Government of Saint Lucia

Response Plan for Extreme Heat Event

Developed by NEMO and based upon
The Heat Wave Plan for England – 2004 and
The Excessive Heat Events Guidebook of the Environmental Protection Agency of the United States of America

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Agreed to by *[The Extreme Heat Event Steering Committee]*	*Approved by* *[NEMAC]*
August 15, 2006	*20th November 2007*
[Date of Approval]	*[Date of Approval]*


Cap Pt.
Pigeon I.
Rodney Bay
Gros Islet
CASTRIES
Grande Cul de Sac Bay
Babonneau
Anse la Raye
Roseau
La Caye
Canaries
Dennery
Mt. Gimie
Praslin
Soufrière
Micoud
Canelles
Desruisseaux
St. Lucia I.
Choiseul
Laborie
Hewanorra Int'l. Airport
Vieux Fort
Maria Is.

Membership of the Extreme Heat Event Steering Committee

1. Ministry of Health
2. Ministry of Agriculture
3. Saint Lucia Met Service
4. Saint Lucia Fire Service/Ambulance Service
5. NEMO Secretariat

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DEFINITIONS

What is Extreme Heat Event?

A period of very hot weather lasting several days but that can sometimes last much longer during which temperatures average more than 38 degrees Centigrade.

Causes of Extreme Heat Event

Disruptions in the north easterly Trade Wind regime producing less effective ventilation or advection of warmer, more humid air from the equatorial region.

Likely impact of Extreme Heat Event

A range of human disorders, including unusual discomfort, heat cramps, heat exhaustion or, more seriously, heat stroke (hyperthermia).

SOURCE: Security and Emergency Management in South Australia at http://www.semo.sa.gov.au/site/page.cfm?u=246

INTRODUCTION

Extreme Heat Events (EHEs) are rare in Saint Lucia because of our geographical location within the tropical maritime north easterly Trade Wind belt. Occasionally, there are departures this normal tropical maritime island temperature cycle and elevated diurnal and nocturnal values may result. Such events may very well become more frequent as Climate Change continues to manifest in various ways. These events are a public health threat because they often increase the number of daily deaths (mortality) and other nonfatal adverse health outcomes (morbidity) in affected populations. Distinct groups within the population, generally those who are older, very young, or poor, or have physical challenges or mental impairments, are at elevated risk for experiencing EHE-attributable health problems. However, because EHEs can be accurately forecasted and a number of low cost but effective responses are well understood, future health impacts of EHEs could be reduced. This plan provides guidance and critical information that local public health officials and others need to begin assessing their EHE vulnerability and developing and implementing EHE notification and response programs.

COMMITTEE MEMBERSHIP

The membership of the Hot Weather Committee shall comprise but not be restricted to:

1. Chief Medical Officer – Ministry of Health
2. Chief Agriculturalist – Ministry of Agriculture
3. Director – Met Services
4. Officer in Charge – Ambulance Service
5. Rep – NEMO Secretariat

The Committee shall ***meet*** at least once a year in November, or as an EHE occurs, to review the system and program, and to plan for the up coming dry season.

HEALTH IMPACTS OF EHEs

EHE conditions are defined by weather that is substantially hotter and/or more humid than average for a location at that time of year. EHE conditions can increase the incidence of mortality and morbidity in affected populations. Recent examples of EHE health impacts include:

- More than 15,000 deaths in France alone (all of western Europe was affected) attributed to EHE conditions in August 2003
- More than 700 deaths attributed to EHE conditions in Cook County, Illinois, in July 1995
- A record high in Saint Lucia of 33.9 °C on 6th August 1973.

Concern over the potential future health impacts of EHEs follows research conclusions that EHEs may become more frequent, more severe.

RESPONDING TO EHE CONDITIONS

The potential for reducing future health impacts of EHEs is significant for several reasons.

First, ***with adequate in-house systems,*** meteorologists can accurately forecast EHE development and the severity of the associated conditions with several days of lead time. This provides an opportunity to activate established EHE notification and response plans or to implement short-term emergency response actions absent an existing plan.

Second, specific high-risk groups typically experience a disproportionate number of health impacts from EHE conditions. The populations that have physical, social, and economic factors and the specific actions that make them at high risk include:

- Older persons (age > 65)
- Infants (age < 1)
- The homeless
- The poor
- People who are socially isolated
- People with mobility restrictions or mental impairments
- People taking certain medications (e.g., for high blood pressure, depression, insomnia)
- People engaged in vigorous outdoor exercise or work or those under the influence of drugs or alcohol.

Identifying these high-risk groups in given locations allows public health officials to develop and implement targeted EHE notification and response actions that focus surveillance and relief efforts on those at greatest risk.

