



Review of EPAR’s Nutrition and Food Security Research

EPAR Research Brief #342

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July 28, 2016

This brief presents an overview of EPAR’s previous research on nutrition and food security and outlines summaries and key findings from 15 technical reports and research briefs. Many of the key findings come from other sources. Please see full documents for references. We also include appendices briefly summarizing EPAR’s research on health and climate change, topics somewhat related to nutrition and food security, and EPAR’s confidential work on nutrition and food security.

We include links to the full reports or briefs for all of our completed nutrition and food security research. All of our publicly available research is available on our website.

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Please direct comments or questions about this research to Principal Investigators Leigh Anderson and Travis Reynolds at epar.evans.uw@gmail.com.

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(1) Relating Seasonal Hunger, Coping and Prevention Strategies, and Household Nutrition in Malawi. [EPAR Technical Report #337](#). January 29, 2016.

Overview: This technical report investigates whether seasonal hunger, distinct from chronic hunger, exists in Malawi, drawing on two waves of panel data from the LSMS-ISA series. The panel sample includes 2,270 rural and 400 urban households (2010 - 2013). The report examines the extent of seasonal hunger, factors associated with variation in seasonal hunger, and how recurring and long-term seasonal hunger might be associated with various household welfare measures.

Key Findings:

- Seasonal hunger occurs when an individual has limited access to food during the months prior to the harvest. In the lean season months between planting and harvest, food availability is lower and prices are higher, yet the energy demands of tending to crops may require more calories than at other times of year. Despite its growing recognition in the literature, the prevalence of seasonal hunger in rural and urban areas of Africa is poorly understood.
- There was evidence of seasonal hunger in both farm and non-farm households, associated with gender, age, education of household head, crop diversity, and storage of crops were associated with lower levels of seasonal hunger. The months with the highest prevalence of hunger were the months preceding the harvest in both farm and non-farm households.
- Farm households employ a variety of strategies to smooth consumption between harvests, such as crop diversification, including planting “off-season crops,” seeking off-farm income, borrowing food or money, skipping meals, or eating less preferable foods or wild foods to fill caloric gaps.
- Results suggest that older and more educated household heads were associated with less seasonal hunger, while increasing the size of the household by one person was associated with an increase of 0.036 months of seasonal hunger.
- Households with greater crop diversity or that cultivated off-season crops were less likely to experience seasonal hunger.
- While increased distance to a road and engaging in wage labor were associated with an increase in seasonal hunger, this relationship may reflect an increased likelihood of farms relying on wage labor if they are food insecure.
- Seasonal hunger was also associated with household decisions to harvest earlier in the year, a short-run response that can exacerbate seasonal, and even chronic, hunger. Harvesting immature crops reduces the crop’s potential yield and nutritional value, and hastens the onset of the lean season.
- There was strong evidence that seasonal hunger over the previous year was correlated with the timing of the maize harvest, such that an increase of one month of seasonal hunger over the previous year was associated with a household harvesting 0.195 months, or approximately six days, earlier. This suggests that a household experiencing four months of seasonal hunger could be harvesting a month earlier than households reporting no seasonal hunger.

The following set of four briefs (319a-d) examine issues in the measurement of food security, including the relationship between food security and poverty, Gross Domestic Product (GDP), and crop yields.

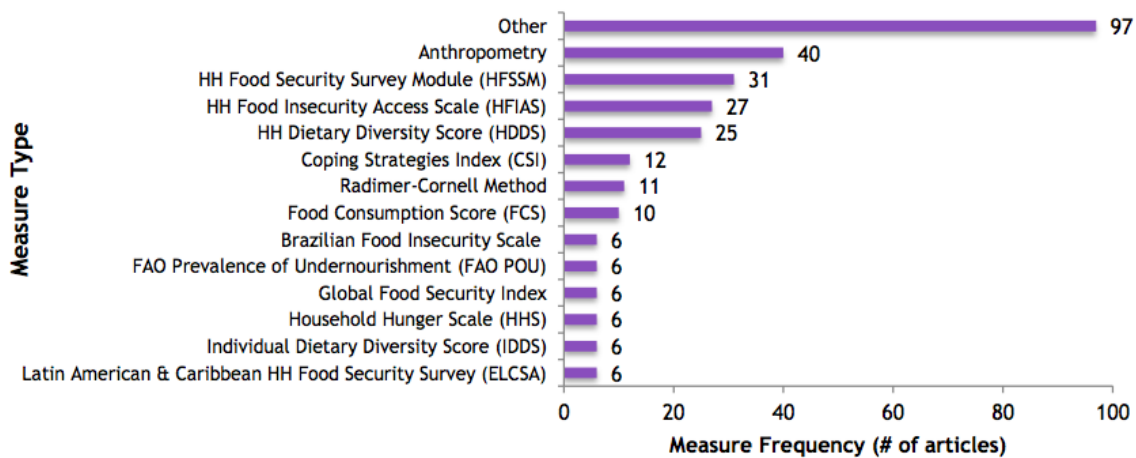
(2) Food Security Measurement Issues. [EPAR Research Brief #319a](#). January 29, 2016.

