SYSTEMS THINKING AND ACTION FOR NUTRITION

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People don't live their lives in health sectors or education sectors or infrastructure sectors, arranged in tidy compartments. People live in families and villages and communities and countries, where all the issues of everyday life merge. We need to connect the dots.

—Robert Zoellick, former head of the World Bank (2010)

OVERVIEW

Practitioners working in nutrition must start thinking about the effect food, health, and education systems have on nutrition practices and outcomes. "Systems thinking" means paying attention to the unpredictable interactions among actors, sectors, disciplines, and determinants of nutrition. That thinking results in new ways of approaching, analyzing, and solving challenges, which must be applied through policy development, program design, implementation, and research. SPRING approaches systems in two ways – by articulating and promoting systems thinking for nutrition and by strengthening specific components of those systems. This paper makes the case for why systems thinking is important for nutrition and proposes several approaches to strengthening systems for nutrition.

INTRODUCTION

Today the world faces a double burden of malnutrition, in which almost three billion people suffer from either undernutrition or overweight and obesity (FAO 2013). No country is untouched. Hunger and inadequate nutrition contribute to high rates of maternal, infant, and child mortality, as well as impaired physical and brain development in the young. This is often irreversible and can, in turn, lead to poor educational attainment and health into adulthood, which affects not only individual wellbeing but also the social and economic development of nations (Black et al. 2013). At the same time, growing rates of overweight and obesity worldwide are linked to a rise in chronic diseases such as cancer, cardiovascular disease, and diabetes.

The United States Agency for International Development's (USAID) *Multi-Sectoral Nutrition Strategy (2014-2025)* recognizes the "multi-factorial causation" of malnutrition (USAID 2014a), calling for multisectoral approaches. Such

COMING TO TERMS

DISCIPLINE: a branch of knowledge, such as those studied in higher education. Disciplines can interact in different ways.

SECTOR: a distinct part or branch of a nation's economy or society, or a sphere of activity. One example of a sector would be the education sector. Sectors can engage and interact in different ways.

SYSTEM: a set of connected things or parts forming a complex whole.

approaches can generate a wider range of benefits than single sector approaches (World Bank 2013). Evidence increasingly suggests that solving malnutrition can benefit from a systems approach (WHO 2009; Hammond and Dubé 2012).

Russell and colleagues stress, "System[s] thinking requires a change in mindset: recognizing that the whole is greater than the sum of its parts and contrasting with a traditional, reductionist approach." This allows for a different way of approaching, inter-linking, analyzing, and solving challenges that moves away from traditional problem-solving—the idea of isolating a system into smaller, digestible parts" (Russel et al. 2014). It is seeing the many components of a complex network of mutual influences. Systems thinking helps to ensure that efforts **promote synergies** and that they **"do no harm"** by anticipating positive and negative consequences. Furthermore, applying systems thinking should result in shifts in culture, policies, resources, and services across sectors, all of which are needed for increased sustainable impact at scale (D'Agostino et al. 2014).

By applying systems thinking, the agriculture sector might expand its focus to consider food security[1] and women's empowerment at the same time as the health sector might shift from a curative approach to a preventive one, collaborating with education and water to build a well-nourished society. This is a systems approach to multi-sectoral collaboration in that it engages multiple sectors in strengthening whole systems – systems thinking and action.

DEFINING SYSTEMS

The UNICEF framework[2] (2013)—first developed in 1990 as part of the UNICEF strategy—continues to guide nutrition planning, defining **immediate, underlying, and basic causes of malnutrition**. The framework highlights the need for multiple actors, disciplines, sectors, and systems (see Annex 1 for definitions) to work together to reduce malnutrition.

Building on the UNICEF framework, considering the World Health Organization's building blocks for health systems (WHO 2010), and broadening them to include the producer, consumer, and nutrition sub-systems outlined by Sobal et al. (1998), SPRING identified several cross-cutting factors that **influence, interact, and impact one another and nutrition outcomes** (see Figure 1). These include:

- policies and governance;

- financing and markets;

- information and communications;

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1   In this paper food security refers to safe nutritious foods.

