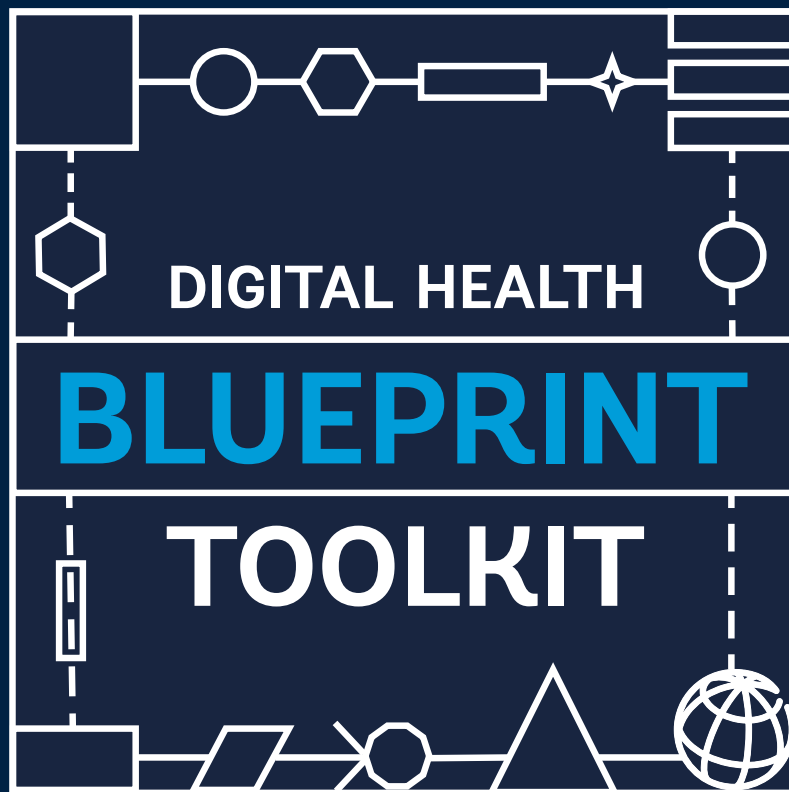




HOW-TO-GUIDE

**How to leverage the Toolkit
to facilitate a set of workshops
culminating in buildable
blueprint artefacts plus
a 10-year Investment Rationale**

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GLOSSARY

ADB	Asian Development Bank
AeHIN	Asia eHealth Information Network
ATNA	Audit Trail / Node Authentication; a global standard for transaction auditing and participant authentication
CCG(s)	Computable Care Guideline(s)
CDC	Centre for Disease Control
CET	Cost-effectiveness Threshold; the point at which an investment generates a net-positive return
CR	Client Registry; the definitive registry of demographic information for all subjects of care, including the unique identifier for each individual
CUA	Cost-utility Analysis; a technique for determining the economic return on an investment
DALY(s)	Disability-adjusted Life-year(s); a metric indicating the combined negative quality of life impact of both death and disability (inverse of QALY)
DHA	WHO's Digital Health Atlas; a global site containing digital health solution deployment survey results
DOC	Microsoft Word document file
EHR	Electronic Health Record; a lifetime longitudinal record of a person's data from all sites of care within a care network
EMR	Electronic Medical Record; a local digital health solution for tracking a care site's patient data
FHIR	HL7 Fast Health Information Resources standard; a digital health content and data exchange standard
FR	Facility Registry; the definitive registry of facility information, including the unique identifier for each facility
GDHM	Global Digital Health Monitor; a global site containing country digital health readiness assessment survey results
GDP	Gross Domestic Product; the total annual output of a country's economy
GDRIVE	A "Google Drive" online folder
GS1	A global supply chain standards organization
GSMA	The global association of mobile phone network operators
H2G	How-to Guide for the Buildable Digital Health Blueprint
HIE	Health Information Exchange
HL7	Health Level Seven; a global digital health standards development organization
HMIS	Health Management Information System; a database for conducting and generating analyses of health system data
HRH	Human Resources for Health
HWR	Health Worker Registry; the definitive registry of health worker information, including the unique identifier for each health worker
IaaS	Infrastructure as a Service; a hosted digital solution architecture that is paid for as an ongoing expense
ICT	Information and Communication Technology

ID	Identifier
IHE	Integrating the Healthcare Enterprise; a digital health standards body that publishes implementable, conformance-testable interoperability specifications
IHE Profile	A standards-based portfolio of specifications that address an interoperability use case
IHME	Institute for Health Metrics and Evaluation
IL	Interoperability Layer; a digital health architectural element that coordinates and audit transactions submitted by authenticated systems
ILR	Interlinked Registry; a system of linking health worker, facility, organization, and health service registries to support identifying which workers deliver which services at which places, and under whose auspices
IPS	International Patient Summary; a global, standards-based specification for expressing person-centric health content
IT	Information Technology
LIS	Laboratory Information System
LMIS	Logistics Management Information System
LOE	Level of Effort
MOH	Ministry of Health
OLTP	Online Transaction Processing
OpenHIE	Open Health Information Exchange
ORG	Organization Registry; a repository of health system organizations and the relationships between them
PEPFAR	US Government's President's Emergency Plan for AIDS Relief
PKI	Public Key Infrastructure; a cryptographic digital system for unambiguously identifying a party using a pair of non-forgeable certificates, one private and one public
PMO	Programme Management Office
POS	Point of Service; the place where care is delivered
PPT	Microsoft PowerPoint presentation file
QALY(s)	Quality-adjusted Life-year(s); a metric indicating quality of life after taking into account the impact of death and disability (inverse of DALY)
ROI	Return on Investment
SHR	Shared Health Record; the repository of person-centric information that establishes each individual's longitudinal electronic health record
SOP(s)	Standard Operating Procedures(s)
THE	Total Health Expenditure; the sum of all health costs per person per year, whether paid by the state, by insurance, or out of pocket
ToR	Terms of Reference
TS	Terminology Service; a repository of digital health codes and the relationships between them
TWG	Technical Working Group
WB	World Bank
WHO	World Health Organization
WS-x	Workshop-x (where x denotes the workshop, e.g. 1, 2, 3...)
XLS	Microsoft Excel spreadsheet file

INTRODUCTION

This section describes the How-to Guide's purpose and intended audience, and the layout of the document including its sections and appendices.

DOCUMENT PURPOSE AND INTENDED AUDIENCE

This How-to Guide (H2G) describes how to leverage the Buildable Digital Health Blueprint Toolkit. It describes the templates and content included in the Toolkit and steps through how to employ these assets to facilitate a set of technical working group (TWG) workshops to capture content that, along with desk research results, can inform the development of digital health blueprint artefacts plus an accompanying 10-year Investment Rationale.

There is broad support for the notion of architecture-based, standards-based health data sharing infrastructure as an essential enabler for leveraging digital health to improve care delivery, at scale. WHO, the US government's PEPFAR programme, the Asia eHealth Information Network (AeHIN), the African CDC and others have all endorsed this approach. More specifically, these organizations actively support the adoption of HL7™ FHIR®-based architectures based on the OpenHIE Framework and the use of these architectures as key enablers of Computable Care Guidelines (CCG) initiatives such as, for example, WHO's SMART Guidelines.

This Toolkit will be leveraged by a facilitator to support a country's initiative. The Toolkit is appropriate for national-scale initiatives that wish to embrace this approach and who need to develop the "construction" specifications that will support implementation efforts. The artefacts that result from employing the Toolkit will inform the **MOH** and be leveraged by them. The MOH is the one who will publish their national Blueprint.

TOOLKIT CONTENTS

The following assets are included in the toolkit:

DIRECTORY-1 CONTAINS THE FILES THAT MAKE UP THE TOOLKIT'S TEMPLATE DOCUMENTS:

- a. 000 Buildable Blueprint Overview – PPT to introduce the toolkit and the process for leveraging it
- b. 00 TWG kick-off meeting – PPT to kick off the initial meeting of a technical working group (TWG)
- c. 01 Context Background and Use Cases – PPT to facilitate workshop-1, background context and use cases
- d. 02 HIE Specifications – PPT to facilitate workshop-2, HIE specifications
- e. 03 Digital Health Building Blocks – PPT to facilitate workshop-3, digital health “Lego® blocks” used for constructing the working HIE
- f. 04 Implementation Science – PPT to facilitate workshop-4, governance and implementation science
- g. 05 Investment Rationale (optional) – PPT to facilitate an optional workshop-5 which may be leveraged to support technical assistance to a country that is interested in developing only an Investment Rationale (and has other support for the activities of WS1-WS4) or where a country partner wishes to leverage their TWG to transparently co-develop a 10-year digital health Investment Rationale
- h. Buildable Digital Health Blueprint (draft for comment) – DOC template that represents the final deliverable blueprint artefact (annotated)
- i. 10-year Investment Rationale – XLS template for developing Investment Rationale
- j. BBP Toolkit graphics – PPT including editable graphics included in the DOC template
- k. EXAMPLE subdirectory – a folder containing a set of example PPT decks, an example blueprint artefact, and an example Investment Rationale.

DIRECTORY-2 CONTAINS THE GOOGLE FORMS EMPLOYED, IN REAL TIME, TO COLLECT TWG INPUTS DURING THE FACILITATED WORKSHOPS

- a. 0.0 TWG Icebreaker – FORM used in TWG kick-off meeting
- b. 1.1 Digital Readiness – FORM used in WS-1
- c. 1.2 Health Metrics and Burden of Disease – FORM used in WS-1
- d. 1.3 Current Health Strategies – FORM used in WS-1
- e. 1.4 HIE Activities and Readiness – FORM used in WS-1
- f. 2.1 Data Sharing Architecture & Standards – FORM used in WS-2
- g. 2.2 Cloud-readiness – FORM used in WS-2
- h. 2.3 CCG approach – FORM used in WS-2
- i. 3.1 Digital Health Landscape – FORM shared in advance of WS-3
- j. 3.2 Existing Solutions as HIE Accelerators – FORM used in WS-3
- k. 3.3 Legacy Solutions' Façades – FORM used in WS-3
- l. 4.1 Health Data Governance – FORM used in WS-4
- m. 4.2 Health Data Sharing and Consent – FORM used in WS-4
- n. 4.3 Funding and PMO – FORM used in WS-4
- o. 4.4 Deployment options – FORM used in WS-4

TO LEVERAGE THE TOOLKIT, A FACILITATOR SHOULD:

1. Create a working folder (e.g. SharePoint folder, GDRIVE, etc.) to contain the Directory-1 content.
2. Copy the contents of Directory-1 into this working folder.
3. Create a GDRIVE folder to contain the Google Form TEMPLATE files.
4. Copy the contents of Directory-2 into this GDRIVE folder.
5. Based on desk review and (ideally) in-country engagement with the MOH, edit the PPT, WORD, XLS, and Google Form files as necessary (following the guidance and examples described in this How-to Guide).
6. Leverage these Toolkit facilitation aids to:
 - a. Conduct TWG workshops.
 - b. Generate documentation based on real-time workshop interactions.
 - c. Reflect the workshop content in a set of blueprint artefacts, including a 10-year Investment Rationale.

USING THE TOOLKIT

The TWG **workshops** are the key to this toolkit-supported process.

It is anticipated, in a typical situation, that four workshops will be held, after the initial kick-off workshop. The topics covered in these workshops will be:

1. Context background and use cases – what is the situation in the country, now.
2. HIE specifications - what should be the design of an implementable, national scale, standards-based, conformance-testable health information exchange.
3. Digital health building blocks – how to leverage legacy digital health investments to accelerate the HIE implementation project.
4. Implementation science – what are some of the techniques and tactics that we should favour to mitigate implementation risk... and in practical terms, what data are needed to drive our project planning and Investment Rationale efforts.

Toolkit assets include template PPT decks that can be leveraged to facilitate these workshops, plus template Google Forms that may be leveraged to support real-time interactions with the TWG members. These interactions will drive the course of the workshop discussions to surface issues and address design trade-offs. The decks will also provide a way to document the resulting content from the Interactions.

In some situations, where significant progress has already been made to develop supporting artefacts, there may be a desire by an MOH partner to “unbundle” the Toolkit and to focus only on an Investment Rationale workshop. We can think of this as a “Workshop-5” (WS-5) scenario. In WS-5, there is an expectation that a summary version of each of the other four workshops will be covered with content omitted where it is duplicative and not needed. The WS-5 concludes with the facilitator working collaboratively with the TWG to transparently fill in the Investment Rationale spreadsheet.

Based on a desk review – and on the content from the workshops – the template Blueprint artefact and Investment Rationale tool can be leveraged to create the buildable blueprint artefacts. The process for preparing for and facilitating the workshops, and for documenting the results, is documented in this How-to Guide.

HELPFUL NOTES REGARDING TRANSLATION

The Toolkit artefacts are developed and published in English. In many contexts, it will be important to develop artefacts that are translated into the national language. Several helpful techniques have been developed to assist in this.

