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# Using Digital Tools to Strengthen Nutrition Service Delivery: An Overview

AUGUST 2020

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## Recommended Citation

USAID Advancing Nutrition. 2020. *Using Digital Tools to Strengthen Nutrition Service Delivery: An Overview*. Arlington, VA: USAID Advancing Nutrition.

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# Contents

Acronyms and Abbreviations ..... iii
Introduction ..... 1
Background ..... 1
Objectives ..... 3
Methods ..... 4
Findings ..... 6
Discussion ..... 15
Conclusions and Recommendations ..... 17
References ..... 19
Annex 1: Classification of Digital Health Interventions ..... 21
Annex 2. Tools Reviewed ..... 26
Annex 3. Supplementary Tables ..... 27

# Acronyms and Abbreviations

| | |
|---|---|
| AIDS | acquired immunodeficiency syndrome |
| AWW | Anganwadi worker [health worker] |
| CHT | Community Health Toolkit |
| CHV | community health volunteer |
| CMAM | Community Management of Acute Malnutrition |
| C-MAMI | Community Management of At-risk Mothers and Infants |
| DHIS2 | District Health Information System 2 |
| ECD | early childhood development |
| eCHIS | Electronic Community Health Information System |
| EMR | electronic medical records |
| GFF | Global Financing Facility |
| GMP | growth monitoring and promotion |
| GMSA | Global Mobile Operators Association |
| HEW | health extension worker |
| HIS | health information system |
| HIV | human immunodeficiency virus |
| HMIS | health management information system |
| iCCM | Integrated Community Case Management |
| ICDS-CAS | Integrated Child Development Services–Common Application Software |
| IMCI | Integrated Management of Childhood Illness |
| LMICs | low- and low-middle-income countries |
| M4D | Mobiles for Development |
| mHealth | mobile health |
| MOH | Ministry of Health |
| MUAC | mid-upper arm circumference |
| OpenSRP | Open-source Smart Register Program |
| PLWHA | people living with HIV and AIDS |
| RMNCH | reproductive, maternal, newborn, and child health |
| UNICEF | United Nations Children's Fund |
| USAID | U.S. Agency for International Development |
| TB | tuberculosis |
| WASH | water, sanitation, and hygiene |
| WHO | World Health Organization |

# Introduction

The U.S. Agency for International Development (USAID) seeks to improve the coverage and quality of nutrition services at the facility and community levels through the health system. Health practitioners, technology providers, and other stakeholders have explored innovative approaches for using digital health to improve service delivery not only in nutrition but in many other program areas.[1] Over the past 10 years, the use of digital tools to strengthen public health programs in low- and middle-income countries (LMICs) has grown from small proofs of concept to national-scale deployments. Along the way, a growing evidence base has shown not only that it is possible to capitalize on increasingly ubiquitous mobile phones to improve public health, but also that the data collected and made available through digital systems can help health stakeholders make better decisions.

To avoid duplication of effort, learn from successful implementations, and guide future work, it is important to understand what tools have already been designed, developed, tested, and taken to scale. Despite recent implementation of many pilots and several large-scale interventions, the most recent broad overview of the use of digital tools to support nutrition service delivery was completed more than 5 years ago (GMSA 2020b). Considering how rapidly digital solutions evolve and the great number of digital health tools created in this period, 5 years represents a significant lapse. This report, intended for experts in both nutrition and digital health—or those interested in either—seeks to fill this gap by providing an overview of how digital tools have been used to strengthen nutrition services while highlighting key examples of different successful tools.

### This Landscape in a Nutshell

Our review examined 53 digital tools used by health care providers. The majority of tools addressed challenges in information flow and overall quality of nutrition services. We focused on tools targeted to providers. Most of these focused on providers working at the community level, serving pregnant women, children under age 2, and people living with HIV and AIDS. We found a pattern of clustered tool use, with certain countries using multiple tools, while many countries have yet to make use of digital technology for nutrition service. We strongly recommend that digital tools for nutrition service delivery be incorporated into more comprehensive digital service delivery platforms. This will enhance the tools' usefulness for the cadres they are designed for, while also enabling scale-up and local ownership.

# Background

Digital health is the "application of information and communications technologies and the data they generate to support informed decision-making and engagement by individuals, health providers, and health systems to increase demand, access, coverage, quality, and affordability of health and wellness for all" (USAID 2020a). Digital health "incorporates the subdomains of eHealth, medical informatics, health informatics, telemedicine, telehealth and mHealth, as well as data-analytics, big data, and artificial intelligence" (USAID 2020a). Digital health interventions can address many health system challenges, ranging from gaps in information and services to availability of commodities and quality of services. Digital health is a fast-moving field; in fact, nearly the entirety of global digital health work has taken place in just over a decade.

[1] While digital tools targeting clients, such as mobile messaging systems, are of great interest to the nutrition community, we excluded them from our review because they do not target the service delivery process.

## Origins of Digital Health in Low- and Middle-Income Countries

Availability and use of mobile phones in low- and low-middle-income countries (LMICs) have grown rapidly in the 21st century. By the mid-2000s, health workers in LMICs were leveraging these devices to access resources and share information quickly. Early digital health interventions focused on the use of mobile phones—basic-feature phones or smartphones—to improve client record keeping. They also tended to focus on a single health program, contact point, or disease (e,g., Integrated Management of Childhood Illness (IMCI), antenatal care visits, or tuberculosis).

**Box 1. Principles for Digital Development**

- Design with the user
- Understand the existing ecosystem
- Design for scale
- Build for sustainability
- Be data driven
- Use open standards, open data, open source, open innovation
- Reuse and improve
- Address privacy and security
- Be collaborative

Source: Digital Impact Alliance N.D.

Ministries of health (MOH), donors, and implementing agencies were increasingly interested in finding ways to harness the power of digital tools. As a result, pilot studies proliferated, documenting evidence of feasibility and usability, as well as evidence of health impact (Agarwal et al. 2015).

In response to the growing use of mobile technology for health, in 2009 global health implementers established the Global Digital Health Network (originally known as the mHealth Working Group) to share experiences among their peers (Global Digital Health Network 2019). In 2010, the World Health Organization (WHO) launched the Global Observatory for eHealth (GOe) initiative, which published profiles of member states and their use of eHealth, defined as the use of information and communications technology (ICT) for health (WHO 2010). The following year, the GOe published another volume in its eHealth series, focusing on mobile health, which included a series of case studies on the use of mHealth in different countries (WHO 2011). Additionally, between 2012 and 2016 six volumes of the *mHealth Compendium* were published by the USAID-funded African Strategies for Health project, documenting many of the early mHealth interventions (African Strategies for Health, 2012-2016).

## From Ad Hoc Pilots toward Alignment and Scale

The large number of pilots, often run by diverse partner organizations, caused some confusion and duplication of efforts. The pilot applications often served similar programmatic functions, and/or served similar cadres, and this siloed approach began to frustrate and overwhelm public health decision makers in LMICs (ICTworks N.D.). The scattered approach also made it difficult to ensure that governments had adequate ability to safeguard the health data of citizens, particularly as regulation lagged behind implementation. In response, in the last 10 years digital interventions have shifted focus from small pilots, conducted simply to prove that digital tools could be used in low-resource settings, to large, complex systems that support cadres across the full range of their responsibilities.

In addition, country governments, donors, and partner organizations have made efforts to move toward greater alignment in design and implementation of digital interventions. In 2015, a group of digital health experts and partners launched the Principles for Digital Development, described as "a set of living guidance intended to help practitioners succeed in applying digital technologies to development programs" (see Box 1) (Digital Impact Alliance N.D.). The principles were quickly endorsed by multiple funding agencies, including USAID, and provided guidance to decision makers about how to evaluate digital health tools. Shortly thereafter, a group of donors, again including USAID, agreed to a complementary set of "Principles of Donor Alignment for Digital Health" (Principles of Donor Alignment, 2018).

At the 2018 World Health Assembly, WHO recognized the important contribution of digital health in achieving the 2030 Sustainable Development Goals, and expressed its commitment to developing a digital health strategy (WHO 2018b), the *Draft Global Strategy on Digital Health 2020–2024* was released this year (WHO 2020). In the same year, WHO developed a framework document, *Classification of Digital Health Interventions v1.0: A Shared Language to Describe the Uses of Digital Technology for Health* (see Methods section for more information) (WHO 2018a). The framework was designed to create a common language for use by health policymakers, software developers, data scientists, epidemiologists, program managers, and health care providers to enable greater clarity in discussions of and comparisons between different interventions.

