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EIR and IIS - An Introduction to Digital Immunization Systems

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Introductions

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Webinar Objectives

- To provide an overview of digital immunization systems and their respective functionalities

- To provide content that enables decision makers to compare different systems against clearly defined functionalities

- To give implementers the opportunity to share their experiences, both positive and negative, on how they selected their system and how the system is deployed in their context

Outline

- **Definitions and Illustrative Requirements**

- **Context and Considerations**

- **Getting Started**

- **The Cambodia Experience**

- **Q&A**

Definitions and Illustrative Requirements:

Electronic Immunization Registries
&
Immunization Information Systems

EIR or IIS?

Digital Immunization Systems:

- Are **confidential**, computerized systems that record, store, and provide access to consolidated individual immunization information

- Capture **data on individuals** in a specific geographic area across multiple healthcare providers

- Can offer other capabilities, such as **reminder/recall notifications**, links to vaccine supply and stock management, and adverse event reporting

ECDC Designing and Implementing an Immunisation Information System 2018
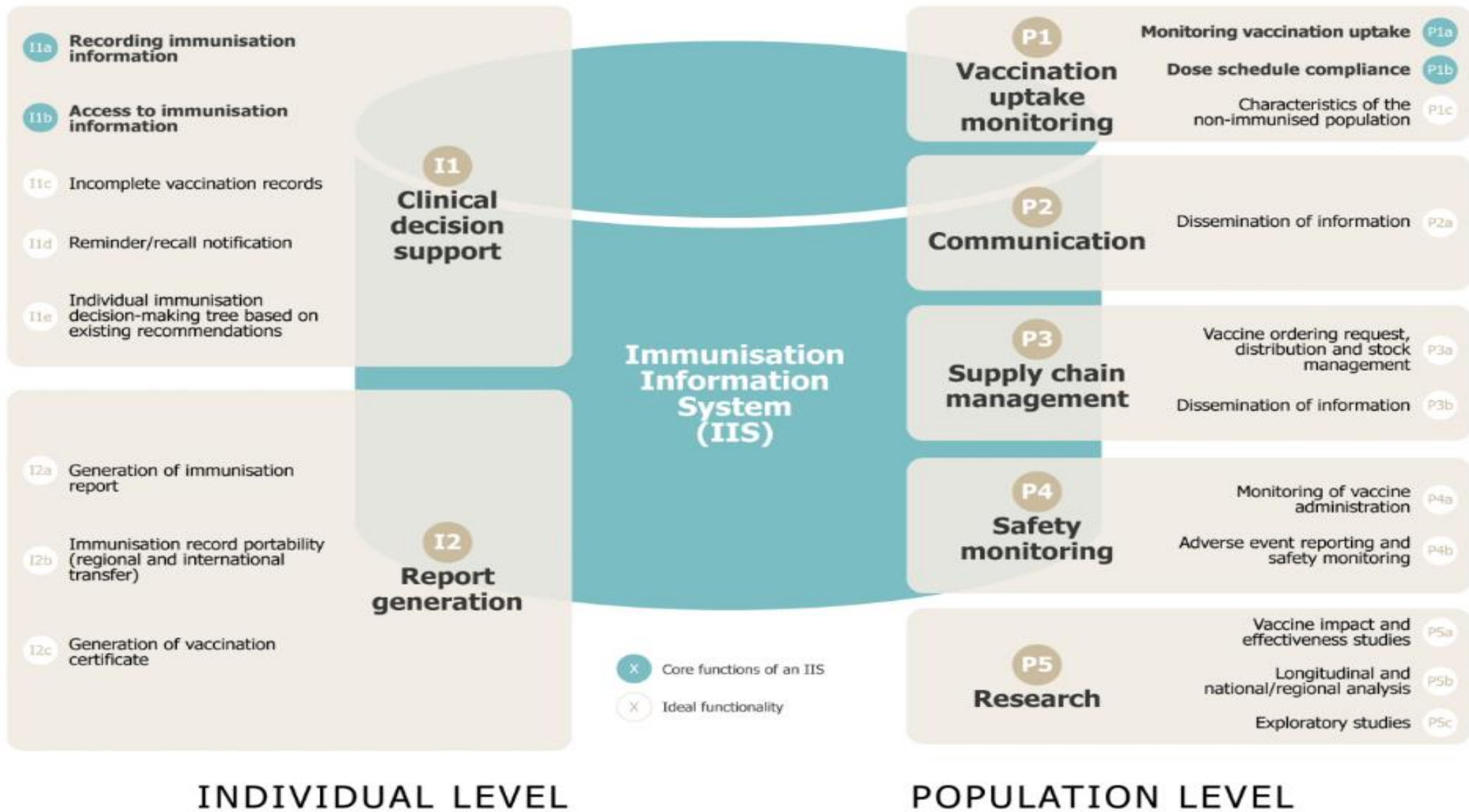
The Value of an Immunization System

