

# Heat Wave: A Major Summer Killer

## A National Problem

Heat kills by taxing the human body beyond its abilities. In a normal year, about 175 Americans succumb to the demands of summer heat. Among the large continental family of natural hazards, only the cold of winter-not lightning, hurricanes, tornadoes, floods, or earthquakes-takes a greater toll. In the 40-year period from 1936 through 1975, nearly 20,000 people were killed in the United States by the effects of heat and solar radiation. In the disastrous heat wave of 1980, more than 1,250 people died.

And these are the direct casualties. No one can know how many more deaths are advanced by heat wave weather-how many diseased or aging hearts surrender that under better conditions would have continued functioning.

North American summers are hot; most summers see heat waves in one section or another of the United States. East of the Rockies, they tend to combine both high temperature and high humidity although some of the worst have been catastrophically dry.

## NOAA's National Weather Service Heat Index Program

Considering this tragic death toll, the National Weather Service (NWS) has stepped up its efforts to alert more effectively the general public and appropriate authorities to the hazards of heat waves-those prolonged excessive heat/humidity episodes.

Based on the latest research findings, the NWS has devised the "Heat Index" (HI), (sometimes referred to as the "apparent temperature"). The HI, given in degrees F, is an accurate measure of how hot it really feels when relative humidity (RH) is added to the actual air temperature.

To find the HI, look at the Heat Index Chart. As an example, if the air temperature is 95°F (found on the left side of the table) and the RH is 55% (found at the top of the table), the HI-or how hot it really feels-is 110°F. This is at the intersection of the 95° row and the 55% column.

**IMPORTANT:** Since HI values were devised for shady, light wind conditions, EXPOSURE TO FULL SUNSHINE CAN INCREASE HI VALUES BY UP TO 15°F. Also, STRONG WINDS, PARTICULARLY WITH VERY HOT, DRY AIR, CAN BE EXTREMELY HAZARDOUS.

## Heat Index/Heat Disorders:

Possible heat disorders for people in higher risk groups.

Heat Index of 130° OR Higher: HEATSTROKE/SUNSTROKE HIGHLY HIGHER LIKELY WITH CONTINUED EXPOSURE,

Heat Index of 105°- 130°: SUNSTROKE, HEAT CRAMPS OR HEAT EXHAUSTION LIKELY, AND HEATSTROKE POSSIBLE WITH PROLONGED EXPOSURE AND/OR PHYSICAL ACTIVITY.

Heat Index of 90°- 105°: SUNSTROKE, HEAT CRAMPS AND HEAT EXHAUSTION POSSIBLE WITH PROLONGED EXPOSURE AND/OR PHYSICAL ACTIVITY.

Heat Index of 80° - 90°: FATIGUE POSSIBLE WITH PROLONGED EXPOSURE AND/OR PHYSICAL ACTIVITY

Note on the HI chart the shaded zone above 105°F. This corresponds to a level of HI that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

### **Heat Index/Heat Disorders**

<b>Category</b>	<b>Heat Index</b>	<b>Possible heat disorders for people in high risk groups</b>
<b>Extreme Danger</b>	<b>130°F or higher (54°C or higher)</b>	<b>Heat stroke or sunstroke likely.</b>
<b>Danger</b>	<b>105 - 129°F (41 - 54°C)</b>	<b>Sunstroke, muscle cramps, and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity.</b>
<b>Extreme Caution</b>	<b>90 - 105°F (32 - 41°C)</b>	<b>Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity.</b>
<b>Caution</b>	<b>80 - 90°F (27 - 32°C)</b>	<b>Fatigue possible with prolonged exposure and/or physical activity.</b>

# Heat Index

Heat index (HI), sometimes referred to as the "Apparent Temperature", is a measure of how hot the air feels when relative humidity (RH) is related to the actual air temperature. Heat Index values are expressed in degrees Fahrenheit (F).

