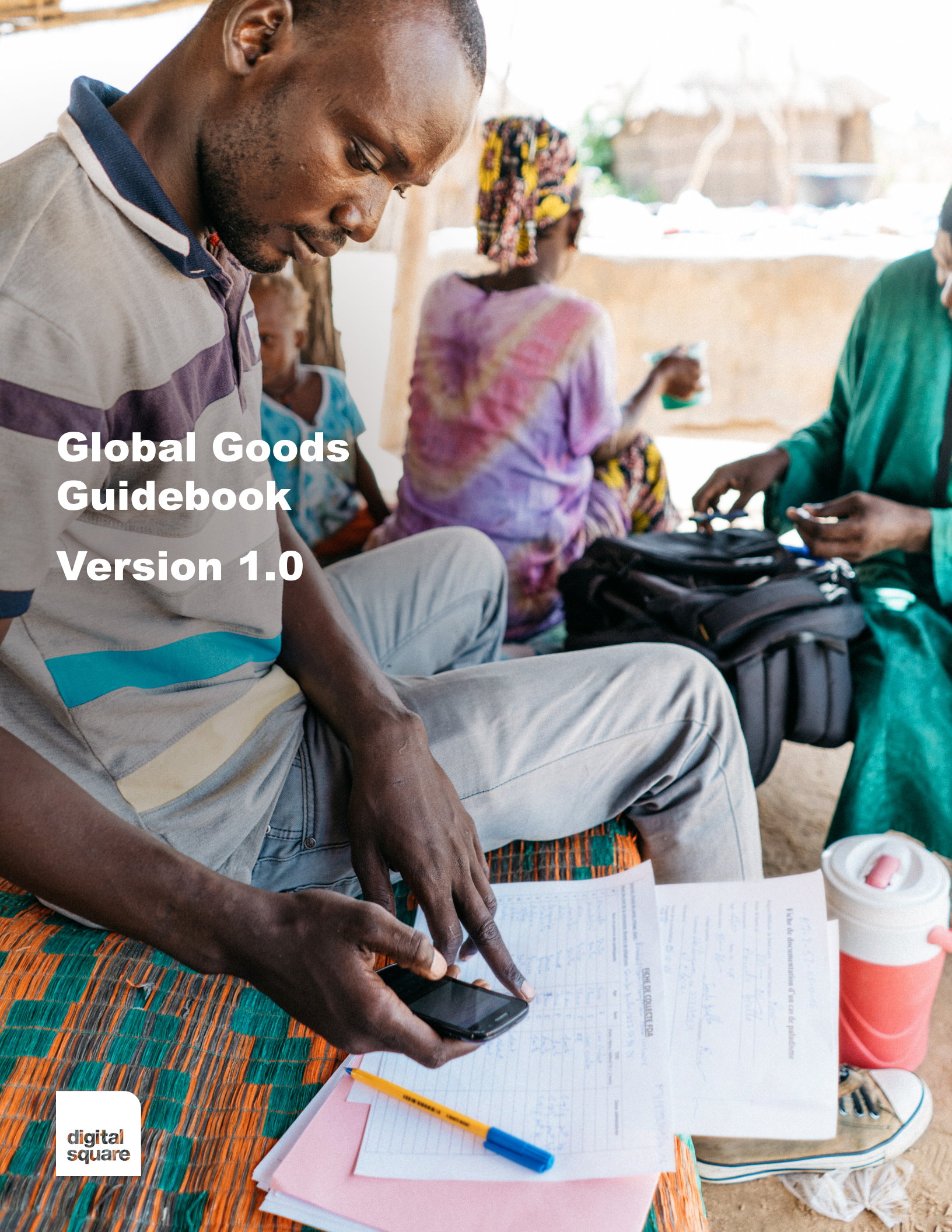

Global Goods Guidebook

Version 1.0

digital square

For more information on Digital Square's philosophy, governance, and how to get involved, please visit our website at www.digitalsquare.org or email digitalsquare@path.org.

For more technical information on Digital Square's global goods, please visit our wiki at www.wikidigitalsquare.io.

Digital Square is a PATH-led initiative, which was initially funded and designed by the United States Agency for International Development and the Bill & Melinda Gates Foundation. Additional funders include Child Relief International Foundation, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ), Last Mile Health, Patrick J. McGovern Foundation, The Rockefeller Foundation, Sall Family Foundation, and Vitol Foundation.

This guidebook is made possible by the support of the American People through the United States Agency for International Development (USAID). The contents of this guidebook are the sole responsibility of PATH or the global good developers as noted within the document, and do not necessarily reflect the views of USAID, the United States Government, or our other funders.

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Cover photo: PATH/Gabe Bienczycki

Endorsements

The Digital Investment Principles describe the need for donors to align around scalable, sustainable, accessible, interoperable, and evidence-based digital health global goods that meet country priorities. Digital health global public goods have an important role to play in moving the global health sector from a past era of digital health donor funding characterized by pilots and other proof-of-concept demonstrations to a future guided by investments in country-led and country-managed digital health strategies and systems that can be independently operated, expanded, and sustained by host governments and local partners over time.

The global health community needs to move away from the current practice of single application solutions to a more strategic approach that acts holistically with both current country priorities and long-term goals for health system strengthening. By better coordinating the development of digital health global goods, such as those presented in this guidebook, stakeholders involved in digital health can reduce duplication and ensure that platforms are not only more aligned with priorities but that they strengthen national systems.

This guidebook is endorsed by:

Bill & Melinda Gates foundation

Federal Ministry for Economic Cooperation and Development

dial Digital Impact Alliance

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

USAID FROM THE AMERICAN PEOPLE

unicef for every child

How to get involved

Through our Open Application Process, Digital Square provides an opportunity for developers to discover new ways that their technologies can work together and create new partnerships; thereby, reducing redundancy and duplication of effort. Digital Square innovates by building on what works. We do this by supporting investments into interoperable, adaptable digital health tools that align with country needs and have the highest potential for success.

If you are interested in making a global good investment, telling us about a global good that has been successful and should be considered for inclusion in this guidebook, or simply learning more, connect with the Digital Square team at digitalsquare@path.org.

This guidebook was funded by the United States Agency for International Development and the Bill & Melinda Gates Foundation.

Table of Contents

This table of contents is arranged by the World Health Organization's Classification of Digital Health Interventions v1.0 system categories.

Introduction

Digital Square is committed to supporting adaptable digital health tools that can be used across different countries and contexts. These tools, or global goods, matter because they cut down on fragmentation and duplication, accelerate scale and health impact, thereby saving lives and improving the health of people around the world.

There are three types of global goods:

- **Software**—A software tool that is free, open source, and used to manage, analyze, or transmit health-related data, with proven utility in several settings.
- **Services**—A software as a service (SaaS) tool that is used to manage, transmit, or analyze health-related data. These tools can be freely accessed and adheres to open data principles.
- **Content**—A resource, toolkit, or data standard that is available under an open license and that is used to improve or analyze health data management processes.

This guidebook is a living document and will be updated regularly. For this inaugural edition (version 1.0), we have focused on software global goods that are approved for investments through Digital Square. The Health Data Collaborative Digital Health & Interoperability Working Group will help develop eligibility criteria for future versions of the guidebook to increase its comprehensiveness.

The information in this guidebook has been provided by the global goods developers and has not been validated by Digital Square for accuracy.

Overview

What are global goods?

Global goods are digital software health tools that are adaptable to different countries and contexts to help address key health system challenges. Mature digital health global good software is free and open source software, supported by a strong community, funded by multiple sources, and designed to be interoperable. It has been deployed at significant scale, used across multiple countries over an extended period of time, and demonstrated effectiveness. Global good software takes many shapes and forms, often works in conjunction with other global good software, and can fulfill many of the technology needs of a health system. Many of these characteristics are drawn from the Principles of Digital Development.

This guidebook describes emergent and established software global goods that have been successfully implemented to address various health system challenges. The global goods in this guidebook are classified across several dimensions including:

Global scale:
Emergent | Established

Tool type:
Applications | Infrastructure

Global scale

- An **emergent** global good is a digital health tool that is a good candidate for multi-national deployment. It may require additional investment to adapt to individual country's needs and priorities.
- An **established** global good is a digital health tool that has already been deployed in multiple countries and is readily adaptable to a country's context without significant software developer support.

Tool type

- An **application** component is a digital health tool that is primarily is designed for use by clients of the health system or by health workers.[1]
- An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

What can global goods do?

Digital health global goods are solutions that can be used across different health program verticals—for example, a global good used for HIV case management can also be used to help manage cases of malaria or tuberculosis. Global goods in digital health are not limited to just clinical information systems. Rather, there are global goods that have been tailored to the needs of different business domains within the health system such as health information systems, supply chain, program monitoring and evaluation, disease surveillance, and health insurance. Developed by the World Health Organization (WHO), the Classification of Digital Health Interventions v1.0 is a standardized vocabulary used to describe and compare digital health global goods in terms of digital health interventions and system categories.

A digital health intervention represents a discrete functionality of a digital technology to achieve health sector objectives. These interventions are intended for different users of digital health tools including health workers, clients or beneficiaries, health system and resource managers, and data analysts. Examples of digital health interventions include "Transmit targeted alerts and reminders to client(s)" and "Manage referrals between points of service within health sector."[2]

System categories represent the types of information and communication technologies applications and systems designed to deliver one or more digital health interventions. Examples of system categories include Logistics Management Information Systems (LMIS) and Electronic Medical Records (EMR).

