

Submission for Advanced Notice of Proposed Rulemaking: “Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings Rulemaking”

(Docket No. OSHA-2021-0009)

<https://www.osha.gov/laws-regs/federalregister/2021-10-27>

Thank you for the opportunity to provide input in response to the Advance Notice of Proposed Rulemaking (ANPRM). **This submission focuses on the need for the rule makers to fully consider the harmful impacts of heat on pregnancy health.**

[Human Rights Watch](#) is a nonprofit, independent organization that investigates allegations of human rights violations in more than 100 countries around the world, including in the United States, by interviewing victims and witnesses, gathering information from a variety of sources, and issuing detailed reports. Where human rights violations have been found, Human Rights Watch advocates for the enforcement of those rights with governments and international organizations and mobilizes public pressure for change.

Access to sexual and reproductive healthcare for women in the US and closing the wide racial disparities in maternal health and birth outcomes are ongoing areas of concern for the women’s rights division of Human Rights Watch. Our US program has also advocated for improvements in working conditions in the US, including in agriculture (for both [child workers](#) and [women workers](#) facing sexual abuse) and in [meat and poultry plants](#).

- The Universal Declaration of Human Rights, which the US helped to draft, states that everyone has the right to a standard of living adequate for the health and well-being of oneself and one’s family, including food, clothing, housing, medical care, and necessary social services. It also specifies that “motherhood and childhood are entitled to special care and assistance” and protects “just and favorable conditions of work.”
- The International Covenant on Economic, Social and Cultural Rights, which the US has signed, though not yet ratified, recognizes “the right of everyone to the enjoyment of the highest attainable standard of physical and mental health” and to “(s)afe and healthy working conditions.”
- The International Convention on the Elimination of Racial Discrimination, which the US ratified in 1994, prohibits policies and practices that have the purpose or the effect of restricting rights based on race, including facially race neutral practices that create racial disparities. Under this treaty, the US is obligated to act affirmatively to eliminate policies and practices with discriminatory impacts.

The below material is relevant to the following questions from the ANPRM:

(1) What are the occupational health or safety impacts of hazardous heat exposure?

- (2) What sources of data are important to consider when evaluating occupational heat-related illnesses, injuries, and fatalities?
- (3) Beyond the studies discussed in this ANPRM, are there other data that provide more information about the scope and magnitude of injuries, illnesses, and fatalities related to occupational heat exposure?
- (8) Are there industries, occupations, or job tasks that should be considered when evaluating the health and safety impacts of hazardous heat exposure in indoor and outdoor work environments? Please provide examples and data.
- (19) Are there specific populations facing disproportionate exposure to or outcomes from hazardous heat in indoor or outdoor work settings? Please provide examples and data.
- (20) Are there data sources available to assess inequalities in exposure to or outcomes from hazardous heat in indoor or outdoor work settings?
- (23) How will climate change affect existing inequities in occupational heat exposure and related health outcomes? Please provide relevant data.
- (24) How will climate change affect the risk of occupational heat-related illness and mortality in the different regions of the United States?
- (25) How should climate change be factored into an OSHA heat illness and injury prevention standard?
- (27) Are OSHA's existing efforts and authorities adequate or effective in protecting workers from hazardous heat in indoor and outdoor work settings?
- (28) What additional efforts or improvements should be undertaken by OSHA to protect workers from hazardous heat in indoor and outdoor work settings?
- (29) What are the gaps and limitations of existing applicable OSHA standards, as well as existing campaign, guidance, enforcement, and other efforts for preventing occupational heat-related illness in indoor and outdoor work settings?
- (48) What factors, beyond those discussed above, contribute to heat stress in outdoor and/or indoor occupational settings?
- (51) What factors are the most important contributors to heat-related illness risk?
- (52) Are there other individual risk factors that contribute to the risk of heat-related illness?
- (53) What individual risk factors are the most important contributors to heat-related illness risk?

Overview

We recommend that maternal health and the specific vulnerabilities pregnant people face from heat in the workplace be fully considered during this rulemaking process, and with the US maternal justice crisis (please see below, but in short: unjust racial disparities in maternal health and birth outcomes) as context.

