

## Climate Change and Children's Health: What We Know

“Children represent a particularly vulnerable group that is likely to suffer disproportionately from both direct and indirect adverse health effects of climate change. Pediatric health care professionals must understand the escalating nature of these threats, anticipate their effects on children’s health, and participate as children’s advocates for strong mitigation and adaptation strategies now and at all levels, from local to global.”

from [\*Global Climate Change and Children’s Health\*](#)  
by Katherine M. Shea, MD, MPH  
and the Committee on Environmental Health

### Why are children more vulnerable to environmental changes?

- Children’s bodies and brains are still developing, so lifelong structural or functional changes in their bodies are more likely than in adults.
- Young children’s immune systems, including the blood-brain barrier, are not fully developed, making them less able to fight and control the effects of biological and chemical assault on their bodies.
- Because children generally have many more years ahead of them than adults, their risks from cumulative exposures are also greater. Diseases and conditions that are slow to develop are more likely to result from childhood exposures or exposures that are repeated over many years.
- Children are often more sensitive to food issues including availability, costs, nutritional quality and increased chemical exposures.
- Children are more sensitive than adults to chemicals such as pesticides, water pollutants, air pollutants, medications and food preservatives. Pollutants can lead to more asthma attacks, allergies, related infections and hospitalizations
- Children breathe faster and spend more time on the ground than adults, increasing their exposures to chemicals in the air and on yards and playgrounds.
- Children often spend more time outdoors than adults and are exposed to insect-borne diseases.
- Children are generally less aware than adults of the symptoms of environmental stressors, such as coughing, watering eyes, headache, itching or digestive upset. They may not communicate symptoms to caregivers until they are advanced. Being dependent on

others, children are less likely to take corrective action when confronted by a stressor such as fumes, insects or contaminated food.

- Children – and especially infants – cannot regulate body temperatures as well as adults. Children sweat less and respond to changes in temperature more slowly, making them more likely to suffer heat exhaustion and other ill effects during heat waves.

## How does climate change affect health?

While no exact predictions are possible at this time, climate change has already begun and will increasingly impact health both directly and indirectly. Information here is from the World Health Organization, the US Centers for Diseases Control and Prevention, the US Environmental Protection Agency, the American Academy of Pediatrics and others as noted.

- **Temperature stress.** Increases in average temperature may lead to more extreme heat waves during the summer, leading to more cases of heat exhaustion and heat stroke, plus other conditions that are an indirect result of increased heat, such as kidney stones (from [Harvard University](#)). Stagnant weather conditions can trap warm air and air pollutants in urban areas, leading to smog episodes with significant health impacts as listed below. Warmer, drier conditions can also lead to more wildfires, greatly impacting air quality.
- **Toxics.** The movement of persistent synthetic chemicals throughout the world is being altered by climate change. As permafrost and polar ice caps melt, toxic chemicals trapped in the ice are being released. Increased precipitation in some areas, and more extreme storms and hurricanes, increases erosion and the release of toxics from soil into air and water (from Grossman, [Cloudy with a Chance of Toxics: How Climate Change Is Increasing Our Vulnerability to Chemical Pollution](#) and [The Toxicology of Climate Change: Environmental Contaminants in a Warming World](#)).
- **Infectious disease.** Climate change may increase the risk of some infectious diseases, particularly those diseases that appear in warm areas and are spread by mosquitoes and other insects. The geographic ranges and disease-transmission seasons of malaria and Lyme disease are expected to increase, for example.
- **Smog.** Warming may increase the frequency of smog (ground-level ozone) events and particulate matter (PM) air pollution. PM pollution is associated with respiratory and cardiovascular diseases including asthma, COPD, and cardiac dysrhythmias, and is responsible for increased absences from school and work, emergency-department visits and hospital admissions. Climate change may indirectly affect the concentration of PM pollution in the air by increasing both natural sources such as wildfires and dust from dry soils and also man-made sources such as the use of coal-burning power plants needed for increased air conditioning and refrigeration.
- **Food and water.** Agricultural production is especially susceptible to climate change: changes in temperature, water availability (droughts and floods) and severe weather events are expected to have major impacts on food production and transport. Warmer

temperatures increase the risk of disease caused by bacteria, viruses, and parasites in food and water and may contribute to greater use of pesticides and preservatives. Increased temperatures may also change the timing, intensity and duration of frosts and cold spells, which can impact crop success. Warming temperatures also contribute to increased ocean acidity, resulting in less productive fisheries. Changes in the availability of food and clean water will directly affect the growth, development and general health of billions of people.

