

BREASTFEEDING SUPPORT AND HOME ENVIRONMENT INTERVENTIONS TO PREVENT
ASTHMA ATTACKS AMONG MARGINALIZED POPULATIONS IN CLEVELAND COUNTY,
NORTH CAROLINA

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ABSTRACT

Jen Funsten, Kathryn Horneffer, Serena Hutchinson, Anna Claire Tucker. Breastfeeding Support and Home Environment Interventions to Prevent Asthma Attacks Among Marginalized Populations in Cleveland County, North Carolina.

Asthma is a condition caused by both biological and environmental factors that impacts 8% of Americans. Residents of Cleveland County, North Carolina report asthma as the 5th most common health issue, and the county's asthma prevalence is almost twice that of the state and national average. Asthma and environmental determinants of asthma disproportionately impact Black, Latinx, and low-income populations. This intervention proposes to prevent the development of and manage the treatment of asthma in Black, Latinx, and low-income populations through two core interventions: breastfeeding promotion by certifying Atrium Health Cleveland as a Baby-Friendly hospital and indoor home environment assessments to manage asthma triggers. This approach will utilize partnerships with the County Health Department, community health workers, and hospital administrators, in addition to current residents with asthma. Short term and long-term impacts will be monitored and evaluated for program effectiveness analysis and data distribution.

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GROUP DELIVERABLES

COMMON PROPOSAL

Problem Statement and Goals

The neighborhood and built environment describes the infrastructure, air quality, transportation, and other health-determining factors that impact the areas in which people live, work, learn, and play. Recognizing the impact of built environment on health outcomes, the Healthy People 2030 plan includes a set of objectives for measuring progress related to built environment characteristics. One such objective is reducing asthma attacks (Healthy People 2030, n.d.). Asthma outcomes are strongly influenced by the physical environment; exposure to air pollution, allergens, tobacco smoke, and indoor irritants can all trigger or exacerbate asthma attacks (Hsu et al., 2018). Breastfeeding and good nutrition, on the other hand, have been shown to play a protective role in the development of asthma (Xu et al., 2009).

Asthma, particularly when inadequately managed, has been linked to a range of negative health outcomes. People living with asthma experience higher risk of absenteeism from work or school, learning disabilities, growth delays, depression, exercise intolerance, obesity, poor quality of life; they also experience higher financial burdens due to hospital stays and doctor visits (Community Preventive Services Task Force, 2019; Fletcher et al., 2010). In severe cases, without proper treatment, an asthma attack can lead to death (Community Preventive Services Task Force, 2019). Thus, it is critical that asthma be effectively managed to avoid exacerbations and associated health consequences.

Cleveland County has a higher burden of asthma than North Carolina as a whole, and its proportion of people living with asthma has increased over recent years (America's Health Rankings, 2022; Cleveland County Public Health Center, 2019). In addition to asthma being the fifth most common health issue in Cleveland County, asthma management for youth aged 9 to 19 was ranked in the top twelve priorities for health topics among residents (Cleveland County Public Health Center, n.d.). Compared to the state average, Cleveland County also has higher air pollution, tobacco use, obesity, and poverty, all factors that influence asthma outcomes (County Health Rankings & Roadmaps, 2021). Rates of preventable hospitalizations are 50% higher in Cleveland County compared to the state average

(County Health Rankings & Roadmaps, 2021). Seeing as asthma-related hospitalizations are preventable about half of the time, unnecessary hospitalizations in the county could likely be reduced by addressing this issue (Flores et al., 2005). This health concern should, therefore, be a priority for county leaders.

To promote health equity in the county, Cleveland County commissioners should prioritize addressing asthma attacks in low-income, Black, and Latinx residents. National data shows that Black, Latinx, and Indigenous Americans are significantly more likely to suffer from severe effects of asthma. Black Americans are diagnosed with asthma 1.5 times as often as white Americans and are 3 times as likely to die from it (Asthma and Allergy Foundation of America [AAFA], 2020). Latinx people in the U.S. experience higher levels of pollution and are almost twice as likely as white people to not have access to healthcare (AAFA, 2020). People of color and low-income populations are also more likely to be impacted by severe housing problems and poor air quality, both triggers of asthma attacks (North Carolina Institute of Medicine, 2020; Fowlie et al., 2020). Finally, those with low incomes have limited financial means to modify their own built environment to address asthma triggers, and they also may suffer more from the financial burdens from asthma outcomes like hospitalizations and missed work.

This proposal provides guidance to Cleveland County commissioners on reducing asthma attacks among low-income, Black, and Latinx residents through environmental and behavioral intervention. This involves a multi-pronged approach: first, improve asthma management through an intervention focused on the indoor home environment; and second, prevent asthma development by promoting breastfeeding through Baby-Friendly training and designation at Atrium Health Cleveland hospital. This proposal leverages evidence-based programs and policies to reduce asthma attacks while also decreasing asthma prevalence among future generations. In doing so, it would promote health equity, reduce healthcare utilization, and improve quality of life for residents living with asthma in Cleveland County.

Policy and programmatic changes

Intervention focused on the indoor home environment

Healthy home environment assessments are an evidence-based program that improves asthma outcomes (What Works For Health, 2019). In these programs, community health workers (CHWs)

conduct home visits for people living with asthma to identify and mediate asthma risks in the indoor environment. For example, this program may help people improve ventilation, manage pests, or obtain cleaning supplies. In Cleveland County, this program would be targeted to low-income, Black, and Latinx residents living with asthma. Healthy home environment assessments have been shown to reduce asthma exacerbations among many different groups, including adults and children in both rural and urban areas, and have been linked to decreased asthma-related health disparities.

Intervention focused on breastfeeding promotion

Breastfeeding has been found to lower an infant's risk of developing asthma later in life, in addition to other benefits such as immune support and decreased healthcare costs (Ding et al., 2015; Miliku & Azad, 2018; Physician's Committee for Responsible Medicine, 2020; University of Wisconsin Population Health Institute, 2022; Wood et al. 2021). Black and low-income communities are disproportionately affected by environmental factors that trigger asthma attacks and are also less likely to breastfeed (Forno & Celedon, 2012). These suboptimal breastfeeding rates lead to higher medical and nonmedical costs associated with lack of breastfeeding among Black, Latinx, and low-income individuals (Bartick et al., 2017; AAFA, 2020). This intervention thus focuses on a preventative approach to improving health outcomes, also with many economic benefits.

Breastfeeding will be addressed at the policy level by instituting Atrium Health Cleveland as a Baby-Friendly designated hospital, which involves implementing standardized steps to promote and remove barriers to breastfeeding (Baby-Friendly USA, n.d.). The Baby-Friendly Hospital Initiative (BFHI) is widely recognized for successfully increasing rates of breastfeeding in hospitals around the world, and such a strong background of supporting evidence at hundreds of other facilities provides a great advantage for instituting this as an intervention in Cleveland County (Pérez-Escamilla et al., 2016). Despite these benefits of Baby-Friendly designation, it does not directly address disparities in healthcare. Therefore, diversity, equity, and inclusion (DEI) training will also be included in this intervention.

This comprehensive intervention proposes to: 1) achieve Baby-Friendly designation from BFHI at Atrium Health Cleveland, 2) establish DEI training for all staff at Atrium Health Cleveland Maternity

Center, 3) connect people who have just given birth at Atrium Health Cleveland Maternity Center with community resources for continued breastfeeding support. Addressing this nutritional determinant of asthma will have great health and health equity impacts on the entire population of Cleveland County.

Stakeholders: Healthy Home Environment Assessments

The following stakeholders will be engaged in the healthy home environment assessments program implementation: 1) Black, Latinx, and low-income residents with asthma in Cleveland County, 2) the Cleveland County Health Department, 3) community health workers, 4) healthcare providers, and 5) local hospital administrators. The county must engage residents with asthma from the priority population to ensure that the program is culturally acceptable, affordable, and feasible. Since the program will be led by the health department and implemented by community health workers, their feedback and buy-in is critical. Finally, providers and hospital administrators will be consulted for their clinical perspective and potential interest in funding the program.

Engagement and Accountability Plan: Healthy Home Environment Assessments

Effective stakeholder engagement is critical to the effective design of a healthy home environment assessments program. The purpose of stakeholder engagement is to gain input on program design and implementation; to build relationships, trust, and awareness; and to identify potential funders. To meet these goals, the health department will conduct key informant interviews to better understand stakeholders' views, experiences, and interests. Additionally, they will utilize the Nominal Group Process and Delphi Method—a shared decision-making technique—to gain input about the types of services that should be provided through the program. Finally, the health department will lead the creation of a give-get grid to explore the nature of each partnership and ensure that partnerships are mutually beneficial. The partnership with hospital administrators will be important, as the hospitals may be interested in funding this program; a Memorandum of Understanding can be used to ensure accountability.

Program/Policy Evaluation

The evaluation of the breastfeeding intervention will determine changes in breastfeeding status among all Black, Latinx, and low-income mothers who come through Atrium Health Cleveland for labor

and delivery before and after the BFUSA designation. Success will be defined by 1) a significant increase in breastfeeding initiation and exclusive breastfeeding continuation at 6 months among Black, Latinx, and low-income mothers, and 2) reduced disparities in breastfeeding initiation and continuation among Black, Latinx, and low-income mothers as compared to white, high or middle-income mothers who give birth at Atrium Health Cleveland. Exclusive continued breastfeeding at 6 months was identified as the measure of choice, as it is the gold standard recommended by the American Academy of Pediatrics (AAP) and World Health Organization (CDC, n.d.). Key deliverables will include a medical journal publication, an academic presentation at a conference, an executive summary report, a public presentation open to residents of Cleveland County, and an infographic for communities impacted.

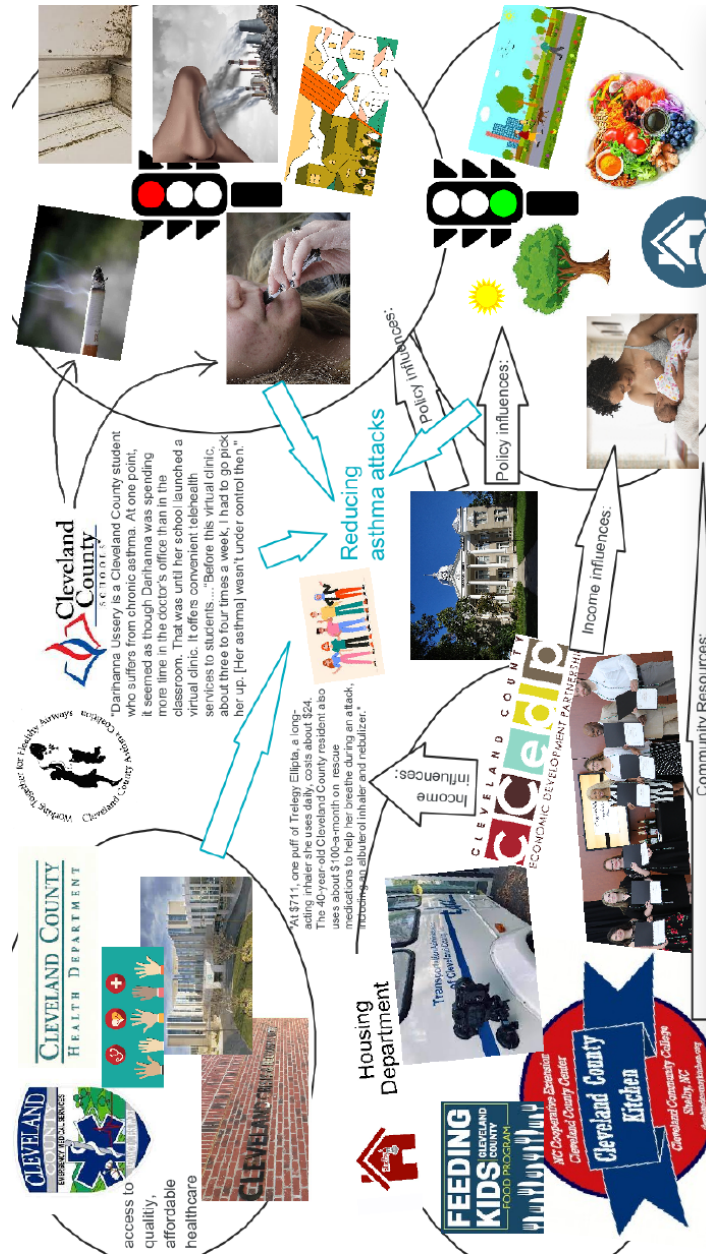
An ecological experimental design will be used to evaluate this program. Participants at baseline will include individuals who give birth at Atrium Health Cleveland Maternity Center 3-12 months before implementation of BFHI standards begins. Likewise, participants at post-accreditation will include individuals who give birth at Atrium Health Cleveland 12-21 months after the center receives BFHI certification. Black, Latinx, and low-income individuals will be oversampled.

EHR records and questionnaires will be used for data collection. Key measures will include breastfeeding initiation, breastfeeding continuation at three months, age, race, income, and social service utilization. Changes in asthma due to breastfeeding will be difficult to quantify and may take many years, perhaps decades, to see the true ramifications of this breastfeeding promotional implementation. Future evaluation will be needed to follow-up with a cohort of mother-child dyads who gave birth or were born at Atrium Health Cleveland following accreditation to measure the incidence of asthma among this population compared to those in Cleveland County who gave birth or were born elsewhere.

For the healthy home environment assessments program, process measures such as number of visits conducted and number of home improvements made, by type, will be assessed and analyzed to determine completeness of intervention and to focus resources on trending issues in the community. The number of emergency department visits and hospitalizations related to asthma in Cleveland County will also be tracked as outcome evaluation measures to analyze the effectiveness of the program.

APPENDIX A: RICH PICTURE

Figure 1. A Representation of the System to Prevent Asthma in Cleveland County



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Preventing Asthma Attacks Among Marginalized Populations in Cleveland County

Jen Funsten, Katie Horneffer,
Serena Hutchinson, and Anna Claire Tucker

Hello! My name is Jen, and I would like to introduce Katie, Serena, and Anna Claire. Today, we will be talking about preventing asthma attacks among marginalized populations in Cleveland County.

Neighborhood and Built Environment

Social determinants of health describe the spaces in which people live, learn, work, eat, play, and pray that impact health.

The neighborhood and built environment focuses on the spaces in which people live.

Objective: reduce asthma attacks.

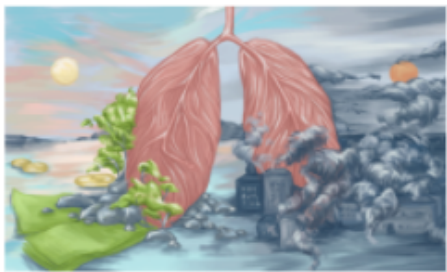
Source: Healthy People 2030, n.d.



The neighborhood and built environment is one of the social determinants of health, outlined by Healthy People 2030, that describes the spaces in which people live that impact people's health. We decided to

focus on one Healthy People 2030 health objective, to reduce asthma attacks.

Reducing Asthma Attacks in Cleveland County, NC



What is an asthma attack?

Asthma in Cleveland County

- 5th most reported health issue
- A top 12 priority for youth
- Twice the state and national average

Asthma determinants in Cleveland County

- Tobacco, air pollution, poverty

Inequities in asthma and determinants

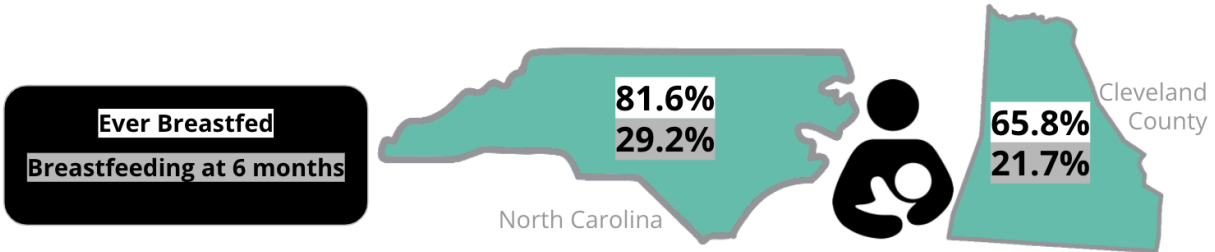
- Higher risk of asthma development and death from asthma

Sources: AAFA, 2020; AAFA, 2021; CDC, 2020; CDC, 2021; County Health Rankings & Roadmaps, n.d.; CCPHC, n.d.; Fowle et al., 2020; Holst et al., 2020; Mayo Clinic, 2020; Xu et al., 2009

An asthma attack is defined as an exacerbation of asthma symptoms where the airways in the lungs become restricted and causes wheezing, coughing, pain, and difficulty breathing. Many biological and environmental determinants contribute to asthma such as air pollution, tobacco exposure, low birthweight, genetics, and more, whereas adequate nutrition and breastfeeding are thought to be preventative factors for asthma. In Cleveland County, asthma was the 5th most reported health issue and was a top health priority for youth. In addition, 15% of residents had been diagnosed with asthma as of 2019, compared to only 8% across NC and in the U.S.. Not only does Cleveland have a higher asthma prevalence compared to the state and the nation, but the county also has higher than average determinants of asthma as well, such as smoking prevalence, air pollution index, and people that live in poverty. These determinants do not impact all people equally, though, as all these determinants impact low income and communities of color disproportionately, which contributes to Black and Latinx communities having higher prevalence of asthma and a higher risk of worse outcomes from asthma. For example, Black and Puerto Rican individuals have 1.5 and 2 times the risk of developing asthma and both have 3 times the risk of dying from asthma when compared to white people. We will therefore focus our asthma intervention on Black, Latinx, and low-income communities in Cleveland County.

Breastfeeding's Preventative Role in Asthma Development

1. Lowers an infant's risk of developing asthma later in life
2. Supports immune system and lung development
3. Addresses disparities in health outcomes and economic costs



Bartick et al., 2017; Covar et al., 2018; CDC, 2021; Ding et al., 2015; Miliku & Azad, 2018; NCDHHS, 2021; University of Wisconsin Population Health Institute, 2022; Wood et al. 2021

There are two interventions that we propose to target the reduction of asthma attacks within Cleveland County. Firstly, our nutrition-focused intervention is aimed at taking a preventative approach through a focus on breastfeeding. One of the main reasons for choosing this approach is due to the existing scientific evidence that supports the connection between breastfeeding and lower incidence of asthma development. As we know asthma is linked to the immune system. Breastmilk is well-known for its immune-building properties as well in healthy infant development. Interventions focused on breastfeeding have proven to successfully reduce disparities not only in breastfeeding but also health outcomes such as asthma. Additionally, breastfeeding reduces medical and non-medical costs for both individuals and the healthcare system. The disparities this intervention will focus on addressing include the percentage of those who initiate breastfeeding and those who continue to breastfeed. In Cleveland County 65.8% of infants are breastfed at least once, which is much lower than North Carolina's 81.6%. Continuation of breastfeeding at 6 months is lower within Cleveland County by 7.5% than the state.

