

# Heat and Health in a Changing Climate

December 13, 2022



**MINISTRY OF HEALTH & WELLNESS**



**COLUMBIA**

MAILMAN SCHOOL  
OF PUBLIC HEALTH

GLOBAL CONSORTIUM  
ON CLIMATE AND  
HEALTH EDUCATION



# What you will learn:

- How is climate change affecting temperatures in the Bahamas?
- What is heat illness?
- What are “heat-sensitive conditions” and who is vulnerable?
- How can we protect our health in the face of extreme heat?



# SCENARIO: HEAT WAVE ALERT!



- It has been over 100°F for the past 4 days...
- Nighttime temperatures are above 90°F...
- Hospital are filling up with patients
- Power outages are spreading



# Gladis Marcy



Age: 77

- Grandmother of 8, mother of 4
- Had a heart attack 1 year ago and takes many medications
- Lives with her daughter in a top floor apartment in Nassau
- Loves to garden



# Scenario: Heat Wave Alert! - Gladis Marcey



According to her daughter, Gladis was pacing the apartment all morning complaining of feeling dizzy and hot...

In the afternoon, Gladis began to get very confused and started vomiting...Her daughter called "919"





# Scenario: Heat Wave Alert! - Gladis Marcey



- In the ER, she is diagnosed with Heat Exhaustion.
- She receives IV fluids and is cooled with water and fans.
- Her confusion slowly improves.
- Gladis wants to know:

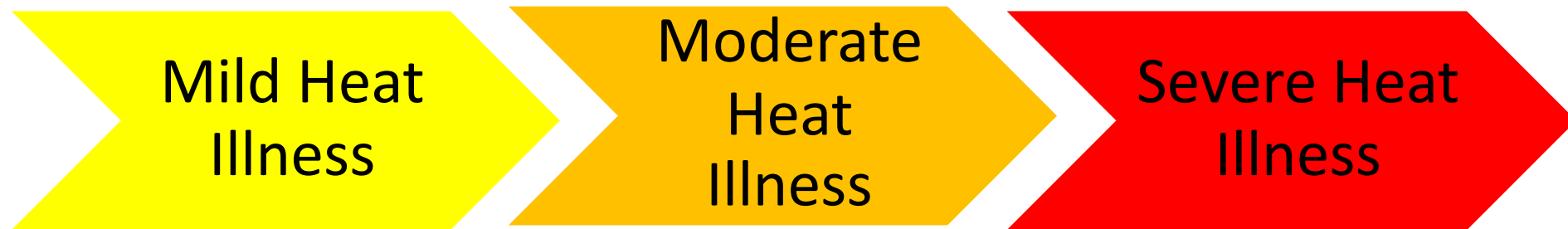
**WHAT HAPPENED??**

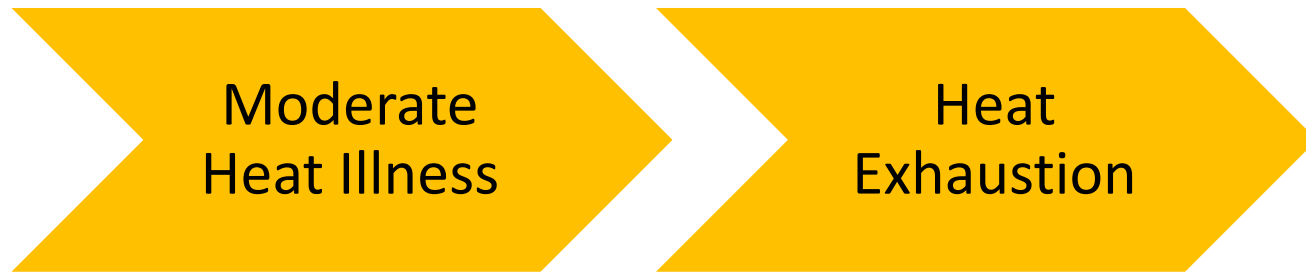




# Heat Illness

- Gladis had **Heat Illness**
- Heat Illness: a medical condition resulting from the body's inability to cope with internal or external heat



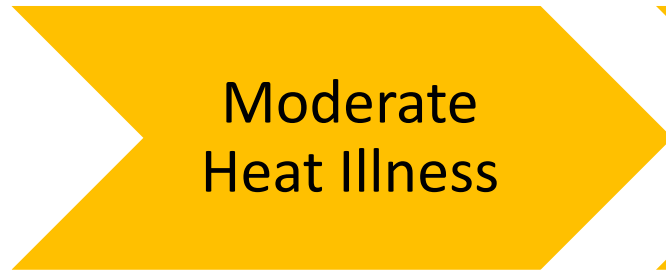


## Symptoms:

- Dizzy, lightheaded, confusion
- Headache or blurry vision
- Excessive sweating or thirst
- Chest discomfort, heavy breathing
- Muscle cramps
- Vomiting and nausea
- Weakness or fatigue







## Symptoms:

- Dizzy, lightheaded, confusion
- Headache or blurry vision
- Excessive sweating or thirst
- Chest discomfort, heavy breathing
- Muscle cramps
- Vomiting and nausea
- Weakness or fatigue

**URGENT  
MEDICAL  
CONDITION!**



## Heat Exhaustion



### Treatment:

- Move person to a cool environment
- Give fluids
- Monitor their temperature, level or awareness and vital signs

**URGENT  
MEDICAL  
CONDITION!**



# Scenario: Heat Wave Alert! - Gladis Marcey



Gladis is shocked to learn she had heat illness. She states that she has been living in the Abacos her entire life and never had an issue...

?

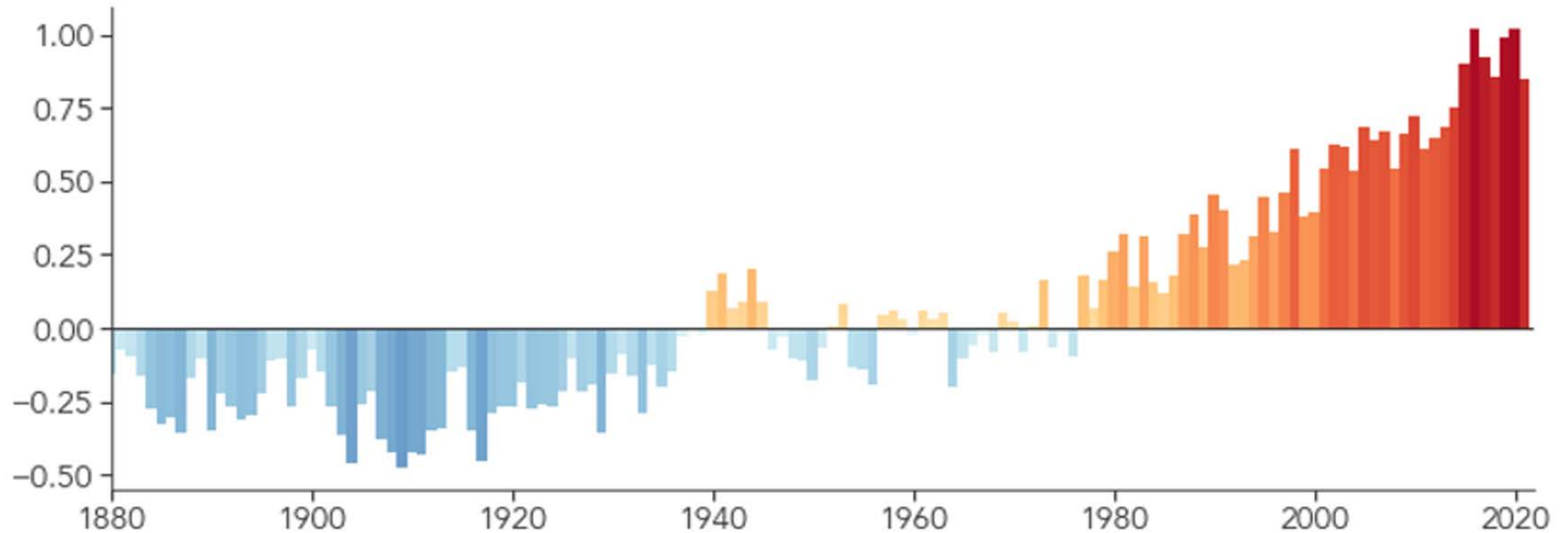


# It's been getting hotter!



## 2021 ties 2018 for Sixth Warmest Year on Record

Global Temperature Anomaly (°C compared to the 1951-1980 average)

