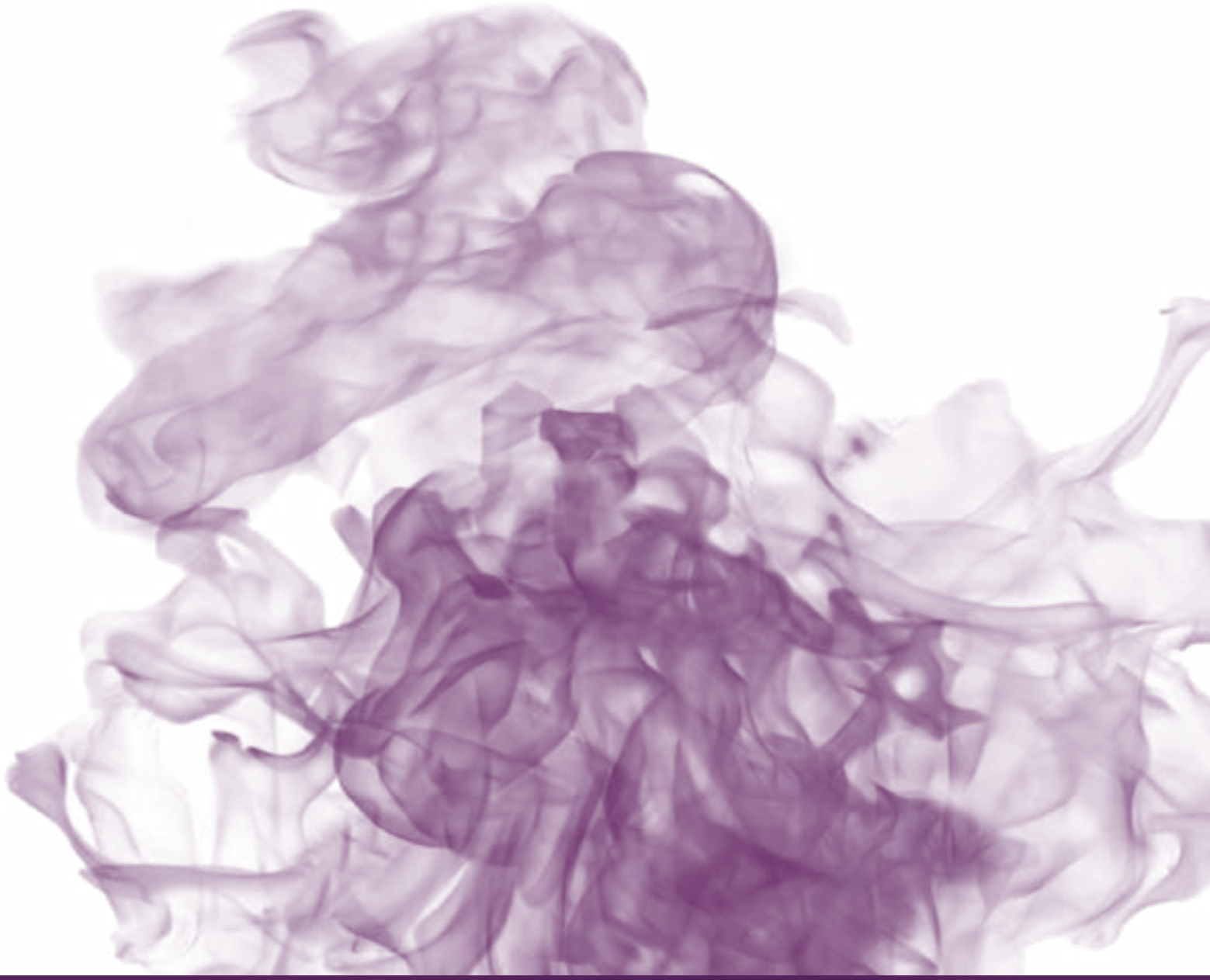
BIRTH IN A BURNING WORLD

The Intersecting Extreme Heat and Maternal Health Crises in Sindh Province, Pakistan



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CONTENTS

SUMMARY

Extreme heat worsened by climate change is **deepening a maternal health crisis in Pakistan** *already marked by high rates of maternal and newborn deaths even when compared to most neighboring and other low-income countries.*

This report provides a window into a major problem that evidence suggests is global: growing extreme heat—and the growing climate crisis more broadly—is having myriad deleterious impacts on maternal and newborn health and well-being with potentially lifelong consequences. Governments need to take urgent action to curb greenhouse gas emissions. While much can be done to reduce the harms of extreme heat including on pregnant people, there is no clear way for low-income communities to adapt their way out of burgeoning heat set to worsen without action.

This report is based on interviews with 16 women in Shikarpur District, Sindh Province, Pakistan, who were either pregnant or recently postpartum during the 2022 heatwave. We also interviewed five health providers or officials in the district. In addition, we consulted epidemiologists, doctors, and other experts in maternal health and the climate crisis, especially regarding extreme heat exposure. We also looked at epidemiological studies and other scientific findings showing links between poor maternal and newborn health and extreme heat.

Of course, heat is only one dimension of the climate crisis, and the 16 women interviewed for this report were also badly affected in 2022 by catastrophic climate crisis-driven flooding that submerged a third of the country and created one of the biggest humanitarian crises in recent years. They survived and struggled with illness, displacement, and loss due to this flooding. Given their experiences, this report provides some information on how the flooding created unique harms for these pregnant women, including by exposing them to even more humid heat under dismal conditions.

Extreme heat is dangerous and can be deadly; in fact, it kills more people each year than any other weather-related disaster and sickens many more. Pregnancy health and fetal development are especially vulnerable to our increasingly hot world. Many studies link hotter than usual temperatures to increased rates of preterm birth and still birth. Preterm birth can have lifelong impacts on development, with increased risks of cerebral palsy, impaired learning, and physical and mental health complications.

A research team from The Gambia found signs of fetal distress when high temperatures are combined with physical labor while farming. Increasingly, studies are showing links between extreme heat and maternal hospitalizations and higher rates of dangerous maternal health conditions, including hypertension.

Extreme heat, without alleviation through cooling, is a miserable experience. Our interviewees described fainting in the heat, hospitalization because of dehydration, listlessness, loss of appetite, and struggling to manage pregnancy or a newborn and their work, which included farming, caring for livestock, carrying water, and cooking over a hot fire. Some also shared their fears that extreme heat was harming their developing fetuses.

Already stressed by heavy workloads and the impact of patriarchal systems and poverty, our interviewees reported that extreme heat negatively affected their emotional well-being, worsening their mood and coloring their experience of pregnancy or motherhood with exhaustion and anger. Women found that breastfeeding in the heat was particularly difficult both for them and for uncomfortably hot newborns. Extreme heat stole their sleep and the opportunity it provides to recuperate. Our interviewees were left tired, sweltering, and working through hot and sleepless nights with handwoven fans to manually cool babies and children since frequent blackouts disabled any electric fans.

Maternal mental health is another dimension of the crisis. Our interviewees conveyed grief, despair, stress, and fear about losses from the flooding and about unyielding and oppressive heat in future summers, which are predicted to become longer. While more research is needed, this report suggests extreme heat may add further stress and worsen mental health for pregnant and postpartum women. This is worrying because pregnancy already increases the risk of mental health conditions, which are a major cause of global maternal morbidity and mortality.

Patriarchal systems across society also play a role in the maternal health crisis. Patriarchal norms mean that women, even while heavily pregnant, may not have the power to renegotiate their roles and responsibilities with a male head of the household, even if extreme heat makes these duties a risk to the health of the mother and fetus or newborn. For example, water is essential to cooling, including bathing, and women bear the burden of carrying more water to meet their family's additional needs. Many women in Sindh complete chilla, a traditional practice that includes not bathing, and thus losing this cooling opportunity, for 40 days after giving birth. Patriarchal systems also limit access to cool spaces based on gender: while men have access to cool spaces in public, such as shops or shaded public areas, sociocultural norms continue to restrict women's ability to enjoy those locations.

We ended the interviews feeling compelled to action by the oppressiveness of extreme heat for those without access to cooling and by heat's power to negatively affect every minute and aspect of life. Interviewees tried to cool themselves by using fans when they worked and especially by bathing in cool water, distracting themselves, or resting as much as their heavy workloads, including during pregnancy, allowed. Sometimes they slept outside to get some relief.

The strength and resilience of our interviewees is notable, but there are limits to what their efforts can accomplish with heat coping strategies. And climate scientists agree that more heat, both higher temperatures and for longer periods, is coming and Pakistan and the South Asia region will face more dangerous temperatures than most of the planet. This is the case even if serious global greenhouse gas emissions are cut immediately. If current emissions continue or rise further, the future will be even more hellish.

Pakistan is a relatively low-emission country, more so given its large population. Deaths, despair, and other unjust harms exacerbated by climate change in Pakistan are linked to the climate impacts of emissions in historic and current high emitters such as the United States, EU countries and China.

To help prevent climate-related disasters like the 2022 flooding and heatwave in Pakistan from increasing, both in strength and numbers, all countries, especially high-emission countries, should severely cut greenhouse gas emissions as advised by the United Nations Intergovernmental Panel on Climate Change (IPCC).

To fulfill its human rights obligations to improve maternal and newborn health, Pakistan's government should act to protect the most vulnerable pregnant women and girls against extreme heat and other impacts. This means Pakistan should take measurable actions to address the poor state of maternal and newborn health services generally, which adds greatly to the vulnerability of pregnant women and families in the face of climate catastrophe. Resources to improve maternal and newborn health should include protections for women and newborns against climate harms on their health, including from extreme heat.

Governmental and non-governmental actions taken to address Pakistan's maternal health crisis should weave in climate adaptation and new protections to better assist pregnant people from blazing temperatures and other climate harms. Healthcare providers and pregnant people need more education on extreme heat and its harms to pregnancy health, but that information needs to be actionable. Pregnant people also need better access to cooling at home and elsewhere and support to help them avoid heavy labor in the heat.

Our interviewees said they need better access to cooling infrastructure, such as more trees planted around their homes, and cash transfers for cooling supplies such as electric fans, and batteries for solar panels. Interviewees also said they needed a reliable source of electricity (both day and night) to power fans. Those without access to

water in their homes said they needed a handpump within easier reach. Interviewees also would greatly benefit from homes that are more resistant to heat (for example, ones made of cooler materials or with white-painted roofs), and cool spaces such as schools or clinics where women and children can find reprieve during the worst of the heat.

Although the IPCC has said that pregnant women and newborns are especially vulnerable to climate change, Pakistan's government has yet to include maternal and newborn health in its climate adaptation plans. This needs to change. The government should include pregnant women and those who serve them most closely in its efforts to develop, implement, and monitor plans to improve maternal and newborn resilience to heat, flooding, drought, and other climate harms. All medical providers, including community health workers, such as the Lady Health Worker Program, should be better supported to provide heat health education tailored to pregnancy and newborn health and should provide spaces and resources for pregnant women. Women-friendly cooling centers and subsidized solar panels and batteries could be two important such resources.

