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**Healthy Environment for a Healthy Start: Promoting
Environmental Justice for Equitable Birth Outcomes**

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Executive summary

The goal of this report is to provide a foundation of data connecting reproductive justice and environmental justice concerns in the United States (US). The briefs contained in this report explain why major environmental health issues such as air pollution, extreme heat, fossil fuels, cosmetics, and natural disasters should also be understood and managed as serious reproductive justice and maternal and newborn health problems. Data and key research are presented showing how environmental health threats are exacerbating the current inequities that exist for Black, Indigenous, and other BIPOC pregnant and birthing people and their infants in the US.

We hope to:

- Build solidarity between people and organizations working to advance equity in maternal health, newborn health, and community health as we are forced to manage new and growing environmental pressures and a platform to build action against fossil fuels, greenhouse gases, and other environmental harms to human health.
- Connect dots between the maternal health crisis in the US and the environmental health inequities that currently exist.
- See action from the US government including funding to maternal health workers including community birth workers to address environmental health concerns and protect the most at-risk pregnant people and positions for reproductive justice experts in government environmental health and environmental justice initiatives.
- Realize protection for pregnancy health through robust government action on climate and other environmental health disasters to protect human health and life, specifically legal, policy, and practice systems that are designed to actively protect pregnancy health.

The Mom and Baby Action Network (M-BAN) Environmental Justice Work Group

The M-BAN Environmental Justice Work Group is a group of activists, maternal and newborn health workers, academics, community members, and public health professionals.

We're working to create a country where all babies, parents, and caregivers—regardless of who they are or where they live—realize the vision of reproductive justice, including a healthy environment for pregnant people and their babies. This path forward in an increasingly volatile world of interconnected crises will mean that human and environmental health is prioritized, that equity is centered in health policy, and historical inequities are addressed and corrected.

The M-BAN Environmental Justice Work Group wrote this report to learn and share information about challenges to achieving equitable outcomes for parents and their babies from an unhealthy environment, develop recommendations in partnership with others, raise awareness among maternal and newborn health workers and advocates, challenge policy makers, and build community. We publish these briefs not to establish our expertise, but instead our commitment to better understanding how racism, socio-economic marginalization, and systems and policies that have degraded our environment interact to contribute to the US maternal health crisis and other injustices here and globally—and to work with others to act in response.

Welcoming complexity and grounding ourselves in lived realities drives our work. The M-BAN Environmental Justice Work Group is one of five work groups working in coalition to address the maternal health crisis in the US from a multitude of different angles through dozens of organizations and individuals.

Report audience

Maternal health workers, public health professionals, advocates, policy makers at all levels of government, environmental health workers of all descriptions, advocates working to end the climate crisis, parents, and activists seeking a healthy dignified environment for all.

Learn more at: ignitingImpactTogether.org

We believe people should be able to get pregnant, have a healthy pregnancy and birth, breastfeed, and raise a family in a thriving community—all while living in a dignified and healthy environment.

– M-BAN EJ Work Group Members

Key findings and messages:

- A healthy environment is a key but undervalued component of reproductive health and rights for individuals, families, and communities.
- Pregnant people and the developing fetus are particularly vulnerable to toxics, pollution, and climate impacts. However, far too little action has been taken to protect pregnancy health and center the most at-risk pregnant people in environmental health policy, including by addressing environmental racism.
- The maternal health crisis in the US, centered by unjust inequities by race as a result of systemic racism, is worsened by climate change and other environmental health harms.
- Pregnant people, newborns, and the people who serve these at-risk populations have unique needs and perspectives as the climate crisis and other environmental degradation worsens.
- Reproductive justice and maternal health workers need to be centered in planning and resource allocation as the US prepares for increasing weather-related disasters, for example.
- The onus of reducing exposure to environmental threats during pregnancy must be taken off the individual and instead placed on the government to dismantle the historical injustices that have led to inequitable exposures and health outcomes.
- Communities in the US are increasingly struggling with infertility, poor maternal health, and high rates of adverse birth outcomes such as low birthweight and preterm birth in part because of poor environmental health, often linked in deep and important ways with other health harms resulting from injustices and marginalization.
- Inadequate climate action and poor government regulation of chemicals in our air, water, soil, food, and products we buy has widespread impacts on public health.

Pregnant people are sometimes included in lists of “vulnerable” people to environmental harms, although this population is often omitted.

- **Partner point:** See, for example: [US: Heat Emergency Plans Missing Pregnancy, Racial Justice.](#)

But even when specific harms to pregnancy health are mentioned, the “so what” is missing. Far too little action is being taken to prevent snowballing degradation of our environment or offset specific harms to perinatal and newborn health.

And even when pregnancy is recognized as a vulnerability to an environmental health threat, the reproductive justice dimension is absent—i.e., the fact that some pregnant people, because of where they live, what they eat, their financial stability, rates of pre-existing conditions, and other factors deeply connected to histories of racism and marginalization—are much more at risk from climate or other environmental health threats.

- **Partner point:** See, for example [Nurturely “Perinatal & Planetary Health & Equity”](#)

These briefs provide information about studies showing important links between poor environmental health and adverse maternal and infant health outcomes, and how communities who are already experiencing poor health are both more exposed to and more vulnerable to environmental threats, thus worsening pregnancy and newborn health further.

Key recommendations

To our allies in the environmental and climate justice movement

- When calculating the costs of the climate crisis, include maternal health and reproductive justice considerations.
- Invite and make space in planning and decision-making for maternal health workers, especially frontline workers such as midwives and doulas working in communities facing high rates of adverse birth outcomes and are especially vulnerable to environmental health threats.
- Help ensure pregnant people know about climate resources, for example subsidized housing improvements to better protect families from climate harm, by connecting and working with maternal health workers and community-rooted organizations.
- Apply for and share environmental justice grants in collaboration with reproductive justice organizations, maternal health workers, and advocates, like community-based doulas, working closely with the most at-risk pregnant people.
- [Join us!](#)

To our allies in maternal health, including service providers and advocates

- Learn more about links between environmental and occupational health and the health of pregnant people, postpartum people, and newborns. [See Resources and Additional Readings]
- Ensure families, pregnant people, and advocates know about and have access to resources to support them when it comes to environmental health exposures.
- Visit [IgnitingImpactTogether.org](https://www.ignitingimpacttogether.org) to learn about the work of the Mom and Baby Action Network and the Environmental Justice Work Group.
- [Join us!](#)

To the Biden-Harris Administration

- The health of pregnant people and newborns is a compelling argument, among many, for strong climate action including ending fossil fuel development in the US and better regulation of toxics and other environmental health concerns.



We call on the administration to connect the dots and uplift the links between Environmental Justice and Reproductive Justice as they roll out climate or other environmental health policies.

- Build interagency coordination on maternal health and reproductive justice implications of the climate crisis and other environmental harms, including establishing an interagency body to review the state of the science and develop an action plan to better protect maternal and newborn health from the climate crisis and other environmental health crises.
- Work to ensure that environmental protection, climate health adaptation, and climate and environmental justice grant funding reaches reproductive justice organizations and frontline maternal and newborn health workers.
- Appoint reproductive justice experts in the White

House Office of Environmental Quality and in other key places, such as within emergency management, the office of air quality, and in the interagency body on extreme heat.

To the EPA

- Create a reproductive justice expert position to help develop environmental justice policy, for example in the Office of Environmental Justice and External Civil Rights.
- Use a reproductive justice lens when including pregnant people as a vulnerable group in policy documents, i.e., write about pregnant people in environmental justice communities as rights holders managing many intersecting pressures on their health.
- Work to help reproductive justice experts and champions access environmental justice grants, for example by doing outreach into this community or asking grantees to consider including RJ sub-grantees or partners.
- Supporting organizations such as the National Environmental Justice Advisory Council (NEJAC) to include reproductive justice experts among their members and examine new developments in maternal and newborn environmental health and incorporate a reproductive justice thread into their work.
- Work as part of an interagency body to review the state of the science and develop a reproductive justice action plan or white paper to better protect maternal and newborn health from the climate crisis and other environmental health crises.

To Health and Human Services

- Appoint a reproductive justice expert in the Office for Climate Change and Health Equity.
- Include pregnancy health and reproductive justice in environmental justice strategy and implementation.
- Include the climate crisis and other environmental health crises in planning to improve maternal and newborn health and reduce unjust racial inequities in outcomes.
- Work as part of an interagency body to review the state of the science and develop an action plan or white paper to better protect maternal and newborn health from the climate crisis and other environmental health crises.

To cities/states

- City governments should convene neighborhood leaders, maternal and infant healthcare providers, and health department staff to champion ideas that achieve equitable maternal health and pregnancy outcomes by addressing environmental health threats. Once locally tailored ideas are decided, the group—in authentic partnership with the community—should collect project data to identify the greatest needs and procure funding to implement paths to scale.
- Include environmental justice considerations in state maternal and infant health initiatives addressing inequitable outcomes.
- Include environmental health experts in maternal mortality and fetal infant mortality review boards.

To Congress

- Pass the Momnibus, including the Protecting Moms and Babies against Climate Change Bill.
- Pass the A. Donald McEachin Environmental Justice for All Act.
- Include maternal and newborn health considerations in any climate health bills.

Join us!

Get involved by joining the Mom and Baby Action Network to collectively advance environmental justice and equitable maternal and infant health outcomes.



Glossary

This glossary provides descriptions and definitions for key terms used throughout the report.

- **Beauty justice/Clean beauty justice** – A field of research and advocacy that addresses inequities in chemical exposures from beauty and personal care products. Beauty and personal care products marketed to women of color often contain more toxic ingredients than products marketed to White women. Women of color deserve the same access to safer, cleaner beauty products.
- **Black carbon** – The sooty black material emitted from gas and diesel engines, coal-fired power plants, and other sources that burn fossil fuel. It comprises a significant portion of particulate matter or PM, which is an air pollutant. Black carbon is a global environmental problem that has negative implications for both human health and our climate. Inhalation of black carbon is associated with health problems including respiratory and cardiovascular disease, cancer, and even birth defects. Black carbon also contributes to climate change causing changes in patterns of rain and clouds.
- **Climate change** – A change in global or regional climate patterns attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels. Climate change can affect our health, ability to grow food, housing, safety, and work.
- **Cosmetics** – A “cosmetic” is any substance used to clean, improve, or change the complexion, skin, hair, nails, or teeth. Cosmetics include beauty preparations (make-up, perfume, skin cream, nail polish) and grooming aids (soap, shampoo, shaving cream, deodorant) also known as personal care products.
- **Endocrine-disrupting chemicals** – Natural or human-made chemicals that may mimic, block, or interfere with the body’s hormones, which are a part of the endocrine system. These chemicals are associated with a wide array of health issues.
- **Environmental justice** – The fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no population bears a disproportionate share of negative environmental consequences resulting from industrial, municipal, and commercial operations or from the execution of federal, state, and local laws; regulations; and policies. Meaningful involvement requires effective access to decision makers for all, and the ability in all communities to make informed decisions and take positive actions to produce environmental justice for themselves.
- **Frontline community** – Groups of people that disproportionately carry the burden of harm from environmental disasters resulting from natural resource exploitation, economic disinvestment, under investment, and or social and political disenfranchisement. Frontline communities are often communities of color, Indigenous, and low-income and experience the first and worst of climate change consequences. They face a legacy of systemic inequities influencing where they live and work, the quality of their air and water, and economic opportunities (<https://www.careaboutclimate.org/blog/what-is-a-frontline-community>).
- **Gestational diabetes** – A type of diabetes that can develop during pregnancy in women who don’t already have diabetes. Every year, 2% to 10% of pregnancies in the US are affected by gestational diabetes. Having gestational diabetes can increase your risk of high blood pressure during pregnancy. It can also increase your risk of having a large baby that needs to be delivered by cesarean section (C-section).
- **Gestational hypertension** – Defined per The American College of Obstetricians and Gynecologists (ACOG) guidelines as blood pressure greater than or equal to 140mmHg systolic or

90mmHg diastolic on two separate occasions at least four hours apart after 20 weeks of pregnancy when previous blood pressure was normal. It occurs in about 6% of all pregnancies and is a risk factor for severe maternal morbidity and mortality.

