

# AHMEDABAD HEAT ACTION PLAN 2015

GUIDE TO EXTREME HEAT PLANNING IN AHMEDABAD, INDIA



## EASY READ VERSION

## EXECUTIVE SUMMARY

Climate change is leading to an increase in average temperatures and increased possibilities of severe heat waves. Extreme heat can lead to dangerous, even deadly, health consequences, including heat stress and heatstroke. The city of Ahmedabad had a major heat wave in May 2010, which led to 1,344 additional deaths registered in the city during the month of May.<sup>1</sup> The 2010 heat wave was a wakeup call that intergovernmental agency action, preparedness, and community outreach was needed to save lives. Rising to this challenge of climate change and increasing heat waves, the Ahmedabad Municipal Corporation (AMC) is working to prepare health systems and residents against dangerous heat waves. The first Heat Action Plan (HAP or Plan) was prepared in 2013 by the AMC with help from national and international academic experts and learning from global best practices on early warning systems and heat adaptation.

The 2015 Heat Action Plan is an updated version of the first comprehensive early warning system and preparedness plan for extreme heat events in India launched in Ahmedabad in 2013. The Plan creates immediate and longer-term actions to increase preparedness, information-sharing, and response coordination to reduce the health impacts of extreme heat on vulnerable populations.

The Heat Action Plan aims to implement four key strategies:

- ***Building Public Awareness and Community Outreach*** to communicate the risks of heat waves and implement practices to prevent heat-related deaths and illnesses. Disseminating public messages on how to protect people against extreme heat through media outlets and informational materials such as pamphlets and advertisements on heat stress prevention. New efforts being launched as part of this year's Plan include the use of modern media such as SMS, text messages, email, radio and mobile applications such as WhatsApp. Special efforts will be made to reach vulnerable populations through inter-personal communication as well as other outreach methods.
- ***Initiating an Early Warning System and Inter-Agency Coordination*** to alert residents of predicted high and extreme temperatures. The AMC has created formal communication channels to alert governmental agencies, the Met Centre, health officials and hospitals, emergency responders, local community groups, and media outlets of forecasted extreme temperatures.
- ***Capacity Building Among Health Care Professionals*** to recognize and respond to heat-related illnesses, particularly during extreme heat events. Such trainings focus on primary medical officers and other paramedical staff, and community health staff so they can effectively prevent and manage heat-related cases so as to reduce mortality and morbidity.
- ***Reducing Heat Exposure and Promoting Adaptive Measures*** by launching new efforts including mapping of high-risk areas of the city, increasing outreach and communication on prevention methods, access to potable drinking water and cooling spaces during extreme heat days. Collaboration with non-governmental organizations is also identified as a means to expand outreach and communication with the city's most at-risk communities.

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<sup>1</sup> Azhar GS, Mavalankar D, Nori-Sarma A, Rajiva A, Dutta P, et al. Heat-Related Mortality in India: Excess All-Cause Mortality Associated with the 2010 Ahmedabad Heat Wave. PLoS ONE (2014) 9(3): e91831. doi: 10.1371/journal.pone.0091831: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0091831#abstract0>

Please see attached 2015 Heat Action Plan Updates for more details of new actions and strategies added in this year's Plan.

Ahmedabad had a major heat wave in May 2010, when the temperature reached 46.8°C (more than 116°F). The following graph shows the May 2010 temperatures and mortality as compared to the averages in May 2009 and 2011. The graph of mortality shows a large rise in daily mortality in 2010 coinciding with the heat wave.

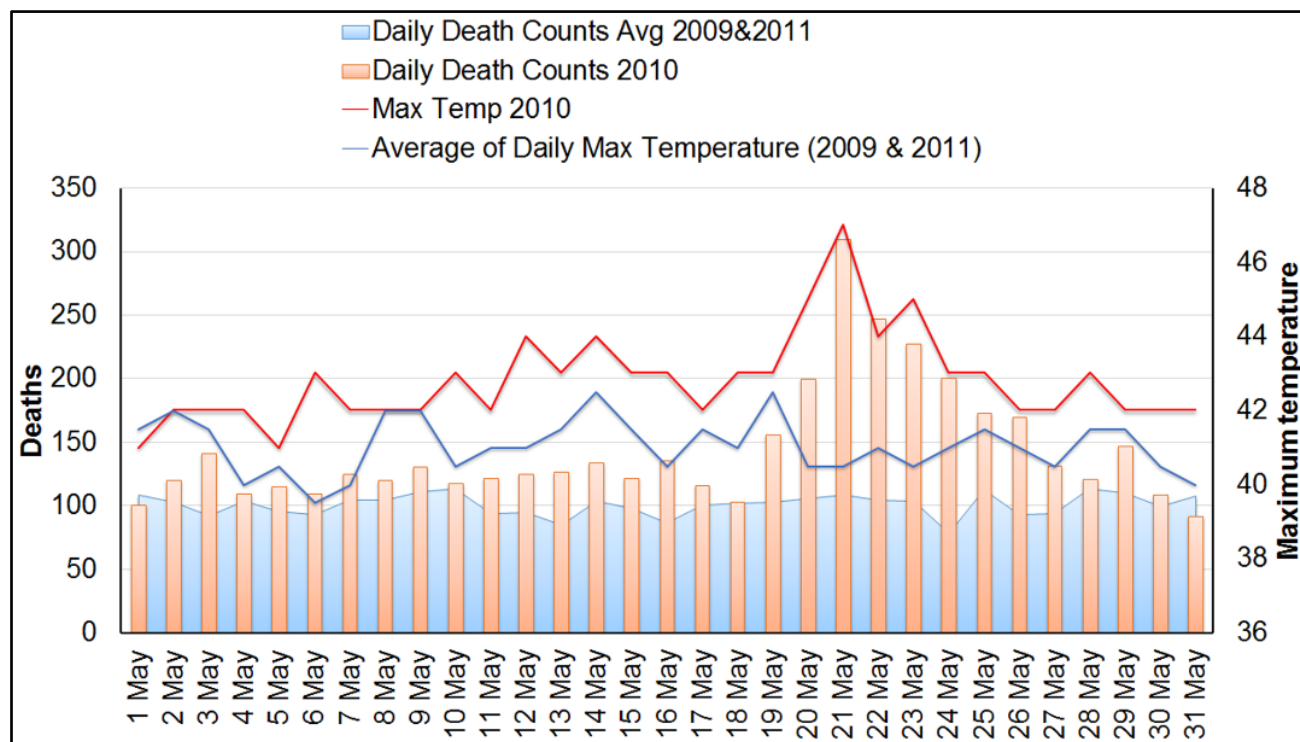


Fig 1; Temperature and all-cause mortality correlation during the 2010 heat wave in Ahmedabad as compared to 2009 and 2011.

Preliminary evaluation of the 2013 and 2014 Heat Action Plans is already showing positive outcomes in reducing mortality during the hottest months of the year. Future responses must be based on an understanding of actions and evidence of their impacts.

#### *How the HAP is organized and implemented:*

As the lead agency, the Health Department has the overarching responsibility for the coordination of heat wave related health activities. This includes monitoring forecasts and sending heat health alerts and disseminating public health messages to local departments and community service providers, as well as working with the AMC press office to increase media around preparedness.

The Plan serves to focus attention on those individuals who are most at risk during heat waves, including slum communities, outdoor workers, elderly and children. The Plan also focuses on individuals and organizations, such as Urban Health Centres (UHCs) and link workers, who frequently work with at-risk populations and can provide early diagnosis of heat-related illnesses and preliminary treatment.

