Personal Risk Factors in Heat Stress

Topics	Topics
Personal Risk Factors – PRFs	Heat Stress Questionnaire
4 Grouping of Personal Risk Factors	Pre-Work Personal Risk Assessment form
Highlights on the 4 Groupings of PRFs	Warning
Graphic - How Heat Affects the Body	OSHA's Protecting Yourself
Graphic – Factors in Play	Signs & Symptoms and First Aid
Medical Conditions	Combined Risk Factors
Inter-relatedness of Risk Factors	Q&A

There is no such thing as a "normal" body temperature, so the 98.6 ºF is actually not really normal…

Humans actually run a bit cooler.

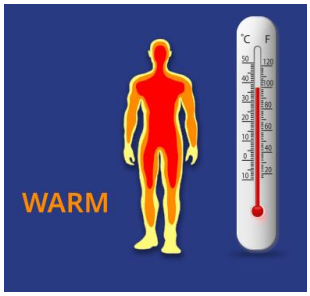
Adults over the age of 60 tend to have a lower body temperature, compared to younger adults. Babies and children have a wider range: 95.9 F to 99.5 F (if measured with an oral thermometer) or 97.9 F to 100.4 F (if measured by a rectal thermometer).

Scientists analyzed the oral temperature measurements of more than 126,000 adults seen at Stanford Health Care between 2008 and 2017.

They found **the average human body temperature to be around 97.9 degrees**, nearly a degree lower than 98.6.

The new study also finds variations in temperature depending on patient characteristics and time of day. For example, **women tend to run hotter than men**. **Older people tend to have lower temperatures than younger people**. And, among all demographics, **temperatures tend to be lower in the morning and higher in the afternoon**.

A normal temperature for adults is in the range of 97 F to 99 F.
For children, the normal temperature range is 95.9 F to 99.5 F



Fever in adults

There are different levels of severity of fevers in adults.

These include:

- Low-grade fevers: 99.1 to 100.4 F
- Moderate-grade fevers: 100.6 to 102.2 F
- High-grade fevers: 102.4 to 105.8 F

If you're an adult with a fever of over 104 F, you should call your doctor.

DaveV Comment: People like simple for easy future reference…

a ***heuristic*** for those who prefer a technical sounding term for what most of us would default to calling a "***rule-of-thumb***."

It is also possible that average body temperatures have dropped in recent decades because humans are getting healthier.

Thanks to advances in medicine and dentistry, patients are dealing with less inflammation than they likely were 150 years ago.

The new study also finds variations in temperature depending on patient characteristics and time of day. For example:

- **women tend to run hotter than men**
- **Older people tend to have lower temperatures than younger people**
- **temperatures tend to be lower in the morning and higher in the afternoon**.

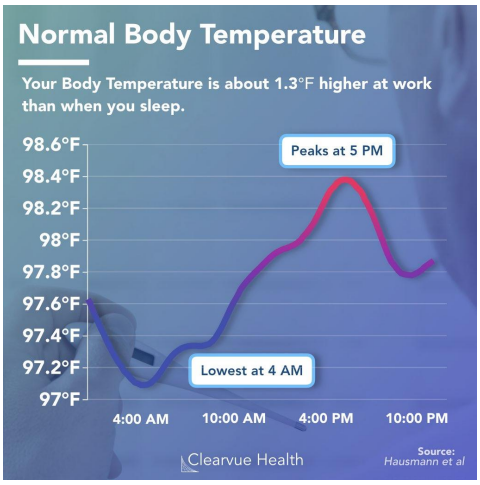
Since there's so much variability in body temperature, a high reading for one person could be normal for someone else.

Individualized temperature evaluations and personalized fever thresholds might be more useful than comparing everyone to the average, the researchers say.

For example, a doctor might consider how a patient's current temperature compares to their historical readings.

A lot of things can change your normal body temperature, making it higher or lower than 98.6 F.

