Supporting the Worcester Community in Mitigating the Effects of Extreme Heat Events

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Supporting the Worcester Community in Mitigating the Effects of Extreme Heat Events

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Abstract

The goal of this project was to establish a baseline understanding of how the Worcester public perceives and manages the mental and physical risks of extreme heat events. This project, sponsored by the Worcester Community Trust and the University of Worcester, was aimed at addressing the effects of rising temperatures in Worcester, England and their impacts on residents' health. With a combination of surveys, interviews, and archival research, the team demonstrated that extreme heat affects people in more ways than they realize, and that there is a lack of information on its effects and how to mitigate them. Using these findings, the team established baseline data on how people react to heatwaves, and developed recommendations on how to best educate the public with example infographics.

Acknowledgements

This project would not have been possible without the aid and input of multiple individuals and organizations, all of which are mentioned below. Your efforts are the reason that our team was able to successfully collect survey responses, and your expertise regarding the city of Worcester truly aided our work.

We would like to thank:

- Dr Jessica Mee, UKRI Future Leaders Fellow, University of Worcester, for her expertise and guidance.
- Helen Davis, CEO, Worcester Community Trust, for sponsoring the project and for letting us access.
- Professors Althea Danielski and Linda Looft for advising and guiding us through this project.
- Professor Caitlin Neer for guiding us on research preparation.
- Katy Boom, Director of Sustainability, University of Worcester for guiding the project and sharing her wealth of knowledge.
- Sanctuary Housing Association for providing insights into social housing.
- All survey participants for helping us gather this important data.

Executive Summary

Introduction

The United Kingdom has been experiencing extreme heat events each summer, increasing in intensity by 1.4°C over the past 60 years. With the rise in frequency and severity of heat events, adverse effects on the human body are worsening, on both the physical and mental level.

As a response, the Worcester Community Trust and the School of Sports and Exercise Science at the University of Worcester are collaborating to better understand the community's current perceptions of heatwaves. The Worcester Community Trust runs community hubs across the city, and The School of Sports and Exercise Science has identified strategies to help athletes mitigate the effects of extreme heat. The school is also seeking to gain baseline knowledge and identify how to spread the information to the Worcester public.

The goal of this project was to establish a baseline understanding of how the Worcester public perceives and manages the mental and physical health risks of extreme heat events. To accomplish this, the team surveyed the Worcester public, interviewed experts, analyzed previous strategies, and researched the best ways to spread information about extreme heat events. Lastly, the team provided the University of Worcester with recommendations on how to best educate the public on mitigating the effects of heatwaves.

Background

With global mean temperatures rising, the risk of heatwaves is also drastically increasing (National Centre for Atmospheric Science, 2025). The frequency and severity of heatwaves in the UK have risen in recent years (Met Office et al., 2025).

As heatwaves increase in duration and severity, the increased strain on the body can lead to thermoregulation issues. These effects can manifest as illnesses such as cardiovascular, kidney, or respiratory disease (Bell et al., 2024). These risks are worsened by the fact that these health issues can occur even in non-extreme heat. Factors such as age also play a significant role. These effects

compound to an increase in mortality due to heatwaves. A rise in temperature also correlates with an increase in suicide rates (Walinski et al., 2023).

Varied efforts have been taken by individuals and governments to address the effects of extreme heat events. These methods all come with benefits and drawbacks that aid or limit widespread use. In countries with warmer climates, electric cooling systems, or air conditioning, are a common method of mitigating the effects of heat. However, in the United Kingdom only 5% of residences have an active cooling system (Aecom et al., 2021).

Objectives and Methods

The objectives for this project were:

1. Investigate how heatwaves are addressed globally

   Archival research was performed to identify recommendations and techniques used in other cities across the globe.
2. Identify what heat-related services and resources are provided to UK residents by the government and other organizations

   Archival research was conducted to locate existing material on heatwaves. The team also performed a semi-structured sponsor interview to identify existing challenges with spreading information about heat events and other resources.
3. Document actions that Worcester residents are taking to mitigate the effects of extreme heat events

   Surveys were conducted to assess residents' current understanding of heatwaves and the techniques used to mitigate their effects.
4. Evaluate potential best heat mitigation practices for Worcester residents in collaboration with the sponsors

   The team worked with the sponsor to identify the key mitigation techniques to inform the public.
5. Identify the best delivery methods for providing information to the public

Archival research was performed on guidance campaigns to identify the best practices for delivering information to the public.

Results

The surveys revealed important inconsistencies in individuals' opinions about heatwaves. Of the surveyed residents, 49.7% believed they were unaffected by heatwaves, but when given specific examples, the majority said they were affected in certain ways. For example, 77.5% of respondents who didn't believe they were affected by heatwaves said their sleep quality was negatively impacted. This shows a disconnect with the survey responses, where individuals do not realize they are affected by heatwaves until asked about specific aspects, such as sleep.

A noteworthy finding from the general survey demonstrated that 26.57% of respondents believed that they had suffered heat stroke symptoms and 53.85% believed they had suffered heat exhaustion symptoms during heatwaves. These numbers are extremely high in comparison to what was expected. For reference, on average, only 0.026% of Americans suffer from heat-related illnesses including both heat exhaustion and heat stroke annually (Dring et al., 2022). Worcester residents are not uniquely susceptible to heat related illnesses; this data demonstrates that many respondents are unaware of the criteria of heat exhaustion and heat stroke, confusing these conditions with heat induced fatigue. This shows that there is a lack of education about the symptoms and effects of extreme heat, causing improper responses when they appear.

When asked about community resources, only 8.4% of Worcester residents knew of any community resources available to them, and when asked what these resources were, they identified only cool spaces and water provided at outdoor events, with other answers being emergency services or unsure.

Through the team's research for Objective 2, it was identified that the UK Government and National Health Service's websites have a substantial number of resources available to the public, however, many of them are hidden behind multiple links within other websites or require the user to manually search for the relevant heat-related guidance in a search engine. This lack of accessibility is reflected in the findings of Objective 3, where the survey results highlighted that much of the

community was unaware of resources available to them, and only 22.4% have accessed the UK Government's official website.

When surveyed, 35% of Worcestershire residents live in rented housing, meaning landlords have a significant impact on the mitigation of extreme heat events for their tenants. This is a complex factor because, due to changes in UK Government and Parliamentary policy, landlords and housing associations have a stricter protocol to follow when it comes to heat mitigation for newly built housing. However, there is no financial incentive or legal requirement to bring the large quantity of existing housing up to the same standard.

To complete Objective 1 archival research was conducted to identify what primary techniques were being used in other cities worldwide during heatwaves. The team found that the most common method being used in other heatwave-affected cities was implementing weather alert systems, with air conditioning being the second most common, and cool roofing, urban green spaces, and cooling centers tied for the third most common.

Recommendations

The team's research culminated in three key recommendations that the Worcester City Council, the University of Worcester, and the Worcester Community Trust could implement to aid in their ongoing efforts to mitigate the effects of extreme heat events.

1) Design and spread information campaigns to inform the public about the risks associated with heat, and heat mitigation techniques

Infographics should be created like the one in Appendix I and spread to increase community knowledge about heatwaves.

2) Create a map of the city with all cooling centers listed

Cooling centers should be established within the city. With this designation, a map containing their locations and hours of operation should be created and made available to the public.

3) Push for government incentives for homeowners/landlords to make their buildings more heat resistant

Incentives should be created in order to help homeowners and landlords bring existing homes up to the same standards as new construction.

Further Research

This project has multiple opportunities for further research to be conducted on the topic of mitigating the effects of extreme heat events within Worcester. These projects could be done individually or in collaboration with other organizations.

1) **Conduct baseline surveying of the Worcester public during or after an extreme heat event**

   Additional surveys should be conducted around the time of extreme heat events to identify changes in baseline when extreme heat is a pressing issue.

2) **Identify infrastructure across the city that could be converted to cooling centers**

   Infrastructure within Worcester that can be converted to a cooling center should be identified, and the public should be informed of their existence.

Authorship

Gavin Hamburg

Gavin was the Project Manager. In this role, he ensured that deadlines were met and meetings were organized and attended. He also ensured that the team understood the requirements of each section. He is the primary author of Appendices D and E. He also co-authored 2.4 and 4.2. Additionally, he created all the graphs found in "Results and Key Findings".

Tucker Johnson

Tucker was the Primary Author. In this role, he ensured that all sections and subsections were written and that the report formed a narrative while also conveying the necessary results and recommendations. He is the primary author of the Abstract, Acknowledgments, 2.3, 2.5, 4.3, 4.4, 5.2, and 5.3. Additionally, he also co-wrote multiple other sections within the report.

Adam Jusczak

Adam was the Research and Design Coordinator. In this role, he focused on collecting Worcester-specific community data through a mix of surveying the public and conducting interviews. He was also the primary graphic designer for the presentations and infographics. He was a primary author of Sections 4.1 and 4.5 and co-authored many other sections of the report.

Nicolas Kishchenko

Nick was the Editor-In-Chief. In this role, he ensured that all statements, deliverables, and sections in the report were precisely written, contained relevant and accurate information, and conveyed a professional tone. He extensively revised and edited all subsections except the appendices.

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1.0 Introduction

In 2025, 16,500 people died in Europe due to heat-related illnesses, and future mortality rates are only predicted to rise (Barnes et al., 2025). While Europe has been heavily impacted by these rising temperatures, the United Kingdom has only recently begun to feel its effects, one being extreme heat events each summer. The average maximum temperature during the summer in the UK has increased by 1.4°C over the past 60 years, with the summer of 2025 having the highest mean temperature in history (Met Office et al., 2025; Met Office, 2025). These rising temperatures in the UK have led to more volatile weather, including more frequent heatwaves. The rise in frequency and severity of heat events has adverse effects on the human body; these range from physical effects such as dehydration to heat stroke, and to mental effects such as impaired cognition and emotional regulation (Xu et al., 2025).

As a response, the Worcester Community Trust and the School of Sports and Exercise Science at the University of Worcester are collaborating to better understand the community's current perceptions of heatwaves. The Worcester Community Trust runs six community hubs across the city and supports populations more vulnerable to heatwaves by providing shelter and free water. The School of Sports and Exercise Science has identified strategies to help athletes acclimate and mitigate the effects of extreme heat. In addition, the school is seeking to gain baseline knowledge and identify how to disseminate information about heat mitigation techniques to the Worcester public.

The goal of this project was to establish a baseline understanding of how the Worcester public perceives and manages the mental and physical health risks of extreme heat events. To accomplish this, the team surveyed the Worcester public, interviewed experts, analyzed previous strategies, and researched the best ways to spread information about extreme heat events. Lastly, the team provided the University of Worcester with recommendations on how to best educate the public on mitigating the effects of heatwaves.

2.0 Background

As the effects of climate change increase and the planet warms, an urgent need has formed for governments and the public to adapt to rising mean temperatures as well as frequent heatwaves, which can be deadly (Lindsey et al., 2025; World Health Organization, 2026). Many countries and regions across the world have been attempting to address the impacts of global warming with varying levels of success. Despite their best efforts, many countries have struggled to mitigate the effects of heat, resulting in a strong need for change. This chapter explores the causes and impacts of heatwaves, as well as the responses by individuals and governments to their effects.

2.1 Heatwaves

With global mean temperatures rising (0.25°C per decade in the UK), the risk of extreme weather events such as heatwaves is in turn, also drastically increasing (National Centre for Atmospheric Science, 2025). Globally, there is no set definition for what is considered a heatwave, as extreme heat is a relative term that varies in different climates. In the UK, a heatwave is defined as a period of at least three consecutive days when the maximum daily temperature exceeds a set threshold, which is determined on a county-by-county basis, based on climate data from that location (*What Is a Heatwave?*, n.d.).This system is designed in this manner, as different climates and locations have different expected levels of heat. Each county's individual threshold can be seen below in Figure 1, as defined by the Met Office.

