

# Climate and Health Youth Education Toolkit



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## Introduction

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CLIMATE CHANGE IS AN IMMEDIATE THREAT TO HUMAN HEALTH. We're already feeling the effects. Whether it's heatwaves, floods, wildfires, extreme weather events or increasing allergens and disease-carrying insects, we're all experiencing the climate crisis—no matter where we live. Children are disproportionately vulnerable to the physical and mental health impacts of climate change. Children from low-income families and from communities of color are even more vulnerable.

While the dangers they're facing may seem overwhelming, young people also have a powerful voice to advocate for climate action. Unfortunately, most schools do not provide education about climate change and its health impacts. It's crucial that their learning is supplemented to fill this gap and provide the information they need to advocate for and work towards climate justice and equitable health outcomes.

Public health professionals are uniquely qualified to play an important role in educating youth about the health impacts of climate change and engaging them in taking steps toward advocating for climate justice in their communities. This toolkit provides resources for outreach and recruitment, and supplementary materials to augment the delivery of the lesson plan by a guest lecturer. It also includes an informational handout for students interested in taking action to address climate change in their communities.

For more resources and information on climate, health, and equity, visit [apha.org/Climate-Change](https://www.apha.org/Climate-Change).

# Acknowledgements

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The following is a list of APHA's Center for Climate, Health and Equity team members who were instrumental in this project.

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The primary supporter of APHA's climate education work, Biogen is partnering with the Center for Climate, Health and Equity as part of the company's long-term commitments to climate, health and equity. Our collaboration will help deliver educational programming to diverse groups of students across the U.S. while furthering leadership development and continued learning through a new student ambassador program. By collaborating with APHA and other stakeholders, Biogen hopes to inspire the next generation and create a healthier, more sustainable and equitable future.

Students who are interested in connecting with further resources and career opportunities can check out the [Biogen Community Lab Alumni Network](#) on LinkedIn. You don't need to have attended the Biogen Community Lab to join, and it's a great community for sharing career opportunities and tips on how to blaze a path to make change through science.





# Climate & Health

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Lesson Plan for Grades 9–12 | Created for APHA in 2020

# Summary

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This lesson plan draws heavily from [materials developed by the National Institute for Environmental Health Sciences](#). That resource has much more detail aimed directly at teachers, while this document adapts those materials to make it easier for APHA member volunteers to present the lesson in their local high schools.

At the end of these lessons, which should take about 100 minutes, students will:

- describe the impacts of a changing climate on human health
- discuss vulnerable populations
- apply systems thinking to create a visual model of health implications
- consider the benefits of climate mitigation on human health
- evaluate adaptation strategies that are protective of human health

A capstone extension activity encourages students to find and use local, state or regional data to evaluate climate adaptation and mitigation strategies, and if desired, plan a resilience-building project for their local school or community.

A second extension option serves more as an educational piece connecting climate and health to environmental justice. This option was suggested by leaders of the [Environmental Justice Coalition](#), a grassroots, student-led coalition mobilizing the next generation of activists in the fight for intersectional environmental justice and health equity and uplifting marginalized communities most impacted by environmental racism and climate injustices. Their work focuses on political advocacy, policy development, community organizing, educational initiatives and content creation.



# Background

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In April 2016, the U.S. Global Change Research Program released a report called *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* (CHA, 2016), which significantly advanced what we know about the impacts of climate change on public health, and the confidence with which we know it. The report builds upon the chapter on human health in the *2014 National Climate Assessment*.

Chapter 9 of that report is devoted to “populations of concern” which describes a number of **vulnerable populations** that will experience “disproportionate, multiple, and complex risks to their health and well-being in response to climate change.” As the public health system prepares for climate-related human health impacts, it will be important to take relevant vulnerable populations into account locally, regionally and globally.

This report describes **seven categories of human health impacts** (chapters 2–8) ranging from heat-related illness and death to vector-borne disease to cardiovascular and respiratory illness and disease. As students consider the numerous health effects of a changing climate, it is important that they also be tasked with identifying adaptation and mitigation strategies that can be implemented to protect human health with respect to climate change.

## Definitions:

**Mitigation strategies** reduce the amount of CO<sub>2</sub> being added to the atmosphere and include deployment of alternative energy sources such as solar and wind power. Current mitigation strategies will likely not be able to reverse the change in climate that has already occurred.

**Adaptation strategies** help people adjust to climate change impacts such as worsened air quality. An example of adaptation strategy would be to improve public transportation and encourage alternative transportation options such as bicycling and walking to reduce vehicle emissions that are harmful to human health.

Through these mitigation and adaptation changes in human activities and practices, we may be able to limit the magnitude of changes to the planet’s climate and the negative impacts to human health. Although it is possible that some mitigation strategies may exacerbate known human health stressors or introduce unanticipated potential for human harm, many strategies will provide **co-benefits**, simultaneously reducing the negative effects of climate change while also reducing illness or death. For example, shifting dietary intake (first in high-income settings) to more environmentally-friendly, sustainable, and healthy options may reduce greenhouse gas emissions along with land and water stress, and improve human health through diet.

# Teacher Preparation Checklist

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1. Read this entire document once through quickly.
2. Make sure students already have a general concept of climate change and the human activities that influence climate through greenhouse gas emissions. Please ask the teacher how much background knowledge about climate change students have going into the lesson. If they have minimal background knowledge, please point students to resources: [Causes of Climate Change](#) (EPA) and [The Causes of Climate Change](#) (NASA).
3. Read the [Executive Summary](#) of the 2016 *Climate and Health Assessment* and/or review the online report and decide whether you want to cover all seven categories of health impacts (chapters 2–8) or focus on select chapters.
4. Decide whether students will read the ½ page chapter summaries, the two-page brochures, or the chapters themselves. Base your decision on their reading level and/or the extent to which you want them to conduct background reading prior to your session. If you want them to read during your session, the ½ summaries would be best.
5. Assign one group of students for each chapter you have chosen and print one copy of the reading for each student. The ½ page chapter summaries are included in the supplementary materials while the other readings will need to be downloaded as PDFs.
  - Chapter 2: Temperature-related Death and Illness ([Brochure](#) or [Chapter](#))
  - Chapter 3: Air Quality Impacts ([Brochure](#) or [Chapter](#))
  - Chapter 4: Extreme Events ([Brochure](#) or [Chapter](#))
  - Chapter 5: Vector-Borne Diseases ([Brochure](#) or [Chapter](#))
  - Chapter 6: Water-Related Illness ([Brochure](#) or [Chapter](#))
  - Chapter 7: Food Safety, Nutrition, and Distribution ([Brochure](#) or [Chapter](#))
  - Chapter 8: Mental Health and Well-Being ([Brochure](#) or [Chapter](#))
  - Chapter 9: Populations of Concern ([Brochure](#) or [Chapter](#))

## **Option for low-level readers:**

*Assign each student either the ½ page or the two-page summary for a chapter(s). Provide ample time for them to read and for you to review the text as a class – emphasizing vocabulary terms and key concepts. Students could also be placed in mixed-ability groups and tasked with reading the text, highlighting unfamiliar words and concepts before summarizing as a group.*



6. Review the [PowerPoint slide set](#) and update if needed to tailor it to your goals or region.
7. Visit [CDC's Environmental Health Tracking page](#) and enter your zip code or county name. Here you will have access to general county-level environmental health information.
8. You or the class can create maps, tables and graphs using this [Tracking Tool](#) to look at temperature, precipitation and health effects related to heat. If this is too much effort, a data visualization related to extreme precipitation is provided on Teacher PPT slide 5.