Overview: This brief identifies recent trends and critiques in the academic literature on food security measures.

Key Findings:

- The FAO’s food security pillars—access, availability, utilization, and stability—are frequently cited as a measurement framework, although several authors note that the pillars are not well-defined. Authors recommend creating a suite of more specific food security indicators, including five new indicators including: (1) food sufficiency, (1) nutrition adequacy, (3) cultural acceptability, (4) safety, and (5) certainty and stability.
- The most frequently used food security measures in the academic literature are anthropometry and the Household Food Security Module, although there appears to be a lack of consensus among researchers as to which measure is the most effective or relevant.
- The following graph illustrates the frequency of use of different types of food security measures in the academic literature identified by this review:

Figure 1. Frequency of Food Security Measures Cited



- Some measures have been developed to estimate food security at a regional level, such as the Brazilian Food Insecurity Scale and the Latin American & Caribbean Household Food Security Survey (ELCSA).
- Similarly, some measures are used at the household level, while others are used at the individual level of consumption. The following are commonly used measurement scales for food security:
 - Individual-level measurement: One of the most popular individual-level measures of food security is anthropometry, including wasting, stunting, and Body Mass Index (BMI). While anthropometric data allow for a greater understanding of differences within households, anthropometry is a reflection of overall nutritional status, which is not solely a result of food

- security. Nutritional dietary surveys, while expensive, are another means of measuring individual-level food security.
- Household Consumption and Expenditure Surveys (HCEs): While HCEs can yield information about food access and expenditure, they also do not take into account seasonal fluctuations and assume that household food acquisition is the same as consumption. Recent research also suggests that HCE results can vary significantly based on survey design.
 - Cross-national Measures: A commonly used cross-national measure of food security is the FAO's prevalence of undernourishment (POU), published every three years in "The State of Food Insecurity in the World." The POU compares average food consumption in terms of dietary energy (kilocalories) with norms for caloric requirements. Criticisms of the POU include its inability to capture the complexity of dietary needs and failure to adequately represent the nutritional status of minority groups, including women and children.

(3) Food Security and Poverty. [EPAR Research Brief #319b](#). January 29, 2016.

Overview: This review identifies major trends in the recent academic and grey literature on the relationship between food security and poverty.

Key Findings:

- Only six academic studies empirically investigate the relationship between food security and poverty. There is lack of consensus in the studies on the nature of the relationship, possibly due to different definitions and modes of measurement for both poverty and food security. Lack of agreed upon definitions among studies is challenging for cross-comparison.
- The most frequently cited definition of food security is the WHO's "all people at all times have access to sufficient, safe, and nutritious food." Studies often supplement this definition with the FAO's food security pillars: access, availability, utilization, and stability.
- Several studies discuss poverty measures that include a minimum intake of calories or nutrients, further confounding the definitions of poverty and food security. 64 of the 175 articles reviewed used "food security" and "poverty" interchangeably, without supporting evidence of the association.
- In the grey literature reviewed, several authors suggest that a reduction in poverty is necessary for improving food security, and two results argue that food insecurity increases poverty. Poverty and food insecurity are frequently cited as closely related concepts, with several articles claiming that it will be extremely difficult to address poverty and food insecurity as separate issues.

(4) Food Security and GDP. [EPAR Research Brief #319c](#). January 29, 2016.

Overview: This review summarizes major trends in the recent academic and grey literature on the relationship between food security and GDP.

Key Findings:

- Few academic articles directly link agriculture and food security, although many discuss the impact of certain factors—like climate change—on both. None of the literature reviewed estimates the direct relationship between GDP and food security, and just three articles discuss the relationship.

- Of the three academic studies that discuss the relationship between GDP and food security, results were mixed. Jha & Mheta (2010) find that hunger in the Philippines rose as GDP grew, which the authors suggest may be due to rising food prices, while Verpoorten et al. (2013) report a positive correlation between GDP growth and reduction of food insecurity in countries in sub-Saharan Africa, despite increases in food prices. When modeling the potential impact of climate change on agricultural production and food security in Yemen, Wiebelt et al. (2013) find that growth in food prices due to climate change would be expected raise agricultural GDP while simultaneously decreasing real household incomes and food security.
- In the grey literature, several search results discuss the relationship between food security and GDP, but rarely rely on empirical evidence to support the association, and a number of reports reference national agricultural contributions to GDP without discussing food security.
- Several results describe the relationship between changes in consumption patterns and GDP growth, as well as the potential impact of these changes on food security.
- The most comprehensive report on food security and GDP found was the FAO's "State of Food Insecurity in the World 2012" which uses FAO and World Bank data to conclude that GDP growth is a necessary but not sufficient condition for food security.

