

**An Economic Analysis of Dietary
Diversification in the Developing World**

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THESIS

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Abstract

Child undernutrition, including micronutrient deficiency, is widespread in many parts of the developing world. Low dietary diversity is a major source of this problem. This occurs where diets are predominantly based on starchy staples with few fruits, vegetables and animal-sourced foods. Improving children's diets is therefore an important step towards solving the nutrition problem in low-income settings and reducing its debilitating symptoms such as stunting.

Despite the importance that nutritionists attach to early childhood dietary diversification, very little research has focused on the key question of how dietary diversification can be accelerated. Chapter 1 reviews an extensive multi-disciplinary literature on dietary diversification that nevertheless fails to systematically address the multidimensional drivers of diversification, particularly in low-income settings. This thesis aims to fill this knowledge gap by investigating factors that drive dietary diversification at a national level (Chapter 2) and at an individual child level (Chapter 3). Chapter 4 sheds light on the nutritional impacts of dietary diversification specifically in the context of dairy, a food group widely perceived to be especially critical for child growth (Chapter 4).

Chapter 2 of the thesis investigates the economic, social and agro-ecological indicators that drive dietary diversification of national food supplies (DFS) over time across countries and regions. The traditional economic view, stemming from Bennett (1944), is that economic growth is the major driver of the diversification of food supplies, but meso- and micro-level work point to many other drivers, and to potential agro-ecological constraints to diversification. This chapter addresses those questions through a cross-country analysis linking a simple measure of diversity of food supply (the share of calories supplied by non-staple foods) with various economic, social

and agro-ecological indicators. Using panel regression models, the analysis shows that while economic growth and other indicators of structural transformation (urbanisation and demographic change) explain changes in DFS within countries, time-invariant agro-ecological indicators also are significantly associated with DFS. In short, broader structural transformation processes do appear to drive diversification, but some countries face retarded diversification because of specific agro-ecological constraints as well.

In contrast to the global view on diversification in Chapter 2, Chapter 3 investigates the determinants of child dietary diversity specifically among pre-school children. Pre-schoolers are a crucial demographic, because most growth faltering occurs between 6 and 23 months of age. This chapter tests the various hypotheses emerging from the economics and nutrition literature by linking Demographic and Health Survey (DHS) data on child dietary diversity to household socioeconomic characteristics with community level indicators of climate and infrastructure. Using non-parametric and parametric regression models, the findings uncover strong support for linear effects of household wealth (again, in keeping with Bennett's Law) but also large and nonlinear associations with parental education, access to health services, infrastructure and climate, and modest associations with an indicator of women's empowerment.

Chapter 4 tests the importance of cow ownership for child growth in rural Bangladesh. Bangladesh is a country with unusually low levels of milk consumption by international standards and very high rates of undernutrition. Unlike previous papers in the literature, this chapter introduces a novel placebo test by distinguishing between lactating dairy cows that have produced milk over the past 12 months and those that have not. Using a rich nationally representative rural household survey,

the results show a robust positive association between ownership of lactating cows and child growth among young children (6-23 months). The empirical analysis also reveals an unusual positive association between ownership of lactating cows and wasting, and some evidence that household dairy production is associated with reduced rates of breastfeeding in the first 12 months of life. In short, the apparent linear growth benefits of increased household milk availability are qualified by adverse breastfeeding outcomes and a disconcerting association with child wasting. Efforts to promote increased dairy consumption arguably should be accompanied by interventions to improve nutritional knowledge and emphasize exclusive breastfeeding in early life.

The findings of this thesis have important implications for food and nutrition strategies that aspire to accelerate dietary diversification. Chapter 5 points to the results providing evidence that the impact of economic growth on dietary diversification is moderately strong; growth alone would yield only modest diversification without accompanying improvements in parental education, health infrastructure, physical infrastructure and broader demographic transformations. Reassuringly for the nutritionists, the results often suggest that nutritional knowledge may indeed be a critical determinant of dietary diversity, and one partly shaped by exposure to formal education and basic health services. However, more research is needed to determine how best to improve nutritional knowledge cost-effectively, and at scale. The demonstrated importance of agro-climatic and infrastructural constraints also provides support for the separability hypothesis. Resolving the problem of poor diets, especially in rural areas, will likely require significant investments in making markets more effective in delivering a diverse and affordable array of foods. More research is needed to determine how much more of such specific investments are needed to improve rural diets in particular settings.

Key words: Dietary diversity; Undernutrition; Child diets; Agriculture; Livestock; Dairy production; Animal-sourced foods

Declaration

I certify that this work contains no material that has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and, where applicable, any partner institution responsible for the joint-award of this degree.

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Dedication

To my late mother, Samina Farhad Chowdhury

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Overall percentage (%)	75%		
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.		
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By signing the Statement of Authorship, each author certifies that:

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- ii. permission is granted for the candidate to include the publication in the thesis; and
- iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

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