- **Greenwashing/Cleanwashing** – The act of conveying a false impression or misleading information about how a company’s products are environmentally sound. Greenwashing involves making an unsubstantiated claim to deceive consumers into believing that a company’s products are environmentally friendly or have a greater positive environmental impact than they actually do.
- **Hypertensive disorders of pregnancy** – Hypertensive disorders in pregnancy (HDPs), defined as pre-pregnancy (chronic) or pregnancy-associated hypertension, are common pregnancy complications in the United States. HDPs are strongly associated with severe maternal complications, such as heart attack and stroke, and are a leading cause of pregnancy-related death in the US.
- **Inequitable exposure** – The same populations or communities experiencing racism, low housing quality, etc. are often those exposed to poorer environmental health, and often from many different sources—toxics in food, chemicals at work, traffic and air pollution, less green space, increased heat—which may together have different effects on human and reproductive health.
- **Low birthweight** – Low birthweight (LBW) is when a baby is born weighing less than 5 pounds, 8 ounces. Some babies with LBW are healthy, even though they’re small. But having a low weight at birth can cause serious health problems for some babies. A baby who is very small at birth may have trouble eating, gaining weight, and fighting off infections. Some may have long-term health problems, too. About 1 in 12 babies (about 8 percent) in the US is born with LBW.
- **NO₂** – Nitrogen dioxide (NO₂) is one of a group of highly reactive gases known as oxides of nitrogen

or nitrogen oxides (NOx). Other nitrogen oxides include nitrous acid and nitric acid. NO₂ is used as the indicator for the larger group of nitrogen oxides. NO₂ primarily gets in the air from the burning of fuel. NO₂ forms from emissions from cars, trucks and buses, power plants, and off-road equipment. Breathing air with a high concentration of NO₂ can irritate airways in the human respiratory system. Such exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing, or difficulty breathing), hospital admissions and visits to emergency rooms. Longer exposures to elevated concentrations of NO₂ may contribute to the development of asthma and potentially increase susceptibility to respiratory infections.

- **Ozone (O₃)** – This is a highly reactive gas composed of three oxygen atoms. It is both a natural and a man-made product that occurs in the Earth’s upper atmosphere (the stratosphere) and lower atmosphere (the troposphere). Depending on where it is in the atmosphere, ozone affects life on Earth in either good or bad ways. Tropospheric or ground-level ozone (what we breathe) is formed primarily from photochemical reactions between two major classes of air pollutants, volatile organic compounds (VOC), and nitrogen oxides (NOx). Ozone contributes to what we typically experience as “smog” or haze, which still occurs most frequently in the summertime, but can occur throughout the year in some southern and mountain regions. The majority of ground-level ozone is the result of reactions of man-made VOC and NOx. Significant sources of VOC are chemical plants, gasoline pumps, oil-based paints, auto body shops, and print shops. Nitrogen oxides result primarily from high temperature combustion. Significant sources are power plants, industrial furnaces and boilers, and motor vehicles.
- **PM_{2.5}** – Particulate matter, or PM_{2.5}, are very small particles in the air that are 2.5 micrometers (about 30 times smaller than a single human hair in diameter) or less in diameter. Particulate matter, one of six U.S. EPA criteria air pollutants, is a mixture that can include organic chemicals, dust,

soot, and metals. Some are emitted directly from a source, such as construction sites, unpaved roads, fields, smokestacks, or fires. Most particles form in the atmosphere as a result of complex reactions of chemicals such as sulfur dioxide and nitrogen oxides, which are pollutants emitted from power plants, industries, and automobiles. Particulate matter contains microscopic solids or liquid droplets that are so small that they can be inhaled and cause serious health problems.

- **PM₁₀** - Particulate matter, or PM₁₀, describes inhalable particles, with diameters that are generally 10 micrometers and smaller. See above for more info on particulate matter.
- **Polycyclic aromatic hydrocarbons (PAH's)** – Polycyclic aromatic hydrocarbons (PAHs) are a class of chemicals that occur naturally in coal, crude oil, and gasoline. They also are produced when coal, oil, gas, wood, garbage, and tobacco are burned. PAHs generated from these sources can bind to or form small particles in the air. People are usually exposed to mixtures of PAHs. Breathing air contaminated with motor vehicle exhaust, cigarette smoke, wood smoke, or fumes from asphalt roads are common ways exposure occurs. People take in PAHs when they eat grilled or charred meats or foods or foods on which PAH particles have settled from the air.
- **Post-traumatic stress disorder** – A mental health condition that develops following a traumatic event characterized by intrusive thoughts about the incident, recurrent distress/anxiety, flashback, and avoidance of similar situations.
- **Preeclampsia/eclampsia** – Preeclampsia happens when a woman who previously had normal blood pressure suddenly develops high blood pressure and protein in her urine or other problems after 20 weeks of pregnancy. Women who have chronic hypertension can also get preeclampsia. Preeclampsia happens in about 1 in 25 pregnancies in the United States. Some women with preeclampsia can develop seizures. This is called eclampsia, which is a medical emergency.
- **Preterm birth** – Childbirth that occurs before 37 weeks of pregnancy. Preterm birth is a leading cause of infant mortality and is linked with lifelong poor mental and physical health. Preterm birth is also a significant financial burden on families and government both short and long-term.
- **Reproductive justice** – This refers to the human right to maintain personal bodily autonomy, have children, not have children, and parent the children we have in safe and sustainable communities.
- **Sacrifice zones** – A sacrifice zone is a geographic area that has been permanently impaired by heavy environmental alterations or economic disinvestment, often through locally unwanted land use (LULU). Sacrifice zones are often defined as populated areas with high levels of pollution and environmental hazards, thanks to nearby toxic or polluting industrial facilities. These zones are usually frontline communities where residents, usually low-income families and people of color, live in proximity to polluting industries or military bases that expose them to dangerous chemicals and other environmental threats, thus “sacrificing” the health of the community. One well-known example of a sacrifice zone is Cancer Alley in Louisiana, a stretch of the Mississippi River between New Orleans and Baton Rouge. There is a large concentration of dangerous petrochemical facilities in this area. One community in Cancer Alley is 50 times more at risk of cancer compared to the national average.
- **Vulnerable populations** – Low-income populations (often communities of color) may be more vulnerable to poor environmental health because of multiple interrelated factors such as increased stress, higher rates of pre-existing conditions, intergenerational health issues, etc.

The vulnerable background to rising environmental threats: US maternal health crisis

Maternal and newborn health are often used as indicators of the general health of a society, and as indicators of inequities in health and unjust disparities in outcomes. The US has a deepening maternal health crisis and some of the worst indicators in the industrialized world as a result of historical and present-day systemic and interpersonal racism.¹ The crisis is centered by unjust racial and ethnic disparities in maternal health and birth outcomes.

For example:

- **Maternal mortality** rates are on the rise in the US and are two to three times worse for Black women than White women.²
- **Many thousands more women face severe health-impacting and life-threatening illnesses** or events during pregnancy, childbirth, and the postpartum period. Severe maternal morbidity is significantly higher among deliveries to women in every racial and ethnic minority category compared with deliveries among non-Hispanic White women.³
- **Maternal health conditions such as gestational diabetes and preeclampsia** are also on the rise, but rates are considerably worse for women of color than White women.⁴ These maternal illnesses are linked to maternal mortality, severe morbidity, and adverse birth outcomes, make other pre-existing conditions worse and can have lifelong consequences for pregnant people who experience them.
- **Reducing preterm birth rates** (birth before 37 weeks' gestation) is a CDC national health priority. Rates of preterm birth increased 4% between 2020 and 2021 in the US. The increases in recent years in preterm birth rates in the US is not fully understood but is linked to racism⁵ and environmental health factors.⁶ Rates of preterm birth are about 50% higher for Black women (14.8%) than White women (9.5%).⁷
- **Low birthweight** (the percentage of infants born at less than 2,500 grams or 5 pounds, 8 ounces) is also one of the leading causes of infant death in the US, and low birthweight infants are also more likely to have health problems. The low birthweight rate (at 8.31%) has risen since the most recent low in 2014 (8.00%), and in 2019 was the highest rate reported since the 2006 peak. Since 2016, low birthweight rates declined 1% for non-Hispanic White women but are up 3% for non-Hispanic Black (13.68 percent) and Hispanic (7.32 percent) women.⁸



Pregnancy Is especially vulnerable

Compared to the general population, pregnant people are at additional risk of multiple adverse health outcomes, including hypertension, diabetes, hemorrhage, thrombosis, stroke, and death.

As one researcher has put it:

“Pregnant women and the growing fetus experience an extraordinary time with many tightly regulated physiologic and psychologic changes. Any environmental perturbation could have both immediate and life-long consequences for both mother and offspring.”⁹



Climate change puts pregnant people and children at risk

“Pregnant people are especially vulnerable to the health harms resulting from climate change, namely preterm birth, small for gestational age, hypertensive disorders of pregnancy, and other adverse reproductive health and birth outcomes.”¹⁰

Pregnant people have special vulnerabilities to some environmental exposures because of their unique physiology, which increases vulnerability to air pollution and heat stress:

- **20% increase** in oxygen consumption
- **40% increase** in minute ventilation (volume of gas inhaled and exhaled in breathing)
- **50% increase** in cardiac output
- **Susceptibility to hypertensive disorders** of pregnancy, including preeclampsia and gestational hypertension
- **Dependence on functional transportation systems** and healthcare institutions during pregnancy also make this a vulnerable period to climate changes⁹

Environmental justice necessitates reproductive justice (and vice versa)

“Reproductive justice is ... the right to have children, not to have children, and parent the children we have in safe and healthy environments ... based on the human right to make personal decisions about one’s life and the obligation of government and society to ensure that the conditions are suitable for implementing one’s decisions.”

- Sistersong, Reproductive Justice¹¹

Approaches to protecting maternal health from environmental harms should use a reproductive justice approach. The framework, developed by Black sexual and reproductive rights activists together with other activists of color in the US, is helpful in thinking about action and what programming we need (for example, to address the greatest environmental injustices to perinatal health). First, the same problem, e.g., increasing extreme heat, may be little more than an inconvenience for some pregnant people who live and work in AC but harmful to others already struggling with injustices like poverty, low-paid and high intensity work, or outdoor work. Second, the approach demands a reality-based approach that includes other harms

to reproductive and pregnancy health and prevents ecological essentialism or approaches that promote the environment concerns over others which might be more important or pressing. Third, this approach calls for empowerment of the most-burdened pregnant people and communities as part of the solutions.

“Reproductive justice and environmental justice intersect at the nexus of woman’s blood and voice. Environmental justice and reproductive justice intersect at the very center of woman’s role in the processes and patterns of continuous creation. Of the sacred things that there are to be said about this, woman is the first environment is an original instruction. In pregnancy, our bodies sustain life”.