[1] The term "health workers" is not limited to solely clinical service providers but applies to all people engaged in actions whose primary intent is to enhance health. https://www.who.int/whr/2006/06_chap1_en.pdf.

[2] World Health Organization website, https://www.who.int/reproductivehealth/publications/mhealth/classification-digital-health-interventions/en/. Accessed April 3, 2019.

How do I select global goods?

This guidebook serves as a reference to a number of digital health global goods that can be used to address health system challenges. It is arranged by the system categories of the World Health Organization's Classification of Digital Health Interventions v1.0.

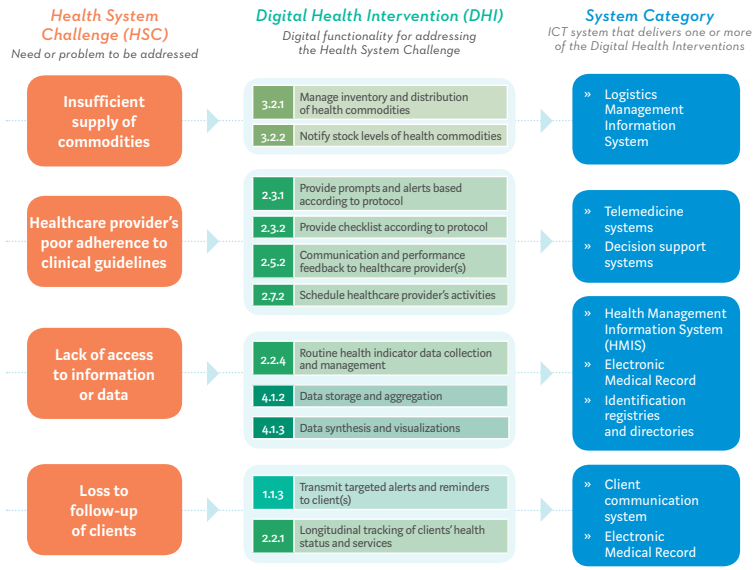
Use the Classification to determine priority health system challenges and the digital health intervention or digital functionality best suited to address it given the local context. Use the system category to locate the appropriate tool in the guidebook's table of contents.

Why should I use global goods?

Since global goods are open source tools, there are many benefits to their use:

- Many developers contribute to a global good; therefore, vendor lock-in, a situation in which customers are unable to switch developers without a substantial cost, can be avoided.
- Source code is freely available and modifiable so there are more opportunities for collaboration across organizations and health programs areas.
- The cost of new feature development and software maintenance is shared across users and supporters of global goods, so resources can be focused on adaptation and implementation.
- Software development best practices in requirements gathering and user acceptance testing, have already been undertaken, and so resources can be focused elsewhere.

Examples of linkages across health system challenges, digital health interventions, and system categories.



Source: WHO Classification of Digital Health Interventions v1.0.

Examples of global health organizations, normative agencies, and investors calling for greater collaboration in the digital health ecosystem.

"Create funding mechanisms and models that enable co-funding and both build and sustain digital health commons."

USAID–Fighting Ebola with Information, 2016

USAID FROM THE AMERICAN PEOPLE

"Support interoperability of digital technologies for health by ... the use of international and open standards as an affordable, effective, and easily adaptable solution."

WHO Resolution–2017 A71/A/CONF./1

World Health Organization

"Transition investments toward global public goods that build national health systems."

National Academies of Science, Engineering, and Medicine, May 2017

The National Academies of SCIENCES ENGINEERING MEDICINE

"Ecosystem collaboration is needed to address current fragmentation and create a holistic digital health model."

GSMA–Scaling Digital Health in Developing Markets, June 2017

GSMA

Interoperability allows global goods to provide additional benefits including:

- Improved data analysis and synthesis.
- Support for continuity of care as clients engage at point of service across the healthcare system.
- Reduced collection costs for data acquisition and management.

Many of the global goods represented in this guidebook already support interoperability standards, in particular those identified in the OpenHIE architecture included in the Appendix.

What is the price of a global good?

Global goods are open source solutions; therefore, there is no cost to access the code for the global good. There is always a cost in deploying an information system or digital health intervention. These costs may include the procurement of services to configure, extend, or model the tool within its existing architecture. As digital health tools are deployed as part of a national health information system, there may also be costs associated with aligning the tool to existing and emerging policies and strategies.

How do I implement global goods?

Global good implementation differs from that of commercial or proprietary software, as there are often different organizations responsible for

development and implementation. An implementation services provider will generally guide you through several considerations such as:

- **Where should the software be deployed?** Software can be deployed from a virtual server, the cloud, or on-site at a national data center or ministry of health server. This decision may be influenced by legislation and policy, capital and recurrent costs, and connectivity. Review legislation or policies that may limit choices, weigh the capital costs (e.g., server hardware) versus the recurrent costs (e.g., monthly cloud service hosting charges) to determine which model is most cost-effective, and consider whether there is sufficient electricity or network connectivity to deploy centrally or if locally-deployed servers are needed.
- **What size computer servers are needed?** You can determine the size based on the expected load of the deployment, including the estimated number of concurrent users, system-managed data, and network traffic.
- **How will software users obtain technical support?** Open source tools (and some proprietary ones) may not have a dedicated help desk team providing technical support; therefore, consider how to provide technical support in your intervention design. One approach is to deploy a help desk. This is often a two-tiered model with the first tier consisting of help desk representatives who serve as the primary points of contact for users. These representatives generally handle bug reports, identify appropriate training materials, and help with administrative tasks such as password resets. They will elevate higher-level technical support concerns to the second tier of representatives at the implementer or developer's office.
- **What adaptations does the software need?** Digital health software tools should be adapted to meet the needs of a particular context. The implementation service provider can assist with a requirements gathering process to understand the users' needs and necessary customizations.
- **Are software developers needed?** A global good may require additional software development depending on the complexity of local requirements and requested modifications. More established global goods have a marketplace of regional developers and consulting firms. They can be hired to provide these types of services. For less established global goods, consider filling this role internally or sourcing a local information and communications technology (ICT) partner.

How do I use this guide?

The following pages describe how this guidebook can be used by people with varying levels of experience and roles.

- **Novice:** A person who is new to digital health and is interested in learning more about digital health tools planning or supporting a digital health intervention.
- **Designer:** A person who is working on a national health information system and wants to learn about digital health tools before strategies and priorities.

- **Evaluator:** A person who is reviewing one or more proposals for a digital health intervention and wants to learn about planning investments in digital health.
- **Integrator:** A person who is looking to bring several sources of health information together and wants to learn best practices in digital health deployment and sustainability.

Each role lists a number of useful resources. This list is not exhaustive and will be updated with each new publication of the guidebook.

Novice

Questions	Resources
I'm not familiar with many of the terms in the guidebook. Where can I find definitions for common digital health terminology?	The AeHIN Terminology Guide has definitions for common digital health terminology. Use this resource to look up unfamiliar terms in this guidebook.
Where can I learn more about a digital health tool deployed in a country?	In this guidebook, each global good entry has a geographic reach section. Review the list of countries where the tool has been deployed. A WHO global technology registry platform, the Digital Health Atlas aims to strengthen the value and impact of digital health interventions, improve coordination, and facilitate institutionalization and scale. Use the Digital Health Atlas to review and catalog a country's implemented digital health tools.
Where can I find an overview of digital health?	MEASURE Evaluation, working collaboratively with the Global Evaluation and Monitoring Network for Health (GEMNet-Health), developed a free, short course for health information system professionals, the Health Informatics for Low- and Middle-Income Countries course. Take this course to become familiar with the most commonly found concerns and tools in digital health.
I'm planning a digital health intervention. What are the key considerations that I should know?	K4Health created a mHealth Planning Guide that includes resources for planning digital health interventions. Read the guide to understand key considerations.

Designer

Questions	Resources
What types of tools are available to help address health system challenge?	The WHO Classification of Digital Health Interventions v1.0 categorizes the different ways in which digital and mobile technologies are being used to support health system needs. Locate the digital health intervention that corresponds to the health system challenge and select the system category that delivers the digital health intervention. In this guidebook, find the tools relevant to the system category and discover which tools can support the intervention. MEASURE Evaluation's Health Information Systems Strengthening Resource Center includes many national health information system strategy plans. Find a country's strategic plan and learn how it is addressing health system challenges. Overseen by the WHO, the Digital Health Atlas is a global technology registry platform. Use the Atlas to identify a country's digital health tools.
How do I scale a digital health intervention?	The WHO MAPS Toolkit details the various stages of scaling a digital health intervention. Review the toolkit to learn how to scale a digital health intervention. Use this guidebook to see which, if any, global goods already have evidence of national scale implementations for the relevant system category.
How do I monitor health impact and estimate costs?	The Asian Development Bank's Digital Health Impact Framework provides a structure for monitoring the impact of digital health interventions. This guidebook provides information on software tools. When making cost estimates of the tools in this guidebook, consider the hardware and human resource costs of using free and open source tools and look at the pricing models for those tools that are also offered as a service.
How do I ensure my intervention is sustainable?	Released by the Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung (BMZ), the Digital Health Ecosystem for African Countries provides an action-oriented framework for digital infrastructure and services based on a well-founded health policy context. Use this framework to ensure interventions are sustainable.