USAID launched the *Digital Health Investment Review Tool* to ensure that programs and investments follow these digital health principles in 2019 and in 2020 released its *Digital Strategy 2020–2024*, which outlines its commitment to using digital technology responses for development and humanitarian issues while promoting local self-reliance (USAID 2020a). Also in 2020, USAID requested external feedback on a digital health–specific document titled *Accelerating the Journey to Self-Reliance through Strategic Investments in Digital Technologies: A Digital-Health Vision for Action*, which outlines how USAID proposes to utilize digital health tools and implement digital health interventions.

## Documentation and Evidence of Nutrition-Specific Digital Health Interventions

One of the Principles for Digital Development is to understand the existing ecosystem (Digital Impact Alliance N.D.). Another is to *reuse and improve* on what has already been done. Without a clear understanding of prior experiences, we cannot learn from and leverage or adapt them. Instead, public health practitioners duplicate efforts, designing and redesigning very similar types of tools. Unfortunately, efforts to document the implementation of digital health interventions quickly become outdated, due to the pace of change in technology, and the speed with which new programs are designed, deployed, and—sometimes just as swiftly—either canceled or scaled up for an enormous number of users. To bring together information on existing digital health interventions and facilitate coordination between in-country implementers and stakeholders, in 2016 WHO launched the *Digital Health Atlas* (N.D.), an open-source platform providing a country-by-country inventory of all digital health interventions.

Reviews of digital health interventions' impact on particular program areas have been carried out at various points in time in the last decade. However, fewer such reports and resources focus on digital innovations for nutrition than on other health program areas. For nutrition, in 2015 the Mobiles for Development (M4D) arm of the Global Mobile Operators Association (GMSA) released a report describing best practices in mHealth for nutrition (GMSA 2020b). This report highlighted many interesting mobile nutrition initiatives targeting clients, providers, and health systems. In the 5 years since its publication, however, both the number of digital interventions for nutrition and their implementation at scale have increased. The most recent overview is from a 2019 report released by the Global Financing Facility (GFF) titled *Innovations and Tools in Child Growth Measurement and Data Visualization*, which mentions digital innovations among a number of other types of innovations but does not go into detail on the wide range of viable digital health interventions for nutrition (GFF 2019).

# Objectives

Documentation and recommendations for digital health interventions for nutrition are limited. This report helps to address this limitation by providing a broad overview of the current state of the field specifically as it pertains to **strengthening service delivery in LMICs**. By increasing understanding of how digital tools are already supporting nutrition service delivery, this report will empower public health implementers and decision makers to leverage prior work to reduce duplication of effort; it will

also help lay the foundation for future guidance on how digital tools for nutrition should be designed. Specifically, this report will—

- provide a current snapshot of the state of digital health tools for providers designed to strengthen nutrition service delivery, updating the 2015 *M4D Report*
- identify areas where digital tools have not been designed, used, or tested
- propose recommendations for advancing the field of digital health for nutrition service delivery.

# Methods

To create the broadest, most comprehensive compilation of digital tools that either have been or are being used to improve nutrition service delivery, we carried out the following steps:

1. ***Targeted Web search of gray literature:*** This included a review of the *Digital Health Atlas* (WHO 2016a), recent conference presentations at events such as the Global Digital Health Forum, and prior compendia of digital tools. Given the pace of change in digital health, we chose to focus on the gray literature, because focusing on the academic literature would necessarily miss many programs that are more recent, or those implemented outside of a research setting.
2. ***Brief survey of nutrition and digital health experts:*** We sent out a brief survey via relevant listservs such as the Global Digital Health Network, Asian eHealth Information Network, Digital Health and Interoperability Working Group, CORE group, Child Health Task Force, and others.
3. ***Direct requests and in-depth conversations:*** We gathered additional information on experiences with and content of tools for nutrition-related service delivery from programs, implementing agencies, and digital solutions providers.

We reviewed, briefly described, and catalogued all digital tools submitted or discovered that 1) had moved beyond the development stage, 2) were designed for service providers, and 3) explicitly addressed the delivery of nutrition services. A tool was excluded if 1) it had been developed but never used/implemented, 2) it had not been in use in the last 5 years, 3) the primary end users were caregivers rather than providers, 4) the example submitted was for an overarching digital platform,[2] but not for a particular country or for a particular programmatic use.

To characterize tools accurately, we reviewed the most detailed descriptions available. We recorded the following characteristics of each tool for analysis: country(ies) where the tool was used, health system challenge(s) addressed; type of digital system; type of service provider for whom the tool was designed (primary end user); type of digital health intervention; type of program or service supported; whether the tool was designed to support the delivery of nutrition services only, or a broader set of services; digital platform used; type of client targeted or recipient of nutrition services (e.g., pregnant women, children, mothers, people living with HIV and AIDS [PLWHA]); funder; scale (number of users); and degree of country ownership/integration of the tool within the health system.

We used the WHO framework mentioned above for classifying health system challenges, types of digital systems, and types of digital health interventions (2018a). The WHO framework identifies eight overarching types of health system challenges that can be addressed by a digital health intervention (see Box 2) and 25 types of digital systems that can be implemented. These range from civil registration and

[2] Digital platforms are designed to run applications in low-resource settings, but are not adapted to any particular health content or context. For example, Dimagi's CommCare platform and DHIS2's tracker application are both software tools designed with the needs of frontline workers in mind (can run on low-cost Android devices, can capture and view data offline, can track clients longitudinally) but are content agnostic. A ***platform*** can usually be leveraged to develop an ***application*** for any type of health program area, or even for other sectors like agriculture or education. In this case, we were looking for a particular ***application*** designed on the ***platform*** for a specific use related to nutrition service delivery in a specific country or countries.

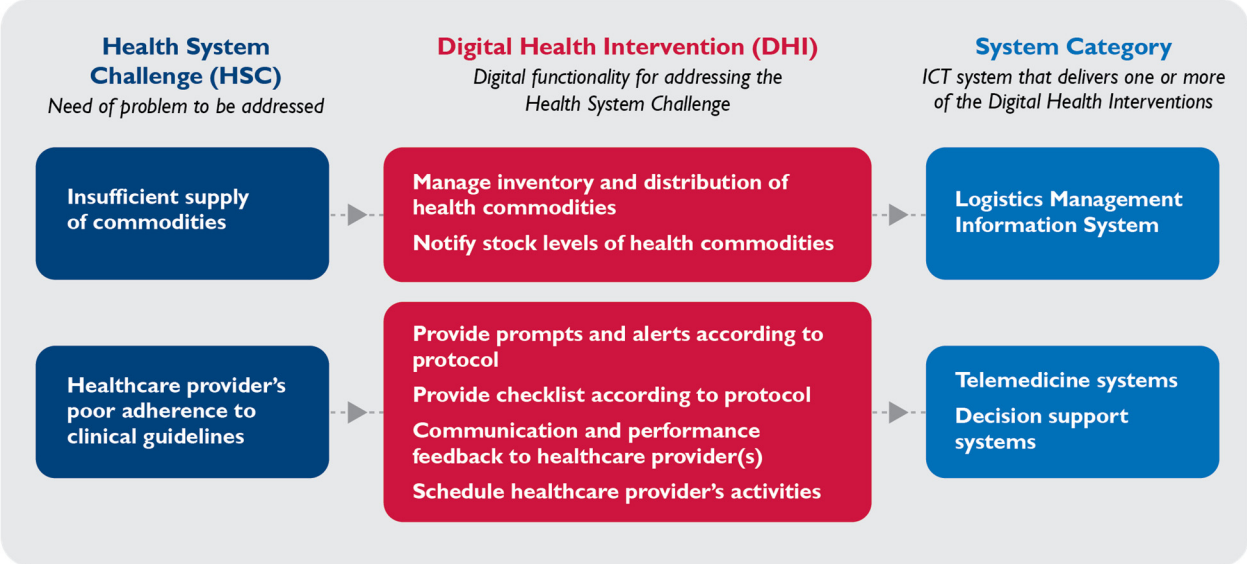
## Box 2. Health System Challenges

- Acceptability
- Accountability
- Availability
- Cost
- Efficiency
- Information
- Quality
- Utilization

vital statistics to telemedicine, such as EMR, geographic information systems, and logistics management information systems (LMIS). For WHO's full list of health system challenges and digital systems, see Annex 1.

According to WHO, a digital health intervention (Figure 1) is the way in which a digital system is leveraged to address a health system challenge (2018a). These interventions are categorized based on the type of primary end user: 1) clients, 2) providers, 3) health system managers, or 4) data managers.[3] **Our review focused on digital health interventions for health providers.**

**Figure 1. Examples of Using WHO's Classification Framework to Define Digital Health Interventions**




Adapted from WHO 2018b. *Classification of Digital Health Interventions v.1.0.* Geneva: WHO.

Digital health solutions for clients range from targeted/untargeted client communication to personal health tracking. Those for providers include client registration, tracking, and decision support systems; and those for health system managers support human resource management, supply chain management, and facility management. Data managers can use digital health platforms for a variety of activities, including data collection, management, and use.

In an effort to reduce duplication of effort, funders who invest in digital health interventions and public health and technology experts who design and deploy them have coalesced around a set of "Global Goods," reusable technical solutions designed for LMIC contexts (Digital Square N.D.). Global Goods are open-source, and are easily accessible and customizable to local country contexts.

Because our interest was primarily in how digital tools have been used to improve nutrition service delivery, we focused on digital health interventions designed for providers—or their direct supervisors.

[3] WHO refers to such interventions as "data services."

Within this category of interventions, WHO has defined 10 subcategories (see Box 3). For the full list of digital health interventions for providers, see Annex 2.

**Box 3. WHO Categories of Digital Health Interventions for Health Care Providers**

- Client identification and registration
- Client health records
- Health care decision support
- Telemedicine
- Health care provider communication
- Referral coordination
- Scheduling and activity planning for health care providers
- Health care provider training
- Prescription and medication management
- Laboratory and diagnostics imaging management

Although we attempted to gather the broadest possible array of examples, it is possible that we missed some digital tools designed to improve nutrition service delivery. The portion of the global digital health community best reached by our call for information has more experience with mHealth than other digital health programs. Therefore, it is possible that recipients of our call for examples may not have considered sharing information about Web- or computer-based applications that are more common for remote learning and health management information systems (HMIS). It is also worth noting that this review was designed for breadth rather than depth. Deeper dives into specific tools were not possible. Without complete system documentation for each tool, it is likely that in some cases we missed health system challenges addressed, digital system used, interventions, or end users.

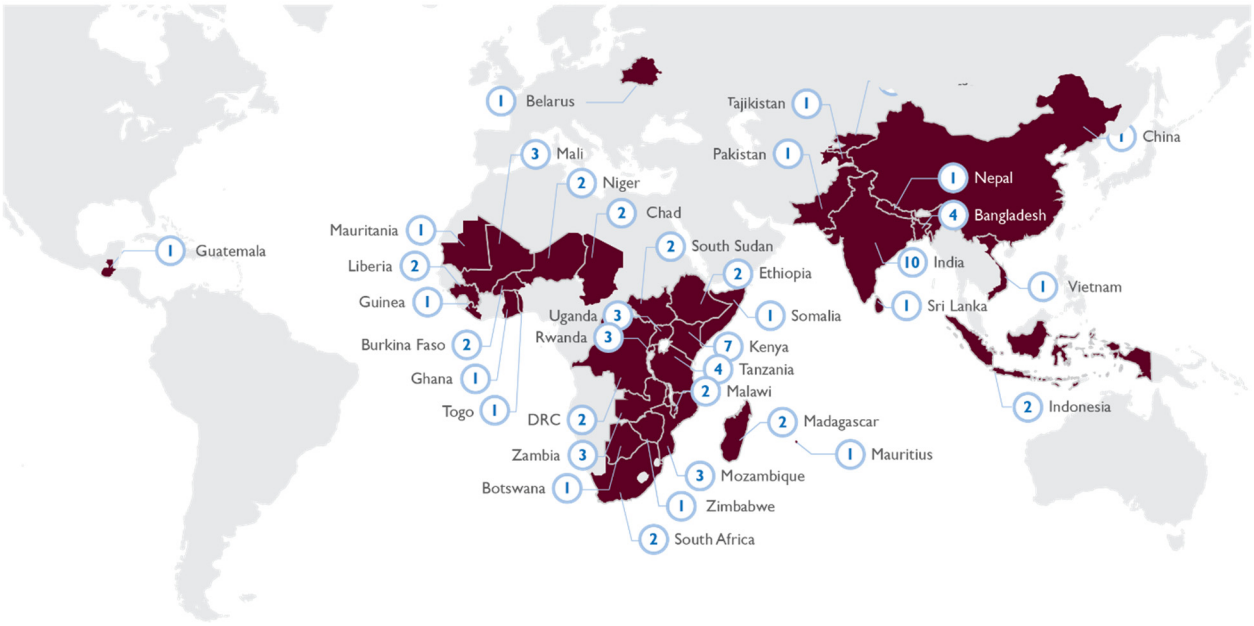
# Findings

We identified 53 tools that met our search criteria. In this section we describe our findings, focusing on those characteristics described under Methods, with the greatest variability and programmatic significance. We include brief descriptions of digital tools that illustrate those characteristics; the complete list of all 53 tools is included in Annex 2 and supplementary table of findings are provided in Annex 3.

## Location of Use

The majority of tools were implemented in Africa (34) and Asia (19) (see Figure 2). Only three tools were used in Eastern Europe, and only one in the Americas. In some cases, one tool has been used in multiple countries. In other cases, multiple tools have been used in the same country—India (10), Kenya (7), and Zambia (6) (Figure 2 and Annex 3). Several tools had reported global use.

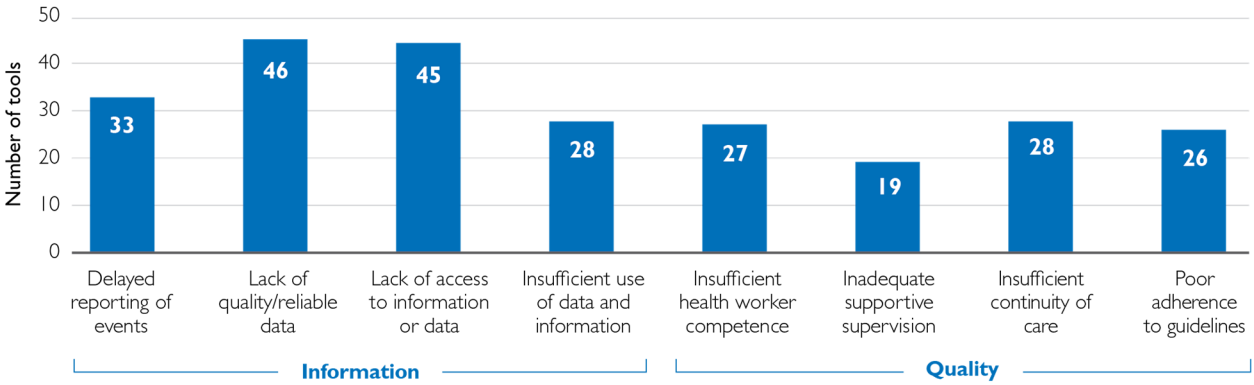
**Figure 2. Number of Digital Tools Reviewed by Country of Use**




## Health System Challenges Addressed

We noted significant commonality in the types of health system challenges these tools were designed to address. Most digital nutrition tools included in this review targeted challenges in the information and quality categories described in the WHO framework (see Methods, above). Figure 3 presents the health system challenges most often referenced. Most tools were designed to address more than one challenge.

**Figure 3. Common Health System Challenges Addressed by Digital Tools Reviewed, per WHO Classification**




## Type of Digital Health Intervention

We found that the most common digital health interventions—using WHO's classification—include client identification and registration, client health records, provider decision support, provider communication, and referral coordination (Table 1). Most tools were designed to deliver more than one digital health intervention.

**Table 1. Common Digital Health Interventions Implemented by Digital Tools Reviewed, per WHO Classification**

| Type of Digital Health Intervention | Number of Tools |
|---|---|
| **Client ID and Registration** | |
| Verify client unique identity | 25 |
| Enroll client for health services/clinical care plan | 10 |
| **Client Health Records** | |
| Enable longitudinal tracking of client's health status and services received | 40 |
| Enable routine health indicator data collection and management | 46 |
| **Health Care Decision Support** | |
| Provide prompts and alerts according to protocol | 37 |
| Provide checklist according to protocol | 36 |
| Screen clients by risk or other health statistic | 35 |
| **Health Care Provider Communication** | |
| Communication from health care provider(s) to supervisor | 14 |
| Communication and performance feedback to provider(s) | 11 |
| **Referral Coordination** | |
| Manage referrals between points of service within the health sector | 11 |

