CHILDREN'S ENVIRONMENTAL HEALTH BORDER SYMPOSIUM

Climate Change Impacts on Children's Health

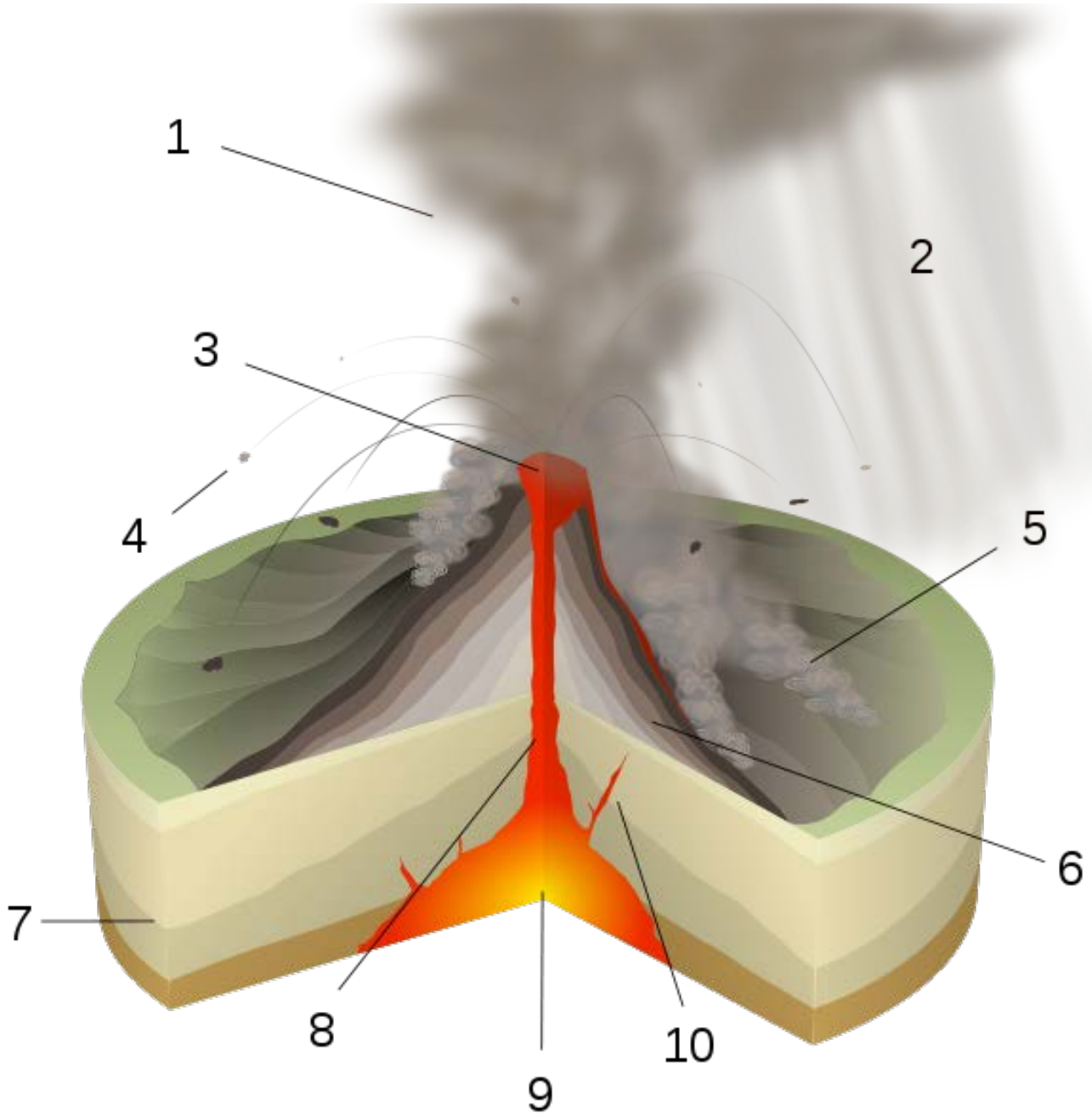
U.S. Environmental Protection Agency
Presented by Ruth Etzel, M.D., Ph.D.
Director| Office of Children's Health Protection

EPA United States Environmental Protection Agency

Audience Poll

Which of the following describes your work?

1. **Promotora**
2. **Nurse**
3. **Doctor**
4. **Environment/Health Professional**
5. **Community Member**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Audience Poll

The World Health Organization (WHO) estimates that worldwide, how much disease could be prevented by modifying the environment?

1. **2%**
2. **12%**
3. **24%**
4. **48%**

WHO Environmental Burden of Disease Working Definition of Environment

Included:

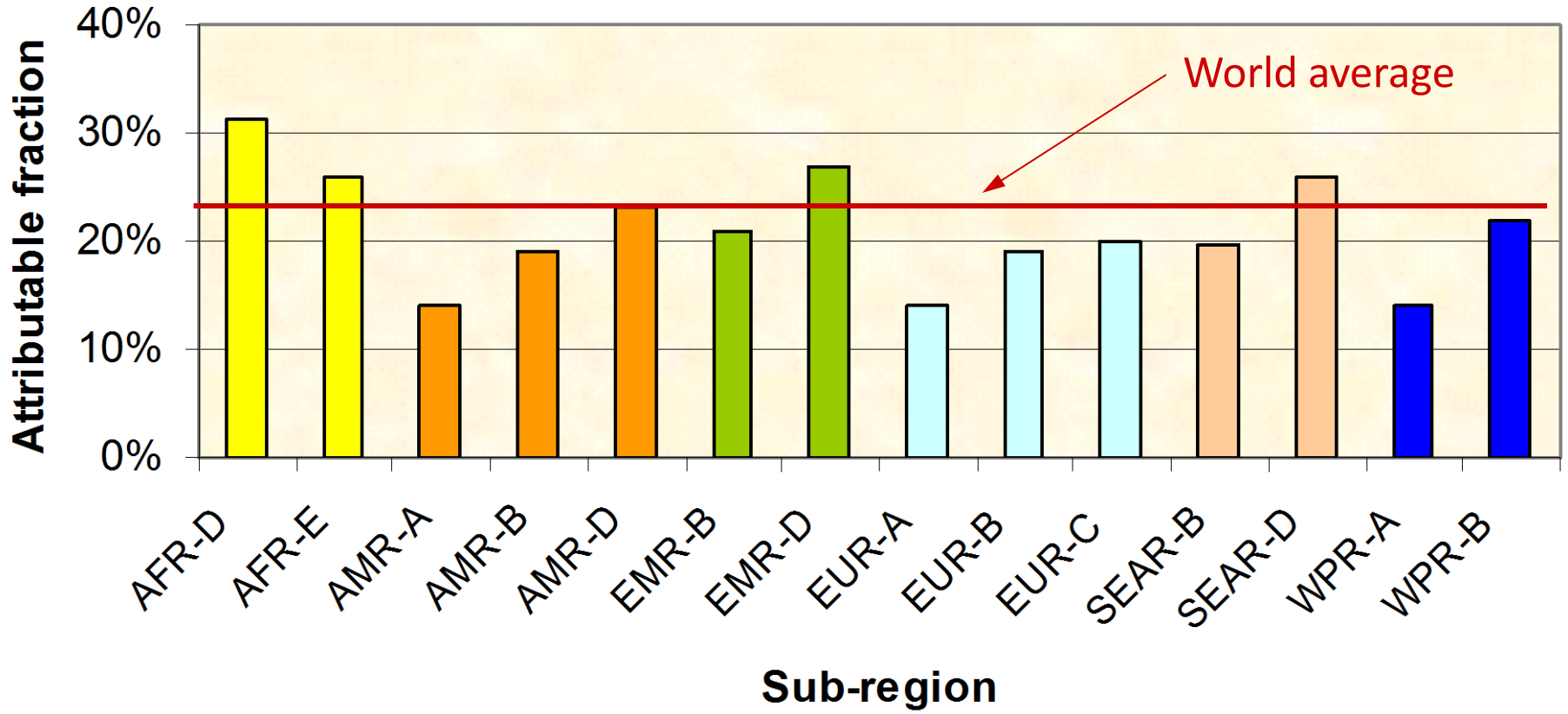
- Air, water, soil pollution
- Radiation
- Noise
- Occupational risks
- Built environment
- Agricultural methods
- Climate change
- Handwashing

Not Included:

- Alcohol, tobacco, drugs
- Diet
- Bed nets
- Unemployment
- Natural hazards
- Person-to person transmission

How much disease could be prevented by modifying the environment ?