These include:

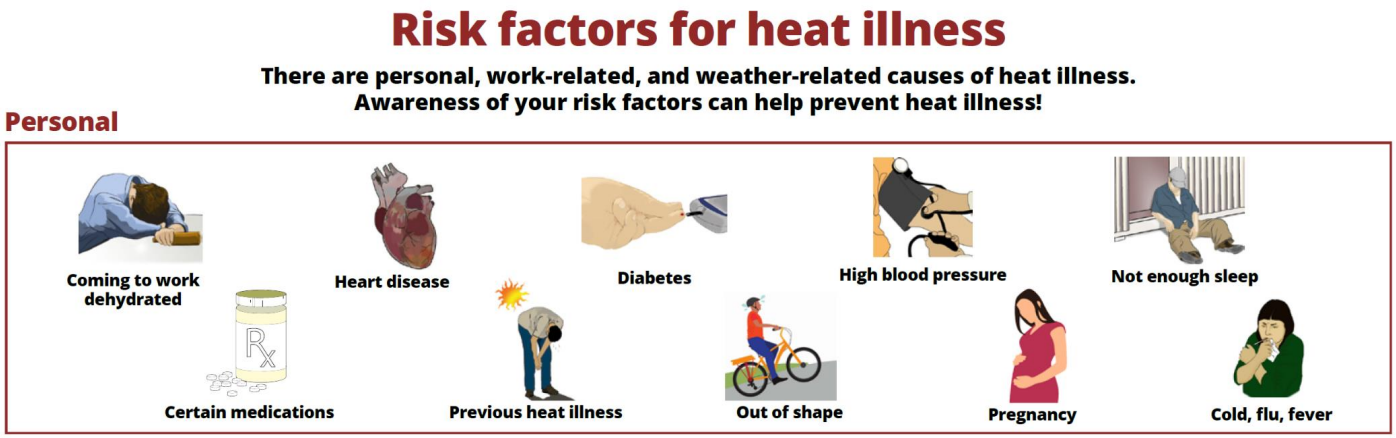


- How active you are
- What time of day it is
- The weather
- Your age
- Your sex
- If you have any medical conditions
- What you've eaten or had to drink
- Where you are in your menstrual cycle
- What body part or method you're using to measure the temperature

  (Underarm readings can be a degree lower than mouth readings, and rectal temperatures are usually up to a degree higher than ones taken in the mouth.)

Personal Risk Factors for Heat Illness: (Per Cal OSHA)

Factors such as an individual's age, degree of acclimatization, health, water consumption, alcohol consumption, caffeine consumption, and use of medications that affect the body's water retention or other physiological responses to heat.



Personal Risk Factors that can reduce your tolerance to heat

Health conditions

Some **health conditions** may cause you to be less likely to sense and respond to changes in temperature.

- Diabetes
- High blood pressure
- Heart disease
- Kidney disease
- Mental health conditions
- Overweight or obese
- Respiratory diseases, like asthma and chronic obstructive pulmonary disease (COPD)

Medications

Certain **medications** may cause you to be less likely to feel heat conditions and/or limit your ability to sweat or retain water to cool your body.

- Antihistamines
- Blood pressure medications
- Diarrhea medications
- Diuretics (water pills)
- Muscle relaxants
- Psychiatric medications
- Sedatives

Physical characteristics

Some **physical characteristics** may cause you to become dehydrated faster and/or limit your ability to cool your body.

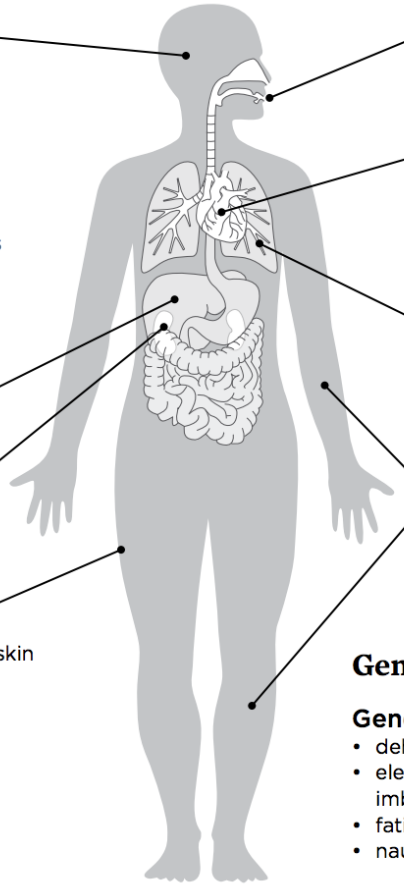
- Older age (60 years and older)
- Lower level of physical fitness
- Pregnancy
- History of prior heat illness
- Acclimatization status (i.e., if you have built up tolerance to the temperature you are working in)

Behavioral characteristics

Certain **decisions**, like what you consume and put in your body, may dehydrate you and impair the way your body normally regulates itself.