## Program/Service Supported

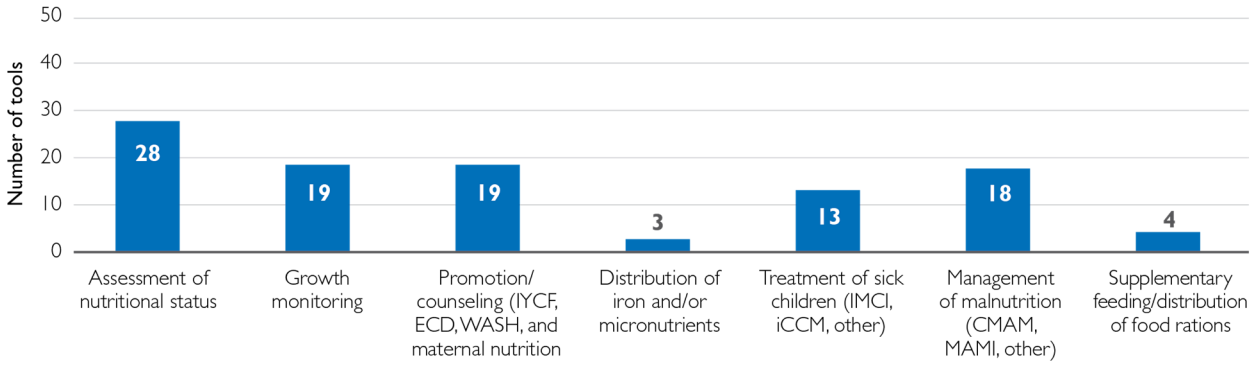
We were also interested in the programs or services the tools were designed to support (Figure 4 and Annex 3). More than one-half (29) were designed to aid health workers in counseling or promotion of nutrition-related practices—specifically, 25 aided in the promotion of infant and young child feeding (IYCF) and 28 supported the assessment of nutrition status. Only two tools mentioned counseling on early childhood development (ECD); one mentioned water, sanitation, and hygiene (WASH) (Annex 3). Neither of these last two areas, however, were the explicit focus of this review.

Also common were tools for growth monitoring (19); 14 of these specifically mentioned growth monitoring and promotion (GMP) and 18 mentioned management of malnutrition.

Thirteen tools were used for the treatment of sick children, often as part of a larger package of services such as IMCI or the Integrated Community Case Management of childhood illnesses (iCCM).

Community Management of Acute Malnutrition (CMAM) was mentioned in descriptions of four tools and Management of At-risk Mothers and Infants (MAMI) was mentioned in one. We did not identify any tools designed to support providers in nutritional care for children with feeding difficulties.

**Figure 4. Common Types of Programs/Service Supported by the Digital Tools Reviewed**




## Nutrition-Only or Integrated Services

We also assessed digital tools or interventions for nutrition in terms of whether they were integrated across or within broader health services, or if they were stand-alone—specifically and solely for nutrition. We found 34 integrated and 21 nutrition-only tools (see Annex 3). Where nutrition was integrated within a larger tool designed for a package of services, integration was most commonly found within IMCI or iCCM packages, or as part of a comprehensive set of reproductive, maternal, newborn, and child health (RMNCH) services.

### Example: Nutrition-Only

**World Vision CMAM Application**

The CMAM application is a facility-based application, used by nurses and doctors who manage the CMAM program, which facilitates screening of both pregnant and lactating women and children under 5 years. The application supports registration of the child, then collects data on the anthropometric measures (including MUAC, presence and severity of bilateral edema, plus support for Z-score calculation). It also guides users through systematic checking for medical complications in the child. Based on the anthropometrics and the status of any medical complications, the application offers decision support for service providers to select various diagnoses and treatment pathways: no acute malnutrition (counseling only); SFP (supplementary feeding program); OTP (outpatient therapeutic program); or referral to the Stabilization Center for inpatient treatment. Once the woman and/or child are within the selected pathway, it provides further guidance to providers for treatment protocols as well as follow-up visits.

**Platform:** CommCare
**Current Number of Users:** No longer active; reached 152 during pilot in 2017

### Example: Integrated Program Areas

upSCALE, developed by the Malaria Consortium and partners, is a mobile phone application that guides community health workers (CHWs) in Mozambique through service delivery. CHWs, known as agentes polivalentes elementares (APEs), conduct health promotion activities; provide iCCM services for children aged 2–59 months, family planning services, antenatal and postpartum care; conduct well child visits; treat all age groups for malaria and diarrhea; assess nutritional status and refer those with acute malnutrition; and follow up with tuberculosis and HIV patients for treatment adherence counseling. The app suggests targeted behavior change messages for patients and collates inputted data. It enables supervisors to monitor APEs' performance and track supplies; facilitates communication between APE peers and supervisors; and provides automated feedback, motivational messages, and follow-up action lists for APEs. Plans are in place to roll out the app as part of the national mHealth system. By early 2020, the upScale app was being used by 13 percent of Mozambique's APEs, serving 32 percent of the country's population.

**Platform**: CommCare
**Current Number of Users:** 13 percent of Mozambique's APEs

## Type of Service Provider for Which Tool Was Designed (Primary End User)

Different types of users (primary end users) use digital tools to meet varying needs. As mentioned, we focused on digital tools for health service providers. We identified three types of service providers: community-level health workers (community health workers, health extension workers, community health volunteers, health surveillance assistants), facility-level health workers (nurses, midwives, doctors), and their supervisors (Table 2).

**Table 2. Types of Providers Using Digital Tools Reviewed**

| Types of Provider Using Tool | Number of Tools |
|---|---|
| Community-level health workers | 32 |
| Facility-level health workers | 21 |
| Supervisors | 4 |

Twenty-six tools were used by CHWs only; however, many tools are used by multiple end users. We also noted examples of connected applications where health workers at the facility and community levels communicate referrals or counter-referrals or where supervisors use data entered by health workers to monitor nutrition outcomes, health worker use of the tool, and/or health worker performance.

## Example: A Tool for Facility-Based Providers

### The Integrated e-Diagnosis Approach and Its Evolution to the Alliance for eDiagnostic

Terre des hommes (Tdh) and the Burkina Faso Ministry of Health created the Integrated e-Diagnosis Approach (IeDA), a package of digital tools that aim to reduce the mortality rate of children under age 5 in Burkina Faso, Mali, and Niger. The Registre Électronique des Consultations is the mHealth tool that guides nurses during consultations with children under 5 in properly diagnosing and treating children according to the IMCI protocol. IeDA also features an on-the-job eLearning module to improve nurses' knowledge and skills in addition to a data-driven approach to collaborative coaching and supervision. Currently, over 60 percent of health centers in Burkina Faso use IeDA, with over 6 million consultations carried out so far, and the tool is being piloted in Mali and Niger. Recognizing that screening and treatment for acute malnutrition is separate but related to the IMCI workflow, Tdh is working with World Vision and Action Against Hunger to incorporate their CMAM application (see above) into IeDA, which will then become known as the Alliance for eDiagnostic or ALeDIA.

**Platform:** CommCare
**Current Number of Users:** Number not provided, but 60 percent of health centers

## Example: Appropriate Tools for Community Health Volunteers

TulaSalud's Kawok is a mobile tool for community health volunteers (CHVs) who serve rural communities in Alta Verapaz, Guatemala. Features for workflows, decision support, and case management activities support maternal and child health, malaria, and malnutrition care during household visits. **Kawok captures individual and community epidemiological data, which are later sent to health officials at the local, regional, and national levels to enable observation of trends and data-driven decisions to improve community health outcomes.** The application also detects beneficiary risk factors and danger signs, facilitating timely interventions. For severe cases, CHVs can call and consult health professionals with more comprehensive training and credentials, such as nurses. Kawok also has 38 health education videos available in eight Mayan languages on topics ranging from family planning to child malnutrition.

**Platform:** CommCare
**Current Number of Users:** 4,300+

## Example: A Tool That Helps Supervisors Help Health Workers

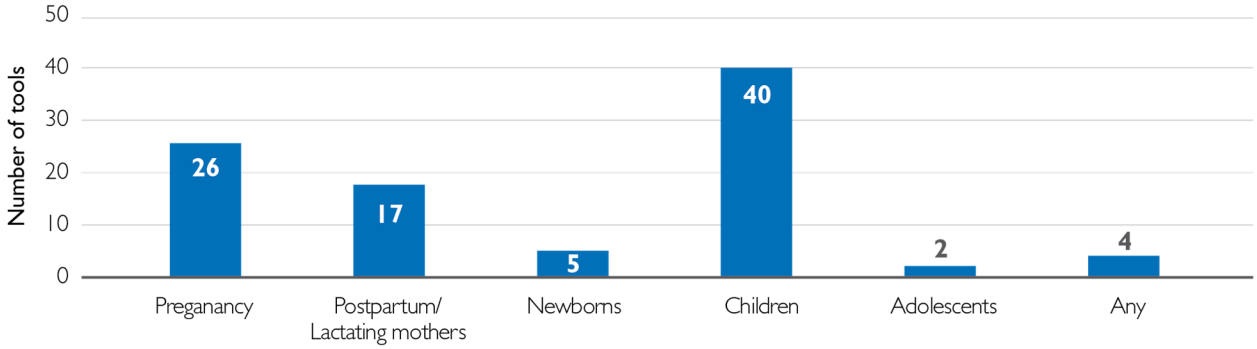
Under USAID's Resiliency in Northern Ghana (RING) Project, the Nutrition Supportive Supervision Tool (Nut_SS) equipped supervisors with a mobile tool to strengthen the quality of supportive supervision provided. The tool improves adherence to supervision protocols and enables real-time scoring and feedback on areas of strength and weakness. There are five supervisory checklists and feedback sections for antenatal care, postnatal care, community-based management of acute malnutrition, growth monitoring and promotion, and supply chain management. When visit observations are completed, supervisors can instantly see the health worker's score by section, and provide feedback and targeted refresher training on the spot.

**Platform:** SurveyCTO
**Current Number of Users:** No longer active

## Type of Client Targeted/Recipient of Nutrition Services

The tools we reviewed helped providers support clients at multiple life stages (see Figure 5). About two-thirds (40) of the tools reviewed were designed to support services for children; 26 were for services for pregnant women, and 17 were for postpartum women, lactating women, and/or mothers of young children. Most tools focused on more than one life stage, however, with four targeting any life stage. This makes sense given that many tools were designed for broad RMNCH or primary health care programs.

**Figure 5. Type of Client Targeted/Recipient of Nutrition Services Supported by Digital Tools Reviewed**




## Digital Systems Deployed

Although the WHO framework includes 25 different types of digital systems, we identified only three types of digital systems deployed for nutrition-related digital health interventions: community-based information systems, electronic medical records, and learning and training systems (Annex 3). Most of these systems are designed to run on mobile phones, though some are Web-based applications that can be accessed on a desktop or laptop computer, or on a mobile device.

## Technology Platform Used

We reviewed which digital platforms were selected most frequently for nutrition services—to understand if Global Goods are being leveraged, and also to see whether decision makers prefer certain platforms for digital nutrition tools. We found that the largest proportion of digital tools for nutrition used Dimagi's CommCare platform (16), a Global Good (see Table 3). Other Global Goods focusing on digital client records were also represented—such as Open-source Smart Register Program (OpenSRP) (6) and Community Health Toolkit (3). The second-most commonly cited technology platform was not a Global Good, however, but a custom-developed application. (Nine tools were listed as running not on any technology platform, but on a custom-developed application.) District Health Information Service 2 (DHIS2), another Global Good, was cited four times, but not all survey entries differentiated between the aggregate form or the case-based, tracker version.

**Table 3. Platforms Used by Digital Tools Reviewed**

| Platform | Number of Tools |
|---|---|
| Commcare | 16 |
| Custom Developed | 3 |
| Web-based | 4 |
| Open SRP | 6 |
| Community Health Toolkit | 3 |
| DHIS2 | 6 |
| Mangologic | 3 |
| SurveyCTO | 2 |
| Magpi | 1 |
| OpenHMIS | 1 |
| OpenMRS | 2 |
| Mobile Technology for Community Health (MOTECH) | 1 |

## Funder

The digital tools we reviewed were most commonly funded by private foundations, companies, or organizations (22 tools), USAID (12), the Bill & Melinda Gates Foundation (9,) or the United Nations Children's Fund (UNICEF) (9) (see Table 4). Host country governments provided funding for 8 of the tools reviewed. In addition, a large number received funding from other private foundations, companies, or organizations (22). It is also important to note that many tools were developed, deployed, and/or tested with funding from more than one source.

**Table 4. Funders of Digital Tools Reviewed**

| Funder | Number of Tools |
|---|---|
| USAID | 12 |
| UK Department for International Development | 4 |
| Bill & Melinda Gates Foundation | 9 |
| WHO | 2 |
| UNICEF | 9 |
| Other donors | 5 |
| Private foundations, companies, or organizations | 22 |
| Host country governments | 8 |

## Scale of Use

Current scale of implementation—defined here as the number of health care providers and their supervisors using the tool—changes quickly, with successful interventions adding users frequently and other tools losing funding or support, with the numbers of users dropping precipitously. For many tools on our list, we could not obtain data on the current number of users. Fifteen tools we reviewed have more than 1,000 users, representing a big shift from the early mHealth pilot days, when pilots and proofs of concept demonstrated usability and feasibility with 10–100 users.

### Example: Digital Health Interventions at Large Scale

The Integrated Child Development Services–Common Application Software (ICDS-CAS) is a nutrition job aid and supervision tool for Anganwadi workers (AWWs) (community health workers who are a part of the Government of India's Integrated Child Development Services program) and their supervisors. The tool, implemented by the Ministry of Women and Child Development, contains eight modules: household management, home visit scheduler, daily nutrition, growth monitoring, take-home rations, due list, Anganwadi management, and monthly progress report. Its features include tracking individual beneficiaries, calculating nutrition status, plotting growth charts, and generating priorities based on crucial time periods during pregnancy and early life. AWW supervisors also have their own application that allows them to assess AWW performance against key performance indicators, and has a checklist for supportive supervision visits.

Supporting more than 649,000 frontline workers and 17,000 supervisors across 28 states and 349 districts in India, ICDS-CAS helps tackle malnutrition by equipping community health workers with a mobile digital solution that improves service delivery and enables effective monitoring, timely interventions, and enhanced decision support. The early success of ICDS-CAS, which tracks 1 in 110 births and 1 in 50 malnourished children in the world, has prompted the Government of India to scale up the program to cover all 36 states and 718 districts in India by 2020. At full scale, ICDS-CAS will cover 1.4 million Anganwadi Centres nationwide and track 1 in 5 of the world's malnourished children.

**Platform:** CommCare
**Current Number of Users:** 649,000

## Local Ownership

It is important to understand the extent to which digital tools for nutrition are integrated into the health system. Many of the tools reviewed are being implemented by nongovernmental organizations, but national governments are increasingly developing digital health strategies and making national-level policy decisions about what digital health tools they will use for various purposes. We had difficulty in determining exactly where a tool fell on this spectrum. Of the 26 tools for which we were able to make a determination, we identified 16 that were considered to be integrated into or owned by the health system. Some countries are developing a single tool for use by an entire community or facility cadre (see example boxes for ICDS-CAS in India, eCHIS in Ethiopia, and Jamii ni Afya in Zanzibar). In other countries, such as Kenya, national governments are setting standards for content and data that must be collected via digital platforms, and allowing local authorities to determine what tool will work best for them in their context. In general, we observed that local ownership of digital health tools, as well as their integration into the national health system, is crucial for achieving the milestones of scale and sustainability necessary for significant health impact. Examples of where and how specific tools meet these key criteria are highlighted below.

### Example: Building a National Community Health Volunteer Program around a Digital Tool

**Jamii ni Afya** is a digital health tool, built on Medic Mobile's Community Health Toolkit (CHT), by and for the national community health volunteer program in Zanzibar, Tanzania. The tool schedules and guides CHVs in providing integrated RMNCH, nutrition, and early childhood development services; it also facilitates client-centered visits for all pregnant women and children in Zanzibar. The digital platform is the foundation of the MOH's CHV program; the two were designed and launched together. The platform includes and guides all the work the CHVs do, and connects them to their health facility–based supervisor and the District Health Management Team. CHT serves as a client tracking and job aid tool for CHVs, with the secondary purpose of collecting data to feed HMIS reporting. Data collected for client visits are automatically synced and aggregated for use in program monitoring and the national information system. Additionally, supervisors at health facilities can monitor CHVs' performance based on indicators. The MOH is leveraging funding from multiple donors to furnish mobile devices to each CHV. By the end of 2020, coverage is expected to reach all 2250 CHVs and 220 supervisors in Zanzibar.

**Platform:** Community Health Toolkit
**Current Number of Users:** 610

### Example: Digitizing Every Household as the Backbone of a Primary Care System

In Ethiopia, the MOH has decided to equip all 40,000 health extension workers (HEWs) with mobile devices, loaded with the Electronic Community Health Information System (eCHIS). The eCHIS is a digital client register, digitizing the complete Family Folder record-keeping system that HEWs use to support the full Health Extension Program for primary health care. As a job aid, the eCHIS includes workflows that support antenatal care, postnatal care, family planning, nutrition, iCCM, and community-based newborn care, and is currently being expanded to tuberculosis and malaria. It also supports referrals to health centers, and includes a supervision model for HEW supervisors. Currently in use at more than 1,200 health posts, the eCHIS has already registered more than 250,000 Ethiopians as clients. The MOH, as developer and designer of this tool, is able to ensure it aligns completely with the Health Extension Program, and will eventually be able to integrate data from the eCHIS into the national HMIS. The MOH seeks to scale up the system for use by all 40,000 HEWs.