However, specific actions should be taken to better protect pregnant workers from dangerous heat:

- The final heat injury and illness prevention rule should be robust enough to provide appropriate protection for pregnant women/people, as well as all workers, from extreme heat. The rule should recognize that some groups, including pregnant workers, are more

at risk from extreme heat. A separate heat standard for pregnant workers may be inappropriate since pregnant workers' individual needs vary.

- Knowledge on heat and pregnancy health is currently low among both health providers, employers, and the public. Training and heat education for all workers should include information on pregnancy health and heat. In advance of the rule and during its rollout, OSHA should consider doing a public awareness campaign including posters, handouts, broader trainings, etc.
- When drafting the heat standard and associated materials to guide employers, OSHA should include the importance of providing accommodations to better support pregnant workers and access to these accommodations should be protected. This includes when pregnancy-related limitations arising from extreme heat trigger the need for an accommodation, such as needing extra water. Where work accommodations are protected by law, OSHA should work to ensure that employers provide information to employees about their rights including when writing this rule.
- The proposed National Advisory Committee for Occupational Safety and Health (NACOSH) should include experts on pregnancy and occupational health, ideally experts with a reproductive justice background.
- Relevant education for health workers should also include heat health information for pregnant people, where possible. OSHA should, if possible, support occupational health and other health worker training on providing information and advice on heat health for pregnant people and on providing support, where requested, to help pregnant people get work accommodations.

A significant body of research over the past 15 years (please see below, and document attached with this submission for more information) shows increasing exposure to heat threatens to worsen an already-existing maternal health crisis in the US, where rates of preterm (or premature) birth have been on the rise for several years.¹ The crisis is centered by racial inequities in maternal health and birth outcomes. Exposure to extreme heat and other climate change impacts worsens disparities between who gets to have a healthy pregnancy and newborn and who does not. The studies suggest that US government policy makers and healthcare workers will need to do more to protect pregnancy and newborn health from increasing and more intense heatwaves, and generally hotter days and nights across the US, and from other climate-related harms.

Ensuring the rights of pregnant people to their health and dignity are respected at work, including through protections from harmful exposure to heat, is one important element. Farmworkers, construction, landscaping, and restaurant and fast-food workers that work in kitchens with poor air conditioning or ventilation are all in industries OSHA should especially consider.

¹ The preterm (birth before 37 weeks gestation) birth rate fell between 2019 and 2020 for some groups according to 2020 CDC data, for example for non-Hispanic whites (by 2 percent) and Hispanic women (by one percent), but not for Black women. Some other countries have also noted reductions in preterm birth during the Covid-19 pandemic. But the general trend remains worrying. In 2019, and for the four previous years, the preterm birth rate increased every year.

Heat Exposure is Increasingly a Concern for Pregnancy Health

Many experts have expressed concern about the impact of heat exposure on pregnancy health. For example:

- The United Nations Food and Agricultural Organization (FAO) issued a report in 2020 on heat exposure and work, especially in agriculture, that included concerns that “heat stress may increase the risk that pregnant females will give birth prematurely or to babies with birth defects.”² The World Health Organization (WHO) issued the report “Heat and health in the WHO European Region: updated evidence for effective prevention” and included a range of studies on pregnancy health and heat and advised that pregnant people be included in heat health efforts.³
- The American College of Obstetrics and Gynecology (ACOG) [issued guidance](#) in July 2021 noting that exposure to extreme heat (and extreme cold) may be associated with preterm birth and low birth weight.⁴ The [International Federation of Gynecology and Obstetrics](#), together with the University of California San Francisco and the Health and Environment Alliance, noted in a 2020 publication that “extreme heat (is) associated with preterm birth, low birthweight, and stillbirth in studies across the world.”⁵ Both institutions recommend that healthcare professionals provide guidance to patients about environmental harms, including from climate change/heat exposure. The TH Chan School of Public Health at Harvard University [has noted](#) “(r)esearch shows that higher temperatures are associated with preterm birth.”⁶
- The Federal Environmental Protection Agency (EPA) and the Centers for Disease Control and Prevention (CDC) include pregnant people as an at-risk group in their [guide](#) to extreme heat for state and local government.⁷
- The National Oceanic and Atmospheric Agency (NOAA) heat safety information for 2021 included pregnant people as an at-risk group, noting “Pregnant women are also at higher risk. Extreme heat events have been associated with adverse birth outcomes such as low birth weight, preterm birth and infant mortality, as well as congenital cataracts.”⁸

² FAO, “Managing Heat in Agricultural Work – Forestry Working Paper 1,” 2018, <http://www.fao.org/3/i9179en/I9179EN.pdf> (accessed January 1, 2022).

