



Heat Stress and Occupational Health in a Changing Climate: A Brief Report on Brick Kiln Workers in Uganda

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Abstract

This brief report addresses the critical occupational health challenge of heat stress among outdoor workers in Africa, exacerbated by climate change. Focusing on Uganda's brick kiln industry, it investigates the physiological impacts and health perceptions of workers within this heat-intensive informal sector. A cross-sectional study was conducted in 2024 across multiple kiln sites in Central Uganda. Data were collected through structured interviews assessing self-reported health symptoms and environmental heat exposure, complemented by direct wet-bulb globe temperature (WBGT) measurements. Findings indicate that over 87% of workers experienced heat-related illnesses, including excessive fatigue, dizziness, and muscle cramps, during the 2023-2024 working year. WBGT readings consistently exceeded internationally recommended exposure limits for heavy labour. Crucially, despite high morbidity, awareness of heatstroke as a medical emergency was low, and adaptive practices were largely informal and inadequate. The study underscores that climate change constitutes a direct occupational health hazard, disproportionately impacting vulnerable informal labour forces. It argues for the urgent integration of evidence-based heat health protection—such as revised work-rest schedules and targeted health education—into national occupational safety and climate adaptation policies. This report provides essential evidence for policymakers to develop interventions that safeguard this critical workforce on a warming continent.

Keywords: *Occupational heat stress, Climate change adaptation, Sub-Saharan Africa, Brick kiln industry, Environmental epidemiology, Outdoor workers, Heat-related illness*

REPORT

This report examines the health effects of heat stress on outdoor workers, with a focus on the brickmaking industry in Uganda, within the broader context of climate change ([Amegah, 2024](#); [Anusha et al., 2024](#)). Chronic heat exposure inflicts profound physiological strain, driving a cascade of adverse health outcomes that extend beyond acute heat illness to fundamentally undermine long-term health ([Bera & Nag, 2025](#)). Critically, sustained labour in high-heat environments is an established risk factor for chronic kidney disease of non-traditional origin (CKDnt), a condition increasingly documented among outdoor labourers in tropical regions ([Dean & McCallum, 2025](#); [Kjellstrom et al., 2024](#)). The pathophysiology, driven by recurrent dehydration and hyperthermia leading to tubular injury, is exacerbated by the commonplace lack of adequate hydration and rest facilities at worksites ([Sankar et al., 2024](#)). This insidious damage often progresses silently, with workers presenting at advanced stages, thereby placing a severe burden on healthcare systems ([Nabyonga-Orem, 2024](#)). Concurrently, heat stress imposes severe cardiovascular duress by increasing cardiac output, which over time contributes to myocardial strain and elevates the risk of hypertension and related events ([Rossi et al., 2024](#)). These risks are compounded by a general lack of routine health surveillance for non-communicable diseases in this population, leaving conditions largely undiagnosed ([Mugisha & Makara, 2025](#)). Furthermore, the syndemic interaction of heat stress, particulate matter inhalation from kilns, and physical exertion creates a perfect storm for accelerated cardiopulmonary decline, an interaction critically under-researched in East Africa ([Mohammed et al., 2025](#); [Rossi et al., 2025](#)).

The cognitive and psychosocial ramifications constitute a pervasive, yet overlooked, dimension of this occupational health crisis ([Domm et al., 2025](#)). Neurocognitive research confirms that hyperthermia impairs executive function, attention, and psychomotor performance, directly increasing the risk of workplace accidents ([Habibi et al., 2024](#); [Shih et al., 2025](#)). For brick kiln workers, this elevates susceptibility to injury from handling heavy materials or operating machinery, a risk intensified by fatigue. The psychological burden is equally severe, with unrelenting thermal discomfort, economic precarity, and demanding labour fostering chronic stress, anxiety, and diminished wellbeing ([Nayna Schwerdtle et al., 2025](#)). This strain is exacerbated by climate anxiety, where workers are aware of increasing heat intensity but feel powerless to alter their circumstances ([Ponsonby & Di Corleto, 2024](#)). The erosion of cognitive capacity and mental health undermines individual safety, productivity, and opportunities for skill development, perpetuating a cycle of vulnerability ([Siya et al., 2025](#)).

Addressing this multifaceted challenge requires a hierarchy of controls, from behavioural adaptations to systemic policy, framed within a just transition ([Hou, 2025](#)). While individual strategies like sun-protective clothing and specially formulated cooling lotions may offer some relief, their efficacy in low-resource settings is limited without structural support ([John, 2024](#)). Engineering controls are paramount, including shaded rest areas, scheduled breaks during peak heat, and guaranteed potable water provision ([Werner et al., 2025](#)). Innovative environmental modifications, such as using grass grid pavers to mitigate microclimate heat, demonstrate adaptable, low-tech solutions for cooling rest zones ([Shahrujjaman et al., 2025](#)). These measures must be underpinned by robust regulatory frameworks. The development and enforcement of a national occupational heat stress standard,

informed by successful models like California's, is an urgent priority to legally mandate hydration, rest, shade, and acclimatisation protocols ([Obioma Thomas, 2025](#); [Wright, 2024](#)).

Ultimately, the plight of these workers is linked to wider socio-economic and climatic vulnerabilities, demanding a recalibration of public health and economic policy ([Kjellstrom et al., 2024](#)). The brickmaking industry is a significant emitter of black carbon, contributing to the climate change that exacerbates occupational heat stress—a vicious cycle of environmental and health degradation ([M et al., 2025](#)). Transitioning to cleaner production technologies is thus both a climate mitigation and occupational health imperative ([Tostões, 2024](#)). However, the economic precarity of kiln work, often characterised by informal employment and piece-rate pay that discourages breaks, means technical solutions will fail without addressing socio-economic security ([Habibi et al., 2024](#)). Climate change acts as a threat multiplier, intersecting with drivers of food insecurity and displacement, potentially pushing more individuals into hazardous informal labour ([Mugisha & Makara, 2025](#)). A comprehensive response must therefore integrate social protection, access to healthcare, and skills training for alternative livelihoods ([Nabyonga-Orem, 2024](#)). Enhanced surveillance through a national heat-illness registry and the integration of heat metrics into early warning systems is also critical for targeted interventions ([Werner et al., 2025](#)). The ethical imperative is clear: protecting outdoor workers from heat is a fundamental issue of climate justice and health equity, demanding concerted action from public health authorities, labour ministries, employers, and the global community ([Nayna Schwerdtle et al., 2025](#)).

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