- Facilitates the **individualized** and **timely monitoring** of **immunization schedules**

- Ensures the **security** and **storage of data** and **guarantees accessibility** to data by authorized stakeholders

- Increases **vaccination data timeliness**, **quality** and **completeness,** disaggregating by vaccine, dose, geographical area, age, provider and facility

- Enables **linkage** of individual **vaccination data** to other **health information systems** to ensure such things as **monitoring of vaccine administration** and vaccine benefit–risk assessment, including **AEFIs**

The Value of an Immunization System

- Facilitates the **identification** of **unvaccinated individuals** (zero dose individuals)

- Supports and facilitates the identification **of immunization supply requirements** at all levels of the health system, especially at the operational level

- Facilitates **vaccine equity** by tracking who is and isn't being vaccinated

- Produces verifiable **digital vaccination certificates**

Immunization Systems should...

- Be **designed** with **user characteristics**, **needs** and **challenges** in mind
- Work in **online and offline modes** to accommodate various settings
- Capture data real-time or close to the **time** and **place** of **data generation**
- Be **flexible**, adaptable and scalable to **integrate new modules** for new vaccines and schedules
- Offer robust **data protection** and confidentiality
- Allow for various **user and administrator roles** and permissions
- Use **standards** for **data exchange**
- Assign a **Unique Identifier (UID),** include search functions and the flagging of duplicate patients/records

Unique Identifiers

- An immunization system should be integrated with other digital records/databases, strengthening these to include access to immunization records

- UIDs are an essential component of an immunization system and can enable this linkage between different digital systems, depending on the legal framework approving such linkages

- UIDs enable the identification of unique persons in the immunization system and help avoid duplicate entries

- They are especially relevant for multiple dose vaccines, such as COVID-19, where patients need to return for a second dose, which might take place at a different facility

- This second dose needs to be linked to the first to verify the individual is fully vaccinated and eligible for a COVID-19 vaccination certificate

Illustrative Requirements

Facilitates decision support for vaccine providers	
Enables the scheduling of appointments, with validation checks to ensure follow up appointments are booked within appropriate timelines	
Captures reasons of refusal for vaccination, as well as access issues such as stock outs	
Facilitates patient monitoring and produces individual patient reports	
Contains data on both vaccinated and unvaccinated individuals	
Displays aggregate data by geographic and/or administrative levels	

Illustrative Requirements

Exchanges data through globally recognized standards such as FHIR	
Produces or exports data consistent with that needed for microplanning	
Produces data visualizations, such as charts and graphs, on vaccine coverage and other relevant program indicators	
Captures Events Attributable to Vaccination and Immunization (EAVIs) or Adverse Events Following Immunization (AEFI)	
Produces digitized, verifiable vaccine certificates	
Supports track and trace of vaccines via the use of standards such as GS1	

Context and Considerations:
Electronic Immunization Registries
and
Immunization Information Systems

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, and Open Innovation

Reuse and Improve

Address Privacy & Security

Be Collaborative

ENDORSED ON 2015

World Health Organization

World Health Organization

Visit website

ENDORSED ON 2015

United Nations Children's Fund (UNICEF)