- Alcohol use within 24 hours of your shift
- Use of illicit drugs, such as opioids, methamphetamine, and cocaine
- Lower intake of water

How Heat Affects Our Bodies



Head
- headache
- dizziness
- irritability
- loss of coordination
- confusion
- delirium
- anxiety
- loss of consciousness
- seizures
- stroke
- coma

Liver
- liver injury

Kidneys
- kidney disease
- kidney failure

Skin
- flushed and clammy skin
- profuse sweating
- heat rash

Mouth
- intense thirst
- dry mouth

Heart
- rapid heartbeat
- irregular heartbeat
- reduced bloodflow to the heart
- heart attack

Lungs
- increased breathing rate
- worsened allergies and asthma
- worsened chronic obtrusive pulmonary disease

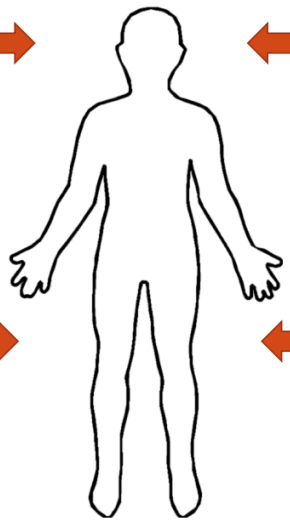
Arms and Legs
- heat cramps
- muscle spasms
- weakness

General Physiology and Unique Circumstances

General
- dehydration
- electrolyte imbalance
- fatigue
- nausea
- vomiting
- drop in blood pressure
- fever

Pregnant People
- fetal nutrition deficits
- preterm delivery and birth
- stillbirth

HEAT STRESS- MANY FACTORS IN PLAY



Thermoregulation
- Sweating
- Vasodilation
- Heart Rate

Extrinsic Factors
- Humidity (water vapor pressure)
- Ambient Temperature
- Wind-Air Velocity
- Clothing
- Shift

Intrinsic Factors
Within Individual's Control
- Acclimatization
- Fitness Levels
- Body Mass
- Hydration
- Nutrition
- Sleep
- Stress
- Certain Supplements & Drugs

Other Intrinsic Factors
- Age
- Gender
- Pre-Existing Medical Conditions

An Individual's "Medical Conditions" can also predispose that particular worker to experience a heat-related illness

- Keep in mind that not all workers tolerate heat the same way.
- Workplace controls should focus on making jobs safe for each individual employee.
- An ***occupational medical monitoring program*** can identify workers who are at increased risk of heat illness, while maintaining confidentiality of those workers' health information.
- When heat hazards are present, workers should receive training about personal factors that can make them more susceptible to heat-related illness.
- When in doubt, workers should talk to their healthcare provider about whether they can work safely in the heat.

Most Workers with Chronic Conditions Haven't Told Employer

*Many workers who are suffering from chronic conditions are not telling their employers, according to a national poll, **U.S. Employee Perspectives on Managing Chronic Conditions in the Workplace** by the Harvard School of Public Health and de Beaumont Foundation.*

The poll found that three-fourths (76%) of those with chronic conditions—such as hypertension, heart disease, diabetes, and asthma—need to manage their conditions during work hours.

*Yet the **majority (60%) have not formally disclosed their conditions to their employer**.*

While more than half of those polled, 58%, report having physical chronic health conditions, they are struggling with getting treatment and managing their jobs.

36% reported either skipping medical appointments or delaying care to avoid interfering with work in the past year.

And about half of those with chronic conditions say they felt they could not take time off work (49%) or take a break while at work (49%), even though they needed to because of their conditions.

Table 3. Common medications (over the counter and prescription) and their associated effects on heat regulation.