Third, broad consensus exists on the types of actions that will provide relief to those at risk during EHEs and help minimize associated health impacts.

These actions include:

- Ensuring real-time public access to information on the risks of the EHE conditions and appropriate responses through broadcast media, web sites, phone lines, and other means
- Establishing systems to alert public health officials about high-risk individuals or those in distress during an EHE (e.g., phone hotlines, high-risk lists)
- Directly assessing and, if needed, intervening on behalf of those at greatest risk (e.g., the homeless, older people, those with known medical conditions).

THE HEALTH RISKS

There are certain groups that are particularly at risk during an Extreme Heat Event. These include:

- older people, especially those over 65 years old and/or living on their own, or in a care home;
- people suffering from mental ill health, those with dementia, and those who rely on help from other people to manage day to day activities;
- people who are house/bed bound;
- people taking certain types of medication; and
- babies and young children, especially those under four years old.

Certain types of environment may exacerbate the risk from extreme heat, such as accommodation in top floor flats, lack of air conditioning, or work places producing heat, such as foundries and bakeries.

During extremely hot weather, there is a risk of developing heat exhaustion and heatstroke. Heatstroke can develop if the symptoms of heat exhaustion are left untreated. It can also occur suddenly and without warning. Heatstroke can result in organ failure, brain damage or death.

Should an EHE occur in Saint Lucia this plan sets out what needs to happen before and during the event. It includes specific measures to protect at risk groups.

Table: Medical Conditions directly attributable to heat exposure

Medical Condition	**Symptoms**	**Responses**
Heat Cramps	Painful muscle cramps and spasms, usually in muscles of legs and abdomen. Heavy sweating.	Apply firm pressure on cramping muscles or gently massage to relieve spasm. Give sips of water; if nausea occurs, discontinue water intake. Consult with a clinician or physician if individual has fluid restrictions (e.g., dialysis patients).
Heat Exhaustion	Heavy sweating, weakness, cool skin, pale, and clammy. Weak pulse. Normal temperature possible. Possible muscle cramps, dizziness, fainting, nausea, and vomiting.	Move individual out of sun, lay him or her down, and loosen clothing. Apply cool, wet cloths. Fan or move individual to air-conditioned room. Give sips of water; if nausea occurs, discontinue water intake. If vomiting continues, seek immediate medical attention. Consult with a clinician or physician if individual has fluid restrictions (e.g., dialysis patients).
Heat Strike [sun stroke]	Altered mental state. Possible throbbing headache, confusion, nausea, and dizziness. High body temperature (106°F or higher). Rapid and strong pulse. Possible unconsciousness. Skin may be hot and dry, or patient may be sweating. Sweating likely especially if patient was previously involved in vigorous activity.	Heat stroke is a severe medical emergency. Summon emergency medical assistance or get the individual to a hospital immediately. Delay can be fatal. Move individual to a cooler, preferably air-conditioned, environment. Reduce body temperature with a water mister and fan or sponging. Use air conditioners. Use fans if heat index temperatures are below the high 40s. Use extreme caution. Remove clothing. If

		temperature rises again, repeat process. **DO NOT GIVE FLUIDS.**

Source: USA/EPA

PLAN SUMMARY

The arrangements outlined here spell out what needs to be done by health and social care services and other bodies to raise awareness of risks relating to severe hot weather and what preparations both individuals and organizations should make to reduce those risks.

The plan also spells out the responsibilities at national and local level for alerting people once an Extreme Heat Event has been forecast, and advising them what to do during an Extreme Heat Event.

The core elements of the plan are:

- A High Temperature Monitoring system, based on Met Office forecasts, which will trigger levels of response from the **Ministry of Health, Ministry of Agriculture** and other Agencies.

- Advice and information issued by the **Ministry of Health and Ministry of Agriculture** direct to the public and to agriculture, health and social care professionals, particularly those working with at risk groups, both before an Extreme Heat Event is forecast and when one is imminent.

- Identification of individuals most at risk by primary car e teams and social services. These people will be the first to receive advice on preventive measures. They may be assessed to see if they need extra car e and support during an Extreme Heat Event.

- Extra help, where available, from the voluntary sector, families and others to care for those most at risk, mainly older people and people with a disability. This will be determined locally, as part of individual care plans, and based on existing relationships between statutory and voluntary bodies.

- Using the media to get advice to people quickly, both before and during an Extreme Heat Event.

Once accepted all plans must be tested. This is usually done in three ways:

1. **Ongoing Maintenance** - Any change in methodologies, organization, staffing, business methods, etc., must be reviewed in terms of impact to the Agency's COOP.