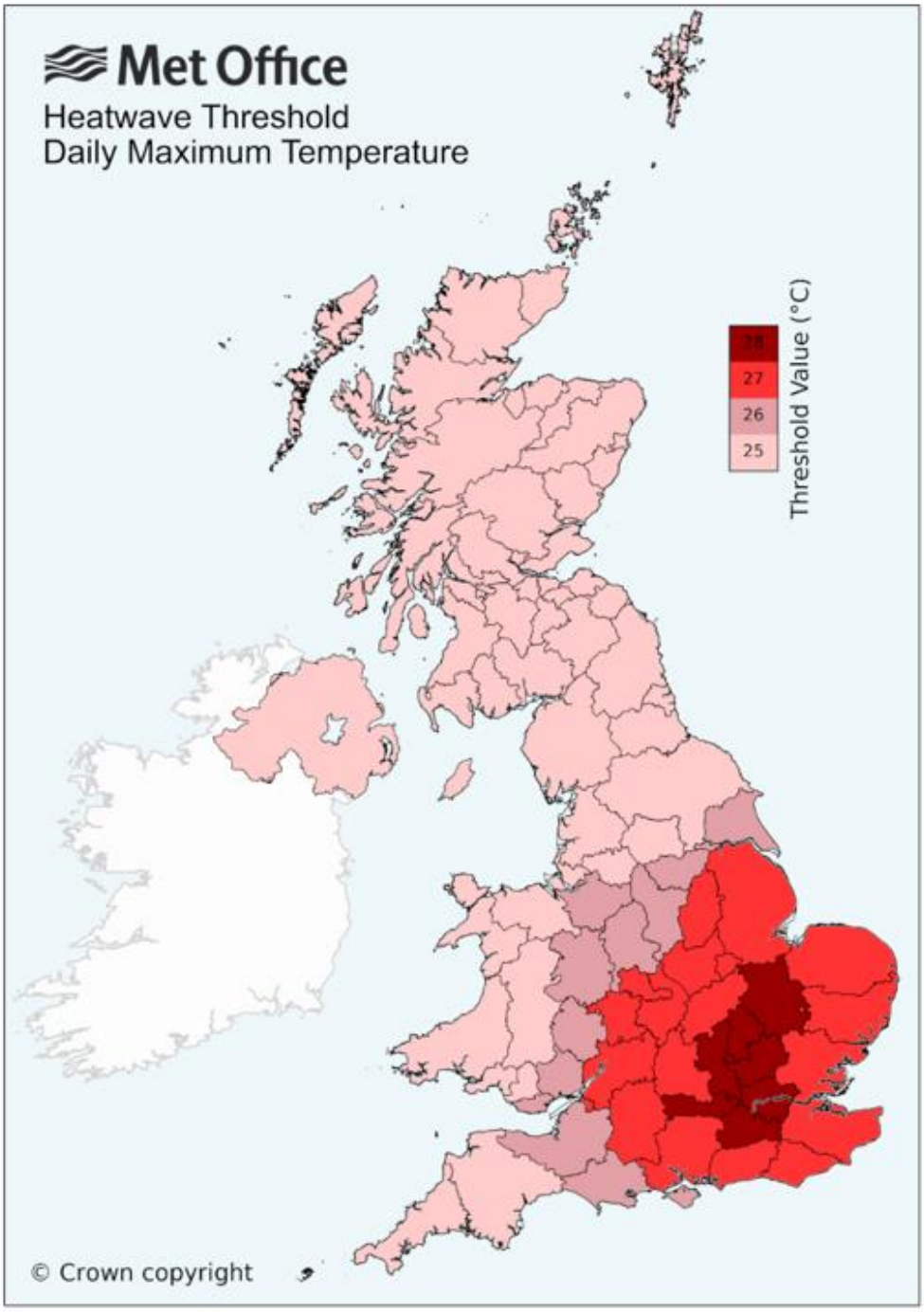

Figure 1. Map of threshold temperatures by county in the United Kingdom (What Is a Heatwave?, n.d.)

Climate records show that the frequency and severity of heatwaves in the UK have risen in recent years (Met Office et al., 2025). One indicator was the summer of 2025, which was recorded as the warmest year in the UK's history, with an average temperature of 16.1°C and a high of 35.8°C

(Met Office, 2025). This increase in cumulative average mean summer temperatures is illustrated in Figure 2 up to 2024.

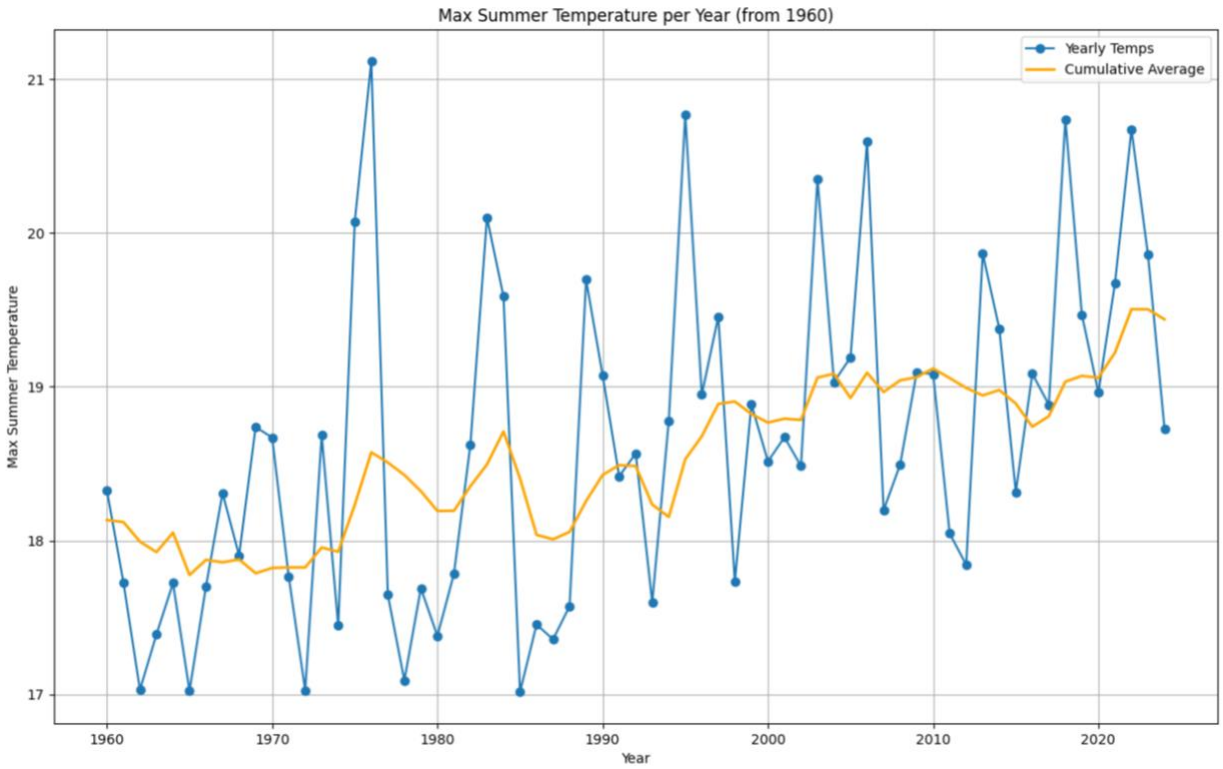

Figure 2. Summer Max Temperature of The United Kingdom 1960-2024 (Met Office et al., 2025)

Along with increased temperatures comes a decrease in the existence of urban cool spots (Huang et al., 2024). An urban cool spot is an area where the temperature is colder than the surrounding area, in which a person is not exposed to the risk of heat stress. Because of increasing temperatures, the density of these cool spots is decreasing, which means fewer times and spaces where a person can escape the effects of heatwaves (Huang et al., 2024). However, the increase in temperature is not constant across all areas of the UK as some regions such as Aberdeenshire have not experienced any at all (Sahani et al., 2022). These factors make it more important to identify which areas are most at risk from rising temperatures, which communities lack the resources to properly mitigate the effects of extreme heat, and how these changes pose significant health risks to individuals.

2.2 Effects of increased temperature on individuals

As ambient temperatures rise, the body begins to thermoregulate, but that has upper limits. As heatwaves increase in duration and severity, the increased strain on the body can lead to issues such as electrolyte imbalances and dehydration. The psychological effects of heat stress on the brain can cause conditions such as anxiety, depression, and more. All these effects can compound to impair cognition and emotional regulation, as well as cause sleep deprivation (Xu. et al., 2025). These effects lead to a reduction in productivity and negatively affect the quality of work and well-being (Mehrhof & Bunn, 2024). For the body, these effects at worst can manifest as illnesses such as cardiovascular, kidney, or respiratory disease (Bell et al., 2024). These risks are worsened by the fact that these health issues can occur even in non-extreme heat if it is hotter than what the body expects. Factors such as age also play a role, as age gradually reduces the body's ability to condition itself against extreme temperatures. Medication may further interfere with or reduce a person’s ability to mitigate an intense fluctuation in heat (Bell et al., 2024). A visual representation of these effects on the body can be found in Figure 3.

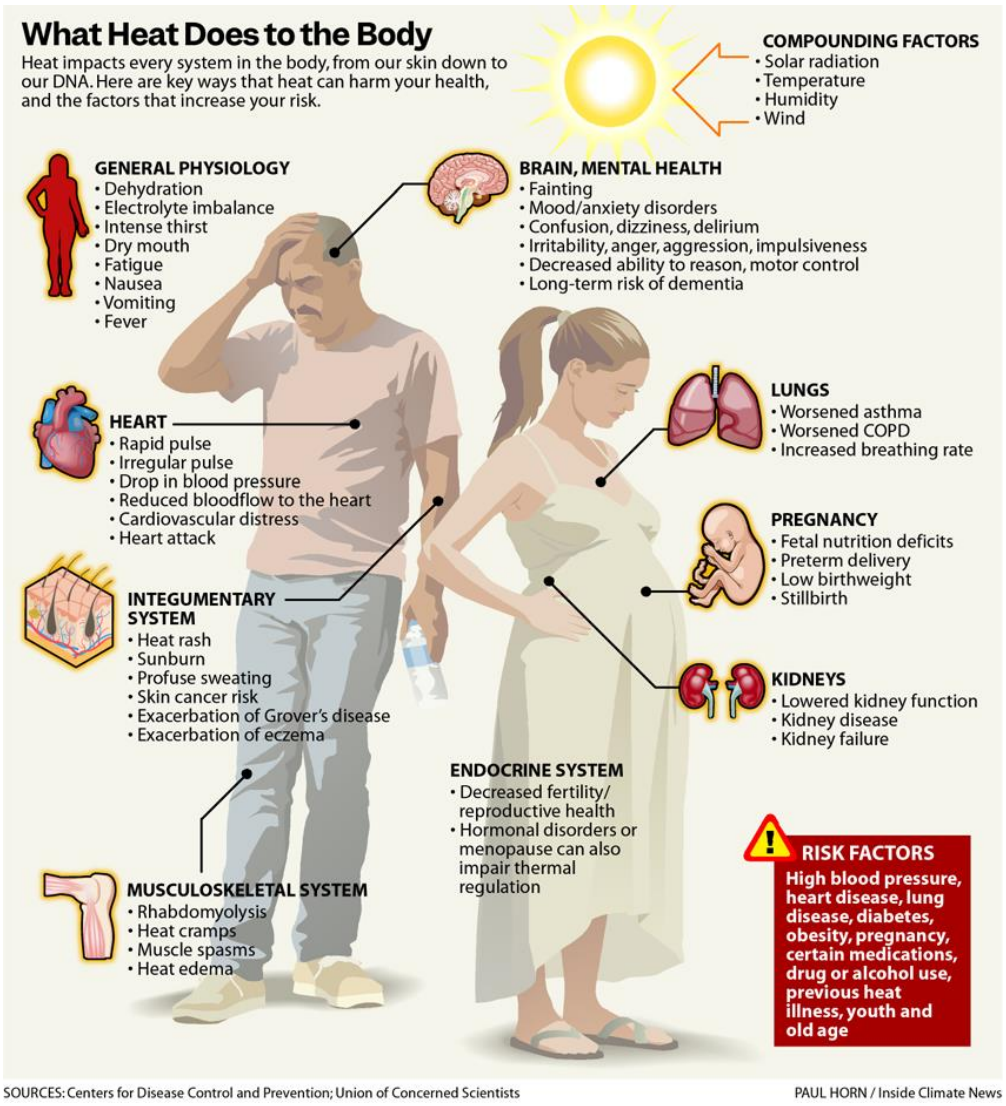

Figure 3. What Heat Does to the Body (Gopal, 2025)

These effects compound to an increase in mortalities due to heatwaves. The 2022 heat periods had an estimated 3,363-5,587 heat related deaths in the UK (Mehrhof & Bunn, 2024). An increase in temperature also correlates with an increase in suicide rates both during and after the heatwave (Walinski et al., 2023). In addition to the increase in suicide rates, there is a 14% increase in violent crime when the temperatures are above 18°C (Mehrhof & Bunn, 2024). All these effects compound, placing greater strain on public health resources.