Medication	Effects On Heat Regulation
Drugs with anticholinergic activity	Altered central thermoregulation, sedation, and cognitive impairment, leads to dry mouth and/or skin, fever, cessation of sweating *(Sorensen & Hess, 2022)*, hypotension and reduced cardiac output may increase risk of fainting and falls. E.g., atropine, antihistamines, tricyclic antidepressants, phenothiazines, butyrophenones
Blood pressure medication	Decrease heart rate and cardiac contractility, which may impair heat loss through vascular mechanisms *(Sorensen & Hess, 2022)*. E.g., Beta-blockers, calcium-channel blockers
Hypotensive drugs and diuretics	Increase dehydration, impaired cardiac output, impaired blood volume (hypovolemic), postural hypotension increases risk of fainting or falls, reduced thirst sensation, renal impairments *(Sorensen & Hess, 2022; Tait, 2011; Westaway, 2015)*. E.g., Chlorothiazide, bumetanide, triamterene

Medication	Effects On Heat Regulation
Sedatives and anti-anxiety drugs	Impaired behavioural responses to temperature, such as drinking fluids or taking cooling/heating actions *(Sorensen & Hess, 2022),* these drugs may also reduce the threshold for shivering *(Tait, 2011)*. E.g., Benzodiazepines,barbiturates, zolpidem, eszopiclone
Antipsychotics	Interference with hypothalamic thermoregulation *(Sorensen & Hess, 2022)*. Additionally, impaired sweating, reduced thirst sensation, hypotension, and reduced cardiac output may increase risks of fainting or falls, sedation and cognitive impairment, such as reduced alertness, judgement, and perception can occur *(Cuddy, 2004; Westaway, 2015)*. E.g., Phenothizines, risperidone, olanzapine, quetiapine, haloperidol

RISK FACTORS

Workers need to be aware of the many factors that can impact their risk of heat illness, but also that ---

workers can be affected by many risk factors at the same time.

Best Practice Recommendation

Post this in Rest Area or closest rest room

especially when you have passed the

High Heat Trigger

Heat Stress Screening Questionnaire

(for self or second-person monitoring)

0 = No discomfort 1 = Mild discomfort 2 = Moderate discomfort 3 = Severe discomfort

How intensely are you suffering from the heat? (i.e. how hot do you feel?) **NOTES**

0 1 2 3

Do you feel that your heart is beating very fast?

❑ No 0 ❑ Yes **Rate Discomfort:** 1 2 3

Do you have any muscle pain/muscle cramps?

❑ No 0 ❑ Yes **Rate Discomfort:** 1 2 3

Do you have a headache?

❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*

Do you have dizziness/drowsiness?

❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*

Do you feel unsteady when standing?

❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*

Do you feel fatigued?

❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*

Do you find it difficult to think?

❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*

Do you find it difficult to breathe or have a shortness of breath?

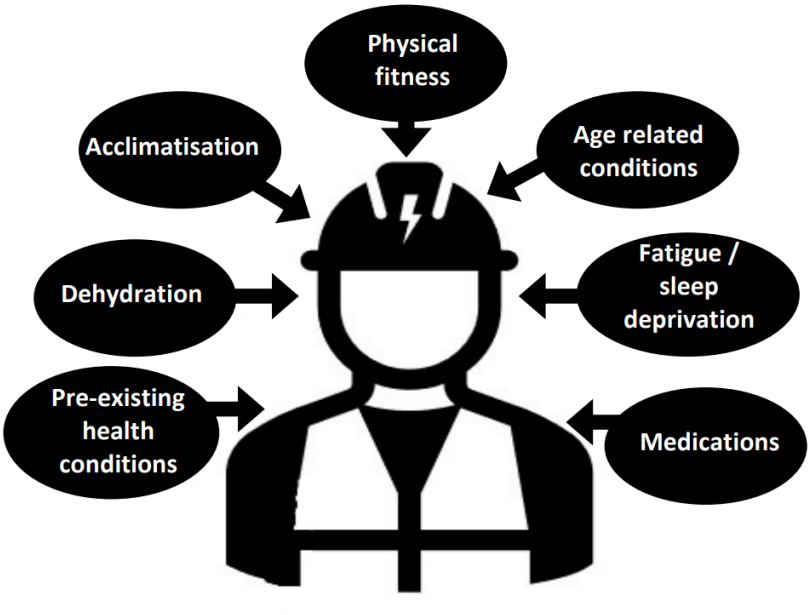
❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*

Do you feel nauseous?

❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*

Do you feel thirsty?

