

Pollution and Climate Change's Effects on Health

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Objectives

- What is climate change?
- What is the difference between global warming, climate, and weather?
- What is global warming? What causes it?
- What is climate change? What causes it?
 - Focus on air pollution
- What are the effects of climate change?
- What are the impacts to human health from these effects?
 - Short term and long term
- What are the implications for clinical practice?



What is “Climate Change”?

- Extreme weather events?
- Melting sea ice?
- “Pollution”?
- Extreme heat?
- Health impacts?
 - Heat stroke? Cardiopulmonary disease? Asthma?
- Greenhouse gas?
- Heating of the planet?
- Rising sea levels?
- Global Warming?



<https://science.nasa.gov/climate-change/what-is-climate-change/>
<https://www.un.org/en/climatechange/science/key-findings>

What is the difference between climate, and weather?

- Weather refers to atmospheric conditions that:
 - occur locally over short periods of time
 - from minutes to hours or days.
- Climate, on the other hand, refers to:
 - the long-term (usually at least 30 years) regional or even global average



<https://science.nasa.gov/climate-change/what-is-climate-change/>

Author/Source: RavensfieldB
<https://www.youtube.com/watch?v=c7M3P5psbqo>

What is Climate Change?

- A long-term change in the average weather patterns
- Defines earth's local, regional and global climates.
- These changes have a broad range of observed **effects**
- These **effects** are used synonymous with the term.



<https://science.nasa.gov/climate-change/what-is-climate-change/>

What is climate change?

- “Climate change” encompasses (includes) global warming
 - refers to the broader range of changes that are happening to our planet.



What is global warming?

- Global warming is the long-term heating of Earth's surface
- Since the pre-industrial period (between 1850 and 1900)
- This term is not interchangeable with the term "climate change."



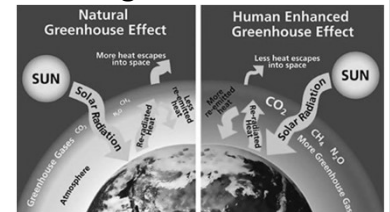
<https://science.nasa.gov/climate-change/what-is-climate-change/>

- Increasing greenhouse gas emissions from **human activity** act like a blanket wrapped around the earth, trapping the sun's heat and raising temperatures.

- CO₂, CH₄, N₂O, SF₆

- Carbon dioxide and methane are the main greenhouse gases that are causing climate change

What causes global warming?

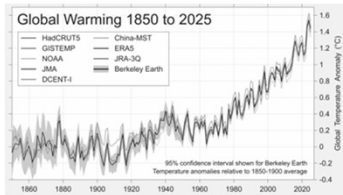


Source: W. Elder, NPS, EPA

Source: National Park Service - <https://www.nps.gov/gogallearn/nature/climate-change-causes.htm>

What is global warming?

- 2020 = 1.02°C above the 20th-century average
- 2024 = 1.28°C above the 20th-century average
- 2024 = 1.46°C above the pre-industrial average (1850 – 1900) and the worlds warmest year since 1850
- 2025 Berkely estimate = 1.44°C above the pre-industrial average (1850 – 1900)



<https://berkeleyearth.org/global-temperature-report-for-2025/>

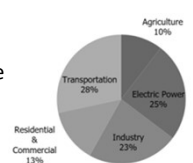
<https://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature>

What are the causes climate change?

- **Human activities causing air pollution (greenhouse gases)** have been the main drivers/causes of climate change

- burning fossil fuels for transportation
- clearing land and forests, release CO₂
- landfills for garbage are a source of methane
- electric power production
- industry burning fossil fuels
- agriculture NO₂ emissions
- livestock CH₄ emissions
- human waste treatment
- residential and commercial emissions
- land use, land-use change, and forestry: a carbon "sink"

Total U.S. Greenhouse Gas Emissions by Economic Sector



<https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#trends>

<https://www.epa.gov/ghgemissions/agriculture-sector-emissions>

What is the difference between climate change and global warming?

- Key concepts:
 1. Climate change is **all** the side effects of global warming
 2. Global warming is **one** symptom/side effect of human-caused climate change
 3. Climate change was **caused naturally** throughout the planet's 4.54-billion-year history.
 - long cold periods ("ice ages") and warm periods ("interglacials") on 100,000-year cycles for at least the last million years.

