The Effects of Climate Variability on Fertility in Sub-Saharan Africa

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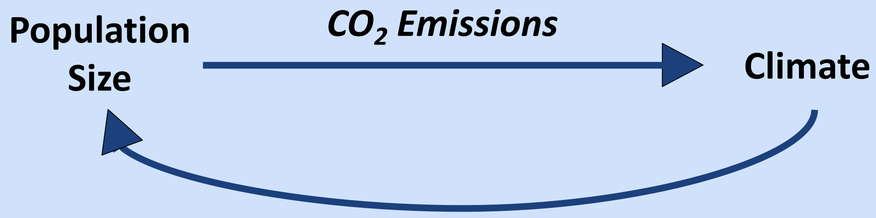
Background

- Project Drawdown predicts that family planning will lead to a decrease in population growth, mitigating CO_2 emissions globally, under the assumption that fertility rates work independently of climate
- Demographic literature suggests that households adapt to climatic variability through a range of demographic processes such as by migrating or modifying reproductive behaviors
- The UN has predicted that by 2100, the African continent will account for one-third of the world's population
- Sub-Saharan Africa is a unique context for studying such population-environment dynamics as the region is vulnerable to climate change and has not neatly fit into traditional demographic transition models



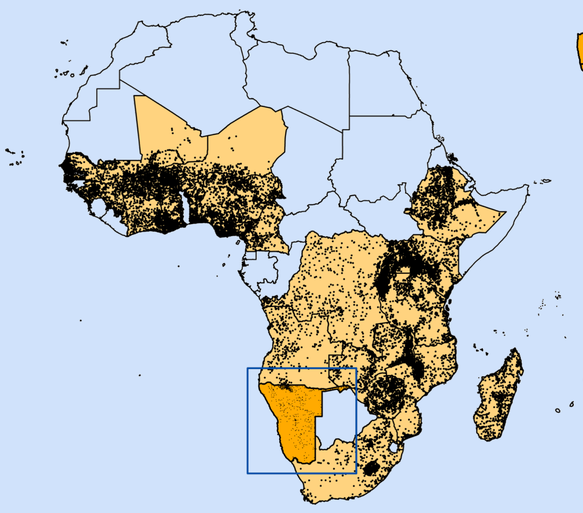
Visualization of the hypothesized feedback loop

Objectives

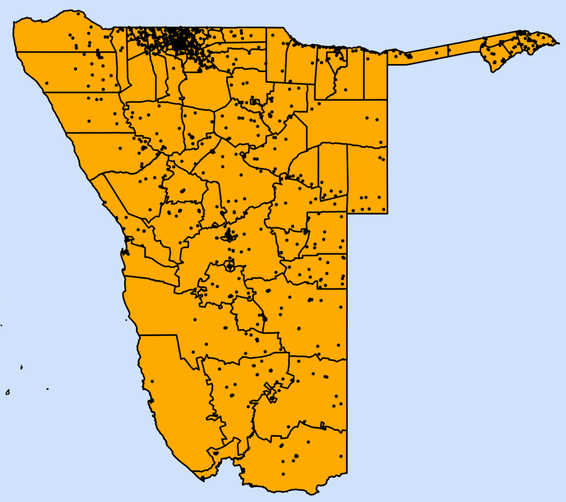
- We seek to assess the potential feedbacks between climate variability and fertility outcomes, which can improve estimates of future population dynamics with and without family planning intervention
- We posit that Drawdown's estimates of population size differ when taking into account the dependent relationship between climate variability and fertility outcomes

Data

- We extracted demographic data for 26 sub-Saharan African countries (77 samples) from the IPUMS-DHS database, compiling birth histories of all women between the childbearing ages of 15-49 years
- These georeferenced Demographic and Health Surveys (DHS) were linked to district shapefiles from the Database of Global Administrative Areas (GADM)
- Temperature and precipitation data from Climate Research Unit Time Series (CRU.ts) for the years 1981-2018 were extracted at the district level
- In the finalized dataset, there are 11,110,155 person-year observations



