

Researcher

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Climate Variability and Infant Mortality in Africa

Variations in heat and precipitation as a result of climate change are expected to have adverse effects on health, particularly among the most vulnerable populations. These changes can affect health directly, through extreme events and changes in the disease environment, as well as indirectly through impact on the economic livelihood of the population. In this paper we use an extensive data set of over 400,000 births combined with detailed historical geospatial weather data on temperature and rainfall, to investigate the impact of extreme weather events on infant survival in Africa. Our results suggest that both extreme heat and extreme rainfall affect the likelihood of infant survival. In particular, we find that excessive heat around the month of birth is predictive of an increased likelihood of death, particularly for neonates but also for older infants. Rainfall during the third trimester of pregnancy increases the likelihood of death for neonates. We also find evidence that excess rainfall can be protective under certain scenarios, most likely as a result of positive income shocks. Using our empirical estimates, we explore four different climate change scenarios that suggest an additional 8 million to 18 million infant deaths in Africa from 2010 to 2030, due to the effects of increased heat and precipitation change, in the absence of effective adaptation or mitigation efforts.

Countries where the research will take place

Twenty-four African countries

How does the research describe the impact of population/reproductive health on poverty reduction and/or economic growth?

Climate change is expected to have substantial impact, both direct and indirect, on health, particularly for vulnerable populations. Changes in heat and precipitation can directly affect health through increased devastating events such as hurricanes and floods, as well as through changes in the disease environment. These changes can also have an indirect impact on health through effects on the economic livelihood of populations.

How will the research address a policy need, and what kind of policy lesson is expected?

Due to climate change between 2010 and 2030, we estimate an additional 8 million to 18 million infant deaths throughout the continent. These estimates assume no effective attempts on the behalf of governments or populations to mitigate or adapt to the projected climate changes. Successful efforts for global mitigation or local adaptation can help substantially avoid cost to human life.

Without such efforts, the human toll may be severe. Numerous countries in Africa have made significant recent gains in their reduction of infant mortality and future progress may be threatened by anticipated climate change. To place

the magnitude of this climate risk in context with the standard interventions that governments implement to improve infant survival, we illustratively calculate the association between infant mortality and a variety of characteristics of mothers and children in the DHS known to be protective of infant health, and then compare these associations with the anticipated effects of climate change. This exercise suggests that the predicted increase in infant mortality likelihood is comparable in magnitude to a 2.6-year to 6.30-year reduction in average mother's schooling, to an 800-gram to 2000-gram reduction in average birth weight, or to roughly one-third to three-quarters' decline in the coverage of tetanus shots for pregnant women. If African nations expected a future event to reduce maternal schooling, birth weight, or tetanus coverage by this magnitude, national efforts, perhaps with donor support, to counteract this effect could be easily mobilized. The challenge to national policymakers is identifying the activities and interventions that can most effectively mitigate the anticipated adverse consequences for infant survival.

Methods used

- Multiple regression
- Linear probability model
- Fixed effects

Data used

- Forty-seven DHS surveys from Africa
- Daily temperatures and rainfall dates from 1980 to 2000 for the entire continent

■ Climate projections from the European Center for Medium-Range Weather Forecasting

Research results

This paper focused on one particular vulnerable population, infants in Africa. We used a data set of over 400,000 births from the DHS to investigate the effect of extreme rainfall and temperature on death within the first year of life. The results suggest that both extreme temperature and rainfall affect the likelihood of dying during the first year of life. Excess rainfall is both detrimental and protective depending on the timing in which it occurs. Excess rainfall soon before birth increases the likelihood of neonatal death, likely the result of a change in the disease environment. On the other hand, rainfall during the second trimester appears protective of death if the infant survives to the fourth quarter of his or

her first year, likely due to an income effect. The impact of rainfall is similar for boys and girls, with the exception of strong protective effects during the third quarter of life on the likelihood of death during the fourth quarter for girls. We also find similar results for urban and rural areas, with rainfall being slightly more protective in rural areas.

Extreme temperature, on the other hand, is always detrimental, particularly during the first quarter of the first year. This result is true for the overall population and particularly for girls and infants of both sexes born in urban areas. We see no evidence of a counteracting positive effect of extreme temperature across specifications or subgroups.

Research products

Forthcoming working paper, journal article