Infant Mortality in West Africa:
The Role of Climate

Peter Han
Graduate Student, Department of Agricultural and Applied Economics
University of Wisconsin-Madison (jhan36@wisc.edu)

Jeremy Foltz
Professor, Department of Agricultural and Applied Economics
University of Wisconsin-Madison (jdfoltz@wisc.edu)


Copyright 2015 by Peter Han and Jeremy Foltz. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.
Infant Mortality in West Africa: The Role of Climate

Peter Han and Jeremy Foltz
Department of Agricultural & Applied Economics
College of Agriculture and Life Sciences, University of Wisconsin-Madison

Introduction

According to the United Nations Children’s Fund (UNICEF), there has been much global reduction in infant deaths within the first 12 months of life. Global infant mortality rate in 2013 was 34 per 1,000 live births compared to 63 per 1,000 live births in 1990, an improvement of over 40% in 25 years. However, the countries with the highest rates of infant mortality are still in Sub-Saharan Africa: at 61 per 1,000 live births (1 in 16), it is more than 12 times the average in developed regions. In Mali, it’s much worse than even by Sub-Saharan Africa standard: 78 per 1,000 live births (1 in 13).

How can the weather affect infant mortality in Mali? The climate in Mali is highly favorable to transmission of vector-borne diseases and heat wave, as well as food insecurity due to rainfall variability. Increased weather variability could affect the prevalence of communicable diseases as well as agricultural output in rural areas. Furthermore, an increase in heat-related mortality due to climate variability is well-documented in public health literature.

The current work examines how infant health is affected by different weather channels in Mali. We investigate the weather effects on an infant’s survival depending on an infant’s birth season. Then, we analyze the effect of weather on an infant survival.

Methods

• The analysis uses two data sources: Demographic Health and Survey (DHS) data from 1996, 2001 and 2006 and Malian Malaria Tsetse and Trypanosomiasis Survey (CHIRPS) data on rainfall and temperature, mapped with each cluster in DHS dataset.
• Sample size: 23,028 infants in 408 clusters (49 cores), born between 1992 and 2006
• Empirical framework: log-logistic accelerated failure time (AFT) parametric survival model

\[
\ln(t_i) = \beta_0 + \beta_1 \text{Temperature} + \beta_2 \text{Rainfall} + \ldots + \beta_k \text{Other covariates} + \epsilon_i
\]

where: Survivors are clusters at cercle level

Results

There are more births toward the end of the dry season, whereas infant deaths are more evenly distributed.

There is a slight increase in average temperature during dry and rainy seasons over the years.

We find evidence that weather conditions affect infant mortality, both in terms of rainfall and temperature. However, stratified analyses indicate that these findings are driven by heterogeneity in our data, such as residency and seasonality of child birth.

The analysis indicates that as the total amount of rainfall increases, an infant’s survival probability decreases. While we cannot separate their individual effects on agriculture and disease environment, we observe that the total effect of an increased rainfall is negative on an infant’s survival. We also find that as the heat stress during the dry season increases, an infant’s survival probability decreases.

We find that weather conditions preceding birth have statistically significant effects on infant mortality. This affirms that a pregnant mother’s health is an important factor in an infant’s health.

We find that for infants in rural areas, living in polygynous households could actually worsen the negative effect of heat stress. When weather shocks affect the entire household, co-wives would try to use limited household resources for their own children’s health first, creating conflicts among them.

With infants in rural areas especially vulnerable to weather effects, healthcare in rural communities should take a priority in public health policy debates in mitigating infant deaths in the future.

Conclusion

Objectives

Our conceptual model is based on the collective household consumption allocation model developed by Han and Foltz (2015, unpublished). It is a household utility maximization model subject to the inter-temporal budget constraint, with weather shocks as exogenous variables affecting survival function of each individual. Incorporating insights from previous literature on child health, we expect to see the following effects of weather and child, parental and household characteristics on an infant survival: