

An expert review of environmental heat exposure and stillbirth in the face of climate change: clinical implications and priority issues

Ana Bonell¹, Cherie Part², Uduak Okomo¹, Rebecca Cole², Shakoore Hajat², Sari Kovats², Amanda Sferruzzi-Perri³, and Jane Hirst⁴

¹Medical Research Council Unit The Gambia at the London School of Hygiene and Tropical Medicine

²London School of Hygiene & Tropical Medicine

³University of Cambridge Centre for Trophoblast Research

⁴University of Oxford Nuffield Department of Women's & Reproductive Health

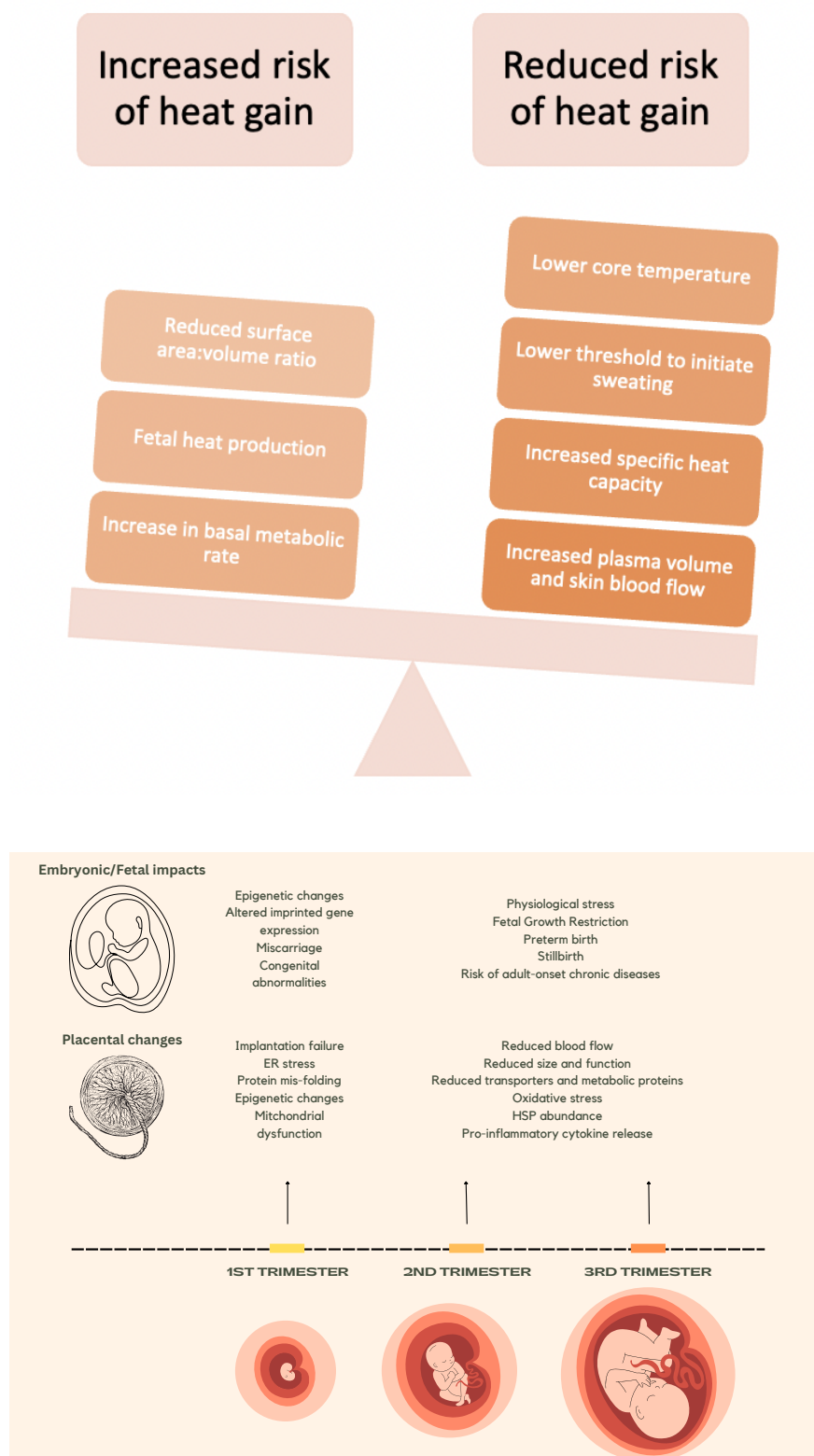
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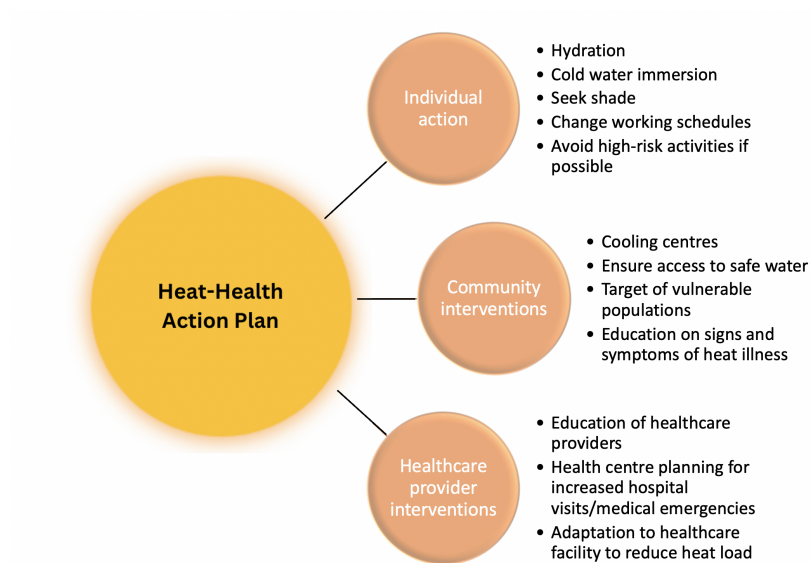
Abstract

Exposure to extreme heat in pregnancy increases the risk of stillbirth. Progress in reducing stillbirth rates has stalled, and populations are increasingly exposed to high temperatures and climate events that may further undermine health strategies. This narrative review summaries the current clinical and epidemiological evidence of the impact of maternal heat exposure on stillbirth risk. 19 out of 20 studies found an association between heat and stillbirth risk. Recent studies based in low-middle- income countries and tropical settings add to the existing literature to demonstrate that all populations are at risk. Additionally, both short-term heat exposure and whole-pregnancy heat exposure increase the risk of stillbirth. A definitive threshold of effect has not been identified, as most studies define exposure as $> 90^{\text{th}}$ percentile of the usual temperature for that population. Therefore, the association between heat and stillbirth has been found with exposures from as low as $>12.64^{\circ}\text{C}$ up to $>46.4^{\circ}\text{C}$. The pathophysiological pathways by which maternal heat exposure may lead to stillbirth, based on human and animal studies, include both placental and embryonic or fetal impacts. Although evidence gaps remain and further research is needed to characterise these mechanistic pathways in more detail, preliminary evidence suggests epigenetic changes, alteration in imprinted genes, congenital abnormalities, reduction in placental blood flow, size and function all play a part. Finally, we explore this topic from a public health perspective; we discuss and evaluate the current public health guidance on minimising the risk of extreme heat in the community. There is limited pregnancy specific guidance within heatwave planning, and no evidence-based interventions have been established to prevent poor pregnancy outcomes. We highlight priority research questions to move forward in the field and specifically note the urgent need for evidence-based interventions that are sustainable.

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