Climate adaptation interventions to improve maternal and perinatal health in low- and middle-income countries: findings from a scoping review

#sdudk

Aamod Dhoj Shrestha

External Lecturer, Centre for Global Health, Department of Clinical Research; Department of Gynaecology & Obstetrics, OUH, University of Southern Denmark, Odense, Denmark

Nepal Development Society

Co-authors

Berhe Gebremichael
School of Public Health, Haramaya University, Harar, Ethiopia
Lucy Rist
Faculty of Science, University of Southern Denmark, Odense, Denmark
Sweta Koirala
Nepal Development Society, Kathmandu, Nepal

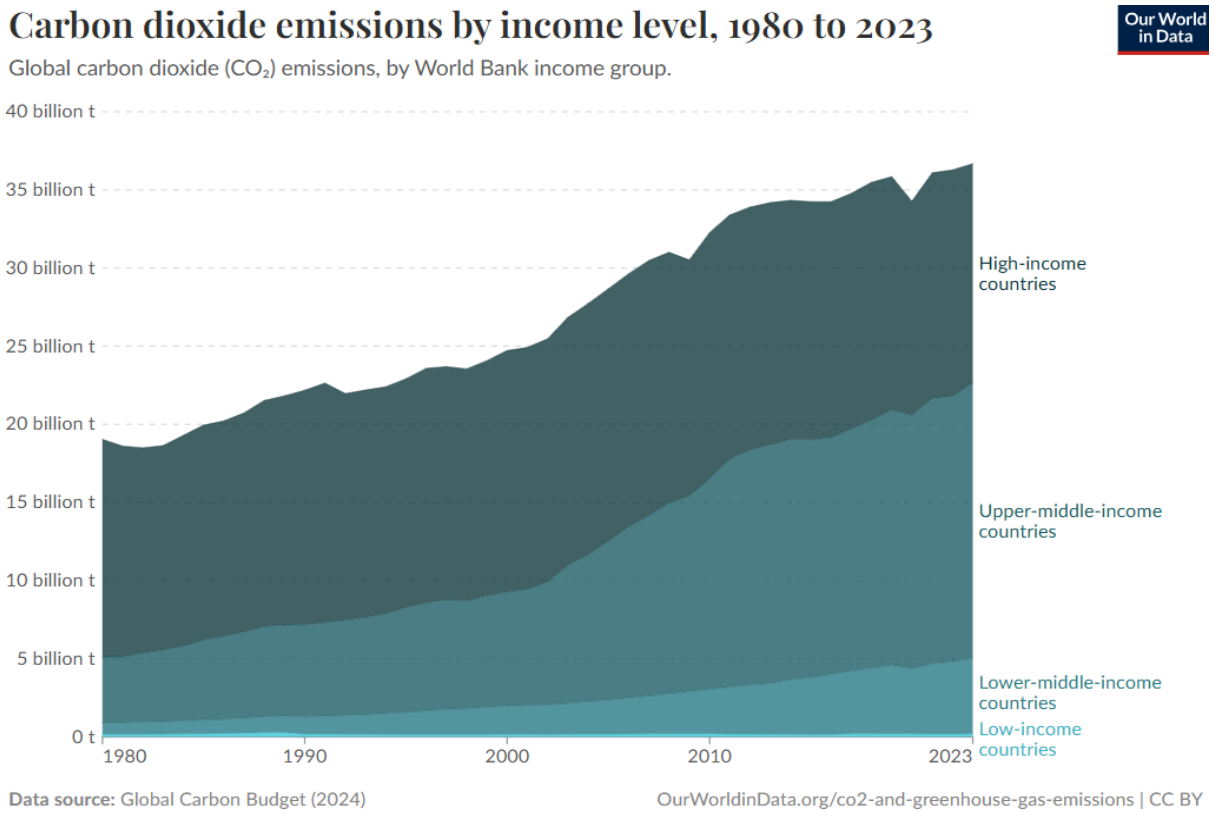
Dinesh Neupane
Department of International Health, Johns Hopkins Bloomberg School of Public Health
Abera K. Tura
School of Nursing and Midwifery, Haramaya University, Harar, Ethiopia; Department of International Public Health, Liverpool School of Tropical Medicine, Liverpool, UK
Ditte S. Linde
Centre for Global Health, Department of Clinical Research; Department of Gynaecology& Obstetrics, OUH, University of Southern Denmark, Odense, Denmark