2. **Tests and Exercises** - These are tests of individual components and exercises that ensure

that staff is familiar with the plan and that the supporting procedures and infrastructure are workable. The tests and exercises to ensure the continued viability of the branch's business continuity plan are itemized below to ensure that every critical aspect of the plan will be effective when required. There are four types of Exercises: Orientation, Drill, Desktop and Full scale

3. **Actual Event:** Though no one wants the experience of an actual disaster, the event provides the opportunity to test the validity of the assumptions within the plan. A review of responses after an event provides the opportunity to upgrade the disaster plan.

ASSUMPTIONS

- That Ministry of Health and the Ministry of Agriculture are the lead responders in their respective sectors.

- A large scale emergency will result in increased demands on personnel at the Ministry of Health and the Ministry of Agriculture

- That the Government of Saint Lucia shall respond to a National Disaster.

- That Emergencies in Saint Lucia may be categorised in two ways:

  - Those that are preceded by a build-up [slow onset] period, which can provide NEMO with advance warnings, which is used to facilitate timely and effective activation of national arrangements

  - Other emergencies occur with little or no advance warning thus requiring mobilization and almost instant commitment of resources, with prompt support from the Government of Saint Lucia just prior to or after the onset of such emergencies

LIMITATIONS

This plan is limited to the coordination of an Extreme Heat Event response.

STATUTORY AUTHORITY

Disaster Management Act No 30 of 2006

Section 11(3) -- The National Disaster Response Plan shall include – (a) procedures related to disaster preparedness and response of public officers, Ministries and Departments of Government, statutory bodies, local government units… for, response to and recovery from emergencies and disaster in Saint Lucia.

Water & Sewage Act No. 14 of 2005

Division 3 Emergencies

Section 10-1 Where on the advice of the agency the Minister is satisfied that by reason of an exceptional shortage of rain, or contamination of water, a serious deficiency of supplies of water exists or is threatened, the Minister shall forthwith, by Order published in the Gazette, in at least two newspapers in the general weekly circulation in Saint Lucia

and by any other media declare a water-related emergency …

Education Act No. 41 of 1999

S139 -- Every Teacher in a public school and an assisted school shall – perform assigned duties as outlined in the school emergency plan developed by the school administration and the teachers to protect the health and safety of students."

Employees [Occupational Health and Safety] Act No. 10 of 1985

Part II Section 3 (d) -- Every employer shall – provide information, training and supervision necessary to ensure the protection of his employees against risk of accident and injury to health arising from their employment.

Employees [Occupational Health and Safety] Act No. 10 of 1985

Section 9 – Effective arrangements shall be made in every place of employment for the disposal of wastes and effluents due to manufacturing process or any other working methods carried on therein.

Police Ordinance No. 30 of 1965

Part IV Section 22 (1) -- It shall be the duty of the Force to take lawful measurers for – (m) Assisting in the protection of life and property in cases of fire, hurricane. Earthquake, flood and other disasters

RELATED DOCUMENTS

This plan is a "stand alone" document that may be activated to support hazard management plans. Other documents related to this plan are:

1. Drought Response Plan
2. Ministry of Health Disaster Plan
3. Ministry of Agriculture Disaster Plan
4. Saint Lucia Met Services Response Plan
5. ALL Hospital Response Plans
6. ALL Health Centres Response Plans
7. Veterinary Clinics Response Plans
8. Continuity of Operations Plans of Companies/Agencies/Ministries
9. National Emergency Management Plan

HIGH TEMPERATURE MONITORING SYSTEM

When the weather gets hotter, the risk of losing control of one's internal temperature increases. Even heat index table results are sensitive, however, to the particular meteorological variables measured. For example, heat index results often assume measurements are taken in a shaded location with light wind. As a result, most heat index tables also note that exposure to direct sunlight can increase heat index values by up to 15°F [9.4°C]. These table notes may also state that exposure to hot dry winds can further increase health risks by promoting rapid dehydration, although a quantitative measure of these conditions' impact is not provided *(NWS Forecast Office, Pueblo, Colorado, 2004).* Ultimately, a change in any meteorological variable that increases heat index values or promotes dehydration will increase the individual's health risk.

A High Temperature Monitoring system will operate in Saint Lucia during the year. The Met Office may forecast severe Extreme Heat Events, as defined by day and nighttime temperatures and duration.

While the High Temperature Monitoring system is in operation, the **Ministry of Health** will monitor the number of calls people make to health centres and the number of visits made to a sample of General Practitioners [GP] practices. Daily and weekly call and consultation rates will be reported to and recorded by the Ministry of Health to assess the correlation between people's health and hot weather. Temperature monitoring systems are encouraged at all hospitals and institutions housing patients.

