend continues when comparing poverty rate by race, based on trends in Durham from 2012-2016. This data estimates 23.5% of Black, 32.4% of Hispanic, and 8.4% of White households were below the poverty line<sup>5</sup> (De Marco & Hunt, 2018).

Durham County has publicized efforts to improve the availability of safe and affordable housing for low-income residents, as highlighted in the Community Health Assessment of 2020. Some of these efforts include funding multi-million-dollar maintenance and repairs to apartments owned by the Durham Housing Authority (DHA), which house low-income residents. In 2019, the city also passed a \$95 million housing bond to create new affordable units, restore current rental properties, and increase opportunities for homeownership (Durham County Department of Public Health, 2021).

### **Priority Population**

Those at risk of living in suboptimal housing conditions that impact health include low-income families, racial minorities, renters, and older adults (Donald, 2009; Swope & Hernández, 2019; Pollack et al., 2010). These demographics are not mutually exclusive, meaning some individuals have double burdened housing related risks

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<sup>5</sup>Poverty status is determined by a family's household income compared to a set of income thresholds based on family size. If the household income is less than the income threshold for a family of that size, then that household income is below the poverty line. These income thresholds are used nationally and are adjusted for inflation (U.S. Census Bureau, n.d.).



based on their income, family size, age, or race. Many residents fall into one or more of these identities. As described in above sections, bigger proportions of Black and Hispanic households in Durham live in poverty and are more likely to be renters when compared to White households (De Marco & Hunt, 2018). These families exist at an intersection of risk factors for unaffordable housing and unsafe housing conditions.

These households are more likely to be cost-burdened and or live in older homes, rental units, or federally subsidized housing, which typically have more health concerns than other housing types (Donald, 2009) ;(Swope & Hernández, 2019; Pollack et al., 2010). Without proper maintenance and renovation, older homes could expose residents to poor insulation, structural defects, mold, lead paint, and asbestos (Progressive, 2022). Suboptimal living conditions have been reported in Durham’s subsidized housing, which are historically disinvested (Durham County Department of Public Health, 2021). In fact, the national backlog of deferred maintenance for public housing is over \$35 million (U.S. Department of Housing and Urban Development, n.d.). According to the National Center of Healthy Housing, rental properties in metropolitan areas, like Durham, tend to have more problems than owner-occupied homes (National Center for Healthy Housing, 2020). Thus, these households should be the priority in efforts to improve housing quality in Durham County.

#### **Measures of SDOH**

Households who spend over 30% of income on rent or mortgage are considered cost burdened (Braveman et al., 2011). According to the North Carolina Housing Coalition, 31% of Durham residents are cost burdened. Renters in Durham are disproportionately cost-burdened compared to homeowners, shown in Table B.2. Those who spend over half of household income on housing are defined as *severely* cost-burdened. The percentage of households in Durham County experiencing severe housing cost burdens are 13%, exceeding percentages at the state and nationwide levels (Table B.3). According to the National Low Housing Association, cost burdened households are more likely to sacrifice necessities such as health care or food to pay for housing. They may also face housing issues such as overcrowding or lack of plumbing or kitchen facilities. In Durham, 17% of households face at least 1 of 4 severe housing problems, including severe cost burden, overcrowding, lack of kitchen facility, or lack of plumbing (National Low Income Housing Coalition n.d.).

#### **Rationale/Importance**

Durham is a city of great diversity (figure B.1). Therefore, the racially disparate rate of housing issues is a concern for many of the county’s residents. These residents are especially at risk with Durham’s increasing

popularity among affluent newcomers. Gentrification has caused increased housing prices, which is causing a surge of relocation for low-income families (De Marco & Hunt, 2018). Improving the safety and affordability of housing would emphasize the county's prioritization of long-time Durham residence over the influx of newcomers.

Positive impacts that would evolve from improving the affordability and safety of housing in Durham include fewer evictions for current residents facing the brunt of gentrification. Additionally, residents spending less of their income on rent would increase local spending, thus boosting the local economy. Long term benefits may include a decrease in housing related health outcomes such as asthma, poor mental health, and malnutrition (D'Alessandro & Appolloni, 2020; Jacobs et al., 2009).

### **Disciplinary Critique**

Housing factors greatly influence a person's nutrition status on multiple levels. Housing conditions should provide a safe, clean, and functioning space to cook and store food. Housing affordability determines the proportion of income available to spend on food. The neighborhood environment affects an individual's access to foods through transportation and distance to grocery stores. Public health nutritionists and registered dietitian nutritionists (RDNs) should be involved in improving housing quality for residents in Durham County because the home is a major determinant of health and nutrition for each family. An RDN would benefit the team addressing this issue because they have experience developing individualized interventions for food insecurity. There is no one-size-fits-all solution for food insecurity, as etiology could vary from household income, kitchen functionality, nutrition knowledge, physical abilities, or self-perceived cooking skills. With training in disease specific needs, the RDN could also help decrease nutrition related health disparities seen in low-income populations, such as diabetes and obesity (Gittelsohn & Trude, 2017). Additionally, the RDN would be aware of local resources which can be recommended to low-income renters facing food insecurity or food access issues.

Improvements to this SDOH would benefit the county in areas not yet considered. Investments in housing would positively impact children's health and brain development (Dunn, 2020). Stable and safe homes could improve math and reading scores, school attendance rates, and graduation rates for students across the county (Habitat for Humanity, n.d). Efforts to improve safety and affordability of housing in Durham would have far reaching benefits in health, education, and socio-economic sectors for current and future generations.

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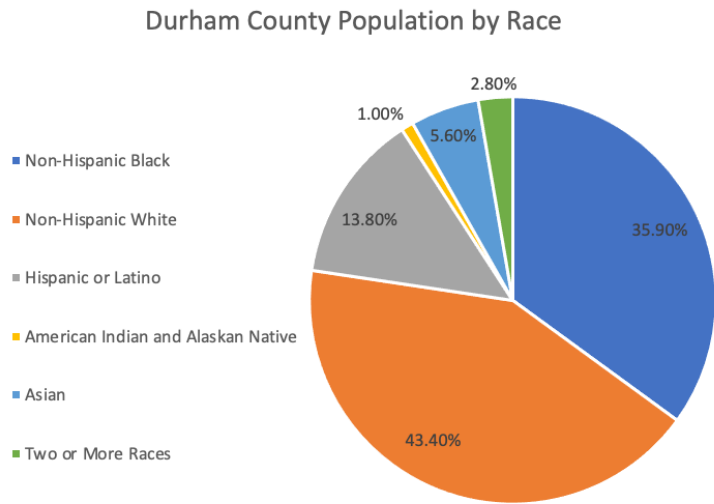
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APPENDIX B.1.A: SDOH ANALYSIS FIGURES AND TABLES

Figure B.1: Race/Ethnicities of Durham County



(U.S. Census Bureau, n.d.)

**Table B.1: Median Household Incomes in Durham County by Race**

	White Households	Black Households	Hispanic Households
<b>Median Household Income</b>	\$80,409	\$44,099	\$47,587

(DataWorksNC., 2019)

**Table B.2: Percentage of Cost-Burdened Households in Durham by Housing Type**

Housing Expense Type	Percentage of Cost-Burdened Residents in Durham
<b>Rent</b>	50.8%
<b>Mortgage</b>	22%

(Data from American Community Survey in the Neighborhood Compass, 2019.)

**Table B.3: Durham County Compared to State and National Percentages**

	Durham County	North Carolina	United States
<b>Severely Cost-Burdened Households</b>	13%	12%	14%
<b>Households Facing Severe Housing problems*</b>	17%	15%	17%

Note. \*Severe housing problems are defined as having at least 1 of 4 problems: overcrowding, high housing costs, lack of kitchen facilities, or lack of plumbing facilities.

(County Health Rankings Model, 2022)

## **APPENDIX B.2: EVIDENCE-BASED NUTRITION PROGRAM**

### **Introduction**

Housing is a social determinant of health (SDOH) that influences the physical, mental, and financial well-being of individuals and their households (D'Alessandro & Appolloni, 2020). Housing's influence on health is dependent on four factors: affordability, quality, stability, and neighborhood opportunity (D'Alessandro & Appolloni, 2020; Swope & Hernández 2019). Those mostly impacted by housing issues are low-income renting families (DataWorksNC, 2019; Swope & Hernández 2019). Renters in Durham are disproportionately cost-burdened compared to homeowners, which may lead to rental households sacrificing necessities such as health care or food (National Low Income Housing Coalition, n.d.). Affordable housing was identified as the number one health priority among residents in Durham County in the 2020 Community Health Assessment, and the county has identified efforts to improve housing affordability (Durham County Department of Public Health, 2021). The county's efforts to improve housing affordability should expand to also address food security issues for low-income renting families to improve health outcomes in this population.

### **Evidence-Based Nutrition Policy or Program**

Low-income families in need of housing assistance could benefit from nutrition services, as housing issues and food insecurity often have a bidirectional relationship (Lee et al., 2021). Food insecurity has been associated with a variety of health conditions including diabetes, obesity, mental stress, depression, and stunted development in children (Seo & Park, 2021). Nutrition related health conditions can contribute to additional healthcare expenses for this already cost-burdened population (Bascom, 2023). To simultaneously address food insecurity and housing issues in Durham, community gardens will be introduced in multiple Durham Housing Authority (DHA) properties. DHA provides affordable housing for low-income families, with rent set to no greater than 30% of household income (Durham Housing Authority, n.d). Additionally, residents of these properties will be invited to participate in education sessions held on DHA residential properties. These education sessions will be hosted by Durham's Innovative Nutrition Education (DINE) program. The purpose of these education sessions is to reduce food insecurity by teaching about meal planning, shopping on a budget, cooking, and accessing food programs like the Supplemental Nutrition Assistance Program (SNAP), Women, Infant, and Children (WIC), and Senior Farmers' Market Nutrition Program (SFMNP).

Community gardens have been shown to increase vegetable consumption, improve mental health, increase community social involvement, and result in higher neighborhood satisfaction among residents (Sadeghzadeh, et al.,

2022). Placing community gardens in DHA properties would be advantageous because food insecurity is high among families receiving federal housing assistance. In a nationwide analysis through the U.S. Department of Housing and Urban Development (HUD) programs, including Public Housing, Multifamily Housing, and the Housing Choice Voucher Program, 37.2% of adult participants reported food insecurity over 30 days in 2011-12 (Helms, et al., 2020). Despite the time that has passed since the percentage of food insecurity among HUD residents was measured, the report remains relevant in representing the prevalence of food insecurity among low-income households.

To further address food insecurity in DHA communities, nutrition education should be provided in conjunction with the community gardens. Nutrition education programs, specifically those funded through SNAP-Ed, have been shown to improve food insecurity by increasing food resource skills for participants (Rivera et al., 2019). Other outcomes of SNAP-Ed programs have been greater self-efficacy in cooking and consuming fruits and vegetables, and increased motivation for nutrition-related behavior change (Rivera et al., 2019 & Kaiser et al., 2015). DINE will be a primary stakeholder in providing education sessions to residents. DINE is funded through SNAP-Ed and Durham County, making them a trusted resource for this population (Durham County Public Health, n.d.).

#### **Evidence Based Outcomes**

A systematic review of garden-based interventions found that outcomes related to reducing BMI, increasing physical activity, and increasing fruit and vegetable consumption were more often achieved when compared to other health related outcomes (Gregis et al., 2021). Other, more subjective, outcomes include improved mental health, increased neighborhood satisfaction, and increased social interaction (Litt et al., 2011 & Barnidge et al., 2013). The short-term outcome for the Durham County community garden and nutrition education program is to: *Produce a 65% increase in the number of residents who report vegetable consumption 'several times per day,' from the pre-season survey to the post-season survey by August 2025* (Carney et al., 2012). This is based on outcomes from community-based participatory research (CBPR) study, in which participating households were Hispanic seasonal migrant workers (Carney et al., 2012). The hope is to replicate these outcomes because participants from the original CBPR are made up of an underrepresented and vulnerable population, much like the demographics of low-income renters in Durham. The long-term impact of this program is to: *Decrease household food insecurity by*



25% for residents of DHA properties that grow community gardens by August 2025 (Carney et al., 2012). More details about data collection and program analysis are to come in appendix B.3.

#### **Evidence Based Implementation Strategies and Activities**

Community gardens, exclusively growing edible plants, will be established on at least three of Durham Housing Authority's properties. These properties will be chosen based on the number of food-insecure residents, available land, and the water accessibility of those properties. Monthly education sessions will be held on-site at DHA properties, inviting residents to learn more about topics such as healthy eating on a budget, meal planning, shopping, nutrition support programs, and gardening. The purpose of establishing community gardens and providing nutrition education is to reduce food insecurity, increase vegetable consumption, and increase neighborhood appeal for residents living in DHA properties (Rivera et al., 2019 & Barnidge et al., 2013 & Litt et al., 2011).

This project will be implemented by a variety of personnel. DHA residents living on the three selected properties should be at the forefront of starting and maintaining the gardens and informing the nutrition education topics. It is important to include residents in every step of the process because they know best about their needs and desires relating to the garden and nutrition. Residents should be aware of the employment opportunities through the program including the project manager and garden keepers. A project manager will initially be needed to write grants and organize fundraisers to obtain funds for establishing the gardens. Other initial duties will be organizing the construction of new gardens, and gathering building/gardening equipment, recruiting, and hiring long-term garden keepers. Long-term responsibilities will be collaborating with DINE to schedule on-site education sessions and connecting with Briggs Ave Community Garden staff to take advantage of their available gardening resources. They will also oversee the payments and responsibilities of garden keepers. Long-term garden keepers will ensure that community garden rules are being upheld and that proper care is taking place. They will also collaborate with residents for planning garden workdays and perform garden workday functions (picking up and returning rented tools). This position may not be necessary if residents demonstrate full responsibility in caring for the gardens, but they will be hired initially to ensure at least the minimal upkeep and watering of the gardens are taking place. There should be one garden keeper for each of the three properties with a garden. Professionals through the DINE program will be responsible for teaching the on-site education sessions, as DINE employees follow the evidence-based guidelines provided by SNAP-Ed (Rivera et al., 2019 & Durham County Public Health, n.d.).

The goal is to build and maintain at least three community gardens at three different DHA property locations. The expected reach of the community gardens would depend on which properties have the space and water access fit to build the gardens. Each property has a different number of units, and resident interest in program participation may vary by property. Ideally, the gardens would be established in the DHA communities with the most interest, but surrounding friends and family of residents could participate in the garden if resident participation is lacking. Community gardens fit within the personal, interpersonal, and community levels of the socioecological model. The gardens fall into the interpersonal level because they would encourage social interaction that may result in strengthened connections between neighbors and family. Gardens also tie into the community level because they boost neighborhood aesthetics and increase communal opportunity through a source of physical activity, and by providing a close source of fresh fruits and vegetables (Gregis et al., 2021 & Litt et al., 2011). The DINE-led nutrition education would fit into the individual level of the socioecological model because it improves the nutrition knowledge of each resident, which in turn influences individual behavior and beliefs surrounding food.

#### **Stakeholders**

Several community stakeholders would be important to include in the launch and management of the DHA gardens and nutrition education program. Stakeholder engagement will be a priority in the planning stage of this program. Uplifting the voices of participants and stakeholders will improve the engagement and impact of the program. The first stakeholder involved would be the Durham Housing Authority (DHA). Partnership with the DHA would provide access to the property details needed to assess the feasibility of garden placement and upkeep. They would also help determine which communities would be most interested in and benefited by the garden and education program. The residents of selected DHA properties would be significant for informing the processes of this program. Residents would be the primary garden tenders and harvesters; therefore, they will be invited to participate in planning and building their community gardens. Residents should also be involved with determining relevant nutrition topics or issues to be considered for education sessions. The next stakeholder would be the DINE program, as they would take the lead during on-site education sessions. Other stakeholders include NC Cooperative Extension, Biggs Ave Community Gardens, and the Master Gardener Volunteers of Durham County, all of which provide support and resources for new gardeners.

## **Budget**

The estimated cost for the inaugural year is \$48,320. The funding goal is set to sustain the gardens for four years, which has an estimated cost of \$170,780. Most of the budget, 86.2%, will be spent on personnel. The project manager will be paid \$22 per hour for up to 1,000 hours per year. It is assumed that after the construction and start of each garden, this position will have limited duties. Hence, the hourly pay instead of a full-time salary. Additional personnel include three garden keepers. Garden keepers will be paid \$19 per hour, based on the average pay of gardeners in Durham County (Indeed, 2022). The garden keeper position will initially be limited to 5 hours per week but may be adjusted according to the voluntary participation of residents. The remaining costs are attributed to building materials, soil, gas reimbursement for tool and supply pick-up, and water utilities. See Table B.4 for a detailed description of each expense.

Funds will be obtained through grants and local fundraising. Local funding could come from an Adopt-a-Garden campaign, which partners with local businesses or universities that would sponsor the gardens. There are a variety of grants available for starting and running community gardens. Gardening grants are available through the Home Depot Foundation, the National Gardening Association, and the Captain Planet Foundation. The NC Cooperative Extension keeps an updated list of funding available for community gardens that would be useful when acquiring means to support this program (Bradley, 2023).

## **Conclusion**

Advantages of community gardens and nutrition education include increased fruit and vegetable consumption, increased community engagement, and increased food resource skills, as seen in outcomes achieved by similar interventions (Gregis et al., 2021; Rivera et al., 2019). Additional advantages include increasing residential access to fresh produce, new opportunity for physical activity, increased engagement among community members, increased beautification of the community, and that it addresses multiple levels of the socioecological model. Disadvantages of the program recommendations include the seasonality and growth times for garden harvests, the population differences between DHA renters and those in previous evidence-based interventions, and the absence of recorded community gardens programs at apartment complexes. Families accessing housing assistance nationwide have high reports of food insecurity (Helms, et al., 2020). Therefore, building community gardens and providing nutrition education on DHA properties could further support low-income renters in Durham

by providing easy access to fresh produce, encouraging vegetable consumption, and reducing food insecurity through the increase of individual food resource skills.

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**APPENDIX B.2.A: EVIDENCE-BASED NUTRITION PROGRAM FIGURES AND TABLES**

**Table B.4: DHA Community Garden Budget**

<b>Expense Item</b>	<b>Purpose</b>	<b>Cost</b>
Project Manager	Planning and organizing the construction of new gardens. Recruiting/hiring long-term garden keepers. Collaborate with DINE and Briggs Ave Community Garden to host guest speaker/education sessions.	\$22/hr for 19 hours a week up to a 1,000 hours per year \$22,000 per year
Long-term Garden Keepers*	Perform weekly duties such as weeding, soil care/fertilizing, and watering. (5 hours week per garden keeper)	\$14,820 per year Based on the average hourly pay for gardeners \$19/hr. (3 employees x 5 hrs x 52 weeks x \$19)
Seeds/Plants	Used to plant and grow produce only.	\$0 In-kind: Digging Durham Seed Library
Gardening Tools	Needed during garden building and planting seasons. Tools are rented for short-term, only on pre-planned garden workdays.	\$0 In-kind from Durham Tool Lending Library
Gas Mileage	Gas reimbursements for the garden keepers when picking up gardening tools/seeds.	\$1000 per year
Utilities, soil, and compost	Water utilities bills and regular upkeep of gardens averages this price according to NC Cooperative Extension.	\$3000 per year (\$1000 per garden)
Supplies for building the garden. <i>Inaugural year expense only</i>	Used to build the garden boxes (Wood, nails, hammers).	\$7,500 (Boekelheide & Bradley, 2017) NC Cooperative Extension estimates the start-up cost for community gardens (¼ acre) in NC to be \$1,000-5,000. We can assume that the cost of these supplies would fall within this price range (\$2500 x 3).
Inaugural Year Estimated Expenses: \$48,320		
<b>Total Cost to Create and Sustain 3 Gardens over 4 Years: \$170,780</b>		

Note. Regarding the Long-Term Garden Keepers: Ideally, the community would be in charge, but this position would ensure the upkeep of each garden. If residents can demonstrate full responsibility for community gardens, employment of garden keepers will not be necessary and can decrease expenses by \$14,820 per year.

## **APPENDIX B.3: EVIDENCE-BASED NUTRITION PROGRAM EVALUATION PLAN**

### **Introduction**

Housing falls within the neighborhood and built environment sector of the social determinants of health (SDOH) (Healthy People 2030, n.d.). Housing influences individual health through multiple factors including mental, physical, and financial wellbeing. Affordable housing was identified as the top health priority among residents in Durham County in the 2020 Community Health Assessment (Durham County Department of Public Health, 2021). According to the North Carolina Housing Coalition, 31% of Durham residents are cost burdened, paying over 30% of income on housing. Durham renters are disproportionately cost-burdened when compared to homeowners and are more likely to sacrifice necessities such as healthcare or food (DataworksNC, 2019; National Low Income Housing Coalition, n.d.). Based on these data, the prioritized aim is to alleviate cost burden for low-income renters. National data shows that nearly 40% of households receiving federal housing assistance reported food insecurity within a 30-day period (Helms, et al., 2020). Thus, a community garden and nutrition education program will be implemented for selected Durham Housing Authority (DHA) rental properties to reduce financial burden and improve food security for these low-income renters. The program will be conducted through the work of a project manager, participating DHA residents, local funders, and in collaboration with Durham's Innovative Nutrition Program (DINE) and NC Cooperative Extension programs.

### **Study Design and Data Collection**

The DHA Garden and Nutrition Education program will be evaluated using a quasi-experimental design. The treatment group is made up of DHA property residents who receive community gardens and on-site education sessions. The control group will consist of residents living on DHA properties that do not receive community gardens or on-site nutrition education. Tools used for data collection will include a demographic survey, pre- and post- gardening season questionnaires and focus groups. An initial survey will gather demographic data from head of households (age, race, sex, household size, etc.). Pre- and post-garden season questionnaires will be used to measure food insecurity status and fruit and vegetable intake of participants and will be developed from those used in the community-based participatory research study and will be pilot tested among a few participants prior to dissemination (Carney et al., 2012). The pre- and post- gardening questionnaire will consist of the same questions and will be used to assess changes in fruit and vegetable intake and food security in relation the gardening season.