Atrium Health Cleveland Baby-Friendly Designation



Achieve Baby-Friendly Designation



Equity, Diversity, Inclusion Training

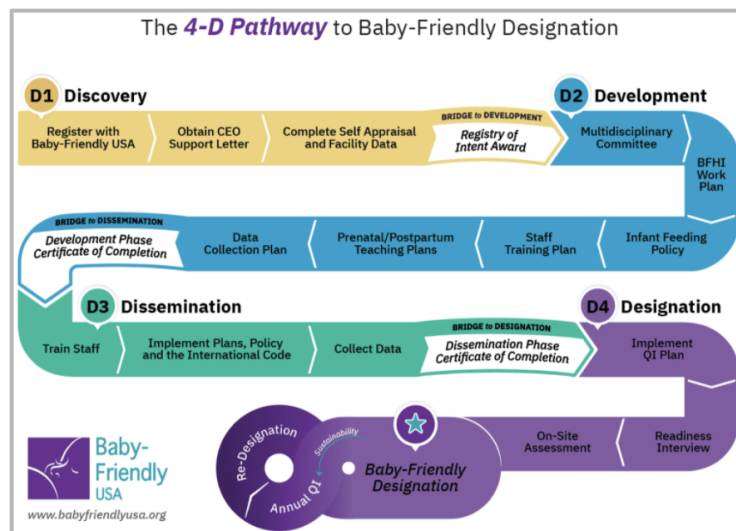


Connect with Community Resources

The breastfeeding promotion intervention will include three components. Atrium Health Cleveland will complete the Baby-Friendly USA designation process along with required equity, diversity, and inclusion training for all hospital staff, and then finally community networks will be developed to ensure continued support once families have left the hospital after delivery.



Achieve Baby-Friendly Designation



Baby-Friendly USA, Inc., 2019

The Baby-Friendly Hospital Initiative is widely recognized for successfully increasing rates of breastfeeding in hospitals around the world with strong supporting evidence from hundreds of other facilities, including our neighboring Atrium Health Pineville located in Mecklenburg County. This 4-D Pathway lays out the 4 stages that will be implemented.



Equity, Diversity, Inclusion Training



EDUCATIONAL TRAININGS

- Cultural Competency
- Health Equity
- Implicit Bias
- Chronic Disease Prevention & Management
- Social Determinants of Health



GOODSTOCK Consulting, LLC, 2020

Despite improved breastfeeding support that develops through the Baby-Friendly Designation process. Many implicit biases and other barriers exist that result in inequitable care across different racial and ethnic backgrounds. Therefore equity, diversity, and inclusion training will be utilized to address these biases.



Connect with Community Resources



Alliance for Health, 2018; Cleveland County Public Health Center, n.d.; Nurse-Family Partnership, 2022; Partners Health Management, 2022

Finally, one of the main barriers in continuation of breastfeeding is the lack of support for families after discharging from the hospital. Developing a network with these organizations will be crucial in

connecting resources within the community and for providing referrals for community members seeking breastfeeding support.

Projected Costs

\$250,000



W.K.
KELLOGG
FOUNDATION™



Historically has funded breastfeeding promotion efforts in marginalized communities

WKKF, n.d.

We have calculated the total cost of this intervention to be about \$250,000. Our plan is to apply for and utilize grant funding from the W.K. Kellogg Foundation who has historically provided funds to similar efforts aimed at improving breastfeeding promotion efforts in marginalized communities.

Healthy Home Environment Assessments

- Outreach targeted toward low-income, Black, and Latinx residents living with asthma
 - Identify, educate, and address asthma triggers in the home environment
 - Examples:
 - Pest control
 - Mold removal
 - Providing cleaning supplies
 - Improving ventilation
- Evidence for effectiveness in priority population
 - Improved asthma symptoms and quality of life
 - Reduced healthcare utilization
 - Cost-saving to healthcare system

What Works For Health, 2019

In addition to the program to support breastfeeding, we are proposing a program that aims to

improve asthma management among residents already living with asthma. Healthy home environment assessments are an evidence-based approach to address triggers of asthma attacks in the indoor home environment. This would involve sending outreach workers to the homes of Cleveland County residents living with asthma, specifically targeted toward our priority population of low-income, Black, and Latinx people. The outreach workers would identify asthma triggers in the person's home, while also educating them about the importance of those risk factors and how they can be addressed. They would also connect residents to free or low-cost services—like traps or spraying services for pests, or effective cleaning supplies—that can help control these risk factors.

This type of program has proven success in a range of different settings, including with both adults and children and in both rural and urban areas. Participants in these types of programs have reported improved quality of life and improved asthma symptoms. It's also been shown to reduce emergency department visits and urgent care visits for asthma, making it potentially cost saving to the healthcare system.

Stakeholders: Healthy Home Environment Assessments



Residents with
asthma



Healthcare
Providers



Cleveland County
Health Department



Local Hospital
Administrators



Outreach Workers

In order to design, implement, and evaluate the Healthy Home Environment Assessments program, we would need to engage different groups that are impacted by the problem of asthma. First, Cleveland County residents with asthma, particularly those who are low-income, Black, and Latinx, will need to be consulted since they are the priority population. We will need to understand the barriers they face in managing their disease, and ensure that the solutions offered are acceptable, affordable and useful. Health department staff and outreach workers will have to be consulted, both to gain their perspective on the problem but also to ensure that the design is feasible. Healthcare providers can provide clinical insight. Finally, local hospital administrators may actually be interested in funding the program since it's potentially cost saving to hospitals, so it's important to engage them as well.




Engagement and Accountability

Goal	Stakeholders Targeted
Build trust and relationships	<ul style="list-style-type: none"> All, with a focus on priority population
Determine overall program design	<ul style="list-style-type: none"> All
Choose services to be offered by outreach workers	<ul style="list-style-type: none"> Priority population Outreach workers Program managers at the Health Department
Identify potential funding sources	<ul style="list-style-type: none"> Hospital administrators

When engaging these stakeholders, we need to keep in mind four goals. First, engagement can build trust and relationships. The success of this program requires residents to be willing to let a stranger into their home. So, consulting with the priority population throughout the process, making sure they know this program is coming and who is leading it, is important. And while trust among the priority population is the main focus here, it will be necessary to build trust with all of the key stakeholders in order to build up their interest and investment in the program. Second, stakeholders should guide the overall program design. While this program is based on existing models, it will need to be tailored to fit the particular context and needs of residents in Cleveland County. So, input from people who know this county and this system is important. Third, the priority population, health department staff, and outreach workers should help choose what services are being offered during the home visit—for example, providing a vacuum, or providing an air filter. Finally, throughout this process of engagement and relationship building, we may be able to identify funding for the program. If hospital administrators see that this program can be cost saving and feel like they have a say in its design, they may be willing to invest money into it. If this does end up being the case, a Memorandum of Understanding between the health department and the hospital can be used to ensure accountability in that partnership.

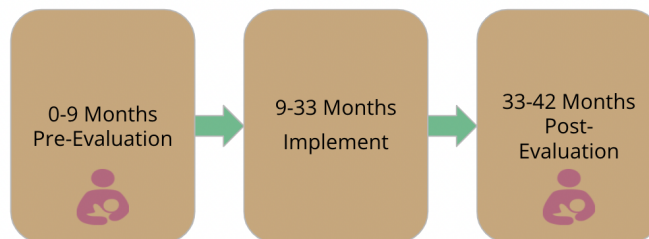
Evaluation: Nutrition & Healthy Home Environment

Key Outcomes:

-  1) Increase breastfeeding initiation and exclusive breastfeeding at 6 months among Black, Latinx, and low-income individuals
-  2) Reduced disparities in breastfeeding initiation and continuation among these communities
-  3) Reduce asthma-related emergency visits and asthma-related hospitalizations

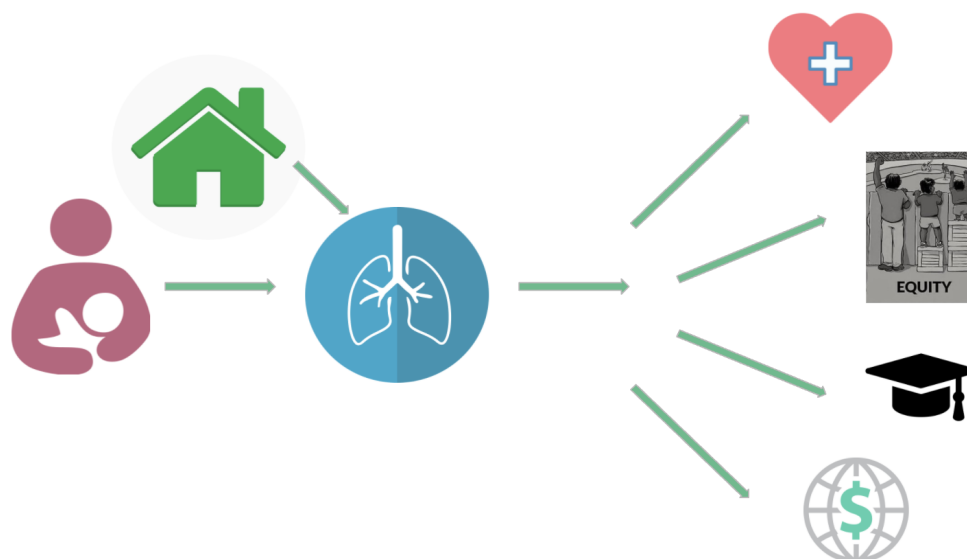
Nutrition

Timeline:



Next is our evaluation plan. We have three key outcomes. The first two are for the nutrition intervention, while the third outcome is for the healthy home environment program. 1st) we aim to increase breastfeeding initiation and exclusive breastfeeding at 6 months among Black, Latinx, and low-income individuals, 2nd) Reduce disparities in breastfeeding initiation and continuation among these communities, and 3rd) Reduce asthma-related emergency visits and asthma-related hospitalizations. Down below we have our timeline for the nutrition intervention evaluation. From 0-9 months, we will conduct a pre-evaluation among individuals who give birth at Atrium Health Cleveland Maternity Center 6-18 months before implementation of Baby Friendly standards begins. From 9-33 months, we will be implementing the program and from 33-42 months, we will be conducting a post-evaluation among individuals who give birth at the clinic 12-21 months after the center receives Baby Friendly certification. Then we will compare breastfeeding initiation and continuation outcomes among pre and post groups.

Conclusion: Long-Term Community Impact



Taken together, we expect the nutrition intervention and healthy home environment program to have a significant impact on the community across multiple sectors. By reducing asthma attacks, we can expect to see improvements in the short- and long-term health of Cleveland County residents, reduce asthma-related health inequities, reduce days missed of school related to asthma attacks, and economic impacts from reduced asthma-related healthcare costs and fewer missed days of work. So, we want to thank you for your time and interest in this presentation and will now open it up for questions.

INDIVIDUAL DELIVERABLES: JEN FUNSTEN

PROBLEM STATEMENT

Social Determinant of Health

The neighborhood and built environment of a community describes the infrastructure, air quality, water quality, transportation, safety, and other health determining factors that impact the areas in which people live, work, learn, and play (Healthy People 2030, n.d.). Because of the great impacts the built environment has on people's health, it is defined as one of the social determinants of health by Healthy People 2030. One of the objectives of working towards a better neighborhood and built environment is reducing asthma attacks (Healthy People 2030, n.d.). Asthma is a respiratory condition that can make breathing difficult due to narrowing of airways and the production of extra mucus (Mayo Clinic, 2020). An asthma attack resulting from an exacerbation of asthma symptoms can be minor and managed at home, but if it is not managed properly, it can become life-threatening (Mayo Clinic, 2021).

There are many environmental and biological factors that can trigger asthma attacks. Thus, it is important to maintain an environment that reduces the incidence of flare-ups (Mayo Clinic, 2020). Tobacco exposure, low birthweight, lack of compliance with recommended childhood vaccines, air pollution exposure, genetics, family history, and more may contribute to the development and exacerbation of asthma (Grabenhenrich et al., 2014; Holst et al., 2020; Xu et al., 2009). Having been breastfed and good nutrition, on the other hand, have been shown to be associated with a lower risk of development of asthma (Xu et al., 2009). Reducing exposures to allergens, eating a diet focused on plant-based foods, reducing animal product and processed food consumption, weight management, and sufficient vitamin D intake are all thought to play a role in asthma prevention and management (Alwarith et al., 2020; Brown et al., 2021; Monteleone & Sherman, 1997).

The severity of a person's asthma impacts a person's health in many ways. Short-term impacts include difficulty breathing, pain in the chest, coughing, wheezing, and shortness of breath (Mayo Clinic, 2020). Long-term impacts include increased risk of infection, exercise intolerance, lower quality of life,

augmented risk of missed days of work, more hospital visits, increased healthcare costs, and increased risk of depression and obesity (Fletcher et al., 2010; Kraemer, 1994).

Geographic And Historical Context

Cleveland County, North Carolina, has a population of about 99,500, as of 2020. It covers 464 square miles and includes both Crowders and Kings Mountains as well as the city of Shelby, and rests at the foothills of the Blue Ridge Mountains. The demographic makeup is about 76% white, 21% Black, and 4% Hispanic or Latinx (U.S. Census Bureau, n.d.; Wikipedia contributors, 2021). Cleveland is historically a farming and agricultural community with a focus on cotton and dairy farms (Martin, 2016). In addition to farms, the county has many manufacturing firms, as well as distribution centers and small businesses. Iron, quartz, crystal, and graphite are also all mined in the county (Martin, 2016). The mining, farming, and industrial plants in Cleveland County have the potential to contribute to harmful air conditions associated with asthma and asthma complications (Herrera et al., 2016; Nordgren & Bailey, 2016).

Cleveland County has many assets when it comes to asthma awareness and management. The Cleveland County Asthma Coalition was founded in 2002 to raise awareness about asthma in the county, provide a youth camp for kids with asthma, and address air quality issues in the county. This group no longer meets but was an active force in the community for over 10 years (Jolley & Glenn, n.d.). The Substance Abuse Prevention Coalition works to reduce tobacco use in the county, which has the potential to reduce the development and severity of asthma attacks (CCPHC, n.d.). Live Healthy Cleveland County is another group that works to minimize harmful social determinants of health, including elements within the neighborhood and built environment, in Cleveland County (CCPHC, n.d.).

Priority Population

Asthma is the fifth most common health issue reported in Cleveland County, and asthma management for youth aged 9-19 was ranked among residents in the top twelve priorities for health topics (Cleveland County Public Health Center [CCPHC], n.d.). This is noteworthy because reflecting the needs and wants of a community ensures decisions are being made with people rather than for people. However,

this condition does not impact all communities equally. Asthma disproportionately affects Black, Latinx, and low-income communities via several different social determinants of health that lead to negative health outcomes for these marginalized communities (AAFA, 2020; Smith et al., 2005). Black individuals are 1.5 as likely to have asthma, five times as likely to be hospitalized because of asthma, and three times as likely to die from asthma as their white counterparts. Puerto Ricans, specifically, are two times as likely to have asthma and three times as likely to die from asthma in comparison to white individuals. Latinx communities in the U.S. also are more likely to experience high levels of pollution and are almost twice as likely as white people to not have access to healthcare (AAFA, 2020). This means that Black and Latinx communities bear more than their share of the condition and the economic and health implications of having asthma.

Measures of Problem Scope

Asthma increased in prevalence from about 12% to almost 15% from 2015 to 2019 in Cleveland County, both of which are higher than the 8% average in North Carolina and the U.S. (Asthma and Allergy Foundation of America [AAFA], 2021; CCPHC, n.d.; Centers for Disease Control and Prevention [CDC], 2021). This means that almost 15,000 residents of Cleveland County are living with asthma. Cleveland County had almost 7,000 preventable hospital stays in 2021, about 1.5 times that of the state average (County Health Rankings & Roadmaps, n.d.). An estimated 15-54% of nationwide hospitalizations from asthma are preventable (Flores et al., 2005), so it can only be presumed that some proportion of the preventable hospitalizations in Cleveland County were due to asthma.

Rationale/ Importance

Beyond the exacerbation of air pollution by major employment industries within the county, smoking prevalence and other environmental factors in the county contribute to worsened health outcomes related to asthma as well (Grabenhenrich et al., 2014; Herrera et al., 2016; Holst et al., 2020; Nordgren & Bailey, 2016). Tobacco use ranks in the top three highest health indicators to be addressed, as 24% of adults smoke in Cleveland County, compared to 18% across North Carolina and 14% nationally (CDC, 2020; CCPHC, n.d.; County Health Rankings & Roadmaps, n.d.). Even for individuals who don't

smoke, secondhand tobacco smoke can still act as a trigger for asthma attacks (AAFA, 2017). In addition to the higher smoking prevalence in Cleveland County, the air pollution index in the county is also higher than the North Carolina average (County Health Rankings & Roadmaps, n.d.). Separately from air quality, 31% of children live in poverty in the county, as compared to 19% across North Carolina and 14% nationally (County Health Rankings & Roadmaps, n.d.; Kearney, 2021). Since air pollution tends to disproportionately impact low-income areas, this puts individuals in these communities at even higher risk (Fowlie et al., 2020). All these environmental factors put residents of Cleveland County at higher risk of experiencing asthma complications.

Disciplinary Critique

In the field of dietetics, asthma is not considered a major concern. For example, the Nutrition Care Manual, published by the Academy of Nutrition and Dietetics, which provides the standards of care for all major nutritional concerns and conditions, does not list any standard of care for asthma (Academy of Nutrition and Dietetics, 2017). One study suggests that the standard of care when working with a child with asthma should include an assessment of allergies and their management of them, of medications and any food medication interactions, of possible gastroesophageal reflux disease, and include education on the Mediterranean diet (McCloud & Papoutsakis, 2011). This approach would ensure that the most prevalent nutrition therapy-related factors contributing to asthma are identified.

For the low-income Black and Latinx communities in the county that are disproportionately impacted by asthma, this issue is inherently a health equity issue (AAFA, 2020; Smith et al., 2005). Not only do asthma contributors like air quality and poverty disproportionately impact these marginalized communities, but resources to treat asthma like quality and affordable healthcare are less accessible in low-income communities of color (Fowlie et al., 2020; National Equity Atlas, n.d.; Ndugga & Artiga, 2021). A targeted asthma intervention to Black, Latinx, and low-income communities will start to break down some of the environmental and health barriers that have been placed in front of these marginalized communities for generations. Addressing these issues will not only show support for these communities

after centuries of mistreatment and systemic racism but could make great impacts for people with asthma in terms of overall health, healthcare costs, missed days of work and school, and overall quality of life.

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IMPLEMENTATION PLAN

Background Information

The neighborhood and built environment describes the infrastructure, air and water quality, transportation, and safety of a community and it impacts the health of people interacting within that environment. Healthy People 2030 outlines health objectives for addressing a neighborhood and built environment, one of which is reducing asthma attacks (Healthy People 2030, n.d.). Asthma can range from being a minor to life-threatening condition that causes the airways to narrow and extra mucus to be produced (Mayo Clinic, 2020). Asthma can cause difficulty breathing, pain in the chest, coughing, wheezing, shortness of breath, and long-term issues such as a higher risk of infection, exercise intolerance, lower quality of life, missed days of work, more hospital visits, higher healthcare costs, and higher risk of depression and obesity (Fletcher et al., 2010; Kraemer, 1994; Mayo Clinic, 2020).

In Cleveland County, asthma is the fifth most common health issue reported among residents (Cleveland County Public Health Center [CCPHC], n.d.). Almost 15% of residents, or 15,000 people in the county, have asthma, higher than the state and national average of 8% (Asthma and Allergy Foundation of America [AAFA], 2021; CCPHC, n.d.; Centers for Disease Control and Prevention [CDC], 2021). Asthma disproportionately impacts Black and Latinx communities as well as people experiencing low income, so those groups will be the focus of the intervention (AAFA, 2020; Smith et al., 2005).