While the average citizen may be able to tolerate short periods of elevated temperatures, these prolonged and intense heatwaves have a high likelihood of posing a severe and disproportionate risk to

particularly vulnerable parts of the population (Hajat et al., 2007). Elderly individuals and those who have severe health conditions are significantly more susceptible to heat-accelerated illnesses such as exhaustion, stroke, and cardiovascular complications (Hajat et al., 2007). Other groups identified to be particularly at risk consist of the homeless, those with pre-existing medical conditions, and members of the workforce without access to specific resources, such as cold water or air-conditioned zones, while at work.

2.3 Public opinion and government response towards rising heat

With a clearer understanding of the impacts of rising temperatures, it is essential to examine both public perception and government responses to increasing extreme heat events in the UK. In recent years, awareness of heat-related risks has grown alongside heat-accelerated mortalities. Historically, heatwaves were not widely perceived as a significant threat due to their relative rarity. For example, a 2023 survey of 1,750 UK residents found that very few individuals considered themselves personally at risk during a heatwave and shifted their concern towards older and more vulnerable populations (Brimicombe et al., 2021).

However, as heatwaves have risen in both frequency and intensity, public perception has shifted, resulting in an increasing recognition of their severity and a need to address their impacts. By 2024, this growing awareness translated into greater public pressure on the UK Government to develop a comprehensive response strategy (Howarth et al., 2024). In response to this pressure, a National Heat Risk Strategy, overview found in Figure 4, was proposed through collaboration between the British Red Cross and the Grantham Research Institute on Climate Change and the Environment. This strategy outlined eight core priorities aimed at both immediate public protection and long-term adaptation towards extreme heat events (Howarth et al., 2024). These priorities include safeguarding vulnerable populations, advancing climate change mitigation efforts and adaptation, strengthening policy and regulatory frameworks in parliament, and promoting a society-wide approach to adapting existing infrastructure.

This strategy represents a shift from previously reactive emergency responses to a more coordinated and preventative national framework. By embedding heat adaptation into policy and prioritizing especially vulnerable groups, these approaches have the potential to reduce heat related mortalities and improve public awareness.

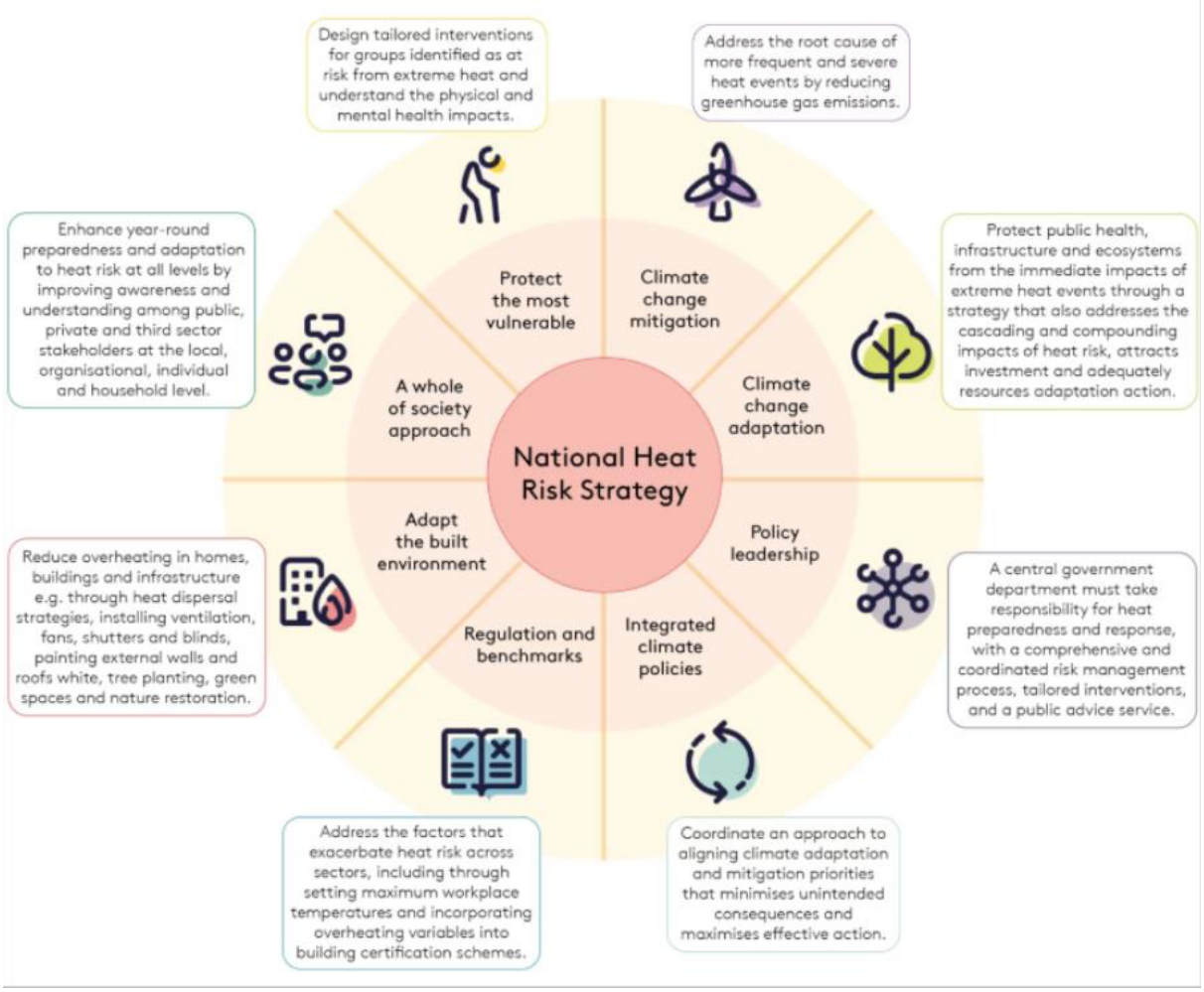

Figure 4. National Heat Risk Strategy for The UK (Howarth et al., 2024)

2.4 Efforts to manage the effects of rising heat

Many different efforts have been taken by individuals and governments to address the effects of extreme heat events. These methods all come with benefits and drawbacks, whether it be ease of implementation, high cost or efficacy; they all have disadvantages that limit widespread use. Thus, mitigation methods should be reviewed based on the feasibility of application.

In the United Kingdom, electric cooling systems, or air conditioning, are uncommon in homes; only 5% of residences have an active cooling system (Aecom et al., 2021). While the UK Government identifies air conditioning as an effective strategy for individuals, the government also recommends that passive solutions be prioritized over those that contribute to emissions (Mehrhof & Bunn, 2024). Besides the energy consumption, cost is also an important factor, as demonstrated in a study from the United States where air conditioning is the primarily used cooling option, and low-income households spend upwards of 33% of their income on energy (Hernández & Phillips, 2015). United Kingdom households are also not designed to accommodate air conditioning units as many of the homes were designed with the intention of keeping accumulated heat in the homes during the winter months (Loughborough University, 2025). While predominantly utilized in the United States, window air conditioning units are also not an option, as in the United Kingdom, there is no standardized window shape and several hundred years of different window styles makes it difficult to mass produce window units. While a window could be retrofitted to accommodate a tower unit, much of the cold air produced would leak out due to poor insulation as retrofits typically are not airtight; additionally, most windows in these homes are heavily affected by old age (Cuce, 2017). These factors, combined with the initial purchase price and an increase in energy costs, result in electric cooling systems being a non-satisfactory option.

Other personal adaptation techniques for dealing with hot weather can provide thermal comfort in the short term. Using an iced towel is effective, but after 30 minutes it loses its effectiveness and needs to be reapplied (Xu et al., 2025). While a method like this is considered usable in the short term, constant replacement results in decreased productivity. Other options such as external shutters, cool roofing, and vegetation are also not considered viable options in the circumstances that Worcester finds itself in. These methods require either extensive exterior modifications which Worcester residents are not able to implement due to financial or residential barriers, or large-scale city-wide planning that is not feasible for this project. The most currently used method within the UK is electric fans, which use 76% less electricity than air conditioning and are much cheaper for an initial purchase (Malik., et al, 2022). While fans are reliable in the short term, as the peak temperature of a heatwave increases, they

begin to lose their effectiveness while still consistently using the same amount of electricity. The lack of existing public techniques to manage the heat has led groups to aid in the development and distribution of more effective mitigation techniques.

2.5 Sponsors

As noted in Sections 2.3 and 2.4, many groups and organizations have increased their attention towards heatwaves and the impacts on their local communities. While local and national governments are involved in policy creation and adaptation, much of the responsibility at the individual level falls on community organizations. One such organization in Worcester is the Worcester Community Trust, which is headed by Helen Davis. The Worcester Community Trust operates six community hubs across the city, aiming to "deliver a wide range of services that make a difference to the daily lives of people in our communities including the socially isolated, the lonely, victims of domestic abuse, and the wider community" (Worcester Community Trust, 2026). Each of these hubs is located in an area of deprivation, which is defined as a location where people's needs are unmet due to a lack of opportunities and resources (*Glossary*, n.d.).

Another organization focused on addressing the physiological impacts of heat events is the School of Sports and Medicine at the University of Worcester. Dr Jessica Mee conducts research on the effects of heat on the human body, as well as research on different methods to prepare one's body for extreme heat events. Both organizations have a vested interest in creating and distributing resources to help the Worcester community in their efforts to address extreme heat events. However, what these organizations lack is the ability to gather data on people's responses and experiences. As such, the team aimed to fill that gap by interviewing and surveying Worcester residents to gather and analyze data.

3.0 Methodology

The goal of this project was to establish a baseline understanding of how the Worcester public perceives and manages the mental and physical health risks of extreme heat events. The team also provided the University of Worcester with recommendations on how to best educate the public on mitigating the effects of heatwaves.

We identified five key objectives required to complete this goal:

1. Investigate how heatwaves are addressed globally
2. Identify what heat-related services and resources are provided to UK residents by the government and other organizations
3. Document actions that Worcester residents are taking to mitigate the effects of extreme heat events
4. Evaluate potential best heat mitigation practices for Worcester residents in collaboration with the sponsors
5. Identify the best delivery methods for providing information to the public

3.1 Investigate how heatwaves are addressed globally

To reach this objective, the team conducted a review of heatwave mitigation strategies from a range of international contexts by drawing on government policy and guidance as well as news reports provided within a variety of cities through archival research. Through this research, the team identified best practices from these locations and highlighted key differences based on climate.

3.2 Identify what heat-related services and resources are provided to UK residents by the government and other organizations

To meet this objective, the team conducted archival research on the heat management resources provided by the Worcester City Council, the Worcester County Council, and by the

national government. This archival research identified the resources available to UK communities, including Worcester residents. Additionally, the team conducted semi-structured sponsor interviews to identify additional resources that may have been missed in the archival research and to explore how these policies and resources are implemented in practice, as well as to identify any gaps or challenges not evident in document review. Sample questions for these interviews can be found in Appendix A.