Current evidence - best conservative estimate 24%



Source: Preventing disease through healthy environments, WHO, 2006

Depiction of children
Egypt – 3300 years ago

Akhenaten, Nefertiti and Their 3 Daughters

CHILDREN = LITTLE ADULTS

Giotto, National Gallery, Washington DC

~600 years ago, children were still thought of as "little adults"

CHILDREN ARE NOT LITTLE ADULTS

Giotto, National Gallery, Washington DC

Raphael, National Gallery of Art, Washington, DC

CHILDREN HAVE DIFFERENT RISKS FROM ADULTS

Raphael, National Gallery of Art, Washington, DC

1. Different and unique exposures
2. Dynamic developmental physiology
3. Longer life expectancy
4. Politically powerless

There is now recognition of:

- special vulnerability of children and developing fetuses to toxicants and physical agents
- effects depend upon: toxicity, dose, timing and amount of exposure
- effects are exacerbated by:
  - poverty
  - malnutrition
  - degraded environments
  - stressful circumstances

WHO

Impacts on Children's Health

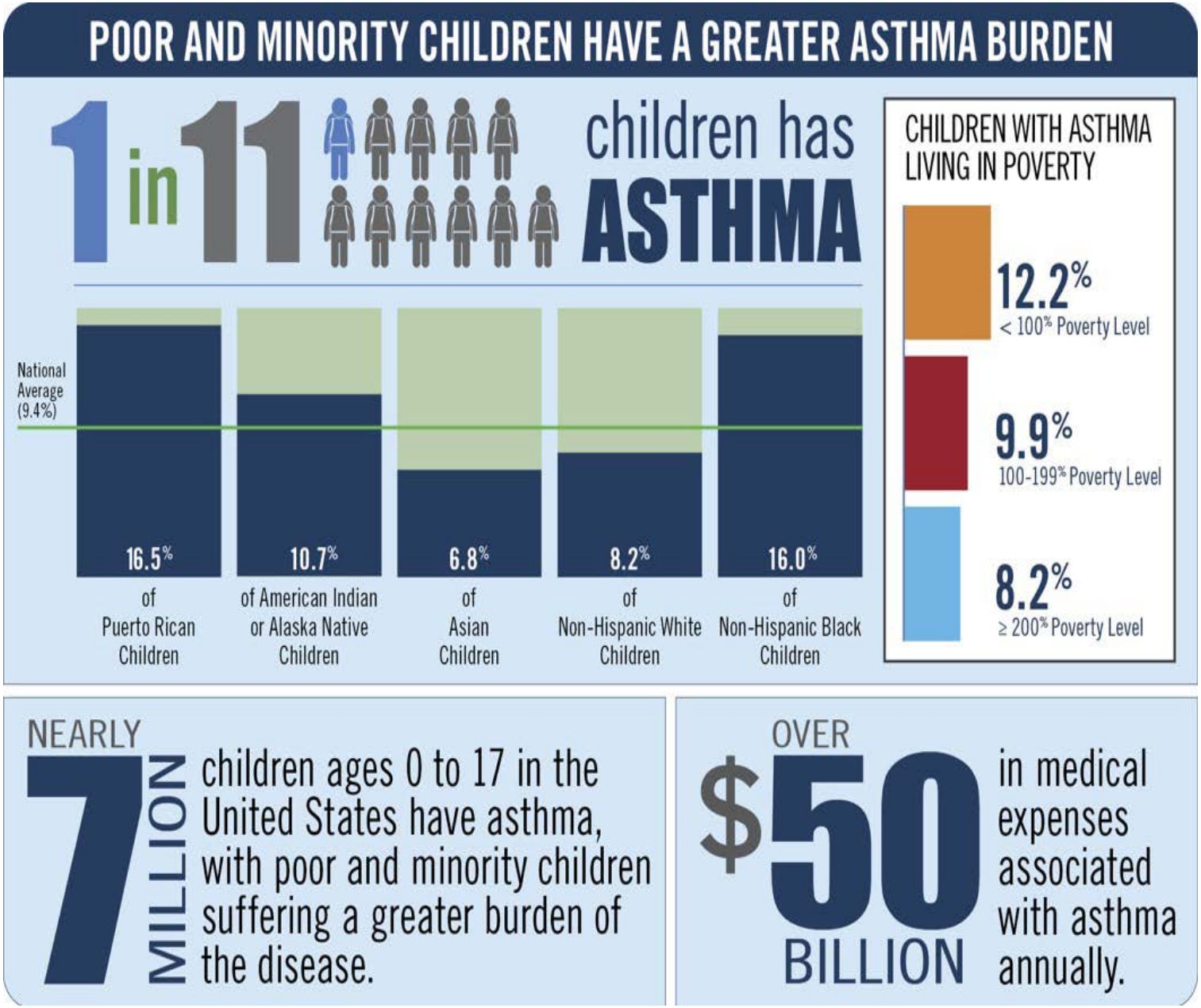
The effects of climate change exacerbate existing health risks:

- More asthma attacks
- Increases in the range of insects that spread diseases such as West Nile
- Over 9,000 U.S. high school athletes are treated for heat illness each year
- In the past decade, deaths of high school and college football players due to heat stroke doubled

Climate Change Health Risks

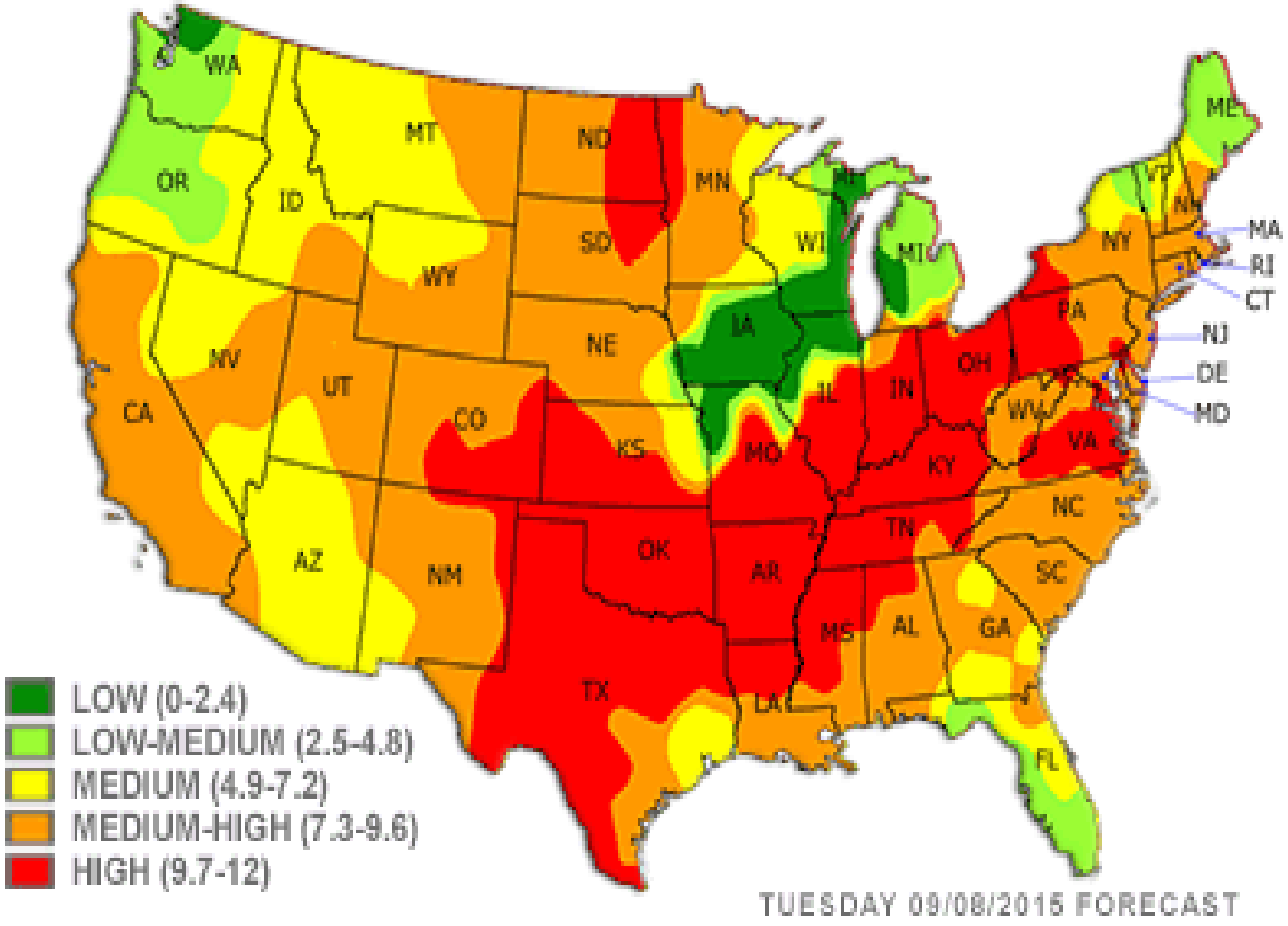
Air Quality. Exposures to higher levels of ozone and particulate matter can result in more school absences, emergency room visits, and hospital admissions of children for respiratory and asthma-related illnesses.

