Using cutting-edge technology to end malnutrition

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The world is facing a malnutrition crisis. One billion people are hungry, at least 3 billion do not receive sufficient nutrients and more than 2.5 billion consume unhealthy diets (UNICEF, WHO and World Bank, 2018). In addition to its immediate impact on health and society, the COVID-19 pandemic will cause significant short- and long-term disruptions to food systems. This will reduce the availability of nutritious foods, particularly for poor and vulnerable populations, and fuel the prevalence of all forms of malnutrition.
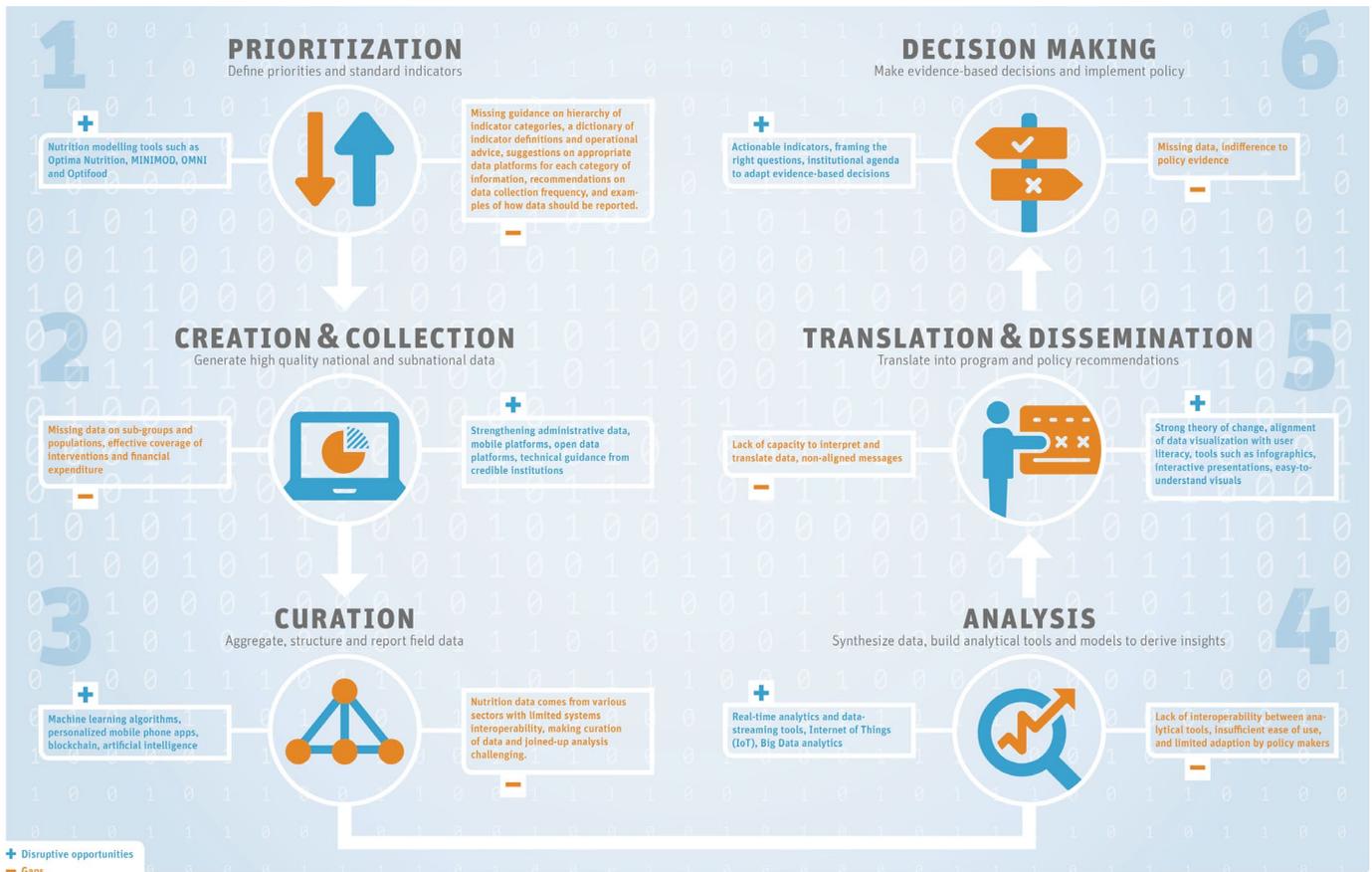
At the same time, we are living in a world that is increasingly data driven. From social media and satellite navigation systems to mobile-phone apps that count calories, robots that fight climate change and governments that forecast future disease outbreaks using Google, data use has transformed our society in unprecedented ways. As the momentum behind the use of data intensifies, the opportunities to avail of it to spark change and drive development are endless. The digital world holds the potential to not only affect the underlying and immediate causes of malnutrition in all its forms, but also its root causes and our ability to address them.