To identify other relevant climate sensitive health outcomes for your state or region the following resources may be useful:

- a. [What Climate Change Means for Your State](#): facts sheets from EPA with a section on health
  - b. [Regional and health-related chapters](#) from the 2018 National Climate Assessment
  - c. Historical and projected climate data from the [Climate Explorer](#)
  - d. Alternatively, students could:
    - i. conduct independent research to find a data visualization on relevant climate sensitive health outcomes for their state
    - ii. research what climate change and health risks may already be impacting or are anticipated to impact their local school/district.
9. Assemble required materials (see *Materials* section below).
  10. Prepare a section of the room, for students to display and organize their visual model of how climate change impacts health. Write the following headings on signs that could be a piece of colored paper, or, if using a board, colored water-based unscented markers, erasable crayon, or chalk. Place the signs on the wall/space in this order from left to right: Climate Driver (green); Exposure Pathway (red); Health Outcome (black). These signs will guide students as they place their work on the wall in these categories.

# Materials

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- Computer with MS Office Software (including PowerPoint)
- Projector

## Engagement

- [Optional] blank index cards

## Exploration

- Copies of the graphic organizer “worksheet” (provided on page 14), one per student
- [Optional] colored highlighters or colored pencils (green, orange, blue, red) for reading
- Copies of the selected reading for each student. The [½ page chapter summaries](#) are included in supplemental materials while the [other readings](#) will need to be downloaded as PDFs

## Explanation

- Colored (green, red, black) water-based unscented markers for display of visual model
- Colored chalk if using a chalkboard for display of visual model
- If using blank wall for display of visual model:
  - Colored (green, red, black) ¼ sheets of paper, index cards or sticky notes
  - Masking tape to attach the colored paper to the wall (if not using sticky notes) and for showing connections between items on the visual model
- [Optional] 1 copy (per student in the group) of blank systems diagram (see PPT slide 14)

## Elaboration

- No special materials aside from PowerPoint slide set are needed for this activity

## Evaluation

- [Optional] Computers with internet access, one per student or student group

# Procedure

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## Engagement (15–20 minutes)

*This short exercise quickly and informally assesses students' pre-existing knowledge of how climate impacts human health and piques their interest in expanding their knowledge. The use of national and/or regional data visualizations provides relevance to students' lives.*

### PART I | EXPLORING PRIOR KNOWLEDGE

1. Draw a **T chart** on the board or large easel; label the left-hand column of the chart “examples of climatic change” and the right-hand column “human health effects.”
2. Ask students to name specific **examples of climatic change** (e.g., increased air temperature, precipitation, extreme weather) to assess their pre-existing content knowledge. Record their responses; do not worry about right or wrong answers.
3. Show [slides 4 and 5](#) that depict **observed** changes in temperature and precipitation for the nation. Alternatively, you may choose to project visualizations from your region of the country or for the entire globe; state and regional data visualizations for temperature and/or precipitation can be created in CDC’s Environmental Public Health Tracking Network (see item 8 above) while global data visualizations are available through [NOAA’s Global Temperature and Precipitation Maps online tool](#) (see [Resources section](#)).
4. As a class, **interpret each figure**, noting regions that are becoming cooler/warmer and drier/wetter. Then discuss your state and region. Alternatively, ask students to do this in writing or with a partner.

Ask students to list **specific impact(s)** of:

- a warming climate on human health
- a wetter climate on human health
- drier climate on human health.

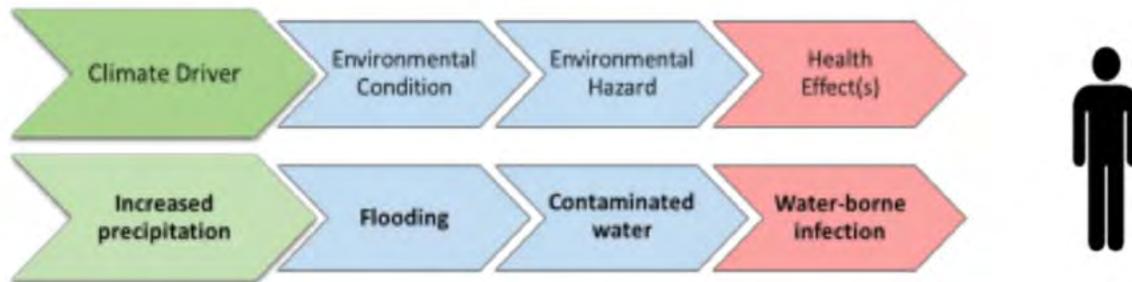
Record their responses in the right-hand column of the T chart aligned with any relevant climatic changes listed in the left-hand column; do not worry about right or wrong answers.

**Alternative:** Ask students to construct their own T charts on 4x6 notecards. The cards could be collected as a pre-assessment. If done anonymously, students could swap cards and share recorded answers aloud as teacher constructs a T chart for the class at the front of the room.

## PART II | CREATING A VISUAL MODEL OF CAUSE AND EFFECT

1. Summarize the conversation and tell the students that the class is going to construct a **visual model** to show the connection between a specific climate change (*default example: heavy precipitation*) and a specific human health effect (*default example: water contamination*).

### Visual Model | Cause and Effect Flooding & Human Health



2. Use *slides 7–8* as a prompt as you ask students to respond to the following questions:

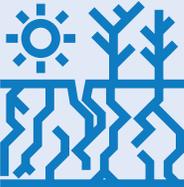
<h2>Flooding &amp; Human Health</h2> <p><b>Data Visualization: Number of days with rainfall above 1 inch in 2090; risk of flooding</b></p>	
<p><b>Q1.</b> What is the specific climate change, also called the climate driver, which is referenced by this data visualization?</p>	<p><b>A1. Heavy precipitation</b></p>
<p><b>Q2.</b> What is/are the environmental condition(s) that arise in response to this specific climate change? These conditions can either create or exacerbate an environmental hazard.</p>	<p><b>A2. Flooding</b></p>
<p><b>Q3.</b> What is the environmental hazard being examined? An environmental hazard is what will directly lead to a negative health outcome. Together, the environmental condition(s) and the hazard(s) comprise the exposure pathway.</p>	<p><b>A3. Exposure to contaminated floodwaters</b></p>
<p><b>Q4.</b> What is/are the health effect(s) that might arise from exposure to the environmental hazard? Health outcomes refer to the specific impacts of the hazard on human health.</p>	<p><b>A4. Water-borne illness</b></p>

3. Tell them this information helped to construct a **visual model** of this cause and effect mechanism (slide 9).
- a. Point out that flooding can be both an environmental condition and a hazard if high waters lead to injury or drowning.
  - b. Ask students if they can think of other human health hazards that might arise from flooding (e.g., growth of mold and mildew after water subsides).



**TEACHING TIP:**

To help students distinguish between an environmental condition(s) and hazard, provide some familiar examples that might arise as a result of a thunderstorm.

Environmental condition		Hazard
	<b>Heavy rain</b>	 <b>Slippery roads</b>  <b>Flooding</b>
	<b>High winds</b>	 <b>Downed trees</b>  <b>Downed electrical wires</b>  <b>Power outages</b>
	<b>Drought</b>	 <b>Wildfire</b>

4. Tell the students that now they are going to work as a class to create a **more complex visual model** of the various health outcomes arising from climate change (as described in the *2016 Climate and Health Assessment*).