- Katsi Cook, Mohawk Nation at Akwesasne¹²



Brief 1: Air pollution worsens inequities in maternal and newborn health



Problem statement

Air pollution is widespread in the US and a major health risk factor, responsible for 63% of deaths from environmental causes.¹³ Typical sources of air pollution are increasingly intense wildfires,^{14,15} vehicular pollution,¹⁶ agriculture and industrial combustions,¹⁷ and common indoor items¹⁸ like cleaning supplies, pesticides, and household paint. For sensitive populations like pregnant people and infants, and for the health of the developing fetus, the risks of air pollution are especially high.

Air pollution is an important environmental justice and reproductive justice issue. Studies show that marginalized communities of color bear the heaviest burden of air pollution in the US.¹⁹ Studies identify Black people, for example, as a group in the US at increased risk for preterm birth because of exposure to the air pollutants PM_{2.5} and ozone.²⁰

Equitable access to clean air and strong legislation to better protect communities exposed to polluted air must be a part of the solution to address the US maternal health crisis.

Key Facts: American Lung Association's State of the Air 2023 report ²¹

The American Lung Association's State of the Air 2023 reports ozone and PM_{2.5} exposures during 2019, 2020 and 2021. Worryingly, the data links climate change to worsening air quality:

- Despite decades of US progress on cleaning up sources of air pollution, nearly 36% of Americans—119.6 million people—are living in places with failing grades for unhealthy levels of particle pollution or ozone.
- The number of people living in counties with failing grades for daily spikes in deadly particle pollution was 63.7 million, the most ever reported under the current national standard.
- Catastrophic wildfires are increasing the number of days and places with unhealthy levels of particle pollution and increasing the severity of pollution.
- People of color were 3.7 times more likely than White people to live in a county with failing grades for all three pollutants.

Air pollution harms maternal health

Studies show that air pollution exposure plays a role in some adverse maternal health outcomes including gestational diabetes and hypertensive disorders of pregnancy which carry life-long risks of medical problems for women.^{22,23,24}

- It's well-established that air pollution worsens the risk of hypertensive disorders of pregnancy.⁷ One meta-analysis showed statistically significantly increased risks for hypertensive pregnancy disorders in association with exposure to PM_{2.5}, NO₂, and PM₁₀ during pregnancy. Exposure to PM_{2.5} and NO₂ were also associated with significantly increased risk for preeclampsia.²⁵

- Air pollution exposure (exposure to PM_{2.5} in the second trimester, and exposures to SO₂, NO₂, and NOx) during pregnancy is also associated with an increased risk of gestational diabetes.^{26,27}

Air pollution harms babies

- Air pollution is linked to higher rates of preterm birth, low birthweight, and stillbirth. Preterm birth and low birthweight are significant risk factors for developmental disabilities, such as learning disabilities, developmental delays, autism, and attention-deficit/hyperactivity disorder.⁵ Air pollution can also disrupt brain development *in utero*. Marginalized communities and families often have the fewest resources to manage significant additional costs associated with lifelong mental, physical, and behavioral health problems.
- A recent review of 52 peer-reviewed studies representing over 32 million births in the US examined the increasingly common exposures of air pollutants and heat associated with a series of adverse birth outcomes (preterm birth, low birthweight, and stillbirth)¹⁰. The authors found that exposure to both PM_{2.5} and ozone was associated with increased risk of preterm birth and low birthweight in 79% and 86% of the studies, respectively. The populations at highest risk were individuals with asthma and minority groups, especially Black moms.
- Combustion-related air pollutants (including PM_{2.5}, polycyclic aromatic hydrocarbons or “PAHs,” nitrogen dioxide, and black carbon) are linked to adverse effects on brain development, including deficits in intelligence, memory, and behavior. Intrauterine exposure to PAHs has been associated with multiple neurodevelopmental disorders, including developmental delays, reduced IQ, anxiety/depression/inattention symptoms, attention deficit hyperactivity disorders (ADHD), and reduced size of brain regions important for processing information and impulse control.²⁸
- The impact of PAH exposure during fetal development on cognitive and behavioral outcomes is amplified by “material hardship or maternal demoralization”²⁹ suggesting marginalized communities could be more deeply impacted.

Wildfires and compounding harms during pregnancy



Climate change is increasing the number and intensity of wildfires, where they burn, how much they burn, and the length of wildfire season such that wildfires are now a major contributor to air pollution in the US.

Wildfires may have multiple impacts on maternal and newborn health:

- Multiple studies, done in Brazil³⁰ and the United States³¹—including California and Colorado—suggest a link between exposure to particulate matter in smoke and pregnancy complications, such as low birthweight and preterm birth.³²
- A recent study found that each additional, single day of exposure raised the risks of preterm birth. This study estimated nearly 7,000 excess preterm births were caused by wildfire smoke from 2007–2012, accounting for almost 4 % of preterm births during this period.³
- The loss of homes, evacuation, and displacement associated with wildfires can have important mental health consequences, with PTSD symptoms being reported in one study of pregnant people.³³ Poorer pregnant people or families may not be able to evacuate smoky areas because of cost.
- Outdoor workers, such as those working in construction and agriculture, who cannot easily limit their exposure or choose not to work, are also at a higher risk. Firefighters may also be at additional harm. One study examining firefighters’ risk compared to non-firefighters found a higher prevalence rate of miscarriages among firefighters.³⁴

Air pollution and inequitable exposure

Many studies document how Black Americans are more highly exposed to air pollution than White Americans because they live closer to industrial facilities³⁵ or due to greater exposure to traffic,³⁶ and due to systemic injustice. **People of color are three times more likely to live in an area with poor air quality than White people.** This leads to more reproductive harm, preterm birth, and low birthweight as well as more asthma, heart attacks, strokes, lung cancer, and preterm death.²⁰ These circumstances mean that Black Americans have a much higher risk of death compared to White people due to PM_{2.5} air pollution exposures³⁷. In the US, air pollutant exposure—specifically to PM_{2.5}—is disproportionately caused by economic activities of the non-Hispanic White majority, but disproportionately impacts Black and Hispanic minorities. This means that non-Hispanic Whites experience a “pollution advantage” on average by experiencing approximately 17% less air pollution exposure than what would be expected given their consumption. Blacks and Hispanics, on average, bear a “pollution burden” of 56% and 63% excess exposure, respectively, relative to the exposure caused by their consumption.³⁷

What happens to birth outcomes when air pollution is reduced?

Researchers took advantage of a “natural experiment” when eight coal and oil power plants in California retired between 2001 and 2011. The research team examined the links between power plant retirements and preterm birth and found that people living near plants experienced significant reductions in preterm births after the plants were shut down. For people living 0-5 kilometers from a power plant for example, they found preterm birth was reduced from 7.0% to 5.1%. They observed larger effects among non-Hispanic Black and Asian people and their infants compared to non-Hispanic White and Hispanic people and their infants.³⁸

General recommendations

- The EPA should explicitly and routinely classify pregnant populations exposed to air pollution as at-risk populations under the US National Ambient Air Quality Standards.
- The EPA and other relevant state and federal departments should identify communities living with significant air pollution and where pregnant people might be especially at risk from air pollution because of high rates of pre-existing conditions, like extreme heat, low nutrition, or poor housing. Special efforts to monitor and reduce air pollution should be made in these communities. Education and outreach to pregnant people and families about ways to reduce exposure should begin immediately.

For additional evidence for these recommendations, see: “Examining Joint Effects of Air Pollution Exposure and Social Determinants of Health in Defining ‘At-Risk’ Populations Under the Clean Air Act: Susceptibility of Pregnant Women to Hypertensive Disorders of Pregnancy.”⁴⁰

Maternal health provider recommendations:

[“Climate Change and Pregnancy: Guidance from the Western States Pediatric Environmental Health Specialty Unit”](#)

Policymaker and advocate recommendations:

See suggested recommendations from these organizations

- American Lung Association: <https://www.lung.org/policy-advocacy>
- Mom’s Clean Air Force: <https://www.momscleanairforce.org/issues/air-pollution/>

Brief 2: Extreme heat worsens inequities in maternal and newborn health



Problem statement

Because of climate change, exposure to extreme heat is increasing. Extreme heat is an emergent public health, pregnancy health, and reproductive justice problem. A growing body of evidence links extreme heat exposure to poorer health for pregnant people and to adverse birth outcomes, most notably preterm

birth and stillbirth. Studies done in the United States (US) disaggregated by race and ethnicity show Black pregnant people are inequitably impacted by extreme heat.

Both overall exposure and vulnerability to extreme heat are justice issues. Marginalized communities (often communities of color), people with low income, and outdoor workers experience an unfair burden of heat, have higher rates of pre-existing conditions that make extreme heat more dangerous, are more likely to work outdoors or in uncooled spaces, and have fewer resources (for example to cool homes).

Despite the maternal health crisis, pregnancy health is often omitted from public health efforts to raise awareness about extreme heat in the US. And even where pregnant people are included in “vulnerable populations” lists, the reality that racial and other injustices make heat an inconvenience to some pregnant people but a serious health challenge to others is glossed over.

Millions More People Will Face Extreme Heat by Midcentury

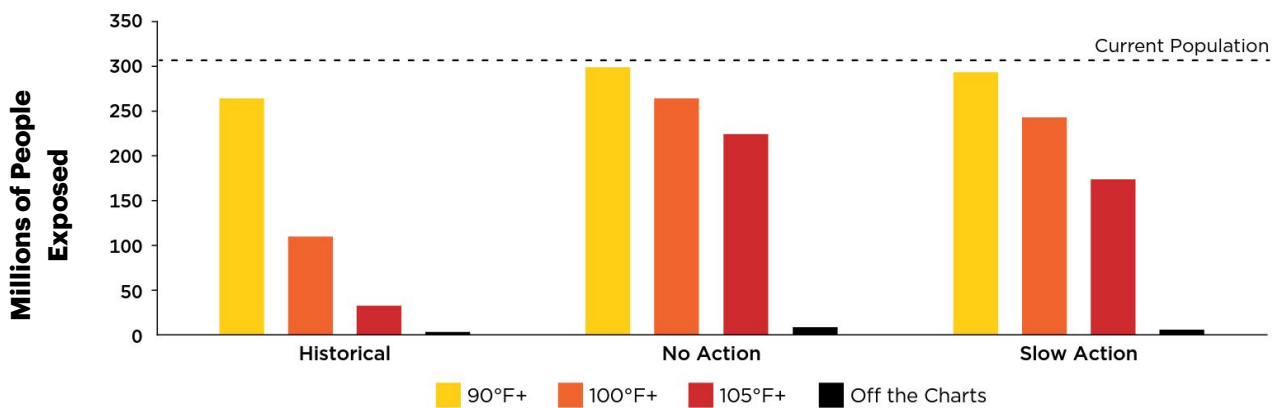


IMAGE from Union of Concerned Scientists’ report, Killer Heat, page 14 “[Millions More People Will Face Extreme Heat by Midcentury](#)”.⁴¹

Heat and pregnancy health

Pregnant people are biologically more vulnerable to their environment than non-pregnant people in many ways. Among other reasons, a smaller surface area to volume ratio, hormonal changes, and the generation of heat by a fetus make thermoregulation harder for pregnant bodies. This puts pregnant people at higher risk for heat-related illnesses. Pregnancy can create additional burdens on people with pre-existing conditions that are known to worsen with heat including respiratory and circulatory problems. Several studies indicate some areas of particular concern when it comes to heat and pregnancy health:

- Gestational diabetes: A 2020 systematic review “found consistent evidence of a seasonal effect on gestational diabetes risk, with higher prevalence ... and higher pregnancy glucose levels in summer months.”⁴²
- Hypertension: A 2022 study in South Africa found “high temperatures in early pregnancy increase risk of severe hypertensive disorders, likely through an effect on placental development.”⁴³
- Hospitalizations: A 2019 study found “prenatal exposure to extreme heat increases the risk of maternal hospitalization during pregnancy, and that this effect is greater for Black than for White mothers,” and that “(a)t childbirth, heat-exposed mothers are more likely to have hypertension and have longer hospital stays.”⁴⁴
- Pregnancy complications: A 2021 study in New York State found “immediate and prolonged effect of extreme heat exposure on pregnancy complications (including threatened or spontaneous abortion, renal diseases, infectious diseases, diabetes, and hypertension) ... stronger in African Americans and counties with lower socioeconomic position.”⁴⁵

Exposure to extreme heat and adverse birth outcomes

A significant body of research over the past ten years links exposure to high temperatures and adverse birth outcomes including preterm birth, low birthweight, and stillbirth.