unicef

Visit website

GLOBAL GOODS GUIDEBOOK VERSION 3.0

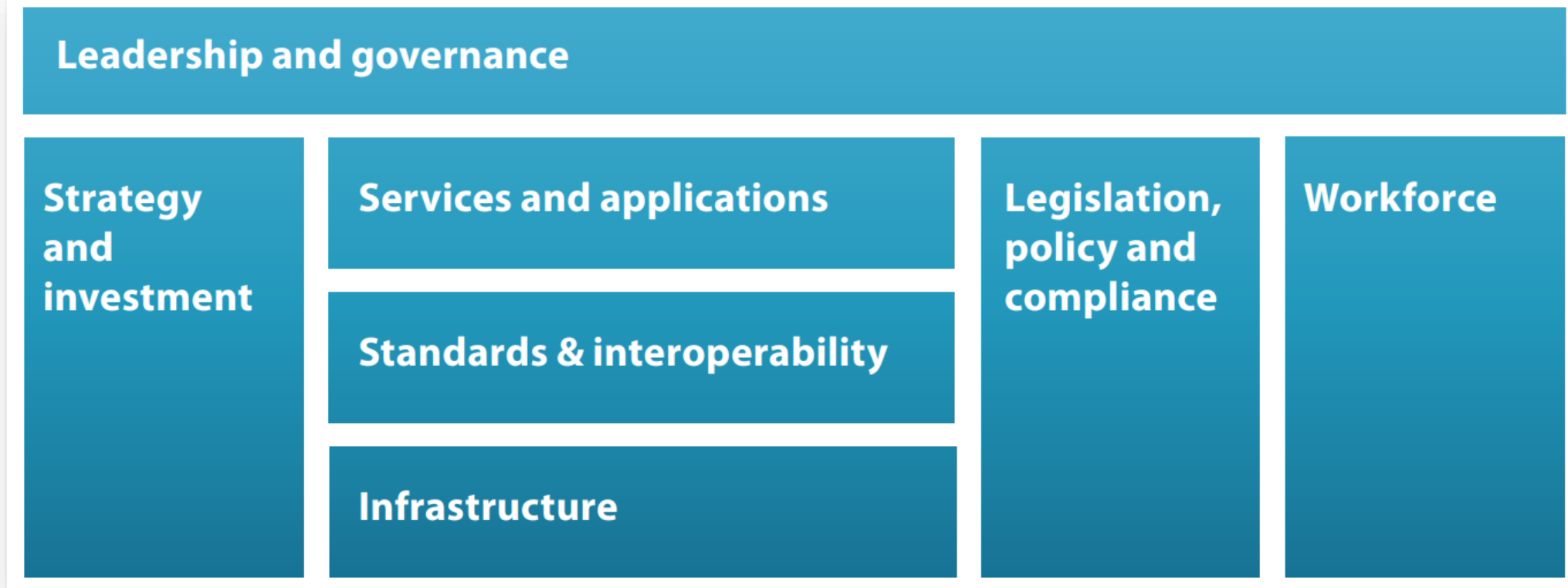All software in this series are either GGs or DPGs.

Global Goods are... software that is **free**, **open source**, and used to manage, analyze, or transmit health-related data, with **proven utility** in **several settings**.

Digital technologies: electronic tools, systems, devices and resources that generate, store or process data.

Digital   Public Goods

Public Goods: a commodity or service that is provided without profit to all members of a society, either by the government or a private individual or organisation which is to the benefit or well-being of the public.

Enabling Environment

Leadership and governance

Strategy and investment

Services and applications

Standards & interoperability

Infrastructure

Legislation, policy and compliance

Workforce

WHO eHealth Strategy Toolkit 2012

Getting Started:
Electronic Immunization Registries
and
Immunization Information Systems

Getting Started

- Digital Blueprinting
- Workflow Mapping
- Requirements gathering
- Technology Roadmap
- Benchmarking
- Total Cost of Ownership & Sustainability

- Resources
    - DICE website

Register/Approve → **Plan** (Forecast/Prioritize) → **Deliver** (Distribute/Monitor/Track) → **Dispense** → **Administer/Record** (incl. Remind/Recall) → **Assess** (Monitor)

Product registration system

Logistics management information system (LMIS) (e.g. VLMIS, VxLMIS, eLMIS, CCMIS, RTM) — T