## Exploration (20–30 minutes)

*A graphic organizer guides students as they construct a visual model that will ultimately be shared with the class in order to construct a larger model. Student reading materials have been prepared exclusively for this activity. For advanced students, you may ask them to read the two-page brochure or the entire chapter.*

1. For each chapter of the assessment you plan to investigate, **assign three to four students per chapter** and distribute copies of the assigned reading to each group member.
2. Either in class or as homework, tell students to **complete the reading**.
3. Ask them, individually or in their group, to complete one or more rows of the **graphic organizer** provided on page 14 based on their reading.
  - a. Note that students seem to find it easier to identify a hazard first, and then work backward to identify the underlying environmental condition(s) that creates the hazard, and then the ultimate climate driver(s) responsible for producing the environmental condition(s).
  - b. To complete a row, students would then list the specific health effects for each hazard identified and then list any vulnerable populations that are more susceptible to experiencing negative health outcomes related to the hazard cited.
  - c. It may be difficult to differentiate the environmental condition(s) from the environmental hazard. For example, increased temperature can be a change in climate, an environmental impact and an environmental hazard. Students may need guidance; the Answer Key that starts on page 24 may assist.
4. Depending on your goals, students could be tasked with **conducting additional research** on their assigned chapter looking at the local or regional perspective, or looking at their own high school/school district. For data on schools, visit your state education department and look for attendance/absenteeism data, facility information such as ventilation/heating/cooling systems and drinking water systems; alternatively, ask your school principal, head custodian and/or facility director.
5. Tell the groups that during the next phase of the activity, the Explanation phase, they will present their visual models to the class. Some groups may have more than one model to present. Each group should **identify one student who will present** the model(s) aloud to the class while the other students in the group contribute to the model by writing and/or placing their model components on the board or wall.

## Explanation (20–30 minutes)

*During this activity, students explain their visual model(s) to the class as a larger model is being constructed that will convey the complex climate and health system. The teacher's actions center on ensuring student explanations are accurate, addressing misinformation and clarifying points of confusion. During the debrief, the teacher introduces systems thinking.*

1. Tell the class they are going to combine their models to create a larger visual model to illustrate the complexity of the climate and health system. One at a time, invite each group to come to the space you have identified and **describe their visual model aloud** for each health outcome identified in their chapter as they place their model on the board or wall. For each health outcome identified, students should also mention any vulnerable populations.
  - Students will either write their words on the board or place their sticky notes or cards in the appropriate location and connect the words using a marker, chalk or tape.
  - Students should note where one environmental condition (e.g., flooding) influences other health outcomes by adding arrows to the model.
  - If a change in climate or environmental condition is already represented on the board/wall, students should **use the term that is already there** and connect that term to the new information they are adding to the board.
  - As a facilitator, prompt students to consider the terms that have already been placed on the board and **make new connections using markers**. For example: Drought will not only cause an increase in wildfires but can also lead to crop failures resulting in a shortage of food, higher food prices and a likely increase in cases of malnutrition and hunger.
  - Check if the “climate driver → environmental condition → environmental hazard → health outcome” sequence is **logical and clearly depicted** before the next group goes.
2. Ask students if they see **overlapping themes** from the placement of the cards and connecting arrows. For example, flooding results in more than one environmental hazard (see slide 16) which, in turn, results in several potential health effects.



### TEACHING TIP:

Ask students to fill in a blank copy of the systems diagram provided on *slide 14* (1 copy per student) to stay on task while others are presenting.

**Educational Materials**

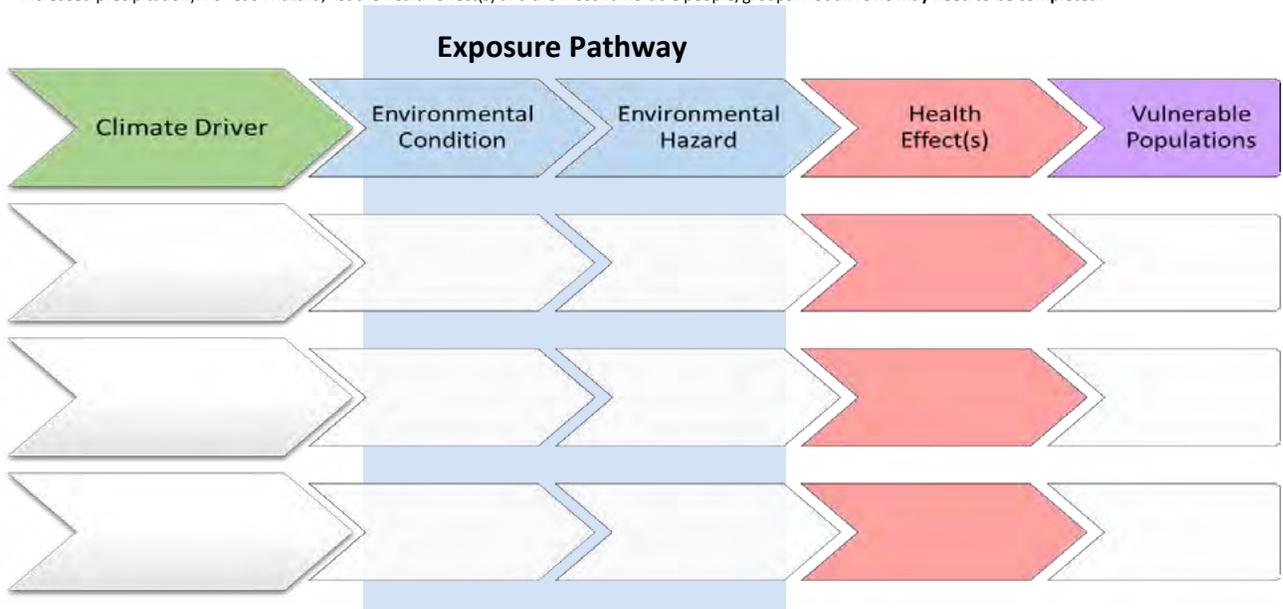
*A Student Exploration of the Impacts of Climate Change on Human Health in the United States*

**Climate Change and Human Health**

Assigned Chapter: \_\_\_\_\_

NAME: \_\_\_\_\_

As you read, identify the environmental condition(s) that produce the environmental hazard(s) cited and then identify the underlying climate driver(s) (e.g., increased precipitation). For each hazard, list the health effect(s) and the most vulnerable people/groups. **Not all rows may need to be completed.**



*It may be difficult to distinguish the environmental condition from the environmental hazard. For example, increased temperatures can be a change in climate, an environmental impact and an environmental hazard! An environmental hazard is what will directly lead to a negative health outcome.*

Lesson plan

National Institutes of Health • U.S. Department of Health and Human Services

November 2016

See printable version on page 32 in the appendix.

## SYSTEMS-THINKING DEBRIEF

By building the larger model and answering the guiding questions provided below, students will see the:

- complex interconnected nature of our environment and its impact on human health
- need to simplify to better understand the individual aspects of the system, as well as their connections to each other.

1. Introduce systems thinking by asking the following questions:

■ **Q1: Is the climate change-human health system depicted here a simple or complex system?**

A1: Complex system — one environmental condition can lead to multiple hazards and multiple health outcomes; multiple climate drivers can interact to produce an environmental condition.

■ **Q2: Is the climate change and human health system a physical system? A chemical system? A biological system?**

A2: Earth's processes and its living inhabitants are systems within systems. The climate change and human health system is composed of physical, chemical and biological systems that interact with each other and all influence human health.

■ **Q3: Are there any smaller (sub) systems within the climate-health system?**

A3: Yes, the hydrosphere represents a system, the atmosphere represents a system, the biosphere represents a system. All together the systems make up the larger climate and health system.

- The human body is also a relevant system and this is an opportunity to emphasize that for each health outcome some individuals are going to be more vulnerable to climate impacts than others. Susceptibility can be influenced by factors such as age, genetic make-up and socio-economic status.
- Chapter 9 of the 2016 Climate and Health assessment provides more information on vulnerable populations with key findings that 1) vulnerability varies over time and is place-specific; 2) health impacts vary with age and life stage; 3) social determinants of health interact with climate factors to affect health risks.

■ **Q4: What is the value of a systems approach to understanding the impact of climate on human health (e.g., how does knowing about the bigger system help with the study of a smaller system, in this case the human body)?**

A4: Answers may vary; look for their logic. Answers may include statements such as:

- it helps identify potential variables/influences on the system
- if you are not aware of the larger system you may reach erroneous conclusions or encounter unintended consequences
- it can identify how communities (including schools) and the public health system will need to adapt to protect public health in response to a changing climate.