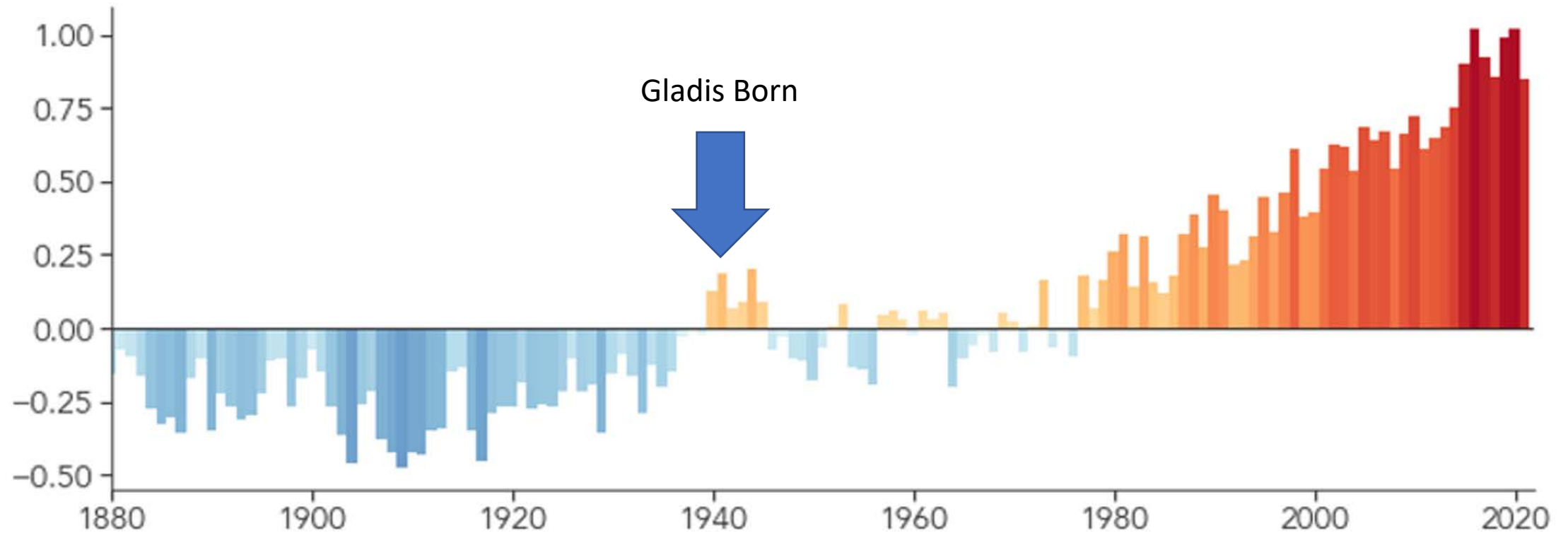


# It's been getting hotter!

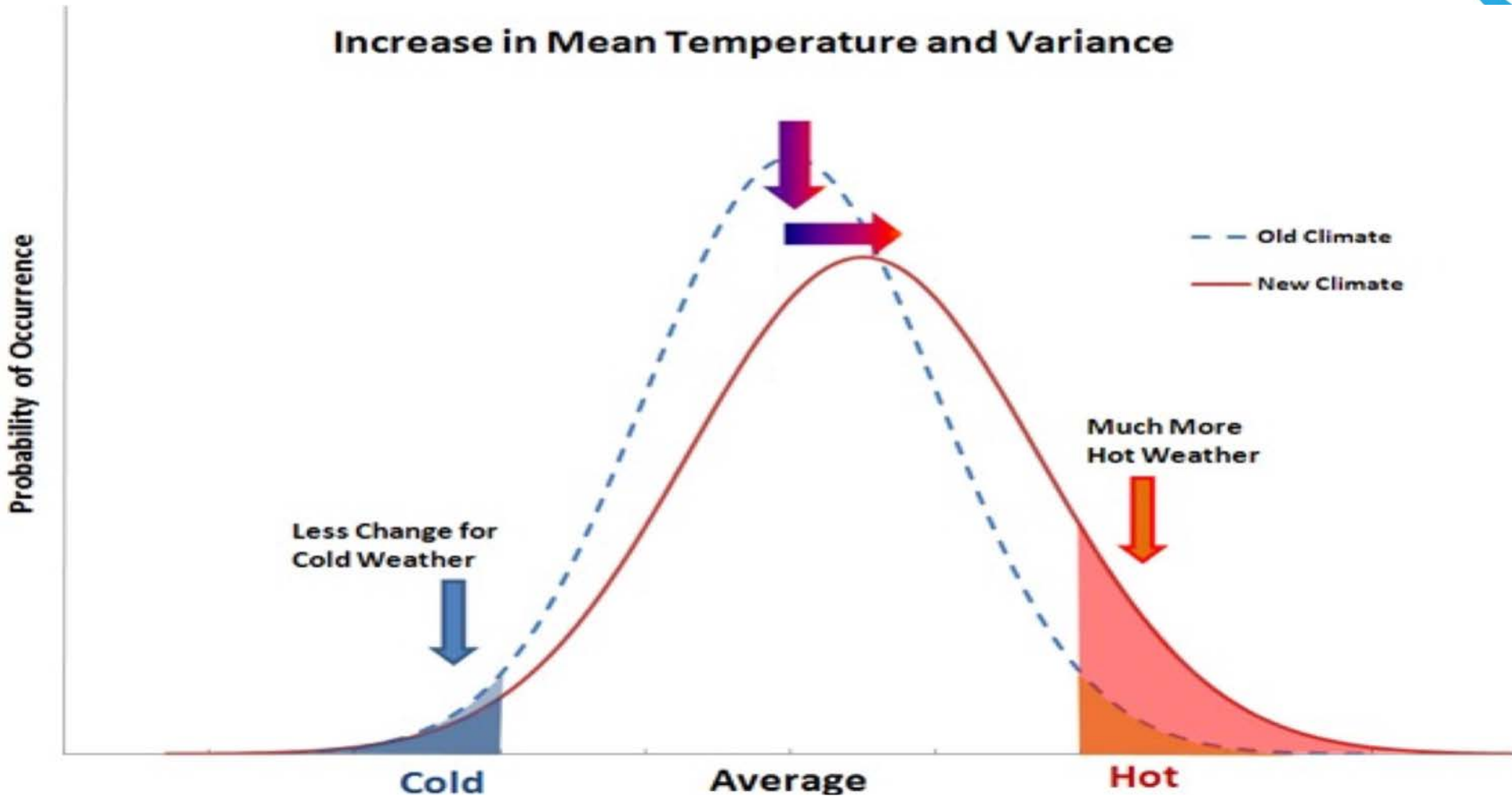


## 2021 ties 2018 for Sixth Warmest Year on Record

Global Temperature Anomaly (°C compared to the 1951-1980 average)



