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Atlanta Heat Action Plan: Combatting the Health Impacts of Extreme Heat with a Justice Lens

Summary

Rising global temperatures due to climate change will disproportionately impact cities, like Atlanta, Georgia, because of an exacerbated urban heat island effect. Increasing heat in cities poses an inequitable burden on the health of vulnerable groups, like low-income populations. City and county stakeholders across the world have developed heat preparedness initiatives to protect the health of their populations, but Atlanta does not have any heat action plan in place. Given the health threat of rising heat in Atlanta, what is the heat action plan that can best protect the health of low-income residents from heat?

Background

Global temperatures are rising due to anthropogenic climate change. Furthermore, the "frequency and intensity of hot extremes" have increased relative to the frequency of cold extremes since 1950[1]. Rising temperatures are primarily attributed to the greenhouse effect. This occurs when gases like carbon dioxide, methane, and nitrous oxide trap solar energy that is re-radiating from the earth in the atmosphere, preventing its release into space[2]. The greenhouse effect has increased since the Industrial Revolution, as anthropogenic sources, from industry to agriculture, have contributed to the highest atmospheric greenhouse gas concentrations of carbon dioxide, methane, and nitrous oxide in hundreds of thousands of years[1].

Global warming has harmful global impacts, which are particularly felt in urban areas. Cities experience an Urban Heat Island (UHI) effect, where they are hotter than surrounding rural areas. Impervious surfaces in cities, like concrete and asphalt, absorb solar radiation during the day and reemit it as longwave radiation at night[3], leading to a nighttime temperature differential of 3-12° C in cities compared to bordering rural areas[4]. Furthermore, trees can serve to cool their surroundings by providing shade and evapotranspiration, but there are often fewer trees in urban spaces[5]. Thus, climate-exacerbated extreme heat will compound the existing UHI effect and lead to more severe heat waves in cities[1].

Urban heat is dangerous to residents' health. When the human body is exposed to heat, it redistributes blood flow toward the skin to improve heat transfer, which releases sweat and increases cardiovascular work. The body may exceed its thermoregulatory capacity, which can lead to heat-related illness, heat stroke, or dehydration if the body's water stores are not replenished. Increased temperatures may even cause cell, tissue, and organ damage that can put people at a greater risk of death for decades after their heat injury[6]. About 25% of all mortality due to natural hazards in the United States is from heat exposure, and heat-related mortality is projected to increase in the coming decades[7].

The state of Georgia is a particularly climate-vulnerable area of the United States. A climate vulnerability assessment found an intense increase in "extreme hydroclimatic events," including floods, droughts, and heatwaves happening in Georgia from 1975 to 2012. These events especially impacted metropolitan Atlanta, an area that is more climate-vulnerable because of its large population of historically marginalized racial minorities and low-income individuals[8].

As for heat specifically, Atlanta experienced a 2.9 °F increase in its average summer temperature from 1970-2021[9]. Compared to other American counties, Atlanta metropolitan counties DeKalb and Fulton have higher expected annual losses in building value and population due to heat waves[10]. This heat rise is impacting residents' health. From 2002-2008, 13,784 individuals visited Georgia emergency departments (EDs) for heat-related illnesses, which amounted to about $6.2 million in healthcare costs[11]. This is an increasing trend in Atlanta, where ED visits for heat illness increased from 1993-2012[12]. Furthermore, the likelihood of being admitted to a hospital after visiting the ED as opposed to being discharged was seen to be much higher in metropolitan Atlanta counties like Cobb and Douglas[11].

The UHI effect disproportionately burdens lower-income residents[13], producing an inequitable heat distribution, which is deeply rooted in discriminatory American systems. An analysis of 108 American cities using data from 2014 to 2017 found that neighborhoods located in formerly redlined areas have hotter land surface temperatures than non-redlined neighborhoods in that same city. Today,

redlined areas still tend to be home to lower-income and minority residents[3]. Coping with heat may be more difficult for low-income residents because they are less able to afford air conditioning (AC) or access to clean drinking water[5]. Atlanta already has relatively high levels of income inequity compared to other cities, which means that UHI distribution will likely increase that inequity[13].

This paper proposes a Heat Action Plan (HAP) as a method of addressing heat-health inequities in Atlanta. HAPs are pursued by various jurisdictions to protect resident health during extreme heat. Common elements include early warning systems, communication guidelines, and community-level response measures. Atlanta has seen efforts to map the prevalence of heat within the city[14], but there is no formal HAP guiding city response. This is a dangerous shortcoming, and an Atlanta HAP should be pursued with high priority. Although decreased mortality cannot be directly associated with HAPs, there are many cases of decreased deaths after HAP implementation. France observed a 68% reduction of expected deaths during a 2006 heat wave and Italian municipalities saw progressively fewer heat-related deaths over the 12 years following the start of heat response measures[4]. Although long-term urban planning measures to reduce the UHI effect, like urban greening and building design, should be pursued[4], HAPs are relatively low-cost and have the potential to achieve immense benefits in the shorter term.

Case Studies

Three strong examples of heat preparedness initiatives to protect community health exist in Montreal, Canada; Maricopa County, Arizona; and Ahmedabad, India. The examples were chosen to inform the development of an Atlanta HAP because they were implemented in local jurisdictions (city/county, as opposed to state/national). Although some HAPs exist at the national level, local involvement facilitates more effective outreach to vulnerable groups because of direct accountability to local communities[4].

Montreal Heat Response Plan (MHRP)

The Montreal Heat Response Plan was first implemented in 2004 with the overarching goal to decrease heat-related mortality and health impacts[15]. After a 2010 heat wave, it was tailored to be more targeted toward vulnerable groups, such as people with mental illness. The MHRP is credited with reducing mortality on hot days by 2.52 deaths per day and was found to be particularly beneficial for vulnerable groups. For instance, one study found that the MHRP reduced mortality differences between low and high-socioeconomic-status neighborhoods[16].

The MHRP has scaled actions based on five levels determined by the Montreal Public Health Department: (1) normal, (2) seasonal watch, (3) active watch, (4) alert, and (5) intervention. “Normal watch” occurs during the non-summer months, and “seasonal watch” includes preventative, awareness-spreading measures taken during the summer months. “Active watch” is triggered at a certain temperature and humidity index issued by Environment Canada. At “intervention,” all partners in the network are mobilized, including healthcare workers from hospitals, youth centers, long-term care facilities, etc., as well as municipal staff including police and fire departments, public transit and ambulance transport, etc. The partners work together to increase AC access for vulnerable individuals. Hospitals conduct intensive surveillance of heat-related health effects through additional phone calls and home visits. Hospitalized patients may even be transferred to common areas with AC, while homecare patients are transported to shelters with AC[15].

Maricopa County Heat Relief Network

Maricopa County is one of the largest metropolitan centers in the Southwestern U.S. and experiences temperatures over 100° F from May through October. The Maricopa County Department of Public Health (MCDPH) reported an average of 87 heat-related deaths and 100 heat-related illnesses each year from 2010 to 2014. In response, the City of Phoenix and the Maricopa County Association of Governments founded the Heat Relief Network (HRN) in 2005. It consists of a voluntary network of organizations including faith-based groups, businesses, and service providers[17].

During the summer, HRN partners provide three different forms of heat relief sites: hydration stations, refuge/hydration locations, and emergency refuge/hydration locations. The hydration stations and refuge/hydration locations provide free water and heat respite all summer, and emergency refuges are activated upon heat warnings from the National Weather Service. All sites are housed in existing

facilities, including community centers, senior centers, religious facilities, homeless shelters, and government office buildings. In addition to cooling services, some centers provided additional services like food/snacks, health and human services (education, employment services, etc.), and housing/utility bill assistance[17].

Because the HRN built upon the existing capacities and operations of existing community centers, most cooling locations reported no additional operating costs. According to an analysis of 53 heat relief sites, the cooling centers seemed to reach vulnerable groups effectively, as many visitors were unemployed, experienced chronic medical conditions, and lacked a permanent residence and/or reliable access to AC in their homes. Overall, about 1500-2000 individuals visited cooling centers each day[17]. However, a community-based project conducted in Phoenix in 2018 found that residents of vulnerable neighborhoods felt cooling centers were inaccessible via public transit and had to resort to paying to enter spaces with AC, like movie theaters[18].

Ahmedabad Heat Action Plan

Ahmedabad is one of the hottest and fastest-growing cities in India[19-20]. It implemented South Asia's first-ever HAP in 2014 after a 2010 heatwave led to hundreds of deaths. The HAP advances global equity considerations, as low-income countries are more vulnerable to extreme heat, and South Asia is an especially vulnerable area[19]. Within India, low-income populations, such as those living in the slums are more likely to experience the effects of extreme heat. The project was initiated by an international partnership between the Natural Resources Defense Council and the Public Health Foundation of India. The implementation consisted of seven phases, including a needs assessment to identify vulnerable populations and community outreach to engage community partners, such as media outlets, worker organizations, and emergency response agencies[20].

The HAP includes three main elements: (1) community outreach to disseminate information about the dangers of extreme heat and how to protect oneself during heat waves; (2) an early warning system (EWS) with guidelines for coordinating communication of the warning; and (3) health care capacity building so healthcare workers can educate patients on heat prevention and monitor and respond to heat-related illness. The EWS is categorized into four levels: no alert, yellow alert, orange alert, and red alert[19]. This is based on probabilistic weather forecasting, and the warning level for any one day was communicated starting 7 days prior[20].

The NRDC developed a communication map for the EWS dissemination, including the interventions that specific partners should pursue. For instance, the Nodal Officer of the Ahmedabad Municipal Corporation (AMC) issues the heat alert. From there, the press circulates it via TV, radio, newspaper, etc. Community centers like places of worship and libraries serve as cooling centers, and water and power agencies ensure that supplies to vulnerable groups are maintained. The AMC engaged in additional outreach to prepare residents for heat, including billboards with tips to "Save Yourself from Heat" and a radio campaign in local languages[20].

One study found that 1,190 deaths were avoided each year in Ahmedabad after the plan was implemented. The plan was particularly associated with a decrease in all-cause mortality during the highest temperatures of the summer[19].

Recommendations

Based on the scientific literature, as well as the above case studies, the City of Atlanta should develop an equity-centered and community-engaged HAP to guide the city's response to rising heat and protect the health of low-income residents. The following recommendations should guide the creation of a HAP in Atlanta.

Health Equity at the Center

The written HAP and all HAP activities should prioritize the health of vulnerable low-income populations. Low-income populations can be defined using U.S. Census Data, particularly the portion of Atlanta's population that the U.S. Census Bureau defines as "persons in poverty[21]." Other HAPs faced a "last mile" failure because of stakeholders' inability to reach vulnerable groups[4]. Thus, the HAP should engage low-income residents from the beginning. The HAP process should begin with a baseline assessment conducted through focus groups, interviews, and site visits to hospitals and community

centers[20]. The assessment should ask community members about how heat impacts their health, the resources that would be most useful during extreme heat periods, and their preferred communication channels. Understanding the population's starting perceptions will help target strategies to improve their health. Low-income residents should continue to be engaged throughout the HAP process. For instance, the 2018 Nature Cooling Systems project in Phoenix held design workshops with community members to understand their heat adaptations, heat-related concerns, and favorite cool spots in their neighborhoods. Project leaders then developed neighborhood HAPs using their input[18].

Centralized Leadership, Strong Partnerships

The WHO Regional Office for Europe recommends that a "lead body" coordinate the "collaborative mechanism" between different stakeholders and direct emergency response[4]. This keeps the response cohesive. A potential lead body could be the Georgia Department of Public Health or the Atlanta Mayor's Office of Resilience.

Community partner organizations will be activated as needed by the lead entity. Partners can contribute to a holistic response that connects low-income populations to important services. Potential partners include the public transit system, MARTA, universities like Emory University, grassroots environmental justice organizations like the West Atlanta Watershed Alliance, service providers like food banks and homeless shelters, and local businesses. Medical partners like hospitals and community health centers must also be included. MARTA can transport individuals to cooling centers, and universities can offer research capabilities in developing temperature forecasting and heat illness tracking. Environmental justice organizations can help provide tailored educational materials, service providers and businesses can act as cooling centers, and health entities can support the health response.

Early Warning System

The plan should be guided by an EWS that is structured into scaled severity levels. Certain community response measures will be triggered depending on the severity level. The EWS should be constructed using historical meteorological and mortality data to understand which temperature thresholds are most lethal and develop associated warnings. The warnings should be communicated beginning about a week in advance to give people time to prepare. They can be circulated through email (for individuals with the technology), local media channels like radio and newspapers, billboards, and flyers at schools and local organizations. These methods would be adjusted according to the findings of the baseline assessment on the communication preferences of the low-income population.

Heat-Conscious Healthcare System

Healthcare workers should be trained to properly diagnose and treat heat-related illnesses. The EWS should trigger a robust surveillance system, and healthcare workers should conduct outreach to vulnerable homecare patients during heat waves. In Montreal, there were often medical personnel shortages during heatwaves, so there should also be an on-call system where additional healthcare workers are activated to respond to heat emergencies[16].