Focus groups will be held after garden seasons to further assess the impact of the program beyond that of the structured questionnaires, and to encourage participant suggestions on program improvement.

#### **Sample and Sampling Strategy**

Convenience sampling will be used to collect data from participants who live on the three gardening properties and three non-gardening properties. The goal is to recruit participation from 20 households from each DHA property, making the total sample size 120 households (60 gardening households and 60 non-gardening households). It is important to note that one similar program, studying the impact of a community garden on vegetable intake and food security, has achieved statistically significant findings with only 40 participating households (Carney et al., 2012). This sampling strategy of both gardening and non-gardening DHA properties would allow for comparison between vegetable intake and food security levels of treatment versus control groups, as well as within-property changes over time. Convenience sampling allows for residence to freely choose to participate in data collection, which could be an advantage for reducing loss to follow-up. It is important that the same households complete both the pre- and post- gardening surveys to accurately determine changes over time.

#### **Specific Measures**

Outputs include the development of community gardens on three DHA properties, harvests of vegetables measured by type, quarterly nutrition education sessions hosted by DINE on each property, pre- and post- gardening season questionnaires (measuring vegetable consumption and self-reported food security status) and focus groups (capturing information beyond survey capabilities). Vegetable consumption will be reported via questionnaires by having participants report their frequency of intake: several times a day, once a day, a few times a week, almost never, or never. Food security variables will also be based on frequency. The number of responses for each category (on both produce consumption frequency and food security levels) will be represented as percentages, which are mutually exclusive of each property. Changes in the percentages for each frequency will be used to determine success of the program. For example, if a gardening property has a 15% response rate for consuming vegetables 'several times a day' in the pre-gardening questionnaire, a successful indication of the community gardens increasing vegetable consumption would be a response rate of 60% for consuming vegetables 'several times a day' in the post-gardening questionnaire. Ideally, these questionnaires would be conducted via interview by public health professionals to control for interpretation bias among participants. Outcome objectives for this program are based on values seen in a similar community-based intervention for low-income families (Carney et al., 2012). The intended

outcome objectives for the treatment group (residents of DHA properties receiving gardens and education sessions) are as follows:

Short-Term Outcome Objective: Produce a 65% increase in the number of residents who report vegetable consumption 'several times per day,' from the pre-season survey to the post-season survey by August 2025 (Carney et al., 2012).

Long-Term Outcome Objective: Decrease household food insecurity by 25% among the treatment group by August 2028 (Carney et al., 2012).

### **Timing**

Surveys collecting demographic and household data will be completed shortly after the participating properties are identified. Preferably, these would be given during the first community meeting. Pre-gardening season questionnaires will be given two weeks before the estimated last spring frost. The last frost in Durham County typically occurs within the first week of April (Almanac, n.d.). The post-gardening surveys will be given two weeks after the first frost, which typically occurs in the beginning of November in Durham (Almanac, n.d.). See Figure B.2 in the appendix for a detailed timeline of all program activities. Progress will be defined through maintaining process objectives. For example, host six DINE education sessions on each property by the end of 24 months. If progress does not occur, the project manager will meet with relevant parties (i.e., DINE managers, DHA administration, garden manager) to resolve or overcome barriers to achieving progress.

### **Analysis Plan**

Both qualitative and quantitative data will be collected. Pre- and post-gardening season questionnaires will provide quantitative data of vegetable consumption and levels of food security among participants. An example of pre- and post-gardening surveys questions can be reviewed in Table B.5 of the appendix. The percentages of reported frequencies for food insecurity and produce intake will be statistically analyzed, via t-tests, to compare the differences in pre- and post- garden response percentages for the treatment and control groups. This analysis will determine if the difference in percentage frequencies from pre and post gardening seasons is statistically significant, through p-values (alpha of 0.05) and confidence intervals. If the null value (1.0, meaning no change in the percentage of reported frequencies) is contained within the confidence interval, then the difference in frequency percentages will be considered insignificant. Qualitative data will be collected during focus groups. The focus groups will be recorded, with consent from participants, and transcribed to identify common themes.

### **Sources of Funding**

Funding will be obtained through local fundraising and grants prior to program initiation. Funds should be sufficient to cover the estimated cost of the program for at least four years to account for the variability and inconsistency of this source of funding. Annual fundraising and grant writing will occur to sustain the program indefinitely, assuming the program produces positive outcomes within the evaluation period. See Figure B.2 in the appendix for a funding timeline.

### **Data Use and Dissemination**

Data collected from this program will be discussed in a research article. No matter the outcomes achieved during this program, it is important to share findings to inform future nutrition interventions for similar populations. Promising outcomes will be used to garner funding through community partners and grants. Findings will also be shared within the Durham County Health Department, stakeholders, and the public through local news outlets and by dissemination of fact sheets.

### **Conclusion**

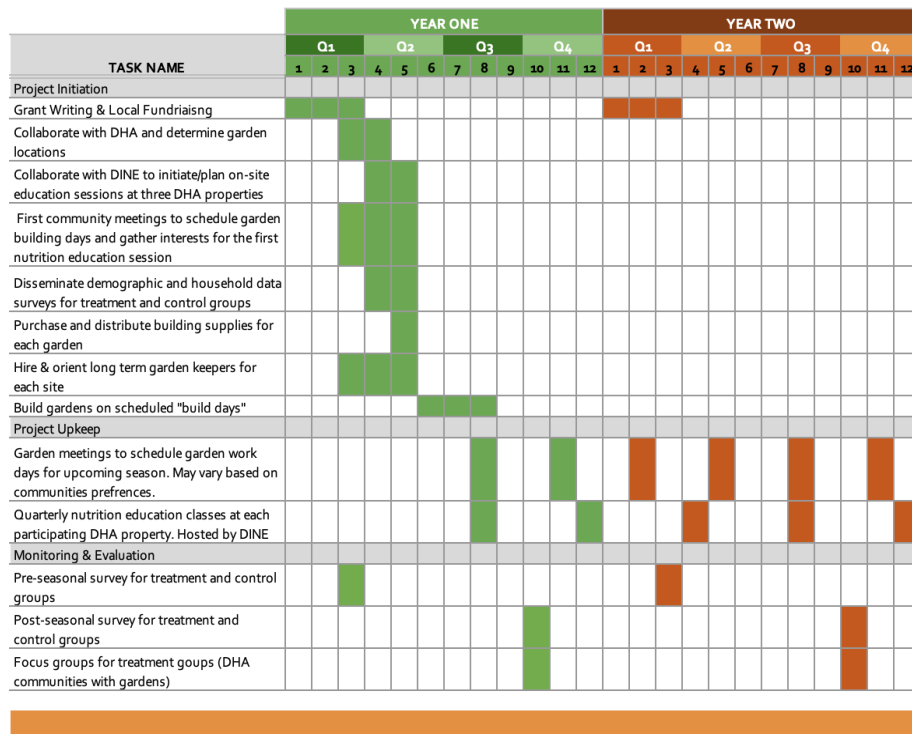
This intervention is intended to improve the food security status for low-income renters of Durham County. It is important to address this issue, as households receiving housing assistance nationally report high rates of food insecurity (Helms, et al., 2020). Benefits of this intervention include increased fruit and vegetable consumption and boosted community engagement among residents in the treatment group (Gregis et al., 2021 & Rivera et al., 2019). Findings from the study will be collected and interpreted through an interdisciplinary team of public health professionals, including statisticians, and nutritionists. This evaluation plan will be useful in supporting future efforts to expand the program throughout Durham County if the data supports improved nutrition among participants. Heavy collaboration between public health professionals and participants will take place throughout the program to ensure equitable decision making and to encourage program leadership within these communities. Through these efforts, Durham County may reduce the financial barriers faced by low-income renters, which would in turn free up income to further support household nutrition and individual health status.

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APPENDIX B.3.A: NUTRITION PROGRAM EVALUATION PLAN FIGURES AND TABLES

Figure B.2: Gantt Chart 24 Month



**Table B.5: Pre/Post Gardening Season Questionnaire Example\***

<b>Vegetable Intake</b>
<p>At what frequency does your household eat vegetables?</p> <ul style="list-style-type: none"> <li>· Several times a day</li> <li>· Once a day</li> <li>· A few times a week</li> <li>· Almost never, or never</li> </ul>
<b>Food Security</b>
<p>At what frequency in the past six months did the household worry that food would run out before money was available to buy more?</p> <ul style="list-style-type: none"> <li>· Never</li> <li>· Sometimes (less than once a month)</li> <li>· Frequently (at least once a month)</li> <li>· All the time (weekly)</li> </ul>
<p>At what frequency in the past six months did adults in the household skip meals due to lack of money to buy food?</p> <ul style="list-style-type: none"> <li>· Never</li> <li>· Sometimes (less than once a month)</li> <li>· Frequently (at least once a month)</li> <li>· All the time</li> </ul>
<p>At what frequency in the past six months did children (&lt;18 years old) skip meals due to lack of money to buy food?</p> <ul style="list-style-type: none"> <li>· Never</li> <li>· Sometimes (less than once a month)</li> <li>· Frequently (at least once a month)</li> <li>· All the time (weekly)</li> </ul>

Note. Questionnaire adapted from: Carney, P. A., Hamada, J. L., Rdesinski, R., Sprager, L., Nichols, K. R., Liu, B. Y., Pelayo, J., Sanchez, M. A., & Shannon, J. (2012). Impact of a community gardening project on vegetable intake, food security and family relationships: a community-based participatory research study. *Journal of community health, 37*(4), 874–881. <https://doi.org/10.1007/s10900-011-9522-z>

## **APPENDIX C: KARINA GONZALEZ INDIVIDUAL DELIVERABLES**

### **APPENDIX C.1: SOCIAL DETERMINANT OF HEALTH ANALYSIS**

Housing, as a social determinant of health, is an indicator of both health and well-being, and directly tied to numerous physical and mental health outcomes (Taylor, 2018). The connection between housing and health stems from four direct pathways, including stability, quality and safety, affordability as linked to cost burden, and neighborhood (Taylor, 2018). Healthy People 2030 outlines the significance of neighborhood and built environment as a social determinant of health, where they outline decreasing the cost burden of housing as a goal, through aiming to decrease the percentage of individuals allocating 30% or greater of their income to housing (Office of Disease Prevention and Health Promotion, 2020). When families experience a high cost burden as defined by 30% or more of income going towards housing, families lack financial access to affordable food and nutrition and health promoting resources, and are less likely to delay seeking healthcare for medical conditions or incidents due to cost (Taylor, 2018). For cost burdened families who rent their home, they are 23% as likely to face difficulties in buying food for their families as compared to their non-cost burdened counterparts (Taylor, 2018).

Direct health outcomes associated with housing environment include decreases in Disability-Adjusted Life Years (DALYs), where low income households have higher rates of unsafe energy sources which has shown to increase death rates and decrease DALYs (D'Alessandro & Appolloni, 2020). Other health outcomes related to housing affordability include adverse mental health outcomes and increased risk of infectious disease such as tuberculosis which can result from overcrowding as a way to mitigate the challenge of housing costs (D'Alessandro & Appolloni, 2020).

#### **Geographic and Historical Context**

Durham County has a unique history of housing defined by segregation, redlining, displacement, and inequities that have led to racially disparate accumulation of wealth (Durham County Department of Public Health, 2021). Within the community, various census tracts were categorized as places with increased risk that did not merit being awarded home loans by the United States' Home Owners' Loan Corporation (Durham County Department of Public Health, 2021). These locations include the neighborhoods, "Hayti, East Durham, Albright, Wellons Village, Historic Hillside, Hillside Park, Massey-Linwood, Oak Grove, Eastway Village, the Fayetteville Street Commercial District, North Carolina Central, Franklin Village, Sherwood Park, Hoover Road, and Old North Durham" (DCDPH, 2021; census.gov, 2020). The implications of redlining on health are many, ranging from increased temperatures and

heat risk resulting from increased pavement and decreased trees as compared to non-redlined areas, to increases in non-white residents living below the federal poverty line (DCDPH, 2021; census.gov, 2020). Health outcomes associated with populations who experienced historic redlining include higher rates of asthma and cardiovascular disease (Bryant-Stephens, 2021; Mujahid et al., 2021).

Durham County, NC, is a rich and vibrant county full of an array of cultures and communities. The Durham community is a strong and prevalent faith-based community, including community organizers and health leaders (DCDPH, 2021). Durham's health focus and community organizations are one of the community's strengths (DCDPH, 2021).

### **Priority Population**

Within North Carolina, cost burdened homes are more prevalent in families of lower socioeconomic status, and among renters rather than homeowners (Census.gov, 2021; Office of Disease Prevention and Health Promotion, 2020). As increased cost burden is associated with socioeconomic status, and median income, economic disparities across races and ethnicities are important to consider (Joint Center for Housing Studies, 2016; Office of Disease Prevention and Health Promotion, 2020).

Within Durham the prevalence rate of households below the federal poverty level is significantly higher for Black or African American, Hispanic, and those who mark "Other" as their racial category (Census.gov, 2021; De Marco & Hunt, 2018). For median income, similarly, in Durham Hispanic and Black households have the lowest median income levels (Census.gov, 2021; De Marco & Hunt, 2018).

Racial discrimination and policies such as historic redlining have led neighborhoods to have disparate rates of access to liquid assets, and access to banks (De Marco & Hunt, 2018). The population in Durham with highest rates of insufficient liquid assets to be financially secure, and those with lack of access to banks are disproportionately Black or African American and Hispanic individuals (De Marco & Hunt, 2018).

Considering the cost burden's disparate impact on renter, and economic disparities by race in Durham, the priority population for housing affordability are those with high cost burden, as defined by 30% or more of a family's income allocated to housing among Black and Hispanic households in (Office of Disease Prevention and Health Promotion, 2020), with a focus on individuals in historically redlined neighborhoods.



### **Measures of Housing Affordability**

Within Durham County, 32% of households are cost burdened and have mortgage or rent payments constituting 30% or more of their income (North Carolina Housing Coalition, 2021). Within Durham County, 47.5% of renters are cost burdened and have rent constitute 30% or more of their income, as shown in Figure 1, where in North Carolina, 47.2% of renters are cost burdened (Census.gov, 2021). Renters are disproportionately cost burdened in both Durham County and North Carolina, as shown in Figure 1., as compared to homeowners, illustrating a disparity (Census.gov, 2021; North Carolina Housing Coalition, 2021).

### **Rationale & Importance**

Durham County has rich community organizations that provide robust infrastructure to address health inequities (DCDPH, 2021). Incorporating housing affordability as a county priority in conjunction with existing community-centered organizations has the potential to begin to reverse the historic inequities of redlining and segregation that still manifest themselves within the county's poverty rate and health rates by neighborhood (DCDPH, 2021). Decreasing cost burden would assist North Carolina in their goal of improving housing quality, and would elevate Durham from falling within the 15 NC counties with 18-26% of people with severe housing problems in 2018 (North Carolina Institute of Medicine, 2020).

### **Disciplinary Critique**

County Commissioners and Public Health Leaders alike would benefit from addressing cost burdened homes within Durham County, as it could work to address disparities and elevate quality of life for Durham County's residents (North Carolina Institute of Medicine, 2020).

With a history of communities of color being disenfranchised, minoritized, and segregated in Durham County (DCDPH, 2021), addressing the health disparities can begin to address the inequities. The Centers for Disease Control and Prevention provide 10 Essential Services of Public Health that elevate equity as the core tenant and central goal of public health (Centers for Disease Control and Prevention, 2020), which many public health leaders have the skills to enact in local communities. Public health leaders hold unique skill sets to address drivers of health that can lead communities towards more equitable systems, policies, and infrastructure, including in the context of affordable housing.

Beyond furthering health equity, in addressing housing affordability, County Commissioners could help improve the well-being and city infrastructure for their constituents and appeal to historically

disenfranchised groups. This could in turn increase their electability through helping Durham County “thrive” as outlined in their motto of “Live. Grow. *Thrive*” (Durham County NC, n.d).

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**APPENDIX C.1A: SDOH ANALYSIS FIGURES AND TABLES**

**Figure C.1: Gross Rent as a Percentage of Household Income in NC**

GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME (GRPI)	Durham County	North Carolina
Less than 15.0 percent	11.2%	14.5%
15.0 to 19.9 percent	11.8%	13.6%
20.0 to 24.9 percent	16.0%	13.2%
25.0 to 29.9 percent	13.5%	11.5%
30.0 to 34.9 percent	10.5%	9.1%
35.0 percent or more	37.0%	38.1%

## APPENDIX C.2: COMMUNITY PARTNER ANALYSIS

### Introduction

Housing is an indicator of health, connected to numerous physical and mental health outcomes (Taylor, 2018). The connection between housing and health stems from four direct pathways: stability, quality and safety, affordability as linked to cost burden, and neighborhood (Taylor, 2018). Cost burdened renters are 23% as likely to struggle acquiring food for their families as compared to their non-cost burdened counterparts (Taylor, 2018). Although renters and homeowners alike can fit the definition of being cost burdened, in North Carolina (NC) renters specifically have a higher prevalence as cost burdened than those who are homeowners (Census.gov, 2021; North Carolina Housing Coalition, 2021). In Durham, NC 47.5% of all renters are cost burdened, which is slightly higher than the state average of 47.2% (Census.gov, 2021).

Historic housing policies in Durham County, such as Redlining, have led to racially disparate accumulation of wealth (Durham County Department of Public Health, 2021). The policy referred to as “Redlining” categorized different neighborhoods as places that were too risky for families who lived there to be given Home Loans by the United States’ Home Owners’ Loan Corporation, which led to and continues to impact racial and economic disparities in Durham (DCDPH, 2021). Redlining is correlated with increased temperatures and heat risk to individuals’ health resulting from increased pavement and decreased trees as compared to non-redlined areas (DCDPH, 2021; census.gov, 2020). Redlining is correlated with an increase in non-white residents living below the federal poverty line in Durham (DCDPH, 2021; census.gov, 2020).

A systems level approach is necessary to address the disparities in affordable housing, due to the complex systems at play. Various programs could effectively target leverage points to address this issue on a systemic level and decrease the health disparities that impact cost burdened renters in Durham County, including a community garden program focused at affordable housing communities. A community garden system would develop sustainable food options to increase produce availability for families, which could be particularly impactful for cost burdened families and food insecure families.

### Community Partner Analysis

The system that promotes health outcomes for cost-burdened renters in Durham County involves many community partners and individuals who are invested in the system and the issue of disparate health outcomes. Such

community partner groups and organizations are outlined in Appendix 1, adjacent to their relationship to the housing system that precedes an array of poor health outcomes for cost burdened renters in Durham County.

#### **Community Partner Influence and Interest Map**

An influence, interest map is used to analyze and illustrate the different levels of influence or power an entity has, in addition to their level of investment. The tool can be used to understand the role community partners may play in regards to the system of health outcomes for cost burdened renters, as illustrated in Appendix 2. Some key partners include the Durham Housing Agency that is high influence and high investment, the City of Durham that is high influence and low investment, and Durham cost burdened families that are low influence and high investment. Each of these partners would be key in developing a comprehensive, effective, and equitable program.

#### **Community Partner Representation and Participation**

Various factors influence who are represented as community partners and who is able and willing to participate in addressing the housing system for cost burdened renters that interact with the health system. One factor affecting participation is the availability of individuals and organizations. Many organizations at an organizational level have limited resources, including time to work to address the issue of the lack of affordable housing in Durham. Various organizations, such as Housing for New Hope Organization, are invested in allocating resources to support families, which may reduce the resources available to address the system at the root of the issue.

Understanding the work that community partners are doing within the community to address the issue is vital in ensuring efforts are not siloed. Of the partners outlined in Appendix 1, key partners to engage include Durham County cost burdened families, the Durham Housing Authority, and Housing for New Hope.

Families and individuals who are cost burdened, which statistically is shown to overlap with being of a lower socioeconomic status (Joint Center for Housing Studies, 2016; Office of Disease Prevention and Health Promotion, 2020), may have less availability to participate. Participating in a process to address the system, such as a Co-Design process, requires time away from family and work responsibilities, and energy. Similarly, families who have been disenfranchised, such as families who have had rent increases and potential displacement related to renter cost burden, may have limited trust in a system that has actively perpetuated harm against them.

## **Worldview Explorations**

All community partners perceive the system of health as it relates to housing for cost burdened renters in Durham County from their own perspectives and worldviews. In order to best approach an intervention or systems change, understanding the different perspectives of those who will be involved in the change process is vital. CATWOEs and Root Definitions illustrate how an individual may perceive an issue. Outlined below are Root Definitions for two community partners, with their CATWOEs respectively reflected in Appendices 3 and 4:

### **Cost Burdened Durham mother: Root Definition**

Root definition: Improve mine and my family's health by decreasing the amount of my income I spend on rent each month, in order to ensure I have sufficient funds available to afford food, healthcare, and basic necessities for me and my family.

### **Private Apartment Complex Owner: Root Definition**

Root definition: Increase income and profit by decreasing the number of housing vouchers and cost burdened families in my rental units, in order to maximize profit margins.

## **Conclusion**

The CATWOE and root definition of the cost burdened mother are focused around affordable housing solutions to ultimately improve her family's health. While the system is actively harming this family that pays over 30% of their family's income to monthly rent costs, it is simultaneously profiting individual landowners and the financial sector. The CATWOE and root definition of the private apartment complex owner illustrate investment in future profit and gain, which increasing rent prices, and hence the percentage of someone's income being allocated to rent, can cause.