# It's been getting hotter!



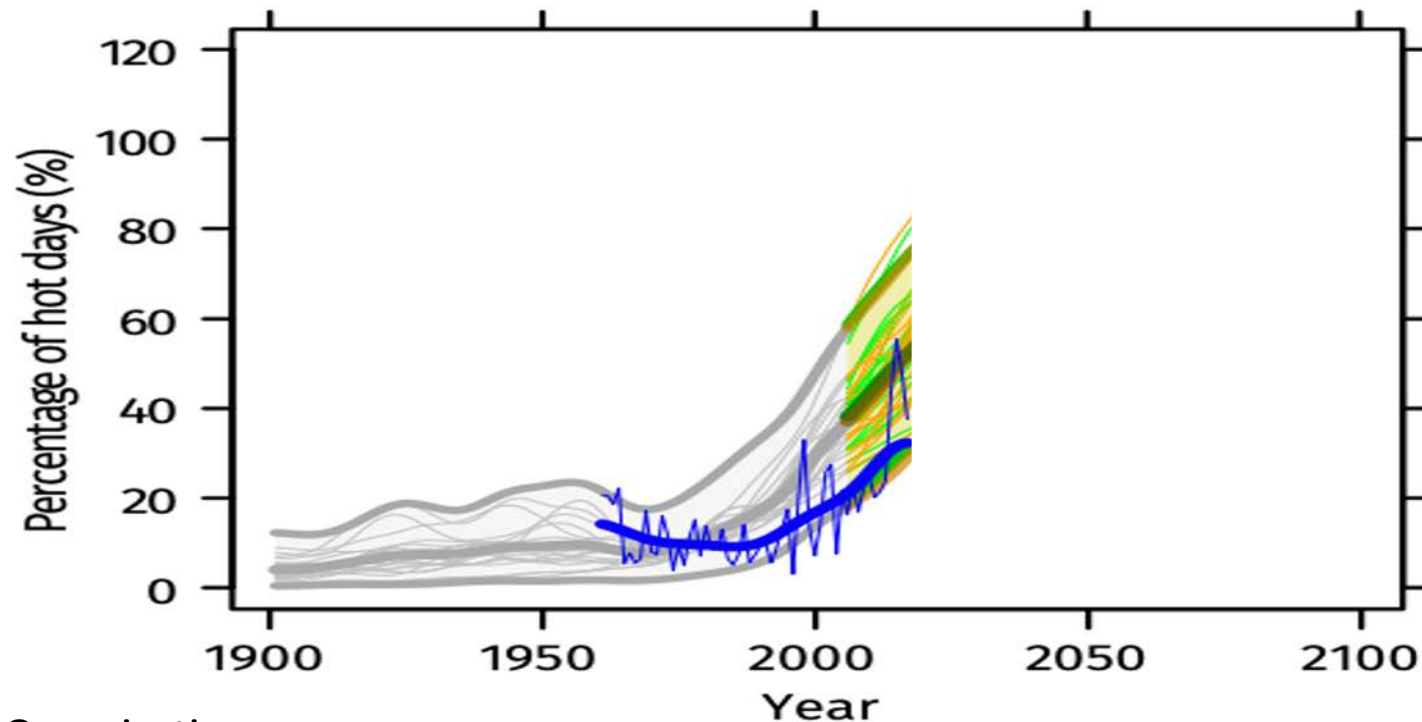


# How is this affecting the Bahamas?



## More high temperature extremes

**FIGURE 3:** Percentage of hot days ('heat stress'), 1900–2100



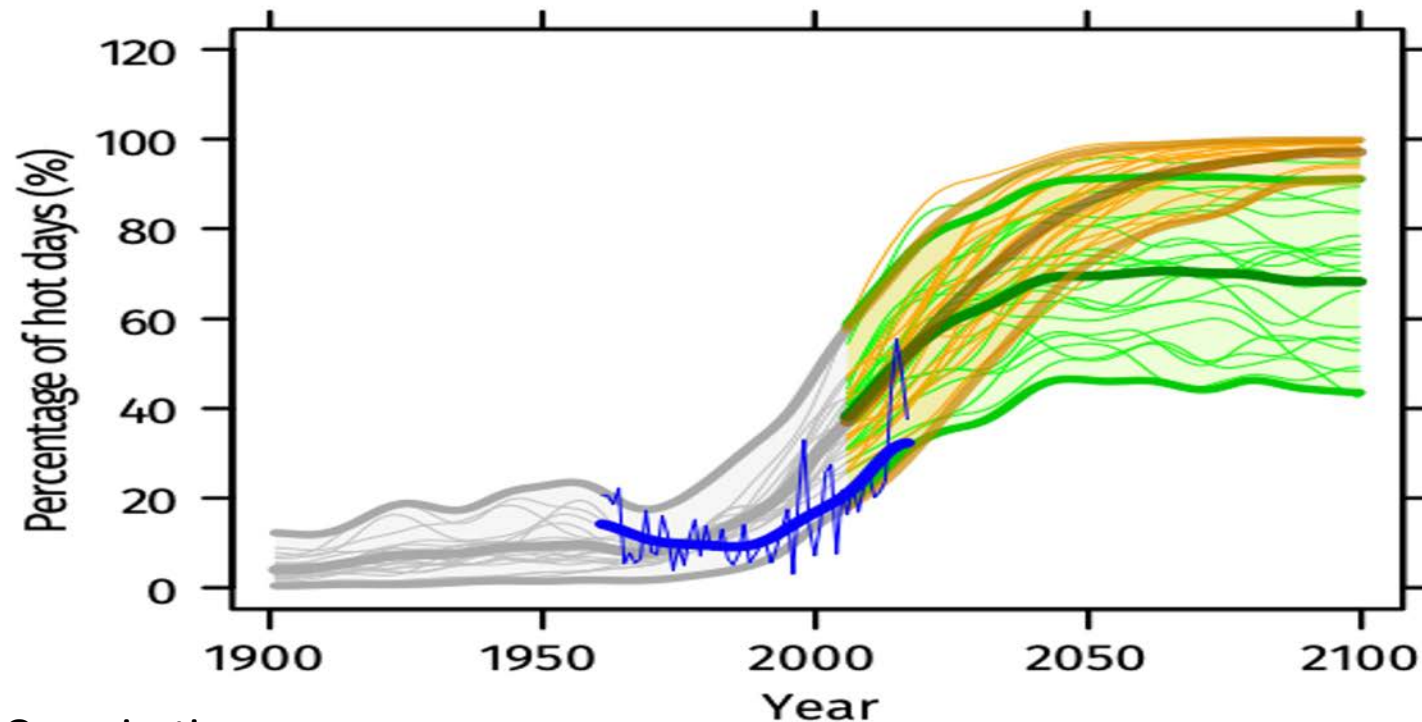
From World Health Organization

# How is this affecting the Bahamas?



## More high temperature extremes

**FIGURE 3:** Percentage of hot days ('heat stress'), 1900–2100



From World Health Organization

# Gladis's Daughter



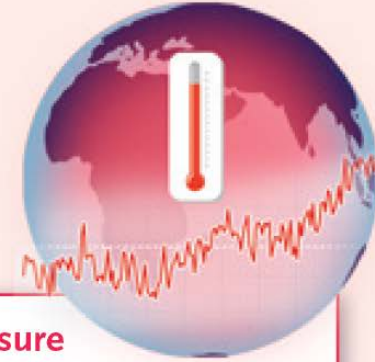
“Why didn’t I get  
heat illness as well?”