2   The UNICEF framework has been verified and validated by many experts working in nutrition. The Lancet 2013 undernutrition series used the UNICEF framework to map out nutrition-specific and -sensitive interventions and the sectors critically involved in delivering those interventions. While the UNICEF framework was designed with undernutrition in mind, it can easily apply to the broader definition of malnutrition (inclusive of overweight and obesity) as well.
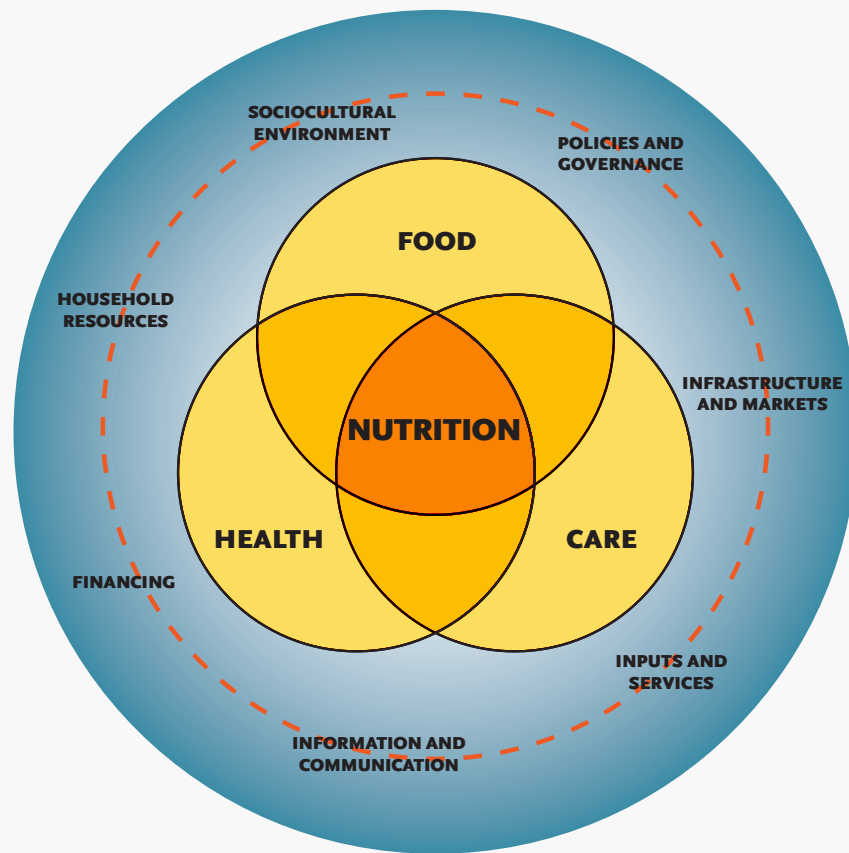
- infrastructure, resources and supplies;

- service delivery and production; and

- the sociocultural environment.

We believe that together these factors form multiple interdependent systems that shape nutrition. Examples are given below to illustrate the relationship of each of these factors to malnutrition.

POLICIES AND GOVERNANCE

Policies and governance affect food, care, health, and the environment—although their impact varies according to adherence and enforcement. For example, maternity-leave policies and legislation can have an impact on breastfeeding practices in countries where the majority of women are formally employed. Likewise, laws regarding smoking in public establishments have had an enormous impact on smoking practices in the United States. Elsewhere, food subsidies and social safety nets affect agricultural practices and food-related decision making.

Governance, which refers to participation, accountability, and voice, also impacts a country's progress towards good nutrition. However, there is rarely, if ever, a ministry of nutrition in countries. This means that nutrition falls between and across various ministries, sometimes ending up with the attention of the Prime Minster, and often requiring multisectoral and multistakeholder platforms to coordinate actions across government ministries. According to the *Fifth Report on the World Nutrition Situation by the United Nations Standing Committee on Nutrition*, "Individuals that are malnourished have been failed by many different sectors: agriculture, health, education, social welfare, finance, and labor. To address malnutrition effectively requires systems planning (Haddad et al. 2012), alliances between sectors" (SUN 2014), and coordination within and between these sectors and stakeholders in order to exchange information, carry out activities for mutual benefit, and achieve a common purpose (Garrett and Natalicchio 2011, Du et al. 2014a).