Leveraging Google Translate

As a quick way to generate an imperfect but useful national language version, full documents can be translated using Google Translate.

To accomplish this:

1. Create a Google Document from the underlying content (e.g. from a WORD document)
2. Select menu option Tools | Translate Document

No such similar “top-level” process exists for generating translated content for PPT files or spreadsheets. The real-time Google Translate web service may be employed to translate snippets of text that can then be copied/pasted into these files – but there is not a shortcut to automate this.

As a particularly helpful tip for translating into English the content of Form 3.1 (preparatory content for Workshop-3):

1. The contents of the Google Form may be exported to a Google Sheet.
2. This sheet may then be copied and pasted into a Google Doc (in landscape mode) as a table.
This table document may be formatted for readability.
3. The Google Doc may be translated from the national language into English using the process described above.

Leveraging Real-time Translation in the Browser

The English-language Google Forms that are included in the Toolkit and leveraged throughout the workshops may be translated in real-time by Chrome or Edge browsers. To do this:

1. Right-click in the browser window
2. Select menu option **Translate to XXXX** (where XXXX will be the target language) NOTE: the target language can be selected from a drop-down list of the browser’s supported languages
3. The Google Form is displayed in the target language.

This technique cannot be used to generate Forms in the national language (the authoring tool does not support full translations). However, the forms can be viewed in the national language and workshop attendees can submit results that may then be displayed by the workshop facilitator in English.

EXAMPLE TERMS OF REFERENCE (TOR) FOR A BLUEPRINT PROJECT FACILITATOR

Following is an example “skeleton” ToR to engage a facilitator to lead the workshops and the development of both the Buildable Blueprint specification and its accompanying Investment Rationale.

Functional Responsibilities

- Leveraging the country’s existing digital health architecture vision, support the overall development of a comprehensive and detailed digital health infrastructure blueprint using appropriate tools and techniques.
- Perform desktop review and co-organize and co-facilitate digital health blueprint meetings, workshops, workgroups, and other stakeholder engagement through the existing HIS/eHealth governance structure to develop technical specifications sufficient to support the construction of national-scale health information exchange (HIE) infrastructure.
- To assist with enhancing the HIS/eHealth governance structure, develop recommendations (as appropriate) regarding the establishment of a programme management office (PMO) function to support HIS/eHealth implementation, developing a set of national eHealth standards (e.g., HL7 FHIR, IHE profiles, ICD-10/11, etc.); standard operating procedures (SOPs) for implementing relevant health data security, privacy, and confidentiality protocols; and a digital health workforce capacity building programme.
- Evaluate and refresh, if necessary, the national inventory of digital health systems and solutions recorded in the Digital Health Atlas (DHA) and readiness content reflected in the Global Digital Health Monitor (GDHM).
- Review relevant WHO publications related to global and regional digital health strategies and make recommendations for aligning the national digital health agenda and blueprint with the actions outlined for Member States’ consideration.
- Develop a roadmap and Investment Rationale for implementing the national digital health infrastructure blueprint.

Deliverables

- Regular progress reports (e.g., 1-page activity stoplight report or situation report)
- Inception meeting (video conference with partners)
- Report of recommendations related to the inventory of digital health systems and solutions reflected in DHA and the readiness content in GDHM.
- In-country visits for meeting with key stakeholders and facilitation of the workshops
- Draft documents as guides, SOPs, recommendations to support digital health governance, programme management, standardization and interoperability, capacity building, and implementation of relevant policies and regulations.
- Final draft of a buildable digital health blueprint artefact that documents the TWG workshop results.
- Final draft of a 10-year digital health Investment Rationale for implementing the national blueprint.

LAYOUT OF THIS HOW-TO GUIDE AND ITS SECTIONS

This document is prepared in eight sections:

Introduction: this section – which includes the purpose and intended audience, toolkit assets, and the layout of the document.

TWG Kick-off Meeting: a description of the tools and facilitation processes supporting the launch of the buildable blueprint project with the technical working group (TWG).

Workshop-1 Context Background & Use Cases: a description of the tools and facilitation processes supporting a review of the country's digital readiness, plus a review of the present burden of disease and how well aligned are the health strategy and digital health strategy to addressing this burden.

Workshop-2 HIE Specifications: a description of architectural actors in a national HIE, the roles they play in operationalizing key workflows, and potential technical deployment options that the TWG should consider in implementing the shared data infrastructure.

Workshop-3 Digital Health Building Blocks: a description of the tools and facilitation processes supporting a review of the country's existing digital health landscape and an assessment of which broadly scaled solutions may be leveraged to provide a “running start” on the national HIE implementation and accelerate the time to value.

Workshop-4 Implementation Science: a description of the tools and facilitation processes supporting a review of the country's current governance and legislative frameworks related to health custodianship, health data sharing, and the programme management tactics that could be leveraged to lead to a successful rollout.

Workshop-5 Investment Rationale (optional): a description of the tools and facilitation processes that may be employed in situations where the Toolkit has been “unbundled” and only technical assistance related to an Investment Rationale is sought by the country partner. This is illustrated through a worked example.

Buildable Blueprint Engineering Artefact: a description of the ways the relevant desk research and collected questionnaire content can inform and be incorporated into the MOH's blueprint artefacts (which the MOH will publish in the country's national language).

10-year Digital Health Investment Rationale: this section describes how to leverage the digital health investment tool (XLS) to develop a 10-year cost-utility analysis (CUA). The ways the collected questionnaire content and the desk research content map to the model's assumptions are documented through a worked example.



TWG KICK-OFF MEETING

This section describes how to prepare for and facilitate the Technical Working Group (TWG) Kick-off Meeting.

EDITING THE PPT DECK – PRE-MEETING (TWG-KO)

The following sections of the How-to Guide assume the template PPT deck, “00 TWG kick-off meeting” is being leveraged.

It is assumed that the first meeting will be attended by the executive sponsor of the Buildable Digital Health Blueprint initiative. If this is so, the **Welcome** slide is edited to introduce this sponsor and invite them to open the meeting and launch the initiative. If the sponsor will not be attending the kick-off, the executive sponsor can be introduced on the slide, and a short welcome statement can be quoted on the slide (perhaps with the sponsor’s picture). Ideally, the sponsor’s statement will underscore the importance of the project and the government’s support for it.

Hopefully, all the members of the TWG will be able to attend the kick-off meeting. Even if this is not so, they should be introduced by name and named on the **Introductions** slide. As a practical matter, this slide could list the TWG participants, including the leadership, in alphabetical order to avoid creating controversy.

Figure 1 - Add Form Sharable URL to PPT

INTERACTION 0.0

<Insert sharable URL, here>

- What is your favourite **animal** as a **PET**?

During our workshops, we will leverage anonymous forms to collect and collate the information we need to develop our blueprint.



 5

The **Interaction 0.0** slide will help facilitate an “icebreaker”; a fun activity to help attendees become comfortable with each other, and with the real-time questionnaires that will be used throughout the workshops. The template **Form 0.0** asks attendees about their favourite pets. This can be edited (see next section). The **Form 0.0** sharable URL should be included in the **Interaction 0.0** slide header (see Figure 1, with relevant content highlighted in red). There are instructions in the next section regarding how to accomplish this.

Edit the **Project Timeline** slide to reflect the expected duration of the overall project and the high-level milestones that will be met. These milestones should include, as a minimum:

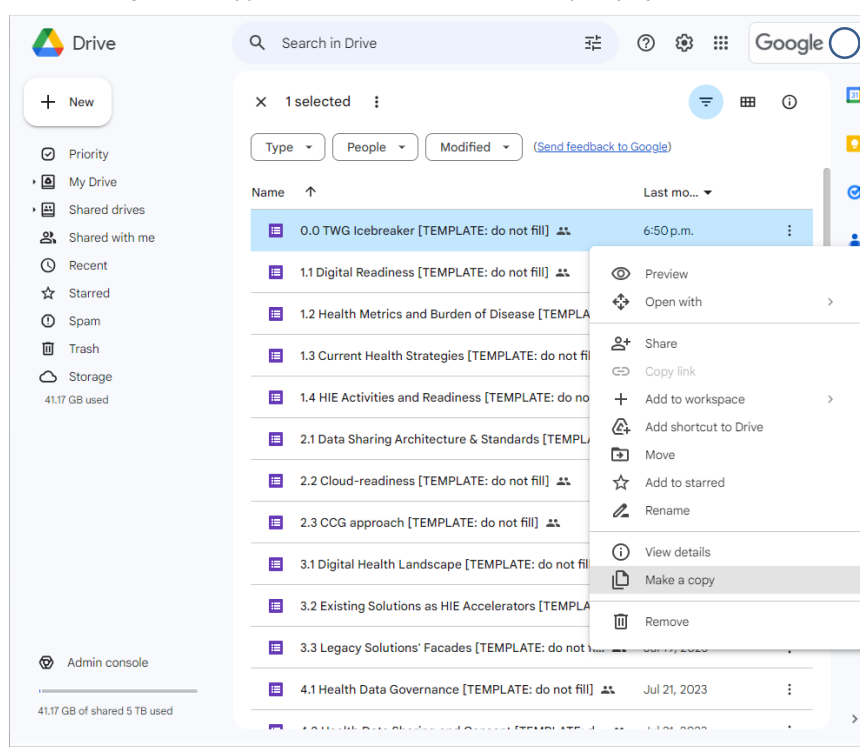
- TWG kick-off meeting
- Each Workshop (the template assumes 4 will be held)
- The release date for the Blueprint Draft-for-Review
- The anticipated publication date for the Blueprint artefact(s).

The Next Steps slide should be edited to reflect that content will be shared with the TWG in preparation for the workshops. The date and time (and place, if in-person meetings will be held) of Workshop-1 should be noted at a minimum. If the entire schedule of workshops is known, this can be shared on the slide.

EDITING THE GOOGLE FORMS (TWG-KO)

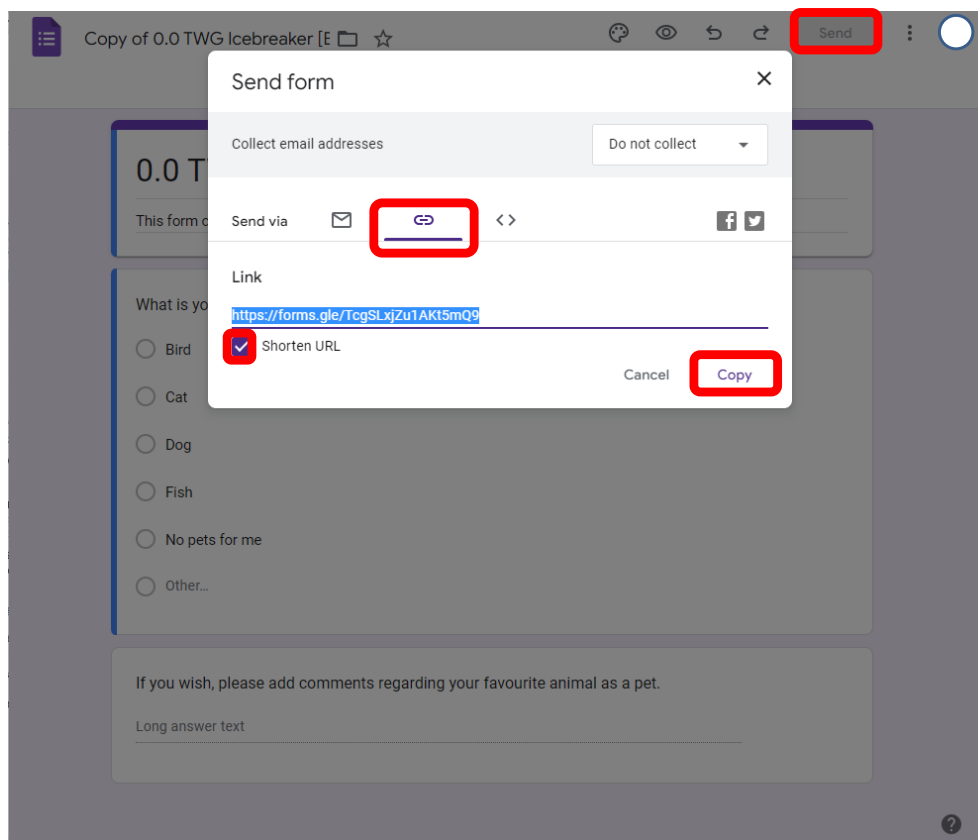
The Form “0.0 TWG Icebreaker” is included in the Forms directory (GDRIVE). You have read-only access to this form. Make a copy of this form and save it to **your** project GDRIVE (see Figure 2).

Figure 2 - Copy the 0.0 TWG Icebreaker form to your project GDRIVE



The purpose of **Form 0.0** is to introduce TWG members to the anonymous Google Forms that will be employed throughout the workshops, and to act as a fun “icebreaker” in the kick-off meeting. The template for **Form 0.0** asks TWG members about their favourite pets. This can, of course, be edited. Whatever question is used should be simple and non-controversial. To introduce the common format used in all the anonymous Google Forms, there is an optional free-text comment field following the mandatory question. If the question is edited, the title of this free-text comment should also be edited.