Airborne Allergens (e.g., Pollen). Infants and babies born to pregnant women who were exposed to high pollen during critical periods of development have a higher chance of pollen allergies, and the health effects that accompany these allergies



EPA United States Environmental Protection Agency

National Snapshot:
Pollen Allergy Forecast



Source: http://www.pollen.com/allergy-weather-forecast.asp

Climate Change Health Risks

Extreme Weather Events:

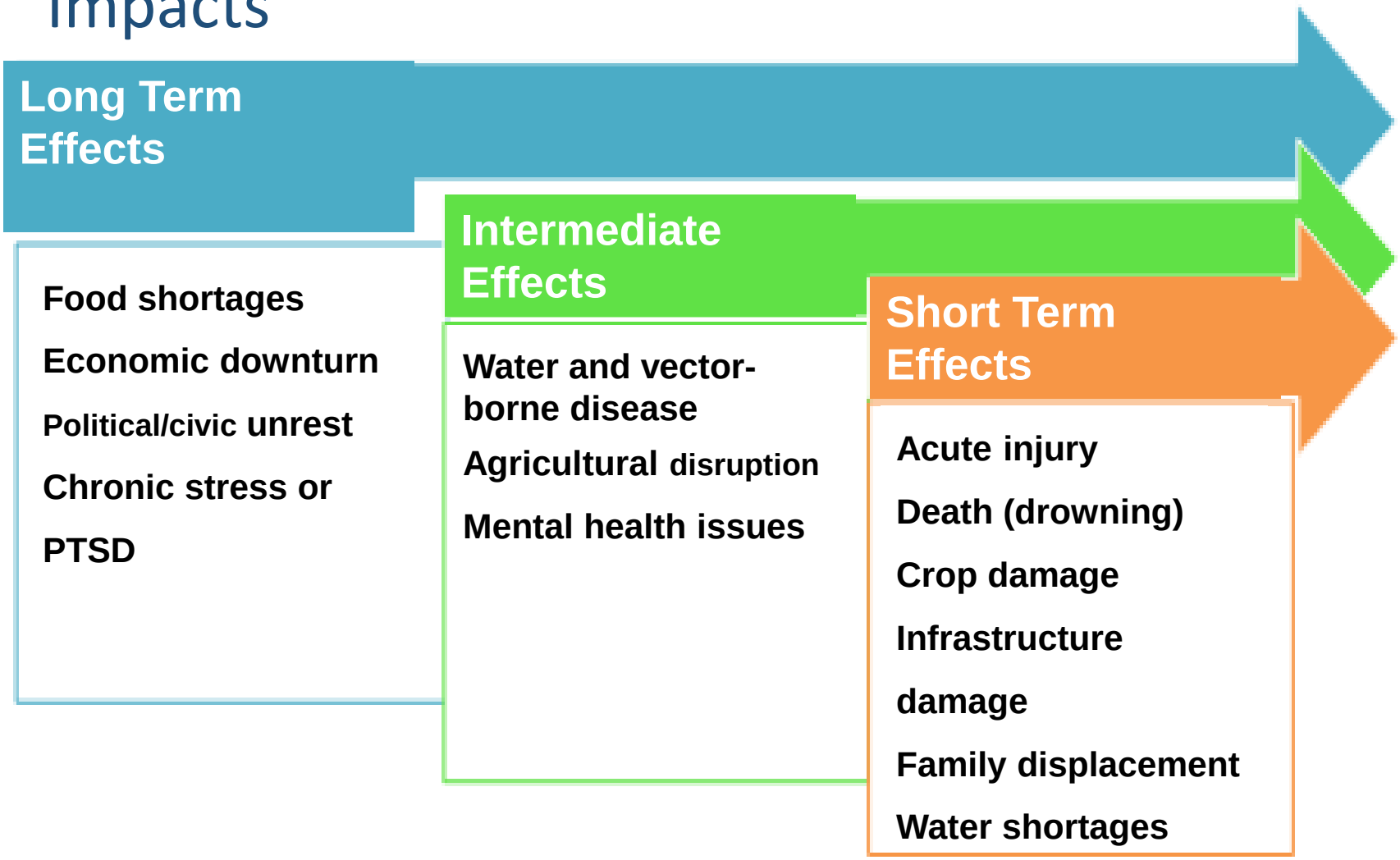
- **Hurricanes & Flooding.** Increasing wet weather and increased humidity can create environments that promote the growth of mold and mildew.

- **Heat.** Young children and infants are particularly vulnerable to heat-related illness and death because their bodies are less effective at adapting to heat than are those of adults.

- **Infectious Diseases.** Increased temperatures and precipitation due to climate change will likely expand or shift the habitat and range of pests - which may also lead to greater pesticide use, putting children at greater risk of exposure.

Extreme Weather Events:

Potential Pathways for Children's Health Impacts

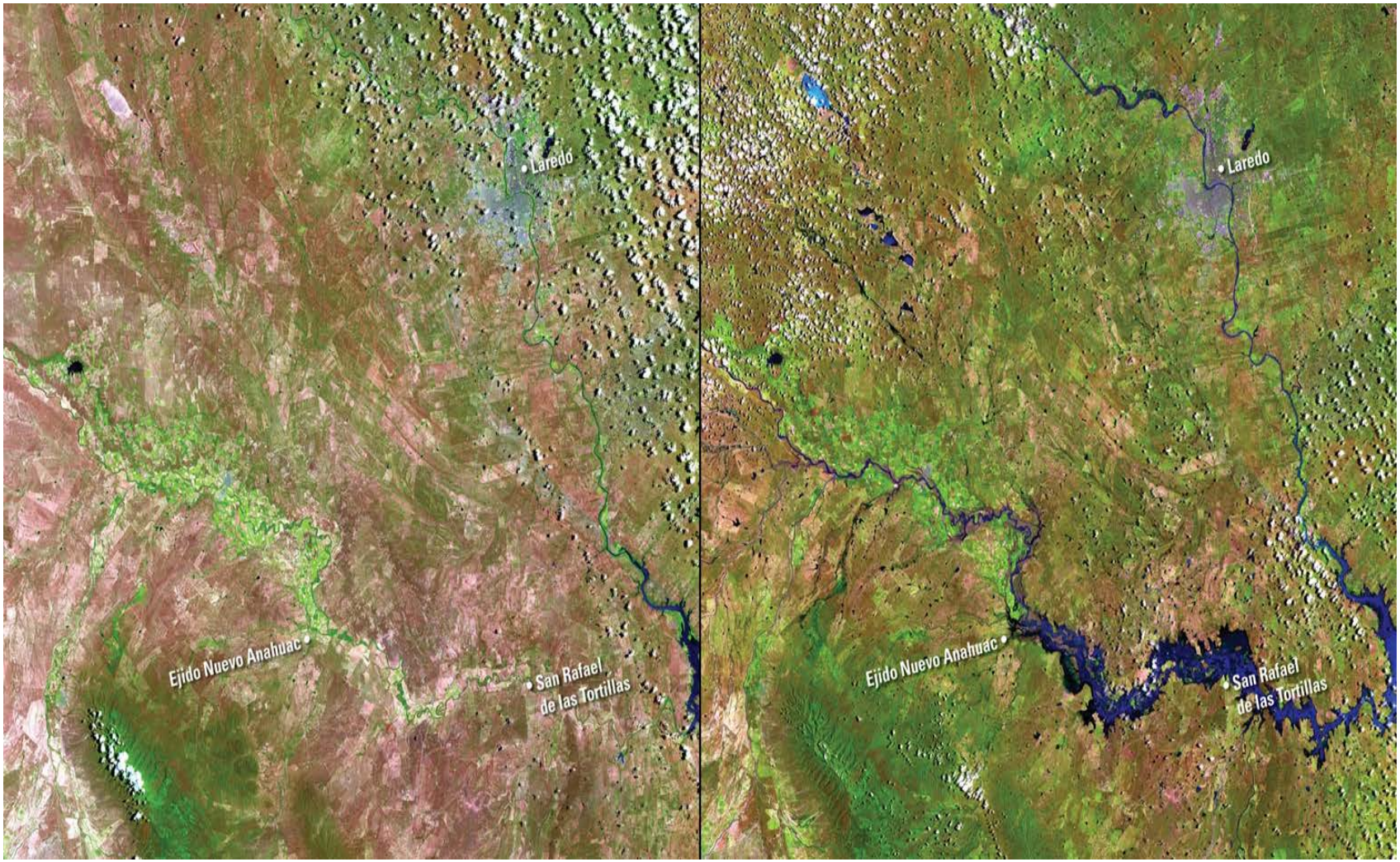


Local Snapshot:

May 2015 Rainfall (*wettest single month on record in Texas)*

Source: www.weather.com

Flood
United States / Mexico



Data source: NASA

Audience Poll

Worldwide, which of the following years was the hottest on record?

1. **2011**
2. **2012**
3. **2013**
4. **2014**

Climate Change

Climate change is happening now…

- This past year (2014) was the hottest on record
- Worsening smog (also called ground-level ozone pollution)
- Increasing intensity and number of extreme weather events
- Increasing the range of insects that spread diseases
- Increasing allergy seasons

Impacts on Children's Health

The effects of climate change creates new health risks:

Heat-related mortality & morbidity

Changes in air quality

Infectious Diseases (*e.g.*, Lyme Disease)

Airborne Allergens (*e.g.*, asthma)

We are more certain about some climate-heath threats (e.g., heat), while for others the science is still emerging (e.g., indoor air quality).

Audience Poll

The global mean surface temperature warmed about how many degrees F during the last (20th) century?

1. **0.09 F**
2. **0.9 F**
3. **9 F**
4. **90 F**

Audience Poll

The global mean surface temperature will increase about how many degrees F by the end of the current (21st) century?

1. 0.09 F

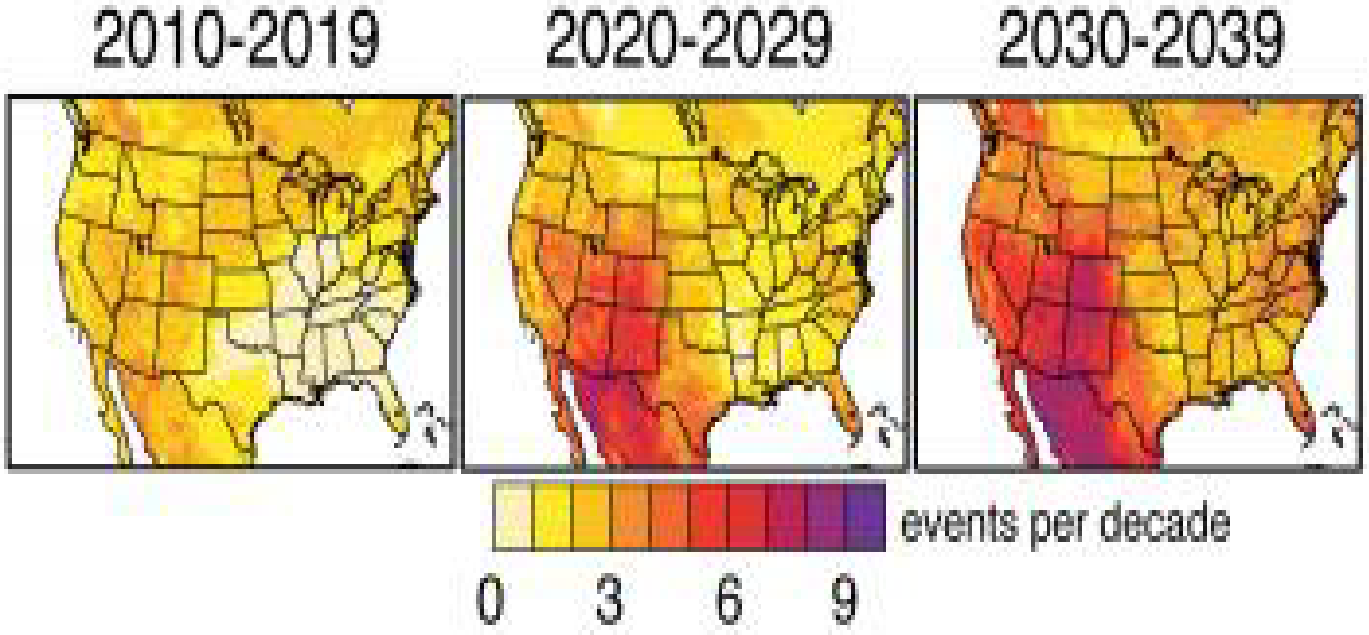
2. 0.9 F

3. 9 F

4. 90 F

Extreme Weather:

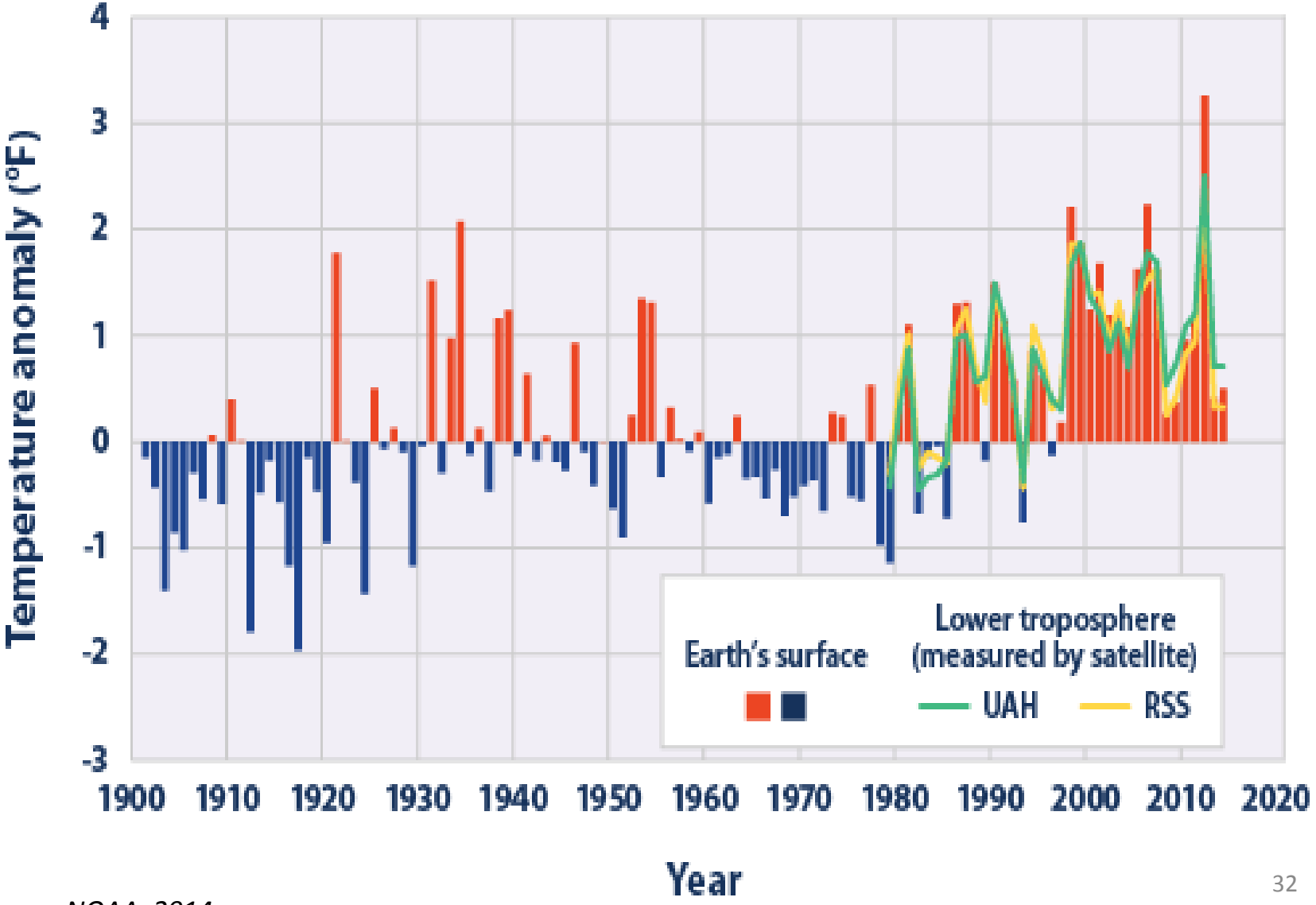
Number of Extremely Hot Seasons Per Decade



By 2039, most of the US could experience at least four seasons equally as intense as the hottest season ever recorded from 1951-1999, according to Stanford University climate scientists. In most of Utah, Colorado, Arizona and New Mexico, the number of extremely hot seasons could be as high as seven.

U.S. and Global Temperature

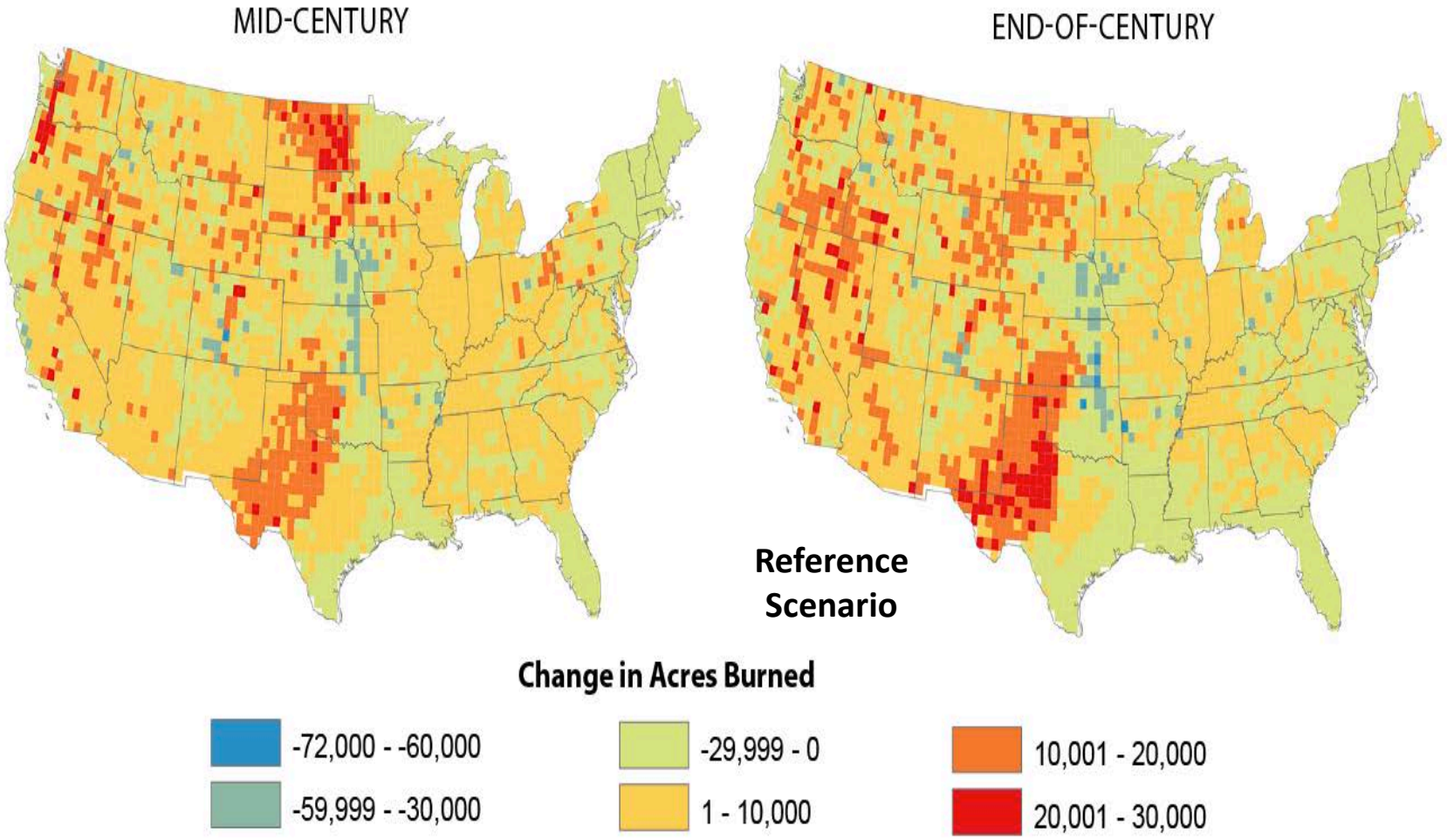
Temperatures in the Contiguous 48 States, 1901-2014