The CATWOEs evoke the questions of what drivers ultimately influence apartment owners to increase costs: are local increases in taxes and expenses drivers, the cost of neighboring apartment complexes or rental properties, demand for different areas which gentrification may influence, or other factors? The understanding of the different dynamics that cause apartment landlords to raise rent beyond accessible standards is vital in fully understanding and determining effective leverage points for interventions.

One strength of Durham community partners is the vast number of organizations dedicated to issues related to or congruent to affordable housing for renters. Many organizations are working to address issues that affect cost burdened families, including how the Proactive Rental Inspection Program prioritizes all rental units that are of safe

living conditions and adherent to city codes. Some of the limitations of the community partner context within Durham County include the lack of funding available for the issue, and the lack of housing options for the growing community which contribute to the issue. These issues create a chasm between community partners and the ability to provide the necessary infrastructure to support cost-burdened families. With limited funds come different priorities of community partners and can cause disagreements of where funds should be allocated. For example, the City of Durham may prioritize addressing the issues of the taxpayers who pay the most in taxes, while Housing for New Hope prioritizes finding sustainable housing options for the individuals with the highest need, especially individuals who are houseless. While both organizations address community issues, with limited resources they may not have much capacity to address affordable housing issues for cost burdened families.



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**APPENDIX C.2.A: COMMUNITY PARTNER ANALYSIS FIGURES AND TABLES**

**Table C.1: Community Partner List**

<b>Community Partner List</b>	<b>Investment in the System of Cost Burdened Homes in Durham County</b>
Cost burdened renters in Durham	Directly affected recipients of the system
Long term Durham residents who experienced redlining	Historically affected by the system, and historically systematically disenfranchised by redlining and the cascading impacts
Durham Housing Authority	Provides affordable housing options for Durham County, NC (Durham Housing Authority, n.d.).
Housing for New Hope Organization	Connects individuals who are unhoused to affordable housing options, and helps individuals with housing waivers find openings (Housing for New Hope, 2023).
Proactive Rental Inspection Program	Regulates safety of apartments and rental properties, including those of cost burdened families, and is invested in the safety of families and their health (City of Durham, n.d.).
City of Durham	The local government system that works with property taxes and affects decision making for housing policies at the city level
Affordable Housing Building Owners	House individuals who may be cost burdened, due to the intersection of being cost burdened and of a lower socioeconomic status (Joint Center for Housing Studies, 2016; Office of Disease Prevention and Health Promotion, 2020); Building owners profit from increasing rental prices as the economy shifts, and as neighborhood gentrification increases the cost of living in areas, however are restricted by prices able to offer to individuals with housing waivers
Durham Apartment Complex Owners	House individuals who may be cost burdened, due to the intersection of being cost burdened and of a lower socioeconomic status (Joint Center for Housing Studies, 2016; Office of Disease Prevention and Health Promotion, 2020); Building owners profit from increasing rental prices as the economy shifts, and as neighborhood gentrification increases the cost of living in areas
Durham County School District	Funded in part by property taxes; Support the community and children of the County, including students who may grow up in cost burdened homes (Durham Public Schools, n.d.).
Durham Health Department	Invested in the health of the community, with particular investment in addressing the social determinants of health, including housing as an indicator of health; Support the community, including cost burdened renters.
Durham’s Children Initiative	Invested in promoting positive resources for children. Support opportunities for the community and children of the County, including students who may grow up in cost burdened homes (Durham Children’s Initiative, n.d.).

Durham Crisis Response Center	Provides resources and protection to survivors of intimate partner violence and of sexual assault and supports individuals who may experience consequences of the lack of available affordable housing (Durham Crisis Response Center, n.d.).
Durham Law Enforcement	Invested in neighborhood safety and crime
Habitat for Humanity	Provides housing options for a limited number of families who indicate need (Durham Habitat for Humanity, 2022).
Urban Community AgriNomics	Invested in promoting access to farm area and garden space for Durham, and affects health for cost burdened individuals due to the increase in fresh free food provided to the community (Urban Community AgriNomics, n.d.).
Durham County Parks and Recreation	Provides community play options, green spaces, recreation, and water access and play throughout Durham County; Support the community, including cost burdened renters (City of Durham, n.d.).

**Table C.2: Community Partner Influence and Interest Map**

<b>High Influence/Low Interest</b> Durham Apartment Complex Owners City of Durham Durham Law Enforcement	<b>High Influence/High Interest</b> Proactive Rental Inspection Program Durham Housing Authority Affordable Housing Buildings
<b>Low Influence/Low Interest</b> Durham’s Children Initiative	<b>Low Influence/High Interest</b> Cost burdened families in Durham Durham County School District Long term Durham residents who experienced redlining Durham Health Department Housing for New Hope Organization Durham Crisis Response Center Habitat for Humanity

**Table C.3: Cost Burdened Durham mother: CATWOE and Root Definition**

Root definition: Improve mine and my family’s health by decreasing the amount of my income I spend on rent each month, in order to ensure I have sufficient funds available to afford food, healthcare, and basic necessities for me and my family.

Customer:	Families who have low income to rent ratio as compared to Area Median Income, or who spend 30% or more of their income on rent in Durham County
Actors:	Durham Housing Authority, City of Durham, and Durham Landlords
Transformation:	Increase access to safe and affordable housing, and control the price of rent as to not increase annually to a degree that displaces low income families and long term renters
Worldview:	Durham is continuing to grow and increasing costs and value of rental options further decreasing the number of affordable housing options available, which increases rent prices and leaves families with inaccessible housing
Owner:	Landlords are the ones who are perpetuating the system and increasing the prices, and the City of Durham and Durham Housing Authority are neglecting providing support for the issues of affordable housing, while the Durham Health Department does not offer sufficient health support
Environment:	Durham County and especially areas that previously had affordable housing options which have been converted to higher cost rentals for medium to high income families

**Table C.4: Private Apartment Complex Owner: CATWOE and Root Definition**

Root definition: Increase income and profit by decreasing the number of housing vouchers and cost burdened families in my rental units, in order to maximize profit margins.

Customer:	Current and future apartment tenants
Actors:	Construction businesses, city planners, rental companies, renters who drive apartment prices up
Transformation:	Maintain the current number of available affordable housing spaces as to not further encroach on profitable areas for landlords, while ensuring there are some options for low-income renters
Worldview:	Gentrification/development is improving our city, bringing in individuals who will pay more for apartments and hence increasing the price of rent, which is increasing my profit. Rent controls and housing wavers infringe on my profit margins, and low income renters are faced with additional challenges related to social determinants of health which create increasing difficulties and complexities for me as an apartment complex owner
Owner:	The local government, housing authority, and city planners have the power to determine and control rent costs
Environment:	Durham County’s rental housing market

## **APPENDIX C.3: ENGAGEMENT AND QUALITY IMPROVEMENT PLAN**

### **Introduction**

Lack of access to affordable housing, and food insecurity are linked (Lee et al., 2021), indicating a need for both to be addressed in order to improve health outcomes for individuals whose income is 30% or Durham's annual median income. The purpose of the proposed program is to decrease food insecurity for cost burdened renters in Durham County, NC. Community gardens offer benefits in the realm of food security and built environment both. Introducing gardens to affordable housing built through the Durham Housing Authority (DHA) could offer immense benefits. In addition to the garden, culturally relevant education sessions surrounding meal planning, shopping on a budget, and accessing governmental safety net programs would be offered in partnership with local community leaders from corresponding organizations.

### **Engagement Strategy**

An engagement plan is necessary to the creation of the community gardens due to its role in facilitating understanding, accountability, and trust between community partners. An engagement plan leads to division of responsibility, understanding of delegated tasks, and will ultimately lead to the framework to beget the activities to lead to set up of community gardens, onsite education facilitation, and connection to safety net programs for low-income renters in Durham County. An engagement plan is necessary to success as it leverages the perspectives and knowledge of what is needed within the community for low-income renters, and what resources are available to subsequently lead to the implementation of community gardens, to increase food security and health outcomes of Durham County low-income renters.

### **Community Partner Selection**

The partnership to implement community gardens and educational programming at Durham Housing Authority affordable housing units would include many responsible partners (see Appendix A). The Durham Housing Authority who manages many affordable housing properties will be a community partner as will Durham's Innovative Nutrition Education (DINE) program who will lead nutrition education. Durham's Department of Social Services, Health Department, and the Durham Center for Senior Life will serve as partners as they respectively house the relevant programs, Supplemental Nutrition Assistance Program (SNAP), Women, Infant, and Children (WIC), and Senior Farmers' Market Nutrition Program (SFMNP). As one of the partner's responsible (see Appendix A), Durham Housing Authority would be the responsible community partner for facilitating and leading the

community garden project due to their role in affordable housing management, facilitation, and investment in promoting quality living for Durham County families. With access and purview over the built environment of affordable housing locations, and values in promoting the well-being of community that generate organizational buy-in, the Durham Housing Authority would be ideal in facilitating community engagement and leading the community garden initiative. The investment of the Durham Housing Authority is paramount as due to their management of locations and as deeply invested in the issue of affordable housing, their opposition could prevent the community garden initiative from being implemented.

#### **Barriers and facilitators**

One potential barrier to the Durham Housing Authority's participation is limited availability of time and staffing to dedicate to the community garden effort. As sufficient affordable housing options remain an issue in Durham, DHA may be focused on increasing pathways to develop further housing locations. Availability of time may be an area where another community partner would be able to contribute their resources of time to support DHA.

Another potential barrier could be the DHA's resistance to wanting a garden without accountability for management of the locations. Addressing the collaboration of the initiative, and providing tools to provide measures of accountability for collaborators could address the issue and further promote DHA's buy-in.

A third potential barrier to the DHA's participation is lack of trust of community partners with which the DHA does not have standing relationships and community experiences with. A lack of shared experiences with some community partners could provide barriers to trusting said partners to be responsible for community garden development and maintenance on DHA property. Tangible accountability measures, and conversations structured to generate experience and trust could provide solutions to such barriers.

#### **Methods, Timing, and Measures**

Six Conversations is an engagement tool where an interview will be used between an array of community partners to discuss the opportunity, the possibilities of the project, who would be responsible, who may dissent and who would support, the strengths that individuals and organizations bring to the conversation, and the agreements and commitments that the group collectively generates and pledges to (Block, 2005). This is a group tool, supporting collaborative and engaged participation, facilitated by the DHA, and would address concerns surrounding accountability and buy-in and time commitments of community partners (Block, 2005). During the design phase,

this interview process will lay the groundwork for subsequent tools to note tangible actions and steps for community partners (Block, 2005).

The second engagement tool which will be used is a Team Charter (Duffy & Moran, 2011). All partners will be involved with the creation of the document and policies to ensure accountability and agreement between partners. The document will outline the responsibility and roles of partners for completing different aspects before the project begins. The creation of the charter will help to manage DHA's time constraints through providing space to delegate responsibility and support in the document (Duffy & Moran, 2011), and will serve to document the tangible agreement and plans resulting from Six Conversations (Block, 2005). The Team Charter tool is a group tool, with collaborative and engaged participation, facilitated by the DHA, and would address concerns surrounding accountability and buy-in and time commitments of community partners during the design phase of the effort (Duffy & Moran, 2011).

Thirdly, a 30/30 Tool will serve as a check in with a broader group and will continue to generate buy-in and encourage any individuals who may have any hesitations through the implementation phase of the project (Morrison, 2017). The tangible nature of the activity and quick moving nature of it (Morrison, 2017) would help accelerate trust and relationship development between community partners. The engagement tool is held in a group format, is collaborative, would be facilitated by the DHA, and addresses the barrier of lack of trust, and hesitation surrounding lack of accountability. The tool generates tangible results, appealing to investors and the broader community (Morrison, 2017).

### **Improvement Plan**

Performance measures and indicators are vital to ensure that outlined efforts are leading to intended results. Each of the generated performance measures indicates the status of the engagement activity in successfully involving community participants, or in completing detailed activities. The measures of participation and activity completion are vital at beginning stages of implementation, as a shift in strategies to alternatives further suited to community partners' unanticipated needs would be necessary if measures are not indicating preliminary success. The data generated would be measured in the relevant outlined stage of program development or implementation (Appendix B), and the analysis of such would lead to actionable change or continuation.

Performance measures corresponding to each respective engagement method are outlined below (see Appendix B for further information):



*Six Conversations performance measure: Percentage of community participants of all requested to participate who engage in the Six Conversations interview and commit to participate in the project regardless of level of RASCI.*

The status of the Six Conversations (Block, 2005) measure will be determined from attendance and participation. Despite occurring at a single point over the project period, the measure sets a foundation for expectations of participation and accountability in addressing lack of affordable housing for low-income families in Durham.

*Team Charter performance measure: Percentage of community partners responsible, accountable and supportive for different aspects of the project who sign and commit to the finalized Team Charter*

The Team Charter measure will be calculated from responsible, accountable, and supportive attendees who sign and commit to the Team Charter (Duffy & Moran, 2011). Despite occurring at a single point over the project period, the measure sets a foundation for expectations of participation and accountability in addressing lack of affordable housing for low-income families in Durham.

*30/30 performance measure: Number of months with completed task per 30/30 tool over the one-year course of the implementation stage.*

The 30/30 measure will be calculated from months with a completed task. As it occurs throughout the entire implementation stage of a year over a set period of 30 days, it will be measured through completion of tasks. The measure guarantees progress, momentum, and action moving forward in addressing the lack of affordable housing for low-income families in Durham.

#### **Accountability Partners**

A Memorandum of Understanding (MOU) would be vital to set the scope and expectations of work between the two parties, the Durham Housing Authority and Habitat for Humanity. As the two agencies would collaborate in the completion of community garden infrastructure with Habitat for Humanity coordinating materials, labor, supervision, and coordination, and DHA providing the locations, the MOU would outline such roles, expectations, and responsibility. Responsibility for provisions of goods and services, and liability would be outlined within the MOU. The scope of the MOU would include shared goals and purpose, roles, expectations, and responsibilities of parties, timeframe, and overall budget. The MOU would be drafted by DHA in collaboration with Habitat for Humanity and reviewed by both organizations.

The scope of the MOU would detail the activities outlined in the collaboration and completion of the community gardens, and should consider grounds for termination. The MOU would span the period of 12 months from the point it is signed by all parties, with a clause outlining grounds for termination. Either party may terminate the MOU with written notice of 30 days.

The MOU would serve as a collaborative document, with the goal of the proposed community garden program to decrease food insecurity for cost burdened renters in Durham County, NC. Once determined to be a mutually agreed upon document, leadership would review the document and subsequently sign and date the MOU into effect.

The MOU would be disseminated to appropriate entities in both organizations, and to appropriate community partners. It would also be shared as relevant through meetings with community partners. The provisions of the document will also be noted and incorporated into the Team Charter developed as a community partner engagement activity to ensure continuity and consistency of roles and responsibilities (Duffy & Moran, 2011).

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APPENDIX C.3.A: ENGAGEMENT & QUALITY IMPROVEMENT PLAN FIGURES AND TABLES

Figure C.2: RASCI Table

RASCI Table		
<b>Policy/Program</b> – Community garden development at Durham Housing Authority properties with education opportunities and connection to safety net governmental and community programs		
RASCI Levels Who is...	Community Partners	Rationale
<b>Responsible</b> =owns the challenge/ project	Durham Housing Authority Durham’s Innovative Nutrition Education (DINE)	Both partners will lead, facilitate, and complete different aspects of the program, and coordinate completion.
<b>Accountable</b> =ultimately answerable for the correct and thorough completion of the deliverable or task, and the one who delegates the work to those <i>responsible</i>	Durham County Commissioners Habitat for Humanity Urban Community AgriNomics	Habitat for Humanity and Urban Community AgriNomics will coordinate specific aspects and activities of the overall goals. County Commissioners provide approval, authority, delegation, and oversight.
<b>Supportive</b> =can provide resources or can play a supporting role in implementation	Durham’s Department of Social Services, Durham County Health Department The Durham Center for Senior Life	Each organization can provide resources and support in implementing services to connect individuals to safety net programs housed in their organizations
<b>Consulted</b> =has information and/or capability necessary to complete the work	Durham County families with 30% or less AMI City of Durham Affordable Housing Building Owners Durham Apartment Complex Owners	Durham families offer necessary and vital perspectives to inform all actions and step of the proposal, while other organizations hold important information and guiding perspectives
<b>Informed</b> =must be notified of results, process, and methods, but need not be consulted	North Carolina Durham Cooperative Extension	Cooperative extension will be kept informed of program benchmarks and goals

**Table C.5: Methods, Timing, and Measures Table**

<b>Engagement Method</b>	<b>Facilitator/Barrier</b>	<b>Phase(s)</b>	<b>Performance measure</b>	<b>Assessment method</b>	<b>Frequency</b>
Six Conversations (Block, 2005).	Limited availability of time; accountability of management	Design	Percentage of community participants who engage in the Six Conversations interview and commit to participate in project regardless of level of RASCI.	Total participants who engage and commit out of the total number of outlined community partners, tracked through minutes of Six Conversation meeting and attendance	One time
Team Charter (Duffy & Moran, 2011).	Limited availability of time; accountability of management; Lack of trust	Design	Percentage of community partners responsible, accountable and supportive for different aspects of the project who sign and commit to the finalized Team Charter	Total participants who engage and commit out of the total number of responsible, accountable or community partners, tracked through Team Charter	One time
30/30 (Morrison, 2017)	Lack of trust	Implementation	Number of months with completed tasks per 30/30 tool over the one-year course of the implementation stage.	Total months with completed task out of the 12 months, tracked through monthly check ins and reflected in meeting minutes	Twelve times

## **APPENDIX D: JOSEFINA LABRA ESCUDERO INDIVIDUAL DELIVERABLES**

### **APPENDIX D.1: SOCIAL DETERMINANT OF HEALTH ANALYSIS**

#### **Social Determinant of Health**

Social Determinant of Health Social Determinants of Health (SDOH) may be defined as the conditions in the environment in which people are born, live, learn, work, and play that impact the quality of life and the health of individuals, while also contributing to health disparities and inequities (Durham County Department of Public Health, 2021). These SDOH's can be divided into five groups: Economic Stability, Education Access and Quality, Health Care Access and Quality, Social and Community Context, and Neighborhood and Built Environment. While all five are equally important, this analysis will focus on the Neighborhood and Built Environment domain, specifically the objective, "Reduce the rate of minor and young adult perpetration of violent crimes --AH-10" (Durham County Department of Public Health, 2021). Oftentimes, those who have entered the justice system will have trouble in school, and have a higher chance of mental health and/or substance use disorders (Durham County Department of Public Health, 2021) In addition, research has shown that exposure to violent crime has been associated with various negative health outcomes such as increased risk for cardiovascular disease, diabetes, asthma, low birth weight, and preterm births (Stafford, 2007; Kramer, 2010). Other research has found that malnutrition has been associated with cognitive deficits and antisocial behavior which may be linked to violence (Dorothy, 2019).

#### **Geographic and Historical Context**

Durham is a 286-square mile single-city county that is located in the central section of North Carolina and is home to over 230 neighborhood associations (Durham County Department of Public Health, 2021). Durham has been changing in many ways in the last couple of decades, with one noticeable difference in population with a 64% increase from the years 2000 to 2019 (Durham County Department of Public Health, 2021). This increase in population has brought a lot of diversity into the county with various people coming from different cultural and ethnic backgrounds.

Over time, there has been an increase in segregated neighborhoods. The rise of segregated neighborhoods has created an issue of concern amongst Durham County residents due to neighborhood violence that has resulted from this segregation. This is in part due to the disadvantages these communities have and the fact that African American and Latinx populations bear the greatest burden of crime (Durham department of Public Health 2021).

Violent crime had the greatest number of responses from residents when asked what is affecting their quality of life the greatest (Durham Department of Public Health, 2021).

While Durham has historically had high rates of violent crimes<sup>6</sup>, trends have been declining in the past couple of years, decreasing by 13% in the total number of violent crimes from 2016-2018 (Durham County Department of Public Health, 2021). These numbers are still much higher than the national average and in the Healthy NC 2030 report, the violent crime objective was not met at a County level for Durham (Durham County Department of Public Health, 2021). To see more stats, refer to Appendix D.1.a.

The Durham County Criminal Justice Resource Center (CRJC) is one of these organizations that have aided in supporting individuals that have been involved with incarceration (Parmer, 2019). This organization acknowledges the various aspects that may lead to incarceration, including racial disparities. They assist individuals with various aspects such as mental health, substance abuse disorders, as well as the chronic health conditions associated with violent crimes stated earlier (Parmer, 2019). In addition, another program that has often helped individuals with reentry is the Formerly Incarcerated Transition (FIT) program that is led by the Durham Department of Public Health (DDPH) (Durham County Department of Public Health, 2023). They do similar work as the CRJC, focusing on connecting individuals with chronic illnesses who have been incarcerated to health care systems (Durham County Department of Public Health, 2023).

### **Priority Population**

The population of interest is communities of color, as they are affected the most regarding crime and violence. There are various explanations for this, such as the increased rates of poverty, unemployment, education inequalities and residential segregation that these communities face (Durham County Department of Public Health, 2021). Extensive racial and ethnic disparities contribute to these factors partly due to dated policies, practices, and laws (Durham County Department of Public Health, 2021). In addition, African Americans are more likely to be arrested, convicted of a crime, and have longer sentences than whites for the same crimes. 36.5% of the population in Durham are non-Hispanic African Americans, and 13.5% are Hispanic (Durham County Department of Public Health, 2021). These two combined make up half of the population of Durham, and both of these communities are the most affected by violent crimes making this a population that should be a priority when addressing this SDOH.

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<sup>6</sup>Violent Crime is defined as an offense that involves force or threat of force. Include robbery, assault, and murder (Federal Bureau of Investigation, 2011).