<https://science.nasa.gov/climate-change/fq/whats-the-difference-between-climate-change-and-global-warming/>

<https://www.climate.gov/news-features/climate-ga/whats-difference-between-global-warming-and-climate-change>

What is the difference between climate change and global warming?


- Key concepts
 3. Global warming is **not the only** side effect of excess heat absorbed by greenhouse gases.
 4. If climate change is the **illness**, global warming is a **symptom**
 - Norovirus is the illness
 - Vomiting, stomach cramps, and diarrhea are the symptoms

<https://www.globalgiving.org/learn/cost-to-end-climate-change/> <https://www.climate.gov/news-features/climate-ga/whats-difference-between-global-warming-and-climate-change>

<https://www.ideastream.org/environment/energy/2023-08-28/climate-question-what-the-difference-between-global-warming-and-climate-change>

What is the difference between climate change and global warming?

Causes and Effects of Climate Change

<p>Causes</p> <ul style="list-style-type: none"> • Rapid industrialization • Energy use • Agricultural practices • Deforestation • Consumer practices • Livestock • Transport • Resource extraction • Pollution 		<p>Effects</p> <ul style="list-style-type: none"> • Rising temperatures • Rising sea levels • Unpredictable weather patterns • Increase in extreme weather events • Land degradation • Loss of wildlife and biodiversity
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What are the social impacts of climate change?
 Displaced people. Poverty. Loss of livelihood. Hunger. Malnutrition. Increased risk of diseases. Global food and water shortages.













GlobalGiving

<https://www.climate.gov/news-features/climate-ga/whats-difference-between-global-warming-and-climate-change> <https://www.globalgiving.org/learn/cost-to-end-climate-change/>

What are the effects of climate change?

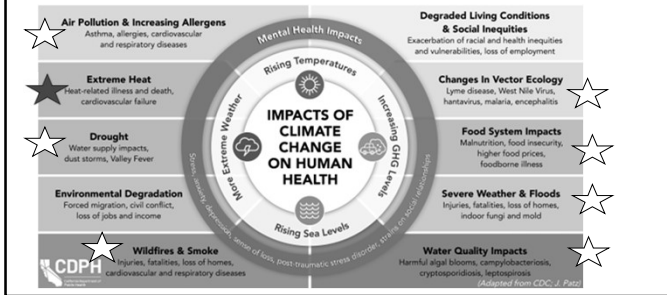
ONEEARTHONECHANGE.COM

10 EFFECTS OF CLIMATE CHANGE

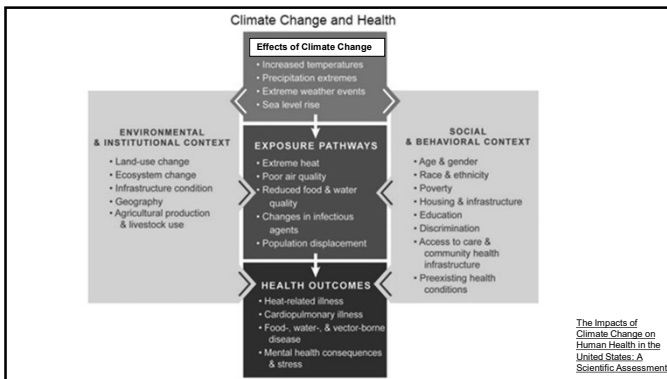
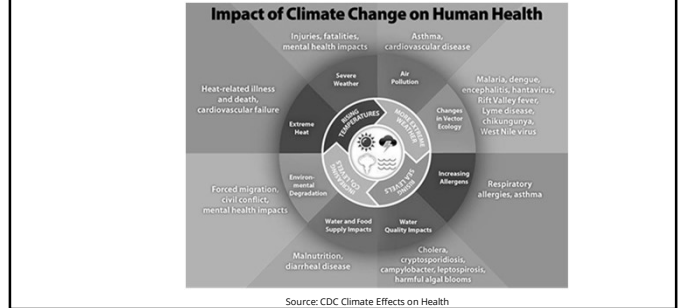
 Rising Temperatures	 Drought	 Melting Ice	 Changes to Ecosystems
 Extreme Weather	 Sea Level Rise	 Wildfires	 Poor Air Quality
 Wildfires	 Health Risks	 Economic Impacts	 Poor Air Quality

Share link:
<https://www.oneearthonechange.com/>

What are the impacts to human health from these effects?