- **Mental health.** Through increases in severe weather events and the resulting destruction and disruption of services, climate change may contribute to increased mental health burdens.
- **Social disruption.** Through impacts on water and food resources, climate change may indirectly lead to increased conflict, economic decline and displacement of people. Impoverished and displaced persons are at increased risk of inadequate nutrition and medical care, and infectious diseases often spread uncontrolled through refugee camps and shelters.

“The warming of the planet and the effects of extreme weather events can affect some of the most fundamental determinants of health: air, water, food, shelter, and freedom from disease.”

from WHO Director-General Dr. Margaret Chan

## What you can do – reponse to climate change for medical professionals

[Climate Change and Children’s Health: What Health Professionals Need to Know and What We Can Do About](#) It by Katherine M. Shea MD, MPH, and Sophie J. Balk, MD

The Consortium on Climate Change and Population Health, which includes the Collaborative and Health and the Environment, has concluded that both a need and an audience exist for a succinct guide to climate science for health professionals. The consortium has taken on the charge to complete and disseminate *Climate Literacy for Health Professionals – A Guide to Understanding and Action*. Please look for this publication here when it is made available. Other publications linking climate change, human health, and public policy are also planned.

[Guidebooks to help public health agencies deal with climate change](#). The University of Oregon's Climate Leadership Initiative, in partnership with the Oregon Coalition of Local Health Officials and public health organizations around the state, have issued two guidebooks aimed at helping health-related agencies and organizations cope with climate change.

New York Times article: [Doctors Prepare Their Professions to Explain and Treat Climate-Related Symptoms](#).

Environmental Health Perspectives article: [Global Climate Change and Children’s Health: Threats and Strategies for Prevention](#)

National Association of County and City Health Officials [Climate Change Toolkit](#).

The Resource Innovation Group and Biositu: [Public Health and Climate Change: A Guide for Increasing the Capacity of Local Public Health Departments](#)

World Health organization (WHO) and the World Meteorological Organization (WMO): [Atlas of Health and Climate](#)

## What you can do – prevention for climate protection and health promotion

### Actions that individuals and families can take:

1. **Reduce fuel use wherever you can:** fly less, drive less, use public transit more, bike more, use energy-efficient vehicles, and turn off your engine if you'll be idling for more than a few seconds. Even if you can't reduce your driving, you can support public transit for others in your community and region. If others drive less, you benefit.
2. **Save home energy:** ensure your home lighting, appliances, heating and cooling systems are energy-efficient. Use less energy when you can – hang clothes to dry or switch to motion-detectors on outdoor lighting. Unplug appliances when not in use (coffeemakers, toasters, cell-phone chargers and such) and turn off lights, computer monitors and television sets when not needed..
3. **Eat for health:** eat more plants and less meat. Choose organically-grown food when possible. Eat more foods grown in your region and follow the seasons. Buying food from thousands of miles away adds substantially to the carbon “footprint” of your diet.
4. **Use renewable and clean energy sources whenever possible:** check if your electricity provider has a program for “green” energy. If not, request that it implement one. Check to see if home electricity production – usually solar or wind energy – or solar water heating makes sense for you.
5. **Reduce/reuse/recycle:** an old refrain, but hauling consumer goods and trash produces greenhouse gases. Trash often releases greenhouse gases and/or toxic chemicals as it burns or decomposes.
6. **Conserve water,** especially from water heaters that produced greenhouse gases. Shorter showers, low-flow shower heads, efficient washing machines and smart lawn watering can save both gallons and dollars.
7. **Convert part of your lawn** to something that doesn't need to be watered and/or mowed frequently. Search for xeriscaping online. Switch to a lower-emissions mower (or even a human-powered model) if you can.
8. **Plant trees in your community:** planting new trees remains one of the cheapest, most effective means of drawing excess carbon dioxide from the atmosphere. Ask you local

elected officials if your community can enroll in the Tree City USA program or another similar one.