Nutrition can play an important role in preventing and managing asthma. Having been breastfed is associated with lower incidence of asthma, and other nutrition practices, such as reducing exposure to allergens, consuming plant-based foods, managing weight, and ensuring sufficient vitamin D intake, are associated with lower incidences of flare ups (Alwarith et al., 2020; Brown et al., 2021; Monteleone & Sherman, 1997; Xu et al., 2009).

Purpose

Breastfeeding provides many benefits for both mother and child, one of which is a reduced risk of asthma in children (CDC, 2021). Although breastfeeding is recommended exclusively for 6 months and afterwards for up to 12 months, there are many barriers to meeting this breastfeeding recommendation,

such as lack of support and information, return to the workplace, pain or discomfort, social acceptance, and inconvenience (CDC, 2021; Jones et al., 2015). Women of color are disproportionately impacted by many of these barriers, leading to lower breastfeeding prevalence among children of color (Jones et al., 2015). About 45% of Black infants are breastfed at 6 months and 17% are exclusively breastfed, in comparison to 62% of white infants breastfed at 6 months, and 29% are exclusively breastfed (Beauregard et al., 2019). Thus, Black children are disproportionately not receiving the benefits and the healthful impacts of breastfeeding, including the prevention of asthma. Since asthma also disproportionately impacts Black and low-income individuals, this program will address breastfeeding in this population to improve breastfeeding outcomes with the goal of reducing asthma attacks (AAFA, 2020).

Baby-Friendly hospitals are hospitals that have implemented standardized measures to promote successful breastfeeding, healthy infant eating, and infant care (Feldman-Winter et al., 2012). Baby-Friendly hospitals have been shown to improve short, medium, and long-term breastfeeding outcomes (Pérez-Escamilla et al., 2016). This paper, therefore, proposes to implement the Baby-Friendly standardized guidelines at the Atrium Health Cleveland hospital in Cleveland County. This hospital receives most of the birthing mothers in Cleveland County, so an intervention here could have the potential to impact mothers and children across the county (Atrium Health, n.d.).

Although the Baby-Friendly hospital designation is supported to improve breastfeeding outcomes, it does not directly address disparities in healthcare (Pérez-Escamilla et al., 2016). Therefore, diversity, equity, and inclusion (DEI) training will also be included as a part of this intervention. Implicit bias among healthcare workers can lead to disparities in care and therefore in health outcomes (FitzGerald & Hurst, 2017). Thus, this issue must be addressed to reduce health disparities in breastfeeding as well as in asthma in Cleveland County.

One important inequity with this intervention is the access to affordable healthcare. Black and Latinx communities are less likely to have access to affordable, quality healthcare and Latinx and low-income communities are less likely to be insured than white or high-income counterparts (AAFA, 2020;

Ndugga & Artiga, 2021). If people cannot access or afford resources such as prenatal and postpartum care, breastfeeding rates will be impacted.

Evidence-Based Outcomes

Short-term outcome objectives

- By April of 2024, the hospital will have completed the four phases of the Baby-Friendly hospital designation and will be an accredited Baby-Friendly hospital (Baby-Friendly USA, n.d.).

Long-term impacts

- Initiation of breastfeeding and excluding breastfeeding at three months will increase for Black, Latinx, and low-income residents of Cleveland County, as evaluated by Baby-Friendly curriculum data collection (Baby-Friendly USA, n.d.; Pérez-Escamilla et al., 2016).
- Atrium Health Cleveland will foster connections with community resources to support mothers along each step of their journeys, before, during, and after delivery (Baño-Piñero et al., 2018).
- Black, Latinx, and low-income community residents of Cleveland County will experience lower incidence of asthma attacks (CDC, 2021).

Strategies and Activities

As a part of the standard Baby-Friendly USA (BFUSA) curriculum, Atrium Health Cleveland staff will undergo training to learn about the best breastfeeding techniques and to comply with the ten steps outlined by BFUSA to earn the Baby-Friendly hospital designation (Baby-Friendly USA, n.d.). This will take place in four phases of training, data collection, and implementation that will challenge current policies and beliefs in the hospital (Baby-Friendly USA, n.d.). Training of hospital staff to utilize best breastfeeding practices in care will be the main activity, along with data collection along the way. Data collection will involve monitoring staff attitudes towards breastfeeding, implementation of the Baby-Friendly policies, costs, and breastfeeding short, medium, and long-term outcomes. Hospital administration and BFUSA staff will work with Atrium Health Cleveland staff to increase willingness to make these changes and embrace this new system of healthcare. In addition to training and data collection, the Supplemental Nutrition Program for Women, Infants, and Children (WIC) consultant from

Cleveland County will also work with stakeholders and community groups to gather resources for nursing mothers to utilize for support in breastfeeding once they have left the hospital. This is essential to ensure mothers continue having support after leaving the hospital.

DEI training will be initiated in the first year of implementation. Over the course of two months, all staff will be required to attend four DEI training sessions to address implicit biases and disparities in healthcare. If staff are unable to attend in person, a recorded option will be provided, and staff will have to certify that they watched it in its entirety. After the first year, DEI training will be held biannually to maintain emphasis on this issue.

The Baby-Friendly designation is supported to have positive impacts on breastfeeding outcomes and behaviors (Pérez-Escamilla et al., 2016). Breastfeeding is a protective factor for asthma, so long-term improvements in asthma attack incidence are projected as an outcome of this intervention (CDC, 2021; Pérez-Escamilla et al., 2016). Because Black children are less likely to be breastfed, we expect to see significant improvements in this population in terms of breastfeeding duration and, eventually, the long-term health benefits of breastfeeding (Beauregard et al., 2019).

This intervention will address all levels of the socioecological model. At the individual level, mothers and children will experience the biological and physiological benefits of breastfeeding. Interpersonally, breastfeeding encourages a bond between mother and child, and the mother will also receive support from hospital staff and other resources in her community along her breastfeeding journey. Lastly, this is a policy-level change that will fundamentally change the way the Atrium Health Cleveland organization operates, and it will connect people and resources in the community and have the potential to change community norms and views around breastfeeding on a larger scale.

Stakeholders

Stakeholders for this intervention will include community members, parents and breastfeeding mothers, schools, teachers, Atrium Health Cleveland workers with emphasis on labor and delivery nurses and newborn nursery nurses, BFUSA coordinators, IBCLCs, doulas, WIC, public health officials, dietitians, pharmacists, respiratory therapists, home health care workers, Atrium Health Pineville,

Cleveland County Alliance for Health, Cleveland County Asthma Coalition, hospital administration, and infant formula companies. Hospital administration will implement the Baby-Friendly transition and will unify the Atrium Health Cleveland staff throughout this change. Atrium Health Pineville, located close by, is also currently in the process of getting their Baby-Friendly designation (Baby-Friendly USA, n.d.). Atrium Health Pineville will be a helpful resource for Atrium Health Cleveland as they are going through this transition. WIC, IBCLCs, and BFUSA coordinators will work together to promote the importance of breastfeeding in the hospital and throughout the community. These groups will build networks of support and resources for mothers and newborns in the community, so that breastfeeding support does not end after mothers leave the hospital. All stakeholders will be involved to offer expertise and knowledge throughout the Baby-Friendly designation and also to be resources for mothers and families as they are undertaking the breastfeeding journey and managing asthma.

Budget

The main budget costs involve training staff on best breastfeeding practices, purchasing breast milk substitutes and other feeding supplies, and fees to BFUSA, as outlined in the table above (Baby-Friendly USA, n.d.). After designation, all fees will be covered by the hospital. A consultant from Cleveland County WIC will also be hired to provide resources and connections in the community so that new mothers will have a support network after leaving the hospital. Lastly, DEI training would be held 4 times the first year, then biannually after that to reduce implicit bias in hospital staff and promote equitable care (GOODSTOCK Consulting, n.d.). This budget is depicted in Appendix B.

Conclusion

Asthma is a key issue in Cleveland County, especially for Black, Latinx, and low-income communities. Breastfeeding is an evidence-based protective factor for asthma, and thus will be addressed at the policy level by instituting Atrium Health Cleveland as a Baby-Friendly designated hospital (CDC, 2021). Baby-Friendly hospitals are effective in improving breastfeeding outcomes, and thus will have positive health impacts on the community. This policy implementation will be a difficult change that will impact the way the hospital operates and will challenge long-held beliefs about infant feeding.

Implementing this intervention may require high staffing costs and high burden on healthcare workers. In addition, although new mothers will be connected with support and resources in the community, this does not remove barriers such as available breastfeeding spaces in the workplace or in public areas. On the other hand, breastfeeding provides many benefits in addition to asthma prevention. Breastfeeding is associated with lower economic costs, decreased risk of postpartum depression, obesity, type II diabetes, hypertension, and certain types of cancers for the mother, as well as decreased risk of obesity, type I diabetes, sudden infant death syndrome, and gastrointestinal, respiratory, and ear infections for the child (CDC, 2021). In addition to saving money on formula, breastfeeding's preventative impacts on asthma have the potential to save families money as well. Asthma treatment and healthcare costs are estimated to cost an individual almost \$3,300 each year (AAFA, 2020). Although it will be an investment on the front end for the hospital, the payoffs for the community are great. This type of policy-level approach is also the most effective way to make substantial behavior changes in a population (Pollack Porter et al., 2018). Addressing this nutritional determinant of asthma will have great health and health equity impacts on the entire population of Cleveland County.

APPENDIX B: BUDGET

Table 1. Estimated costs of Baby-Friendly implementation at Atrium Health Cleveland hospital to address asthma among Black, Latinx, and low-income communities in Cleveland County.

Baby Friendly Designation Fees	\$14,750
Supplies	\$50,000
Breastfeeding education, training, implementation, and evaluation	\$30,000
Diversity, Equity, and Inclusion Training	\$10,000 / training
Consultant from Cleveland County Supplemental Nutrition Program for Women, Infants, and Children	\$30 / hour

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EVALUATION PLAN

Intervention Summary

Healthy People 2030 outlines five social determinants of health, one of which is the neighborhood and built environment (Healthy People 2030, n.d.). A neighborhood and built environment refers to the spaces and environment in which people live, work, play, learn, and pray, that can have impacts on health. Reducing asthma attacks is one health outcome of addressing the neighborhood and built environment, as many environmental factors contribute to asthma (Healthy People 2030, n.d.). Asthma is a condition of the lungs, in which, during an asthma attack, the airways narrow and extra mucus is produced, causing wheezing, coughing, pain, and making breathing extremely difficult (Mayo Clinic, 2020). This condition can lead to increased risk of infections, exercise intolerance, lower quality of life, and economic burden (Fletcher et al., 2010; Kraemer, 1994; Mayo Clinic, 2020).

In Cleveland County, North Carolina, 15% of the residents have asthma (Cleveland County Public Health Center, n.d.). This is almost double the state and national average of 8% (Asthma and Allergy Foundation of America [AAFA], 2021; CDC, 2021). Black, Latinx, and low-income people also have a higher incidence of asthma and have higher risk of negative health outcomes from asthma, so they will be the focus of this intervention (AAFA, 2020; Smith et al., 2005).

In terms of determinants of asthma, nutrition is an important factor in asthma development and management, and breastfeeding has been found to be a protective factor for it (CDC, 2021). Women of color are disproportionately impacted by barriers to breastfeeding, leading to lower breastfeeding prevalence among children of color and thus less reaped benefits of breastfeeding, including the lower risk of asthma (CDC, 2021; Jones et al., 2015). This intervention therefore will address asthma through breastfeeding among low-income, Black, and Latinx communities in Cleveland County.

The main hospital for labor and delivery, Atrium Health Cleveland, will require staff to undergo training to become a Baby-Friendly USA (BFUSA) designated hospital. Such hospitals put a special emphasis on promoting successful breastfeeding and connecting families with resources to continue

support throughout breastfeeding after leaving the hospital (Baby-Friendly USA, n.d.). Since breastfeeding is considered a protective factor for asthma, this BFUSA designation is expected to have long term benefits on asthma in Cleveland County (CDC, 2021). BFUSA does not directly address disparities in health or implicit biases in healthcare in their training, so diversity, equity, and inclusion (DEI) trainings will supplement the BFUSA training to support access to quality, unbiased healthcare to all people in Cleveland County.

Two outcomes of interest are prioritized for this evaluation. First, initiation of breastfeeding for Black, Latinx, and low-income residents will be evaluated by data collection as a part of the Baby-Friendly designation curriculum from electronic health records (EHR). Second, exclusive breastfeeding at three months for Black, Latinx, and low-income residents will be evaluated by follow-up data collection. A three-month benchmark will be used instead of six months to assess the effect of breastfeeding support and resources in the community on a shorter-term scale.

Evaluation Plan

Study Design and Data Collection

This evaluation will seek to determine changes in initiation of breastfeeding and exclusive breastfeeding status at three months among Black, Latinx, and low-income mothers who come through Atrium Health Cleveland for labor and delivery before and after the BFUSA designation. This will, therefore, be an ecological experimental design.

Specific Measures and Outputs

As process level outputs, collection and coordination of community resources and compliance with BFUSA training schedule will be monitored. Outcomes include breastfeeding initiation and exclusive breastfeeding at three months among Black, Latinx, and low-income mothers before and after BFUSA designation. Data on initiation of breastfeeding will be obtained as a part of the BFUSA curriculum from the patient's EHR. Race, ethnicity, and Supplemental Nutrition Program for Women, Infants, and Children (WIC) eligibility status, used as criteria for low-income status, will also be

recorded. A research assistant will follow up separately with all mothers who delivered at Atrium Health Cleveland to inquire about breastfeeding status at three months, and will confirm race and ethnicity as well as WIC eligibility, as a marker of low-income status.

Sampling and Timing

With patient consent, baseline data collection of individuals who gave birth at Atrium Health Cleveland Maternity Center will take place 3-12 months before implementation of BFUSA training. Post-accreditation data collection will follow individuals who gave birth at Atrium Health Cleveland Maternity Center 12-21 months after BFUSA designation, to determine the impacts of BFUSA designation on initiation of breastfeeding and exclusive breastfeeding status at three months. Data collection post-accreditation will start one year after designation to give time for breastfeeding resources to be gathered and community relationships to be established.

Analysis Plan

A t-test will be utilized to analyze the pre- and post-designation breastfeeding data. Progress will be defined as a statistically significant or trending increase in both breastfeeding initiation and exclusive breastfeeding at three months across the population of interest.

Sources of Funding and Program Sustainability

This project would be funded by grants such as the W.K. Kellogg Foundation, which can provide hundreds of thousands of dollars for causes including breastfeeding promotion in marginalized populations (WKKF, n.d.). This project will be self-sustaining because the BFUSA designation is a one-time investment that only requires upkeep (Baby-Friendly USA, n.d.). Such upkeep will involve training new staff, ensuring that all veteran staff are still knowledgeable and capable of executing the BFUSA principles, and keeping up with BFUSA and quality improvement and redesignation. Fees for redesignation and other upkeep will be covered by the Atrium Health as soon as BFUSA designation is achieved. Atrium Health supports another hospital location in Pineville, North Carolina as a BFUSA designated hospital, so this will not be an entirely new undertaking.

Strengths and Challenges

Strengths of this evaluation include being able to detect direct impacts on breastfeeding initiation as a result of staff training and BFUSA compliance, as this outcome is heavily influenced by the decisions and practices of healthcare providers. The comprehensiveness of the breastfeeding resources in the community and the connections the hospital maintains with these resources will also be evaluated through exclusive breastfeeding status at three months. Another strength of this implementation is the sustainability of the program. The BFUSA designation is designed to be maintained by the hospital indefinitely, with proper maintenance and redesignation. This implementation can also be implemented at any hospital with the proper investment of resources, so will have broad applicability. Challenges of this evaluation include being able to show an associative or causal link between breastfeeding and asthma. Changes in asthma due to breastfeeding will be difficult to quantify, as there are many complex biological and environmental determinants of asthma, and may take many years, perhaps decades, to see the true ramifications of this breastfeeding promotional implementation.

Data Use and Dissemination

This data will be used to provide evidence for other hospitals in the implementation of the BFUSA curriculum and designation with a health equity focus. Over a longer period of time, this evidence may also highlight an important relationship between breastfeeding and asthma (CDC, 2021). The results will be published in a medical journal so that other health and public health officials can learn more about the link between breastfeeding and asthma and the impacts of BFUSA training and designation. The results will also be shared in the community in a public presentation and by distributing infographics about the results. This implementation program has the potential to have great impacts for Black, Latinx, and low-income mothers and children. It is predicted to benefit the overall health, economic burden, quality of life, and asthma prevalence in the priority population, and could be applicable to implement in hospitals across the country.

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Preventing Asthma Attacks Among Marginalized Populations in Cleveland County

Jen Funsten, Katie Horneffer,
Serena Hutchinson, and Anna Claire Tucker

Hello! My name is Jen, and I would like to introduce Katie, Serena, and Anna Claire. Today, we will be talking about preventing asthma attacks among marginalized populations in Cleveland County.

Neighborhood and Built Environment

Social determinants of health describe the spaces in which people live, learn, work, eat, play, and pray that impact health.

The neighborhood and built environment focuses on the spaces in which people live.

Objective: reduce asthma attacks.



Source: Healthy People 2030, n.d.

The neighborhood and built environment is one of the social determinants of health, outlined by Healthy People 2030, that describes the spaces in which people live that impact people's health. We decided to focus on one Healthy People 2030 health objective, to reduce asthma attacks.

Reducing Asthma Attacks in Cleveland County, NC

What is an asthma attack?

Asthma in Cleveland County

- 5th most reported health issue
- A top 12 priority for youth
- Twice the state and national average

Asthma determinants in Cleveland County

- Tobacco, air pollution, poverty

Inequities in asthma and determinants

- Higher risk of asthma development and death from asthma



Sources: AAFA, 2020; AAFA, 2021; CDC, 2020; CDC, 2021; County Health Rankings & Roadmaps, n.d.; CCPHC, n.d.; Fowlie et al., 2020; Holst et al., 2020; Mayo Clinic, 2020; Xu et al., 2009

An asthma attack is defined as an exacerbation of asthma symptoms where the airways in the lungs become restricted and causes wheezing, coughing, pain, and difficulty breathing. Many biological and environmental determinants contribute to asthma such as air pollution, tobacco exposure, low birthweight, genetics, and more, whereas adequate nutrition and breastfeeding are thought to be preventative factors for asthma. In Cleveland County, asthma was the 5th most reported health issue and was a top health priority for youth. In addition, 15% of residents had been diagnosed with asthma as of 2019, compared to only 8% across NC and in the U.S.. Not only does Cleveland have a higher asthma prevalence compared to the state and the nation, but the county also has higher than average determinants of asthma as well, such as smoking prevalence, air pollution index, and people that live in poverty. These determinants do not impact all people equally, though, as all these determinants impact low income and communities of color disproportionately, which contributes to Black and Latinx communities having higher prevalence of asthma and a higher risk of worse outcomes from asthma. For example, Black and Puerto Rican individuals have 1.5 and 2 times the risk of developing asthma and both have 3 times the risk of dying from asthma when compared to white people. We will therefore focus our asthma intervention on Black, Latinx, and low-income communities in Cleveland County.