You may want to use this as an opportunity to discuss how the diagram on the board relates to career interests of students; for example, there will be a need for informed public health professionals and adequate infrastructure along with informed city and regional planners, and school administrators who can prepare schools and communities for these challenges.

2. Ask the students to consider the environmental condition for a single climate impact such as flooding (use their work or *slide 16*) and all the potential health effects associated with it. You may choose to use a different colored marker or tape to denote the numerous health effects.
3. Prompt the class to consider how scientists study the climate and health system; suggested questions are provided below but you may come up with your own questions.

■ **Q1: Why do you think scientists study one part of a bigger system (e.g., incidence of malaria in areas of drought)?**

A1: Answers may vary; look for logic. Answer may be “to make it easier.” For example, there are many things that could be studied with respect to drought (such as weather patterns, occurrence, length of time, quality of water supplies, amount of water supplies, increase or decrease in specific pests, use of chemicals as a result of certain pests, etc). There is too much to look at if you tried to do it all. Thus, in order to study or understand a complex system it needs to be simplified. Simplifying a system can include looking at one part of the system, at a simple “cause and effect” level, or manipulating a variable within the system (experimentation).

■ **Q2: What do you think are the challenges for a scientist trying to study a smaller part of a bigger system? Consider the parts of a system and its boundaries.**

A2: Answers may vary; look for logic. Answers may include statements like:

- defining the boundaries of the system (i.e. how much do you include in the study)
- identifying and controlling for variables
- keeping track of what enters and leaves the system
- accurately identifying actions and reactions.

4. Conclude this activity by reiterating that the climate and health system is inherently complex.
  - To better understand the system and assess how climate change impacts human health, it is essential to study its component parts while keeping connections in mind.
  - The way scientists think about these connections is through the concept of a “system.”
  - Scientists and policymakers also **need to consider other systems** connected to their system of interest as they advocate for strategies that are protective of human health.
  - For example, there is a push for use of biofuels to reduce our reliance on non-renewable petroleum-based sources. Doing that would solve one set of problems like oil spills and dependence on foreign oil, but it may introduce another set of problems in an interconnected system, such as using a food source as a fuel when the world’s population is increasing or the emissions from that alternative fuel may still contribute to air pollution or climate change.
  - These interconnections will be explored further in the next activity.

## Elaboration (10–15 minutes)

*During this solutions-focused activity, students elaborate on the concepts they have learned and make connections to other related concepts; this activity also promotes critical thinking by asking the students to evaluate solutions.*

1. Reinforce to students that **greenhouse gas emissions** resulting from human activities are driving the climatic changes described in this module.
2. Introduce students to the concept of **climate mitigation** (taking action to reduce or prevent the emissions of greenhouse gases).
3. Prompt students to consider the **health co-benefits** that might be conferred by mitigation.
  - For example, implementing renewable energy technologies means fewer greenhouse gas emissions and also reduced emissions of particulate matter, thus improving air quality which will translate into overall improved cardiopulmonary health.
  - This improved health outcome is an example of a health co-benefit. It should also be emphasized that these health co-benefits may have maximum impact on already vulnerable populations (e.g., those with asthma).
4. Task students with considering how **climate mitigation will impact the health outcomes** described in their reading. They should:
  - Answer “What are the relevant health co-benefits?”
  - Identify both personal (individual) and societal (collective) solutions that could be advanced to either
    - Prevent the negative health outcome(s) from occurring in a changing climate; and/or
    - Promote preparedness/adaptation so that the negative health outcomes are less severe or occur to a lesser extent than without the intervention.
  - These solutions can be thought of as **adaptation strategies**. A list of possible adaptation strategies is included for each chapter in the Answer Key (starting on page 24).

**Alternative:** The class could vote on what they consider to be the most relevant human health impact for their community or state and in small groups, come up with relevant adaptation strategies.
5. Students could also be asked to **investigate local adaptation strategies** that are either being planned or implemented to address health outcomes mentioned in their assigned chapter.



### TEACHING TIP:

Students may find that some strategies could be both a mitigation strategy and an adaptation strategy. For example, an urban forest can reduce greenhouse emissions (mitigation) and it can improve air quality (adaptation).

6. For each adaptation strategy identified have students **evaluate the pros and cons of implementation**. Some adaptation strategies may counter mitigation efforts! For example, building an urban cooling center for people to go to on extreme heat days will be associated with increased greenhouse gas emissions unless the center is powered by renewable energy.
7. Next, invite each group to share one or more of their adaptation strategies with the class.

## Evaluation (Time Varies)

*During this phase, students demonstrate what they have learned by extending their knowledge and practicing their science communication skills. Depending on the amount of time devoted to assessment of student learning as result of this module, a range of evaluation options is provided and organized from least to most time intensive.*

### OPTION 1

Task students with **writing a concluding paragraph** for their assigned chapter of the 2016 Climate and Health Assessment that describes relevant health co-benefits of climate mitigation efforts and describes adaptation strategies that could be implemented to protect human health in light of climate change.

#### *Sample evaluation rubric*

- 10 POINTS** ► State specific health effect(s) cited in the chapter.
- 10 POINTS** ► Distinguish between mitigation and adaptation.
- 20 POINTS** ► Accurately describe health co-benefits of climate mitigation efforts.
- 30 POINTS** ► Clearly describe at least one adaptation strategy.
- 20 POINTS** ► Describe pros and cons of implementation of adaptation strategy

### OPTION 2

Task students with **thoroughly evaluating at least one adaptation strategy (solution)** they identified during the elaboration activity from an economic, social (including vulnerable populations) and environmental perspective and present their analysis either in writing or as an in-class presentation that could include development of a poster, brochure, infographic, video or other materials. This could entail evaluation of a local solution to a health outcome cited in their assigned chapter. Students may choose to write a letter to the editor of the local paper or to a policymaker outlining how their community should prepare for human health outcomes related to their chapter.

#### *Sample evaluation rubric*

- 10 POINTS** ► State specific health effect(s) cited in the chapter.
- 20 POINTS** ► Clearly describe the adaptation strategy being recommended.
- 20 POINTS** ► Evaluate strategy from an economic perspective (pros/cons).
- 20 POINTS** ► Evaluate strategy from a social perspective (pros/cons).
- 20 POINTS** ► Evaluate strategy from an environmental perspective (pros/cons).
- 10 POINTS** ► End product/project clearly communicates information.

### OPTION 3

Task students with **designing a solution** to combat a specific health outcome that is relevant to their local community, state or region of the country. Their design could be described in writing, through a schematic drawing/diagram, or a physical prototype through creative reuse of household materials. Students present their design to the class which could be accompanied by a brochure or fact sheet. *A grading rubric is not provided but students should state the specific problem they are trying to solve and clearly describe their solution.*

### OPTION 4

Task students with **developing a resilience building project** (climate adaptation plan) to address a specific climate threat (e.g., flooding) that is relevant to their local school, community, state or region of the country. Students are prompted to:

- use the [U.S. Climate Resilience Tool Kit](#) and other relevant geoscience data to investigate their assigned climate threat.
- support their findings with additional geoscience data, including climate predictions, which can be accessed using the [Climate Explorer](#)
- identify vulnerable populations (check out the [Social Vulnerability Index](#)).
- evaluate options for adaptation.
- make a recommendation.

The Tool Kit helps users navigate the steps of developing a resilience-building project. While designed for use by communities, this tool kit can guide students through the process of developing a plan to prepare the community for *one* climate-sensitive health outcome in an effort to simplify the activity. The plan could be outlined in writing and/or through an in-class presentation.