(5) Food Security and Crop Yield. [EPAR Research Brief #319d](#). June 22, 2016.

Overview: This review identifies major trends in the recent academic and grey literature on the relationship between food security and crop yields.

Key Findings:

- As with food security, a number of definitions are used to quantify crop yield, including the quantity of crop harvested divided by the area harvested (the most common definition), yield by area planted, total factor productivity, or technical efficiency.
- Few articles discuss the relationship between food security and crop yield. Of the literature reviewed, nine articles offer empirical evidence that food security is dependent on crop yield, and three articles argue that crop yields are dependent on food security.
- There was no empirical evidence in the literature reviewed testing the association between food security and crop yield, although a number of articles discussed the impact of climate change on crop yield and the projected impact on food security. Much of the evidence focuses on potential changes in crop yield caused by climate change, innovation and accelerated genetic gains, or access to credit, and discusses how these changes might be expected to impact food security.
- In many studies, measures of crop yield are used as indicators of food security, such that the association between the two is assumed rather than tested.

(6) Morbidity and Economic Growth. [EPAR Technical Report #293](#). March 31, 2015.

Overview: This brief reviews the current body of peer-reviewed scholarship exploring the impacts of morbidity on economic growth and provides a concise introduction to major theories and empirical evidence linking morbidity to economic growth, defined in terms of Gross Domestic Product (GDP) and related metrics.

Key Findings:

- Morbidity in this brief refers to the overall burden of disease, specifically incidence and prevalence of certain diseases and life expectancy. Household-level literature on economic impacts of health typically use individual or household income as measures, while country-level analyses use real per capita GDP.
- A variety of theoretical pathways have been proposed linking morbidity to economic growth. Three commonly cited theoretical pathways include: (1) direct loss of well-being to an individual as a result of disease, including health-related expenditures, lower work productivity, and absenteeism; (2) life cycle consequences of illness and disability, including the impact of poor health or nutrition in childhood on adult health and earning potential; and (3) intergenerational spillovers of disease, including the impact of parental illness on child development. Other potential economic consequences of morbidity include firm-level and economy-wide impacts of disease and disability.
- Most of the published literature linking morbidity and economic growth is recent, with the majority of studies conducting individual or household-level analyses, as opposed to firm or economy-wide. The largest body of academic literature consists of disease-specific analyses of the association between cause-specific morbidity and mortality and economic growth.
- DALYs and QALYs were primarily used to evaluate the cost effectiveness of disease-specific interventions, as opposed to the economic growth consequences of morbidity.
- There is limited empirical information on firm-level impacts of morbidity on economic growth.

(7) LSMS-ISA Tanzania: Nutrition. [EPAR Technical Report #166](#). September 30, 2011.

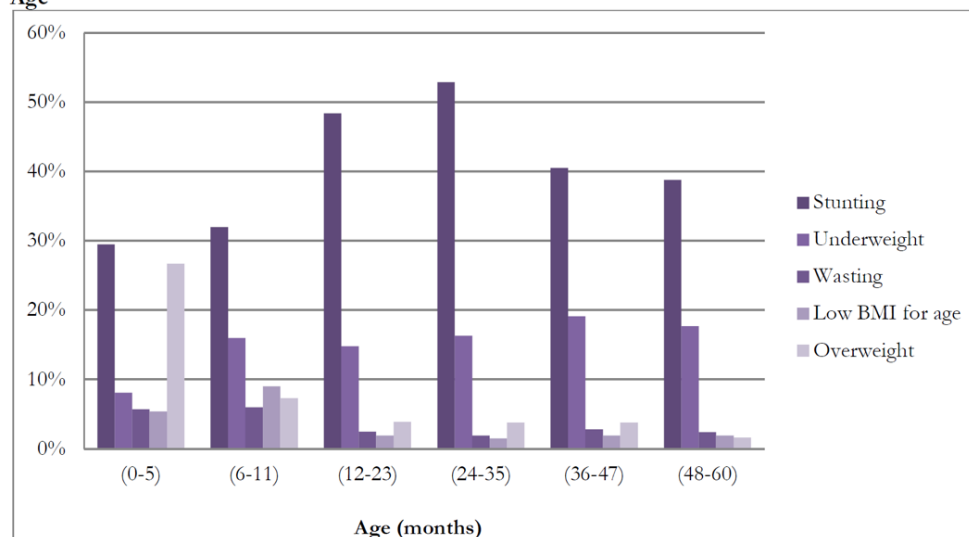
Overview: This technical report presents summary statistics on nutrition from the Tanzania National Panel Survey (TZNPS), part of the Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA). The first wave of LSMS-ISA data for Tanzania was collected from 2008 - 2009 in 3,265 households from eight administrative zones, with 2,474 respondents reporting any involvement in crop, fishing, or livestock cultivation (referred to as agricultural households). Measures of malnutrition for children under five were calculated using LSMS data on sex, age, weight, and height and the World Health Organization (WHO) child growth standards.