Pakistan is not the only country that should consider maternal and newborn health in addressing climate change. Other countries should include maternal and newborn health in their climate adaptation plans in ways that reflect real not theoretical risks. However, this is frequently not the case, and reviews of climate adaptation plans show that maternal health is rarely included. When it is, "maternal health" or "pregnant women" is usually just one group in climate health lists of "at-risk" people. This checks a box but does little else, especially when considering the role of socioeconomic factors. The risks are very low for women with resources and good housing but high for marginalized and poor communities where women work and live with little protection, are more vulnerable because of other environmental or other stresses on their health and have far less agency against the climate crisis. Furthermore, such lists usually omit "newborns," who are uniquely suspectable; even when "babies" appears, they are usually lumped with "children" despite facing different risks from those of older children.

Pakistan's government, alongside other affected countries and civil society, successfully pressed delegates at COP27, the 2022 iteration of the annual UN climate conference, to include loss and damage as an agenda item. Delegates agreed to establish a loss and damage fund that would move money from wealthy high-emitting countries to poorer countries most impacted by the consequences of burning fossil fuels. Pakistan's foreign minister called this decision a "victory." However, it remains to be seen how and when the fund will be filled, managed, or dispersed.

Finally, governments, including Pakistan's and donors, providing climate change funding should prioritize funding maternal and newborn health, which are especially vulnerable to the climate crisis and decide lifelong health. Equally, health funding and implementation should include climate adaptation. Pakistan's government should allocate adequate financial and human resources to improving midwifery services and better supporting midwives, who are marginalized within the health system. Public health authorities, with the support of donors, should also provide the Lady Health Worker Program the resources and recognition it deserves. Pakistan's government should also ensure that contraceptive health, which is currently siloed, is comprehensively integrated into other healthcare services.

RECOMMENDATIONS

Global Recommendations

All countries should cut greenhouse gas emissions to keep global warming below 1.5°C. Countries should urgently work to protect pregnancy and other human health and well-being from the climate crisis. The failure to urgently curb greenhouse gases will make it more difficult for low-income countries to adapt to extreme heat predictions in a manner that fully protects the rights to life, health, and well-being.

All countries with historical or current high emissions should provide funding to address harms caused by the climate crisis to low- and middle-income countries and should meet their human rights obligation to address harms to marginalized populations in their own territories. These resources should supplement international cooperation funds provided, such as those by the UN humanitarian system, to address emergency and development needs in low-income countries as envisaged in international human rights treaties.

All countries should take more measurable steps to include maternal and newborn health in their climate crisis adaptation planning and resourcing. Countries should initiate a robust international process to establish—and share learnings and other information from—pilot interventions. Countries should also launch and fund more community-based research aiming to better protect maternal and newborn health in low-income countries or otherwise marginalized communities from extreme heat and other climate harms.

The international sexual and reproductive health and rights movement and the international reproductive justice movement should do more to center climate justice and the right to a healthy environment in their work.

Recommendations for Pakistan

Local, Sindh, other provincial, and national governments, together with non-governmental service providers and international donors, should implement interviewees' recommendations for increased access to cooling, including by:

- Providing cash transfers for climate disasters, including ahead of heatwaves so that families can take time off work if they need to or pay for cooling, additional water, for example.
- Providing a steady supply of electricity that is enough to at least run fans for 24 hours a day. Consider subsidizing the purchase of solar panels and batteries to store power for the nighttime.
- Providing access to adequate drinkable water for staying hydrated in high temperatures and for frequent bathing as a cooling mechanism.
- Creating infrastructure to help cool housing and neighborhoods, which could include tree planting within compounds, using materials that stay cooler for building, or painting surfaces, such as roofs white.
- Running public information campaigns on inexpensive cooling techniques for people and their home, such as use of foot baths and wet cloths and shuttering windows.
- Creating cooled spaces where women and children can spend time, such as schools after the school day or in spaces associated with clinics and work.
- Ensuring clinics, hospitals, and other medical establishments providing reproductive health services, including prenatal and obstetric care, are cool spaces and open for visitation by pregnant people, newborns and others needing cooling.
- Running maternal and newborn health-centered heat awareness campaigns with information and advice for women and their families.

In consultation with the most-affected communities, the Sindh, other provincial, and national governments, together with national and international NGOs and other non-governmental service providers and their financial supporters, should build programming on extreme heat into maternal health services. Specifically, they should take measurable steps to:

- Ensure all government officials working in health or addressing the climate crisis are aware of the maternal and newborn health implications of extreme heat, and the climate crisis more broadly.
- Work to develop knowledge on the links between extreme heat and maternal/newborn health in the non-governmental health sector, including through trainings, meetings, and conferences.
- Include maternal and newborn health in all government planning and spending in response to the climate crisis, and actively include health providers and women as experts in addressing climate needs.
- Undertake a scoping study to better understand what different actors are already doing to address extreme heat and other climate harms to maternal and newborn health across Pakistan and what gaps remain.
- Map cooling capacities of low-income communities, and consult with women, healthcare providers, and other stakeholders to develop ways forward.
- Ensure that maternal health—and sexual and reproductive health more broadly—and newborn health is fully included in all climate adaptation planning, especially any climate health adaptation planning. Specific efforts could include:
- Education for men, women, pregnant people, families, and communities on the harms of extreme heat, including on pregnancy and newborn health.
- Education for families that covers the importance of reducing heat exposure, including during domestic and other work, during pregnancy.
- Additional support and resources as well as training for Lady Health Workers and other perinatal community health workers so they can better provide pregnant people with information, services, and connections to climate adaptation programs.

Recommendations for Future Research

Universities and other academic institutions, governments, and non-governmental organizations should fund, conduct, and widely disseminate research at the intersection of extreme heat and maternal and newborn health, including on:

- Unpaid work, including childcare and subsistence farming, paid work that takes place in the home or in informal settings, and paid work in workplaces such as factories and agriculture, and each's relationship with pregnancy and newborn health.
- How to better protect pregnant women and girls from extreme heat and to better involve women and girls, including pregnant people, in climate action (advocacy and adaptation efforts) in low- and middle-income settings.
- The intersection of maternal mental health and possible interventions.

METHODOLOGY

This project was a joint undertaking between White Ribbon Alliance Global and Human Rights Watch. White Ribbon Alliance Global colleagues conducted all the interviews, and Human Rights Watch drafted most sections of the report. Both parties contributed to and reviewed and approved research instruments, such as the questionnaire, and final products. The recommendations were written by White Ribbon Alliance Global and reflect their own positions.

We interviewed all 16 pregnant or recently postpartum interviewees in their homes in Muhammad Ameen Umrani, Kumbar Mollah, and Mohalla Morani villages, which are all in Shikarpur District. Interviews were conducted in Sindhi or in a mix of Sindhi and Urdu. The pregnant and postpartum interviewees are a convenience sample, and we found them with the help of field mobilizers and input from Lady Health Visitors. In addition, we interviewed five health providers or officials in the district as well as consulted epidemiologists, doctors, and other experts in maternal health and the climate crisis, especially regarding extreme heat exposure.

All interviewees provided consent after receiving an overview of the questionnaire's contents, an estimate of how long the interview would take, and a detailed description of planned reporting and dissemination of results. No payment was provided for interviews, and interviewees were told there were no consequences for not participating. Names of participants have been removed or replaced by pseudonyms in accordance with Pakistan research regulations.

This report also references epidemiological studies and other scientific findings showing links between poor maternal and newborn health and extreme heat.

BACKGROUND

Rising global temperatures due to human-made greenhouse gas emissions, mostly resulting from burning fossil fuels in industrialized nations, have led to a wide range of harmful impacts on humans and environmental systems, including extreme heat and sea level rise, and more frequent and intense extreme weather events like hurricanes, droughts, and floods. Human activities have already caused about 1°C of warming above pre-industrial levels, and global warming is likely to reach 1.5°C between 2030 and 2052 if global emissions continue increasing at their current rate.[1] Consequently, the small window of opportunity to prevent "catastrophic" global heating above 2°C is rapidly closing.[2] Deeper, repeating, and new harms await low-income and geographically and socially at-risk people, including our interviewees.

Because of the climate crisis, the planet has become increasingly dangerous for pregnancy and childbirth. Higher temperatures make work during pregnancy harder and unhealthier, intensify air pollution, worsen rates of preterm and low-weight births, and make it harder for mothers and their newborns to sleep and breastfeed.[3] Erratic rains threaten to flood homes or desiccate the crops that families rely on. Increasing wildfires contaminate the air with smoke containing toxics that cross the placenta and undermine maternal health.[4] In some places, the climate crisis also driving other violations of women and girls' rights, such as forced and child marriage and deepening female poverty.[5]

The 2021 UN Intergovernmental Panel on Climate Change (IPCC) report on governments' failures to adequately manage the climate crisis referenced multiple ways that it impacts pregnancy health.[6]

- Food insecurity, which disproportionately impacts women and girls.
- Loss of water sources and water quality, as pregnant people need more water.
- Lack of water and lower quality water, which negatively impacts lactation and is associated with maternal, newborn, and child illness.
- Infectious diseases, such as malaria and tick- and rodent-borne diseases, foodborne infections, and air pollution, all of which are greater hardships or dangers to pregnant people and mothers.
- Reduced access to prenatal and pediatric care as well as increasingly unattended deliveries, all of which are associated with extreme weather events.

Climate Change and Deadly Disasters in Pakistan

Pakistan faces some of "the highest disaster risk levels in the world" because of the climate crisis.[7] For

> I do feel that summers are getting hotter every year, but this year was even hotter and dry and choking.
>
> • **Interviewee**, pregnant at the time of the interview, September 20, 2022

1 Intergovernmental Panel on Climate Change (IPCC), "Synthesis report of the IPCC Sixth Assessment Report," Summary for Policymakers, March 20, 2023, https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_LongerReport.pdf (accessed July 28, 2023).

2 Ibid

3 Nathalie Roos et al., "Maternal and newborn health risks of climate change: A call for awareness and global action," Acta Obstetricia et Gynecologica Scandinavica 100, no. 4 (2021): 566-570, accessed October 12, 2023, https://doi.org/10.1111/aogs.14124.

4 Emilia Basilio et al., "Wildfire Smoke Exposure during Pregnancy: A Review of Potential Mechanisms of Placental Toxicity, Impact on Obstetric Outcomes, and Strategies to Reduce Exposure," International Journal of Environmental Research and Public Health 19, no. 21 (2022): 13727, accessed October 12, 2023, https://doi.org/10.3390/ijerph192113727.

5 For example, see Heather Barr, "Climate Change is Forcing Bangladeshi Girls into Child Marriage," Human Rights Watch new release, June 9, 2015, https://www.hrw.org/news/2015/06/09/climate-change-forcing-bangladeshi-girls-child-marriage.

6 IPCC "Climate Change 2022: Impacts, Adaptation, and Vulnerability," Cambridge University Press, (2023), accessed June 12, 2023, doi:10.1017/9781009325844.

