Concept Note: FOOD & NUTRITION SECURITY

The Alliance for a Healthier World (AHW) aims to raise the health, nutrition and wellbeing of the world’s most disadvantaged people by using the best scientific, analytic, and creative capabilities of Johns Hopkins University (JHU) and our partners. Health equity refers to two intersecting topics: 1) the opportunity and ability to achieve good health, 2) an equal and fair distribution of health care. Central to health equity is food and nutrition security (FNS), maintaining adequate access to safe and nutritious foods. Addressing global health inequities and raising FNS standards across the world requires both micro and macro interventions, reflecting policies, programs, or individual medical and behavioral actions. JHU has an important role to play by bridging gaps between science, policy, and practice in tackling complex and difficult problems to improve FNS.

This note seeks to: (1) Describe the main issues related to food and nutrition security and similar health inequities around the world; and (2) Spark a discussion across JHU around gaps in knowledge and potential policy interventions to simultaneously improve FNS rates and reduce health inequities; (3) Propose that FNS and global health Equity serve as a thematic area in the AHW.

Background

While the World Health Organization and dozens of governments consider FNS to be a basic human right, millions of people around the globe lack access to sufficient safe and nutritious food. The Scaling Up Nutrition movement and those that participate in the Global Nutrition Report represent two of many multilateral, international institutions aimed at improving FNS rates across the globe, but malnutrition, in combination with undernutrition, overweight, and obesity, continues to exacerbate health inequities throughout the world.

Currently, 784 million people are undernourished (1). Iron and zinc deficiency affect even greater populations, with rates of 2 billion and 1.2 billion people, respectively (2). The data on children under five years old are particularly severe: 159 million children are chronically undernourished or stunted, while 50 million are acutely malnourished or wasted (3). Although child mortality and undernutrition has slowly begun to decline, it is unclear how rates will respond to the external, unpredictable factors that will challenge us in the coming decades – namely, climate change, population pressure, persistent social inequalities, and geopolitical conflict.

Undernutrition and micronutrient deficiencies are not the only burdens we face. Globally, 2.1 billion adults, and 43 million children are overweight or obese (4). Obese individuals and
those with unhealthy diets\(^1\) face higher risks for non-communicable diseases (NCDs) such as cardiovascular disease (CVD), cancer, and diabetes (5). Worldwide, two out of every three deaths can be attributed to NCDs, with rates increasing from 14.6 million in 2000 to 16 million in 2012. Seventy-five percent of these deaths occur in developing countries (6). Younger people are dying at higher rates from NCDs in low- and middle-income countries (LMICs), with mortality rates of 30% in LMICs compared to 13% in high income countries (7, 8).

The intersecting burdens of malnutrition, obesity, and unhealthy diets reflect deeply entrenched political, social and economic factors, specific to each country’s context. Health inequities will continue to grow if FNS concerns remain unaddressed as a political and social priority.

Dimensions of Food & Nutrition Security Inequities

**Food and Nutrition Security Issues and Impacts on Health Inequities**

Inadequate nutrition has been described as “a scourge in our world” (9). Failing to receive the recommended amount and type of nutrients, inadequate health care, and disabling environments can all lead to undernourishment and/or obesity — both of which have serious, deleterious effects on health and development. Poor nutrition contributes to early deaths for mothers, infants and young children. Impaired and often irreversible physical and brain development in the young can also result from inadequate nutritional intake. Insufficient nutrition during the first year of life has important consequences throughout adulthood (10, 11). Poor adult health, in turn, reduces individual well-being and impairs the social and economic development of nations (2, 12). In particular, nutritionally vulnerable populations include young children, adolescent girls, pregnant and lactating women, geographically displaced or marginalized groups, and people who are ill or immune-compromised. Such individuals tend to experience higher rates of malnutrition due, in part, to less control over food choices in the household and extremely tight food budgets (13).

While poverty has always been associated with severe forms of acute undernutrition, we know today that poverty affects an individual’s health throughout their lifetime. More than two-thirds of the one billion people living in extreme poverty are hungry every day (14, 15). Billions of people are now five times more likely to die before turning five years old due to extreme hunger (16, 17). Low access to food and associated levels of malnutrition reduces an individual’s intellectual capability, leading to lower learning levels and work capacity. Such a vicious cycle of poverty and malnutrition ultimately limits an individual’s earning potential throughout a lifetime, increasing vulnerability to serious medical conditions and

\(^{1}\) Unhealthy diets consist of a diet low in fruits, vegetables, omega-3 fatty acid seafood, nuts and seeds, whole grain and fiber and high in sugar and sugar sweetened beverages, saturated and trans fats, red meats and processed meats, and sodium.
health inequities. Overweight and obesity disproportionately impact LMICs, nations which require greater productivity and a healthy workforce. Estimates indicate individuals lose 10% of their potential lifetime earnings, while countries lose 2-3% of their GDP due to undernutrition (18).