INDIVIDUAL DELIVERABLES: KATHRYN HORNEFFER

PROBLEM STATEMENT

Social Determinant of Health

In the public health field, practitioners often like to say that “zip code is more important than genetic code” in determining health outcomes. Indeed, neighborhood and built environment characteristics are important components of what practitioners call the “social determinants of health”—the “conditions in the environments where people are born, live, learn, work, play, worship, and age” that drive health and well-being (U.S. Department of Health and Human Services, n.d.). The built environment influences health drivers such as exposure to air pollution and other toxins; access to healthcare, healthy food, and other resources and services; school system quality and educational opportunity; housing quality and access to affordable housing; social networks; and green space and other areas for physical activity (Braveman, Cubbin, Egerter, & Pedregon, 2011). Research shows that people living in lower-income neighborhoods experience worse health compared to those who are socioeconomically similar but live in higher-income neighborhoods (Edmonds, Braveman, Arkin, & Jutte, 2015). Because neighborhoods in the US tend to be segregated by income, race, and other demographic factors, the built environment must be addressed in order to reduce health disparities.

Recognizing this link, the U.S. Department of Health and Human Services “Healthy People 2030” plan includes a set of objectives for measuring progress related to characteristics of the neighborhood and built environment (U.S. Department of Health and Human Services, n.d.). One such objective is reducing asthma attacks, a medical concern that is closely linked to the physical environment. Asthma attacks can be triggered by environmental factors such as exposure to allergens and pollutants (National Heart Lung and Blood Institute, 2012). Problems related to housing quality—such as mold, rodents, cockroaches, and dust mites—can trigger exacerbations (Hsu, Sircar, Herman, & Garbe, 2018). Secondhand smoke exposure can also lead to asthma attacks, as well as outdoor pollutants (Hsu et al., 2018). Obesity and diet, which may be driven by neighborhood characteristics influencing food access, also play a role in asthma exacerbations (Ding, Ji, & Bao, 2015). Exacerbations of asthma can lead to

hospitalizations, emergency department visits, burdensome healthcare expenses, missed school or workdays, limitations in daily activities and, in severe cases, death (Community Preventive Services Task Force, 2019). Clinical guidelines recommend a “multifaceted approach to control exposures” in patients diagnosed with asthma (National Heart Lung and Blood Institute, 2012).

Geographic and Historical Context

Understanding asthma exacerbations in Cleveland County, North Carolina requires first understanding the broader health and community context. Cleveland County is a mostly rural county in the western part of North Carolina. 40% of its workforce works in the manufacturing industry (Cleveland County Public Health Center, 2019). 75% of the population is White and 21% is Black. Cleveland County is a Tier 1 economically disadvantaged county with a median household income of \$40,000, about \$10,000 less than the state average (Cleveland County Public Health Center, 2019). The most disadvantaged areas include East and West Shelby, the Town of Kingstown, and the Town of Grover. These zip codes tend to have lower levels of income and education and less access to transportation.

The county does have several assets, including a business district, theater, new public health center and behavioral health facility, and nearby state parks and other areas for recreation (Cleveland County Public Health Center, 2019). The Accelerate Cleveland program helps connect underemployed residents with opportunities to work in the local manufacturing industry. Although there is no bus system, one bus line was established in the main urban center of Shelby to increase access to local resources (Cleveland County Public Health Center, 2019).

Measures of Problem Scope

Cleveland County is one of the least healthy in North Carolina (County Health Rankings & Roadmaps, 2021). 23% of adults report fair or poor health, compared to 18% statewide. Compared to the state as a whole, Cleveland County performs worse than average on outcomes related to adult smoking, obesity, food insecurity, and air pollution (County Health Rankings & Roadmaps, 2021). In the county’s 2019 Community Health Assessment, residents prioritized poverty, adverse childhood experiences, tobacco use, and teen birth rates as the main concerns to be addressed (Cleveland County Public Health

Center, 2019). These health burdens are distributed unequally throughout the county (Cleveland County Public Health Center, 2019). Compared to white residents, Black residents experience higher heart disease death rates, diabetes death rates, infant mortality rates, preventable hospitalization, and teen pregnancy (Cleveland County Public Health Center, 2019).

The county has a higher burden of asthma than North Carolina as a whole, and its proportion of people living with asthma has increased over recent years (America’s Health Rankings, 2022; Cleveland County Public Health Center, 2019). Chronic lower respiratory disease, which includes asthma and COPD, is the third leading cause of death in the county (Cleveland County Public Health Center, 2019). Cleveland County also performs poorly on a number of measures that drive asthma exacerbation, as indicated in the table in Appendix C.

Priority Population

County leaders should prioritize addressing asthma exacerbations in low-income residents (with a median income less than 200% federal poverty line) and residents of color who have a diagnosis of asthma. Although Cleveland County does not report disparities related to asthma and respiratory disease, national data shows that Black, Latinx, and Indigenous Americans are significantly more likely to suffer from severe effects of asthma. For example, compared to white Americans, Black Americans are three times more likely to die from asthma (Asthma and Allergy Foundation of America, 2020). A Healthy North Carolina report also notes that severe housing problems—a trigger of asthma attacks—disproportionately impact people of color and low-income populations (North Carolina Institute of Medicine, 2020). Lower-income populations would also be less able to afford the negative consequences of asthma attacks, such as emergency healthcare bills or missed workdays. Thus, while changes to the built environment can promote health in the county as a whole, leaders should prioritize action to reduce asthma triggers in these communities.

Rationale/Importance

Asthma exacerbation, driven by neighborhood factors, is an important public health problem that requires attention from Cleveland County leadership. Compared to North Carolina overall, the proportion

of people in Cleveland County living with asthma is approximately twice as high (America's Health Rankings, 2022; Cleveland County Public Health Center, 2019). Given that chronic lower respiratory disease is the third leading cause of death in the county, county leaders should take steps to ensure that people living with asthma do not experience dangerous exacerbations. The county's lower-than-average income levels suggest that residents may not have the resources they need to address exposure to indoor and outdoor pollutants that trigger asthma attacks.

Disciplinary Critique

Strong public health leadership is necessary to address asthma exacerbation at a county level. Asthma attacks are triggered by a combination of factors; it is difficult to pinpoint one specific factor or exposure. Therefore, it requires a leader to bring together different sectors to effectively address the many drivers. Asthma attacks are preventable and disproportionately experienced by people of color, low-income communities, people with limited access to healthcare or health literacy, and people with poor-quality housing. Thus, public health leaders have an important opportunity to improve health and health equity by tackling the social determinants that drive asthma exacerbations.

APPENDIX C: HEALTH OUTCOMES COMPARISON

Table 1. Comparison of Relevant Health Outcomes and Their Drivers Between Cleveland County and North Carolina (*Source: County Health Rankings & Roadmaps, 2021*)

	Cleveland County	North Carolina
<i>Health Outcomes Related to Asthma Attacks</i>		
Percentage of people with Asthma Diagnosis	14.7% (total)	8.3% (adults); 6.3% (children)
Preventable Hospitalizations (Per 100K Medicare enrollees)	6,911	4,539
<i>Drivers of Asthma Attacks</i>		
Severe Housing Problems	15%	15%
Air Pollution (Particulate Matter Density)	10.2	8.5
Median Household Income	\$46,000	\$57,400
Adult Tobacco Use	24%	18%
Adult Obesity	37%	32%
Residential Segregation Score (Black/White)*	31	50

**Higher scores indicate greater segregation.*

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BUILT ENVIRONMENT PROGRAM SUMMARY

Proposed Program Transformation

The prevalence of asthma in Cleveland County has increased over recent years, and the county now has a higher burden of asthma than North Carolina as a whole (America’s Health Rankings, 2022; Cleveland County Public Health Center, 2019). Asthma outcomes are closely linked to the built environment—indoor air pollution, mold, pests, tobacco smoke, and outdoor air pollution have all been linked to asthma attacks (Hsu, Sircar, Herman, & Garbe, 2018). Because asthma exacerbations can lead to emergency healthcare utilization, absenteeism, poor quality of life, and other negative effects, they are a major public health concern (Community Preventive Services Task Force, 2019). Low-income people and people of color face particularly high burdens of asthma and its negative effects (Asthma and Allergy Foundation of America, 2020; North Carolina Institute of Medicine, 2020). In order to effectively improve asthma outcomes and address asthma-related health disparities, Cleveland County leaders should consider a program that addresses triggers of asthma in the built environment, particularly for Black, Latinx, and low-income residents.

One such program is healthy home environment assessments, an evidence-based approach to improving asthma outcomes (What Works For Health, 2019). These types of programs employ community health workers (CHWs) to identify, educate, and address asthma triggers in the indoor home environment. Healthy home environment assessments can take many forms, but they often involve a similar set of steps (American Lung Association, 2022; Kearney et al., 2014). First, a CHW conducts a home visit to an individual or family living with asthma, educates them about asthma triggers in the indoor environment, and identifies potential risk factors in the home. The CHW then works with the resident to develop an action plan that involves free and low-cost solutions to address these identified risks. The CHW may return to provide additional free or low-cost products as necessary, such as air purifiers, cleaning products, or dehumidifiers. Finally, the CHW will conduct a follow-up visit or phone call a few weeks later to remind the residents about the action plan and check in on their progress. These

programs are typically targeted toward lower-income families, those living in lower-quality housing, and families of color (What Works For Health, 2019).

Evidence for Impact

Versions of healthy home environment assessments have shown success across a range of populations and geographic areas. Program impacts have been particularly profound among children. Multiple studies have found that healthy home environment assessments lead to improvements in asthma symptoms, decreases in rescue medicine use, less absenteeism from school, and reduced asthma-related healthcare utilization (What Works For Health, 2019). For example, one meta-analysis of 20 studies of healthy home environment assessments targeting children found that the program led to 21 additional symptom-free days, 12 fewer missed school days, and 0.57 fewer asthma-related acute care visits per year (Crocker et al., 2011). A program aimed at low-income children of color in rural areas—similar to the priority population in Cleveland County—led to a 58% decrease in asthma symptoms and a 33% reduction in emergency department visits (Kearney et al., 2014).

Although more research is needed to determine the impact of such programs on adults, available evidence suggests that healthy home environment assessments can improve quality of life, asthma management, and asthma symptoms in the adult population (Parekh, Copeland, Dransfield, & Cherrington, 2019). For example, one study of low-income adults in Seattle found that, compared to a control group, adults receiving home visits had 2.02 more symptom-free days per two weeks and improved self-reported quality of life (Krieger, Song, & Philby, 2015).

Healthy home environment assessments are often cost-saving to the health system due to their impact on expensive emergency healthcare utilization. A program targeting both adults and children in New York State led to a net benefit of \$311-781 per home visit (Gomez, Reddy, Dixon, Wilson, & Jacobs, 2017). Furthermore, a program focused on low-income children was found to save \$1.90 for every additional dollar invested, while another program focused on low-income Black children in Chicago saved \$5.58 for every dollar invested (Campbell et al., 2015; Margellos-Anast, Gutierrez, & Whitman, 2012).

By implementing a healthy home environment assessments program, Cleveland County has the opportunity to improve asthma management, decrease healthcare utilization, and reduce disparities among Cleveland County residents living with asthma, all while seeing a high financial return on investment.

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STAKEHOLDER ANALYSIS

Introduction

Built environment is an important social determinant of health (U.S. Department of Health and Human Services, n.d.). An individual or community's health outcomes can be driven by the characteristics of the places where they live, work, and play. Asthma is one example of a disease whose outcomes can be heavily influenced by environmental factors. For example, indoor pollutants like mold and vermin can trigger asthma attacks, while outdoor air pollution might worsen respiratory problems (Braveman, Cubbin, Egerter, & Pedregon, 2011). Recognizing this, the Healthy People 2030 plan identified "reducing asthma attacks" as one measurable objective for public health practitioners as they work to improve neighborhoods and the built environment (U.S. Department of Health and Human Services, n.d.).

14.7% of Cleveland County, North Carolina residents have an asthma diagnosis; this is almost double the rate of North Carolina as a whole (County Health Rankings & Roadmaps, 2021). Low-income, Black, and Latinx individuals experience higher rates of asthma and poorer asthma outcomes compared to other groups (Asthma and Allergy Foundation of America, 2020). Thus, Cleveland County leaders have an important opportunity to improve residents' health and promote health equity by addressing environmental determinants that trigger asthma attacks, with a particular focus on low-income, Black, and Latinx residents.

Program Transformation

Healthy home environment assessments are an evidence-based program that improve asthma outcomes (What Works For Health, 2019). In these types of programs, community health workers conduct home visits to identify and mediate asthma risks in the indoor environment through education and the provision of free and affordable resources. For example, this program may help families improve ventilation, manage pests, or obtain cleaning supplies. These programs are typically targeted toward lower-income families, those living in lower-quality housing, and families of color. When implemented in other counties, this program improved asthma outcomes across different groups of asthmatics (What

Works For Health, 2019). Among children, healthy home environment assessments have been linked to improved asthma symptoms, reduced hospital visits, and less absenteeism (What Works For Health, 2019). Adults targeted by these programs saw increased symptom-free days and improved self-reported quality of life (Krieger, Song, & Philby, 2015; Gomez et al., 2017). Because they reduce the utilization of emergency and inpatient care, these programs have the potential to be cost saving for the healthcare system (What Works for Health, 2019). Healthy home environment assessment programs have been linked with decreased health disparities among children with asthma, as well as reduced urgent care admissions among low-income families and families of color in rural areas (What Works For Health, 2019). Healthy home environment assessments programs have proven success within rural, low-income, Black, and Latinx populations and across all age ranges. Thus, if Cleveland County were to establish such a program, they would likely see improved asthma outcomes among marginalized residents, reduced health disparities, and financial benefit to the health system.

Stakeholder Analysis: Approach

In order to effectively design, implement, and fund such a program, county leaders must understand stakeholders' views, values, and interests. A CATWOE analysis, paired with root definitions, can be a helpful tool for analyzing stakeholder interests. CATWOE analyses explore how different stakeholders view a problem and the current system surrounding the problem (Basden & Wood-Harper, 2002). In doing so, leaders can better understand stakeholder needs, consider the role they would play in system transformation, and gain insight into the impact of potential changes. Based on the CATWOE analysis, root definitions provide a concise summary of how each stakeholder views the problem. It is important to note that CATWOE analyses and root definitions have several limitations: concepts may be poorly defined, conclusions can be subjective, and the analysis may not represent the wide variety of perspectives *within* stakeholder groups (Bergvall-Kareborn, Mirijamdotter, & Basden, 2004). Despite these shortcomings, however, these tools remain useful for understanding stakeholder perceptions of the system and potential transformations. Appendix D presents CATWOE analyses and root definitions for the following stakeholders who would be interested in or impacted by healthy home environment

assessments: 1) residents with asthma, 2) the Cleveland County Health Department, 3) community health workers, 4) healthcare providers, and 5) hospital administrators.

Stakeholder Analysis: Summary

The analysis reveals that these five stakeholders have different views surrounding asthma management and different definitions of success. Cleveland County residents living with asthma want to improve their own health and quality of life, reduce disruptions in their daily life, and keep themselves out of the hospital. They may struggle to manage their disease, as it can be difficult to understand and navigate various asthma triggers. They will need solutions that are culturally acceptable, affordable, and easy to implement; consulting them will be necessary to implement an effective program. Unfortunately, low-income residents and residents of color, in particular, may feel like they do not have a voice in influencing the system for asthma management since county officials and healthcare providers dictate its parameters.

The Cleveland County Health Department leadership hopes to improve the overall health of the residents in their county. They want to address the social determinants that influence the public's health and contribute to health disparities. This program is one way to achieve that, although it may compete with other priorities. The Health Department leadership sees itself as the most appropriate actor to manage and implement this program.

Like the health department, community health workers want to improve health in the county, particularly among marginalized groups. Community health workers (CHWs) may have grown up in the communities and neighborhoods most affected by asthma, and they have a personal connection to improving their patients' and neighbors' health. Their goal is to help people navigate complex information: they want to educate people about asthma triggers and link them to resources to help address those triggers. CHWs—as staff of the Health Department— would be implementing the program, so their feedback and buy-in is critical. Additionally, because they work directly with community members, CHWs are a good source of information and ideas about how a program could best address residents' needs.

Healthcare providers want what is best for their patients' health, and thus they are certainly interested in improving asthma management. However, they may not be as invested in the non-medical drivers of asthma exacerbation. Some providers may have to be convinced to focus on built environment rather than individual behavior or medication adherence. Because they are typically wealthy, respected members of a community, provider voices could be important leverage for moving this program forward. Finally, hospital administrators should be included in the planning of this program. Because healthy home environment assessments have been shown to reduce inpatient admissions, hospitals could see cost savings if this program keeps uninsured or Medicaid patients out of the hospital. Hospital administrators would need to be convinced that built environment improvements are a good investment. However, if convinced, hospitals could potentially be motivated to provide some funding for this program; thus, it is important to keep them engaged.

The stakeholder analysis reveals the values and priorities of different stakeholders and provides insight into how each group might be engaged. Fortunately, a healthy home environment assessment program aligns with the goals of all stakeholders. The design and implementation of such a program should build off of the insights provided by the CATWOE analysis.

APPENDIX D: CATWOE ANALYSIS AND ROOT DEFINITIONS

Stakeholder #1: Cleveland County Residents Living with Asthma

Customer	People living with asthma
Actor	Cleveland County residents living with asthma
Transformation	Make asthma management strategies accessible, affordable, and effective.
Worldview	I want to have control over my own disease, but managing asthma can be complicated, confusing, and expensive (Engel-Smith, 2021). Hospital and emergency care visits are scary, expensive, and a waste of time. I try to avoid using medications but feel like my doctor focuses too much on medications instead of other strategies (Bidad, Barnes, Griffiths, & Horne, 2018).
Owner	Health system (including health department and healthcare providers)
Environment	For some residents, housing is segregated, inequitable, and unaffordable (County Health Rankings & Roadmaps, 2021). Income constraints force some people to live in old and unhealthy housing and to forgo necessary repairs (Stout, Chen, Farquhar, Karmer, & Song, 2021). Additionally, healthcare is expensive, and prescriptions can be unaffordable (Engel-Smith, 2021).

Root definition: The system for reducing asthma attacks in Cleveland County helps me access resources and information by making them affordable and easy to understand in order to improve my quality of life.

Stakeholder #2: Cleveland County Health Department

Customer	People living with asthma
Actor	Cleveland County Health Department
Transformation	Improve health of all county residents living with asthma, including those who are low-income and people of color.
Worldview	Not all residents have access to the resources and information that they need to avoid asthma attacks. Medication adherence is not enough to appropriately manage asthma.
Owner	Cleveland County Health Department
Environment	Income constrains some residents’ ability to obtain healthy housing, medication, healthy food, and other resources that relate to asthma (Cleveland County Public Health Center, 2019). Low-income communities and people of color are more likely to have asthma and experience asthma exacerbations. Cleveland County residents experience a wide variety of health issues, asthma being just one of them (Cleveland County Public Health Center, 2019).

Root definition: The system for reducing asthma attacks in Cleveland County improves asthma management by increasing access to knowledge and resources in order to improve the residents’ health, particularly for those currently experiencing disparities.

Stakeholder #3: Community health workers

Customer	People living with asthma
Actor	Community health workers
Transformation	Encourage healthier behaviors among those living with asthma
Worldview	Asthma is a manageable disease, but many people do not understand how best to manage it. Many people may not comprehend the role that certain triggers play in their asthma attacks, particularly if they are marginalized by the health system. One-on-one assistance and tailored information is necessary to improve people’s understanding.
Owner	Community members living with asthma
Environment	People are overwhelmed with the health information they receive and have difficulty navigating a complex healthcare system. Sometimes, informational materials do not account for socioeconomic conditions that may limit a patient’s ability to manage their health (Silverman, Krieger, Sayre, & Nelson, 2018).