Data source: NOAA, 2014

Wildfires:

Effects of Unmitigated Climate Change on Wildfire Activity



Both figures present estimates using climate projections of the IGSM-CAM climate model.

See Mills et al. (2014b) and Lee et al. (2015)

Wildfires:

Estimated Area Burned With and Without Global GHG Mitigation

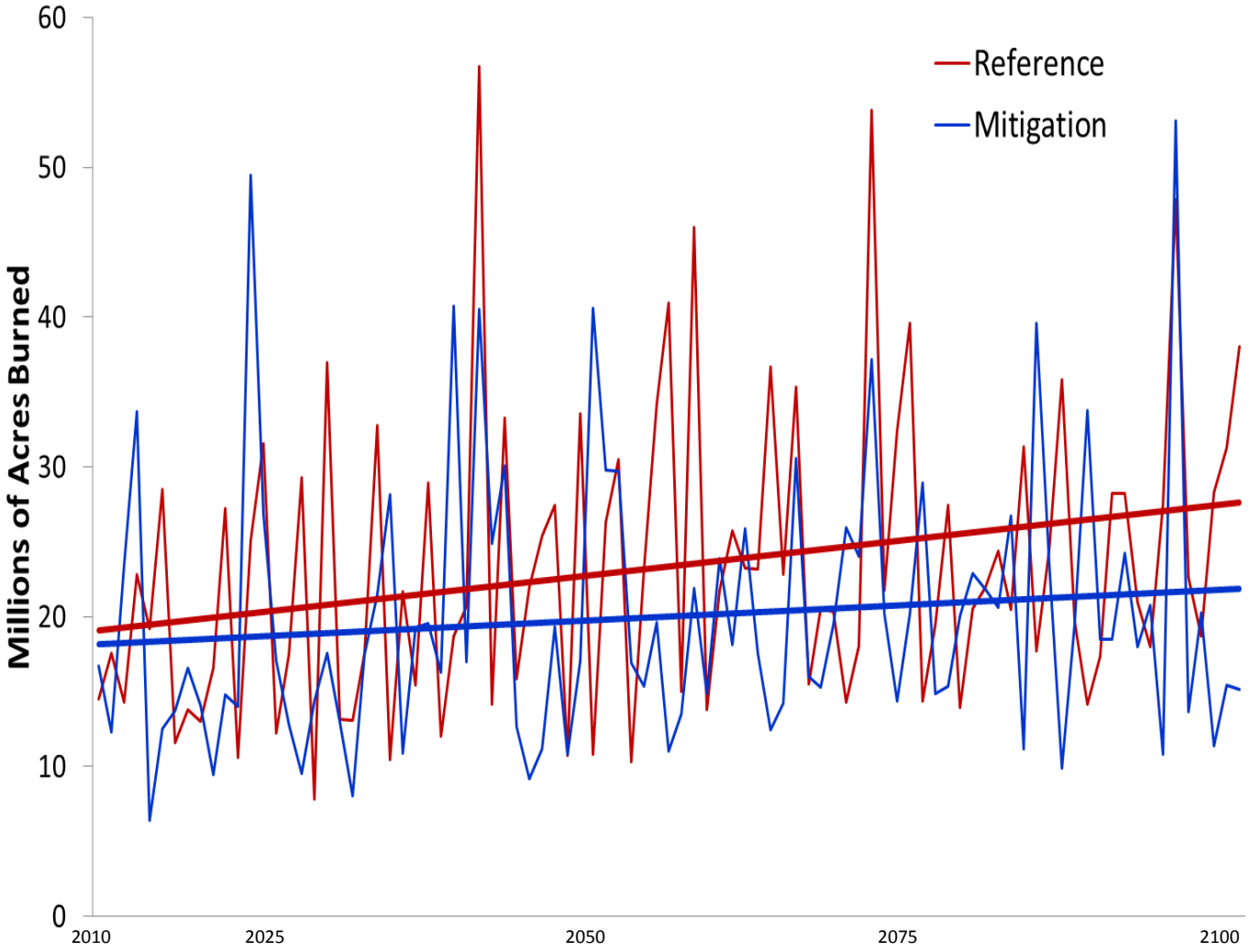
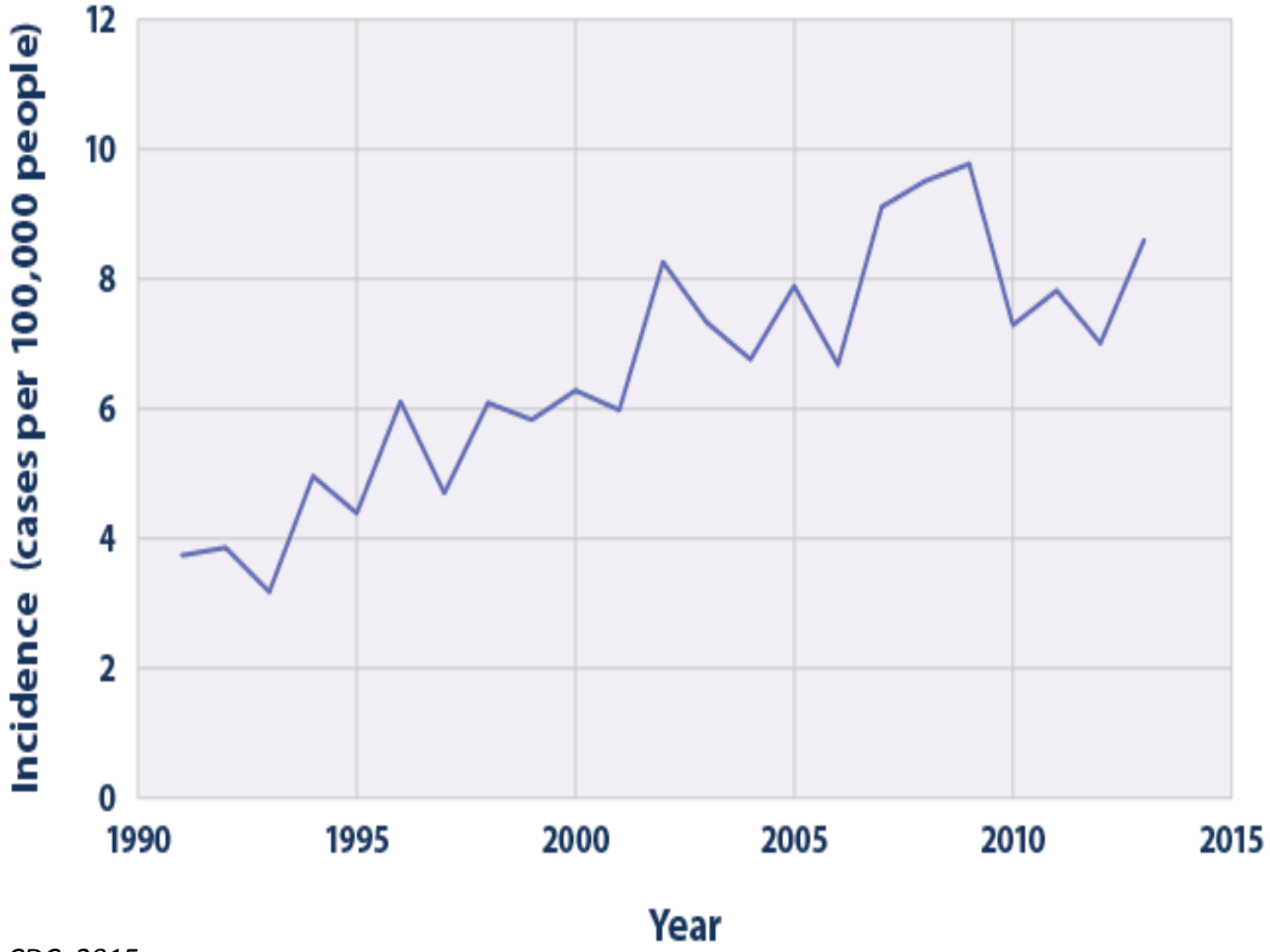