The High Temperature Monitoring system comprises four levels of response. It is based on threshold day and nighttime temperatures as defined by the Met Office. These may vary, but the average threshold temperature is 38º C during the day and 31º C over night. Details of individual regional thresholds are given at the end of this plan.

Level 1 Awareness – Threshold temperatures not expected to be reached. This is the minimum state of vigilance. Both before and during this period, preparedness must be enhanced and maintained by the measures set out in the Extreme Heat Event plan

Level 2 Alert – This is triggered as soon as the Met Office forecasts threshold temperatures for at least three days ahead, or that there is an 80% chance of temperatures being high enough ***(> 35 ^{0}C)*** on at least two consecutive days to have significant effects on health.

Level 3 Extreme Heat Event – This is triggered as soon as the Met Office confirms that threshold temperatures have been reached.

Level 4 Emergency – This is reached when an Extreme Heat Event is so severe and/or prolonged that its effects extend outside health and social car e, such as power or water shortages, and/or where the integrity of health and social car e systems is threatened.

RESPONSES

Responsibilities at Level 1: Awareness

Preparations at this level will be the overall responsibility of the **Ministry of Health and Ministry of Agriculture**, in collaboration with the **Met Office** and the **Health Centres**.

The **Met Office** will develop and publicize the regional threshold temperatures ready for Level 2, and ensure three day forecasts are disseminated as appropriate to the Ministry of Health, and via national, regional and local weather forecasts.

The **Ministry of Health** and **Ministry of Agriculture** will issue general advice to the public, health care professionals and farmers, including details of what to do at Levels 2 and 3.

- A public information leaflet will be available through GP practices, pharmacies, Health

Centres, hospitals, care homes and voluntary sector organizations such as National Council of and for the Elderly, National Council of and for Persons with Disabilities, Help the Aged and Agricultural Extension Officers. The same advice will be posted on the GOSL Website.

- A fact sheet is available from the **Ministry of Health** and **Ministry of Agriculture,** for health and social care professionals, particularly those who visit people in their homes. This offers advice on practical measures to reduce health risks during an Extreme Heat Event and encourages identification of at risk individuals in advance, and assessment of additional car e needs.

- A second fact sheet is specifically aimed at the managers and staff of residential and nursing care homes, where people are particularly at risk during hot weather.

Implementation of the practical advice in the leaflet and both fact sheets is central to the plan.

The **Ministry of Health**, in collaboration with **Health Centres**, will refine mechanisms for the surveillance of increased heat related illness with the aim of being able to provide daily real time reports to the Ministry of Health. These will provide a source of intelligence on (a) how severe the effects are, and (b) how well services are responding.

The **Ministry of Agriculture** shall do the same with its respective agencies.

Primary care trusts and local social services authorities will support community and primary care staff in:

- identifying individuals who are at particular risk from extreme heat, especially those aged over 75. These people are likely to be already receiving care;
- identifying any changes to individual care plans that might be necessary in the event of an Extreme Heat Event, including initiating daily visits by formal or informal ***care givers*** to check on people living on their own;
- working with at risk individuals' families and informal ***care givers*** to put simple protective measures in place, such as installing proper ventilation and ensuring fans and fridges are available and in working order; and
- reviewing surge capacity and the need for, and availability of, staff support in the event of an Extreme Heat Event, especially if it lasts for more than a few days.

Strategic health authorities and primary care trusts will ensure independent healthcare providers are aware of all the guidance on minimizing and coping with heat related health risks.

Strategic health authorities and local authorities will raise awareness about heat related health risks among nursing and residential care home managers and staff, and encourage additional staff training, in line with the Ministry of Health fact sheet.

The **Ministry of Agriculture, Ministry of Health** and **Health Centres** will check the resilience of their equipment, especially medical and IT systems, to ensure that where necessary they can be maintained at working temperatures and there is no risk of system failure through overheating.

Responsibilities at Level 2: Alert

The **Met Office** will notify the **Ministry of Health, Ministry of Agriculture** and other organizations with High Temperature Monitoring responsibility immediately threshold temperatures are forecast for three days ahead for any one district. A warning will also be broadcast to the public via television and radio weather reports. This warning will resemble the examples given at the end of this plan.

The **Ministry of Health** and the **Ministry of Agriculture** will issue specific advice to the public and health and social care professionals in affected areas, in preparation for an imminent Extreme Heat Event, via the **Met Office**, Doctor's Offices, Health Centres and GOSL website. Ministry will be sent direct to key groups at local level, including chief executives and GPs, and recipients of the National Weather Reports, such as NEMO Secretariat, Office of the Prime Minister and weather information providers.