Evaluator

Questions	Resources
How do I know if a proposed solution is right for my context?	Developed by the USAID Maternal and Child Survival Program and partners, The Digital Health Investment Review Tool provides high-level guidance based on widely accepted best practices. Use the tool to support strategic investments in the use of digital technologies.
How can I ensure that a digital health intervention maximizes impact?	The Asian Development Bank has released the publication, Guidance for Investing in Digital Health designed to help governments consider the interests of all stakeholders when planning investments in digital health. It includes a digital health impact framework. Use the guidance and accompanying digital health impact framework to assess cost, benefit, and timescales.

Integrator

Questions	Resources
How does my digital health intervention fit within a national strategy?	Developed by the WHO and International Telecommunications Union (ITU), the National eHealth Strategy Toolkit helps align digital health interventions with a national health strategy. Additionally, MEASURE Evaluation has collected a catalogue of national health information strategies. Search the catalogue to find a specific national strategy.
How do I determine an appropriate architecture for bringing systems together?	MEASURE Evaluation Interoperability Maturity Model identifies the major components of health information system interoperability. Use the maturity model and accompanying Toolkit to identify an appropriate architecture for bringing systems together.
How do I know if a solution is interoperable?	All of the global goods in this guidebook are interoperable. Read the interoperability section in each entry to learn more. The appendix includes an overview of the interoperability OpenHIE architectural framework. Study the framework to understand the extent to which systems and devices can exchange and interpret shared data. Review the Digital Health Atlas for details on specific digital health interventions. Integrating the Health Enterprise (IHE) provides conformance testing for its interoperability profiles and has a product registry of tools and technologies that have undergone conformance testing against its status.

Civil Registration and Vital Statistics • B

OpenCRVS

Summary

OpenCRVS is an open source software product that supports civil registration (CR) and vital statistics (VS) services in low-resource countries and is interoperable with other systems.

Health Verticals and Applications

The OpenCRVS team, led by Plan International, is producing an open source and rights-based civil registration system that will streamline the registration of births, deaths, marriages, and divorces; monitor operational performance; and integrate data from multiple systems. The prototype will showcase how data from the health care sector, such as immunization data, can trigger a birth notification within OpenCRVS and then track how these data are used throughout the CR processes, resulting in the production of a birth certificate for the newborn child. The prototype will also demonstrate interactions with other systems, such as a mobile money app for birth certificate fee payment and a short message service app for sending a text message to notify a mother when her child's birth certificate is ready to be collected.

An important feature of OpenCRVS is the data-driven management dashboard where CR managers can view key performance indicators, such as registration coverage rates per district and time taken between birth registration and the collection of the birth certificate. The prototype will also demonstrate how aggregated data from CR services can be easily accessed by national VS agencies to produce accurate and timely VS.

Interoperability

OpenCRVS is designed to be interoperable and uses the OpenHIM interoperability layer to enable standards-based data exchange.

Geographic Reach

Bangladesh, South Africa, United Kingdom.

Resources

Website
www.opencrvs.org

Contact Information
Edward Duffus, Edward.duffus@plan-international.org

Source Code
link forthcoming

Global scale:

Emergent | Established

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Civil Registration and Vital Statistics • B

Clinical Terminology and Classifications • E

Open Concept Lab

Summary

The Open Concept Lab (OCL) consists of an open source terminology management system (distributed under MPLv2 with a health care disclaimer) to help collaboratively manage, publish, and use metadata in the cloud alongside the global community. Imagine GitHub for indicators, terminology, and metadata—a one-stop shop to access international standards, create and publish your own definitions, or browse country and global indicators with mappings to the diagnoses, procedures, and other data definitions used to calculate them.

Health Verticals and Applications

With investment, OCL will directly facilitate:

- Digital publication of high-priority nationally endorsed health information standards mapped to international reference vocabularies. Early endorsed standards typically include Health Management Information System indicators, disease classifications, drugs and supplies lists, and insurance claims.
- Modeling and publication of data element definitions from data collection instruments used within the health system mapped to international reference vocabularies.
- Harmonization and reconciliation of data collection and reporting requirements across programs, partners, and tools facilitated by an electronic tool that highlights duplicates and close matches.
- Providing an electronic service for management, publication, and distribution of information standards to the health system in a variety of formats. This allows for expansion into other domains.
- Making published information standards available as a foundational service within a national digital health architecture, allowing for integrations and metadata subscriptions.

Interoperability

OCL currently consists of an application programming interface core that can stand alone and a thin web user interface to simplify access. OCL has also implemented OpenHIM to support custom presentations and synchronization of metadata between information systems. OCL is cloud hosted on the Jetstream environment, provided by OpenMRS and Regenstrief Institute.

Geographic Reach

Ethiopia.

Resources

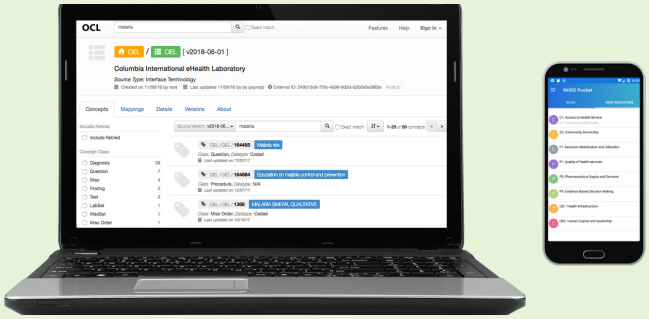
Website
https://openconceptlab.org/

Wiki
https://github.com/OpenConceptLab/oclapi/wiki

Contact Information
Jonathan Payne, paynejd@gmail.com

Source Code
https://github.com/OpenConceptLab

OCL



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System categories: Clinical Terminology and Classifications • E

Community-Based Information System • F

CommCare

Summary

CommCare is an offline-capable mobile data collection and service delivery platform designed for everything from simple surveys to comprehensive longitudinal data tracking. A straightforward application builder allows for easy digitization of surveys and forms, as well as the integration of decision support, notifications, and SMS (short message service, or text) messaging. Programs can be scaled from the community to the national level, thanks to simple device deployment and translation features.

Health Verticals and Applications

CommCare has been used across most verticals, from child health, nutrition, and maternal and newborn health to Ebola response, HIV/AIDS prevention and treatment, tuberculosis, and more. It is also employed by all levels of the supply chain, from nationwide health care administration to community health care worker and beneficiary-level deployments.

Interoperability

Dimagi's MOTECH is a CommCare-based interface that supports the integration of scalable mobile services and health information systems. MOTECH implements the OpenHIE standards, which are emerging as the global standards for interoperability of health information systems and registries. MOTECH is designed to enable integration with a set of self-service features, enabling the sharing of data between systems to be configured without software developers or code changes. MOTECH supports integration with DHIS2 and OpenMRS.

Geographic Reach

Afghanistan, Algeria, Angola, Bangladesh, Belize, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cambodia, Cameroon, Canada, Chad, Chile, Colombia, Costa Rica, Côte d'Ivoire, Democratic Republic of the Congo, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, France, Ghana, Greece, Grenada, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, India, Indonesia, Iraq, Jordan, Kenya, Laos, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Malaysia, Mali, Mauritius, Mexico, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, People's Republic of China, Peru, Philippines, Republic of Korea, Rwanda, Senegal, Sierra Leone, South Africa, South Sudan, Spain, Sri Lanka, Sudan, Swaziland, Syria, Tanzania, Thailand, The Gambia, Timor-Leste, Togo, Turkey, Uganda, Ukraine, United Kingdom, United States, Vanuatu, Vietnam, Zambia, Zimbabwe.

Resources

Product Summary Page
https://dimagi.com/commcare/

Product Login Page
https://www.commcarehq.org/

Quick Start Guides
https://dimagi.com/quick-start/

Product Support Pages
https://confluence.dimagi.com/display/commcarepublic/Home

Evidence Base
https://www.dimagi.com/toolkits/commcare-evidence-base/

Case Studies
https://www.dimagi.com/case-studies/

CommCare Onboarding Series
https://www.youtube.com/watch?v=ng4zGf1PGxM

CommCare Key Features Series
https://www.youtube.com/watch?v=wpQ-Xm2liKs

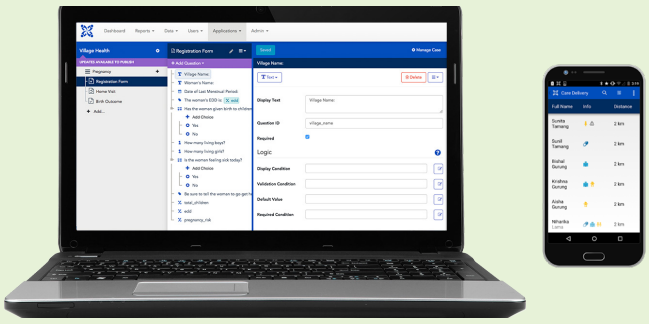
CommCare Webinars
https://www.youtube.com/watch?v=h3Xig1kEoCw

CommCare in Action
https://www.youtube.com/watch?v=oJOSYmPJ528

Contact Information
info@dimagi.com

Source Code
https://github.com/dimagi/commcare-hq

CommCare



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System categories: Community-Based Information System • F

Community-Based Information System • F

Community Health Toolkit

Summary

The Community Health Toolkit (CHT) is a collection of open source technologies, open access design, technical and implementer resources, and a forum for our community of practice. It is designed to support community health systems and community health teams delivering care in the hardest-to-reach communities. The CHT is being co-created by the community as an open-source project. Medic Mobile, a US 501(c)(3) public charity incorporated in the United States, serves as the technical lead and initial steward for the Community Health Toolkit—the organization contributes opensource code, design resources, documentation, and other assets, and it also facilitates contributions from others.

Health Verticals and Applications

The CHT supports an exceptional range of features and health service areas, including comprehensive reproductive, maternal, newborn, and child health services; early childhood development; HIV and tuberculosis services; voluntary medical male circumcision; noncommunicable diseases; and more. The community health application framework supports this range of interventions through five highly configurable areas of functionality: messaging, task and schedule management, decision support workflows, longitudinal person profiles, and analytics. The software supports community health workers and community health teams as they deliver care in reimagined health systems—where care begins at home, services are delivered through proactive visits, and health workers are supported with offline-first algorithms, connections to health facility teams, and data-driven performance management.

Interoperability

The Community Health Toolkit is designed for community health systems that improve the quality, coverage, speed, and equity of primary health care. Given this mandate, building community health apps that share data with the broader digital health ecosystem is a powerful opportunity to integrate care from the patient doorstep to frontline facilities and beyond. Specifically, the software is designed to complement stand-alone apps that run on the health workers' phones and to support more complex backend integrations through a REST API and using OpenHIE standards. Through the Community Health Toolkit, Medic Mobile and partners are releasing documentation about how they have supported integrations with biometrics tools, a computer vision app that reads rapid diagnostic tests, health records systems (e.g., OpenMRS), and health information management systems (e.g., DHIS2).

Geographic Reach

Contributions from many countries, including Kenya, Nepal, and the United States.

Resources

Community Health Toolkit Project Site
https://communityhealthtoolkit.org/

Community Health Toolkit FAQs
https://communityhealthtoolkit.org/faqs/

Features and Demo Access
https://communityhealthtoolkit.org/features/

Community Health Toolkit YouTube Channel
https://www.youtube.com/channel/UC181IppaxJy9MhnIGkcUpKg

CHT Introduction Video
https://www.youtube.com/watch?v=7_2hL7VxuRA

Demo Video
https://www.youtube.com/watch?v=fKvgWEaaAGA

Community Health Application Framework GitHub
https://github.com/medic/medic-webapp

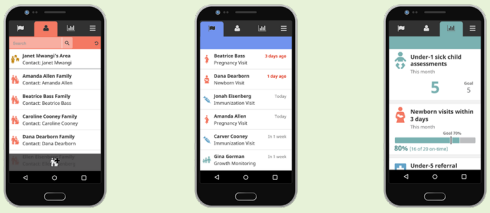
Medic Mobile Blog
https://medicmobile.org/blog

Contact Information
Josh Nesbit, CEO of Medic Mobile
josh@medicmobile.org

Jacqueline Edwards, COO of Medic Mobile
jacqueline@medicmobile.org

CHT Information Desk
cht-info@medicmobile.org

CHT



Global scale:

Emergent | **Established**

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

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System categories: Community-Based Information System • F

Data Interchange Interoperability and Accessibility • G

OpenHIM

Summary

The Open Health Information Mediator (OpenHIM) is an open source middleware component designed to ease interoperability between disparate information systems. It provides secure communications and data governance as well as support for routing, orchestrating, and translating requests as they flow between systems.

Health Verticals and Applications

Some examples of common workflows that the OpenHIM can support are:

- Saving a patient's clinical encounter to a shared health record so that authorized health care providers are able to access key clinical data that can inform better care.
- Retrieving relevant information about patient encounters and care plans for authorized health care providers.
- Receiving aggregate reporting information from a client system and sending this to an aggregate datastore.
- Managing health facilities.
- Managing patient demographics and identity to allow the tracking of a patient's activity within and between health care organizations and across the continuum of care.

Interoperability

The OpenHIM is a tool of choice for a range of partners when looking for options to better facilitate data exchange within their scope of work. The OpenHIM was implemented to support the exchange of information (for example, health worker information) during the Ebola outbreak in Liberia and has become a core component of the mHero solution. In Zimbabwe, it has been used by teams to facilitate data exchange for nurse and health worker management between systems. In Tanzania, it has been used to support birth and immunization data exchange. And in South Africa, the OpenHIM has been used to manage aggregate data exchange as well as laboratory results data push into point-of-care systems (Tier.Net)—facilitating data exchange between services for local health insurance companies and the importing of data from research databases into a perioperative health record for the patient.

Geographic Reach

Rwanda, South Africa.

Resources

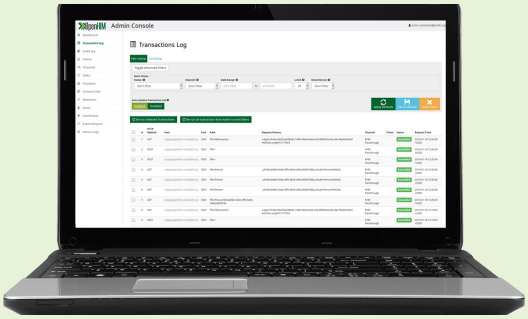
OpenHIM Website
http://openhim.org/#about

Documentation
https://openhim.readthedocs.io/en/latest/

Contact Information
Daniel Futerman, daniel.futerman@jembi.org

Source Code
https://github.com/jembi/openhim-core-js

OpenHIM



Global scale:

Emergent | Established

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Data Interchange Interoperability and Accessibility • G

Electronic Medical Records • H

Bahmni

Summary

Bahmni is an easy-to-use hospital information system and electronic medical record (EMR) system developed in the global south to meet the needs of low-resource environments. Bahmni is a distribution of the OpenMRS medical record platform, with a user interface built from the ground up. It also supports Odoo (formerly OpenERP), OpenELIS, and dcm4chee, providing an integrated, robust solution that manages patient information in a flexible fashion throughout the care cycle, including registration, various points of care, investigations, laboratory orders and results management, picture archiving and communication systems, and billing.

Health Verticals and Applications

Primary care, tuberculosis, HIV, multidrug-resistant tuberculosis, reconstructive surgery, neurosurgical care, community health.

Interoperability

In a health information exchange (HIE) architecture, Bahmni can run at many hospitals and clinics (or in the cloud, accessed by community health workers, or in a vertical program). These installations are integrated via the HIE, sharing data via the master patient index and shared health record. Bahmni can also synchronize data from the various registries (terminology, facility, provider). An example is in Bangladesh, where Bahmni serves as the reference client application demonstrate integration with the Shared Health HIE.

Geographic Reach

Armenia, Bangladesh, Belarus, Cambodia, Cameroon, Ethiopia, Georgia, Haiti, India, Indonesia, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lesotho, Myanmar, Nepal, Pakistan, Papua New Guinea, Peru, Philippines, Sierra Leone, South Africa, Tanzania, Uganda, Zambia.

Resources

Website
https://www.bahmni.org/

Blog
https://medium.com/bahmni-blog

Demo
https://bahmni.atlassian.net/wiki/x/CwGyAw

GitHub
https://github.com/bahmni

Wiki
https://bahmni.atlassian.net/wiki/spaces/BAH/overview

Feature Guide
https://bahmni.atlassian.net/wiki/x/F4DxAQ

Implementers Guide
https://bahmni.atlassian.net/wiki/x/CYAk

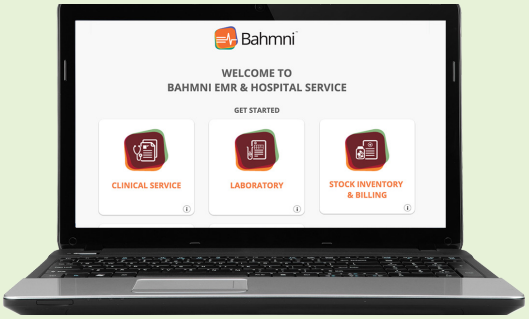
User Guide
https://bahmni.atlassian.net/wiki/x/AoDoAQ

YouTube
https://www.youtube.com/channel/UC6hTFy77jJ0dxhKeiA-Uy3A

Contact Information
contact@bahmni.org

Source Code
https://github.com/bahmni

Bahmni™



Global scale:

Emergent | Established

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Tool type:

Applications | Infrastructure

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System categories: Electronic Medical Records • H

Electronic Medical Records • H

OpenMRS

Summary

OpenMRS is a software platform and a reference application that enables design of a customized medical records system (MRS). It is a common platform upon which health informatics and eHealth efforts in low-income countries can be built. The system is based on a conceptual database structure that is not dependent on the actual types of medical information required to be collected or on particular data collection forms and so can be customized for different uses.

OpenMRS is based on the principle that information should be stored in a way that makes it easy to summarize and analyze (i.e., minimal use of free text and maximum use of coded information). At its core is a concept dictionary that stores all diagnoses, tests, procedures, drugs, and other general questions and potential answers.

Health Verticals and Applications

Primary health care; HIV/AIDS care and treatment; tuberculosis and extremely drug-resistant tuberculosis; noncommunicable diseases and chronic diseases (e.g., hypertension, diabetes, chronic lung disease, epilepsy, and heart failure/cardiovascular disease); maternal, newborn, and child health; mental health; nutrition services; disease outbreak response (e.g., Ebola); emergency triage; post-surgery notes; oncology and chemotherapy; radiology orders and results; pathology specimen tracking.

Interoperability

OpenMRS is a reference tool used for the shared health record component of OpenHIE and as the source for individual-level clinical data from visits and encounters. A shared health record (SHR) facilitates the sharing of clinical information between the health information system to enable better patient care, thus improving health outcomes. The SHR is a means of allowing different services to share health data stored in a centralized data repository. It contains a subset of normalized patient data from various systems such as the electronic medical record, laboratory information system, and more. This record is queried and updated between the different institutions and systems that are authorized to do so. An SHR is distinct from a data warehouse; it is an operational, real-time transactional data source.

Geographic Reach

The OpenMRS system works in more than 3,000 medical sites for about 8.7 million patients in more than 64 countries.

Albania, Argentina, Armenia, Australia, Bangladesh, Belarus, Bhutan, Bolivia, Botswana, Brazil, Burundi, Cambodia, Cameroon,* Chile, Colombia, Democratic Republic of the Congo, Ecuador, Ethiopia, The Gambia, Georgia, Ghana, Haiti, Honduras, Hungary, India, Indonesia, Israel, Japan, Jordan, Kazakhstan, Kenya,* Kiribati, Kyrgyzstan, Laos, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Mali, Mexico, Mozambique,* Myanmar, Nepal, Nicaragua, Nigeria,* Norway, Pakistan, Peru, Philippines, Rwanda, Senegal, Sierra Leone, South Africa, Spain, Sri Lanka, Tajikistan, Tanzania, Uganda,* Ukraine, United States, Vietnam, and Zimbabwe.

**Denotes OpenMRS has been selected by the Ministry of Health as the national electronic medical record for clinical care, either broadly or for a vertical system.*

Resources

OpenMRS Website
https://openmrs.org

Atlas - Map of Places Where OpenMRS is Used
https://atlas.openmrs.org

Talk - Our Discussion Forum
https://talk.openmrs.org

Wiki - About Our Software and Community
https://wiki.openmrs.org

Demo
https://openmrs.org/demo/

OpenMRS Brochure
https://github.com/hannahkleyn/openmrs-contrib-brochure/blob/master/OpenMRS_Brochure.pdf?raw=true

OpenMRS Case Studies
https://openmrs.org/category/case-studies/

Introducing the Open Medical Records Systems Project (OpenMRS) - YouTube Presentation
https://www.youtube.com/watch?v=qCazfU6kPyA

OpenMRS Guide for the New and Curious
https://wiki.openmrs.org/display/docs/Guide+for+the+New+and+the+Curious

Contact Information
Paul Biondich, Executive Director
paul@openmrs.org

Source Code
https://github.com/openmrs/

OpenMRS
MEDICAL RECORD SYSTEM

Global scale:

Emergent | **Established**

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Electronic Medical Records • H

Electronic Medical Records • H

OpenSRP

Summary

Open Smart Register Platform (OpenSRP) is an open source mobile health platform to empower frontline health workers and simultaneously provide program managers and policymakers with current data for decision-making and policymaking.

Health Verticals and Applications

Due to its functionally modular and technologically adaptable architecture, OpenSRP has been used to build localized applications for reproductive, maternal, newborn, child, and adolescent health; immunization; early childhood development; and tuberculosis treatment management.

Interoperability

OpenSRP provides a best-in-class user experience for frontline workers using tablet and smartphone Android-based devices, pushes that data to a deployment management system (OpenSRP Server), and integrates with an electronic medical records system (OpenMRS) to provide scalable data management across large geographic areas. OpenSRP can also integrate with third-party systems like DHIS2 for automated reporting, RapidPro for direct-to-client messaging, and electronic data warehouses for robust data analytics. Each component of the platform provides a function that supports clinic or community health workers, centralized management of deployment, and a robust data repository that follows industry best practices.

Geographic Reach

Bangladesh, Indonesia, Kenya, Pakistan, Zambia.

Resources

Website
https://smartregister.org

Contact Information
Matt Berg, info@smartregister.org

Source Code
https://github.com/OpenSRP

OPENSRP

Global scale:

Emergent | **Established**

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Electronic Medical Records • H

Knowledge Management System • Q

Digital Health Atlas

Summary

The Digital Health Atlas (DHA) is an open-source digital health software platform that allows Ministry of Health (MOH) leadership teams, financial and technical investors, and technology partners to help improve the coordination of digital health project activities. DHA was developed by WHO and partners as a web-based technology registration and assessment web platform to enable governments and financial and technical investors to manage information about existing and planned digital health deployments, to support cataloging related to scale, functionality, data capture, investment, and use.

Health Verticals and Applications

The DHA is a crosscutting tool that collects information on digital health tools and specific digital health projects across health verticals.

Interoperability

The DHA is an inventory registry to help monitor and coordinate individual digital health projects in a specific country. The registration process includes a standard questionnaire, which can be enhanced by an MOH team to include additional questions relevant to the national digital health system planning process. Within the standard questionnaire, there are data fields that ask specific planning questions regarding how each project aligns with components from OpenHIE architecture. This information can then be leveraged by the local Ministry of Health team to enhance planning activities in-country.

Geographic Reach

The DHA has registered projects from 51 countries globally, representing North America, South America, Europe, Asia, and Africa. It is the recognized inventory tool of the Ministries of Health of Kenya, Uganda, Nigeria, Malawi, Lesotho, and Sri Lanka.

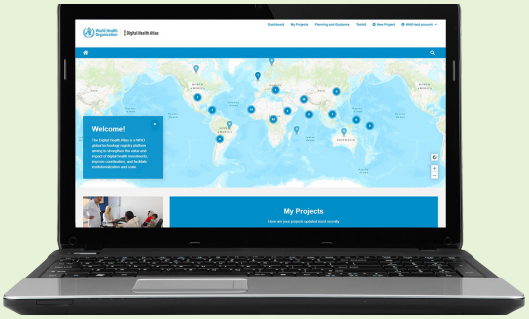
Resources

Website
www.digitalhealthatlas.org

Contact Information
Maeghan Orton, maeghan.orton@gmail.com

Source Code
https://github.com/pulilab/digital-health-atlas

Digital Health Atlas



Global scale:

Emergent | **Established**

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Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Knowledge Management System • Q

Health Finance and Insurance Information System Core Role • M

openIMIS

Summary

openIMIS is the first and only open source software for managing health financing schemes. It electronically links and processes beneficiary, provider, and payer data. The system is designed to manage social protection systems such as health insurance schemes—from enrolling beneficiaries to transmitting and processing claims and calculating reimbursements. Free and ready to download, openIMIS offers a flexible solution that can be adjusted to the needs of different schemes and countries. The adaptable modular design covers health financing business processes in a user-friendly manner.

Health Verticals and Applications

Health system challenges: information, acceptability, efficiency, workflow management, cost core challenges, accountability.

Information and communication technology system categories: clinical terminology and classifications, data interchange interoperability and accessibility, health finance and insurance information system core role, identification registries and directories, public health and disease surveillance system.

Digital health interventions: clients, health care providers, client identification and registration, health system managers, certification/registration of health care providers, public health event notification, health financing core intervention, facility management.

Interoperability

For health financing schemes, a number of interfaces are relevant, offering the potential to streamline operations, improve data quality, and gain analytical insight. With openIMIS, a user can:

- Receive updated reference or master data from a central repository.
- Receive enrollment data and contribution payment information from a mobile app.
- Receive claims data from claiming apps or medical records systems.
- Share approved cumulated claims data with finance management systems for payment.
- Share reporting data with a national Health Management Information System for integrated reporting.

The openIMIS Initiative is actively engaged in the OpenHIE working groups. Modules for connecting to an electronic medical record system, master facility lists, client registries, and reporting platforms are being discussed and worked on.

Geographic Reach

Cameroon, Chad, DRC, Nepal, Tanzania.

Resources

openIMIS Home Page
https://openimis.org

openIMIS Demo Server
https://demo.openimis.org

openIMIS Code Repositories
https://github.com/openimis

openIMIS Wiki
https://openimis.atlassian.net/wiki/spaces/OP

Contact Information
contact@openimis.org

openIMIS

Global scale:

Emergent | Established

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Tool type:

Applications | Infrastructure

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System categories: Health Finance and Insurance Information System Core Role • M

Health Management Information System • N

DHIS2

Summary

District Health Information Software 2 (DHIS2) is an open source, web-based Health Management Information System (HMIS) platform. The core DHIS2 software development is managed by the Health Information Systems Program (HISP) at the University of Oslo. HISP is a global network composed of 11 in-country and regional organizations, providing day-in, day-out direct support to ministries of health and local implementers of DHIS2.

Health Verticals and Applications

Since DHIS2's release in 2006, nongovernmental organizations (NGOs) and national governments in more than 100 countries have deployed DHIS2 for health-related projects, including monitoring patient health, improving disease surveillance and pinpointing outbreaks, and speeding up health data access. DHIS2 has been applied to HIV/AIDS; tuberculosis; malaria; reproductive, maternal, newborn, and child health; neglected tropical diseases; highly communicable and noncommunicable diseases; water, sanitation, and hygiene; food security; crisis response; integrated management of childhood illness and community case management; facility electronic medical records; and immunization.

Interoperability

The open application programming interface (API) makes it easy to connect DHIS2 to other external software through an interoperability layer or with a direct API-to-API connection. Many generic DHIS2 interoperability layers exist, such as OpenFn, and direct-connection DHIS2 plug-ins for dozens of other external software, such as Tableau. More specifically, DHIS2 has turnkey interoperability with iHRIS, the most widely applied open source human resources information system, as well as OpenLMIS, the largest open source logistics management information system.

Geographic Reach

DHIS2 is the world's largest HMIS platform, used in 67 low- and middle-income countries, including national-scale deployments in 46 countries, pilot programs in 21 countries, and 17 Indian states implementing at full scale. More than 2 billion people live in countries using DHIS2. With the inclusion of NGO-based programs, DHIS2 is used in more than 100 countries.

Resources

Website
https://www.dhis2.org/

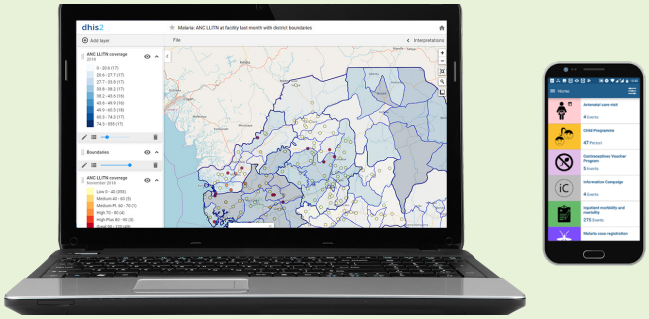
DHIS2 YouTube Playlists
https://www.youtube.com/channel/UC7IT6wGX_IXkfguh2DvcrSA/playlists

Experts Academy Videos
https://www.dhis2.org/oslo2018-videos#overlay-context=academy

Contact Information
post@dhis2.org

Source Code
https://github.com/dhis2/

dhis2



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Tool type:

Applications | Infrastructure

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System categories: Health Management Information System • N

Human Resource Information System • O

iHRIS

Summary

Effective health workforce management is crucial for countries to address health worker shortages and meet the health care needs of their people. Human resources managers and other decision-makers require up-to-date and accurate data on the current number of health workers, where they are deployed, their skill sets, and information on vacant posts and migration. Unfortunately, many countries lack this information in a central database, making it difficult to locate employee records or aggregate data for analysis. iHRIS is a free and open-source software solution that forms an integrated human resources information system, enabling countries to more easily collect, maintain, and analyze health workforce data and manage health workforce resources at a ministry of health (MOH), district health offices, and health care facilities.

Health Verticals and Applications

Each health vertical/business can leverage the following features to support managing its human resources. iHRIS is a package of software built on a flexible framework that can be adapted to meet a wide variety of needs for managing health workforce information:

- iHRIS Manage supports MOH and other service delivery organizations to track, manage, deploy, and map their health workforce.
- iHRIS Qualify enables professional councils and associations to maintain a database of registered and licensed health professionals to support increased quality of care.
- iHRIS Plan is a predictive modeling tool used to project the likely changes in the health workforce under different scenarios and compare them with projected needs.
- iHRIS Retain is a cloud-based tool developed in collaboration with the World Health Organization to help countries plan and cost retention interventions.
- iHRIS Train is a new iHRIS application to track and manage health worker training activities, including pre-service education and in-service continuing education.

iHRIS applications are designed to work together but may also be deployed independently or integrated with other health information systems. All of these applications may be accessed through the iHRIS website.

Interoperability

In many countries, health worker data are managed by multiple systems, and often an MOH seeks to deploy iHRIS across multiple areas that wish to aggregate data to a national database. iHRIS has built-in functionality to exchange data with other information systems using the following interoperability standards: Care Services Discovery for health worker information, SDMX-HD for medical indicators, Sharing Value Sets for standardized lists, DXF2 for the DHIS2 Exchange Format, and HL7 FHIR for health data. The OpenHIE technologies are based on the Care Services Discovery (CSD) international standard. iHRIS is compliant with the CSD standard, and developers will find the code base very similar to iHRIS. Multiple iHRIS installations or other systems that are CSD compliant can use the OpenHIE Health Worker Registry to share data.

Geographic Reach

Botswana, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Dominican Republic, Ghana, Guatemala, Guinea, India, Kenya, Lesotho, Liberia, Malawi, Mali, Namibia, Nigeria, Rwanda, Senegal, Sierra Leone, Tajikistan, Tanzania, Togo, Uganda.

Resources

iHRIS Website
https://www.ihris.org/

Demo Page
https://www.ihris.org/ihris-suite/ihris-demos/

Road Map
https://trello.com/b/PnyMpHsl/ihris-roadmap

Implementation Guide
https://www.ihris.org/toolkit-new/

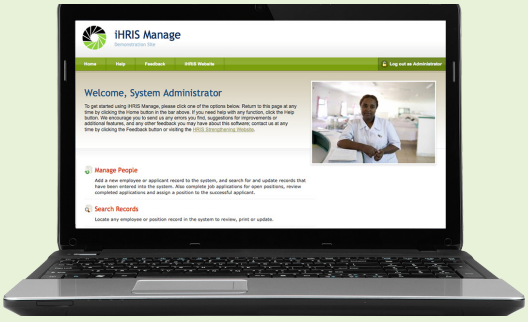
Developer Guide
https://www.ihris.org/implementers/developers-guide/

Community Groups
https://www.ihris.org/community-support/

Contact Information
digitalhealth@intrahealth.org

Source Code
https://wiki.ihris.org/wiki/Developer_Resources

iHRIS



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Tool type:

Applications | Infrastructure

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System categories: Human Resource Information System • O

Laboratory and Diagnostics Information System • R

Child Growth Monitor

Summary

Malnutrition is one of the leading causes of death in children, especially in the most remote regions of the world. Malnutrition is extremely complex to monitor; traditional measuring tools are often too expensive, prone to human error, inaccurate, and costly to deploy. Child Growth Monitor (CGM) uses mobile technology (augmented reality and artificial intelligence) to capture body scans of children as anthropometric data to deduce levels and variations in malnutrition. This allows efficient measurement, early diagnosis, and rapid emergency response to the early symptoms and effects of malnutrition.

Health Verticals and Applications

- Planning and forecasting: Macro-level planning due to real-time, supply-demand data enabled by tool analysis.
- Service delivery: Leverages real-time diagnosis and speedy response time due to interoperability with treatment and other social services.
- Reporting and analytics: Easy-to-use dashboards and reporting metrics.
- Child monitoring: Real-time tracking on progress following diagnosis.
- Mobile integration: Leverages mobile applications to equip health workers with fast and reliable diagnostic tools. The tool (in contrast to current traditional measures) allows for rapid, cost-efficient deployment in remote and resource-scarce communities.

Interoperability

The open source CGM application aims to complement and be interoperable with the existing ecosystem of digital innovations and instruments dedicated to addressing child malnutrition and hunger broadly. Through application programming interface–driven interoperability, CGM works with a country's existing health management information system specifically to improve measurement and data quality. Other components include the client registry as well as shared health records.

Geographic Reach

CGM is currently rolled out in India in four provinces, with plans to cover the entire country by 2020. Welthungerhilfe has a large footprint in both Southeast Asia and Africa and intends to roll out CGM in every constituency.

Resources

CGM Video Walk
https://we.tl/t-QwyonGyBRb

CGM Web Page
https://childgrowthmonitor.org/

CGM Overview
https://www.itu.int/en/ITU-T/AI/2018/Documents/Presentations/Jochen%20Moninger.pdf

Contact Information
Jochen Moninger, Jochen.Moninger@welthungerhilfe.de

Markus Matiaschek, MMatiaschek@gmail.com

Ayanda Ntombela, Ayanda.Ntombela@welthungerhilfe.de

Source Code
https://github.com/Welthungerhilfe/ChildGrowthMonitor

Child Growth Monitor

Global scale:

Emergent | Established

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Laboratory and Diagnostics Information System • R

Laboratory and Diagnostics Information System • R

OpenLabConnect

Summary

OpenLabConnect is a decoupled mediator that transports and transforms data and commands between laboratory test instruments and laboratory information systems (LIS). Collecting data from laboratory analyzer instruments can be time consuming and highly subject to error due to manual transcription between the order, the machine, and the results report. Additionally, precise algorithms and rules for quality assurance and validation are often haphazardly followed by staff. Historically, much of the digital interfacing with instruments has been custom and tightly coupled to its software through point-to-point programming. OpenLabConnect can be used as a generalized solution to bridge the LIS and the laboratory analyzer exchange to mitigate these issues.

Health Verticals and Applications

HIV care and treatment, cholera, and other infectious disease outbreaks.

Interoperability

OpenLabConnect is intended to work as a mediator within a facility for connecting data into the LIS. It uses the OpenHIM tool to do so; however, it can also be connected into the OpenHIE architecture to report results back to the clinic's electronic medical records and shared health records, and for program and disease surveillance in national repositories, such as DHIS2 or other data warehouses.

Geographic Reach

Vietnam.

Resources

OpenLabConnect GitHub
https://github.com/OpenLabConnect/OpenLabConnect

Contact Information
Jan Flowers, Lead OpenHIE LIS CoP
jflow2@uw.edu

Source Code
https://github.com/OpenLabConnect/OpenLabConnect

Global scale:

Emergent | Established

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Laboratory and Diagnostics Information System • R

Logistics Management Information System • T

OpenLMIS

Summary

Health systems in many countries continue to experience stockouts of essential medicines, leaving people vulnerable to treatable illness. The OpenLMIS initiative seeks to improve supply chain visibility, agility, reliability, and responsiveness in low-resource settings to ensure that people—no matter where they live—have access to essential medicines and products when they need them.

OpenLMIS is a powerful, open source, cloud-based electronic logistics management information system (LMIS) purpose-built to manage health commodity supply chains. OpenLMIS automates LMIS business processes throughout the entire supply chain, reducing the burden on health workers while improving data accuracy, data timeliness, and data visibility.

Health Verticals and Applications

OpenLMIS is not specific to the needs of any one vertical and has been used to manage multiple verticals concurrently, from essential medicines, the Expanded Program on Immunization, family planning, and nutrition, to HIV and tuberculosis.