### **Measures of SDOH**

A comparison of violent crime rates in Durham and two other counties, Forsyth and Cumberland, in North Carolina that are of similar population size showed that Durham County had the highest rate of violent crimes of the three counties being looked at (Durham County Department of Public Health, 2021). The thing to note is that while Durham may have the highest rate, Durham's rates were consistently decreasing over the three years whereas the two other counties actually had increased rates from 2016. Durham County had a -13% change from 2016-2018 (Durham County Department of Public Health, 2021). The other two counties, Forsyth and Cumberland, had a +1.36% and +8.06% change from 2016-2018 (Durham County Department of Public Health, 2021). Even though Durham has been seeing this slight decrease, its numbers are still higher than 88% of other counties in North Carolina (NeighborhoodScout, 2022).

Durham has a rate of 7.48 per 1000 residents for violent crimes, this is almost double the national median rate of 4 per 1000 residents (NeighborhoodScout, 2022). North Carolina as a whole has a rate of 4.3 per 1000 residents which is slightly higher than the national median but still less than Durham County (NeighborhoodScout, 2022).

### **Rationale/Importance**

When 2019 Community Health Assessment (CHA) survey participants were asked to select three issues that had the greatest effect on their quality of life in Durham County, violent crime received the greatest number of responses (Durham County Department of Public Health, 2021). The community health assessment does not state what the statistics for the responses are, but it was out of 424 surveys conducted (Durham County Department of Public Health, 2021). This negatively impacts the quality of life of many as it is an increased stressor. In addition, reducing the rate of violent crimes will decrease the amount of individuals that may have the increased risk for chronic diseases that are associated with violent crimes (Durham County Department of Public Health, 2021). Because of the chosen population of interest, this will have a large impact on Durham as a whole, considering the chosen communities make up half the population of Durham County.

### **Disciplinary Critique**

Diet plays a large role in the lives of individuals and can affect various aspects of one's life, either negatively or positively, depending on the quality of diet. Research has shown that there are links to the quality of diet and potential outcomes of violence among individuals (Dorothy, 2019). Malnutrition is associated with



cognitive deficits and antisocial behaviors which often lead to violence (Dorothy, 2019). While not having proper nutrition is linked to violence, implementing “dietary change or nutrition have successfully reduced disciplinary problems and improved morale” (Schauss, 2010). Public Health Nutritionists in Durham, such as those who work in Durham’s Innovative Nutrition Education (DINE) program, can work within the priority population to increase nutrition education, which will positively impact future behavior (Durham County, 2023). These public health nutritionist in Durham would have knowledge of local resources which will allow for the best assistance amongst this population.

Addressing violent crimes in colored communities is crucial to improve the overall wellbeing of over half the population of Durham directly, and perhaps more indirectly. Violent crimes are linked to many other health disparities that are prevalent, and they continue to deepen racial and ethnic injustices that are seen. By reducing violent crimes, there can be a decrease in chronic illnesses which can then increase health outcomes for Durham county as a whole (Office of Disease Prevention and Health Promotion, 2021). In addition, it can bring more business to Durham as fear for one’s safety can decrease and make individuals more comfortable bringing their business to this county.

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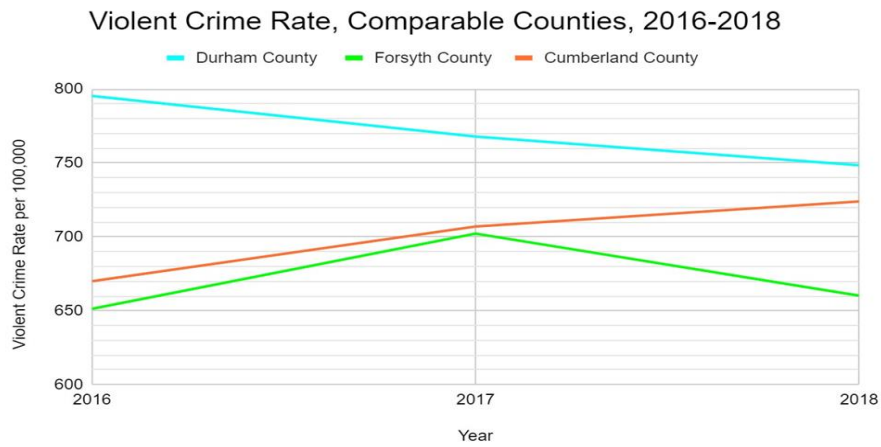
**APPENDIX D.1.A: SDOH ANALYSIS FIGURES AND TABLES**

**Table D.1: Total Violent Crimes 2016-2018% Change, Comparable Counties**

<b>County</b>	<b>2016-2018 % Change</b>
	-13%
Forsyth	+1.36%
Cumberland	+8.06%

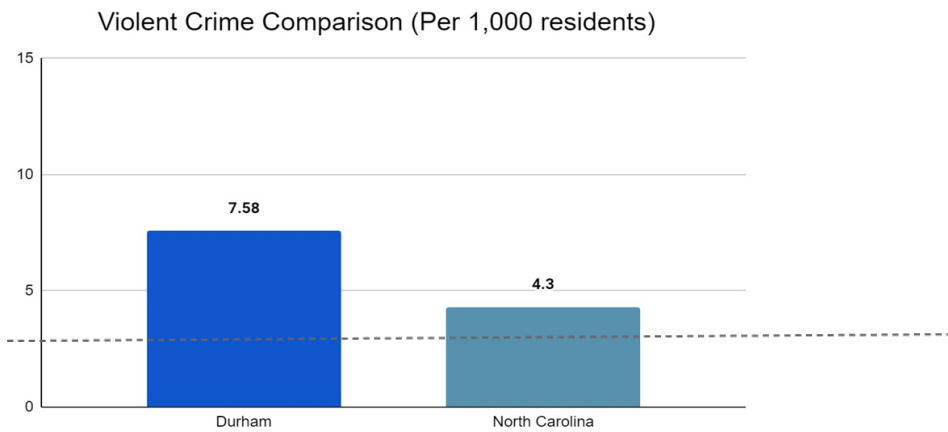
Note. Violent Crime Rate Comparison Among Three NC Counties: Durham, Forsyth, and Cumberland County. Data Composed over Three Years: 2016, 2017, 2018.

**Figure D.1: Violent Crime Comparison Dash Line**



Note. Violent Crime Comparison per 1,000 residents between Durham County and North Carolina. National Median Demonstrated by Dash Line.

**Figure D.2: Violent Crime Comparison Graph**



Note. Violent Crime Comparison per 1,000 residents between Durham County and North Carolina. National Median (4) Demonstrated by Dash Line.

## **APPENDIX D.2: EVIDENCE-BASED NUTRITION PROGRAM**

Social Determinants of Health (SDOH) are defined by the Office of Disease Prevention and Health Promotion (OASH) as the conditions in the environment in which people are born, live, learn, work and play that impact the quality of life and the health of individuals, while also contributing to health disparities and inequities (Durham County Department of Public Health, 2021). Neighborhood conditions, specifically affordable housing, can have a large impact on the health of individuals in indirect ways. The number one health priority that was identified among residents in Durham County in the 2020 Community Health Assessment, was affordable housing (Durham County Department of Public Health, 2021). Those who do not have access to safe and affordable housing are at higher risk of suffering from food insecurity. In order to improve health outcomes across the county, it is important for the county to not only focus on improving housing amongst low-income families in the neighborhood and built environment SDOH, but also addressing the problematic issue of food insecurity.

### **Evidence Based Nutrition Program**

Our group will be focusing on addressing food insecurity and vegetable consumption with the implementation of community garden and nutrition education program. In Durham County, the percentage of people who are food insecure is 16.5% (Food Bank Central, 2020). Specifically, one in four Latinos and one in six Black residents had to skip or reduce the size of their meals due to not having sufficient money (Durham County, n.d). According to the U.S Department of Agriculture (USDA), food security is defined as having access to foods that promote an active and healthy lifestyle (USDA, n.d.). Food insecurity is a critical public health issue as it affects various aspects of one's life. Research has shown that individuals who are food insecure are at higher risk of obesity, chronic disease, developmental problems, and negative mental health issues (Healthy People, 2021).

Increasing access to healthy food options is crucial to address this public health concern. Implementing community gardens amongst different Durham Housing Association (DHA) properties could potentially increase this access. Research shows that community gardens have various positive benefits amongst individuals who participate in them (Alamino et al., 2016 & Sadeghzadeh et al., 2022).

Not only can community gardens increase food security, but there can be benefits to the beautification of the neighborhood and environments, increase in mental health, increase in physical activity and overall wellbeing, increased intake of fruits and vegetables, decreased risk of chronic disease, decreased BMI, and greater sense of

community. (Garden Pals, 2023 & Sadeghzadeh et al., 2022). Beautification of the neighborhood and environments has various positive outcomes. A study done in Philadelphia reported a 13% decrease in crime rates where landscaping vacant lots has occurred (Dengler, 2018). A greater sense of community comes from members of the community working together to create something that will benefit them all, in various ways.

### **Evidence Based Outcomes**

Short-term objective: By August 2025, vegetable intake of “several times a day” will increase by 65% from baseline for residents that are involved in the community gardens that are implemented on DHA properties. There will be a survey at pre-gardening<sup>7</sup> to the community about their consumption of vegetables per day to gather a baseline and then another survey will be administered post gardening<sup>8</sup> season. This community-based participatory research (CBPR) approach was used in Oregon and had positive results due to allowing for the necessary time to build trust between partners and community members (Carney et al., 2012).

Long-term outcome impact: By August 1, 2027, the prevalence of food insecurity amongst residents that are involved in the community gardens, implemented on DHA properties, will decrease by 25%. The CBPR had similar results regarding decrease in food insecurity amongst their priority population (Carney et al., 2012). During the program evaluation, the responses from the food insecurity survey will be investigated.

These outcomes come from the same study and therefore have the same strengths and weaknesses. Strengths include the approach that was taken for this study, which allowed for proper trust to be built between researchers and participants, which can lead to better results. Surveys were conducted verbally, which prevents literacy being an obstacle for properly answering the survey questions. This allows a broader audience to be reached. A weakness of the study is that it is an observational study and done pre-post and is not a randomized design.

### **Evidence Based Implementation Strategies and Activities**

The whole program that will be implemented will revolve around the establishment of at least one community garden on three different DHA properties. The three properties that are selected, will be based on the prevalence of food insecure residents per property, land that is available and suitable to house a community garden

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<sup>7</sup>Pre-Garden Season: Occurs two weeks prior to the last frost. Last Frost typically occurs during the first week of April in Durham County, North Carolina (NC Cooperative Extension, N.d).

<sup>8</sup>Post-Garden Season: Occurs up to the week of the first frost. First frost typically occurs during the first week of November in Durham County, North Carolina (NC Cooperative Extension, N.d).

(i.e. safe soil conditions, water access source, large enough area) and number of responses from residents regarding willingness to run a community garden. Each month, guest speakers from Durhams Initiative Nutritional Education program (DINE) will present education sessions on various topics such as nutrition support programs, gardening, healthy eating on a budget, meal planning, and shopping tips. These educational sessions will occur at the community gardens themselves. This will reduce barriers for attendance from the community members as they will occur on their own properties. Combining nutritional education with the implementation of community gardens allows for greater change as it provides not only behavior change but the means to put these efforts into practice. Community gardens along with nutritional education have shown to reduce food insecurity amongst a variety of different populations (Rivera et al., 2019 & Sadeghzadeh et al., 2022, Rivera et al., 2016). These studies examined community gardens on populations made up of: only Hispanics, college educated white women, minorities in rural areas, and low income individuals (Rivera et al., 2019 & Sadeghzadeh et al., 2022, Rivera et al., 2016).

The goal is to build at least one community garden on three different DHA properties and sustain them for a minimum of four years. The expected reach will depend on which properties will be appropriate to host the community gardens, which can vary greatly from one property to another.

The levels of socio ecological model addressed by community gardens are the interpersonal and community levels. Community gardens beautify neighborhoods and surrounding areas, provide fresh produce nearby and increase interactions within a community (Gregis et al., 2021 & Litt et al., 2011). All these aspects tie into the community level. These community gardens also fall into the interpersonal levels because of the social interactions that may occur between residents of the community when working on the gardens. It can foster new relationships, while also strengthening existing ones, creating a better sense of community within amongst members.

From an equity lens, the community garden locations will strategically be placed in minority and low-income neighborhoods to benefit these underserved populations. This will apply specifically to those who are residents in DHA properties and may be facing food insecurity.

#### **Community Partners**

Potential community partners that will be involved in the implementation of this program are members from the DHA, Durhams Initiative Nutritional Education program (DINE), Durham County Health Department (DCHP), Briggs Ave Community Garden Members, North Carolina Cooperative Extension, and residents of DHA

properties. It will be important to have members of the DHA to be involved, because these community gardens will be created on their properties. By briefing the DHA about the various benefits that community gardens have, they can be more inclined to contribute to these gardens. DHA will be the final decider on which properties can host the community gardens, so it is crucial to share every aspect of this community in order to reap the most benefits from the program. DINE members will be a crucial component of this nutritional program, as they will be the ones who provide nutritional education for the members of the community garden. This will not only benefit communities but will bring more awareness to the programs that DINE already offers. Briggs Ave Community Garden is a well-known community garden organization in Durham County that may offer resources and support in the creation and sustainability of community gardens. North Carolina Cooperative Extension also offers various resources to support the creation of community gardens, including information on how communities may secure funding. Residents of DHA will play a large role as they will be the ones who are interacting with the gardens more often than any of the other individuals. They will be involved in planting and harvesting the produce in the gardens as well as the upkeep.

#### **Budget**

The program budget is \$170,780 for the creation of three community gardens and sustaining them for a minimum of four years. Funding will be obtained through grant opportunities. There are a variety of grant opportunities for starting and sustaining community gardens. The North Carolina Cooperative Extension has a list of potential funding that would benefit community gardens (Bradley, 2023). In addition to grant opportunities, adopt-a-garden campaigns can be done where local businesses or colleges can adopt a garden and financially contribute and/or support a garden. It is important to note that the educational sessions conducted by DINE are already a free resource and will continue to be a free resource for this program.

Expense items that have been calculated into the \$170,780 budget include, supplies for the creation of the garden, project manager salary, long-term garden keepers\*, seeds/plants, gardening tools, gas mileage adjustment for garden keepers, and utilities and upkeep of gardens. A table is listed in the appendix outlining the expense item, cost, and purpose for each item.

#### **Conclusion**

There are many advantages that community gardens can have on both individuals and the SDOH: Neighborhood and Environment Built. There are many health outcomes that may be improved from community



gardens. These include reduced stress, increased physical activity, decreased BMI, and decreased risk for chronic disease. In addition, members of a community garden typically report increased intake of fruits and vegetables, and overall healthier eating patterns. Community gardens can also beautify surrounding areas. Beautifying surrounding areas can not only make the space a more enjoyable place to be in but have shown to reduce crime rates. Community gardens can strengthen the sense of community within these properties, while addressing the prominent issue of food insecurity amongst residents in DHA properties.

There are also disadvantages of community gardens, such as months where not as much produce may grow such as winter/early springtime. Community gardens may also prevent the development of other buildings/more housing depending on the size of land the community garden is established on. An important disadvantage to be aware of is that there may be residents who are not interested in growing their own food in order to feel more food secure. The DHA already assists in making housing more affordable, and they can take it one step further by assisting in addressing food security amongst their residents.

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**APPENDIX D.2A: EVIDENCE-BASED NUTRITION PROGRAM FIGURES AND TABLES**

**Table D.2: Nutrition Program Budget Table**

<b>Expense Item</b>	<b>Cost</b>	<b>Purpose</b>
Supplies for the creation of the gardens	\$7,500 \$2500 Per Garden	NC Cooperative Extension estimates the cost of a community garden start up for ¼ acre of land in NC to be \$1000-\$5000. We can assume the cost to be about \$2500 for each of these gardens.
Project Manager	\$22/hr for 19 hours a week up to a 1,000 hours per year \$22,000 per year	Planning and organizing the construction of the gardens. Collaborates with DINE, Briggs Ave Community Garden to host speaker and education services. WFH position.
Long-Term Garden Keepers*	\$14,820 per year Based on the average hourly pay for gardeners \$19/hr. (3 employees x 5 hrs x 52 weeks x \$19)	Employed individuals to ensure the garden is well maintained, and plants are properly cared for. Residents will be encouraged.
Seeds/Plants	\$0	Used to plant and grow produce. No Fee due to Digging Durham Seed Library.  Donations are always welcome.
Gardening tools	\$0	Necessary to build and maintain gardens. No Fee due to Durham Tool Lending Library Program.  Donations are always welcome.
Gas Mileage	\$1000 per year	Gas Reimbursement for garden keeps when picking up and returning the gardening tools
Utilities and upkeep of Garden	\$3000 per year \$1000 per garden	Utilities bills and regular upkeep of garden averages this price according to NC Cooperative Extension
<b>Total Cost to Create and Sustain 3 Gardens over 4 Years: \$170,780</b>		

Note \*Regarding the Long-Term Garden Keepers: Ideally, the community would be in charge but this would ensure the upkeep of the garden. If residents can demonstrate full responsibility for community gardens, employment of garden keepers will not be necessary and can decrease expenses by \$14,820 per year.

### **APPENDIX D.3: EVIDENCE-BASED NUTRITION EVALUATION PLAN**

#### **Introduction**

Our group social determinant of health (SDOH) is Neighborhood and Built Environment. This SDOH can greatly affect a person's health. Our group key issue is helping alleviate cost-burden amongst low-income renters in Durham County, North Carolina, which is defined as individuals with less than 30% AMI<sup>9</sup> Under this SDOH domain, there is housing, which is what our group's specific focus is on. As of 2021, 48% of renters had difficulty affording their homes and were cost-burdened; "Cost-Burdened households spend more than 30% of their income on housing" (North Carolina Housing Coalition, 2021). Individuals who are cost-burdened are having to spend a significant amount of their income on housing, which limits their spending for food. This may lead to more health risk, which ties to food insecurity and poor nutrition. To help combat this food insecurity and poor nutrition, community gardens and nutrition education programs will be implemented on three different Durham Housing Authority (DHA) rental properties. There will be various people that help conduct this program; project manager, local funders, participating DHA residents, employees from the Durham Innovative Nutrition Program (DINE) and NC Cooperative Extension Programs.

#### **Evidence Based Evaluation Plan**

Our evaluation plan will be focused on the short-term objective that by August 1, 2025, vegetable intake of "several times a day" will increase by 65% from baseline for residents that are involved in the community gardens implemented on Durham Housing Authority (DHA) properties. There will be a survey at pre-gardening (two weeks before the last frost) to the community about their consumption of vegetables per day to gather a baseline and then another survey will be administered post gardening season. This community-based participatory research (CBPR) approach was used in Oregon and had positive results due to allowing for the necessary time to build trust between partners and community members (Carney et al., 2012).

#### **Study Design/Data Collection**

Our evaluation will use an observational community-based participatory research approach and our evaluation tool will include both written and verbal validated surveys (Carney et. al, 2012). This will allow data collection to be inclusive of everyone participating, regardless of literacy levels. These surveys will be administered

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<sup>9</sup>AMI is defined as the Area Median Income. It is defined as "the midpoint of a specific area's income distribution and is calculated on an annual basis by the Department of Housing and Urban Development" (Hamann, 2023).

every pre<sup>10</sup> and post<sup>11</sup> garden season. These surveys will be conducted over a two-week period each time. The data collected from these surveys will be from residents on DHA properties that participate in the community gardens that have been implemented on DHA properties. The information collected will be about these residents' average consumption of vegetables.

### **Sample and Sampling Size**

Our sample size will be composed of 15 households per each of the three community gardens that are to be implemented (Carney et al, 2012). The households will be chosen at random to reduce risk of selection bias. 15 households per community garden implemented will bring our total sample size to 45 households. This is a relatively small sample size, but it will still be able to generate data that can be used to demonstrate the effectiveness of community gardens amongst low-income individuals (Carney et al, 2012). The surveys will be given at the beginning and end of every gardening season for the next 3 years, i.e.. Pre-gardening season, post-gardening season. These surveys will collect the average consumption of vegetables for both the pre/post gardening seasons. The survey conducted at the beginning of the first pre-gardening season will serve as the baseline vegetable intake. We will calculate the difference in the vegetable intake at the beginning and end of each gardening season. At the end of the third post gardening season in November 1, 2025, we expect to see at least a 65% increase in vegetable consumption of “several times per day” compared to the March, 2023 baseline intake. Each household will designate one adult to complete the surveys. If there are multiple individuals in a household, each person who participates in the community garden or consumes any produce from the community garden will be asked to complete their own survey. This will include children, but if the child is under 12 then the survey will be completed with the assistance of an adult. The adult can be in the household or can be part of the research team if literacy is of concern.

### **Specific Measures**

Our evaluation is focused on the vegetable intake amongst DHA resident members participating in DHA property community gardens. Our outputs include the percent of participation from our target population, the development of community gardens on three DHA properties. Our intended outcome is a percent change increase in the consumption of vegetables amongst participants from DHA residents. The way this will be measured will be

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<sup>10</sup>Pre-garden season can be defined as the two weeks leading up to the last estimated frost date for Durham County (NC Extension, N.d).

<sup>11</sup>Post-garden season can be defined as the two-weeks leading up to the first estimated frost date for Durham County (NC Extension, N.d)

from questions on the surveys that will ask individuals to rate their vegetable consumption. They will rate their vegetable consumption from: *Several Times a Day*<sup>12</sup>, *Once a Day*, *a Few Times a Week*<sup>13</sup>, and *Almost Never* (Carney et., al, 2012).