## Key Factors Affecting the Risk of Heat-Related Illness

### Individual Susceptibility

- Age
- Coexisting conditions
- Pregnancy
- Medications or drugs
- Cognitive impairments
- Disabilities
- Social isolation
- Immobility



### Heat Exposure

- Ambient temperature and humidity
- Heat amplification (urban heat islands)
- Occupation (outdoor or indoor without cooling)
- Lack of access to cooling at home
- Indoor heat sources

### Sociocultural Factors

- Poverty
- Structural and environmental racism
- Social cohesion
- Housing status
- Literacy
- Limited worker protections



**Figure 1.** Factors Affecting the Risk of Heat-Related Illness.



# Heat affects everyone, but not equally!



## Individual Susceptibility:

- Age



# What makes older adults more sensitive to heat?



- Normal physiologic changes of aging
- Higher rates of co-morbid conditions
- More likely to be on multiple medications
- Impaired sensorium or cognition
- Dependence on caregivers
- Impaired mobility
- Social isolation





# Heat affects everyone, but not equally!



## Individual Susceptibility:

- Age
- **History of Heart disease**



# What conditions make people more vulnerable to heat?



- Heart disease
- Lung disease
- Kidney disease
- Diabetes
- Dementia
- Substance use (alcohol, cocaine, etc)



# Heat affects everyone, but not equally!



## Individual Susceptibility:

- Age
- History of Heart disease
- **Use of multiple medications**



# What medications put people at risk??



**Table 2. Medications and Drugs with Potential to Increase Risk of Heat-Related Illness.\***

Agent	Mechanism <sup>27</sup>
Alcohol	May reduce alertness and affect judgment and perception of heat; exacerbates dehydration and affects vasodilation and cardiac contractility
Amphetamines	May increase metabolic heat production
Anticholinergics	May decrease sweat production
Antihistamines	May cause peripheral vasoconstriction, limiting radiative cooling
Antipsychotics	Interferes with hypothalamic thermoregulation
Benzodiazepines	May reduce alertness and affect judgment and perception of heat
Beta-blockers	Decreases heart rate and contractility
Calcium-channel blockers	Decreases cardiac contractility and compromises vascular compensatory mechanisms
Diuretics	May increase risk of dehydration and hypovolemia
Illicit drugs (e.g., cocaine, heroin, phencyclidine, and MDMA)	May increase metabolic heat production and reduce alertness and judgment
Laxatives	May increase risk of dehydration and hypovolemia
Lithium	May reduce alertness and affect judgment and perception of heat and lead to nephrogenic diabetes insipidus; levels may rise to dangerous levels and cause kidney injury in the context of dehydration
Serotonin-reuptake inhibitors	May interfere with hypothalamic thermoregulation
Thyroid agonists	May increase metabolic heat production
Tricyclic antidepressants	May cause peripheral vasoconstriction, thereby limiting radiative cooling, and may affect central thermoregulation
Weight-loss supplements that may increase metabolic rate (e.g., carnitine and green tea extract)	May increase metabolic heat production

# Marcus DeSanto



35 year old man

- History of depression
- Works in construction
- Drinks alcohol regularly
- Struggles with homelessness





# SCENARIO: HEAT WAVE ALERT! – Marcos DeSanto



It has been over 100°F for the past 3 days... with a heat index of 120 degrees

Marcus has been working outside everyday under pressure to complete a project





# SCENARIO: HEAT WAVE ALERT! – Marcos DeSanto



At 2pm, co-workers notice that Marcus appears more clumsy, dropping tools and working slowly.

At 4pm, co-workers find Marcus collapsed adjacent to the scaffolding, unable to be aroused. They immediately call “919”



# SCENARIO: HEAT WAVE ALERT! – Marcos DeSanto



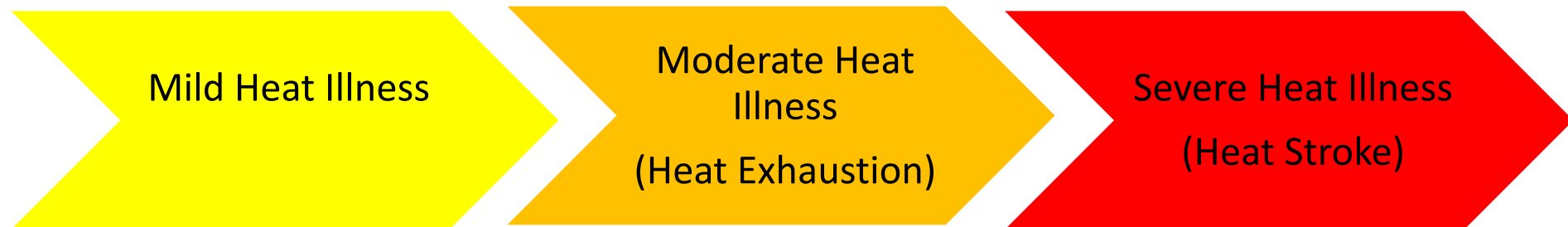
In the ER, Marcus is diagnosed with **Heat Stroke**. His core body temperature is 41°C (105.8°F).



# SCENARIO: HEAT WAVE ALERT! – Marcos DeSanto



**Heat Stroke:** a life-threatening resulting from exposure to high temperatures, characterized by elevated body temperature, confusion and difficulty breathing



# Severe Heat Illness (Heat Stroke)



- Symptoms:
  - Severe Confusion
  - Loss of consciousness
  - Elevated body temperature
  - Difficulty breathing
  - Vomiting



# Severe Heat Illness (Heat Stroke)



- Symptoms:
  - Severe Confusion
  - Loss of consciousness
  - Elevated body temperature
  - Difficulty breathing
  - Vomiting

**IMMEDIATELY LIFE  
THREATENING  
CONDITION!**



# Severe Heat Illness (Heat Stroke)



## Treatment:

- Must lower body temperature within 30 minutes
  - Cold/ice water immersion
  - Monitor core temperature carefully
- Rehydrate
- Monitor for respiratory or cardiovascular collapse





# SCENARIO: HEAT WAVE ALERT! – Marcos DeSanto



Luckily, the doctor and nurse caring for Marcus have been trained in recognizing and treating heat stroke.

He is rapidly cooled and gradually regains consciousness and his temperature normalizes.

He suffers a mild liver kidney injury and is hospitalized for 4 days

2 months later, he has trouble still with coordination and short-term memory and cannot work

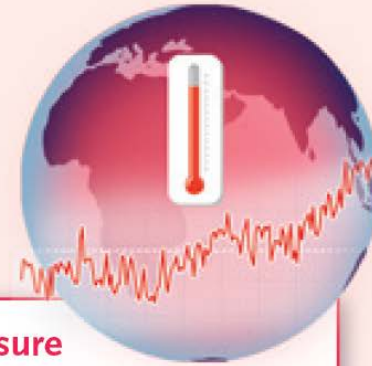


# Key Factors Affecting the Risk of Heat-Related Illness



## Individual Susceptibility

- Age
- Coexisting conditions
- Pregnancy
- Medications or drugs
- Cognitive impairments
- Disabilities
- Social isolation
- Immobility



## Heat Exposure

- Ambient temperature and humidity
- Heat amplification (urban heat islands)
- Occupation (outdoor or indoor without cooling)
- Lack of access to cooling at home
- Indoor heat sources

## Sociocultural Factors

- Poverty
- Structural and environmental racism
- Social cohesion
- Housing status
- Literacy
- Limited worker protections



**Figure 1.** Factors Affecting the Risk of Heat-Related Illness.

# What put Marcus at Risk of Heat Illness?



- Individual Susceptibility
  - History of Substance use
  - History of Depression
- Sociocultural Factors
  - Homeless/insecure housing
- Heat Exposure
  - Occupation





# Kiara Paulson



Age: 34

- Currently 30 weeks pregnant
- Lives with partner and 2 children
- Lives in high-rise apartment
- No access to air conditioning



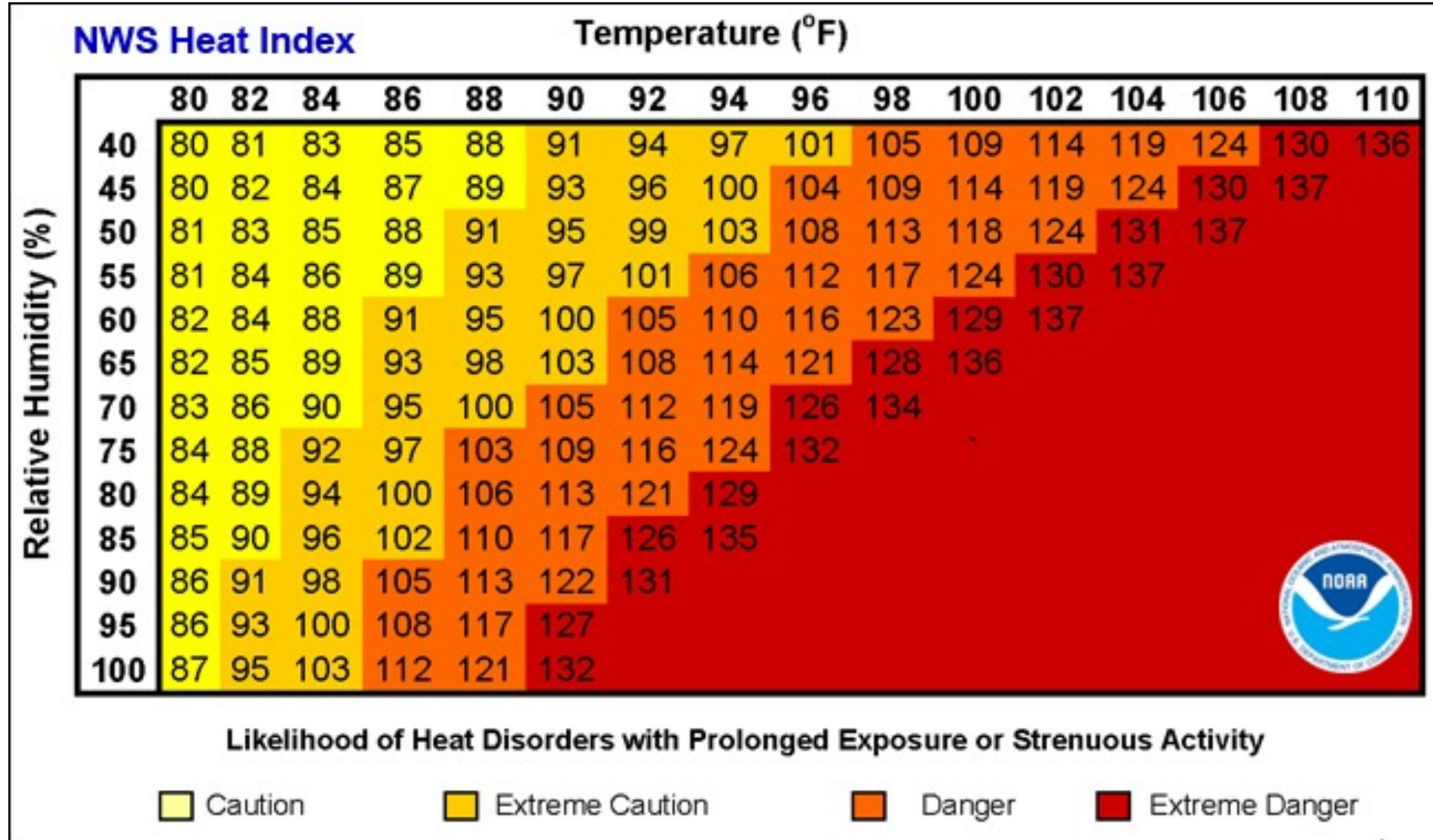
# SCENARIO: HEAT WAVE ALERT! – Kiara Paulson



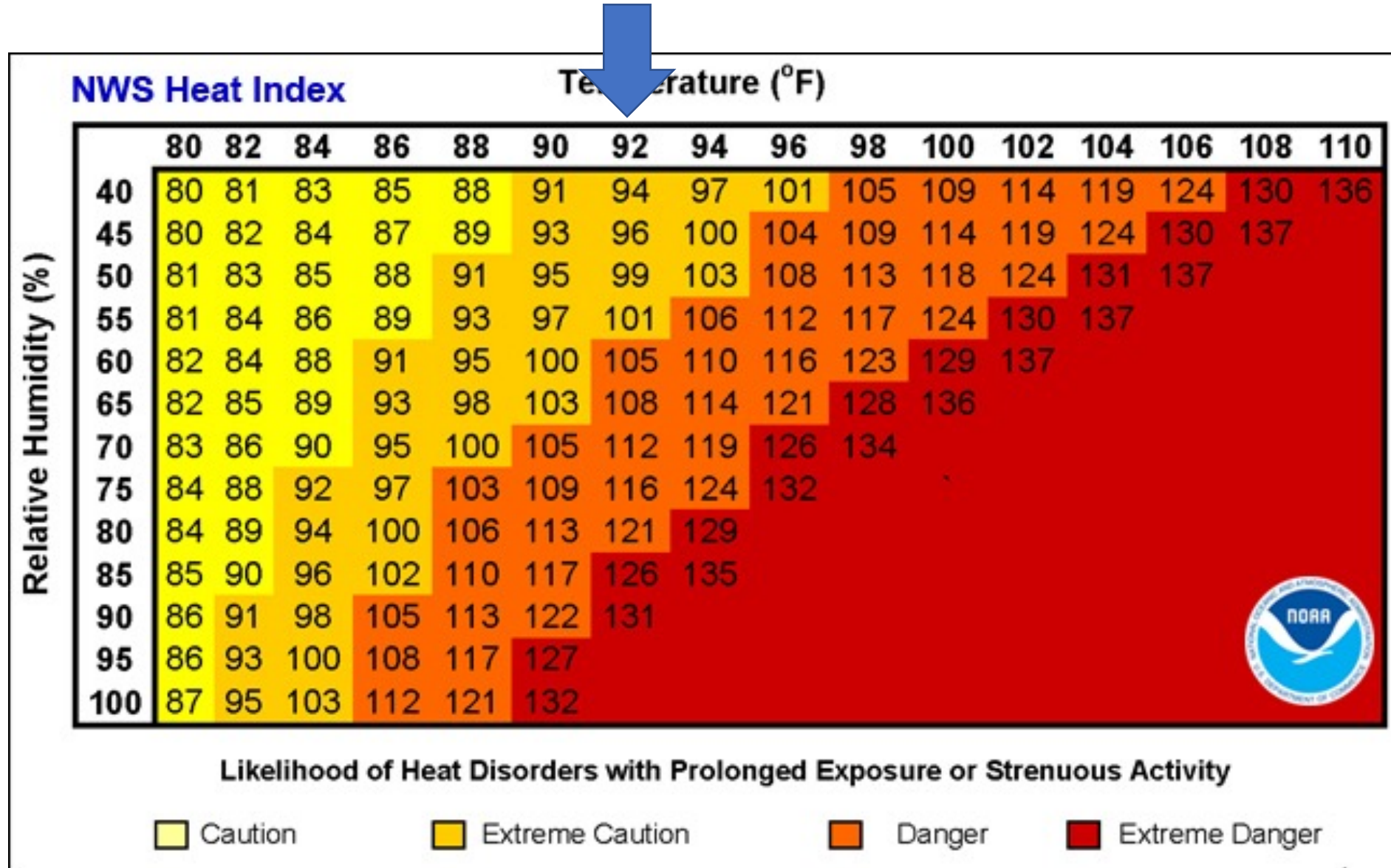
It has been 95 degrees for the past 2 days...