Root definition: The system for reducing asthma attacks in Cleveland County mitigates asthma triggers by educating people about these triggers in order to encourage healthy behaviors.

Stakeholder #4: Providers

Customer	People living with asthma
Actor	Providers
Transformation	Improve health outcomes of patients living with asthma
Worldview	Many patients do not adhere to prescribed treatment or follow doctor’s recommendations. This can put them at greater risk of asthma exacerbations. There is a need to better educate patients in this area (Mowrer et al., 2015).
Owner	Healthcare providers
Environment	Patients may face specific barriers that keep them from following doctor’s orders, like financial barriers or lack of understanding. Some patients live in unhealthy environments that make it more likely for them to experience exacerbations, making it even more important for them to understand how to manage their asthma.

Root definition: The system for reducing asthma attacks in Cleveland County encourages adherence to treatment by improving understanding of asthma management in order to keep patients healthy.

Stakeholder #5: Hospital administrators

Customer	Hospitals
Actor	Hospital administrators
Transformation	Reduce hospital costs by keeping uninsured patients and patients with Medicaid out of the hospital by keeping them healthy and preventing disease.
Worldview	Prevention, disease management, and community health are important to reducing hospital costs; it can be cost saving to a hospital to invest in these areas (Tsega, Lewis, McCarthy, Shah, & Coutts, 2019). Primary care providers are responsible for their patients’ outcomes and should ensure that their patients have the information they need to stay healthy.
Owner	Healthcare providers
Environment	Hospitals often have to pick up the cost of uninsured patients who land in the hospital, and Medicaid reimburses for many services at a rate below cost (Khullar, Song, & Chokshi, 2018). Many hospitals, particularly in more rural areas, are under financial strain. Nonprofit hospitals are required under the Affordable Care Act to assess and invest in community health, and hospitals are increasingly realizing the potential cost-savings from doing so (Tsega, Lewis, McCarthy, Shah, & Coutts, 2019).

Root definition: The system for reducing asthma attacks in Cleveland County encourages adherence to treatment by improving access to knowledge and resources in order to reduce unnecessary care and thus overall costs.

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ENGAGEMENT AND ACCOUNTABILITY PLAN

Part 1: Stakeholder Engagement Methods

Proposed Program

A community's health outcomes are influenced by neighborhood and built environment characteristics. Asthma is one example of a disease that is heavily impacted by environmental factors; the Healthy People 2030 plan identifies reducing asthma attacks as one objective related to the built environment. Cleveland County, North Carolina has higher rates of asthma than the state average (America's Health Rankings, 2022; Cleveland County Public Health Center, 2019). Black, Latinx, and low-income groups tend to experience asthma and its negative health effects at higher rates than other groups (Asthma and Allergy Foundation of America, 2020). A county-wide program to address the built environmental triggers of asthma attacks could have a positive impact on health and health equity (What Works for Health, 2019). The proposed healthy home environment assessments program aims to reduce asthma attacks among people living with asthma in Cleveland County, with a specific focus on low-income residents and residents of color (What Works For Health, 2019). Led by the health department, this program would send community health workers into the homes of people living with asthma to assess the conditions of their home, provide education and suggestions about how to reduce asthma triggers in their home, and refer them to organizations that can provide these services for free.

Purpose and Rationale Driving Stakeholder Engagement

The following key stakeholders will play a role in the design and implementation of the healthy home environment assessments program: the priority population of Black, Latinx, and low-income residents with asthma; program managers in the health department; health department leadership; community health workers (CHWs); healthcare providers; and local hospital administrators (Appendix E). In addition to these key stakeholders, there are several housing-related stakeholders—including the Housing Authority, the Cleveland County Community Development Corporation, local landlords, and local pest control organizations—who should be consulted when considering the types of housing interventions that should be provided through the program. Finally, schools and community-based

organizations that provide social services should be informed at later stages so that they can refer residents to the program as needed.

Effective stakeholder engagement is critical to the design and implementation of an effective program. First, stakeholder input—particularly from the priority population—is needed to guide the design of the program. The intended beneficiaries should choose the types of education, interventions, and solutions offered by CHWs through the program. Additionally, the key stakeholders can help determine who should be targeted by the program and how those residents are identified. Second, engagement helps build relationships, trust, and awareness among the stakeholders (Minnesota Department of Health, n.d.). Program leaders need buy-in from all stakeholders, particularly from the CHWs who will be implementing the program and the priority population who will be allowing these CHWs into their homes. Stakeholders need to know that this program is being created, understand how it would work, and consider how it would interface with their own activities. Additionally, stakeholder input promotes partnerships that are mutually beneficial, which is important to building longer-lasting collaborations (Minnesota Department of Health, n.d.). Finally, stakeholder engagement can help identify funding sources; some organizations may be willing to contribute financially if they are aware of and contributing to the design of the program.

Proposed Engagement Methods

The health department's stakeholder engagement plan will include three methods, as summarized in Appendix F. First, the health department program managers should conduct key informant interviews with stakeholder representatives, particularly the intended beneficiaries of the program and the CHWs (Appendix G). These 30-minute interviews are an important step to gaining information about stakeholder views, experiences, and interests, which can help guide the design of the program. They can also be used to build relationships and trust between the health department and interviewees. This is particularly important for the program's target population, who may have past experiences with discrimination, mistrust, or marginalization related to the health system. Second, the health department program managers should gather all stakeholders together to identify the types of housing-based solutions that

should be offered through the program, using the nominal group process and Delphi method. These processes encourage shared idea generation and decision-making, which the health department can use to identify housing-based interventions that are desired, useful, and feasible (McMillan, King, & Tully, 2016). A sample approach to this process is described in Appendix H. Finally, the health department program managers should gather all key stakeholders to complete a give-get grid. The give-get grid describes how each entity contributes to and benefits from the partnership (Southerland, Behringer, & Slawson, 2013). Each stakeholder can be asked to complete a give-get grid outlining their partnership with the health department throughout the program design, implementation, and evaluation process; the health department program managers can then compare results with their own give-get grid. An example of a give-get grid is provided in Appendix I. This process provides insight into how different stakeholders view the program and the contributions that they plan to make while also identifying opportunities for better alignment.

Part 2: Accountability Plan

MEMORANDUM OF UNDERSTANDING Between Cleveland County Health Department And Atrium Health Cleveland

Purpose

The purpose of this partnership is to implement a program to address built environmental factors of asthma exacerbations in Cleveland County. Based on the evidence-based healthy home environment assessments approach, the proposed program will send community health workers to conduct outreach to low-income, Black, and Latinx residents living with asthma in Cleveland County, with the goal of educating about, identifying, and addressing asthma triggers in the indoor home environment. The community health workers can refer residents to free or low-cost services that can make needed improvements in the home, such as pest control, mold treatment, or improved ventilation. Although this program is led by the Cleveland County Health Department, Atrium Health Cleveland will provide critical support through its Community Benefit Team.

Expectations, Visions, and Values

The Cleveland County Health Department and Atrium Health Cleveland agree to the following:

- The partners share a vision of a Cleveland County with no disparities in asthma-related health outcomes by race or income, where all residents have the resources and information they need to manage their asthma.
- The partners share a goal of improving asthma management in Cleveland County, particularly among low-income, Black, and Latinx residents who experience higher rates of asthma than White and higher-income residents.
 - The partners expect to reduce asthma exacerbations, with the related goals of 1) reducing the use of emergency department and inpatient services among patients with asthma and 2) improving quality of life for residents living with asthma

- The partners will invoke shared values of prevention, community-health, patient-centered care, community empowerment, and health equity.

Scope of Activities

The Health Department’s expected activities include the following:

- Lead the design of the program, informed by reviews of the literature and stakeholder engagement processes.
- Hire and train community health workers to implement the program.
- Combine data from medical and social services sources to identify the addresses of residents living with asthma.
- Identify additional funding sources as needed to ensure the sustainability of the program.
- Evaluate the program for its impacts on health outcomes and healthcare utilization.

Atrium Health Cleveland’s responsibilities include the following:

- Provide funding to cover the wages of Community Health Workers hired to implement the healthy home environment assessments program for the first year.
 - Estimated personnel needs: Two Community Health Workers spending 10 hours a week on the healthy home environment assessments program, at \$20 per hour.
 - This funding will be revisited based on the outcomes from the first year of the program.
- Allocate Community Benefit Team bandwidth and resources to help identify areas of highest need, recruit stakeholders to participate in the program design processes, and inform providers and other relevant partners of the program.
- Share hospital administrative data on asthma-related health outcomes for the purposes of:
 - Identifying residents living with asthma who may benefit from the program.
 - Evaluating the impact of the program on health outcomes and healthcare utilization.

Goals, Milestones, and Metrics

- All data collected will be stratified by race/ethnicity, income, and insurance status.
- The following metrics will be calculated from Health Department data:

- Number of home visits conducted
- Number of interventions and services provided, stratified by type
- Self-reported asthma symptoms from a sample of program participants, including symptom-free days and quality of life perceptions
- Community health worker opinions of the program
- Priority population opinions of the program
- The following metrics will be calculated from hospital claims data:
 - Change in asthma-related emergency department visits
 - Change in asthma-related inpatient hospitalizations
- Program goals for the first year include the following:
 - Within 1 year, conduct home visits with 50% of Cleveland County residents living with asthma who are low-income ($\leq 200\%$ FPL), Black, or Hispanic.
 - Within 1 year, reduce self-reported asthma symptoms by 50%.
 - Within 1 year, reduce asthma-related emergency department visits and asthma-related inpatient hospitalizations among Cleveland County residents living with asthma by 25%.

APPENDIX E: RESPONSIBLE, ACCOUNTABLE, SUPPORTIVE, CONSULTED, INFORMED (RASCI) ANALYSIS

Table 1. Analysis of key stakeholders for a healthy home environment assessments program

Who is...	Stakeholders	Rationale for Partner Participation
Responsible	Program Managers in the Cleveland County Health Department	This program will be led by program managers in the county’s Health Department, which has the resources and expertise needed to implement such a program. The program managers would make decisions about the structure and design of the program and be responsible for the execution of the program.
Accountable	Cleveland County Health Department leadership County government officials	The Health Department leadership is ultimately responsible for the health outcomes of the public in their county. They have the power to make high-level decisions and to allocate funding. The county government is also responsible for the overall well-being of residents of their county, which includes health. They have the ability to pass policies to support the program and allocate funding.
Supportive	Community Health Workers Hospital Administrators	Community Health Workers play a key role in the implementation of the program and will have the best understanding of its on-the-ground effects. Hospital administrators are interested in investing in preventive health services to reduce unnecessary hospital utilization. They may be willing to provide financial support for the program.

<p>Consulted</p>	<p>Low-income, Black, and Latinx residents of Cleveland County living with asthma</p> <p>Healthcare providers</p> <p>Housing-related stakeholders, such as the Housing Authority, the Community Development Corporation, landlords, and local pest control organizations.</p>	<p>People living with asthma must be consulted throughout the design and implementation of this program, and their feedback must be thoughtfully considered and integrated. These are the potential clients for the program, and they know their own needs best and understand what would be helpful to them.</p> <p>Providers play a key role in educating patients about asthma management and helping them access needed resources. They should be consulted to understand the type of information currently being provided in the medical setting and the types of medical issues that they believe most impact their patients' asthma management.</p> <p>Housing-related stakeholders should be consulted to ensure that suggested housing interventions would be acceptable to landlords, developers, and those who would implement the desired services. Although most interventions will likely be minor, housing-related stakeholders should be consulted in case they have concerns with particular interventions.</p>
<p>Informed</p>	<p>Schools</p> <p>Community-based organizations that provide social services to the target population</p>	<p>They should be aware of this program so that they can refer students and clients to it.</p>

APPENDIX F: STAKEHOLDER ENGAGEMENT METHODS

Table 1. Summary of stakeholder engagement methods for a healthy home environment assessments program

Method	Description	Group or Individual?	Stakeholders Targeted	Purpose
Key Informant Interviews	Health department program managers conduct 30-minute interviews with key stakeholders.	Individual	All key stakeholders, with a particular focus on the priority population and community health workers.	Build relationships. Better understand gaps, assets, needs, and opportunities.
Nominal Group Process and Delphi Method	Health department program managers lead an iterative process where stakeholders generate and rank ideas.	Group	Target population, community health workers, health department program managers, and housing-related stakeholders.	Identify types of interventions to be offered through the program, based on what residents want, what community health workers are willing to provide, and what housing-related stakeholders are willing to accept.

Give-Get Grid	Each entity describes what they expect to give and get from their partnership with the health department, throughout the design, implementation, and evaluation of the program. Results are compared across entities.	Group	All key stakeholders	Build trust by ensuring mutually beneficial partnerships. Identify opportunities for alignment. Identify stakeholders who may need additional compensation. Identify stakeholders who may be willing to contribute funding.
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APPENDIX G: SAMPLE QUESTIONS FOR KEY INFORMANT INTERVIEWS

Key informant interview guides would vary based on the type of stakeholder being interviewed. Below are some sample questions that may be used in key informant interviews.

For residents living with asthma:

- How does it feel to live with asthma?
- What steps do you take to try to manage your asthma or avoid asthma attacks?
- Where do you get your information about how to manage your asthma? What would you like to know more about?
- Are there any triggers that you find difficult to avoid?
- Tell me about the building that you live in. What's it like? Are you happy with where you live? Does it feel clean? Do you feel like you're able to make changes to it when you want to?

For community health workers:

- Do you currently have patients who are living with asthma? If so, what barriers do you see to their management of their disease? Are there common misconceptions related to asthma management?
- Have you conducted home outreach visits in Cleveland County before? If so, how were they received? What were some of the challenges?

For healthcare providers:

- What kind of information do you provide to patients living with asthma related to disease management?
- How well do you think patients are able to follow your recommendations related to asthma management? What barriers do they face?

APPENDIX H: SAMPLE SCRIPT TO GUIDE THE NOMINAL GROUP PROCESS AND DELPHI METHOD

For people living with asthma, asthma attacks are often triggered by pollutants in the home environment. Common indoor air pollutants include mold, radon, rodents, cockroaches, pollen and dust mites, stoves and space heaters, and certain cleaning products. These issues are worse if a house isn't cleaned well or if it has poor ventilation and airflow. Our proposed healthy home environment assessments program would send community health workers into the homes of people living with asthma to assess the conditions of their home, provide education and suggestions about how to reduce asthma triggers in their home, and refer them to organizations that can provide these services for free. The focus is on low-income people and people of color living with asthma in Cleveland County.

Today, we are hoping to get your input on what types of services you would like to see provided through the program. Remember, the goal of these services is to reduce indoor asthma triggers by improving conditions in the home. A comprehensive list of indoor asthma triggers has been provided to each of you for your reference.

Please brainstorm answers to the following questions. After individual brainstorming, we will use a round robin technique to share ideas and discuss. We will then use a ranked voting system to determine which services should be provided through the program.

- Question 1: What services would you like to see provided through this program? You can use the list provided as a starting point or come up with your own ideas.
- Question 2: What services do you think would be easiest to implement?

APPENDIX I: GIVE-GET GRID

Table 1. Sample give-get grid for a healthy home environment assessments program

Below is a sample of what a give-get grid might look like. Each entity would be expected to complete the give-get grid for a partnership between themselves and the health department.

	Gives...	Gets...
Health Department	Time and labor, resources, expertise	Feedback from other stakeholders about how to create an effective program; funding
Black, Latinx, and Low-Income Residents with Asthma	Time and labor, personal stories/feedback about personal experiences, emotional labor	A well-tailored program to help address a health problem that they face
Community Health Workers	Time and labor, expertise, emotional labor	Wages/salary for their work
Hospital Administrators	Funding	Potential cost-savings
Providers	Spreads awareness among patients	Healthier patients

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PRESENTATION SLIDES

Healthy Home Environment Assessments

- Outreach targeted toward low-income, Black, and Latinx residents living with asthma
 - Identify, educate, and address asthma triggers in the home environment
 - Examples:
 - Pest control
 - Mold removal
 - Providing cleaning supplies
 - Improving ventilation
- Evidence for effectiveness in priority population
 - Improved asthma symptoms and quality of life
 - Reduced healthcare utilization
 - Cost-saving to healthcare system

What Works For Health, 2019

In addition to the program to support breastfeeding, we are proposing a program that aims to improve asthma management among residents already living with asthma. Healthy home environment assessments are an evidence-based approach to address triggers of asthma attacks in the indoor home environment. This would involve sending outreach workers to the homes of Cleveland County residents living with asthma, specifically targeted toward our priority population of low-income, Black, and Latinx people. The outreach workers would identify asthma triggers in the person's home, while also educating them about the importance of those risk factors and how they can be addressed. They would also connect residents to free or low-cost services—like traps or spraying services for pests, or effective cleaning supplies—that can help control these risk factors.

This type of program has proven success in a range of different settings, including with both adults and children and in both rural and urban areas. Participants in these types of programs have reported improved quality of life and improved asthma symptoms. It's also been shown to reduce emergency department visits and urgent care visits for asthma, making it potentially cost saving to the healthcare system.

Stakeholders: Healthy Home Environment Assessments



Residents with
asthma



Healthcare
Providers



Cleveland County
Health Department



Local Hospital
Administrators



Outreach Workers

In order to design, implement, and evaluate the Healthy Home Environment Assessments program, we would need to engage different groups that are impacted by the problem of asthma. First, Cleveland County residents with asthma, particularly those who are low-income, Black, and Latinx, will need to be consulted since they are the priority population. We will need to understand the barriers they face in managing their disease, and ensure that the solutions offered are acceptable, affordable, and useful. Health department staff and outreach workers will have to be consulted, both to gain their perspective on the problem but also to ensure that the design is feasible. Healthcare providers can provide clinical insight. Finally, local hospital administrators may actually be interested in funding the program since it's potentially cost saving to hospitals, so it's important to engage them as well.

Engagement and Accountability

Goal	Stakeholders Targeted
Build trust and relationships	<ul style="list-style-type: none"> All, with a focus on priority population
Determine overall program design	<ul style="list-style-type: none"> All
Choose services to be offered by outreach workers	<ul style="list-style-type: none"> Priority population Outreach workers Program managers at the Health Department
Identify potential funding sources	<ul style="list-style-type: none"> Hospital administrators

When engaging these stakeholders, we need to keep in mind four goals. First, engagement can build trust and relationships. The success of this program requires residents to be willing to let a stranger into their home. So, consulting with the priority population throughout the process, making sure they know this program is coming and who is leading it, is important. And while trust among the priority population is the main focus here, it will be necessary to build trust with all of the key stakeholders in order to build up their interest and investment in the program. Second, stakeholders should guide the overall program design. While this program is based on existing models, it will need to be tailored to fit the particular context and needs of residents in Cleveland County. So, input from people who know this county and this system is important. Third, the priority population, health department staff, and outreach workers should help choose what services are being offered during the home visit—for example, providing a vacuum, or providing an air filter. Finally, throughout this process of engagement and relationship building, we may be able to identify funding for the program. If hospital administrators see that this program can be cost saving and feel like they have a say in its design, they may be willing to invest money into it. If this does end up being the case, a Memorandum of Understanding between the health department and the hospital can be used to ensure accountability in that partnership.