### **Timing**

As mentioned previously, we will be conducting surveys at the beginning of the gardening season, 2 weeks prior to the last frost date, and the end of a gardening season, 2 weeks prior to the first frost date. This will occur for three years until the last post-gardening season in September 2025. Progress will be defined as having an increase of vegetable intake from baseline. Ideally, this will be an increase of 65% from baseline. If this goal is not met, then there will be follow-ups with individuals on what can be done to help increase vegetable intake within their households. These will be open-ended questions. The project manager and team will address these questions to determine what the next best steps could be. It is crucial to get their inputs because of the community-based approach that is being used

### **Analysis Plan**

This evaluation plan will be using quantitative statistics to describe the difference in vegetable intake from each survey over the period of three years. Analysis will be conducted to determine if significant changes have occurred for vegetable consumption through p-values and confidence intervals. The type of analysis conducted may include a t-test because the sample size is less than 30 for each group studied and the population variance is unknown. The data will be analyzed and coded to note any differences pre- and post- intervention of fruit and vegetable consumption within the community. This data will be statistically analyzed and determine if significant changes have occurred for vegetable consumption or in the levels of reported food insecurity. For t-tests the significance threshold is traditionally set at  $p = 0.05$  and frequently calculated at a confidence level of 95%. If the results show a p-value equal or less than 0.05, there is statistical significance and therefore, the intervention of community gardens amongst cost burden areas would show to be successful.

If the statistics come to show that the community gardens were not deemed success, there will be follow-up interviews conducted to the participants. These interviews will be open-ended questions and will be collecting qualitative data. Questions will regard methods that the participants believe can help increase their vegetable intake.

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<sup>12</sup>Several Times a Day: 3-5 times a day

<sup>13</sup>Few Times a Week: 2-3 times a week

Qualitative data will also be collected at the last post-gardening season to collect the experiences of the participants and the community gardens (Carney et., al, 2012). Common themes will be identified from these interviews.

#### **Funding Source**

The North Carolina Cooperative Extension has a list of potential funding opportunities that we will be seeking to help start and sustain community gardens. In addition to grant opportunities, we will be hosting adopt-a-garden campaigns. The adopt-a-garden campaign allows local businesses or colleges to adopt a community garden and financially contribute/or support the garden in question. See Table 1. in the appendix for a funding timeline.

#### **Data Use and Dissemination**

We will use the evaluation data to inform Durham County Admissions of the impacts that community gardens have amongst the DHA residents. We will create a presentation to deliver to this audience. In this presentation, we will share the results of the programs in order to encourage the start-up of similar programs for all low-income renters. In order to replicate this program, we will ensure that all of our evaluation data will be detailed in a report along with a How To document to be able to implement a program similar to ours.

#### **Conclusion**

An interdisciplinary and collaborative approach is necessary when combating public health concerns as oftentimes, they are multidimensional and will require inputs from a diverse team of Public Health Specialists. Lack of affordable housing and poor nutrition go hand in hand, and equity concerns need to be carefully considered as racial and ethnic minorities are more often affected by these issues. Therefore it is important to work with a diverse team to ensure all aspects are considered.



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**APPENDIX D.3.A: NUTRITION PROGRAM EVALUATION PLAN FIGURES AND TABLES**

**Table D.3: Pre/Post Gardening Season Questionnaire Example\***

<b>Vegetable Intake</b>
<p>At what frequency does your household eat vegetables?</p> <ul style="list-style-type: none"> <li>· Several times a day</li> <li>· Once a day</li> <li>· A few times a week</li> <li>· Almost never, or never</li> </ul>
<b>Food Security</b>
<p>At what frequency in the past six months did the household worry that food would run out before money was available to buy more?</p> <ul style="list-style-type: none"> <li>· Never</li> <li>· Sometimes (less than once a month)</li> <li>· Frequently (at least once a month)</li> <li>· All the time (weekly)</li> </ul>
<p>At what frequency in the past six months did adults in the household skip meals due to lack of money to buy food?</p> <ul style="list-style-type: none"> <li>· Never</li> <li>· Sometimes (less than once a month)</li> <li>· Frequently (at least once a month)</li> <li>· All the time</li> </ul>
<p>At what frequency in the past six months did children (&lt;18 years old) skip meals due to lack of money to buy food?</p> <ul style="list-style-type: none"> <li>· Never</li> <li>· Sometimes (less than once a month)</li> <li>· Frequently (at least once a month)</li> <li>· All the time (weekly)</li> </ul>

Note. Questionnaire adapted from: Carney, P. A., Hamada, J. L., Rdesinski, R., Sprager, L., Nichols, K.

R., Liu, B. Y., Pelayo, J., Sanchez, M. A., & Shannon, J. (2012). Impact of a community gardening project on vegetable intake, food security and family relationships: a community-based participatory research study. *Journal of community health, 37*(4), 874–881. <https://doi.org/10.1007/s10900-011-9522z>

Figure D.3: Timeline Example

TASK NAME	YEAR ONE												YEAR TWO											
	Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Project Initiation																								
Grant Writing & Local Fundraisng																								
Collaborate with DHA and determine garden locations																								
Collaborate with DINE to initiate/plan on-site education sessions at three DHA properties																								
First community meetings to schedule garden building days and gather interests for the first nutrition education session																								
Purchase and distribute building supplies for each garden																								
Hire & orient long term garden keepers for each site																								
Build gardens on scheduled "build days"																								
Project Upkeep																								
Garden meetings to schedule garden work days for upcoming season. May vary based on communities preferences.																								
Quarterly nutrition education classes at each participating DHA property. Hosted by DINE																								
Monitoring & Evaluation																								
Pre-seasonal survey for sample population																								
Post-seasonal survey for sample population																								
Follow-up open-ended question interviews*																								

Commented [PAN1]: Consider making landscape

Commented [KG2]: I fixed formatting here so would love someone to double check

Note. Follow-up interviews will only occur if community gardens are not seen to be statistically significant.

## **APPENDIX E: ARIANA PITCHER INDIVIDUAL DELIVERABLES**

### **APPENDIX E.1: SOCIAL DETERMINANT OF HEALTH ANALYSIS**

#### **Background of the Community and Built Environment and Transportation**

The community and built environment have been widely accepted as a determinant of health and estimated to influence 10% of health outcomes (County Health Rankings & Roadmaps, n.d). The community and built environment include where individuals live, learn, work, and play, the air and water they intake, houses they live, and transportation systems to move between places. Notably, of all these facets related to the built environment, Durham County residents listed public transportation as the top service needing improvement with physical activity infrastructure being third (Durham County Community Health Assessment (DCCHA), 2020). Promoting safe bike infrastructure is one tactical approach to addressing both these needs in Durham County and would fall in line with HealthyPeople2030's objective of increasing the "proportion of adults who walk or bike to get places" (Health.gov, n.d). Effective bike infrastructure has been shown to improve access to health resources, address equity, increase physical activity, reduce air pollution, and lessen injuries and fatalities from motor vehicles (U.S DOT. 2019). However, unlike important strides taken throughout the past decade to reduce passenger motor vehicle deaths by 33%, there has been a rise in bicyclist injuries and fatalities due to collisions with motor vehicles (U.S DOT, 2014) as demonstrated with pedestrian fatalities rising by more than 40% (Schneider, 2020). The evidence to link safe bike infrastructure to short- and long-term health outcomes is strong. In the Netherlands, one of the most renowned countries for biking, around 25% of daily trips are made by bicycle compared to only 1% in the U.S (Kuzmyak & Dill, 2012). Their effective bike facilities have prevented 6,500 deaths a year with economic benefits worth 3% of the Dutch GDP (Fishman & Schepers, 2015). Similar benefits have been noted in the U.S. In 2015, every \$1,300 that NYC invested in building bike lanes yielded one additional year of life over the lifetime of all city residents and increased the probability a resident would bike by almost 10% (Doyle, 2016). Also, installing protected bike lanes in NYC dropped the injury crash rate for all road users by 40% (NYC, 2011). Early data on growingly popular bike share programs in the U.S have been attributed to an annual reduction of 4.7 premature deaths and 737 disability-adjusted life years, and \$36 million in economic benefits (Clockston & Rueda, 2021). Lastly, good bike facilities can be positively reinforcing as the number of bicyclists killed or injured declines as cities build more bike lane networks even as bike ridership increases, due to motorists being less likely to collide with bicyclists in greater flocks (National Association of City Transportation Officials (NACTO), 2016; Jacobsen, 2004).

### **Geographical and Historical Context of Durham County and Bike Infrastructure**

Nationwide, the transportation system has historically been a driver of racial and ethnic inequalities by planning highways, roads, bridges, sidewalks, and public transit in ways that predominately benefit white communities, while pulling resources away from people of color and making it more difficult for quick access to economic opportunities (Archer, 2021). Structural racism by the transportation system also destroyed black neighborhoods and displaced thousands of families and businesses during the 1960s and 70s after development of the Durham Freeway (DCCHA, 2020). In the most recent decades, the population of Durham County has been expanding due to the industrial technology boom and more biopharmaceutical companies in the triangle region (Carlson et al., 2018). In response to population growth, there has been more attention to strengthen transportation. Although there were no bike lanes in Durham in 2000, the area now has more than 50 miles of bike lanes (DCCHA, 2020). The county has ongoing projects to increase transportation choices, local and regional connectivity, bicycle facilities (sidewalks, bike lanes, trails, intersection improvements, etc.), and bicycle safety (DCCHA, 2020). One important recent effort includes the “Durham Bike + Walk Implementation Plan (DBWIP),” which was adopted in 2017. The plan identified and prioritized more than 450 miles of bicycle facility needs and 480 intersection improvements to strengthen public safety. Of all the identified needs, only 75 projects were selected to move forward after a prioritization process. However, it appears that none of the bike corridor projects, which will repair or construct new bike lanes/side paths, have been funded or completed according to the Durham County website (DBWIP, 2017). In addition, of all Durham County’s expenditures budgeted for fiscal years 2022 to 2023, only .25% is allocated to transportation (Durham County Approved Budget FY 2022-23, 2021), which highlights additional investments are needed to realize the full potential of county plans to promote safe and effective infrastructure. Though despite inadequate county financial resources, the Durham County bike community is lively and an asset when it comes to advocacy efforts and potential partnerships. Some of these groups, to name a few, include Bike Durham, the Durham Bicycle Cooperative, the Durham Bicycle and Pedestrian Advisory Commission, Bicycle Boulevards initiative, and the statewide “Watch for Me NC” program (DBWIP, 2017).

### **Priority Population: Durham County Neighborhoods with a High Minority Population**

Consistent with structural racism reinforced by the transportation system, bike safety concerns show a racial divide as Black and Hispanic bicyclists have a fatality rate that is 30% and 23% higher than white bicyclists, respectively (NACTO, 2016). Other estimates have displayed that black cyclists suffer about 34 deaths for every

100 million miles traveled on a bicycle in contrast to only 7.5 deaths for white cyclists (Raifman and Choma, 2022). One explanatory factor for these racial bike fatality disparities is likely tied to the built environment as low-income and minority neighborhoods have been found to have fewer sidewalks and unsafe bike infrastructure (U.S DOT, 2014). The DBWIP, as mentioned, aims to promote stronger bike facilities and prioritizes these projects by four evaluation criteria, including safety, connectivity, demand, and equity. However, equity is based on households in poverty within half a mile (DBWIP, 2017). It is widely known that small counties with a large university, such as Duke University in this case, have artificially higher community poverty rates due to the presence of students living off campus (U.S Census Bureau, 2018). Thus, this may confound efforts for the county to prioritize and ensure an equitable allocation to minority neighborhoods. Consequently, most of these prioritized bike facilities are concentrated in downtown Durham, whereas most minority neighborhoods are on the eastern side of the county and may be unlikely to receive planned bike facility improvements (DBWIP, 2017).

#### **Measures of Bike Safety and Infrastructure in Durham County**

Approximately 1,000 bicyclists are involved with crashes with motor vehicles each year in NC (NCDOT, 2021). Literary evidence supporting that minority neighborhoods have less supportive bike infrastructure is apparent within Durham County. When selecting the top five neighborhoods according to the highest percentage of minorities by the total population (East Durham, Welons Village, Greysons Green, Y.E Smith, and Allbright) compared to the five neighborhoods with the lowest percentage (Old West Durham, Watts Hospital-Hillandale, Burch ave., Duke Park, and Croasdaile Farm Master), minority neighborhoods had lower bikeability scores (less bike infrastructure) compared to more white neighborhoods who had higher bike-ability scores (more bike infrastructure) (See Figure E.1). Upstream factors of these inadequate bike facilities may then explain the health disparities seen amongst NC black cyclists who experience 6.8 bike crashes per 10,000 population versus only 3.6 among whites (See Figure E.2). The need for better bike infrastructure is noted amongst the community as 82% of Durham County residents at a 2016 public workshop noted the need for more biking infrastructure improvements (DBWIP, 2017).

#### **Importance of Addressing and Promoting Safe Bike Infrastructure and Leveraging Policy as Tool**

As mentioned early in this analysis, promoting safe bike facilities in Durham County is an important public health priority for residents as it would address two of the top three needs of services needing improvement within the CHA (public transportation and physical activity infrastructure). Additionally, it can have a downstream effect on traffic congestion and motor vehicle fatalities amidst a growing population that has heightened these problems.

But most importantly, racism is widely recognized as a public health issue and given the disparities in bicyclist crash rates among people of color, improving bike-ability in these minority communities can begin to rectify historic racial injustices imposed by the transportation system. Moreover, it is essential for policy professionals to be involved in transportation improvements since these require sufficient resources from the state and any consumption of resources needs a robust policy evaluation for efficient resource allocation to areas of most need. Policy analysts also ensure interventions will meaningfully impact health equity and health outcomes. The impact of addressing safe bike conditions is likely large. As reiterated by the U.S DOT, biking is “not just a lifestyle choice,” but can “improve the economic and social well-being of a community and its residents” (U.S DOT, 2014). Lastly, safe bike facilities raise other valuable secondary benefits likely to gather buy in from other stakeholders. They have been proven to better connect individuals to essential services and jobs and school, help individuals quickly escape emergencies, reduce car congestion, improve property values, and help companies attract top talent to communities (The Railyards, 2017; U.S DOT, 2002).

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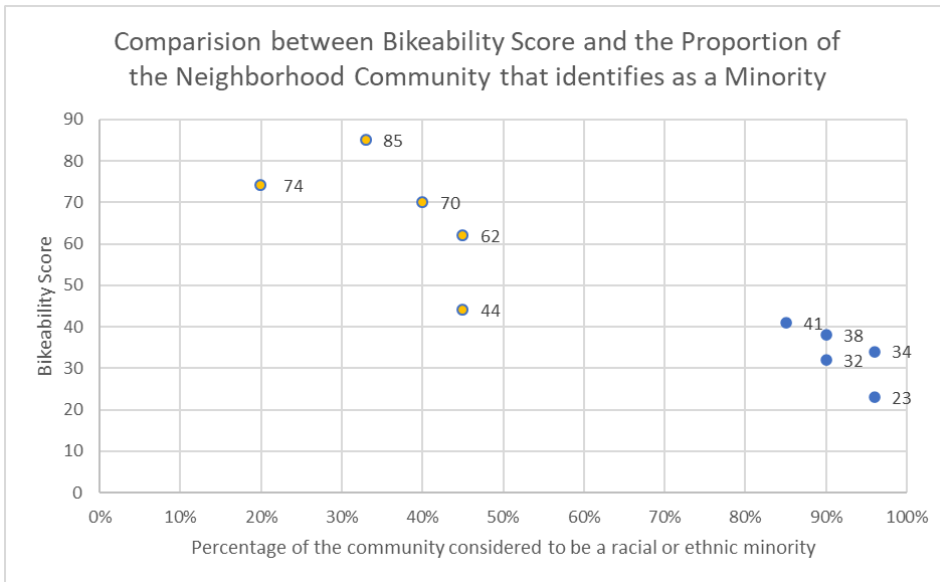
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APPENDIX E.1.A: SDOH ANALYSIS FIGURES AND TABLES

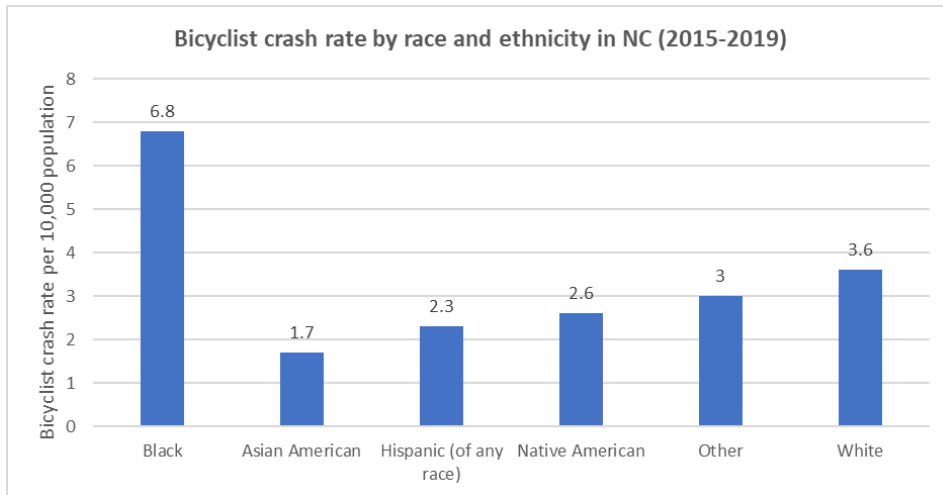
Figure E.1: Disparities in Bikeability Scores within Communities of Color



(WalkScore.Com & City-Data.com)

Note. Bikeability measures whether an area is good for biking. For a given location, a Bike Score is calculated by measuring bike infrastructure (lanes, trails, etc.), hills, destinations, road connectivity, and the number of bike commuters. These component scores are based on data from the USGS, open street map, and the U.S Census. The higher the score, the more bikeable a particular location is. Ranges 90-100 indicate that daily errands can be accomplished on a bike; 70-89 indicate that biking is convenient for most trips; 50-69 indicate the presence of some bike infrastructure; and 0-49 is very minimal bike infrastructure.

Figure E.2: North Carolina Bicyclist Crash Rate by Race and Ethnicity Between 2015-2019



(NC DOT, 2021)

## APPENDIX E.2: POLICY ANALYSIS

### Background

Counties across the U.S have faced growing challenges in ensuring affordable housing for residents, including in Durham County (DC) where affordable housing is considered one of the top community issues (DC Public Health et al., 2021). DC has witnessed an increase of over 16% in rent for fair market two-bedroom apartments between 2016 and 2020 (DC Public Health et al., 2021). For a family to afford the fair market price of \$1,200 for a two-bedroom rental apartment, a household would need an hourly wage of \$23.06. Current North Carolina (NC) minimum wage is only \$7.25 per hour, and a household would need to work 106 hours a week at minimum wage to afford this fair market price (National Low Income Housing Coalition, 2022). Currently 32% of households are considered cost-burdened in DC as of 2021, meaning that they spend more than 30% of their income on mortgage or rent (NC Housing Coalition, 2023). The burden is especially heavy on renters, of whom 47.5% are considered cost-burdened (NC Housing Coalition, 2023). DC Commissioners should consider land use policies and regulations that have the potential to help renters who face issues in accessing affordable, quality housing, which is a crucial determinant to overall health (Health.gov, n.d). Policy efforts should assist vulnerable renters that are 30% below the area mean income (AMI). AMI, based on the midpoint of a specific area's income distribution, is a key metric in affordable housing utilized by state and federal governments when determining housing assistance. Households earning under 30% of the AMI are considered extremely low income and would strongly benefit from housing assistance (Orange County, n.d).

### Description of Policy Options and Evaluation Criteria

NC is not a home rule state, meaning that local and county governments often have limited authority over certain structures or methods of financing activities, which inherently makes it difficult to adopt affordable housing policies like rental control, housing vouchers, or tax credits (McFarland et al., 2019). There is slightly more flexibility for local governments in policies related to zoning and land use (Mulligan, 2010). One policy option worth consideration is inclusionary zoning (IZ), which has been adopted by hundreds of jurisdictions and local governments since as early as the 1970s (U.S Department of Housing and Urban Development (HUD), n.d). It mandates that housing developers set aside a specific percentage of housing units to be given to low-income individuals at below market rates (Enterprise Community Partners, n.d). IZ policies have varying features and forms, including the mandatory or voluntary nature, the percentage of affordable units required, income eligibility criteria,

and in lieu of fees (Williams, 2016). Another potential policy is to reduce minimum parking requirements (MSR). These policies are embedded within zoning codes and mandate a minimum number of off-street or within building parking spaces that must be created for residential development. Requirements may be based on the number of bedrooms or established on a per unit basis (Local Housing Solutions, n.d). In urban areas, creating parking may cost anywhere between \$25,000 to \$65,000 per space, which may be passed on to renters (Local Housing Solutions, n.d). IZ and MSR will be scored with equally weighted evaluation criteria on a five-point scale (1 = unfavorable; 5= favorable) based on impact on the problem, cost, equity, and political feasibility. The most plausible option with the highest score will be recommended to DC.

#### **Policy Option #1: Inclusionary Zoning**

DC does not currently operate any identifiable IZ programs (*DurhamNC.gov, n.d*). DC may implement IZ into its local ordinances and zoning regulations by requiring that 15% of the units that developers build must go to affordable units for cost-burdened, low-income families under 30% of the AMI. Developers must keep the units at an affordable rate for 30 years for rental units. In exchange, developers will be granted density bonuses to build more units per acre. Violators of the policy must pay a fine that will go towards an affordable housing trust fund for county residents.