- A 2020 systematic review of US-based studies by the Journal of the American Medical Association found an increased risk of preterm birth, low birthweight, and stillbirth from maternal exposure



to heat. “Four studies identified a range of increased risk of preterm birth from 8.6% to 21.0%. ... The subpopulations at highest risk were persons with asthma and minority groups, especially [B]lack mothers.”⁴⁶

- A 2020 systematic review by the British Medical Journal concluded that pregnant women must be included as an at-risk class for heat exposure and noted that heat exposure affects population health, including developing fetuses and pregnant women, and “we are likely to see an increase in preterm birth, a decrease in birth weight, and an increase in stillbirth rates.”⁴⁷

Several other studies have also found that adverse birth outcomes linked to heat exposure during pregnancy might be more likely for groups already vulnerable to higher rates of preterm birth and low birthrate.

- A 2017 study for example found that women with pre-existing or gestational hypertension or diabetes were at greater risk.⁴⁸ Similarly, Schifano et al. found that women in Rome, Italy, with chronic disease (especially cardiac conditions) were at higher risk of preterm delivery.⁴⁹
- A 2022 study using data from Texas found “ambient heat was associated with spontaneous preterm birth, with stronger associations occurring earlier in pregnancy and in racially and economically disadvantaged neighborhoods, suggesting climate change may worsen existing social inequities in preterm birth rates.”⁵⁰
- And a 2022 Australian study found “higher temperatures increase the risk of preterm birth and women with pre-existing health conditions and who smoke during pregnancy are potentially more vulnerable to these effects.”⁵¹

Labor rights protections for pregnancy and heat at work

Pregnant workers are more vulnerable to heat-related illnesses than workers who are not pregnant. Low-income workers, including already vulnerable undocumented workers, are especially likely to face unhealthy amounts of heat at work and poor protections. Only a handful of states have laws in place to protect workers from excessive heat. Pregnancy itself and the pressure to save money ahead of giving birth, especially with limited or no paid family leave, can also make workers more likely to work longer and harder in extreme heat. There has been limited research on pregnant workers health in extreme heat, but one Florida study said that interviewed workers “believe that heat exposure can adversely affect general, pregnancy, and fetal health, yet feel they lack control over workplace conditions and that they lack training about these specific risks.”⁵⁶

A new US law, the **Pregnant Workers Fairness Act**, went into effect on June 27, 2023, and requires employers to make reasonable accommodations for employees who have a known limitation due to pregnancy, childbirth, or related medical conditions, unless the accommodation poses an undue hardship to the employer. Under this law, pregnant and postpartum employees who work for employers with 15 or more employees can ask for accommodations such as extra rest or water breaks, cooling accommodation, or temporary transfers in hot weather. We recommend state agencies, advocates, health providers, and other stakeholders educate themselves and their communities about the new law.

For more on pregnancy and postpartum accommodations see: A Better Balance - <https://www.abetterbalance.org/our-issues/>

A smaller body of research has found links between heat exposure and birth defects.⁵² Studies have found links between in utero heat exposure and congenital heart defects as well as weak associations between elevated ambient temperature and neural tube defects.⁵³

Newborns and infants are also poor thermoregulators. Studies in California⁵⁴ and another using data from the city of Philadelphia have found elevated rates of infant deaths linked to increased temperatures.⁵⁵

Lack of awareness about risks to maternal and newborn health from extreme heat

Several studies have found that both maternal health workers and pregnant people who are exposed to heat, at work for example, lack information about the detrimental impact of heat on pregnancy health.

- A 2013 Florida-based study of agricultural workers and health workers found “limited knowledge about agricultural work or occupational and environmental health risks during pregnancy.”⁵⁷
- A study in Texas with maternal health workers (MHWs) found “while all participants were familiar with some heat illness symptoms, they were generally unaware of their clients’ vulnerability. MHWs’ minimal heat-risk knowledge leaves pregnant women and developing fetuses at risk of preventable harm.”⁵⁸ City-level heat plans and heat advisories often omit pregnant people as an at-risk group.⁵⁹



Successful public awareness campaign in Miami

A local women's rights advocacy organization in Miami area, Florida, The Women's Fund Miami-Dade, broke new ground in the summer of 2021 by erecting a billboard in central Miami warning of the impact of heat on the health of pregnant people. This billboard is the first of its kind: A public health awareness effort by an NGO focused on extreme heat and dangers to maternal health. The billboard was designed to raise public awareness, but also provides information on a website <https://womensfundmiami.org/heathealth/> where pregnant people and families can access information on "What they should know & what they can do" during heat waves and when suffering from extreme heat.

Florida is home to thousands of farmworkers and others, for example in the tourism industry, who work in extreme heat and without adequate labor protections, including a heat standard that would mandate access to water, rest, and shade. Miami city is already struggling to address extreme heat and significant increases in dangerous heat are predicted for the future. In 2021, Miami Dade County hired its first Chief Heat Officer to work to address heat and related justice issues.



General recommendations:

- Advocate for local public health jurisdictions and state health departments to include pregnant people and their infants in public awareness messaging re: heat, when they provide information about cooling centers and supports to help low-income households access cooling.
- Ensure pregnant workers are aware of their rights for accommodations, including in extreme heat.

Maternal health provider recommendations:

- "Climate Change and Pregnancy: Guidance from the Western States Pediatric Environmental Health Specialty Unit" http://wspehsu.ucsf.edu/wp-content/uploads/2022/06/cc-preg_fxsh_0530.pdf
- CDC Extreme Heat and Pregnant Women https://www.cdc.gov/disasters/extremeheat/heat_and_pregnant_women.html#:~:text=Why%20are%20pregnant%20women%20more,body%20and%20the%20developing%20baby

Policymakers, advocates, and climate activist recommendations:

- "Factsheet: Increasing Temperatures Because of the Climate Crisis is a Reproductive Justice Issue in the US" https://www.hrw.org/sites/default/files/media_2020/10/climatecrisis-reproductivejustice-US_1020_web.pdf
- "Higher Temperatures Hurts Moms and Babies" <https://www.nationalpartnership.org/our-work/health/moms-and-babies/higher-temperatures-hurt-moms.html>
- For more, please see: <https://www.heat.gov/pages/who-is-at-risk-to-extreme-heat#pregnant-people>

Brief 3: Disasters and displacement worsen maternal and infant health inequities



Problem statement

Due to climate change, disasters are growing in frequency and severity.⁶⁰ The World Health Organization (WHO) classifies a disaster as an occurrence disrupting the normal conditions of existence and causing a level of suffering that exceeds the capacity of adjustment of the affected community. Some populations are at more risk of facing health impacts, like people living on coastlines or areas prone to severe storms are more vulnerable to extreme weather-related disasters. Likewise, people living in poverty may have fewer resources to prepare or respond to disasters and as a result experience greater impacts.⁶¹ Recent research has provided evidence showing that long-standing structural racism has led to increased vulnerability of lower income and racially and ethnically marginalized individuals to exposures to climate related disasters.⁶²

Pregnant and postpartum people and their infants are especially vulnerable to the impacts of disasters. Disasters can lead to exposure to environmental pollutants, psychological stressors, and lack of healthcare access while also interacting with other

social drivers of health that may already have adverse impacts on health outcomes. Both short- and long-term effects can impact maternal and infant health, worsening already inequitable outcomes for the most vulnerable people and communities.⁶³ Studies have shown an association between disasters and impacts on maternal mental health, early pregnancy loss, birth defects, low birthweight, preterm birth, and placental abruption.⁶⁴

There are few interventions or mitigation efforts that have been tested and shown to be effective to improve outcomes for pregnant people and infants before, during, and post disasters. Creating a safe community where families thrive requires policies and solutions that not only address the harmful impacts of climate change but also mitigate future impacts on frontline families. This brief is a call to action for institutions and governments to dismantle unjust systems that uphold systemic injustices and that include pregnant people and infants in disaster planning and solutions. Families deserve policies and habitats that affirm their right to a healthy and more dignified future.

* Geographic scope: this brief focuses primarily on disaster related effects in the United States, but includes international data and examples to inform the overall work and potential policy solutions.

Maternal, infant, and child health and disasters

Disasters can increase adverse pregnancy outcomes such as preterm birth through a number of pathways including increased stress, environmental contamination, exacerbating pre-existing diseases, or disruption in healthcare services and loss of utilities.^{66,67,68} A systematic review including 49 peer-reviewed studies showed that various types of disasters including terrorist attacks, environmental and chemical disasters, and natural disasters (hurricanes, earthquakes) can lead to increased risk for adverse

health outcomes for pregnant people and their infants.⁹ Some examples of the impact disasters can have on pregnancy include:

- **Hurricanes:** Pregnant people with high hurricane exposure during Hurricane Katrina experienced higher risk of having low birthweight infants and preterm birth when compared to pregnant people with lower hurricane exposure.⁶⁹



- **Earthquakes:** Disaster events can impact pregnancy outcomes years after exposure. A study of over 73,000 Chinese pregnant people examined impacts years after exposure to the 2008 Wenchuan earthquake and found an increased risk of adverse outcomes including still birth, preterm birth, low birthweight, and small for gestational age for individuals exposed to the earthquake compared to those who were not exposed.⁷⁰
- **Floods:** A study comparing maternal and neonatal outcomes before and after the 1997 Red River flood in North Dakota found an increase in maternal morbidities such as anemia and uterine bleeding as well as adverse pregnancy outcomes including low birthweight and preterm birth following the event.⁷¹
- **Wildfires:** A review of research from 2012 – 2022 showed that wildfire exposure may be associated with adverse birth outcomes and increased maternal and infant morbidity; the effects can have long-term and wide-ranging health implications.⁷²

Refer to the framework in [APPENDIX A](#)

Inequitable exposure to disasters

Low-income communities of color are often at the frontline, experiencing the most immediate and most harmful impacts of climate change due to long standing environmental inequities, exploitation, and unequal policy infrastructure. Women, infants, and children in frontline communities bear the brunt of these risky conditions. Pregnant people in frontline communities are particularly vulnerable because, as demonstrated by peer-reviewed studies, the lasting effects of climate change on future generations begins before they're born, as pregnant people endure environmental crises similar to those their children will experience later in life.⁹⁵

Future forecasting reveals inequitable impacts of climate change

A report released by the EPA in April 2023, *Climate Change and Children's Health and Well-Being in the United States* quantifies projected health effects to children from climate change and reveals inequitable impacts to BIPOC, low-income, and non-English speaking households. The report looks at projected climate change impacts to flooding, air quality, extreme heat, seasonality, and infectious disease. The report includes projected increases in preterm births as a result of forecasted wildfire activity. With 2° C and 4° C of annual warming it is projected that there will be an additional 7,700 and 13,600 babies born preterm. The report also describes how future flooding may impact children and frontline communities with respect to short-term displacement and total home loss. With a 50cm and 100cm global sea level rise, approximately 185,000 and 1.13 million children, respectively, may be at risk to lose their homes completely. It's also noted that the increased stress associated with displacement from flooding can affect birth outcomes. The report demonstrates the critical and urgent need to address climate change to mitigate future health impacts for children and families.