#### **Sample evaluation rubric**

- 10 POINTS** ► Clearly state specific health threat.
- 10 POINTS** ► Identify vulnerable populations..
- 10 POINTS** ► Clearly state goal of resilience building project.
- 20 POINTS** ► Use geoscience data to support need for project.
- 30 POINTS** ► Clearly describe the adaptation strategies that make up your plan.
- 20 POINTS** ► Evaluate and prioritize strategies.

## Extend

### OPTION 1

Students could further extend their learning by either working to implement their resilience project in their school or community (if applicable) or by advocating for their adaptation strategy or resilience building project through civic engagement with relevant policymakers (students could partner with a U.S. Government/Civics class).

### OPTION 2

Another avenue is to deliberately connect what students learned about climate change and human health to environmental justice, racism, and the health disparities that marginalized communities in the state, community or school district face due to climate change. Please see information below.

### History of the environmental justice movement

The catalyst for the environmental justice movement was in Warren County, North Carolina, home to a small, poor, predominantly African American community. The state government announced its plans to dump 6,000 truckloads of soil laced with toxic polychlorinated biphenyls (PCBs), sparking outrage among residents who feared the toxic substances would leak into their drinking water supply and endanger the health of the community.

When the soil trucks drove into Warren County in mid-September of 1982 making their way to a new hazardous waste landfill in Afton, the community and its allies laid down in the streets, blocking the trucks' path. Six weeks of nonviolent protests ensued, and over 500 people were arrested.

Although Warren County ultimately lost its fight and the toxic waste was dumped into the landfill, their cause resonated with people of color and low-income communities across the country, and the story of ordinary people defending their homes against this grave environmental injustice garnered media attention and lit a spark that catalyzed what we now know as the environmental justice movement.

The events of Warren County, North Carolina, brought to light how the racism African American and Black communities faced in areas such as education and employment, extended to fronts like pollution and toxic waste. This time, it was **environmental racism** (a term coined by Dr. Benjamin Chavis in 1982). A new faction of the civil rights movement fighting for **environmental justice** for communities of color emerged.

### By the numbers

Environmental racism encompasses areas, such as air pollution, food inequality, proximity to hazards (toxic waste facilities, chemical plants, etc.), vulnerability to disasters (hurricanes, wildfires, etc.), access to quality and affordable healthcare, and access to clean drinking water. The EPA reports 71% of African Americans live in counties in violation of federal air pollution standards compared to only 58% of non-Hispanic whites. The Asthma and Allergy Foundation of America reports African Americans are around 1.5 times more likely to have asthma and three times more likely to die from the condition than non-Hispanic whites. A study published in the Proceedings of the National Academy of Science reports Black people experience 56% more pollution than their consumption generates.

A study published in the *American Journal of Public Health* showed minority neighborhoods are less likely to have access to healthy food options and Move for Hunger reports African American households face twice the hunger rate of non-Hispanic white ones.

Similar connections can be drawn to low-income communities and communities of color facing increased vulnerability to disasters, such as wildfires, but not receiving the same government support and efforts to rebuild high-income, predominately white neighboring counterparts. Children who live in rural areas, Indigenous peoples and migrant farmworkers face higher rates of water contamination (National Resources Defense Council), which can in turn, lead to waterborne diseases, blood disorders and cancer.

### **In cities across the U.S.**

**Cancer Alley, Louisiana:** Cancer Alley is an 85-mile strip of land along the Mississippi River from New Orleans to Baton Rouge lined with oil refineries and chemical plants. It earned its title because its residents are 50 times more likely to develop cancer than the average American.

**Pahokee, Florida:** October in Pahokee brings “black snow,” a thick layer of soot that covers the area, when sugar cane farmers set their fields on fire before harvest. Residents of the Glades face higher rates of respiratory disease, especially those from its low-income and Black communities.

**Cheraw, South Carolina:** Up until the 1970s, polychlorinated biphenyls (PCBs), a type of toxic chemical, were dumped in a creek in Cheraw, South Carolina, by Burlington Industries. When Hurricane Florence hit, those chemicals washed up in peoples’ yards, homes and a local playground.

**Uniontown, Alabama:** In 2008, over a billion tons of coal ash spilled into the Emory River Channel in Kingston, Tennessee. The workers that had to clean the site tragically developed chronic diseases, such as brain cancer, lung cancer and leukemia. In 2010, the Tennessee Valley Authority transported 4 million cubic yards of coal ash from the spill to Uniontown, Alabama, home to a predominantly low-income, Black community.

**The Bronx, New York:** The Bronx is one of the most racially diverse parts of New York City and bears disproportionately high rates of air pollution. Close to 20% of children there have asthma, and the South Bronx earned the nickname “Asthma Alley” because there are five times more hospitalizations than the national average and 21 times more than other NYC neighborhoods.

**Flint, Michigan:** Flint, Michigan failed to properly treat its municipal water system, leading to mass lead poisoning from 2014 to 2015, despite repeated complaints from local residents, who were mostly low-income people of color.

**Houston, Texas:** The Harrisburg / Manchester neighborhood of Houston, Texas, is 98% Hispanic and riddled with oil refineries, chemical plants, sewage treatment facilities and hazardous waste sites. Up to 484,000 pounds of toxic chemicals are released there annually.

**Detroit, Michigan:** “Detroit’s most polluted zip code is 71% Black, and the air pollution is so bad it can make the sky look like a fiery orange glare (Insider, 2020).” The Marathon Oil Company Detroit Refinery has received over 15 violations of federal and state emission guidelines from Michigan Department of Environment, Great Lakes, and Energy in the past seven years yet continues to expand.

# Resources

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- Angela H., David C. H., and Jayna D., 2012:  
*Neighborhood Disparities in Access to Healthy Foods and Their Effects on Environmental Justice.*  
American Journal of Public Health 102, 1644\_1654, <https://doi.org/10.2105/AJPH.2012.300865>
- *A Framework for K–12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.* 2012. Committee on a Conceptual Framework for New K–12 Science Education Standards. Board on Science Education, Division of Behavioral and Social Sciences and Education. National Research Council. Washington, DC: The National Academies Press. <http://www.nap.edu/>
- *Climate Change Impacts in the United States: The Third National Climate Assessment.* 2014. Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. U.S. Global Change Research Program, Washington, DC, 841 pp. doi:10.7930/J0Z31WJ2. <http://nca2014.globalchange.gov/>
- *10 Egregious Examples of Environmental Racism in the U.S.* 2020. Natalie C. Insider. <https://www.insider.com/environmental-racism-examples-united-states-2020-8#warren-county-north-carolina-9>
- *Volume II: Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment.* Reidmiller, David R., Avery, Christopher W., Easterling, David R., Kunkel, Kenneth E., Lewis, Kristin L.M., Maycock Thomas K., and Brooke C. Stewart, Eds. U.S. Global Change Research Program, Washington, DC, 1515 pp. doi: 10.7930/NCA4.2018. <https://nca2018.globalchange.gov/>
- *Climate Literacy: The Essential Principles of Climate Science.* 2009. U.S. Global Change Research Program, Washington, DC, 18 pp. <http://www.globalchange.gov/browse/reports/climate-literacy-essential-principles-climate-science-high-resolution-booklet>
- *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.* 2016. Crimmins, A., J. Balbus, J.L. Gamble, C.B. Beard, J.E. Bell, D. Dodgen, R.J. Eisen, N. Fann, M.D. Hawkins, S.C. Herring, L. Jantarasami, D.M. Mills, S. Saha, M.C. Sarofim, J. Trtanj, and L. Ziska, Eds. U.S. Global Change Research Program, Washington, DC, 312 pp. <http://dx.doi.org/10.7930/J0R49NQX> (<https://health2016.globalchange.gov/>)
- *Next Generation Science Standards: For States, By States.* 2013. NGSS Lead States. Washington, DC: The National Academies Press. [www.nextgenscience.org/](http://www.nextgenscience.org/)
- NOAA's Global Temperature and Precipitation Maps <http://www.ncdc.noaa.gov/temp-and-precip/global-maps/>
- Social Vulnerability Index <http://svi.cdc.gov/>
- What Climate Change Means for Your State | Fact Sheets from the EPA  
[https://19january2017snapshot.epa.gov/climate-impacts/climate-change-impacts-state\\_.html](https://19january2017snapshot.epa.gov/climate-impacts/climate-change-impacts-state_.html)

## Multimedia

- Feeling the Effects of Climate Change, PBS video (13-minute video)  
<http://video.pbs.org/video/1939995285>
- National Climate Assessment: Health chapter (~ 2-minute video)  
<https://vimeo.com/92569617>

# Chapter-by-Chapter Organizer for Comprehension *Answer KEY*

## Chapter 2 | Temperature-related Death and Illness | Extreme Heat

Climate Driver(s)	Exposure Pathway		Health Outcome(s)	Vulnerable Populations
	Environmental Condition	Environmental Hazard		
<ul style="list-style-type: none"> <li>• increasing air temperature</li> <li>• more frequent elevated air temperature</li> <li>• prolonged heat waves</li> <li>• seasonal timing of events</li> </ul>	<ul style="list-style-type: none"> <li>• elevated air temperatures</li> <li>• combined impact of temperature, humidity, wind &amp; sunlight</li> </ul>	<ul style="list-style-type: none"> <li>• prolonged exposure to extreme heat</li> </ul>	<ul style="list-style-type: none"> <li>• heat-related illness and death, including heat cramps, heat exhaustion, heatstroke and hyperthermia; dehydration; exacerbation of respiratory, cardiac and other illnesses associated with extreme heat; hospital and emergency department visits</li> <li>• potential decrease in cold-related deaths, including hypothermia and frostbite</li> </ul>	<ul style="list-style-type: none"> <li>• children and the elderly; economically disadvantaged groups; chronically ill; outdoor workers and athletes</li> </ul>

### POSSIBLE ADAPTATION STRATEGIES TO ADDRESS EXTREME HEAT



**PERSONAL:** stay hydrated, be aware of heat advisories and adjust work/play time outdoors, etc. Students may be prompted to identify adaptive behaviors for athletes who participate in school sports during high temperature events.



**SOCIETAL:** issue heat advisories, offer cooling centers or water play features at parks, adjust shifts of outdoor workers or time of outdoor practices to avoid the hottest part of the day, construct green roofs, cool roofs, plant street trees, train emergency personnel for heat-related illness, etc. Regarding school sports, students could be prompted to identify actions the athletic department/school administration can take to protect athletes who participate in school sports during high-temperature events.

## Chapter 3 | Air Quality Impacts

Climate Driver(s)	Exposure Pathway		Health Outcome(s)	Vulnerable Populations
	Environmental Condition	Environmental Hazard		
increasing temperature + changes in precipitation	longer growing seasons	longer pollen season	Increased allergies/asthma-timing, frequency, severity	children and elderly; asthmatics and people whose immune systems are compromised; economically disadvantaged groups
higher temperature and lower humidity	increasing air temperature + UV radiation = less cloud cover and rainfall	Increase in ground level ozone	Increased cardiac effort, impairs pulmonary gas exchange, acute myocardial infarction, premature deaths, hospital visits, lost school and workdays, acute respiratory symptoms, lung inflammation & scar tissue, chest pain, coughing, throat irritation, congestion, bronchitis, emphysema, asthma	children and elderly; asthmatics and people whose immune systems are compromised
increase in temperature less rain or snow	drought wildfires	dust, particulate matter, smoke	Respiratory symptoms, allergies, lung damage, premature death, adverse chronic and acute cardiovascular and respiratory health outcomes	children and elderly; asthmatics
higher temperature more rain or snow	increasing moisture & humidity	More molds & airborne allergens	allergies, asthma, respiratory symptoms	children and elderly; asthmatics and people whose immune systems are compromised
more heavy precipitation and severe weather events can lead to increased humidity	More indoor humidity and dampness	An increase in indoor mold, dust mites, bacteria and other bio contamination indoors More indoor volatile organic compounds (VOCs)	asthma and allergy exacerbation	children and elderly; asthmatics and people whose immune systems are compromised

### POSSIBLE ADAPTATION STRATEGIES TO ADDRESS AIR QUALITY



**PERSONAL:** limit outdoor exercise near roadways, increase distance from high-traffic roadways, educate self and family about asthma/allergies, reduce personal carbon emissions.



**SOCIETAL:** provide air conditioning and filtration, education about asthma/allergies, reduce carbon emissions, urban greening; air quality warnings (e.g., ozone alerts)

## Chapter 4 | Extreme Events

Climate Driver(s)	Exposure Pathway		Health Outcome(s)	Vulnerable Populations
	Environmental Condition	Environmental Hazard		
increasing precipitation	flooding	flooding, mudslides, slippery roads, debris, loss of infrastructure, contaminated drinking water	traumatic injury and death; drowning; mental health impacts; carbon monoxide poisoning related to power outages; hospitalization; famine; poor water quality; displacement; gastrointestinal illness	coastal populations; persons with disabilities; certain racial/ethnic minority groups; pregnant women and children; low income populations; persons with limited English proficiencies
increasing temperature	extreme weather events: hurricanes, tornadoes, severe thunderstorms	wind, flooding, storm surge, power outages	damaged structures can injure or kill people; displacement from homes and/or businesses	pregnant women and children; persons with disabilities; elderly; low-income populations
increasing temperature decrease in precipitation	drought	wildfires (smoke); decrease in potable water supplies; decrease in water supplies for agriculture	smoke inhalation; burns; asthma exacerbation; mental health impacts; dehydration; famine; illness from reduced water quality and quantity	asthmatics; low-income populations; certain populations of color; pregnant women and children; elderly

### POSSIBLE ADAPTATION STRATEGIES TO ADDRESS EXTREME EVENTS



**PERSONAL:** respond to evacuation orders and other emergency warnings, pack an emergency preparedness kit or “Go Bag” and develop a family communication plan in advance of extreme events.



**SOCIETAL:** avoid building in floodplains and coastal areas subject to extreme high tides and sea level rise, provide extreme event plans/coordination, storm preparation and evacuation warnings

## Chapter 5 | Vector-Borne Diseases

Climate Driver(s)	Exposure Pathway		Health Outcome(s)	Vulnerable Populations
	Environmental Condition	Environmental Hazard		
extreme high and low temperatures	geographic range of disease vectors increases	increased vector-borne disease	spread of vector-borne and zoonotic diseases (e.g., Lyme disease spread north as the range of the deer tick increases)	persons in close proximity to vector habitat; persons with outdoor occupations; children ages 5–9 and adults ages 55–59; males
rising temperature and changes in precipitation patterns	increase in vector populations	increased vector-borne disease	spread of West Nile Virus and other pathogens	persons in close proximity to vector habitat; persons with outdoor occupations; low socioeconomic groups
altered weather patterns	drought	decrease in some vector populations (e.g., mosquitoes require water)	decrease in some vector-borne diseases in some areas	
rising temperature	Longer growing season; increase in pests/vectors;	Greater use of pesticides	neurological diseases, cancer, developmental effects	outdoor occupations; low socioeconomic groups; children, pregnant women, and elderly

### POSSIBLE ADAPTATION STRATEGIES TO ADDRESS VECTOR-BORNE DISEASES



**PERSONAL:** wear bug repellent, cover skin when outside during peak times of year, check for pests potentially carrying vector-borne diseases after prolonged time outdoors, make use of screens on windows and doors (barriers) and air conditioning to limit exposure to vector-borne pathogens; remove standing water



