

Burden of low birthweight attributable to anthropogenic climate change

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Introduction

- LBW and preterm birth are the most common causes of mortality for children under five.
- More than 90% of LBW globally occurs in low and middle-income countries.
- Climate change is exacerbating risk factors for LBW, especially in L&MIC, which are most vulnerable to climate risks.
- The ensuing analysis and findings advance the existing literature on how temperature and precipitation changes affects LBW by (1) using counterfactual scenarios to calculate the burden of low birthweight attributable to anthropogenic climate change (temperature and precipitation) for global and country specific outcomes; (2) presenting an effect modification analysis to explain heterogeneity in findings; and (3) generate estimates of temperature on LBW until 2100.

Methods

- A retrospective observational cohort study of 349,555 mother-infant dyads from 2002 to 2022 in 42 countries estimates the prevalence and variation of LBW using distributed lag non-linear models and counterfactual estimates of anthropogenic climate change-driven temperature and precipitation anomalies.
- Data comes from the Demographic and Health Surveys Program and Harmonize with Detection and Attribution Model Intercomparison Project, part of the CMIP6.
- In addition to examining how changes in temperatures and precipitation globally are related to LBW, the paper examines the role of a range of factors through which increased temperatures and precipitation affect LBW, antenatal visits, household wealth, and maternal education.

Results

- Anthropogenic climate change, both temperature and precipitation, is associated with lower birthweight, specifically when the exposure occurs in the final months of gestation.
- Temperature exposure anomalies during pregnancy of -5°C, -3°C, -1°C, 1°C, 3°C, and 5°C are associated with corresponding reductions in birthweight of 106.1g, 45.1g, 8.9g, -2.7g, 10.5g, and 48.4g respectively.
- Precipitation exposure anomalies during pregnancy of -500mm, -300mm, 300mm, and 500mm are associated with corresponding declines in birthweight of 267.2g, 98.4g, 70.5g, and 220.7g, respectively.
- Countries most vulnerable to the adverse effects of temperature and precipitation from human-caused climate change are Liberia, Mauritania, and Rwanda.
- Mothers who have more than 7 antenatal visits during pregnancy or who are in the 4th or 5th wealth index are at lower risk of LBW because of exposure to temperature anomalies, while mothers with greater educational attainment (secondary) are buffered from the adverse effects.