[Climate Change and Children's Health and Well-Being in the United States \(epa.gov\)](#)



Community organizations provide essential education and resources

Birthmark Doula Collective is a birth justice organization that supports, informs, and advocates for pregnant and parenting people and their families in New Orleans. Birthmark has addressed emergency preparedness needs in New Orleans with the Infant Ready™ program. The program provides training, educational materials, and an emergency feeding kit. Their training provides emergency response workers, lactation support professionals, and healthcare providers with information about perinatal emergency preparedness. Educational materials are low-literacy and visually diverse containing information on safe infant feeding. Finally, the emergency feeding kits are lightweight and portable and include supplies for families to safely feed young children ages 0-2 years during and immediately following an emergency. Find more information about this program: <https://www.birthmarkdoulas.com/infant-ready>

This unequal impact is not a coincidence nor an accident. Legacies of structural racism continue to shape contemporary underinvestment in infrastructure. Low- and moderate-income communities suffer disproportionately from disasters. The disparities are borne out by evidence across minority groups and categories of risk. In the US, low-income people are less likely to have flood insurance,⁷⁵ Black people are more likely to contract and die from COVID-19,⁷⁶ and Native Americans are six times more likely than other populations to live in wildfire-prone areas.⁷⁷ Families urgently need support, especially frontline communities. Not only are they disproportionately exposed to disasters, they're also under-represented in disaster planning, policy, and funding decisions. A study in Arizona found that while there's a need for more strategic and equitable federal resource distribution and mitigation efforts for wildfires, the most vulnerable communities were less likely to be involved in decision making.⁷⁸

Disasters fuel an intergenerational cycle of vulnerability

Increased exposure of pregnant people to climate related disasters such as flooding, wildfire, extreme heat, and air pollution will leave a "fingerprint on future generations" that can have lifelong consequences.⁸⁰

- Results of a 2017 study indicate that infants in utero and young children suffer long-lasting effects including "less human capital accumulation, worse health, and fewer assets when they are adults."⁸¹
- The same study indicates that children born to mothers exposed to natural disasters also have less education and increased child labor.
- One meta-analysis showed that natural disaster-related prenatal maternal stress "significantly influences all spheres of child development" including worse cognitive, motor, socio-emotional, and behavioral outcomes.⁸²
- Fetal health is shaped by maternal exposure to disasters during pregnancy, predisposing infants to chronic health conditions later in life including obesity, metabolic disorders, congenital defects, allergies, and neurodevelopmental and psychological impairments.⁸³

Thus, climate injustice creates a cycle during the infant's entire lifespan that may ultimately impact their own children and future generations.

Immediate investment is needed

Immediate investment is needed to create more resilient systems for women and infants in frontline communities who will likely experience new and worsening disasters. This is especially vital following the COVID-19 pandemic, as women and children in unsafe situations have experienced increased vulnerability and reduced options for support. Governments must create policy that focuses on the modifiable factors within a disaster, such as land-use planning, disaster preparedness and response planning, healthcare infrastructure, and public awareness. Historically, support systems that exist on an everyday basis for pregnant people and infants have been weakened following disasters. The US needs support systems that can withstand disasters, but also adapt to be stronger and more robust immediately following a disaster. The very best disaster plans look beyond response to mitigation. For mitigation to be possible, systems that perpetuate climate injustice must be dismantled.



Maternal health provider recommendations:

- Include disaster planning for maternity services and consider regional patterns and disaster scenarios at the point of care.
- Promote breastfeeding and milk expression. See the CDC’s “Facts about infant feeding during emergencies” [Facts About Infant Feeding During Emergencies | Nutrition | CDC](#)
- Support the maternal-infant dyad in disaster and displacement planning for transport.

How can clinicians help reduce risks to children – [EPA Climate Change and Children’s Health and Well-Being in the United States report.](#)

Policymakers, advocates, and climate activist recommendations:

- Include pregnant people and their infants when creating disaster mitigation and response planning and funding.
- Fund community-based organizations that serve pregnant people and their infants by providing disaster related support, resources, and education.

Brief 4: Toxicants in cosmetics worsen maternal and infant health inequities



All personal care products, including shampoos, conditioners, body cleansers, and lotions, and beauty products, including color cosmetics and all other products used to clean or beautify appearance are considered “cosmetics” under the Food and Drug Administration’s (FDA) definition.⁸⁴ **This brief addresses concerns relevant to several product types in this category, here referred to generally as “cosmetics.”**



Problem statement

Exposure to toxicants in cosmetics is an environmental justice and reproductive health concern. Pregnancy can heighten a woman’s susceptibility to environmental toxicants and chemicals resulting in risks to both women’s and infant’s health outcomes.⁸⁵ Growing concerns stem from research linking cosmetic use and cosmetic-associated ingredients to adverse pregnancy and birth outcomes such as gestational diabetes, preterm birth, and low birthweight infants.⁸⁶ Women

of reproductive age use an average of 10 cosmetics in their daily routines which may include hair products, toothpaste, soap, and makeup.⁸⁷

Cosmetic use may play a role in the persistent and increasing racial and ethnic disparities in maternal and infant health outcomes, therefore it’s imperative for education, policies, and research to include beauty justice as a maternal and child health issue. Pregnant people of color experience higher exposures to cosmetic-associated chemicals of concern compared to other racial/ethnic groups, exacerbating the inequities that already exist in maternal and infant health outcomes.⁸⁸

Additional studies confirm higher exposures to cosmetic-related chemicals of concern for pregnant people of color:

- A 2017 study showed women of color have higher levels of beauty product-related environmental chemicals in their bodies compared to White women, even when adjusting for economic status.⁸⁹
- A 2022 study including pregnant people from five states observed that Hispanic women had higher exposure to phthalates, suspected endocrine disrupting chemicals (EDC’s), compared to non-Hispanic White women.⁹⁰
- A 2010 study reported that non-Hispanic Black women have significantly higher concentrations of methylparaben, a suspected EDC, compared to non-Hispanic White women using data from the National Health and Nutrition Examination Survey (NHANES).⁹¹

These differences in exposure to cosmetic chemicals are hypothesized to contribute to the racial and ethnic disparities in maternal and child health outcomes that are well-documented in the United States (US).⁹²

Cosmetics are not subject to premarket review in the US. There’s no standard review process for cosmetic ingredient safety (with the exception of color additives)

The prenatal period is a critical window of development

The prenatal period has been identified as a potentially sensitive window in terms of environmental exposures for both maternal and infant health.⁹⁴ The Developmental Origins of Health and Disease theory hypothesizes that environmental exposures during the prenatal period may contribute to health effects later in life, including obesity, diabetes, and cardiovascular disease.⁹⁵ Since pregnancy is a sensitive window for both maternal and child health and more than 80% of women are reported to experience pregnancy,⁹⁶ there's a need to explicitly consider maternal and infant health when evaluating the safety of cosmetics and developing policies/regulations surrounding cosmetic ingredients.

nor are there protection factors applied to account for particularly susceptible subpopulations, such as pregnant people and their developing child.⁹³ Products that pregnant people use may be a source of exposure to potentially harmful chemicals. Notably, the prenatal period is a critical window of development, and early life exposures may impact pregnancy health outcomes as well as health outcomes for the infant later in life.

Beauty is not skin deep—and while there's a growing awareness of this issue in the public space, additional attention and interventions should be developed to protect pregnant people. Furthermore, without current regulatory oversight at the product level, consumers must rely on public health interventions including consumer and healthcare provider education.

Cosmetic ingredients and pregnancy health

Some healthcare providers, academics, and other groups recommend that pregnant people avoid certain cosmetic ingredients or types, although we're not aware of any standardized approach for sharing this information with consumers. Key examples include preformed vitamin A such as retinol commonly used in anti-aging products, and Beta-hydroxy Acids (BHAs) such as salicylic acid commonly used in anti-acne products and as a preservative in

Beauty justice

Beauty justice is the fair and equitable access to cleaner and safer beauty products. The color of your skin or texture of your hair should not block your access to clean and safe beauty products.

Learn more about the history and context around beauty Justice by listening to the podcast:

Beauty + Justice

- Led by Lissah Johnson, doctoral candidate; Dr. Marissa Chan, doctoral candidate; and Tamarra James-Todd, Associate Professor Harvard T.H. Chan School of Public Health, Beauty + Justice takes a deep look into the history and context around beauty injustices. Topics include discussions about the potential impacts on health—from asthma to early menstruation to breast cancer—and the emotional toll of trying to attain a certain beauty standard. The podcast features guests from healthcare, academia, nonprofits, and clean beauty businesses to explore how we can achieve clean and equitable beauty practices. The podcast also brings to light the connection between racism and beauty product marketing, selling, and utilization. In the series trailer, Lissah Johnson says, “The fact is beauty is not harmless, nor frivolous, or only skin deep. It’s also a source of toxic environmental exposures and a tool for othering and excluding specific groups of people.”



a variety of cosmetics. Although exposure to most cosmetic ingredients may be at low concentrations in the formula, repeated exposure throughout the gestational period warrants a precautionary approach for ingredients that have documented reproductive or developmental toxicity.

Several ingredients or ingredient classes have been identified that may pose a health risk to pregnant people and the developing fetus and are a target for increased research, education, or awareness initiatives. A developing research area includes the use of suspected EDCs in cosmetics. These ingredients may be of particular concern since the concept of threshold, i.e. “the dose makes the poison,” may not be

the appropriate model for risk assessment for EDCs. Additionally, multiple, ubiquitous exposures across environmental sources, including food, water, and consumer products, may result in higher cumulative exposure than expected in any one category of exposure.⁹⁷

Studies have reported links between exposure to EDCs and cosmetic use with adverse pregnancy complications and birth outcomes. To list a few:

- A 2021 study from Preston et al. investigated associations between prenatal hair product utilization with gestational age at delivery and reported that daily use of hair oils later in pregnancy was associated with on average an eight-day decrease in gestational age at delivery compared to non-hair oil users.¹⁰⁰
- A 2017 study from Geer et al. examined the relationship between exposure to parabens and antimicrobial compounds with birth outcomes. They reported an increase in the odds of preterm birth, decreased gestational age at birth, birth weight, and body length from exposure to a variety of parabens and triclocarban.¹⁰¹
- A 2016 study from James-Todd et al. examined the association between urinary phthalate metabolites and risk factors associated with gestational diabetes—and reported that exposure to mono-ethyl phthalate during the second trimester and averaged across pregnancy was associated with an increased odds of impaired glucose tolerance and excessive gestational weight gain, respectively.¹⁰²

Refer to [APPENDIX B](#) for a table that outlines several ingredient classes of concern.