Outline

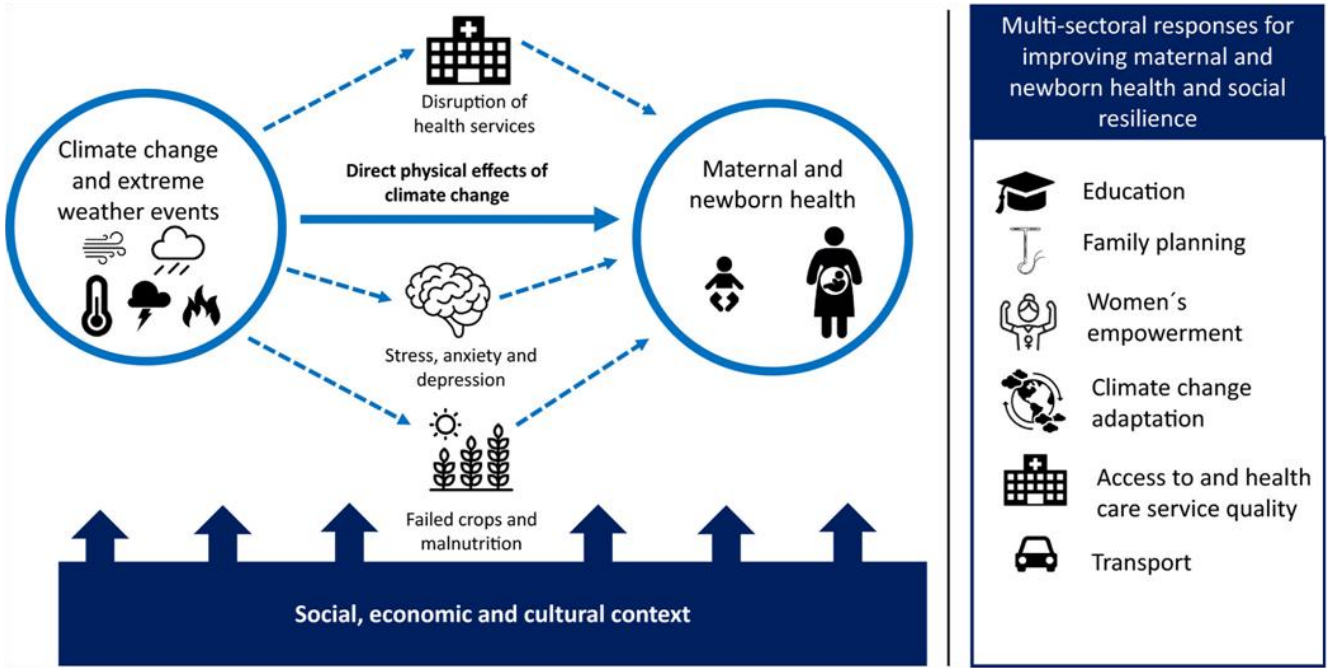
1. Background
2. Objective
3. Methodology
4. Results
5. Conclusion

Background

a



b



Framework for the direct and indirect effects of climate change on maternal and neonatal health and the multisectoral responses needed to strengthen resilience

[a]Carbon dioxide emissions by income level [Internet]. Our World in Data. Available from: https://ourworldindata.org/grapher/co2-income-level

[b]Roos N, Kovats S, Hajat S, Filippi V, Chersich M, Luchters S, et al. Maternal and newborn health risks of climate change: A call for awareness and global action. Acta Obstetricia et Gynecologica Scandinavica. 2021 Mar 4;100(4):566–70.

Objective

This scoping review aimed to map out the evidence on the impact of climate change on maternal and perinatal health and existing adaptation interventions in LMICs.