Individuals, community groups, and the media are also essential in fighting the effects of extreme heat. Individuals can take specific preventative steps to protect themselves, their families, and their communities from harmful heat waves including learning about early signs of heat exhaustion, limiting heavy work during extreme heat, drinking water, staying out of the sun; wearing light

clothing, checking on neighbors, and informing their fellow community members about how to keep cool and protect themselves from heat. The media is vital in spreading the word about the harm heat poses to health, and protecting people against dangerous heat waves. The media plays an essential awareness-building role by sharing news about health threats, and increases public protection by running ads and providing local resources information.

*Key stakeholders who helped develop the HAP:*

The Heat Action Plan is part of a broader collaboration between AMC and public health and policy experts at the Indian Institute of Public Health, Gandhinagar, Public Health Foundation of India, Natural Resources Defense Council, Icahn School of Medicine at Mount Sinai, Rollins School of Public Health of Emory University, Georgia Institute of Technology, and supported by the Climate and Development Knowledge Network. This network of partnering institutions was formed following the deadly May 2010 heat wave in Ahmedabad to develop local responses to extreme heat. Additional activities have been supported by the Good Energies Foundation and the Indo-US Science and Technology Forum.

In support of the Heat Action Plan, four related issue briefs entitled ***Rising Temperatures, Deadly Threat***, were also released by the partners in 2013. These briefs outline key strategies and policy interventions that form the basis for the Heat Action Plan, focusing on the most vulnerable groups. These issue briefs are located at: <http://www.nrdc.org/international/india/extreme-heat-preparedness/>

From start to finish, this project is about saving lives and helping the people of Ahmedabad to create healthier communities, more secure from the dangers of extreme heat, even as climate change bears down on cities like Ahmedabad, and states like Gujarat, all around the world. It is hoped that this action plan will guide other cities and rural areas in India and other developing countries to adapt and develop their own heat action plans. Through preventative action such as the HAP, countless lives can be saved as the weather becomes increasingly hot and more extreme.



## INTRODUCTION

Higher daily peak temperatures and longer, more intense heat waves are becoming increasingly frequent globally due to climate change.<sup>2</sup> Extreme heat events already have a significant impact in India. After a deadly heat wave hit the city of Ahmedabad in May 2010, the Ahmedabad Municipal Corporation (AMC) has taken the initiative to develop a comprehensive heat action plan for extreme heat events, the first city in India to do so.



*Ahmedabad community members, July 2011.*

*Credit: Gulrez Shah Azhar & Kathy Tran*

To protect and prepare Ahmedabad for extreme heat events, AMC and its partners have undertaken the following activities to develop this Heat Action Plan:

- Epidemiological analysis of the health effects of heat exposure among Ahmedabad's residents;
- Examination of specific vulnerability factors among slum dwellers and highly exposed occupational workers;
- Exploration of longer-term forecasting options to give earlier warnings;
- Development of heat illness management training for health professionals; and
- A review of heat action plans around the world.

From this work it is clear that coordinated action is needed among government agencies on the municipal level to reduce the devastating health effects of heat stress on local residents. A practical plan of targeted policy interventions can increase information-sharing, communication, preparedness, and response coordination to improve the most vulnerable populations' resilience to rising temperatures.

## PURPOSE

This Heat Action Plan aims to provide a framework for the implementation, coordination, and evaluation of extreme heat response activities in Ahmedabad that reduce the negative health impacts of extreme heat. The Plan's primary objective is to alert those populations most at risk of heat-related illness that extreme heat conditions either exist or are imminent, and to take appropriate precautions.

### **Extreme heat planning includes:**<sup>3</sup>

- Identifying vulnerable populations and the health risks specific to each group;
- Developing effective strategies, agency coordination, and response planning to shape a Heat Action Plan that addresses heat-health risks;
- Implementing the Heat Action Plan and activating heat alerts; and
- Evaluating and updating the Heat Action Plan regularly.

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<sup>2</sup> IPCC, "Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation," March 8, 2012: <http://www.ipcc-wg2.gov/SREX/>.

<sup>3</sup> State of Victoria Department of Human Services, "Heatwave Planning Guide: Development of heatwave plans in local councils in Victoria [Australia]," 2009, <http://www.health.vic.gov.au/environment/climate/heatwave.htm>.

## AHMEDABAD BACKGROUND

One of India's fastest growing cities, Ahmedabad is the economic center of the state of Gujarat. Ahmedabad district, including the surrounding suburban and rural areas, is home to 7.2 million people.<sup>4</sup> Ahmedabad is predicted to be one of the world's nineteen fastest growing urban areas in the coming decade, according to Forbes magazine.<sup>5</sup> Located in the arid Northwest region of India, Ahmedabad's warm, dry conditions are conducive to heat waves. While summer is defined as spanning March, April, and May, Ahmedabad's hottest temperatures can run from March through June, with temperatures generally peaking in May and warm days through November.<sup>6</sup> Across India, higher daily peak temperatures and longer, more intense heat waves are becoming increasingly frequent globally due to climate change; thus the deadly extreme heat events already impacting Ahmedabad are expected to increase in intensity, length, and frequency in the coming decade.<sup>7</sup>

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### Criteria for Heat Wave

*(as defined by Indian Meteorological Department)*

Heat wave need not be considered till maximum temperature of a station reaches at least 40°C for Plains and at least 30°C for Hilly regions.

**When normal maximum temperature of a station is less than or equal to 40° C**

- Heat Wave Departure from normal is 5° C to 6° C
- Severe Heat Wave Departure from normal is 7° C or more

**When normal maximum temperature of a station is more than 40° C**

- Heat Wave Departure from normal is 4° C to 5° C
- Severe Heat Wave Departure from normal is 6° C or more

**When actual maximum temperature remains 45°C or more irrespective of normal maximum temperature, heat wave should be declared.**

Source: Indian Meteorological Department, <http://www.imd.gov.in/doc/termglossary.pdf>. The Meteorological Centre, Ahmedabad ("Met Centre") currently determines whether to declare a *heat wave* once the daily maximum temperature exceeds a 40°C (104°F) threshold.<sup>8</sup>

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<sup>4</sup> Office of the Registrar General & Census Commissioner, "Census of India 2011: Provisional Populations Totals, Ranking of Population Districts, 2001-2011," Government of India: [http://www.censusindia.gov.in/2011-prov-results/prov\\_data\\_products\\_gujarat.html](http://www.censusindia.gov.in/2011-prov-results/prov_data_products_gujarat.html) (last accessed July 26, 2012).

<sup>5</sup> Kotkin, Joel, "The World's Fastest Growing Cities," Forbes, October 7, 2010:

<http://www.forbes.com/2010/10/07/cities-china-chicago-opinions-columnists-joel-kotkin.html>.

<sup>6</sup> See "Weather and Climate in Ahmedabad," Maps of India: <http://www.mapsofahmedabad.com/general-information/weather.html>.

<sup>7</sup> IPCC, "Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation," March 8, 2012: <http://www.ipcc-wg2.gov/SREX/>.

<sup>8</sup> Meteorological Centre, Ahmedabad: <http://www.imdahm.gov.in/#> (click on About MC Tab) (last visited July 30, 2012). Terminologies and Glossary, India Meteorological Department: <http://www.imd.gov.in/doc/termglossary.pdf>.

## HEAT ACTION PLAN (HAP)

Successful implementation of a Heat Action Plan in Ahmedabad requires coordinated action between many diverse stakeholders, including government departments; health care professionals including emergency medical personnel, health center staff, and hospital staff; and community groups. Following the forecasting of an extreme heat event, immediate notification of the public and all those participating in the response is critical to ensure the plan is activated.