Key Findings:

- 43% of the under-five population was moderately to severely stunted.
- 16% of children under five were underweight (low weight for age).
- Males under five were more likely to be stunted or underweight than females under five.
- A higher proportion of children in female-headed households experienced stunting (46% in female-headed households versus 42% in male-headed households) and/or were underweight (19% versus 16% in male-headed households).

- Children under five in agricultural households were more likely to be stunted or underweight than children under five in non-agricultural households.
- The proportion of malnourished children under five differed significantly by zone, ranging from 31% of children in Zanzibar to 52% of children in the Southern Highlands.

Figure 1: Proportion of Under-five Population Suffering from Moderate to Severe Malnutrition by Age



Questions sbq2, sbq4, suq1, suq2, suq4, suq5, suq6

(8) LSMS-ISA Tanzania: Food Consumption and Expenditures. [EPAR Technical Report #165](#). September 30, 2011.

Overview: This technical report presents summary statistics on food consumption and expenditures from the Tanzania National Panel Survey (TZNPS), part of the Living Standards Measurement Study - Integrated Surveys on Agriculture (LSMS-ISA). The first wave of LSMS-ISA data for Tanzania was collected from 2008 - 2009 in 3,265 households from eight administrative zones, with 2,474 respondents reporting any involvement in crop, fishing, or livestock cultivation (referred to as agricultural households). The LSMS survey includes data on 59 food items, grouped into the following categories: cereals, starches, sugar and sweets, pulses, nuts, vegetables, fruits, and meat and meat products (includes fish), milk and milk products, oils and fats, spices, and beverages. Total value of consumption was calculated based on the value of all foods consumed by the household in the seven days prior to survey administration.

Key Findings:

- The mean total value of household consumption was higher for agricultural households (US\$27.28) compared to non-agricultural households (US\$26.59), but the mean per capita value of household consumption was higher for non-agricultural households (US\$7.32) compared to agricultural households (US\$5.24).

- Very few households purchased a food item that they also produced over the past week. Within a particular category, households are likely to consume the majority of food in that category from either purchases or self-production in a one-week period.
- Households that produced a particular food item tended to consume a higher mean quantity over the last seven days than households that purchased the food item, with the exception of rice and fresh milk. Households that purchased rice consumed more (17kg) than households that produced rice (5.9kg), and households that purchased fresh milk consumed more (3L) than households that produced fresh milk (1.7L).
- The Central zone had the lowest mean weekly value of consumption at US\$20.77 compared to the highest mean of US\$34.20 in the Southern Zone. Mean per capita weekly consumption for the Central zone was US\$4.40, also the lowest.
- Mean per capita weekly consumption for the Southern zone was valued at only US\$5.34, compared to the highest mean per capita value of US\$6.63 in the Eastern zone.

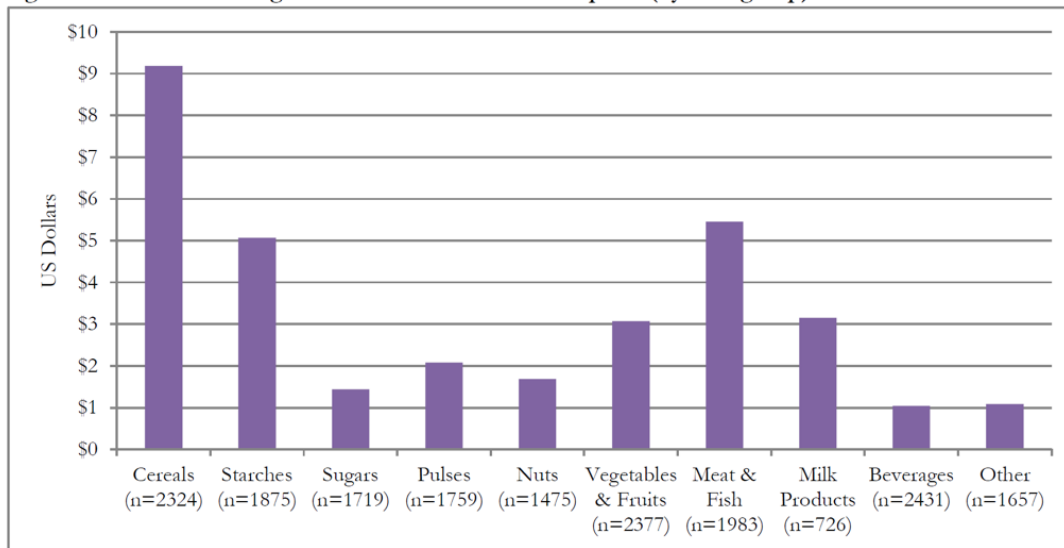
(9) Contribution of Calories and Fats to Nutritional Outcomes. [EPAR Research Brief #119](#). December 17, 2010.