Clinical information system (e.g. EMR, EHR, ePrescribing) — H X

Microplanning / Geographic information system (GIS) — L

Pharmacy information system — U

Health management information system (HMIS) — N

CRVS system / Population register — A B

Waste management system

AEFI surveillance system — V

Electronic immunization registry (EIR) — X

Appointments system — D

Paper vaccine certificate

VPD surveillance system — V

Digital vaccine certificate

Citizen engagement platform

OpenHIE Shared Services

Product catalogue

Terminology service — E

Client registry / MPI — P

Facility registry — K

Health worker registry — P

○ WHO Classification of Digital Health Interventions v1.0

AEFI = adverse events following immunization
CRVS = civil registration and vital statistics
EHR = electronic health record (longitudinal)
eLMIS = electronic LMIS
EMR = electronic medical record (facility-based)
MPI = master patient index
VLMIS = vaccine LMIS
VPD = vaccine-preventable disease

Vaccine Workflows

## OpenHIE Architecture Specification Vaccine Workflows

- The system can record a vaccine document to an HIE using the **Save Patient-level Clinical Data Workflow** transaction

- The system can query for a vaccine document from an HIE using the **Query Patient-level Clinical Data Workflow** transaction

WHO DDCC Workflows

Requirements Gathering

- Establish clear project objectives
- Identify your stakeholders – don't forget your end users and the private sector
- Document every single activity – it might be important to understand the rationale for certain decisions further down the line
- Share this documentation with stakeholders and be transparent
- Talk to the right stakeholders, not forgetting your end users
- NEVER make assumptions
- Focus on the requirements – what does the system need to do? Be system agnostic
- Create a clear benefit hypothesis for each feature
- Prioritize your product features – you can even traffic light them
- Use this to create your technology roadmap
- Never lose sight of the fundamentals, such as data security and privacy

Benchmarking
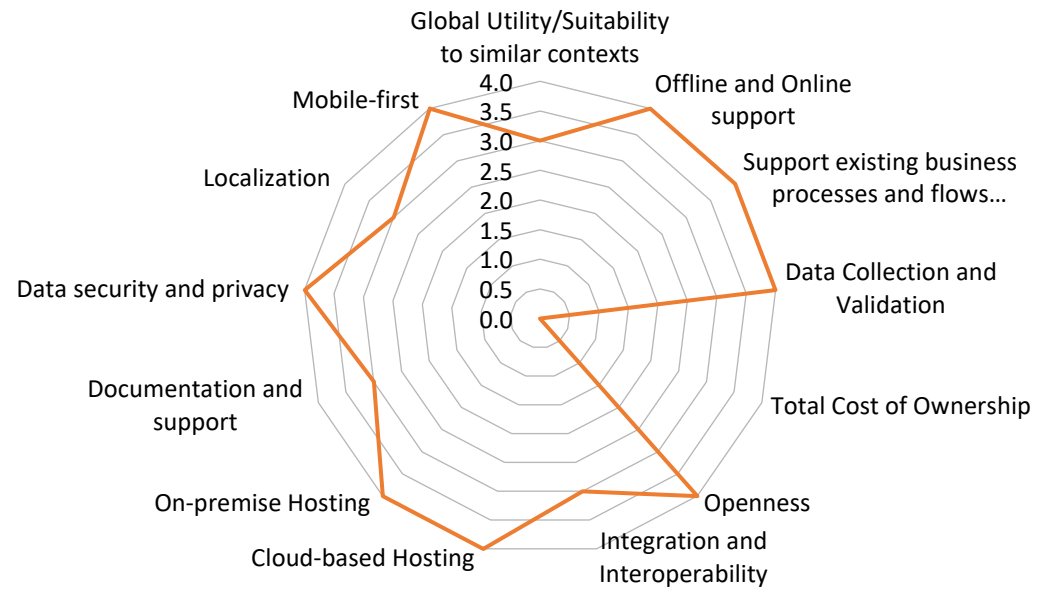
Total Cost of Ownership & Sustainability

- The TCO of an IIS is the **sum** of **all direct and indirect costs** incurred by that solution and should be **critical** to the **decision-making process**
- The TCO includes the **startup costs** and **operational costs** over the **lifespan** of the solution
- Startup costs include **licensing** and **initial implementation costs** including **data migration** (if any other systems are in place) as well as costs associated with **training and customizations**
- **Operational costs** include **maintenance** and **support costs**