It has also been incredibly HUMID with a relative humidity of 80% today

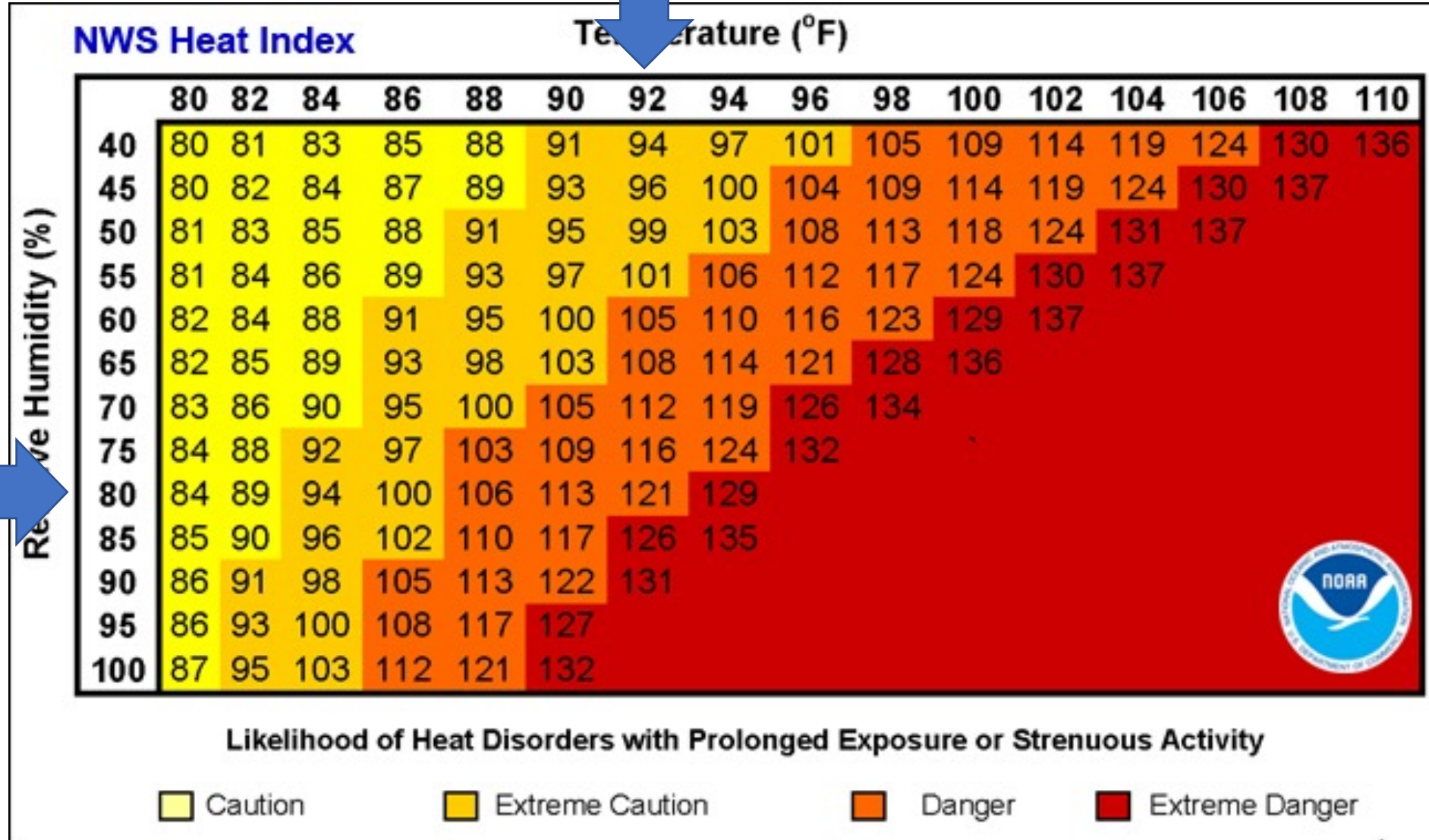


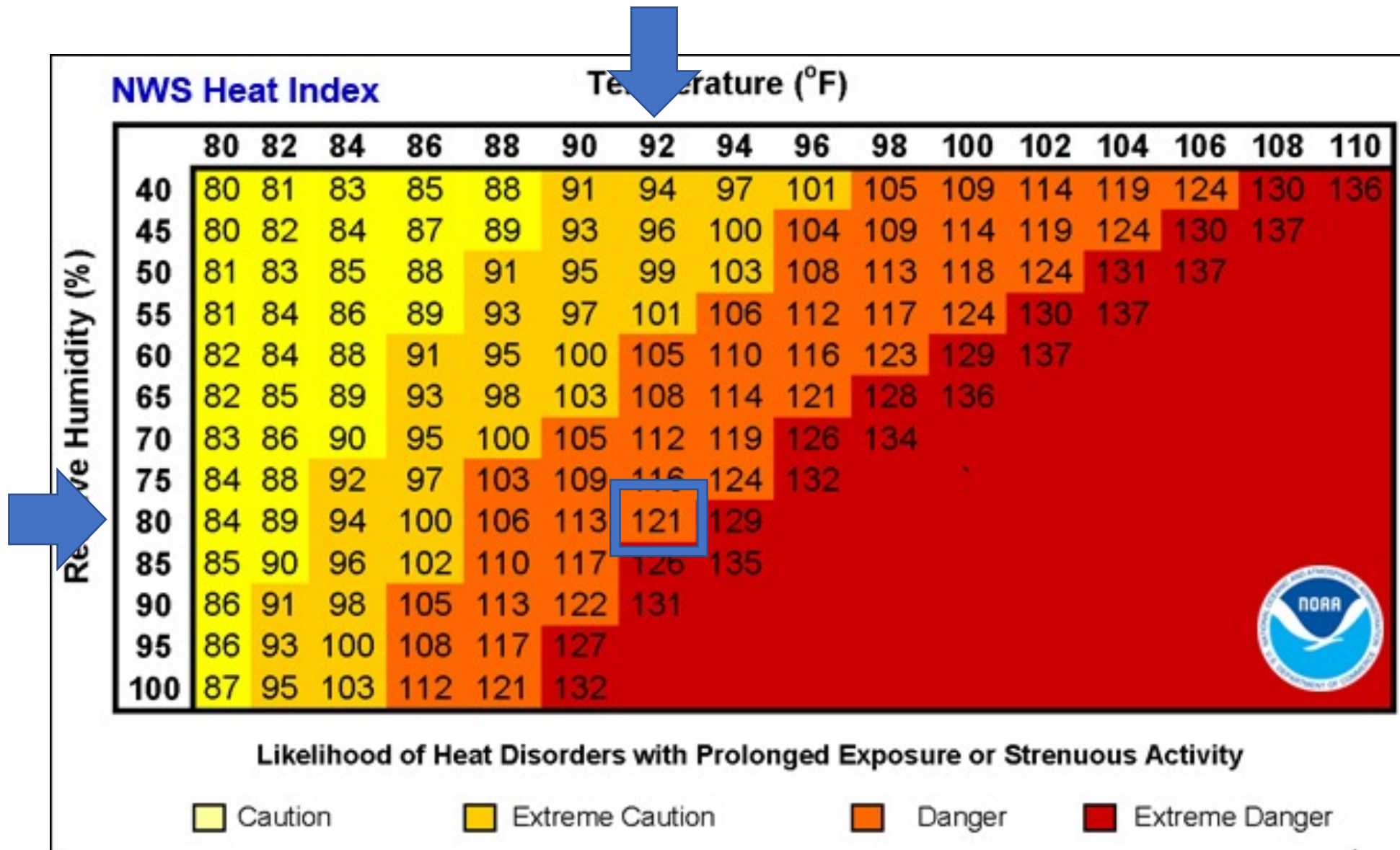












# SCENARIO: HEAT WAVE ALERT! – Kiara Paulson



Kiara goes into pre-mature labor at 30 weeks and her infant is rushed to the intensive care unit.

The hospital is overcrowded and is running on a back up generator.

Kiara is very worried...







Kiara senses that the heat wave may have affected her pregnancy and wants to know if there is a link.



# Does extreme heat affect pregnancy?



Extreme heat is associated with:

Preterm birth

Low birth weight

Stillbirth

Complications like gestational diabetes and hypertension





Kiara is worried about her other children, who are waiting at home with sister.

Should she worry?

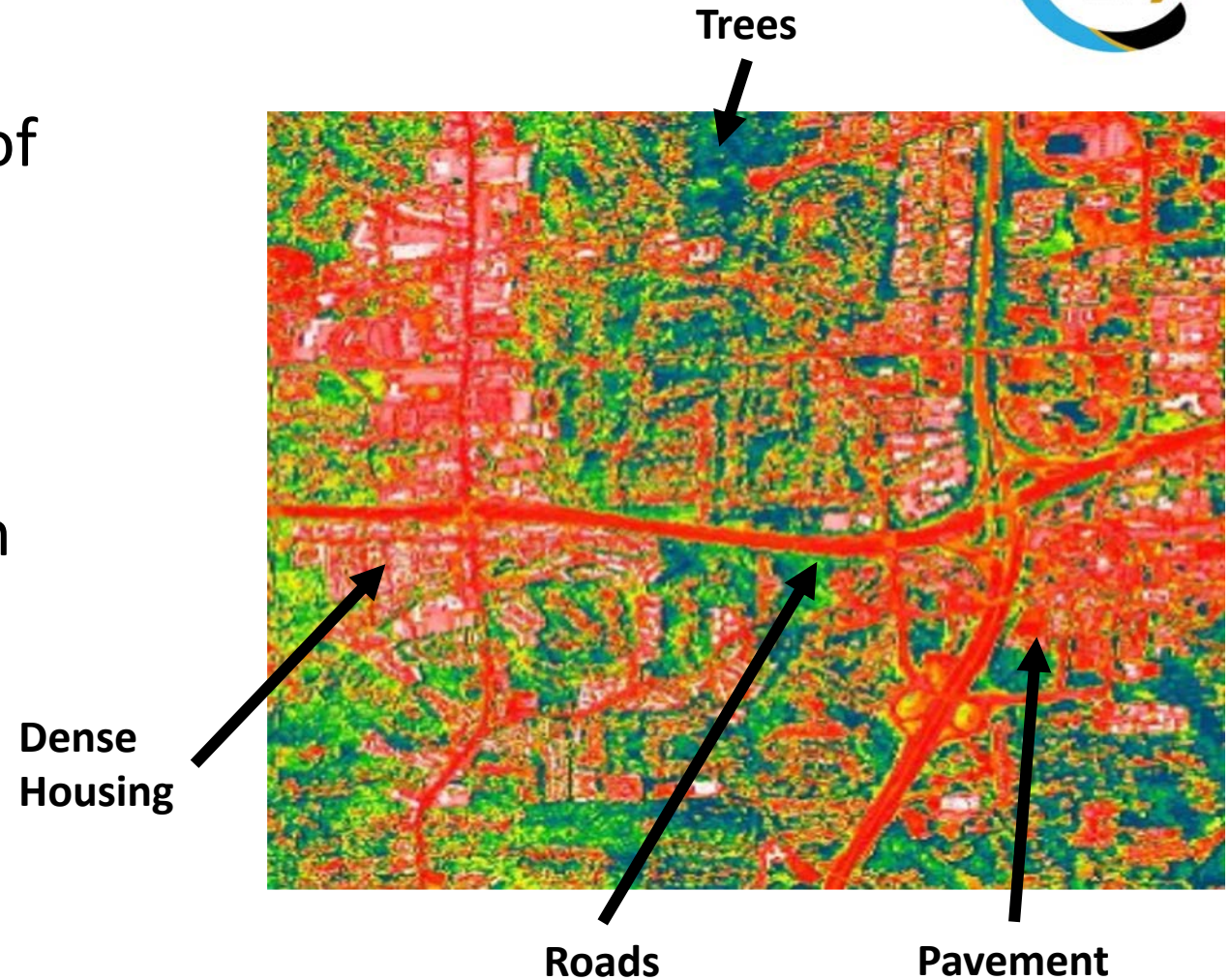




# Kiara lives in a vulnerable place



**Urban Heat Islands** are areas of densely built infrastructure, which absorbs and then re-emits heat from the sun, resulting in “islands” of higher temperatures; temperatures in these areas can be 1° to 7°F (0.6° to 3.9°C) hotter

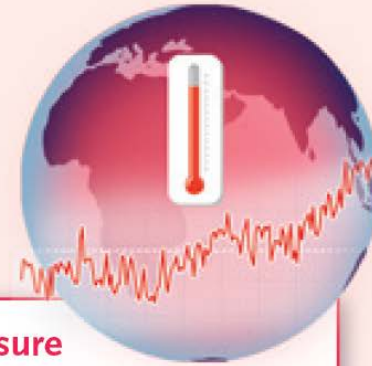


# Key Factors Affecting the Risk of Heat-Related Illness



## Individual Susceptibility

- Age
- Coexisting conditions
- Pregnancy
- Medications or drugs
- Cognitive impairments
- Disabilities
- Social isolation
- Immobility