INFRASTRUCTURE AND MARKETS

A systems view takes into account how a country's infrastructure and market dynamics impact nutrition. Included in this cross-cutting factor is the infrastructure, markets, and behaviors of farmers, firms, and consumers, as they produce, distribute, and consume sufficient, safe, and nutritious food. Infrastructure and markets are also critical to the delivery and consumption of health products and services essential for reducing disease prevalence, a key determinant of nutrition. For example, improving infrastructure and tackling marketplace dynamics is rarely considered by nutrition programs; however, building a road to a market or trading post may allow communities to engage in value chains that impact incomes and accessibility to healthy, diverse foods.

INPUTS AND SERVICES

In addition to the roads and "brick and mortar" structures, many supplies are needed for food production, storage, preparation, and distribution as well as health service delivery (e.g., seeds, fertilizers, storage bins, food processing equipment, preventive and curative medicines, and medical devices and technologies).

Food, health, care, and nutrition also require the human resources (including their training, financing, and supervision) to sell/distribute inputs, produce foods, ensure safety, and provide quality services are essential. Despite a global consensus on actions that are essential to address malnutrition, the workforce to promote those actions is often insufficient and unqualified for the task; to improve maternal and child nutrition, a robust nutrition workforce is essential (USAID 2014a; Mucha and Tharaney 2013).

In order to improve nutritional status, the health sector must integrate evidence-based, high-quality nutrition services into primary health care (e.g., nutrition counseling and breastfeeding support during antenatal care visits and/or child health days) and water and sanitation services must be accessible. Likewise, food value chains and marketing must produce and distribute safe, affordable, and nutritious foods. A systems approach calls for better integration of nutrition services in food policies, food supplies, and choice of technologies and crops.

FINANCING

Political will for nutrition must be reflected through financial support, both at the national and sub-national level (USAID 2014a). On a global level, the Scaling Up Nutrition (SUN) Movement has recognized and highlighted the challenges countries face with resource mobilization and availability, as well as the difficulty countries have in tracking resources destined for and expended by nutrition programs. The SUN Movement has called for countries to "track the mobilization and use of domestic and external investments [...] so as to encourage alignment and scale up of intention, action and outcomes" (SUN 2013). Only by taking a broad systems approach can financing be effectively allocated and used to improve nutrition.

INFORMATION AND COMMUNICATIONS

Information systems for nutrition have three main functions: (1) they measure changes in the nutrition status of vulnerable people—namely children and women, (2) they track progress in the implementation of actions by policymakers, enterprise owners, health services providers, farmers, households, and individuals, and (3) they help to prioritize response (ACC/SCN 2004). The functioning of information systems influences how and what programs are prioritized and where they are emphasized.

Likewise, what and how policies and messages are communicated through government decrees, mass media, community mobilization, and/or interpersonal communication affects actions at all levels related to food availability, care practices, health services, and the sociocultural environment. Changes in policies, financing, and information or monitoring systems, for example, will do little good if they are not communicated from national to community to household levels. Similarly, the information that is or is not communicated with regard to the cost of agricultural inputs and food, available health services, priority nutrition practices, and prevalence of malnutrition, for example, can affect what food is grown, stored, and/or purchased, if health services are utilized, how children are fed, or which nutrition programs are funded. Negative feedbacks often hinge on the messages themselves to ensure that behavior change messages do not cause harm, or that there isn't a "saturation" of information to the point of indifference.

Communication also relates to the coordination and collaboration of multiple sectors and actors. According to the *Fifth Report on the World Nutrition Situation by the United Nations Standing Committee on Nutrition*, "Individuals that are malnourished have been failed by many different sectors: agriculture, health, education, social welfare, finance, and labor. To address malnutrition effectively requires alliances between sectors" (SUN 2014). Alignment of public and private sector communication is essential for advocating for nutrition and leading to a healthy and nutrition-informed community.

HOUSEHOLD RESOURCES

Household access to adequate resources, such as education, income and technology are important basic drivers of nutrition. Access to these resources and equitable intrahousehold distribution, allows households to access food, health, water, and sanitation services (UNICEF 1990). Systems thinking links efforts to improve household resources and maximize use of these resources for nutrition outcomes.

For example, education and income enables women to make well-informed decisions for their health and nutrition and that of their children.

