Climate Change and Human Capital Accumulation in Sub-Saharan Africa : Effects on Health Inegalities

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Background and Problem (1/5)

- Rapid increase in the frequency of climate shocks has drawn the attention of the scientific community and policy makers to its effects on infrastructure, agricultural production, and, most importantly, human development and human lives (IPCC, 2012 ; Tol, 2018 ; Park et al., 2020).

- Worsening socioeconomic conditions of households resulting from these effects, may affect their ability to invest in human capital and improve their living standards (Maccini Yang, 2009 ; Randell Gray, 2016 ; Fishman et al., 2019 ; Park et al., 2020).

Background and Problem (2/5)

- Fall below the poverty line and remain there (World bank, 2013).
- Reinforce social inequalities, especially health inequalities.
- Existing studies have shown that climate change could have effects on infectious and chronic diseases, including chronic respiratory disorders, heat- or cold-related diseases such as cardiovascular disease, injuries, and psychological disorders (McMichael et al,, 2001 ; Basu Samet, 2002 ; Deschênes Greenstone, 2011 ; Deschenes, 2014 ; Geruso Spears, 2018 ; Meierrieks, 2021).

Background and Problem (3/5)

- Burden of disease and mortality from these chronic diseases is trending upward in populations of developing countries, particularly those in sub-Saharan Africa. This region is one of the most affected by climate change (IPCC, 2007).

- The region's vulnerability can be explained by its strong dependence on agricultural activities (more than half of the workforce, 15% of the region's GDP (OCDE FAO, 2016)), low adaptive capacity and weak institutions.

Background and Problem (4/5)

- Gap in the literature on climate change and health
  - The majority of existing studies have focused on the effects of climate change on population health without considering health inequalities and quality of life.
  - These studies have focused on the effects of a single climate variable, which may bias the estimated effects of climate change (Auffhammer et al., 2013).

Background and Problem (5/5)

- This study contributes to the literature on climate change and health in three ways.
  - Our study takes into account health inequalities and quality of life.
  - It highlights the effects of climate change on gender disparities in health over the short and long run.
  - We study the effects of two climate variables, namely temperature and precipitation. This allows us to provide a hollististic view on the effects of climate change.

Objective

The objective of this paper is to assess the effects of climate change on population health inegalities in 45 sub-Saharan African countries over the period 1960 to 2019.

Methodology (1/3)

- **Model specification**

$$Y_{it} = \gamma_i + \alpha_1 X_{it} + \alpha_2 W_{it} + \alpha_3 Q_{it} + \gamma_t + \gamma_s t + \vartheta_{it} \quad (1)$$

Y :life expectancy at birth, adult mortality and disability-adjusted life years.

X and W : temperature and precipitation.

Q : real GDP per capita, democracy, access to public services.

Methodology (2/3)

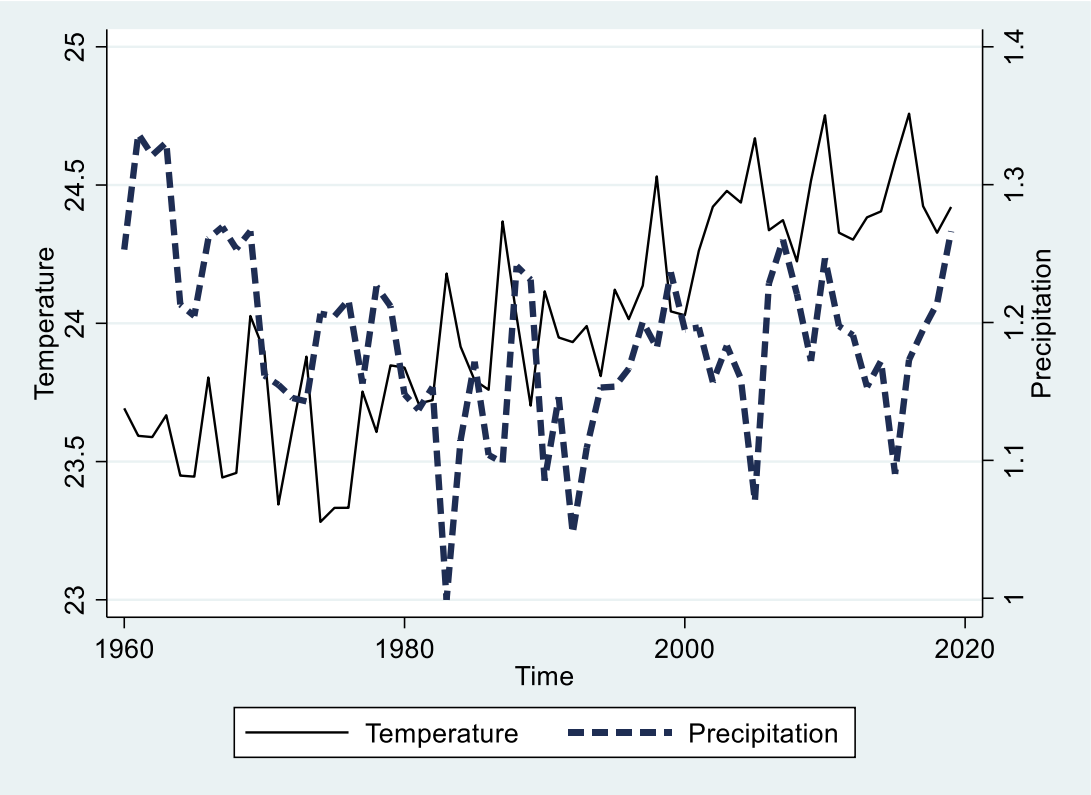
- To estimate equation 1, we use an ARDL model.
- The Pooled Mean Group (PMG) method is used to estimate the parameters of de ARDL model.
- PMG estimator allows : heterogeneity of the short-term coefficients and homogeneity of the long-term coefficients; the parameters to differ freely between groups, but forces the long-term parameter to be identical for each group in the panel.