## Air Temperature

		70	75	80	85	90	95	100	105	110	115	120	125	130
	0	64	69	73	78	83	87	91	95	99	103	107	111	117
	5	64	69	74	79	84	88	93	97	102	107	111	116	122
R	10	65	70	75	80	85	90	95	100	105	111	116	123	131
E	15	65	71	76	81	86	91	97	102	108	115	123	131	
L	20	66	72	77	82	87	93	99	105	112	120	130	141	
A	25	66	72	77	83	88	94	101	109	117	127	139		
T	30	67	73	78	84	90	96	104	113	123	135	148		
I	35	67	73	79	85	91	98	107	118	130	143			
V	40	68	74	79	86	93	101	110	123	137	151			
E	45	68	74	80	87	95	104	115	129	143				
	50	69	75	81	88	96	107	120	135	150				
H	55	69	75	81	89	98	110	126	142					
U	60	70	76	82	90	100	114	132	149					
M	65	70	76	83	91	102	119	138						
I	70	70	77	85	93	106	124	144						
D	75	70	77	86	95	109	130							
I	80	71	78	86	97	113	136							
T	85	71	78	87	99	117								
Y	90	71	79	88	102	122								
	95	71	79	89	105									
(%)	100	72	80	91	108									

Note: Exposure to the Full Sun can increase the Heat Index by up to 15 Degrees Fahrenheit.

Note:

Heat index values were devised for shady and light wind conditions. Exposure to full direct sunshine can increase heat index values by up to 15 degrees Fahrenheit. Studies show that heat index values above 105 degrees Fahrenheit correspond to a level that may cause increasingly severe heat disorders with continued exposure and/or physical activity.

### **Summary of NWS's Alert Procedures**

The NWS will initiate alert procedures when the HI is expected to exceed 105° (- 1 to 10°F) (depending on local climate) for at least two consecutive days. The procedures are:

- Include HI values in zone and city forecasts.
- Issue Special Weather Statements and/or Public Information Statements presenting a detailed discussion of
  - Extent of the hazard including HI values
  - Who is most at risk
  - Safety rules for reducing the risk.
- Assist state/local health officials in preparing Civil Emergency Messages in severe heat waves. Meteorological information from Special Weather Statements will be included as well as more detailed medical information, advice, and names and telephone numbers of health officials.
- Release to the media and over NOAA's own Weather Radio all of the above information.

### **How Heat Affects the Body Human**

Human bodies dissipate heat by varying the rate and depth of blood circulation, by losing water through the skin and sweat glands, and-as the last extremity is reached-by panting, when blood is heated above 98.6 degrees. The heart begins to pump more blood, blood vessels dilate to accommodate the increased flow, and the bundles of tiny capillaries threading through the upper layers of skin are put into operation. The body's blood is circulated closer to the skin's surface, and excess heat drains off into the cooler atmosphere. At the same time, water diffuses through the skin as perspiration. The skin handles about 90 percent of the body's heat dissipating function.

Sweating, by itself, does nothing to cool the body, unless the water is removed by evaporation, and high relative humidity retards evaporation. The evaporation process itself works this way: the heat energy required to evaporate the sweat is extracted from the body, thereby cooling it. Under conditions of high temperature (above 90 degrees) and high relative humidity, the body is doing everything it can to maintain 98.6 degrees inside. The heart is pumping a torrent of blood through dilated circulatory vessels; the sweat glands are pouring liquid-including essential dissolved chemicals, like sodium and chloride onto the surface of the skin.

## **Too Much Heat**

Heat disorders generally have to do with a reduction or collapse of the body's ability to shed heat by circulatory changes and sweating, or a chemical (salt) imbalance caused by too much sweating. When heat gain exceeds the level the body can remove, or when the body cannot compensate for fluids and salt lost through perspiration, the temperature of the body's inner core begins to rise and heat-related illness may develop.

Ranging in severity, heat disorders share one common feature: the individual has overexposed or over exercised for his age and physical condition in the existing thermal environment.

Sunburn, with its ultraviolet radiation burns, can significantly retard the skin's ability to shed excess heat. Studies indicate that, other things being equal, the severity of heat disorders tend to increase with age-heat cramps in a 17-year-old may be heat exhaustion in someone 40, and heat stroke in a person over 60.

Acclimatization has to do with adjusting sweat-salt concentrations, among other things. The idea is to lose enough water to regulate body temperature, with the least possible chemical disturbance.