SOCIOCULTURAL ENVIRONMENT

For the purposes of this paper, society is defined as the community of people living in a particular country or region and having shared customs, laws, and organizations and culture is understood to be the attitudes and behaviors of a particular nation, people, or other social group, which includes their customs, arts, social institutions, and achievements (Oxford English Dictionary). The sociocultural environment involves social structures and knowledge, attitudes, beliefs, norms, and practices of social substructures including individuals, families, communities, civil society, and governments (Diamond 2005). Social structures and norms mediate interactions with all of the other systems described. Social roles, relationships, and policies in settings such as schools, neighborhoods, workplaces, businesses, places of worship, health care settings, and other public places influence perceptions of and access to resources and services, as well as nutrition-related behaviors and decisions around what is produced, purchased, prepared, consumed, or disposed.

INTERCONNECTIONS, NON-LINEAR INTERACTIONS, AND FEEDBACK LOOPS

Systems also include the interconnections, non-linear interactions, and feedback loops between the cross-cutting factors and causes of malnutrition described above. To illustrate this, one can look to the relationship between diet and disease, which are intertwined in a synergistic cycle where disease perpetuates nutrient loss and poor nutritional status, and malnutrition further increases susceptibility to disease. A poorly nourished individual is more likely to develop disease, and an ill person may require more calories, absorb calories less efficiently, or suffer from anorexia. Although both inadequate dietary intake and disease can independently contribute to malnutrition, it often results from a combination of the two. Therefore, ensuring adequate dietary intake, together with disease prevention and control, are the most effective interventions. When done together, they can create a positive feedback loop that significantly reduces chronic and acute malnutrition during the first two years of life.

Similarly, access to food or to improved sanitary facilities alone does not necessarily lead to improved dietary intake or health status. Where food is accessible, for example, a caretaker must still make decisions about how the food is prepared and whether and how often the food is fed to children. Furthermore, the presence of a latrine does not necessarily imply that the latrine will be used at all or used appropriately. Interventions to address these causes include efforts to increase

BOX 1: TEN PRINCIPLES FOR ENGAGING LOCAL SYSTEMS

1. Recognize there is always a system.
2. Engage local systems everywhere.
3. Capitalize on convening authority.
4. Tap into local knowledge.
5. Map local systems.
6. Design holistically.
7. Ensure accountability.
8. Embed flexibility.
9. Embrace facilitation.
10. Monitor and evaluate for sustainability.

(USAID 2014b)

access to an affordable, diverse, and nutrient-rich diet; promote optimal maternal and child feeding and care practices; increase the access to and quality of adequate health services; and, improve sanitation and hygiene practices. These underlying factors directly impact the immediate causes of malnutrition— nutrient intake and utilization, and manifestation of disease.

PUTTING SYSTEMS THINKING INTO ACTION FOR NUTRITION

The systems approach to nutrition is the application of systems thinking – putting systems thinking into action. As policymakers and program managers adopt a systems approach to address the complexities of malnutrition, they will need to consider the cross-cutting factors and causes described above. To begin with, USAID's report on local systems (2014b) emphasized 10 principles for engaging local systems for improved sustainability. These practical principles can be adapted to the nutrition context for those working at the local systems level (See Box 1). Additional actions that can be taken to apply systems thinking are presented below in a checklist format. Many are followed by questions that can be used to dig deeper and ensure quality.

- **Form cooperative and trans-disciplinary teams** for the development and coordination of a nutrition plan of action. This process is well described by the SUN Movement in the multidisciplinary, multisectoral platforms.

- **Conduct a contextual assessments and analysis** within and across projects and portfolios to determine the context-specific epidemiology of malnutrition; identify enablers and barriers to nutrition programming as well as existing interventions; determine the most appropriate actions to reduce malnutrition; and identify opportunities for collaboration and integration across sectors. Network mapping, social network analyses, and process mapping involve a range of tools to illustrate and analyze nutrition directive connections of systems approaches between people, organizations, or processes in both qualitative and quantitative ways (Peters 2014). Key questions to consider when doing this include:

  - **Are all relevant local stakeholders participating in the shaping the assessment (e.g. policymakers, community members, private sector, managers)?**

  - **Is there a process to ensure voice and knowledge of stakeholders is equitably incorporated in analysis and planning?**

- **Develop and implement a multisectoral nutrition plan** based on evidence and best practice for reducing malnutrition.