❑ No 0 ❑ Yes ***Rate Discomfort:*** *1 2 3*



– Individual and pre-disposing factors

Symptoms Self-Assessment Questionnaire

Name		Date	

Symptoms	Not At All 0	A Little 1	Somewhat 2	Moderate 3	A Lot 4	Extreme 5
Lightheaded						
Headache						
Dizzy						
Thirsty						
Weakness						
Irritable						
Hard to breathe						
Muscle cramp						
Tiredness						
Nauseous						
Felt Hot						
Trouble concentrating						
'Goosebumps' or chills						
Management Guide	All symptoms 0 or 1 **Proceed**		Some symptoms 2 or 3 **Monitor symptoms and adjust work rate**		Any symptoms 4 or 5 **Stop and Report to Supervisor**	

Could work at my best	Strongly Agree 0	Agree 1	Somewhat Agree 2	Somewhat Disagree 3	Disagree 4	Strongly Agree 5

Workload	Less Than Normal	Normal	Higher Than Normal

Is your supervisor/HSC aware of medications currently being used that may impair your ability to perform duties in heat? □ Yes □ No

PRE-WORK CHECKLIST OF PERSONAL HEAT EXPOSURE RISK FACTORS

(NOTE: Provide a printed copy of Pages 5 and 6 to each individual in the work crew who will be directly engaged in this heat-involved work.)

Personal Risk Factors are provided under the ***physical*** and ***situational*** sub-factors, below.

Check boxes □ are provided so you can identify what you need to disclose and discuss with your designated Heat Stress Coordinator, who is required to know and to collaborate with you on what precautions & limitations to put in place that will prevent you from experiencing a heat-related illness.

Please take the time to read through this and evaluate what factors personally apply to you.

Physical Risk Factors

- □ Obesity (body mass index ≥ 30 kg/m²)
- □ Diabetes
- □ High blood pressure
- □ Heart disease
- □ Skin disorders (such as heat rash and sunburn that prevent effective sweating)
- □ Advanced age (65+)

PRE-WORK CHECKLIST OF PERSONAL HEAT EXPOSURE RISK FACTORS

Situational Factors

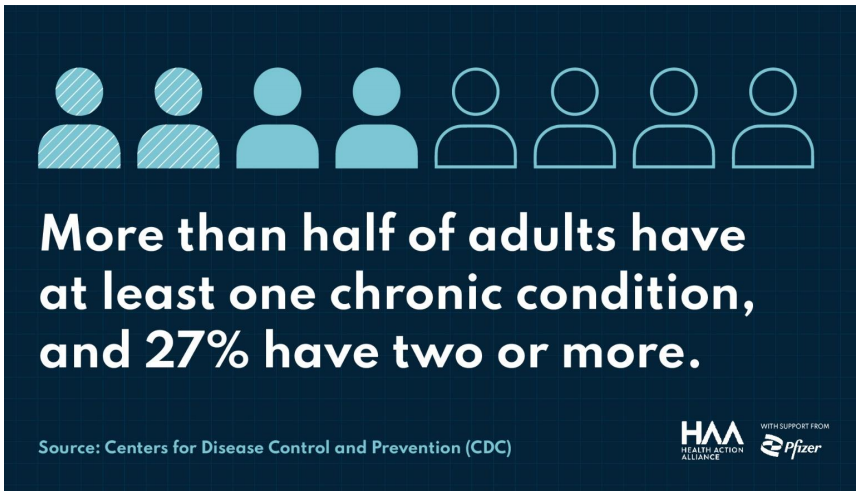
- ☐ Prior history of heat illness (a heat stroke or two or more episodes of heat exhaustion)
- ☐ Use of certain medications (which can result in an inability to feel heat conditions and/or the inability to sweat, so symptoms of heat stress may not be evident)
  - Diuretics (water pills) or dietary aids and some psychiatric or blood pressure medications
  - Taking prescribed or over-the-counter supplements, cold remedies, stimulants, or performance-enhancing drugs, even energy boosting drinks
- ☐ A recent lack of quality sleep
- ☐ Your current state of hydration (be it from low fluid consumption or high alcohol consumption)
- ☐ Use of alcohol in the last 24 hours
- ☐ Lack of sustenance (not eating or dieting for extended period, before working in a hot environment)

Considerations (worth reviewing to keep in mind, for personally managing your own well-being)