Endocrine disrupting chemicals

Endocrine disrupting chemicals (EDCs) mimic or interfere with the body's hormones, the messengers of the endocrine system. EDCs are linked to developmental, reproductive, brain, immune, and other health problems. EDCs can be found in many everyday products including cosmetics. Common EDCs include bisphenol A (BPA), dioxins, perchlorate, perfluoroalkyl and polyfluoroalkyl substances (PFAS), phthalates, phytoestrogens, polychlorinated biphenyls (PCB), and triclosan. People can be exposed to EDCs in many ways including food, pesticides, and cosmetics through air, skin, and water.⁹⁸ Several studies have linked phthalate exposure during pregnancy to low birthweight and preterm birth.⁶ Phthalate exposure can also result in altering 38 genes within the placenta. Pregnant Black women tend to have greater phthalate exposure than White women leading to disproportionate health outcomes among infants.⁹⁹

Unique challenge: Fragrances

On an ingredient list, the term “fragrance” may refer to a complex mixture of several ingredients; in fact, the International Fragrance Association (IFRA) lists more than 3,000 ingredients used as fragrance compounds including potential EDCs.¹⁰³ Therefore, consumers may not know what they are exposed to when using fragranced products. SB312, The Cosmetic Fragrance and Flavor Ingredient Right to Know Act of 2020, in California (CA) was the first law passed in the US that required the reporting of potentially hazardous fragrance and flavor ingredients on the CA Safe Cosmetics Program's website to make the information publicly available on their database.¹⁰⁴ The passing of this bill into law is an important step towards ensuring ingredient transparency for consumers and salon professionals. This still poses a challenge for consumers who need to look up each product to determine its safety.



Reducing chemical exposure during pregnancy

Since there are no premarket safety testing or requirements for ingredients in cosmetics in the US, currently the burden is placed on consumers to seek information and shop safer. Pregnancy (or planning to become pregnant) may be a key moment where an individual evaluates, and possibly changes, their participation in higher risk habits. The simplest intervention is to reduce or eliminate exposure to potentially harmful chemicals, which may be easier said than done. Common examples recommended by clinicians and others working in maternal and child health include switching to organic foods from conventionally farmed alternatives, replacing BPA-containing plastic in the home with safer alternatives, reducing intake of fish with high levels of methylmercury, and reducing or eliminating alcohol, tobacco, and drug use. These examples suggest that clinician-led education has the potential to impact a patient's behaviors and therefore reduce overall exposure to potentially hazardous chemicals during pregnancy. Furthermore, avoiding cosmetics with ingredients that may be harmful to health, such as those included in the table above, is another avenue to reduce exposure. It's important to note that there are barriers in terms of shopping safer based on price and product availability.

Inequitable access to safer products

Studies suggest that safer product purchasing discrepancies exist based on socioeconomic status (SES), which may contribute to environmental and beauty justice concerns within the subpopulation of pregnant people.

- A 2014 study by Barrett et al., found that White married people with higher household income and educational attainment were more likely to

participate in purchasing behaviors that would limit exposures to chemicals of potential concern in products.¹⁰⁶

- A study in 2021 by Preston et al., reported that lower SES women had higher use of perfume and bar soap in addition to higher total product use.¹⁰⁷

Chemicals of concern and dollar store products

The Campaign for Healthier Solutions produced a report Toxic Chemicals in Dollar Store Products: 2022 Report to examine the burden of toxic chemicals in consumer products sold in dollar stores. Through testing 226 products, they identified that more than half of the products contained one or more chemicals of potential concern, including phthalates, lead, and flame retardants. Many of these products tested were marketed to children. This report raises concern regarding potential differences in access to safe products across different store types which may be more accessible by certain communities than others.¹⁰⁵

Furthermore, there are barriers to safer product use among different communities and studies have identified that communities of color are more exposed to high hazard ingredients, such as EDCs, which may in part be driven by targeted marketing and beauty standards.

- A 2022 study by Buckley et al. examined the urinary concentrations of emerging chemicals among pregnant people and reported higher concentrations among those who identified as non-Hispanic Black, other race, multiple race, Hispanic, and having lower educational attainment. Notably, Hispanic participants were observed to have higher concentrations compared to non-Hispanic White participants.¹⁰⁸
- A 2021 study by James-Todd et al. reported that six commonly used hair products by Black women contained hormonally active ingredients which could negatively affect health outcomes.¹⁰⁹
- A 2020 Nguyen et al. study using NHANES data observed that women of color had higher levels of a variety of environmental chemical biomarkers including parabens and monoethyl phthalate compared to non-Hispanic White women.¹¹⁰

- A 2020 commentary by Dow and Murphy evaluated the influence of preconceived skin tone preference and targeted marketing. Their findings suggest that colorism and externalized discrimination in beauty products may hinder the formulation of racially and ethnically inclusive skincare products.¹¹¹
- A 2018 study by Helm et al. tested 18 hair products used by Black women finding 45 EDCs or asthma-associated chemicals. The product with the highest number of banned or regulated chemicals was a hair relaxer kit marketed to young girls.¹¹²
- A 2017 commentary by Zota and Shamasunder identified three key external factors influencing disproportionate exposure among vulnerable populations: colorism (dark-skinned women), hair texture preferences (African American women), and odor discrimination (African American women).¹¹³
- A foundational 2011 study by James-Todd et al. observed that African American and African-Caribbean women were more likely to use products containing EDCs compared to White women.¹¹⁴



Research has temporally documented differences in exposure to cosmetic chemicals of concern and the potential societal drivers of these differences (colorism, discrimination) which disproportionately burden women of color. However, consumer education can only go so far and even within the populations that are educated about exposure-reducing decisions, most individuals are unable to identify concrete opportunities for alternative cosmetic options. For example, one study found that the population educated and aware of household exposures to potentially harmful chemicals still continued to engage in behaviors that may expose them to environmental

Salon workers experience increased exposure to chemicals

Salon workers (such as nail technicians, hair stylists, and cosmetologists) experience continuous exposure to cosmetic chemicals due to the nature of their profession. Research has documented adverse pregnancy outcomes experienced by pregnant people in these professions which may be driven by increased exposure to cosmetic chemicals of concern. For example, one study in New York observed that cosmetologists had a 36% increased odds of giving birth to a low birthweight infant compared to realtors (the non-occupationally exposed reference group).¹¹⁵ Furthermore, a preliminary community-based health study led in part by Black Women for Wellness in Los Angeles identified a variety of health outcomes experienced by hair salon workers including nausea, fatigue, and irritation.¹¹⁶ These studies along with community-based work such as that led by Black Women for Wellness and the CA Healthy Nail Salon Collaborative speak to the need for solutions explicitly focusing on salon workers who face occupational exposure to cosmetic chemicals.

chemicals, such as wearing perfume during pregnancy, a potential source of phthalate exposure.¹¹⁷ Findings such as these underline the need for legislative action to reduce the burden of chemicals of potential concern in cosmetics marketed to all pregnant people.

Maternal health and/or cosmetic safety organization recommendations:

- Review and publish opinions on the ingredients of potential concern outlined in this report.
- Develop consumer facing materials, educational campaigns, and information outlining maternal health concerns from use of cosmetic ingredients of potential concern.
- Incorporate cosmetic chemical exposure as a maternal health issue in campaigns, briefs, and other materials.

Spotlight community based organization:

Black Women for Wellness (BWW) began as a group of women concerned with the health and wellbeing of Black babies. They teamed up with the Birthing Project to implement the Shangazi Program—a grassroots program that matched women to mentors who coached parents from pregnancy through one year postpartum. Within four years of implementation, BWW began moving upstream to address systems and policy in California. Their environmental justice program, Perfectly Natural, is an environmental health and justice project that generates and publishes community driven research by working with beauty professionals, hair stylists, and nail technicians and studying the impact of chemical use on health status.

- Healthy Hair Initiative
 - Beauty Professionals Behind the Chair – Research, reports addressing health risks to hair care professionals.
 - Curls & Conversations – Consumers, hair care professionals, and advocates discuss openly about the Black beauty industry.
 - Natural Evolutions – Report compilation of the work of BWW to provide insights into the culture, conversations, and research surrounding Black women’s hair, the beauty industry, and the subsequent effect on Black women’s health.
- Toxic Beauty Additives Advocacy, Education, and Studies

Maternal health provider and academia recommendations:

- Incorporate education regarding cosmetic chemicals, their potential harm to maternal and child health, and disparities in exposure in medical school curricula and continuing education requirements.
- Discuss cosmetic ingredients of potential concern and recommendations with patients as appropriate.

Policymaker and advocate recommendations:

- Support legislation focused on maternal health and cosmetic product safety for consumers and salon workers, who may themselves also be pregnant.
- Support legislation and initiatives focused on green chemistry and the development and utilization of safer ingredients.
- Consider working with advocacy organizations to develop bills focused on protecting maternal and child health from cosmetic chemicals of concern.



Brief 5: The fossil fuel cycle worsens maternal and infant health inequities

Fossil fuels overview

Coal, oil, and gas are fossil fuels that are found in the Earth. They're burned as fuel to generate electricity for our homes, schools, workplaces, and communities, to power cars, trucks, and airplanes, and for industrial processes. At each stage of the process, fossil fuel use presents harm to our health and environment, creating vulnerabilities for oil spills, groundwater contamination, air pollution, and other risks. To get them from the Earth to the point of use involves a complex process, including:



- Exploration: Searching for fossil fuels in the earth through mapping, sonars, drilling, coring, and constructing wells and site facilities.
- Extraction: Removing fossil fuels from the Earth through mining, drilling, hydraulic fracturing (fracking).
- Processing: Treating and refining the extracted fossil fuel to create a useable fuel product, including petrochemicals, the primary raw material of plastics.
- Transport: Moving the fossil fuel product from one location to another so it can be used for power or fuel, most often via pipeline, tanker, truck, or train.
- Combustion: Burning fossil fuels to generate energy.
- Waste Disposal: Intentionally or unintentionally storing or dumping waste products from any part of the fossil fuel life cycle on land, in water, or underground.



Problem statement

Fossil fuel dependence drives not one, but two human health crises: climate change and environmental pollution.¹¹⁸ Air pollution caused by the burning of fossil fuels such as coal, oil, and gas are often the most cited source of health problems. But a growing body of research shows that coal, oil, and gas activity is disruptive to health across the entire life cycle of fossil fuels.¹¹⁹

The perinatal experience is a critical period of development for the pregnant person, fetus, and newborn, and one that is particularly vulnerable to harmful or hazardous environmental exposure.¹²⁰ From extraction and processing to transport, combustion and waste disposal, exposure to fossil fuels has been linked to poor pregnancy, birth and newborn health outcomes, such as preterm birth, fetal or infant loss, and birth defects.¹²¹ Pollutants released during fossil fuel operations can contaminate the air, water, and soil, creating ample opportunities for exposure during the perinatal period.¹²²

While some have extracted great wealth from fossil fuels and their byproducts (including petrochemicals), the cost has been exacted disproportionately onto poor, Black, brown, and Indigenous communities. Through a long legacy of environmental racism, the

land and bodies of marginalized communities have been extracted from, dumped on, exploited, and sacrificed for fossil fuels. This has fundamentally shaped the ability of families to conceive and birth children in a safe environment free from harmful exposures, making it both a reproductive and environmental justice issue.

Failing to see the connections between the health crisis for pregnant people, its disparities, and continued fossil fuel use hinders our collective ability to advance meaningful change for birthing families. A just transition off fossil fuels is not only necessary to avoid catastrophic climate warming—it is necessary to avert a worsening maternal health crisis with glaring inequities. Legislation to decarbonize our energy, across electricity, transportation, buildings, homes, and industry, must also be viewed as maternal and child health policy. Reducing pollution from and production and use of fossil fuels and petrochemicals is a health intervention for pregnant people and babies that stakeholders across policy, healthcare delivery, and communities all must consider.