What are the effects of climate change impacting human health?

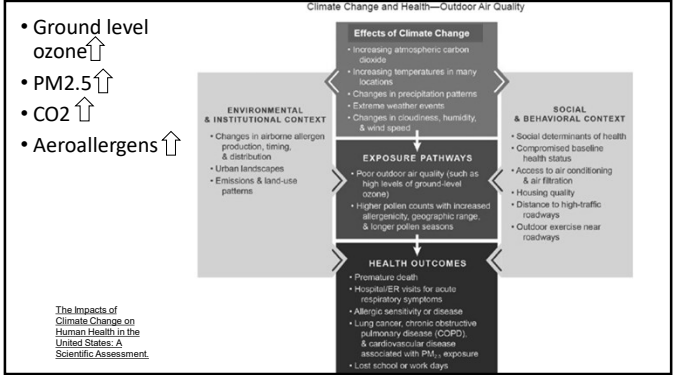


Climate change impacts to human health: Air Quality

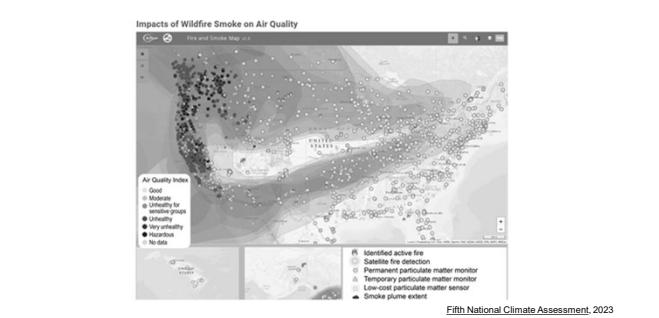


Fifth National Climate Assessment, 2023

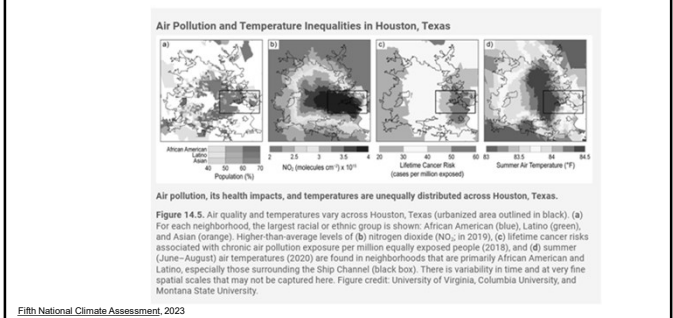
Climate change impacts to human health: Air Quality