9. **Use an online carbon footprint calculator** to help you measure your impact on climate change (search the Internet for “[carbon footprint calculator](#)”). Some are fairly quick but not very accurate, while others take longer to complete but give a more complete answer. Find one that suits you and then see what a difference you can make, for example, by cutting meat from your diet one day a week or cutting your electricity use by 10 percent.
10. **Implement** as many of these ideas in your school and office as you can.
11. **Ask your elected officials** to take the actions in the list below.

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**Did you know:** According to the [New York Times](#), picking a vehicle that goes just two miles farther on a gallon of gasoline than your current model could cut emissions of global warming gases up to five times as much as replacing five 60-watt incandescent bulbs in your home with compact fluorescents.

**Did you know:** According to the [BBC](#), unplugging appliances on standby can save up to 8% of your electricity use.

**Did you know:** Food miles is a measure of the distance food travels from farm to plate and is a simple way to gauge food’s impact on climate change. Produce in the US travels, on average, 1300 to 2000 miles from farm to consumer.

**Make it fun:** If you have children, make saving energy at home a family activity – you may even put a coin in a piggy bank every time someone remembers to turn off an unused light or appliance (you will be saving money by using less electricity, after all!). When the coins add up, use the cash for something fun.

**Make it friendly:** Join a community that shares information about steps you can take and how to make it easier. Online groups are available from the [Environment Site](#), the [Sierra Club](#), [Green Options](#) and others. Or see if there’s a local group in your community – or if you might help start one.

**Did you know:** A [2006 United Nations report](#) found that the livestock industry produces more greenhouse gases than all the SUVs, cars, trucks, planes, and ships in the world combined.

**Fun fact:** Many of these climate-friendly actions also directly benefit you by improving your health and fitness and saving money. They may also reduce your exposure to toxic chemicals. What’s not to like?!

### **Actions for community decision makers**

*from school board members and company CEOs to state and federal officials*

1. **Support lower-emission transportation systems**, including making roadways safe and accessible for pedestrians and bikers. Build bike parking lots where needed, and survey neighborhoods to find ways to make public transit more convenient and safe.
2. **Provide tax support for transit systems**: everyone benefits with each car taken off the road and each parking lot that doesn't need to be built and maintained.
3. **Provide incentives** for energy-efficient transportation, buildings and appliances.
4. **Promote telecommuting** or reduced-commuting schedules where appropriate.
5. **Encourage** public facilities to use renewable energy.
6. **Press for stronger air-pollution regulations** and a cap on greenhouse-gas emissions.
7. **Support and implement school curricula** and youth programs that address climate change.
8. **Support local food production** and organic food programs, such as community supported agriculture, farmers markets, and farm-to-school and farm-to-hospital programs.
9. **Look at land-use** in your community and support decisions that discourage locating new jobs and schools away from where people live. Remove tax structures that support new development that increases dependence on cars.
10. **Support and fund programs** that encourage farmers, homeowners and businesses to plant trees and reforest available land, especially in areas vulnerable to erosion and flooding.
11. **Educate policymakers**, teachers, health professionals and others about children's unique vulnerabilities regarding climate change.

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**Did you know:** According to [Treehugger.com](http://Treehugger.com), if just one in 10 Americans used public transportation daily, US reliance on foreign oil would decrease 40 percent.

**Make it easy:** Challenge your household or your business to reduce your carbon footprint by a few percentage points each year for the next five years. You don't have to change your whole life all at once, but a few changes each year can make a big difference.

**Did you know:** The [Rodale Institute](http://RodaleInstitute.com) estimates that if 10,000 medium-sized US farms converted to organic production they would store so much carbon in the soil that it would be the carbon-saving equivalent to taking one million cars off the road.