Methodology

Search strategy

PubMed/Medline
Scopus
Web of Science,
Cochrane
Library
Global Health
(EBSCO)
EMBASE
Google Scholar

Selection criteria

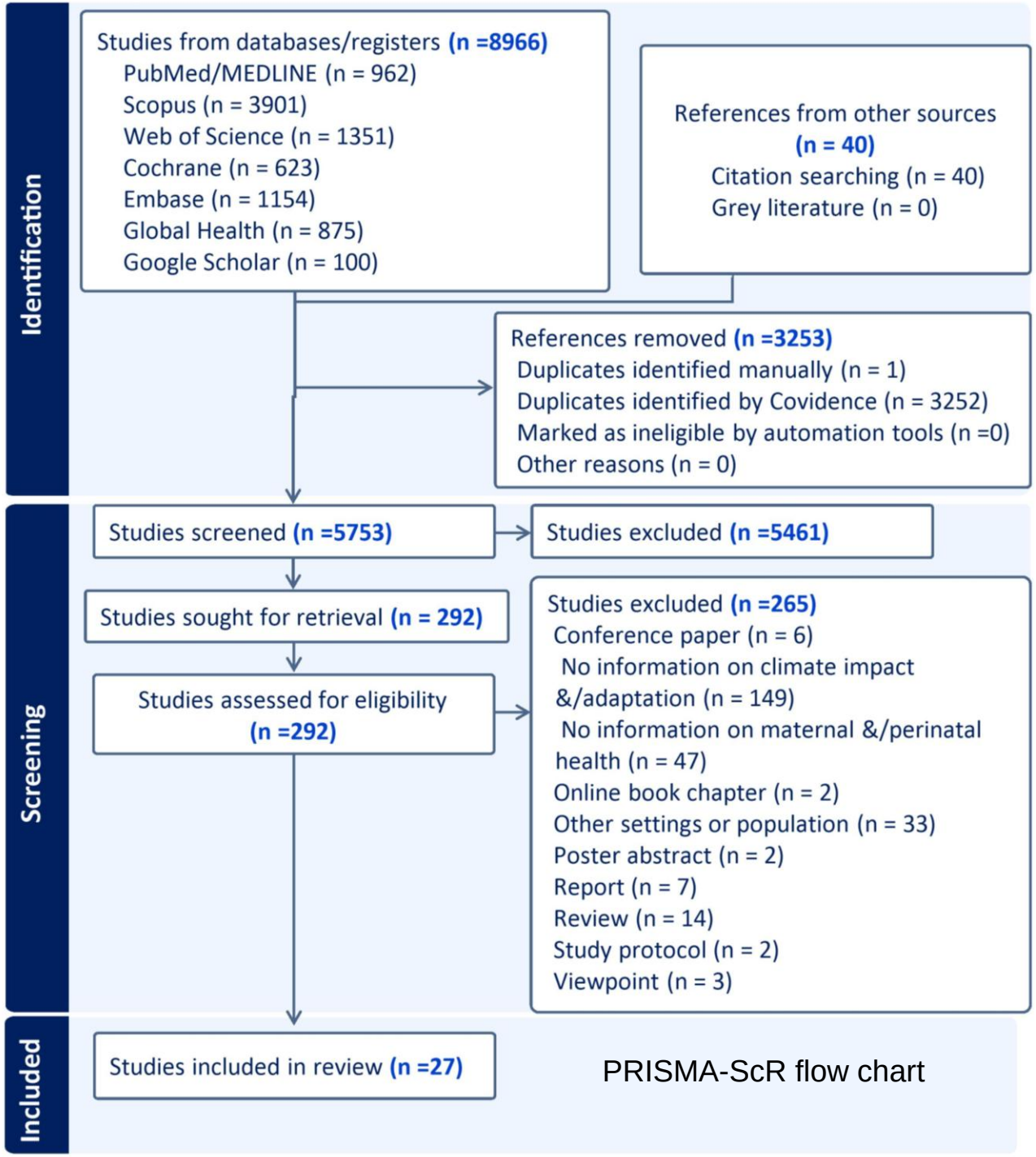
The included studies reported climate change impact and/or adaptation interventions among pregnant women and newborns (up to two years after birth) in LMICs.