  - **Have you considered how basic, underlying, and immediate causes of malnutrition (under and over-nutrition) might be addressed in this context?**

  - **Have you considered all of the cross-cutting factors? How could policies be better utilized, systems strengthened, communication improved, etc. for addressing the priority challenges or behaviors in a given context? For example, where rates of early initiation of breastfeeding are low, could health workers' standard operating procedures be revised,**

could facilities be asked to track and report early initiation, could a communication campaign be launched focusing on this topic?

  ☐ **Is there evidence supporting the interventions and approaches?**

  ☐ **Have scale and sustainability been defined and have plans for achieving them been articulated?**

  ☐ **Are roles, responsibilities, and systems for collaboration and coordination of a multisectoral nutrition plan clearly defined?**

  ☐ **Are the costs of proposed activities as well as collaboration and coordination – both actual cost and opportunity costs – adequately budgeted?**

■ **Adapt plans for specific local needs and hard-to-reach, underserved populations.**

  ☐ **Is there a need to build capacity among certain populations or organizations (e.g. marginalized groups) to ensure they have access to information and the ability to participate in shaping and implementing the plans?**

■ **Monitor implementation, including feedback loops and interactions** across sectors and systems. Learn and adapt systems approaches as their impact on nutrition become apparent.

  ☐ **Is there a need to strengthen existing capacity for data collection and appropriate use of data for decision-making?**

  ☐ **Are scale and sustainability being monitored?**

It may not always be within the scope of a project or the budget of a country to undertake such high level, multidisciplinary, and multisectoral activities. A range of activities that are somewhat smaller in scope could be undertaken to help set the stage for a broader systems thinking approach:

■ Perform a situation analysis that evaluates each level of cause (immediate, underlying, and basic) as well as the cross-cutting components at the community level.

■ Take at least two major sectors—agriculture and health—and understand how they work in relation to nutrition. Build systems approaches from there.

■ Focus on the community and do a stakeholder mapping exercise (or network mapping) to understand who is doing what, where, and how. Each stakeholder could be mapped to a sector and the level of cause.

■ Map health workforce numbers, training, qualifications, and tasks. This is one of the first steps toward ensuring the effective delivery of nutrition actions at various levels.

■ Assess the range of services and level of integration of nutrition services into the health system.

- Undertake a supply chain management assessment, which is an exercise that recognizes and characterizes interactions among subsystems in a very operational and applied sense, with an eye toward what it takes to make and keep essential products available to the people who need them. This assessment can be done in many sectors including health, agriculture, environment, and education.

- Using mapping tools, map the infrastructure (roads, clinics, agriculture landscape, mobile towers) to communities to better understand the influence of infrastructure to communities.

CONCLUSIONS

Research suggests that the nutritional context is more complex than previously thought and, most prominently, the emergence of the "dual burden" of over- and undernutrition in individuals and populations present a particular challenge The ability to address this dual burden requires a systems approach that is inclusive of all agencies and stakeholders throughout the chain including effective and integrated interactions among health, agricultural, and economic systems. (p. 101, Vélez et al. 2014)

A systems approach – the application of systems thinking – to nutrition may not be easy; however, given the many factors, sectors, and disciplines that affect nutritional status, it is needed (Beake et al. 2012; Ihab et al. 2013; Pearson & Ljungvist 2011; United Nations Summit 2010; Vélez et al. 2014). Even if a country or a program cannot address all immediate, underlying, and basic causes of malnutrition and the many sectors and components involved, it is important for policymakers and program managers to understand how even the most limited, vertical programs fit within the larger context. It is only by doing this, that we will see sustained improvements in nutrition at the global scale.

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ANNEX I: DEFINING TERMS

SYSTEM: A system is a set of connected things or parts forming a complex whole.