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### Color Signals for Heat Alert

The AMC will issue heat alerts, based on thresholds determined by the AMC, as an additional means of communication by using the following color signal system

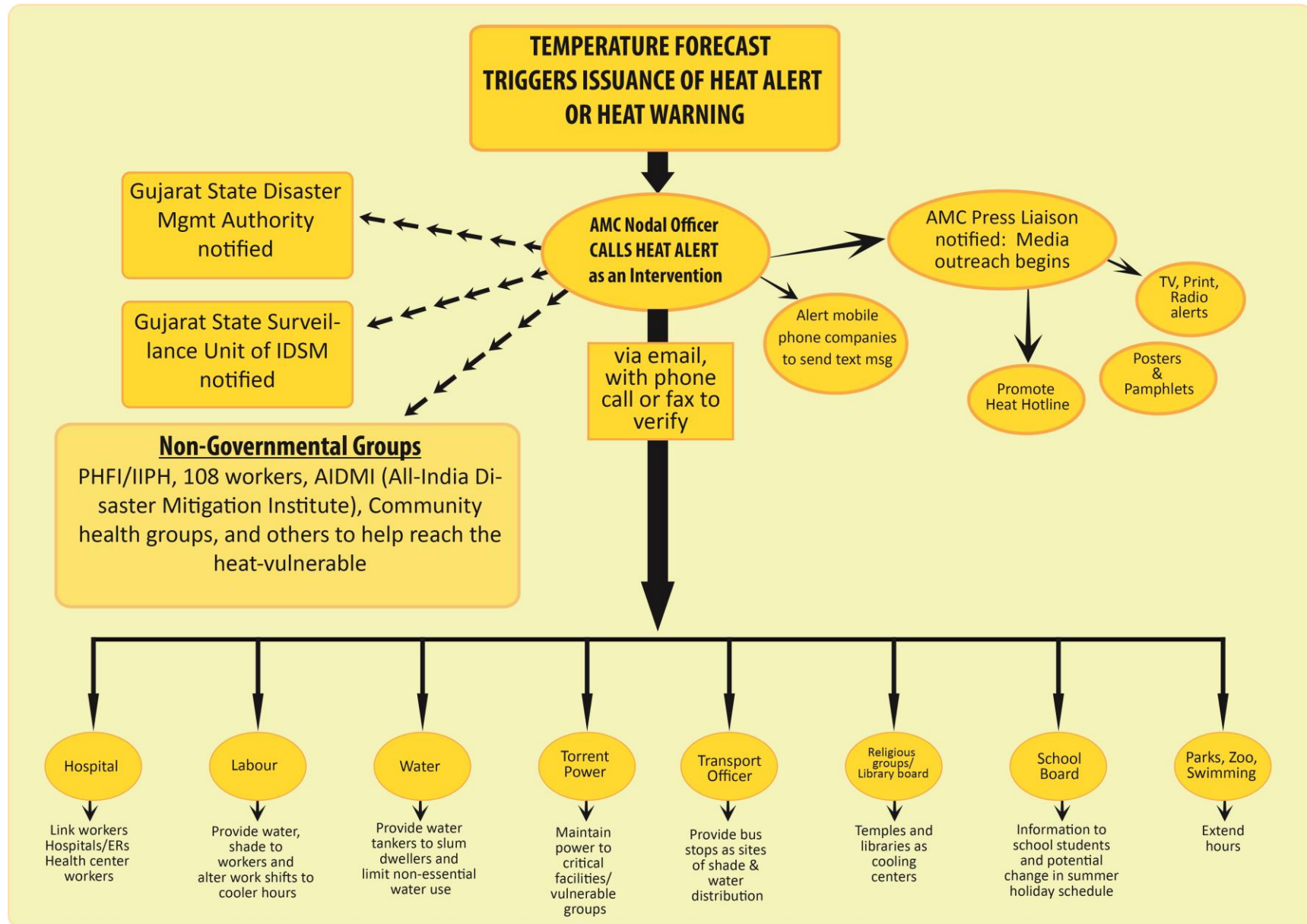
<b>RED ALERT</b>	<b>Extreme Heat Alert Day</b>
<b>ORANGE ALERT</b>	<b>Heat Alert Day</b>
<b>YELLOW ALERT</b>	<b>Hot Day</b>
<b>WHITE</b>	<b>No Alert</b>

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*Beherampura UHC (South Zone, Ahmedabad) Credit: Nilesh Vilas Thube*

## Communication Plan When the AMC Nodal Officer Activates a Heat Alert





## Launching the Heat Action Plan:

The AMC has appointed an **AMC Nodal Officer** to head the Heat Action Plan. The appointed nodal officer is responsible for coordinating and communicating ahead of, and during, extreme heat events, and provide support staff through the Nodal Office as necessary. The AMC Nodal Officer is considering adopting the following preparations under the 2015 Heat Action Plan (*see attached 2015 Heat Action Plan Updates and Agency Action Checklists for more detail*).

### Phase 1: Pre-Heat Season (Annually from January through March)

#### *AMC Nodal Officer:*

- Convene key agency leaders to respond to extreme heat events.
- Reengage state and local agencies to facilitate internal communications.
- Organize preventative training and outreach efforts for health workers, link workers, school children, and the local community with the Health Department.
- Distribute multilingual pamphlets and posters with tips to prevent heat stress to hospitals, schools, and professional associations (*see pamphlets attached*).
- Create a list of the high-risk areas of the city vulnerable to heat waves for more focused activities on heat prevention.

#### *Media and AMC Press Officer:*

- Increase public communication including distributing the multilingual pamphlet and advertisements on heat stress prevention and tips for health protection during extreme heat events (*see pamphlets and ads attached*). Focus outreach efforts in identified high-risk areas.
- Provide information and heat communication materials developed by the AMC to the public.
- Increase the number of installed LED screens with rolling updated temperature forecasts available to the public.

#### *AMC Health Department and Medical Professionals:*

- Enhance targeted training programs, capacity building efforts and communication on heat illness for medical staff at local hospitals and Urban Health Centres (UHCs), based on the Framework of AMC Medical Professionals and Health Workers (*see attachment*). These efforts should include nursing staff, paramedics, field staff and link workers, and consider the susceptibility of particular wards.
- Have hospitals update their admissions and emergency case records to track heat-related morbidity and mortality. Train hospitals to improve expedience of recording of cause of death certificates. Explore creation of simple, user-friendly means to track daily heat-related data and behavioral change impacts. The training could also include recording information education & communication (IEC) efforts.
- Adopt heat-focused examination procedures at local hospitals and urban health centers.
- Purchase and distribute reusable soft plastic ice packs for the citywide UHCs, 108 emergency centres, ambulances and hospitals.
- Explore creation of ice pack dispensaries to increase access to vulnerable communities.

#### *AMC Labour & Employment Department:*

- Organize training for employers, outdoor laborers and workers regarding health impacts of extreme heat and recommendations to protect themselves during high temperatures.
- Utilize maps of construction sites to identify more high-risk outdoor workers. Potentially overlay with irradiation map from IMD or heat island map. Conduct publicity campaigns during high-risk days to these specific areas.

*108 Emergency Service:*

- Create displays on ambulances during local events to build public awareness (*see ad attached*)
- Identify at-risk areas of vulnerable populations, in part by utilizing the list of high-risk areas.

*Community Groups and Individuals:*

- Lead child-friendly educational preventative trainings and distribute heat protection materials at local schools. For example, potentially design a “Teach the Teachers” workshop designed to equip teachers with knowledge with heat protection tips and materials that they can disseminate in classrooms on heat protection, and activities that can engage students on health dangers of extreme heat.
- Conduct training workshops and outreach sessions with community groups and mobilizers such as Mahila Arogya Samiti, Self-Employed Women's Association (SEWA), ASHA workers, *aanganwadis*, and municipal councils to help inform and get vulnerable communities more actively involved. Incorporate other sectors such as higher education, non-profits, and community leaders to increase reach to communities.
- Encourage individuals’ discussion of the early signs of heat exhaustion with their local doctor or Urban Health Centre.
- Inform fellow community members about how to keep cool and protect oneself from heat.