Obesity has already begun to generate significant health care costs, and will continue to do so in the approaching decades. From 2011 to 2025, the global economic burden of NCDs will total USD $7 trillion, with cardiovascular disease accounting for most of that expense.

**Frameworks**

The FAO's 1996 World Food Summit (WFS) categorized food security as a state of being: “All people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (19). While this definition incorporates nutrition as an essential part of food security, food security itself is only one aspect of achieving optimal nutrition. To achieve robust nutrition outcomes, both the quality and quantity of food is essential. However, optimal healthcare, improved hygiene and sanitation, and adequate childcare practices are all integral components to achieving sufficient nutrition.

A larger food system model often frames the multiple and related components of food security as shown in **Figure 1**. This framework combines food system activities – producing, storing, processing, packaging, trading and consuming food – with food security outcomes – the nine elements of food access, including stability, utilization, and availability. The model also arranges the impacts of global environmental change (GEC) on food systems and social welfare outcomes (20).

Policymakers from multiple disciplines and sectors must work together to make demonstrable impacts on nutrition outcomes (21). The UNICEF causal framework for nutrition effectively demonstrates the importance of such varied sectors, including: agriculture and food, health, education, environment, water and sanitation, and women’s empowerment (**Figure 2**) (16). Beyond modeling, implementation of full-scale multi-sectoral responses to address the intersecting components of food security is challenging. Sufficient resources rarely exist to fund and oversee the many interventions needed to secure adequate nutrition for everyone.
Figure 1: Food Systems Framework (UNHLPE 2017, provided by Fanzo)
**Figure 2: UNICEF Causal Framework of Malnutrition** (UNICEF, 2013)
Complexities of the Issue
One of the great dilemmas of our time is how we will secure and provide plentiful, healthy and nutritious food for all. Inextricably related concerns to the quality of our food supply reflects environmentally sustainable and safe policies, all while addressing the multiple burdens of undernutrition, overweight, obesity, and micronutrient deficiencies. The goal of most food security policies focuses on ensuring the world is producing and consuming enough calories to reduce hunger and ensure survival. A goal often overlooked is adequate nutrition for well-being and development.

The process of crafting policies to safeguard our food supply is riddled with uncertainties and complexities. Key issues to consider include: 1) making societal decisions and defining values about food security that impact nutrition outcomes, and 2) evaluating the trade-offs between environmental sustainability and meeting individual dietary and nutritional needs. Such complex issues underscore the need to articulate the broader landscape of the nutrition debate within the global food security debate.

Individuals, households, and communities face many challenges in achieving and maintaining food security. Certain country- and cultural-specific determinants that can impact nutritional status include socioeconomic status, social norms, and behavior choices. Several global factors deserve closer examination, as building resiliency in communities is essential to ensure families are able to withstand shocks stemming from food and health systems bottlenecks. Challenges listed and discussed in-depth below are serious threats but simultaneously opportunities, requiring careful consideration within the post 2015 food and nutrition security agenda.

1. **Climate change and variability**: The world is experiencing climate change and variability and with that, increased severity and frequency of natural disasters. Both floods and droughts will continue to occur but with less predictability and more difficulty, as the variability of climate systems increases (22). These changes are likely to have the greatest impact on the agricultural output of many low-resource regions, reducing yields of crops, soil fertility, and forest and animal productivity, which may result in lower income, reduced climate resiliency, and subsequently, decreased access to sufficient, nutrient dense foods, impairing the nutritional status of many low-income communities (23).

   It is estimated that there will be that a world with a medium-high climate change will have an additional 25.2 million malnourished (shown as stunted) children than one without climate change (24) with Africa having the most number of stunted children by 2050. By 2030, in South Asia and East Africa alone, 21,000 and 27,000 annual deaths of children under five will be associated with undernourishment due to climate change globally. Furthermore, climate change modeling shows reductions in
global food availability with decreases in fruits and vegetables and red meat consumption by 2050. These reductions will potentially attribute to 529,000 more deaths (25).

1. **High and volatile food prices:** Global food prices have greatly fluctuated since the latest food price hike in 2007-2008. This instability has created further social unrest and conflict in and between low resource countries and LMICs. Much of the increase in food prices results from reduced crop yields, land grabs, and shifting agriculture policies, or what is known as “food for fuel” (26). The consequences of increased food prices are felt most strongly by the poorest communities, and female-headed households in particular. Increases in food costs force people to reduce the quantity and nutrient quality of the food they purchase. Such a tradeoff between nutrition and budgets disproportionately impacts those who are in need of nutrient-dense foods, such as young children, and pregnant or lactating women.