Fossil fuels and pregnancy health

Prenatal exposure to fossil fuels and petrochemicals has been associated with significant health risks to the pregnant person. Emerging research highlights the following areas for concern:

- **Fertility:** A 2022 study linked the decline in global reproductive health, including poor semen quality and oocyte failure, to chemical exposure from fossil fuels in industrialized nations.¹²⁴
- **Pregnancy Loss:** Studies have documented links between prenatal exposure to oil spills and increased risk of pregnancy loss.^{125,126}
- **High-risk pregnancy:** A 2020 systematic review on oil spills and gas flares found an association of these fossil fuel activities with health problems including hypertensive disorders and gestational diabetes in the pregnant person.⁹ The amount of exposure to fossil fuels plays a role. Casey et al. found that pregnant people living near high activity drilling and production were 30% more likely to have a high-risk pregnancy diagnosis.¹²⁷ A 2021 study found that living within 1km of an oil or gas extraction site during pregnancy is associated with increased odds of hypertensive conditions during pregnancy.⁶

A host of toxic pollutants are commonly emitted by oil and gas development. These are significantly associated with risks to the developing brain and with health problems in infants and children,¹²³ and include:

- Heavy metals
- Polycyclic aromatic hydrocarbons (naphthalene, chlorobenzene, phenol)
- Endocrine-disrupting chemicals
- Particulate matter
- Volatile organic compounds (benzene, toluene, ethylbenzene, and xylene)
- Other pollutants, including formaldehyde, ethylene glycol, methane

Fossil fuels and infant health

Fossil fuels and petrochemicals are also associated with serious health risks for the developing fetus and infant, a population incredibly vulnerable to environmental exposure in ways that disrupt development in early infancy and across the lifespan.

- **Preterm birth:** Exposure to oil and gas well sites has been found to be associated with increased risk of spontaneous preterm birth.¹²⁸ In high oil and gas activity areas, Casey et al. found pregnant people living nearby were 40% more likely to experience preterm birth.¹⁰ A 2020 scoping review found associations between unconventional oil and gas development, or “fracking,” and preterm birth.¹²⁹ Proximity matters: A 2022 cohort study looking at pregnancies in rural Alberta, Canada from 2013 to 2018 found pregnant individuals living within 10 km of 100 or more fracking wells one year prior to or during pregnancy had increased risk of preterm birth.¹³⁰ Pregnant people living near oil refineries,¹³¹ petrochemical plants,¹³² and power plants powered by fossil fuels were also associated with higher risk of preterm delivery, even at distances up to 20 km.¹³³
- **Fetal growth:** Recent studies have raised concerns about the association of low birthweight with living near oil and gas sites during pregnancy,⁶ and babies born in close proximity to a hydraulic fracturing (fracking) site.^{134,135,136} In a study of over 1 million births in Pennsylvania from 2004 to 2013, Currie et al. found that babies born within 1 km of a fracking site were 25% more likely to be born

with a low birthweight.¹⁹ Proximity to fracking sites has also been associated with infants born small for gestational age.¹³ For each 1% increase in active surface mining within 5km of the maternal residence, Buttling et al. found a 14g decrease in birth weight.¹³⁷

- Birth defects: A 2016 scoping review found moderate evidence for an increased risk of birth defects associated with oil and gas extraction activities.¹³⁸ In a study of over 100,000 births in Colorado, McKenzie et al. found that pregnant people exposure to natural gas development was associated with congenital heart and neural tube defects in the developing fetus.¹³⁹ Surface mining has also been linked to increased risk of birth defects compared to areas with no mining.¹⁴⁰



- Infant mortality: Studies emerging out of the Niger Delta, one of the largest crude oil producers in Africa and the setting of many catastrophic oil spills, have found that exposure to oil spills prior to conception increased risk of neonatal mortality for the pregnant people and babies studied.¹⁴¹

Fracking: A threat to maternal and infant health equity

Hydraulic fracturing, or fracking, is a method for extracting oil and gas from shale and other kinds of deep rock in the ground. Fracking has grown rapidly across the U.S. over the past decade. In fact, about 17.6 million Americans currently live less than one-mile from at least one active oil or gas well.¹⁴² Nearly 30,000 births in the U.S. occur within a one-mile radius of active fracking sites.¹⁹ Mounting evidence suggests that fracking is a threat to reproductive health and health equity.

- Pregnant people living near active fracking wells are 30% more likely to have a high-risk pregnancy and 40% more likely to give birth preterm.¹⁰ Additional studies continue to support the link between fracking sites and increased risk of preterm birth and high-risk pregnancies.^{12,13,143}
- Fracking has also been linked to low birthweight,^{10,144,145} and congenital birth defects.^{13,21,22}
- Fracking wells are disproportionately located near Black, brown, Indigenous, and low-income communities.^{146,147}
- These communities are also more likely to be exposed to fracking waste from wastewater disposal sites and flaring of excess gas, exacerbating their human and environmental health burdens.¹⁴⁸

Fracking pollutes our air, water, and soil

The process of fracking uses large amounts of water mixed with chemicals and sand to create fractures in the rock and release the fossil fuels inside. More than 1,000 chemicals are used in this fracking fluid, many of which are toxic, cancer-causing, or otherwise hazardous to human health.¹⁴⁹ A notable amount of the chemicals used in fracking are endocrine disruptors,¹⁵⁰ posing threats to fertility and reproduction. Its methods pollute soil, air, groundwater, and drinking water in local communities.

Current regulations are insufficient to protect families and communities from exposure to fracking's harms and to hold industry to safer practices for human and planetary health. It's essential for decisions about fracking, from the community to the state and federal levels, to consider the health and equity costs paid by pregnant people and babies.

To learn more: Center for Environmental Health's webinar series on how fracking and natural gas impact maternal child health <https://ceh.org/webinar-series-how-fracking-and-natural-gas-impact-maternal-health/>

Fossil fuels and inequitable exposures

Across the entire life cycle of fossil fuels, Black, brown, Indigenous, and low-income communities bear a disproportionate burden compared to other populations. They are more likely to be exposed and more likely to experience adverse health impacts from exposure. Fossil fuel activities are most often located in or near marginalized communities,² affecting the environments in which these communities seek to conceive, grow, and raise children. Studies have shown there is a higher risk of negative birth outcomes associated with exposure to fossil fuel activity among Black, brown, Indigenous, and low-income pregnant people.^{151,152}

Designing sacrifice zones of fossil fuel activity has created grave health and safety risks for communities seeking to resist and reduce the impacts of extractive fossil fuel industry on their land and bodies, particularly for women and young people. Systemic racism plays a critical role in the geography of sacrifice zones. Several studies show that fossil fuel plants are more likely to be built in areas where people of color live and work.^{153,154} People of color, including African Americans, Latinos, and Asian Americans, comprise a majority of the population in neighborhoods co-located with commercial hazardous waste facilities. 46% of housing units for low-income populations—mostly people of color—sit within a mile of factories reporting toxic emissions to the Environmental Protection Agency (EPA).¹⁵⁵



Inequitable impacts of oil spills on pregnant people and babies

Oil spills that occur in the extraction, transport, or storage of fossil fuels have catastrophic health, environmental, and socioeconomic consequences. They draw connections across other topics we have focused on in these briefs. In the case of the Deepwater Horizon oil spill, this impacted communities who also weather repeated natural disasters, racism, and socioeconomic inequities. Communities with proximity to oil spills are also often in proximity to oil combustion, subjecting them to additional air pollution.

A 2018 study found there was an increased incidence of preterm birth and low birthweight for infants living in coastal communities affected by the Deepwater Horizon oil spill.¹⁵⁷ These adverse impacts were more pronounced for young, Black, Hispanic, and unmarried moms.⁴⁰ Primary pathways of exposure to oil spill dispersants included breathing in, ingesting, or contacting through the skin.¹⁵⁸ The fossil fuel-related disaster also stressed health indirectly through environmental contamination, toxic stress, and disruptions to family systems through loss of income or opportunity.⁴¹ White children coming from families with higher income and education were less likely to experience reported health problems.⁴¹

Additional concerns about violence and the health toll it takes on pregnant and birthing people also arise. The Women's Earth Alliance describes how job opportunities at fossil fuel extraction sites draw encampments of a largely male workforce, fueling high rates of gender-based violence in the local Indigenous communities where extraction often occurs.¹⁵⁶ This highlights a dangerous intersection between fossil fuel activity and violence against women and LGBTQIA2S+ people.³⁹ Exposure to fossil fuel extraction and to the violence it breeds is threatening the health, safety, and survival of marginalized people who can become pregnant.

Learn about community impacts of fossil fuel storage, transport, and utilization

[Watch the Red Hill Fuel Leak: Oahu, Hawaii Video](#)

The Red Hill Bulk Fuel Storage Facility in Hawaii has a history of leaking fuel into the environment since 1947. The most recent leak occurred in November 2021, when a mixture of water and fuel was released from a drain line. The leak sickened fence line families who relied on a nearby well for their water. A CDC survey revealed that 87% of people who took the survey experienced new or worsening health symptoms including nausea, skin rashes, fatigue, and headaches.¹⁵⁹ Families were displaced from their homes and experience both health and economic hardship as a result of the fuel leak. The fuel spill also forced the shutdown of several water sources operated by the Honolulu Board of Water Supply that provided drinking water for urban Honolulu.

[Watch Smells Like: A Documentary Outlining Community Health Impacts from Industrial Air Pollution in Houston, Texas](#)

Persistent air pollution in Harris County, Texas is an example of environmental injustice with marginalized communities experiencing the burden of exposure. Watch this documentary to learn more about the historical injustice and the reproductive health impacts on the community.¹⁶⁰

“For decades, residents of Harris County, Texas, have endured life-threatening air pollution from oil refineries and petrochemical plants. This short documentary portrays the neighborhoods that border oil refineries and a determined activist, Juan Flores, who fights for clean air for his community.”

[Explore the Richmond Listening Project](#)

Learn about how the people living in the City of Richmond are experiencing environmental threats such as air pollution from fossil fuel operations. The project was developed to learn and better understand the needs of the community.

General recommendations

- Uphold human rights obligations to a clean, healthy, and sustainable environment by phasing out use of fossil fuels and investing in a just

transition to a clean energy economy.

- Reduce polluting emissions from existing fossil fuel and petrochemical operations by implementing and enforcing tighter regulations, banning practices such as fracking, and expanding environmental justice provisions of US law.

Maternal and newborn health worker recommendations

- Provide patient education about the risks fossil fuels pose to health from conception to pregnancy, birth, and across the lifespan. Partner with them on identifying strategies to reduce risk to their health.
- Advocate for clean, renewable energy access in your workplaces and communities in alignment with a just phase-out of fossil fuels. Ask your organization to commit to the U.S. Department of Health and Human Services’ pledge calling on the health sector to help meet the nation’s GHG emissions reduction targets and get fossil fuels out of our healthcare and our communities ([HHS, 2022](#)).

Policymaker and advocate recommendations

- See recommendations from Lake & Charles (2021) directed at lawmakers and the Biden administration: <https://genderpolicyreport.umn.edu/fossil-fuel-extraction-endangers-womens-health-and-safety-who-is-accountable/>
- Include and prioritize human and ecosystem health related assessments in new energy projects including renewable energy, using a gender and equity lens to center already marginalized communities as well as pregnant people and infants.
- Ensure fossil fuel disaster related risk assessments include special protections and funding for the needs and safety of pregnant people and infants.
- Include communities and individuals with lived experience and reproductive justice expertise in decision-making when it comes to a just transition off fossil fuels, risk assessments, and related policy decisions.

See also recommendations outlined in [The Influence of Environmental Toxicity, Inequity and Capitalism on Reproductive Health](#) report from the Center for Biological Diversity.