## Phase 2: During the Heat Season (Annually from March through July)

### *AMC Nodal Officer:*

- Activate a **heat alert** and the local response citywide when extreme heat events are forecast by notifying the key agency leaders, AMC Deputy Municipal Commissioners and the Gujarat state agencies in accordance with the Communication Plan above.
- Monitor and increase the **heat alert** level when necessary to match the severity of the forecast and threshold established, and have the Municipal Commissioner convene a special meeting with key agency leaders.
- Activate “cooling centers,” such as temples, public buildings, malls, during a **heat alert** and/or AMC-run temporary night shelters for those without access to water and/or electricity.
- Expand access to shaded areas for outdoor workers, slum communities, and other vulnerable populations. For example, confirm that night shelters stay open all day for migratory populations during a **heat alert**.
- Hold a frequent, possibly daily, conference call to discuss reports and breaking developments during a **heat alert**, and ensure that communication channels remain operational.
- Identify and set up public displays of temperature and forecasts, such as LED electronic scrolling boards.
- Continue surveillance of temperature data and forecasts.
- Communicate the suspension of all non-essential uses of water (other than drinking, keeping cool) via the AMC Water Project’s protocol procedures during any water shortage.
- Increase efforts to distribute fresh drinking water to the public. For example, expand potable water access during a **heat alert** at religious spaces including temples and mosques, BRTS transit stations, pouch handouts to the poor, and high-risk areas (identified by the mapping of high-risk areas).
- Communicate the local utility protocol to prioritize maintaining power to critical facilities (such as hospitals and UHCs).
- Notify the Steering Committee and relevant agencies when the **heat alert** is over.

### *Media and AMC Press Officer:*

- Commence public messaging to the public about the dangers of heat-related illness with the AMC Nodal Officer via AMC press conferences.
- Circulate warnings via text alerts or WhatsApp mobile messages, in collaboration with private sector telecom companies utilizing centralized mobile databases, in addition to traditional media during a **heat alert**.
- Circulate warnings in bulk to the public via centralized email databases during a **heat alert**.
- Develop an SMS alert system to send direct messages to private practitioners in addition to the medical professionals at public hospitals and UHCs.
- Utilize local radio FM broadcasts to disseminate heat protection tips and high temperature warnings to the city’s at-risk populations during a **heat alert**.
- Explore other means of communications, such as broader use of social media, for example, Facebook and the WhatsApp mobile application.

### *AMC Health Department and Medical Professionals:*

- Post heat-related illness prevention tips and how to stay cool around hospitals and UHCs (*see poster attached*).
- Ensure adequate medical supplies available.
- Produce weekly reports of the public health impact for AMC Nodal Officer during a **heat alert**.
- Increase staffing at hospitals and UHCs to attend to the influx of patients during a **heat alert**,

if feasible.

- Increase link worker and community health worker outreach in at-risk neighborhoods during a **heat alert**, if feasible.
- Have zonal health officer visit UHCs to confirm proper preparation has been made for heat-related illness and conduct case audits during heat season.

*108 Emergency Service:*

- Ensure adequate supply of ice packs and IV fluids.
- Disseminate SMS text messages to warn local residents during a **heat alert**.

*AMC Labour & Employment Department:*

- Encourage employers to shift outdoor workers' schedules away from peak afternoon hours (1pm – 5pm) during a **heat alert**.
- Pilot project to provide emergency ice packs and heat-illness prevention materials to traffic police, BRTS transit staff and construction workers.

*Community Groups and Individuals:*

- Keep cool and hydrated during the heat season by drinking water, staying out of the sun, and wearing light clothing.
- Check on vulnerable neighbors, particularly during a **heat alert**.
- Limit heavy work in direct sun or indoors if poorly ventilated, especially during a **heat alert**.



### **Phase 3: Post-Heat Season** (Annually in July through September)

#### *AMC Nodal Officer:*

- Organize an annual Heat Action Plan evaluation meeting with key agency leaders and relevant stakeholders.
- Evaluate the Plan process based on performance and revise accordingly.
- Evaluate the reach and impact of the Plan and revise accordingly.
- Post the revised Plan to the AMC website ahead of the 2016 heat season for stakeholders.
- Build on the “Green Cover” activity to establish tree-plantation campaign in hotspot areas such as roadsides and during plantation festival in June. Incorporate student volunteers or incentivize builders to plant trees to help effect this effort.
- Discuss establishing cooling center facilities in high-risk areas around city.

#### *AMC Health Department and Medical Professionals:*

- Perform an epidemiological case review of heat-related mortalities during the summer.
- Conduct and gather epidemiological outcomes from the data on heat risk factors, illness and death, based on average daily temperatures.
- Incorporate data and findings into future versions of the Heat Action Plan.
- Measure mortality and morbidity rates based on data before and after the Plan’s interventions.

### **Conclusion:**

In Ahmedabad, strong local government leadership has enabled the effective implementation of the Heat Action Plan since 2013. Buy-in from the city leadership elevates coordinated action that is essential to protect communities, especially their most vulnerable members, from the dangerous health effects of extreme heat.

## **LIST OF ATTACHMENTS**

- 2015 Heat Action Plan Updates
- “How to Protect Yourself” Poster (English and Gujarati)
- Heat Awareness Advertisement for Newspapers (English and Gujarati)
- Heat Awareness Advertisement for Buses and Rickshaws (Gujarati)
- Medical Heat Awareness Pamphlet (English and Gujarati)
- Framework of AMC Medical Professionals and Health Workers
- Case Definitions
- Agency Action Checklists

## 2015 Heat Action Plan Updates

New and enhanced efforts proposed to be launched as part of the Plan this year include:

### *Phase 1: Before the heat season:*

- Create a list of the high-risk areas of the city vulnerable to heat waves for more focused activities on heat prevention.
- Increase the number of installed LED screens with rolling updated temperature forecasts available to the public.
- Enhance targeted training programs, capacity building efforts and communication on heat illness for medical staff at local hospitals and Urban Health Centres (UHCs), based on the Framework of AMC Medical Professionals and Health Workers (*see attachment*). These efforts should include nursing staff, paramedics, field staff and link workers, and consider the susceptibility of particular wards.
- Train hospitals to improve expedience of recording of cause of death certificates. Explore creation of simple, user-friendly means to track daily heat-related data and behavioral change impacts. The training could also include recording information education & communication (IEC) efforts.
- Purchase and distribute reusable soft plastic ice packs for the citywide UHCs, 108 emergency centres, ambulances and hospitals.
- Explore creation of ice pack dispensaries to increase access to vulnerable communities.
- Utilize maps of construction sites to identify more high-risk outdoor workers. Potentially overlay with irradiation map from IMD or heat island map. Conduct publicity campaigns during high-risk days to these specific areas.
- Lead child-friendly educational preventative trainings and distribute heat protection materials at local schools. For example, potentially design a “Teach the Teachers” workshop designed to equip teachers with knowledge with heat protection tips and materials that they can disseminate in classrooms on heat protection, and activities that can engage students on health dangers of extreme heat.
- Conduct training workshops and outreach sessions with community groups and mobilizers such as Mahila Arogya Samiti, Self-Employed Women's Association (SEWA), ASHA workers, *aanganwadis*, and municipal councils to help inform and get vulnerable communities more actively involved, including women. Incorporate other sectors such as higher education, non-profits, and community leaders to increase reach to communities.

### *Phase 2: During the heat season:*

- Expand access to shaded areas for outdoor workers, slum communities, and other vulnerable populations. For example, confirm that night shelters stay open all day for migratory populations during a **heat alert**.
- Increase efforts to distribute fresh drinking water to the public. For example, expand potable water access during a **heat alert** at religious spaces including temples and mosques, BRTS transit stations, pouch handouts to the poor, and high-risk areas (identified by the mapping of high-risk areas).
- Circulate warnings via text alerts or WhatsApp mobile messages, in collaboration with private sector telecom companies utilizing centralized mobile databases, in addition to traditional media during a **heat alert**.
- Circulate warnings in bulk to the public via centralized email databases during a **heat alert**.
- Develop an SMS alert system to send direct messages to private practitioners in addition to

the medical professionals at public hospitals and UHCs.