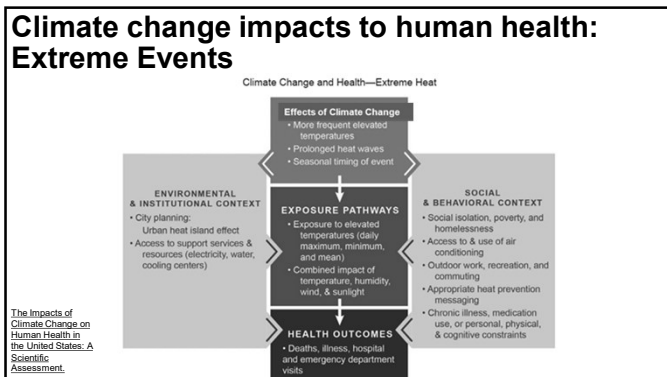
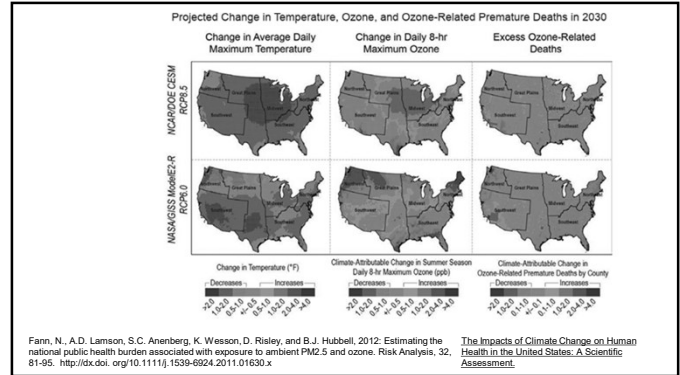
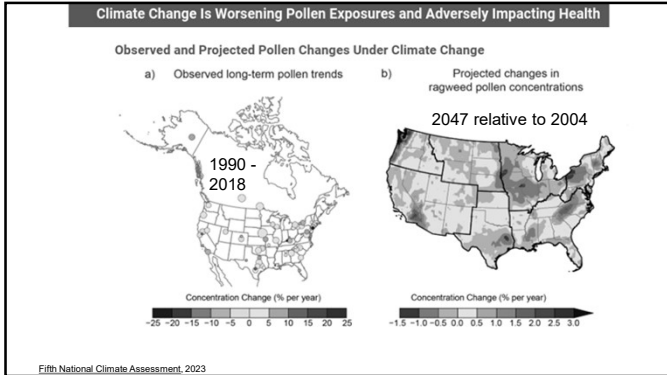


Climate change impacts to human health: Air Quality



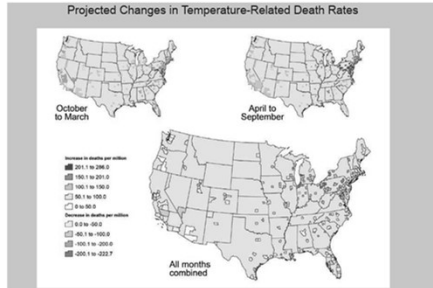
Climate change impacts to human health: Air Quality





- ### Climate change impacts to human health: Extreme Heat or Cold
- Loss of internal temperature control
 - Heat cramps, heat exhaustion, heatstroke, hyperthermia,
 - hypothermia and frostbite in the presence of extreme cold,
 - cardiovascular disease, respiratory disease, cerebrovascular disease,
 - diabetes-related conditions,
 - increased hospital admissions for cardiovascular, kidney, and respiratory disorders.
 - Adverse pregnancy outcomes
 - Electrolyte imbalance
- The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.

Comparing results for 2100 to those for a 1990 baseline period in 209 U.S. cities.



Schwartz, J.D., M. Lee, P.L. Kirney, S. Yang, D. Mills, M. Sarofim, R. Jones, R. Streeter, A. St. Juliana, J. Peers, and R.M. Horton. 2015. Projections of temperature-attributable premature deaths in 209 U.S. cities using a cluster-based Poisson approach. *Environmental Health*, 14. <http://dx.doi.org/10.1186/s12940-015-0071-2>

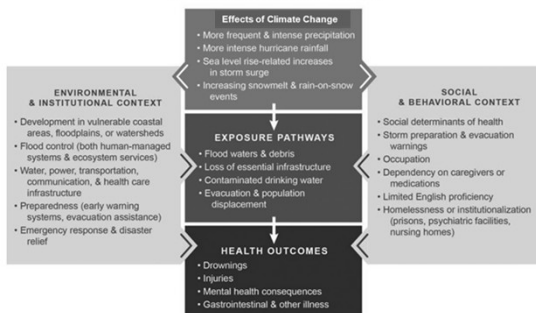
Fifth National Climate Assessment, 2023 The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.

Climate change impacts to human health: Extreme Events

- Flooding Related to Extreme Precipitation, Hurricanes, Coastal Storms, and Winter Storms and Severe Thunderstorms
- Traumatic injury and death (drowning)
- Mental health impacts
- Preterm birth and low birth weight
- Infrastructure disruptions and post-event disease spread
- Carbon monoxide poisoning related to power outages
- Hypothermia and frostbite

Fifth National Climate Assessment, 2023 The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.

Climate Change and Health—Flooding



The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.