7 The World Bank Group and the Asian Development Bank, "Climate Risk Country Profile: Pakistan" 2021, https://climateknowledgeportal.worldbank.org/sites/default/files/2021-05/15078-WB_Pakistan%20Country%20Profile-WEB.pdf (accessed March 24, 2023), p. 12.

example, one Pakistan government report provided a long list of climate-related problems for the country, including variations in precipitation and temperatures, increased frequency and severity of tropical storms and coastal rains, glacial melt, glacial lake outburst floods, sea level rise, seawater intrusion, extended and frequent riverine floods and heatwaves, loss of biodiversity, desertification, and droughts, all of which affect "economic and human development."[8]

In 2022, unusually massive flooding affected 30 million people in Pakistan.[9] According to the World Bank, Sindh Province was the worst-affected province in the country, bearing about 70 percent of rebuilding costs.[10] (See textbox "Mass Flooding in 2022: Harms to Interviewees" below for more on how the floods affected interviewees for this report.)

Scientists have blamed the intensity of both the heatwave and flooding on the climate crisis. World Weather Attribution Initiative's climate scientists reported that Pakistan's 2022 monsoon rainfall likely increased because of climate change and warned that rainfall intensity will further increase if global temperatures rise to 2°C above pre-industrial times.[11] A 2023 IPCC report said that "especially" in the South and South East Asia region (and some other areas), "continued global warming is projected to further intensify the global water system [including] monsoon precipitation."[12] Regarding the 2022 heatwave, which also crushed next-door India, World Weather Attribution Initiative determined that it was at least 30 times more likely because of anthropogenic climate change.[13]

Extreme Heat and Its Impacts

While there is no definition for "extreme heat," it is usually understood as a period of prolonged high temperatures relative to those usually expected. Climate scientists have high confidence that the "duration, intensity, and likelihood of extreme heat has increased dramatically due to human-induced climate change."[14]

Rising extreme heat poses problems around the world, including in areas that are historically warmer at least part of the year like Sindh Province, Pakistan, and other parts of South Asia. In South Asia, an IPCC assessment concluded that there is "a high confidence in an increase in the intensity and frequency of hot extremes in the region, as well as a high confidence in a human contribution to the observed increase in the intensity and frequency of hot extremes."[15] Further increases in extreme heat as well as decreases in cold extremes are predicted for the region on all emission pathways, including if global warming only increases by 1.5°C.[16]

Even if new global greenhouse gas emissions are cut dramatically and swiftly, extreme heat will increase due to pre-existing carbon in the air. Nevertheless, it is critical to do so because unless emissions are reduced rapidly, heat in Pakistan will become an even bigger/greater problem. The Berkeley Earth Tracker's data suggests that

8 The Government of Pakistan et al., "Pakistan Floods 2022 Post Disaster Assessment Report," October 2022, https://www.undp.org/pakistan/publications/pakistan-floods-2022-post-disaster-needs-assessment-pdna (accessed March 24, 2023), p. 12.

9 World Weather Attribution, "Climate change likely increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan" September 14, 2022, https://www.worldweatherattribution.org/wp-content/uploads/Pakistan-floods-scientific-report.pdf (accessed March 24, 2023).

10 "Pakistan: Flood Damages and Economic Losses Over USD 30 billion and Reconstruction Needs Over USD 16 billion - New Assessment," World Bank press release, October 28, 2022, https://www.worldbank.org/en/news/press-release/2022/10/28/pakistan-flood-damages-and-economic-losses-over-usd-30-billion-and-reconstruction-needs-over-usd-16-billion-new-assessme (accessed March 24, 2023).

11 World Weather Attribution, "Climate change likely increased extreme monsoon rainfall, flooding highly vulnerable communities in Pakistan."). This report notes that while the IPCC has reported an increasing trend in extreme rainfall in South Asia and a scientific study has found an increasing strength and westward movement of the monsoon over Pakistan, there is "low confidence" in the finding that the observed extreme rainfall increase is due to human influence on the climate system in part because it is known that other factors also impact monsoon patterns, such as irrigation. See page 12.

12 IPCC, "Synthesis Report of the IPCC Sixth Assessment Report," 2023, https://report.ipcc.ch/ar6syr/pdf/IPCC_AR6_SYR_LongerReport.pdf (accessed July 28, 2023), p. 34.

13 Ibid. The study found that a heatwave like this one now has about a 1 in 100 chance of occurring in any given year. Before global warming began, the chances would have been at least about 1 in 3,000. And the chances would increase to as much as 1 in 5, the researchers said, if the world reaches 2 degrees Celsius of warming, as it is on track to do unless nations sharply reduce emissions.

14 IPCC "Climate Change 2022: Impacts, Adaptation, and Vulnerability," Cambridge University Press, (2023), accessed June 12, 2023, doi:10.1017/9781009325844.

15 Sonia Seneviratne et al, "Weather and Climate Extreme Events in a Changing Climate," in Climate Change 2021: The Physical Science Basis, IPCC, 2021, pp. 1513-1705. See also IPCC, "Climate Change 2021: The Physical Science Basis," 2021, https://report.ipcc.ch/ar6/wg1/IPCC_AR6_WGI_FullReport.pdf (accessed July 28, 2023), p. 1127.

16 Sonia Seneviratne et al, "Weather and Climate Extreme Events in a Changing Climate," in Climate Change 2021: The Physical Science Basis, IPCC, 2021, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter11.pdf (accessed October 12, 2023), p. 1638.

Pakistan has already warmed 1.2°C since pre-industrial times and is headed for a 3.5°C increase by 2100 even in the best-case scenario, one where emissions are stabilized and then decline.[17]

Higher temperatures are linked to an increased risk of mortality and bad health outcomes, especially in infants, older people, people with disabilities, and people with respiratory or cardiac conditions.[18] Increasing extreme heat in Pakistan also harms farming, like crops and animals, both of which have implications for families' incomes and nutrition and drive migration from rural areas to cities.[19] In addition, heat can damage buildings, roads, and other infrastructure.[20]

The Human Body

Extreme heat is deadly; indeed, "almost everywhere that reliable data is available, heatwaves are the deadliest weather-related hazard."[21] For example, a heatwave in Europe in 2003 saw 70,000 additional deaths.[22] Heat stroke deaths or others directly attributed to heat form only a small proportion of heat-related deaths.[23] Instead, heat exacerbates existing health conditions at a staggering rate: one study worried that 90 percent of existing global causes of death are worsened by heat.[24] Hospital admissions and deaths from chronic respiratory or heart diseases spike in hotter weather.[25] One study estimated 500,000 deaths per year from heat-related causes.[26]

But the problem of high temperatures precedes heatwaves. Importantly, heat-related deaths often begin rising long before hot weather becomes a heatwave or an emergency. In fact, "[t]he cumulative effects of low- and middle-intensity heatwaves on total and cause-specific mortality may, in fact, be greater than for high-intensity heatwaves."[27] This is likely because protective behavior often changes only after high temperatures reach official emergency levels.[28]

Exposure to high temperatures can result in dehydration, reduced cognitive function, and heat stroke, which can exacerbate existing chronic conditions such as heart conditions, lung disease, kidney disease, and diabetes, and can be fatal.[29] Heat exposure can also increase the transmission of some diseases, be harmful to mental health, and alter human behavior.[30] Extreme heat "has negative impacts on … well-being, life satisfaction, happiness, cognitive performance and aggression."[31]

17 "Actionable Climate Science for Policy Makers," Berkeley Earth Tracker, https://berkeleyearth.org/policy-insights/ (accessed March 24, 2023).

18 Professor Kristie L Ebi et al., "Hot weather and heat extremes: health risks," The Lancet, 398, no. 10301: 698 – 708, accessed October 12, 2023, https://doi.org/10.1016/S0140-6736(21)01208-3.

19 IPCC, "Climate Change 2022: Impacts, Adaptation and Vulnerability," 2022, https://report.ipcc.ch/ar6/wg2/IPCC_AR6_WGII_FullReport.pdf (accessed March 24, 2023), p. 929.

20 Ibid., p. 907.

21 United Nations Office for the Coordination of Humanitarian Affairs (OCHA), the International Federation of Red Cross and Red Crescent Societies (IFRC), and the Red Cross Red Crescent Climate Centre, "Extreme Heat: Preparing for Heatwaves of the Future," October 2022, https://www.unocha.org/publications/report/world/extreme-heat-preparing-heatwaves-future-october-2022 (accessed July 28, 2023), p. 5.

22 Ibid.

23 Ibid.

24 Ibid., p. 17. See also the Global Heat Health Information Network website https://ghhin.org/heat-and-health/.

25 OCHA, IFRC and the Red Cross Red Crescent Climate Centre, "Extreme Heat: Preparing for Heatwaves of the Future," October 2022 https://www.unocha.org/publications/report/world/extreme-heat-preparing-heatwaves-future-october-2022 (accessed July 28, 2023), p. 17.

26 Professor Qi Zhao et al., "Global, regional, and national burden of mortality associated with non-optimal ambient temperatures from 2000 to 2019: a three-stage modelling study," The Lancet Planetary Health, 5, no. 7 (2021): e415-e425, accessed October 12, 2023, doi: 10.1016/S2542-5196(21)00081-4.

27 US Agency for International Development, "Heat Waves and Human Health, Emerging Evidence and Experience to Inform Risk Management in a Warming World," February 2019, https://www.climatelinks.org/sites/default/files/asset/document/2019_USAID-ATLAS_Heat-Waves-and-Human-Health.pdf (accessed July 28, 2023).

28 Ibid.

29 Professor Kristie L Ebiet al., "Hot Weather and Heat Extremes: Health Risks"; Jose Guillermo Cedeño Laurent et al., "Reduced Cognitive Function during a Heat Wave among Residents of Non-Air-Conditioned Buildings: An Observational Study of Young Adults in the Summer of 2016," PLOS Medicine, no. 7 (2018), accessed October 12, 2023, https://doi.org/10.1371/journal.pmed.1002605.

30 Sadie J Ryan, "Mapping Thermal Physiology of Vector-Borne Diseases in a Changing Climate: Shifts in Geographic and Demographic Risk of Suitability," Current Environmental Health Reports, no. 4 (2020): 415–23, accessed October 12, 2023, https://doi.org/10.1007/s40572-020-00290-5; Helen Louise Berry, Kathryn Bowen, and Tord Kjellstrom, "Climate Change and Mental Health: A Causal Pathways Framework," International Journal of Public Health, 55 (2010): 123–132, accessed October 12, 2023, https://doi.org/10.1007/s00038-009-0112-0; Craig A Anderson., "Temperature and Aggression," Advances in Experimental Social Psychology, 32 (2000): 63–133, accessed October 2023, https://doi.org/10.1016/S0065-2601(00)80004-0.

31 IPCC "Climate Change 2022: Impacts, Adaptation, and Vulnerability," p. 1057.

High and still rising nighttime temperatures are especially dangerous, as the body has a better chance to recuperate during cooler nights. Nighttime heat also negatively impacts sleep, which in turn has many negative implications for health.[32] One estimate shows that by the end of the 21st century, if emissions continue to rise (a "high emissions scenario"), death rates from extreme heat could become comparable to those of all cancers or all infectious diseases worldwide.[33]

Staying cool is critical because when the body is too hot, vital organs like the heart must work harder to cool it down.[34] Above 37°C (the optimal temperature for humans), the blood thickens, requiring the heart to work harder. Older people, people with disabilities, young children, and infants often struggle to effectively regulate their body temperatures while potentially being less aware of how the heat is affecting them. Moreover, heat has a disproportionate impact on people without access to cooling.