Overview: This memo summarizes research on the contribution of caloric and fat/lipid deficiencies to nutritional outcomes and provides evidence for the role of food in nutrition measures. It investigates whether calories or fats are deficient in the diets of the poor and evidence that deficiencies impact anthropometry.

Key Findings:

- Numerous studies have found that calorie deficiency reduces work capacity and productivity. There is some evidence that diet quality and energy intake are associated with increased income.
- In Sub-Saharan Africa in 2009, approximately 17.3% of the population suffered from undernutrition; however, the geographical spread of caloric intake varied significantly. One study in Central and West Africa found that, while calorie and protein intake increased from 1961 to 2000, intake levels were still below the recommended amounts. Calorie and protein intake was mainly derived from cereals, raising policy questions about food security and import dependency.
- Most of the literature on fat intake and nutrition concerns obesity and overweight, although there is a potential link between Docosahexaenoic acid (an omega-3 fatty acid) and cognitive function in adults.
- There appears to be an association between increases in income and intake of fats.

Figure 3: Total Value of Agricultural Household Consumption (by food group)



(10) Agriculture and Diet Diversification: Evidence and Pathways to Improved Nutrition. [EPAR Technical Report #100](#). September 28, 2010.

Overview: Given the high global prevalence of malnutrition, there is increasing interest in sustainable agricultural solutions to supplement or replace biomedical interventions. This technical report explores the relationship between diversified diets and nutritional status and investigates whether agricultural interventions can change production and consumption behavior as they relate to changes in diet. It also investigates the cost effectiveness of agricultural interventions as a means of improving nutritional outcomes.

Key Findings:

- There is a growing body of evidence suggesting an association between dietary diversity, improved nutritional status, and reduction in disease incidence. However, the positive correlation between dietary diversity and anthropometric status was not observed in all settings, and the accuracy of dietary diversity as a proxy for diet quality may vary by setting.
- The health benefits of dietary diversity are not exclusive to nutrient adequacy, and include improved bioavailability of micronutrients when consumed in combination. There also appears to be a strong association between the intake of animal source foods and nutrient adequacy.
- There are clear indications in the academic literature that agricultural interventions can have a strong positive effect on nutritional status, although nutritional effects can be mediated by intra-household dynamics, disease status, and access to sanitation services.
- The interventions with the most robust evidence of success are multi-platform, combining agricultural training and inputs with nutrition education. Nutrition education is most suitable when food sources are available but under-utilized, when community members are involved in planning, implementation, and monitoring, and when gender is taken into account.
- Research addressing the mechanisms by which agricultural interventions achieve improved nutritional outcomes is limited. The World Bank describes two main pathways: (1) production for own-

consumption and (2) production for sale and increased income, but there is a dearth of information as to the tradeoffs between production for income or own-consumption.

- There are also a number of macro-level factors that can influence country-wide trends in dietary diversification, including: (1) investments in research and development, (2) provision of adequate infrastructure, (3) removal of non-trade barriers, and (4) provision of relevant technology and knowledge. There has been little empirical work analyzing agricultural diversification at a macro-level.
- Cost effectiveness analyses in the literature are overwhelmingly targeted towards fortification, bio-fortification, and supplementation programs. There is minimal information available on the cost effectiveness of agricultural interventions from a nutrition standpoint.

(11) Re-evaluating the Hunger Numbers. [EPAR Research Brief #21](#). March 13, 2009.

Overview: This brief examines the Food and Agriculture Organization's (FAO) methodology for calculating the global prevalence of undernutrition. Because collecting new survey data is expensive and not always viable, the FAO uses a methodology based on existing data to calculate the number of undernourished persons in each county. This methodology uses several key assumptions, including a lognormal distribution of per person energy consumption, the accuracy of mean caloric availability, and estimates of caloric cutoff points.

