



Climate-Responsive Maternal Care: Heat, Equity, and Maternal Care Systems

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ABSTRACT

Extreme heat is an emerging threat to maternal health, particularly for pregnant and lactating people whose physiological changes heighten vulnerability to heat-related complications. Risks are intensified by structural inequities that shape exposure, access to cooling, and timely care. Evidence linking heat to adverse maternal outcomes is growing, yet responses remain fragmented across climate science, maternal health, and health-system planning. This paper presents the Climate-Responsive Maternal Care (CRMC) Framework, which links environmental exposure, maternal physiology, social determinants, health-system responsiveness, and mitigation. The framework clarifies how intersecting vulnerabilities shape risk during extreme heat, defines responsibilities of healthcare organizations, and identifies pathways through which heat affects maternal populations. It highlights intervention points across levels of care and proposes indicators to guide implementation, evaluation, and climate-resilient maternal care. Further research should test the framework in diverse health systems.

KEYWORDS

Climate-Resilient Health Systems, Maternal Health, Extreme Heat, Health Equity, Environmental Justice, Corporate Social Responsibility, Sustainable Healthcare, Reproductive Justice and Climate Change

1. INTRODUCTION

Rising global temperatures and increasingly frequent extreme heat events have brought renewed attention to the ways in which climate change threatens human health (World Health Organization [WHO], 2023). Among the populations most susceptible to these changes are pregnant and lactating individuals, whose physiological adaptations make them particularly vulnerable to heat stress and dehydration (London School of Hygiene & Tropical Medicine [LSHTM], 2025; U.S. Environmental Protection Agency [EPA], 2024). Over the past decade, evidence has grown linking high ambient temperatures to heightened risks of preterm birth, hypertensive disorders of pregnancy, low birthweight, and increased maternal discomfort during pregnancy and postpartum recovery (Chersich et al., 2020; Jiao et al., 2023; Lakhoo et al., 2025; Li-Maloney et al., 2025; LSHTM, 2025). Lactating individuals face additional challenges, as elevated heat can compound fluid demands and influence milk production, potentially affecting both maternal well-being and infant nutrition (Howells et al., 2025; Traylor et al., 2025). As climate change accelerates, these pressures are expected to intensify,

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creating an urgent need for health systems to better understand and anticipate the effects of extreme heat on maternal populations (LSHTM, 2025; WHO, 2023).

The burden of heat exposure is not evenly distributed. Structural inequities shape where people live, work, and access resources such as cooling, water, and safe housing (EPA, 2024; LSHTM, 2025; WHO, 2023). Individuals in low-income communities are often concentrated in urban heat islands, reside in poorly insulated homes, or lack reliable air conditioning (Benz & Burney, 2021; California Environmental Protection Agency [CalEPA], n.d.; EPA, 2024; Hsu et al., 2021; Scott et al., 2025). Many pregnant people work in occupations that involve outdoor labor, prolonged standing, or environments where heat mitigation is limited, including agriculture and other manual work (CalEPA, n.d.; Flocks et al., 2013; Howells et al., 2025). Others face social conditions, limited transportation, unstable housing, lack of paid leave, that constrain their ability to modify their exposure or seek timely care during heat events (EPA, 2024; Howells et al., 2025; LSHTM, 2025). These disparities mirror long-standing inequities in maternal health more broadly, reflecting the intersection of environmental risk and the social determinants of health (Benz & Burney, 2021; Hsu et al., 2021; LSHTM, 2025; Weaver, 2023).

These patterns are not uniform across regions. In many low- and middle-income countries, pregnant and lactating individuals contend with extreme ambient temperatures, high humidity, and limited access to reliable cooling or electrification, often in combination with demanding physical work and constrained access to antenatal and postpartum care (Bonell et al., 2022; Lusambili et al., 2024; Part et al., 2022; Lakhoo et al., 2025; Li-Maloney et al., 2025; LSHTM, 2025). Rural subsistence farmers in The Gambia or Burkina Faso, for example, face prolonged outdoor labor during pregnancy, while postpartum women and neonates in peri-urban settlements in Kenya must navigate crowded housing and scarce cooling options (Bonell et al., 2022; Lusambili et al., 2024; Part et al., 2022). In contrast, pregnant individuals in high income countries may be more likely to have access to air conditioning but still experience marked inequities in workplace protections, housing quality, and neighborhood heat burden, particularly among racially marginalized and low-income populations (Benz & Burney, 2021; Hsu et al., 2021; Scott et al., 2025). These regional and social gradients in exposure underscore the need for a framework that can accommodate diverse climatic conditions and health system capacities.

Despite the significance of these concerns, the current approach to climate-related maternal health remains fragmented. Climate science offers extensive data on temperature trends and heat hazards, but rarely addresses the specific physiological or psychosocial implications for pregnancy and lactation (WHO, 2023). Research in maternal health increasingly documents associations between heat exposure and adverse outcomes, yet tends to emphasize epidemiologic relationships rather than the broader systems in which risk unfolds (Chersich et al., 2020; Jiao et al., 2023; Lakhoo et al., 2025; Li-Maloney et al., 2025; LSHTM, 2025). Meanwhile, the field of corporate social responsibility (CSR) and sustainability in healthcare underscores the responsibility of health systems to address environmental determinants of health, reduce emissions, and strengthen community resilience, but these discussions seldom link directly to the unique needs of pregnant and lactating individuals (Health Care Without Harm, 2019; Health Care Without Harm, 2025; Karliner et al., 2020; Seervai et al., 2022; Senay & Landrigan, 2018; WHO, 2020). As a result, policymakers, clinicians, and health-system leaders lack a cohesive conceptual model that integrates these domains and guides comprehensive, equity-oriented responses (LSHTM, 2025; Weaver, 2023).

This paper introduces the Climate-Responsive Maternal Care (CRMC) Framework, a new conceptual model designed to bridge this gap. The framework synthesizes evidence and theory from climate science, maternal physiology, public health ethics, environmental justice, and healthcare sustainability to create a coherent structure for understanding how heat exposure affects pregnant and lactating individuals (Chersich et al., 2020; LSHTM, 2025; Traylor et al., 2025; Weaver, 2023; WHO, 2020, 2023). It also situates maternal health within the broader responsibilities of healthcare organizations as both providers of care and institutional actors accountable for climate adaptation and

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