Community Outreach

Community outreach for the HAP should include spreading the EWS warnings and educating residents on heat protection measures. Heat is the leading cause of weather-related fatalities in the U.S., but it "lacks the 'awe' factor" of other natural disasters[22], so residents might not perceive heat waves with the proper seriousness. Thus, community members must be educated about the health dangers of heat and at-home solutions. Solutions include drinking water, staying out of the sun[20], wearing lightweight and water-soaked clothing, and immersing one's feet and/or forearms in water[23].

In all communication, it is critical to reach low-income populations in the way that is most accessible for them, whether that is communicating heat warnings in multiple languages[20] or using different communication channels. For instance, Montreal HAP decision-makers found that some individuals in their vulnerable population target group heard about heat-health effects through local news sources and word of mouth from their doctors and friends[16]. The Maricopa County cooling locations found that many visitors heard about cooling centers by physically seeing them and by word of mouth, so these more organic communication means should be considered.[17]

Community Response Measures

Different response measures will be triggered based on the heat warning level established by the EWS. Preventative educational measures will be pursued all year[15], cooling and hydration centers will open during the summer[17], and the highest warning level will initiate emergency response measures. Emergency measures include increased heat-illness surveillance by hospitals, the opening of additional cooling centers, and the "buddy system" where community members check on vulnerable neighbors[24].

In developing the community measures that are triggered by the EWS, the HAP should build upon existing local capacities. The HAP should create a network of air-conditioned locations where low-income individuals can seek heat refuge at the locations they normally visit for other services[17]. Facilitating low-income individuals' access to AC is important because it can reduce an individual's risk of heat-related mortality[23]. However, AC requires energy costs, and nationally, Atlanta has the third-highest median energy burden for low-income households[25].

Cooling centers should be accessible via a short walk or a free ride on public transit. All centers should offer a cool space, free water, and education on heat prevention strategies. They should provide a welcoming community space for vulnerable people, for instance, by offering simple recreational activities[15].

Evaluation and Improvements

The plan should be evaluated and improved after each summer heat season. This should include an evaluation of the temperature threshold that triggers the activation of the HAP actions so it can be set at a level that maximizes health protection benefits. Low-income residents should be involved in evaluating the HAP and can share their experiences and feedback so that the HAP can be adjusted to meet their needs more effectively.

Conclusion

This paper seeks to address the question, what is the heat action plan that can best protect the health of low-income residents from climate-exacerbated heat in Atlanta, Georgia? As global temperatures continue to rise due to climate change, cities will be significantly impacted because of the urban heat island effect. This trend particularly threatens the health of vulnerable city residents, like low-income populations. Cities around the world have responded to rising heat by developing heat preparedness measures like heat action plans. However, Atlanta lacks a HAP, which is dangerous for residents' health. A review of heat preparedness responses in other cities has informed a set of recommendations for an equity-focused Atlanta HAP, including its structure, communication, and community response measures.

A few limitations and uncertainties surround HAPs, but the possible benefits outweigh these concerns. Firstly, attributing a decrease in mortality directly to a HAP is difficult because of confounding factors. For instance, more individuals may survive post-HAP implementation because they gain access to AC separate from the HAP[19]. Despite this, HAP evaluations consistently show a reduction in expected mortality between the pre-HAP and post-HAP periods. Furthermore, efforts could be dedicated to reducing the UHI effect through city design, rather than pursuing a HAP. City design measures might include urban greening and building design requirements[4]. Ideally, a HAP would help to shift the city towards structural means of reducing the UHI effect. However, these measures can be quite expensive and are long-term initiatives rather than "quick fixes[18]." For the time being, HAPs that adapt a city's social networks can implement achievable, low-cost, and relatively quick behavior changes that save lives.

Outreach to vulnerable populations takes time and intentionality in all stages of the engagement process, from the initial survey to the program evaluation. When decision-makers take time to genuinely listen to the communities they seek to help, this facilitates collaboration, trust, and more sustainable outcomes[18]. This paper focused on low-income populations in Atlanta, but hopefully, a HAP could eventually expand to other vulnerable populations and include tailored provisions most relevant to their unique challenges. Unfortunately, the inequitable impacts of climate change show no sign of improving, so it is important to help vulnerable populations adapt. If pursued with an equity-centered and

community-engaged approach, an Atlanta Heat Action Plan (HAP) is a promising method of protecting the health of low-income city residents from heat exposure.

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