³ WHO Regional Office for Europe, “Heat and health in the WHO European Region: Updated evidence for effective prevention,” 2021, <https://www.euro.who.int/en/publications/abstracts/heat-and-health-in-the-who-european-region-updated-evidence-for-effective-prevention-2021> (accessed January 20, 2022).

⁴ “Reducing Prenatal Exposure to Toxic Environmental Agents,” The American College of Obstetricians and Gynecologists (ACOG) Committee Opinion Number 832, July 2021, <https://www.acog.org/clinical/clinical-guidance/committee-opinion/articles/2021/07/reducing-prenatal-exposure-to-toxic-environmental-agents> (accessed January 20, 2022).

⁵ International Federation of Gynecology and Obstetrics (FIGO), Health and Environment Alliance (HEAL), UCSF Program on Reproductive Health and the Environment, “How Does Climate Change and Air Pollution Affect Pregnancy and Human Development?” April 2020, <https://www.env-health.org/wp-content/uploads/2020/04/FINAL-Climate-Change-and-Pregnancy-Fact-Sheet.pdf> (accessed January 20, 2022)

⁶ Harvard T.H. Chan School of Public Health, C-Change Center for Climate, Health, and the Global Environment, “Pregnancy and Preterm Birth,” <https://www.hsph.harvard.edu/c-change/subtopics/climate-change-and-pregnancy-preterm-birth/> (accessed January 20, 2022).

⁷ EPA and the CDC “Climate Change and Extreme Heat What You Can Do to Prepare,” October 2016 <https://www.cdc.gov/climateandhealth/pubs/extreme-heat-guidebook.pdf>, (accessed January 20, 2022).

⁸ National Weather Service and NOAA, “Heat Safety Tips and Resources,” <https://www.weather.gov/safety/heat> (accessed January 20, 2022).

- The congressionally mandated “[Chapter 14: Human Health](#)” in *Fourth National Climate Assessment*, US Global Change Research Program, 2018, also notes links in studies between heat and premature birth, low birth weight and stillbirth.⁹ State plans to address climate change that include pregnancy health impacts from exposure to high temperatures as an area for action include New York, North Carolina, and Oregon.
- A Better Balance, The Black Women’s Health Imperative, Human Rights Watch, the National Birth Equity Collaborative and the National Latina Institute for Reproductive Justice produced a [factsheet in 2020](#) on why extreme heat is a reproductive justice issue in the US.¹⁰ This factsheet includes concerns and policy recommendations (including a federal heat standard) for better protecting pregnant workers.
- More than 55 organizations working in maternal health and environmental justice signed [a letter in 2021](#) to ask President Biden to include maternal health in federal climate adaptation plans, including with regard to exposure to higher temperatures.¹¹
- The Center for American Progress [in a 2021 article](#) recommended: “to prevent heat-related maternal morbidity or mortality, federal policymakers must also develop and disseminate standards, such as a national heat vulnerability index, that states and local governments can use as a model to ensure better uniformity in assessing exposure to extreme heat.”¹²
- The National Partnership for Women and Families noted in a 2021 policy brief “pregnant people who work outdoors in high temperatures (such as farmworkers) have a higher risk for heat exhaustion and adverse newborn outcomes such as preterm birth, low birth weight, heart birth defects, and infant mortality.”¹³

Some worker rights organizations have recently drawn specific attention to how poor worker protections make extreme heat dangerous for pregnant laborers. For example, A Better Balance, a pregnancy rights advocacy organization, has been campaigning to pass federal and state laws to close legal gaps (including in the Pregnancy Discrimination Act and Americans with Disabilities Act) to ensure that pregnant workers can get simple pregnancy accommodations instead of being forced out of work or into unpaid leave or risk their health by working as usual, ignoring the risks of extreme heat or associated problems such as lack of sufficient water.¹⁴ For example, from [A Better Balance 2021 report](#):

⁹ “Chapter 14: Human Health” in *Fourth National Climate Assessment*, US Global Change Research Program, 2018, <https://nca2018.globalchange.gov/chapter/14/> (accessed January 25, 2022).