3.3 Document actions that Worcester residents are taking to mitigate the effects of extreme heat events

To address this objective, the team collected data via surveys with Worcester residents. Specifically, the team conducted these data collection activities online and in-person at the community hubs operated by the Worcester Community Trust as well as at a local Earth Day Celebration to ensure data collection from a diverse range of participants. The Earth Day Celebration was an event hosted by the Worcestershire City Council and the University of Worcester to promote awareness about sustainability. Meanwhile, the surveys were offered for in-person completion at community hubs, the University of Worcester Campus, and The Hive library. These locations provided access to locals with firsthand experience of heat-related challenges and offered valuable insight into the cooling methods they find most effective. By directly engaging with the affected population, the team used these methods to gather detailed data on first-hand experiences that are relevant to the community the team aims to support. The general survey can be found in Appendix B, and a specialized one for nurses in Appendix C. For participants' safety, all surveys were conducted with the informed consent statements in Appendices D and E. In addition, the team attended the Worcester City Council Landlord Forum to survey landlords about what they do to address their residents' heat-related issues. The introduction speech is in Appendix F, while the survey used is in Appendix G. The team also conducted landlord interviews with Sanctuary, a social housing group, and the questions can be found in Appendix H.

3.4 Evaluate potential best heat mitigation practices for Worcester residents in collaboration with the sponsors

To achieve this objective, the team compiled and analyzed data from the previous methods. The team then identified which heat mitigation strategies are most easily implementable and financially viable for different demographics. This approach was chosen based on previous studies on heat adaptation (Takacs et al., 2025). From there, the team reviewed the data with the sponsors to further understand the circumstances faced by Worcester residents and determine the most appropriate and practical responses to potential heat events.

3.5 Identify the best delivery methods for providing information to the public

To achieve this objective, the team determined effective ways to inform the Worcester public about the effects of extreme heat by investigating and documenting how various countries and cities around the world inform their citizens. Data analysis and archival research cataloged information campaigns from various cities in response to extreme weather events. The team reviewed various methods for cataloging how information has previously been distributed, then identified the methods that have proven most effective for the adoption of proposed techniques.

4.0 Results and Key Findings

This chapter discusses the results and findings of the project objectives proposed in Section 3.0. For our first three objectives, which focused on government and public response, we organized the results by spheres of influence, starting at the individual level and expanding to the community and then governmental levels. These results were achieved using archival research, surveys, and interviews. For the last two objectives, which focused on best practices and information distribution, we organized the results into a single category. These results came from archival research and data analysis. These findings were used to form recommendations that the Worcester Community Trust and the School of Sport and Exercise Science at the University of Worcester can use to inform the public.

4.1 Findings at the Individual Level

The surveys the team used to complete Objective 3 (surveying the Worcester public about heatwaves) revealed important inconsistencies in individuals' opinions about heatwaves. Of the surveyed residents, 49.7% believed they were unaffected by heatwaves, as seen in Figure 5, but when given specific examples, the majority said they were affected in certain ways. For example, Figure 6 shows that 77.5% of respondents who didn't believe they were affected by heatwaves said their sleep quality was negatively impacted. This shows a disconnect with the survey responses, where individuals do not realize they are affected by heatwaves until asked about specific aspects, such as sleep. This suggests that when respondents are asked about being affected by heatwaves, they are thinking of major health effects that would require hospitalization and failing to consider the smaller impacts on their lives.

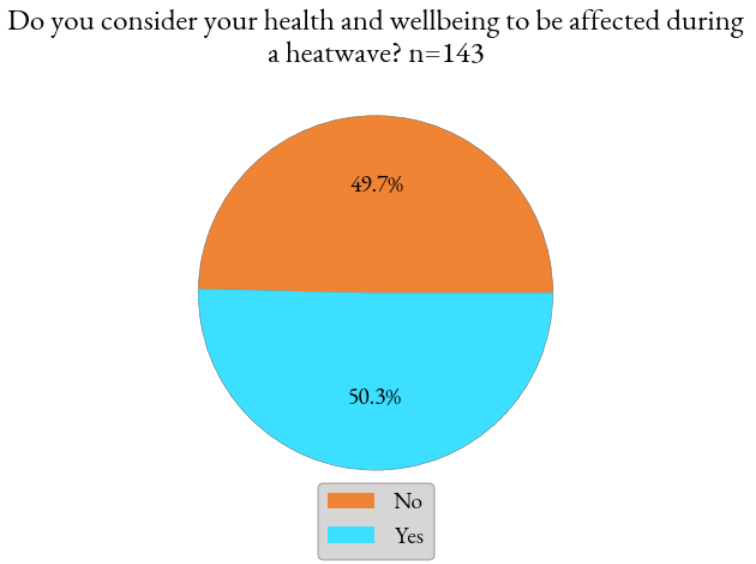

Figure 5. Pie chart illustrating responses for if their health is affected by heatwaves

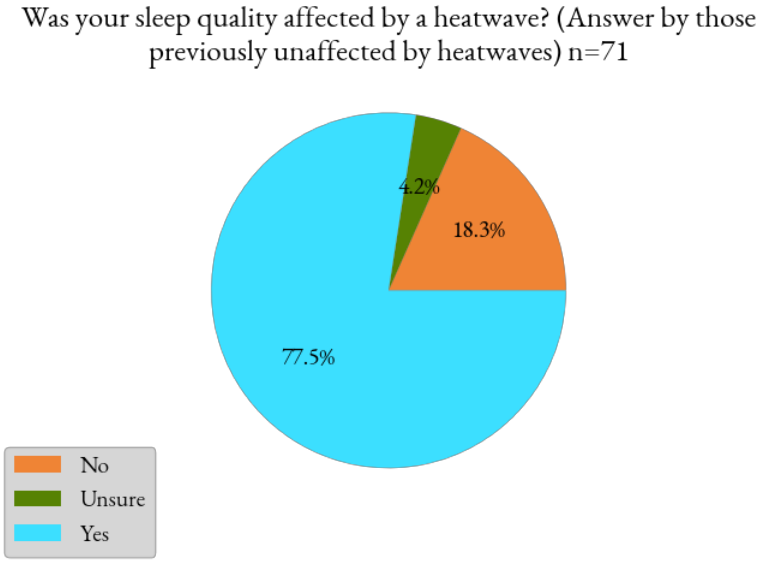

Figure 6. Pie chart illustrating the sleep quality of those who believed themselves unaffected by heatwaves

The overall breakdown of how people were affected by heatwaves is seen in Figure 7. A noteworthy finding from the general survey demonstrated that 26.57% of respondents believed that they had suffered heat stroke symptoms and 53.85% believed they had suffered heat exhaustion symptoms during heatwaves. These numbers are extremely high in comparison to what was expected. For reference, on average, only 0.026% of Americans suffer from heat-related illnesses including both

heat exhaustion and heat stroke annually (Dring et al., 2022). This doesn't mean that the residents of Worcester are uniquely susceptible to heat-related illnesses but rather implies that many respondents are unaware of the specific criteria of heat exhaustion and heat stroke and likely confused these serious conditions with heat-induced fatigue. This also shows that there is a lack of education about the symptoms and effects of extreme heat among the Worcester population, which can lead to improper responses when they appear.

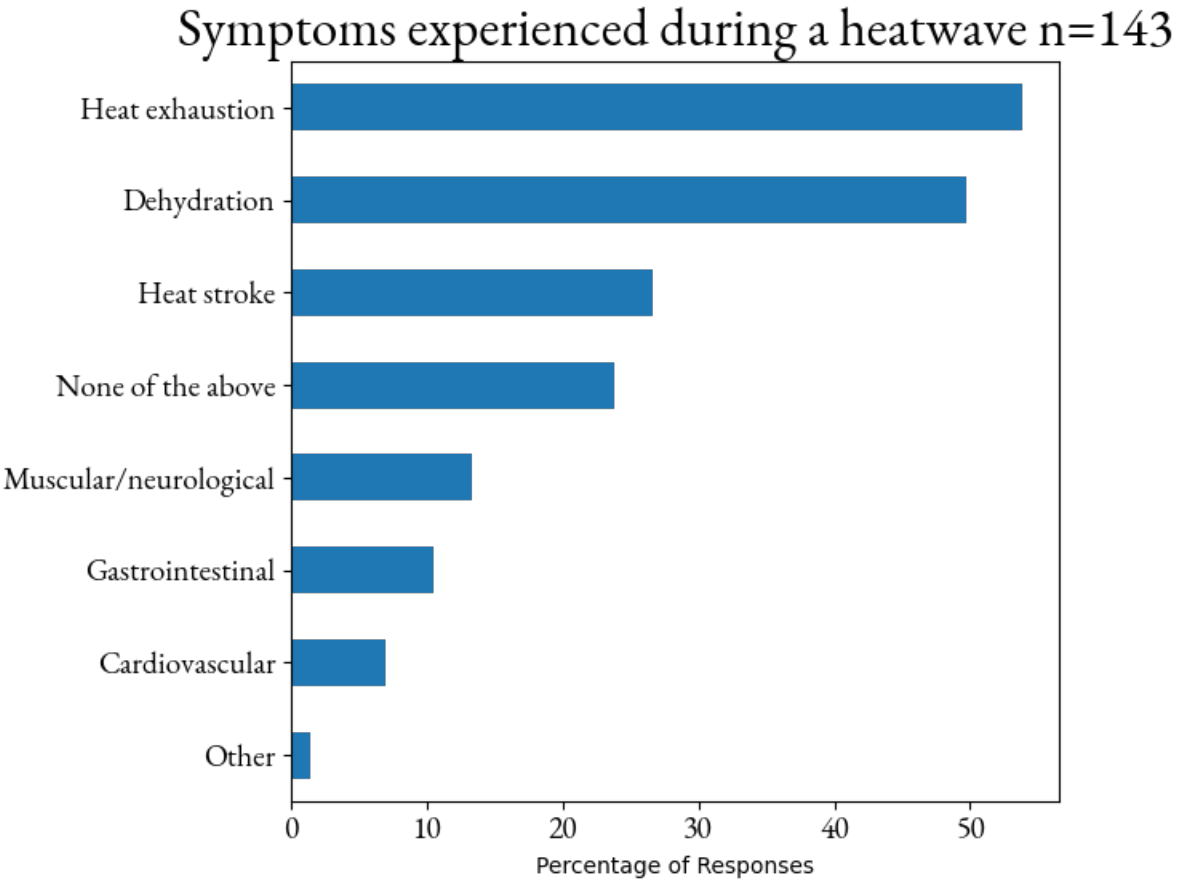

Figure 7. Bar chart illustrating symptoms experienced during heatwaves

Another point of interest was how far in advance people learned about future extreme heat events and the source of that information. The main places that people got their information about heatwaves were weather apps, word of mouth, and social media, as seen in Figure 8. This told the team

what methods of outreach were the most effective in informing the community. Additionally, 42% of respondents reported finding out about heatwaves between 0-2 days in advance, which can be dangerous, as it does not grant the individual much time to prepare for the extreme heat event. The breakdown of the responses can be seen in Figure 9.