Each health vertical/business can leverage the following features to support the management of its supply chain:

- **Inventory management:** Capture inventory data and stock movements to provide an overview of full stock availability for any program or product.
- **Mobile integration:** Leverage mobile tools to track stock movements at facilities with limited connectivity through third-party products like OpenSRP and SIGLUS.
- **Reporting and analytics:** Easy-to-use dashboards and reporting metrics across all programs and facilities make it simple to capture data from third-party applications.
- **Order fulfillment:** View and fulfill orders from other facilities and send shipments to initiate a receiving process.
- **Requesting and ordering:** Use stock data to generate orders using the configurable approval process.
- **Cold chain inventory management:** Capture cold chain equipment inventory, functional status, and temperature status.
- **Inventory management:** Capture inventory data and stock movements to provide an overview of full stock availability for any program or product.

Interoperability

OpenLMIS believes in a world where many systems can interoperate to deliver better health care and provide end-to-end visibility in supply chains. With standards-based interoperability, countries can determine which systems are best for which function without giving up the ability to share data across all systems for critical decision-making. Through application programming interface–driven interoperability, OpenLMIS works with a country's existing health information system to increase supply chain efficiency. OpenLMIS supports IHE mCSD with FHIT STU3, GS1 (GTIN, GLN), HTTP, REST with JSON, and OAuth2.

Geographic Reach

Benin, Côte d'Ivoire, Guinea, Malawi, Mozambique, Tanzania (mainland and Zanzibar), Zambia.

Resources

OpenLMIS Website
http://openlmis.org/

OpenLMIS Community
http://openlmis.org/about/community/

OpenLMIS Road Map
https://openlmis.atlassian.net/wiki/spaces/OP/pages/35487752/Living+Product+Roadmap

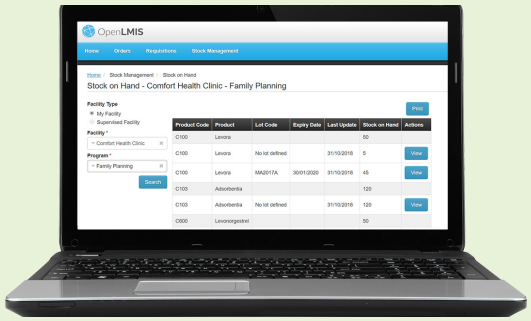
OpenLMIS Demo Page
https://openlmis.atlassian.net/wiki/spaces/OP/pages/250249255/Version+3+Demo+Supporting+Documentation

Short Demo Videos on YouTube
https://www.youtube.com/results?search_query=openlmis+3.3

Contact Information
info@openlmis.org

Source Code
https://github.com/OpenLMIS/open-lmis

OpenLMIS



Global scale:

Emergent | **Established**

An **emergent** global good is a digital health tool that shows great promise to be utilized in multiple countries though may require additional investments to adapt for a different context. An **established** global good has already been deployed in multiple countries.

Tool type:

Applications | Infrastructure

An **application** component is a digital health tool that primarily is designed for use by clients of the health system or by health workers, in the broad WHO definition. An **infrastructure** component is a digital health tool that is designed to facilitate the exchange and interoperability of data between applications.

System categories: Logistics Management Information System • T

Public Health and Disease Surveillance • V

Reveal

Summary

To ensure interventions reach recommended coverage thresholds, it is necessary to know exactly how many homes should be targeted and their precise locations. Reveal, formerly mSpray, is a spatial mapping and monitoring platform that optimizes health intervention coverage through spatial planning, tasking, in-app navigation support, role-specific dashboards, and built-in decision-making protocols to drive intervention planning. This approach optimizes intervention coverage with data accuracy and transparency. By improving coverage and smart targeting interventions, resources will be spent more effectively and more lives will be saved. We call this approach precision service delivery.

Health Verticals and Applications

Thus far, Reveal has been used to precisely target and monitor interventions to decrease the incidence of malaria. Reveal is recognized as capable of serving the needs of multiple health verticals, including but not limited to neglected tropical diseases, vaccinations, community and reproductive health, and drug access. Expansion is coupled with offering the tool as open source and transitioning ownership to governments and implementing partners.

Interoperability

Reveal's in-field app is built on OpenSRP. Reveal's geospatial tool relies on OpenStreetMap for enumeration and in-field map support. In Q1 2019, it will be expanded to include an integration with the common georegistry. A Q2 2019 release will facilitate integration with DHIS2 for push/pull to drive reactive case detection, foci investigation, and intervention planning. In this same release, Reveal will integrate DiSARM algorithms for enhanced planning support.

Geographic Reach

Since 2014, implementation of Reveal for indoor residual spraying of insecticides for mosquitoes, and thus malaria control, has covered 49 districts in Zambia. However, Reveal has global applicability.

In 2019, Reveal will pilot application to mass drug administration, insecticide-treated bednet distribution, focal investigations, and reactive case detection for malaria elimination in three countries in Africa and Latin America. Reveal is an approachable product with the precision to meet public health goals in all countries.

Resources

About
https://akros.com/mspray/

Research, Media, and Success Stories
https://blog.ona.io/general/2018/04/18/gates-mspray.html

https://africatimes.com/2015/12/04/how-tech-is-changing-international-development/

http://vitalwave.com/article-presentation/mobile-solutions-for-malaria-elimination-surveillance-systems/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5824454/

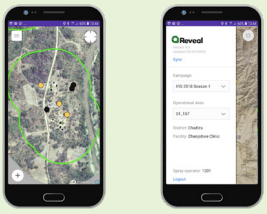
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4704423/

http://www.cidrz.org/mspray-spatial-data-to-improve-intervention-coverage/

Contact Information
Laurie Markle, lmarkle@akros.com

Source Code
https://github.com/onaio/mspray

Reveal
REDEFINING PRECISION



Global scale:

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System categories: Public Health and Disease Surveillance • V

Public Health and Disease Surveillance • V

SORMAS

Summary

The Surveillance Outbreak Response Management and Analysis System (SORMAS®) is an open source software that is designed to organize and facilitate disease control and outbreak management procedures in addition to disease surveillance and epidemiological analysis for all administrative levels of the public health system. The mission of SORMAS is to improve prevention and control of communicable diseases particularly in resource-poor settings. SORMAS is free of charge and adheres to the highest data protection standards, good scientific practice, and open access policy. SORMAS is characterized by the following features: digitalized notification at the health facility level, bidirectional information flow, contact follow-up management, and user-centered design. SORMAS includes disease-specific process models for high-priority, epidemic-prone diseases.

Health Verticals and Applications

According to the World Health Organization classification of digital health interventions, SORMAS classifies as follows:

SORMAS intentionally follows a comprehensive and integrated approach to health care and prevention, thus it has so far prioritized diseases that do not yet benefit from vertical health programs. SORMAS has a modular and flexible architecture and is adaptable, which was proven during the recent monkeypox outbreak in Nigeria in 2017, when SORMAS was able to quickly include monkeypox as a novel disease. Furthermore, SORMAS includes 11 user interfaces, including hospital informants, laboratory officers, and epidemiologists, and covers ten high-priority, epidemic-prone diseases. With this approach, SORMAS addresses the strategic goal of the 2017 *Berlin Declaration of the G20 Health Ministers* and the core capacity requirements laid out in the International Health Regulations.

Interoperability

SORMAS has a fully functional application program interface (API) with other third-party platforms. A prototype API for DHIS2 exists, and a fully functional version is expected to be developed before the end of 2019. SORMAS adheres to contextual standards of the Integrated Disease Surveillance and Response system, the International Health Regulations, and Centers for Disease Control and Prevention's Epi Info application. The API framework within SORMAS supports interoperability, which is in line with and takes into consideration the International Organization for Standardization standards like ISO/TC215 and OpenHIE standards like HL7 FHIR.

Geographic Coverage

Nigeria, Ghana (pilot). SORMAS is being tested and is now implemented in 15 federal states and covers ~49 million people.

Resources

SORMAS Website
https://sormas.org/

SORMAS Demo Page
https://sormasorg.helmholtz-hzi.de/sormas-demo.html

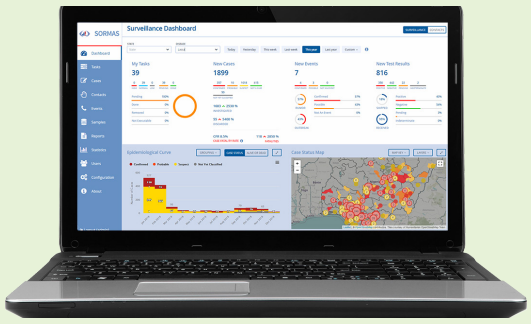
SORMAS Configuration Guide
https://github.com/hzi-braunschweig/SORMAS-Project/blob/development/README.md

Short Demo Videos on YouTube
https://sormasorg.helmholtz-hzi.de/overview-video.html

Contact Information
Gerald Krause, Gerard.Krause@helmholtz-hzi.de

Source Code
https://github.com/hzi-braunschweig/SORMAS-Project

sormas



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System categories: Public Health and Disease Surveillance • V

Shared Health Record and Health Information Repositories • X

Hearth

Summary

Hearth was developed out of the need to provide a national-level patient-centric longitudinal data store for a variety of use cases. Hearth is a centralized patient record containing clinical information provided by and accessible to the disparate information systems making up the health information space of low- and middle-income countries. Hearth is primarily a Fast Healthcare Interoperability Resource (FHIR) data store. It allows implementers the means of storing and querying FHIR resources as well as implementing some of the FHIR queries and functions as per the FHIR specification.