Thermal Inequality

Access to cooling is a lifesaving intervention. Air conditioning is highly protective, and fans and other cooling devices can help, although above certain temperatures, fans can dehydrate bodies further.[35] Increasing the number of trees and green spaces can also cool neighborhoods, and these and other infrastructural efforts, like improving building insulation and painting roofs white, are gaining attention as ways to reduce heat.[36] But not everyone can afford or otherwise access cooled air; for example, not everyone can go to cooler shops or other public places. These victims of "thermal inequality" are frequently the least responsible for the climate crisis; living in poor quality, hotter housing, and/or hotter less-green neighborhoods (dramatic differences in temperatures within cities are common, even within small areas); and/or laboring in high temperatures.

Climate scientists have determined that Pakistan is a country where "intense and frequent heatwaves will render coping mechanisms inadequate as conditions in some regions meet and exceed limits to human survivability."[37] While acclimatization to heat is protective, mortality increases dramatically when temperatures exceed 40°C, even in places where people are "used to" heat.[38] Additionally, according to a joint UN-ICRC report, "acclimatization wanes in the absence of prolonged heat exposure … it affords less protection against the types of abrupt and unusual changes in humidity and temperature made more likely by climate change."[39]

Extreme Heat and Work

Low-income people usually must continue working regardless of the heat. Work is often unhealthily hot for low-income people. For example, harvesting food is often "piece work" (work paid for by the amount produced rather than paid by the hour), so workers are under pressure to labor hard despite dangerous temperatures.

The International Labour Organization has noted that all over the world, countries with high and rising temperatures may not have or adhere to worker protections and that workers may often work without breaks,

32 Keltor Minor., "Rising Temperatures Erode Human Sleep Globally," One Earth 5, no. 5 (2022): 534-549, accessed October 12, 2023, https://doi.org/10.1016/j.oneear.2022.04.008; and Daniel I. Rifkin, Michael W. Long and Melissa J. Perry, "Climate change and sleep: A systematic review of the literature and conceptual framework," Sleep Medicine Reviews 42 (2018): 3-9, accessed October 12, 2023, https://doi.org/10.1016/j.smrv.2018.07.007.

33 Tamma A Carleton et al., "Valuing the Global Mortality Consequences of Climate Change Accounting for Adaptation Costs and Benefits," National Bureau of Economic Research (2021), accessed October 12, 2023, https://www.nber.org/papers/w27599.

34 Braian M Beker et al., "Human Physiology in Extreme Heat and Cold," International Archives of Clinical Psychology 1, no. 1 (2018), accessed October 12, 2023, doi.org/10.23937/iacph-2017/1710001.

35 The Global Heat Health Information Network, co-hosted by the World Meteorological Society and the World Health Organization provides a library of resources on extreme heat, health effects and research on cooling methods. Please see the Global Heat Health Information Networks website, https://ghhin.org/resource-library/ and The Lancet, "Sustainable Ways to Stay Cool," 2021, https://www.thelancet.com/pb-assets/Lancet/infographics/heat-health/cooling-strategies-1648207816290.pdf (accessed October 12, 2023).

36 Ibid.

37 World Weather Attribution, report, "Climate Change made devastating early heat in India and Pakistan 30 times more likely."

38 Ibid., see also Daniel J. Vecellio et al., "Greatly enhanced risk to humans as a consequence of empirically determined lower moist heat stress tolerance," PNAS 120, no. 42 (2023), accessed October 16, 2023, https://doi.org/10.1073/pnas.2305427120; Carter M Powis et al., "Observational and model evidence together support wide-spread exposure to noncompensable heat under continued global warming," Science Advances (2023), accessed October 16, 2023, doi: 10.1126/sciadv.adg9297; Sureh K. Rathi, P. R Sodani and Suresh Joshi, "Summer Temperature and All-cause Mortality from 2006 to 2015 for Smart City Jaipur, India," Journal of Health Management 23, no. 2 (2021), accessed October 12, 2023, doi.org/10.1177/09720634211011693.

39 OCHR, IFRC and the Red Cross Red Crescent Climate Centre, "Extreme Heat: Preparing for Heatwaves of the Future," p. 16.

shade or other cooling, or enough water.[40] As such, addressing heat in the workplace is a labor rights priority for the climate crisis.

Our understanding of the relationship between heat and work has often focused on paid labor, in fields and factories, for example. However, globally, the labor burden of rural women is probably greater than that of men and much is unpaid and not done in a traditional workplace.[41] Therefore, traditional labor protections, even if they are strengthened, will do little for millions of subsistence farmers, mostly women, including in the many areas set to experience significant increases in temperatures in Africa and Southeast Asia. There is little research on the unique risks to pregnant people working in high-temperature agriculture of any type or on women who do subsistence farmwork. One important exception is the recent work on pregnant subsistence farmers in The Gambia (see 'Maternal Health and Birth Outcomes' section below).[42]

Furthermore, improving labor standards in places where paid work occurs will not provide protection for work in the home, caring for children and others, carrying water, cooking over hot fires and other work. A response to extreme heat that includes care work and subsistence work is necessary to address unpaid labor dimensions.

Maternal Health and Birth Outcomes

Heat exposure during pregnancy is linked to adverse birth outcomes, many of which can have lifelong impacts. Many studies have found an association between increased heat exposure and the risk of preterm birth and stillbirth,[43] even with small changes in temperature.[44] For example, a recent analysis of 70 studies across 27 countries found that with every 1°C rise in temperature, the risk of preterm birth increased.[45] Preterm birth can have lasting impacts on neurodevelopment, with increased risks of cerebral palsy, impaired learning, and physical and mental health complications.[46]

High temperatures may also increase the risk of some congenital anomalies, including heart defects (for which there is strong evidence),[47] as well as spina bifida and craniofacial differences (although research on both is more limited).[48]

Studies are also finding links between extreme heat and maternal physical health complications. Research shows that heat exposure during pregnancy is associated with increased emergency hospital admissions, gestational diabetes, and pre-eclampsia.[49] One recent study found that high temperatures in early pregnancy in

40 International Labour Organization (ILO), "Working on a Warmer Planet, The Impact of Heat Stress on Worker Productivity and Decent Work," 2019, https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_711919.pdf

41 Food and Agriculture Organization of the United Nations (FAO), "The State of Food and Agriculture: The role of women in agriculture 2010-2011," 2011, https://www.fao.org/3/i2050e/i2050e.pdf (accessed October 12, 2023).

42 Anna Bonell et al., "Environmental heat stress on maternal physiology and fetal blood flow in pregnant subsistence farmers in The Gambia, west Africa: an observational cohort study," The Lancet Planetary Health 6, no. 12 (2022): e968-e976, accessed October 12, 2023, doi: 10.1016/S2542-5196(22)00242-X; Spencer Shantelle et al., "The Challenges of Working in the Heat Whilst Pregnant: Insights From Gambian Women Farmers in the Face of Climate Change" Frontiers in Public Health 10 (2022), accessed October 12, 2023, doi: 10.3389/fpubh.2022.785254.

43 Nathalie Roos et al., "Maternal and newborn health risks of climate change: A call for awareness and global action," Acta Obstetrica et Gynecologica Scandinavica 100, no. 4 (2021): 566-570, accessed October 12, 2023, doi: 10.1111/aogs.14124.

44 Matthew Francis Chersich et al., "Climate Change and Heat-Health Study Group. Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: systematic review and meta-analysis," British Medical Journal (2020): m3811, accessed October 12, 2023, doi: 10.1136/bmj.m3811.

45 Ibid.; Louisa Samuels et al., "Physiological Mechanisms of the Impact of Heat during Pregnancy and the Clinical Implications: Review of the Evidence from an Expert Group Meeting," International Journal of Biometeorology 66 (8): 1505–1513, accessed October 12, 2023, https://doi.org/10.1007/s00484-022-02301-6.

46 Hannah Blencowe et al., "Preterm birth–associated neurodevelopmental impairment estimates at regional and global levels for 2010," Pediatric Research 74 (2013): 17-34, accessed October 12, 2023, https://www.nature.com/articles/pr2013204; Farin Soleimani, Farzaneh Zaheri and Fatemeh Abdi, "Long-Term Neurodevelopmental Outcomes After Preterm Birth," Iranian Red Crescent Medical Journal 16 (6): e17965. https://doi.org/10.5812/ircmj.17965.

47 Marjan Mosalman Haghighi et al., "Impacts of High Environmental Temperatures on Congenital Anomalies: A Systematic Review," International Journal of Environmental Research and Public Health 18 (9): 4910. https://doi.org/10.3390/ijerph18094910; Alissa R. Van Zutphen et al., "A Population-Based Case–Control Study of Extreme Summer Temperature and Birth Defects," Environmental Health Perspec. 120, no.10 (2013): 1443–1449, accessed October 12, 2023, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3491926/.

48 Marjan Mosalman Haghighi et al., "Impacts of High Environmental Temperatures on Congenital Anomalies: A Systematic Review," p. 4910.

49 Louisa Samuels et al., "Physiological Mechanisms of the Impact of Heat during Pregnancy and the Clinical Implications: Review of the Evidence from an Expert Group Meeting"; see also Sagi Shashar et al., "Temperature and Preeclampsia: Epidemiological Evidence That Perturbation in Maternal Heat Homeostasis Affects Pregnancy Outcome," PLoS ONE 15, no. 5 (2020), accessed October 12, 2023, https://doi.org/10.1371/journal.pone.0232877;

particular are associated with an increased risk of severe hypertensive disorders.[50] In addition, studies suggest that higher than normal temperatures are associated with a heightened risk of experiencing cardiovascular events during labor or delivery.[51]

Extreme heat may also negatively impact maternal mental health, as heat exposure is linked to emotional stress during pregnancy.[52] Hot weather can disrupt sleep patterns, and poor sleep quality is associated with an increased risk for depression among pregnant women.[53] This is particularly concerning given the already elevated risk of experiencing mental health conditions, including depression, during and after pregnancy.[54]

Some pregnant women and newborns may face greater risks due to heat than others. For example, links between temperature and outcomes, like preterm birth and stillbirth, are strongest among groups of pregnant women with lower socioeconomic status and who are at age extremes.[55] In the United States, historical and current racism has already resulted in a Black maternal health crisis where preterm birth, low-birth weight, and infant death rates are twice as high for Black mothers as white ones. Several studies found greater effects of higher-than-normal temperatures on adverse birth outcomes for Black mothers compared to white ones suggesting that increasing temperatures are exacerbating inequities.[56]

A recent study of pregnant farmworkers in The Gambia found that pregnant subsistence farmers are frequently exposed to extreme heat stress, leading to maternal heat strain.[57] The study concluded that maternal heat strain is significantly associated with fetal strain.[58] Women form about half of the agricultural workforce in The Gambia. A separately published qualitative study by the same team that found evidence of fetal strain also found that "layered identities, experiences, and household power structures shaped the extent to which women who participated in the study were able to prevent and reduce the effects of heat exposure during their work while pregnant" and that a "predominantly patriarchal society … limited their access to resources … and ability to take adaptive action to mitigate their risk of heat stress." Sometimes, when women were unable to work, less food was cultivated as a result.

Though research in this field is ongoing, it is clear that pregnant women and newborns are uniquely vulnerable to rising temperatures.[59] As such, they will require unique support to adapt to our warming world and must be included as an at-risk class for heat exposure.[60]

Yanji Qu et al., "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," Science of The Total Environment 777, (2021), accessed October 16, 2023, https://doi.org/10.1016/j.scitotenv.2021.146134.

50 Chérie Part et al., "Ambient temperature during pregnancy and risk of maternal hypertensive disorders: A time-to-event study in Johannesburg, South Africa," Environmental Research (2022), accessed October 12, 2023, doi: 10.1016/j.envres.2022.113596.

51 Sandie Ha et al., "Ambient Temperature and Risk of Cardiovascular Events at Labor and Delivery: A Case-Crossover Study," Environmental Research 159 (2017): 622–628, accessed October 12, 2023, https://doi.org/10.1016/j.envres.2017.09.010; Tao Xiong et al., "Association between Ambient Temperature and Hypertensive Disorders in Pregnancy in China," Nature Communications 11, no. 1 (2020): 2925, accessed October 12, 2023, https://doi.org/10.1038/s41467-020-16775-8; Sagi Shashar et al., "Temperature and Preeclampsia: Epidemiological Evidence That Perturbation in Maternal Heat Homeostasis Affects Pregnancy Outcome."; Jiaqi Wang et al., "Associations of Maternal Ambient Temperature Exposures during Pregnancy with the Placental Weight, Volume and PFR: A Birth Cohort Study in Guangzhou, China," Environment International 139 (2020), accessed October 12, 2023, https://doi.org/10.1016/j.envint.2020.105682.

52 Yanfen Lin et al., "Association between temperature and maternal stress during pregnancy," Environmental Research 158 (2017): 421-430, accessed October 12, 2023, https://doi.org/10.1016/j.envres.2017.06.034.

53 Ming Gao et al., "Association of sleep quality during pregnancy with stress and depression: a prospective birth cohort study in China," BMC Pregnancy Childbirth 444 (2019): 444, accessed October 12, 2023, https://doi.org/10.1186/s12884-019-2583-1.

54 Ziyi Wang et al., "Mapping global prevalence of depression among postpartum women," Translation Psychiatry 11 (2021), accessed October 12, 2023, https://doi.org/10.1038/s41398-021-01663-6.

55 Matthew Francis Chersich et al., "Climate Change and Heat-Health Study Group. Associations between high temperatures in pregnancy and risk of preterm birth, low birth weight, and stillbirths: systematic review and meta-analysis."

56 "Preterm Birth," Centers for Disease Control and Prevention (CDC), accessed October 12, 2023, https://www.cdc.gov/reproductivehealth/features/premature-birth/index.html#:~:text=Preterm%20Birth%20in%20the%20United%20States&text=However%2C%20racial%20and%20ethnic%20differences,or%20Hispanic%20women%20(10.2%25).

57 Ana Bonell et al., "Environmental Heat Stress on Maternal Physiology and Fetal Blood Flow in Pregnant Subsistence Farmers in The Gambia, West Africa: An Observational Cohort Study." The Lancet Planetary Health 6, no. 12 (2022): e968–e976, accessed October 12, 2023, https://doi.org/10.1016/S2542-5196(22)00242-X.

58 Ibid.

59 Darshnika Pemi Lakhoo et al., "The Effect of High and Low Ambient Temperature on Infant Health: A Systematic Review," International Journal of Environmental Research and Public Health 19, no. 15 (2022): 9109, accessed October 12, 2023, https://pubmed.ncbi.nlm.nih.gov/35897477/.

60 Matthew Francis Chersich et al., "Climate Change and Heat-Health Study Group. Associations between high temperatures in pregnancy and risk of

Children's Health

Children are also more likely to be affected by respiratory disease, renal disease, electrolyte imbalance, and fever during persistent hot weather.[61] These associations may be explained partly by the fact that very young children have a high body surface to volume ratio, which increases relative exposure to temperature.[62] Furthermore, children sweat less than adults and may have limited ability to avoid or reduce heat exposure, rendering them less able to self-regulate temperature.[63] Heat can also have detrimental impact on children's ability to learn.[64] Children in low-income settings are uniquely vulnerable to the health impacts of heat due to pre-existing burdens of infection, undernutrition, poor healthcare systems, and dwellings that do not provide sufficient protection from the heat.[65] Heat exposure may even worsen these health conditions. For example, in some regions, extreme heat has been linked to an increased prevalence of both chronic and acute malnutrition.[66]

Rising temperatures caused by climate change are already undermining improvements made to children's health. One study found that by 2009, heat-related child mortality in Africa was double what it would have been without climate change; this impact outweighed reductions in heat mortality that resulted from improvements associated with social development.[67] This phenomenon is particularly concerning given that childhood exposure to extreme heat events is projected to increase.[68]

Overview of Maternal and Newborn Health in Pakistan

The impacts of the climate crisis, including extreme heat, exacerbate Pakistan's maternal and newborn health outcomes, which are poor even in comparison to other low-income countries. In August 2022, the Research and Development Forum for Safe Motherhood (FSM) published a landscape analysis, Ending Preventable Maternal Mortality and Early Newborn Action Plan in Pakistan, including examples from Sindh, on how policy and funding gaps and poor oversight of private healthcare providers undermine maternal and newborn health.[69]
That report concluded that "over the past several decades the government's interventions in maternal and child health have been partial, disintegrated, erratic and unsustainable."[70]

While Pakistan's neighbors, except Afghanistan, have reduced fertility rates to 2.1 births per woman or below over the past several decades, Pakistan's has remained high at 3.6 per woman and only declined marginally since 2012-13 when it was 3.8 births per woman.[71] High fertility rates are partly due to poor government structuring of services and failing commodity chains.[72] For example, since the Department of Population Welfare

preterm birth, low birth weight, and stillbirths: systematic review and meta-analysis."

61 Zhiwei Xu et al., "The impact of heat waves on children's health: a systematic review," International Journal of Biometeorology 58 (2014): 239–247, accessed October 12, 2023, https://doi.org/10.1007/s00484-013-0655-x.

62 Darshnika Pemi Lakhoo et al., "The Effect of High and Low Ambient Temperature on Infant Health: A Systematic Review."

63 Francis Vergunst and Helen L. Berry, "Climate Change and Children's Mental Health: A Developmental Perspective," Clinical Psychological Science 10, no. 4 (2022): 767–785, accessed October 12, 2023, https://doi.org/10.1177/21677026211040787.

64 See for example in Human Rights Watch, "Australia: Extreme Heat Threatens Lives" Photo Essay Highlights Urgent Need for Reduced Emissions, Heat Management Plans, March 21, 2022.

65 Perry E Sheffield and Philip J Landrigan, "Global climate change and children's health: threats and strategies for prevention," Environmental Health Perspective 119, no. 3 (2011): 291-8, accessed October 12, 2023, doi: 10.1289/ehp.1002233; Charlotta Rylander, Jon Øyvind Odland and Torkjel Manning Sandanger, "Climate change and the potential effects on maternal and pregnancy outcomes: an assessment of the most vulnerable – the mother, fetus, and newborn child," Global Health Action (2013), accessed October 12, 2023, doi: 10.3402/gha.v6i0.19538.

66 Sylvia Blom, Ariel Ortiz-Bobea and John Hoddinott, "Heat exposure and child nutrition: Evidence from West Africa," Journal of Environmental Economics and Management 115 (2022), accessed October 12, 2023, https://doi.org/10.1016/j.jeem.2022.102698.

67 Sarah Chapman et al, "Past and projected climate change impacts on heat-related child mortality in Africa," Environmental Research Letters 17, no. 7 (2022), DOI:10.1088/1748-9326/ac7ac5.

68 UNICEF, 2022, "The Coldest Year of the Rest of their Lives," October 2022, https://www.unicef.org/reports/coldest-year-rest-of-their-lives-children-heatwaves (accessed October 12, 2023).

69 Forum for Safe Motherhood (White Ribbon Alliance Pakistan Chapter), "Ending Preventable Maternal Mortality and Early Newborn Action Plan in Pakistan," August 2022. Available upon request.

70 Ibid.

71 Forum for Safe Motherhood (White Ribbon Alliance Pakistan Chapter), "Ending Preventable Maternal Mortality and Early Newborn Action Plan in Pakistan," August 2022, p.8. See also Pakistan Demographic and Health Survey (PDHS) of 2017-18.

72 "World Population Dashbord: Pakistan," United Nations Population Fund, accessed October 16, 2023, https://www.unfpa.org/data/world-popula-

provides maternal, newborn, and child health and family planning services separately, healthcare providers are not held accountable for providing either information about or access to contraception. The landscape analysis recommends a centralized approach by relocating all family planning service delivery points to health facilities, noting that despite high-level governmental concerns about high rates of unwanted pregnancies and population growth, "momentum [is] yet to be seen as action at service delivery level."

Even in comparison to its neighbors, Pakistan also suffers from high maternal and neonatal mortality rates. In 2019, Pakistan's maternal mortality rate was about 186 per 100,000 births. This is higher than in neighboring countries, except Afghanistan. And during the past decade, Pakistan's neonatal mortality rate has fluctuated between 42 to 54 per 1,000 live births, whereas its regional neighbors have neonatal mortality rates of less than 20 per 1,000 births. Finally, Pakistan's perinatal mortality rate, which includes stillbirths and deaths in the first week of life, is 70 per 1,000 total births, which is high compared to other middle- and low-income countries. 63 percent of deaths of children under five in Pakistan are newborns.[73]

Worryingly, although government data indicates that coverage has improved over the past several decades—for example, more women receive antenatal care and skilled birth attendance—fertility and neonatal and perinatal mortality rates have not, suggesting a gap in the implementation of adequate care. FSM's landscape analysis also found no significant improvement in access to emergency obstetric care and that, as far as its researchers could find, the government had not established referral systems from more local health centers to emergency care.[74]

A 2020 study of a small sample of pregnancies found a very high rate of preterm birth: more than 21 percent of all births were preterm (globally, about 10 percent of babies are born preterm, but rates are highly variable from 5 to 18 percent).[75] In addition, according to a large-scale study, almost one in four newborns are reported as having low-birth weight and newborns with low-birth weight in Pakistan are at higher risk of developing wasting (low weight for height) and stunting (retardation of linear growth).[76]

The Global Network for Women and Children's Health Research and Aga Khan University in Karachi have a maternal and newborn health surveillance system in Thatta District, Sindh Province.[77] Between 2010 and 2018, the maternal mortality rate there was about 319 per 100,000 live births, which is significantly higher than the average maternal mortality rate of 125 per 100,000 live births in the Network's other six sites (in Argentina, Democratic Republic of Congo, Guatemala, India, and Zambia). Furthermore, in the Pakistan site, the neonatal mortality rate was 49 per 1,000 live births and the stillbirth rate was 54 per 1,000 total births, compared to averages of 20 and 23, respectively, in the other six sites. The study attributed the gap to poverty, low literacy, and poor quality of available maternal and newborn health services in the Pakistan site.

Fortunately, there are opportunities to repair Pakistan's maternal health infrastructure. FSM recommends strengthening and remodeling the Lady Health Worker Program, a community health worker program that provides a first point of contact between families and health systems, antenatal care, family planning, and

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tion/PK (accessed July 28, 2023). See also Sadia Jabeen et al., "Demand- and supply-side factors associated with the use of contraceptive methods in Pakistan: a comparative study of demographic and health surveys, 1990–2018," BMC Women's Health 20 (2022), accessed October 12, 2023, https://doi.org/10.1186/s12905-020-01112-4.

73 Forum for Safe Motherhood (White Ribbon Alliance Pakistan Chapter), "Ending Preventable Maternal Mortality and Early Newborn Action Plan in Pakistan," August 2022. See also "Pakistan" Healthy Newborn Network, accessed October 12, 2023, https://www.healthynewbornnetwork.org/country/pakistan/.

74 Forum for Safe Motherhood (White Ribbon Alliance Pakistan Chapter), "Ending Preventable Maternal Mortality and Early Newborn Action Plan in Pakistan," August 2022.

75 Asif Hanif et al., "Prevalence and risk factors of preterm birth in Pakistan," Journal of the Pakistan Medical Association 70, no. 4 (2020), accessed October 12, 2023, https://doi.org/10.5455/JPMA.295022.

76 Faisal Abbas et al., "Impact of children born with low birth weight on stunting and wasting in Sindh province of Pakistan: a propensity score matching approach," Scientific Reports 11, (2021), accessed October 12, 2023, https://doi.org/10.1038/s41598-021-98924-7. For global rates see "Preterm Birth, factsheet," World Health Organization, accessed October 12, 2023, https://www.who.int/news-room/fact-sheets/detail/preterm-birth#:~:text=An%20estimated%2015%20million%20babies%20are%20born%20too%20early%20every,of%20preterm%20birth%20(1). For definitions of "wasting" and "stunting" see "Malnutrition," World Health Organization, accessed October 12, 2023, https://www.who.int/health-topics/malnutrition#tab=tab_1.

77 Aleha Aziz et al., "Why are the Pakistani maternal, fetal and newborn outcomes so poor compared to other low and middle-income countries," Reproductive Health 17, (2020), accessed October 12, 2023, https://doi.org/10.1186/s12978-020-01023-5.

referrals for facility-based deliveries and family planning services. Introduced in the 1990s, this program successfully brought reproductive health services to many rural women. Despite its significant potential, the program has been under resourced everywhere and all but abandoned in one province. Across Pakistan, the much-needed expansion of health workers to the program never materialized, funding dwindled, and management remained poor. Better resourced midwives, who experience less support and respect than other providers, should also be made a priority. They are well-placed to make maternal care more responsive and patient centric, which policymakers have identified as important.

The findings of this report on how the climate crisis is worsening maternal health reinforce a key recommendation from the landscape analysis: Pakistan should create a plan to prepare its healthcare system to provide essential reproductive healthcare during disasters. The landscape analysis also found that maternal and newborn health services were not well-coordinated with other sectors whose work contributes to saving maternal and newborn lives, such as sanitation, education, and nutrition services. Better coordination is needed not only for public health gains and disaster preparedness, but also for climate adaptation, which must be inherently intersectoral. In fact, the climate crisis is pressing governments all over the world to break down silos to make sure, for example, communities at risk from extreme heat receive adequate public health messaging and have access to better-designed housing, public spaces, and transport infrastructure.

EXPOSURE TO EXTREME HEAT AND ITS IMPACTS

All the women interviewed for this report said extreme heat was worsening every year. They said that extreme heat undermined well-being for everyone in their families and communities but was most harmful for people exposed to more heat (for example, through their work) or who had additional vulnerabilities such as illness or pregnancy. Interviewees also noted that extreme heat had implications for their family's economic well-being, including by making wage earners less productive at work.

Gendered and unpaid "women's" work exposed interviewees to additional heat, including cooking over hot fires and fetching water, which was needed in greater volumes for cooling. Females also had fewer cooling options than men.

Heat was often associated not only with constant discomfort, but also with poor mood. Unremitting high temperatures without cooling was miserable and adversely affected sleep quality. Pregnancy made heat and working in the heat harder to endure and looking after and breastfeeding babies more difficult and stressful, which adversely affected the psychological well-being of the mothers we interviewed.

General Harms

When asked who was worst affected by heat, our women interviewees often began answering by noting that harms were felt by all, including by everyone in their families. "The extreme dryness causes dehydration, headache, and fatigue and lethargy," said Madiha Raza, speaking generally about the harms of heat. Her list of adverse experiences echoed that of many other interviewees. "My entire family, including my mother and children, fell sick in the recent heatwave. Many people in our community complained about fever, dehydration, and malaria," described a respondent, Maryam Mahboob. Children, as well as people with pre-existing illnesses, were also often understood to be hard-hit by heat.

"I was impacted the worst by the extreme heat in my family. I have some health issues [Hepatitis C], which have made me more vulnerable to being impacted by the extreme heat," said Marjan Zia, a lactating interviewee.

> It is getting hotter every year and we were not able to sleep well this summer due to this. It has also changed our eating patterns as most of the time, we do not feel hungry.... And it affects my mood as I easily get infuriated and depressed in hot summers.
>
> • **Interviewee**, pregnant at the time of the interview.

> Due to a lack of information about the causes [and] preventive measures and my personal experience, I would rate [extreme heat] as a very big problem ... especially in rural areas where communication channels are limited.
>
> • **Interviewee**, postpartum at the time of the interview.

Extreme heat was also linked with worse sleep for everyone in our women interviewees' families, although pregnant women and mothers described additional difficulties.

Economic Consequences for Poor Families

The economic implications of higher temperatures for their families caused respondents to worry about the future. "Increased periods of extreme heat will impact our future as it takes a toll on productivity," said Aisha Hassan. "Agriculture is the most affected sector. Due to the unavailability of water, crop production will also decrease."

The 2022 extreme heatwave hit at a critical time, during the final period of the growing season, extensively impacting the agricultural sector.[78] Globally, extreme heat severely harms agricultural productivity, which in turn reduces economic output and exacerbates poverty.[79] Low income communities in India and Pakistan are especially vulnerable to extreme heat because about 60 percent of India's workforce and about 40 percent of Pakistan's are in agriculture, where the bulk of labor is outdoors.[80] Like laborers worldwide, these workers must make the difficult choice between working in dangerously high temperatures or forgoing their livelihoods.[81]

A female medical officer (who sees only female patients) working with the People's Primary Health Initiative (PPHI), a government-funded NGO that provides much of the primary healthcare services in Sindh, noted that she often saw women agricultural workers who had come to her clinic because of extreme heat. "On a monthly basis, I receive 10 to 15 female patients with heat stroke who were working in hot weather," she said. She also said that she noticed a rise in overall patient numbers during high temperature weather.

Aisha Hassan, a mother, including of a baby born in April 2022, said that her family worries most about her husband during high temperatures. She said he has a kidney disease that makes him more vulnerable to extreme heat. "He fell unconscious, and we were not able to get him treated properly due to our poverty," Aisha Hassan said. "[His health] gets worse during extreme heat, [but] he is a day laborer and has to work even in extreme heat as we do not have any other livelihood sources."

Challenges for Unpaid Labor

All the interviewees for this report worked in their homes, including by cooking, cleaning, carrying water, and providing childcare. Extreme heat made them feel more exhausted and less able to work. Below, we describe how being pregnant, and/or breastfeeding, worsened women's experiences of extreme heat while laboring in fields or in the home in ways that are often gendered.

Subsistence Farming

Most interviewees worked as subsistence farmers, either in the fields (for example, planting rice) or with livestock. Bushra Akmal told us that she struggled with the heat while performing household chores, including carrying water, but she felt hottest when she

> Extreme heat is becoming a major issue these days as women's [outdoor] workload has increased as we are responsible for collecting [more] water because water consumption has increased due to hot summers. [This] makes us weak and dehydrated. I do all household chores, such as cooking, taking care of the children and livestock, collecting water, but I feel the heat the most during cooking as we use firewood, which also increases the temperature.
>
> • **Bushra Akmal**, pregnant at the time of the interview.

78 World Weather Attribution, "Climate Change made devastating early heat in India and Pakistan 30 times more likely."

79 ILO, "Working on a Warmer Planet, The Impact of Heat Stress on Worker Productivity and Decent Work," 2019, https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_711919.pdf.

80 World Weather Attribution, "Climate Change made devastating early heat in India and Pakistan 30 times more likely."

81 Ibid.

used the grass-cutting machine in the afternoons to prepare fodder for the livestock. Marjan Zia also found agricultural work, namely rice harvesting, to be the most taxing.

Carrying Water

According to interviewees, extreme heat created more work for them while making them feel weaker and less able to complete necessary tasks. One such task was collecting and transporting water, of which more is needed during hot weather, especially for bathing. "I fell sick and felt touchy and sensitive due to continuous sweating caused by dry weather," described Asma Rashid, pregnant at the time of the interview. "I somehow managed it by taking frequent bath with water and increased water intake to cool off."

Some respondents had handpumps in their household compounds and did not need to carry water long distances. However, they noted that they still needed to jump up and down to work the lever to get the water flowing. In addition, as the pump's location is fixed, pumping water in the shade is not always an option.

Cooking

Cooking, which is typically done inside and without fans or other cooling devices, is especially hot work. Several interviewees struggled the most with extreme heat when cooking, mostly over wood burning fires. "I feel the heat the most during cooking as it causes temperatures to rise, which makes me lethargic and dehydrated," said Muneeba Shahbaz. Aisha Hassan described the problem: the only way to stay cool was not to cook, but this was "not possible because if we do not cook food, then how we will survive?"

Child Care Work

According to the ICRC, care work such as "caring for infants or the elderly tends to be less adaptable to dangerously hot conditions … [and] not amenable to breaks or adjustments in working hours."[82] Our findings reflected the struggles of women to care for the most vulnerable in their families, highlighting how extreme heat is adding a further labor and stress to unpaid care work. In particular, interviewees experienced negative feelings or moods, including about their children and motherhood, and sleep loss.

Many interviewees also linked heat to feeling depressed or angry, often in connection with childcare, which is already stressful and emotionally taxing work. Women were already burdened with managing household chores and childcare; however, the situation became harder due to the extreme heat that negatively affected the interviewees' moods and made them feel bad while doing this work. "As the only woman in the household, it became challenging to take care of a baby along with routine chores," said Bushra Akmal. "And extreme heat further made it more difficult as I feel tired and stressed during those days."

Hajra Osman recounted the additional challenges in taking care of both her household obligations and her new baby when it was very hot in June and July. "I turned out to be easily irritated and aggressive," she said. Habiba Abid said the heat worsened her financial worries, which began after the floods destroyed their home and her family had to rent a place to live. When asked how the heat affected her mental health, she said: "I noticed many changes in my mood, especially when I breastfeed my child, and I was not able to manage payments due to the additional expenses from renting. I often take out my anger on the children, but when my anger cools down, I realize that I should not beat them."

Poor sleep is another problem that extreme heat exacerbates. Pregnant women and mothers of babies are already at risk for poor sleep because of physiological changes during pregnancy and infant care needs postpartum.[83] Adequate sleep is crucial for all human health, and for expecting and new mothers, poor maternal sleep is linked to postpartum depression and may be linked to worse birth outcomes and poorer infant health.

82 OCHA, IFRC, and the Red Cross Red Crescent Climate Centre, "Extreme Heat: Preparing for Heatwaves of the Future," p. 21.

83 Rosalia Silvestri and Irene Aricò, "Sleep disorders in pregnancy," Sleep Science 12, no. 13 (2019): 232-239, accessed October 12, 2023, doi: 10.5935/1984-0063.20190098; Mahboobeh Maghami et al., "Sleep disorders during pregnancy and postpartum depression: A systematic review and meta-analysis," International Journal of Developmental Neuroscience 81, no. 6 (2021): 469–478, accessed October 12, 2023, https://doi.org/10.1002/jdn.10118.

Unfortunately, several interviewees cited loss of sleep at night because of the discomfort of heat. “Our sleep patterns were affected by the hot summers, which made us concerned. I easily get infuriated, so it has also affected my mood,” said Banu Gul, the wife of a butcher in Kumbah Mollah village who was pregnant at the time of the interview. “It becomes difficult to get good sleep in these hot summers and women often suffer from lack of sleep,” Gul e Lala said.

Mothers face additional obstacles to sleeping adequately during heat. Mothers had to perform additional work to keep children, especially highly vulnerable babies, cool by using hand fans made from woven palm leaves. “We women are supposed to manage [hot nights] by using hand fans to get our children sleep,” Hira Imran said. These cooling efforts were constant, including at night, after exhausting hot days.

Several interviewees said their worst anger or mood swings occurred around long periods of cooling their children with homemade fans. “I noticed many mood changes, especially when I have to get my children sleep,” said one mother. Two interviewees noted that the anger experienced while fanning their children—while feeling exhausted and hot themselves—adversely affected how they felt about their children and mothering.

Maternal and Children’s Health Consequences

Extreme heat impacted expecting and new mothers in several ways, described below.

Maternal Mental Health

Mental health is a major problem within maternal health and can affect more than just the mother. For example, maternal depression is associated with worse health for the pregnant person and may also harm the baby and other family members.[84]

According to the World Health Organization (WHO), “perinatal (defined as the period of pregnancy and for the year after birth) anxiety and depression in the perinatal period are common, affecting an estimated 1 in 10 women in high-income countries and one in five in low- and middle-income countries.”[85] Rates in Pakistan may be even higher.[86] The WHO also notes that high levels of stress or constantly living in stressful conditions can affect physical and mental health and that natural disasters are also associated with worse maternal mental

> Women, especially pregnant women, are the most affected by extreme heat. If a child is sick at home, everybody is concerned, but if a female is sick, nobody cares about her because of our patriarchal society. The patriarchal mindset is one in which you just care about your kids, house, and fields. Also, there is much poverty, and females, even when pregnant, have to work in the fields.
>
> • **District Manager**, People’s Primary Health Initiative (PPHI)

84 For example, one study noted: “[i]nfants are dependent on their mothers for breastfeeding, physical care, comfort and social interaction. Infant development is compromised if a mother is insensitive or unresponsive to the infant’s behavioural cues and needs. In low- and lower-middle-income countries, maternal depression is associated with higher rates of malnutrition and stunting, diarrhoeal diseases, infectious illnesses, hospital admissions, lower birth weight and reduced completion of immunization schedules among infants.” Prevalence and determinants of common perinatal mental disorders in women in low- and lower-middle-income countries: a systematic review.

85 “WHO guide for integration of perinatal mental health in maternal and child health services,” WHO, accessed October 12, 2023, https://www.who.int/publications/i/item/9789240057142.

86 Jane Fisher et al., “Prevalence and determinants of common perinatal mental disorders in women in low- and lower-middle-income countries: a systematic review,” Bulletin of the World Health Organization 90, no. 2 (2012): 139-149H, accessed October 12, 2023, doi: 10.2471/BLT.11.091850. . General statistics show that in Pakistan’s rural areas, 25–48% of women experience antenatal depression. and 28–36% of women experience postnatal depression.

health.[87]

Although mental health conditions in expecting and new mothers are common, most women do not receive the care they need for various reasons, including that mental health conditions are not identified or treated because maternal health providers are not trained and specialists are not available.[88] Community support and family support, and "[e]mpathetic, competent health-care providers who treat women with respect and dignity" as well as a sense of agency in the pregnant women, including "feeling informed and able to make decisions," are all protective against such conditions.[89]

As mentioned above, interviewees repeatedly linked extreme heat with worsened mood or other mental health concerns. "I believe that somehow, the extreme heat was also a contributing factor in my mood swings and exhaustion during pregnancy," said Habiba Abid. Unhappiness was reported in connection with poor sleep because of heat, stress over economic or health consequences, the misery of working in high temperatures, and/or despair at the prospect of an ever-hotter future.

Several interviewees expressed their worries about the vulnerability of their children and babies, which added to their stress, during both the day and night. Worries about extreme heat harming young children are well-placed (see sections "Maternal Health and Birth Outcomes" and "Children's Health" above). Respondents further recounted difficulties around breastfeeding and extreme heat (examined in more detail below) and also worried about older children who struggled to cope with extreme heat, sometimes fell ill, and suffered decrease in appetite.

Dehydration

Interviewees reported that being pregnant made it harder to bear extreme heat. Many said that high temperatures often made them feel unwell, dizzy, dehydrated, tired, or lethargic during their pregnancy.

"Although I did not faint, [I felt like I] was about to die in the hot summers," Bushra Akmal said, adding that she often felt lightheaded and fatigued when she was hot during her pregnancy. Dehydration was one reported concern. Kalsoom Jawed, pregnant at the time of the interview, felt sick and dehydrated and worried that the heat was negatively impacting her overall health. And two interviewees were diagnosed with dehydration during their pregnancies. Hajra Osman required an intravenous drip for dehydration, which she believes was due to the extreme heat. "[The heat] also made me feel bad about being pregnant as my pregnancy experience got more complicated and worse in the recent heatwave," she said. As discussed above, dehydration increases the risk of premature birth. Madiha Raza's complaints of dehydration and nausea from the very hot weather echoed other interviewees.

> "I suffered from dehydration, nausea, vomiting, and severe headaches [caused by extreme heat], which made my pregnancy more difficult. We managed it by visiting the hospital [so I could] get treatment. The doctor administered an IV treatment to address the symptoms, which kept me hydrated somehow. [Heat] is a major problem now … affecting our health.
>
> • **Maryam Mahboob**, pregnant at the time of the interview.

Asma Rashid said: "I wish I could change my pregnancy months and do this during the winter." Like Asma

87 "WHO guide for integration of perinatal mental health in maternal and child health services," WHO, accessed October 12, 2023, https://www.who.int/publications/i/item/9789240057142.

88 Ibid. When health-care providers in MCH services are trained to identify symptoms of mental health conditions and to deliver appropriate interventions during routine contacts during the perinatal period, they can address the treatment gap in PMH care and improve mental and physical health outcomes for women and their children. Routine screening and general psychosocial support from MCH providers are appropriate for all women in the perinatal period, ensuring that they feel able to discuss and manage their mental health struggles. More intensive or specialized treatment is appropriate for women with longer-term, more severe mental illnesses.

89 Ibid.

Rashid, Madiha Raza said: “Sometimes I feel that women should not get pregnant during hot summers.”

Worries about Fetal Development

Kalsoom Jawed and others worried about the effects of hot weather on their gestating baby’s health. Sometimes Aisha Hassan did not feel her baby move when she herself was experiencing “severe weakness.” She believes the hot weather contributed to both problems. Asma Rashid said that she visited the hospital frequently during her pregnancy when she felt her fetus was not moving as much as normal. She linked the reduced fetal movement as well as her tiredness, weakness, and lack of appetite to extreme heat.

Some interviewees had a loss of appetite, which was particularly concerning during their pregnancies, a time when women have extra nutritional needs. Several interviewees worried about this. Aisha Hassan ate less while pregnant because she felt dizzy and unwell because of the heat.

Interviewees who had other illnesses while pregnant told us that high temperatures exacerbated those conditions. This was the case for Farida Bibi, who had malaria in her fourth month of pregnancy, and Fatima Kamran, who suffered from anemia during her pregnancy and fainted from “weakness” twice. She said the heat made the condition feel worse.

Breastfeeding

Extreme heat not only changed how our interviewees experienced pregnancy, but also created obstacles to breastfeeding their babies.

All the interviewees with babies said that because of the hot weather, breastfeeding became less comfortable, they felt more lethargic, and their babies became less cooperative. Several, including Hira Imran, also said the heat made them eat less, which they believed impacted their milk supply. Marjan Zia said she ate less in the heat, which affected lactation, and that sometimes the heat made her so tired that she slept without feeding her baby.

Interviewees told us about the impact on their babies of their exhaustion and what some felt was inadequate breastfeeding. Habiba Abid found it hard to eat in the heat, which made her too tired to breastfeed as much as she would have liked, and both which she believes contributed to her baby becoming weaker and less healthy between May and June. Aisha Hassan’s baby lost weight because she could not properly feed her. “My baby was born healthy and beautiful, but due to severe heat and lack of care from me, she turned out weak in recent hot summers,” she said. Hajra Osman reported not only “exhaustion,” but also soreness related to the heat, causing her to breastfeed her baby less than recommended, which she believed made her baby unwell.

Exclusive breastfeeding for the first several months of life provides a host of health benefits for the baby, such as antibodies against diseases, protection from water-borne diseases and protection against future diseases like diabetes.[90] As a result, exclusive breastfeeding for the first six months is one of the most effective interventions to promote adequate growth. Breastfeeding also has important health benefits for the mother,

> My baby was healthy when he was born, but he became weak or unhealthier during hot months. It was very difficult to breastfeed him, and I sometimes fell sleep without feeding my baby due to [my own] weakness and exhaustion. [In the heat,] I fell sick and stopped taking food as I didn’t feel a need to eat, and this affected lactation.
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> • **Hira Imran**, postpartum woman.

90 “Breastfeeding,” WHO, accessed October 12, 2023, https://www.who.int/health-topics/breastfeeding#tab=tab_3.

such as reduced rates of some cancers.[91]

A 2022 global survey of breastfeeding practices and perceptions of infants' changing needs in times of hot weather found that mothers supplement breastmilk with other liquids or foods when they feel their babies are not getting an adequate supply of breastmilk or are thirsty.[92] The study's authors worried about the addition of water, which can be dangerous since it often contains harmful bacteria or other disease-causing agents.