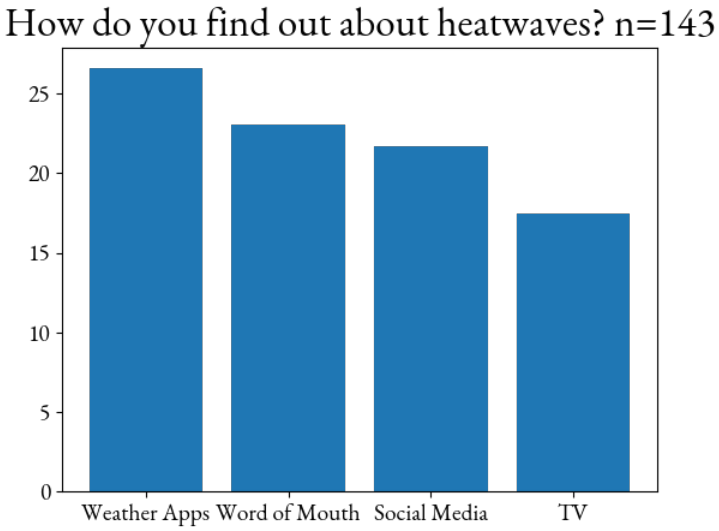

Figure 8. Bar chart illustrating the leading ways people learn about heatwaves

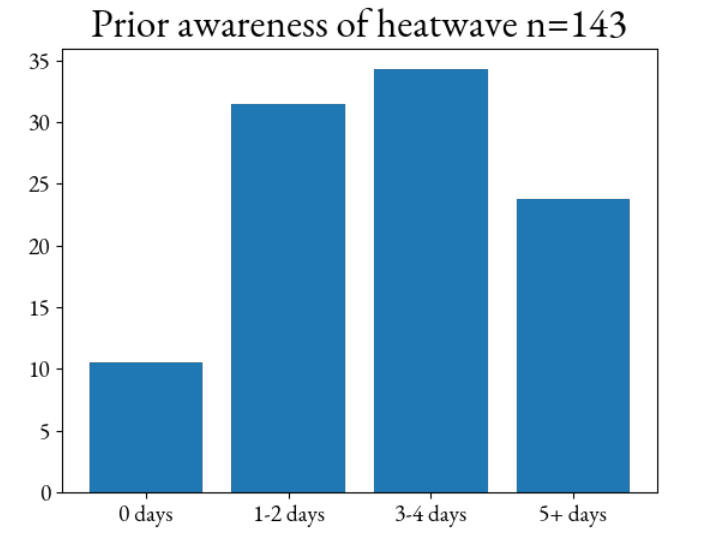

Figure 9. Bar chart illustrating how far in advance people find out about heatwaves

When we asked respondents which mitigation techniques were effective in keeping them cool during a heatwave, common responses included staying hydrated, opening windows, taking breaks, staying in the shade, and using personal fans. However, when asked about what techniques were ineffective, the common responses also included opening windows, closing blinds, and using personal fans. This highlights a key issue with the public's lack of understanding of the proper use and implementation of heat mitigation methods to keep themselves cool and safe during extreme heat events.

4.2 Findings at the Community Level

Due to the health risks that extreme heat poses, community organizations have begun taking action to help vulnerable residents. Through the team's interview and research conducted for Objective 2 (Identify what heat related services and resources are provided to UK residents by the government and other organizations), the team identified a few of these resources, such as infographics produced by the Worcestershire County Council and Worcester City Council. The infographics provide basic guidance such as telling people to hydrate and check in on neighbors. The resources provided by the county also redirected to the UK Government or National Health Service websites, while the resources provided by the city did not. Additionally, the official Worcester Facebook page creates posts to inform the public about what to do during hot weather, shown in Figure 10. However, these posts appear to have had minimal reach within the community, which is likely another reason for the lack of information about the dangers of heat and how to stay cool.

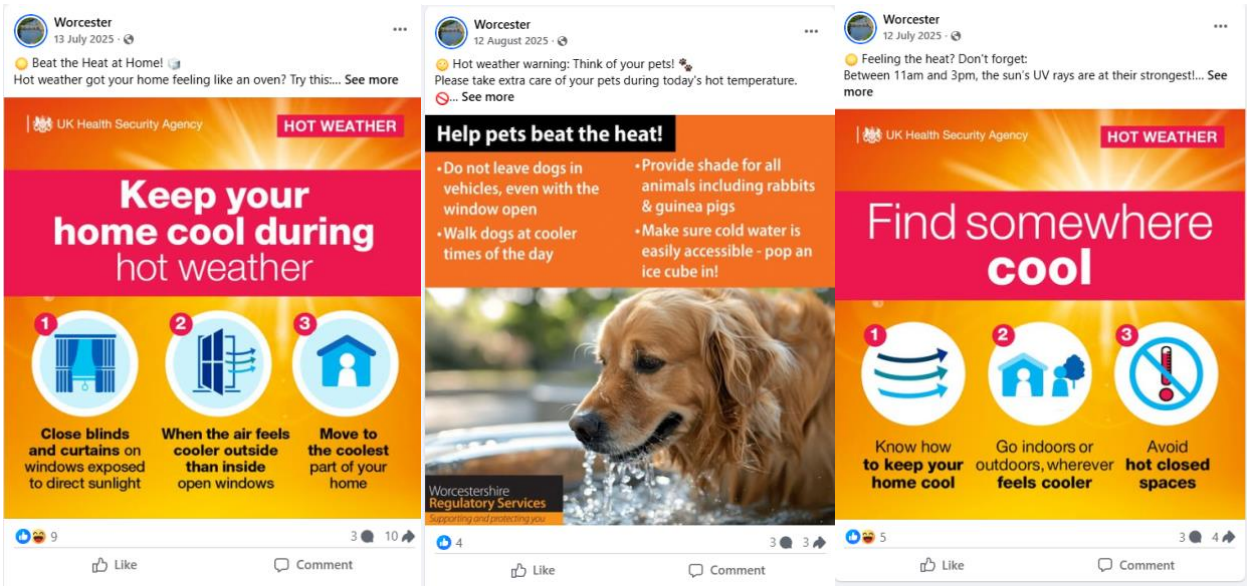

Figure 10. Heat advisory posts on the Worcester Facebook page (Worcester | Worcester | Facebook)

This lack of information is further reinforced by the surveys conducted for Objective 3. As seen in Figure 11, only 8.4% of Worcester residents know of any community resources available to them. When asked what these resources were, they identified only cool spaces and water provided at outdoor events, with other answers being emergency services or unsure.

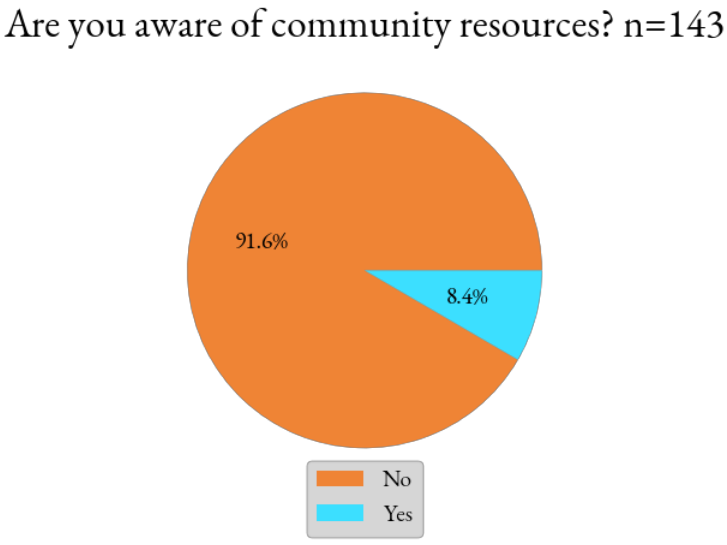

Figure 11. Pie chart illustrating awareness of community resources for heatwaves

Later, when asked about what resources they wanted to see in the community, there were a few key trends. Firstly, people want to see support for the homeless, the elderly, and other vulnerable groups. This stems from a general concern about their ability to stay cool and safe in extreme heat. Secondly, there was a trend toward the provision of free water or hydration stations. Lastly, there was a trend for wanting air conditioning in more buildings or places with air conditioning to be more accessible so that people could have dedicated places to cool off.

4.3 Findings at the Government and Housing Level

With communities feeling the effects of extreme heat events, government and housing organizations are naturally the next to be concerned about heat. Through the team's research for Objective 2 (Identify what heat related services and resources are provided to UK residents by the government and other organizations), it was identified that the UK Government, the MET Office, and National Health Service's websites have a substantial number of resources available to the public, including heat-health alert services, however, many of them are hidden behind multiple links within other websites or require the user to manually search for the relevant heat-related guidance in a search engine. This limits the public's ability to easily inform themselves, which may be the cause of the trends found in the survey.

This lack of accessibility is reflected in the findings of Objective 3, where the survey results highlighted that much of the community was unaware of resources available to them, and only 22.4% have accessed the UK Government's official website.

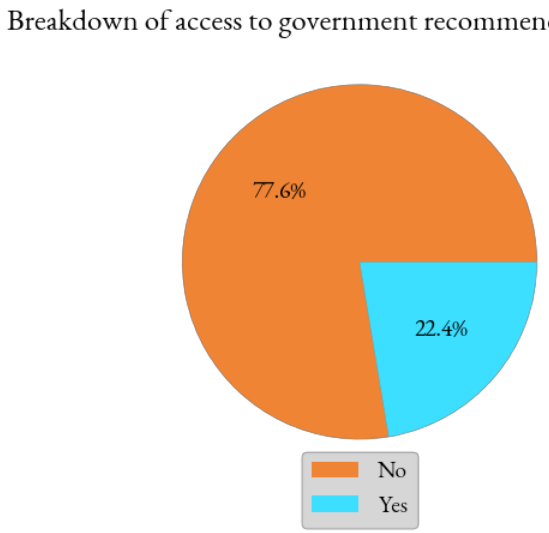

Figure 12. Pie chart illustrating how many people access official guidance

As demonstrated by Figure 13, 35% of surveyed Worcestershire residents live in rented housing, meaning landlords have a significant impact in the mitigation of extreme heat events for their tenants. This is a complex factor because due to changes in UK Government and Parliamentary policy, landlords and housing associations have a stricter protocol to follow when it comes to heat mitigation for newly built housing. However, there is no financial incentive or legal requirement to bring the large quantity of existing housing up to the same standard.

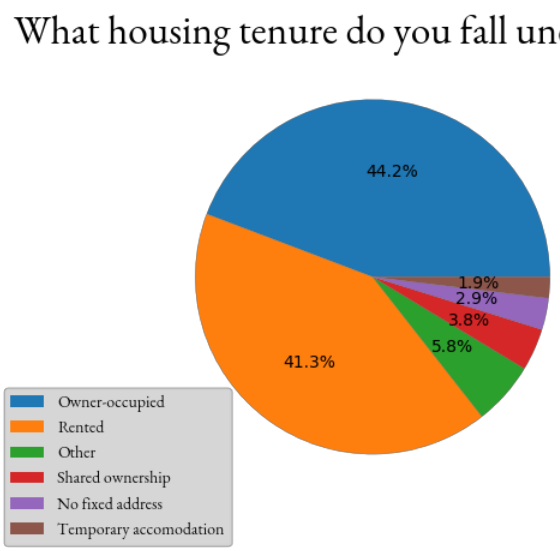

Figure 13. Pie chart illustrating housing tenure of residents

To achieve Objective 3, the team attended a forum for landlords at the Worcester Guildhall on March 26th, 2026, which was organized by the Worcester City Council. While the data the team collected was insufficient to make a statistically significant claim, the trend the team identified, as shown in Figure 14, demonstrated that individual landlords have not considered installing heat-mitigating devices within their properties.

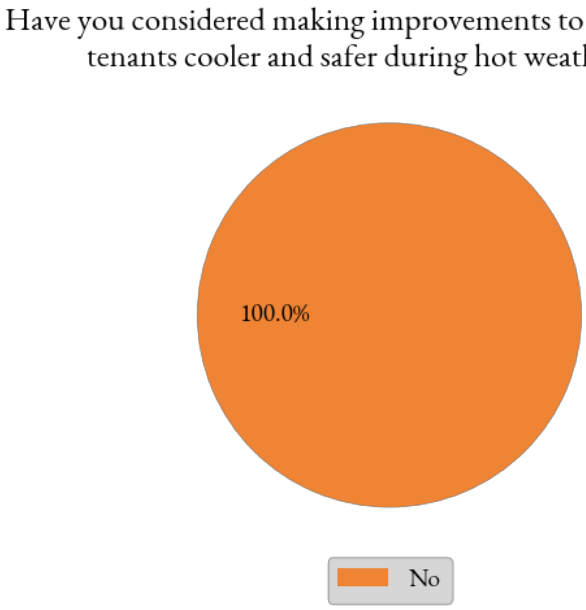

Figure 14. Pie chart illustrating small landlords' willingness to make improvements to keep properties cool

Additionally, during an interview on April 22, 2026 held with Sanctuary Housing Association, a major housing provider for the UK, a representative from Sanctuary stated that "the government provides a large grant funded for energy efficiency and they have said that in the Warm Homes programs they are looking to also use the fund for overheating prevention and mitigation measures to be improved." However, at this time this fund cannot cover improvements to cooling. Additionally, Sanctuary has considered the installation of devices such as external shutters or awnings to their existing properties, however as previously stated, currently there are no government grants which cover these options, which means that Sanctuary and individual landlords would be required to finance these changes themselves. This lack of incentive significantly reduces the likelihood of these parties taking these actions.