The **Ministry of Health** will continue surveillance of increased heat related illness reflected in calls to Health Centres and GP consultations to provide daily real time reports to the Ministry of Health. These will provide a source of intelligence on (a) how severe the effects are, and (b) how well services are responding.

The **Ministry of Agriculture** will continue surveillance of increased heat related illness reflected in calls to Agricultural Officers and Vets to provide daily real time reports to the Ministry of Agriculture These will provide a source of intelligence on (a) how severe the effects are, and (b) how well services are responding.

In collaboration with the **Met Office** with the **Bureau of Health Education** and the **Information Unit of the Ministry of Agriculture** will target the media with publicity about Met Office warnings and Ministry of Health advice to the public.

In addition, as soon as possible after the Level 2: Alert is announced, and no later than the second day of an Extreme Heat Event if Level 3 is reached:

Health Centres, Hospitals and Doctors Officers will ensure:

- Distribution of Ministry of Health advice to all those defined as at risk living at home, and the initiation of home visits as planned, where appropriate;
- Distribution of Ministry of Health advice to the managers of residential and nursing care homes.
- **Health Centres** will also ensure that Ministry of Health advice is distributed to all nursing and residential care home managers, including those with whom the Ministry may have no contract.

Agricultural Officers, Vet Clinics

- Distribution of Ministry of Agriculture advice to all those defined as at risk;
- Distribution of Ministry of Agriculture advice to Farmers;
- **Vet Clinics** will also ensure that Ministry of Agriculture advice is distributed to all their clients as the Ministry may have no contract with them.

Responsibilities at Level 3: Extreme Heat Event

The **Met Office** will confirm that the high temperature threshold has been reached. The forecast will include the likely duration of the Extreme Heat Event, the likely temperatures to be expected and the probability of other regions exceeding their threshold. The **Met Office** will continue to monitor and forecast temperatures in each region. ***Press release/EHE advisory will be issued separate from normal public weather bulletin.***

The **Ministry of Health** and the **Ministry of Agriculture** will continue to issue advice to the public and health and social care professionals (as Level 2).

The **Health Centres** will continue surveillance of increased heat related illness reflected in calls to Health Centres and GP consultations to provide daily real time reports to the Ministry of Health. These will provide a source of intelligence on (a) how severe the effects are, and (b) how well services are responding.

The **Agriculture Officers** will continue surveillance of increased heat related illness reflected in calls to them and **Vet Clinic** consultations to provide daily real time reports to the **Ministry of Agriculture**. These will provide a source of intelligence on (a) how severe the effects are, and (b) how well services are responding.

In collaboration with the **Met Office** the **Bureau of Health Education** and **Agriculture Information Unit** will target the media with publicity about Met Office warnings and Ministry of Health and Ministry of Agriculture advice to the public.

Hospitals and Health Centres authorities will:

- Continue to distribute advice to people at risk and managers and staff of residential and nursing care homes.
- Commission additional care and support, involving at least daily contact, as necessary for at risk individuals living at home. This may involve informal carers, volunteers and care workers. It will be particularly targeted at people with mobility or mental health problems, or receiving medication likely to give rise to heat related risks, and those living in accommodation that cannot easily be kept cool. Informal carers should be consulted about additional arrangements wherever possible.
- Ensure Ministry of Health advice reaches residential and nursing care home managers as soon as an Extreme Heat Event starts.

Ministry of Health will ensure hospital services are in a state of readiness in case there is a rise in admissions. Discharge planning should reflect local and individual circumstances so that people at risk are not discharged to unsuitable accommodation or reduced care during an

Extreme Heat Event.

Health Centres will continue to ensure that Ministry of Health advice is distributed to all residential and nursing care home managers.

Ministry of Agriculture will ensure Vet Clinics [State and Private] are in a state of readiness in case there is a rise in admissions. Discharge planning should reflect local and individual circumstances so that animals at risk are not discharged to unsuitable accommodation or reduced care during an Extreme Heat Event.

Field Officers will continue to ensure that Ministry of Agriculture advice is distributed to all residential and nursing care home managers.

RESPONSIBILITIES AT LEVEL 4: EMERGENCY

At this stage, an Extreme Heat Event is judged so severe and/or prolonged that its effects extend outside the health, social care and agriculture system. It may be declared locally or nationally, according to established operating doctrines.

In the event of a 'major incident' being declared, all existing emergency policies and procedures will apply.

All Level 3 responsibilities will also continue.

