Guidance from the Western States Pediatric Environmental Health Specialty Unit

Climate Change and Pregnancy

WESTERN STATES PEHSU Pediatric Environmental Health Specialty Unit

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Climate change is resulting in more extreme temperatures and weather, rising sea levels, more natural disasters (e.g., wildfires, hurricanes, droughts, and flooding), and population displacement. Pregnant women are especially vulnerable to the health harms resulting from climate change, with increased risks of adverse pregnancy complications, including preterm birth, small for gestational age, and hypertensive disorders of pregnancy.

Strategies to minimize harms include

- **mitigation** (steps to decrease CO2 and other greenhouse gas levels to minimize the change in climate),
- **adaptation** (strategies to deal with a climate that is hotter and stormier), and
- **resilience** (sustainability).

Clinicians are in a unique position to protect the health of families:

- providing clinical recommendations for patients to protect themselves from the health impacts of climate hazards.

HEALTH RISKS

Climate change is risky for pregnancy and childhood:

Pregnancy causes special **vulnerabilities** to some environmental exposures (especially air pollution and heat) because of the **unique physiology** of pregnancy:

- 20% increase in oxygen consumption
- 40% increase in minute ventilation
- 50% increase in cardiac output
- susceptibility to hypertension, including preeclampsia and gestational hypertension
- dependence on functional transportation systems and health care institutions

Children are more susceptible to climate change, due to:

- a greater surface area to body mass makes them more susceptible to heat illnesses
- more sensitivity to air pollutants due to immature lung & immune function, more outdoor activities, higher ventilation rate, and frequent mouth breathing
- more frequent serious complications from infectious diseases, including vector-, water-, and food-borne diseases, which increase with extreme weather
- dependence on caregivers for basic health needs and safety

Air pollution increases risks to reproductive health and human development

- **Prenatal exposure** to air pollution, including PM2.5 and ozone, contribute to adverse pregnancy outcomes, including preterm birth, low birthweight, stillbirth, as well as abnormal childhood neurodevelopment
- Air pollution also **increases the risk of hypertensive disorders** of pregnancy. These harms are often greater for vulnerable populations, including people of color and those with asthma

Health risks from high heat during pregnancy

- **High heat exposure** during pregnancy is associated with increased **abruption** (premature placental separation), **gestational diabetes, preterm birth, low birthweight,** and **stillbirth**, especially in those with underlying co-morbidities. Mechanisms by which high ambient heat may cause these outcomes include dehydration, altered blood viscosity, impaired thermo-regulation, reduced uterine blood flow, and lowered **amniotic fluid volume**.
- Pregnant women are at greater risk for **heat exhaustion and heat stroke** than non-pregnant, especially for those who work outdoors and other places with excess heat exposures.

Climate Change and Pregnancy: Health Risks

Vector ecology and pregnancy

- Climate change impacts the geographic range of insect vectors. In the United States, Dengue fever and Lyme disease are becoming more prevalent.
- Pregnant women are at risk due to suppressed immunity and potential impacts on fetal outcome. Risks from vector-borne diseases such as malaria and **Zika** can include pre-eclampsia, HELLP syndrome, preterm birth, low fetal birth weight, mother to child transmission, and fetal congenital deformities.

Water salinity and pregnancy

- Rising sea levels intrude inland into local water sources and increase the salinity (salt content) of both surface and ground water. Regions in the US (including the Mississippi River and Sacramento River deltas) are at risk for increased water salinity from climate change.
- Drinking water with **high sodium levels** is associated with **gestational hypertension and preeclampsia**.

Natural disasters (hurricanes, floods, fires, and others) and pregnancy

- **Climate-induced natural disasters** can be major stressors for families and prevent access to necessities or care facilities.
- **Floods and pregnancy**: Studies of exposure to flooding during pregnancy have shown:
  - decreases in birth weight.
  - delayed neurodevelopment of toddlers if mothers exposed to high stress from flooding during pregnancy.
  - composite neonatal morbidity increased by 50% in the hurricane-exposed pregnancies.
  - increased composite maternal morbidity.

Wildfire and pregnancy

- Climate change increases the risk of wildfires
- Wildfire exposure (smoke and stress) during pregnancy can cause:
  - an increased risk of fetal **growth restriction** and **preterm birth**.
  - Exposure to wildfire directly, including emergency evacuation, can increase risks further through stress-related mechanisms.
  - Burns and inhalational injuries may lead to maternal and fetal death.

Natural disasters and mental health

- Direct **exposure to wildfires, hurricanes, and flooding has been associated with increased risk for mental health disorders**, particularly post-traumatic stress disorder and depression.
- Impacts are particularly severe in those experiencing a loss of place, home, and social capital during these disasters.
- Atypically **high nighttime temperatures** combined with high humidity are associated with insufficient **sleep**, a risk factor for several mental health outcomes.