- Heat intolerance happens for a variety of reasons.
- A worker may be affected by many risk factors at the same time.
- The more factors, the higher the risk.
- Along with **workload**, **clothing & protective gear** can reduce the body's ability to cool itself.
- Some workers handle heat stress less effectively than others, so do keep in mind that not all workers tolerate heat in the same way, because their medical conditions can also predispose them to heat-related illnesses
- ***Physiological monitoring*** can identify workers who are at increased risk of heat illness, while maintaining confidentiality of those workers' health information.
- When in doubt, workers should talk to their healthcare provider about whether they can work safely in the heat.
- Regardless, **pay attention to your body, habits, and lifestyle when working in the heat.**

Warning

When conducting employee and supervisor training, make sure not to discuss employees' own personal risk factors. Once employees and supervisors have been fully trained, encourage them to discuss freely any of their personal risk factors with their health care provider.



In conjunction with evaluating your own individual capabilities (i.e., self-assessing) against the recognized heat exposure risk factors that can impact your personal well-being, **PLEASE READ** through the Federal OSHA reminders below, to make sure that you are better prepared to keep in mind what you need to know and what you need to do, to "***protect yourself from heat stress***."

Protecting Yourself from Heat Stress

Heat stress, from exertion or hot environments, places workers at risk for illnesses such as heat stroke, heat exhaustion, or heat cramps.

Heat Stroke

A condition that occurs when the body becomes unable to control its temperature, and can cause death or permanent disability.

Symptoms

- High body temperature
- Confusion
- Loss of coordination
- Hot, dry skin or profuse sweating
- Throbbing headache
- Seizures, coma

First Aid

- Request immediate medical assistance.
- Move the worker to a cool, shaded area.
- Remove excess clothing and apply cool water to their body.

Heat Exhaustion

The body's response to an excessive loss of water and salt, usually through sweating.

Symptoms

- Rapid heart beat
- Heavy sweating
- Extreme weakness or fatigue
- Dizziness
- Nausea, vomiting
- Irritability
- Fast, shallow breathing
- Slightly elevated body temperature

First Aid

- Rest in a cool area.
- Drink plenty of water or other cool beverages.
- Take a cool shower, bath, or sponge bath.

Heat Cramps

Affect workers who sweat a lot during strenuous activity. Sweating depletes the body's salt and moisture levels.

Symptoms

- Muscle cramps, pain, or spasms in the abdomen, arms or legs

First Aid

- Stop all activity, and sit in a cool place.
- Drink clear juice or a sports beverage, or drink water with food.
  - Avoid salt tablets.
- Do not return to strenuous work for a few hours after the cramps subside.
- Seek medical attention if you have the following: heart problems, are on a low-sodium diet, or if the cramps do not subside within one hour.

Protect Yourself

Avoid heavy exertion, extreme heat, sun exposure, and high humidity when possible. When these cannot be avoided, take the following preventative steps:

- Monitor your physical condition and that of your coworkers for signs or symptoms of heat illnesses.
- Wear light-colored, loose-fitting, breathable clothing such as cotton.
  - Avoid non-breathable synthetic clothing.
- Gradually build up to heavy work.
- Schedule heavy work during the coolest parts of day.
- Take more breaks when doing heavier work, and in high heat and humidity.
  - Take breaks in the shade or a cool area.
- Drink water frequently. Drink enough water that you never become thirsty.
- Be aware that protective clothing or personal protective equipment may increase the risk of heat-related illnesses.

Recovery Actions (per ANSI A10-50-2024 recommendation)

Upon onset of the signs or symptoms of heat stress, inform job leader or assigned Heat Stress Coordinator of self-removal for recovery in rest area.

A heat stresses worker must remain there to rest & rehydrate until cleared to return to work, which is only permissible after spending at least 15 minutes in the rest area.

First Aid for Heat Illness: Signs & Symptoms and What to Do

Cooling is key, so:

1) **Stop work**;
2) **Get to a cooler area**; and
3) **Hydrate** –

are what to do if you should you feel or see one of your co-workers begin to show the signs or symptoms of heat illness.

Don't ignore cramps or spasms in the stomach, arms, or legs, because your/ or a co-worker's condition could degrade suddenly. And, **NEVER leave a worker with heat illness alone**.