LEVEL 4: EMERGENCY - ACTIVATING THE NATIONAL RESPONSE MECHANISM

A major situation, such as an Emergency Declaration for an Extreme Heat Event, which threatens population centres will require that the **Ministry of Health and Ministry of Agriculture** Incident Commanders [IC] receive support for its control and management. This will be coordinated by the National Emergency Operations Centre (NEOC). The decision to advise the NEMO Secretariat of the need for additional support will be made by the IC.

Both IC will complete a Situation Report for the Director NEMO.

The Director NEMO in consultation with both IC and the Cabinet Secretary, will decide on activation of the Plan and if necessary, the NEOC.

The NEOC, once activated, will coordinate response, request additional resources and ensure adequate support to all relevant functions. Once the NEOC is activated all Standing Operating Procedures shall come into effect.

The individual IC will retain operational control of all operations.

LEVEL 4: EMERGENCY - ACTIVATING REGIONAL RESPONSE MECHANISMS

A major situation, such as an Emergency Declaration for an Extreme Heat Event, which threatens population centres in Saint Lucia may require that the Government of Saint Lucia receives support for its control and management. This will be coordinated by the Caribbean Disaster Emergency Response Agency [CDERA].

The decision to advise the CDERA Coordination of the need for additional support will be made by the Prime Minister, the Cabinet Secretary or the Director NEMO, based upon established response levels.

The Director NEMO will complete a Situation Report Form for the Coordinator of CDERA.

The Coordinator of CDERA in consultation with the Government of Saint Lucia, will decide on activation of the Regional Response Plan.

Once activated, CDERA Coordinating Unit will coordinate regional response, request additional resources and ensure adequate support to all relevant National functions. Once activated all Standard Operating Procedures shall come into effect.

The National Emergency Operations Centre [NEOC] shall retain operational control of all operations in Country.

OF SPECIAL NOTE: Should the CDERA/CU receive a request for activation from an alternate source regardless of its apparent credibility, the CU is to confirm the request with the Prime Minister, the Cabinet Secretary or the Director NEMO.

DEMOGRAPHIC SENSITIVITIES

Individuals possessing any combination of the following characteristics or conditions are at greater risk for experiencing an EHE-attributable adverse health outcome:

- **Physical constraints:** It is difficult for some people to increase their circulation and perspiration during an EHE to help them remain cool. This at-risk group includes infants, older people (age 65 and older, who may also be less likely to recognize symptoms of excessive heat exposure), the obese, the bedridden, those with underlying medical conditions (e.g., heart disease, diabetes), those taking certain medications (e.g., for high blood pressure, depression, insomnia), and individuals under the influence of drugs or alcohol.

- **Mobility constraints**: People with mobility constraints are at higher risk during EHEs if the constraints limit their ability to access appropriately cooled locations. This group includes the very young and the bedridden.

- **Cognitive impairments:** People with mental illnesses, with cognitive disorders, or under the influence of drugs or alcohol may be unable to make rational decisions that would help limit their exposure to excessive heat or to recognize symptoms of excessive heat exposure.

- **Economic constraints:** The poor may be disproportionately at risk during EHEs if their homes lack air conditioning or they are less likely to use available air conditioning because of the cost *(NWS, 2004)*. In addition, if the poor disproportionately reside in high crime areas, fear of crime can increase their risks by hindering their willingness to take appropriate responses [e.g., opening doors and windows for circulation, visiting cooling shelters *(American Medical Association Council on Scientific Affairs, 1997)*].

- **Social isolation:** Socially isolated individuals are less likely to recognize symptoms of excessive heat exposure. This can delay or prevent treatment and result in more serious health outcomes. Members of this group, which include the homeless and those living alone, may also be less willing or able to reach out to others for help.

BEHAVIORAL CHOICES

In addition to demographic characteristics, the choices individuals make during an EHE can have a profound effect on the health risks they face. Examples of personal choices that can increase an individual's health risks during an EHE include the following *(American Medical Association Council on Scientific Affairs, 1997; CDC 2004a,c; NWS, 2004)*:

- **Wearing inappropriate clothing**: Heavy, dark clothing can keep the body hot and limit cooling from evaporation of perspiration. Clothing that exposes skin to the sun increases the risk of sunburn, which limits the potential for evaporative cooling.

- **Failing to stay adequately hydrated:** During EHE conditions, we rely heavily on perspiration to regulate our body temperature. Without enough water consumption, perspiration will be inadequate or even cease and body temperature will rise.

- **Consuming alcohol:** Alcohol is a diuretic and thus limits perspiration. It can also impair judgment and result in excessive exposure to the elevated temperatures.

- **Engaging in outdoor activities:** Any activities that increase exposure to the sun or generate additional body heat (e.g., attending outdoor events, exercising, outdoor labor) increase the amount of body heat that must be dissipated.