INDIVIDUAL DELIVERABLES: SERENA HUTCHINSON

PROBLEM STATEMENT

Social Determinant of Health

Social determinants of health are circumstances such as economic and education status, access to healthcare, healthy foods, clean air and water, and exposure to racism and discrimination that all impact people's well-being and quality of life (Office of Disease Prevention and Health Promotion, 2022).

Neighborhood and built environment is a major social determinant of health that the Office of Disease Prevention and Health Promotion defines as the impact of health and well-being within the areas that people work, play, learn, worship, age and live (2022). Physiological and safety needs are foundationally essential for health and survival as noted by Abraham Maslow in his well-known hierarchy (Henize et al., 2015). These two levels coincide with this social determinant of health with its inclusion of clean air and water, access to healthy food through transportation or reduction of other barriers, housing to provide shelter for sleep and rest, safety from violence, security of employment and property, and other environmental resources to maintain health (National Institute of Environmental Health Sciences, 2022).

One objective from the "neighborhood and built environment" sub-section of the Office of Disease Prevention and Health Promotion's Healthy People 2030 report is to reduce asthma attacks. One of the most interconnected components of the neighborhood and built environment is air quality and the need for clean air to promote well-being. The short-term impacts of poor air quality include increased breathing difficulty, coughing and wheezing, increased risk of respiratory infections, and triggering asthma attacks (Office of Disease Prevention and Health Promotion, 2022). The long-term impacts include the development of asthma, emphysema, chronic bronchitis, chronic obstructive pulmonary disease (COPD), and lung cancer as well as premature death (Office of Disease Prevention and Health Promotion, 2022). The objective to reduce asthma attacks allows for the quantification of the improvement of various environmental factors that lead to these health outcomes. Asthma attacks are surrogate indicators of asthma control and range in severity. An asthma attack can last from minutes to

days and either resolve spontaneously or require medication and even potentially hospitalization (American College of Allergy, Asthma & Immunology, 2022).

Geographic and historical context

Cleveland County, North Carolina located at the southern border of the state west of Charlotte and 55.8% of its population resides in rural areas with Shelby as its major city (University of Wisconsin Public Health Institute, 2022). Cleveland County is ranked 81st out of the 100 counties in North Carolina in regard to negative health outcomes. Regarding the neighborhood and built environment, it's important to note that Cleveland is a top ranking economically disadvantaged county with 19.9% of residents at or below the poverty line (Cleveland County Public Health Center, 2020). In 2019 the poverty line is defined as a weighted average income of \$26,172 for a family of four (Census.gov, 2022). The median household income in Cleveland County is \$40,002, much less than the state's \$50,320 (Cleveland County Public Health Center, 2020). With limited economic resources, this makes creating necessary changes to the neighborhood and built environment difficult. The most recent unemployment rate recorded for Cleveland County was 3.7% in November 2021; however, based on the last several years, the average unemployment rate is 7.26% (YCharts Inc., 2021).

Historically this county has built its economy around the farming industry, and at its peak housed 25 textile plants and over 400 dairy farmers. Agriculture along with manufacturing plants are currently the major drivers of the economy in the present day. Over 40% of the county's workforce is part of the manufacturing sector including electric motors, transmissions, truck cabs, motor vehicle parts, aerospace, fiberglass, and specialized textiles (Cleveland County Public Health Center, 2020). A major asset of Cleveland County is the development of the *Accelerate Cleveland* program in April 2019 which connects underemployed individuals to the manufacturing industry with a focus on addressing inadequate wages (Cleveland County Public Health Center, 2020). Unfortunately, byproducts of farms and production plants increase exposure to air pollutants and other toxins that affect workers and those living or working nearby.

Priority population

Within Cleveland County, everyone's health is affected by environmental factors, especially in regard to air pollutants and toxins. However, there are certain populations that are more vulnerable to adverse health outcomes such as asthma attacks, respiratory infections, or development of chronic respiratory diseases. Based on national data, populations that are most vulnerable include low-income individuals as well as those of Black and LatinX racial and ethnic groups. (Asthma and Allergy Foundation of America, 2020). Prioritizing non-Hispanic Black and LatinX communities and low-income households within Cleveland County would mean addressing major neighborhood and built environmental factors that perpetuate inequities of poor health outcomes within the county. At a national scale Black Americans are disproportionately burdened by asthma at a rate of nearly 1.5 times that of white Americans. Black Americans are three times more likely to die from asthma than white Americans with the highest rates among Black women (Asthma and Allergy Foundation of America, 2020). Over the past ten years the prevalence of asthma attacks have increased for the LatinX population. In 2019 LatinX individuals compared to white people faced 63% greater pollution inequity which is defined as unfair and avoidable levels of exposure to harmful pollutants (American Lung Association, 2020; Asthma and Allergy Foundation of America, 2020).

Measures of problem scope

Asthma along with chronic bronchitis and emphysema are categorized as chronic lower respiratory diseases. Within Cleveland County, 411 deaths from 2014 to 2018 were due to chronic lower respiratory disease. This equates to a rate of 84.6 per 100,000 people in Cleveland County, compared to the state of North Carolina's rate of chronic lower respiratory disease-related deaths of 52.1 per 100,000 (Cleveland County Public Health Center, 2020).

Rationale/Importance

Those with asthma are more sensitive to poor air quality due to harmful environmental factors that trigger asthma attacks. Although non-Hispanic whites make up a majority (72.8%) and non-Hispanic Blacks (20.6%) and LatinX (3.8%) make up a minority of the population in Cleveland County, asthma and respiratory conditions disproportionately affect these minority groups (University of Wisconsin

Population Health Institute, 2022; U.S. Census Bureau, 2021). The annual medical cost per person with asthma is \$3,266 (Asthma and Allergy Foundation of America, 2020). Cleveland County is vulnerable to both the human cost and economic cost of asthma based on current economic and environmental challenges that the county faces. Addressing the neighborhood and built-environmental factors that disproportionately affect those of marginalized backgrounds will work towards reducing disparities in health outcomes such as asthma attacks.

Disciplinary critique

The social determinants that cause disparities in rates of asthma attacks include physical and social environmental factors that are directly connected with educational and economic status. These factors are further perpetuated by racism and lack of healthcare access (Asthma and Allergy Foundation of America, 2020). The neighborhood and built environment is a primary determinant of morbidity of asthma due to the prominence of tobacco use and the increased level of pollutants from agricultural and manufacturing facilities. Nutrition-focused public health interventions designed to reduce community asthma burden should focus on inequities perpetuated by disparities worsened by poverty, poor housing conditions and barriers to healthcare access.

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IMPLEMENTATION PLAN

Background Information

Social determinants of health are conditions in the surroundings of where people are born, learn, play, practice devotion, and age (Office of Disease Prevention and Health Promotion, 2022). The Office of Disease Prevention and Health Promotion categorizes social determinants of health into five domains, including neighborhood and built environment. This domain includes several determinants that affect people's health and safety, including violence, transportation, water or air pollutants, built spaces for walking and biking, and worksites that increase exposure to chemicals and pollutants (Office of Disease Prevention and Health Promotion, 2022).

Many factors within the neighborhood and built environment can trigger asthma attacks for those with asthma (Asthma and Allergy Foundation of America., 2020). Asthma is a reactive airway disease in which inflammation results from exposure to a range of potential factors including allergens, inhaled environmental irritants, stress, exercise, cold temperatures, gastroesophageal reflux, and certain medications (National Heart, Lung, and Blood Institute, 2020; Physician's Committee for Responsible Medicine, 2020). At least half of those currently living with asthma have reported having an asthma attack within the past year (Covar et al., 2018).

Although the exact pathogenesis of asthma is unclear, many potential risk factors have been analyzed from genetics to environmental and lifestyle-related determinants (Ding et al., 2015). Of these lifestyle-related factors, several nutritional elements play protective roles against the development of asthma. For example, diets higher in antioxidants, especially vitamin C and E, carotenoids, flavonoids, selenium, and zinc, have shown to result in lower incidence of childhood asthma than diets low in these. Other potential association relates to the ratio of ω -3 to ω -6 polyunsaturated fatty acids consumed due to their involvement with inflammatory responses (Ding et al, 2015). Additionally, breastfeeding has shown to play a protective role against the development of asthma potentially through its impact on infants' immune, lung, and microbiota development (Ding et al., 2015; Miliku & Azad, 2018; Physician's Committee for Responsible Medicine, 2020; University of Wisconsin Population Health Institute, 2022).

Purpose

Cleveland County is vulnerable to both the human and economic costs of asthma based on current economic and environmental challenges that the county faces. Black and LatinX populations and those with low incomes are at greater risk to built environment-related exposures and suboptimal nutrition that result in poor health outcomes including asthma (University of Wisconsin Population Health Institute, 2022). These inequities are due to systemic racism, residential segregation, and healthcare access disparities. At a national scale, Black Americans are disproportionately burdened by asthma at a rate of nearly 1.5 times that of white Americans (Asthma and Allergy Foundation of America, 2020). Black and LatinX populations are three times more likely to die from asthma than white Americans and, similarly, emergency department visits are two to three times higher among both these groups (Asthma and Allergy Foundation of America, 2020).

For the majority diagnosed with asthma, symptoms first develop prior to age five (Covar et al., 2018; Miliku & Azad, 2018). Breastfeeding promotion programs have proven to be cost effective and likely to decrease health outcome disparities between racial and socioeconomic groups (University of Wisconsin Population Health Institute, 2022). The burden of suboptimal breastfeeding per 100,000 women is higher among Black and LatinX populations, compared with non-Hispanic whites. These marginalized groups endure a higher economic burden of disease compounded by these lower breastfeeding rates. These suboptimal breastfeeding rates lead to Black and LatinX individuals having nonmedical costs on average of about \$150 more than white individuals (Bartick et al., 2017).. An example of a nonmedical cost includes missed work due to infant ear infection or gastrointestinal infection (Bartick et al., 2017). Additionally, the annual medical cost per person with asthma is \$3,266 (Asthma and Allergy Foundation of America, 2020). Breastfeeding plays many roles in infants' development including immune support which many studies have shown to be associated with reduced rates of disease burden including asthma and related healthcare costs (Ding et al., 2015; Miliku & Azad, 2018; Wood et al. 2021).

Evidence-based outcomes

The breastfeeding initiation rate between 2018-2019 in Cleveland County is 65.8%, compared to 81.6% for the state of North Carolina (Centers for Disease Control and Prevention, 2021). Atrium Health Cleveland is the main hospital and accounts for the greatest number of births in the county. In order to address breastfeeding rate disparities as well as associated health outcomes, the objective for Atrium Health is to take the ten steps to adopt the Baby-Friendly Designation by April of 2024. There is strong scientific evidence collected from over 600 designated facilities that supports the efficacy of this Baby-Friendly Designation program in increasing breastfeeding initiation and duration (Baby-Friendly USA, 2019; University of Wisconsin Population Health Institute, 2022). This has proven to be a cost-effective approach for not only reducing health outcomes but also for addressing disparities that exist between racial and ethnic groups and across income status. The return on investment is much greater, not only economically, but also in the improvement of health outcomes for these mothers and their infants.

One long-term impact is to increase the breastfeeding initiation rate in Cleveland County especially among Black, LatinX, and low-income populations. With greater initiation rates of breastfeeding, this will decrease existing health outcome disparities including incidence of asthma attacks between Black and LatinX populations compared to non-Hispanic whites. To help increase breastfeeding rates community support resources are necessary to provide prenatal breastfeeding education as well as postpartum lactation support. Therefore, another long-term impact will be a well-established network of communication, data-sharing and referral systems between Atrium Health Cleveland and community programs and resources.

Strategies and activities

To help address low breastfeeding initiation rates within Cleveland County, Atrium Health Cleveland will work with the Baby-Friendly USA (BFUSA) program to implement the ten steps required for Baby-Friendly Designation. Atrium Health Pineville, located within Mecklenburg County, is currently in the process of receiving the Baby-Friendly Designation (Baby-Friendly USA, 2019). Atrium Health Cleveland is within the same hospital system and can utilize the knowledge and experience from those involved with the implementation process at the Pineville location.

The designation process is simplified by the 4-D Pathway tool (see Appendix J) created as a guide for facilities. The program would be initiated after Atrium Health Cleveland registers with BFUSA and Eugene Woods, the CEO of Atrium Health, signs a support letter, similar to what he had done for Atrium Health Pineville, regarding intent for acquiring this designation. From this point, appraisal and facility data must be collected and shared with the BFUSA program. Upon completion, the facility will receive a “Registry of Intent Award” to allow continuation into the development phase (Baby-Friendly USA, 2022). Next, the development of a multidisciplinary committee must be formed in order to develop a facility-specific plan prior to implementation. This committee may be composed of hospital administration, International Board-Certified Lactation Consultants (IBCLCs), doctors, labor and delivery and newborn nursery nurses, pharmacists, doulas, social workers, or any clinician involved with perinatal care. This task force will review and provide feedback for Atrium Health Cleveland’s current breastfeeding policy and make revisions that support the World Health Organization’s and United Nations International Children’s Emergency Fund’s ten steps to successful breastfeeding. The committee will then develop a staff training plan or curriculum as well as a prenatal and postpartum education plan for patients that adhere to these ten steps. And finally, the team including the research assistant and partners from Atrium Health Pineville will develop a plan for collecting data on these changes (Baby-Friendly USA, 2022).

The next phase of the designation pathway is dissemination of what has been developed in the previous phase. This means training all of the staff that interact with any element of maternity care. Training will include updating staff and providers on the facility’s position of breastfeeding, the revisions of the policy, and the competencies that the staff must meet. One of the largest steps that’s taken during this phase is meeting the standards of the International Code of Marketing Breast-milk Substitutes. This means that the hospital can no longer accept free samples or supplies or advertise infant formula of any kind. And with all of these changes data, again, must be collected to evaluate the facility’s progress toward implementing the steps required by the Baby-Friendly Hospital Initiative (Baby-Friendly USA, 2022). Additionally, education about breastfeeding alone is not enough to address disparities regarding

quality of care and understanding trauma-informed care strategies required to effectively support women from marginalized groups. A specific training by Goodstock Consulting, LLC will include a series of trainings specific to equity, diversity, and inclusion. This program has been utilized by the Carolina Global Breastfeeding Institute and is able to tailor the training to the field of lactation support

The last phase includes finalizing the designation and preparing Atrium Health Cleveland for long-term sustainability. At this point the hospital will establish a quality improvement plan for areas that are evaluated that are not fully compliant with the Baby-Friendly requirements. A readiness interview during this phase will provide BFUSA the opportunity to provide additional feedback for necessary areas of improvement prior to the final on-site assessment. After passing this final assessment by BFUSA, designation will be granted. Re-designation will be required every five years (Baby-Friendly USA, 2022).

This approach mainly focuses on the organizational level within the socioecological framework to address health outcomes. Although asthma attacks are the major health outcome of interest, breastfeeding promotes much more beyond improved lung health. However, if the Baby-Friendly practices and position on breastfeeding is limited to the hospital, the impact will be limited. Therefore, through connections and further development with community programs and stakeholder facilities, this intervention can influence the population at a community and interpersonal level as well. This intervention will aim towards reducing inequities for the over 330 births in Cleveland County among Black and LatinX populations each year (North Carolina Department of Health & Human Services, 2022).

Stakeholders

Within the hospital setting stakeholders include clinicians such as labor and delivery and newborn nursery nurses, IBCLCs, physicians, and also breastfeeding moms themselves. Community partnership, data sharing, and access to services are all crucial to accomplish breastfeeding success within Cleveland County. Therefore, partnerships with various stakeholders are necessary to support breastfeeding beyond just the inpatient setting. OBGYN and pediatric offices and home health care services within the community are important stakeholders because they play a major role in outpatient prenatal and postpartum care and education. WIC, Nurse-Family Partnership at Cleveland County Health Department,

the Alliance for Health in Cleveland County, Inc., and the Minority Health Council of Cleveland County are all community focused organizations that provide and connect residents with proper resources. Childcare and employment agencies are also important stakeholders in addressing other potential challenges breastfeeding parents may face. With partnerships with these stakeholders, breastfeeding support and continued level of care can be provided beyond the hospital by effectively connecting individuals to community resources and support groups.

The main advantage to this program selection is that there is strong evidence supporting the efficacy of these methods in hundreds of other facilities. Also, this approach focuses on a preventative approach to improving health outcomes which has many economic benefits. Breastfeeding promotion initiatives have also proven to address disparities among ethnic and racial groups, which is one of the major priorities for this program. The biggest disadvantage of this program is that it does not directly address asthma attacks which is the health outcome that is being addressed. Likewise, it is unethical to perform a randomized control trial on the link between asthma and breastfeeding; therefore, the link between the two has not clearly been defined. With taking the trade-offs into account, the equity focus and strong potential for improvement of outcomes related to asthma makes this the choice program for Cleveland County.

APPENDIX J: Budget

Implementation requirement	Cost	Justification
Baby-Friendly Designation Fee	\$14,750	BFUSA’s fee for assessment during the entire 4D-Pathway and for establishing the official designation.
Breastfeeding education training, implementation and evaluation	\$30,000	Payment to the implementation and evaluation team including IBCLCs and trained educators, including partners from Atrium Health Pineville partners that support implementation.
Facility supplies	\$50,000	This includes hospital-grade pumps, additional breastfeeding supplies, donor milk, breastmilk substitutes, education booklets and addition of lactation rooms within the hospital.
Goodstock Consulting LLC EDI Trainings	\$40,000	In order to address disparities in quality of care between racial groups, four EDI trainings will be required for all staff.
Cleveland County WIC Consultation	\$30 per hour	Consulting with established breastfeeding-focused community partners will aid in the development of a well-connected network of community resources and partnerships to provide support services and resources prenatally and postpartum.
Expenses after initial implementation:		
Quality Improvement for BFUSA	\$1,900	BFUSA requires post-designation annual fees to support quality improvement efforts.
Re-designation for BFUSA	\$3,400	Every two years, BFUSA requires every facility to be re-assessed to maintain Baby-Friendly designation
Continuous Goodstock EDI Trainings	\$10,000 per training	To maintain cultural humility by hospital staff, continued equity, diversity and inclusion training will be mandatory twice a year.

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EVALUATION PLAN

Intervention summary

Neighborhood and built environment is one of the social determinants of health domains defined in Health People 2030 as the surroundings in which people are born, learn, play, practice devotion, and age (Office of Disease Prevention and Health Promotion, 2022). Asthma is a strong immune response often triggered by a substance in the environment such as tobacco smoke, pollen, and molds (National Heart, Lung, and Blood Institute, 2020). Inflammation results from this response making it harder to breathe and potentially lead an asthma attack (National Heart, Lung, and Blood Institute, 2020). Asthma is often established in early childhood (Miliku & Azad, 2018). Breastfeeding may be associated with lung health through several potential mechanisms, including lung development, immunity, modulation of gut microbiota and epigenetics (Miliku & Azad, 2018). Some studies indicated that breastfeeding reduces the incidence of asthma development (Ding et al., 2015; Miliku & Azad, 2018; Physician's Committee for Responsible Medicine, 2020; University of Wisconsin Population Health Institute, 2022).

In order to focus on the prevention of asthma development and therefore the prevalence of asthma attacks within Cleveland County, Atrium Health Cleveland will complete the Baby-Friendly Designation process. Through completing the four phases of the designation process, the community will be better supported to address disparities among breastfeeding initiation and exclusivity rates (Munn et al., 2016). In order to address health outcome disparities among the Black and LatinX populations, there will be additional equity, diversity, and inclusion training included into the process. Short-term measures of this intervention will compare pre- and post-intervention breastfeeding initiation rates. While the long-term outcome is the increase in exclusive breastfeeding rates at three months among Black, LatinX and low-income infants.

Evaluation Plan

Study design/data collection

The study design will be a pre- and post-test experimental design. To evaluate the pre-intervention measures, data will be collected from current electronic health records within Atrium Health

Cleveland as well as Cleveland County's Special Supplemental Nutrition Program for Women, Infants and Children's (WIC) electronic medical record called NC Crossroads. Additionally, questionnaires developed by the research team will be administered to ensure validity of data collected.

Sample and sampling strategy

The sampling strategy for this intervention is to be collected from only patients at Atrium Health Cleveland. Detailed hospital records already exist from patients who previously gave birth at the hospital. Consent forms will be provided and signed by all mothers who give birth at Atrium Health Cleveland who are willing to allow their information to be analyzed in the data collection and evaluation. The study sample will consist of all low income, Black, and LatinX mother/infant dyads that give birth at the hospital within the year prior to initiating the designation process and within the year after the completion of the designation process.

Specific measures

The breastfeeding initiation rate and exclusivity rate at three months will be measured and recorded for pre- and post-intervention comparison. Regarding exclusivity rates, data will be analyzed on whether medically necessary supplementation was required, and if so if the infant was provided donor human milk or formula. If breastfeeding initiation did not occur, data about the reason will be included such as parent preference, milk production issues, psychological barriers, etc. Data on other potential barriers that will be collected include labor type, gestational age, parity, breastfeeding history if multiparous, history of maternal disease such as gestational diabetes, preeclampsia, polycystic ovarian syndrome and history of surgery (e.g., breast or bariatric), and labor complications.

Training sessions will take place for all individuals who input information into the EHR for both Atrium Health Cleveland and WIC. Equity, diversity, and inclusion (EDI) training will also be required for these individuals in order to ensure that assumptions are being avoided and biases are being addressed regarding breastfeeding expectations of patients that may differ from patients' actual goals. At Atrium Health both nursing staff and IBCLCs must be trained on where and what to report regarding initiation of breastfeeding within health records. WIC staff including breastfeeding peer counselors must be trained to

ensure accurate recording of exclusive breastfeeding rates and follow-up of patients through regular postpartum checks via phone or scheduled in-person visits. A research assistant will be designated to collect data from both sets of electronic medical records. Their responsibility is to ensure that the collected data are free of errors and that all required information (mom's ethnicity, race and income) is present.

Analysis plan

In order to measure the effectiveness of the equity-focused Baby-Friendly Designation implementation at Atrium Health Cleveland data will be analyzed through a two sample t-test. Analysis of potential effect modifiers or confounders will be analyzed as well to determine associations strengthened by presence of certain labor or maternal history-related factors. The change in breastfeeding initiation and exclusivity rates will be analyzed from the year prior to the Baby-Friendly Hospital Designation to the year after the completion of the designation process.

Timing

Data will be collected through administered questionnaires and from records for the year prior to the Baby-Friendly Designation process of Atrium Health as well as a year after the completion of the designation process. The designation process will be completed in April of 2024 and therefore data will be collected for all births from May 2024 through April 2025.

Sources of funding

Applications will be completed for funding through the Robert Wood Johnson Foundation grant proposal titled "Evidence for Action: Innovative Research to Advance Racial Equity." This grant focuses on individuals and communities exhibiting the greatest health burdens and also focuses on addressing systems and structures to address resources and opportunities for improving health and addressing disparities. This intervention fits the grant's criteria due to the fact that this intervention has adapted a strong focus on equity, diversity and inclusion to address disparities within the community.

Data use and dissemination

Data will be used to inform other communities in addressing health outcome disparities between racial/ethnic and income groups. This will be the first equity-focused implementation of the Baby-Friendly Designation within a hospital setting. Therefore, the data collected can be used to support other breastfeeding promotion efforts in addressing disparities across racial and ethnic groups.

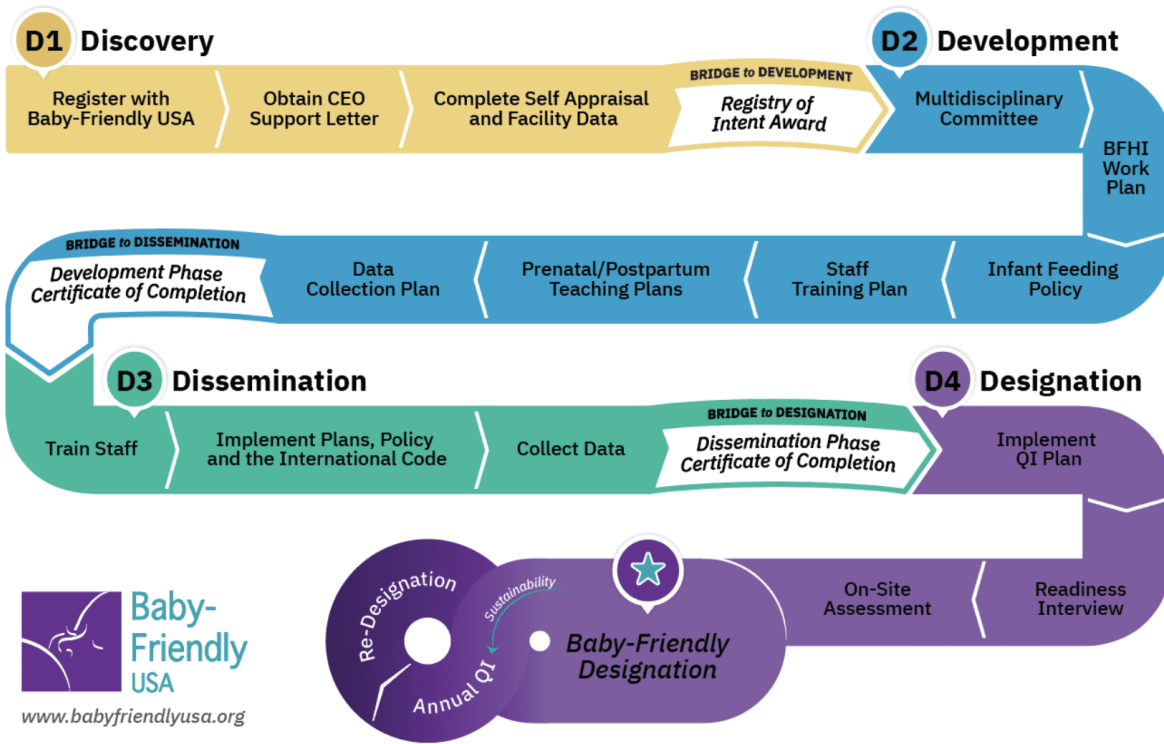
Strengths and challenges

With more than 500 hospitals in the US that are already designated as Baby-Friendly, this intervention is evidence-based (Baby-Friendly USA, 2019). Despite hundreds of facilities across the country already completing the baby-friendly designation process, implicit biases and racism built into the healthcare system results in disparate quality of care and adversely influences behaviors and health outcomes. A strength of this intervention is the equity focused-lens of the Baby-Friendly Designation process. Other strengths include consideration of community-partnerships for maintaining support beyond the in-patient setting. This approach focuses on prevention of asthma through the foundation of immune development versus reactive measures which often can be more complex and expensive. With a nearby affiliated-hospital that has already undergone the Baby-Friendly designation process, Atrium Health Pineville, knowledge and resources can be utilized within the implementation and evaluation of this intervention.

Challenges of this intervention include a potential that providers are resistant to the Baby-Friendly or EDI training. Through the success of promotion of “fed is best” and other campaigns from formula companies. A preconception exists among many individuals including healthcare providers that breastfeeding promotion takes on the position of shaming parents who choose to formula feed their infants. Another challenge is this intervention doesn’t address asthma directly. But while breastfeeding does play a preventative role in asthma development, there are many other challenges to initiation and continuation of breastfeeding outside of access to care and support that the Baby-Friendly Hospital is focused on addressing.

APPENDIX K: THE 4-D PATHWAY TO BABY FRIENDLY DESIGNATION

The **4-D Pathway** to Baby-Friendly Designation



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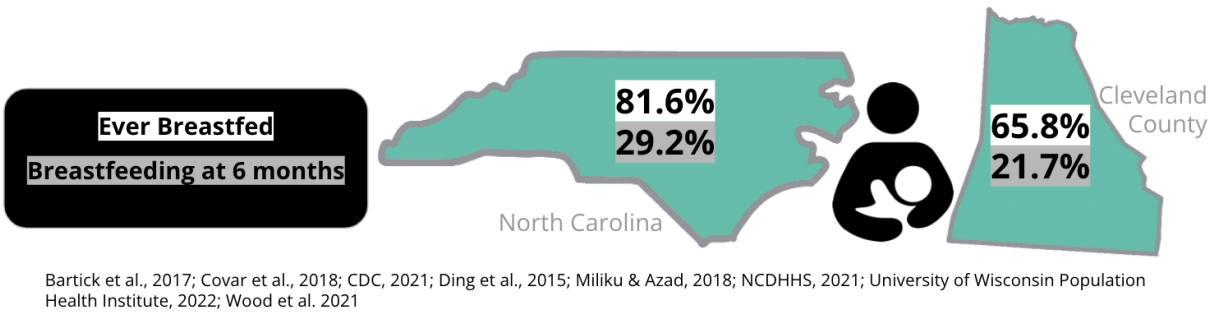
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<https://doi.org/10.1111/all.14736>

PRESENTATION SLIDES

Breastfeeding's Preventative Role in Asthma Development

1. Lowers an infant's risk of developing asthma later in life
2. Supports immune system and lung development
3. Addresses disparities in health outcomes and economic costs



There are two interventions that we propose to target the reduction of asthma attacks within Cleveland County. Firstly, our nutrition-focused intervention is aimed at taking a preventative approach through a focus on breastfeeding. One of the main reasons for choosing this approach is due to the existing scientific evidence that supports the connection between breastfeeding and lower incidence of asthma development. As we know asthma is linked to the immune system. Breastmilk is well-known for its immune-building properties as well in healthy infant development. Interventions focused on breastfeeding have proven to successfully reduce disparities not only in breastfeeding but also health outcomes such as asthma. Additionally, breastfeeding reduces medical and non-medical costs for both individuals and the healthcare system. The disparities this intervention will focus on addressing include the percentage of those who initiate breastfeeding and those who continue to breastfeed. In Cleveland County 65.8% of infants are breastfed at least once, which is much lower than North Carolina's 81.6%. Continuation of breastfeeding at 6 months is lower within Cleveland County by 7.5% than the state.

Atrium Health Cleveland Baby-Friendly Designation



Achieve Baby-Friendly Designation



Equity, Diversity, Inclusion Training

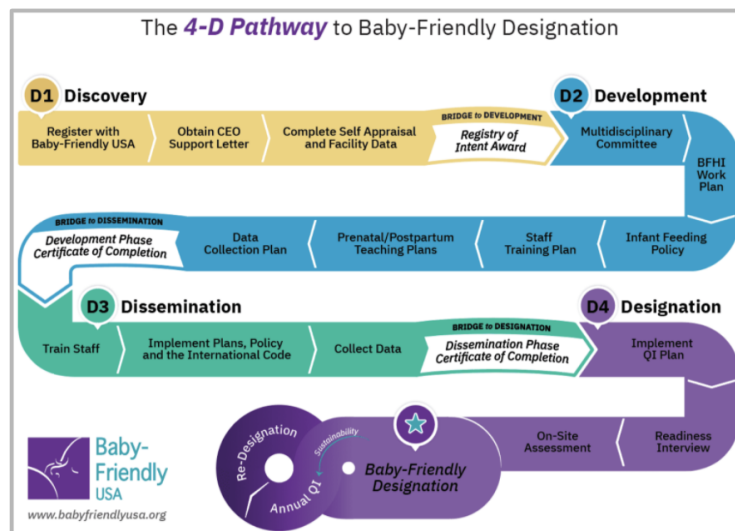


Connect with Community Resources

The breastfeeding promotion intervention will include three components. Atrium Health Cleveland will complete the Baby-Friendly USA designation process along with required equity, diversity, and inclusion training for all hospital staff, and then finally community networks will be developed to ensure continued support once families have left the hospital after delivery.



Achieve Baby-Friendly Designation



Baby-Friendly USA, Inc., 2019

The Baby-Friendly Hospital Initiative is widely recognized for successfully increasing rates of breastfeeding in hospitals around the world with strong supporting evidence from hundreds of other facilities, including our neighboring Atrium Health Pineville located in Mecklenburg County. This 4-D Pathway lays out the 4 stages that will be implemented.



Equity, Diversity, Inclusion Training



EDUCATIONAL TRAININGS

- Cultural Competency
- Health Equity
- Implicit Bias
- Chronic Disease Prevention & Management
- Social Determinants of Health



GOODSTOCK Consulting, LLC, 2020

Despite improved breastfeeding support that develops through the Baby-Friendly Designation process. Many implicit biases and other barriers exist that result in inequitable care across different racial and ethnic backgrounds. Therefore equity, diversity, and inclusion training will be utilized to address these biases.



Connect with Community Resources



Alliance for Health, 2018; Cleveland County Public Health Center, n.d.; Nurse-Family Partnership, 2022; Partners Health Management, 2022

Finally, one of the main barriers in continuation of breastfeeding is the lack of support for families after discharging from the hospital. Developing a network with these organizations will be crucial in

connecting resources within the community and for providing referrals for community members seeking breastfeeding support.

Projected Costs

\$250,000



W.K.
KELLOGG
FOUNDATION™



Historically has funded
breastfeeding promotion efforts
in marginalized communities

WKKF, n.d.

We have calculated the total cost of this intervention to be about \$250,000. Our plan is to apply for and utilize grant funding from the W.K. Kellogg Foundation who has historically provided funds to similar efforts aimed at improving breastfeeding promotion efforts in marginalized communities.

INDIVIDUAL DELIVERABLES: ANNA CLAIRE TUCKER

PROBLEM STATEMENT

Social Determinant of Health

As society moves away from blaming individuals for poor health, there is growing interest in the role of social and physical conditions (Healthy People 2030, n.d.). These social determinants of health (SDOH) impact an individual's health, well-being, and capacity to make healthful choices. Healthy People 2030 identifies the neighborhood and built environment as a critical SDOH to address. The neighborhood and built environment encompass access to healthcare, good nutrition, education, housing quality, pollution exposure, and opportunities for physical activity (Health.Gov, n.d.).

Asthma is a chronic disease strongly influenced by the physical environment (ATSDR, 2012). Exposure to air pollution, allergens, tobacco smoke, and indoor irritants can all trigger or exacerbate asthma attacks (ATSDR, 2012). During an asthma attack, airways become inflamed and produce mucus, making it difficult to breathe (Healthline, n.d.). In children, asthma increases the risk of learning disabilities and growth delays, while adults with asthma have an increased risk of depression (Healthline, n.d.). Those with asthma are also more likely to miss work and school, leading to lower pay and poorer learning outcomes (Healthline, n.d.). Uncontrolled, long-term impacts on health include: increased risk of obesity, infections, respiratory damage, poor sleep, gastroesophageal reflux disease, and pregnancy complications (Asthma.Com, n.d.). Therefore, the objective of this paper is to explore how asthma attacks can be reduced through improving the neighborhood and built environment.

Geographic and Historical Context

In the foothills of the Blue Ridge Mountains, Cleveland County is in the Southwest of North Carolina, bordering South Carolina (Advisory Council on Historic Preservation, n.d.). As a nonmetropolitan area, Cleveland County has a population of 97,947 people (NCIOM, n.d.). The majority of the population is White (72.8 percent), with the second largest demographic being Black/African American (20.8 percent) (NCIOM, n.d.). Like much of southern North Carolina, Cleveland County was dominated by the cotton and textile industries from the late 19th through mid-20th centuries (Advisory

Council on Historic Preservation, n.d.). However, the introduction of the boll weevil in the 1940s and textile industry's movement overseas in the 1970s led to the demise of both cotton and textile industries (Advisory Council on Historic Preservation, n.d.). Today, manufacturing and healthcare are the largest employment sectors in the county (Data USA, n.d.).

Priority population

Black, Hispanic, and low-income communities are disproportionately affected by asthma (Forno & Celedón, 2018). Nationally, Black individuals experience asthma at 1.5 times the rate of white individuals in the United States (AAFA.Org, n.d.). This population is also five times more likely to be hospitalized and three times more likely to die from asthma (AAFA.Org, n.d.). This problem is compounded by the effects of low socioeconomic status which makes it more challenging to receive proper health care and afford medications (Louisias & Phipatanakul, 2017). For this reason, efforts to address asthma in Cleveland County should focus on improving the environments of low-income, Black, and Hispanic communities to reduce the burden of asthma attacks among these populations.

Measures of Problem Scope

In Cleveland County, asthma is the fifth most prevalent health condition, impacting 14.7 percent of the population (Cleveland County Public Health Center, n.d.). In the 2019 Community Health Assessment, asthma was ranked as one of the thirteen most pressing public health issues (Cleveland County Public Health Center, n.d.). Within the county, there are statistics for several SDOH associated with an increased risk for asthma. Cleveland County has an average daily pollution score of 10.6 (measured in fine particulate matter in micrograms per cubic meter) (NCIOM, n.d.). This is higher than the state of North Carolina, but still within the EPA's range of safe air quality standards (NCIOM, n.d.; New York State Department of Health, n.d.) Cleveland County also has an adult smoking rate of 18 percent, which is higher than the state average (NCIOM, n.d.). In addition to environmental conditions, factors such as poverty and poor nutrition are also associated with an increased risk of asthma. At 19 percent, the county has a high poverty rate, and the per capita income hovers under \$22,600 (NCIOM, n.d.; U.S. Census Bureau, 2020). Meanwhile, over 16 percent of the county is food insecure, meaning

food intake is disrupted due to insufficient money or other resources, and only 14.8 percent of adults consume five servings of fruit, vegetables, and/or beans a day (NCIOM, n.d.; Healthy People 2030; n.d.).

Rationale/Importance:

The environment can impact health independent of choice. For instance, when air pollution is above safe levels, asthma can be exacerbated by simply going outside (EPA, 2018). Unfortunately, the burden of these factors falls disproportionately on lower-income, Black, and Hispanic communities (AJMC, n.d.). Specifically, Black individuals are more likely to live in communities with higher levels of pollution than white communities, due to historical segregation and the building of roads and industries nearer to these communities (AJMC; n.d.). Additionally, Black communities are more likely to live in older houses and experience poorer housing conditions, increasing the chances of mold exposure (AJMC, n.d.). Because low-income and minority communities are disproportionately affected by asthma and the environmental risk factors which exacerbate this condition, it is imperative to concentrate resources for tackling this problem in these communities.

Disciplinary Critique

Asthma has long term health implications that reduce quality of life and increase the risk of other high priority conditions such as obesity and pregnancy complications (Healthline, n.d.). It is the responsibility of public health leaders to ensure all people have an equal opportunity to live a healthy, productive life. Public health leaders, including dietitians and nutritionists, have failed to ensure everyone has that opportunity in Cleveland County. Given the burden of asthma in this county, it is essential these leaders take action by addressing root causes of asthma among those most affected. The responsibility of improving SDOH lies not with individuals, but with governments and organizations tasked with protecting public safety and promoting public health.