Methodology (3/3)

- PMG is also useful for capturing cointegration and long-run relationships between variables.
- The PMG estimator is more appropriate in the dynamic panel models when the period is longer than the number of countries, which is the case in this study ($T = 60 > N = 45$).
- Data: We use secondary data, which are coming from the World Development Indicators database of the World Bank, the Climate Research Unit of the University of East Anglia and the Global Health Metric.

Results (1/4)

Graph 1 : Evolution of Temperature and Precipitation, 1960-2019.



Source: Author based on CRU data (2021)

Results (2/4)

- We perform the unit root test on panel data in order to check the stationarity of the variables and to be able to adopt the appropriate regression.
- We use the Fisher-type test to perform the unit root test, which is adapted to our data since we have an unbalanced panel.
- The results of the panel unit root test indicate that the PMG estimation technique is suitable for our study, since the variables are integrated of order I(0) and I(1).

Results (3/4)

Climate Variables	Life expectancy at birth	
	Female	Male
Temperature	Negative and significant effect in LR (4.96)	No significant effect in SR and LR
Precipitation	Negative and significant effect in SR (0.043)	No significant effect in SR and LR

Climate Variables	Adult mortality	
	Female	Male
Temperature	Positive et significant Effect in LR (4.76)	Positive et significant Effect in LR (9.35) and SR (2.73)
Precipitation	Positive et significant Effect in LR (3.480)	No significant effect in SR and LR

Climate Variables	Disability-adjusted life years	
	Female	Male
Temperature	Positive et significant Effect in LR (9.321)	Positive et significant Effect in LR (23.213)
Precipitation	Positive et significant Effect in LR (14.704)	Positive et significant Effect in LR (17.203)

Results (4/4)

Robustness check

Climate Variables	Under-five mortality rate	
	Girl	Boy
Temperature	Positive et significant Effect in LR (12.86)	Positive et significant Effect in LR (12.19)
Precipitation	Positive et significant Effect in SR (0.396)	Positive et significant Effect in SR (0.427)

Climate Variables	Health expenditure
Temperature	Negative and significant effect in LR (2.287) et in SR (0.352)
Precipitation	No effect in LR

Conclusion and Policy Recommandation (1/3)

- We found temperatures and precipitation are associated with health losses.
- These losses are manifested in lower life expectancy at birth, higher adult mortality rates, and years of life lost due to mortality and morbidity.
- The climate policy will involve the adoption of new heat-resistant crops, which can improve agricultural production and reduce malnutrition.
- Adoption of a water resources management approach will help to meet water needs and avoid water-borne diseases.

Conclusion and Policy Recommandation (2/3)

- Improving the quality and access to public services, including access to financial services, can help to reduce health inequalities.
- These measures should be accompanied by reforestation and the use of green and renewable energy sources.
- Our empirical approach provides an estimate of the total short and long run effect of climate change on health.

Conclusion and Policy Recommandation (3/3)

- It does not take into account the potential mechanisms through which climate change affects the health stock.
- Future research look at the transmission channels to identify which one has the greatest effect on health.
- Future research can also explore the health effects of climate change by considering cause-specific disability adjusted years.

THANK YOU