COST CATEGORY	EXAMPLES OF ASSOCIATED COSTS
Administrative support	» Wages of administrative personnel who provide support for related processes » Office supplies » Travel and meetings
Development	» Developer costs » System customization costs, in the event that a ready-made system is being adapted for the country » Costs of pilot deployment and subsequent modifications to the system
Scale-up	» Cost of technical support at the national level » Travel and meetings » Training
Hardware	» Computers » Central processing units (CPUs) » Printers » Surge protectors
Software	» System software licensing (per user, per environment, free, etc.) » Licensing of other necessary software products
Network infrastructure	» Internet connectivity costs
Security	» System security costs (antivirus, firewall, etc.) » Backup costs
Physical infrastructure	» Proper space for hardware and data entry

COST CATEGORY	EXAMPLES OF ASSOCIATED COSTS
Training	» Costs of travel and meetings for personnel in charge of training and participants » Hours devoted to staff training
Data servers	» Servers for data storage and protection
Management and technical support	» Help desk/call center » Wages of personnel assigned to answer user queries » Time devoted to the formulation of registry guidelines
Maintenance	» Cost of preventive maintenance » Cost of corrective maintenance » Cost of evolutionary maintenance » Cost of adaptive maintenance » Renewal of software licenses » Replacement of obsolete or lost equipment
Human resources at the local level	» Wages of data entry clerks (if a new position is created or overtime is required) » Wages of personnel in charge of the system
Communications	» Strategy for communication and dissemination of EIR use
Monitoring and evaluation	» Wages of HR professionals (with different profiles) » Data quality assessments » Field inspections » Periodic data quality evaluations at all levels

Common Challenges

- The most common challenges include:
  - A lack of human resources
  - A lack of funding
  - Issues relating to data protection

- During the design phase, challenges faced by most countries included:
  - Defining the functions required by the system
  - A lack of standards to provide a point of reference for developing the system
  - Defining the core data set to be collected

- During the early implementation phase, challenges included:
  - Training vaccine providers on use of the immunization system
  - Validation of data entered by different users
  - Quality control of data completeness

Data Security and Privacy

- With **individualized information exchange** at the center of an immunization system, it is **imperative** to have **data security** and **privacy** in place to protect sensitive information and prevent security breaches

- The solution, throughout the entire data lifecycle, should consider the **laws, regulations, acts** and **decrees that regulate data** protection and privacy in the country of implementation

References

- [Village Reach Landscape Analysis of Electronic Immunization Registries](#)

- [BID Initiative Lessons Learned Encyclopedia](#)

- [PAHO Electronic Immunization Registry: Practical Considerations for Planning, Development,Implementation, and Evaluation](#)

- [Path The Design, Development and Deployment of an Electronic ImmunizationRegistry in Vietnam: Reflections, guidance & global similarities](#)

- [ECDC Designing and implementing an immunisation information system: A handbook forthose involved in the design, implementation or management of information systems](#)

- [Digital Square Electronic Immunization Registries in Low- and Middle-Income Countries](#)