**Did you know:** According to the [Colorado Tree Coalition](http://ColoradoTreeCoalition.com), one large tree not only sequesters up to 330 pounds of carbon from the atmosphere per year, but also absorbs 10 pounds of air pollutants, including four pounds of ozone and three pounds of particulates.

## Additional resources

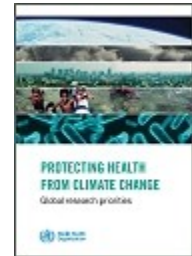
### World Health Organization

- [Protecting Health from Climate Change: Connecting Science, Policy and People](#)
- [Climate Change and Human Health](#)
- [Climate and Health Fact Sheet](#)
- [The Impact of Climate Change on Human Health: Statement by WHO Director-General Dr. Margaret Chan](#)
- [Protecting Health from Climate Change: Global Research Priorities](#)



### American Academy of Pediatrics

- Katherine M. Shea, MD, MPH, and the Committee on Environmental Health. [Global Climate Change and Children's Health](#), 2007.



### US Centers for Disease Control and Prevention

- [Climate Change and Public Health – Health Effects](#)

### National Institute of Environmental Health Sciences

- [A Human Health Perspective on Climate Change](#)



### Standing Committee of European Doctors (Comité Permanent Des Medecins Europeens, CPME)

- [Global Warming and Health](#)

### US Institute of Medicine of the National Academies

- [Climate Change, the Indoor Environment and Health](#)

### The Association of State and Territorial Health Officials

- [Climate Change and Public Health](#)
- [Resources for Building Climate Change Capacity in Health Agencies](#)

*The Lancet*

- [Public health benefits of strategies to reduce greenhouse-gas emissions: health implications of short-lived greenhouse pollutants](#)
- [Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers](#)

*Family Medicine*

- Mona Sarfaty, MD; Safiya Abouzaid, PharmD. [The Physician's Response to Climate Change](#). May 2009.

*Environmental Justice*

- [Special Issue on Climate Justice](#)

*Online Journal of Issues in Nursing*

- [Global Warming: A Public Health Concern](#)



Collaborative on Health and the Environment

- [Web event: Report from the United Nations Climate Change Conference in Copenhagen: Implications for Human Health](#)

Collaborative on Health and the Environment – Washington

- [Climate Change and Public Health in Washington](#)

The Center for Public Health & Climate Change

- [ClimateChangeConnect](#)

National Environmental Education Foundation

- [Climate Change and Health Fact Sheet](#)
- [Climate Change](#)

US Climate Change Science Program

- [Analyses of the Effects of Global Change on Human Health and Welfare and Human Systems](#)



## US Environmental Protection Agency

- [Climate Change – Health and Environmental Effects](#)
- [Climate Change and the Health of Children](#)
- [State and Local Climate and Energy Program](#)
- [Change the World, Take the Energy Star Pledge](#)
- [Tips to Save Energy and Fight Climate Change this Summer](#)
- [What You Can Do](#)
- [A Student's Guide to Global Climate Change](#)



## USC Program for Environmental and Regional Equity (PERE)

- [The Climate Gap: Inequalities in How Climate Change Hurts Americans & How to Close the Gap](#)



## Environmental Health News

- [The Daily Climate](#)

## National Public Health Week

- [Healthy Climate Pledge](#)

## National Wildlife Federation

- [Climate Classroom](#)

## Sierra Club

- [Green Home](#)
- [Climate Crossroads](#)

## Institute for Agriculture and Trade Policy

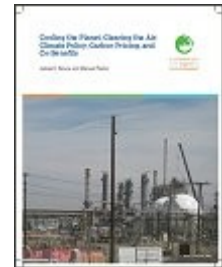
- [Identifying Our Climate Footprint](#)

Northwest Earth Institute

- [Healthy Children—Healthy Planet](#)

Economics for Equity and the Environment Network

- [Cooling the Planet, Clearing the Air: Climate Policy, Carbon Pricing, and Co-Benefits](#)



“Over the next few decades in the United States, climate change is likely to have a significant impact on health.”

from Howard Frumkin, Director of the  
National Center for Environmental Health