**SOCIETAL:** educate vulnerable populations on how to limit exposure to vector-borne diseases, provide air conditioned work conditions, vector control and public health practices, change landscape

## Chapter 6 | Water-Related Infection

Climate Driver(s)	Exposure Pathway		Health Outcome(s)	Vulnerable Populations
	Environmental Condition	Environmental Hazard		
decreased precipitation	drought	increased concentration of effluent pathogens in wastewater treatment plants	waterborne pathogens	residents of low income rural areas; small community or private groundwater wells
increase in extreme precipitation	flooding, freshwater runoff, storm surge, changes to coastal salinity	contaminated water supply (pathogens); compromised quality of recreational waters; decrease in shellfish harvesting	vomiting, diarrhea, wound/skin infections; famine and dehydration; infrastructure failure	tribal groups that consume shellfish; populations that use recreational waters (fishing, swimming, boating); children and pregnant women
increasing air temperature	increasing water temperature	more pathogenic organisms such as diarrhea-causing vibrio bacteria; more growth of toxic algal blooms; increase in seafood-related poisonings (e.g., ciguatera)	diarrhea; neurotoxic or respiratory effects from toxic algae	beach goers; remote populations or villages; residents of low income rural areas; children and pregnant women

### POSSIBLE ADAPTATION STRATEGIES TO ADDRESS WATER-RELATED INFECTIONS



**PERSONAL:** awareness about raw shellfish consumption and recreating in marine waters with open wounds, informed recreational activities, education of social determinates of health that affect immune status



**SOCIETAL:** public health surveillance system and monitoring; communications between public health officials and state or tribal shellfish resource managers; management decisions regarding shellfish bed closures; public health communication regarding the use of recreational waters after large precipitation events (awareness of swimming restrictions)

## Chapter 7 | Food-Related Infection

Climate Driver(s)	Exposure Pathway		Health Outcome(s)	Vulnerable Populations
	Environmental Condition	Environmental Hazard		
altered weather patterns, rising temperatures	increased temperatures and flooding	bacterial pathogens (e.g., salmonella); food spoilage and contamination; disrupted distribution	increased illness from pathogens that cause vomiting and diarrhea which can result in decreased nutrients in the body; famine	low socioeconomic groups; children, elderly, and pregnant women; indigenous populations; persons with weakened immune systems
rising CO <sub>2</sub> levels	direct CO <sub>2</sub> fertilization effect on plant photosynthesis	stimulate growth and carbohydrate production in some plants = lower levels of protein and essential minerals	negative implications on human dietary nutrition	pregnant women, elderly, and children; persons with weakened immune systems
increasing air temperature	increasing ocean temperature	accumulation of mercury in seafood; introduce contaminants into the food chain	mercury poisoning; seafood-related gastroenteritis	populations that consume diet high in fish; pregnant women, elderly, and children; persons with weakened immune systems
more frequent extreme weather events	increase in CO <sub>2</sub> concentrations	altered incidence and distribution of pests, parasites, and microbes = increase in use of pesticides and veterinary drugs	bioaccumulation of pesticides; resistance to pesticides	agricultural workers; pregnant women, elderly, and children; low socioeconomic groups; persons with weakened immune systems
higher temperature and drought	stress plants, making them more susceptible to mold growth	Increase in mold growth and mycotoxin production	illness and death; impaired development in children and immune suppression	children and pregnant women; persons with weakened immune systems; persons with respiratory illnesses
more extreme weather events	more precipitation and flooding	entry of contaminants into the food chain (e.g., PCBs, organic pollutants, dioxins, pesticides)	illness and death; adverse health effects	children and pregnant women; persons with weakened immune systems

### POSSIBLE ADAPTATION STRATEGIES TO ADDRESS FOOD-RELATED INFECTIONS



**PERSONAL:** home refrigeration, awareness of food-handling practices and preparation, wash produce before consumption, awareness of outbreaks



**SOCIETAL:** efficacy of practices that safeguard food in the US, standardize food-handling practices and preparation, response to outbreaks, regulate agricultural practices and livestock processing, regulate water quality management, regulate transportation and infrastructure for food distribution

## Chapter 8 | Mental Health and Well-being

Climate Driver(s)	Exposure Pathway		Health Outcome(s)	Vulnerable Populations
	Environmental Condition	Environmental Hazard		
altered weather patterns	extreme weather events (hurricanes, wildfires, flooding)	geographic displacement, damage or loss of property, death or injury of loved ones, recovery efforts	anxiety, emotional stress; acute traumatic stress; post-traumatic stress disorder (ptsd); grief; chronic psychological dysfunction; depression, poor concentration, sleep disorders, etc.	children; elderly women (especially pregnant and post-partum women); people with preexisting mental illness; economically disadvantaged and homeless; first responders
altered weather patterns, temperature changes	extreme temperatures	prolonged heat or cold	chronic stress; poor physical and mental health; increased risk of disease or death	people with preexisting mental illness; elderly populations and people taking prescription medications that impair their body's ability to regulate temperature

### POSSIBLE ADAPTATION STRATEGIES TO ADDRESS MENTAL HEALTH/WELL-BEING



**PERSONAL:** acknowledge condition and seek help; provide assistance to family and loved ones; psychological counseling



**SOCIETAL:** community engagement, risk messaging and communications; improving access to necessary services for people with mental illness



# Appendix:

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## Tools and Resources

# VISUAL MODEL DIAGRAM

## Educational Materials

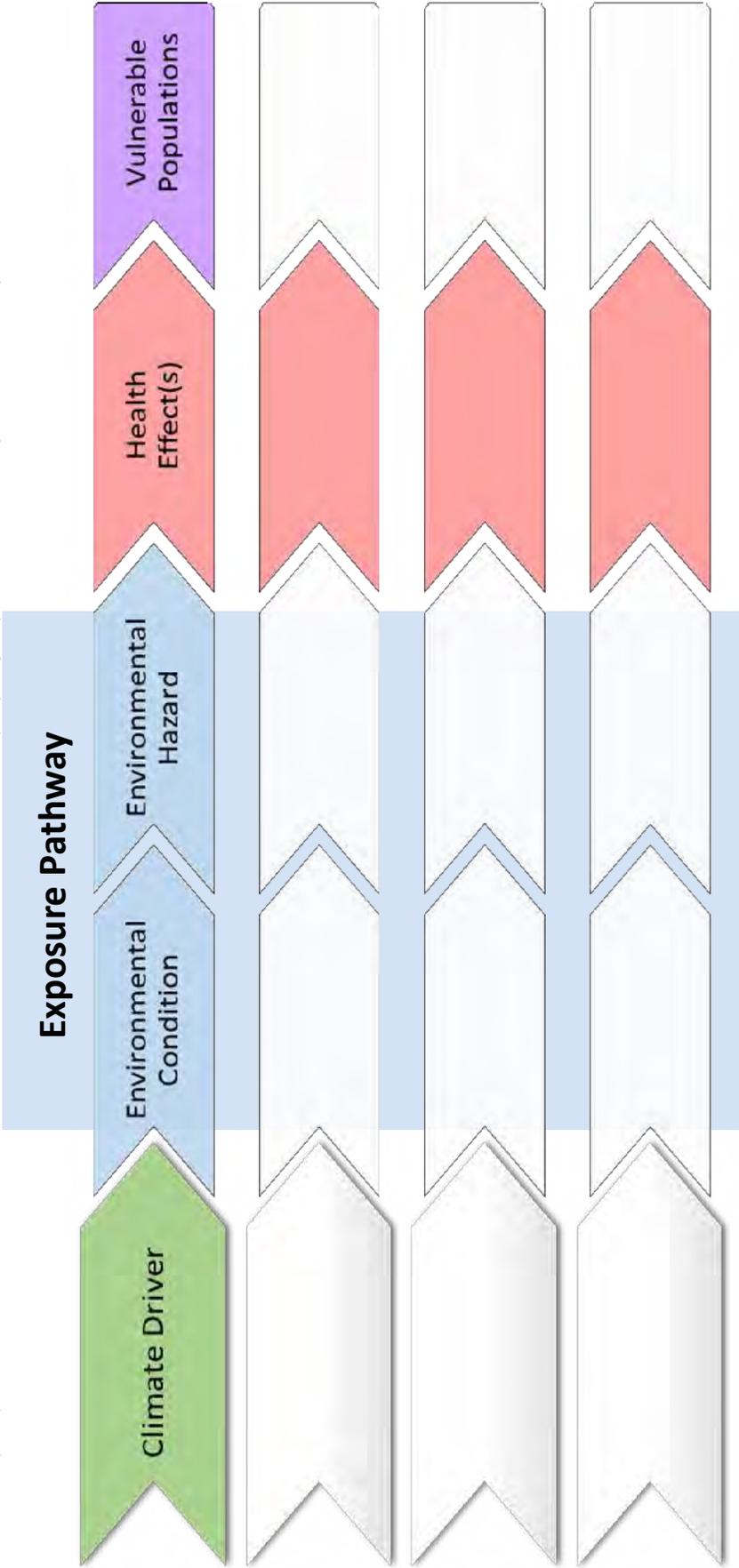
A Student Exploration of the Impacts of Climate Change on Human Health in the United States