Environmental Justice is an important consideration

Harms from climate change have a **disproportionate impact** on otherwise vulnerable communities.These communities have exposures to **air pollution**, higher risks of **flooding**, and more susceptibility to heat waves. Communities of color are more likely to live in "**heat islands**," urban areas with less tree canopy cover, which retain heat. Moreover, coping **resources** are often less accessible to these vulnerable communities.

It is imperative to **prioritize supporting vulnerable populations** in their adaptation to climate change and providing necessary resources to prevent adverse health effects from natural disasters [further information here: https://www.hrw.org/sites/default/files/media_2020/10/climatecrisis-reproductivejustice-US_1020_web.pdf].

References and Resources

References and resources are available at: wspehsu.ucsf.edu/wp-content/uploads/2022/05/climatechange_preg_fs_resources_refs.pdf

Climate Change and Pregnancy: What Clinicians Can Do /Health Advice

WHAT CAN CLINICIANS DO?

- **Advise patients and communities regarding mitigation** of health impacts
- Serve as educators regarding health hazards. Providers such as midwives, doulas, and community health workers, as well as patients, their families, and communities, should be informed about these issues.
- **Decrease the carbon footprint of health care.** Healthcare accounts for 10% of US greenhouse gas emissions. Clinicians can limit their carbon footprint by engaging in evidence-based care which foregoes unnecessary tests and procedures as exemplified by the Choosing Wisely campaign [https://www.choosingwisely.org/].
- **Advocate for public policies** that protect patients and communities by reducing pollutants and global warming and building resilience in the health care sector. Several physician organizations, including ACOG, FIGO, and the AAP, have published recommendations for providers, the health sector, and the government to take actions towards mitigating and adapting to climate change (*see figure at right*).

Protective public policies are essential for health

Advocating for public policies that promote mitigation, adaptation, and resilience in the face of climate change is vital. To help the cessation of global environmental change, **preventing wildfire** is critical in reducing the release of substantial greenhouse gas. On the infrastructure level, **air filtration** should be standardized across public buildings and schools (e.g., doh.wa.gov/). Equally, indoor air pollution monitoring and establishing standards at school and other public spaces warrant funding and research. Communities should assess their **infrastructure resources needed to address disasters**, including cooling centers, disaster response teams, and flood mitigation measures. Advocating for more renewable sources to fund power for your local power grid will decrease its contribution to climate change.

HEALTH ADVICE

Advice to patients and communities

When counseling patients on mitigating risk of exposure to climate disasters, air pollution and heat, consider the following:

1 **Assess what risks are important where your patients live**: air pollution (including pollution in urban areas, near roadways, from industrial facilities, wildfires, etc), high heat (even unusually hot days in temperate climates can have health effects), flooding (from heavy rain, hurricanes, or sea level rise), other severe weather including tornadoes or blizzards.

2 Provide **local resources** where patients can get information to **plan ahead** (e.g., https://www.readyforwildfire.org/, https://www.ready.gov/hurricanes, https://www.redcross.org/get-help/how-to-prepare-for-emergencies.html) The CDC provides resources specific to pregnancy and breastfeeding regarding preparing for disasters. (https://www.cdc.gov/reproductivehealth/emergency/safety-messages.htm?CDC_AA_refVal=https://www.cdc.gov/reproductivehealth/emergency/wildfires.htm)

3 **Preparations should include a "go-bag,"** in addition to the bag packed in anticipation of going to the hospital for birth. Items to include a battery or hand crank powered radio, medications, hand sanitizer, masks, drinking water, and maps of evacuation routes or local hospitals.

4 Pregnant women should be **educated about the symptoms of preterm labor and hypertensive disorders** of pregnancy, including abdominal pain or contractions, bleeding or leaking of fluid vaginally, headache, visual changes, and decreased fetal movement.

Climate Change and Pregnancy: Health Advice

5 If you live in an area that now has the **mosquitos** that carry Zika or other viruses (https://wwwnc. cdc.gov/travel/page/zika-information), be sure to follow the CDC's advice to avoid insect bites, including wearing bug spray. (https://www.cdc.gov/pregnancy/zika/pregnancy.html)

6 Strategies to **increase mental health resilience** can help with recovery from disasters. **Group prenatal care programs** which foster relationship-building and health knowledge have shown some success in reducing some pregnancy complications. These programs may mediate some disaster-related pregnancy risks. The American Psychological Association has published tips to support individuals' climate resilience, including:

- Build belief in one's own resilience.
- Foster optimism.
- Boost personal preparedness.
- Cultivate active coping and self-regulation skills.
- Maintain practices that help to provide a sense of meaning.
- Promote connectedness to family, place, culture, and community.
- Care for oneself through healthy habits.

https://www.apa.org/news/press/releases/2017/03/mental-health-climate.pdf

For tornadoes:

Prepare ahead of time with an emergency kit located in a safe area of the house or easily accessible.