*Impact (3.5):* IZ policies have proven to be moderately successful. IZ has been associated with improved access to affordable and quality housing. After making housing units more affordable in higher income neighborhoods, IZ has also linked families to more community resources, including employment, public services, transportation, and recreation centers (County Health Rankings and Roadmaps Program, 2022). Montgomery County, Maryland implemented one of the first IZ policies in 1976. Since then, it has produced over 16,703 moderately priced dwellings, accounting for half of the affordable housing production within the county (Montgomery County Government, 2023; Brown, 2001). However, other jurisdictions have produced only a few affordable units, possibly attributed to weak housing markets, little county enforcement, and few incentives for builders (Williams, 2016). Some studies in California found cities with IZ policies had higher market-rate housing prices and reduced the construction of new homes (Powell and Stringham, 2004). Though, other studies have found no significant negative effect on resale values or housing production of nearby homes (Brown, 2001; Schuetz et al., 2011).

*Cost (4/5):* There are no major upfront costs to the county for IZ, as most of the cost burden falls on developers who may see profit impacts when providing cheaper units. Some small costs may be incurred for new staff needed to administer this new policy. IZ policies may be a source of income. For example, Chapel Hill's IZ policy has brought in an income due to in lieu fees, which has helped construct new units and provide rental assistance to residents (Chapel Hill Town Council, 2010).

*Political Feasibility (2/5):* Some conservative states explicitly permit or allow some form of IZ, including Florida, Louisiana, South Carolina, Kentucky, and Missouri (McFarland et al., 2019). However, several cities in NC have enacted mandatory IZ programs (Chapel Hill, Davidson, Manteo, etc) and faced legal challenges, including lawsuits causing city settlements (McFarland et al., 2019). Although NC doesn't explicitly outlaw IZ, the statute prohibits rent control and its language has been used by IZ opponents (McFarland et al, 2019). IZ within DC would be complemented by extra advocacy efforts to reform the rent control statute at the state level. Opponents of IZ are likely to be corporate developers who have financial resources and means to take legal action (U.S District Court, 2021). Proponents of IZ likely include the Durham Housing Authority (DHA), who is the leading provider of affordable housing in the county and manages federal housing voucher programs (DHA, n.d).

*Equity (5/5):* Montgomery County's IZ policy has been shown to help low- and moderate- income households of diverse racial and ethnic backgrounds and promote racial integration across neighborhoods over time (Brown, 2001; Kontocosta, 2013). It has also had strong educational impacts among children who live in affordable housing units. Although some of these children attended lower- income schools, they performed significantly better than peers in moderate- income schools on math and reading (Schwartz, 2010). IZ has also reduced gentrification in other settings and the racial wealth gap as less income is spent on housing (County Health Rankings and Roadmaps Program, 2022).

#### **Policy Option #2: Eliminating Minimum Parking Requirements**

DC may reform zoning regulations to eliminate MPR for all new residential developments and can consider imposing parking maximums for areas of the county within half a mile of public transit. Developers who build affordable housing units for cost-burdened renters below 30% of the AMI after reducing parking spaces will be eligible for density bonuses and prioritization in application processes.

*Cost (5/5):* Reducing MPR mostly requires a change in zoning regulations with little to no significant costs for the county, except potential personnel costs for implementing the policy change. The impact would be on the

developers who would experience cost-savings. 2012 estimates show that the average cost to build one underground parking space was \$34,000 and \$24,000 for aboveground parking spaces (Shoup, 2014). Additionally, one parking space per housing unit increases total housing development costs by 12.5% and 25% for two parking spaces per housing unit (Litman, 2004).

*Impact (4/5):* Developers shift high parking development costs to renters through pricier rents. A California study found the cost of single family-units increased by more than 12% when including off-street parking (Jia and Wachs, 1999). Similarly, the costs of garage parking increases rents in urban areas by an additional 17% (Gabbe and Pierce, 2016). Another analysis by the City of Portland shows that low-end rent in one building with no parking costs \$800 per month, but the same building unit with the cheapest parking option (surface) increases rent to \$1,200 and to \$1,300 with underground parking (City of Portland, 2012). Moreover, eliminating MPR in Seattle was successful in that developers unbundled parking costs from rent, built 40% less parking, and saved \$537 million. Seattle MPR was the most important predictor of the quantity of parking provisions, and 34% of developments hit the exact amount of minimum parking (Gabbe et al, 2020). Removing MPR in Los Angeles allowed developers to provide more housing, including lower-priced housing and in previously disinvested areas (Manville and Shoup, 2010). Studies have showed that MPR reduces a developer's incentive to provide affordable housing since there is less land to make housing units and fewer housing units can be put at a high price to cover parking costs (Litman, 2004).

*Political Feasibility (4/5):* Precedent for eliminating MPR has already been set in NC. Twelve NC cities have already made reforms, including Raleigh, Graham, and Albemarle. Additionally, Durham has eliminated parking minimums in the downtown core area and brookside business district area (Parking Reform Network, n.d). Thus, eliminating the requirements to other districts is a logical next step. Developers are likely to be proponents of the policy since it will reduce costs of development. Renters with cars may be opponents in the beginning if developers fail to provide a reasonable number of parking spaces that precisely meets demand.

*Equity (4/5):* Parking is relatively a fixed expense, which means that MPR are regressive since it requires low-income households to pay a greater proportion of rent towards parking than high-income households (Litman, 2004). Additionally, 24% of those in poverty do not own a vehicle, and households without cars are more likely to have lower income and be people of color (Brown, 2017). Instituting this policy will assist low-income, carless renters the most as they often subsidize an amenity they do not benefit from. Lastly, cities building more parking

spaces has been associated with urban sprawl due to more land required, which may negatively impact rural communities (Jhaveri, 2021).

**Final Recommendation**

In scoring both IZ and eliminating MPR with identical evaluation criteria, MPR has a higher score of 17 compared to IZ with 14.5 and is the recommended policy option. Although IZ has been around for decades and has been found to promote equity and be successful in producing more affordable units if implemented correctly, it has some mixed evidence and a rough track record in NC due to legal challenges. MPR has proven to be successful in a wide array of cities, embraced by developers, already accepted in NC, and can directly impact affordable rents. If implemented within DC, one process measure would include an attestation process whereby developers both attest to reductions in parking and show building plans where extra land or parking funds are converted to units for renters below 30% of the AMI. After attestation, developers may then be fast-tracked in the queue for housing applications for new construction. Lastly, an outcome measure would quantify the impact of eliminating MPR by measuring the average rental cost, adjusted for inflation, for new residential buildings with no or reduced parking compared to comparable buildings with full parking.



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### APPENDIX E.3: BUDGET INTRODUCTION

Over 200 cities across the U.S have implemented reforms to reduce parking requirements for more efficient land use and to promote affordable housing (Parking Reform Network, n.d). Minimum parking requirements (MPR) are specified in local zoning codes and mandate a minimum number of off-street or within-building parking spaces for residential development, often based on the number of bedrooms or on a per unit basis (Local Housing Solutions (LHS), n.d). However, these are extremely expensive for developers who experience costs anywhere between \$25,000 to \$65,000 per parking space, increasing total housing development costs by 12.5% for one space and 25% for two spaces per housing unit (LHS, n.d; Litman, 2004). Consequently, these costs are passed on to renters. Off-street parking and garage parking have been found to increase rents by 12% and 17%, respectively (Jia and Wachs, 1999; Gabbe and Pierce, 2016). Lastly, one analysis indicates that shows that low-end rent in one building with no parking costs \$800 per month, but the same building unit with the cheapest parking option (surface) increases rent to \$1,200 and to \$1,300 with underground parking (City of Portland, 2012).

Durham County (DC) will establish a parking reform that will: 1) eliminate MPR for all new residential developments within one-quarter mile of public transit that runs at least every 40 min for most of the day 2) mandate parking to be unbundled from the cost of rent with the option to pay for parking separately 3) provide prioritization during housing applications processes and density bonuses to developers who attest that extra land from parking will be used for affordable housing units (AHUs) for cost-burdened renters below 30% of the area median income (AMI). These three elements will require changes to *Section 10.3 Required Parking* of the DC Unified Development Ordinance (UDO) and will be housed under DC's City-County Planning Department who manages all issues related to the UDO, land use, and zoning (City of Durham, n.d). It will also necessitate geographic identification of all eligible residential properties within reasonable distance to public transit. An attestation process must be developed to assess policy impact, so developers can both attest to reductions in parking and provide evidence of plans to make AHUs. A new workflow process should also be implemented to prioritize developers intending to build AHUs during the housing approval process. Several outreach points will be required to spread awareness among developers and to then allow time for public comments after notice of proposed ordinance changes, which often involve public hearings (City of Durham, n.d). Lastly, a data collection process should be in place to assess a primary outcome that would quantify the impact of eliminating MPR by measuring the average rental cost, adjusted for inflation, for new residential buildings with no or reduced parking compared to comparable buildings with full parking. Two

programmatic goals would be for 1) rents to be at least 12% cheaper in units with no or fewer parking compared to comparable buildings 2) for 100% of developers to unbundle parking from rent 3) for a third of developers who reduce parking to attest to building AHUs.

**APPENDIX E.4: ESTIMATED PARKING REFORM BUDGET**

Personnel Expenses		Year 1				Year 2				Year 3				Total Personnel Cost
Position	Base Salary	FTE	Salary	Fringe Benefit (30%)	Personnel Cost	FTE	Salary	Fringe Benefit (30%)	Personnel Cost	FTE	Salary	Fringe Benefit (30%)	Personnel Cost	
Lead Policy Analyst	\$58,000	1	\$58,000	\$17,400.0	\$75,400.0	1	\$59,160	\$17,748.0	\$76,908.0	1	\$60,343	\$18,103.0	\$78,446.2	\$230,754.16
Community Outreach Coordinator	\$29,000	0.5	\$14,500	\$4,350.0	\$18,850.0	0.5	\$14,790	\$4,437.0	\$19,227.0	0.5	\$15,086	\$4,525.7	\$19,611.5	\$57,688.54
Administrative Assistant	\$42,000	-	-	-	-	0.5	\$21,000	\$6,300.0	\$27,300.0	0.5	\$21,420.0	\$6,426.0	\$27,846.0	\$55,146.00
														<b>\$343,588.70</b>

Note. The Durham City-County Planning Department has around 53 FTEs, including 7 for Policy and Urban Design, 5 for Land Use Workers, and 1 Administrative Assistant . There are already staff with the needed requirements. However, the department notes staffing concerns, including “unexpected demands on the work program [from UDO requirements]” (City of Durham FY 2023 Budget, 2022). Thus, extra staff is encouraged.

Non-Personnel/Other-Programmatic Expenses			
Item	Cost per unit	Number	Total Cost
Land Use Attorney Consulting Fee	\$200	5	\$1,000
ArcGIS Analytic Software	\$550	3	\$1,650
Luncheon Venue	\$75	4	\$300
Luncheon Catering	\$107	6	\$642
Laptops	\$129	3	\$387
Qualtrics Data Collection	\$1,500	3	\$4,500
	<b>Total Non-Personnel Costs</b>		<b>\$8,479</b>

Note. Staffing costs are estimated to increase by 2% each year, which would be salary x 1.02.

Potential Revenues	
Item	Amount
County Fund or Yes In My Backyard Grant	\$352,067.70
Penalties for Zoning Violations	\$540,750
<b>Estimated Total Policy Costs (Personnel + Non-Personnel Costs)</b>	<b>\$8,479.00</b>
<b>Potential Net Income (if including revenue from penalties)</b>	<b>\$540,750</b>

Note. Penalty Fee Calculations: Last year, Durham County reported 35 notices of violation (NOV) of zoning codes that received formal enforcement action (City of Durham FY 2023 Budget, 2022). The City of Seattle in enforcing rental agreements, including for unbundling parking, penalizes property owners “up to \$150 per day for each violation for the first ten days of noncompliance; and up to \$500 per day for each day beyond ten days of noncompliance” (*Seattle Municipal Code, Chapter 7.24*). DC parking zoning changes is expected to go into effect the second year. It is assumed that it will take the first quarter to conduct audits

and identify violators, and up to a month to send out NOVs and give violators time to react. After, the first penalties will occur 120 days into the year. Based on Seattle’s methodology and if assuming the NOV are also 35, then 1) For the first ten days:  $35 \times 10d \times \$150 = \$52,500$ ; 2) Assuming 50% start to comply after 10 days for the next 30 days:  $35 \times .50 \times 30d \times \$500 = \$262,500$ ; 3) Assuming half of the previous month (25%) still don’t comply:  $35 \times .25 \times 30d \times \$500 = \$131,250$ ; 4) Assuming most start to comply afterwards (99%) for the remainder of the year (as this policy is actually favorable to house owners):  $35 \times .01 \times 175d \times \$500 = \$30,625$ ; 5) For the second year, still assuming most comply with possibility some still don’t:  $35 \times .01 \times 365d \times \$500 = \$63,875$ ; 6) Total (shown above):  $\$52,500 + \$262,500 + \$131,250 + \$30,625 + \$63,875$

Item	Link
Lead Policy Analyst Salary	<a href="https://www.indeed.com/career/policy-analyst/salaries/NC">https://www.indeed.com/career/policy-analyst/salaries/NC</a>
Community Outreach	
Coordinatory Salary	<a href="https://www.ziprecruiter.com/Salaries/Community-Outreach-Coordinator-Salary-in-North-Carolina#:~:text=How%20much%20does%20a%20Community%20approximate%20%2414.10%20an%20hour,">https://www.ziprecruiter.com/Salaries/Community-Outreach-Coordinator-Salary-in-North-Carolina#:~:text=How%20much%20does%20a%20Community%20approximate%20%2414.10%20an%20hour,</a>
Administrative Assistant	
Salary	<a href="https://www.indeed.com/career/administrative-assistant/salaries/NC">https://www.indeed.com/career/administrative-assistant/salaries/NC</a>
Land Use Attorney Fee	<a href="https://www.crestrealestate.com/land-use-attorney/">https://www.crestrealestate.com/land-use-attorney/</a>
ArcGIS Analytic Software	<a href="https://www.esri.com/en-us/arcgis/products/arcgis-online/buy">https://www.esri.com/en-us/arcgis/products/arcgis-online/buy</a>
Luncheon Venue	<a href="https://bluehilleventcenter.com/venue-spaces/">https://bluehilleventcenter.com/venue-spaces/</a>
Catering from Potbelly	<a href="https://www.grubhub.com/restaurant/potbelly-sandwich-works-catering-210-ids-cente-80-8th-s-minneapolis/2534021/catering">https://www.grubhub.com/restaurant/potbelly-sandwich-works-catering-210-ids-cente-80-8th-s-minneapolis/2534021/catering</a>
Laptop	<a href="https://www.walmart.com/ip/Lenovo-Ideapac-14-0-Laptop-Intel-Pentium-N5030-4GB-RAM-128GB-eMMC-Storage-Cloud-Grey-Windows-11-in-5-Mode-82V6001DUS/218677677?wmlspartner=wspa&amp;selectedSellerId=0">https://www.walmart.com/ip/Lenovo-Ideapac-14-0-Laptop-Intel-Pentium-N5030-4GB-RAM-128GB-eMMC-Storage-Cloud-Grey-Windows-11-in-5-Mode-82V6001DUS/218677677?wmlspartner=wspa&amp;selectedSellerId=0</a>
Yes in my backyard grant	<a href="https://www.planning.org/blog/9262900/congress-funds-new-yimby-grants-for-zoning-reform/">https://www.planning.org/blog/9262900/congress-funds-new-yimby-grants-for-zoning-reform/</a>
Penalties for Bundling Parking	See City of Seattle, 7.24.140 - Notice of violation <a href="https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT7COPR_CH7.24REAGRE_7.24.030REAGRE">https://library.municode.com/wa/seattle/codes/municipal_code?nodeId=TIT7COPR_CH7.24REAGRE_7.24.030REAGRE</a>
Qualtrics	<a href="https://www.getcloudapp.com/management-collaboration/what-is-qualtrics/#:~:text=Plans%20start%20at%20%2419%2C500%20a,plan%20that%20works%20for%20you.">https://www.getcloudapp.com/management-collaboration/what-is-qualtrics/#:~:text=Plans%20start%20at%20%2419%2C500%20a,plan%20that%20works%20for%20you.</a>
City of Durham Budget	<a href="https://www.durhamnc.gov/DocumentCenter/View/46235/Final-FY23-Budget-Book">https://www.durhamnc.gov/DocumentCenter/View/46235/Final-FY23-Budget-Book</a>

Note. These are the sources that informed budget line items and assumptions.

#### **APPENDIX E.5: PARKING REFORM BUDGET NARRATIVE**

Costs associated with implementing MPR reforms are devoted mainly to staffing time (Town of Carrboro, 2022). A full-time Lead Policy Analyst was hired to revise changes in the ordinance, coordinate with other parties for implementation, and reform the policy overtime through quality improvement. After zoning changes occur within the first year, another Administrative Assistant can be onboarded to aid with triaging housing applications, especially in the event of an increase due to new incentives for building AHUs. This is very needed as the department already has issues with “limited staff resources...resulting in lengthy review timelines” (City of Durham FY 2023 Budget, 2022). The department currently does not have a Community Outreach Coordinator (COC), which is necessary to build awareness of the policy change and engage the public in the public hearing processes after proposed amendments to the UDO are considered. The COC may plan two, two-hour luncheon events accommodating 60 people during the first year (costs based on the Local Blue Hill Center and providing Potbelly Sandwiches to attendees). Other non-personnel expenses include legal consultant fees, which may be necessary to review the current UDO and highlight steps needed to prevent litigation. Additionally, technological support may be needed. The department already has Urban Planning expertise who can help set up a supportive ArcGIS tool. This tool is a geospatial mapping tool that can analyze data from multiple sources (Esri, n.d) and be leveraged to identify eligible areas close to public transit and track changes in parking spaces and rents over time. A Qualtrics subscription for survey development and management can help implement the attestation process and allow for continuous feedback. Laptops for the new employees are also included. The policy would likely need to be funded by revenues from the county budget equal to total personnel plus non-personnel costs, which may require slight tax increases. Though, there is potential for new revenues. Recently, the Department of Housing and Urban Development launched the new “Yes in My Backyard (YIMB)” Grant Program in 2023. Communities who implement land use reforms are eligible, some of which include eliminating or reducing off-street parking requirements, donating vacant land for affordable housing development, and creating transit-oriented development zones (American Planning Association, 2023). DC would be a competitive applicant but could not rely on this as the primary funding source until details regarding YIMG grant amounts and applications are announced. The Lead Policy Analyst with some support from existing county staff would write the grant in the second year after implementing zoning changes in the first, and YIMB funds would start to flow in at year 3. Additionally, several cities implementing this policy introduced penalties for failure to comply with unbundling parking. For example,

Seattle makes violators “subject to a cumulative penalty of up to \$150 per day for each violation from the date the violation begins for the first ten days of noncompliance; and up to \$500 per day for each violation for each day beyond ten days of noncompliance until compliance is achieved” (*Seattle Municipal Codes, Section 7.24.030*). Last year, DC had 35 notices of violation (NOV) of zoning codes that received formal enforcement action (City of Durham FY 2023 Budget, 2022). If merging Seattle’s penalty methodology and the number of potential violations in DC, and if assuming most developers/owners comply after the first couples of months as supported by data showing strong adherence to parking reform policies, then revenues from penalties can be less or more of \$540,750 (Please see footnote on page 3 for more detailed calculations). Recommended policy costs are \$352,067, and net income would be \$540,750 if including potential revenues from penalty fees and the county fund (or YIMB).



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## **APPENDIX F: ABHISHEK SHANKAR INDIVIDUAL DELIVERABLES**

### **APPENDIX F.1: SOCIAL DETERMINANT OF HEALTH ANALYSIS**

#### **Background**

Social determinants of health are fundamental conditions and environments in which people exist and interact with that impact health, daily function, quality of life and health outcomes. Housing exists as an archetypal example of a social determinant of health - its “stability, quality, safety, affordability... and physical characteristics” are all related to health outcomes (Taylor, 2018). In particular, housing falls within the neighborhood and built environment category for social determinants of health.

Across the United States, financial hardship and lower health outcomes can be perpetuated through lack of access to affordable housing. Affordable housing refers to housing that is financially feasible to low-income (earning less than 80% of Area Median Income) or cost-burdened families. Cost-burdened families consist of families that pay 30% or more of their monthly income for housing. When families are cost-burdened, they may not have suitable resources to account for other important aspects of life, such as groceries, utilities or healthcare. In turn, this can place undue stress on such individuals and cascade towards worsening physical, mental and emotional health and increased likelihood of disease or injury (Office of the Surgeon General (US), 2009). In 2017, 34.6% of families across the United States were cost burdened (Office of Disease Prevention and Health Promotion, 2020). In Durham County, North Carolina, this problem exists at a comparable rate – 31% of households or approximately 40,000 residents – are categorized by the cost-burdened status, significantly above the national target rate of 25.5 percent (Durham County Public Health et al., 2021). As a result, reducing the proportion of cost-burdened families is an area of high priority in Durham County when attempting to address the social determinants of health.

#### **Geographic Context**

Durham is a county in central North Carolina, and home to an estimated 326,126 residents as of July 1, 2021 (*U.S. Census Bureau QuickFacts: Durham County, North Carolina*). Originally a haven for English, Scots and Irish along North Carolina’s waterways, the City of Durham formally came to be as a railroad station and settlement. The tobacco manufacturing industry transformed Durham into a thriving and prosperous county (*Durham County History*, n.d.). In more recent years, the Triangle - inclusive of Durham - has been named among the fastest-growing economies in the United States, largely due to technology and biotechnology sectors (Purtell & Calvey, 2022).

As a result of this major growth and economic activity, Durham has been revitalized into a more attractive destination for affluent newcomers to move to. As these individuals move in, and as the professional industries in these areas become increasingly more concentrated and vertically stratified, longtime residents of Durham have begun to be priced out and dislocated from their homes. The 2020 Durham County Community Health Assessment additionally notes that “structural racism and historical policies such as redlining, immigration laws and segregation are causes of health disparities” (Durham County Public Health et al., 2021). However, Durham entities have identified and attempted to work towards balancing creating and providing affordable housing with revitalizing the city.