¹⁰ A Better Balance, Black Women’s Health Imperative, Human Rights Watch, Latina Institute for Reproductive Justice, National Birth Equity Collaborative, “Factsheet: Increasing Temperatures Because of the Climate Crisis is a Reproductive Justice Issue in the US,” 2021, https://www.hrw.org/sites/default/files/media_2020/10/climatecrisis-reproductivejustice-US_1020_web.pdf.

¹¹ “US: Include Maternal Health in Climate Change Action,” Human Rights Watch news release, April 20, 2021, <https://www.hrw.org/news/2021/04/20/us-include-maternal-health-climate-change-action>.

¹² Center for American Progress, “Five Ways to Improve Maternal Health by Addressing the Climate Crisis,” April 22, 2021, <https://www.americanprogress.org/article/5-ways-improve-maternal-health-addressing-climate-crisis/> (accessed 20 January, 2022).

¹³ National Partnership for Women and Families, “Higher Temperatures Hurt Moms and Babies,” May 2021, <https://www.nationalpartnership.org/our-work/health/moms-and-babies/higher-temperatures-hurt-moms.html> (accessed January 20, 2011).

¹⁴ Ibid.

In 2020, at the height of the pandemic, we heard from Tesia, a pregnant retail worker in Missouri, who was forced out of work after her employer refused to let her keep a water bottle with her after the store's water fountain was shut down due to concerns about COVID-19.¹⁵

And:

In November 2020, we heard from Jordan, a cashier at a large retailer in Mississippi, who was forced onto unpaid leave after her employer refused to give her a lifting accommodation, more frequent breaks to drink water and sit, and reduced schedule, even though she had experienced preterm contractions and severe dehydration requiring medical attention.¹⁶

Current Information Publicly Available on Heat and Pregnancy/Reproductive Health From OSHA/NIOSH/CDC

Webpages and documents (see bulleted list of examples below) on occupational health and heat written by federal agencies to provide information and guidance to the public and employers on heat and pregnancy health have been important but have only provided a partial picture of heat and pregnancy health. For example, research that has found links between heat exposure and preterm birth, low birth weight, and stillbirth has not been cited. There is also no clarity on what pregnant workers can do to best protect their health from extreme heat at work and instead vague recommendations are provided to seek medical advice or ask supervisors to provide cooler work if possible.

- The National Institute for Occupational Safety and Health (NIOSH) “Criteria for a Recommended Standard Occupational Exposure to Heat and Hot Environments” helpfully notes the dangers of heat to pregnant people and the fetus. For example, the document notes that pregnancy elevates the body’s temperature, which is dangerous for the pregnant worker and that there is increased risk of infertility and teratogenicity associated with heat.¹⁷
- The CDC/NIOSH webpage “[Heat – Reproductive Health](#)” warns pregnant people that they are more likely to get heat exhaustion, heat stroke or dehydration and that “exposure to excess heat at work could increase your chances of having a baby with a birth defect or other reproductive problems.”¹⁸
- The OSHA [webpage on heat exposure](#) does not include pregnancy in a list of personal risk factors,¹⁹ and heat is not included in at least one key [webpage on reproductive hazards](#).²⁰ The OSHA heat awareness campaign does not seem to include pregnant

¹⁵ Ibid., p. 6.

¹⁶ Ibid., p. 7.

¹⁷ NIOSH, “Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments,” 2016, <https://www.cdc.gov/niosh/docs/2016-106/default.html> (accessed January 25, 2022).

¹⁸ NIOSH, “Heat – Reproductive Health,” last reviewed April 2017, <https://www.cdc.gov/niosh/topics/repro/heat.html> (accessed January 20, 2022).

¹⁹ OSHA, US Department of Labor, “Heat Personal Risk Factors” <https://www.osha.gov/heat-exposure/personal-risk-factors> (accessed January 20, 2022).