Key Findings:

There are a number of critiques in the literature of the FAO's assumptions for calculating the prevalence of undernourishment, including:

- **Lognormal distribution:** Although there is additional evidence from household expenditure survey data that supports the assumption of a lognormal distribution, there is a concern that the use of probability functions to estimate the number of undernourished persons is highly sensitive to slight alterations in already uncertain parameters.
- **Caloric availability:** To estimate the mean of the distribution of caloric intake by country, the FAO relies on Dietary Energy Supply estimates calculated from country-based Food Balance Sheets (FBS). A criticism of this approach is that FBS measures the national availability of food at a macro-level, as opposed to household-level availability. Critics argue that food availability may be underestimated due to global underreporting of subsistence farming outputs, and, as household survey estimates are now more readily available, these surveys should be used in place of national figures.
- **Calorie cutoff point estimation:** Because dietary energy requirements vary between people, there is a question as to whether the basal metabolic rate (BMR) per kilogram of body weight is constant across countries, an assumption that is contradicted by studies from the 1990s that showed lower BMRs for people living in the Tropics compared to Northern populations. Because the FAO uses BMRs from Northern groups to calculate cutoffs, there is a possibility of bias. Calorie cutoff points also do not take into account variation in job activities, work productivity, and among people.

This brief also includes a list of recommendations for future research, including a comparison of FAO hunger estimates to anthropometric data and a more in-depth look at the correlation between household-level data and estimates derived from FBS.

(12) Using DALYs to Address Agricultural Interventions. [EPAR Research Brief #13](#). January 27, 2009.

Overview: This brief discusses the use of Disability-adjusted Life Years (DALYs) to evaluate socio-economic interventions, with specific attention paid to agricultural projects and their impact on malnutrition. Because malnutrition is considered a risk factor for disease outcomes, rather than a disease itself, the burden of DALYs attributable to malnutrition is calculated differently, utilizing: (1) the relative risk for each associated cause of death and disability given the exposure (nutritional status); (2) the level of exposure; and (3) the burden of disease from the associated causes of death and disability in the population.

Key Findings:

- DALYs have been used to evaluate interventions that are not biomedical, including agricultural projects, but these interventions must be tied to specific health outcomes.
- Examples include the use of DALYs in *ex ante* analyses to determine the potential cost effectiveness of bio-fortification programs and to calculate the disease burden associated with poor water, sanitation, and hygiene.
- The brief concludes that DALYs are useful for the Agricultural Policy and Statistics Division of the Bill & Melinda Gates Foundation primarily for programmatic planning, especially in *ex ante* cost effectiveness analyses in which an agricultural intervention is designed to impact a specific health outcome (e.g. Vitamin A or iron deficiency).

(13) Links Between Fertilizer and Nutrition in South Asia and Africa. [EPAR Technical Report #5](#). December 15, 2008.

Overview: This literature review explores the links between macro- and micronutrient fertilizers and human nutrition. The review focuses on the academic literature discussing the effects of fertilizer on plant and human nutrition in areas with nutrient deficient soils, particularly in South Asia and Sub-Saharan Africa.

Key Findings:

- The shift to high yield cereals over pulses during the Green Revolution led, in some areas, to lower consumption of nutrient-rich pulses, the prioritization of increasing crop yields over maintaining or increasing nutritional value in plant breeding, decreased per capita production of micronutrient-rich crops, and heavy use of nitrogen fertilizer.
- The use of nitrogen fertilizer has in many cases reduced crop rotation, which, along with a shift to mono-cropping, has led to soil nutrient depletion and a corresponding decline in the nutritive value of crops.
- Research indicates that the introduction and increased use of macronutrient fertilizers, including nitrogen (N), phosphorous (P), and potassium (K), can increase crop yields as well as the nutritional quality of staple cereal crops when applied in the correct ratios given soil conditions. However, the optimal ratio and timing of NPK fertilizers differs depending on whether the aim is to optimize plant or human nutritional value.
- The application of macronutrient fertilizers can also impact the concentration of other vitamins and minerals in plant tissues, including negative effects of the over-application of nitrogen on

concentrations of Vitamin C, soluble sugar, and calcium. Over-application of phosphorous fertilizer can increase grain yields while decreasing the presence of zinc.

- Less attention has traditionally been paid to micronutrient fertilizers than macronutrient fertilizers, although the application of zinc fertilizers, especially in areas where zinc is deficient in soils, can be very effective in addressing zinc deficiency, although increasing the concentration of zinc in plant tissues does not necessarily increase the amount that is bioavailable to humans.
- Addressing iron deficiency in soil, a potential cause of iron deficiencies in plants and humans, through fertilizer is more complex than for other nutrient deficiencies. Direct spraying of liquid iron fertilizers on soil, the most common technique used, is generally ineffective because the iron is quickly oxidized and rendered insoluble. Increasing the concentration of iron in plant tissue may also be insufficient to address human nutrition.
- Current research on multi-nutrient fertilizers focuses on the interactions between different nutrients, as well as the method and rate of application given soil conditions, which can either positively or negatively affect nutritional quality.
- The costs and benefits of fertilizer application for human nutrition have not been well-studied in comparison to other methods, like fortification or plant breeding, and it is unclear if they are more suitable or cost effective for addressing human nutrient deficiencies.

(14) Literature Review of Strategic Grain Reserves. [EPAR Research Brief #4](#). October 22, 2008.

Overview: This literature review examines the use of strategic grain reserves (SGRs), primarily as tools for the mitigation of price fluctuations or as food-crisis response measures.

Key Findings:

- Recent academic articles focus on the use of SGRs in Asia primarily to lessen price fluctuations in grain markets and in Eastern and Southern Africa for responding to food crises.
- It appears that SGR capacity has been significantly reduced in recent years due to changes in international trade protocols and the transition towards more market-based storage systems in which farmers are incentivized to store grain reserves in private bins.
- The majority of articles relied on case studies with minimal systematic evaluation.

The review also includes a list of ten SGR-related articles and their full abstracts.

(15) Links Between Agriculture and Human Nutrition in South Asia. [EPAR Research Brief #2](#). October 30, 2008.

Overview: There is substantial evidence that the Green Revolution successfully raised agricultural productivity and dietary energy supply in South Asia. However, the Green Revolution has also been accompanied by a transition in staple crops (fruits, vegetables, pulses, etc.) to carbohydrate-rich cereals. This brief explores the association between agricultural productivity, increased consumption, and nutrition in South Asia.

Key Findings:

- In theory, increased productivity allows for increases in consumption and improved nutrition via an increase in yields from existing crops, additional income, or from the opportunity to diversify crops through “freed up” land or labor resources.
- This relationship between increased productivity and consumption of micronutrient-rich goods including dairy, vegetables, fish, etc. is often confounded by agricultural policies, exogenous price changes, soil quality, intra-household dynamics, or low household purchasing power that affects food and cropping choices.
- Because of the complexity of this relationship, as well as additional factors that impact nutritional status, like disease and water and sanitation access, more immediate biomedical interventions are often proposed in place of agricultural interventions.
- There is a general consensus in the literature that nutrition education is an important component of agricultural interventions aimed at improving nutritional status. Programs that invest in human capital, like those that provide nutrition education or consider and integrate gender issues, were more likely to improve nutritional outcomes.
- There are relatively few rigorous empirical evaluations to inform the policy debate and resolve disagreements, including scant literature that empirically attributes household-level nutritional and distributional impacts to particular policy changes, such as land titling, agricultural infrastructure development, or education.

The brief also includes a list of nine related articles and their full abstracts, and a summary chart of further resources.

Appendix 1. EPAR Health Research Briefs and Technical Reports.

Product Title	Number	Description
The Public Health Benefits of Sanitation Interventions (2010)	EPAR Technical Report #104	This literature review summarizes the risks of inadequate sanitation to public health and presents empirical evidence on public health benefits of complete, intermediate, and multiple factor sanitation interventions. We find that complete or improved sanitary systems can offer concrete public health benefits by reducing exposure to infectious diseases contained in human feces and wastewater. Substantial complementary economic gains are also predicted to accrue. In addition, community-wide sanitation interventions seem to offer the greatest promise for reducing pathogenic health risks.
Analysis of World Bank PAD Indicators For Water, Sanitation & Hygiene Projects (2010)	EPAR Research Brief #113	This brief analyzes the indicators used by the World Bank in its Project Appraisal Documents (PAD) to measure the outputs and outcomes of Water, Sanitation, and Hygiene projects in Africa and Asia from 2000-2010. It details the methods used for collecting and organizing the indicators, and provides a brief analysis of the type of indicators used.
Sanitation Policy in India (2010)	EPAR Research Brief #116	This brief provides an overview of India's Sanitation Policy, as embodied in the National Urban Sanitation Plan of 2008. The plan focuses on decentralized approaches and prioritizes rehabilitation and increased usage of existing sanitation infrastructure networks over new infrastructure construction.
Waste Treatment and Reuse (2011)	EPAR Technical Report #130	This literature review provides qualitative and quantitative examples of technologies, constraints, and incentives for efficient waste treatment and reuse in Sub-Saharan Africa and Southeast Asia. We present relevant case studies and expert observations on the nutrient content in urine and feces, contaminants frequently found in untreated wastewater, relevant waste treatment technologies, risks associated with waste reuse, and benefits to resource recovery in agriculture. We further discuss reasons for waste treatment failures. Much of the evidence in the literature relates to wastewater treatment processes or the sludge produced from wastewater treatment as opposed to untreated fecal sludge.
Sanitation Extraction and Transport (2011)	EPAR Technical Report #131	This brief reviews the literature and empirical evidence on waste extraction and treatment in the developing world. The brief assesses the quantity and quality of research supporting key components of program theory related to the extraction of sludge from on-site sanitation facilities and pre-disposal transport.
Social Costs of Alcohol in Sub-Saharan Africa (2014)	EPAR Technical Report #269	The technical report investigates tradeoffs between increased market access for smallholders and societal costs associated with harmful alcohol consumption, and provides an inventory of the societal costs of alcohol in Sub-Saharan Africa (SSA). We