- Utilize local radio FM broadcasts to disseminate heat protection tips and high temperature warnings to the city's at-risk populations during a **heat alert**.
- Explore other means of communications, such as broader use of social media, for example, Facebook, Twitter and the WhatsApp mobile application.
- Have health officer visit UHCs to confirm proper preparation has been made for heat-related illness and conduct case audits during heat season.
- Ensure adequate supply of ice packs and IV fluids.
- Pilot project to provide emergency ice packs and heat-illness prevention materials to traffic police, BRTS transit staff and construction workers.

*Phase 3: Post-heat season:*

- Build on the "Green Cover" activity to establish tree-plantation campaign in hotspot areas such as roadsides and during plantation festival in June. Incorporate student volunteers or incentivize builders to plant trees to help effect this effort.
- Discuss establishing cooling center facilities in high-risk areas around city.



## “How to Protect Yourself” Poster (English and Gujarati)

### HOW TO SAVE YOURSELF FROM HEAT WAVES

- ☀ Drink water, chaas, and other liquids (no soft drinks)
- ☀ Stay out of the sun
- ☀ Find a place to cool down
- ☀ Wear light clothing
- ☀ Check in with friends & family

**DRINK  
MORE  
WATER**



**In case of an emergency, CALL 108**



### ગરમીથી તમે કેવી રીતે બચશો

- ☀ પાણી, છાશ અથવા અન્ય પ્રવાહી પીવો (ઠંડા પીણા નહિ)
- ☀ તડકામાં ન રહો
- ☀ હળવા રંગના કપડાં પહેરો
- ☀ ઠંડક વાળું કોઈ સ્થળ શોધી કાઢો
- ☀ મિત્રો અને કુટુંબીજનોની સંભાળ રાખો

**પાણી વધુ પીવો**



**ઈમરજન્સીમાં ૧૦૮ પર ફોન કરો**



## Heat Awareness Advertisement for Newspapers (English and Gujarati)

# HEAT ALERT

### DOS & DON'TS DURING HEAT WAVES

- ☀ Drink water, chaas, and other liquids (no soft drinks)
- ☀ Stay out of the sun
- ☀ Find a place to cool down
- ☀ Wear light clothing
- ☀ Check in with friends & family

### Symptoms to watch for:

- ☀ Heat rash or cramps
- ☀ Heavy sweating and weakness
- ☀ Headache and nausea
- ☀ Lack of sweating despite the heat
- ☀ Red, hot, and dry skin
- ☀ Muscle weakness or cramps
- ☀ Nausea and vomiting

### DRINK MORE WATER

People at high risk: children, elders, and pregnant women

In case of an emergency, CALL 108

NRDC  
The Earth's Best Defense

INDIAN INSTITUTE OF PUBLIC HEALTH GANDHINAGAR



# હીટ એલર્ટ

### ગરમીથી તમે કેવી રીતે બચશો

- ☀ પાણી, છાશ અથવા અન્ય પ્રવાહી પીવો (ઠંડક પીણા નહિ)
- ☀ તડકામાં ન રહો
- ☀ હળવા રંગના કપડાં પહેરો
- ☀ ઠંડક વાળું કોઈ સ્થળ શોધી કાઢો
- ☀ મિત્રો અને કુટુંબીજનોની સંભાળ રાખો

### ધ્યાન આપવા લાયક લક્ષણો:

- ☀ ગરમીની અળાઈઓ કે તાણ
- ☀ ખૂબ પરસેવો થવો અને અશક્તિ લાગવી
- ☀ માથામાં દુખાવો થવો અને ઉજકા આવવા
- ☀ ગરમી હોવા છતાં પણ પરસેવો ન થવો.
- ☀ ચામડી લાલ, સૂકી અને ગરમ થઈ જવી.
- ☀ સ્નાયુઓમાં દુખાવો અને અશક્તિ.
- ☀ ઉજકા અને ઉલ્ટી થવી.

### પાણી વધુ પીવો

બાળકો, વૃદ્ધો અને ગર્ભવતી સ્ત્રીઓ માટે વધુ જોખમી

ઈમરજન્સીમાં ૧૦૮ પર ફોન કરો

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INDIAN INSTITUTE OF PUBLIC HEALTH GANDHINAGAR





## Heat Awareness Advertisement for Buses and Rickshaws (Gujarati)



# Medical Heat Awareness Pamphlet (English)

## SAVE YOURSELF FROM HEAT

**SPRING AND SUMMER IN AHMEDABAD CAN GET VERY HOT!  
 CLIMATE CHANGE WILL CAUSE HEAT WAVES TO BE MORE FREQUENT.  
 THE ELDERLY, INFANTS AND CHILDREN, OUTDOOR WORKERS AND SLUM COMMUNITIES  
 ARE AT HIGH-RISK OF SERIOUS HEALTH EFFECTS FROM HEAT.  
 HEAT ILLNESSES ARE PREVENTABLE! ALL SHOULD BE CAUTIOUS.  
**DIAL 108 FOR MEDICAL EMERGENCIES!**  
 HERE IS HOW YOU CAN PROTECT FROM THE HEAT:**

PREPARATION	DURING HEAT WAVES	COOLING CENTERS
<ul style="list-style-type: none"> <li>Be aware of heat illnesses</li> <li>Insure you have a functioning fan or access to shade</li> <li>Locate parks, pools or other areas with shade or air-conditioning access</li> </ul>	<ul style="list-style-type: none"> <li>Create a plan of action with neighbors</li> <li>Subscribe to the emergency SMS system</li> <li>Drink water, lemonade or chaas</li> <li>Use air-conditioning, fans or shade to stay cool</li> </ul>	<ul style="list-style-type: none"> <li>Stay out of the sun</li> <li>Avoid physical activity during peak hours</li> <li>Wear loose-fitting, light-colored clothing</li> </ul>
		<ul style="list-style-type: none"> <li>Use the Bus Rapid Transit System to travel to public pools, shelters, and shaded parks.</li> <li>Consult <a href="http://www.egovamc.com">www.egovamc.com</a> for maps of locations and operating hours</li> </ul>

### NOT FEELING WELL?

Heat illnesses occur when your body cannot cool off. These illnesses are treatable, but require IMMEDIATE attention.

Illness	Symptoms	Actions
<b>Heat cramps</b>	Muscle cramps in abdominal area or extremities. Can be accompanied by heavy sweating and mild nausea.	Move to a cool or shaded place. Apply firm pressure to muscle. Gently stretch the muscle, follow with gentle massage. Drink water or chaas.
<b>Heat exhaustion</b>	Heavy sweating, fainting, vomiting, cold, clammy skin, dizziness, headache, nausea, weakness.	Move to cool or shaded place. Loosen clothes, and apply cold cloths. Sip water slowly. Heat exhaustion can lead to heat stroke. If symptoms worsen, <b>dial 108</b> .
<b>Heat stroke (This is an emergency.)</b>	Hot red, dry skin, rapid pulse, high fever, loss of alertness and confusion, unconsciousness, rapid breathing.	<b>Dial 108.</b> Wrap victim in cool sheets. Bring to cooled or shaded space.

Adapted from New York State Department of Health Documents. For more information visit [www.phtl.org](http://www.phtl.org) or [www.egovamc.org](http://www.egovamc.org).