Emmanuel Bayo
T4D Specialist, Cambodia

The Cambodia Experience

Country Profile
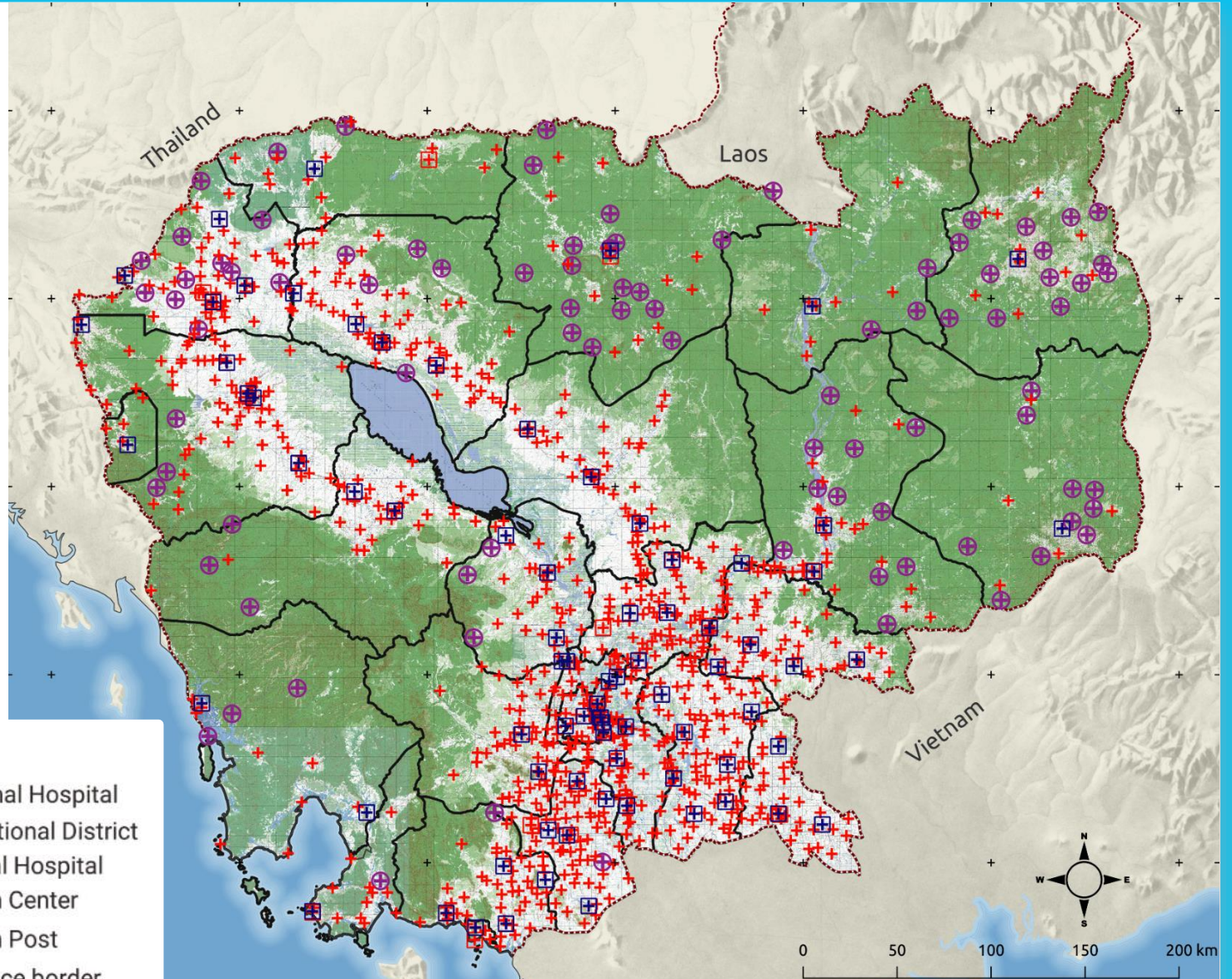
Population: 16.5 Million (2019 est.)
Target Population: ~350k
No. of health centers: 1,221
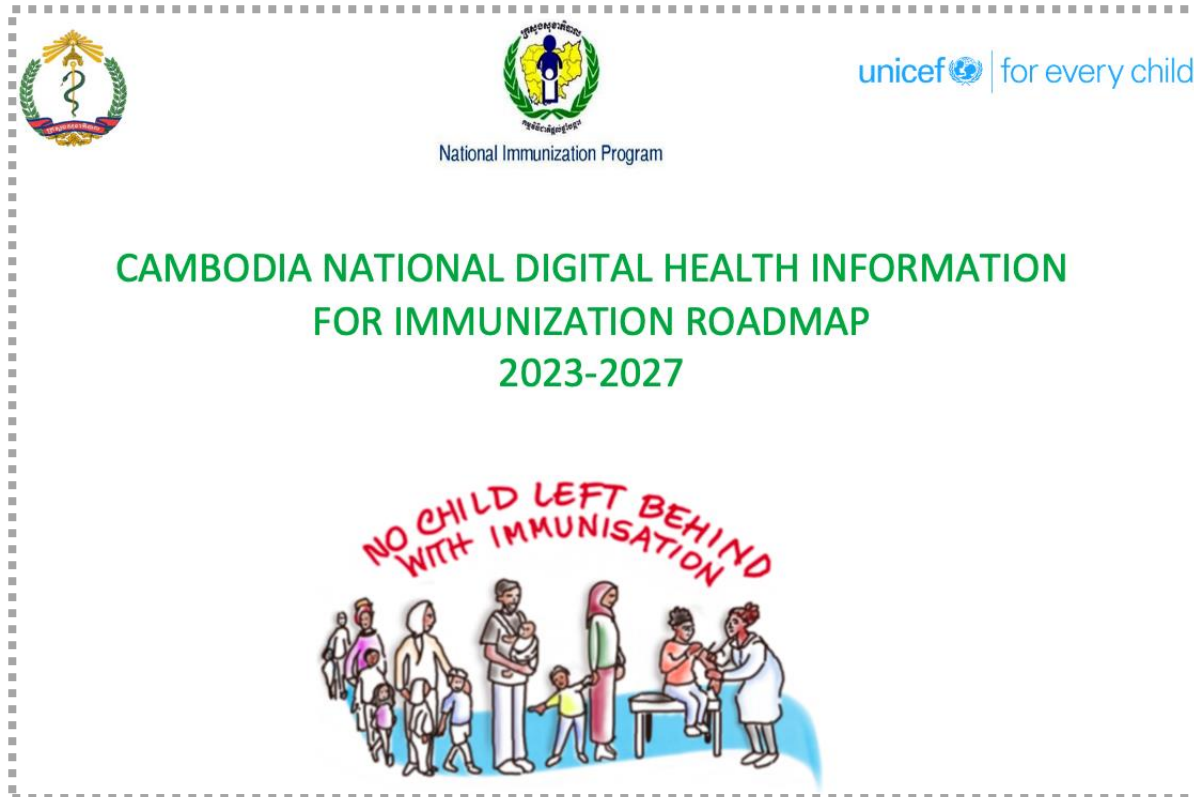**% of children fully vaccinated:** 76% (2021-22 CDHS)