		examine direct costs associated with addressing harmful effects of alcohol and treating alcohol-related illnesses, as well as indirect costs associated with the goods and services that are not delivered as a consequence of drinking and its impact on personal productivity.
Delivering Development? Evidence on Self-Help Groups as Development Intermediaries in South Asia and Africa (2014)	EPAR Technical Report #283a	Donors and governments are increasingly seeking to implement development projects through self-help groups (SHGs) in the belief that such institutional arrangements will enhance development outcomes, encourage sustainability, and foster capacity in local civil society at lower cost to coffers. But little is known about the effectiveness of such institutional arrangements for the delivery of development aid. This report synthesizes available evidence on the effectiveness of SHGs in promoting health, finance, agriculture, and empowerment objectives in South Asia and Sub-Saharan Africa. Our findings are intended to inform strategic decisions about how to best use scarce resources to leverage existing SHG interventions.
Evidence on the Effectiveness of Self-Help Groups for Achieving Maternal and Child Health Outcomes in South Asia and Africa (2014)	EPAR Technical Report #283b	See #238a.
Local Spillovers and Broader Impacts of Health Interventions (2014)	EPAR Technical Report #287	This report draws on peer-reviewed articles and published reports by institutions including the World Health Organization, the UK Department for International Development, and others to provide a scoping summary of the household-level spillovers and broader impacts of a select group of health initiatives. Rather than focusing on estimates of the direct health impacts of investments, we focus on estimates of the less-often reported spillover effects of specific health investments on household welfare or the broader economy.

Appendix 2. EPAR Climate Change Research Briefs and Technical Reports.

Product Title	Number	Description
Agriculture and Climate Change (2010)	EPAR Technical Report #59	This two-part literature review discusses agriculture's contribution to climate change and its potential role in mitigation.
Environmental Impact of Agricultural Technologies (2010)	EPAR Technical Report #65	A review of the unintended environmental consequences of agricultural technologies.
Alternative Energy Pumps to Irrigate Smallholder Farmers' Land: What is the State of the Art?	EPAR Technical Report #102	A research brief providing an overview of state-of-the-art alternative energy irrigation systems.
Crops & Climate Change: Executive Summary (2011)	EPAR Technical Reports #62, 71, 114, 115, and 118	This executive summary (#118) combines analyses from four reports in the Crops & Climate Change series, including maize (#62), rice (#71), wheat (#114), and sorghum and millet (#115). It then compares the importance of each crop, vulnerability to climate change, and research and policy resources dedicated to each.
Environmental Implications of Livestock (2011)	EPAR Research Briefs #155 - 158	This set of four literature reviews investigates the environmental impacts of livestock raising of cattle, goats, chicken, and water buffalo in mixed rain-fed crop/livestock and pastoralist agronomic systems.
Herbicide Resistant Cassava (2012)	EPAR Technical Report #200	This literature review provides background on the potential environmental and socio-economic costs and benefits of herbicide-resistant cassava varieties.
Agriculture & the Environment Series(2014)	EPAR Research Briefs #208, 212, 213, 215, 225, 228, and 254	These six research briefs examine crop-environment interactions for several crops in smallholder food production systems in Sub-Saharan Africa and South Asia, including an overview of the entire Agriculture-Environment Series (#254). The briefs cover the following food crops: rice (#208), maize (#218), sorghum/millet (#213), sweet potato/yam (#225), and cassava (#228). Drawing on the academic literature and the field expertise of crop scientists, these briefs highlight crop-environment interactions at three stages of the crop value chain: pre-production, production, and post-production. At each stage we emphasize environmental constraints on crop yields and impacts of crop production on the environment. These briefs provide a framework for stimulating across-crop discussions on the full range of crop-environment interactions in agricultural development initiatives.
Current Status and Growth Trajectory of International Climate Finance (2014)	EPAR Research Brief #258	This brief draws on recent reports by the OECD, the World Bank, the Overseas Development Institute, the Climate Policy Initiative and others to provide an overview of climate finance in

		<p>developing countries. The brief is divided into three sections: (1) sources of global climate finance; (2) country-level flows of climate finance; and (3) applications of climate finance in developing countries. The brief gives a concise overview of financial flows directed at climate change mitigation and adaptation, with an introduction to climate finance accounting such that climate financial flow volumes can be compared to aid volumes in other sectors.</p>
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Appendix 3. Confidential Nutrition and Food Security EPAR Research Briefs and Technical Reports.

EPAR has prepared several confidential research products relating to nutrition and food security.

Product Title	Number
Agriculture and Nutrition Working Paper (2009)	EPAR Research Brief #26
Household Food Consumption Data (2011)	EPAR Results Coding #149
Agricultural Development and Nutrition Grant Portfolios (2012)	EPAR Technical Report #177