Climate Change and Human Health

Assigned Chapter: \_\_\_\_\_

NAME: \_\_\_\_\_

As you read, identify the environmental condition(s) that produce the environmental hazard(s) cited and then identify the underlying climate driver(s) (e.g., increased precipitation). For each hazard, list the health effect(s) and the most vulnerable people/groups. **Not all rows may need to be completed.**



*It may be difficult to distinguish the environmental condition from the environmental hazard. For example, increased temperatures can be a change in climate, an environmental impact and an environmental hazard! An environmental hazard is what will directly lead to a negative health outcome.*

## SCHOOL OUTREACH EMAIL TEMPLATE

Dear [Superintendent/Principal/Teacher last name]:

Would you be interested in having a guest speaker explain the impact of climate change on health?

I am an active volunteer and professional member of the American Public Health Association (APHA), representing some 25,000 public health professionals. A workgroup of APHA's Environment Section developed a lesson plan that is about 100 minutes long for high school students based on the existing [curriculum](#) created by the National Institutes of Environmental Health Sciences.

Ideally, I would visit with a science class over two days during the week of April 4th, designated as National Public Health Week. Also, Earth Day on April 22 presents another opportunity. The date doesn't matter that much, though; climate is important every day of every month!

Please let me know if you or someone else at [school name] would be interested in learning more!

Best,

[Name, Degrees, Title, and, if you feel comfortable, your vaccination status]

## TIPS FROM A HIGH SCHOOL TEACHER

**Dr. Rebecca Hamilton** has served 39 years as an educator in Texas and Florida with an extensive background in education. BA in English/History, ME in Guidance & Counseling, Education Specialist in Curriculum and Instruction, and a Ph.D. in Multicultural Education & Literature. She currently teaches AP Capstone Seminar and AP Capstone Research.

### **What are your main three pieces of advice for teaching high school students?**

1. Form a relationship with your students and treat them like adults.
2. Expect respect -reciprocal for students and teacher, the classroom
3. Find a good combination of personal and professional. Show students that you care.

### **How can guest lecturers form these relationships/respect quickly, and what strategies do you use to increase student buy-in with lecture materials?**

- Ask the students if they have prior knowledge and their opinion.
- Ask the students why they think you are doing this.
- Invite the students to help you teach or let them prepare in advance and help you teach.

### **What other settings can/should we explore outside the classroom to engage with high school students?**

Field trips can involve a lot of 'red tape,' so it would require too much effort to go outside the classroom.

### **What questions would you have as a teacher if a public health professional approached you with this lesson plan?**

- *Is there an associated cost to the teacher/ school?* No
- *Can the lesson plan be split up?* Yes
- *Does this lesson involve a call to action or is it simply intended to educate students?* The lesson plan includes an extension activity created by the [Environmental Justice Coalition](#). An additional handout can be provided to students after the lesson (see [Youth Take Action!](#)).

### **What general feedback/ advice do you have for volunteers considering guest lecturing?**

- Approach schools that have environmental magnet/ special studies. Talk to the environmental science/science teachers.
- Ask how long class periods are at the school. In our school, classes are 100 minutes long.
- If you can, break up the curriculum into 2 class periods.
- Give all the material to the teacher at least two weeks before you come to the lecture.
- There is strength in numbers; if possible, have two public health professionals give the lectures together.

### **Is there a time of year best for reaching out to teachers as potential classroom hosts?**

- Approach teachers while they plan during teacher workdays the week before classes begin. Give teachers options for dates or let them recommend dates.

### **Is there a time of year best for implementing this lesson plan in the classroom? Or just times during the year that would not work?**

- Depending on the class, the lesson may fit into their curriculum. So a teacher may ask you to come in after a test, so they can focus on grading or even before a new section as an introductory piece.
- Don't present in April or May because of all the end-of-the-year testing. Scheduling would be near impossible, and the students would likely be burnt out or not engaged.



# Calling all Public Health Professionals

## Teaching Climate & Health Challenge



Use your expertise and engage local high school students.  
**Teach the Climate & Health Lesson Plan as a guest speaker!**

**With this lesson plan, you will help students...**

- Describe the impacts of a changing climate on human health
- Discuss vulnerable populations
- Apply systems thinking to create a visual model of health implications
- Consider the benefits of climate mitigation on human health
- Evaluate adaptation strategies that are protective of human health

**Lesson Plan Duration: ~100 minutes**

**Share your experience:**

Tag @APHAEnvironment, use #ClimateChangesHealth, then complete [the quick survey](https://bit.ly/ClimateHealthSurvey) (<https://bit.ly/ClimateHealthSurvey>)

**To explore the Lesson Plan and other resources & to complete the survey...**  
Scan the QR Code or Visit <https://bit.ly/TeachClimateAndHealth>



This flyer was developed by the [APHA Environment Section's Children's Environmental Health Committee](#).

# YOUTH TAKE ACTION HANDOUT



## Youth Take Action! Climate Change & Health



### PRIORITIZE SELF-CARE!

- [Ten Tips for Self Care](#) (Climate for Health)
- [Resources](#) to promote your mental health, including eco-anxiety (ecoAmerica)

### USE YOUR VOICE!

- [Op-ed writing tips](#) (APHA)
- [Op-Ed templates](#) (Citizens Climate Lobby)



### GET INVOLVED!

- Commit your school district to local climate goals with ecoAmerica's [Schools for Climate Action Replication Guide](#)
- Start a project at your school or in your community with this [Project Toolkit](#) (Student Climate Coalition)
- [Resources for Getting Involved](#) at the local or national level (Climate for Health)

### ADVOCATE FOR CLIMATE & HEALTH!

- [Letter campaign](#) (Children's Environmental Health Network)
- Help register others to vote with [WhenWeAllVote.org](#)



Scan the QR Code to explore the links provided in this handout!  
(also available at [bit.ly/CCYEyouthaction](https://bit.ly/CCYEyouthaction))

This handout was developed by the APHA Environment Section's [Children's Environmental Health Committee](#).



**Don't forget to take the survey after  
your lecture so that APHA can track outcomes  
and get continued support for this work!**

**Take Survey**

The American Public Health Association champions the health of all people and all communities. We strengthen the public health profession, promote best practices and share the latest public health research and information. We are the only organization that combines a 150-year perspective, a broad-based member community and the ability to influence policy to improve the public's health.



AMERICAN PUBLIC HEALTH ASSOCIATION  
*For science. For action. For health.*