- Eating **inappropriate meals**: Eating hot and heavy (e.g., high-protein) foods will increase the metabolic rate and increase the amount of body heat that must be dissipated.

REGIONAL FACTORS

Finally, regional characteristics can help determine an individual's health risks during EHEs. These characteristics include:

- **Geographic location:** Climate variability is largely a function of location, and increased variability has been associated with elevated heat-attributable mortality rates *(Chestnut et al., 1998)*.

- **Urbanization and urban design:** As buildings, especially those with dark roofs and dark paving materials replace vegetation in urban areas, the heat absorbed during the day increases and cooling from shade and evaporation of water from soil and leaves is lost. Urban areas can also have reduced air flow because of tall buildings, and increased amounts of waste heat generated from vehicles, factories, and air conditioners. These factors can contribute to the development of an urban heat island, which has higher daytime maximum temperatures and less nighttime cooling than surrounding rural areas. Urban heat islands can increase health risks during EHEs by increasing the potential maximum temperature residents are exposed to and the length of time that they are exposed to elevated temperatures.

- **Residential location:** Residents on the upper floors of buildings will feel the effects of rising heat. This can elevate room temperatures and make it more difficult to maintain a consistent internal temperature if air conditioning is not available or is not used, or if ventilation is restricted.

Table: Summary of Factors

Meteorological Characteristics
• Increased temperature • Increased relative humidity • Dry, hot winds or light winds/poor ventilation.
Demographic Characteristics
• Physical constraints (including underlying medical conditions) • Mobility constraints • Cognitive impairments • Economic constraints • Social isolation
Behavioral Choices
• Wearing inappropriate clothing • Failing to stay adequately hydrated • Consuming alcohol • Engaging in outdoor activities • Eating heavy and/or hot foods

Regional Characteristics
• Living in an area with a variable climate • Living in an urban area • Living on the upper floors of buildings

FUTURE ACTIONS

EHE prediction
Ensure access to weather forecasts capable of predicting EHE conditions 1-5 days in advance

- Forecasting the development and characteristics of an EHE is a critical element of both EHE risk assessment and notification and response activities.

EHE risk assessment
Coordinate transfer and evaluation of weather forecasts by EHE program personnel

- EHE program personnel may need to review forecast data to determine whether location-specific criteria for EHE conditions are satisfied and, potentially, how the forecast conditions match with any established EHE severity criteria. Establishing forecast transfer and evaluation protocols involves specifying under what conditions forecasters forward information to local officials (and confirm receipt) and identifying who within the EHE program reviews and evaluates the information. Alternatively, electronic systems can be established to retrieve and review forecast data from meteorologists and notify EHE program personnel if certain criteria are satisfied.

Develop quantitative estimates of the EHE's potential health impacts

- Use meteorological forecast data as inputs to health impact models, which identify when forecast conditions could result in excess mortality and then estimate the potential number or probability of heat-attributable deaths. These quantitative health impact estimates can then be used to determine if and what type of heat emergency is declared. These determinations affect the type and scope of notification and response activities that will be implemented.

Use the broader criteria to identify heat-attributable deaths

- Medical examiners can use the criteria in Donoghue et al. *(1997)* to define heat attributable deaths and to provide the public with more accurate reporting of an EHE's health impacts. This information can increase public awareness and appreciation of the health risks of the conditions, which may improve compliance with recommended actions.

Develop information on high-risk individuals

- Recognizing that some individuals have an elevated risk facilitates notifying and responding to these individuals (e.g., older individuals, the homeless) to achieve the greatest public health benefit for a given resource commitment. Easily accessible

EHE notification and response

Coordinate public broadcasts of information about the anticipated timing, severity, and duration of EHE conditions, and availability and hours of any public cooling centers.

Effective public notification of forecast EHE conditions helps eliminate the risk of an EHE taking a population by surprise. More specifically, notifying the public of anticipated EHE conditions will enable many residents to prepare and will enable public assessment and intervention actions to concentrate on known high-risk individuals and locations. Likewise, advance public notification about the availability of cooling centers will increase the likelihood that at-risk individuals can take advantage of these services.

Arrange for extra staffing of emergency support services

- EHEs will place additional burdens on emergency medical and social support services through increased activity focused on preventing adverse health outcomes and increased need for medical services. Increasing the staffing of emergency medical and social support services in response to an EHE forecast increases the opportunity to avert some outcomes with intervention and assessment activities or at least have them addressed at an earlier and less severe stage by preventing the emergency medical system from becoming overwhelmed.