Review the **CDC/NIOSH table (next slide)**, keeping in mind that:

Symptoms can occur in any order, so you don't need to have all of the symptoms in a category to be experiencing a heat illness.

	Signs and Symptoms	What to Do
Heat Rash/ Prickly Heat	• Red cluster of pimples or small blisters, usually on neck, upper chest, groin, under breasts, and in elbow creases • Extensive areas of skin that do not sweat on heat exposure, but present a gooseflesh appearance that subsides with cool environments	• When possible, a cooler, less humid work environment is the best treatment • Keep rash area dry • Do not use ointments or creams, as they may impair cooling—warm, moist skin can make the rash worse
Heat Cramps	• Muscle cramps, pain, or spasms in the abdomen, arms, or legs	• Drink fluids every 15 to 20 minutes and eat a snack or sports drink • Avoid salt tablets, but drinks containing electrolytes are OK • Get medical help if the worker has heart problems, is on a low sodium diet, or if cramps do not subside within 1 hour
Heat Syncope (Fainting)	• Fainting, dizziness, or light-headedness after standing or suddenly rising from a sitting/lying position	• Sit or lie down in a cool place when beginning to feel faint or dizzy • Slowly drink water or clear juice
Heat Exhaustion	• Headache • Nausea • Dizziness, weakness • Irritability • Thirst, heavy sweating • Elevated body temperature • Decreased urine output	• Call for medical help or take worker to a health facility for evaluation and treatment • Stay with worker until help arrives • Remove worker from hot area and give liquids to drink • Remove unnecessary clothing, including shoes and socks • Cool worker with water, cold compresses, an ice bath, or fans • Encourage frequent sips of cool water

Exertional Heat Stroke	• Confusion, altered mental state, slurred speech, loss of consciousness
	• Hot, dry skin or profuse sweating
	• Seizures
	• Very high body temperatures
	• Fatal if treatment delayed
		• This is an emergency! Call for emergency care immediately!
		• Move worker to a cool area and remove clothing
		• Immerse worker in a tub of ice water
		• If a tub is not available, place worker in a tarp with ice and water (e.g., tarp-assisted cooling with oscillation†)
		• If cold-water immersion is not possible,
		  • Soak worker with cold water from a hose or shower
		  • Apply cold, wet towels to as much of the skin as possible, and replace towels frequently

Recommended Best Practices:

1) Review the highlights of the five levels to heat illness in a pre-job briefing, including --

2) Review emergency response actions on who is responsible for first aid care and who is to call for help

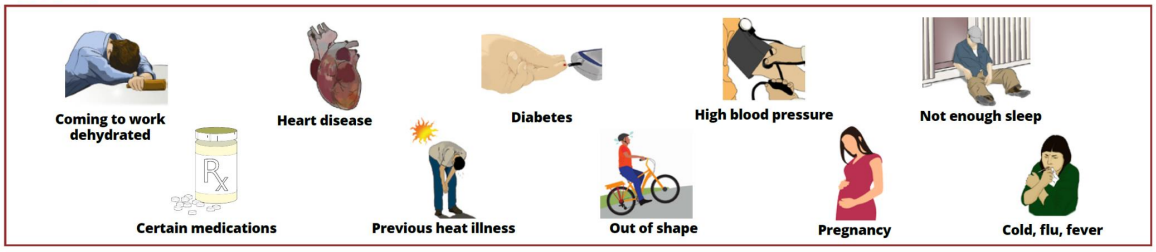
3) Post this on the jobsite (preferably in the designated rest area) so workers can self-check

4) Consider staging an AED in rest area, especially if there is a worker with a known heart problem.

Risk factors for heat illness

There are personal, work-related, and weather-related causes of heat illness.
Awareness of your risk factors can help prevent heat illness!

Personal



Work

Weather

Science Stunner: People under 35, not seniors, most likely to die from heat

What if everything we thought we knew about who's most at risk during extreme heat was wrong?

A new study turns conventional wisdom on its head, revealed that, **in Mexico**, it's actually young people – not the elderly – who are dying more frequently from heat exposure.

The research shows that **75% of heat-related deaths occur among people under 35 years old**, with many victims being otherwise healthy young adults.