Figure 3 - Generating a Sharable URL for the Form



Form 0.0 needs to be shared with the TWG Kick-off attendees **during** the meeting. To obtain a sharable link that can be used during the meeting, open Form 0.0 and click the **Send** button on the top right side of the Google Form editor, select the “link” icon in the Send Form dialog box, choose the Shorten URL option, and Copy the shortened link address to your clipboard (see Figure 3, with relevant buttons noted in red). The sharable link can be inserted into the PPT deck on the **Interaction 0.0** slide (note Figure 1). During the meeting itself, this link can be shared via online meeting to all the attendees (even in-person attendees) or emailed to the meeting attendees list.

The **Interaction 0.0** slide will help facilitate an “icebreaker”; a fun activity to help attendees become comfortable with each other, and with the real-time questionnaires that will be used throughout the workshops. The template **Form 0.0** asks attendees about their favourite pets. This can be edited (see next section). The **Form 0.0** sharable URL should be included in the **Interaction 0.0** slide header (see Figure 1, with relevant content highlighted in red). There are instructions in the next section regarding how to accomplish this.

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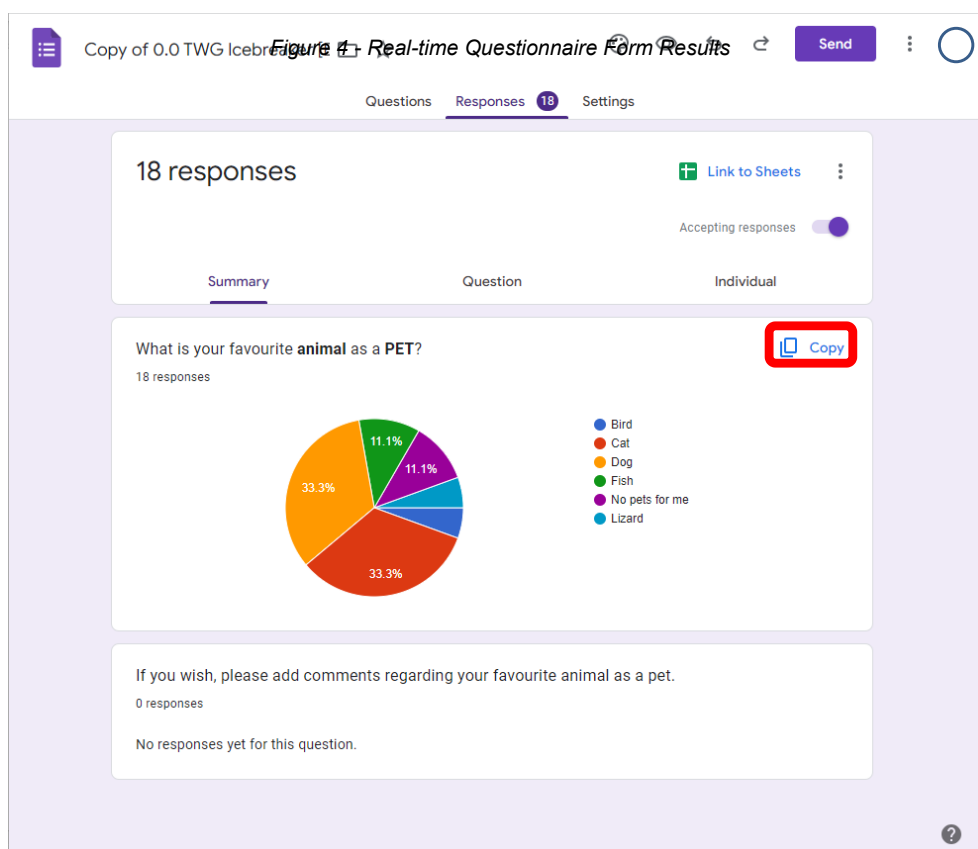
FACILITATING THE TWG KICK-OFF MEETING

The purpose of the TWG Kick-off Meeting is, literally, to launch the Blueprint project. Typically, such a meeting can be brief (one hour) and it lends itself to being held as an online meeting. Even for an in-person meeting, attendees should be encouraged to have a PC or a phone that can access the network so that real-time questionnaire form filling can be easily done.

The following notes apply to facilitating this meeting:

- **Welcome:** It is very helpful for the executive sponsor to attend the kick-off meeting in person and announce the commencement of the project. If this is not possible, a short message from the executive sponsor can be read by an MOH representative or by the facilitator.
- **Introductions:** Following the order on the slide, the facilitator can invite each of the TWG members to briefly introduce themselves. Since the TWG can be large, it should be noted to attendees that introductions should remain brief (60 seconds, maximum, per attendee). For TWG members not in attendance, the facilitator can introduce them by name and affiliation.
- **Interaction 0.0:** This is intended to be an “icebreaker”. It should be light-hearted and fun. The real purpose is to familiarize TWG members with the real-time forms that will be used throughout the workshops. It is useful to frame the activity that way.

At the time the slide is presented, the sharable URL should be copied to the online meeting chat and/or emailed to all the meeting invitees. The Google Form editor will display the number of responses in real time as they are being submitted on the **Responses** tab. This browser tab can be shared to attendees after the questionnaire data-entry period is “closed” by the facilitator, or alternatively, the graphic can be copied and pasted into the PPT deck in real time (see Figure 4).



- **Optional** – the “000 Buildable Blueprint Overview” PPT deck may be shown, in its entirety, at this point in the meeting. Alternatively – select slides from this deck may be shown. The purpose of this section is to inform TWG members about the motivations for the initiative, the processes that will be followed, and the expected outputs. If there is concern for time, this optional section can be omitted altogether. In this case, it may be useful for the “000 Buildable Blueprint Overview” deck to be shared as pre-read material before the TWG Kick-off.
- **Project Scope:** it is important that it is clear to the TWG what is in and what is out of scope. Ideally, this slide will identically reflect the stated scope of the facilitator’s mandate (verbatim is preferred).

- **Project Timeline:** it should be emphasized that this is a short-duration project. The toolkit is very much intended to be leveraged to quickly develop a buildable blueprint artefact plus the accompanying Investment Rationale. Hopefully the project timeline will be a matter of only a few months. The quick pace is important because of how much the arc of the work follows from one workshop to the next. If there is too much spacing between the workshops, this arc can be broken, and momentum can be lost. This point should be emphasized.
- **Iterative Process:** to further emphasize the importance of short timeline message (above), this slide notes how the output of each workshop (the real-time questionnaire results) is treated as an input to the following workshop. Two points are noteworthy, and should be emphasized by the facilitator:
 - Relevant background material will be shared ahead of the workshops. It will greatly improve the effectiveness of the workshops if all TWG members have read this material (and will impede progress if they have not).
 - All questionnaire inputs are anonymous. This will assist in surfacing challenges or issues that can sometimes be difficult or awkward to raise – but which can also be crucially important and must be considered if the initiative is to succeed. Of course – it is also useful to note that the blueprint artefact will inform the MOH; not bind it to one course of action or another.
- Next steps: the TWG's immediate action items should be listed, including noting the scheduling of (at least) the first workshop, if not the whole workshop series.

EDITING THE PPT DECK – POST-MEETING (TWG-KO)

As a recommended practice, after each meeting, slides should be created to document the results of submitted real-time questionnaire forms. These should be inserted into the “facilitation” PPT deck immediately following each **Interaction** slide. The summary graphic can be copied from the Google Form editor (note Figure 4) and pasted onto the relevant PPT slide, as illustrated by Figure 5.

Figure 5 - Included Questionnaire Results in PPT deck



This archiving discipline will allow the PPT decks to become part of the supporting documentation of the eventual Blueprint artefact, and its accompanying Investment Rationale.

WORKED EXAMPLE (TWG-KO)

The file “00 TWG kick-off meeting – EXAMPLE” is included in the EXAMPLE subdirectory of the toolkit folder.



WORKSHOP-1

CONTEXT BACKGROUND & USE CASES

This chapter provides a description of the tools and facilitation processes supporting a review of the country's digital readiness, plus a review of the present burden of disease and how well aligned are the health strategy and digital health strategy to addressing this burden.

PRE-WORKSHOP READING LIST (WS-1)

TWG members should be provided with links to the source materials that will be employed during the workshop. These data will come from:

- Global Digital Health Monitor:
<https://digitalhealthmonitor.org/>
- GSMA country coverage site:
<https://www.gsma.com/coverage/>
- IHME country summaries:
<https://www.healthdata.org/research-analysis/health-by-location/profiles>

For each source, the shared link should navigate to the target country data set. As an illustration, for the Workshop-1 **worked example** PPT, an “amalgam” of disparate country data was employed to show how this may be done, and the relevant navigable links are shown below:

- https://monitor.digitalhealthmonitor.org/country_profile/KHM
(Cambodia)
- <https://www.gsma.com/coverage/#321>
(Rwanda, MTN)
- <https://www.gsma.com/coverage/#5815>
(Rwanda, kt)
- <https://www.healthdata.org/research-analysis/health-by-location/profiles/senegal>
(Senegal)

In addition to the digital readiness and IHME metrics sources, the country **health strategy** and **digital health strategy** should both be shared (as PDFs). It should be noted to TWG members that the **Executive Summary** of each should be reviewed prior to Workshop-1. For the purposes of illustration, in the **worked example** PPT deck, the Health Strategy and eHealth Policy strategic plan for Kenya were employed; the relevant links are here:

- http://guidelines.health.go.ke:8000/media/Kenya_Health_Sector_Strategic_Plan_July_2018- June_2023.pdf
(Strategic Plan)
- <https://repository.kippra.or.ke/handle/123456789/1786>
(eHealth Policy)

As Workshop-1 will introduce the topic of computable care guidelines (CCGs) it is recommended that TWG members briefly familiarize themselves with these:

- 200-second intro to CCGs: <https://vimeo.com/347427025>

An email containing the relevant links (or attachments, where necessary) should be shared to the TWG members ahead of the workshop and with enough advance notice that it is reasonable for them to have time to do the readings. Of note – to ensure strong uptake of the material, the aggregate pre-reading time commitment should be less than an hour.

IF THERE IS NO GLOBAL DIGITAL HEALTH MONITOR RECORD

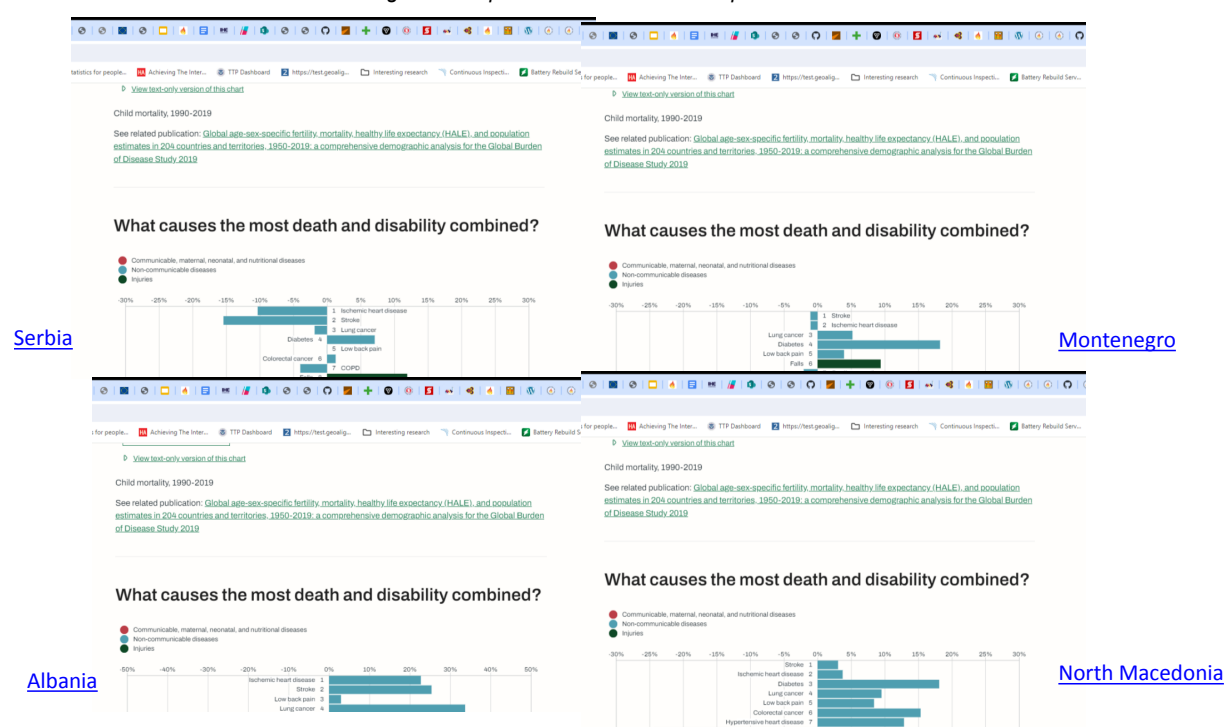
There may be cases where the country has not submitted a GDHM survey, or where this survey is woefully out of date. In such cases, a Google Form of the GDHM survey may be shared to workshop attendees as part of the pre-workshop content. This survey instrument, **GDHM Survey Form**, is included on the GDRIVE in the Forms directory. NOTE: instructions regarding how to display the form in the national language may need to be included when it is shared with the TWG members.