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IMPLEMENTATION PLAN

Background

Social determinants of health, such as the built environment, impact an individual's health, well-being, and capacity to make healthful choices. Healthy People 2030 identified improving the neighborhood and built environment as a key strategy for preventing asthma attacks. In Cleveland County, asthma is the fifth most prevalent health condition, impacting almost 15 percent of the population (Cleveland County Public Health Center, n.d.). During an asthma attack, airways become inflamed and produce mucus, making it difficult to breathe (Healthline, n.d.). In children, asthma increases the risk of learning disabilities and growth delays, while adults with asthma have an increased risk of depression (Healthline, n.d.). Those with asthma are also more likely to miss work and school, leading to lower pay and poorer learning outcomes (Healthline, n.d.). Uncontrolled, long-term impacts on health include: increased risk of obesity, infections, respiratory damage, poor sleep, gastroesophageal reflux disease, and pregnancy complications (Asthma.com, n.d.).

Asthma is strongly influenced by the physical environment — exposure to air pollution, allergens, tobacco smoke, and indoor irritants can all trigger or exacerbate asthma attacks (CDC, 2012). Additionally, there is evidence to suggest breastfeeding lowers an infant's chances of developing asthma later in life (Dogaru, 2014). Unfortunately, Black and low-income communities are disproportionately affected by environmental factors that trigger asthma attacks, while they are also less likely to breastfeed (Forno & Celedon, 2012). Thus, numerous risk factors intersect in these communities, leaving low-income communities of color with the highest risk of developing asthma. For example, Black individuals experience asthma at 1.5 times the rate of white individuals in the United States (AAFA.org, n.d.). This population is also five times more likely to be hospitalized and three times more likely to die from asthma (AAFA.org, n.d.).

Purpose

While sweeping changes are needed to address the numerous determinants of asthma in low-income and minority communities, increasing rates of breastfeeding may be the single most important

nutritional change that can be made in Cleveland County. In addition to decreasing an infant's risk of developing asthma, breastfeeding is also associated with numerous benefits such as a lower risk of chronic diseases for breastfeeding mothers and breastfed children (Cleveland Clinic, n.d.). The Baby-Friendly Hospital Initiative (BFHI) is widely recognized for successfully increasing rates of breastfeeding in hospitals around the world (Pérez-Escamilla, 2016). Baby-Friendly hospitals receive accreditation for implementing standardized steps to promote and remove barriers to breastfeeding (Pérez-Escamilla, 2016). Previous research demonstrates that individuals were eight times more likely to stop breastfeeding if they gave birth in a hospital not following any of BFHI's steps, compared to individuals that gave birth in a hospital following at least six of BFHI's ten steps (DiGirolamo et al, 2008). BFHI was established by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) to promote and recognize hospitals that provide a supportive environment for breastfeeding. The *CDC Guide to Strategies to Support Breastfeeding Mothers and Babies* identifies BFHI's Ten Steps to Successful Breastfeeding as a highly effective strategy to increase breastfeeding rates in the United States (CDC, 2013).

However, Black and low-income individuals face additional barriers to breastfeeding such as pressures rooted in historical racism, cultural norms, predatory marketing of breastmilk alternatives, and other structural barriers such as lack of support and returning to work (Robinson, 2019). Since the BFHI does not specifically address disparate rates of breastfeeding among low-income and minority communities, additional support in the form of Diversity, Equity, and Inclusion (DEI) training is needed to help clinicians reduce these disparities. Furthermore, while Baby-Friendly hospitals increase breastfeeding initiation, they do not provide the longer-term support needed for continued exclusive breastfeeding. For this reason, efforts are needed to connect families with resources upon leaving the hospital to facilitate breastfeeding after the first few weeks. Accordingly, this comprehensive intervention proposes to: 1) achieve Baby-Friendly designation from BFHI at Atrium Health Cleveland Maternity Center, 2) establish DEI training for all healthcare providers at Atrium Health Cleveland Maternity

Center, 3) connect people who have just given birth at Atrium Health Cleveland Maternity Center with community resources for continued breastfeeding support.

Evidence Based Outcomes

Short-term outcome objectives

By April 1, 2024, Atrium Health Cleveland Maternity Center will receive a Baby-Friendly designation from Baby-Friendly Hospital Initiative.

Long-term impact

This intervention aims to achieve the following long-term impacts: 1) Increase rates of breastfeeding initiation among low-income and minority individuals who give birth at Atrium Health Cleveland Maternity Center, 2) Increase usage of community resources such as Cleveland WIC among low-income and minority families, and 3) decrease the incidence of asthma attacks among low-income and minority children in Cleveland County.

Strategies and Activities

Breastfeeding is one of the first steps that can be taken in life to promote a child's health and prevent chronic diseases, including asthma. However, there have been no documented efforts to facilitate breastfeeding for individuals at Atrium Health Cleveland Maternity Center, despite this hospital being recognized on Newsweek's Best Maternity Care Hospitals list (Newsweek, 2021).

To obtain a "Baby-Friendly" designation from BFHI, hospitals are expected to implement the specific steps described in BFHI's *Guidelines and Evaluation Criteria for Facilities Seeking Baby-Friendly Designation* guidebook (Baby-Friendly USA, 2021). Broadly, these include providing culturally respectful, evidence-based education about breastfeeding; protecting patients from misleading product marketing or advertisement; and providing an environment which is conducive to breastfeeding while respecting each person's right to make their own decision (Baby-Friendly USA, 2021).

All health professionals who provide prenatal, delivery, and/or post-natal care have a role in implementing BFHI practices. All clinic staff engaged in these activities should be aware of maternity

care and infant feeding policies. Specific practices to be implemented at Atrium Health Cleveland Maternity Center include: training clinic staff on policies, practices, and effective communication strategies; providing prenatal counseling on breastfeeding; enabling immediate skin-to-skin contact and breastfeeding within the first hour of birth; problem-solving barriers to breastfeeding; and facilitating continued breastfeeding after discharge (Baby-Friendly USA, 2021).

While Baby-Friendly designated hospitals effectively increase rates of breastfeeding (CDC, 2013), further efforts to reduce disparities in breastfeeding initiation among low-income and minority communities in Cleveland County are necessary. First, DEI training will be provided by Goodstock Consulting, LLC. This organization has extensive experience providing DEI training tailored to the healthcare setting (Goodstock Consulting, n.d.). Staff will attend four DEI training sessions across two months. In the following years, continuous DEI training will be held biannually to maintain emphasis on this issue. Training sessions will focus on identifying and addressing sources of bias to help clinicians provide more equitable care to all patients at Atrium Health Cleveland Maternity Center. The primary goals of this training are to 1) increase quality of care for low-income and minority families and 2) increase the effectiveness of BFHI's breastfeeding practices for low-income and minority patients by ensuring culturally sensitive care.

Additionally, further steps are needed to connect families with resources to facilitate continued breastfeeding and promote health after discharge. For this reason, a WIC consultant will be hired to implement strategies for connecting families with WIC and additional social services that may be needed by families.

These goals will be achieved through targeting factors at the individual, community, and institutional levels. At the individual level, health care providers will promote breastfeeding through education about the benefits and strategies to overcome challenges to breastfeeding. At the community level, health care providers will connect families with the resources to continue breastfeeding and further infant health. At the institutional level, Atrium Health Cleveland Maternity Center will create an

environment which is conducive to breastfeeding and free from misleading product marketing and advertising.

Stakeholders

Stakeholders for this project will include: clinicians and administrative staff of Atrium Health Cleveland Maternity Center; families who will use Atrium Health Cleveland Maternity Center for pregnancy care; BFUSA; Cleveland County social services; dietitians; lactation consultants; and infant formula companies. It will be necessary to make connections with Cleveland County social services such as WIC to ensure patients receive resources they need after leaving the hospital. BFUSA will be responsible for designating Atrium Health Cleveland Maternity Center as a “Baby Friendly” center. It will be necessary to have buy in and support from families who will use Atrium Health Cleveland Maternity Center for pregnancy care. Lastly, implementing this program will not be possible without the support and buy-in from Atrium Health, since the administrative staff will provide financial support for this policy and clinicians will be responsible for implementing new changes.

Budget

Appendix K describes the budget for this project. BFUSA designation is estimated to cost \$14,750. Likewise, DEI training from Goodstock Consulting will cost \$40,000. A WIC consultant will be hired on an hourly rate to advise Atrium Health on connecting clinic and WIC services. Likewise, a Research Assistant will be hired to assist with data collection and analysis. Future costs include the cost of maintaining BFUSA designation, maintaining DEI training, and conducting quality improvement.

Conclusion

Asthma impacts both short-term quality of life as well as long-term health outcomes. Its disparate impact on low-income and minority communities necessitates action to address this issue in Cleveland County. By increasing breastfeeding, this intervention aims to prevent asthma from the very beginning of life while initiating a plethora of secondary benefits for the community. The main disadvantages of this intervention are the cost and intensity. However, Baby-Friendly designated hospitals are a highly evidence-based way to increase breastfeeding, while additional components will ensure the priority

population is reached and breastfeeding is sustained through an appropriate age. Given its widespread reach and impact, this intervention has the potential to significantly improve health for all residents of Cleveland County, but particularly those most impacted by health inequities.

APPENDIX L: BUDGET

Table 1. Estimated Costs Associated with Implementing Baby Friendly Hospital Initiative; Diversity, Equity, and Inclusion Training; and Increasing Access to Community Resources at Atrium Health Cleveland County.

Item	Cost
Designation from Baby Friendly-USA	\$14,750
Staff Diversity, Equity, and Inclusion Training	\$40,000
WIC Consultant	\$30 / hr
Research Assistant	\$20/hour
Future Costs	
Quality Improvement	\$1,900
Redesignation	\$3,400
Continuous DEI Trainings	\$10,000 per training

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EVALUATION PLAN

Intervention Summary

Social determinants of health, such as the built environment, impact an individual's health, well-being, and capacity to make healthful choices. Healthy People 2030 identified improving the neighborhood and built environment as a key strategy for preventing asthma attacks. In Cleveland County, asthma is the fifth most prevalent health condition, impacting almost 15 percent of the population (Cleveland County Public Health Center, n.d). In children, asthma increases the risk of learning disabilities and growth delays, while adults with asthma have an increased risk of depression (Healthline, n.d.). Those with asthma are also more likely to miss work and school, leading to lower pay and poorer learning outcomes (Healthline, n.d.). Uncontrolled, long-term impacts on health include: increased risk of infections, respiratory damage, poor sleep, gastroesophageal reflux disease, and pregnancy complications (Asthma.com, n.d.). There is evidence to suggest breastfeeding lowers an infant's chances of developing asthma later in life (Dogaru, 2014). Unfortunately, Black and low-income communities are disproportionately affected by environmental factors that trigger asthma attacks, while they are also less likely to breastfeed (Forno & Celedon, 2012). The Baby-Friendly Hospital Initiative (BFHI) is widely recognized for successfully increasing rates of breastfeeding in hospitals around the world (Pérez-Escamilla, 2016). Baby-Friendly hospitals receive accreditation for implementing standardized steps to promote and remove barriers to breastfeeding (Pérez-Escamilla, 2016). Therefore, this comprehensive intervention proposes to: 1) achieve Baby-Friendly designation from BFHI at Atrium Health Cleveland Maternity Center, 2) establish DEI training for all healthcare providers at Atrium Health Cleveland Maternity Center, 3) connect people who have just given birth at Atrium Health Cleveland Maternity Center with community resources for continued breastfeeding support.

By April 1, 2024, Atrium Health Cleveland Maternity Center will receive a Baby-Friendly designation from Baby-Friendly Hospital Initiative. This intervention also aims to achieve the following long-term impacts: 1) increase rates of breastfeeding initiation among low-income, Black, and Latinx individuals who give birth at Atrium Health Cleveland Maternity Center, 2) increase continued

breastfeeding among this population at 6 months, 3) decrease disparate rates of breastfeeding initiation and continuation at three months among low-income, Black, and Latinx individuals compared to middle- and high-income, White individuals.

Evaluation Plan

Study design/data collection

An observational ecologic study design will be used to evaluate this program. EHR records and questionnaires will be used to collect data for analysis.

Sample and sampling strategy

Participants at baseline will include individuals who give birth at Atrium Health Cleveland Maternity Center 3-12 months before implementation of BFHI standards begins. Participants at time point 2 will include individuals who give birth at Atrium Health Cleveland Maternity Center 12-21 months after the center receives BFHI certification.

Specific measures

According to a meta-analysis by Cohen et al, the following factors are strongly associated with breastfeeding initiation and continuation: “maternal smoking, vaginal delivery, multiparity, dyad separation and connection, maternal education level, and breastfeeding education/support.” Data on vaginal delivery, maternal smoking, multiparity, age, race, and breastfeeding initiation will be collected via EHR records. Lastly, a research assistant will contact participants via phone to collect data on continued breastfeeding, maternal education, income, social service utilization, and breastfeeding education/support.

Outputs

Outputs will include the following: BFHI accreditation, DEI training sessions attended by clinicians and staff, social service utilization among participants. Outcomes will include proportion of individuals who initiate breastfeeding and proportion of individuals with continued breastfeeding at 6 months postpartum. Exclusive continued breastfeeding at 6 months was identified as the measure of

choice, as it is the gold standard recommended by the American Academy of Pediatrics (AAP) and World Health Organization (CDC, n.d.).

Analysis Plan

We will compare data from two different cohorts: individuals who give birth before BFHI accreditation is obtained and individuals who give birth at Atrium Health Cleveland after BFHI accreditation is obtained. Given that pre- and post- data come from different cohorts, as in an ecologic study, the data must be analyzed using regression analysis and multilevel modeling to account for confounding.

Timing

Evaluation activities will occur at multiple stages. The first stage of data collection will occur 12 months before implementation begins. Individuals who give birth between 12 and 3 months before implementation will be identified via EHR records and contacted 6 months after giving birth. If they consent to participate, a research assistant will collect data. The second stage of data collection will occur twelve months after the center receives BFHI certification. This cohort will include individuals who give birth between twelve and twenty-one months after Atrium Health Cleveland receives BFHI certification and will be identified via EHR records and contacted three months after giving birth.

Funding

This intervention will be funded through the Carolina Global Breastfeeding Institute, which received funding from Blue Cross Blue Shield to help North Carolina hospitals receive BFHI accreditation (Duke Endowment, n.d.).

Sustainability

Atrium Health will be expected to sustain this project after the hospital receives accreditation.

Dissemination

A final evaluation report and infographics will be made available to Cleveland County residents, with a special emphasis on reaching low-income, Black, and Latinx communities impacted by the intervention.

Strengths and Challenges

Strengths of this evaluation include the collection of data before and after BFHI accreditation is achieved, as it allows for a comparison of groups. However, the nature of breastfeeding makes it impossible to conduct a true experimental pretest post test evaluation. Therefore, limitations of this evaluation include the ecological fallacy, making it challenging to account for confounding. Regression analysis will be used to minimize this limitation by controlling for confounding.

Potential Impact

Ultimately, this intervention has the potential to impact breastfeeding individuals and children across Cleveland County. However, the inclusion of DEI training and connecting families with community resources will hopefully concentrate the impact on Black and Hispanic individuals to reduce disparities across breastfeeding and long-term health outcomes.

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PRESENTATION SLIDES

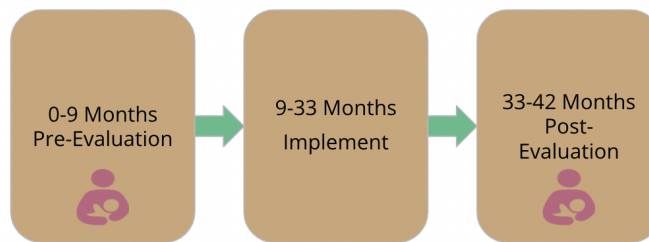
Evaluation: Nutrition & Healthy Home Environment

Key Outcomes:

- 1) Increase breastfeeding initiation and exclusive breastfeeding at 6 months among Black, Latinx, and low-income individuals
- 2) Reduced disparities in breastfeeding initiation and continuation among these communities
- 3) Reduce asthma-related emergency visits and asthma-related hospitalizations

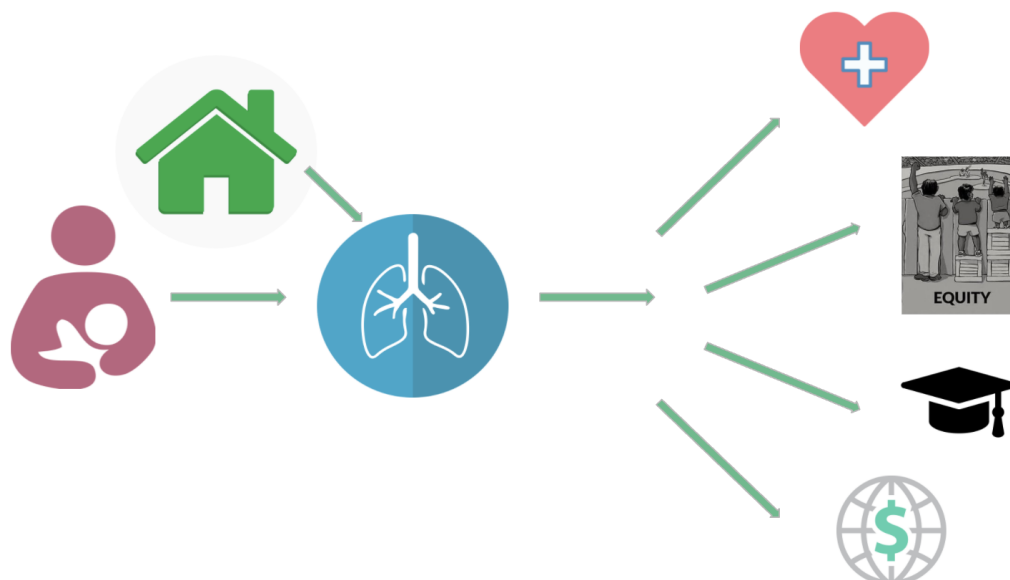
Nutrition

Timeline:



Next is our evaluation plan. We have three key outcomes. The first two are for the nutrition intervention, while the third outcome is for the healthy home environment program. 1st) we aim to increase breastfeeding initiation and exclusive breastfeeding at 6 months among Black, Latinx, and low-income individuals, 2nd) Reduce disparities in breastfeeding initiation and continuation among these communities, and 3rd) Reduce asthma-related emergency visits and asthma-related hospitalizations. Down below we have our timeline for the nutrition intervention evaluation. From 0-9 months, we will conduct a pre-evaluation among individuals who give birth at Atrium Health Cleveland Maternity Center 6-18 months before implementation of Baby Friendly standards begins. From 9-33 months, we will be implementing the program and from 33-42 months, we will be conducting a post-evaluation among individuals who give birth at at the clinic 12-21 months after the center receives Baby Friendly certification. Then we will compare breastfeeding initiation and continuation outcomes among pre and post groups.

Conclusion: Long-Term Community Impact



Taken together, we expect the nutrition intervention and healthy home environment program to have a significant impact on the community across multiple sectors. By reducing asthma attacks, we can expect to see improvements in the short- and long-term health of Cleveland County residents, reduce asthma-related health inequities, reduce days missed of school related to asthma attacks, and economic impacts from reduced asthma-related healthcare costs and fewer missed days of work. So, we want to thank you for your time and interest in this presentation and will now open it up for questions.