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Attributing child undernutrition from agricultural shocks to climate change in Burkina Faso

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Climate change significantly threatens food security, particularly in low-income countries heavily reliant on subsistence and rainfed agriculture. Most existing empirical literature has examined the impacts of climate variability and extremes on undernutrition and agricultural outputs independently. There is a lack of studies exploring the causal pathway from climate change to agricultural shocks and their consequent nutritional and health impacts.

In this study, we investigate the extent to which the current and historical burden of child stunting in Burkina Faso can be attributed to climate change-induced agricultural deficits. First, we combine individual anthropometric data from five rounds of the Demographic Health Survey (DHS) and provincial-level crop yield data to assess the association between child stunting and exposure to agricultural deficits at birth. We define agricultural deficits as annual deviations in crop yields from their long-term average for three major food crops in the region: maize, millet, and sorghum. Second, we employ observationally-derived climate reanalysis data as well as counterfactual and factual climate data from ATTRICI (four pairs of datasets based on different reanalysis data), part of ISIMIP3a. These are analysed with a statistical crop yield modelling approach to estimate crop yields with and without climate change, respectively.

The epidemiological analysis reveals a non-linear health risk function, with risk of child stunting increasing rapidly when crop yields at birth are lower than the period average (<100%). The crop yield modelling shows a clear climate signal in annual variation in crop yields. The comparison between the factual and counterfactual climate data show a signal, especially in temperature. The outputs of the two models and the counterfactual/factual datasets are combined in an attribution framework in order to estimate the number of stunted children at the province level that can be attributed to climate change-induced agricultural deficits for the period 1984-2022. Repeating the analysis with factual and counterfactual CMIP6-DAMIP data to attribute explicitly the anthropogenic climate change is also considered. The study thus complements the climate impact attribution literature by a regional case study of so-far not attributed health aspects of crucial societal and economic importance.