Data extraction

Data on authors and publication year, country, study design, sample size, climate parameter(s), maternal and perinatal outcome(s), and key findings were extracted by ADS and were verified by BG.

Data synthesis

Narrative analysis of the study findings. Main study outcomes: stillbirths, maternal stress, gestational hypertension preterm birth, and low birth weight.



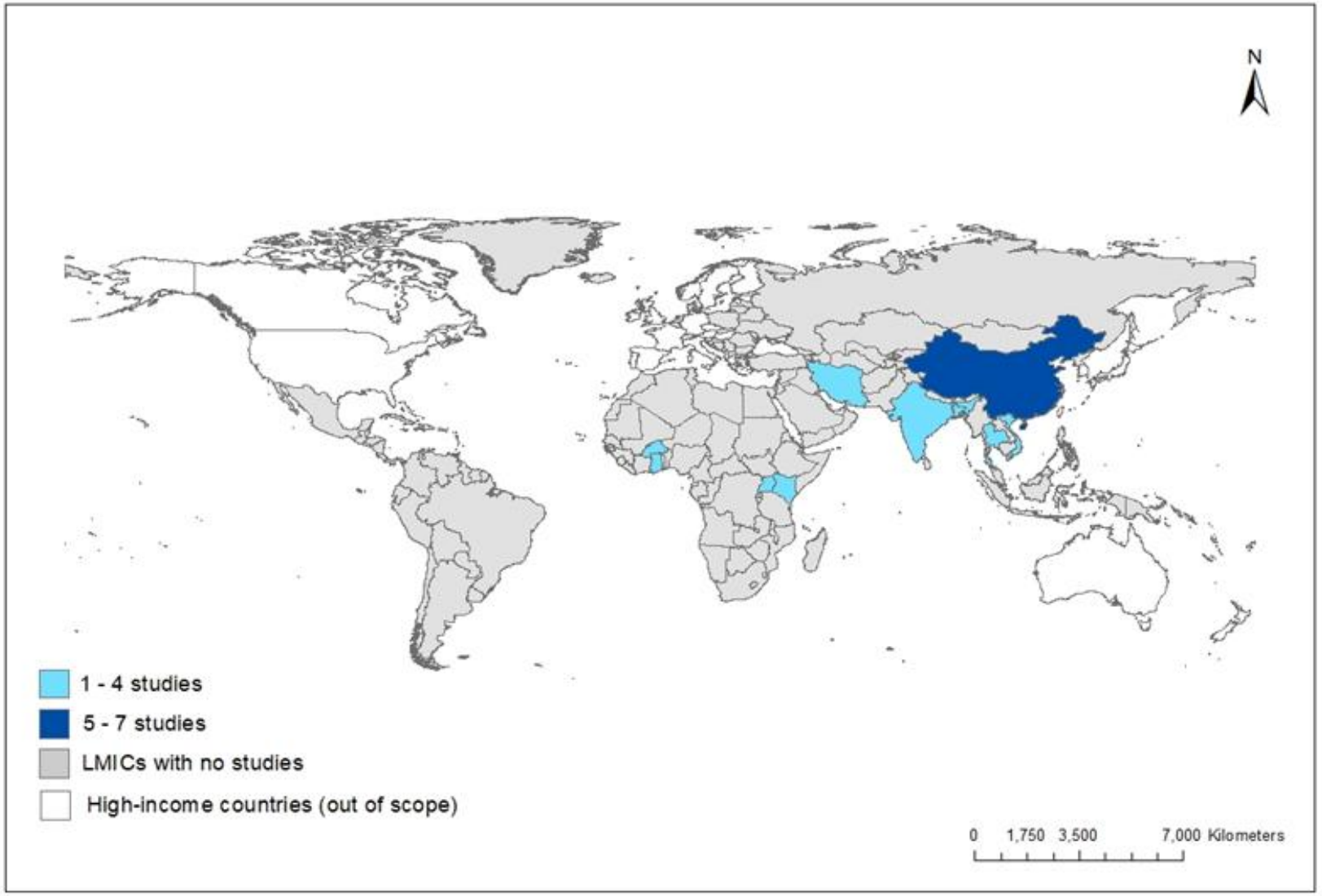
PRISMA-ScR flow chart

Results

The search yielded 9006 records, of which 3253 were duplicates.