Still, nutrition data remain fragmented and incomplete, particularly in low- and middle-income countries (LMICs), making it difficult for governments, development partners and other stakeholders to access and use them to monitor ongoing efforts and allocate resources. The 2018 Global Nutrition Report affirms that "there are still vast gaps in the data available to help us better understand the nature and extent of malnutrition in all its forms. Many countries do not yet collect the necessary data to fully understand the nature of the burden of malnutrition, diet or indicators of progress" (Development Initiatives, 2018). As we strive to end all forms of malnutrition by 2030, there is an urgent need to harness data to track progress, hold stakeholders accountable and foster rapid collaboration. Being able to collect, analyse and translate nutritional data, therefore, is essential to understanding the challenges and making important decisions to meet global nutrition goals.

The nutrition-data value chain (Figure 1) considers data a value-adding ingredient that not only serves to gauge progress towards nutrition goals, but which is essential to achieving them. This end-to-end systems approach was first proposed by the Data for Decisions to Expand Nutrition Transformation (DataDENT) initiative in 2017 and encompasses multiple links, from the prioritization of what to measure and how, through the collection, curation and analysis of the data and its translation into information and evidence that is widely shared and informs decision-making (DataDENT, 2019). Each link is vital to collect, assess and transform data into action, as well as to build capacity and transform information into sound decisions. Here, we use the data value chain as the organizing framework to discuss the ways in which technologies are changing, how we address malnutrition and to highlight examples of innovations featured in the publication *Data in Nutrition* (Sight and Life, 2019).

Figure 1. THE NUTRITION DATA VALUE CHAIN: GAP AND DISRUPTIVE OPPORTUNITIES

1

PRIORITIZATION
Define priorities and standard indicators

+ Nutrition modelling tools such as Optima Nutrition, MINIMOD, OMNI and Optifood

− Missing guidance on hierarchy of indicator categories, a dictionary of indicator definitions and operational advice, suggestions on appropriate data platforms for each category of information, recommendations on data collection frequency, and examples of how data should be reported.

2

CREATION & COLLECTION
Generate high quality national and subnational data

− Missing data on sub-groups and populations, effective coverage of interventions and financial expenditure

+ Strengthening administrative data, mobile platforms, open data platforms, technical guidance from credible institutions

3

CURATION
Aggregate, structure and report field data

+ Machine learning algorithms, personalized mobile phone apps, blockchain, artificial intelligence

− Nutrition data comes from various sectors with limited systems interoperability, making curation of data and joined-up analysis challenging.

6

DECISION MAKING
Make evidence-based decisions and implement policy

+ Actionable indicators, framing the right questions, institutional agenda to adapt evidence-based decisions

− Missing data, indifference to policy evidence

5

TRANSLATION & DISSEMINATION
Translate into program and policy recommendations

− Lack of capacity to interpret and translate data, non-aligned messages

+ Strong theory of change, alignment of data visualization with user literacy, tools such as infographics, interactive presentations, easy-to-understand visuals

4

ANALYSIS
Synthesize data, build analytical tools and models to derive insights

+ Real-time analytics and data-streaming tools, Internet of Things (IoT), Big Data analytics

− Lack of interoperability between analytical tools, insufficient ease of use, and limited adaption by policy makers

+ Disruptive opportunities
− Gaps

Source: *Sight and Life (2019)*

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Malnutrition results in the intergenerational transmission of inequity, poverty and poor health and poses a significant barrier to equitable and sustainable social and economic development. The data-collection step in the value chain is, perhaps, the most important and requires the establishment of high-quality national and subnational systems to collect reliable information. Yet, many nutrition issues still lack dependable data. This is the case for micronutrient deficiencies, which are still poorly understood in most countries due to vast data gaps.