## Heat Exposure

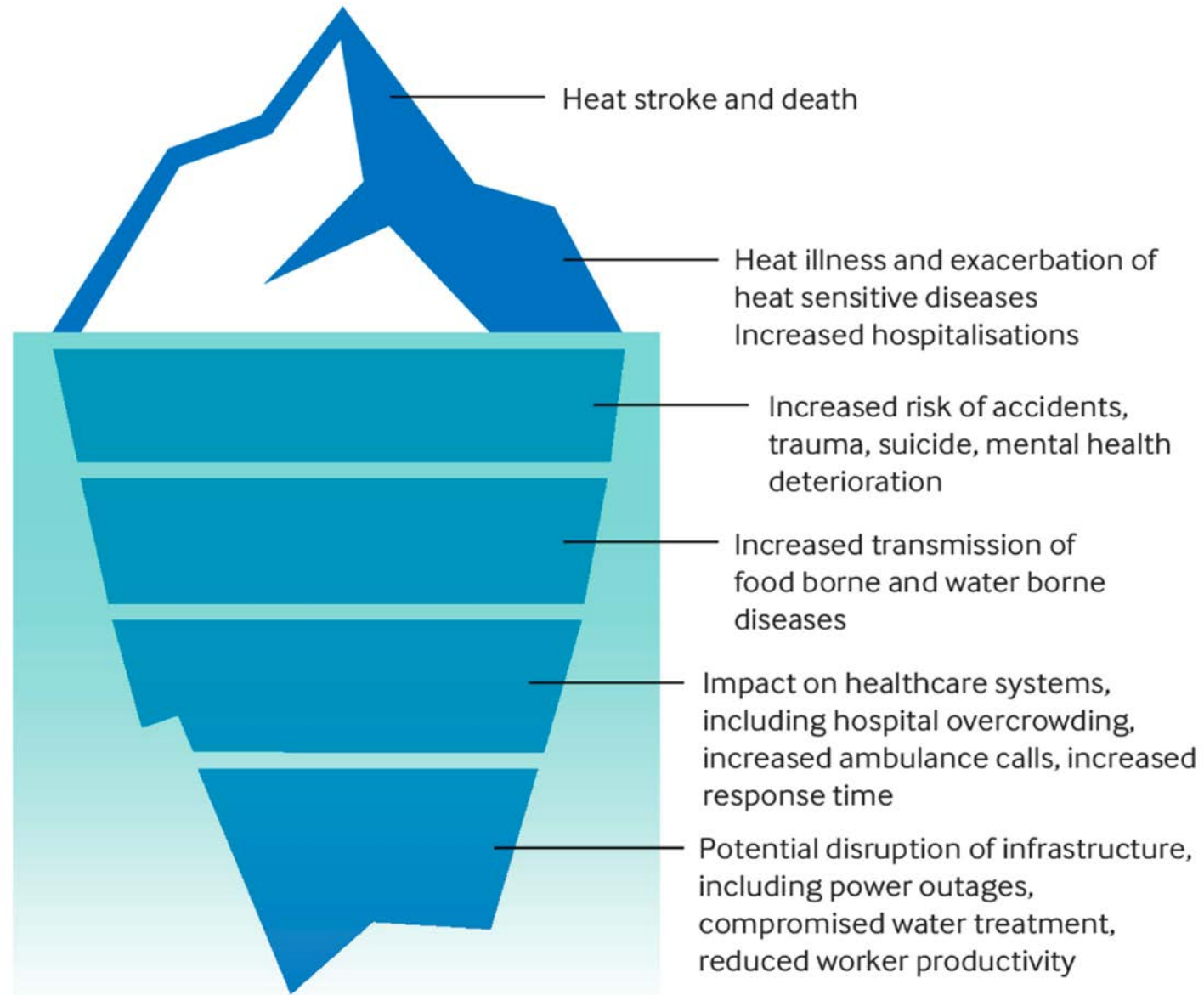
- Ambient temperature and humidity
- Heat amplification (urban heat islands)
- Occupation (outdoor or indoor without cooling)
- Lack of access to cooling at home
- Indoor heat sources

## Sociocultural Factors

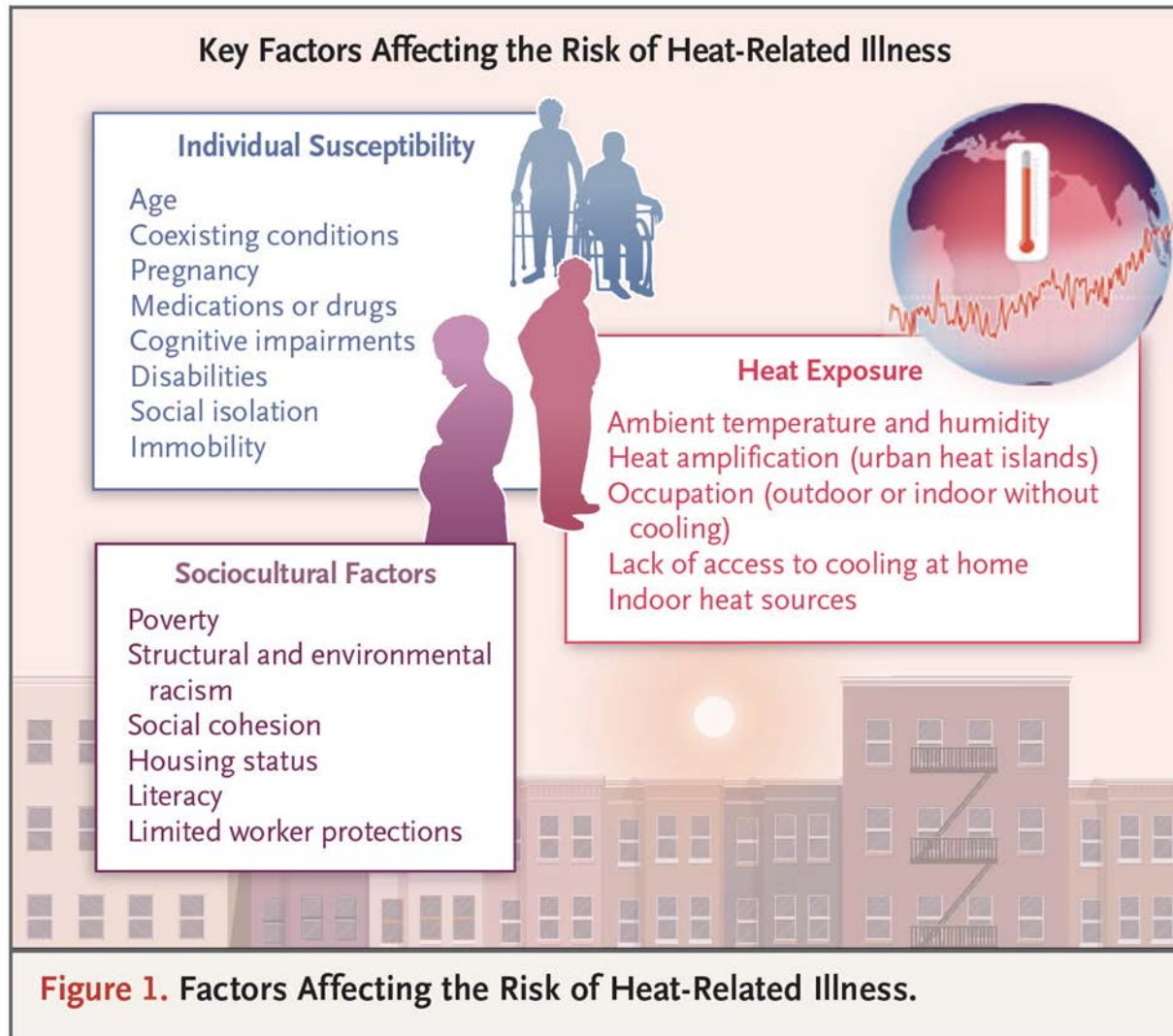
- Poverty
- Structural and environmental racism
- Social cohesion
- Housing status
- Literacy
- Limited worker protections



**Figure 1.** Factors Affecting the Risk of Heat-Related Illness.







**Figure 1.** Factors Affecting the Risk of Heat-Related Illness.

# What can you do to prevent getting heat illness?



- Cool living spaces with fans or air conditioning, while keeping curtains and windows closed during the day
- Cool living spaces with fans or air conditioning, while keeping curtains and windows closed during the day
- Limit physical activity
- Increase water intake
- Wear lightweight clothing
- Take cool showers or baths
- Monitor for symptoms of heat illness
- Establish an emergency contact
- Check on vulnerable neighbors, family, and friends





# What can health professionals do?

- Know the local conditions!
- Know which patient are vulnerable and council them
- Educate staff and other providers
- Work within your facility to be “heat ready” and have a heat-stroke activation plan
- Council patients before heat season as to how they can protect themselves