### **Priority Population**

Low-income populations are of particular priority in Durham, especially given cost-burdened individuals are forfeiting at least 30% of their income to housing. 30% of income (monthly or annual) is considered the line at which housing is unaffordable. In Durham, 40.8% of renters - or 29,253 renter households - identify as cost burdened (*Cost-Burdened Renters (Census Blockgroups)*, 2019). The City of Durham has additionally identified households below 50% Area Median Income (AMI) as a priority population in their 2016-2021 Affordable Housing Goals. Cost-burdened individuals in Durham disproportionately belong to underrepresented communities, particularly of Black and Hispanic origin (De Marco & Hunt, 2018).

### **Measure of Problem Scope**

Table 1 shows key demographic and housing-related estimates for Durham County, North Carolina. While 326,126 people reside in Durham County, North Carolina, only 149,204 units are available. In Durham, the fair market rent for a two-bedroom unit has increased over 16% between 2016 and 2020. The 2020 fair market rent of \$1088 is 5% less than the actual median gross rent of \$1,162. With a per capita income of \$39,602, residents that are renting are paying roughly \$13,944 in rent per year, which is 35.2% of their income (over the 30% mark). As housing is a key aspect of the social determinants of health, it demonstrates a clear health linkage in many ways. Having a safe, secure and affordable location of housing is evidenced to improve health and decrease healthcare costs. Housing instability is associated with worse caregiver and child health among low-income renter households. Individuals who face chronic housing instability are more likely to demonstrate poor health. This housing instability is further associated with increased risk of worse mental health, drug usage and teenage pregnancy (Taylor, 2018). Thus, residents of Durham County are at particular risk, especially those belonging to disadvantaged backgrounds.

**Rationale/Importance**

Rising costs of housing have elevated housing insecurity to a major priority in Durham, with the 2020 Durham County Health Assessment identifying affordable housing as a key area of concern (Durham County Public Health et al., 2021). The juxtaposition of minimal wage increases per year against the ever-increasing necessary livable wage is significant. As a result of individuals being priced out of homes and apartments, homeless shelters have seen record highs of tenants and length of stays. In 2019, the Urban Ministries of Durham reported a threefold increase in stay in just over a year, from an average of 24 days to 77 days for singles and 33 days to 116 days for families (Abrams, 2019). With these general rising costs and dwindling wages, combined with unemployment concerns and an expected recession, housing insecurity is a pressing area for improvement in Durham.

**Disciplinary Reflection - Health Policy**

In order to address the social determinants of health, an interdisciplinary approach is essential. Part of that approach should consist of a health policy team member, as the social determinants of health are fundamentally health-related and policy grounds the system through which health proliferates. Health policy allows for an avenue to ensure that there is a systematic reference for community members to rely on and legislators/enforcers to govern by. Health policy professionals can provide immense value by providing comprehensive, innovative and affordable solutions. In the context of affordable housing, health policy professionals can provide rent By taking into account precedence, especially at differing levels of government, health policy professionals can ensure a valuable and effective intervention for the Durham community.

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**APPENDIX F.1.A: SDOH ANALYSIS FIGURES AND TABLES**

**Table F.1: Key Demographic and Housing Estimates for Durham County, North Carolina**

Population Estimates (July 1, 2021)	326,126
Median household income (2017-2021)	\$67,000
Per capita income in past 12 months (2017-2021)	\$39,602
Housing units (July 1, 2021)	149,204
Persons in poverty, percent	13.4%
Owner-occupied housing unit rate (2017-2021)	55.3%
Median gross rent (2017-2021)	\$1,162

*(U.S. Census Bureau QuickFacts: Durham County, North Carolina)*

## **APPENDIX F.2: POLICY ANALYSIS**

Across the United States, worse health outcomes can be perpetuated through lack of access to affordable housing. If families contribute a significant portion of their income to housing-related needs, they may be unable to provide for other important aspects of their life, including food or healthcare (Taylor, 2018). Additionally, housing insecurity is imbued with a major equity issue – nationally, over 50% of Black and Latino renters spent more than 30% of their income on housing, compared to 40% of their White counterparts (Center on Budget and Policy Priorities, 2022). Additionally, low-income renters suffer worse quality and less safer housing options.

Many residents are cost burdened, contributing at least 30% of their income to housing needs. In Durham County, North Carolina, this problem is particularly concentrated – 31% of households (or approximately 40,000 residents) are considered cost-burdened (Durham County Public Health et al., 2021). Additionally, housing costs are rising faster than wages and rental assistance, and renters' incomes are especially not proportionally keeping up due to rampant and pervasive inflation (Center on Budget and Policy Priorities, 2022). Housing cost burden is considered a key measure of housing insecurity, and must be addressed to ensure renters have an affordable, safe and healthy environment to live in.

### **Summary of Policy Options and Evaluation Criteria**

Two policy options – inclusionary zoning and renter circuit breaker tax credits – will be considered to address housing insecurity and renter cost burden in Durham County. Inclusionary zoning refers to developers being required to ensure a certain percentage of new housing developments be dedicated to below-market-priced renting and buying. Renter circuit breaker tax credits refers to the reduction of property tax burden on financially burdened taxpayers. As renters indirectly pay property tax through rent, renters will be able to use a dedicated percentage of their rent as assumed property tax and use it to calculate their expected circuit breaker credit (Institute on Taxation and Economic Policy, 2019).

Several key evaluation criteria will be used to determine the range and scope of success for these policy options. These criteria include cost to the county, impact on reducing cost burden for low-income renters, political feasibility and equity in reduction of cost burden. Cost to the county examines the financial aspect of Durham County's ability to fund respective policy options. Impact on reducing renter cost-burden analyzes the extent to which rent in Durham County is reduced, particularly in relation to percentage of renter income. Political feasibility



indicates whether a policy option is viable in the current county political climate. Finally, equity denotes whether disparities in cost burden for renters are addressed.

All policy evaluation criteria will be given a number score from 1-5, 1 being the least impact and 5 being the greatest for each criterion. The impact on reducing cost burden for low-income renters, political feasibility and equity will be given double weight. These criteria are receiving a double weight so as to place emphasis on the ultimate impact and realistic nature of these policy options transpiring.

#### **Analysis of Policy Options**

One policy option for consideration is inclusionary zoning, which requires developers to provide a certain percentage of their development to low-income individuals and families in exchange for various development incentives, such as permit expediting or fee waivers. There is evidence that inclusionary zoning “increases access to and production of quality, affordable housing for households with low and moderate incomes, especially in urban areas with strong housing demand” (*Inclusionary Zoning & Housing Policies, 2022; Tuller, 2018*). The Town of

Chapel Hill, in Durham County’s neighbor Orange County, enacted a Inclusionary Zoning Ordinance that stipulates developments with five or more units must provide 15% of the units at a price affordable to low- and moderate-income households; this policy option will seek a 15% allocation as well (Town of Chapel Hill).

Inclusionary zoning appears to be a cost-effective and practical approach to reducing housing insecurity, although evidence for success varies with policy design and local context (*Inclusionary Zoning & Housing Policies, 2022*). As inclusionary zoning does not require direct governmental fund allocations, it is generally cost saving and pivots housing development responsibility to the private sector. However, some county income may be lost through fee waivers provided to incentivize inclusionary zoning. Additionally, inclusionary zoning has been discussed as an option for Durham County, as recently as 2017-2018 in the NC General Assembly (*Inclusionary Zoning - Durham, 2017*) and neighboring counties employ this policy, establishing precedence and making it particularly recognizable and potentially feasible. [SB11] Impact on renter cost burden will vary immensely, depending on the number and size of affordable units being built. From an equity standpoint, inclusionary zoning appears to make some significant impacts – affordable units created through this policy are more likely to be located in higher-income neighborhoods and enhance accessibility to higher-rated schooling systems (Tuller, 2018).

Another potential policy option is the translation of circuit breaker tax credits to renters for state and local level taxes. Although circuit breaker programs generally are geared towards homeowners, this policy would be

focused on renters with the understanding that renters indirectly fund property taxes via elevated rent (Institute on Taxation and Economic Policy, 2019). Renters generally earn less than homeowners, yet disproportionately bear property tax burdens (Lincoln Institute of Land Policy, 2009). Durham County currently employs a Circuit Breaker program, but it is limited to the elderly (65+) and/or disabled homeowners (*Property Tax Relief for Homeowners*, 2022). Under this proposal, the program would expand eligibility to include renters and provide them with tax credits if a percentage of their rent passes a predetermined income-rent chart provided by the county. 15% of rent would be used as their assumed property tax contribution, and the tax credit would be capped at \$750.

Circuit breaker tax credits for renters appear to be a significantly more impactful approach to addressing housing insecurity and cost burden, but will incur a larger cost and require more political buy-in. Durham County government will be required to increase budgets to account for funding for this program, and a lower percentage of coverage will result in more government dollars. One such model suggests a 5.2-7.8% decrease of property tax revenue if credits were claimed by all eligible (Lincoln Institute of Land Policy, 2009). Accordingly, this proposal will be less politically feasible as it will be resource-heavy and require administrative oversight. Other states employ a program similar to this and have found that this structure are most effective and targeted as they primarily benefit low-income taxpayers (Institute on Taxation and Economic Policy, 2019). This program will take a more direct approach to equity and impact on cost burden, as lower-income communities are targeted directly and will receive a direct, usable kickback from the tax credit.

#### **Final Recommendation and Evaluation Metric**

Considering all relevant factors of both policy proposals, inclusionary zoning appears to be the most cost-effective option, but circuit breakers appear to have significantly greater impact. Although circuit breaker tax credits for renters will be more far-reaching, they will be significantly more resource heavy and less politically feasible (Institute on Taxation and Economic Policy, 2019). Political feasibility seems to be worse for circuit breaker tax credits due to its more innovative nature and expansion of financial involvement from the government. Inclusionary zoning can still have an impact, especially after several years of existence, and diversify housing availability and location and associated outcomes. According to Appendix 1, renter circuit breakers will ultimately be the best option

Success following implementation of either policy will be evaluated via a process measure and an outcome measure. The primary process measure to be utilized is the number of moves of Durham County renters. A greater number of moves within a county is considered a measure of residential instability and housing insecurity (Leopold

et al., 2016). Residents that move more often are often priced out of their current places of residence. The primary outcome measure to be utilized is the percentage of Durham County renters that are cost burdened. As the purpose of the policy options is to address housing insecurity and cost burden, this measure will determine whether any changes have occurred to cost-burden proportions in Durham County.

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**APPENDIX F.2.A: POLICY ANALYSIS FIGURES AND TABLES**

**Table F.2: Policy Scoring Matrix**

	Inclusionary Zoning	Renter Circuit Breakers
Cost to county	4	2
Impact on reducing cost-burden for low-income renters (x2)	2 4	4 8
Political feasibility (x2)	3 6	2 4
Equity (x2)	3 6	5 10
Total	22	24

### **APPENDIX F.3: PROGRAM BUDGET & NARRATIVE**

#### **Program Summary**

In order to address cost burden for low-income renters in a feasible manner at the county level, the Durham County Board of Commissioners should implement a policy that removes Minimum Parking Requirements (MPR). MPR is a stipulation that new developments include a certain number of associated parking spaces – removing requirements can stimulate local economies and improve housing affordability by offering more housing and less rent. Accordingly, parking can be unbundled from rent costs. Constructing off-street and garage parking through existing MPR increases costs for developers, which in turn can result in rent increases. As off-street and garage parking have been associated with rent increases in urban areas and cost increases to the developer, a change in zoning regulations will allow for developers to just prioritize building housing and accordingly increase housing density (Jia and Wachs, 1999; Gabbe and Pierce, 2016). The program manager will review overall implementation of zoning code changes and monitor data that is received from internal departmental staff. Existing resources will be leveraged to enforce these changes as part of the larger zoning policy picture.

#### **Budget Narrative**

This program will aim to create at least five large (750+ units) housing developments over the next 3 fiscal years under new standards with higher density housing aimed at ensuring lower rents. The program will utilize sending out mailers and holding seminars with local developers to ensure that changes in zoning regulations are communicated properly and associated incentives (housing development application prioritization and application fee waivers) are understood. This program will focus on changing zoning regulations to remove minimum parking standards. Accordingly, an essential outreach methodology will be the primary arm of this program. Mailers will be created and sent out/distributed generally to ensure that residents are made aware of changes and developers understand incentives for building now and accordingly reducing rent. Mailers will be created on Canva, using the subscription service Canva Pro (priced at \$120/yr. for one person) (“Plans and Pricing”). Additionally, several workshops will be held throughout the years of this program for developers to explain how zoning regulations have changed and why they are incentivized to build parking-free within Durham County. Speakers will be paid \$900 for 8 hours of their time for each session, with an anticipated \$500 space rental fee per session. Travel will include gas mileage over the course of 3 years, as cars use around 470 gallons of gas per year over the course of 3 years – additional funds will act as mileage reimbursement for travel to the convenings (Smith).

Staffing will support this approach directly. An urban planner (average salary of \$54,000) will be hired at half FTE to identify sites for development and offer them up to developers – as time goes on, this FTE will be cut further as less sites are needed to be identified (U.S. Bureau of Labor and Statistics). Other general staff for the program will be a program manager, administrative assistant, and outreach lead. The outreach lead is essential for executing the outreach strategy and making the community aware of changes and benefits, including organizing dissemination of mailers. The outreach lead will make a starting salary of \$50,000 and stay staffed fully the entire duration. The administrative assistant will manage general program costs and daily function. Administrative assistants make around \$42,000 – for the specialization of this work, they will make slightly more in this program (Salary.com). The program manager will focus on execution of the strategy, metric collection, and policy analysis. They will additionally perform site visits and policy assessments to ensure MPR are being applied properly. On average, MPH program managers make around \$70,000 (Jordan).

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**APPENDIX F.3.A: PROGRAM BUDGET & NARRATIVE FIGURES AND ANALYSIS**

**Table F.3: MPR Budget**

FY2022-23				
	FTE	Salary	Fringe benefits (payroll taxes, health insurance)	Personnel cost
MPH level program manager	1	\$ 70,000	\$ 21,000	\$ 91,000
Urban planner	0.5	\$ 27,500	\$ 8,250	\$ 35,750
Administrative assistant	1	\$ 45,000	\$ 13,500	\$ 58,500
Outreach lead	1	\$ 50,000	\$ 15,000	\$ 65,000
<b>Total</b>	<b>3.5</b>	<b>\$ 192,500</b>	<b>\$ 57,750</b>	<b>\$ 250,250</b>
FY2023-24				
	FTE	Salary	Fringe benefits (payroll taxes, health insurance)	Personnel cost
MPH level program manager	1	\$ 71,400	\$ 21,420	\$ 92,820
Urban planner	0.25	\$ 28,050	\$ 8,415	\$ 36,465
Administrative assistant	1	\$ 45,900	\$ 13,770	\$ 59,670
Outreach lead	1	\$ 51,000	\$ 15,300	\$ 66,300
<b>Total</b>	<b>3.5</b>	<b>\$ 196,350</b>	<b>\$ 58,905</b>	<b>\$ 255,255</b>
FY2024-25				
	FTE	Salary	Fringe benefits (payroll taxes, health insurance)	Personnel cost
MPH level program manager	1	\$ 72,828	\$ 21,848	\$ 94,676
Urban planner	0.25	\$ 28,611	\$ 8,583	\$ 37,194
Administrative assistant	1	\$ 46,818	\$ 14,045	\$ 60,863
Outreach lead	1	\$ 52,020	\$ 15,606	\$ 67,626
<b>Total</b>	<b>3.5</b>	<b>\$ 200,277</b>	<b>\$ 60,083</b>	<b>\$ 260,360</b>

**Non personnel costs (FY2022-23, 2023-24, 2024-25)**

Direct		Indirect	
Conferences/meetings	\$5,000	Printing/copying	\$1,600
Speaker (3x)	\$2,700	Ink	\$200
Space rental	\$1,500	Printer	\$300
Food	\$800	Paper	\$100
Travel (Gas, etc.)	\$5,000	Copier	\$1,000
Canva Pro Subscription	\$120	<b>Total</b>	<b>\$1,600</b>
<b>Total</b>	<b>\$15,120</b>		
<b>Total personnel costs</b>		<b>\$ 765,865</b>	
<b>Total direct non-personnel costs</b>		<b>\$ 15,120.00</b>	
<b>Total indirect non-personnel costs</b>		<b>\$ 1,600.00</b>	
<b>Total program costs</b>		<b>\$ 782,585</b>	

## **APPENDIX G: ALEXA STACHOWSKI INDIVIDUAL DELIVERABLES**

### **APPENDIX G.1: SOCIAL DETERMINANT OF HEALTH ANALYSIS**

#### **Background**

According to Harvard University's State of the Nation's Housing Report, in 2020, 30% of all households had "unaffordable" rent or mortgage payments. This translates to more than 1 in 7 households within the US paid over half their income on housing. House prices rose by 20.6% from March 2021 to March 2022 and rents by 12% (2022 State of the Nation's Housing Report: 4 Key Takeaways for 2022, n.d.). When a person pays more than 30% of their income on housing and utilities it is defined as a cost burden. For the state of North Carolina, the graph found in the appendix (Figure 1) highlights' percentages of those cost-burdened groups (North Carolina, n.d.).

In a cross-sectional research study from 1980-1997, cost burden households were found to be associated with negative health outcomes. Data was collected over the 17 years from lower-income areas on how these participants would rate their own health. The results showed a much lower rating provided by lower income areas in comparison to the higher-income neighborhoods (Do & Finch, 2008). This study performed by Do & Finch resulted in short term negative impacts to health amongst lower income. These negative health outcomes included higher rates of stress/anxiety, sleep disturbances, mental health issues, relationship problems, and even suicide rates (Do & Finch, 2008). As for longer term impacts of cost burden households, some health outcomes that may result include food insecurity, which can lead to malnutrition and suppression of the immune system. Other long-term effects include decrease in mental health, and due to poor housing conditions, it can lead to long term impacts on cardiovascular issues, asthma, injuries, etc. (D'Alessandro & Appolloni, 2020).

#### **Geographical and Historical Context**

The current 2023 population of Durham County North Carolina is 300,060 persons and it is the 4<sup>th</sup> largest city in NC (Durham, North Carolina Population 2023, n.d.). Durham is also, growing at a rate of 1.87% annually (Durham, North Carolina Population 2023, n.d.).

In 2020, 41,000 out of the 300,000 population in Durham were living below the poverty line. The largest demographic are females ages 25-34, followed by females ages 18-24, followed by males 18-24. (Durham, North Carolina Population 2023, n.d.) In Durham, the most common racial ethnic group below the poverty line (see figure 2) is Hispanic (36.81%), followed by Black (19.42%) (Durham, North Carolina Population 2023, n.d.). In 2021, 20.6% of the children were living in poverty in Durham as well.

According to the former mayor of Durham: Steve Schewel, the average income of a family moving into Durham is \$10,000 more per year than the average family living here now. These incoming families are competing for housing and further driving up prices (State of the City 2021: Affordable Housing, n.d.). In 2021, 16.7% of the population was living with severe housing problems (Durham, North Carolina Population 2023, n.d.) In addition, the COVID 19 pandemic did not help with inflation and poverty levels (Durham, North Carolina Population 2023, n.d.). In fact, “Durham faces a citywide housing shortage. The average time a house spent on the market in May 2018 was a mere 14 days. Builders report that they are struggling to keep up with demand.” (De Marco & Hunt, 2018)

In North Carolina, the median rent (including utilities) for an apartment was \$930/month in 2019, an 8 percent increase since 2001. However, wages have not caught up. North Carolina last raised its state minimum wage in 2008, when it increased \$0.70, from \$6.55 to \$7.25 per hour. Today, North Carolina’s 2023 minimum wage remains at \$7.25 per hour (North Carolina Minimum Wage Data, n.d.). This problem contributes to the 668,100 people who live in the 320,100 low-income households and pay more than half their income for rent (US, 2019).

#### **Priority Population**

Cost burden households who pay more than 30% of their income in rent is the focus of this research. Within Durham, North Carolina, this results in the priority population to include more Black, Hispanic racial and ethnic groups. Both Black and Hispanic groups are disproportionately affected in comparison to other races (De Marco & Hunt, 2018). As stated above, Black and Hispanic groups suffer the most in terms of poverty as well. This carries over to poor housing status. (De Marco & Hunt, 2018)

#### **Measurements of SDOH**

Beyond mental, educational and emotional effects that lower income houses can impact on health, it can further impact physical health. Families paying excessive amounts of their income for housing may not be able to afford other necessities such as food, medical insurance, and health care, which can threaten one’s physical health because it may result in not going to the doctor, not buying healthy foods, refilling medications, etc. (Maqbool et al., n.d.). A big disadvantage to low-income housing is the size of the house as well, which can negatively impact one’s health. Overcrowding is a common occurrence within these households. Overcrowding is defined as more than 2 people living in the same bedroom or multiple families living in 1 residence and can affect increase the risk of infectious disease (Housing Instability - Healthy People 2030 | Health.gov, n.d.). This can specifically affect the physical health and well-being of children.

Children who experience and live in cost burden households are often not able to commit their time and energy towards school. If these children are challenged with transportation issues, sanitation and crowded living conditions it can lead to them leaving school at a younger age and/or never graduating from college (Perez, 2022). Hence, affordable housing is a huge component to providing a good foundation towards both mental and physical health for both children and adults.

**Rationale/Importance**

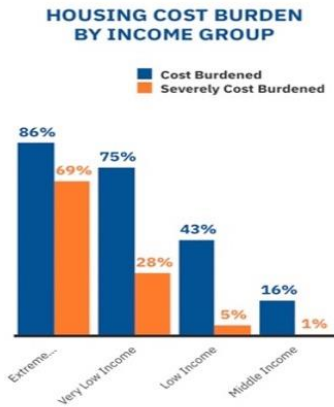
Some positive impacts that would result from more affordable, safe housing would be less money being spent on the houses and more money spent on health. These households would be able to prioritize their health. This could lead to improving upon those short-term impacts including mental health issues and food insecurity, which can provide the domino effect to improving long term impacts such as cardiovascular health, nutrition status by choosing to eat healthier and asthma by living in a safer environment. (D'Alessandro & Appolloni, 2020).

**Disciplinary Critique**

Within dietetics the field could display more cultural humility by understanding the population of the people who reside within these areas and providing educational resources to these areas. This can be done in the form of community gardens. Community gardens have been shown to improve health through increased physical activity and changes to diet, particularly eating more fruits and vegetables and fewer processed foods (Sadeghzadeh et al., 2021). This can provide health benefits to these areas in both short- and long-term ways.

APPENDIX G.1.A: SDOH ANALYSIS FIGURES AND TABLES

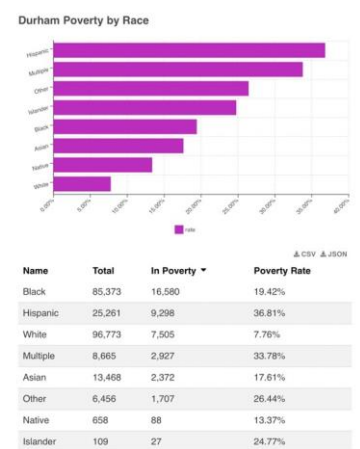
Figure G.1: Housing Cost Burden by Income Group Bar-Graph



**Note:** Renter households spending more than 30% of their income on housing costs and utilities are cost burdened; those spending more than half of their income are severely cost burdened.  
**Source:** NLIHC tabulations of 2020 5-Year ACS PUMS

(North Carolina, n.d.).

Figure G.2: Durham Poverty by Race Graph



(Durham, North Carolina Population 2023, n.d.).

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## APPENDIX G.2: EVIDENCE-BASED NUTRITION PROGRAM

### Introduction

In 2020, according to Harvard University's State of the Nation's Housing Report, 30% of all households had "unaffordable" rent or mortgage payments (*2022 State of the Nation's Housing Report: 4 Key Takeaways for 2022*, n.d.). This translates to more than 1 in 7 households within the United States paid over half of their income on housing. House mortgage prices rose by 20.6% from March 2021 to March 2022 and rental payments by 12% (*2022 State of the Nation's Housing Report: 4 Key Takeaways for 2022*, n.d.). When a person pays more than 30% of their income on housing and utilities it is defined as a cost burden (*2022 State of the Nation's Housing Report: 4 Key Takeaways for 2022*, n.d.). In the state of North Carolina, the graph found in Figure 1 presents the percentages of those cost-burdened groups (*North Carolina*, n.d.). Households that spend excessive amounts of their income on their home may not be able to afford other necessities such as food, which can lead to food insecurity. As a result, this can negatively impact one's health both physically and mentally (Maqbool et al., n.d.).

### Evidence Based Nutrition Policy or Program

In a cross-sectional research study conducted from 1980-1997 by Do and Finch, cost burden households were found to be associated with negative health outcomes. The 17-yearlong study was collected on individuals in both low income and high-income households to determine the total effects on their health, as well as personal ratings/surveys on their health. In the study it found that the odds of reporting poor health are 1.63 times greater for a person who resides in a high-poverty neighborhood than for a comparable person in a low-poverty neighborhood (Do & Finch, 2008). Within the low-income household areas, their results further suggested both short-term and long-term negative health impacts (Do & Finch, 2008). The short-term impacts included higher rates of stress and anxiety, sleep disturbances, mental health issues, relationship problems, and suicide rates (Do & Finch, 2008). The long-term impacts included food insecurity, which could lead to malnutrition and further suppression of the immune system. Other long-term effects included decrease in mental health and exposure to chronic diseases such as asthma, cardiovascular damage, and permanent injuries as a result of poor housing conditions (D'Alessandro & Appolloni, 2020).

Since most of the cost burdened households are within low-income areas it is important to note, “Low-income groups (LIGs) have a greater tendency to consume unhealthy diets and develop chronic diseases at an earlier age, compared with higher socio-economic groups. Improving the diets of LIGs is a priority... and focuses largely on improving access to and affordability of a healthy diet.” (Dibsdall et al., 2002) One way to support a healthier diet and affordability to these neighborhoods is through community gardens. Community gardens can provide an affordable and accessible way to obtain and incorporate a healthy diet (Dibsdall et al., 2002), which can positively impact a person’s health.

In a study conducted on fruit and vegetable intake among urban community gardens, the study found that, “Adults with a household member who participated in a community garden consumed fruits and vegetables 1.4 more times per day than those who did not participate, and they were 3.5 times more likely to consume fruits and vegetables at least 5 times daily.” (Alaimo et al., 2008) This evidence suggests that community gardens can help increase fruit and vegetable consumption, which further, can lead to lowering chances of heart disease, stroke, and certain types of cancer. Additionally, it can help alleviate digestive issues, balance blood sugar levels, as well as support appetite balance (*Vegetables and Fruits / The Nutrition Source / Harvard T.H. Chan School of Public Health*, n.d.).

Within Durham, North Carolina, the proposed evidence-based nutrition program to address food insecurity amongst cost burdened neighborhoods and increase fruit and vegetable consumption to encourage a healthier diet/lifestyle is twofold. First, it would require building community gardens within low-income areas. Second, educational resources would be provided at the community gardens through Durham’s Innovative Nutrition Education (DINE). By pairing these together, individuals who participate are provided a greater opportunity to forming both short- and long-term positive effects on their health.

Community gardens fit within the interpersonal and community levels of the socioecological model. The gardens fall into the interpersonal level because it provides the opportunity to create personal interactions while at the garden. The gardens fall within the community level because the social interactions at the interpersonal level provides a domino effect, which can lead to a larger impact and/or formation of a community bond. The DINE



component is the organizational level of the socioecological model and is informed by Snap-ed Curriculum (USDA, 2021).

DINE is a program supported by funds from SNAP Education and Durham County that provides nutrition education in various ways. One specific way DINE could provide education is through their adult education program. In DINE's adult education program DINE offers interactive nutrition and culinary workshops. The hope would be to provide these at the community gardens to teach people how to cook and show how different ways fruits and vegetables can be consumed and enjoyed (*DINE for Life | Durham County - NC - Public Health*, n.d.).

#### **Evidence Based Outcomes**

With a community garden the goal would be to reduce food insecurity within the neighborhood, while increasing the option to receive education on healthy eating patterns through DINE. This would be able to provide both knowledge, accessibility, affordability and applicability to consuming a healthier diet. Evidently, a systematic review of garden-based interventions found that community gardens can reduce BMI, increase physical activity, and increase fruit and vegetable consumption, which can lead to positive impacts on health and lifestyle (Gregis et al., 2021).

The short-term outcome objectives of these community gardens are to: Increase the percentage of DHA residents who report fruit and vegetable consumption, via survey, 'several times per day,' from baseline to 65% by August 2025 (Carney et al., 2012). This objective is similar to a study that was published in 2011 on the impacts of community gardens. In this study, they found a 66.6% increase in fruit and vegetable consumption based on a pre and post gardening survey given to the community (Carney et. al., 2011). The measurement for Durham County's community garden short term objective will be done through a survey given at baseline and provided every 6 months after every post gardening season. This timeline will help gather and compare the data of the community's consumption of fruits and vegetables.

The long-term impact of this program is to: Decrease household food insecurity by 28% for residents of DHA properties that grow community gardens by August 2027 (Carney et al., 2012). This was evident in the same study: "Before the gardening season, the sum of the frequencies of "Sometimes" and "Frequently" worrying in the past month that food would run out before money was available to buy more was 31.2% and the sum of these

frequencies dropped to 3.1% during the post garden period, ( $P = 0.006$ ).” (Carney et. al., 2011) Although the ethnicities differ between this study and Durham’s population, the study is applicable due to it involving a lower income, underrepresented population, which is a similar representation to the low-income renters found in Durham County. In the evaluation paper, the methods and details of measurement of these short- and long-term outcomes will be discussed further.

#### **Evidence Based Implementation Strategies and Activities**

The goal would be to build and maintain at least 3 community gardens at 3 different locations. This goal would need to be supported and in agreement with other community partners. Specifically, the plan is to collaborate with the Durham Housing Authority (DHA) to have them provide 3 areas with the land needed to build a community garden within each area. The reach of these gardens would depend on water access to be provided for said garden to be fully functional.

The setting of the educational component would be at the community gardens. The education would be given by DINE guest speakers and organized by community garden workers based on chosen or desired topics, which will be discussed in greater detail within the next paper. Some topics, however, may include shopping on a budget, how to garden, cooking lessons, and more. The purpose of these classes is to promote a more profound impact on the community population, or those who spend greater than 30% of their income on housing costs.

#### **Community Partners/Stakeholders**

As mentioned above, DHA and DINE are two community partners that would be critical to the success of the program. Some other stakeholders that would be needed to reduce cost would be the Digging Durham Seed Library, which provides free vegetable, herb and flower seeds that can be taken home to be planted (*Digging Durham Seed Library – Durham County Library*, n.d.). An additional stakeholder that would be needed is the NC Department of Agriculture and Consumer Services that provides free soil testing kits (*Fee-Free Soil Testing Season Is Here – Extension Master Gardener Volunteers of Durham County*, 2018) The last stakeholder to help the gardens grow is the Keep Durham Beautiful non-profit, that provides tools to community groups for free (*Tool Lending Library – Keep Durham Beautiful*, n.d.).

**Budget**

The estimated cost for the inaugural year is \$21,530. These funds will be collected from grant opportunities and local funds. Local funds may include the Adopt-a-Garden campaign, which partners with local businesses or universities who would sponsor the gardens. Other options include grants through businesses and organizations like the Home Depot Foundation, the National Gardening Association, and the Captain Planet Foundation. The NC Cooperative Extension has a list of resources to support funding for gardens (Bradley, 2023).

**Conclusion**

One advantage to this proposed plan is that it will increase affordability and accessibility to the community. These gardens can lead to healthier eating patterns and more awareness around what type of food individuals should be consuming each day. Another advantage is the impact that fruits and vegetables can have on overall physical and mental health. Fruits and vegetables consumption may reduce chronic disease as stated previously.

One disadvantage of community gardens is the lack of funding and government-based programs. This would include the ability to obtain the space needed for the garden, as well as providing the education proposed for the community members. In addition, lack of personnel is another barrier to community gardens. If there are not enough people interested in running the community gardens, the gardens will not be able to sustain.

Overall, from a social justice lens, community gardens provide an opportunity to expand nutritional awareness and bring communities together amongst cost burden areas.

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**APPENDIX G.2.A: EVIDENCE-BASED NUTRITION PROGRAM FIGURES AND TABLES**

**Table G.2: Nutrition Program Budget Table**

<b>Expense Item</b>	<b>Cost</b>	<b>Purpose</b>
Supplies for the creation of the gardens	\$7,500 \$2500 Per Garden	NC Cooperative Extension estimates the cost of a community garden start up for ¼ acre of land in NC to be \$1000-\$5000. We can assume the cost to be about \$2500 for each of these gardens.
Project Manager	\$22/hr for 19 hours a week up to a 1,000 hours per year \$22,000 per year	Planning and organizing the construction of the gardens. Collaborates with DINE, Briggs Ave Community Garden to host speaker and education services. WFH position.
Long-Term Garden Keepers*	\$14,820 per year Based on the average hourly pay for gardeners \$19/hr. (3 employees x 5 hrs x 52 weeks x \$19)	Employed individuals to ensure the garden is well maintained, and plants are properly cared for. Residents will be encouraged.
Seeds/Plants	\$0	Used to plant and grow produce. No Fee due to Digging Durham Seed Library.  Donations are always welcome.
Gardening tools	\$0	Necessary to build and maintain gardens. No Fee due to Durham Tool Lending Library Program.  Donations are always welcome.
Gas Mileage	\$1000 per year	Gas Reimbursement for garden keeps when picking up and returning the gardening tools
Utilities and upkeep of Garden	\$3000 per year \$1000 per garden	Utilities bills and regular upkeep of garden averages this price according to NC Cooperative Extension
<b>Total Cost to Create and Sustain 3 Gardens over 4 Years: \$170,780</b>		

Note \*Regarding the Long-Term Garden Keepers: Ideally, the community would be in charge but this would ensure the upkeep of the garden. If residents can demonstrate full responsibility for community gardens, employment of garden keepers will not be necessary and can decrease expenses by \$14,820 per year.

## **APPENDIX G.3: EVIDENCE-BASED NUTRITION PROGRAM EVALUATION PLAN**

### **Introduction**

Housing falls within the neighborhood and built environment sector of the social determinants of health (SDOH) (Taylor, 2018). Housing, as a social determinant of health, is an indicator of both health and well-being, and directly tied to numerous physical and mental health outcomes (Taylor, 2018). Families paying excessive amounts of their income for housing may not be able to afford other necessities such as food and nutrition and health promoting resources. In addition, they are less likely to delay seeking healthcare for medical conditions, which can lead to negative health outcomes such as depression, anxiety, malnutrition, obesity, high blood pressure, cardiovascular diseases and more (Maqbool et al., n.d.).

When families experience a high cost burden as defined by 30% or more of income going towards housing, families lack financial access to affordable food and nutrition and health promoting resources (Taylor, 2018). Alleviating cost burden amongst low income renters in Durham County, North Carolina, as defined by individuals with less than 30% area median income (AMI), is imperative in improving affordable housing and equity (Hamann, 2023). These individuals are considered extremely low-income, and thus, they're the focus of this intervention as they are the most vulnerable and would be the best population to receive county resources.

As a result, within Durham, North Carolina, our proposal is based on previous evidence based research, titled, "Impact of a Community Garden Project on Vegetable Intake, Food Security and Family Relationships: A Community-based participatory research study." (Carney et al., 2011) This evidence-based research led to a similar approach to help address food insecurity amongst cost burden neighborhoods and increase fruit and vegetable consumption within Durham. The proposal includes building community gardens with the help of the Durham Housing Association (DHA) for selected properties to reduce financial burden that healthy foods can cause and improve food security for these low-income renters. Our proposal also includes providing educational resources such as cooking classes and how to grow and maintain a garden that would be offered at these community gardens through Durham's Innovative Nutrition Education (DINE). By pairing these two resources together, individuals who participate are provided a greater opportunity to form both short- and long-term positive effects on their health.

### **Study Design/Data Collection**

The short-term outcome objectives of these community gardens are to: increase the percentage of DHA residents who report fruit and vegetable consumption, via a survey, from baseline to 65% by November 2025

(Carney et. al., 2011). Baseline will be considered the point when the families first enter the program; 2 weeks before frost date, which would be around the first week of April in Durham. (NC Cooperative Extension, n.d). The survey will be called: “Community Gardens Health Survey.” The sampling strategy used to assess the short-term outcome objective will be through an observational community-based participatory research approach and our evaluation tool will include options for both written or verbal surveys during the pre- and post- garden seasons.<sup>14 15</sup> The project manager will conduct these questionnaires verbally to the participants either over the phone or in person and should not take longer than 15 minutes. Questions on these surveys will be developed from those used in the community-based participatory research study by Carney et al. This may include questions focused on demographics, family size, frequency of eating vegetables and food security (quantifiable data). An example of food security may be: “How many times a week do you find yourself hungry, but with no food available?” In addition to the survey’s, focus groups will be held post garden seasons to further assess the impact of the program beyond that of the structured surveys, and to encourage participant suggestions on program improvement.

#### **Sample and Sampling Strategy**

The convenience sample size of the study will be taken from the first 20 households that sign up out of the three communities. This makes our total sample size 60 households. This is a relatively small sample size, but it will still be able to generate data that can be used to assess the effectiveness of healthy eating patterns as a result of implementation of community gardens amongst low-income neighborhoods. The surveys will be given at the beginning and end of every gardening season for 3 years. By having families sign up for the study themselves, they are more likely and willing to participate and follow through with the survey (Carney et al., 2014) and this approach would require no extra need to recruit. This strategy is similar to a study that was published in 2011 on the impacts of community gardens (Carney et. al., 2011). In this study, the researchers found a 66.6% increase in fruit and vegetable consumption amongst 15 households based on a pre and post gardening survey given to the participants (Carney et. al., 2011).

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<sup>14</sup>Pre-Garden Season: Occurs two weeks prior to the last frost. Last Frost typically occurs during the first week of April in Durham County, North Carolina (NC Cooperative Extension, N.d).

<sup>15</sup>Post-Garden Season: Occurs up to the week of the first frost. First frost typically occurs during the first week of November in Durham County, North Carolina (NC Cooperative Extension, N.d).



## **Specific Measures**

For this study, in order to have a proper comparison from these surveys, the participants/ families will have to remain the same throughout the study. The population that would be measured are low-income renting families in the Durham area, which are individuals with less than 30% area median income (AMI) as this is the focus population of the research. The specific measurement will be based on fruit and vegetable consumption amongst the participants, which will be gathered from the pre- and post- garden season survey (measuring fruit and vegetable consumption and self-reported food security status). Fruit and vegetable consumption will be reported via survey by having participants select their frequency of intake: several times a day, once a day, a few times a week, almost never. Several times a day will be defined as 3-5 times a day and a few times a week will be defined as 2-3 times per week. This will be assessed and broken down into percentages amongst each of these categories. For example, several times will be 75%, once a day will be 50%, a few times a week will be 25% and almost never 0%. This will provide the ability to assess any increase in consumption by percentage. An example question on the survey may state: "How often do you eat green leafy vegetables (spinach, collard greens, lettuce, spring mix, etc)?" This type of question is similar to our referenced evidence based study on community gardens (Carney et al., 2011).

The information gathered will help support or negate whether the intervention of adding community gardens appear to be successful and/or worthwhile for those who participated. In addition, it may help people manage the participants' eating habits and improve upon them because it allows the person to obtain recognition of any change over the 6 months. The intended outcome objectives for the treatment group (residents of DHA properties receiving gardens and DINE education sessions) are as follows:

**Short-Term Outcome Objective:** Produce a 65% increase in the number of residents who report fruit and vegetable consumption 'several times per day,' from the pre-season survey and the post-season survey by August 2025.

**Long-Term Outcome Objective:** Decrease household food insecurity by 25% among treatment groups by August 2028.

## **Timing**

The measurement for Durham County's community garden short-term objective will be done through a survey given at baseline and provided every 6 months after every post-gardening season. These participants will be followed for 3 growing seasons. Progress over these 6 months is defined by the reported intake of fruit and vegetable consumption gathered from the survey.

### **Analysis Plan**

The analysis plan for these surveys will consist of both qualitative and quantitative data. The quantitative data will be collected from the questions on fruit and vegetable consumption. After the data is collected, the data will be sent to a bio-statistician that works for non-profits and does statistics and data analytics review. The type of analysis conducted may include a t-test because the sample size is less than 30 for each group studied and the population variance is unknown. The data will be analyzed and coded to note any differences pre- and post-intervention of fruit and vegetable consumption within the community. This data will be statistically analyzed and determine if significant changes have occurred for fruit and vegetable consumption or in the levels of reported food insecurity. For t-tests the significance threshold is traditionally set at  $p = 0.05$  and frequently calculated at a confidence level of 95%. If the results show a p-value equal or less than 0.05, there is statistical significance and therefore, the intervention of community gardens amongst cost burden areas would show to be successful. Qualitative data will also be collected from pre- and post- garden season surveys through open ended questions. Survey questions will come from the study and the information collected from the qualitative data will be gathered and assessed on overlapping themes and most common answers (Carney et, al, 2012).

### **Sources of Funding**

The estimated cost for the inaugural year is \$21,530 (budget found in appendix). These funds will be collected from grant opportunities as well as local funds one year prior to building the community gardens. Local funds may include the Adopt-a-Garden campaign, which partners with local businesses or universities who would sponsor the gardens. Other options include grants through businesses and organizations like the Home Depot Foundation, the National Gardening Association, and the Captain Planet Foundation. The NC Cooperative Extension has a list of resources to support funding for gardens (Bradley, 2023).

### **Data Use and Dissemination**

The data from this study will be used and disseminated within the community. By disseminating this data to the community, it may bring about a greater awareness on the impact that a community garden can bring. One impact may include the improvement gardens can provide to the health of a community. If the data shows an increase in fruit and vegetable consumption, those results can suggest that the community families who participated in the study have assimilated to a healthier diet, which has been shown to improve health outcomes and reduce chronic disease such as asthma, cardiovascular damage, and permanent injuries as a result of poor housing

conditions (D'Alessandro & Appolloni, 2020). By providing this data to the community, it may result in more people wanting to get involved, which can lead to a greater health impact and outcome to the community.

Some other ways the data collected can be used is to disseminate the outcomes to stakeholders and/or future stakeholders, in hopes that they continue to invest in the community gardens. Similarly, this data can be applied to be used for grant money and/or additional grants. Lastly, this data can be disseminated nationwide to be used as a reference in support for community gardens throughout the country to benefit low-income/cost-burden neighborhoods.

### **Conclusion**

Affordable housing was identified as the number one health priority among residents in Durham County in the 2020 Community Health Assessment (*Durham County Department of Public Health, 2021*). From a public health standpoint, community gardens provide an opportunity to expand nutritional awareness, which may improve health outcomes. Also, community gardens provide a chance for communities to come together and collaborate on improving their environment. One advantage to this proposed plan is that it promotes potential equitability because it will increase affordability and accessibility to healthy food options, which these communities may not otherwise have. Finally, these gardens can give interdisciplinary insight into both the impact that community gardens have on the people in the community, as well as health benefits for those people. From a social justice lens, community gardens provide an opportunity to bring communities together amongst cost burden areas.

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