

Doctoral Thesis (Abridged)

Agricultural livelihoods, dietary diversity, and stunting in Rwanda
(ルワンダにおける農家家計の生計と栄養の多様性・発育阻害)

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Stunting, a condition of growth faltering in children, is a major social challenge in Rwanda, affecting children in rural and urban areas and across the household distribution of wealth. While economic growth in Sub-Saharan Africa does have a strong influence on achieved adult height in part through its influence on growth during early childhood, the prevalence of stunting is persistently elevated in wealthy households in the region, and Rwanda is no exception to this. It appears hence that in countries that are very poor at the outset, economic growth alone will not be enough to stamp out stunting. The current state of affairs calls for concerted research and intervention efforts to be implemented in conjunction with economic growth to accelerate the rate of decrease in both relative and absolute numbers of stunted children. This study addresses the following correlates of stunting in Rwanda: (i) geographical access to health centers, (ii) childcare and work arrangements of mothers, (iii) dietary diversity, (iv) livelihoods and their effects on parental work strenuousness and time allocation. Correlates were respectively investigated in the following manner: (i) geographical access was analyzed at the national level using AccessMod 4.0, an add-on to ArcGIS 9.3.1 that simulates travel times to health centers by accounting for differences in travel speed induced by varying types of land covers as well as terrain elevation; (ii) childcare and work arrangements of mothers and dietary diversity were assessed at the national level by estimating a number of regression equation models on a number of available demographic health survey (DHS) datasets of Rwanda; (iii) associations between livelihoods and other factors with stunting, both direct and those mediated by livelihoods' effects on parents' work strenuousness and time allocation, were analyzed by undertaking an in-depth field survey in two sectors in the east of the country that consisted of a questionnaire survey and a compact spot-check examination that estimated parents' time allocation and strenuousness of effort on work-related tasks.

The dissertation comprises seven chapters. Chapter 1, the introduction, first summarizes the current problematics of malnutrition, stunting, livelihoods and development in developing countries. The introduction then focuses more on summarizing the current situation of stunting in Rwanda, and the rationale for the research. The second chapter consists of two parts. The first presents the conceptual flow adopted and followed throughout by the research effort. The second part briefly explains the methods used to analyze the correlates of stunting, and conjunctionally provides a brief summary of the geographical areas under study. Chapter 3 presents the results of the geographical analysis. While virtually all urban residents are within a 60 minutes walking distance from health centers (the government's target is having everyone within this time boundary), a little more than 50% of rural residents are within this time boundary. A previous analysis at the level of the eastern province of Rwanda showed a significant negative association between travel time to health centers and stunting. The fourth chapter comprises the results of the mother's childcare and work arrangements and dietary diversity correlates analysis, at the national level. The estimation found that, relative to the base case of stay at home mothers, the associations between dummies coding for the mother earning cash for work while taking the child with her to the workplace, and for the cases where the mother does not earn cash for work and either takes the child with her or not, and child height were significant and negative. The dummy for the case where mothers earn cash for work and do not take the child with them to the workplace was insignificant. Since the latter group of mothers and stay at home mothers are wealthier and more educated, these results could then be reflecting the effects of wealth and the superior ability to care of educated mothers. Regarding food diversity, the analysis yielded significant and positive associations between child height and diversity of food intake, despite controlling for both relative and absolute wealth. Chapter 5 shows the results of the field survey undertaken in the east of the country, and that tackled the subject of agricultural labor and farming livelihoods and stunting. Using child height as a dependent variable, a regression equation found that belonging to a farming household is associated with better growth for a child. The dummies coding for whether the household possesses a kitchen garden, if it had experienced a lack of rainfall that diminished its yields and an index reflecting the household's diet's richness in protein were also significantly associated with child height out of other significant variables, with the signs of the coefficients being positive for the kitchen garden dummy and the index, and negative for the lack of rainfall dummy. Regarding the spot-check method survey, a Mann-Whitney two sample test on medians found no significant difference in work strenuousness according to livelihood group, for both males and females. Qualitative interviews suggest limited landholdings might be preventing male and female farmers and laborers from working as much as desired, and thereby resulting in similar patterns of work for both livelihood groups. For females, childcare and housework also constituted a limiting factor, and hence time for childcare does not seem to be an issue in the area of study, though the quality of care could be one. Chapter 6, based on the above results and an estimation of the nutrient balance of Rwandese across wealth quintiles, recommends the combination of the kitchen garden and small livestock programs implemented by the government into one homestead farming program for poor families. Chapter 7 concludes by summarizing the results of the whole dissertation, highlighting the significance of the study, and suggesting future research topics of relevance.