- Safer areas include the basement or a windowless room in the center of the house. For added protection get under something sturdy (a heavy table).
- Cover your body with a blanket, sleeping bag or mattress. Protect your head with anything available.

Do not stay in a mobile home. If you are outside or in a mobile home, find a nearby building preferably with a basement. If you are in a car, do not try to outrun a tornado but instead find the nearest sturdy building.

- During storms, use a battery-operated radio to listen to weather updates and instructions from local officials.
- Be aware of **tornado warning signs**, including dark or greenish skies; large, dark, low-lying clouds; a loud roar; large hail; or a visible, rotating funnel.

- Emergency preparedness information from the CDC https://www.cdc.gov/nceh/features/tornadosafety/index.html and the American Public Health association: http://www.getreadyforflu.org/Resources/Fact-Sheets/Family-Tornadoes provides more recommendations.

For loods:

Before pregnant women and their families return to an area impacted by flooding, **utilities and public services should be functional**:

- water supply re-established, and water for drinking and bathing meets standards for biological and chemical contaminants.
- supply of electricity and gas restored, and damage to transmission system or gas pipes repaired.
- reliable food supply is re-established, and food storage is available.
- sanitation system (including sewage) functional, and debris / trash collection re-established.
- communication system including 911 access is restored, reliable, and readily accessible.
- Healthcare services, including emergency and mental health services, are available and accessible.
- Families returning know the location and status of their nearest hospital that cares for pregnant women giving birth, and the route to reach it is open and passable.
- Buildings are appraised for damage.
- If renovating, all flood hazards are addressed by properly trained experts. **Pregnant women should avoid entering areas that have not been cleaned and made safe**. The CDC has guidance for returning to a home impacted by mold here: https://www.cdc.gov/disasters/mold/index.html

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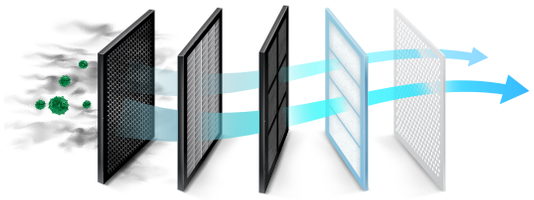
Climate Change and Pregnancy: Health Advice

For air pollution:

- Avoid outdoor activities on high pollution days & **monitor the local Air Quality Index** (AQI). (https://fire.airnow.gov/).
- Wear an N95 mask if you must be outdoors when the air quality is poor.
- When exercising, avoid being within 300 meters of high-traffic areas.
- Close your windows on high pollution days.
- Invest in an **air purifier or home air filter** if in an area with air pollution or wildfire risk.
  - A less expensive Do-It-Yourself alternative Filter-Fan can be made at home. https://www.epa.gov/coronavirus/air-cleaners-hvac-filters-and-coronavirus-covid-19 Video https://www.youtube.com/watch?v=aEn2xzlvrdo



- Keep the **indoor air as clean** as possible:
  - Avoid smoking and vaping
  - Avoid using gas, propane, wood-burning stoves, fireplaces, or candles
  - Avoid ozone-generating air cleaners
  - Avoid natural gas or gasoline-powered generators indoors
  - Avoid using unnecessary chemical products
  - Avoid frying or broiling meat
  - Use ventilation when cooking (cook on the back burner and turn on the range hood if you have one; or use fans and windows)
  - Avoid vacuuming (unless vacuum has a HEPA filter)

For wildfires :

- Wildfire evacuation checklist: (https://ucanr.edu/sites/fire/files/294649.pdf)
- Wildfire smoke and pregnancy advice from the CDC: https://www.cdc.gov/air/wildfire-smoke/pregnancy.htm
- Follow the air pollution recommendations above

For high heat:

- During extreme heat, **limit outdoor activities** to cooler times of day. Avoid being in the sun for long periods and seek shade, take breaks, and **drink water regularly**. Increased fluid intake on hot days as doing so has been associated with lower risk for heatstroke. https://nihhis.cpo.noaa.gov/Planning-Preparing
- Educate your patients on the **signs and symptoms** of dehydration.
- Access air conditioning (e.g., friend's house, cooling center, or mall), to reduce risk for heatstroke or heat-related mortality.
- Fans should vent warmer air outdoors or bring cooler air into a room. Keep in mind: Electric fans may provide comfort, but when the temperature is in the high 90s, they will not prevent heat-related illness. Taking a **cool shower or bath** or moving to an air-conditioned place is a much better way to cool off. https://www.cdc.gov/disasters/extremeheat/heattips.html

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