# Medical Heat Awareness Pamphlet (Gujarati)

## તમારી જાતને ગરમી/ભૂથી બચાવો

વસંત અને ગ્રીષ્મમાં અમદાવાદમાં ગરમી અતિસય વધી શકે છે  
કલાઇમેટ ચેન્જના લીધે હીટવેવ હવે સામાન્ય બનશે  
વૃહ્દોની, નવજાત શીશુ, બાળકો, મજૂરો અને મુંડપટ્ટીમાં રહેતા  
લોકોના આરોગ્યને ગરમીથી વધુ ભય છે.

**મેડીકલ ઈમરજન્સી માટે ૧૦૮નો સંપર્ક કરો!**

આ રીતે તમે ગરમીથી બચી શકો:

પૂર્વ તૈયારી	હીટવેવ દરમિયાન	રાહત કેન્દ્રો
<ul style="list-style-type: none"> <li>ગરમીથી થતી બીમારી વિષે માહિતગાર બનો.</li> <li>તકીદ રાખો કે તમારી પાસે પંખો રાહુ ઠાલવતાં ઢોલ છાંયડો નજીકમાં હોય.</li> <li>બગીચા, સીમીંગ પુલ, સેડ કં વાતાનુકૂલિત વગ્ગરો ગ્રીષ્મી રાખો.</li> <li>પડોશીઓ સાથે મળી બચાવ મટે સ્પર્ધેના ટેવર કરો.</li> </ul>	<ul style="list-style-type: none"> <li>સૂર્ય પ્રકાશમાં વધુ ના રહેવો.</li> <li>બપોરના સમયે શારીરિક મયુરિ ટાળો.</li> <li>હીલ કે ખુલ્લા અને આછા રંગના કપડા પહેવો.</li> </ul>	<ul style="list-style-type: none"> <li>સ્વનિર્મિત મૂલ, આજીવસ્થાના/શેડર, છાંયવાળા બગીચામાં જવા બી.આર.ટી.કોરાની ઉપયોગ કરો.</li> <li>નકકાના રાત્રે કામના કલાકો વિષે માહિતી લેવા <a href="http://www.egovamc.com">www.egovamc.com</a></li> </ul>

## હીક નથી લાગતું?

વધુ ગરમીમાં રહેવાથી લૂ લાગી શકે છે. આ મટાડી શકાય છે, પણ તાત્કાલીક સારવાર અનિવાર્ય છે.

બીમારી	લક્ષણો	શું કરવું?
હીટ ડેમ્ફસ	પેટની સ્વસ્થપરના સ્નાયુઓમાં તાણ, વધુ પરોવો અને ઉબકા પણ શક્ય થાય છે.	હીક વાળી જગ્યા સમગ્ર છાંયમાં લગત વાળો. સ્નાયુઓ દબાવો. સ્નાયુઓ સ્થિર કરી ઠંડાઈ માલીસ કરો. પ.ટી કે છાક ચીકો.
લૂ લગાવી (હીટ એકગોસન)	વધુ પરોવો થયો, બેભાન થવું, ઊંઘાઈ થવી, હંડા પડવું સ્ત્રીબન, ચામડી બીનો થવી, સાકર સ્વસ્થ, મારું કુશળું, ઉબકા પણ શક્ય, સ્નાયુક્રિત	હીક વાળી જગ્યા સમગ્ર છાંયમાં લગત વાળો. કપડા ટીકા કરો, પાણીના પોલ મુકો, થીમે થીમે પાણી પીવો. લૂ હીટ સ્થિતિમાં પરિવર્ત થાય છે. તબિયત વધુ બગડે તો ૧૦૮નો સંપર્ક કરો.
હીટ સ્ટ્રોક (સા એક ઈમરજન્સી છે.)	ભાગ અને લુધી થાવડી, હલકાસ થવી થવા, સમગ્ર વાચ, સ્પર્શતા બીકો થવી અને ગાભરાક થવો, બેભાન થવું, હીક થાયો.	૧૦૮નો સંપર્ક કરો હીમે હંડા સ્થિતિમાં વાળેડો અને હીક વાળી જગ્યા સમગ્ર છાંયમાં લગતો.



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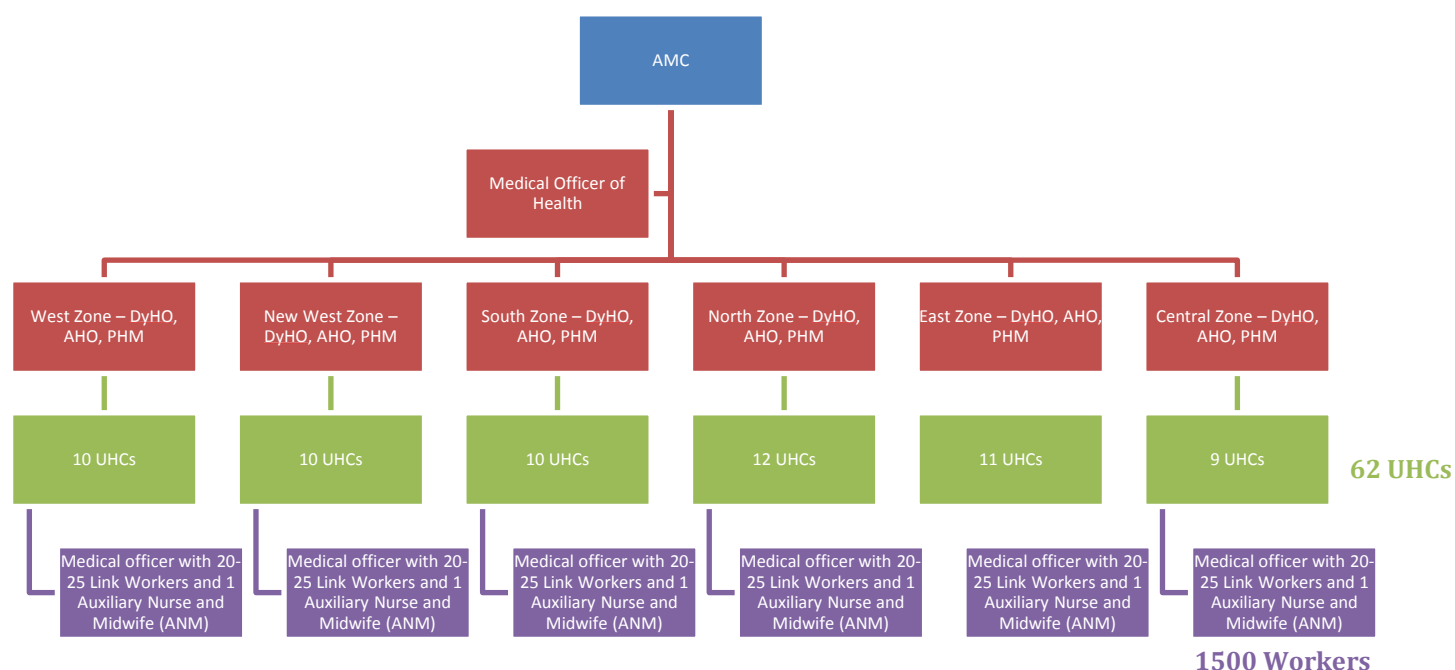
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GOVERNMENT OF GUJARAT

## Framework of AMC Medical Professionals and Health Workers

This organizational mapping serves as a framework to coordinate communication of heat protection tips and early warnings of heat wave response among of medical workers and health clinics involved in the Heat Action Plan. This framework shows the linkages between the AMC as the nodal government institution down to grassroots-level response teams of medical officers, link workers, and auxiliary nurse and midwives in urban health centres located in each of the six city's geographic zones. This map of actors can help guide trainings and future action based on the susceptibility of particular wards.