5753 records reviewed, 5461 were excluded after title and abstract screening, leaving 292 articles for full text review.

27 articles published from 1997-2024 were included.



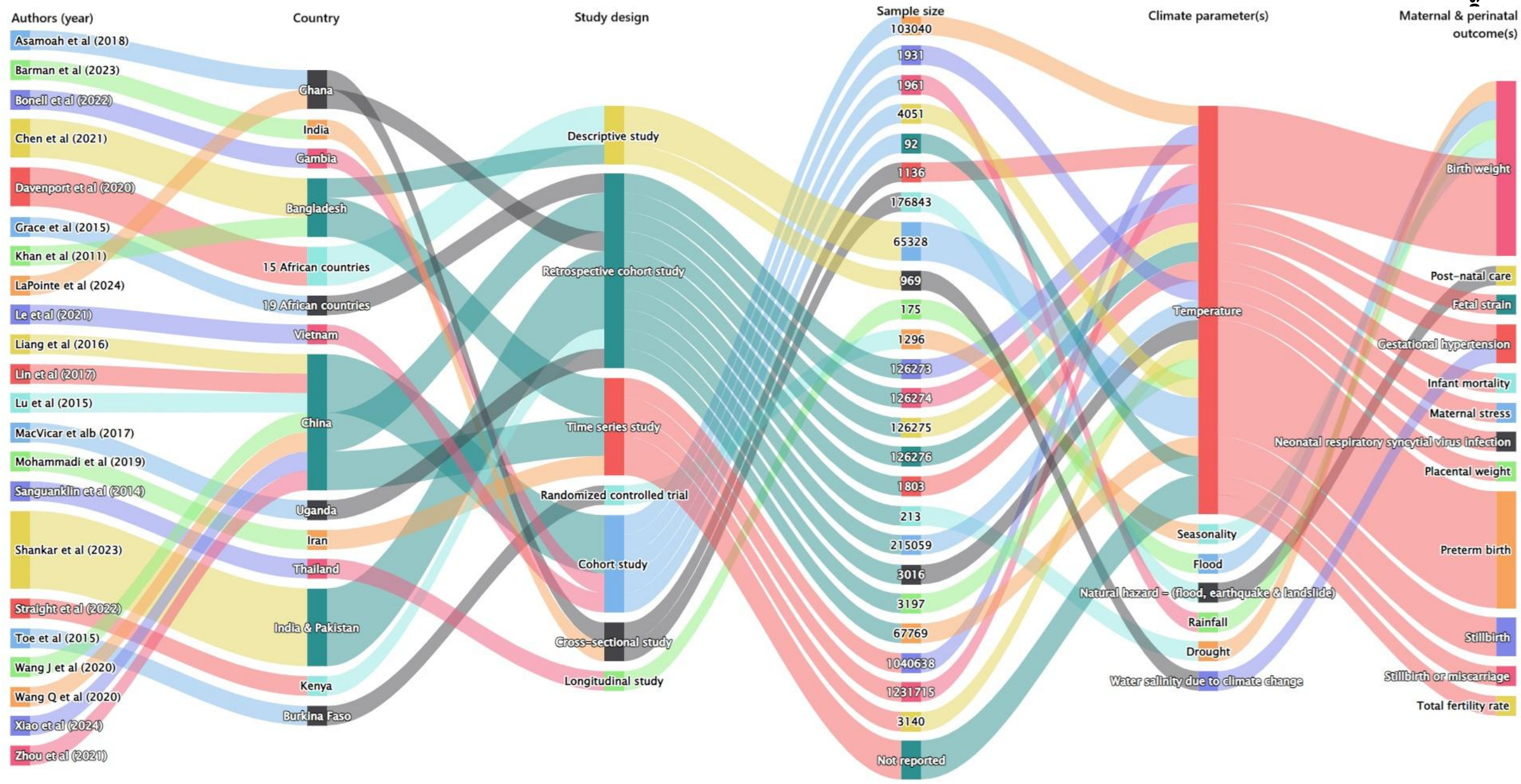
Heat map: Geographic distributions of 24 studies

Results continue..