To improve data to better understand where micronutrient deficiencies are located and to better target programming and interventions, OpeN-Global was created as an online resource to support the collection of micronutrient status data (OpeN-Global, n.d.). It provides downloadable laboratory standards of practice to LMICs, including details on quality control and accreditation, technical support and fully referenced general information for more than 20 nutrition biomarkers, to support the objective, detailed, accurate and high-quality assessment of nutrition biomarkers normally used in population surveys and research. In the short-term, it has built capacity and fostered collaboration in LMICs to improve quality control and assurance, technical accreditation, investment and trust – leading to more and better data. In the long term, it is expected to enable greater understanding of the specific nutrition challenges of LMIC regions, leading to targeted programmes and policies (Farebrother and Moore, 2019).

Because of the multisectoral nature of nutrition, data come from various sectors that have limited ability to connect in a coordinated manner, thus the curation step of the data value chain is critical to aggregate, structure and report on the data collected. Dalili is an innovative tool that uses smartphone-based data curation to put affordable, nutritious food on the plates of the world's most vulnerable (WFP Innovation Accelerator, n.d.). Dalili ("my guide" in Arabic) is a smartphone app developed by the World Food Programme, together with its innovation accelerator in Munich and retail team in Beirut, that allows anyone in Lebanon to compare the prices of 250 staple foods in local shops using the phone's global positioning function. Users can also compile shopping lists and leave anonymous feedback to help shop owners improve their stores. The app had more than 20 000 users in 2018 and is an important step in empowering families to take control of their own nutrition and health.

Synthesizing, translating and packing data to facilitate action is one of the final and most important steps in the data value-chain approach, as the ability to provide high-quality data on the right indicators at the right time can galvanize decision makers. Data-driven technologies can support the translation of data into action, especially in real time, and are being used to improve nutrition and health outcomes at the individual and global level in unimaginable ways – from nutrition apps that employ machine-learning algorithms to track dietary intake to educational games and web- or media-based digital nutritional education tools.

GeoPoll uses mobile technology to collect nutrition-related data from difficult-to-reach, remote and dangerous locations (GeoPoll, n.d.). Tools including SMS surveys, automated voice calls and web applications collect household and community-level information, track nutrition and dietary habits, and conduct baseline and endline studies. These data are synthesized to provide valuable insights into service delivery, feeding behaviours and project effectiveness. GeoPoll's systems are directly integrated with mobile networks in more than 70 countries and can disseminate surveys to almost any country through voice calls, the GeoPoll mobile app and other means.

In the face of all of these innovations, it is important to note that low-tech administrative data, routinely collected by low-and-middle-income countries, are a goldmine of actionable information, with the potential benefits of timeliness and full coverage of programme participants. However, governments need to focus their efforts on improving the quality of administrative data. A systematic strengthening of data-collection procedures can produce accurate and actionable information. This includes intensive training of actors across tiers, reviews of existing technological equipment against ideal requirements and the systematic triangulation of collected data through independent checks. Consistent real-time administrative data can help diagnose immediate problem areas to better inform policy and programme interventions targeting nutrition outcomes.

These are a few illustrative examples of the power of data for nutrition and how innovations across the data value chain can impact real change. Challenges exist at each link in the nutrition-data value chain, from prioritization to analysis, which currently fails to capture the complex, multisectoral causes of and responses to malnutrition. However, new technologies offer the potential to strengthen nutrition programmes and improve outcomes.

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