## Case Definitions

### Heat Illness - Typical Presentations

Clinical Entity	Age Range	Setting	Cardinal Symptoms	Cardinal Signs	Pertinent Negatives	Prognosis
<b>Heat rash</b>	All, but frequently children	Hot environment; +/- insulating clothing or swaddling	Itchy rash with small red bumps at pores in setting of heat exposure; bumps can sometimes be filled with clear or white fluid	Diffuse maculopapular rash, occasionally pustular, at hair follicles; pruritic	Not focally distributed like a contact dermatitis; not confluent patchy; not petechial	Full recovery with elimination of exposure and supportive care
<b>Heat cramps</b>	All	Hot environment, typically with exertion, +/- insulating clothing	Painful spasms of large and frequently used muscle groups	Uncomfortable appearance, may have difficulty fully extending affected limbs/joints	No contaminated wounds/tetanus exposure; no seizure activity	Full recovery with elimination of exposure and supportive care
<b>Heat exhaustion</b>	All	Hot environment; +/- exertion; +/- insulating clothing or swaddling	Feeling overheated, lightheaded, exhausted and weak, unsteady, nauseated, sweaty and thirsty, inability to continue activities	Sweaty/diaphoretic; flushed skin; hot skin; normal core temperature; +/- dazed, +/- generalized weakness, slight disorientation	No coincidental signs and symptoms of infection; no focal weakness; no aphasia/dysarthria; no overdose history	Full recovery with elimination of exposure and supportive care; progression if continued exposure
<b>Heat syncope</b>	Typically adults	Hot environment; +/- exertion; +/- insulating clothing or swaddling	Feeling hot and weak; lightheadedness followed by brief loss of consciousness	Brief, generalized loss of consciousness in hot setting, short period of disorientation if any	No seizure activity, no loss of bowel or bladder continence, no focal weakness, no aphasia/dysarthria	Full recovery with elimination of exposure and supportive care; progression if continued exposure
<b>Heat stroke</b>	All	Hot environment; +/- exertion; +/- insulating clothing or swaddling	Severe overheating; profound weakness; disorientation, obtundation, seizures, or other altered mental status	Flushed, dry skin (not always), core temp $\geq 40^{\circ}\text{C}$ ; altered mental status with disorientation, possibly delirium, coma, seizures; tachycardia; +/- hypotension	No coincidental signs and symptoms of infection; no focal weakness; no aphasia/dysarthria; no overdose history	25-50% mortality even with aggressive care; significant morbidity if survive

## Heat Illness - Case Definitions

Clinical Entity	Case Definition
<b>Heat rash</b>	Diffuse, pruritic, maculopapular or vesicular rash in the setting of heat exposure, often with insulating clothing or swaddling.
<b>Heat cramps</b>	Painful contractions of frequently used muscle groups in the setting of heat exposure, often with exertion
<b>Heat exhaustion</b>	Syndrome of generalized weakness and or exhaustion, often with lightheadedness, limiting functioning in a hot environment, without history of recent infection. May or may not be exertional.
<b>Heat syncope</b>	Brief loss of consciousness in the setting of heat exposure without evidence of seizure activity, stroke, or medication overdose.
<b>Heat stroke</b>	Altered mental status (including disorientation, delirium, seizure, obtundation) with elevated core body temperature $\geq 40^{\circ}\text{C}$ in the setting of heat exposure, without signs of stroke, history of infection, or signs of medication overdose. May or may not be exertional.



## Heat Illness – Treatment Protocol

Recognizing that treatment protocols may vary slightly according to the setting (EMS, health center, clinic, hospital emergency department, etc.), the following should apply generally to any setting and to all patients where there is a potential concern for heat illness. Special thanks to Drs. Arthur Yancey and Nee-Kofi Mould-Millman of Grady Emergency Medical Services, Emory University Department of Emergency Medicine, Atlanta, GA USA

1. Initial patient assessment – primary survey (airway, breathing, circulation, disability, exposure), vital signs, including temperature
2. Consider heat illness in differential diagnosis if:
  - a. Presenting with suggestive symptoms and signs (see table)
  - b. Patient has one or more of the following risk factors:
    - i. Extremes of age (infants, elderly)
    - ii. Debilitation/physical deconditioning, overweight or obese
    - iii. Lack of acclimatization to environmental heat (recent arrival, early in summer season)
    - iv. Any significant underlying chronic disease, including psychiatric, cardiovascular, neurologic, hematologic, obesity, pulmonary, renal, and respiratory disease
    - v. Taking one or more of the following:
      1. Sympathomimetic drugs
      2. Anticholinergic drugs
      3. Barbiturates
      4. Diuretics
      5. Alcohol
      6. Beta blockers
3. Remove from environmental heat exposure and stop physical activity
4. Initiate passive cooling procedures
  - a. Cool wet towels or ice packs to axillae, groin, and around neck; if patient is stable, may take a cool shower, but evaluate risk of such activity against gain and availability of other cooling measures
  - b. Spray cool water or blot cool water onto skin
  - c. Use fan to blow cool air onto moist skin
5. If temperature lower than 40°C, repeat assessment every 5 minutes; if improving, attempt to orally hydrate (clear liquids, ORS can be used but not necessary; cool liquids better than cold) and observe
6. If temperature 40°C or above, initiate IV rehydration and immediately transport to emergency department for stabilization

## Agency Action Checklists

### Checklist for AMC Nodal Officer

#### *Pre-Summer*

- ✓ Designate heat health point of contact for each department
- ✓ Reengage key agencies to facilitate communications and schedule monthly meetings
- ✓ Establish heat mortality tracking system and update datasets
- ✓ Establish Heat Action webpage on AMC website
- ✓ Educate school children and send home age-appropriate pamphlets about the heat season
- ✓ Create list of high-risk areas of city heat-wise

#### *During Heat Event*

- ✓ Contact point person in each department announcing heat event at least seven days in advance
- ✓ Maintain contact with department points of contact for updates on conditions
- ✓ Ensure staff presence and availability of supplies with each department – including distributing fresh drinking water
- ✓ Communicate locations of emergency facilities and cooling centers/shaded areas with each department
- ✓ Monitor heat alert and increase level when severe forecast

#### *Post-Summer Evaluation*

- ✓ Review quantitative and qualitative data for process evaluation and improvements
- ✓ Call meeting for annual evaluation of heat plan with key agency leaders and community partners
- ✓ Post revised heat action plan online for stakeholders

### Checklist for Medical Colleges and Hospitals

#### *Pre-summer*

- ✓ Adopt heat-focused examination materials
- ✓ Get additional hospitals and ambulances ready
- ✓ Update surveillance protocols and programs, including to track daily heat-related data
- ✓ Establish more clinician education
- ✓ Continue to train medical officers and paramedics

#### *During Heat Event*

- ✓ Adopt heat-illness related treatment and prevention protocols
- ✓ Equip hospitals with additional materials
- ✓ Deploy all medical staff to be on duty
- ✓ Keep emergency ward ready
- ✓ Monitor water borne diseases, malaria and dengue
- ✓ Keep stock of small reusable ice packs to apply to PULSE areas
- ✓ Report heat stroke patients to AMC daily
- ✓ Expedite recording of cause of death certificates

#### *Post-summer Evaluation*

- ✓ Participate in annual evaluation of heat action plan
- ✓ Review revised heat action plan

### **Checklist for Public Health Managers**

#### *Pre-summer*

- ✓ Identify areas that are vulnerable
- ✓ Check inventories of medical supplies in health centers
- ✓ Identify cooling centers and barriers to access cooling centers
- ✓ Community involvement for workers and trainers education

#### *During Heat Event*

- ✓ Prepare rapid response team
- ✓ Distribute “Dos and Don’ts” to community
- ✓ Effectively send a “Don’t Panic!” message to community
- ✓ Ensure access to Medical Mobile Van in the Red Zone
- ✓ Ensure additional medical vans available

#### *Post-summer Evaluation*

- ✓ Participate in annual evaluation of heat action plan
- ✓ Review revised heat action plan

