MODULE 1

HEAT WAVES: What Are They & Why Are They Changing?

SESSION DURATION:
15–20 MINUTES

MODULE OVERVIEW:
This module introduces audiences to global warming and heat waves, and explains how and why heat waves are changing. It is meant to provide background and context for Modules 2–5.

SLIDE 1: Heat Waves: What Are They & Why Are They Changing?

PURPOSE: **To introduce Module 1 and to emphasize that understanding what heat waves are and why they are changing lays the groundwork for all subsequent modules. Those modules, in turn, are focused on learning how to identify and treat heat illnesses (Module 2), knowing who is most at risk for heat illnesses (Module 3), learning how to prevent heat illnesses (Module 4), and learning about actions that can be taken to create a "cool" community (Module 5).**

KEY TALKING POINTS:

1. This module is designed to help you understand what heat waves are and why they are changing.
2. Knowing what heat waves are and why they are changing is important for understanding the need to take precautions to prevent heat illnesses. We'll talk about those illnesses later on.

NOTES:

SLIDE 2: Objectives

PURPOSE: **To introduce the objectives for Module 1 and to provide audiences members with an overview of what they will learn. This is the Module 1 roadmap.**

KEY TALKING POINTS:

1. This module has three objectives designed to help you learn what heat waves are and why they are changing, including in San Diego County.
2. The three objectives are:
   a. To understand why Earth is getting warmer
   b. To define heat waves
   c. To understand how warming influences heat waves

NOTES:

SLIDE 3: Conversation Starter

PURPOSE: **This Conversation Starter is designed to create a break in the presentation and to help audiences start thinking critically about the seriousness of weather-related deaths generally, and heat-related deaths specifically, in the US. Presenters may choose to ask audiences only to reflect on the question or to discuss it with the people around them and/or with the broader audience. Note that this Conversation Starter is optional. Presenters are also encouraged to create their own questions (or their own Conversation Starters at other points in the presentation) that they know will resonate strongly with their audiences.**

KEY TALKING POINTS:

1. Let's pause for a moment.
2. What do you think are the top weather-related causes of death in the US?
3. Would anyone like to share their ideas with the group?

NOTES:

SLIDE 4: Top Weather-related Causes of Death in the US

PURPOSE: **To provide audiences with an answer to the question asked in the preceding Conversation Starter and to emphasize that heat is the #1 weather-related cause of death in the US.**

KEY TALKING POINTS:

1. Averaged over 30 years (1993–2022), these are the top weather-related causes of death in the US.
2. Note that heat is #1! Followed by flood, tornado, hurricane, cold, lightening, and winter.

NOTES:

SLIDE 5: A Warmer Earth

PURPOSE: To provide audiences with an overview of why the earth is warming and by how much. Understanding that the earth is warming is important for understanding why heat waves are changing, which will be discussed in subsequent slides.

KEY TALKING POINTS:

1. Global warming is the long-term heating of Earth's surface since the pre-industrial period (1850-1900).
2. Since then, yearly average temperature has increased by ~0.14°F per decade (or ~2°F in total).
3. By the end of the century, yearly average temperature is expected to increase even more, by ~4-6°F (or possibly up to ~7-9°F).
4. By comparison, about 20,000 years ago at the peak of the last ice age, global temperatures were ~10°F colder than they are today.

NOTES:

SLIDE 6: Why Is the Earth Warming?

PURPOSE: To help audiences understand why the earth is warming (i.e., to help audiences understand why average yearly temperatures are increasing as explained on the previous slide).

KEY TALKING POINTS:

1. The greenhouse effect is a process that occurs when gases in the Earth's atmosphere trap heat from the sun.
2. Examples of "greenhouse gases" include carbon dioxide, methane, nitrous oxide, and fluorinated gases.
3. The more greenhouse gases, the more trapped heat, the warmer Earth becomes.

ADDITIONAL (OPTIONAL) INFORMATION:

What are carbon dioxide (CO_2), methane, nitrous oxide, and fluorinated gases? Carbon dioxide is a chemical compound that is released into the atmosphere through different ways, one of which is the burning of fossil fuels (i.e., coal, natural gas, crude oil, and petroleum). Some examples of activities that burn fossil fuels include heating buildings, operating cars, buses, ships, and airplanes, and doing manufacturing. Methane is a chemical compound that is emitted into the atmosphere during the production and transport of coal, natural gas, and oil. Methane can also be emitted from livestock and other agricultural practices, land use, and via the decay of organic waste from municipal landfills. Nitrous oxide (N_2O) is a chemical compound that is emitted into the atmosphere during agricultural activities, land use, industrial activities, combustion of fossil fuels and solid waste, and during treatment of wastewater. Fluorinated gases are chemical compounds that are emitted from a variety of household, commercial, and industrial applications and processes.