Additional resources

[Climate Change and Pregnancy: Guidance from the Western States Pediatric Environmental Health Specialty Unit](#)

[California Safe Cosmetics Program \(CSCP\) Product Database](#)

[Reproductive Justice Briefing Book: A Primer on Reproductive Justice and Social Change](#)

[The Climate Resilience for Frontline Clinics Toolkit](#)

[The New School: Tishman Environment and Design Center - Local Policies for Environmental Justice: A National Scan](#)

[The Link between Climate Change and Sexual and Reproductive Health and Rights](#)

[The Influence of Environmental Toxicity, Inequity and Capitalism on Reproductive Health](#)

[Gender and the Climate Crisis: Equitable Solutions for Climate Plans](#)

[The Influence of Environmental Toxicity, Inequity and Capitalism on Reproductive Health](#) report from the Center for Biological Diversity.

[In the Eye of the Storm: A People's Guide to Transforming Crisis & Advancing Equity in the Disaster Continuum](#) from the NAACP.

Suggested Readings to learn more

Peer-reviewed publications

- [Climate Change and Pregnancy: Risks, Mitigation and Adaptation](#)¹⁶¹
- [Racial disparities in preterm birth in USA: A biosensor of physical and social environmental exposures](#)¹⁶²
- [Impacts of climate change on reproductive, perinatal and paediatric health](#)¹⁶³
- [Indigenous Peoples of North America: Environmental Exposures and Reproductive Justice](#)¹⁶⁴
- [Climate change, women's health, and the role of obstetricians and gynecologists in leadership](#)¹⁶⁵

Reports, articles, and op-eds

- [Fertile Ground: Women Organizing at the Intersection of Environmental Justice and Reproductive Justice](#)¹⁶⁶
- [Why Every Environmentalist Should Be Anti-Racist](#)¹⁶⁷
- [It's time to combine the fights for climate change and reproductive justice](#)¹⁶⁸
- [Environmental advocates are asking the EPA to take a stand on reproductive justice](#)¹⁶⁹

Key readings from the briefs

Overall summary

- Burris, H.H., et al, "We propose that racial disparities in preterm birth are a cumulative biosensor of exposures that vary by race, arising from long-standing inequities."¹⁷⁰
- Morello-Frosch, R, et al, "We conclude that current environmental policy, which is focused narrowly on pollutants and their sources, should be broadened to take into account the cumulative impact of exposures and vulnerabilities encountered by people who live in neighborhoods consisting largely of racial or ethnic minorities or people of low socioeconomic status."¹⁷¹
- Zota, A.R., et al, "[We] illustrate how interlocking systems of racism and sexism may affect Black women's exposure to environmental chemicals, their epigenetic regulation of uterine fibroids, and their clinical care. Because health relies on biological and social-structural determinants and varies across different intersectional positions, our proposed framework may be a promising approach for understanding environmental health inequities and furthering social justice."¹⁷²

Air pollution

- Koman PD, Hogan KA, Sampson N, Mandell R, Coombe CM, Tetteh MM, Hill-Ashford YR, Wilkins D, Zlatnik MG, Loch-Carusio R, Schulz AJ, Woodruff TJ. Examining Joint Effects of Air Pollution Exposure and Social Determinants of Health in Defining “At-Risk” Populations Under the Clean Air Act: Susceptibility of Pregnant Women to Hypertensive Disorders of Pregnancy. *World Med Health Policy*. 2018 Mar;10(1):7-54. doi: 10.1002/wmh3.257. Epub 2018 Mar 12. PMID: 30197817; PMCID: PMC6126379.
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- Ghosh R, Causey K, Burkart K, Wozniak S, Cohen A, et al. (2021) Correction: Ambient and household PM2.5 pollution and adverse perinatal outcomes: A meta-regression and analysis of attributable global burden for 204 countries and territories. *PLOS Medicine* 18(11): e1003852. <https://doi.org/10.1371/journal.pmed.1003852>
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- Stieb DM, Chen L, Eshoul M, Judek S. Ambient air pollution, birth weight and preterm birth: a systematic review and meta-analysis. *Environ Res*. 2012;117:100–111. doi:10.1016/j.envres.2012.05.007
- Li X , Huang S , Jiao A , et al Association between ambient fine particulate matter and preterm birth or term low birth weight: An updated systematic review and meta-analysis. *Environ Pollut* 2017;227:596–605.doi:10.1016/j.envpol.2017.03.055
- Bekkar B, Pacheco S, Basu R, DeNicola N. Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US: A Systematic Review. *JAMA Netw Open*. 2020;3(6):e208243. doi:10.1001/jamanetworkopen.2020.8243
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Extreme heat

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Disasters and displacement

- Issue brief on [chest/breastfeeding in emergencies](#)

Fossil fuels

- Fracking and fetal impacts PSR <https://psr.org/wp-content/uploads/2019/06/compendium-6.pdf>
- David Gonzalez, et al. “[Oil and gas production and spontaneous preterm birth in the San Joaquin Valley, CA.](#)” *Environmental Epidemiology*, Vol 4, August 2020
- Lisa M. McKenzie, et al, “[Congenital heart defects and intensity of oil and gas well site activities in early pregnancy.](#)” *Environment International*, Vol 132 November 2019;
- Ellen Webb, et al, “[Developmental and reproductive effects of chemicals associated with unconventional oil and natural gas operations.](#)” *Reviews on Environmental Health*, Vol. 29 Issue 4, published online 5 December 2014.
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Appendix A

Harville, et al developed a framework to assess the effects of disasters and their aftermath on pregnancy and infant outcomes. The framework considers the short-term effects, long-term consequences, and possible mediators impacting the perinatal population in disasters. This framework elucidates the profound effect of disrupted systems on birthing people and infant health.

Modifiable factors within a disaster and associated health impacts (after Harville, et al. 2021)	
Modifiable factors	Associated health impacts
Access to healthcare	Temporary or permanent closure of clinics, loss of income or savings to pay for care, delay of care due to competing demands. De-prioritization of reproductive healthcare post-disaster and concomitant increases in unplanned pregnancies.
Stress	Directly linked to pregnancy complications; increased blood pressure, reduced fetal growth, and preterm birth; child development impacts; chronic disease in parent and child; vulnerability to infection; postpartum depression.
Smoking and other substance use	Addiction treatment may be limited after disasters when individuals are struggling to cope.
Diet	Severe nutrient restriction: fetal growth restriction and preterm birth. Excessive weight gain: gestational diabetes, preeclampsia, and labor and delivery complications.
Physical activity	Overexertion associated with preterm birth. Leisure or health related physical activity may be deprioritized post-disaster, raising risk of gestational diabetes and hypertension.
Support for breastfeeding	Reduced milk supply, lack of support, and provision of formula in relief packages can discourage breastfeeding.

Short-term and long-term effects of disasters on pregnancy and outcomes (after Harville, et al. 2021)

	Hazard	Associated health impacts
Short-term	Physical trauma - e.g. vegetation or structure collapse	Physical injury; health system may be overwhelmed impacting ability to treat physical trauma.
	Environmental contaminants - e.g. floodwaters carrying animal waste or harmful chemicals, harmful algal blooms	Wide array of impacts depending on contaminant.
	Extreme temperatures	Extreme heat is associated with placental abruption, preterm birth, low birthweight, birth defects, and stillbirth.
	Exposure to disaster itself - hurricane, wildfire, flood, etc.	Spontaneous miscarriage, preterm birth, low birthweight, emergency room visits for pregnant people, prolonged labor, and increased chance of cesarian delivery.
	Air pollution/particulate matter/wildfire smoke	Preterm birth, low birthweight, stillbirth.
	Extreme precipitation	Adverse birth outcomes, increased risk of exposure to mosquito-borne diseases.
	Mold	Allergies, asthma, eczema.
	Housing disruption/displacement	Increased exposure to heat and cold, dehydration, malnutrition, preterm labor triggered by acute trauma, physical exertion, transportation accidents, disrupted care. Mold or other environmental contaminants may be introduced into housing or already exist in short-term housing/trailers.

Long-term	Relocation/displacement	Worse physical and mental health indicators; disrupted pregnancy and/or postpartum care; loss of continuity between providers; increased risk of preterm birth and maternal mortality.
	Mental health adjustment/coping	Disrupt social networks and degrades social cohesion and community resilience.
	Domestic violence	Pregnancy complications and adverse birth outcomes; childhood abuse associated with adverse pregnancy outcomes later in life.
	Changes in family functioning/roles	Worsening birth outcomes; changes in rates of marriage, divorce, and remarriage have all been observed.

Appendix B

Table 1 includes additional ingredient classes of concern. Although not exhaustive, this list can be used as a guidance for clinicians, birth workers, professional organizations, community organizations, and legislators to target further research and decision-making activities regarding cosmetic usage within the pregnant population. Since “greenwashing” or “cleanwashing” practices may be used by companies or lobbying groups without completing due diligence on the tradeoffs between ingredient options, Table 1 provides targets for additional research and education, and caution should be taken when seeking “safer” alternatives.

Table 1. Potential health concerns for ingredients & ingredient classes typically found in cosmetics

Ingredient	Examples	Potential health concerns	Function	Typically found in
Parabens	<ul style="list-style-type: none"> Methylparaben Butylparaben Propylparaben Benzylparaben 	Endocrine disruption	Preservative	All cosmetics
Phthalates	<ul style="list-style-type: none"> Dibutyl phthalate (DPB) Dimethyl phthalate (DMP) Diethyl phthalate (DEP) 	Endocrine disruption	Fragrance, plasticizer, solvent	“Fragrance”
Formaldehyde-releasing ingredients	<ul style="list-style-type: none"> DMDM hydantoin Diazolidinyl urea Imidazolidinyl urea Tosylamide/formaldehyde resin Quaternium-15 Sodium hydroxymethylglycinate 2-bromo-2-nitropropane-1,3-diol Polyoxymethylene urea 5-bromo-5-nitro-1,3 dioxane Glyoxal Methenamine Benzylhemiformal 	Cancer, DNA damage, developmental toxicity, endocrine disruption	Preservative	All cosmetics
Hydroquinone	N/A	Cancer, DNA damage, endocrine disruption	Skin bleaching, hair coloring	Skin lightening
Oxybenzone/ Benzophenone-3	N/A	Crosses placenta, endocrine disruption	SPF ingredient	Sunscreens

Aluminum chloride hexahydrate	N/A	DNA damage, Reproductive toxicity	Antiperspirant	Antiperspirant deodorant
“Fragrance/ Parfum”	N/A	Transparency—consumer cannot determine ingredients	Fragrance	All cosmetics
Retinoids	Retinol, “Retinol X”, and OTC retinoids	Reproductive/developmental toxicity	Anti-aging	Anti-aging products
Ethanolamines	Monoethanolamine (MEA), diethanolamine (DEA) and triethanolamine (TEA)	Contamination with nitrosamines; cancer, reproductive/developmental toxicity, endocrine disruption	pH adjuster	All cosmetics
Butylated hydroxytoluene (BHT)/Butylated hydroxyanisole (BHA)	N/A	Cancer, reproductive/developmental toxicity, endocrine disruption	Antioxidant, fragrance	All cosmetics
Triphenyl phosphate (TPHP)	N/A	Crosses placenta, endocrine disruption	Plasticizer	Nail polish
Cannabis	Cannabidiol (CBD), cannabitol (CBN), tetrahydrocannabinol (THC)	Reproductive/developmental toxicity, liver toxicity	Varies, pain management	Leave-on cosmetics