²⁰ OSHA, US Department of Labor, “Reproductive Hazards” <https://www.osha.gov/reproductive-hazards/hazards> (accessed January 20, 2022).

people. A NOAA webpage linked to the heat awareness campaign, for example, includes pets, but not pregnant people as an at-risk group.²¹

- However, a September 20, 2021 memorandum “[Inspection Guidance for Heat-Related Hazards](#)” does mention pregnancy as a condition that may increase the risk of heat-related illness, but it is unclear what this information then means for inspectors in terms of inspecting workplaces.
- The [OSHA heat training guide](#) mentions pregnancy as an additional risk factor for heat illness, but this is accompanied by only a vague recommendation that: “if you have these (diabetes, kidney and heart problems, pregnancy, and being overweight) it would be good to talk to your doctor about the work you do and ask whether there are any special precautions you need to take.”²²

Recent Research on Heat and Pregnancy Health

1. Maternal Health

Research on the specific impacts of heat at work on pregnant people is still nascent. For example, authors of a 2014 study of female farmworkers in Florida noted, “women working in agriculture are exposed to the same hazards and risks as their male counterparts but can face additional adverse impacts on their reproductive health. [But] few occupational risk assessment studies have considered the reproductive health of female farmworkers.”²³

A 2016 study of young, female farmworkers did find “that outdoor work during pregnancy in hot, humid days might increase body temperature up to levels that could induce fetal destruction or anomaly.”²⁴

However, studies indicate that maternal health can be negatively impacted by hotter temperatures:

- **Gestational diabetes:** A recent [survey of studies](#) warned that there may be a connection between hot summer weather and increased rates of gestational diabetes, a common but serious complication that can occur during pregnancy.²⁵
- **Hospitalizations:** In a [2019 study](#) health economists Jiyeon Kim, Ajin Lee, and Maya Rossin-Slater found that “prenatal exposure to extreme heat increases the risk of maternal hospitalization during pregnancy, and that this effect is greater for Black than for white

²¹ National Integrated Heat Health Information System, “Understanding the Health Risk of Extreme Heat,” <https://nihhis.cpo.noaa.gov/> (accessed January 20, 2022).

²² OSHA, “A Guide for Employers to Carry Out Heat Safety Training for Workers,” 2011, https://www.osha.gov/sites/default/files/osha_heattraining_guide_0411.pdf (accessed January 20, 2022).

²³ Jennifer Runkle, Joan Flocks, Jeannie Economos, J. Antonio Tovar-Aguilar, and Linda McCauley, “Occupational risks and pregnancy and infant health outcomes in Florida farmworkers,” *International Journal of Environmental Research and Public Health* 11, no. 8 (2014): 7820-7840.

²⁴ Juma Rahman, S. H. M. Fakhruddin, AKM Fazlur Rahman, and M. A. Halim, “Environmental heat stress among young working women: a pilot study,” *Annals of Global Health* 82, no. 5 (2016): 760-767.

²⁵ Emma V. Preston, Claudia Eberle, Florence M. Brown, and Tamarra James-Todd, “Climate factors and gestational diabetes mellitus risk—a systematic review,” *Environmental Health* 19, no. 1 (2020): 1-19.

mothers,” and that “(a)t childbirth, heat-exposed mothers are more likely to have hypertension and have longer hospital stays.”²⁶

- **Pregnancy complications:** A [2021 study](#) in New York State by Yanji Qu et al. found “immediate and prolonged effect of extreme heat exposure on pregnancy complications (including threatened/spontaneous abortion, renal diseases, infectious diseases, diabetes, and hypertension)... stronger in African Americans and counties with lower socioeconomic position.”²⁷

2. Birth Outcomes

A significant body of recent research has found links between exposure to high temperatures and poor birth outcomes including preterm birth, low birthweight, and stillbirth (see below section for studies, and attached document). These are serious, entrenched, and hard-to-solve health problems in the US. Rates are far worse for women of color, making this a significant reproductive justice problem too.