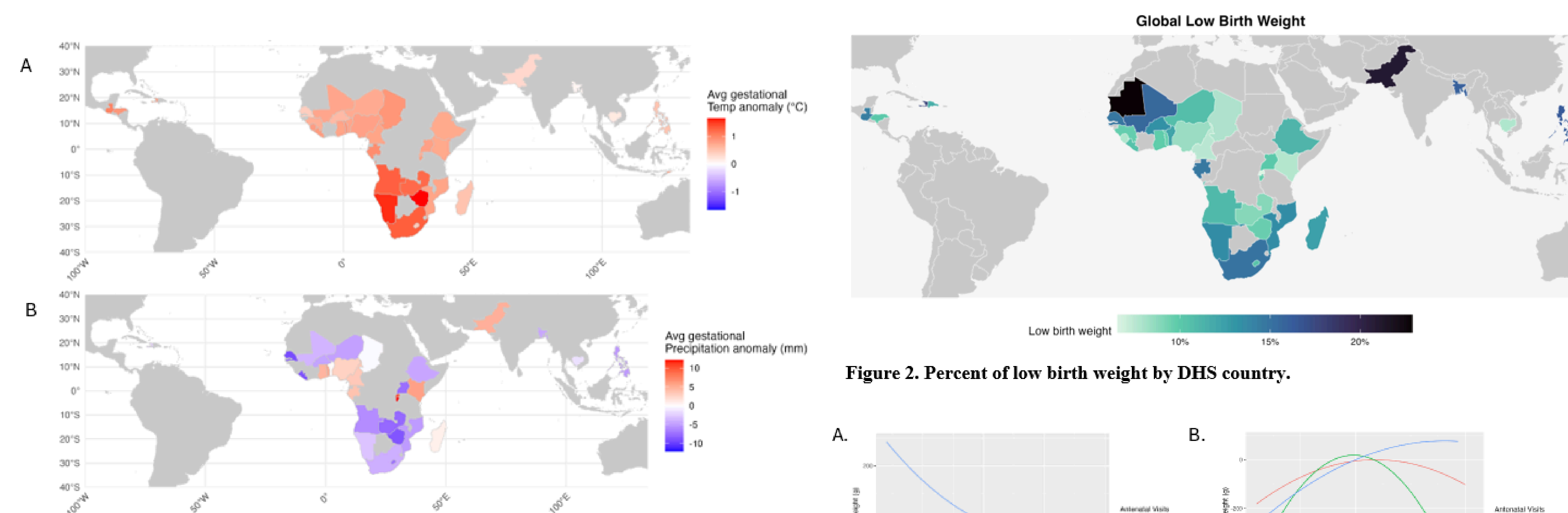


Figure 1. A. Average gestational temperature anomaly by Country. B. Average gestational precipitation anomaly by country. Gray color indicates no data available.

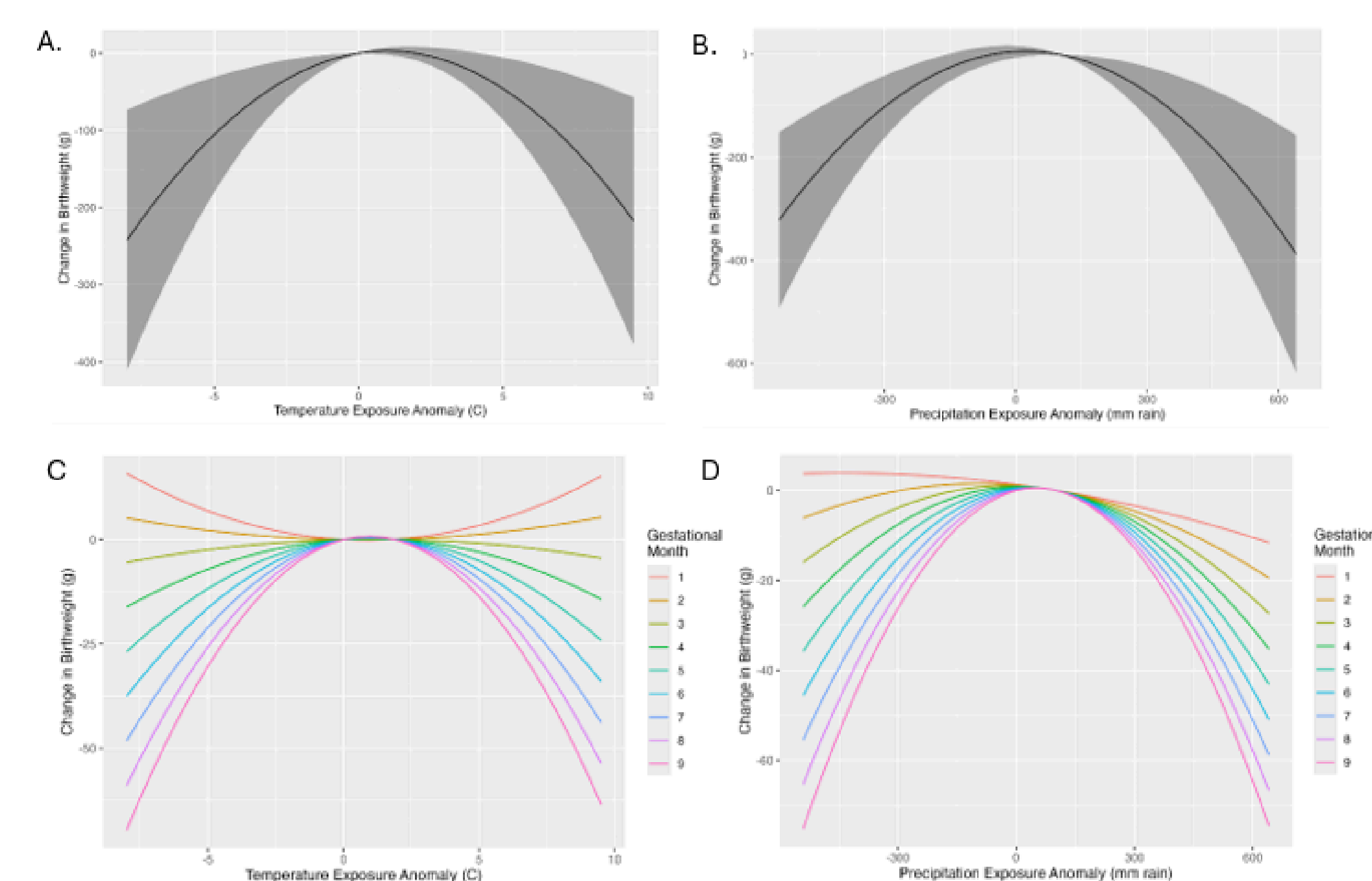


Figure 3. A. Predicted cumulative change in birthweight by temperature exposure anomaly. B. Predicted cumulative change in birthweight by precipitation exposure anomaly. C. Predicted change in birthweight by monthly temperature exposure anomaly. D. Predicted change in birthweight by monthly precipitation exposure anomaly.