### **Checklist for Urban Health Centres and Link Workers**

#### *Pre-summer*

- ✓ Distribute pamphlet and other materials to community
- ✓ Sensitize link workers and community leaders
- ✓ Develop and execute school health program
- ✓ Dissemination of materials in slum communities
- ✓ Coordinate outreach efforts with other community groups, non-profits, and higher education

#### *During Heat Event*

- ✓ Recheck management stock
- ✓ Modify worker hours to avoid heat of day
- ✓ Visit at-risk populations for monitoring and prevention
- ✓ Communicate information on tertiary care and 108 service

#### *Post-summer Evaluation*

- ✓ Participate in annual evaluation of heat action plan
- ✓ Review revised heat action plan

### Checklist for AMC Press Officer

#### *Pre-Summer*

- ✓ Secure commercial airtime slots for public service announcements
- ✓ Identify areas to post warnings and information during heat season
- ✓ Organize training for health workers and medical professionals
- ✓ Activate telephone heat hotline
- ✓ Begin placing temperature forecasts in newspapers
- ✓ Increase installed LED screens with scrolling temperature data

#### *During Heat Event*

- ✓ Issue heat warnings in heat and electronic media
- ✓ Contact local FM radio and TV stations for announcements
- ✓ Use SMS, text and WhatsApp mobile messaging and centralized mobile databases to send warnings
- ✓ Contact BRTS and transport department to place warnings on buses

#### *Post-Summer Evaluation*

- ✓ Evaluate reach of advertising to target groups and other means of communication such as social media
- ✓ Participate in annual evaluation of heat action plan
- ✓ Review revised heat action plan

### Checklist for Labour Department

#### *Pre-Summer*

- ✓ Heat illness orientation for factory medical officers and general practitioners
- ✓ Generate list of factory medical officers and contractors to include in heat action communications from Nodal Officer
- ✓ Communicate directly about heat season with non-factory workers
- ✓ Utilize maps of construction sites to identify more high-risk outdoor workers.
- ✓ Conduct publicity campaigns during high-risk days in identified high-risk areas

#### *During the Heat Season*

- ✓ Provide water at work sites
- ✓ Request use of A/C at factory facilities
- ✓ Extended hours at Occupational Health Centers
- ✓ Consider extended afternoon break or alternate working hours for workers

#### *Post-Summer Evaluation*

- ✓ Participate in annual evaluation of heat action plan
- ✓ Review revised heat action plan
- ✓ Pilot project to provide emergency ice packs and heat-illness prevention materials to traffic police, BRTS transit staff and construction workers

## Checklist for 108 Emergency Service

### *Pre-Summer*

- ✓ Prepare handouts for paramedics about heat illness
- ✓ Create displays on ambulances to build public awareness during major Spring events
- ✓ Establish Dynamic Strategic Deployment Plan for ambulances
- ✓ Ensure adequate supply of IV fluids
- ✓ Identify at-risk areas
- ✓ Prepare SMS messages to disseminate during emergencies
- ✓ Identify media point of contact

### *During the Heat Season*

- ✓ Ready medicine stocks
- ✓ Keep accurate records of pre-hospital care
- ✓ Send messages to all employees alerting them of heat action plan
- ✓ Activate Dynamic Strategic Deployment Plan
- ✓ Staff surplus employees and restrict leave

### *Post-Summer Evaluation*

- ✓ Provide data to key agency leaders
- ✓ Participate in annual evaluation of heat action plan
- ✓ Review revised heat action plan

## Partnering Organizations

### ***Ahmedabad Municipal Corporation***

The Ahmedabad Municipal Corporation (AMC) is the municipal governing body of Ahmedabad, responsible for the city's civic infrastructure and administration. Led by its mayor and commissioner, AMC has pioneered the development of heat vulnerability reduction strategies and an early warning system for extreme heat events to protect its residents. <http://www.egovamc.com/>

### ***Indian Institute of Public Health, Gandhinagar***

The Indian Institute of Public Health, Gandhinagar (IIPH) is a leader on public health education, advocacy and research on public health. IIPH pushes the mandate of equity in public health, applying strategy, resources and networks to the issues and practice of public health in India. IIPH's programs aim to make education and research activities relevant to India in content and context.

### ***Public Health Foundation of India***

The Public Health Foundation of India (PHFI) is a public-private partnership structured as an independent foundation. PHFI is the hub of teaching, research, sharing knowledge and experiences in areas at the cutting-edge of public health in India. PHFI has launched four institutes of public health, including IIPH-Gandhinagar. <http://www.phfi.org>

### ***Natural Resources Defense Council***

The Natural Resources Defense Council (NRDC) is one of the most effective environmental groups, combining 1.3 million members and online activists with the expertise of more than 350 scientists and other professionals. NRDC is a leader in public health research, policy, and advocacy- including building resilience in local communities and fighting climate change. In 2009, we launched our India Initiative focused on climate change and clean energy with projects on climate change preparedness and adaptation and energy efficiency. With our partners, we advocate for increased policy development and implementation to protect communities from environmental threats. <http://www.nrdc.org>

### ***Rollins School of Public Health of Emory University***

Founded in 1990, the Rollins School of Public Health is one of the United States' top public health schools and offers 22 degree programs in a wide range of health areas including Global Environmental Health. Rollins benefits greatly from its location in Atlanta, Georgia, home to the Centers for Disease Control and Prevention and several other organizations that work in the public health space. The School strives to educate the world's future public health leaders and offers students unique opportunities to gain practical experience and work in the field during their coursework. <http://www.sph.emory.edu/cms/index.html>

### ***Mount Sinai School of Medicine***

The Mount Sinai School of Medicine is internationally recognized as a leader in groundbreaking clinical and basic science research and is known for its innovative approach to medical education. With a faculty of more than 3,400 in 38 clinical and basic science departments and centers, Mount Sinai is a top-ranked medical school based in New York City. <http://www.mssm.edu/>

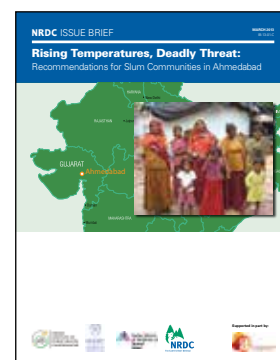
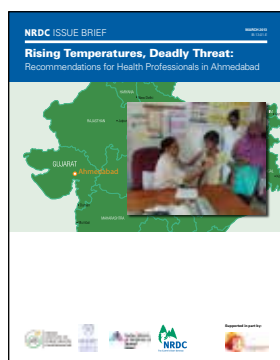
### ***Georgia Institute of Technology***

The Georgia Institute of Technology is one of the United States' top research universities, distinguished by its commitment to improving the human condition through advanced science and technology. Located in Atlanta, Georgia, more than 20,000 undergraduate and graduate students receive a focused, technologically-based education. The School of Earth and Atmospheric Sciences leads innovative research for the 21st century within the context of a premier technological research university. <http://www.eas.gatech.edu/>

### ***Climate & Development Knowledge Network***

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Inside Story: Addressing heat-related health risks in urban India: Ahmedabad's Heat Action Plan: <http://cdkn.org/resource/addressing-heat-related-risks-india>



PlosOne: Heat-Related Mortality in India: Excess All-Cause Mortality Associated with the 2010 Ahmedabad Heat Wave (March 2014) <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0091831>



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Journal of Environmental and Public Health: Neonates in Ahmedabad, India, during the 2010 Heat Wave: A Climate Change Adaptation Study (January 2014) <http://www.hindawi.com/journals/jeph/2014/946875/>



A Cross-Sectional, Randomized Cluster Sample Survey of Household Vulnerability to Extreme Heat among Slum Dwellers in Ahmedabad, India (June 2013) <http://www.mdpi.com/1660-4601/10/6/2515>

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