2. **Urban migration with increased population pressures:** The world has undergone major economic and demographic transitions, disrupting patterns of fertility, mortality, and disease. Parallel to these changes is the “nutrition transition,” or shifts in the structure of individual diet, physical activity and body composition. Urbanization is one of the main drivers of nutrition transition. Many families are leaving behind their rural livelihoods by moving to urban centers. Expanded population growth within urban environments will put pressure on both global resources and the food system, changing where people work and how they live on a daily basis.

From 1950 to 2050, the population of cities is forecasted to double, increasing from 30% to an estimated 66% (27). Increased urbanization may displace arable, agricultural land throughout the world. While Africa and Asia remain predominantly rural with just under half of their population living in urban areas, researchers expect this to grow to 56% and 64%, respectively, as both continents are urbanizing faster than other regions of the world (28). Just three countries combined—India, China and Nigeria—will account for the 37% of the projected growth of the world’s urban population between 2014 and 2050 (27).

Urbanization has both positive and negative effects on both the supply and demand of food across the world, disrupting the intricate relationship that exists between urban consumers and rural producers. Urban demand will increasingly dictate food producers’ growing choices, as well as the trading, processing, distributing, and marketing of food. City dwellers will increasingly demand greater access to a greater diversity of foods, such as meat, dairy, and convenient, highly-processed foods (29).
Supply side metrics, such as economic growth, regulatory liberalization, and global trade, will change the way food is produced, processed, and sold (e.g. mega supermarkets), creating new markets for rural producers.

Currently, one-third of urban dwellers live in poorly constructed shantytowns (30). Limited access to social services, safe and nutritious food, and poor public health infrastructure leave shantytown populations at high risk for both communicable and non-communicable diseases (31).

Changes to where we live and work now require delicate decisions on how much quality food to produce, what type of food consumers will demand, and where food can be sustainably grown. The nutrition outcomes of highly vulnerable populations will decline without the proper planning, infrastructure, and health and social services that many of the LMICs lack. We must change our food system networks to not only feed the growing population, but to ensure people are able to access food in an equitable way regardless of geopolitical boundaries.

3. **Dietary shifts:** A rapid transition in diet and physical activity patterns is occurring globally, paralleled by major demographic and socioeconomic changes. Rising consumer income, changing lifestyles, and shifting preferences of leisure time all contribute to changing demands for specific foods (32). Most people now consume more vegetable oils, sugar-sweetened beverages, and ultra-processed and fast and street foods (33). Such dietary changes reflect shifts in the globalized food system, including food value chains with more fast-food outlets, takeaway and packaged foods, and advertising of unhealthy foods on mass media platforms. Together with a decrease in exercise rates, dietary shifts have contributed to rising global levels of obesity, increasing prevalence of NCDs, and higher rates of health inequities in LMICs. In particular, diet choices are directly related to the morbidity and mortality associated with NCDs. Forouzanfar and colleagues found that diet is the number one risk factor for NCDs, ultimately accounting for 11.3 million deaths (Figure 3) (5, 34). High body mass index has become a significant cause of greater NCD risk (35). Research shows that the type of diet and overall dietary patterns matter: as compared to Mediterranean, pescatarian and vegetarian diets, diets with high proportions of meats, especially processed meats, contribute to a higher risk of multiple NCDs (36).

To improve food and nutrition security for individuals, households or communities, multi-sectoral approaches are essential (21). However, effectively engaging organizations and individuals across diverse and distinct sectors has proven to be complex. At minimum, three key systems must collaborate with one another: agriculture, health, and water sectors. Each has the capability of improving nutrition
access for both functionality and effectiveness (37). The interactions between health, nutrition, water and agriculture are mutual and intersecting, with both positive and negative effects (38).

Joint action in agriculture, health, and water for nutrition could benefit food security and state development, while substantially reducing the risks for women and impoverished populations. Intersectional interventions are likely to also improve incomes, allowing individuals to purchase and then demand higher quality foods as fully integrated consumers (39, 40). However, the linkages between the three sectors are still primarily theorized, as evidence remains weak (40-42). Our main challenge is to understand how food, health and water systems can work at both the domestic and international policy levels, with changes to system approaches implemented on the ground (43).

