ADVANCING THE USE OF HOUSEHOLD SURVEYS FOR NUTRITION:
Nutrient Adequacy at the household level and cost of nutritious diets in Malawi

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Motivation

Make more and better use of household surveys for nutrition

Background

Address household unit of observation for food consumption

Our Approach

Families procure food together and eat shared meals

Data

Little is known about the cost of healthy diets

Methods

Results

Icon credits: Hut by Ker'is, Food cost & Family eating together by Gan Khoon Lay; Man with money by PdxSymbols, Noun Project

Image: A group of children in Malawi share a bowl of food. © 2010 SC4CCM/JSI, Courtesy of Photoshare
Prior research using HCES for nutrition analyses divides foods over individuals:

- **Adult male consumption equivalents are the most common approach.** Coates et al 2017; Fiedler et al 2012; Mori, Ishibashi & Dyck 2011; Waid et al 2018; Weisell et al 2012.
  
  - Based on well-established methods to analyze household budgets. [Brown 1954; Friedman 1952; Prais 1953; Prais & Houthakker 1955]
  
  - But nutrients are needed in different proportions, per nutrient, relative to adult men. [IOM (2006, 2011, 2019); WHO & FAO (2004); FAO, WHO & UNU (2001)]
Relative Nutrient Density Needs (Range) Over the Life Course
Selected Nutrients by Gender

- Breastfeeding
- Adolescents 9-13
- Toddlers

Note the unit varies depending on the nutrient.
Quantity per calorie standardizes needs over members of different types for comparison.
Linear programming has long been used to determine least cost diets meeting nutritional requirements:

- Least cost diets have been used to inform dietary guidance and implement nutrition interventions.

Akhter et al. 2018; Chastre et al. 2007; Daelmans et al. 2013; Deptford et al. 2017; Dizon & Herforth 2018; Masters et al. 2018; Optifood 2012; Stigler 1945
Key approach: Assuming families share food and each individual eats in proportion to his or her own energy needs. [Beaton 1995, 1999; IOM 2001]

Shared household diet is dense enough in each nutrient to meet everyone’s needs.

1. Are current household diets adequate for all family members?

2. What is the cost of a healthy diet for households?
Motivation

Background

Specific Aims

Data

Methods

Results

Consumer Price Index Market Food Price Data
Malawi NSO

Integrated Household Panel Survey
Malawi NSO & World Bank

Malawi Food Composition Table (2019)
South African Medical Research Council & Nutrition Innovation Lab (Tufts)

Dietary Reference Intakes
Institute of Medicine, US & Canada

Nutrient Requirements & Growth Charts
WHO & FAO
22 Nutrients, 5 Nutritional Requirements:

- Energy (EER) for an appropriate level of physical activity for a rural, agricultural population
- Estimated average requirements (EARs) for micronutrients
- Upper limits (UL) not to be exceeded (and chronic disease risk reduction level for sodium)
- Acceptable macronutrient distribution range (AMDR) bound the percentage of calories from carbs, protein, and fats
Are current diets adequate?

**Most Under-Consumed Nutrients by Rural Malawian Households**

Energy-adjusted adequacy ratios, consumption relative to needs under household food sharing

- Excludes outside values & adequately consumed nutrients. Adjusted for survey weights.
- Sources: Integrated Household Survey Panel (NSO Malawi) 2019-2016, Malawi Food Composition Table (MAFOODS 2019) & USDA Nutrient Database where Malawi does not have a value

Adequacy ratio of 1 indicates 100% of needs met
Are current diets adequate?

Household Mean Adequacy Ratio by Survey Round

Energy-adjusted adequacy ratio, consumption relative to needs under household food sharing

Adequacy ratio of 1 indicating 100% of needs met

Proportion of Total Nutrient Needs Met

2010 2013 2016/17

Note: Nutrient adequacy ratios truncated at 100% such that excess consumption of a given nutrient cannot compensate for inadequate consumption of another in the calculation of the HMAR. HMAR by definition has a maximum value of 1.

Adjusted for survey weights
Sources: Integrated Household Survey Panel (NSO Malawi) 2010-2016
Malawi Food Composition Table (MAFOODS 2019) & USDA where Malawi does not have a value
Household Cost of Nutrient Adequacy (CoNA)

- Mean = $13.26 (1927 MWK)
- Median = $7.48 (856 MWK)

Robust standard errors clustered at the individual level in parentheses. Household, market and month fixed effects included in both models. Poorest wealth quintile is the reference group. Market dependence is a binary measure where 1 equals above median. * p<0.1, ** p<0.05, *** p<0.01

Almost 60% of the rural population lived below the national poverty line of 4518 MWK per day in 2016.

Over 70% live below $1.90 per day.


Source: Integrated Household Survey Panel (NSO Malawi) 2010-2017; Malawi Food Composition Table (draft) & USDA where Malawi does not have a value; Dietary Reference Intakes, Institutes of Medicine (2006); Human Nutrient Requirements, WHO & FAO (2004); Consumer Food Price Dataset, National Statistics Office (NSO) [Malawi].

Note: Winsorized to the 1st and 99th percentiles. Adjusted for survey weights.
Conclusions

- Defining nutritional requirements at the household level can address the challenge of using HCES for nutrition analysis & incorporates the reality that families share foods.
- Households in Malawi are meeting some of their nutrient needs but not all: fats, zinc, and B12 are especially deficient.
- Least cost diets may be unaffordable for many of the poor.

Next steps

- Further analysis of the diet cost index including relationships with nutritional adequacy, spatial and temporal variation.
- Analyze nutrient shadow prices.

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