Although the Pakistani health system has recognized the importance of breastfeeding, it is not the norm in the first six months. According to a 2018 government survey, only 20 percent of children born during the last two years were breastfed within one hour of birth and fewer than half were exclusively breastfed for six months; instead, the median duration of breastfeeding was only 1.6 months.[93] A study on low rates of breastfeeding and exclusive breastfeeding in Pakistan recommended: "there is dire need to consider the maternal socioeconomic status and peer counseling in order to enhance exclusive breastfeeding."[94] A qualitative study on barriers to breastfeeding in a rural area in Sindh Province found a range of reasons for reduced breastfeeding, including low knowledge about benefits and techniques to breastfeed more easily (such as baby positioning), poor maternal nutrition, maternal work such as in agriculture, and short intervals between pregnancies.[95] The authors also noted that women in their focus groups often said they supplemented with animal milks or other foods and water when they felt their baby was not getting enough milk or was still hungry. The authors said the perception that the baby was hungry or thirsty could be heightened by extreme heat.

Safe and affordable alternatives to breast milk are necessary, especially where breastfeeding is not feasible. However, affordable infant formula is often not available in poorer rural areas, leaving mothers with few safe options.[96]

Struggles with breastfeeding because of heat may also impact maternal mental health. As well as providing the benefits outlined above, a recent systematic review found that breastfeeding was generally associated with positive effects on maternal mental health (although not always, such as when there was discordance between expectations of breastfeeding and actual experiences or when women were stigmatized or made to feel guilty for not wanting to breastfeed).[97] A study in India found that the risk of postnatal depression was greater among mothers who had experienced difficulty breastfeeding.[98]

We saw maternal health impacts in our interviews. As mentioned, the heat also worsened mothers' moods, which in turn affected their ability or desire to breastfeed their babies. Gul e Lala, for example, said she experienced depression, which she blamed, at least partly, on extreme heat which, for example, made her find breastfeeding difficult and stressful.

91 "Breastfeeding gives babies the best possible start in life and breastmilk acts like a baby's first vaccine," WHO Pakistan, accessed October 12, 2023, https://www.emro.who.int/pak/pakistan-news/breastfeeding-gives-babies-the-best-possible-start-in-life-and-breastmilk-works-like-a-babys-first-vaccine.html.

92 Jessica M Edney et al., "A systematic review of hot weather impacts on infant feeding practices in low-and middle-income countries," Frontiers in Pediatric 10, (2022), accessed October 12, 2023, doi: 10.3389/fped.2022.930348.

93 For more on low breastfeeding in Pakistan see "Breastfeeding," UNICEF, accessed October 16, 2023, https://www.unicef.org/pakistan/media_10018.html.

94 Sidra Arif et al., "Factors influencing exclusive breastfeeding duration in Pakistan: a population-based cross-sectional study," BMC Public Health 21, (2021), accessed October 12, 2023, https://doi.org/10.1186/s12889-021-12075-y.

95 Atif Riaz et al., "Barriers and facilitators to exclusive breastfeeding in rural Pakistan: a qualitative exploratory study," International Breastfeeding Journal 17, no. 59 (2022), accessed October 12, 2023, https://doi.org/10.1186/s13006-022-00495-4.

96 Ibid.

97 Megan Yuen et al., "The Effects of Breastfeeding on Maternal Mental Health: A Systematic Review," Journal of Women's Health 31, no. 6 (2022): 787-807, accessed October 12, 2023, https://doi.org/10.1089/jwh.2021.0504.

98 Vikram Patel, Merlyn Rodrigues and Nandita DeSouza, "Gender, poverty, and postnatal depression: a study of mothers in Goa, India," American Journal of Psychiatry 159, no. 1 (2002): 43–47, accessed October 12, 2023, doi:10.1176/ appi.ajp.159.1.43.

MANAGING EXTREME HEAT

Interviewees told us about their heat management methods, which included using electric fans, bathing in cool water, distracting themselves, or resting. Their ability to control how often they used these methods was limited by work demands and erratic electricity supply. Most interviewees had electric fans in their homes, but the fans often did not work because of power cuts. Consequently, many had bought solar panels to at least have a working fan during the day. "We have … solar panels to survive hot summers in the daytime, while at night, we sleep in the courtyard under the open sky as the solar panels do not work at night," said Aisha Hassan.

Asma Rashid also uses solar panels for daytime cooling. She noted some problems with this strategy: "It's not a permanent solution and it only works in the daytime. Moreover, the majority of households in the community do not have solar panels, so they keep suffering from extreme heat."

Begum Kanwal remarked that avoidance and fans were their only coping methods: "We can only avoid the worst of the heat by not going outside during peak hours [of hot weather] and by sitting under the fan after cooking food and other vigorous tasks in middle of the day." Using water to cool off was another essential strategy. Aisha Hassan shared a view held by others: "We do not have many resources to reduce the amount and impact of extreme heat; therefore, we prefer local arrangements, such as using handmade straw fans and frequently taking baths, to cool off."

When possible, women took rests; however, domestic duties prevented pregnant women from resting as frequently as they would have liked. Fatima Kamran captured this experience: "Taking rest and doing nothing always helped me cope better with the heat during my pregnancy; however, I was unable to continuously rest due to my domestic responsibilities," she said. Unfortunately, all these efforts to mitigate the impacts of the heat were temporary fixes. Women tried to distract themselves with other activities when their efforts failed. Hira Imran bathed in cool water, which helped, but she ultimately felt there was little she could do to make herself feel better in the extreme heat. "I keep myself busy doing household chores or visiting neighbors to gossip so that I can avoid the mood swings," she said. Banu Gul said: "I managed [feeling hot] by keeping myself busy in different [and routine] activities as we know that there is no other way out."

> "[Heat] is a major problem … it has increased women's workload as we women are supposed to manage each and every thing…. I feel the heat the most during cooking in the afternoon, especially in making chapatis or rotis, and while working in the field. Sometimes, I want to leave everything behind and just rest, but it's not possible as we have to feed our children. Therefore, we cannot rest or stop working.
>
> • **Fatima Kamran,** postpartum and lactating woman.

Access to Information about Protective Measures

Pregnant people and their families need access to information about extreme heat's impacts—both in general health and on maternal and newborn health—so they understand the risks and how to protect themselves.

Some health care providers are giving advice to pregnant women about extreme heat. Dr. Zeba Paras said that

Mass Flooding in 2022: Harms to Interviewees, Including Making Extreme Heat Worse

In addition to extreme heat, catastrophic flooding in 2022 affected our interviewees. Rates of malaria, a disease that is more dangerous for pregnant people than non-pregnant people, and can harm or kill the fetus, spiked in flooded areas.

The disaster also destroyed health infrastructure and reduced access to medical care. Several interviewees said that they could not access maternal health care because of the flooding, either because services were lost or overwhelmed or because they could not afford additional travel costs. All said that they or their family members suffered from malaria or scabies in the aftermath of the flooding.

Many interviewees lost their homes, property, or important income. Three women said their husbands had lost work that provided the household with cash. Many interviewees said that their financial hardships, which the flooding worsened, caused them great stress, and some noted that this negatively impacted their well-being during their pregnancy. "[The flooding] affected my health badly and made my pregnancy worse as my workload increased due to these heavy rains, which impacted my mental well-being too. We are in continuous stress and worrying," said Bushra Akmal, pregnant at the time of the interview.

Interviewees noted that a government-funded cash transfer humanitarian program was very helpful.

The flooding also curtailed access to food. The IPCC has noted how reductions in access to food, both quantity and quality, because of climate-related disaster is especially concerning for pregnant and lactating people who have greater nutritional needs. The immediate and longer-term impacts of the flooding on families' access to food were stark. Several respondents' crops had been destroyed or damaged and others reported missing meals even though they were pregnant. Interviewees also felt that the floods threatened their families' futures. "Our crops are damaged, and it will affect our consumption of food," Aisha Hassan said, adding that because of the flooding, her family was running out of fodder to feed their cattle.

Our interviewees also connected the harms from flooding to those from extreme heat. Several interviewees said their worst experiences of heat occurred against the backdrop of standing water because of poor drainage after the deluge and the consequent increases in illnesses like malaria. This was because of the additionally oppressive humidity and because interviewees were often stressed and, in some cases, also sick for at least part of this time, including with illnesses that gave them fevers.

The flooding further complicated heat management because families had lost some of the ways they usually used, such as fans, due to the flooding. The flooding not only displaced Fatima Kamran's family, but also permanently destroyed their electric fans. "We had electric fans, which we used when there was electricity, but these fans were damaged in the recent floods when our roof collapsed," she said. Nazreen Wali's family, on the other hand, still had a fan, but the flooding damaged their solar panel.

The aftermath of the 2022 flooding in Sindh Province provides a heartbreaking example of how climate-related impacts and disasters layer on top of each other, causing multiple harms to the poorest communities already living with poverty.

her clinic conducts trainings on heat health to groups of women and that she advises pregnant women to finish their work before midday during periods of extreme heat and to not leave their houses without good reason; if they must leave their house, they should put a wet cloth over their heads. Rabia Didar Hussain, a Lady Health Worker, said that she and other Lady Health Workers advise pregnant women to drink more and avoid hard labor in the heat.

The District Manager for People's Primary Health Initiative (PPHI), Dr. Ali Raza Buzdar, said that although heat stroke interventions had been established, "we don't have exclusive program specifically for pregnant women or young babies." Dr. Salah Uddin, the Assistant District Health Officer for Sindh said that community health workers, including Lady Health Workers, provided health messaging about extreme heat, including "protect yourself from heat by covering your head, use of water and stay at home during peak hours of heat." He also said that families are advised to use oral rehydration salts during heatwaves. According to Dr. Salah Uddin, this work—providing heat advisories along with literature and oral rehydration salt sachets, iodine-enriched salt, and water purifying tablets—takes place every year in March.

However, only one of our interviewees reported seeing or hearing any public messaging on health impacts of extreme heat generally. She said her family had received messages with warnings about heatwaves on their mobile phones. None of the women we interviewed received any health warnings about heat from any maternal health provider.

Gendered Differences in Access to Cooling

According to the interviewees, the men in their community had ways of cooling off that women could not access because of gender-based sociocultural restrictions. For example, men can go to hotels or community centers to cool off, but women are not allowed to spend time in these locations. The restrictions are so pervasive that even sitting under trees in public is difficult for women.

Fatima Kamran's only option was the school: "I used to go [to the school] and spend time alone as it makes me happy and relaxed."

Marjan Zia explained how the sociocultural norms prevented women's access to public places: "There are no public places or parks in our community for women and kids. Moreover, we do not have permission to visit public places to cool off." Instead, she sat under the trees in her courtyard to try and stay cool.

Women's clothing is another gender-based risk in extreme heat. The ICRC noted that "social and cultural expectations such as heavy layering of clothes, predispose many women and children to other direct heat-related risks."

Gender-based traditional practices pose similar challenges. Women in Sindh commonly perform chilla, a traditional practice where, for the first 40 days after giving birth, they rest without bathing. Thus, women practicing chilla during periods of extreme heat miss bathing as an important cooling method. "I did chilla, and it was not a pleasant experience in the extreme summer weather," Marjan Zia said. Hira Imran, who fainted while performing a chilla, considered those 40 days to be her worst experience of extreme heat.

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