**Figure 3: Dietary risk factors are now the top risk factor attributing to the global disease burden** (Forouzanfar et al., 2015; GLOPAN, 2016)
Main Gaps in Interventions and Knowledge

The international nutrition community is unified and cohesive, successfully advocating for improving nutrition on both national and global levels. As a result of such efforts, nutrition has become a higher priority for policymakers and donors alike. Moreover, the global nutrition community now uses a common narrative on the evidence, strategies, and tasks now needed to improve nutrition.

While most acknowledge similar policy solutions, many gaps still remain in translating theory into practice. Figure 4 shows the nutrition-specific and nutrition-sensitive policy interventions that could address the multiple causes and consequences of malnutrition around the world. Nutrition-specific interventions refer to the policies aimed at targeted populations. The interventions discussed below largely focus on the most disadvantaged populations, including pregnant and lactating women, and children under 2 years of age. Significant evidence proves nutrition-specific tools, if scaled and utilized properly, can significantly reduce stunting, micronutrient deficiencies, and wasting, while simultaneously reducing the risk of overweight and obesity.

Nutrition-sensitive approaches address the underlying determinants of undernutrition and obesity, potentially serving as platforms for future nutrition-specific interventions. However, much less evidence exists on how to effectively engage other sectors to deliver nutrition-sensitive interventions.

As Figure 4 denotes, the “explicit” nature of the interventions for nutrition-sensitive approaches is quite vague, symbolic of the limited evidence base to date. Some evidence, however, supports scale-ups of programs in specific country and local contexts, including agriculture, social transfers, early childhood development, and education. While some areas are not represented in the framework below, this model references several challenges addressed earlier in this brief, including climate change, food value chains, urbanization, response to disasters, and conflict.
Figure 4: Nutrition Specific and Sensitive Interventions Across Multiple Sectors, Systems and Disciplines (Black et al 2013)

Benefits during the life course

- Mortality and mortality in childhood
- Cognitive, motor, socioemotional development
- Social performance and learning capacity
- Adult stature
- Obesity and NCDs
- Work capacity and productivity

Nutrition specific intervention programs
- Adolescent health and preconception nutrition
- Maternal dietary supplementation
- Micronutrient supplementation or fortification
- Breastfeeding and complementary feeding
- Dietary supplementation for children
- Dietary diversification
- Feeding behaviors and stimulation
- Treatment of severe acute malnutrition
- Disease prevention and management
- Nutrition interventions in emergencies

Optimum Fetal and child nutrition and development

- Breastfeeding, nutrient-rich foods, and eating routine
- Feeding and caregiving practices, parenting, stimulation
- Low burden of infectious diseases

Nutrition sensitive programs and approaches
- Agriculture and food security
- Social safety nets
- Early childhood development
- Maternal mental health
- Women’s empowerment
- Child protection
- Classroom education
- Water and sanitation
- Health and family planning services

Building an enabling environment
- Rigorous evaluations
- Advocacy strategies
- Horizontal and vertical coordination
- Accountability, incentives, regulation, legislation
- Leadership programs
- Capacity investments
- Domestic resource mobilization

Knowledge and evidence
- Politics and governance
- Leadership, capacity and financial resources
- Social, economic, political, and environmental context (national and global)
What Could Hopkins do to Address Food & Nutrition Security and Health Inequities?

Hopkins faculty, staff, and students are already engaged in multi-sectoral research to address the complex challenges described above. However, certain grand challenges require the transdisciplinary expertise of the Hopkins research. Collective research could further drive problem solving and evidence-based research, if experts engage and work together.

Table 1 outlines some research topics that the Hopkins community could begin to explore. The columns of this table outline research area, internal actors, and the advantages and disadvantages of taking responsibility for the challenge.

Six key questions below address some of the challenges highlighted in this note, all of which could bring together many of the experts at Hopkins working throughout the world. These questions are broad, grand challenges for humanity, involving food, health, social equity and justice issues. Many also will require innovation, technology, and unique scientific perspectives.