Figure present estimates using climate projections of the IGSM-CAM climate model.
See Mills et al. (2014b) and Lee et al. (2015)

www.epa.gov/cira

Infectious Disease:

Reported Cases of Lyme Disease in the United States, 1991-2013



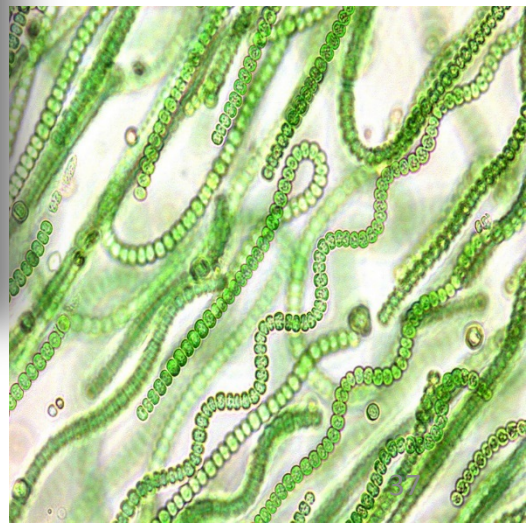
Data source: CDC, 2015

EPA's 2007 National Lakes Assessment

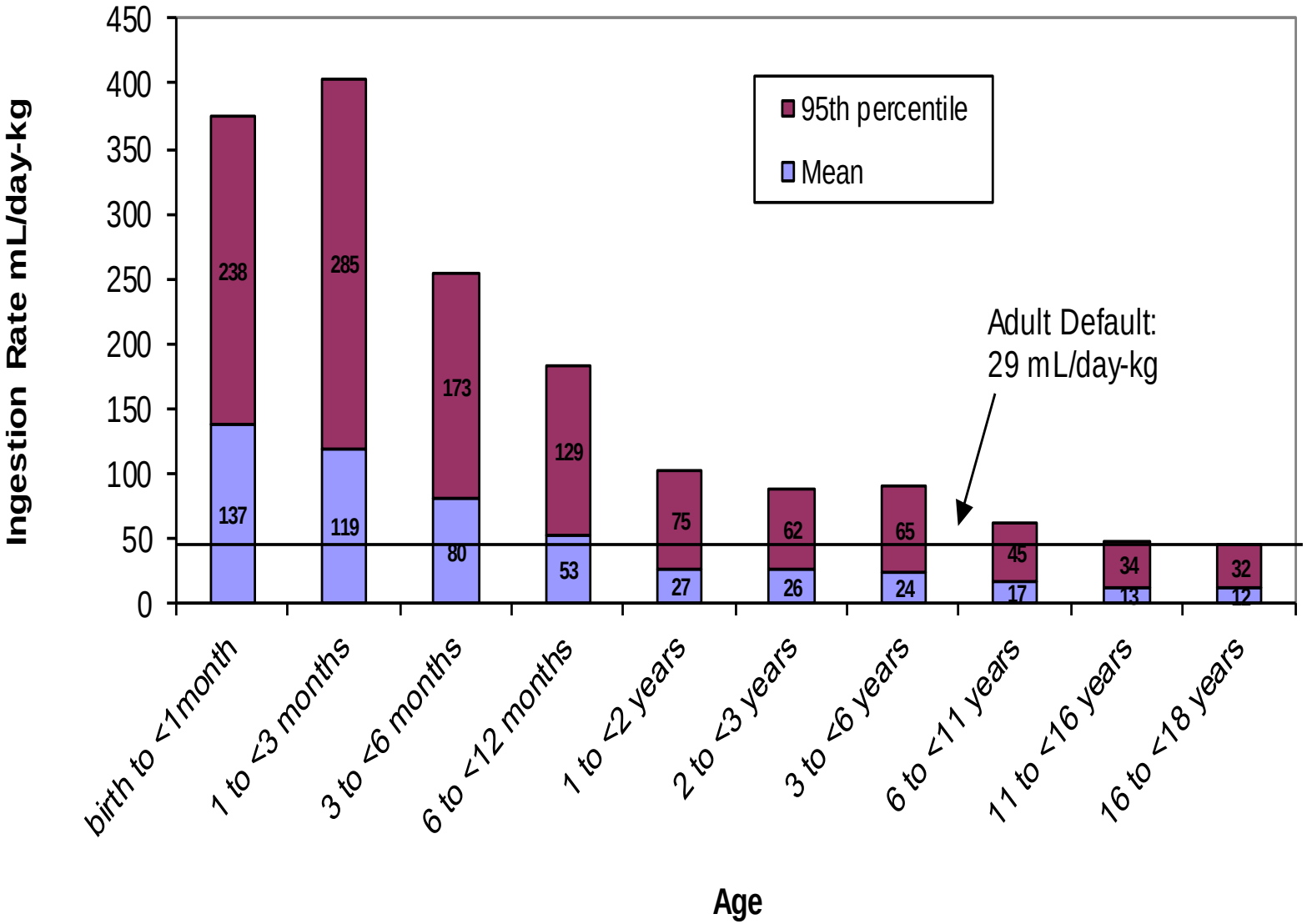
56 Texas lakes sampled for cyanobacteria during EPA's 2007 National Lakes Assessment: 26 lakes presented moderate to high risk conditions for exposure to cyanotoxins.

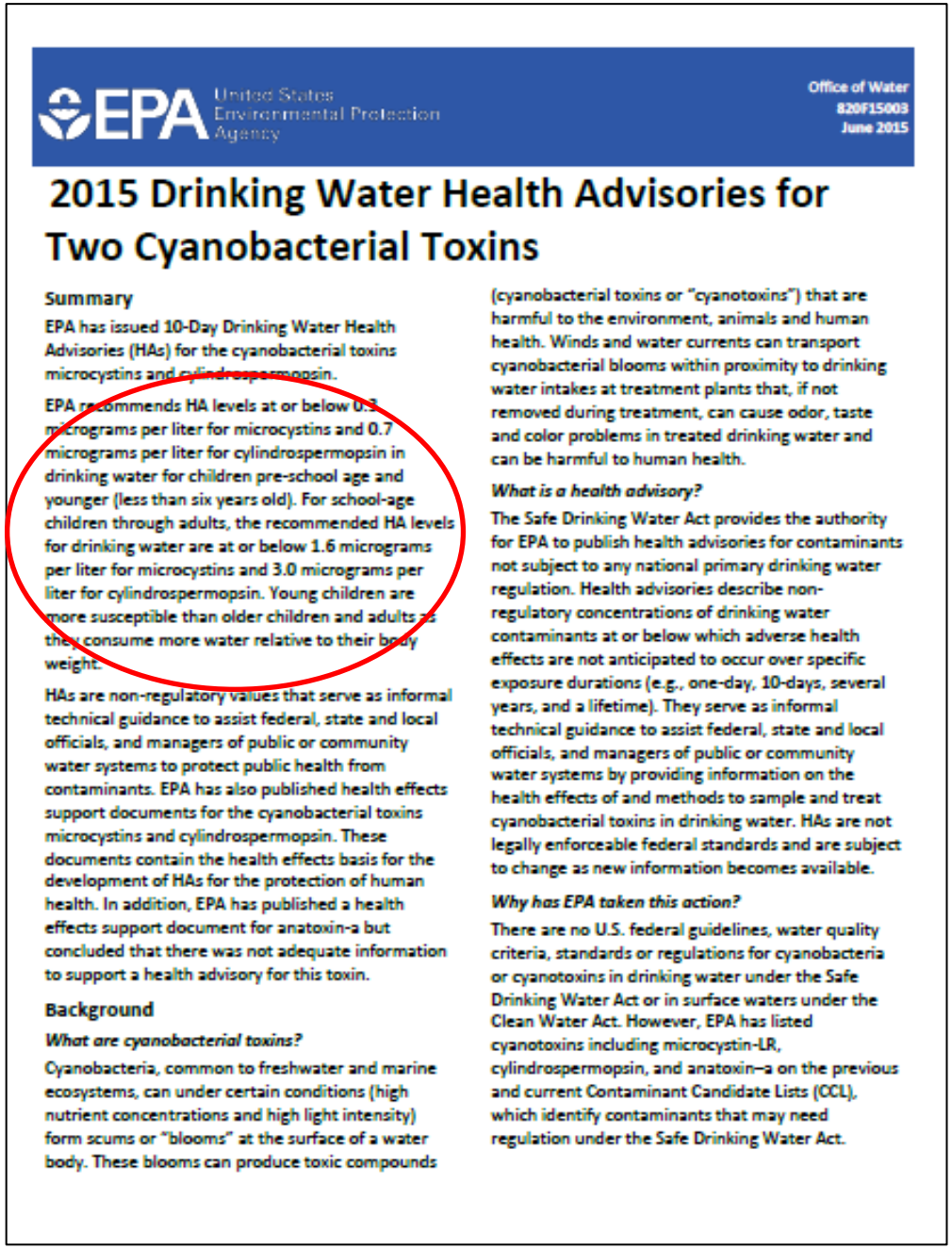
Data source: EPA, 2009

Cyanobacteria and Drinking Water



Children's Drinking Water Ingestion Rates





EPA United States Environmental Protection Agency

Office of Water
820F15003
June 2015

2015 Drinking Water Health Advisories for Two Cyanobacterial Toxins

Summary

EPA has issued 10-Day Drinking Water Health Advisories (HAs) for the cyanobacterial toxins microcystins and cylindrospermopsin.