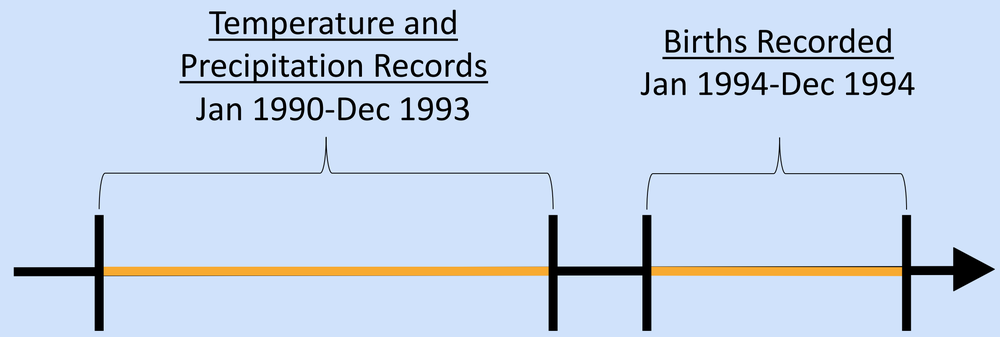
Map of 26 countries in sample with location of DHS clusters



District level boundaries and IPUMS-DHS respondents in Namibia

Methods

- **Outcome Variable:** Fertility is defined as whether a respondent had a birth in a given year or not
- **Independent Variables:** Z-scores for district-level precipitation and temperature were calculated for the three years prior to each person-year observation. A three-year period was used to take into account possible delays between climate variability and impact on demographic processes
- **Controls:** Age, primary education attainment, marriage status, cumulative number of births, rural or urban residency, time period (half-decades), and country
- **Model:** We estimated a pooled logistic regression model

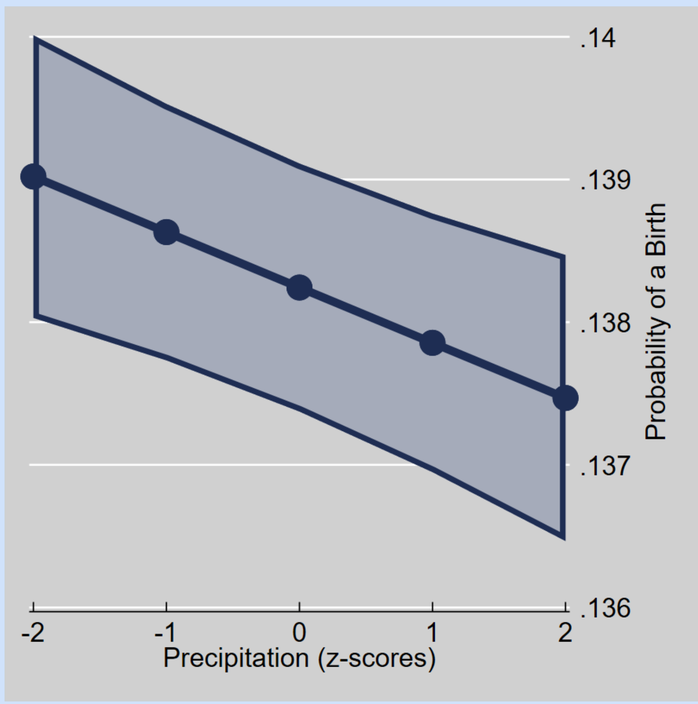


This timeline illustrates how we used monthly CRU.ts data to analyze the impact of climate shocks on future births

Preliminary Results

- Temperature was not a significant predictor of births during this time period and for this region (B = 0.0015, p = 0.3320)
- Precipitation significantly affects the probability of having a birth after holding for our controls (B = -0.0033, p = 0.0020)
- Each one-standard deviation decrease in precipitation is associated with a 0.3% increase in the odds of a birth

Plot of Precipitation Z Scores vs. Probability of a Birth



Next Steps

- Preliminary results highlight the need to account for interactions between climatic changes and demographic dynamics in sub-Saharan Africa. Future population trends may not operate independently of climate change
- Further analyses will test for non-linearities in climate effects, and examine if these effects vary across different regions of sub-Saharan Africa

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