The team also identified that some landlords do view heatwaves as a rising issue, particularly within vulnerable portions of the population. A Sanctuary representative stated that "within the UK, as heatwaves become more prevalent, we will need to deal with the education of them much better, as we are not very good as a country at knowing how to keep our homes cool, which I believe will need to be changed in the future." Additionally, within Sanctuary's care home portion of their properties, much more action is being taken to address the effects of heatwaves on their residents. A Sanctuary representative stated that "within our care homes, we have specific heatwave risk assessments and hopefully we can learn at what works really well and apply it elsewhere," demonstrating that actions being taken within these care homes are being considered for their other properties.

4.4 Best Practices

To identify strategies that may be missing within the UK, the team examined what is occurring in cities that have already adapted to heatwaves. To complete Objective 1 (Investigate how heatwaves are addressed globally), archival research was conducted to identify what primary techniques were being used in other cities worldwide during heatwaves. These findings were compiled and can be found in Figure 15. The results demonstrate significant overlap between cities in different locations. The team found that the most common method being used in other heatwave-affected cities was

implementing weather alert systems, with air conditioning being the second most common, and cool roofing, urban green spaces, and cooling centers tied for the third most common. While very effective in other locations, some of these methods cannot be carried over to Worcester at the same level of effectiveness, due to numerous barriers such as power grid availability, inability to make significant modifications to existing buildings, and lack of space for new heat-mitigating infrastructure. Some methods currently being utilized in Worcester that were found in other cities consist of weather alerts and community outreach. However, identifying effective strategies alone is not sufficient if these measures are not clearly communicated to the public; therefore, it is equally important to consider how this information is presented to ensure both awareness and engagement.

Heat Mitigation Method	**Cities**
Cool Roofing	Phoenix, USA; Washington, DC, USA; Dhaka, Bangladesh
Air Conditioning	Phoenix, USA; Syndey, Australia; Accra, Ghana; New Orleans, USA
Weather Alerts	Phoenix, USA; Sydney, Australia; Berlin, Germany; Washington, DC, USA; New Orleans, USA
Urban Green Space	Accra, Ghana; New Delhi, India; Paris, France
Cooling Centers	Washington, DC, USA; Madrid, Spain; Dhaka, Bangladesh

Figure 15. Heat mitigation techniques found in other cities

To complete Objective 5 (Identify the best delivery methods for providing information to the public), the team conducted archival research into what methods of presenting information would be the most effective at relaying guidance based on the team's research to the public. There were three primary methods of presenting information that were found to be the most effective; those being

infographics (Spicer & Coleman, 2022), posters (Miller, 2007), and social media campaigns (Ozkent, 2022). Posters have the potential for wide and easy distribution, as they are able to be left up in one location for long periods of time with little intervention. On the other hand, social media campaigns are able to go viral and reach the maximum number of people. However, upon further investigation it was identified that the best method of spreading medical and health advice to the public was in the format of an infographic, particularly combined with a poster, due to its ability to present information in an easy to follow yet visually appealing format.

4.5 Limitations

The team faced multiple limitations that impacted the results of this project. One factor was that the project took place between March and May, meaning the UK was just getting out of the cold season. This resulted in Worcester residents being less enthusiastic about taking a survey about heatwaves, as it was not viewed as relevant at the time. Additionally, due to the large number of health-related questions presented in the "Heatwave Effects on Daily Life" section of the survey, a large proportion of potential respondents dropped out of the survey. While this data was necessary, shorter surveys may have had a higher completion rate.

5.0 Recommendations & Conclusions

This chapter discusses the team's recommendations on how to assist residents in staying cool and safe based on survey, research, and interview results. It also discusses future research considerations and opportunities for working on heat mitigation in Worcester.

5.1 Recommendations

The team's research culminated in three key recommendations that the Worcester City Council, the University of Worcester, and the Worcester Community Trust could implement to aid in their ongoing efforts to mitigate the effects of extreme heat events.

1) Design and spread information campaigns to inform the public about the risks associated with heat, and heat mitigation techniques

A common trend seen by the team was a lack of public understanding of heat-related illnesses and their symptoms, as well as how to properly use heat-mitigating techniques. As temperatures continue to rise, it becomes more necessary to properly inform residents about how to stay safe. One good way would be to create and promote more infographics that incorporate or redirect to guidance from the UK Government, MET Office, or National Health Service, an example of which can be seen in Appendix I. Another way could be to add this information to reports in weather apps and social media posts, as those are the most prominently used information sources in Worcester.

2) Establish cooling centers and create a map for the city

Another way to aid residents during extreme heat events is the establishment of dedicated cooling centers. Existing infrastructure could also be converted into cooling centers during extreme heat events. With the designation of cooling centers, it is important to have an accessible, up-to-date map for residents to locate them and find their hours of operation.

3) Push for government incentives for homeowners/landlords to make their buildings more heat resistant

Due to a lack of government incentives, such as grants or tax breaks, landlords are not incentivized to prepare their properties for extreme heat events. Currently, UK Government policy does not cover the preparation of homes for heatwaves, which results in a lack of initiative from landlords. In the Future Homes and Buildings Standard specified in Section O, there will be requirements starting in 2027 for new homes to be built with proper ventilation and passive cooling infrastructure. However, this does not address existing properties, leaving a large portion of the population not covered in this new legislation.

5.2 Further Research

This project has multiple opportunities for further research to be conducted on the topic of mitigating the effects of extreme heat events within Worcester. These projects could be done individually or in collaboration with other organizations.

1) Conduct baseline surveying of the Worcester public during or after an extreme heat event

More research should be conducted when extreme heat events are prominent in people's minds. As noted in our limitations, the team's research covered a baseline of the public's understanding when extreme heat was out of the public's focus, and it is important to see how this understanding shifts when extreme heat is a prominent issue. Future studies should also consider alternative ways to ask about pre-existing medical conditions, as this was a major point of dropout for survey participants.

2) Identify infrastructure across the city that could be converted to cooling centers

An analysis should be conducted of the city's existing infrastructure to identify buildings that could be transformed into cooling centers. This could include identifying locations that can already act as cooling centers, or the efforts required to convert a location into a cooling center. This study should also identify areas that are deprived of cooling centers and propose potential solutions.

5.3 Conclusion

In conclusion, the team's findings reveal a lack of preparedness for the impact of extreme heat events, alongside limited awareness of guidance and community resources. Individuals displayed a lack of comprehension of the symptoms of heat-related illnesses and effective mitigation techniques. When it comes to government guidance, existing resources and strategies are underutilized due to poor communication and accessibility. Additionally, efforts to modify housing and other existing infrastructure face financial limitations. Overall, improving education, resource visibility, and support for vulnerable groups is essential to prepare and protect the public against the increasing dangers posed by heatwaves.

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Appendices

Appendix A: Sponsor Interview Questions

Appendix A is the script and questions that was used in a sponsor interview with Dr Jessica Mee to complete Objective 2 (Identify what heat-related services and resources are provided to UK residents by the government and other organizations).

Preamble:

This interview is being conducted to gather insights from the sponsors on current heat-related policies and community responses in Worcester. This will support the identification of existing gaps and opportunities for improving engagement and heat mitigation strategies.

Please find the attached informed consent statement in Appendix D.

Questions:

All questions will be posed, but depending on the flow of conversation, the order may change to promote a more free -flowing conversation.

1. Can you briefly describe your occupation and role in supporting the community during heat events?
2. What heat-related services or resources are currently available to Worcester residents?
3. How are those services communicated to the public?
4. In your experience, how does the community typically respond to heat events?
5. What challenges have you observed or experienced in engaging the public with heat mitigation strategies?
6. Are there particular groups within the community who you perceive as more vulnerable?
7. Are there particular groups within the community who are harder to reach?

8. What gaps do you perceive in current support for community members in heat events?
9. What improvements or additional measures would you recommend to better support Worcester residents during extreme heat events?

Appendix B: Community Survey Questions

Appendix B is the general survey that was used to collect data for Objective 3 (Document actions that Worcester residents are taking to mitigate the effects of extreme heat events). These questions were created in collaboration with Dr Jessica Mee to gather experience and demographic based data.

These questions are designed to determine the circumstances of community members and to provide information on the effects of extreme heat events on them. This will help us develop resources to assist community members during extreme heat events. A heatwave is defined as a prolonged period of hot weather relative to a region's expected conditions. A heatwave lasts at least three days, whereas a heat event is a singular day of heightened temperatures. The designation of a heatwave is relative to a location's normal temperatures and, as such, cannot be compared to high temperatures in another location, as the level of "normal" can differ. Your data will be stored anonymously, and no personally identifiable information will be collected. By continuing, you agree that you are over the age of 18 and that you wish to participate in our study. Attached is the informed consent statement in Appendix E.

1. Do you agree to partake in the study?
    - Yes

Heatwave Information and Warning

Understanding how people receive information about heatwaves helps us see how warnings reach different communities. On this page, we'd like to know how you usually find out about heatwaves and the sources of information you rely on.

2. How soon before a heatwave do you generally find out that it is coming?

   0 days 1-2 days 3-4 days 5+ days
3. What is your primary source for finding out about heatwaves before they happen?
    - TV weather reports
    - Radio
    - Weather apps
    - Social Media

- News articles (online)
- News articles (paper)
- Official alerts (e.g. government or weather warnings)
- Word of mouth (Family, friends)
- I do not usually receive information about heatwaves
- Other [text box]

4. Are you aware of resources provided by the community during a heatwave?
    - Yes
    - No
5. Please describe any local community resources, support, or services you are aware of that can help people during a heatwave. [text box]
6. Have you accessed the Public Health England / UK Health Security Agency's guidance on staying safe in hot weather?
    - Yes
    - No
7. What efforts would you like to see your community make to assist during heatwaves?

Heatwave Effects on Daily Life

Extreme heat can influence a range of daily activities, including sleep, wellbeing, work, and caring responsibilities. This section asks about the ways heatwaves impact your daily life.

8. A range of clinical conditions can increase a person's vulnerability during a heatwave. Please select any that apply to you:
    - Cardiovascular disease
    - History of cancer
    - Multiple sclerosis
    - Mental health disorder (e.g. anxiety, depression, PTSD, etc.)
    - Neurological condition
    - Obesity

- Physical disability
- Reparatory disease
- None of the above
- Prefer not to answer
- Other (please specify)

9. Do any of the following make it difficult for you to cope during a heatwave?
    - Caring responsibilities (e.g. young children, dependents)
    - Limited mobility or physical disability
    - Health conditions that make heat harder to manage
    - Work commitments (e.g. cannot change schedule or location)
    - Financial constraints (e.g. cost of cooling, travel)
    - Housing conditions (e.g. unable to keep home cool)
    - Lack of access to cooler or shaded spaces
    - Lack of information or warning about heatwaves
    - Nothing limits my ability
    - Other (please specify)
10. Do you consider your health and wellbeing to be affected during a heatwave?
    - Yes
    - No
11. Have you ever experienced any of the following symptoms during a heatwave? Please select all answers that apply.
    - Heat stroke symptoms (e.g. very high temperature, confusion fainting, or feeling very unwell)
    - Heat exhausting symptoms (e.g. feeling very weak, dizzy, nauseous, or sweaty)
    - Dehydration symptoms (e.g. dark urine, very thirsty, dry mouth)
    - Cardiovascular symptoms (e.g. rapid heart rate, chest pain tightness, fainting)
    - Muscular / Neurological symptoms (e.g. muscle cramps, fatigue, weakness, headaches)

- Gastrointestinal symptoms (e.g. nausea vomiting, diarrhea, loss of appetite)
- None of the above
- Other (please specify)

12. Do you perceive your sleep quality to be affected during heatwaves?
    - Yes
    - No
    - Unsure
13. How do heatwaves affect your ability to do normal activities caring for family / children / working, etc.? [textbox]
14. During a heatwave, which of the following aspects are affected? Select all that apply
    - Ability to concentrate or focus
    - Physical presence
    - Productivity or efficiency
    - Workload management (tasks take longer)
    - None of the above
    - Other (please specify)
15. What techniques have you found **effective** to mitigate the effects of heatwaves? [textbox]
16. What techniques have you found **ineffective** in mitigating the effects of heatwaves? [textbox]

Participant Characteristic

We will now ask a few questions about your personal characteristics. This information will help us understand how perceptions of heatwaves may vary across different groups and identify important trends in vulnerability and experience

17. What is your biological sex?
    - Male
    - Female
    - Prefer not to say

18. What is your age?
    - Under 18
    - 18-24 years
    - 25-34 years
    - 35-44 years
    - 45-54 years
    - 55-64 years
    - 65 years and over
    - Prefer not to say
19. What is your ethnicity?
    - Asian or Asian British
    - Black, Black British, Caribbean or African
    - Mixed or multiple ethnic groups
    - White
    - Prefer not to say
    - Other [text box]
20. How long have you lived in the UK? [Drop down]
    - Under 1 year
    - 1-3 years
    - 3-5 years
    - 5-7 years
    - 7-9 years
    - 10+ years
    - Prefer not to say
21. What is the first half of your postal code? e.g. WR1 or WR11
22. What housing tenure do you fall under?
    - Owner-occupied

- Shared ownership
- Rented
- Temporary accommodation (e.g. hostel, shelter, emergency or council-provided housing)
- No fixed address
- Prefer not to answer
- Other [text box]

23. What access to outside space do you have?
    - No access to outside space
    - Access to outside space that is shared
    - Access to a private garden
    - Access to a balcony
    - Other (please specify)

Thank you!