EPA recommends HA levels at or below 0.3 micrograms per liter for microcystins and 0.7 micrograms per liter for cylindrospermopsin in drinking water for children pre-school age and younger (less than six years old). For school-age children through adults, the recommended HA levels for drinking water are at or below 1.6 micrograms per liter for microcystins and 3.0 micrograms per liter for cylindrospermopsin. Young children are more susceptible than older children and adults as they consume more water relative to their body weight.

HAs are non-regulatory values that serve as informal technical guidance to assist federal, state and local officials, and managers of public or community water systems to protect public health from contaminants. EPA has also published health effects support documents for the cyanobacterial toxins microcystins and cylindrospermopsin. These documents contain the health effects basis for the development of HAs for the protection of human health. In addition, EPA has published a health effects support document for anatoxin-a but concluded that there was not adequate information to support a health advisory for this toxin.

Background

What are cyanobacterial toxins?

Cyanobacteria, common to freshwater and marine ecosystems, can under certain conditions (high nutrient concentrations and high light intensity) form scums or "blooms" at the surface of a water body. These blooms can produce toxic compounds (cyanobacterial toxins or "cyanotoxins") that are harmful to the environment, animals and human health. Winds and water currents can transport cyanobacterial blooms within proximity to drinking water intakes at treatment plants that, if not removed during treatment, can cause odor, taste and color problems in treated drinking water and can be harmful to human health.

What is a health advisory?

The Safe Drinking Water Act provides the authority for EPA to publish health advisories for contaminants not subject to any national primary drinking water regulation. Health advisories describe non-regulatory concentrations of drinking water contaminants at or below which adverse health effects are not anticipated to occur over specific exposure durations (e.g., one-day, 10-days, several years, and a lifetime). They serve as informal technical guidance to assist federal, state and local officials, and managers of public or community water systems by providing information on the health effects of and methods to sample and treat cyanobacterial toxins in drinking water. HAs are not legally enforceable federal standards and are subject to change as new information becomes available.

Why has EPA taken this action?

There are no U.S. federal guidelines, water quality criteria, standards or regulations for cyanobacteria or cyanotoxins in drinking water under the Safe Drinking Water Act or in surface waters under the Clean Water Act. However, EPA has listed cyanotoxins including microcystin-LR, cylindrospermopsin, and anatoxin–a on the previous and current Contaminant Candidate Lists (CCL), which identify contaminants that may need regulation under the Safe Drinking Water Act.

EPA recommends HA levels at or below 0.3 micrograms per liter for microcystins and 0.7 micrograms per liter for cylindrospermopsin in drinking water for children pre-school age and younger (less than six years old)…. Young children are more susceptible than older children and adults as they consume more water relative to their body weight.

Focal Point: Hurricane Katrina

- Hurricane Katrina was the costliest and one of the deadliest hurricanes to strike the United States in recorded history.
- Katrina's destruction wasn't limited to just Louisiana and Mississippi with damage reported as far east as the Florida Panhandle due to the large wind field and storm surge associated with the hurricane.
- In all, Hurricane Katrina was responsible for 1,833 fatalities and caused $108 billion in damage [unadjusted 2005 dollars].

Hurricane Katrina: Impacts on Children's Health

- Katrina displaced hundreds of thousands of youth from their homes and left tens of thousands of them traumatized by the event, according to the group (USA Today)

- Texas avoided any direct damage from Hurricane Katrina, but the state took in an estimated 220,000 people who sought refuge from Louisiana.

Mental Health & Disasters:
Children's Health Effects Post-Katrina

	Displaced population (2006)	Pre-Katrina Urban Louisiana pop. (2003)
Number of randomly sampled children (Weighted)	492	1,685
Overall health is "poor" or "fair"	14%	4%
Chronic Conditions		
Asthma	19%	14%
Learning Disabilities	23%	10%
Behavioral or Conduct Problems	19%	7%
Developmental Delay or Physical Impairment	12%	4%
Depression or Anxiety	10%	4%
Diabetes	<1%	<1%
Percent of children with ANY chronic condition	40%	26%

Source: Abramson and Garfield (2006)

Simultaneous and Urgent Action

GOAL – AVOID

"Dangerous Climate Change"

- Dramatic sea level rise & massive extinctions
- Limit temperature rise to 1-2^{o}C this century

MITIGATION ~ PRIMARY PREVENTION

GOAL – ADAPT to warming

already assured

- Public Health Infrastructure
- Focus on vulnerable groups and local conditions

ADAPTATION ~ SECONDARY PREVENTION

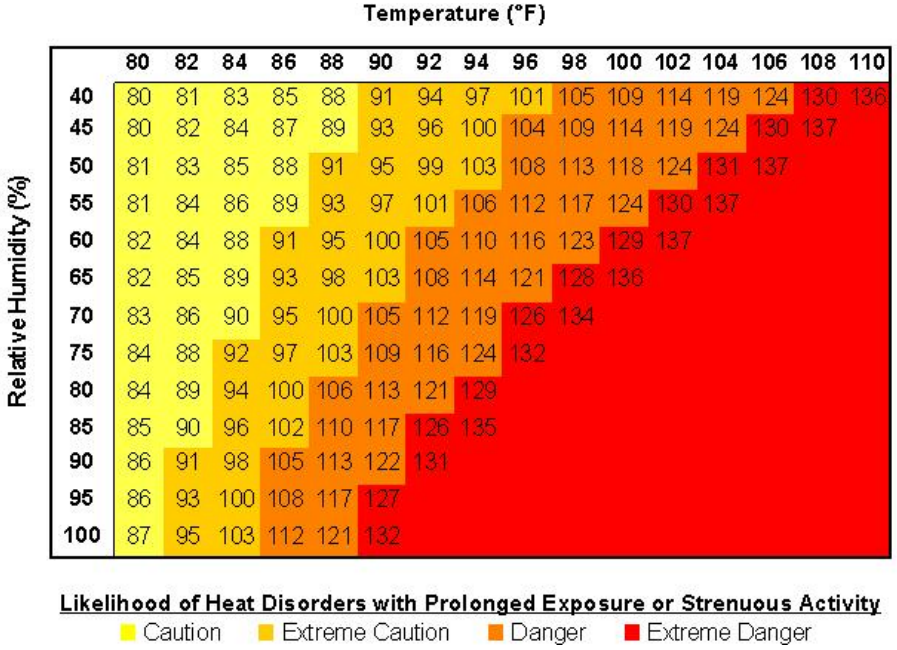
Role of Health Sector

Adaptation - Prepare for the Unavoidable

- **Direct patient care**
  - Optimize immunizations and access to care
  - Teach use of UV, heat, air quality Indices, early warning systems and responses
  - Identify vulnerable individuals in the practice
- **Work with local public health officials**
  - ***Develop a local "climate-related health risk profile"***
  - Include vulnerable groups' issues in disaster planning
  - Develop low toxicity vector control programs
  - Improve disease reporting and surveillance
- **In the Community**
  - Protect drinking water supply and quality
  - Support local agriculture
  - Develop broad partnerships and programs across sectors

Adaptation – e.g. Heat Waves

NOAA Heat/Health Watch Warning Systems



- Extreme Heat Response Programs – Local Level
  - Telephone “heatlines”
  - Neighborhood buddy systems
  - Public cooling stations
  - Cooperation with seniors organizations
  - Coordinate with local utilities
  - Outreach to at risk groups including homeless
- Medical Response
  - Ensure adequate emergency room and in-patient capacity

http://www.weather.gov/om/heat/index.shtml

http://www.epa.gov/hiri/about/heatresponseprograms.html

Adaptation – e.g. Floods

- Tetanus booster
- Food & water safety
- Sanitation & hygiene
- Power outages
- Carbon monoxide risk
- Animal & insects
- Cleanup
- Mold
- Electrical hazards
- Reentering flooded buildings

Ohio, 2008

http://emergency.cdc.gov/disasters/floods/

Mitigation: Avoid the Unmanageable

- Everyone's Responsibility
  - CO_2 is the main problem
- Action must be individual to international
- Options vary greatly
  - By regional climate
  - By level of development
  - By institutional organization
- **Good for health!**
  - **Environment / Health professionals natural leaders**

Federal Actions: President Obama's Climate Action Plan

- Cuts Carbon Pollution in America
- Prepares the United States for the Impacts of Climate Change
- Leads Efforts to Address Global Climate Change

“While no single step can reverse the effects of climate change, we have a moral obligation to future generations to leave them a planet that is not polluted and damaged. Through steady, responsible action to cut carbon pollution, we can protect our children’s health and begin to slow the effects of climate change so that we leave behind a cleaner, more stable environment.”

