Conceptual framework

Extreme heat and maternal, newborn and child health





- Increased intensity, duration and frequency of heat stress and heatwaves
- Seasonal timing of events
- · Rise in average temperatures
- Future climate scenarios
- · Solar radiation, humidity, wind

Critical windows of exposure

Vulnerability

- factors

 Compound
- hazards
 Biological factors
- · Socio-political factors
- Geographical factors
- Socio-economic factors



Direct impacts through ←

- Dehydration
- · Endocrine system dysfunction
- Vasodilation
- · Increased skin blood flow
- · Heat strain
- Oxidative stress and release of stress hormones
- · Release of heat shock proteins
- · Elevation of core temperature
- · Hyperventilation/hypotension
- Sleep disturbances

Indirect impacts through

Individual level

- Work conditions
- · Self-care and family care practices
- · Lactaction and sub-optimal feeding practices
- · Care-seeking
- · Social interaction
- Food security
- Risk and patterns of transmission of food, water and vector-borne diseases

Family and community level

- Family stress
- · Lack of local plans to prepare for extreme heat
- Food security
- Risk and patterns of transmission of food, water and vector-borne diseases
- · Domestic violence/ community violence
- Migration/immigration

Health worker and facility level

- · Health worker performance
- Impaired cold chain and safe storage of drugs
- Effects on service delivery, quality of care and response times
- Power outages

Organized services

- Disruption to infrastructure (power, water, transport)
- School closures
- Loss of productivity
- · Economic losses



Maternal health

- · Gestational hypertension
- · Pre-eclampsia
- · Gestational diabetes

Fetal and perinatal health

- · Stillbirths
- · Congenital disorders

Newborn health

- · Preterm birth
- Low birthweight
- $\cdot \, \mathsf{Hospital} \, \, \mathsf{admissions} \,$

Child Health and development

- · Infant mortality
- Respiratory diseases, including asthma
- · Wasting, stunting, being underweight, and weight loss
- · Heat stroke, heat related illness
- Infections, including vector-borne diseases
- Gastrointestinal conditions, including diarrhoea
- · Hospital admissions
- · Lower educational attainment



Drivers

- · Fossil fuel combustion
- · Increased GHG emissions
- · Agriculture and land use change
- Industry processes
- Urbanisation





Additional information

Extreme heat and maternal, newborn and child health

Examples of vulnerability factors

Compound hazards

(pollution, drought, wildfire, flash flood, and drought);

Biological factors

(nutritional status, comorbidities, disabilities, etc...);

Geographical factors

(urban/rural, greenspace, infrastructure, altitude, access to water, etc...);

Socio-political factors

(complex emergencies, political stability, etc...);

Socio-economic factors

(poverty, displacement, occupation, cultural practices and gender norms, education, security, equity and human rights).

Additional direct impacts

Maternal and Fetal/Perinatal health

- Dehydration
- · Compromised placental development and function
- · Elevation of core temperature
- · Endocrine system dysfunction
- Vasodilation
- · Increased skin blood flow
- Hyperventilation/hypotension
- · Heat strain
- · Oxidative stress and release of stress hormones
- · Release of heat shock proteins
- · Sleep disturbances
- Impaired cognition
- · Lactation practices

Newborn health

- Elevation of core temperature
- · Impaired heat exchanges
- · Increased heat absorption rate (high ratio of surface area to mass)
- Dehydration
- Vasodilation
- Hypotension
- Hypernatremia
- Inefficient heat dissipation
- · Oscillations in breathing patterns
- · Impact on the autonomic nervous system
- · Heat stress
- Sleep disturbances
- · Dependency on others for cooling and hydration
- Lactation practices

Child Health

- Elevation of core temperature
- · Impaired heat exchanges
- · Increased heat absorption rate (high ratio of surface area to mass)
- Dehydration
- Vasodilation
- Hypotension
- Inefficient heat dissipation
- · Small blood volume compared to body size
- · Low sweating rate
- · Activation of inflammatory response
- · Heat stress
- Sleep disturbances
- Impaired cognition
- · Dependency on others for cooling and hydration

Additional maternal health outcomes

- · Antepartum and postpartum haemorrhage
- · Mental health
- · Infections, including vector-borne diseases
- · Prelabour rupture of membranes
- · Caesarean section
- · Skin disorders
- · Renal disease
- · Maternal admissions
- · Caesarean section rates

Additional newborn health outcomes

- Jaundice
- · Infections, including vector-borne diseases
- INR alterations
- · Sudden infant death syndrome (SIDS)

Additional child health outcomes

- · Renal disease, including kidney stones
- · Cardiovascular disease
- · Unintentional injuries
- · Allergy development
- · Cardiovascular disease
- · Violence against children

Sources

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- Chersich MF, Scorgie F, Filippi V, et al. Increasing global temperatures threaten gains in maternal and newborn health in Africa: A review of impacts and an adaptation framework. Int J Gynaecol Obstet. 2023;160(2):421-429.