- **Preterm birth:** rates of preterm/premature birth (birth before 37 weeks gestation) increased between 2013 and 2019 in the US. Reducing preterm births is a CDC national health priority. Rates of preterm birth are twice as bad for Black women than white women and although rates decreased between 2019 and 2020 for white women (by two percent) and Hispanic women (by one percent), they did not for Black women.²⁸ Preterm birth is a leading cause of infant mortality and is linked with lifelong poor mental and physical health.²⁹ Preterm birth is also a significant financial burden on families and government, both in the immediate term and because of lifelong health consequences.
- **Low birthweight:** Low birthweight (the percentage of infants born at less than 2,500 grams or 5 pounds, 8 ounces) is among the leading causes of infant death in the US and low birth weight infants are also more likely to have health problems. The low birthweight rate (at 8.31 percent) has risen since the most recent low in 2014 (8.00 percent), and in 2019 was the highest rate reported since the 2006 peak (8.26 percent). Since 2016, low birthweight rates declined 1percent for non-Hispanic white women but are up 3 percent for non-Hispanic Black (13.68 percent) and Hispanic (7.32 percent) women.

²⁶ Jiyoung Kim, Ajin Lee, and Maya Rossin-Slater “What to Expect When It Gets Hotter: The Impacts of Prenatal Exposure to Extreme Heat on Maternal and Infant Health,” Working Paper 19-029, October 2019, <https://siepr.stanford.edu/publications/working-paper/what-expect-when-it-gets-hotter-impacts-prenatal-exposure-extreme-heat> (accessed January 20, 2022).

²⁷ Yanji Qu, Wangjian Zhang, Ian Ryan, Xinlei Deng, Guanghui Dong, Xiaoqing Liu, and Shao Lin, “Ambient extreme heat exposure in summer and transitional months and emergency department visits and hospital admissions due to pregnancy complications,” *Science of The Total Environment* 777 (2021).

²⁸ Joyce A. Martin, M.P.H., Brady E. Hamilton Ph.D., and Michelle J.K. Osterman, M.H.S., “Births in the United States, 2020” NCHS Data Brief, no 418, September 2020, <https://www.cdc.gov/nchs/products/databriefs/db418.htm> (accessed January 25, 2022).

²⁹ CDC, “Reproductive Health – Preterm Birth,” last reviewed November 1, 2021, <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pretermbirth.htm> (accessed January 20, 2022).

- **Stillbirth:** Rates of stillbirth vary considerably by race and are more than twice as high for non-Hispanic Black women as for non-Hispanic white women.³⁰

Please see the excel sheet that was provided with this submission for a fuller list of some of the available studies linking heat and these adverse birth outcomes. We have found at least seven review studies including:

- **“Association of Air Pollution and Heat Exposure With Preterm Birth, Low Birth Weight, and Stillbirth in the US.”**³¹ This 2020 study found that “Nine of 10 [90 percent] [studies] on heat showed a significant association of ... heat exposure with birth outcomes. ... The subpopulations at highest risk were persons with asthma and minority groups, especially black mothers. ... Four studies identified a range of increased risk of preterm birth from 8.6 percent to 21.0 percent. ... Three included studies evaluating the association of maternal exposure to heat with low birth weight ... all found an increased risk. ... two studies evaluating the association of maternal exposure to heat with stillbirth, and both found an increased risk.”
- **“Heat Exposure and Maternal Health in the Face of Climate Change”**³² This 2017 study found “(E)vidence that temperature extremes adversely impact birth outcomes, including, but not limited to: changes in length of gestation, birth weight, stillbirth, and neonatal stress in unusually hot temperature exposures. ... Current literature largely refers to heat-susceptible individuals as poor, elderly, young children, minority groups, outdoor workers, individuals with chronic respiratory or cardiovascular disorders, socially isolated individuals, and living in an urban heat island. Notably, pregnant women are not included. However, limited thermoregulatory abilities warrants, dependent on medical care access, the inclusion of pregnant women as a vulnerable class in the face of heat exposure. Therefore, when considering *the exaggerated impacts of heat, pregnant women must also be included as an at-risk class*. ... Heat exposure promises to affect population health, such as developing fetuses and pregnant women. We are likely to see an increase in preterm birth, a decrease in birth weight, and an increase in stillbirth rates.” (Emphasis added).
- **“Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight and still births: systematic review and meta-analysis”** This 2020 study found “the public [also] appears largely unaware of the risks of heat exposure during pregnancy [one reason may be that] in high income countries, the focus has been on heat related mortality among groups such as elderly people or those with chronic conditions ... Pregnancy raises the vulnerability of women to environmental hazards, including exogenous heat. The physiological and anatomical changes that occur during pregnancy pose particular challenges to thermoregulation. Internal heat production rises with fetal and placental metabolism, and with increased body mass and the resulting