NOTES:

SLIDE 7: Heat Waves

PURPOSE: To provide audiences with a definition of heat waves and to explain how warming can influence the nature of heat waves (i.e., by making them more frequent, more intense, longer duration, more humid, and hotter at night). Also, to convey to audiences the potential magnitude of impacts resulting from heat waves by sharing some statistics from the unprecedented 2006 heat wave in California. The statistics presented in this slide are from a journal article published in *Environmental Health Perspectives*. To access the article for more information, visit:
https://ehp.niehs.nih.gov/doi/epdf/10.1289/ehp.11594

KEY TALKING POINTS:

1. A heat wave is a period of unusually hot weather generally lasting more than two days.
2. Global warming increases the frequency, duration, and intensity of heat waves. It can also make them more humid and hotter at night.
3. Heat waves can have major impacts on human health. In 2006, an unprecedented heat wave in California resulted in:
   a. ~5,594 excess emergency department visits along the South Coast (including coastal San Diego County)
   a. ~861 excess emergency department visits in the South Desert (including inland San Diego County)

NOTES:

SLIDE 8: Conversation Starter

PURPOSE: **This Conversation Starter is designed to create a break in the presentation and to help audiences start thinking critically about heat waves in San Diego County. Presenters may choose to ask audiences only to reflect on the question or to discuss it with the people around them and/or with the broader audience. Note that this Conversation Starter is optional. Presenters are also encouraged to create their own questions (or their own Conversation Starters at other points in the presentation) that they know will resonate strongly with their audiences.**

KEY TALKING POINTS:

1. Let's pause for a moment.
2. Have you experienced a heat wave in San Diego County? If so, what was it like?
3. Would anyone like to share their experiences with the group?

NOTES:

SLIDE 9: A Warmer San Diego County

PURPOSE: To emphasize that just like global yearly average temperature has been increasing, temperatures in San Diego County have also been increasing and are expected to continue to increase. This is important for understanding how heat waves in San Diego County are changing, which will be discussed in subsequent slides.

KEY TALKING POINTS:

1. Temperatures in San Diego County have been increasing and are expected to continue to increase.
2. Historically, the average hottest day per year has been:
   a. Coast: 90-110°F
   b. Inland: 105-110°F
3. At the end of the century, the average hottest day per year could increase to:
   a. Coast: 100-100°F
   b. Inland: 110-125°F

KEY TALKING POINTS

NOTES:

SLIDE 10: Heat Waves in San Diego County

PURPOSE: To help audiences understand how a warming climate has changed the nature of heat waves specifically in San Diego County (i.e., they have become more frequent, more intense, longer duration, more humid, and warmer at night). Also, to emphasize that if the earth continues to warm, the nature of heat waves in San Diego County will likely continue to change in the ways described above (and below).

KEY TALKING POINTS:

1. As the climate warms, heat waves in San Diego County have and will continue to become:
   a. More frequent
   b. More intense
   c. Longer duration
   d. More humid
   e. Warmer at night

NOTES:

SLIDE 11: Increased Frequency & Intensity

PURPOSE: **To provide audiences with an example of the increased intensity of heat waves in San Diego County. Note that use of this particular news article as an example is optional. Presenters are encouraged to include news articles or other fact-based local- or county-level information that demonstrates the increased frequency and/or intensity of heat waves in San Diego County, and that they know will resonate strongly with their audiences. For more details on this story or to read the full news article, visit: https://timesofsandiego.com/life/2023/07/16/san-diego-county-heat-wave-to-continue-through-mid-week/**

KEY TALKING POINT:

1. In an example of increased intensity, a July 2023 heat wave in the Southwest US pushed temperatures in San Diego County to a range of 104-121.

KEY TALKING POINTS

NOTES:

SLIDE 12: Increased Humidity

PURPOSE: To help audiences understand the potential human health implications of more humid heat waves. In short, the combination of high temperature and high relative humidity (RH) can make the air feel much warmer to the human body. This can increase the likelihood of heat illnesses like heat cramps, heat exhaustion, and heat stroke occurring (see Module 2). For this reason, presenters should emphasize to audiences that it is especially important to take precautions on days when it is both hot and humid.

KEY TALKING POINTS:

1. Relative humidity (RH) is how much moisture is in the air compared to the maximum amount of moisture that could exist in the air at a given moment.
2. The combination of high temperature and high RH can make the air feel a LOT hotter, for example:
   a. On a 100°F day with 40% relative humidity, it can feel like 110°F
   b. On a 105°F day with 40% relative humidity, it can feel like 115°F
3. So, it's especially important to be careful when it's both hot and humid.

NOTES:

SLIDE 13: Warmer Nighttime Temperatures

PURPOSE: To help audiences understand the potential human health implications of higher nighttime temperatures. In short, when temperatures are higher at night (i.e., when they do not cool down after a hot day), the body has less opportunity to cool down naturally (see Module 2). This can increase the likelihood of heat illnesses like heat cramps, heat exhaustion, and heat stroke occurring (see Module 2). For this reason, presenters should emphasize to audiences that it is especially important to take precautions during those months where the highest daytime and the highest nighttime temperatures tend to overlap.

KEY TALKING POINTS:

1. The highest daytime temperatures in San Diego County typically occur during these months:
   a. Coast: June-October
   b. Inland: May-October
2. The highest nighttime temperatures in San Diego County typically occur during these months:
   a. Coast: July-September
   b. Inland: July-September
3. Reduced cooling at night can make it harder for the body to cool down. It can also disrupt sleep, which plays a critical role in restoring and maintaining the body.

NOTES:

SLIDE 14: Summary

PURPOSE: **To reinforce the objectives of this module by highlighting key takeaways.**

KEY TALKING POINTS:

1. Yearly average temperature is increasing.
2. As the climate warms, heat waves in San Diego County have and continue to become:
   a. More frequent
   b. More intense
   c. Longer duration
   d. More humid
   e. Warmer at night
3. Heat is a serious issue – it is the #1 weather-related cause of death in the US.

NOTES:

SLIDES 15–17: Module 1 Templates

PURPOSE: These Module 1 slide templates are included so that presenters can add additional information in the presentation that they consider important for audiences to know. If a presenter needs more templates, they can simply copy those provided here.

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