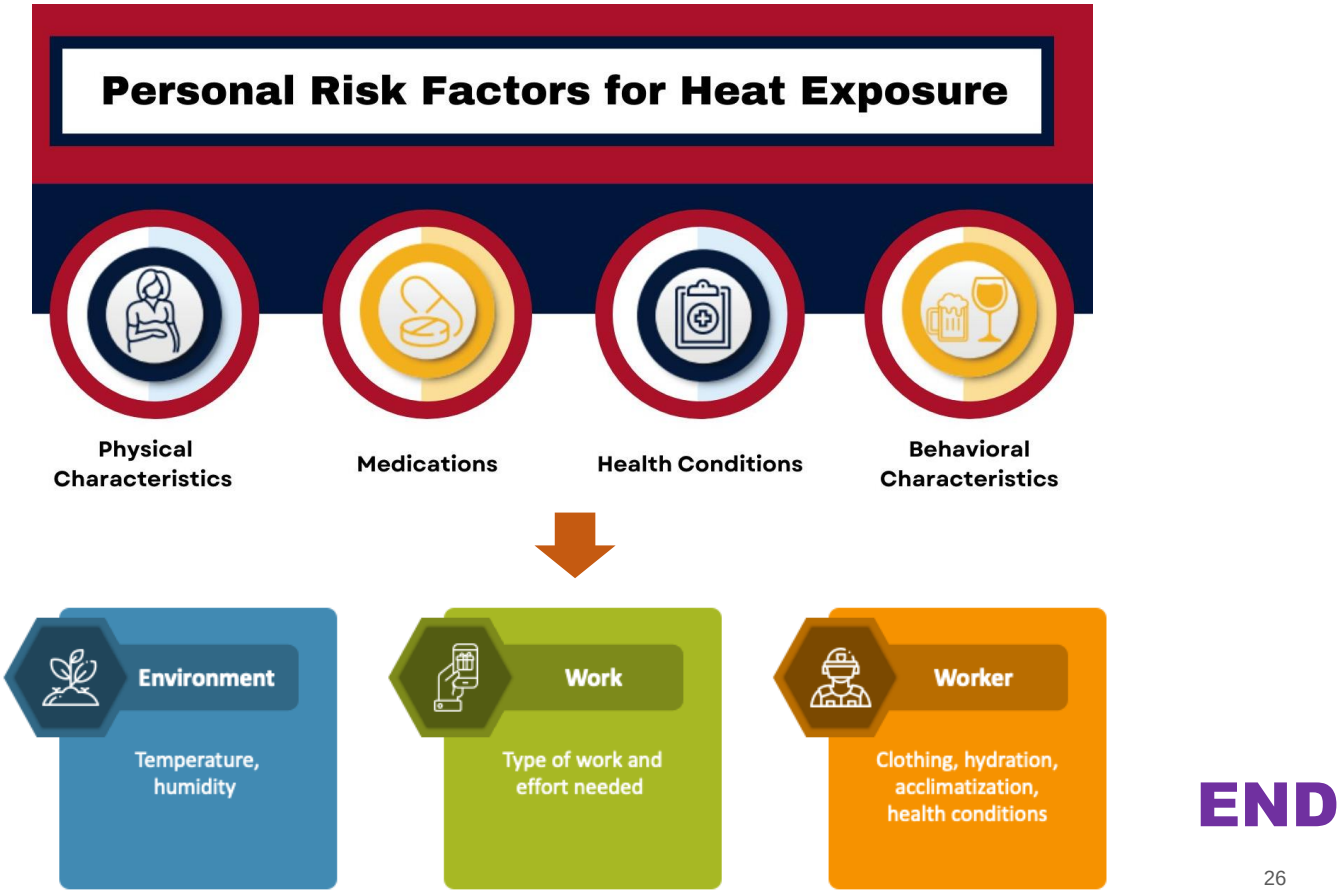
Again, conventional wisdom has been that the elderly are more vulnerable to temperature extremes.

The study looked at 3,300 deaths per year over the period of 1998 - 2019, wherein those age 50 – 70 who were thought to be the most vulnerable had the lowest rates of heat-related deaths.

Why Mexico is that it had the data and of course the hot weather.

When WBGT reaches **95ºF** it becomes more difficult to *thermoregulate* without artificial cooling because sweating is just not sufficient anymore.

Research led by R. Daniel Bressler (Columbia U.), and Andrew Wilson (Stanford U), supported by NOAA grant Dec 06, 2024



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