³⁰ CDC, “Stillbirth, Data and Statistics,” last reviewed August 13, 2020, <https://www.cdc.gov/ncbddd/stillbirth/data.html> (accessed January 20, 2022)

³¹ Bruce Bekkar, Susan Pacheco, Rupa Basu, and Nathaniel DeNicola, “Association of air pollution and heat exposure with preterm birth, low birth weight, and stillbirth in the US: a systematic review,” *JAMA Network Open* 3, no. 6 (2020).

³² Leeann Kuehn and Sabrina McCormick, “Heat exposure and maternal health in the face of climate change,” *International Journal of Environmental Research and Public Health* 14, no. 8 (2017).

physical strain. Equally, pregnancy could bring social vulnerabilities to the fore ... Exposure to high temperatures in agricultural and other outdoor work, could occur before the pregnancy is recognised, and, even late in pregnancy, poorer women might work beyond their heat tolerance limits to avoid losing pay.”³³

Several studies have highlighted connections between pre-existing conditions and other vulnerabilities such as low socioeconomic status and adverse birth outcomes linked to heat exposure.

A 2017 study “The Impact of Maternal Factors on the Association Between Temperature and Preterm Delivery,” found that women with pre-existing or gestational hypertension or diabetes were at greater risk.³⁴

- Similarly, Schifano et al. in a study on heat and pregnancy health in Rome, Italy. found that women with chronic disease (especially cardiac conditions) and young mothers (less than 20 years of age) were at higher risk of preterm delivery (Schifano, Cappai et al., 2013; Schifano et al., 2016).³⁵
- A 2022 study [using data from Texas](#) found “ambient heat was associated with spontaneous preterm birth, with stronger associations earlier in pregnancy and in racially and economically disadvantaged neighbourhoods, suggesting climate change may worsen existing social inequities in preterm birth rates.”³⁶
- A [recent 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.”³⁷

A smaller body of research has found links between heat exposure and congenital disorders. For example:

- At least three studies have found links between in utero heat exposure and congenital heart conditions.³⁸

³³ Matthew Francis Chersich, Minh Duc Pham, Ashtyn Areal, Marjan Mosalam Haghighi, Albert Manyuchi, Callum P. Swift, Bianca Wernecke et al., “Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: systematic review and meta-analysis,” *BMJ* 371 (2020).

³⁴ Rupa Basu, Hong Chen, De-Kun Li, and Lyndsay A. Avalos, “The impact of maternal factors on the association between temperature and preterm delivery,” *Environmental Research* 154 (2017): 109-114.

³⁵ Patrizia Schifano, Adele Lallo, Federica Asta, Manuela De Sario, Marina Davoli, and Paola Michelozzi, “Effect of ambient temperature and air pollutants on the risk of preterm birth, Rome 2001–2010,” *Environment International* 61 (2013): 77-87.

³⁶ Amelia K. Wesselink and Gregory A. Wellenius, “Impacts of climate change on reproductive, perinatal and paediatric health,” *Paediatric and Perinatal Epidemiology* 36, no. 1 (2022).

³⁷ Edward Jegasothy, Deborah A. Randall, Jane B. Ford, Tanya A. Nippita, and Geoffrey G. Morgan, “Maternal factors and risk of spontaneous preterm birth due to high ambient temperatures in New South Wales, Australia,” *Paediatric and Perinatal Epidemiology* 36, no. 1 (2022): 4-12.

³⁸ Nathalie Auger, William D. Fraser, Reg Sauve, Marianne Bilodeau-Bertrand, and Tom Kosatsky, “Risk of congenital heart defects after ambient heat exposure early in pregnancy,” *Environmental Health Perspectives* 125, no. 1 (2017): 8-14.; K. Agay-Shay, M. Friger, S. Linn, A. Peled, Y. Amitai, and C. Peretz, “Ambient temperature and congenital heart defects,” *Human Reproduction* 28, no. 8 (2013): 2289-2297; and Wangjian Zhang, Tanya L. Spero, Christopher G. Nolte, Valerie C. Garcia, Ziqiang Lin, Paul A. Romitti, Gary M. Shaw et al., “Projected changes in maternal heat exposure during early pregnancy and the associated congenital heart defect burden in the United States,” *Journal of the American Heart Association* 8, no. 3 (2019).