-President Obama’s Climate Action Plan

EPA Priority Action: Clean Power Plan

The Clean Power Plan Protects Our Health & Our Air

- **45% average per capita carbon footprint is individual activity – under personal control**
  - **Much higher individual footprints in most industrialized nations**
  - **Much lower individual footprints in developing nations**
- **Mitigation in developed countries – contraction and transition to low/no-carbon energy**
- **Mitigation in developing countries – "climate proofing" with clean energy and sustainable development as initial strategies**

Mitigation Strategies

- **Personal Choices MATTER**
  - **Calculate your carbon footprint**
  - **Reduce it iteratively and tell the stories**
- **Practice Choices MATTER**
  - **"Green" your office and institution**
  - **Educate and innovate**
- **Political Choices MATTER**
  - **Make change locally**
  - **Educate decision makers**
  - **Participate fully in the local political process**

www.healthandenvironment.org/?module=uploads&func=download&fileId=418

Find the Win-Win Choices

- **“Burn calories instead of carbon”**
  - More active transport cleans the air and fights obesity (muscle power is carbon neutral - on the right diet)
- **Social time instead of “screen” time**
  - More interactive family and group time combats isolation and depression
- **Eat fresh, local and lower on the food chain**
  - Supports local farms/economy, improved nutritional quality, lower risk of chronic diseases
- **Energy efficiency saves money**
  - Wealth supports health

Find the Win-Win Choices

- Improve public transport, create bike lanes
  - Reduces need for personal vehicle, decreases congestion, noise, and air pollution, promotes active transport
- Promote solar hot-water and water conservation
  - Reduces air pollution, promotes health, saves money
- Strengthen traditional diet – continue to eat low on the food chain, local when available
  - Supports local farms/economy, improved nutritional quality, prevents obesity, lower risk of chronic diseases

Win-Win-Win: the Triple Bottom Line

1. **Sustainable Communities (Planet)**
2. **Strong Economy (Profit)**
3. **Health (People)**
    - Alternative Energy – Wind, Wave, Solar
    1. Carbon Neutral
    2. New Green Jobs, Keep Energy Profits Local
    3. Clean Air
    - Green Buses, More Bikes
    1. Reduced Cars and Emissions
    2. New “Green Jobs”
    3. Clean Air, Fewer Accidents, More Physical Activity

Audience Poll

Which of the following is the most important action you can take to reduce climate change?

1. **Calculate my carbon footprint**
2. **Eat low on the food chain**
3. **Use public transport instead of automobiles**
4. **“Green” my office**

THE OFFICIAL NEWSMAGAZINE OF THE AMERICAN ACADEMY OF PEDIATRICS

DEDICATED TO THE HEALTH OF ALL CHILDREN

AAP News

"There's no voice more credible than public health professionals to convey that our climate crisis is a public health crisis."

Actions You Can Take

- **In Healthcare Services.** Climate change risks are already causing families to seek medical care. Parents of children with asthma or chronic lung disease will need advice about how to protect their health when air quality deteriorates and ozone levels increase because of heat and traffic congestion.
- **In the Workplace.** In the context of a typical medical practice can be approached from two sides—from the point of view of purchasing and from the point of view of disposal.
- **In Communities.** As community leaders, you can get involved in the public policy arena as potential influencers. Check the Air Quality Index (AQI) for a reporting of daily local air quality.

Networks and Resources

Pediatric Environmental Health Specialty Units (PEHSUs) were created to ensure that children and communities have access to, usually at no cost, special medical knowledge and resources for children faced with a health risk due to a natural or human-made environmental hazard.

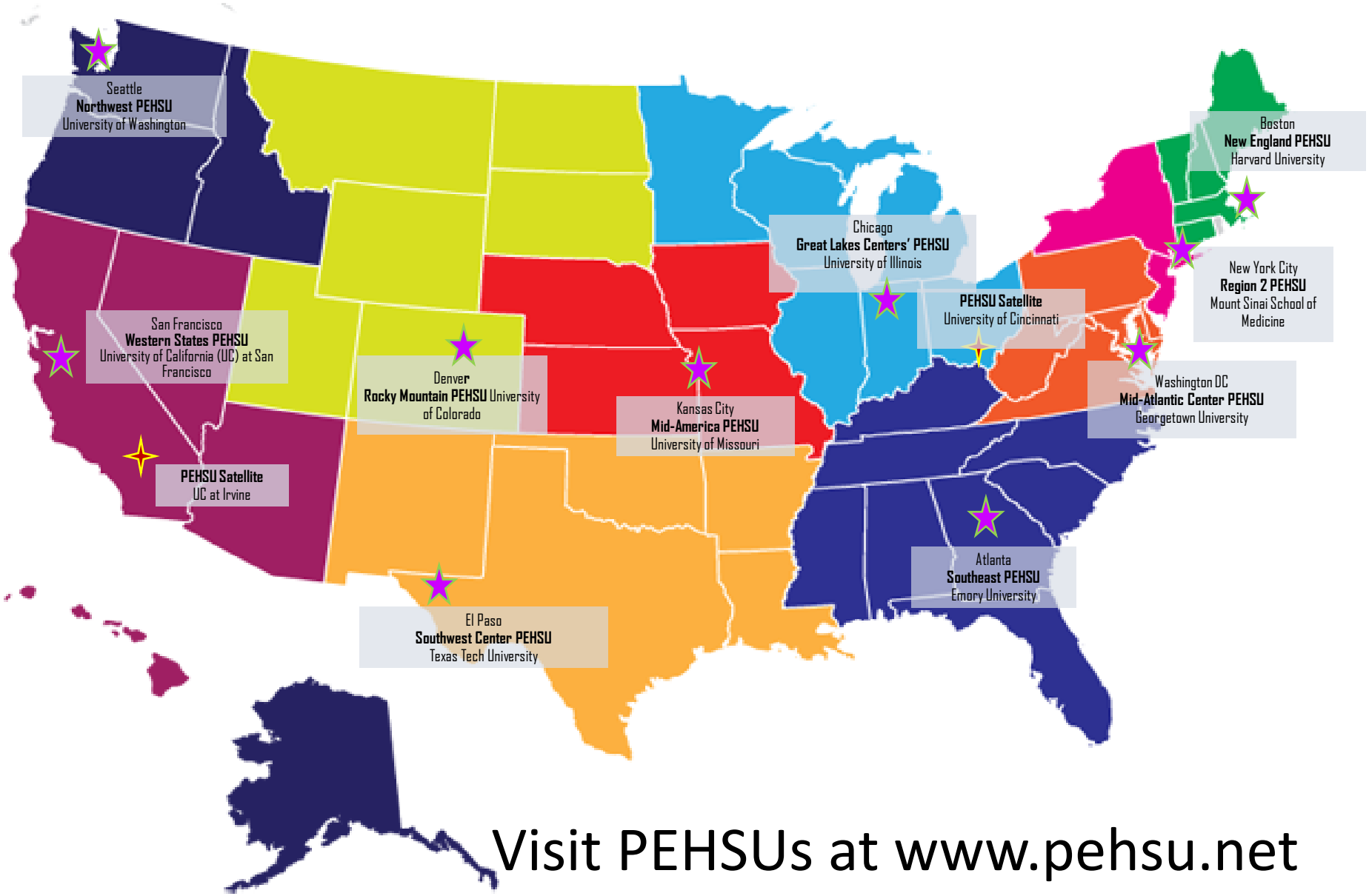
- Educate physicians during grand rounds.
- Organize conferences and seminars to provide trainings.
- Prepare the next generation of health professionals.

PEHSU Specialties

Because children's environmental health covers a wide variety of issues, the PEHSU network has experts in:

- Pediatrics
- Allergy/Immunology
- Neurodevelopment
- Toxicology and medical toxicology
- Occupational and environmental medicine
- Nursing
- Other specialties

PEHSU Academic Affiliations



Visit PEHSUs at www.pehsu.net

Networks and Resources

Migrant Clinicians Network's (MCN) Environmental and Occupational Health Program Initiatives. Educational tools for farmworkers and their families that includes both resources to help reinforce the messages and support changes in behavior as well resources to conduct trainings and carry out a broader intervention.

http://www.migrantclinician.org/services/initiatives/occupational-health.html

Networks and Resources: MCN

Promotor de Salud Curricula and Resources:

- Aunque Cerca... Sano Pesticide Training Manual- step-by-step training manual is designed to equip promotores with information and exercises to conduct pesticide safety trainings and reduce work-to-home exposure pathways that put families at risk to exposure.
- Poco Veneno... ¿No mata?Pesticide Education Manual- reinforces the relevant pesticide safety information and community outreach strategies that promotores need to know when conducting pesticide education activities.

Networks and Resources: MCN

Patient Education Materials:

- Aunque Cerca... Sano**:** a full color Spanish language comic book that targets farmworker families to educate parents about children's risks to pesticide exposure and ways to protect their children.
- Lo que bien empieza... bien acaba: a full color Spanish language comic book that addresses pesticide exposure in women of reproductive age.
- Spanish Radio Novela 4- These radio novelas were developed as part of MCN regional EPA project that we did on the Eastern Shore of Virginia to educate families about environmental health concerns.

Additional Information

- Children's health and air quality: http://www2.epa.gov/children
- Progress under the Clean Air Act: http://epa.gov/airtrends/
- Actions EPA is taking to address outdoor and indoor air pollution
  - Ozone: http://www.epa.gov/air/ozonepollution/
  - Particle pollution: http://www.epa.gov/particles/
  - Mercury: http://epa.gov/mercury/
  - Lead: http://www2.epa.gov/lead
  - Asthma and indoor air triggers: http://epa.gov/asthma/
  - Radon: http://epa.gov/radon/
  - Clean Power Plan: http://www2.epa.gov/carbon-pollution-standards
- Climate Adaptation and Resilience: http://epa.gov/climatechange/impacts-adaptation/

Contact

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HTTP://WWW2.EPA.GOV/CHILDREN

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