1. How can we better understand the complex, multiple burdens of malnutrition in low and middle income countries: Undernutrition, micronutrient deficiencies and overweight/obesity, their determinants (including genetics), and interactions of nutrition and poor health?
2. How can sustainable diets and food systems for planet and human health be defined, measured, and implemented? Where can technology play a role in ensuring sustainability, and where is it disruptive?
3. What are the mechanism to improve the food environment within urban settings: South Asia, SE Asia, Africa? How can food value chains be more nutrition sensitive?
4. What tools and technology do we have to prevent, adapt, and mitigate against food and water insecurity of populations in conflict regions or situations, and extreme weather?
5. How can we better design and evaluate national programs or policies to promote adaptation to climate change? How can we determine if they effectively reach the poor and address systemic inequities?
6. What are the health and environmental impacts of industrial animal production in low and middle income countries?
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<tr>
<th>Candidate research theme</th>
<th>JHU faculty or research groups</th>
<th>Potential funders</th>
<th>Advantages of focus on this research theme</th>
<th>Disadvantages of focus on this research theme</th>
<th>Relation to 4 sub-initiatives</th>
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<tr>
<td>1. Complex, multiple burdens of malnutrition in low and middle income countries: Undernutrition, micronutrient deficiencies and overweight/obesity, their determinants (including genetics), and interactions of nutrition and poor health</td>
<td>IIP HN</td>
<td>Gates USAID NIH</td>
<td>Brings together existing ongoing research by HN and evaluation by IIP</td>
<td>None</td>
<td>#1 Food Security *** #2 Gender Equity #3 Healthy Environments * #4 Transformative Technologies and Institutions</td>
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<td>2. Defining and measuring sustainable diets and food systems for planet and human health and where (disruptive) technology can play a role</td>
<td>CLF Berman HN</td>
<td>Philanthropists</td>
<td>Needs more rigorous science – which JHU can provide</td>
<td>Newer work for JHU that integrates nutrition, agriculture, environment/climate</td>
<td>#1 Food Security *** #2 Gender Equity #3 Healthy Environments * #4 Transformative Technologies and Institutions</td>
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<td>3. Improving the food environment of urban settings: South Asia, SE Asia, Africa and how to improve the value chain towards more nutrition sensitivity</td>
<td>CLF HN Berman Obesity Center EAS IS SAIS</td>
<td>Gates Philanthropists</td>
<td>Not many focusing on this yet outside the U.S.</td>
<td>JHU is limited in its depth in food security, but that is changing</td>
<td>#1 Food Security *** #2 Gender Equity #3 Healthy Environments * #4 Transformative Technologies and Institutions</td>
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<td>4. Preventing, adapting and mitigating food and water insecurity of populations in conflict regions/situations and extreme weather (storms, drought)</td>
<td>Human Rights Center Refugee Center Berman IIP SAIS CLF</td>
<td>USAID/PRM</td>
<td>JHU is strong in working in conflict areas – addressing these grand challenges of food and water security in the context of health should not be ignored</td>
<td>JHU is limited in its depth in food security, but that is changing</td>
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2 Acronyms for Research Groups: AS = African Studies Program, KSAS; Berman = Berman Bioethics Institute; CLF = Center for a Livable Future, JHSPH; DoGEE = Department of Geography and Environmental Engineering. WSE; EAS = East Asian Studies Program, KSAS; EPS = Earth and Planetary Sciences, KSAS; GDEC = Global Disease Epidemiology and Control Program, DIH, JHSPH; HBS = Department of Health, Behavior and Society, JHSPH; HN = Program in Human Nutrition, Department of International Health, JHSPH; HS = Health; Systems Program, Department of International Health, JHSPH; IIP = Institute for International Programs, Department of International Health, JHSPH; IS = International Studies Program, KSAS; PFRH = Population, Family and Reproductive Health, JHSPH; SAIS = School for Advanced International Studies; SBI = Social and Behavioral Interventions Program, DIH, JHSPH; SON = School of Nursing; WSE = Whiting School of Engineering
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| 5. Design and evaluation of national programs / policies to promote adaptation to climate change – do they reach the poor / address inequities? | IIP – evaluation methodology        | USAID, World Bank, Green Climate Fund, Rockefeller    | JHU is strong on rigorous design and evaluation of programs. Could be extended to look at climate in the context of health and food systems | Very few experts at Hopkins on climate change. Good links with those who do work on climate at Homewood and SAIS. | #1 Food Security *  
#2 Gender Equity **  
#3 Healthy Environments ***  
#4 Transformative Technologies and Institutions |
|                                                                                        | SAIS and HS – analysis of policy alternatives | Foundation                                              |                                                                                                             |                                                                                                                |                                                                                             |
|                                                                                        | HN – Nutrition interventions           |                                                        |                                                                                                             |                                                                                                                |                                                                                             |
| 6. Health and environmental impacts of industrial animal production in low and middle income countries | HN, CLF, Berman, EHS, GDEC            | NIH                                                    | An area that many are working in at Hopkins (large joint Wellcome Trust proposal in the works)               | JHU is limited in its depth in food security, agriculture economics and but that is changing                    | #1 Food Security ***  
#2 Gender Equity  
#3 Healthy Environments ***  
#4 Transformative Technologies and Institutions |
REFERENCES

1. FAO. The state of food insecurity in the world. Rome; 2015.
Other references: