

**A FRAMEWORK FOR REDUCING THE ADVERSE EFFECTS  
OF EXTREME HEAT AMONG MATERNAL CHILD HEALTH  
HOME VISITATION PROGRAM PARTICIPANTS**

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## **ABSTRACT**

### **Jennifer (Ginger) Clough: A Framework for Reducing the Adverse Effects of Extreme Heat Among Maternal Child Health Home Visitation Program Participants**

(Under the direction of Dana Rice)

Extreme heat events are the leading cause of weather-related mortality in the United States. Age, health status, occupation and the built environment are all factors that increase heat related illness and mortality risks. Of particular concern are the adverse effects of extreme heat exposure on vulnerable maternal-child health populations: pregnant and postpartum people, infants and young children. Despite the growing evidence for heat health risks among this population, there are currently no interventions addressing risk or disparities for risk through the US Department of Health and Human Services Maternal Child Health Bureau. This paper explores the use of Healthy People 2020 MAP-IT as the framework for preventing, mitigating and responding to heat health risks among MCH Home Visitation participants through stakeholder coalition building. Included is a discussion of how public health leadership skills, attributes, and style best support a diverse coalition to address a complex public health problem.

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## LISTS OF ABBREVIATIONS

AHA	American Heart Association
BCDHHS	Buncombe County Department of Health and Human Services
CIMA	Compañeros Inmigrantes de las Montañas en Acción
CDC	Centers for Disease Control and Prevention Services
DHHS	Department of Health and Human Services
EHE	Extreme Heat Event
HRSA	Health Resources and Services Administration
HRI	Heat-Related Illnesses
HV	Home Visitation
IMR	Infant Mortality Rates
MIECHV	Maternal Infant and Early Childhood Home Visitation
NAF	Nurturing Asheville and Area Families
NEMAC	National Environmental Modeling and Analysis Center
NIEHS	National Institute for Environmental Health Sciences
NOAA	National Oceanic and Atmospheric Association
NC	North Carolina
NCDEQ	North Carolina Department of Environmental Quality
ODPHP	Office of Disease Prevention and Health Promotion
SDoH	Social Determinants of Health
US	United States
US EPA	United States Environmental Protection Agency
USGCRP	United States Global Change Research Program
WNC	Western North Carolina

## **A Framework for Reducing the Adverse Effects of Extreme Heat Among Maternal Child Health Home Visitation Program Participants**

### **Introduction**

The increased frequency, intensity and duration of extreme heat events (EHE) is a growing environmental and human health crisis. Extreme heat events are the leading cause of weather-related mortalities in the United States (National Institute of Environmental Health Sciences [NIEHS], 2017). In addition, prolonged exposure to extreme heat can cause heat-related illnesses (HRI) and exacerbate chronic health conditions (NIEHS, 2017). Age, health status, occupation and the built environment are factors that increase heat exposure risks (Fears et al. 2020; Friel et al., 2008; Friel & Marmot, 2011; Galvao et al., 2009; Gronlund, 2014; Houghton, & English, 2014; O’Neill et al., 2009; Roach, n.d., 2016; Runkle et al., 2012; Sengupta, 2020; Union of Concerned Scientist, 2019; Wheeler, 2020b). Heat-related illnesses (HRI) and deaths can be reduced through heat early warning and emergency systems that identify heat vulnerable populations and provide outreach and care during an extreme heat event (Fuhrmann et al., 2016; Gronlund, 2014; Hajat et al., 2010; Harduar Morano & Waller, 2017; Roach, 2016; Runkle et al., 2012; Schmeltz et al., 2015; Wheeler, 2020a, 2020b). Although pregnant people, infants and young children are understood to have an increased risk for HRI, there are currently no public health initiatives specific for this population (Auger et al., 2014; Adler & Rehkopf, 2008; Beltran et al., 2014; Kim et al., 2019; Kuehn & McCormick, 2017; Rylander et al., 2013; Wheeler, 2020b; Zhang et al., 2019).

Through the lens of an equity-focused program planning and evaluation process, this paper outlines a program proposal to prevent maternal, newborn and child morbidity and



mortality due to extreme heat exposure among vulnerable women and young children. The program's key feature is the utilization of Maternal Child Health (MCH) home visitation (HV) programs to reach pregnant and postpartum people and children with the highest risks for HRI. The program design uses a three-phase process. *Phase 1* builds MCH HV and medical workforce capacity for recognizing, educating and responding to MCH populations at risk for extreme heat impacts. *Phase 2* focuses on building MCH HV participants' awareness and place-based knowledge to reduce their families' risk for heat related illnesses. During this phase, participants in HV programs conduct self-assessments of their homes and neighborhoods for environmental and social risk factors for extreme heat. In *Phase 3*, members from *Phase 1* and *Phase 2* join with other stakeholders, including local public health leaders and regional climate scientists, to assess, plan and implement heat adaptation and mitigation solutions at the community level. This paper explores the program planning and evaluation process for *Phase 1* of the program and discusses leadership implications for addressing a complex public health problem.

## **Background**

### **Extreme Heat Events**

Extreme heat events are prolonged periods of higher than average temperatures, and sometimes humidity levels, for a specific season and geographic area (Fuhrmann et al., 2016; Holden, 2019; North Carolina Department of Environmental Quality [NCDEQ], 2020; Sampson et al., 2013; United States Environmental Protection Agency [US EPA] 2016). Climate-related increase in EHE result from human activity producing greenhouse gases that trap heat and result in hotter than normal days and nights (NCDEQ, 2020; Roach, 2016; US Global Change Research Program [USGCRP], 2017). Extreme heat events are expected to become more frequent, severe

and last longer and drive other climatic stressors, such as extreme rain in some areas and drought in others, larger, stronger and wetter hurricanes, wildfires and air pollution (NCDEQ, 2020; Roach, 2016; USGCRP, 2017).

### **Extreme Heat & Health**

Extreme heat is the primary cause of all weather-related mortalities in the United States (Convergence of Climate-Health Vulnerabilities, n.d.; Hess et al., 2014; Luber & McGeehin, 2008; NCDEQ, 2020; USGCRP, 2017). Prolonged exposure to extreme heat can cause a cascade of heat illnesses including heat exhaustion, heat cramps, heat stroke and death (National Institute of Environmental Health Sciences [NIEHS], 2017). (See Appendix A). Extreme heat exposure also exacerbates chronic health conditions such as diabetes, asthma, renal disease, psychiatric illnesses, and cardiovascular disease (Sorensen et al., 2018; NIEHS, 2017; USGCRP, 2016; Schmeltz et al., 2015). As temperatures rise, heat-related morbidity and mortality rates also increase (EPA, 2016; USGCRP, 2016; World Health Organization [WHO], 2009).

### **Disparities in Extreme Heat Health Risks**

There are three elements of population vulnerability to extreme heat: sensitivity to risk, exposure to climate stressors and the adaptive capacity to respond to risks (Gamble et al., 2016).

Sensitivity refers to the individual and community's biologic factors of overall health status and age (Gamble et al, 2016). In urban and rural communities, Indigenous people, racial and ethnic minorities, women, LBGTQAI+ persons, persons with disabilities, veterans, persons experiencing homelessness, persons living in poverty and low wealth are at higher risk for health disparities and premature deaths (National Academies of Sciences et al. [NAS]; 2017; Gamble et al., 2016; USGCRP, 2016; Plescia & Emmanuel, 2014; Woolf & Braveman, 2011). Climate change serves as a threat multiplier amplifying existing health disparities. Hotter ambient

temperatures and other non-climate stressors, such as racism, economics, pollution, and aging infrastructure simultaneously work to enhance population vulnerability to extreme heat.

The final two elements, exposure and the ability to respond to risk, are made up of the social, cultural, and political aspects of health, known as the social determinants of health (SDoH) (Centers for Disease Control and Prevention [CDC], 2020d, 2020b). The SDoH, are “conditions in the places where people live, learn, work, and play that affect a wide range of health risks and outcomes” (Artiga & Hinton, n.d.; Braveman et al., 2011; CDC, 2020a). There are five key areas of SDoH: economics, health and access to health care, education, social and community context, and the built environment (CDC, 2020a). Each of these key areas contribute to buffering or exacerbating extreme heat risks.

Exposure to risk includes the natural and built environment of home, work and play settings for both urban and rural communities. While extreme heat affects an entire region, at the community level, there are protective factors in the natural and built environment that can mitigate the effects of heat. Neighborhoods with more greenspaces and tree canopies have lower temperatures than nearby communities with fewer trees and more concrete (Center for Climate and Energy Solutions, 2017). This community level temperature differentiation occurs due to the heat trapping properties of asphalt parking lots, streets, and concrete buildings and is referred to as the heat island effect (Center for Climate and Energy Solutions, 2017).

The design of individual neighborhoods is not random. Institutionalized racial discrimination policies, such as redlining (practice of city planners assigning lower property values for homes in minority communities) and the development of interstate highways through minority and low income communities have created inequities in the built environment for EHE

(Poon, 2020; Schell et al., 2020; Hoffman & Shandas, 2019; National Academies of Sciences [NAS], et al., 2017)

Compounding the conditions of the natural and built environment are other key factors of the SDoH as it relates to exposure: social, economic and political capital affecting a communities' ability to mitigate or adapt to EHE risks. Discriminatory policies pull economic and social resources away from black, brown, immigrant, Indigenous and low wealth communities and concentrate the wealth and resources in predominately white communities (Poon, 2020; Schell et al., 2020; Yale School of the Environment, 2020). Individuals and communities with financial means and political advantage have increased adaptive capacities for reducing extreme heat exposure risks in their homes and neighborhoods, such as installing and running home cooling systems, increasing greenspaces, maintaining or increasing tree canopies and zoning to keep communities greener (Center for Climate and Energy Solutions, 2017). Whereas, historically and intentionally marginalized communities may have less collective political and economic power to make protective adaptations at the neighborhood level and are more likely to live in substandard homes with limited ventilation and financial resources for cooling (Bolitho & Miller, 2017; Cardoza et al., 2020; Gamble et al., 2016; Gronlund, 2014; Poon, 2020; Schell et al., 2020;).

### **Extreme Heat and Maternal-Child Health**

The physiological vulnerabilities during pregnancy and the postpartum period, infancy and early childhood create unique sensitivities and exposure for extreme heat. Prolonged exposure to higher than normal temperatures has been linked to a number of adverse maternal, infant, and child outcomes (American Heart Association [AHA], n.d.; Homer et al., 2009; Kuehn

& McCormick, 2017; Rylander et al., 2013; Sorensen et al., 2018; USGCRP, 2016; Wheeler, 2020a, 2020b; Zhang et al., 2019).

Physiological changes during pregnancy increase susceptibility to heat-related illnesses. Pregnant people are less able to regulate their body's temperature and cool by sweating due to prenatal weight gain and the body heat of their fetus, amplifying the risk of decreased thermoregulation ( Barnett, & Tong, 2011; Kim et al., 2019; Strand,2011). Chronic conditions during pregnancy, such as diabetes, psychiatric illnesses, and cardiovascular disease, may cause pregnant people to be more sensitive to heat (Beggs, 2000; Kim, Lee, & Rossin-Slater, 2019; Stöllberger, Lutz, & Finsterer, 2009). Many medications taken to treat these high-risk conditions have side effects that are aggravated in the presence of heat and may increase susceptibility to HRI. Many conditions associated with maternal complications during pregnancy, such as preeclampsia, eclampsia, cardiomyopathy, preterm delivery, and placental abruption, are also worsened in response to extreme heat exposure (Auger, Naimi, Smargiassi, Lo, & Kosatsky, 2014; Kim et al., 2019; Rylander et al., 2013; Sorensen et al., 2018; Strand et al., 2011).

Chronic health conditions pre-dating or arising during pregnancy continue through the postpartum period and during this sensitive time, climatic disasters, such as EHE, can worsen those conditions, and can lead to an escalation in other psychiatric conditions (Clark & Zolnikov, 2020; Dodgen et al., 2016; EPA, 2016; Olsen and Metz, 2020).

Extreme heat can have a profound negative affect on mental and emotional status, disrupting social and emotional relationships and correlates with increases in interpersonal violence (Sarofim et al., 2016). In addition to interpersonal relationship conflicts, experiencing or worrying about climate events, including extreme heat, can initiate the onset or worsen mental health conditions, reducing a caregiver's ability to care for self and their children (Dodgen et al.,

2016; Sarofim et al., 2016). A primary caregiver's preoccupation with their own distress jeopardizes their parenting attunement, making young children more vulnerable to abuse and neglect (Dodgen et al., 2016).

### **Infant and Early Childhood Extreme Heat Sensitivity**

Emerging evidence indicates that EHE during fetal development may increase risks for cardiac defects, low birth weight, preterm delivery, stillbirth, cataracts and neural tube defects (Konkel, 2019; Ward et al., 2019; Auger et al., 2014; Beltran et al., 2014). Infants exposed to extreme heat in utero are at greater risk for dehydration at birth and increased hospitalization rates over the first year of life (Auger et al., 2014; Xu et al., 2012, 2014; W. Zhang et al., 2019). Additionally, children under one year of age are at higher risk of heat-related mortality due to their immature thermoregulatory response system (Xu et al., 2012).

As with infants, young children are highly susceptible to heat exposure due to their bodies' immature thermoregulation processes (Gamble et al., 2016; Sarofim et al., 2016; Xu et al., 2012). They are also at an increased risk for metabolic imbalances due to dehydration, leading to renal disease (Xu et al., 2014). Extreme heat events can potentiate factors that adversely affect children's health, such as respiratory, infectious and vector-borne diseases (Xu et al., 2012). Because of their age and stage of physiological and psychological development, the adverse effects of EHE can negatively affect infants and children across their life course (Gamble et al., 2016; Xu et al., 2014; Y. Zhang et al., 2017).

### **Intersectionality of MCH, Inequities and Extreme Heat Exposure**

The categories making up the SDoH create cumulative protective factors or burdens on the health of individuals and communities. As noted previously, extreme heat amplifies the burdens of poorer health, limited economic and political capital, and systemic social

marginalization. Pregnant and postpartum people and their children are members across groups at higher risk for experiencing inequities. In 2017, approximately 1 in 5 infants and young children lived in poverty; 790,000 lived in extreme poverty (Child Trends, 2019; Children's Defense Fund, 2018). Children of color were more likely to live in poverty than their white counterparts were and single-mother led households had the highest poverty rates (Child Trends, 2019; Children's Defense Fund, 2018). Across all races, women are more likely to live in poverty and women of color are disproportionately poor (Bleiweis, et al., 2020). Gender-based inequities such as the wealth and gender gap, domestic violence, lack of affordable childcare and housing, occupational segregation into undervalued and low wage jobs, and disabilities are leading causes of women's poverty (Bleiweis et al., 2020).

In addition to economic and social inequities, a leading indicator of MCH, maternal and infant mortality rates, further demonstrate the fragile status of this population. Maternal Mortality refers to the death of a person during pregnancy, at delivery or soon after delivery (CDC, 2020a); infant mortality refers to the death of an infant before the first birthday (CDC, 2020c). The United States (US) ranks among the highest for maternal and infant mortality rates among high wealth nations in the world (Agrawal, 2015). The US maternal mortality rate (MMR) is 17.4 deaths per 100,000 live births (Agrawal, 2015; Liese et al., 2019) and the infant mortality rate (IMR) is 5.7 per 1,000 (CDC, 2020c). Within these figures, are disproportionate maternal and infant morbidity and mortality rates for African American, Native Hawaiian and other Pacific Islanders, Indigenous American Indian and Alaskan Native women and infants (CDC, 2020a, 2020c; Hoyert & Miniño, 2020). The infant mortality rates (IMR) for African American infants is 10.8% compared to non-Hispanic whites at 4.6% (CDC, 2020c); and African American

maternal mortality rate of 37.3 vs non-Hispanic white maternal mortality rates of 14.3% (Hoyert & Miniño, 2020).

Reducing maternal and child morbidities and mortalities are long standing US health policy goals, beginning with the establishment of the Children's Bureau in 1912 through Title V, the first federal agency to focus on the health of children and families (Health Resources and Services Administration [HRSA], 2019; Lesser, 1985; Lu et al., 2015). Today, Title V continues to fund maternal and child health services through the Maternal and Child Health Bureau with a budget of \$1.3 billion in fiscal year 2019 (HRSA, 2019). The reach of the program is enormous: in 2018, 86% of all pregnant and postpartum persons, 99% of all infants and 55% of all children in the US received some service through the MCH Bureau (HRSA, 2019). Along with research, technical support, screening and direct medical services, the program provides home visitation through the Maternal Infant Early Child Home Visitation (MIECHV) Program. The MIECHV Program pairs pregnant persons and parents with children ages birth to kindergarten who have SDoH risks, to improve the family's health and life course outcomes (HRSA, 2019; Lu et al., 2015). Evidenced-based HV programs help prevent child abuse and neglect, promote child development and school readiness, support positive parenting and improve child and family health (HRSA, 2019). In 2018, 150,000 families in 42 percent of the highest risk counties in the US received over 930,000 home visits (HRSA, 2019). In addition 1,047,000 children birth to 5 and pregnant persons were enrolled in Head Start and Early Head Start with 36% receiving home visitation services and the remaining having some level of family-centered services (Head Start, 2020; HRSA, 2019).

Given the reach of the MCH Bureau to address the health needs of vulnerable and poor MCH populations, implementing a HRI risk reduction program for pregnant and postpartum



people and their young children through MCH services can have significant impact and reduce adverse health outcomes.

### **Rational for Addressing Extreme Heat Risk through Maternal Child Health Services**

Evidence supports that high-quality HV programs improve life course outcomes for families with multiple stressors and lacking social and economic resources (Maye & Poppe, 2019). The addition of a heat reduction program through MCH services has the potential to protect large numbers of the vulnerable MCH population.

Families enroll in the programs voluntarily, commit to consistent visit schedules, and cite the relationship with their home visitor as pivotal to the health and safety of their family. In addition to providing direct pregnancy, postpartum and child health and development education and support, home visiting professionals serve as social system navigators and assist families in accessing and utilizing health and social service resources, including primary healthcare. The collaborative team approach between families, home visiting professionals and other health and human services providers (government, nonprofit and faith based) is designed to eliminate barriers to care and support families' efficacy as they work towards their health and life course goals.

The systemic nature of the MCH network of families, HV professionals, and multiple governmental, nonprofit and faith-based stakeholders provides an opportunity for a participatory change process to reduce heat health risks. However, an exhaustive literature review produced only one example of a US MCH program, "*Nurses for Cool and Healthy Homes*" that include heat risk in the home visitation protocols (Health Care Without Harm, 2015). During HV, public health nurses assist parents in identifying their home heat risks and provide referrals for adaption cooling and energy efficient adaptations (Health Care Without Harm, 2015). No MCH programs

include home visit clients in a participatory change process to address heat risks at the individual and community level.

### **MCH Extreme Heat Risks Reduction Program Design**

The design of the MCH Extreme Heat Risks Reduction Program addresses HRI among vulnerable MCH populations at the individual and neighborhood level. The program is divided into three phases that focus on implementation for specific audiences within the MCH professional and HV participant network before expanding to include greater community involvement. (See Appendix B). The premise of the program is that the relationships between HV participants and MCH professionals provide an opportunity for individualized risk education as well as offering support for HV participants to join a participatory change process in Phase III. The Healthy People 2020 MAP-IT framework provides the schema underlying the process (Center for Community Health and Development, n.d.; CDC, 2019; Office for Disease Prevention and Health Promotion [ODPHP], 2020). See Appendix B for detail of the program design.

The following discussion provides recommendations and instructions for implementing *Phase I* of the MCH Extreme Heat Risks Reduction Program using the MAP-IT framework with Buncombe County, North Carolina (NC) as the community example. (See Appendix E).

Buncombe is a mid-sized county in Western North Carolina (WNC). Like other municipalities across the country, the community lacks an organized plan to address HRI risks for vulnerable MCH community members. However, the county has several factors that make it ideal for use as an example pilot setting. The county has MCH health and SDoH inequities similar to those across the nation (Chandler, et al, 2019). A MCH network of medical, social work, educational and health advocates already engage in collective work addressing MCH

disparities. The Buncombe County Health and Human Services (BCHHS) is central to the MCH network and is the ideal lead for the program. Additionally, the *WNC Climate and Health Working Group* founded by local climate scientists from the National Oceanic and Atmospheric Association (NOAA), the NC Institute for Climate and Health, the University of NC Asheville National Environmental Modeling and Analysis Center (NEMAC) and community public health partners, noted the need for regional climate and health planning (Runkle and Powell, 2019). Finally, the area is experiencing climatic changes with increased day and nighttime temperatures (Kunkle et al., 2020; USGCRP, 2018).

## **Methods**

Mobilize: In *Phase I* of the program, mobilizing and engaging stakeholders requires outreach to MCH professionals at both the direct service and administrative levels. Creating a Stakeholder Analysis helps program leaders identify stakeholders that may affect or be affected by this phase of the program (ODPHP, 2020; Center for Community Health and Development, n.d.d). (See Appendix D). Understanding the role that stakeholders have in the program helps program leaders more specifically reach out to gain support. Often, program directors' buy-in is essential so their staff have authorization to participate. Before they agree to participate, stakeholders need to know how the time and energy they invest collaborating with the MCH Extreme Heat Risks Reduction Program aligns with their program's goals. Conducting in-service presentations at network partners' meetings creates an opportunity for dialogue about shared objectives and benefits for collaborating. For example, in Buncombe, there is already a community initiative addressing IMR disparities. By emphasizing the joint mission of reducing disparities in IMR, there is more likelihood of gaining support. Community partnerships are better able to collaborate and join efforts when sharing objectives.

Outreach also includes announcements and reminders of training opportunities through MCH network listservs, news and social media outlets. In all outreach efforts, it is important to avoid using health and climate jargon so that communication methods inclusively reaches across all disciplines within the MCH network. Another strategy for increasing participation is to include and draw upon the expertise of members from the MCH Extreme Heat Risks Reduction Program planning and evaluation team. Spotighting team members as champions for the program's promotion, such as Doulas from Sistas Caring 4 Sistas, Early Head Start Home Visitors, clinicians from prenatal and pediatric practices, and participants in HV programs, supports team member's development and utilizes their expertise to increase participation. Finally, when possible, using personal contact, such as calls or hand-written notes to engage key stakeholders utilizes the power of relationships to garner participation and support.

Analysis: An analysis of MCH professionals' knowledge of HRI risks, SDoH impact on health, and ability for working with HV participants in Phase II, will provide program leadership a map of where participants begin in the program and how to move the training forward (Center for Community Development and Health, n.d.b). Online surveys that easily tally and organize results and save program leadership time in the analysis step. Additionally, reviewing the latest Buncombe County Community Assessment of MCH health disparities as well as other county health indicators as part of a strategic planning session will help to tailor the content to the local audience.

Plan: The next step in Phase I is to create a plan for implementation and evaluation. Together with stakeholders, program leaders will complete a Logic Model setting objectives and detailing activities. (See Appendix C). The Logic Model outlines when and where program activities occur and expected short and long-term outcomes (CDC, 2019; Compass, n.d.). This is

the opportunity to consider what supports the program needs, such as training space or virtual platforms. The team will consider the needs of participants when choosing a location in addition to the trainers' needs, such as technical equipment. For in-person sessions, we will choose sites that most participants can easily access (including free parking costs) regardless of physical limitations and that can be adapted for comfort while conducive for learning. Examples of site options in Buncombe County include BCHHS facilities, local churches with large halls for community use, and community centers, such as the Dr. Wesley Grant, Sr. Southside Center. This center is equipped for audio-visual presentations, has spacious rooms, free on-site parking, features a living roof, is walking distance to cafes and shops, and is nestled in a neighborhood at high risk for EHE. The team will offer various times and dates for the synchronous virtual training sessions so that professionals have flexibility for attending sessions.

Planning also entails determining how to measure objectives of Phase I. Setting targets through SMART goals that can be measured, such as a number of MCH professionals trained in a specified period, will help program leaders to monitor whether or not the program is delivering its stated goals.

Implement: The implementation stage will include the actual trainings as well as communications to the greater public of the program's launch and achievements. Program leaders will monitor the process and ensure that the implementation process is on track.

Track: The participatory change approach facilitates a culturally competent evaluation process when stakeholders, especially primary stakeholders, have been active members informing each step of the process (Davis & Gervin, 2015). Evaluation of *Phase I* occurs throughout each step of MAP-IT. The team will monitor participants' knowledge change and readiness to provide education to HV participants through practice teach-backs and pre and

posttest questionnaires. We will track the number of trainings and persons trained for future reporting. When evaluating *Phase I*, we will choose measurements, such as Likert Scales and short answer evaluation tools, that help the planning and evaluation team capture both quantitative and qualitative data for comparisons across training sessions and for all steps of *Phase I*. (Center for Community Health and Development, n.d.c). Ultimately, tracking will help the program leaders know if the plan is on course. Tracking will provide insights into learner's growth, need for continuing support and readiness for the next phase, as well as, the effectiveness of the training process. It also will provide an opportunity for course corrections if any step in *Phase I* is not delivering expected outcomes.

Communicating findings to stakeholders and the greater community is crucial for identifying next steps, finding gaps, celebrating successes and providing transparency and accountability for public health services (Davis & Gervin, 2015). The primary purpose of communicating results is to increase awareness of the issue and garner more support for continuing efforts (Center for Community Health and Development, n.d.f). Communication methods will depend on the audience. For example, in Buncombe County, formal presentations and written reports are best for funders, lead agency, and significant MCH network partners, such as BCHHS Board of Health and Mothering Asheville. Sharing results through press releases, editorials and social media posts can reach the broader public audience. It is also important that participants of the trainings and members of the MCH Extreme Heat Risks Reduction Program understand and can communicate program aims, findings, and next steps.

### **Implications for Public Health Leadership**

The MCH Extreme Heat Risk Reduction Program seeks to address a complex public health problem that is fundamentally a social and environmental justice issue. Leadership skills

require political astuteness, project management, and coalition building of diverse stakeholders. Likewise, strong communications skills are required in order to communicate the program's vision, the science of climate change and the connection between extreme heat risks and the SDoH to broader audiences. In addition, leadership for the program must generate attention, resources and a sense of urgency regarding a health issue that many may not perceive as an imminent threat, a priority given the plethora of other health concerns, and/or a topic too political or overwhelming to approach. Further, leadership for the program will require sharing and, at times, relinquishing power over the process so that those most affected by the health risk and those with expert knowledge about climate science can make their own leadership contributions. To this end, it requires recruiting others who can bring "their expertise, skills, enthusiasm and innovative approaches" to the program and to "develop leaders for public health" as well as lead a public health initiative (Shickle et al., 2014).

Building and maintaining a coalition of diverse stakeholders is one of the primary tasks for the MCH Extreme Heat Risk Reduction Program. The coalition is comprised of pregnant and parenting people most at risk for extreme heat, MCH professionals, climate scientists, other public health leaders, as well as, community members ranging from political, faith-based, business and non-profit organizations. One task for the leader is to consider how to ensure that all participants have equitable opportunities for engagement. While most of the members are accustomed to meetings as part of their workday, some of the pregnant and parenting people living in the most systemically marginalized communities may not have the same level of experience or comfort in workgroup settings, transportation to meetings or financial support to attend meetings. It is incumbent upon the leader to assure equitable participation and leadership opportunities by determining where, when and how the primary stakeholders can participate and

contribute to the program. Possible actions may include, holding meetings in the neighborhoods of those most at risk, securing funding for stipends for participation (transportation, childcare and time committed to the program), avoiding the use of jargon and technical terminology in discussions, and including introductions in each meeting to help everyone feel welcomed and valued. Creating coalitions of primary and secondary stakeholders and establishing safety and respect among members so they may best contribute their expertise is foundational for leading a participatory change process.