Climate change impacts to human health: Extreme Events

- Droughts
 - Heat related mortality and morbidity
 - Reduced water quality and quantity
 - Respiratory impacts related to reduced air quality
 - Mental health impacts for rural farmers
- Wildfires
 - Smoke inhalation
 - Burns and other traumatic injury, and adverse reproductive outcomes
 - Asthma exacerbations
 - Mental health impacts

Fifth National Climate Assessment, 2023 The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment.

Climate change impacts to human health: Climate – Sensitive Infectious Diseases

5 VECTOR-BORNE DISEASES

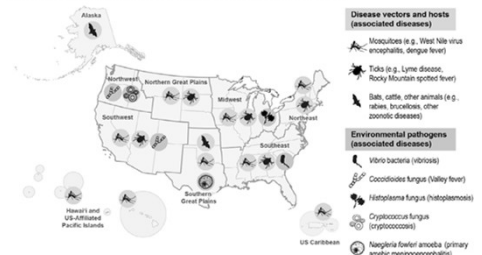


Fifth National
Climate
Assessment, 2023

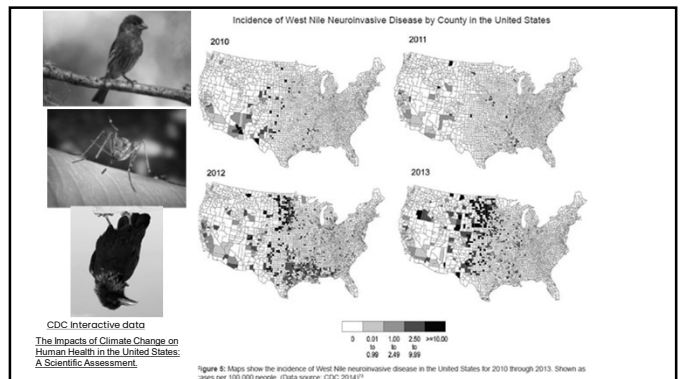
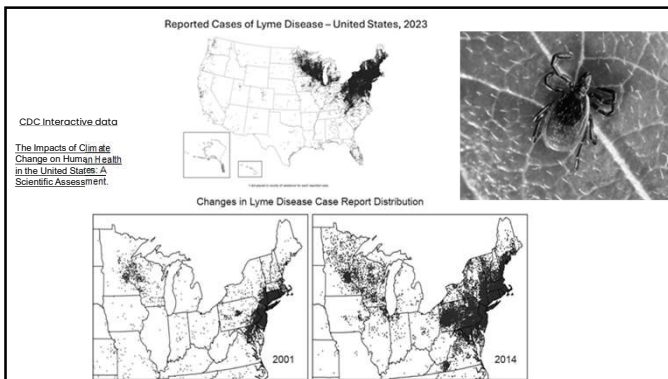
The Impacts of Climate Change on Human Health in the United States: A
Scientific Assessment.

Climate change impacts to human health: Climate – Sensitive Infectious Diseases

Regional Examples of Climate-Sensitive Infectious Diseases



Fifth National
Climate
Assessment, 2023



What are the effects of climate change impacting mental health?

Climate change and mental health

Climate change affects mental health both directly and indirectly.

Direct impacts, e.g.

- exposure to flooding
- exposure to extreme heat
- stress

Indirect impacts, e.g.

- vulnerabilities due to food insecurity
- housing instability
- eco-anxiety

Centre for Climate and Health Security

<https://www.gov.uk/guidance/overview-of-the-climate-change-and-mental-health-report>

What are the effects of climate change impacting mental health?

Those most at risk:

- Children and young people
- Socioeconomically disadvantaged groups
- Some occupational groups, e.g. farmers and front line responders
- People with mental or physical health conditions

Key messages for policymakers:

- 1** Climate change is impacting mental health
 - largely through extreme weather
 - impacts include suicide, depression and anxiety
 - more research is needed but impacts are likely to worsen as the climate warms further
- 2** There is evidence for interventions to protect population health
 - both individual and community resilience is needed
 - taking part in environmental action can help
 - targeted support for communities affected by adverse weather can be beneficial
- 3** There is more that can be done to protect our mental health
 - long-term and acute health impacts should be considered
 - more research is needed to evaluate interventions
 - cost effective analyses are needed

<https://www.gov.uk/guidance/overview-of-the-climate-change-and-mental-health-report>

What are the effects of climate change impacting mental health ?

Addressing the Climate Crisis An Action Plan for Psychologists

REPORT OF THE APA TASK FORCE ON CLIMATE CHANGE
APPROVED BY APA COUNCIL OF REPRESENTATIVES, FEBRUARY 2022

<https://www.apa.org/science/about/publications/climate-crisis-action-plan.pdf>

CLIMATE CHANGE MENTAL HEALTH FACT

People with mental health conditions are more likely to be affected by extreme weather and subsequent disruption in health services.

Psychiatric medications can interfere with a person's ability to regulate heat and their awareness that their body temperature is rising, which is associated with injury and death.

APHA Climate Change & Mental Health

Source: American Psychiatric Association

What are the effects of climate change impacting mental health?

CLIMATE CHANGE MENTAL HEALTH FACT

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APHA Climate Change & Mental Health

CLIMATE CHANGE MENTAL HEALTH FACT

Extreme heat affects more than just your body.

Exposure to extreme heat may lead to increases in aggression, but people with mental illness or developmental conditions are increased in public, and increased use of alcohol to cope with stress.

APHA Climate Change & Mental Health

CLIMATE CHANGE MENTAL HEALTH FACT

Protecting our climate isn't just good for our bodies, it's good for our brains too.

Spending more time in nature has been shown to lower stress levels and reduce stress-related illness.

APHA Climate Change & Mental Health

Source: American Psychiatric Association

What are the implications for clinical practice? Climate and Health History-Taking

- **Environmental Exposure:** Where does the patient live and work? What are typical daily temperatures? Is there access to cooling (e.g., shade, fans, air conditioning)?
- **Occupation:** Does their work involve heat-exposed outdoor (e.g., agriculture, construction) labor, or indoor (e.g., manufacturing plants, commercial kitchens) labor?
- **Housing Conditions:** Is their home constructed to withstand extreme heat or flooding? What materials are used?
- **Animal and Vector Exposure:** Are there animals nearby (e.g., livestock, domestic pets) that may also experience heat-related stress or contribute to zoonotic risks?

<https://pmc.ncbi.nlm.nih.gov/articles/PMC1278572/#abstract1>

What are the implications for clinical practice? Climate and Health History-Taking

- **Social Determinants:** Does the client have reliable transportation, access to clean water, and economic stability to adapt to extreme weather events? Does the client have access to healthy and affordable food, particularly during climate-related disruptions that affect supply chains and local markets?
- **Health History:** Are there pre-existing conditions (e.g., diabetes, hypertension, kidney disease), mental health conditions, pregnancy, and medications that increase susceptibility to heat or dehydration, such as diuretics, beta-blockers, antipsychotic medications, and certain stimulants?

Video - How to discuss the health impacts of climate change with patients in a clinical setting



Use the conversation structure to connect the:

- Personal
- Environmental
- Global

Source: Minnesota Department of Health

What are the implications for clinical practice?

• *J Eval Clin Pract.* 2024 Jul 30;31(1):e14103. doi: [10.1111/jep.14103](https://doi.org/10.1111/jep.14103)

Climate change and the pivotal role of health professionals

Patricia Huston ^{1,2,✉}

• *Ochsner J.* 2023 Spring;23(1):7-8. doi: [10.31486/toj.23.5033](https://doi.org/10.31486/toj.23.5033)

The Era of Climate Change Medicine—Challenges to Health Care Systems

Kevin Conrad ¹

Climate Change and Health Systems: A Scoping Review of Health Professionals' Perceptions and Readiness for Action

by Vasilios Gkoufaveras ¹, Stavros Kalogiannidis ¹, Dimitrios Kalfas ¹, Apostolia Papakonari ² and Stamatia Kontsas ¹

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² Pedagogical Department of Primary Education, School of Social Sciences and Humanities, University of Western Macedonia, 53100 Florina, Greece

✉ Authors to whom correspondence should be addressed.

Climate 2024, 7(4): 43. <https://doi.org/10.3390/clm7040043>

**How will climate change affect
your clinical practice?**



Image by geralt from Pixabay