- A 2017 study, “Elevated ambient temperatures and risk of neural tube defects,” found “elevated ambient temperatures may be weakly associated with risk of neural tube defects during tube closure.”³⁹

Low Knowledge of Heat and Pregnancy Health in Providers and the General Public

Several studies have found that both maternal health workers and pregnant people who are exposed to heat lack information and training about the detrimental impact of heat on pregnancy health:

- A 2013 study in Florida noted:

“While agricultural workers have elevated risks of heat-related illnesses (HRI), pregnant farmworkers exposed to extreme heat face additional health risk, including poor pregnancy health and birth outcomes. Qualitative data from five focus groups with 35 female Hispanic and Haitian nursery and fernery workers provide details about the women’s perceptions of HRI and pregnancy. Participants 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.”⁴⁰
- Another 2013 paper, also researched in Florida said:

“Interviews with rural health care providers reveal limited knowledge about agricultural work or occupational and environmental health risks during pregnancy. Professional associations, government organizations, academic institutions, and practice settings must renew their efforts to ensure that environmental and occupational health education, especially as it relates to women and their children, is incorporated into academic and practice environments.”⁴¹
- A study in Texas with maternal health workers (MHW) 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.” Another paper found, however, that this problem has a solution and that “assessments indicated that a training session can improve provider knowledge of maternal heat–health risks and can encourage providers to discuss heat risks with patients/clients.”⁴²

³⁹ Nathalie Auger, William D. Fraser, Laura Arbour, Marianne Bilodeau-Bertrand, and Tom Kosatsky, “Elevated ambient temperatures and risk of neural tube defects,” *Occupational and environmental medicine* 74, no. 5 (2017): 315-320.

⁴⁰ Joan Flocks, Valerie Vi Thien Mac, Jennifer Runkle, Jose Antonio Tovar-Aguilar, Jeannie Economos, and Linda A. McCauley, “Female farmworkers’ perceptions of heat-related illness and pregnancy health,” *Journal of Agromedicine* 18, no. 4 (2013): 350-358.

⁴¹ Maureen A. Kelley, Joan Flocks, Jeannie Economos, and Linda A. McCauley, “Female farmworkers’ health during pregnancy: health care providers’ perspectives,” *Workplace Health & Safety* 61, no. 7 (2013): 308-313.

⁴² Adelle Dora Montebalco, Jennifer K. Vanos, Sarah LeRoy, Patricia M. Juarez, and Gregg M. Garfin, “An evaluation of a maternal health and extreme heat exposure training,” *Journal of Social, Behavioral, and Health Sciences* 15, no. 1 (2021): 31-42.

The marginalization of pregnancy in efforts to reduce health harms from extreme heat is still prevalent. Human Rights Watch conducted a review in 2020 and found that most plans by local, state, and federal authorities in the US to respond to heat extremes and climate change miss the threat that extreme heat poses to pregnancy, particularly for low-income and Black and brown people.⁴³ Human Rights Watch reviewed 105 official heat safety web pages, climate action plans, heat plans, heat advisories, disaster plans, and sustainability initiatives for 18 large US cities, including the 15 most populous, with a total of 32 million people. As of August 2020, only two of these documents, from Chicago and Philadelphia, explicitly addressed the danger heat poses during pregnancy. Since the review was conducted, New York City, Miami and possibly other cities have included pregnancy. Concerns about the dangers of heat for pets, in contrast, were found 37 times.

For more information, please contact:

In Washington, DC, senior women’s rights researcher, Skye Wheeler (English): +1-646-203-2539 (mobile, WhatsApp); or wheeles@hrw.org.

⁴³ “US: Heat Emergency Plans Missing Pregnancy, Racial Justice,” Human Rights Watch news release, October 23, 2020, <https://www.hrw.org/news/2020/10/23/us-heat-emergency-plans-missing-pregnancy-racial-justice> (accessed January 20, 2022)