# DETERMINANTS OF STUNTING IN EASTERN RWANDA

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## ABSTRACT

During the Copenhagen World Summit for Social Development, the United Nations Commission for Social Development committed itself to eradicate hunger and malnutrition and promote the rights of children by providing them with adequate nutrition. The heads of State and Government defined more concrete targets in the Millennium Declaration by pledging to combat hunger by halving the proportion of hungry people by the year 2015. They also aimed to reduce under-five child mortality rate by two thirds by the same date. A well-nourished population has now been recognized as a pre-condition for sustainable development and strategies to combat malnutrition are being increasingly integrated into development programs and policies.

Africa suffers from the highest incidence of stunting, which stood at 40% of all children younger than 5 years old in 2005. Stunting is a main indicator of malnutrition. Height for age z-score (HAZ) is the indicator for measuring stunting. It is determined by calculating the difference of the under 5 years old child's current height from a median universal standard of growth path calculated by the World Health Organization. The child is stunted if HAZ falls below two standard deviations of the mean reference. Stunting causes higher child mortality and morbidity in the short-term and lowers intellectual ability, economic productivity and

reproductive ability in the long-term. In Rwanda, despite remarkable economic growth after the 1994 genocide, the prevalence of stunting stood at 44% in 2010 for children younger than 5 years old and was responsible for 9.9% of child deaths in 2008. The prevalence of stunting remains especially high in rural areas compared to urban areas, and is a major social and health challenge for rural communities.

The purpose of this study is to determine the factors behind stunting in the Eastern province of Rwanda. Prevalence of stunting in the Eastern province stood at 43% in 2010, which is close to the national average. The Eastern province however suffers from considerable food shortages during the dry season and prices of food rise significantly. It also has a historical proneness for droughts and famines.

The approach to assess the factors behind the variations in HAZ follows two measures. The first measure is geographical accessibility to healthcare. Given Rwanda's hilly nature and the dearth of studies focusing on travel time to health centers in Sub-Saharan Africa, this study comes as an initial attempt to clarify the relationship between travel time to healthcare service delivery points and stunting in Rwanda. The second measure is the effect of the mother's role in intra-household allocation of resources. Recent studies on child health have been increasingly shedding light on additional determinants of stunting in Sub-Saharan Africa, other than traditional variables such as distance from health service delivery points and cost of consultation. The study will constitute an initial exploration of the relationship between a mother's role in allocating nutritional resources in the household and stunting in Rwanda.

The dataset for the study consisted of data extracted from the Demographic Health Survey (DHS) database and field surveys. The DHS sample consisted of 974 children younger than 5 years old in the Eastern province with information about HAZ, household's wealth index and GPS location, mother's education, sex, preceding birth interval, birth order, and mother and

father's involvement in agriculture. Travel time from GPS locations of households to health centers was calculated using ArcGIS software and AccessMod, an add-on tool developed by WHO for the purpose of simulating traveling scenarios to health centers. Land cover and population data and health center GPS locations were obtained from the Center for Geographic Information Systems and Remote Sensing of the National University of Rwanda and the Rwanda Natural Resources Authority. Field data obtained through a wide survey that targeted 600 households divided equally between the sectors of Rukara and Mwiri in the Eastern province complemented the data from DHS by additionally inquiring about waiting time and travel safety. The questionnaire inquired about general health behavior, food security and socio-economical background. Measurements of children's height were also taken. The sample size of children extracted from the field survey consisted of 260. A smaller nutritional survey targeted 32 households in Rukara and Mwiri and inquired about the household members' daily food intake. It was used to complement the DHS based study on intra-household allocation.

Due to the lack of a theoretical basis for a model/equation of healthcare access, the time to health center variable was used in a step-by-step multiple regression analyses with HAZ as a dependent variable. Variables of wealth index, mother's education, sex, preceding birth interval and birth order were added respectively. A similar regression analysis with HAZ as dependent variable was undertaken with waiting time and perception of travel safety's effect by caregivers as independent variables. An equation of a simple model of intra-household allocation was estimated with DHS HAZ as a dependent variable, the involvement of the father and the mother in agricultural activities and the mother's primary and secondary education levels as independent dummy variables. The estimation was complemented with the results of the nutritional survey. The HAZ of 17 children was used as a dependent variable in a series of bivariate regressions against a variety of foods.

Both time to health center and mother's education proved to be highly significant factors of HAZ variation for travel time values below 120 minutes. The presence of a 120 minutes time "barrier" after which the relationship flattens out might mean that households have become way too far for there to be any significance for travel time. Waiting time at health center and travel safety were also significant factors in explaining HAZ variations. Mother's involvement in agriculture and her completion of a secondary degree had a positive effect on the distribution of HAZ. The nutritional survey showed that differences in HAZ were significantly correlated with differences in meat and milk intake, which are high protein foods and therefore point to the possible role of the mother in better allocating nutritional resources.

Given the strong positive impact of mother's involvement in agriculture and her secondary education on stunting, its alleviation is therefore not a simple matter of improving accessibility. Further studies are required to investigate the effect of the mother's status in intra-household dynamics on the children's HAZ. A higher status of the mother can affect different aspects of her life, such as time management, nutritional allocation and employment. The effects are expected not to be straightforward, since higher status women can become employed, and devote less time on their children's health. Also, more accurate studies of travel time to the health center are recommended, such as researchers undertaking the actual journey to the health center with the caregivers while measuring travel time.

*Key words:* Malnutrition, Stunting, Intra-household allocation, Geographical accessibility, Mother's education