Health Verticals and Applications

Perioperative care, immunization, civil registration, vital statistics, facility reconciliation, provider lists, and maternal records.

Interoperability

Hearth is intended to perform the role of Shared Health Record and can also act as client registry, provider registry, and facility registry if needed. It is generally used in conjunction with an interoperability layer—usually the OpenHIM.

Geographic Coverage

South Africa, Bangladesh.

Hearth, as part of the Global Open Facility Registry (GOFR) solution linked to the Design and Analysis Toolkit for Inventory and Monitoring (DATIM), is also deployed in Guinea, Liberia, Uganda, and Sierra Leone.

Resources

GitHub
https://github.com/jembi/hearth

Contact Information
Daniel Futerman, daniel.futerman@jembi.org

Thabo Chiloane, thabo.chiloane@jembi.org

Source Code
https://github.com/jembi/hearth

Global scale:

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System categories: Shared Health Record and Health Information Repositories • X

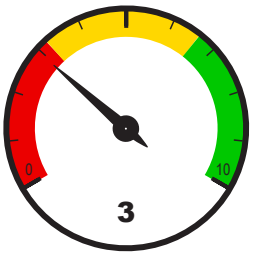
Appendix

Global Good Maturity Model

To help identify areas in which investment is needed in global goods, Digital Square collaborated with the digital health community, including the Digital Health & Interoperability Working Group of the Health Data Collaborative, to develop the Global Good Maturity Model for digital health tools. The Global Good Maturity Model specifies common metrics for understanding how advanced a digital health tool is so that we can compare global goods and prioritize the most promising global goods for investment. The model assesses the maturity of the tool as low, medium, or high across three dimensions:

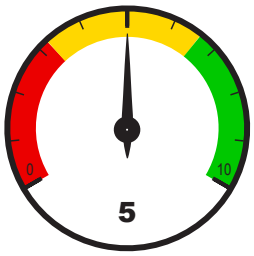
- **Global Utility:** Assesses how widely the tool is used, how well funded it is, and other metrics measuring its adoption and potential for use.
- **Community Support:** Assesses both support for a community of users (such as documentation and multilingual support) and engagement of the user community with the tool.
- **Software Maturity:** Assesses the level of development of the software in such areas as security, interoperability, technical documentation, and scalability.

The Global Good Maturity Model provides at-a-glance ratings of potential global goods. The Maturity Model is used to prioritize investments and identify the digital health tools with the most potential for scaling, adaption, and sustainability.



Global Utility

- Country utilization
- Country strategy
- Digital health interventions
- Source code accessibility
- Funding and revenue



Community Support

- Community engagement
- Community governance
- Software roadmap
- User documentation
- Multilingual support

Software Maturity

- Security
- Scalability
- Software productization
- Technical documentation
- Interoperability and data accessibility

For more information on the Global Good Maturity Model, please visit the wiki: https://wiki.digitalsquare.io/index.php/What_are_Global_Goods.

Appendix

OpenHIE

The global goods presented in this guidebook are each designed to address specific business domains within the health information ecosystem. When deployed together, they provide a strong backbone for the digital health infrastructure within a country. In this appendix, you will find an overview of OpenHIE, which provides a blueprint, using best practices in interoperability and open standards, for bringing these global goods together.

OpenHIE (Open Health Information Exchange)[3] is dedicated to improving the health of the underserved through open and collaborative development and support of country-driven, large-scale health information sharing architectures. OpenHIE's mission includes:

- Enabling large-scale health information interoperability.
- Offering freely available standards-based approaches and reference technologies.
- Supporting each other's needs through peer technical assistance communities.

OpenHIE Background

As health systems have evolved, care delivery has increasingly been distributed among a broad assortment of health care personnel: primary care physicians, specialists, nurses, technicians, public health practitioners, community health workers, and corresponding health system management personnel. Each member of the team has specific, limited interactions with an individual patient and differing vantage points into the patient's health. In effect, the health care team's view of the patient has become fragmented into disconnected facts and clusters of information.

Health information systems, like health care personnel, also typically operate independently of one another. The result is disaggregated information stored in different locations and formats, making it impossible for data to be harmonized and for health care personnel to share knowledge, collaborate in care, and truly understand the full breadth of an individual's health history. Those who manage and oversee the health system have little ability to make inferences from these data for monitoring and evaluation purposes. Many other health care personnel are forced to make life-altering decisions for their population without key health information.

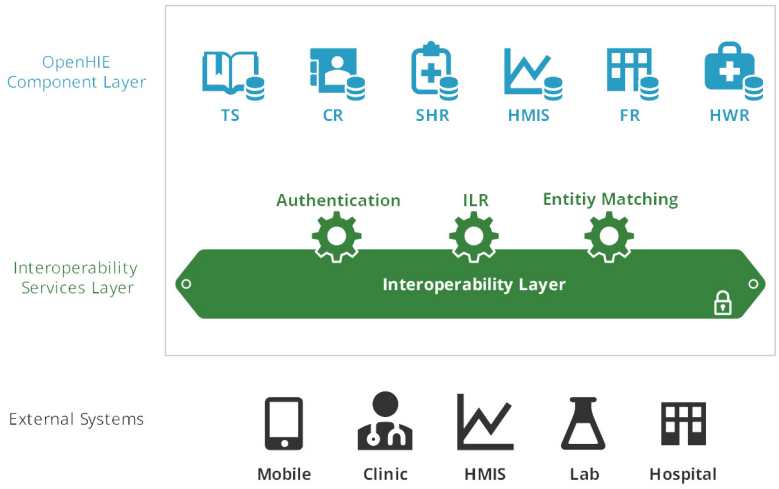
OpenHIE Architecture

The OpenHIE community supports interoperability by creating a reusable architectural framework that introduces a service-oriented approach,

[3] OpenHIE website, https://ohie.org. Accessed October 12, 2018

maximally leverages health information standards, enables flexible implementation by country partners, and supports interchangeability of individual components.

The OpenHIE architecture focuses on making available the key data and metadata describing the health system across multiple business domains. The architecture comprises multiple components for managing and sharing the metadata. External systems at a place of health service can access these data through the Interoperability Layer, which enforces privacy and security while ensuring consistent identification of health facilities, health workers, and clients and consistent coding of health concepts.



OpenHIE Components

Terminology Service (TS)

The Terminology Service component of the OpenHIE architecture provides a centralized source for the HIE's standards and definitions, including terminologies, ontologies, dictionaries, code systems, and value sets. Other HIE components can use these standards and definitions to normalize clinical data and achieve consistent aggregation and reporting.

Client Registry (CR)

The identity of an individual who receives health services is crucial to enabling health care record sharing across institutions and systems. Yet, sharing health care records can be a challenge in a complex environment where there are multiple systems across multiple health care institutions and each institution and/or system has a different way to identify their clients. Even in environments where citizens are assigned national identification cards, there is need to ensure the unique identity of an individual among the myriad fragmented information systems that collectively represent a person's electronic health record. The Client Registry is designed to assist in uniquely identifying individuals who receive health care services by:

- Maintaining a central registry of all patients and their demographics and assigning a unique identifier to each patient.
- Linking patient registration entries that result due to changes in patient demographics (patient moved to another location), data entry errors during patient registration, or missing demographic information.
- Enabling health care workers to identify facilities at which a patient has received care.

Shared Health Record (SHR)

The Shared Health Record facilitates the sharing of clinical information between health information systems to enable better patient care, thus improving health outcomes.

The Shared Health Record is a means of allowing different services to share health data stored in a centralized data repository. It contains a subset of normalized data for a patient from various systems, such as an electronic medical record or the Laboratory Information Management System. This record is queried and updated between the different institutions and systems that are authorized to do so. The Shared Health Record is distinct from a data warehouse; it is an operational, real-time transactional data source.

Health Management Information System (HMIS)

A Health Management Information System, also called a Routine Health Information System, facilitates the collection of periodic health service delivery and public health indicators from a variety of information systems and the effective use of information at facility, district, and higher levels to help improve health care outcomes.

Facility Registry (FR)

The purpose of a health facility registry is to act as the central authority to collect, store, and distribute an up-to-date and standardized set of facility data. The resulting standardized and current facility dataset stored in the registry is called the Master Facility List (MFL). While these concepts are closely related, a facility registry can be understood as the technology that manages and shares facility data and the MFL is the standardized data stored in the tool.

Health Worker Registry (HWR)

The Health Worker Registry serves as the central authority for maintaining the unique identities of health workers within a country. The Health Worker Registry is a database containing a minimum dataset of details of all health workers working in both the public and private sectors.

With multiple and disparate sources of data on health workers, it is a complex task to pull together and maintain a master and canonical list of all health workers in a country. The health worker registry seeks to reduce the complexity of this task by:

- Pulling the minimum dataset of health workforce information from the various source data systems.

- Merging the source data systems into an authoritative registry of health workers according to a data governance policy.
- Allowing queries of health worker information by client systems.

OpenHIE Business Domains

The OpenHIE architecture can be applied to multiple business domains that describe clinical and health system needs. These business domains encompass activities such as:

- Routine reporting of health system indicators for monitoring and evaluation.
- Provision of a longitudinal record of a client's clinical care and health status across all health verticals.
- Management of medical commodities as part of the health system supply chain.
- Purchasing of health care goods, services, and interventions on behalf of a covered population.

Digital Square
455 Massachusetts Avenue, NW,
Washington, DC 20001

t: 206.822.0033
e: digitalsquare@path.org

Scan here to learn more about
the Global Goods Guidebook.