Thank you for taking the time to complete this survey.

Your responses will help us better understand how heatwaves affect people and how communities can support those most at risk. We really appreciate your input.

If you would be interested in a follow up-survey about new heat mitigation techniques please fill out [link to second survey asking for an email address]

Appendix C: Nurse Survey

Appendix C is the survey that was sent out in a mass email chain to 1st,2nd,and 3rd year nursing students at the University Of Worcester. One additional question was added from the general survey aimed at collecting responses tailored to caring for patients.

These questions are designed to determine the circumstances of community members and to provide information on the effects of extreme heat events on them. This will help us develop resources to assist community members during extreme heat events. A heatwave is defined as a prolonged period of hot weather relative to a region's expected conditions. A heatwave lasts at least three days, whereas a heat event is a singular day of heightened temperatures. The designation of a heatwave is relative to a location's normal temperatures and, as such, cannot be compared to high temperatures in another location, as the level of "normal" can differ. Your data will be stored anonymously, and no personally identifiable information will be collected. By continuing, you agree that you are over the age of 18 and that you wish to participate in our study. Attached is the informed consent statement in Appendix E.

1. Do you agree to partake in the study?
    - Yes

Heatwave Information and Warning

Understanding how people receive information about heatwaves helps us see how warnings reach different communities. On this page, we'd like to know how you usually find out about heatwaves and the sources of information you rely on.

2. How soon before a heatwave do you generally find out that it is coming?

0 days 1-2 days 3-4 days 5+ days

3. What is your primary source for finding out about heatwaves before they happen?
    - TV weather reports
    - Radio
    - Weather apps
    - Social Media

- News articles (online)
- News articles (paper)
- Official alerts (e.g. government or weather warnings)
- Word of mouth (Family, friends)
- I do not usually receive information about heatwaves
- Other [text box]

4. Are you aware of resources provided by the community during a heatwave?
    - Yes
    - No
5. Please describe any local community resources, support, or services you are aware of that can help people during a heatwave. [text box]
6. Have you accessed the Public Health England / UK Health Security Agency's guidance on staying safe in hot weather?
    - Yes
    - No
7. What efforts would you like to see your community make to assist during heatwaves?

Heatwave Effects on Daily Life

Extreme heat can influence a range of daily activities, including sleep, wellbeing, work, and caring responsibilities. This section asks about the ways heatwaves impact your daily life.

8. A range of clinical conditions can increase a person's vulnerability during a heatwave. Please select any that apply to you:
    - Cardiovascular disease
    - History of cancer
    - Multiple sclerosis
    - Mental health disorder (e.g. anxiety, depression, PTSD, etc.)

- Neurological condition
- Obesity
- Physical disability
- Reparatory disease
- None of the above
- Prefer not to answer
- Other (please specify)

9. Do any of the following make it difficult for you to cope during a heatwave?

   - Caring responsibilities (e.g. young children, dependents)
   - Limited mobility or physical disability
   - Health conditions that make heat harder to manage
   - Work commitments (e.g. cannot change schedule or location)
   - Financial constraints (e.g. cost of cooling, travel)
   - Housing conditions (e.g. unable to keep home cool)
   - Lack of access to cooler or shaded spaces
   - Lack of information or warning about heatwaves
   - Nothing limits my ability
   - Other (please specify)

10. Do you consider your health and wellbeing to be affected during a heatwave?

    - Yes
    - No

11. Have you ever experienced any of the following symptoms during a heatwave? Please select all answers that apply.

- Heat stroke symptoms (e.g. very high temperature, confusion fainting, or feeling very unwell)
- Heat exhausting symptoms (e.g. feeling very weak, dizzy, nauseous, or sweaty)
- Dehydration symptoms (e.g. dark urine, very thirsty, dry mouth)
- Cardiovascular symptoms (e.g. rapid heart rate, chest pain tightness, fainting)
- Muscular / Neurological symptoms (e.g. muscle cramps, fatigue, weakness, headaches)
- Gastrointestinal symptoms (e.g. nausea vomiting, diarrhea, loss of appetite)
- None of the above
- Other (please specify)

12. Do you perceive your sleep quality to be affected during heatwaves?

    - Yes
    - No
    - Unsure

13. How do heatwaves affect your ability to do normal activities caring for family / children / working, etc.? [textbox]
14. During a heatwave, which of the following aspects are affected? Select all that apply

    - Ability to concentrate or focus
    - Physical presence
    - Productivity or efficiency
    - Workload management (tasks take longer)
    - None of the above
    - Other (please specify)

15. What techniques have you found **effective** to mitigate the effects of heatwaves? [textbox]

16. What techniques have you found **ineffective** in mitigating the effects of heatwaves? [textbox]
17. If you have clinical experience, please elaborate on your experience caring for patience during heatwaves [textbox]

Participant Characteristic

We will now ask a few questions about your personal characteristics. This information will help us understand how perceptions of heatwaves may vary across different groups and identify important trends in vulnerability and experience

18. What is your biological sex?
    - Male
    - Female
    - Prefer not to say
19. What is your age?
    - Under 18
    - 18-24 years
    - 25-34 years
    - 35-44 years
    - 45-54 years
    - 55-64 years
    - 65 years and over
    - Prefer not to say
20. What is your ethnicity?
    - Asian or Asian British
    - Black, Black British, Caribbean or African
    - Mixed or multiple ethnic groups
    - White

- Prefer not to say
- Other [text box]

21. How long have you lived in the UK? [Drop down]
    - Under 1 year
    - 1-3 years
    - 3-5 years
    - 5-7 years
    - 7-9 years
    - 10+ years
    - Prefer not to say
22. What is the first half of your postal code? e.g. WR1 or WR11
23. What housing tenure do you fall under?
    - Owner-occupied
    - Shared ownership
    - Rented
    - Temporary accommodation (e.g. hostel, shelter, emergency or council-provided housing)
    - No fixed address
    - Prefer not to answer
    - Other [text box]
24. What access to outside space do you have?
    - No access to outside space
    - Access to outside space that is shared
    - Access to a private garden
    - Access to a balcony
    - Other (please specify)

Thank you!

Thank you for taking the time to complete this survey.

Your responses will help us better understand how heatwaves affect people and how communities can support those most at risk. We really appreciate your input.

If you would be interested in a follow up-survey about new heat mitigation techniques please fill out [link to second survey asking for an email address]

Appendix D: Interview and Focus Group Informed Consent Form

Appendix D is the informed consent form that was provided at the beginning of the team's interviews and focus groups.

The following is the consent form presented to all study participants.

Informed Consent Agreement for Participation in a Research Study

Investigators: Gavin Hamburg, Tucker Johnson, Adam Jusczak, Nicolas Kishchenko, Linda Looft, Althea Danielski, Worcester Polytechnic Institute

Contact Information: gr-uk26heat@wpi.edu

Title of Research Study: Supporting the Worcester Community in Mitigating the Effects of Extreme Heat Events

Sponsors: Worcester Community Trust; University of Worcester, Sports and Exercise Science

Introduction:

You are being asked to participate in a research study focused on heatwaves. Before you agree to participate, we need to inform you about the purpose, procedures, and risks possessed by participating in the study. This form provides all the information needed to make an informed choice about your decision to participate in the study.

Purpose of the study:

The purpose of our study is to learn more about the techniques used to mitigate the effects of heatwaves and about past experiences with them. This data will allow future groups to design resources to assist with heatwaves.

Procedures to be followed:

This interview should take no longer than 30 minutes, and the information gathered will be used in pie charts and quotations; no direct names will be used in the report, and you will be referred to as a community member attending a Worcester Community Trust center.

Risks to study participants: There are no known risks to partaking in this interview. However, there may be topics you do not feel comfortable discussing. You may choose not to answer any question for any reason or stop participating at any time.

Benefits to research participants and others: By participating in this study, you help develop future resources to aid the community in mitigating heatwaves.

Record keeping and confidentiality: Data from this interview will be aggregated via jisc a platform used by the University of Worcester for creating and storing the results of surveys. Records of your participation in this study will be held confidential so far as permitted by law.

The study investigators, the sponsor or its designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. However, any publication or presentation of the data will not identify you.

Compensation or treatment in the event of injury:

Due to the minimal risk of injury or harm, no compensation or medical treatment will be available. You do not give up any of your legal rights by signing this statement.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact:

Gavin Hamburg, Tucker Johnson, Adam Jusczak, Nicolas Kishenko**,** Linda Looft, Althea Danielski, Email: gr-uk26heat@wpi.edu

Ruth McKeogh, Tel. 508 831-6699, Email: irb@wpi.edu

Gabriel Johnson, Tel. 508-831-4989, Email: gjohnson@wpi.edu

Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

By signing below, you acknowledge that you have been informed about and consent to be a participant in the study described above. Make sure that your questions are answered to your satisfaction before signing. You are entitled to retain a copy of this consent agreement.

_____ Date: _____

Study Participant Signature

_____

Study Participant Name (Please print)

Appendix E: Survey Informed Consent Form

Appendix E is the informed consent statement that was used for the general survey and nursing survey, which appeared at the beginning before participants were permitted to answer questions.

The following is the consent form presented to all study participants.

Informed Consent Agreement for Participation in a Research Study

Investigators: Gavin Hamburg, Tucker Johnson, Adam Jusczak, Nicolas Kishchenko, Linda Looft, Althea Danielski, Worcester Polytechnic Institute

Contact Information: gr-uk26heat@wpi.edu

Title of Research Study: Supporting the Worcester Community in Mitigating the Effects of Extreme Heat Events

Sponsors: Worcester Community Trust; University of Worcester, Sports and Exercise Science

Introduction:

You are being asked to participate in a research study focused on heatwaves. Before you agree to participate, we need to inform you about the purpose, procedures, and risks possessed by participating in the study. This form provides all the information needed to make an informed choice about your decision to participate in the study.

Purpose of the study:

The purpose of our study is to learn more about the techniques used to mitigate heatwaves and about past experiences with them. This data will allow future groups to design resources to assist with heatwaves.

Procedures to be followed:

This survey should take no longer than 15 minutes, and the information gathered will be used in pie charts and quotations; no direct names will be used in the report, and you will be referred to as a community member attending a Worcester Community Trust center.

Risks to study participants: There are no known risks to partaking in this interview. However, there may be topics you do not feel comfortable discussing. You may choose not to answer any question for any reason or stop participating at any time.