**Platform:** CommCare
**Current Number of Users:** 1,250

# Discussion

Our review of these 54 tools revealed the breadth and diversity of digital tools in use to improve nutrition service delivery, and highlighted the range of digital health interventions that these tools are delivering. It also identified a few gaps.

The large majority of tools identified and reviewed for this report are from Africa and, to a lesser extent, Asia. Few are from the Americas or Europe, likely because the search focused on digital health in the context of LMICs. Furthermore, many of those tools being used in Africa and Asia are in use in just a few countries. Though the use of digital tools has grown, the patterns of interventions identified in this review as specifically targeting nutrition seem to indicate that digital tool use has grown in a clustered fashion, and may not be reaching, or barely reaching, some **countries or regions**.

The digital nutrition tools we reviewed primarily seek to address **challenges** in information quality and flow as well as quality of care. They do less—if anything—to address other categories of challenges identified by WHO: availability, acceptability, utilization, efficiency, cost, or accountability. This omission of these other challenges is partly because we limited our scope to tools that targeted providers, and quality and information flow are most directly in health workers' purview. It is difficult to have an impact on acceptability without targeting clients, or on availability without targeting health systems managers. The focus on information and quality also seems consistent with current priorities for nutrition services. Furthermore, since nutrition services are typically bundled with other services, other challenges, such as health worker trainings, are perhaps more likely to be addressed in holistic packages (and therefore would not have been flagged in our nutrition-specific outreach).

Using WHO's classification of **digital health interventions,** the tools we reviewed are for client identification and registration, client health records, decision support, communication, and referral coordination for providers. Significant areas of the provider category of digital health interventions are still insufficiently represented; these include telemedicine, health worker planning and scheduling, health care provider training, prescription and medication management, and laboratory and diagnostics imaging management. These gaps merit further research to determine whether these broader digital health interventions are truly missing, or if tools addressing these areas tend to target the entire health system and therefore were not highlighted in a search for nutrition-specific interventions. For example, we suspect that tools for training providers generally focus on a broader swath of the curriculum for a particular cadre and therefore, perhaps, did not come to mind when we requested submission of nutrition tools. Some digital innovations identified are still in the research and development phase, but may soon become relevant for incorporation into applications for nutrition providers—such as the Severe Acute Malnutrition Photo Diagnosis App (Knowledge Against Hunger, N.D.) and smartphone apps for noninvasive detection of anemia (Mannino et al. 2018).

The digital nutrition tools reviewed are used for a **range of programs and services**—from assessment and growth monitoring to treatment and counseling. They support globally recognized packages including CMAM, GMP, iCCM, IMCI, and MAMI. Based on the information we collected, none of the tools supports providers in the nutritional care of children with feeding difficulties and few target newborns or adolescents or address ECD or WASH.

The tools are also used by country-specific **integrated** health services.

We also considered the **digital systems** used for nutrition services to be appropriate and consistent with the challenges that the tools seek to address. Most tools were deployed on mobile devices, which is appropriate in low-resource settings where power and device access are variable. However, as systems become more integrated and complex, particularly at the facility, providers may require access to a true EMR with more robust decision support, which would require access to laptop or desktop computers. Dimagi's CommCare platform was the **platform** most commonly used for nutrition-related digital interventions. This wide use merits further investigation to see whether features of this platform are better designed for nutrition activities in particular.

That a majority of the tools are being used by community health workers reflects the reality that nutrition services are typically provided at the community level, but reaching community-level cadres with mobile devices, and ensuring adequate training and supervision at scale, involve unique challenges. It also signals the need for these tools to support the linkages between the community and other health services locations—particularly health facilities.

The **client types** for which most of the digital tools reviewed are designed include pregnant woman, children under 2 years old, and PLWHA. This finding aligns with the focus that the nutrition community has placed on the first 1,000 days and the proper dietary intake and good nutritional status of PLWHA.

Yet digital tools hold great potential for reaching and providing services to more clients—adolescents, nonpregnant and nonlactating women, adult men, and the elderly.

It is difficult to obtain an accurate estimate of **scale** for tools reviewed, since the number of active users is constantly changing. Moreover, while the number of users tells us how robust the implementation of the digital system is, it does not indicate how many ultimate beneficiaries—nutrition service clients—are reached by those tools. Clients registered is another metric that could be reviewed to provide more context, as is geographic reach within a country. The number of users is also important to determine in terms of the number of potential users (e.g., 1,000 nurse midwives out of 10,000 nationally is quite different from 1,000 out of 1,500). For ministries of health that have to support all of the country's health workers, tools being used by only a small percentage of providers are much less relevant than those used consistently by all health workers in the country.

Nearly 40 percent of tools reviewed were developed only for the delivery of nutrition services. Though we see this as a positive, as it means that digital health practitioners are paying attention to nutrition, we believe that for the sustainability of digital interventions, it is important to prioritize and **integrate** nutrition into existing systems, services, and digital tools. It will be difficult for country governments to recognize digital tools as the systems of record (supplanting paper-based record-keeping tools) until these tools capture all data elements required for an entire cadre, not just those related to nutrition. This requirement means that integrated tools are more likely to reach scale; integrated large-scale tools are more likely to be fully owned and supported by country governments.

# Conclusions and Recommendations

This review identified many digital tools for strengthening the delivery of nutrition services. We found various tools covering a range of service delivery actions—from assessment and growth monitoring to treatment, counseling, referral, counter-referral, and follow-up. However, we identified some gaps in where and how digital tools have been used.

We also found that, while each country, program, and developer approaches digital health interventions for nutrition slightly differently, the tools have more elements in common than differences. Despite the similarities, however, most of the content of these digital nutrition applications was developed for each context independently, requiring significant initial investment in time and software development resources. Their context-specific nature also makes the tools difficult to reuse elsewhere, as they would require significant adaptation.

Finally, despite the wealth of existing experience represented across these digital health tools, we did not find much in the way of guidance on the design, development, and use of digital tools for nutrition service delivery. Furthermore, more effort is needed to share lessons learned in the successful development and deployment of digital tools for nutrition, guide application owners in updating their tools based on these lessons, and provide resources to ensure that future applications developed adhere to evidence-based guidelines.

To address some of these challenges, we recommend five areas of further work:

1. Deeper dives into the content of selected tools—including specific indicators collected, behaviors promoted, and decision support logic.
2. Exploration of existing tools for counseling on ECD and WASH.
3. Review of the evidence of the acceptability, usability, and/or effectiveness of these tools for improving the quality, completeness, and outcomes of nutrition services.
4. Development of a toolkit and generic digital content for the delivery of nutrition services (e.g., GMP, CMAM, MAMI). Similar to the WHO Accelerator Kits (2019), this toolkit would be based

on both existing successful nutrition content and a distillation of global guidance, and would be presented in a format compatible with digitization (e.g., decision logic tables, data elements, indicator definitions). Such a toolkit would also include reference applications (prototype versions of mobile applications that are generic to country context) to illustrate common nutrition services such as GMP, CMAM, and others.

5. A further landscape analysis of other types of digital tools for nutrition that target clients.

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# Annex 1: Classification of Digital Health Interventions

| Health System Challenges |
|---|
| **I. Information** |
| 1.1 Lack of population denominator |
| 1.2 Delayed reporting of events |
| 1.3 Lack of quality/reliable data |
| 1.4 Communication roadblocks |
| 1.5 Lack of access to information or data |
| 1.6 Insufficient utilization of data and information |
| 1.7 Lack of unique identifier |
| **2. Availability** |
| 2.1 Insufficient supply of commodities |
| 2.2 Insufficient supply of services |
| 2.3 Insufficient supply of equipment |
| 2.4 Insufficient supply of qualified health workers |
| **3. Quality** |
| 3.1 Poor patient experience |
| 3.2 Insufficient health worker competence |
| 3.3 Low quality health commodities |
| 3.4 Low health worker motivation |
| 3.5 Insufficient continuity of care |
| 3.6 Inadequate supportive supervision |
| 3.7 Poor adherence to guidelines |
| **4. Acceptability** |
| 4.1 Lack of alignment with local norms |
| 4.2 Programs which do not address individual beliefs and practices |
| **5. Utilization** |
| 5.1 Low demand for services |
| 5.2 Geographic inaccessibility |
| 5.3 Low adherence to treatments |

| Health System Challenges |
|---|
| 5.4 Loss to follow up |
| **6. Efficiency** |
| 6.1 Inadequate workflow management |
| 6.2 Lack of or inappropriate referrals |
| 6.3 Poor planning and coordination |
| 6.4 Delayed provision of care |
| 6.5 Inadequate access to transportation |
| **7. Cost** |
| 7.1 High cost of manual processes |
| 7.2 Lack of effective resource allocation |
| 7.3 Client-side expenses |
| 7.4 Lack of coordinated payer mechanism |
| **8. Accountability** |
| 8.1 Insufficient patient engagement |
| 8.2 Unaware of service entitlement |
| 8.3 Absence of community feedback mechanisms |
| 8.4 Lack of transparency in commodity transactions |
| 8.5 Poor accountability between the levels of the health sector |

(Source: WHO 2018a)

| Systems Category |
|---|
| **Digital Client Record[1]** |
| A Census, population information & data warehouse* |
| B Civil registration and vital statistics |
| C Client applications |
| D Client communication system |
| E Clinical terminology and classifications* |
| F Community-based information system |
| G Data interchange interoperability and accessibility* |
| H Electronic medical record* |
| I Emergency response system* |
| J Environmental monitoring system* |
| K Facility management information system |
| L Geographic information system (GIS) |
| M Health finance and insurance information system* |

| Systems Category |
| --- |
| N Health management information system (HMIS) |
| O Human resource information system |
| P Identification registries and directories* |
| Q Knowledge management system |
| R Laboratory and diagnostics information system* |
| S Learning and training system |
| T Logistics management information system (LMIS) |
| U Pharmacy information system* |
| V Public health and disease surveillance system* |
| W Research information system |
| X Shared Health Record and health information repositories* |
| Y Telemedicine |

(Source: WHO 2018a)

[1]Digital Client Record is not included in the WHO's Digital Health Systems taxonomy

| Digital Health Interventions for Healthcare Providers |
|---|
| **2.1 Client identification and registration** |
| 2.1.1 Verify client unique identity |
| 2.1.2 Enroll client for health services/clinical care plan |
| 2.2 Client health records |
| 2.2.1 Longitudinal tracking of clients' health status and services |
| 2.2.2 Manage client's structure |
| 2.2.3 Manage client's unstructured clinical records (e.g. notes, images, documents) |
| 2.2.4 Routine health indicator data collection and management |
| **2.3 Healthcare provider decision support** |
| 2.3.1 Provide prompts and alerts based according to protocol |
| 2.3.2 Provide checklist according to protocol |
| 2.3.3 Screen clients by risk or other health status |
| **2.4 Telemedicine** |
| 2.4.1 Consultations between remote client and healthcare provider |
| 2.4.2 Remote monitoring of client health or diagnostic |
| 2.4.3 Transmission of medical data (e.g. images, notes, and videos) to healthcare provider |
| 2.4.4 Consultations for case management between healthcare providers |
| **2.5 Healthcare provider communication** |
| 2.5.1 Communication from healthcare provider(s) to supervisor |
| 2.5.2 Communication and performance feedback to provider(s) |
| 2.5.3 Transmit routine news and workflow notifications to healthcare provider(s) |
| 2.5.4 Transmit non-routine health event alerts to healthcare provider(s) |
| 2.5.5 Peer group for healthcare providers |
| **2.6 Referral coordination** |
| 2.6.1 Coordinate emergency response and transport |
| 2.6.2 Manage referrals between points of service within health sector |
| 2.6.3 Manage referrals between health and other sectors (social services, police, justice, economic support schemes) |
| **2.7 Scheduling and activity planning for healthcare providers** |
| 2.7.1 Schedule client appointments based on clinical care plan |
| 2.7.2 Schedule healthcare provider's activities |

| Digital Health Interventions for Healthcare Providers |
|---|
| **2.8 Healthcare provider training** |
| 2.8.1 Provide training content and reference material to healthcare provider(s) |
| 2.8.2 Assess capacity of healthcare provider(s) |
| **2.9 Prescription and medication management** |
| 2.9.1 Transmit or track prescription orders |
| 2.9.2 Track client's medication consumption |
| 2.9.3 Report adverse drug events |
| **2.10 Laboratory and diagnostics imaging management** |
| 2.10.1 Transmit client diagnostic result to healthcare provider |
| 2.10.2 Transmit and track diagnostic orders |
| 2.10.3 Capture diagnostic results from digital devices |
| 2.10.4 Track biological specimens |

(Source: WHO 2018a)

# Annex 2. Tools Reviewed

See accompanying Excel file.

# Annex 3. Supplementary Tables

| Number of Digital Tools Reviewed by Region of Use (N=53) | | |
|---|---|---|
| **Region** | **Number of Tools** | **Percent of Tools** |
| Global | 2 | 4% |
| Asia | 18 | 34% |
| Central America | 1 | 2% |
| Eastern Europe | 3 | 6% |
| European Union | 0 | 0% |
| Middle East | 0 | 0% |
| North America | 0 | 0% |
| Oceania | 0 | 0% |
| South America | 0 | 0% |
| The Caribbean | 0 | 0% |
| Africa | 33 | 62% |
| *Eastern Africa* | *26* | 49% |
| *Middle Africa* | *4* | 8% |
| *Northern Africa* | *2* | 4% |
| *Southern Africa* | *2* | 4% |
| *Western Africa* | *7* | 13% |

| Health System Challenges Addressed by the Digital Tools Reviewed, per WHO Classification (N=53) | | |
|---|---|---|
| **Health System Challenge Addressed** | **Number of Tools** | **Percent of Tools** |
| 1.1 Lack of population denominator | 1 | 2% |
| 1.2 Delayed reporting of events | 32 | 59% |
| 1.3 Lack of quality/reliable data | 44 | 81% |
| 1.4 Communication roadblocks | 10 | 19% |
| 1.5 Lack of access to information or data | 44 | 81% |
| 1.6 Insufficient utilization of data and information | 27 | 50% |
| 1.7 Lack of unique identifier | 15 | 28% |

| Health System Challenges Addressed by the Digital Tools Reviewed, per WHO Classification (N=53) | | |
|---|---|---|
| **Health System Challenge Addressed** | **Number of Tools** | **Percent of Tools** |
| 2.1 Insufficient supply of commodities | 5 | 9% |
| 2.2 Insufficient supply of services | 1 | 2% |
| 2.3 Insufficient supply of equipment | 0 | 0% |
| 2.4 Insufficient supply of qualified health workers | 2 | 4% |
| 3.1 Poor patient experience | 9 | 17% |
| 3.2 Insufficient health worker competence | 27 | 50% |
| 3.3 Low quality health commodities | 2 | 4% |
| 3.4 Low health worker motivation | 10 | 19% |
| 3.5 Insufficient continuity of care | 27 | 50% |
| 3.6 Inadequate supportive supervision | 19 | 35% |
| 3.7 Poor adherence to guidelines | 26 | 48% |
| 5.1 Low demand for services | 2 | 4% |
| 5.2 Geographic inaccessibility | 1 | 2% |
| 5.3 Low adherence to treatments | 0 | 0% |
| 5.4 Loss to follow up | 2 | 4% |
| 6.1 Inadequate workflow management | 5 | 9% |
| 6.2 Lack of or inappropriate referrals | 9 | 17% |
| 6.3 Poor planning and coordination | 2 | 4% |
| 6.4 Delayed provision of care | 2 | 4% |
| 6.5 Inadequate access to transportation | 1 | 2% |
| 8.1 Insufficient patient engagement | 1 | 2% |
| 8.2 Unaware of service entitlement | 0 | 0% |
| 8.3 Absence of community feedback mechanisms | 1 | 2% |
| 8.4 Lack of transparency in commodity transactions | 0 | 0% |
| 8.5 Poor accountability between the levels of the health sector | 3 | 6% |

| Digital Health Interventions Offered by the Digital Tools Reviewed, per WHO Classification (N=53) | | |
|---|---|---|
| **Digital Health Interventions Offered** | **Number of Tools** | **Percent of Tools** |
| 2.1 Client identification and registration | -- | -- |
| 2.1.1 Verify client unique identity | 25 | 47% |
| 2.1.2 Enroll client for health services/ clinical care plan | 11 | 21% |
| 2.2 Client health records | 48 | 91% |
| 2.2.1 Longitudinal tracking of clients' health status and services | 41 | 77% |
| 2.2.2 Manage client's structure | 7 | 13% |
| 2.2.3 Manage client's unstructured clinical records (e.g. notes, images, documents) | 10 | 19% |
| 2.2.4 Routine health indicator data collection and management | 48 | 91% |
| 2.3 Healthcare provider decision support | 34 | 64% |
| 2.3.1 Provide prompts and alerts based according to protocol | 38 | 72% |
| 2.3.2 Provide checklist according to protocol | 37 | 70% |
| 2.3.3 Screen clients by risk or other health status | 36 | 68% |
| 2.4 Telemedicine | 1 | 2% |
| 2.4.1 Consultations between remote client and healthcare provider | 1 | 2% |
| 2.4.2 Remote monitoring of client health or diagnostic | 1 | 2% |
| 2.4.3 Transmission of medical data (e.g. images, notes, and videos) to healthcare provider | 2 | 4% |
| 2.4.4 Consultations for case management between healthcare providers | 1 | 2% |
| 2.5 Healthcare provider communication | 19 | 36% |
| 2.5.1 Communication from healthcare provider(s) to supervisor | 15 | 28% |
| 2.5.2 Communication and performance feedback to provider(s) | 11 | 21% |
| 2.5.3 Transmit routine news and workflow notifications to healthcare provider(s) | 3 | 6% |
| 2.5.4 Transmit non-routine health event alerts to healthcare provider(s) | 2 | 4% |

| Digital Health Interventions Offered by the Digital Tools Reviewed, per WHO Classification (N=53) | | |
|---|---|---|
| **Digital Health Interventions Offered** | **Number of Tools** | **Percent of Tools** |
| 2.5.5 Peer group for healthcare providers | 4 | 8% |
| 2.6 Referral coordination | 12 | 23% |
| 2.6.1 Coordinate emergency response and transport | 2 | 4% |
| 2.6.2 Manage referrals between points of service within health sector | 12 | 23% |
| 2.6.3 Manage referrals between health and other sectors (social services, police, justice, economic support schemes) | 2 | 4% |
| 2.7 Scheduling and activity planning for healthcare providers | 4 | 8% |
| 2.7.1 Schedule client appointments based on clinical care plan | 3 | 6% |
| 2.7.2 Schedule healthcare provider's activities | 2 | 4% |
| 2.8 Healthcare provider training | 11 | 21% |
| 2.8.1 Provide training content and reference material to healthcare provider(s) | 1 | 2% |
| 2.8.2 Assess capacity of healthcare provider(s) | 11 | 21% |
| 2.9 Prescription and medication management | 1 | 2% |
| 2.9.1 Transmit or track prescription orders | 0 | 0% |
| 2.9.2 Track client's medication consumption | 1 | 2% |
| 2.9.3 Report adverse drug events | 0 | 0% |
| 2.10 Laboratory and diagnostics imaging management | 2 | 4% |
| 2.10.1 Transmit client diagnostic result to healthcare provider | 1 | 2% |
| 2.10.2 Transmit and track diagnostic orders | 1 | 2% |
| 2.10.3 Capture diagnostic results from digital devices | 2 | 4% |
| 2.10.4 Track biological specimens | 1 | 2% |
| 3.1 Human resource management | 2 | 4% |
| 3.1.1 List health workforce cadres and related identification information | 1 | 2% |
| 3.1.2 Monitor performance of healthcare provider(s) | 6 | 11% |
| 3.1.3 Manage registration/ certification of healthcare provider(s) | 0 | 0% |
| 3.1.4 Record training information on healthcare provider(s) | 0 | 0% |
| 3.2 Supply chain management | 1 | 2% |

| Digital Health Interventions Offered by the Digital Tools Reviewed, per WHO Classification (N=53) | | |
|---|---|---|
| **Digital Health Interventions Offered** | **Number of Tools** | **Percent of Tools** |
| 3.2.1 Manage inventory and distribution of health commodities | 1 | 2% |
| 3.2.2 Notify stock levels of health commodities | 1 | 2% |
| 3.2.3 Monitor cold-chain sensitive commodities | 0 | 0% |
| 3.2.4 Register licensed drugs and health commodities | 0 | 0% |
| 3.2.5 Manage procurement of commodities | 1 | 2% |
| 3.2.6 Report counterfeit or substandard drugs by clients | 0 | 0% |
| 3.3 Public health event notification | 0 | 0% |
| 3.3.1 Notification of public health events from point of diagnosis | 0 | 0% |
| 3.4 Civil Registration and Vital Statistics (CRVS) | 1 | 2% |
| 3.4.1 Notify birth event | 1 | 0% |
| 3.4.4 Notify death event | 0 | 0 |
| 3.5 Health financing | 0 | 0% |
| 3.6 Equipment and asset management | 0 | 0% |
| 3.7 Facility management | 0 | 0% |
| 4.1 Data collection, management, and use | 2 | 4% |
| 4.1.1 Non-routine data collection and management | 1 | 2% |
| 4.1.2 Data storage and aggregation | 2 | 4% |
| 4.1.3 Data synthesis and visualizations | 2 | 4% |
| 4.1.4 Automated analysis of data to generate new information or predictions on future events | 0 | 0% |
| 4.2 Data coding | 1 | 2% |
| 4.2.1 Parse unstructured data into structured data | 1 | 2% |
| 4.2.2 Merge, de-duplicate and curate coded datasets or terminologies | 1 | 2% |
| 4.2.3 Classify disease codes and cause of mortality | 0 | 0% |
| 4.3 Location mapping | 2 | 4% |
| 4.3.1 Map location of health facilities/ structures | 0 | 0% |
| 4.3.2 Map location of health event | 0 | 0% |
| 4.3.3 Map location of clients and households | 2 | 4% |

| Digital Health Interventions Offered by the Digital Tools Reviewed, per WHO Classification (N=53) | | |
|---|---|---|
| **Digital Health Interventions Offered** | **Number of Tools** | **Percent of Tools** |
| 4.3.4 Map location of healthcare providers | 0 | 0% |
| 4.4 Data exchange and interoperability | 1 | 2% |
| 4.4.1 Data exchange across systems | 1 | 2% |

| Types of Programs/Service Supported by the Digital Tools Reviewed (N=53) | | |
|---|---|---|
| **Program / Service** | **Number of Tools** | **Percent of Tools** |
| Assessment of nutritional status | 28 | 53% |
| Growth monitoring | 19 | 36% |
| Growth monitoring | 4 | 8% |
| Growth monitoring and promotion (GMP) | 15 | 28% |
| Treatment of sick children | 11 | 21% |
| Sick children (iCCM) | 7 | 13% |
| Sick children (IMCI) | 4 | 8% |
| Promotion / counseling | 28 | 53% |
| IYCF* | 25 | 47% |
| ECD | 2 | 4% |
| WASH | 1 | 2% |
| Maternal nutrition | 7 | 13% |
| Adolescent nutrition | 0 | 0% |
| Distribution of iron/MN | 3 | 13% |
| Distribution of iron/MN to children | 3 | 6% |
| Distribution of iron/MN to women | 0 | 0% |
| Management of malnutrition | 20 | 0% |
| Management of malnutrition (CMAM) | 4 | 8% |
| Management of malnutrition (C-MAMI) | 1 | 2% |
| Management of malnutrition (unspecified) | 15 | 28% |
| Supplementary feeding / distribution of food rations | 4 | 8% |

* IYCF counseling including GMP as well.

| Digital Systems Deployed by the Digital Tools Reviewed (N=53) | | |
|---|---|---|
| **Digital Health System** | **Number of Tools** | **Percent of Tools** |
| Digital Client Record | 38 | 72% |
| A Census, population information & data warehouse* | 0 | 0% |
| B Civil registration and vital statistics | 0 | 0% |
| C Client applications | 0 | 0% |
| D Client communication system | 1 | 2% |
| E Clinical terminology and classifications* | 0 | 0% |
| F Community-based information system | 3 | 6% |
| G Data interchange interoperability and accessibility* | 0 | 0% |
| H Electronic medical record* | 8 | 15% |
| I Emergency response system* | 0 | 0% |
| J Environmental monitoring system* | 0 | 0% |
| K Facility management information system | 0 | 0% |
| L Geographic information system (GIS) | 0 | 0% |
| M Health finance and insurance information system* | 0 | 0% |
| N Health management information system (HMIS) | 2 | 4% |
| O Human resource information system | 0 | 0% |
| P Identification registries and directories* | 0 | 0% |
| Q Knowledge management system | 0 | 0% |
| R Laboratory and diagnostics information system* | 0 | 0% |
| S Learning and training system | 7 | 13% |
| V Public health and disease surveillance system* | 1 | 2% |
| W Research information system | 0 | 0% |
| X Shared Health Record and health information repositories* | 0 | 0% |
| Y Telemedicine | 0 | 0% |
| Other | 5 | 9% |

*Other is a sum of those with only 1 in the table above.

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USAID Advancing Nutrition is the Agency's flagship multi-sectoral nutrition project, addressing the root causes of malnutrition to save lives and enhance long-term health and development.

This document was produced for the U. S. Agency for International Development. It was prepared under the terms of contract 7200AA18C00070 awarded to JSI Research & Training Institute, Inc. The contents are the responsibility of JSI and do not necessarily reflect the views of USAID or the U.S. Government.