Out of 27, 22 articles assessed the association between climate change and maternal and perinatal health

Majority (n=7) of the studies were from China

Association of climate change and maternal/perinatal outcomes



Association continue..

Gestational HTN

High temperature (>40°C) was associated with gestational hypertension among women in the third trimester (Relative Risk(RR) 1.07, 95% CI 1.02–1.12, p<0.01) in a multi-country study from India and Pakistan.[a]

Maternal stress

In a study from China, 2017, women exposed to extreme temperatures (31.2–34.1°C) during pregnancy experienced high maternal stress. (sunlight duration<7.3 hours/day, for temperatures ≥20°C, OR=3.2; 95% CI: 1.7, 6.0; P=<0.01; for temperatures ≤25°C, OR=2.0; 95% CI:1.3, 3.2; P<0.01).[b]

Preterm birth

A multi-country study conducted in cities of India and Pakistan reported that risk of preterm birth was positively associated with high temperature in the second trimester (RR 1.05, 95% CI 1.02–1.07, P<0.01).[a]

Stillbirth

Three studies, one study from Ghana and two multi-country studies from India and Pakistan and 15 countries from Africa reported the impact of temperature with stillbirth.[a,c,d]

[a]Shankar K, Hwang K, Westcott JY, Saleem S, Sumera Aziz Ali, Saleem Jessani, et al. Associations between ambient temperature and pregnancy outcomes from three south Asian sites of the Global Network Maternal Newborn Health Registry: A retrospective cohort study. Bjog: An International Journal Of Obstetrics And Gynaecology. 2023 Nov;130 Suppl 3(Suppl 3):124-133.
[b]Lin Y, Hu W, Xu J, Luo Z, Ye X, Yan C, et al. Association between temperature and maternal stress during pregnancy. Environmental Research. 2017 Oct;158:421–30.
[c]Davenport F, Dorélien A, Grace K. Investigating the linkages between pregnancy outcomes and climate in sub-Saharan Africa. Population and Environment. 2020 Apr 23;41(4):397–421.
[d]Asamoah B, Kjellstrom T, Östergren PO. Is ambient heat exposure levels associated with miscarriage or stillbirths in hot regions? A cross-sectional study using survey data from the Ghana Maternal Health Survey 2007. International Journal of Biometeorology [Internet]. 2018 Mar 1;62(3):319–30.

Climate adaptation

Authors (year)	Country	Study design	Sample size	Climate parameter(s)	Maternal and perinatal outcome(s)
Lusambili et al (2023)	Kenya	Qualitative/ Co-design	21	Temperature	Intervention strategies to reduce the impact of heat exposure on maternal and neonatal health
Bryson et al (2021)	Uganda	Qualitative	46	Temperature	Maternal food security and health
MacVicar et al (2017) (a)	Uganda	Qualitative	26	Temperature	Perinatal health
Kakkad et al (2014)	India	Retrospective cohort	2025	Temperature	Heat related admissions, birth weight
Myaux et al (1997)	Bangladesh	Longitudinal	52652	Flood	Neonate and infant mortality

Conclusion

This review reported a direct association between climate change and maternal and perinatal outcomes such as gestational hypertension, maternal stress, preterm birth, low birth weight and stillbirths in LMICs.

Extreme temperature was the most prevalent climate variable associated with preterm birth and birth weight and correlated with stillbirth.

There were limited studies on climate change and adaptation interventions, and future studies are needed to mitigate the consequences of climate change on maternal and perinatal health.

There is critical need of local climate adaptation interventions to improve maternal and perinatal health in LMICs.

#sdudk

Aamod D. Shrestha is an external lecturer at SDU and member at NeDS. His research focuses on NCDs, climate and health nexus. He is experienced in teaching and research collaboration with national and international partners.

Thank you to all the co-authors for your contribution to this scoping review.

THANK YOU