Increase outreach efforts to the homeless and establish provisions for their protective removal to shelters

- The homeless are vulnerable during EHEs, so additional effort must be devoted to homeless outreach and evaluation during an EHE, especially during the day. This increased outreach effort should be supported by authorization for officials to move individuals believed to be experiencing medical difficulties or at extreme risk to cooling shelters for observation and treatment.

Reschedule public events to avoid large outdoor gatherings, when possible

- When an EHE is forecast, there are likely to be previously scheduled outdoor activities involving large gatherings of individuals (e.g., games, outdoor camps, concerts). If these activities take place as scheduled, many people may experience significant heat exposure. To the extent that local officials have control over how these events proceed (e.g., through permits or use of facilities), efforts should be made to reschedule the event or, when rescheduling is not feasible, require more medical staff

ANNEX 1 - THRESHOLD DAY AND NIGHT TEMPERATURES

Threshold day and night temperatures defined by the Met Office in Temperature (degrees Centigrade)

Saint Lucia	**Day: 38°C**	**Night: 31°C**

ANNEX 2 – PUBLIC INFORMATION

Copies of the public information leaflet and fact sheets for health and social care professionals and residential and nursing care home managers can be downloaded from: www.stlucia.gov.lc [www.dh.gov.uk/publications]

ANNEX 3 – MEDIA MESSAGES

These are the core messages to be broadcast as 'official Ministry of Health and Ministry of Health warnings' alongside national weather forecasts. They may be expanded or otherwise refined in discussion with broadcasters and weather presenters.

Level 1: Awareness

No warning required unless there is a 50% probability of the situation reaching Level 2: Alert in Saint Lucia within the next five days, then something along the lines of:

If this does turn out to be an Extreme Heat Event, we'll try and give you as much warning as possible.

But in the meantime, if you are worried about might be at risk, go to the nearest Health Centre, visit your Doctor, speak with your Agricultural Officer or Vet.

Alternatively information is online for advice at the GOSL website at www.stlucia.gov.lc

Level 2: Alert

'The Met Office in conjunction with the Ministry of Health and the Ministry of Agriculture is issuing the following Extreme Heat Event Alert for Saint Lucia

Responsible Agency – Saint Lucia Met Service

'Extreme Heat Events can be dangerous, especially for the very young or very old or those with chronic disease and animals.

Advice on how to reduce the risk either for yourself or somebody you know or your livestock can be obtained from the nearest Health Centre or visit your Doctor, speak with your Agricultural Officer or Vet.

Alternatively information is online for advice at the GOSL website at www.stlucia.gov.lc

Level 3 or 4: Extreme Heat Event/Emergency

The Met Office, in conjunction with the Ministry of Health and the Ministry of Agriculture, is issuing the following Extreme Heat Event advice for Saint Lucia

'Stay out of the sun for prolonged periods. Keep your home as cool as possible – open or shut windows to achieve this.

Keep drinking fluids to re-hydrate yourself.

If there's anybody you know, for example an older person living on their own, who might be at special risk, make sure they know what to do.

Keep animals in shaded areas.
Ensure they have plenty of water.

Advice on how to reduce the risk either for yourself, somebody you know, your pet or livestock can be obtained from the nearest Agricultural Extension Officer, Health Centre or visit your Doctor or Vet.

Alternatively Online for advice at the GOSL website at www.stlucia.gov.lc

ANNEX 4 - USE OF PORTABLE ELECTRIC FANS DURING EXTREME HEAT EVENTS

The widespread availability and ease of using portable electric fans draw many people to use them for personal cooling during an EHE. Portable electric fans can, however, increase the circulation of hot air, which increases thermal stress and health risks during EHE conditions. As a result, portable electric fans need to be used with caution and under specific circumstances during an EHE. Here is a list of Do's and Don't's for their use:

Do

- Use a portable electric fan in or next to an open window so heat can exhaust to the outside (box fans are best).
- Use a portable electric fan to bring in cooler air from the outside.
- Plug your portable electric fan directly into a wall outlet. If you need an extension cord, check that it is approved by the Saint Lucia Bureau of Standards.

Don't

- Use a portable electric fan in a closed room without windows or doors open to the outside.
- Believe that portable electric fans cool air. They don't. They just move the air around and keep you cool by helping to evaporate your sweat.
- Use a portable electric fan to blow extremely hot air on yourself. This can accelerate the risk of heat exhaustion.
- Use a fan as a substitute for spending time in an air-conditioned facility during an EHE.

If you are afraid to open your window to use a portable electric fan, choose other ways to keep cool (e.g., cool showers, spend time in an air-conditioned location).

Sources: Philadelphia Office of Mental Health & Mental Retardation, 2002; Toronto Public Health, 2002.