In addition to skills required for effective leadership of the MCH Extreme Heat Risk Reduction Program, there are leadership qualities and styles that support effective leadership. For this program, the primary leadership qualities are cultural humility, personal integrity and perseverance with the hope that the objectives of the program are achievable. The leadership style may vary based on tasks but the servant leadership style is an effective approach for leading a participatory change process that requires both technical expertise and participation from those most at risk to achieve an equitable and beneficial health outcome.

Leadership qualities refer to the characteristics of the leader. When working with a broad and diverse coalition and cultivating leaders for public health, it is important to have reverence for the experiences and expertise of other program members. Developing cultural humility can enhance a leader's ability to share power with members of the program team. Tervalon and Murray-Garcia coined the term cultural humility to refer to the personal, lifelong reflective process for physicians in order to shift power inequality in physician-patient interactions to become a more mutually respectful partnership (1998). It includes being open to and appreciating the complexity of others' personal and cultural experiences and committing to self-discovery of one's own perspectives and biases (Foronda et al., 2016).



The issue of power is of particular concern when the burden of risk and health disparities are inequitable. When leaders authentically practice cultural humility, there is a two-fold shift in the power dynamic. First, the leader takes purposeful actions that establish respect and value of each members' expertise and their importance to the work. Secondly, the leader's commitment to on-going personal self-reflection regarding their use of personal and institutionally bestowed power, reduces the leader's sense of self as all-knowing and therefore, dominating the team and the group's work (Foronda, 2020). Such an approach is essential when working on social and environmental justice issues in which the systemic use of power has, and is, used to hurt others. Equity is not achievable without addressing the role of power; therefore, leaders must continuously examine their relationship to and their use of power.

Personal integrity communicates to others the leader's trustworthiness, commitment to the vision of an equitable outcome and participatory change process, concern for members and the issue, and demonstrates emotional maturity. The integrity of the leader fundamentally establishes relational safety for members of the program and sets the stage for honorable interactions. The program will face challenges from the outside and possibly within the group; trust in the personal integrity of the leader can help bridge conflicts within and unify the group to face barriers pressing from outside. The leader's violation of principles of integrity can jeopardize the collective work. Therefore, leading with personal integrity includes both modeling integrity and embedding integrity in the group processes. By establishing and following norms for working together, holding one another accountable, and using respectful communications the leader demonstrates both respect for the members and for the work process. Leading with integrity sets a standard for how the leader approaches working with self, others, and towards the shared goal. Additionally, integrity is crucial for creating psychological safety which, in turn,

correlates with high achieving teams (Delizonna, 2017; jbowen100., 2020; Qosja, 2019; Slack, n.d.). Leading with personal integrity, therefore, is a powerful component in the way a leader leverages a leadership quality in order to help the group achieve their goals.

It is imperative for the leader to have hope that the program's vision is achievable, in the face of daunting barriers and obstacles, and convey this conviction to group members.

Persevering when climate data suggests limited time to make the substantial changes necessary to protect health and lives can be difficult. Persevering when political agendas deny climate health risks or prevent action to avert climate health risks requires innovative action to instill hope and help program members stay engaged and effective. Leading participatory change includes instilling hope that together the group can accomplish more than any one member does alone. As in deepening cultural humility, cultivating hope is a lifelong task that requires self-care and practice of emotional, psychological and spiritual renewal. Public health leaders need not shy away from seeking support to maintain help through whatever method best serves them personally. Hope is both a mindset and a spiritual practice and may sustain the leader and the group during periods of challenge.

The nature of participatory change and coalition building is relational; the leader simultaneously shepherds the work forward while creating opportunities for others to move into leadership roles, support one another and work collectively towards their common goal. The reality of leadership is that different situations require differing approaches. However, for the MCH Extreme Heat Risk Reduction Program, the servant leadership style is well suited for guiding a participatory change process with a broad coalition of diverse members (Coetzer et al., 2017; Center for Community and Healthy Development, n.d.). According to Yukl, the servant leader focuses on developing a vision, building individual and team capacities to meet goals and

personal development (2013). Similarly, in a systematic literature review, Coetzer et al. found consensus that empowering others, providing stewardship for the work and team members' development, building relationships and communicating a compelling vision of the work were the servant leadership competencies most strongly valued (2017). This approach aligns with the work required to build a vision-focused, respectful and effective coalition that works as a team to reach a difficult goal.


## **Conclusion**

Global temperature rise is a growing threat to human and environmental health it is a social and environmental justice issue, as well. Evidence supports increased HRI risks during the prenatal, postpartum, infancy and early childhood period that disproportionately affect low wealth and minority MCH populations. Yet, despite the broad range of programming in the MCH Bureau of the US DHHS, there are currently no health initiatives to address heat risks among vulnerable MCH populations. This paper outlines the use of an equity-focused program planning and evaluation process to guide a participatory change approach through a diverse coalition of both primary and secondary stakeholders. By building a coalition of pregnant and parenting persons, their MCH professional allies, climate scientists and other secondary stakeholders, the reach to address inequities associated with heat risk is broad and solutions come from the collective work of all members. The leader of the program initiative is responsible for communicating, guiding and delivering an outcome that is beneficial to the health and wellbeing of the primary stakeholders. The risk of extreme heat aligns with other SDoH inequities that are of intentional design and have caused harm by those with power over the primary stakeholders; therefore, it is of utmost importance that the leader continuously examine both personal and institutionally bestowed power and how it is used. Choosing a servant

leadership approach offers a framework for continued self-reflection in the personal use of power, as well as, the development of members and the vision of the program. Such an approach facilitates a respectful and mutually supportive work environment and theoretically results in improved outcomes (Coetzer et al., 2017; Yukl, 2013). Additionally, in its attention to power, the servant leadership style includes a focus on the team's wellbeing and individual members' development and it creates the conditions in which participants are encouraged to grow as health leaders. Finally, solving complex public health problems takes time and perseverance. Public health leaders must take time for self-renewal so they are able to cultivate resilience and hope necessary for solving complex problems.

## Appendix A: Heat Related Illness Warning Signs

HEAT-RELATED ILLNESSES	
WHAT TO LOOK FOR	WHAT TO DO
<b>HEAT STROKE</b>	
<ul style="list-style-type: none"> <li>• High body temperature (103°F or higher)</li> <li>• Hot, red, dry, or damp skin</li> <li>• Fast, strong pulse</li> <li>• Headache</li> <li>• Dizziness</li> <li>• Nausea</li> <li>• Confusion</li> <li>• Losing consciousness (passing out)</li> </ul>	<ul style="list-style-type: none"> <li>• Call 911 right away-heat stroke is a medical emergency</li> <li>• Move the person to a cooler place</li> <li>• Help lower the person's temperature with cool cloths or a cool bath</li> <li>• Do not give the person anything to drink</li> </ul>
<b>HEAT EXHAUSTION</b>	
<ul style="list-style-type: none"> <li>• Heavy sweating</li> <li>• Cold, pale, and clammy skin</li> <li>• Fast, weak pulse</li> <li>• Nausea or vomiting</li> <li>• Muscle cramps</li> <li>• Tiredness or weakness</li> <li>• Dizziness</li> <li>• Headache</li> <li>• Fainting (passing out)</li> </ul>	<ul style="list-style-type: none"> <li>• Move to a cool place</li> <li>• Loosen your clothes</li> <li>• Put cool, wet cloths on your body or take a cool bath</li> <li>• Sip water</li> </ul> <p><b>Get medical help right away if:</b></p> <ul style="list-style-type: none"> <li>• You are throwing up</li> <li>• Your symptoms get worse</li> <li>• Your symptoms last longer than 1 hour</li> </ul>
<b>HEAT CRAMPS</b>	
<ul style="list-style-type: none"> <li>• Heavy sweating during intense exercise</li> <li>• Muscle pain or spasms</li> </ul>	<ul style="list-style-type: none"> <li>• Stop physical activity and move to a cool place</li> <li>• Drink water or a sports drink</li> <li>• Wait for cramps to go away before you do any more physical activity</li> </ul> <p><b>Get medical help right away if:</b></p> <ul style="list-style-type: none"> <li>• Cramps last longer than 1 hour</li> <li>• You're on a low-sodium diet</li> <li>• You have heart problems</li> </ul>
<b>SUNBURN</b>	
<ul style="list-style-type: none"> <li>• Painful, red, and warm skin</li> <li>• Blisters on the skin</li> </ul>	<ul style="list-style-type: none"> <li>• Stay out of the sun until your sunburn heals</li> <li>• Put cool cloths on sunburned areas or take a cool bath</li> <li>• Put moisturizing lotion on sunburned areas</li> <li>• Do not break blisters</li> </ul>
<b>HEAT RASH</b>	
<ul style="list-style-type: none"> <li>• Red clusters of small blisters that look like pimples on the skin (usually on the neck, chest, groin, or in elbow creases)</li> </ul>	<ul style="list-style-type: none"> <li>• Stay in a cool, dry place</li> <li>• Keep the rash dry</li> <li>• Use powder (like baby powder) to soothe the rash</li> </ul>



(CDC, 2017)

## APPENDIX B: PROGRAM DESIGN

MCH Heat Risks Reduction Program	
Program Phase	Objectives
<p><b>Phase I</b> Increase MCH Home Visitation Professionals and medical staff's knowledge of extreme heat health risks, inequities in the SDoH underlying disparities in risk, and life course implications for vulnerable MCH populations.</p>	<ol style="list-style-type: none"> <li>1. MCH professionals increase their understanding of extreme heat impact on health, the root causes of inequities and SDoH for extreme heat risks, and the impact on vulnerable MCH population's life course outcomes</li> <li>2. MCH professionals learn best strategies to help educate, assess and respond to extreme heat risks for families in MCH home visiting services.</li> <li>3. 3. MCH professionals become active stakeholders in Phase 3 of the program and engage in participatory change process to reduce inequities of heat risk for MHC populations.</li> </ol>
<p><b>Phase II</b> Build parent education and support in understanding and responding to heat risks in the home and community setting. Families receiving home visits will conduct self-assessments of their homes and neighborhoods to determine heat risks.</p>	<ol style="list-style-type: none"> <li>1. Increased maternal knowledge of extreme heat risks for self and children</li> <li>2. Increased self-efficacy for reducing extreme heat exposure for self and children</li> <li>3. Complete household and community level assessment of heat risks and protective factors</li> <li>4. Home visitation participants become active stakeholders in Phase 3 of the program and engage in a participatory change process to reduce inequities of heat risk in their homes, communities and regions.</li> </ol>
<p><b>Phase III:</b> Convene stakeholders from Phases I and II, as well as additional community stakeholders, local public health leaders and regional or state climate scientists</p>	<ol style="list-style-type: none"> <li>1. Through a participatory change process, this group will work to advance public policy related to extreme heat and implement adaptation strategies at the community level to reduce extreme heat exposure inequities.</li> </ol>

**APPENDIX C: LOGIC MODEL**

<b>Phase I Logic Model MCH Heat Risks Reduction Program</b>						
<b>Priorities</b>	<b>Inputs</b>	<b>Activities</b>	<b>Outputs</b>	<b>Short-term Outcomes</b>	<b>Long-term Outcomes</b>	<b>Impact</b>
<p><b>Increase HRI Knowledge Base of MCH Professionals</b></p> <p><b>Prepare MCH Professionals to assist MCH Home Visitation Participations reduce HRI risks and conduct home and neighborhood assessments</b></p>	<p><b>Funds</b></p> <p><b>Teaching and Technical Assistance</b></p> <p><b>Partners</b></p> <p><b>Training</b></p> <p><b>Space/Virtual Platforms</b></p>	<p><b>Outreach for MCH Professionals Engagement</b></p> <p><b>Train MCH Professions about HRI and conducting home and neighborhood assessments</b></p>	<p><b>MCH Professional Network Partnership engaged in HRI reduction</b></p> <p><b>MCH Professional trained in HRI and prepared to teach HV Participants about HRI and environmental assessments for heat risks</b></p>	<p><b>Increase MCH Professionals' knowledge of HRI in MCH</b></p> <p><b>MCH Professionals provide teaching, assessment and referrals for HRI for MCH HV participants</b></p> <p><b>MCH Professionals assist MCH HV participants collect data on home and neighborhood HRI risks</b></p>	<p><b>MCH Professionals engage in policy and advocacy to mitigate HRI risks for vulnerable MCH populations</b></p>	<p><b>Decrease MCH HRI</b></p> <p><b>Eliminate disparities in MCH HRI risks</b></p>

(CDC, n.d.; Compass, n.d., OPDPHP, 2020)

## APPENDIX D: STAKEHOLDER ANALYSIS

Stakeholder Name	Contact Person	Impact How much does the project impact them? (Low, Medium, High)	Influence How much influence do they have over the project? (Low, Medium, High)	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
Early Head Start (EHS)	Julie Jones, MPH	High	High	Leading effective HV program for staff and EHS participants; MCH equity; ensuring climate justice for HV participants	Staff participation; Communicate with other stakeholders to express their support for participation; recruit HV participants for Phase II	Withdraw from program undermines MCH network participation	Monthly round-table discussions; email; personal calls
Project NAF (Nurturing Asheville and Area Families)	Belinda Jones, MS	High	Medium	Leading effective HV program for staff and African-American Prenatal & Postpartum participants; reducing health inequities and IMR	Staff participation; Communicate with other stakeholders to express their support for participation; recruit HV participants for Phase II	Withdraw from program undermines MCH network participation, especially in the African American community	Monthly round-table discussions; email; personal calls
Mothering Asheville	Maggie Adams, MPH	High	High	MCH Equity and social justice	Leadership in program planning and management; recruit participants	Withdraw support and influence MCH network	Monthly round-table discussions; email; personal communications
Sistas Caring 4 Sistas	Nikita Smart, Doula	High	High	MCH Equity, reduce IMR, social justice	Influence Doula Staff to participate; recruit primary stakeholders	Withdraw support for program undermines MCH network participation, especially in African-American community	Monthly round-table discussions; email; personal communications (texts and calls)
Federally Funded Clinics	Lucy Sparks, LPN & Cynthia Yancey, MD	High	High	MCH health equity; access to care	Influence other medical providers to participate	Withdraw support and advocate for other health issues	Monthly round-table discussions; email; personal communications
Children's Developmental Services	Maggie Panther, Director	Medium	Low	Meeting mandates of NC Infant-Toddler Services	Influence staff participation and		Monthly round-table discussions; email; personal communications



Stakeholder Name	Contact Person	Impact How much does the project impact them? (Low, Medium, High)	Influence How much influence do they have over the project? (Low, Medium, High)	What is important to the stakeholder?	How could the stakeholder contribute to the project?	How could the stakeholder block the project?	Strategy for engaging the stakeholder
BCHHS	Zo Mpofu, MPH, Jennifer Mullendorfe, MD, Ellis Vaughn, DPN,	High	High	MCH equity, reducing IMR and disparities, improving MCH outcomes	Provide funding, community organizing, program planning an implementation expertise, facilities, influence community partners and internal staff (nursing, social work and economic services) to participate	Withdraw of support will effectively undermine community MCH network collaboration	Monthly meetings, email communications, reports
YWCA Mother Love		Medium	Medium	MCH for adolescents and their children; equity; reducing IMR; keeping students in school	Influence YWCA participation, provide facilities,	Withdraw of support reduces key partner in equity approach and adolescent providers	Monthly roundtable discussions; email; personal communications
Compañeros Inmigrantes de las Montañas en Acción-CIMA	Bruno Hinojsa Ruiz and Ilse Y. Ramirez Garcia	High	High	Health equity for immigrants, especially Latinx community; healthcare access for undocumented residents	Ensure outreach to non-English speaking MCH populations underserved by HV programs	Withdraw support limits outreach to health and social service programs	Monthly roundtable meetings, personal calls and texts.
Eblen Charities	Robin Boettche, Executive Director	Medium	Medium	Helping county residents meet healthcare needs	Charitable support for adapting HV participants' home through AC donations or funds for purchase or utility bills	Not support adaptation measures as part of the charitable outreach	Personal calls and email
WNC Climate & Health Working Group	Jennifer Runkle, PhD	Medium	High	Regional climate resilience and readiness; communicating climate science to the community	Content expertise for curriculum development (additional mapping and data analysis in Phase III)	Withdraw from the project undermines curriculum, heat risk analysis and credibility of project	Monthly roundtable meetings, personal calls, email, reports

(CDC, 2019; Center for Community Health and Development, n.d.; tools4dev, 2014)

## Appendix E: MAP-IT Framework



(ODPHP, 2020)

## References

- A Practitioner's Guide for Advancing Health Equity: Community Strategies for Preventing Chronic Disease—Foundational Skills for Public Health. (n.d.). 65.
- Adler, N. E., & Rehkopf, D. H. (2008). U.S. Disparities in Health: Descriptions, Causes, and Mechanisms. *Annual Review of Public Health*, 29(1), 235–252.  
<https://doi.org/10.1146/annurev.publhealth.29.020907.090852>
- Agrawal, P. (2015). Maternal mortality and morbidity in the United States of America. *Bulletin of the World Health Organization*, 93(3), 135–135.  
<https://doi.org/10.2471/BLT.14.148627>
- American Heart Association. (n.d.). Summer heat brings special health risks for pregnant women. *Www.Heart.Org*. Retrieved November 30, 2019, from  
<https://www.heart.org/en/news/2019/07/01/summer-heat-brings-special-health-risks-for-pregnant-women>
- Artiga, S., & Hinton, E. (n.d.). Beyond Health Care: The Role of Social Determinants in Promoting Health and Health Equity. 13.
- Auger, N., Naimi, A. I., Smargiassi, A., Lo, E., & Kosatsky, T. (2014). Extreme Heat and Risk of Early Delivery Among Preterm and Term Pregnancies. *Epidemiology*, 25(3), 344.  
<https://doi.org/10.1097/EDE.0000000000000074>
- Beggs, P. J. (2000). Impacts of climate and climate change on medications and human health. *Australian and New Zealand Journal of Public Health*, 24 (6) 630-632. Retrieved  
<https://onlinelibrary-wiley-com.libroxy.lib.unc.edu/doi/epdf/10.1111/j.1467-842X.2000.tb00531.x>

- Beltran, A. J., Wu, J., & Laurent, O. (2014). Associations of Meteorology with Adverse Pregnancy Outcomes: A Systematic Review of Preeclampsia, Preterm Birth and Birth Weight. *International Journal of Environmental Research and Public Health*, 11(1), 91–172. <https://doi.org/10.3390/ijerph110100091>
- Bleiweis, R., Boesch, D., Alex, & Gaines, ra C. (2020). *The Basic Facts About Women in Poverty*. Center for American Progress.  
<https://www.americanprogress.org/issues/women/reports/2020/08/03/488536/basic-facts-women-poverty/>
- Bolitho, A., & Miller, F. (2017). Heat as emergency, heat as chronic stress: Policy and institutional responses to vulnerability to extreme heat. *Local Environment*, 22(6), 682–698. <https://doi.org/10.1080/13549839.2016.1254169>
- Braveman, P., Egerter, S., & Williams, D. R. (2011). The Social Determinants of Health: Coming of Age. *Annual Review of Public Health*, 32(1), 381–398.  
<https://doi.org/10.1146/annurev-publhealth-031210-101218>
- Cardoza, J. E., Gronlund, C. J., Schott, J., Ziegler, T., Stone, B., & O’Neill, M. S. (2020). Heat-Related Illness Is Associated with Lack of Air Conditioning and Pre-Existing Health Problems in Detroit, Michigan, USA: A Community-Based Participatory Co-Analysis of Survey Data. *International Journal of Environmental Research and Public Health*, 17(16). <https://doi.org/10.3390/ijerph17165704>
- Center for Climate and Energy Solutions. (2017). Resilience-strategies-for-extreme-heat.pdf.  
<https://www.c2es.org/site/assets/uploads/2017/11/resilience-strategies-for-extreme-heat.pdf>

Center for Excellence in Maternal and Child Health. (2015, August 14). Maternal Health in the United States [Harvard Chan School of Public Health]. Maternal Health Task Force.

<https://www.mhtf.org/topics/maternal-health-in-the-united-states/>

Center for Community Health and Development. (n.d.a). *Chapter 2, Section 14: MAP-IT: A Model for Implementing Healthy People 2020*. University of Kansas. Retrieved

September 2, 2020, from the Community Tool Box: <https://ctb.ku.edu/en/table-of-contents/overview/models-for-community-health-and-development/map-it/main>

Center for Community Health and Development. (n.d.b). Chapter 3, Section 7: *Conducting Needs Assessment Surveys*. University of Kansas. Retrieved September 21, 2020, from the Community Tool Box: <https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/conducting-needs-assessment-surveys/main>

Center for Community Health and Development. (n.d.c). Chapter 3, Section 15: *Qualitative Methods to Assess Community Issues*. University of Kansas. Retrieved September 21, 2020, from the Community Tool Box: <https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/qualitative-methods/main>

Center for Community Health and Development. (n.d.d). Chapter 7, Section 8: *Identifying and Analyzing Stakeholders and Their Interests*. University of Kansas. Retrieved December 8, 2019, from the Community Tool Box: <https://ctb.ku.edu/en/table-of-contents/participation/encouraging-involvement/identify-stakeholders/main>  
<https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/develop-a-plan/main>

Center for Community Health and Development. (n.d.e). Chapter 13, Section 2: *Servant Leadership: Accepting and Maintaining the Call of Service*. University of Kansas. Retrieved September 26, 2020, from the Community Tool Box:

<https://ctb.ku.edu/en/table-of-contents/leadership/leadership-ideas/servant-> Centers for Disease Control and Prevention. (2019, May 20). Program Evaluation Home.

<https://www.cdc.gov/eval/index.htm>

Center for Community Health and Development. (n.d.f). Chapter 39, Section 4: *Communicating Information to Funders for Support and Accountability*. University of Kansas. Retrieved November 16, 2020 from: <https://ctb.ku.edu/en/table-of-contents/evaluate/evaluation-to-understand-and-improve/funder-support-accountability/main>

Centers for Disease Control and Prevention. (2017). *Warning Signs and Symptoms of Heat-Related Illness | Natural Disasters and Severe Weather | CDC*.

<https://www.cdc.gov/disasters/extremeheat/warning.html>

leadership/main

Centers for Disease Control and Prevention. (2020, August 13a). *Maternal Mortality*.

<https://www.cdc.gov/reproductivehealth/maternal-mortality/index.html>

Centers for Disease Control and Prevention. (2020, August 19b). Social Determinants of Health.

<https://www.cdc.gov/socialdeterminants/index.htm>

Centers for Disease Control and Prevention. (2020, September 10c). *Infant Mortality | Maternal and Infant Health | Reproductive Health | CDC*.

<https://www.cdc.gov/reproductivehealth/maternalinfanthealth/infantmortality.htm>

Centers for Disease Control and Prevention. (2020, September 30d). About Social Determinants

of Health (SDOH). <https://www.cdc.gov/socialdeterminants/about.html>

Centers for Disease Control and Prevention. (n.d.). *Evaluation Guide Developing and Using a*

*Logic Model*. Retrieved from [https://www.cdc.gov/dhdsp/docs/logic\\_model.pdf](https://www.cdc.gov/dhdsp/docs/logic_model.pdf)

- Chandler, C., Greck, S., LaMotte, D., Legerton, H., & Lorenz, L. (2019). *Buncombe County Community Health Assessment 2018* (p. 202). Retrieved November 12, 2020 from: [https://www.wnchn.org/wp-content/uploads/2019/07/Buncombe\\_2018-community-health-assessment.pdf?x85983](https://www.wnchn.org/wp-content/uploads/2019/07/Buncombe_2018-community-health-assessment.pdf?x85983)
- Child Trends. (2019). Children in Poverty. *Child Trends*.  
<https://www.childtrends.org/indicators/children-in-poverty>
- Children's Defense Fund. (2018, September 12). *Child-Poverty-in-America-2017-National-Fact-Sheet.pdf*. <https://www.childrensdefense.org/wp-content/uploads/2018/09/Child-Poverty-in-America-2017-National-Fact-Sheet.pdf>
- Clark, T., & Zolnikov, T. R. (2020). Climate Change and Mental Health. In *The Palgrave Handbook of Climate Resilient Societies* (pp. 1–26). Springer International Publishing.  
[https://doi.org/10.1007/978-3-030-32811-5\\_2-1](https://doi.org/10.1007/978-3-030-32811-5_2-1)
- Coetzer, M. F., Bussin, M., & Geldenhuys, M. (2017). The Functions of a Servant Leader. *Administrative Sciences*, 7(1), 5. <https://doi.org/10.3390/admsci7010005>
- Compass. (n.d.). *How to Develop a Logic Model*. Retrieved September 21, 2020, from <https://www.thecompassforsbc.org/how-to-guides/how-develop-logic-model-0>
- Convergence of Climate-Health Vulnerabilities. (n.d.). Heat. Convergence of Climate-Health-Vulnerabilities. Retrieved November 1, 2020, from <https://convergence.unc.edu/climate-extremes/heat/>
- Davis, R., & Gervin, D. (2015, June). CDC Coffee Break Evaluating Health Equity.  
[https://www.cdc.gov/dhdsp/pubs/docs/cb\\_june2015.pdf](https://www.cdc.gov/dhdsp/pubs/docs/cb_june2015.pdf)

- Delizonna, L. (2017, August 24). High-Performing Teams Need Psychological Safety. Here's How to Create It. Harvard Business Review. <https://hbr.org/2017/08/high-performing-teams-need-psychological-safety-heres-how-to-create-it>
- Dodgen, D., Donato, D., Kelly, N., Greca, A. L., Morganstein, J., Reser, J., Ruzek, J., Schweitzer, S., Shimamoto, M. M., Tart, K. T., & Ursano, R. (2016). Ch. 8: Mental Health and Well-Being. In *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (pp. 217–246). U.S. Global Change Research Program, Washington, DC. [mental-health-and-well-being](#)
- Fears, D., Siddiqui, F., Kaplan, S., & Eilperin, J. (2020, August 21). Heat is turbocharging fires, drought and tropical storms this summer. Washington Post. <https://www.washingtonpost.com/climate-environment/2020/08/21/heat-climate-change-weather/>
- Foronda, C. (2020). A Theory of Cultural Humility. *Journal of Transcultural Nursing*, 31(1), 7–12. <https://doi.org/10.1177/1043659619875184>
- Foronda, C., Baptiste, D. L., Reinholdt, M. M., & Ousman, K. (2016). Cultural Humility: A Concept Analysis. *Journal of transcultural nursing : official journal of the Transcultural Nursing Society*, 27(3), 210–217. <https://doi.org/10.1177/1043659615592677>
- Friel, S., & Marmot, M. G. (2011). Action on the Social Determinants of Health and Health Inequities Goes Global. *Annual Review of Public Health*, 32(1), 225–236. <https://doi.org/10.1146/annurev-publhealth-031210-101220>
- Friel, S., Marmot, M., McMichael, A. J., Kjellstrom, T., & Vågerö, D. (2008). Global health equity and climate stabilisation: A common agenda. *Lancet* (London, England), 372(9650), 1677–1683. [https://doi.org/10.1016/S0140-6736\(08\)61692-X](https://doi.org/10.1016/S0140-6736(08)61692-X)



- Fuhrmann, C. M., Sugg, M. M., Konrad, C. E., & Waller, A. (2016). Impact of Extreme Heat Events on Emergency Department Visits in North Carolina (2007–2011). *Journal of Community Health*, 41(1), 146–156. <https://doi.org/10.1007/s10900-015-0080-7>
- Galvao, L. A. C., Edwards, S., Corvalan, C., Kira, F., & Akerman, M. (2009). Climate change and social determinants of health: Two interlinked agendas. *Global Health Promotion; Saint-Denis Cedex*, 16(1\_suppl), 81–84.  
<http://dx.doi.org.libproxy.lib.unc.edu/10.1177/1757975909103761>
- Gamble, J. L., Balbus, J., Berger, M., Bouye, K., Campbell, V., Chief, K., Conlon, K., Crimmins, A., Flanagan, B., Gonzalez-Maddux, C., Hallisey, E., Hutchins, S., Jantarasami, L., Khoury, S., Kiefer, M., Kolling, J., Lynn, K., Manangan, A., McDonald, M., ... Wolkin, A. F. (2016). Ch. 9: Populations of Concern. *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. U.S. Global Change Research Program. <https://doi.org/10.7930/J0Q81B0T>
- Gronlund, C. J. (2014). Racial and Socioeconomic Disparities in Heat-Related Health Effects and Their Mechanisms: A Review. *Current Epidemiology Reports*, 1(3), 165–173.  
<https://doi.org/10.1007/s40471-014-0014-4>
- Hajat, S., O'Connor, M., & Kosatsky, T. (2010). Health effects of hot weather: From awareness of risk factors to effective health protection. *Lancet*, 375, 856–863.  
[https://doi.org/10.1016/S0140-6736\(09\)61711-6](https://doi.org/10.1016/S0140-6736(09)61711-6)
- Harduar Morano, L., & Waller, A. E. (2017). Evaluation of the Components of the North Carolina Syndromic Surveillance System Heat Syndrome Case Definition. *Public Health Reports*, 132(1\_suppl), 40S-47S. <https://doi.org/10.1177/0033354917710946>

- Head Start. (2020, April 28). Head Start Program Facts: Fiscal Year 2019. Head Start Early Learning and Knowledge Center. <https://eclkc.ohs.acf.hhs.gov/about-us/article/head-start-program-facts-fiscal-year-2019>
- Health Care Without Harm. (2015, May 20). Protecting Patients From Climate Change One Nurse At A Time. Healthcare Without Harm. <https://medium.com/@HCWH/protecting-patients-from-climate-change-one-nurse-at-a-time-eddee5c068ff>
- Health Equity. (n.d.). UNC Center for Maternal & Infant Health. Retrieved September 13, 2020, from <https://www.mombaby.org/health-equity/>
- Health Resources and Services Administration. (2019). Maternal and Child Health Bureau Programs. 2.
- Hess, J. J., Saha, S., & Lubber, G. (2014). Summertime Acute Heat Illness in U.S. Emergency Departments from 2006 through 2010: Analysis of a Nationally Representative Sample. *Environmental Health Perspectives*, 122(11), 1209–1215. <https://doi.org/10.1289/ehp.1306796>
- Hoffman, J. S., & Shandas, V. (2019). Participatory Research Collaboratories and Urban Heat Islands: Informing Equity-centered Climate Action. AGU Fall Meeting Abstracts, 53. <http://adsabs.harvard.edu/abs/2019AGUFMPA53A..05H>
- Holden, E. (2019, September 16). Climate Change Is Having Widespread Health Impacts. *Scientific American*. <https://www.scientificamerican.com/article/climate-change-is-having-widespread-health-impacts/>
- Homer, C. S. E., Hanna, E., & McMichael, A. J. (2009). Climate change threatens the achievement of the millennium development goal for maternal health. *Midwifery*, 25(6), 606–612. <https://doi.org/10.1016/j.midw.2009.09.003>

- Houghton, A., & English, P. (2014). An Approach to Developing Local Climate Change Environmental Public Health Indicators, Vulnerability Assessments, and Projections of Future Impacts. *Journal of Environmental and Public Health*, 2014. <https://doi.org/10.1155/2014/132057>
- Hoyert, D. L., & Miniño, A. M. (2020). Maternal mortality in the United States: Changes in coding, publication, and data release, 2018. *National Vital Statistics Reports*, 69(Number 2), 18.
- jbowen100. (2020, March 29). Do Your People Feel Safe? How Leaders Create Psychological Safety. 3x5 Leadership. <https://3x5leadership.com/2020/03/29/do-your-people-feel-safe-how-leaders-create-psychological-safety/>
- Keller, L. O., Schaffer, M. A., Lia-Hoagberg, B., & Strohschein, S. (2002). Assessment, Program Planning, and Evaluation in Population-Based Public Health Practice. *Journal of Public Health Management and Practice*, 8(5), 30–43.
- Kim, J., Lee, A., & Rossin-Slater, M. (2019). What to Expect When It Gets Hotter: The Impacts of Prenatal Exposure to Extreme Heat on Maternal and Infant Health (No. w26384; p. w26384). National Bureau of Economic Research. <https://doi.org/10.3386/w26384>
- Konkel, L. (2019). Taking the Heat: Potential Fetal Health Effects of Hot Temperatures. *Environmental Health Perspectives*, 127(10), 102002. <https://doi.org/10.1289/EHP6221>
- Kunkle, K. E., Easterling, D. R., Ballinger, A., Bililign, S., Champion, S. M., Corbett, D. R., Dello, K. D., Lackmann, G. M., Luettich Jr, R. A., Perry, L. B., Robinson, W. A., Stevens, L. E., Stewart, B. C., & Terando, A. J. (2020). *North Carolina Climate Science Report*

- Kuehn, L., & McCormick, S. (2017). Heat Exposure and Maternal Health in the Face of Climate Change. *International Journal of Environmental Research and Public Health*, 14(8), 853. <https://doi.org/10.3390/ijerph14080853>
- Lesser, A. J. (1985). The origin and development of maternal and child health programs in the United States. *American Journal of Public Health*, 75(6), 590–598. <https://doi.org/10.2105/AJPH.75.6.590>
- Liese, K. L., Mogos, M., Abboud, S., Decocker, K., Koch, A. R., & Geller, S. E. (2019). Racial and Ethnic Disparities in Severe Maternal Morbidity in the United States. *J Racial Ethn Health Disparities*. <https://doi.org/10.1007/s40615-019-00577-w>
- Lu, M. C., Highsmith, K., de la Cruz, D., & Atrash, H. K. (2015). Putting the “M” Back in the Maternal and Child Health Bureau: Reducing Maternal Mortality and Morbidity. *Maternal and Child Health Journal*, 19(7), 1435–1439. <https://doi.org/10.1007/s10995-015-1665-6>
- Luber, G., & McGeehin, M. (2008). Climate Change and Extreme Heat Events. *American Journal of Preventive Medicine*, 35(5), 429–435. <https://doi.org/10.1016/j.amepre.2008.08.021>
- Maye, A., & Poppe, J. (2019, November 18). Early Childhood Home Visiting: What legislators need to know. <https://www.ncsl.org/research/human-services/early-childhood-home-visiting-what-legislators-need-to-know.aspx>
- National Academies of Sciences, E., Division, H. and M., Practice, B. on P. H. and P. H., States, C. on C.-B. S. to P. H. E. in the U., Baciu, A., Negussie, Y., Geller, A., & Weinstein, J. N. (2017). The State of Health Disparities in the United States. In *Communities in*

- Action: Pathways to Health Equity. National Academies Press (US).  
<http://www.ncbi.nlm.nih.gov/books/NBK425844/>
- National Institute of Environmental Health Sciences. (2017). Effects of Heat—Climate and Human Health. National Institute of Environmental Health Sciences.  
[https://www.niehs.nih.gov/research/programs/geh/climatechange/health\\_impacts/heat/index.cfm](https://www.niehs.nih.gov/research/programs/geh/climatechange/health_impacts/heat/index.cfm)
- National Institute of Environmental Health Sciences. (2017). *Effects of Heat—Climate and Human Health*. National Institute of Environmental Health Sciences.  
[https://www.niehs.nih.gov/research/programs/geh/climatechange/health\\_impacts/heat/index.cfm](https://www.niehs.nih.gov/research/programs/geh/climatechange/health_impacts/heat/index.cfm)
- North Carolina Department of Environmental Quality. (2020, June). Climate Risk Assessment and Resilience Plan | NC DEQ. <https://deq.nc.gov/energy-climate/climate-change/nc-climate-change-interagency-council/climate-change-clean-energy-17>
- Office of Disease Prevention and Health Promotion. (2020, October 8). Program Planning MAP-IT: A Guide to Using Healthy People 2020 in Your Community. Healthy People 2020.  
<https://www.healthypeople.gov/2020/tools-and-resources/Program-Planning>
- Olson, D. M., & Metz, G. (2020). Climate change is a major stressor causing poor pregnancy outcomes and child development. *F1000Research*, 9, F1000 Faculty Rev-1222.  
<https://doi.org/10.12688/f1000research.27157.1>
- O’Neill, M. S., Carter, R., Kish, J. K., Gronlund, C. J., White-Newsome, J. L., Manarolla, X., Zanobetti, A., & Schwartz, J. D. (2009). Preventing heat-related morbidity and mortality: New approaches in a changing climate. *Maturitas*, 64(2), 98–103.  
<https://doi.org/10.1016/j.maturitas.2009.08.005>

- Plescia, M., & Emmanuel, C. (2014). Reducing Health Disparities by Addressing Social Determinants of Health: The Mecklenburg County Experience. *North Carolina Medical Journal*, 75(6), 417–421. <https://doi.org/10.18043/ncm.75.6.417>
- Poon, L. (2020, January 22). *The Link Between Redlining and Extreme Urban Heat*. Bloomberg City Lab. <https://www.bloomberg.com/news/articles/2020-01-22/the-link-between-redlining-and-extreme-urban-heat>
- Qosja, N. (2019, November 20). Inclusive Leadership: The Role of Psychological Safety. *Training Industry*. <https://trainingindustry.com/articles/leadership/inclusive-leadership-the-role-of-psychological-safety/>
- Roach, M. (n.d.). Climate Change and Extreme Heat: What You Can Do to Prepare. 20.
- Roach, M. (2016, October). Climate Change and Extreme Heat: What You Can Do to Prepare. <https://www.cdc.gov/climateandhealth/pubs/extreme-heat-guidebook.pdf>
- Runkle, J. D., Brock-Martin, A., Karmaus, W., & Svendsen, E. R. (2012). Secondary Surge Capacity: A Framework for Understanding Long-Term Access to Primary Care for Medically Vulnerable Populations in Disaster Recovery. *American Journal of Public Health*, 102(12), e24–e32. <https://doi.org/10.2105/AJPH.2012.301027>
- Runkle, J. D., Powell, J. (2019). *Engaging Rural Health Leaders in Addressing Climate Resilience in Southern Appalachia*. Grant Proposal. Western North Carolina Climate and Health Working Group.
- Rylander, C., Odland, J. Ø., & Sandanger, T. M. (2013). Climate change and the potential effects on maternal and pregnancy outcomes: An assessment of the most vulnerable – the mother, fetus, and newborn child. *Global Health Action*, 6. <https://doi.org/10.3402/gha.v6i0.19538>

- Sampson, N. R., Gronlund, C. J., Buxton, M. A., Catalano, L., White-Newsome, J. L., Conlon, K. C., O'Neill, M. S., McCormick, S., & Parker, E. A. (2013). Staying cool in a changing climate: Reaching vulnerable populations during heat events. *Global Environmental Change*, 23(2), 475–484. <https://doi.org/10.1016/j.gloenvcha.2012.12.011>
- Sarofim, M. C., Saha, S., Hawkins, M. D., Mills, D. M., Hess, J., Horton, R., Kinney, P., Schwartz, J., & Juliana, A. S. (2016). Ch. 2: Temperature-Related Death and Illness. In *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (pp. 43–68). U.S. Global Change Research Program, Washington, DC. <https://health2016.globalchange.gov/temperature-related-death-and-illness>
- Schell, C. J., Dyson, K., Fuentes, T. L., Roches, S. D., Harris, N. C., Miller, D. S., Woelfle-Erskine, C. A., & Lambert, M. R. (2020). The ecological and evolutionary consequences of systemic racism in urban environments. *Science*, 369(6510). <https://doi.org/10.1126/science.aay4497>
- Schmeltz, M. T., Sembajwe, G., Marcotullio, P. J., Grassman, J. A., Himmelstein, D. U., & Woolhandler, S. (2015). Identifying Individual Risk Factors and Documenting the Pattern of Heat-Related Illness through Analyses of Hospitalization and Patterns of Household Cooling. *PLOS ONE*, 10(3), e0118958. <https://doi.org/10.1371/journal.pone.0118958>
- Sengupta, S. (2020, August 7). Here's What Extreme Heat Looks Like: Profoundly Unequal—The New York Times. New York Times. <https://www.nytimes.com/interactive/2020/08/06/climate/climate-change-inequality-heat.html>
- Shickle, D., Day, M., Smith, K., Zakariasen, K., Moskol, J., & Oliver, T. (2014). Mind the public health leadership gap: The opportunities and challenges of engaging high-profile

- individuals in the public health agenda. *Journal of Public Health*, 36(4), 562–567.  
<https://doi.org/10.1093/pubmed/fdu003>
- Slack. (n.d.). Psychological safety first: Building trust among teams. Slack. Retrieved October 25, 2020, from <https://slack.com/blog/collaboration/psychological-safety-building-trust-teams>
- Sorensen, C., Murray, V., Lemery, J., & Balbus, J. (2018). Climate change and women’s health: Impacts and policy directions. *PLoS Medicine*, 15(7).  
<https://doi.org/10.1371/journal.pmed.1002603>
- Stöllberger, C., Lutz, W., & Finsterer, J. (2009). Heat-related side-effects of neurological and non-neurological medication may increase heatwave fatalities: Drug-induced heatwave fatalities. *European Journal of Neurology*, 16(7), 879–882.  
<https://doi.org/10.1111/j.1468-1331.2009.02581.x>
- Strand, L. B., Barnett, A. G., & Tong, S. (2011). The influence of season and ambient temperature on birth outcomes: A review of the epidemiological literature. *Environmental Research*, 111(3), 451–462. <https://doi.org/10.1016/j.envres.2011.01.023>
- Tervalon, M., & Murray-García, J. (1998). Cultural Humility Versus Cultural Competence: A Critical Distinction in Defining Physician Training Outcomes in Multicultural Education. *Journal of Health Care for the Poor and Underserved*, 9(2), 117–125.  
<https://doi.org/10.1353/hpu.2010.0233>
- tools4dev. (2014). Stakeholder Analysis Matrix Template.  
<http://www.tools4dev.org/resources/stakeholder-analysis-matrix-template/>
- Union of Concerned Scientist. (2019, July 2). Killer Heat in the United States.  
<https://www.ucsusa.org/resources/killer-heat-united-states-0>



- US Environmental Protection Agency. (2016). Climate Change Indicators in the United States, 2016 (p. 96).
- US Global Change Research Program. (2017). Climate Science Special Report.  
<https://science2017.globalchange.gov/>
- U.S. Global Change Research Program (2009- ). (2016). The impacts of climate change on human health in the United States: A scientific assessment.
- Ward, A., Clark, J., McLeod, J., Woodul, R., Moser, H., & Konrad, C. (2019). The impact of heat exposure on reduced gestational age in pregnant women in North Carolina, 2011–2015. *International journal of biometeorology*, 63(12), 1611-1620.
- Wheeler, S. (2020a, July 8). Pregnancy Risks Rise with Extreme Heat, But Public Health Info is Lacking. Human Rights Watch. <https://www.hrw.org/news/2020/07/08/pregnancy-risks-rise-extreme-heat-public-health-info-lacking>
- Wheeler, S. (2020b, October 23). US: Heat Emergency Plans Missing Pregnancy, Racial Justice. Human Rights Watch. <https://www.hrw.org/news/2020/10/23/us-heat-emergency-plans-missing-pregnancy-racial-justice>
- Woolf, S. H., & Braveman, P. (2011). Where Health Disparities Begin: The Role Of Social And Economic Determinants—And Why Current Policies May Make Matters Worse. *Health Affairs*, 30(10), 1852–1859. <https://doi.org/10.1377/hlthaff.2011.0685>
- World Health Organization. (2009). Protecting health from climate change: Connecting science, policy and people. World Health Organization.
- Yale School of the Environment. (2020, January 16). *Study Finds Link Between Deadly Heatwave Exposure and Redlining Housing Policies* [Yale School of the Environment].

E360. <https://e360.yale.edu/digest/study-finds-link-between-deadly-heatwave-exposure-and-redlining-housing-policies>

Xu, Z., Etzel, R. A., Su, H., Huang, C., Guo, Y., & Tong, S. (2012). Impact of ambient temperature on children's health: A systematic review. *Environmental Research*, 117, 120–131. <https://doi.org/10.1016/j.envres.2012.07.002>

Xu, Z., Sheffield, P. E., Su, H., Wang, X., Bi, Y., & Tong, S. (2014). The impact of heat waves on children's health: A systematic review. *International Journal of Biometeorology*, 58(2), 239–247. <https://doi.org/10.1007/s00484-013-0655-x>

Yukl, G. (2013). *Leadership in Organizations* (8th ed.). Pearson.

Zhang, W., Spero, T. L., Nolte, C. G., Garcia, V. C., Lin, Z., Romitti, P. A., Shaw, G. M., Sheridan, S. C., Feldkamp, M. L., Woomert, A., Hwang, S., Fisher, S. C., Browne, M. L., Hao, Y., Lin, S., the National Birth Defects Prevention Study, Hobbs, C., Carmichael, S., Reefhuis, J., ... Botto, L. (2019). Projected Changes in Maternal Heat Exposure During Early Pregnancy and the Associated Congenital Heart Defect Burden in the United States. *Journal of the American Heart Association*, 8(3). <https://doi.org/10.1161/JAHA.118.010995>

Zhang, Y., Yu, C., & Wang, L. (2017). Temperature exposure during pregnancy and birth outcomes: An updated systematic review of epidemiological evidence. *Environmental Pollution*, 225, 700–712. <https://doi.org/10.1016/j.envpol.2017.02.066>