Benefits to research participants and others: By participating in this study, you help develop future resources to aid the community in mitigating heatwaves.

Record keeping and confidentiality: Data from this survey will be aggregated via jisc a platform used by the University of Worcester for creating and storing the results of surveys. Records of your participation in this study will be held confidential so far as permitted by law.
However, the study investigators, the sponsor or its designee and, under certain circumstances, the Worcester Polytechnic Institute Institutional Review Board (WPI IRB) will be able to inspect and have access to confidential data that identify you by name. Any publication or presentation of the data will not identify you.

Compensation or treatment in the event of injury:

Due to the minimal risk of injury or harm, no compensation or medical treatment will be available. You do not give up any of your legal rights by signing this statement.

For more information about this research or about the rights of research participants, or in case of research-related injury, contact:

Gavin Hamburg, Tucker Johnson, Adam Jusczak, Nicolas Kishchenko**,** Linda Looft, Althea Danielski, Email: gr-uk26heat@wpi.edu

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Your participation in this research is voluntary. Your refusal to participate will not result in any penalty to you or any loss of benefits to which you may otherwise be entitled. You may decide to stop participating in the research at any time without penalty or loss of other benefits. The project investigators retain the right to cancel or postpone the experimental procedures at any time they see fit.

Appendix F: Landlord Forum Intro

Appendix F is the script that was read to introduce the team to the landlord forum held at Guild Hall on March 26th, 2026.

Hello everyone, my name is Adam Jusczak, and I am an undergraduate mechanical engineering student studying at Worcester Polytechnic Institute, which is a university in Worcester, USA. Next to me are my colleagues…

Hand mic over to rest of team and they introduce themselves

My team and I are conducting research with the Worcester Community Trust and the School of Sport and Exercise Science at the University of Worcester to understand the impacts of heatwaves on Worcester residents. The goal of the project is to establish a baseline understanding of how the Worcester public perceives and manages the mental and physical health risks of extreme heat events. The way we are going to carry this out is by surveying the Worcester public on how they have dealt with heatwaves in the past, and what helpful resources they have access to. Today, we're hoping to learn more about what landlords are doing to keep their properties safe and comfortable for their tenants. Up on the screen will be a QR code for a quick anonymous survey. We would really appreciate it if you could take the time to fill this out as it would greatly help our understanding of what challenges you may face when trying to prepare for extreme heat. We appreciate your time and would be pleased to speak to you after this program. We will be at a table outside and welcome your questions, comments, or ideas. Thank you for your time

Appendix G: Landlord Survey

Appendix G is the survey that was presented to the attendees at the landlord forum at Guild Hall on March 26th , 2026.

We are a group of researchers from a university in the United States working with the University of Worcester and Worcester Community Trust to understand how heatwaves affect the community and how people manage these impacts. The specific goal of this survey is to understand the barriers that landlords face in implementing heat-mitigating technologies on their properties, as well as any incentives being offered by the government. The purpose of this survey is to understand the possibility for landlords to implement of various heat mitigation methods to aid residents in heatwaves.

A heatwave is defined as a prolonged period of hot weather relative to a region's expected conditions. A heatwave lasts at least three days, whereas a heat event is a singular day of heightened temperatures. A heatwave is defined relative to a location's normal temperatures and, as such, cannot be compared to high temperatures in another location, as the level of normal can differ.

We ask you to reflect on recent UK heat events such as:

1) July 2022, when the UK recorded its highest temperature (40.3°C in Coningsby, Lincolnshire)
2) Summer 2025, the warmest UK summer since records began in 1884, during which four heatwaves occurred**.**

Your data will be stored anonymously, and no personally identifiable information will be collected. By continuing, you agree to participate in our study.

1. What Worcester neighborhoods do you oversee property in?
2. Have you ever had residents complain about excessive heat in their homes?
    - Yes
    - No

3. Are you aware of any incentives from the UK Government to implement heat mitigation measures in your properties, such as air conditioning or external shutters?
4. What heat-related improvements have you made to your properties?
    - Shading
    - Blinds
    - Reflective Materials
    - Improved Insulation
    - Other
5. Have you considered making improvements to help keep your tenants cooler and safer during hot weather?
    - Yes
    - No
6. Do any of your properties use low carbon heating or cooling technologies (e.g. heat pumps)?
    - Yes
    - No
7. Do any of your properties have mechanical cooling systems
    - Portable Cooling Units
    - Fixed Cooling System
    - Enhanced Ventilation
8. How has your business benefitted from making heat-related improvements to your properties?
9. Have you seen any negative results from making heat-related improvements to your properties?

Appendix H: Sanctuary Interview

Appendix H is the script and questions that were posed at the interview with Sanctuary Housing Group on April 22nd , 2026.

We are a group of student researchers from Worcester Polytechnic Institute (WPI) who are investigating the effects of extreme heat events on residents in collaboration with the School of Sports and Exercise Science at the University of Worcester and Worcester Community Trust. Based on our survey responses, 37.5% of respondents lived in rented dwellings, underscoring the important role housing providers play by helping tenants mitigate the effects of extreme heat events. We are interested in learning about what actions you are taking to keep your residents cool and safe during extreme heat.

Your participation in this interview is entirely voluntary; you can stop at any time or choose not to answer certain questions. Additionally, with your consent, we would like to record. We will be taking notes during the interview. We may wish to quote you in our final report. If you are quoted, you will dictate what, if any, identifying information we can include, such as your name and job title. We will also be happy to provide a copy of our completed report upon request. Thank you so much for being willing to work with us.

Questions:

All questions will be posed, but depending on the flow of conversation, the order may change to promote a more free -flowing conversation.

1.) Have you received any guidance from regulatory bodies on preparing for or responding to heatwaves?

2.) In your Decarbonization and Net Zero strategy, you discuss bringing your existing homes into line with the Future Home Standard by 2030. To what extent will you be modifying these homes to bring them more in line with the new standard with regard to extreme heat?

3.) You have pre-existing policies and strategies aimed at addressing cold weather and mold in your properties. Similarly, do you have any policies or strategies in place to keep your tenants safe and cool during heatwaves?

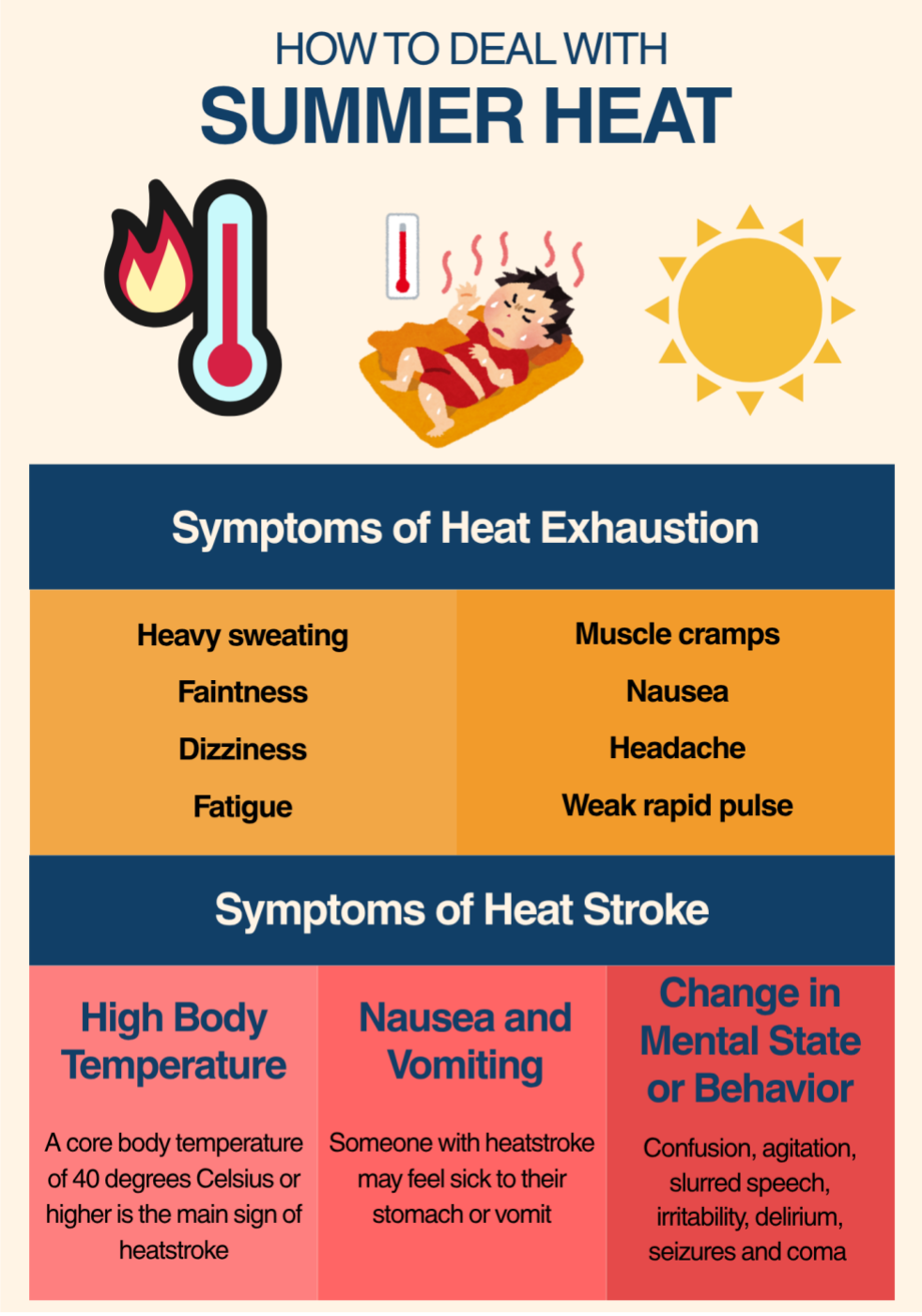
4.) Do you consider your current regulations and organizational policies sufficient to address the increasing frequency and intensity of heatwaves, or do you believe they will need to be updated as extreme heat events are expected to become more frequent?

5.) Have tenants raised concerns about excessive heat in their homes, and if so, what actions were taken to address these concerns?

6.) Is there anything else you would like to add about your organization's experience or responsibilities in managing extreme heat events?

Appendix I: Example Infographic

Appendix I contains the example infographics on heat stress, heat stroke, and personal heat mitigation techniques.



IF YOU THINK A PERSON MAY BE EXPERIENCING HEATSTROKE

SEEK IMMEDIATE MEDICAL HELP AND CALL 999

Take immediate action to cool the person with heatstroke while waiting for emergency treatment

1. Get the person indoors or into shade

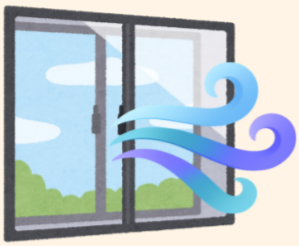
2. Remove excess clothing

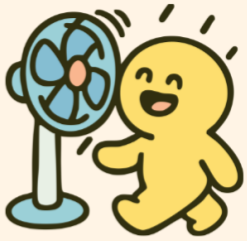
3. Cool the person with whatever means available

- Put in a cool tub of water or a cool shower
- Spray with a garden hose
- Sponge with cool water
- Fan while misting with cool water
- Place ice packs or cold, wet towels on the person's head, neck, armpits, and groin

WHAT TO DO TO

STAY COOL





Windows

Windows should be kept closed with shades shut when the temperature outside is higher than inside (usually around 11 am - 3 pm). Otherwise, windows should be kept open to let cool air in

Fans

Fans should be used when your home's temperature is 35 degrees Celsius or less, otherwise it will have the opposite effect, and make you feel hotter

Staying Hydrated

Staying hydrated is one of the most important thing you can do when it's hot out. Make sure to drink lots of water and replenish your electrolytes with sports drinks

Community

Create a buddy system to check up on someone else during and after an extreme heat event to make sure they are doing alright

Light Clothing

Wearing loose, light colored clothing can help you stay cool when it is hot outside

Shade

When working outside, make sure to take breaks in shaded areas and not to overwork yourself