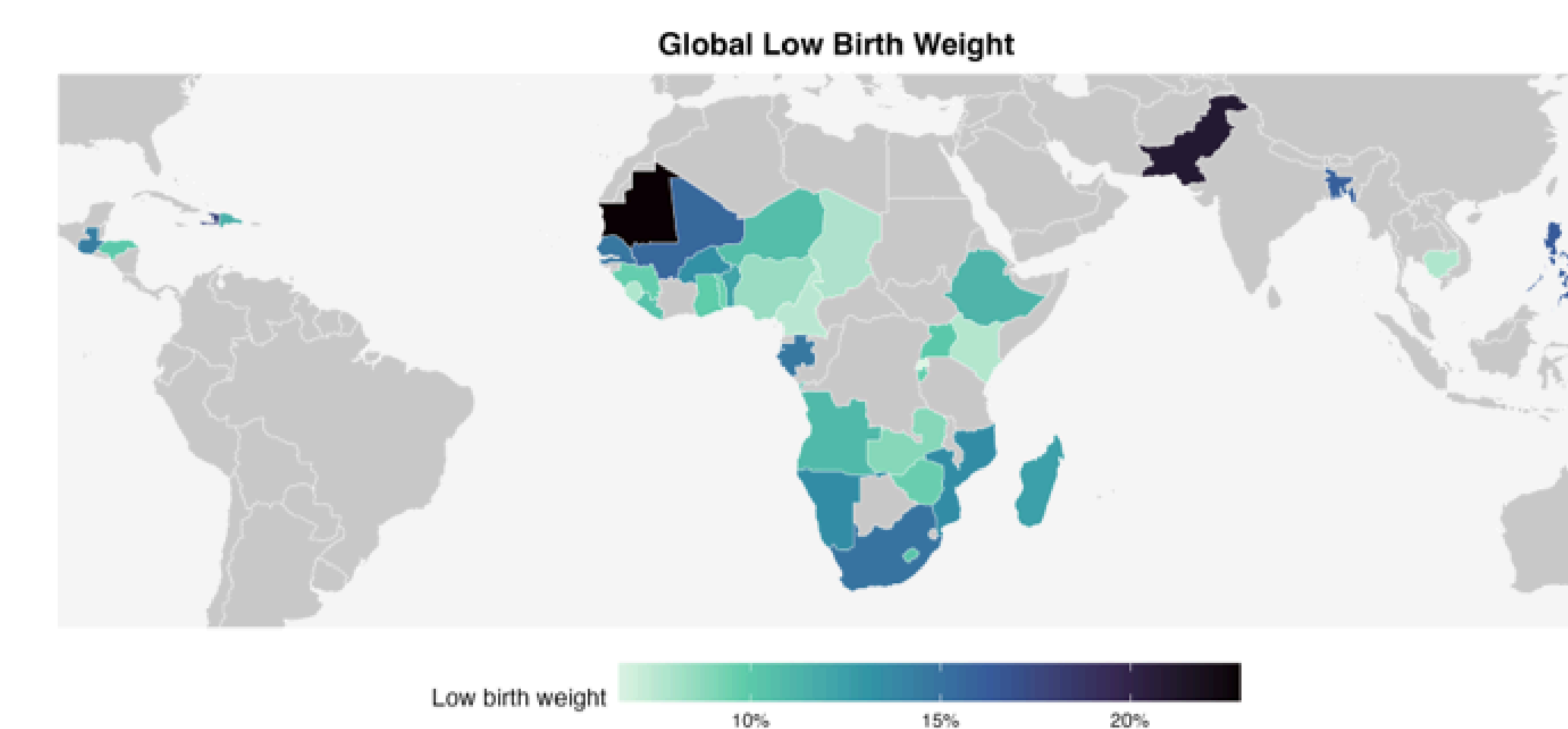


Figure 2. Percent of low birth weight by DHS country.

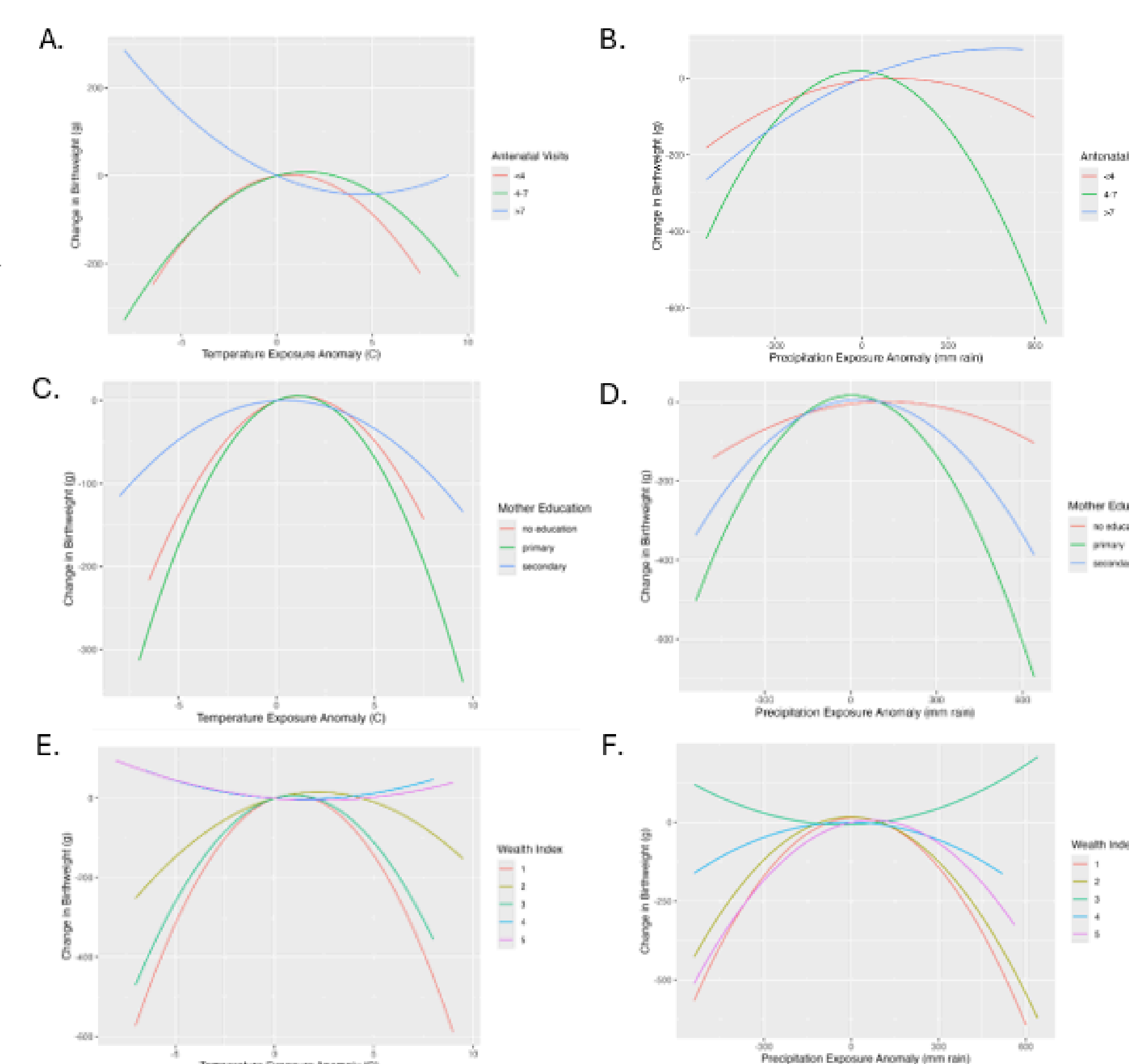


Figure 4. A. Effect modification by antenatal visits on temperature and birthweight. B. Effect modification by antenatal visits on precipitation and birthweight. C. Effect modification by mothers' education on temperature and birthweight. D. Effect modification by mothers' education on precipitation and birthweight. E. Effect modification by household wealth on temperature and birthweight. F. Effect modification by household wealth on precipitation and birthweight.

Climate change is associated with lower birthweight

Specifically, when the exposure occurs in the final months of gestation

Countries most vulnerable are Liberia, Mauritania, and Rwanda

More than 7 antenatal visits, greater wealth, and higher education buffer the adverse effects