Legend
- ✛ National Hospital
- ⊞ Operational District
- ⊞ Referal Hospital
- ✛ Health Center
- ⊕ Health Post
- ▭ Province border

Date modified

February 11, 2021, 8:57 AM (UTC+07:00)

Country context

CAMBODIA NATIONAL DIGITAL HEALTH INFORMATION FOR IMMUNIZATION ROADMAP 2023-2027

- **Cambodia National Immunization Strategy 2021-2025** identifies several key areas that DHI can support:
    - Identification and reach of zero-dose and under-immunized
    - digital supply chain information systems
    - RTM of immunization campaigns
    - Sub-national data use
    - vaccine confidence and demand, & vaccine preventable disease surveillance

- **KhmerVacc** deployed excluseively for C-19

- **NDHS** envisions an interoperable DH ecosystem: IIS/EIR prioritised.

- **The NIS SitAn, various field assessments** including the rapid DHI for immunisation assessments has identified key barriers to access for routine immunization across EPI system components

Priorities

- Digitising paper-based RI

- Automatic tracking of appointments/missed doses through SMS reminders to caregivers

- Integration with HMIS / DHIS2, KhmerVacc...to start with

- Configurable to support the roll out of HPV vaccine across in 2023

- Demand generation and strengthened community engagement

Enablers

- Capacity building is the main enabler to be prioritised

Indicator Categories	Phase/Score
Leadership and Governance	4
Strategy & Investment	2
Legislation, Policy, and Compliance	3
Infrastructure	2
Workforce	1
Standards and Interoperability	3
Services & Applications	2
Average Score	**2**

Provisional Global Digital Health Index (GDHI)

- DP digital health sub-working group established co-chaired by UNICEF and WHO (Members include: WB, USAID, JICA, GIZ, KfW, UNAIDS, CHAI, FHI360, embassy of Czech Republic and France)

Proposed Timeline

Phase	Milestone	Timeline
1. Initiation	• Vendoring completed and vendor onboarded	Sept - Nov
2. Analysis and Design	• Functional and non-functional requirement mapping • Business process workflow mapping	Nov
	• Interactive interface wireframes, and prototype design • System architecture & illustrations • On-premises vs cloud-hosting capacity and specifications, including requirements for all hardware, network, and internet configurations produce	January
3. Deployment and implementation	• First release; UAT and QA testing and documentation	March
4. Documentation & Capacity building	• Technical documentation • Training manuals, SOP, and user guidelines produced • Software code documentation and Git hub repository handover • Trainings conducted	May
5. Post deployment	• Cloud-hosting and maintenance for an initial period of one year provided • Final report and handover of all relevant documentation	September
TOTAL		**12 months**

Questions and Answers:
Electronic Immunization Registries
and
Immunization Information Systems

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