## **Cities Pose Special Hazards**

The stagnant atmospheric conditions of the heat wave trap pollutants in urban areas and add the stresses of severe pollution to the already dangerous stresses of hot weather, creating a health problem of undiscovered dimensions. A map of heat-related deaths in St. Louis during 1966, for example, shows a heavier concentration in the crowded alleys and towers of the inner city, where air quality would also be poor during a heat wave.

The high inner-city death rates also can be read as poor access to air-conditioned rooms. While air conditioning may be a luxury in normal times, it can be a lifesaver during heat wave conditions.

The cost of cool air moves steadily higher, adding what appears to be a cruel economic side to heat wave fatalities. Indications from the 1978 Texas heat wave suggest that some elderly people on fixed incomes, many of them in buildings that could not be ventilated without air conditioning, found the cost too high, turned off their units, and ultimately succumbed to the stresses of heat.

## **Preventing Heat-Related Illness**

Elderly persons, small children, chronic invalids, those on certain medications or drugs (especially tranquilizers and anticholinergics), and persons with weight and alcohol problems are particularly susceptible to heat reactions, especially during heat waves in areas where a moderate climate usually prevails.

## **Heat Wave Safety Tips**

**Slow down.** Strenuous activities should be reduced, eliminated, or rescheduled to the coolest time of the day. Individuals at risk should stay in the coolest available place, not necessarily indoors.

**Dress for summer.** Lightweight light-colored clothing reflects heat and sunlight, and helps your body maintain normal temperatures.

**Put less fuel on your inner fires.** Foods (like proteins) that increase metabolic heat production also increase water loss.

Drink plenty of **water or other non-alcohol fluids**. Your body needs water to keep cool. Drink plenty of fluids even if you don't feel thirsty. Persons who (1) have epilepsy or heart, kidney, or liver disease, (2) are on fluid restrictive diets or (3) have a problem with fluid retention should consult a physician before increasing their consumption of fluids.

**Do not drink alcoholic beverages.**

**Do not** take salt tablets unless specified by a physician.

**Spend more time in air-conditioned places.** Air conditioning in homes and other buildings markedly reduces danger from the heat. If you cannot afford an air conditioner, spending some time each day (during hot weather) in an air conditioned environment affords some protection.

**Don't get too much sun.** Sunburn makes the job of heat dissipation that much more difficult

---

### **Know These Heat Disorder Symptoms**

**SUNBURN:** Redness and pain. In severe cases swelling of skin, blisters, fever, headaches. First Aid: Ointments for mild cases if blisters appear and do not break. If breaking occurs, apply dry sterile dressing. Serious, extensive cases should be seen by physician.

**HEAT CRAMPS:** Painful spasms usually in muscles of legs and abdomen possible. Heavy sweating. First Aid: Firm pressure on cramping muscles, or gentle massage to relieve spasm. Give sips of water. If nausea occurs, discontinue use.

**HEAT EXHAUSTION:** Heavy sweating, weakness, skin cold, pale and clammy. Pulse thready. Normal temperature possible. Fainting and vomiting. First Aid: Get victim out of sun. Lay down and loosen clothing. Apply cool, wet cloths. Fan or move victim to air conditioned room. Sips of water. If nausea occurs, discontinue use. If vomiting continues, seek immediate medical attention.

**HEAT STROKE (or sunstroke):** High body temperature (106° F. or higher). Hot dry skin. Rapid and strong pulse. Possible unconsciousness. First Aid: HEAT STROKE IS A SEVERE MEDICAL EMERGENCY. SUMMON EMERGENCY MEDICAL ASSISTANCE OR GET THE VICTIM TO A HOSPITAL IMMEDIATELY. DELAY CAN BE FATAL. Move the victim to a cooler environment Reduce body temperature with cold bath or sponging. Use extreme caution. Remove clothing, use fans and air conditioners. If temperature rises again, repeat process. Do not give fluids. Persons on salt restrictive diets should consult a physician before increasing their salt intake.

\*For more information contact your local American Red Cross Chapter. Ask to enroll in a first aid course.