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
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• 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)

Gladis Born
It’s been getting hotter!
How is this affecting the Bahamas?

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

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
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>
<thead>
<tr>
<th>Agent</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>May reduce alertness and affect judgment and perception of heat;</td>
</tr>
<tr>
<td></td>
<td>exacerbates dehydration and affects vasodilation and cardiac contractility</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>May increase metabolic heat production</td>
</tr>
<tr>
<td>Anticholinergics</td>
<td>May decrease sweat production</td>
</tr>
<tr>
<td>Antihistamines</td>
<td>May cause peripheral vasoconstriction, limiting radiative cooling</td>
</tr>
<tr>
<td>Antipsychotics</td>
<td>Interferes with hypothalamic thermoregulation</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>May reduce alertness and affect judgment and perception of heat</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td>Decreases heart rate and contractility</td>
</tr>
<tr>
<td>Calcium-channel blockers</td>
<td>Decreases cardiac contractility and compromises vascular compensatory</td>
</tr>
<tr>
<td></td>
<td>mechanisms</td>
</tr>
<tr>
<td>Diuretics</td>
<td>May increase risk of dehydration and hypovolemia</td>
</tr>
<tr>
<td>Illicit drugs (e.g., cocaine, heroin, phencyclidine, and MDMA)</td>
<td>May increase metabolic heat production and reduce alertness and judgment</td>
</tr>
<tr>
<td>Laxatives</td>
<td>May increase risk of dehydration and hypovolemia</td>
</tr>
<tr>
<td>Lithium</td>
<td>May reduce alertness and affect judgment and perception of heat and lead</td>
</tr>
<tr>
<td></td>
<td>to nephrogenic diabetes insipidus; levels may rise to dangerous levels and</td>
</tr>
<tr>
<td></td>
<td>cause kidney injury in the context of dehydration</td>
</tr>
<tr>
<td>Serotonin-reuptake inhibitors</td>
<td>May interfere with hypothalamic thermoregulation</td>
</tr>
<tr>
<td>Thyroid agonists</td>
<td>May increase metabolic heat production</td>
</tr>
<tr>
<td>Tricyclic antidepressants</td>
<td>May cause peripheral vasoconstriction, thereby limiting radiative cooling,</td>
</tr>
<tr>
<td></td>
<td>and may affect central thermoregulation</td>
</tr>
<tr>
<td>Weight-loss supplements that may increase metabolic rate (e.g., carnitine and green tea extract)</td>
<td>May increase metabolic heat production</td>
</tr>
</tbody>
</table>
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”
In the ER, Marcus is diagnosed with **Heat Stroke**. His core body temperature is 41°C (105.8°F).
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
• Symptoms:
  • Severe Confusion
  • Loss of consciousness
  • Elevated body temperature
  • Difficulty breathing
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IMMEDIATELY LIFE THREATENING CONDITION!

Severe Heat Illness
(Heat Stroke)
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.
Figure 1. Factors Affecting the Risk of Heat-Related Illness.

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

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**Heat Exposure**
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- Indoor heat sources

**Sociocultural Factors**
- Poverty
- Structural and environmental racism
- Social cohesion
- Housing status
- Literacy
- Limited worker protections
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
NWS Heat Index

Temperature (°F)

Relative Humidity (%)

80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110

40 80 81 83 85 88 91 94 97 101 105 109 114 119 124 130 136
45 80 82 84 87 89 93 96 100 104 109 114 119 124 130 137
50 81 83 85 88 91 95 99 103 108 113 118 124 131 137
55 81 84 86 89 93 97 101 106 112 117 124 130 137
60 82 84 88 91 95 100 105 110 116 123 129 130 137
65 82 85 89 93 98 103 108 114 121 128 130 137
70 83 86 90 95 100 105 112 119 126 130 137
75 84 88 92 97 103 109 116 124 132
80 84 89 94 100 106 113 121 129
85 85 90 96 102 110 117 126 135
90 86 91 98 105 113 122 131
95 86 93 100 108 117 127
100 87 95 103 112 121 132

Likelihood of Heat Disorders with Prolonged Exposure or Strenuous Activity

- Caution
- Extreme Caution
- Danger
- Extreme Danger
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.
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- Indoor heat sources
Heat stroke and death

Heat illness and exacerbation of heat sensitive diseases
Increased hospitalisations

Increased risk of accidents, trauma, suicide, mental health deterioration

Increased transmission of food borne and water borne diseases

Impact on healthcare systems, including hospital overcrowding, increased ambulance calls, increased response time

Potential disruption of infrastructure, including power outages, compromised water treatment, reduced worker productivity
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**Individual Susceptibility**
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*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