SECTOR: A distinct part or branch of a nation's economy or society or of a sphere of activity such as education
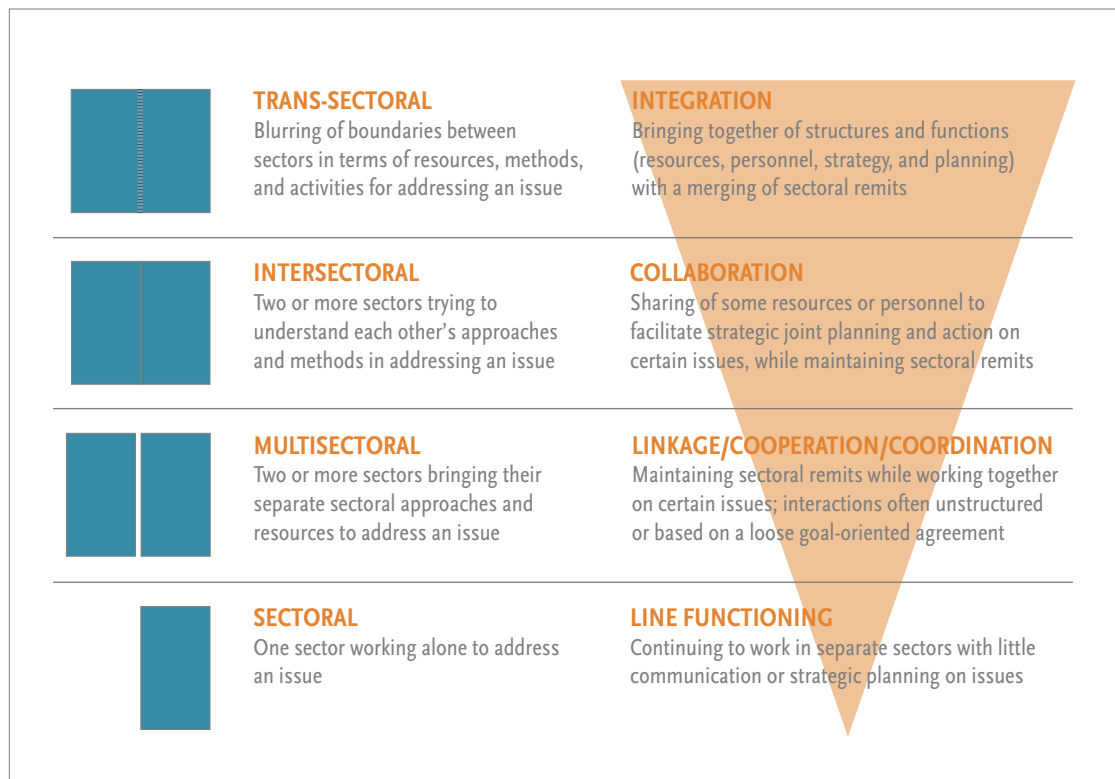

TRANS-SECTORAL
Blurring of boundaries between sectors in terms of resources, methods, and activities for addressing an issue

INTEGRATION
Bringing together of structures and functions (resources, personnel, strategy, and planning) with a merging of sectoral remits

INTERSECTORAL
Two or more sectors trying to understand each other's approaches and methods in addressing an issue

COLLABORATION
Sharing of some resources or personnel to facilitate strategic joint planning and action on certain issues, while maintaining sectoral remits

MULTISECTORAL
Two or more sectors bringing their separate sectoral approaches and resources to address an issue

LINKAGE/COOPERATION/COORDINATION
Maintaining sectoral remits while working together on certain issues; interactions often unstructured or based on a loose goal-oriented agreement

SECTORAL
One sector working alone to address an issue

LINE FUNCTIONING
Continuing to work in separate sectors with little communication or strategic planning on issues

Figure adapted from Harris and Drimie 2011

DISCIPLINE: A branch of knowledge, typically one studied in higher education

INTER-DISCIPLINARY: The process of combining two or more disciplines, fields of study or professions but is also attempting to synthesis them into something new.

CROSS-DISCIPLINARY: Coordinated effort involving two or more academic disciplines.

MULTI-DISCIPLINARY: Relating to, or making use of several disciplines at once. This acknowledges that there are differences between disciplines in "how the work is done", but doesn't have a way to bridge these differences.

TRANS-DISCIPLINARY: Transcends boundaries of conventional approaches. This attempts to get around the issue of methods of thinking completely by working from the problem space out.