IF THERE IS NO IHME RECORD

There may be cases where there does not exist an IHME record for the target country. Where this is the case, the following is the recommended process (using Kosovo as an example):

1. Select a set of peer or neighbour countries for which there is IHME content.
2. For each of these peer countries, obtain the top-10 DALYs from their respective country summary reports on the IHME site (found, here: <https://www.healthdata.org/research-analysis/health-by-location/profiles>). Create a list of the distinct/unique top-10 DALYs.

Figure 6 - Top-10 DALYs for Kosovo's peer countries



3. Leveraging the IHME GHDx site (<https://vizhub.healthdata.org/gbd-results/>):
 - a. Select Cause of death or injury in the GBD Estimate field
 - b. Select DALYs (only) in the Measure field
 - c. Select Number (only) in the Metric field
 - d. In the Cause field, select each of the distinct top-10 DALYs causes from the list of peer countries
 - e. In the Location field, select the list of peer countries
 - f. Select All ages and Both sexes in the Age and Sex fields, and in the Year field, select the most recent year
 - g. Click Search
 - h. Download the results (you may need to create an account, but this is simple to do, and there is no cost).

Figure 7 - Example GHDx Query (triangulating DALYs for Kosovo)

Measure	Metric	Cause	Location	Age	Sex	Year	Value	Upper	Lower
DALYs (Disability-Adjusted Life Years)	Number	Ischemic heart disease	Serbia	All ages	Both sexes	2021	491,639.49	561,466.76	427,236.19
DALYs (Disability-Adjusted Life Years)	Number	Stroke	Serbia	All ages	Both sexes	2021	436,173.15	531,839.11	368,356.02
DALYs (Disability-Adjusted Life Years)	Number	Low back pain	Serbia	All ages	Both sexes	2021	174,204.16	234,840.13	124,316.14
DALYs (Disability-Adjusted Life Years)	Number	Tracheal, bronchus, and lung cancer	Serbia	All ages	Both sexes	2021	166,150.50	205,346.31	130,943.78
DALYs (Disability-Adjusted Life Years)	Number	Diabetes mellitus	Serbia	All ages	Both sexes	2021	162,738.69	201,163.07	130,952.72
DALYs (Disability-Adjusted Life Years)	Number	Stroke	North Macedonia	All ages	Both sexes	2021	119,595.89	141,508.01	97,686.17
DALYs (Disability-Adjusted Life Years)	Number	Ischemic heart disease	Albania	All ages	Both sexes	2021	107,500.58	125,961.95	91,802.53
DALYs (Disability-Adjusted Life Years)	Number	Stroke	Albania	All ages	Both sexes	2021	97,119.81	115,879.57	79,011.26
DALYs (Disability-Adjusted Life Years)	Number	Ischemic heart disease	North Macedonia	All ages	Both sexes	2021	89,846.64	105,218.84	75,733.89
DALYs (Disability-Adjusted Life Years)	Number	Chronic obstructive pulmonary disease	Serbia	All ages	Both sexes	2021	79,310.95	91,575.57	67,836.90
DALYs (Disability-Adjusted Life Years)	Number	Colon and rectum cancer	Serbia	All ages	Both sexes	2021	77,936.14	94,855.02	62,827.43
DALYs (Disability-Adjusted Life Years)	Number	Hypertensive heart disease	Serbia	All ages	Both sexes	2021	66,664.61	83,379.34	50,141.94
DALYs (Disability-Adjusted Life Years)	Number	Age-related and other hearing loss	Serbia	All ages	Both sexes	2021	64,439.51	89,887.09	44,548.59
DALYs (Disability-Adjusted Life Years)	Number	Breast cancer	Serbia	All ages	Both sexes	2021	58,777.73	75,051.25	44,548.59
DALYs (Disability-Adjusted Life Years)	Number	Headache disorders	Serbia	All ages	Both sexes	2021	58,613.04	75,076.88	47,828.78
DALYs (Disability-Adjusted Life Years)	Number	Falls	Serbia	All ages	Both sexes	2021	57,695.07	75,075.13	43,715.43
DALYs (Disability-Adjusted Life Years)	Number	Cardiomyopathy and myocarditis	Serbia	All ages	Both sexes	2021	51,086.75	64,394.69	39,063.77
DALYs (Disability-Adjusted Life Years)	Number	Low back pain	Albania	All ages	Both sexes	2021	50,118.76	67,965.51	35,761.82
DALYs (Disability-Adjusted Life Years)	Number	Self-harm	Serbia	All ages	Both sexes	2021	47,427.63	55,995.95	39,677.22
DALYs (Disability-Adjusted Life Years)	Number	Diabetes mellitus	North Macedonia	All ages	Both sexes	2021	41,218.12	51,701.48	33,368.94
DALYs (Disability-Adjusted Life Years)	Number	Low back pain	North Macedonia	All ages	Both sexes	2021	37,104.14	50,283.93	26,144.99
DALYs (Disability-Adjusted Life Years)	Number	Neonatal disorders	Serbia	All ages	Both sexes	2021	34,186.48	40,810.47	28,765.57
DALYs (Disability-Adjusted Life Years)	Number	Road injuries	Serbia	All ages	Both sexes	2021	32,672.22	37,485.19	28,102.40
DALYs (Disability-Adjusted Life Years)	Number	Ischemic heart disease	Montenegro	All ages	Both sexes	2021	32,323.34	38,553.82	26,567.75
DALYs (Disability-Adjusted Life Years)	Number	Stroke	Montenegro	All ages	Both sexes	2021	31,861.57	37,180.66	27,281.89
DALYs (Disability-Adjusted Life Years)	Number	Tracheal, bronchus, and lung cancer	North Macedonia	All ages	Both sexes	2021	27,576.40	34,606.40	20,887.60

- In Excel, leverage the downloaded data set to create a summary metric for each of the distinct top-10 DALY causes from the list of peer countries. Sort this by DALYs, from largest to smallest. Prorate by population to develop a metric for the target country. The first 10 of these represent the triangulated top-10 DALYs for the target country.

Figure 8 - Kosovo "Triangulated" top-10 DALYs

DALYs Cause	DALYs total across peers	Estimated DALYs (Kosovo)
Ischemic heart disease	721,312	107,152
Stroke	706,750	104,989
Low back pain	272,658	40,504
Tracheal, bronchus, and lung cancer	230,330	34,216
Diabetes mellitus	230,147	34,189
Chronic obstructive pulmonary disease	109,650	16,289
Colon and rectum cancer	101,645	15,100
Age-related and other hearing loss	99,439	14,722
Headache disorders	94,516	14,040
Hypertensive heart disease	91,850	13,644
Falls	87,360	12,977
Breast cancer	80,169	11,909
Cardiomyopathy and myocarditis	75,101	11,156
Neonatal disorders	70,934	10,537
Self-harm	61,922	9,199
Road injuries	52,762	7,838
Populations		
Kosovo	1,800,000	
Montenegro	617,000	
Serbia	6,660,000	
North Macedonia	2,060,000	
Albania	2,780,000	
Ratio: Kosovo / peers	0.148551622	

EDITING THE PPT DECK – PRE-MEETING (WS-1)

The following sections of the How-to Guide assume the template PPT deck, “01 Context Background and Use Cases” is being leveraged.

Country content from the Global Digital Health Monitor (GDHM) should be leveraged to create and populate a set of slides related to digital readiness. To do this:

1. Navigate to the GDHM site
2. Select the target country
3. Expand all the content sections
4. Make a screen capture (which copies the screen image to the clipboard)
5. Paste the screen capture image onto its own PPT slide
6. Crop the image
7. Return to the browser window and scroll down to reveal the next content section and repeat steps 4-6... until all the relevant content is captured and copied onto slides.

Figure 9 - Screen-capture Relevant Content from GDHM

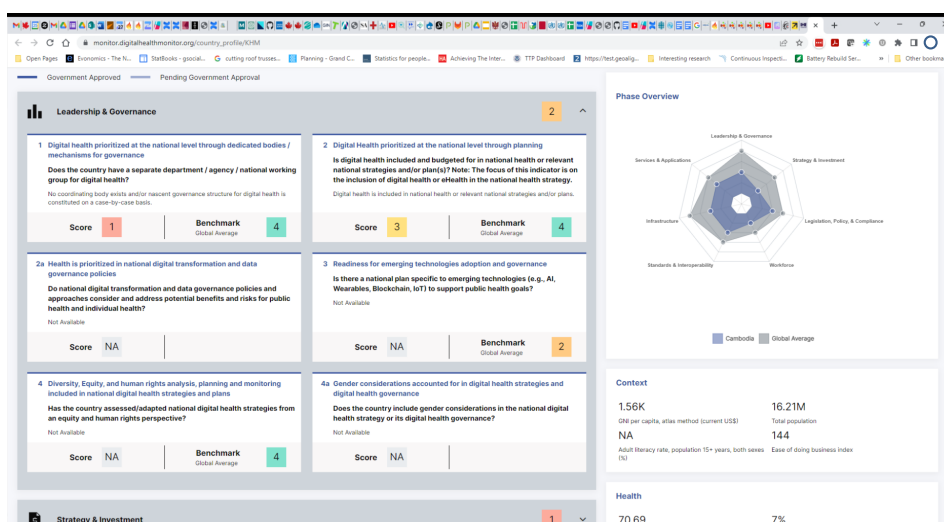
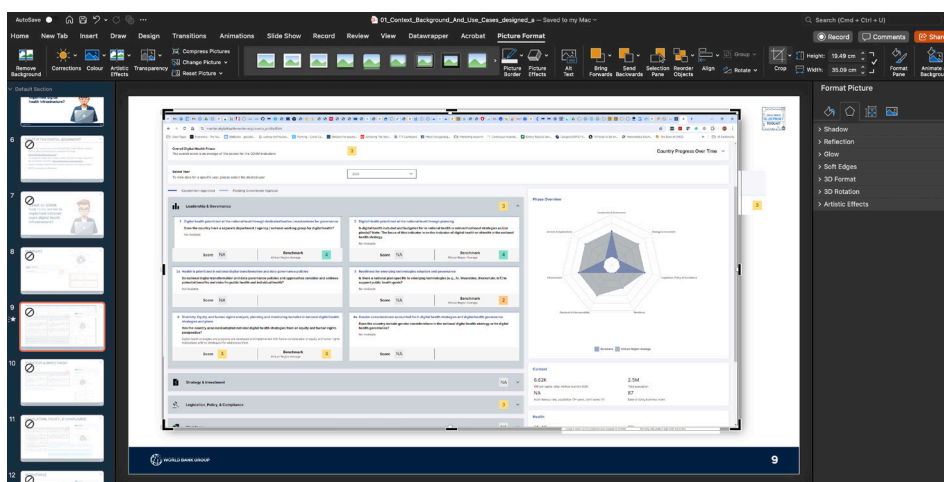
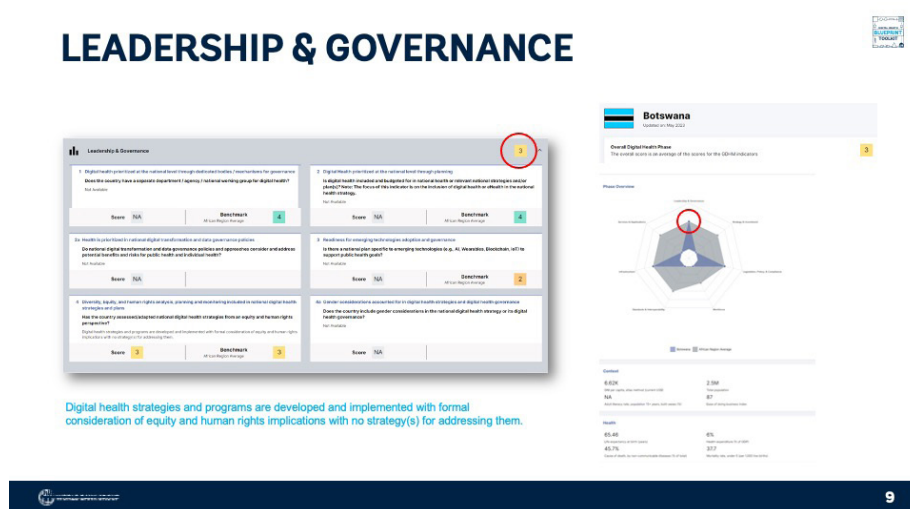


Figure 10 - Paste and Content onto a PPT slide and Crop the image



Leveraging GDHM content for Cambodia, as an example, the process is illustrated above. Sections of the GDHM assessment can be separately screen-captured and copied into the Workshop-1 PPT deck. The process of screen-capturing the content from the GDHM site, and pasting and cropping the resulting image in PPT, is illustrated by Figure 9 and Figure 10, respectively. The resulting slide (as an example) is shown in Figure 11.

Figure 11 - Resulting Slide with GDHM Content



NOTE: If there is no “official” country record in the GDHM, then the Google Form included in the Template may be leveraged to collect inputs from the TWG regarding digital health readiness (see section: If there is no Global Digital Health Monitor record). To develop the GDHM “spider graph” graphic, the information collected from the TWG responses may be hand-entered into the “GDHM Spider Graph” Excel tool included in the Toolkit. The overall score and GDHM spider graph may be copied into the Workshop-1 PPT deck in place of the GDHM website content.

In addition to the GDHM content, it is useful to provide TWG attendees with a visual representation of the country’s mobile network coverage. This underscores where there will be, and where there will not be, network access to the national HIE. Network coverage maps are available from the GSMA site. As with the GDHM content, to create appropriate slides:

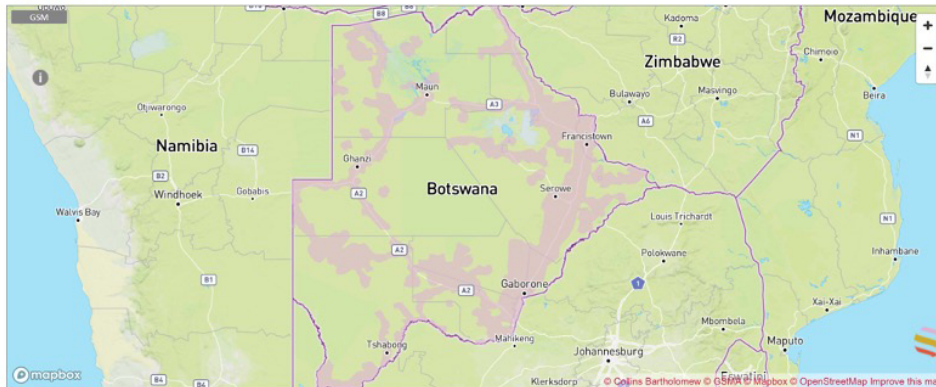
1. Navigate to the GSMA site
2. Select the target country and, iteratively, the top one or two mobile network providers
3. For each – highlight all the relevant network protocols (GSM / 2G, 3G, and LTE) and screen capture the coverage map, and paste and crop the captured image onto a PPT slide.

Figure 12 - Example GSMA Coverage Map (Botswana)

MOBILE NETWORK COVERAGE

Botswana

Operator: btc



WORLD BANK GROUP

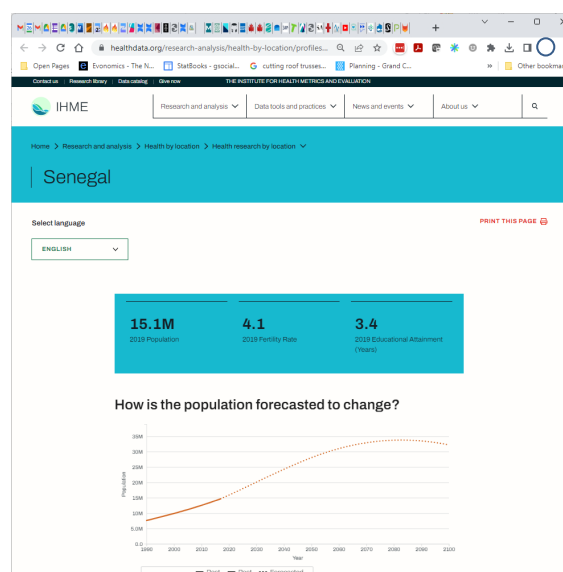
18

An example of the resulting PPT slide (illustrating the coverage for Botswana) is shown in Figure 12.

To set up for **Interaction 1.1**, a short sharable URL link for **Form 1.1** should be generated from the Google Form editor and added to the header of the slide. The process for this is illustrated by Figure 3.

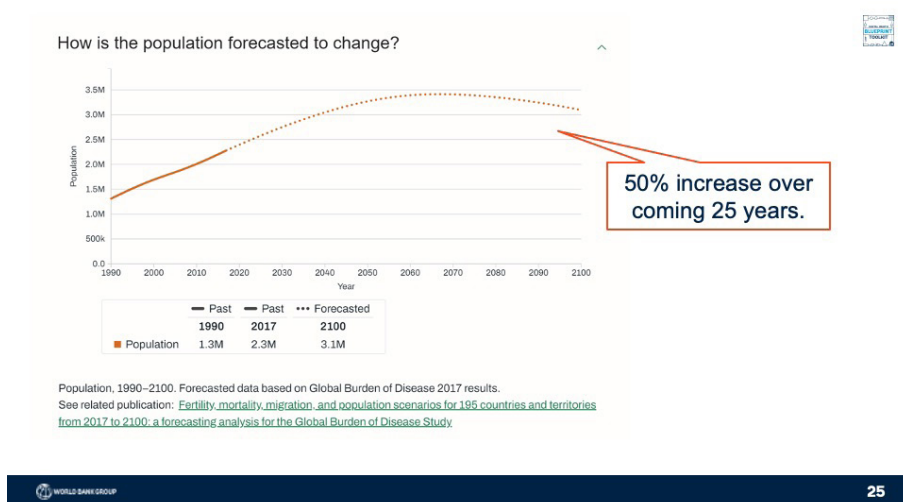
The summary content related to the country's health metrics and burden of disease should be retrieved from the Institute for Health Metrics and Evaluation (IHME) site. For demonstration purposes, the following example will illustrate capturing IHME metrics for Senegal (Figure 13).

Figure 13 - Capturing Content from IHME



The process for capturing the content and pasting into the slides is the same as was illustrated in the previous section (see Figure 9 and Figure 10). As was the case for the GDHM content, it is recommended to create one slide for each of the IHME metrics that will be included in the Workshop-1 PPT deck. An example the resulting set of slides is illustrated by Figure 14.

Figure 14 - Set of IHME Metric slides in PPT deck



NOTE: in cases where there is no IHME record for the target country, a set of discussion slides should be prepared that describe the process that was followed to triangulate a top-10 DALYs list. Content from the H2G section, If there is no IHME record, can be leveraged to describe this for the TWG. A slide showing the triangulated top-10 DALYs should be prepared (note Figure 8).

In preparation for the real-time activity, the Google Form editor should be used to generate a sharable link for **Form 1.2**, and this should be copied to the header of slide **Interaction 1.2**.

Content for the PPT slides related to health and digital health strategies should, wherever practical, be sourced directly from the published artefacts. Leveraging the Executive Summary of each document, copy and paste key points and present them as a short series of slides that conveys the gist of each document.²

The purpose of this section is to ensure TWG members can evaluate and provide feedback on the timeliness (currency) and consistency of the present strategy documents related to the disease burden and related to each other. To help prepare for such a discussion, it may be helpful to create key point summaries of the two documents and present these as the last two slides in this section. An example of such a key point summary is shown in Figure 15.

² NOTE: the strategy documents published by Kenya were leveraged to create sample content in the Workshop-1 worked example PPT deck. This deck is included in the EXAMPLE subdirectory.

KEY TAKEAWAY POINTS

- Botswana's strategic **health focus** is broadening (since 2010) to address the growing **NCD** burden.
- Driven by UHC goals, a package of **basic health services** has been defined, largely to be delivered in **primary** or **community care** settings.
- More recently, the digital health focus has shifted from M&E-only toward **broader support of care delivery workflows** executed at the point of service.
- **Care continuity** is recognized as important. Health **data sharing infrastructure** has been identified as a strategic initiative to help address it.
- Botswana needs a national digital health “blueprint”, including national **norms and standards**.

The Google Editor should be used to generate a sharable link for **Form 1.3** and this link should be pasted into the header of slide **Interaction 1.3**. Likewise, a sharable link for Form 1.4 should be generated and pasted into the header of slide **Interaction 1.4**.

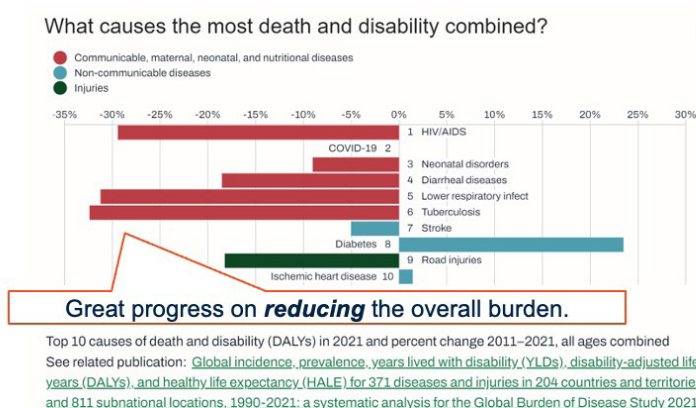
The final slide should be edited to reflect further details related to upcoming Workshop-2 (perhaps to include the date and time, location, and online meeting link, if these are known). Of course, other further edits may be made by the facilitator to reflect content particular to the context and to the preferences of the workshop leader, the MOH, and of the TWG membership.

EDITING THE GOOGLE FORMS (WS-1)

It is assumed that Google Form editor is leveraged to make necessary edits to the project's **copies** of the Toolkit's Form files.

Form 1.1 lists a set of potential challenges that could impede digital health adoption. The list is not expected to be exhaustive, and an “other” option is included. The form should be edited, if necessary, to better reflect local context. The sharable link for **Form 1.1** should be generated and pasted to the header of the **Interaction 1.1** slide in the Workshop-1 PPT deck.

Figure 16 - IHME top-10 DALYs (example)



Form 1.2 must be edited to reflect the country's top-10 Disability Adjusted Life-years (DALYs) lost, as reported on the IHME country summary page. An example of such an IHME top-10 DALYs metric is shown in Figure 16. Using the editor, rename the “placeholder” labels with the conditions listed on the IHME graphic (in order). An example of making such edits for **Form 1.2** is illustrated in Figure 17.

Other edits to Form 1.2 should be made, as necessary, and then a sharable link for **Form 1.2** should be generated and pasted to the header of the **Interaction 1.2** slide in the Workshop-1 PPT deck.

Figure 17 - Form 1.2 edited to represent top-10 DALYs

Copy of 1.2 Health Metrics and Burden of Dis

Questions Responses Settings

What do you believe should be the **top 2 care use cases** supported by our national HIE? Please select **only two** options from the list.

☐ Neonatal disorders

☐ Diarrheal diseases

☐ Malaria

☐ Lower respiratory infections

☐ Congenital defects

☐ Stroke

☐ Ischemic heart disease

☐ Tuberculosis

☐ Dietary iron deficiency

☐ Road injuries

☐ Other...

☐ Add option

Required

Form 1.3 is leveraged to capture TWG members' opinions regarding the refresh cycles for strategy and blueprint artefacts, as well as the degree of alignment between the health strategy, digital health strategy and national burden of disease. Free form comments on these topics can also be submitted by TWG members. Content from this form is leveraged to develop the blueprint and Investment Rationale artefacts. The sharable link for **Form 1.3** should be generated and pasted to the header of the **Interaction 1.3** slide in the Workshop-1 PPT deck.

Form 1.4 is leveraged to capture TWG members' opinions regarding the activities necessary to support guideline-adherent care for their selected conditions (per **Form 1.2**) as well as opinions related to the adoption and timeframe within which health benefits should be realized from the national HIE investments. Free form comments on these topics can also be submitted by TWG members. Content from this form is leveraged to develop the blueprint and Investment Rationale artefacts. The sharable link for **Form 1.4** should be generated and pasted to the header of the **Interaction 1.4** slide in the Workshop-1 PPT deck.

FACILITATING WORKSHOP-1

As a practical matter – the meeting invitations should emphasize that attendees should have with them a PC, tablet, or mobile phone that will allow them to respond to the real-time questionnaires.

Workshop-1 begins the work of the TWG on the primary task that must precede **any** digital project: establishing the “as-is” baseline context and capturing requirements. To facilitate this, the template Workshop-1 PPT agenda focuses on:

- Country context
 - Digital readiness
 - Burden of disease
 - Strategic goals
 - Health system strategy
 - Digital health strategy
- Key question: “what should our HIE **do**?”

To provide an unbiased assessment of readiness, the Global Digital Health Monitor (GDHM) site is referenced. The first section of the deck should present to the TWG the **verbatim** overview of the GDHM assessment. GDHM is an initiative with broad support from the development partner community; the GDHM results are typically provided by the country MOH and so should be presented to the TWG as a “**credible**” snapshot of the country’s digital readiness. *NOTE: if there was no GDHM record, leverage the TWG’s results from the GDHM Google Form and the GDHM Spider Graph Excel tool, instead.*

Over recent years, many countries have enjoyed a significant uptake of mobile phones. Since mobile networks will be the dominant way to access network-hosted digital infrastructure, the **mobile network coverage** will be a key factor as the HIE is scaled. The GSM Association (GSMA) is the global mobile network industry association. GSMA network coverage maps for key operators will illustrate for TWG members where there is broad coverage and where there may be gaps. The national HIE rollout plans will need to be sensitive to this contextual reality.

Interaction 1.1 will elicit feedback from the TWG members related to what they perceive as the **two greatest hurdles** and the **two most powerful accelerators** of digital health adoption. It is intentional that only two are to be selected; the key is to tease out (if possible) a consensus opinion regarding each of these. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 1.1** should be discussed with the group. The hoped-for outcome:

Uncover a consensus opinion within the TWG regarding the top barriers and the most helpful accelerators for the national HIE project.

The section related to IHME metrics is **crucial** to the entirety of the blueprint and its supporting Investment Rationale. The key premise is that national-scale adoption of digital health will systemically increase adherence to evidence-based care practices, and this will, in turn, improve care quality and improve population health outcomes. As with the GDHM content, the **IHME-published metrics** should be presented to the TWG, verbatim, with the expectation that IHME is a highly regarded source that provides a “**credible**” snapshot of the country’s health context. Particular note should be made of the top-10 causes of death and, especially, the **top-10 causes of DALYs lost**. This latter metric will be leveraged to drive the Investment Rationale “benefits” calculation (NOTE: depending on the group, it may be useful to explain what DALYs are and how they are calculated. Resources to help do this are available in the toolkit’s **reference materials** folder.).

Interaction 1.2 will elicit feedback from the TWG members related to what they perceive should be the **two highest priority care use cases** and the **two most impactful reportable indicators** for informing health system management. It is intentional that only two are to be selected by each TWG member; the key is to tease out (if possible) a consensus opinion regarding each of these. The questionnaire link should be shared to the meeting attendees via the online meeting link or via real-time email to the attendees as a way for the facilitator to “open the questionnaire for input”. After the facilitator closes the data input window, summary results can be displayed to the meeting attendees by sharing the Google Form “responses” tab or by copying and pasting the graphic for each question onto a new PPT slide. These questionnaire results of **Interaction 1.2** should be discussed with the group. The hoped-for outcome:

Uncover a consensus opinion within the TWG regarding the top 3-4 care paths and reportable indicators that the national HIE project should focus on.

The section regarding the national **Health Strategy** and the national **Digital Health Strategy** is intended to ensure all TWG members are apprised of the content of these artefacts. NOTE: if one or both of these are either missing, or woefully out of date (more than 10 years old), then this section can be abridged or even omitted. The key goal in this section of Workshop-1 is to present the gist of these artefacts, side by side, and look for the **alignment** between them and between each of them and the burden of disease (as represented by the IHME metrics, especially the top-10 DALYs).

Interaction 1.3 will elicit feedback from the TWG members related to key information needed to inform the Investment Rationale (regular artefact update intervals) as well as providing overall feedback regarding the **degree of alignment** between the strategies, the health burden, and the potential impact the HIE can have on these. The questionnaire link should be shared to the meeting attendees via the online meeting link or via real-time email to the attendees as a way for the facilitator to “open the questionnaire for input”. After the facilitator closes the data input window, summary results can be displayed to the meeting attendees by sharing the Google Form “responses” tab or by copying and pasting the graphic for each question onto a new PPT slide. These questionnaire results of **Interaction 1.3** should be discussed with the group. The hoped-for outcome:

Surface issues, if there are any, regarding alignment of the national strategies to each other and to the national disease burden. Develop a sense of the potential impact a national HIE project can be expected to have on furthering strategic objectives and on addressing key disease challenges.

The last section of Workshop-1 focuses on the **care activities** that would be included, as action “verbs”, in a computable care guideline (**CCG**). The gist of this section is to start to frame the HIE infrastructure investments in terms of healthcare pathways and the evidence-based care activities that will occur along those pathways.

To underscore this idea of HIE-supported care activities, in **Interaction 1.4** TWG members are invited to recall their top-2 care use cases (from **Interaction 1.2**) and to identify the evidence-based care activities that would need to be supported to operationalize these two use cases. TWG members are also asked to estimate the **proportion** of the care network that is, today, ready to digitally support such activities and the number of **years** they believe it will take before we reach a “**tipping point**”

when most of the care network (+80%) will be able to digitally support care pathways. The questionnaire link should be shared to the meeting attendees via the online meeting link or via real-time email to the attendees as a way for the facilitator to “open the questionnaire for input”. After the facilitator closes the data input window, summary results can be displayed to the meeting attendees by sharing the Google Form “responses” tab or by copying and pasting the graphic for each question onto a new PPT slide. These questionnaire results of **Interaction 1.4** should be discussed with the group. The hoped-for outcome:

Illustrate that a full suite of care activities will need to be supported by the HIE in order to make a health impact; a siloed approach will not be effective. Identify what is the “starting point” for our digital health adoption and get a sense of what the TWG believes will be the duration of effort to get to a digital health “tipping point”.

The meeting should conclude with a Q&A and a review of “next steps”. The agenda and the scheduling of Workshop-2 should be shared.

EDITING THE PPT DECK – POST-MEETING (WS-1)

As a recommended practice, after each meeting, slides should be created to document the results of submitted real-time questionnaire forms. The relevant graphics and submitted comments should be inserted into the “facilitation” PPT deck immediately following each Interaction slide. For an example of how this may be accomplished, note Figure 5.

WORKED EXAMPLE (WS-1)

For a worked example PPT deck for Workshop-1, refer to the “01 Context Background and Use Cases – EXAMPLE” file in the toolkit’s EXAMPLE folder.



WORKSHOP-2

HIE SPECIFICATIONS

This chapter provides a description of the workshop tools that articulate the architectural actors in a national HIE, the roles they play in operationalizing key workflows, and potential technical deployment options that the TWG should consider in implementing the shared data infrastructure.

PRE-WORKSHOP READING LIST (WS-2)

Workshop-2 delves into engineering artefacts and system design areas that will not be the “typical” domain for non-technical TWG members. For this reason, the pre-read materials are intended to introduce (and de-mystify) these topics.

- Introduction to the OpenHIE Framework: <https://ohie.org/framework/>
TWG members should just read the content on this introduction web-page to get a sense of the component elements of this HIE framework and the role each element plays.
- A short, easy-to-digest summary of the OpenHIE community’s role and the benefits of the OpenHIE approach:
<https://www.youtube.com/watch?v=9k66GbtWYII&t=204s>
- A short paper reporting on Brazil’s use of IPS as a way to improve care continuity: <https://www.hilarispublisher.com/open-access/brazilian-patient-summary-exchange-health-data-using-ips-and-fhir.pdf>
- A short (200-second) summary of the International Patient Summary, and its role in supporting CCGs and a global learning health system.
<https://www.youtube.com/watch?v=xjEzGM8kBPw>

An email containing the relevant links (or attachments, where necessary) should be shared with the TWG members ahead of the workshop and with enough advance notice that it is reasonable for them to have time to do the readings. Of note – to ensure strong uptake of the material, the aggregate pre-reading time commitment should be less than an hour.

EDITING THE PPT DECK – PRE-MEETING (WS-2)

The Workshop-2 template PPT deck is largely pedagogical and describes the operations of an OpenHIE-on-FHIR based infrastructure and how such an infrastructure can support the execution of CCGs. Where there are plans to deviate from the toolkit's underlying assumptions, edits should be made to the deck to reflect these.

EDITING THE GOOGLE FORMS (WS-2)

Form 2.1 is leveraged to capture TWG inputs regarding the present context related to **standards-based**, **architecture-based**, digital health infrastructure. Such “as-is” context is important to developing the blueprint and Investment Rationale artefacts. The form should be edited, if necessary, to align to edits that may have been made to the Workshop-2 PPT deck. The sharable link for **Form 2.1** should be generated and pasted to the header of the **Interaction 2.1** slide in the Workshop-2 PPT deck.

Form 2.2 is leveraged to capture TWG inputs regarding the present interest in and/or adoption of **cloud-hosted** digital solutions by government departments and to determine whether integrations to legacy solutions have been made in other use cases. The form should be edited, if necessary, to align to edits that may have been made to the Workshop-2 PPT deck. The sharable link for **Form 2.2** should be generated and pasted to the header of the **Interaction 2.2** slide in the Workshop-2 PPT deck.

Form 2.3 is leveraged to capture TWG inputs regarding the adoption of normative care guidelines related to the top-10 DALYs list, to elicit feedback on the implications of multi-purpose vs single-purpose digital health solutions, and to understand the appetite for or interest in leveraging AI or other big data analytic techniques. Question 1 on **Form 2.3** should be edited to reflect the top-10 DALYs as noted from the IHME website (and as represented in **Form 1.2**). The form should also be edited, if necessary, to align to edits that may have been made to the Workshop-2 PPT deck. The sharable link for **Form 2.3** should be generated and pasted to the header of the **Interaction 2.3** slide in the Workshop-2 PPT deck.

FACILITATING WORKSHOP-2

As a practical matter – the meeting invitations should emphasize that attendees should have with them a PC, tablet, or mobile phone that will allow them to respond to the real-time questionnaires.

Workshop-2 is largely pedagogical. The overall Buildable Blueprint toolkit is focused on an *implementable* HIE infrastructure and national digital health POS adoption plan that is in line with the approaches presently favoured by WHO, PEPFAR, AeHIN, Africa CDC, and others. The content in the Workshop-2 PPT template reflects this.

The first section of the WS-2 deck leverages a story-telling approach to help establish with the TWG a common understanding of an HIE’s underlying “metaphor”. This section is intended to move along at a storytelling pace. The key role of this section is to illustrate the idea that point of service (POS) encounters are supported by, and feed, the person-centric content in the HIE. There are three very important takeaway messages:

1. A hosted POS solution should not be conflated with the HIE. Be it local or hosted, a POS solution gets its information from the HIE, and the HIE is separate.
2. The pattern is repeated across each care encounter: identify the care subject; get the health story; provide the service; update the shared copy of the health story.
3. Engaging people in their own care can have a significant and immediate impacts. For this reason, it is useful to begin conversations within the TWG regarding the role that might be played by an MOH-hosted patient portal.

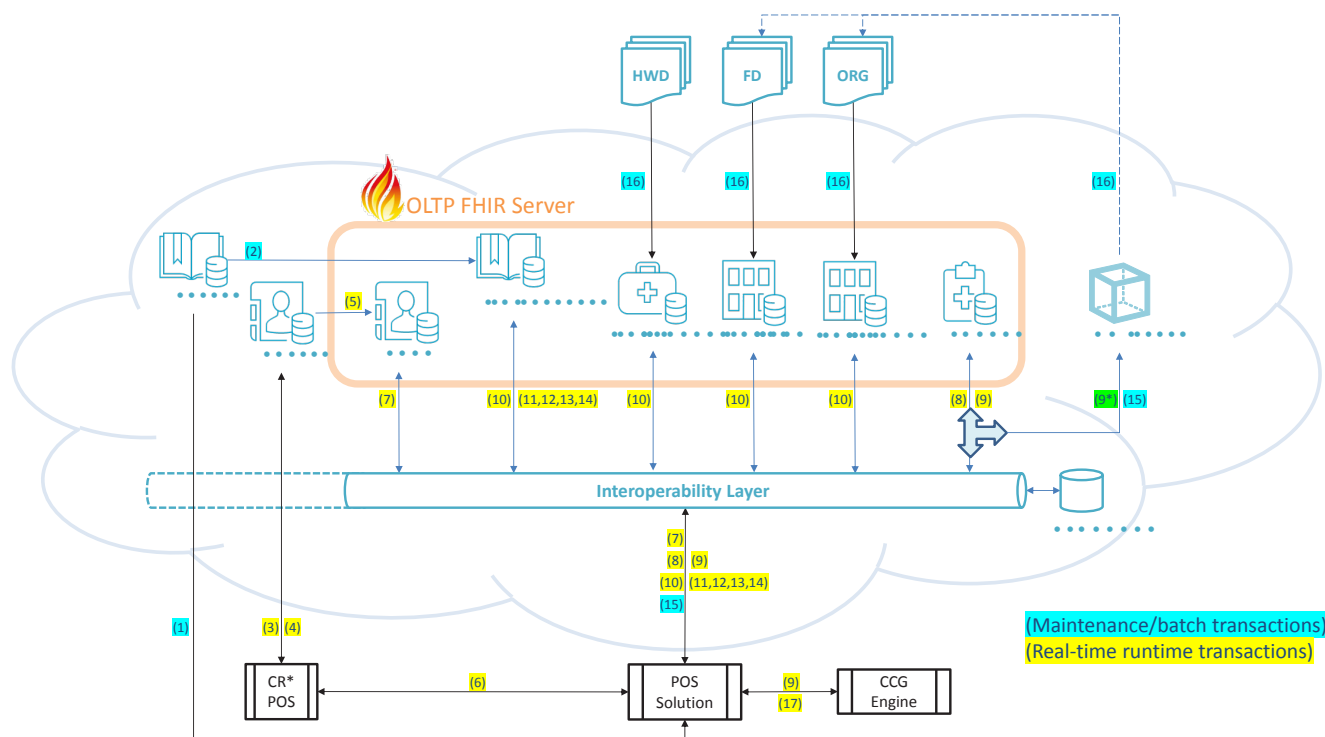
The next section describes, very generically, the premises of health enterprise architecture and quickly introduces the **OpenHIE** framework as an example of this. At a high level, the conformance-testable, standards-based technical specifications (**FHIR-based IHE Profiles**) and the workflows that are operationalized by the OpenHIE “blueprint” are described, along with the person-centric health data content model: **IPS**. Although there is a significant amount of technical information that underpins this family of specifications – it is important to not get mired in unnecessary detail. The chief goal of this section is to convey to TWG members the top-level message: “there is a broadly supported approach for operationalizing a national HIE... and adopting this approach can significantly reduce implementation risk and cost.”

Interaction 2.1 will elicit feedback from the TWG members related to what they perceive as the present context related to **standards-based, architecture-based**, digital health infrastructure. Using the generic OpenHIE infrastructure actors as a model, TWG members identify which components exist, already. Input is also captured regarding the uptake of the HL7 FHIR standard in country digital health solutions and regarding the use of standards to codify health data. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 2.1** should be discussed with the group. The hoped-for outcome:

Capture information about the “as-is” context regarding digital health infrastructure and regarding the uptake of the HL7 FHIR standard and of health data coding standards.

The second section of Workshop-2 illustrates a generic hosting model for the national HIE based on a high-level set of design principles. The model depicts the adoption of performance-related engineering techniques important to supporting large communities of concurrent online users. The actors in the HIE infrastructure are recognizable from the OpenHIE diagram shown in the previous section, but are depicted at a higher degree of detail. Leveraging the “story” from the first section, a set of actor-transaction interactions are described and issues germane to the recommended architectural design are explained (Figure 18). Particular note is made of the opportunities for leveraging big-de-identified data approaches to support improved HMIS analytics as well as an introduction of design options for embracing broadly scaled legacy solutions as part of the national HIE infrastructure.

Figure 9 - Screen-capture Relevant Content from GDHM



Interaction 2.2 will elicit feedback from the TWG members related to the country’s perceived appetite for cloud-hosting as a deployment option (and whether there are examples of this, already, in other government departments). Input is also sought regarding the present use of software façade patterns to incorporate proprietary legacy solutions into standards-based infrastructures. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to

the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 2.2** should be discussed with the group. The hoped-for outcome:

Measure the level of interest in a cloud-hosted deployment option for the national HIE and the level of familiarity with software façade approaches for embracing legacy solutions into a standards-based infrastructure.

The third and last section of the Workshop-2 PPT deck introduces the value proposition of CCGs and describes, at a top level, how they may be leveraged to improve population health outcomes. The normative behaviour of point of service applications is described in a basic way (Figure 19) – as is the overall behaviour of all of the POS solutions across the whole of the care delivery network (Figure 20).

Figure 19 - Normative POS behaviours

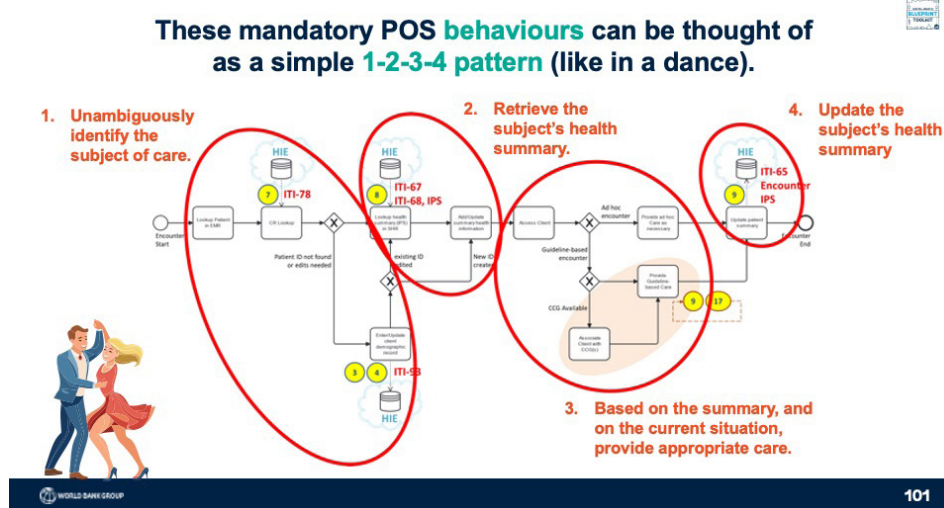
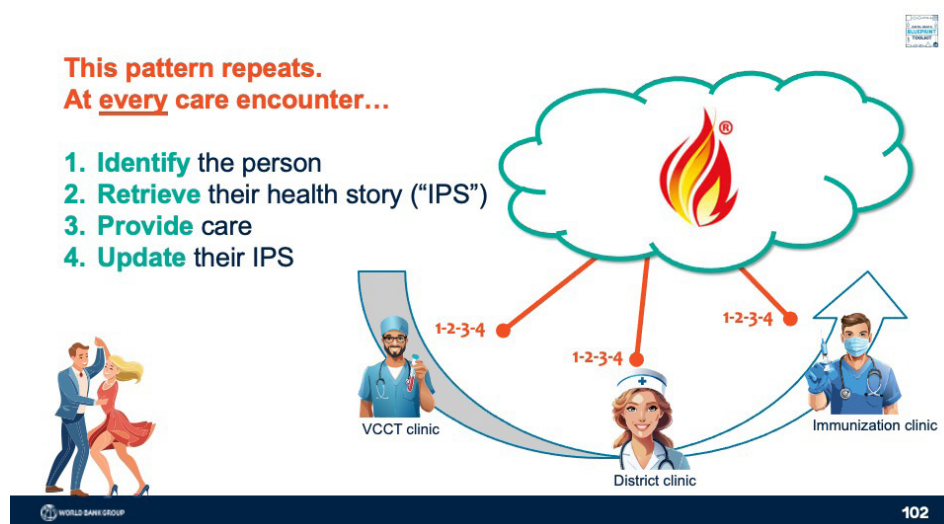


Figure 20 - 1-2-3-4 Pattern across the care delivery network



Interaction 2.3 elicits feedback from the TWG members related to the present level of adoption of guideline-based care. TWG members are also asked for their relative preference of stand-alone (single use case) apps vs multi-use case “platform” solutions that can (via CCGs) be used across wide variety of care scenarios. The questionnaire gauges TWG members’ perception of the benefits vs effort of detailed, person-centric data collection as well as their thoughts on the number of separate solutions a care provider should have to employ to conduct an encounter. Lastly, TWG members are asked whether they believe there can be significant value from leveraging AI in healthcare. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 2.3** should be discussed with the group. The hoped-for outcome:

Measure the level of interest in guideline-based care encounters driven by CCGs, and perceptions of the relative value of the resultant health benefits (vs data entry effort).

EDITING THE PPT DECK – POST-MEETING (WS-2)

As a recommended practice, after each meeting, slides should be created to document the results of submitted real-time questionnaire forms. The relevant graphics and submitted comments should be inserted into the “facilitation” PPT deck immediately following each Interaction slide. For an example of how this may be accomplished, note Figure 5.

WORKED EXAMPLE (WS-2)

For a worked example PPT deck for Workshop-2, refer to the 02 HIE Specifications - EXAMPLE” file in the toolkit’s EXAMPLE folder.



WORKSHOP-3

DIGITAL HEALTH BUILDING BLOCKS

This how-to chapter provides a description of the tools and facilitation processes that will collect information about the country's **existing** digital health landscape and an assessment of which broadly scaled solutions may be leveraged to provide a “**running start**” on the national HIE implementation and accelerate the time to value.

PRE-WORKSHOP READING LIST (WS-3)

Workshop-3 looks for opportunities to accelerate the deployment of the national HIE and, hence, reduce the time to value realization. The key tactic explored in this workshop is to evaluate existing digital health solutions that have been broadly scaled. To help **find** these, the following pre-reading material are recommended:

- **WHO Global Digital Health Atlas:** <https://digitalhealthatlas.org/en/-/>
TWG members should review the country entries in the atlas and familiarize themselves with the “reach” and “scale” of the deployments listed there.
- **Digital Square Global Goods for Health:**
<https://digitalsquare.org/digital-health-global-goods>
TWG members should familiarize themselves with information about solutions they know to be broadly implemented (whether listed in the atlas, or not). There *may* be more in-depth experience found at the registry than is found on the Atlas.
- **Digital Public Goods Alliance:** <https://digitalpublicgoods.net/registry/>
Although there can be degree of duplication between this registry and the Digital Square registry, TWG members should familiarize themselves with information about solutions broadly deployed in the country.
- Any digital health landscape analyses that may have been recently published.
- **Form 3.1** – note, unlike the real-time forms used during the workshop, Form 3.1 is leveraged to collect information about the digital health landscape **prior to** Workshop-3. It is the only form in the toolkit that is **not anonymous** (and also the only one that supports edits after submission). The information submitted using **Form 3.1** will be used to help identify potential “building block” solutions that should be discussed during Workshop-3. A **sharable link** should be generated for **Form 3.1** and included with the pre-read materials.

An email containing the relevant links (or attachments, where necessary) should be shared with the TWG members ahead of the workshop and with enough advance notice that it is reasonable for them to have time to do the readings. Of note – to ensure strong uptake of the material, the aggregate pre-reading time commitment should be less than an hour.

*NOTE: **Form 3.1** may be shared with selected digital health solution support organizations (see next subsection). This should be done well in advance of Workshop-3 so that there is time to collect and collate responses.

EDITING THE PPT DECK – PRE-MEETING (WS-3)

The first section of the Workshop-3 PPT deck is devoted to providing information related to the landscape of legacy digital health solutions that may be considered for inclusion as HIE infrastructure elements or as POS solutions that should be **prioritized** for being connected to the HIE. For the purposes of Workshop-3, the **infrastructure** elements are those that were illustrated as being “**in the cloud**” during Workshop-2. All care provider solutions or patient-facing solutions are categorized as **POS**.

Leveraging information available from the recommended pre-reading materials, and/or from **Form 3.1** submissions received in advance of the Workshop, a set of slides should be prepared that provides summary information about existing, broadly deployed legacy solutions that may be good candidates as HIE components. For each candidate solution, it is recommended to include the following information:

- Product name
- How many deployed sites (or users); and an estimate of the population coverage or the aggregate size of the patient database
- Deployment model (is it PC-based, mobile phone based, client-side or hosted, etc.)
- Interoperability standards implemented (especially, does it support HL7 FHIR?)
- Open source or closed source; is there an application programming interface (API) that can be employed for integration
- Who is the local country support organization
- What would be the estimated annual support costs (in USD) of a national implementation

At Workshop-3, it may be appropriate to invite a select set of **guest** presentations to be made. As an example – if there is a national DHIS2 instance and the MOH is keen to leverage this as part of the HIE, then to have a short presentation from the local DHIS2 support organization would be a very good idea. The gist of the guest presentation would be to answer the question: “what would be the best way to include your solution as part of the new national HIE?”. If the guest-presenter approach is being followed, then placeholders should be put in the Workshop-3 PPT deck where the guest slides will be shown. NOTE: all guest slides must be shared with the facilitator so that they can be included with the overall project documentation.

If in-person guest presentations would not be feasible, it would nevertheless be useful to have selected (invited) responsible **organizations** provide the content related to their widely deployed products. This can be accomplished by sharing with them a link to **Form 3.1** and requesting them to fill in the optional “submitted by” field. Their submitted content should be incorporated into the Workshop-3 PPT deck.

*It is essential that the content collected using Form 3.1 is **correct**. That is to say – if content has been submitted that identifies a POS solution that purports to be able to play the role of an HIE Infrastructure actor, this needs to be surfaced immediately with the submitter and corrected. It will be problematic and potentially very confusing for the TWG if blatantly incorrect information is shared during the Workshop.*

Except for the digital health “landscape” slides – few other edits should be necessary on the Workshop-3 PPT deck. The whole of the discussion for Workshop-3 will be driven by the TWG members’ responses collected during **Interaction 3.2** and **Interaction 3.3**.

NOTE: if there simply are not many options for leveraging existing legacy solutions, then this workshop could prove to be relatively light on content. Where that may be the case – an alternative could be to slightly extend the duration of Workshop-2 to cover this topic.

EDITING THE GOOGLE FORMS (WS-3)

Form 3.1 is intended to elicit information from TWG members and/or (potentially) solution support organizations regarding which legacy solutions they are aware of that should be considered for inclusion in the national HIE. It is not expected to be used in real time during Workshop-3. **Form 3.1** is the only form in the toolkit that is **not anonymous** (and the only one that supports editing of already submitted content). NOTE: if there are solutions that arise from the facilitator’s desk research, but which are not submitted by any TWG member or external support organization, these options may be added by the facilitator using **Form 3.1**.

Form 3.2 is intended to elicit TWG members’ recommendations for which, if any, of the existing legacy digital health solutions can play a role in the national HIE infrastructure, or which are POS candidates that should be connected as early-adopters to help accelerate the implementation and more quickly go to national scale. The multiple-choice options for each question on **Form 3.2** should be edited to list the (credible) software solutions submitted using **Form 3.1**. The sharable link for **Form 3.2** should be generated and pasted to the header of the **Interaction 3.2** slide in the Workshop-3 PPT deck.

Form 3.3 is intended to elicit TWG members’ recommendations regarding how existing legacy digital health solutions should be incorporated into the national HIE. Suggestions are sought regarding who should conformance test these solutions and

how necessary source code updates (or façade development) should be funded. Also, input is requested regarding how long existing POS solutions should be given as a “grace period” before they must be ready to connect to the national HIE. In respect of the challenges this may pose, TWG members are also asked for input regarding what technical support should be made available to the country’s software development community to help them meet the requirements of being able to connect their digital health solutions. The sharable link for **Form 3.3** should be generated and pasted to the header of the **Interaction 3.3** slide in the Workshop-3 PPT deck.

FACILITATING WORKSHOP-3

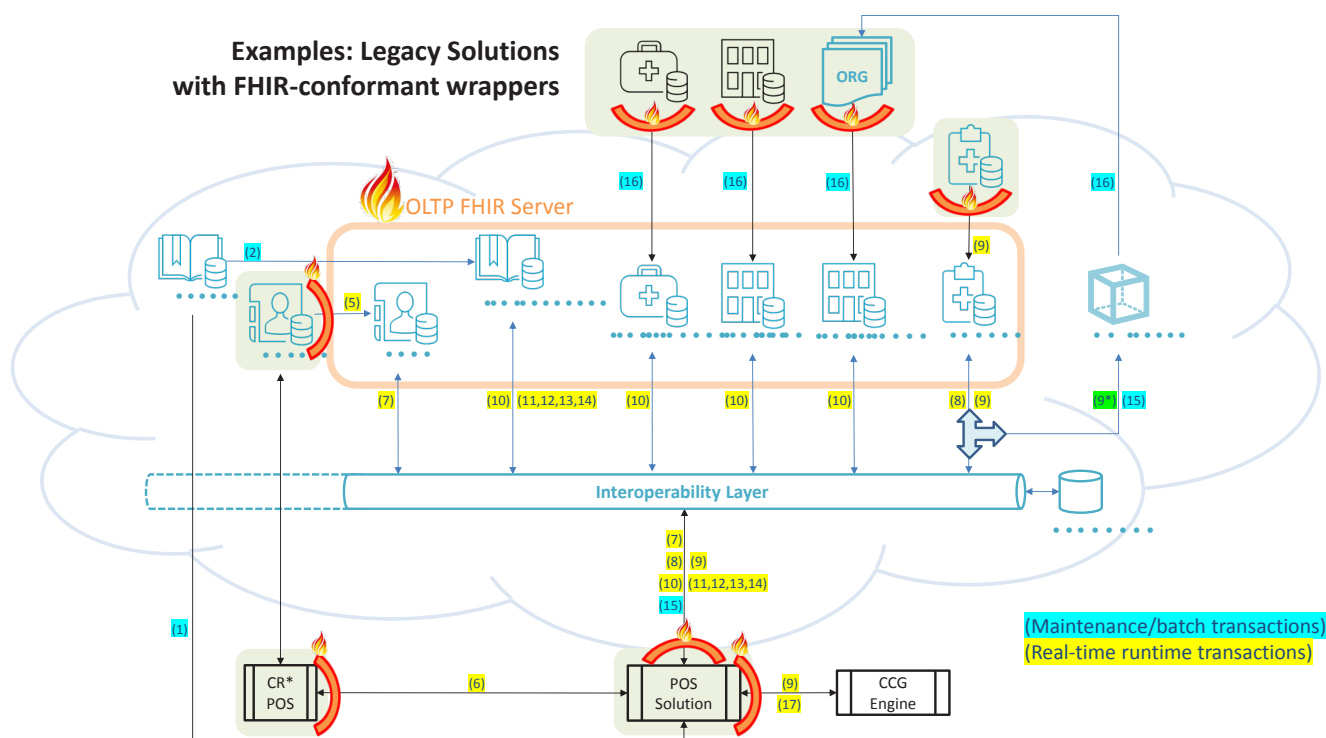
The primary objective of Workshop-3 is to surface opportunities for leveraging legacy software to increase the rapidity of the national HIE implementation. As a companion goal – leveraging existing solutions can also help build community around the project. Teams that were responsible for the deployment of these solutions will welcome having their efforts recognized and taken forward as part of the new initiative. Of course – this has a potential downside, too. If the projects were not successful, were never standards-based, and if scale was never reached (for whatever reason) then trying to embrace these solutions in the core infrastructure could actually **impede** the ability to progress a successful national HIE. As a practical matter, facilitating Workshop-3 will require a sensitivity to these aspects and to the danger the second objective (building social currency) can create for the first one (having a successful HIE project that scales).

A “tool in the toolbox” for helping address this challenge is the **façade** pattern. As a technical approach, the role of the façade pattern is to allow a non-standard or a slow performing solution to become part of the HIE without endangering the shared infrastructure’s OLTP performance targets or its need for standardization. This is accomplished by:

- Adding standards-based APIs on top of non-standard legacy products that are functionally “sufficient” (where there is the necessary content... just not in the format needed to connect to the HIE);
- Keeping slow processes out of the real-time processing flow by allowing the data from a legacy solution to be leveraged in the OLTP FHIR server but doing this through an asynchronous API that is not burdened with the processing speed requirements needed to be part of the online engine.

The strongly preferred approach for connecting legacy solutions into the HIE should be via a software façade or add-on. This approach is illustrated by the graphic below (Figure 21), which is included in both the Workshop-3 PPT deck (as a reminder) and the Workshop-2 PPT deck.

Figure 21 - Illustration of the façade pattern



As may be noted from the illustration, many façades can be implemented as batch-oriented interfaces. Where there is to a real-time interface (shown in yellow), consideration must be given to the tall performance requirements that must be met to ensure the scalability of the overall HIE. Discussion on this point must be frankly facilitated. No legacy solution can be afforded the right to undermine the national initiative.

The first section of Workshop-3 should be a faithful review of the content submitted via **Form 3.1**. It should be expected that all the submitted content is verifiable. If they are present, the submitter should be asked to step through the submission and provide brief additional information as appropriate. Although performance metrics were not asked for in the form, the persons who provided the submission should be able to speak to this point during the plenary (and should be asked to).

Interaction 3.2 is used to gather TWG feedback on the list of legacy solutions regarding which ones, if any, should be considered for inclusion in the HIE infrastructure. The trade-offs and caveats listed in the prior paragraphs should be conveyed to the members as a “set-up” prior to opening the questionnaire period. These will especially apply to “in the cloud” infrastructure – but also to POS solutions that should be given priority due to their ability to help build momentum. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 3.2** should be discussed with the group. The hoped-for outcome:

Identify legacy solutions that should be included in the HIE infrastructure or as “priority” POS solutions that will rapidly build implementation momentum.

For any candidate legacy solutions for which there is a consensus, the discussion should turn to a high-level discussion of how their inclusion in the HIE will be made to happen. NOTE: this section of Workshop-3 slightly overlaps (and sets up) the fulsome implementation science discussion that will be the subject of Workshop-4. This will not be a good place to begin technical engineering of APIs or performance enhancing software design updates; rather, the last section of Workshop-3 should be used to highlight some of the nontrivial aspects related to conformance and funding. The hoped-for outcome:

The TWG has an appetite for change. Members are ready to rethink and re-engineer existing workflows and the digital health solutions that operationalize them. Where existing solutions accelerate the initiative, they are embraced, and a plan is made to “connect them” to the HIE. Where solutions will not fit, a plan is made to replace them with new solutions that better support the MOH’s new vision.

Interaction 3.3 elicits feedback from the TWG members related to conformance testing and funding and the timing window and support that should be given to legacy solutions that are not part of the “priority” group. present level of adoption of guideline-based care. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 3.3** should be discussed with the group. The hoped-for outcome:

Consensus regarding who should operationalize conformance testing; how the façade development for legacy solutions should be funded; and what length of “on ramp” will be provided to legacy solutions not prioritized as accelerators (and what support should be provided to them to successfully connect to the HIE during this on ramp time period).

EDITING THE PPT DECK – POST-MEETING (WS-3)

As a recommended practice, after each meeting, slides should be created to document the results of submitted real-time questionnaire forms. For the Workshop-3 PPT deck, all the content submitted ahead of time (using **Form 3.1**) will already have been incorporated into the deck. The relevant graphics *and submitted comments* should be inserted into the “facilitation” PPT deck immediately following each Interaction slide. For an example of how this may be accomplished, note Figure 5.

WORKED EXAMPLE (WS-3)

For a worked example PPT deck for Workshop-3, refer to the “03 Digital Health Building Blocks - EXAMPLE” file in the toolkit’s EXAMPLE folder.



WORKSHOP-4

IMPLEMENTATION SCIENCE

This chapter provides a description of the tools and facilitation processes supporting a review of the country's current governance and legislative frameworks related to health custodianship, health data sharing, and the programme management tactics that could be leveraged to lead to a successful rollout.

PRE-WORKSHOP READING LIST (WS-4)

- Executive summary information related to national Data Protection laws and policies and/or digital “readiness” assessments that included legislative frameworks / governance as one of the assessment's axes;
- Executive summary information related to MOH digital health project implementation plans and the governance structures that are proposed to manage these;
- Executive summary information related to Health System Census documents that would provide insights related to the facilities (by level), health human resources (by cadre) and socio-economic information related to health spending per capita;
- National economic metrics including GDP per capita and annual inflation rates.

An email containing the relevant links (or attachments, where necessary) should be shared with the TWG members ahead of the workshop and with enough advance notice that it is reasonable for them to have time to do the readings. Of note – to ensure strong uptake of the material, the aggregate pre-reading time commitment should be less than an hour.

EDITING THE PPT DECK – PRE-MEETING (WS-4)

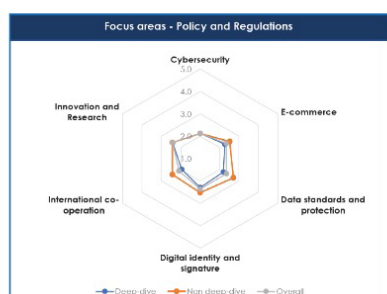
For the benefit of TWG members, key summary information from the pre-reading list, including relevant charts and graphs, should be included in the Workshop-4 PPT deck.

- Content related to data protection laws and policies should be presented in a short set of summary slides in the current data protection policies and laws section. An example is shown in Figure 22.

Figure 22 - Example of data protection laws

DIGITAL DATA PROTECTION LAWS

Findings: UNDP Digital Maturity Assessment (DMA)



The country enacted the Electronic Data Protection Act in 2017 to strengthen protection of personal information and govern the collection, use and disclosure of electronic information. **The country does not have an overall data protection law**, such as the Global Data Protection Regulation (GDPR).

The Act applies to domestic or foreign individuals, legal persons or incorporated bodies who live and operate in the country. It also applies to foreign data users if they conduct business or have domestic operations.

The Act also includes key provisions on consent requirements and global digital government practices related to data transfer, retention, data erasure and breach notification.

During the DMA survey and interview sessions, it was observed that, with the exception of a few ministries and provinces, **awareness regarding implementation of the laws remains low.**

- Content related to digital health implementation governance and programme management should be presented in a short set of summary slides in the *current context regarding digital health programme management* section. An example is shown in Figure 23.

Figure 23 - Example of programme governance and management structures

GOVERNANCE & COORDINATION

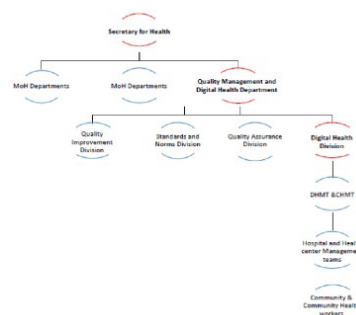


Figure 10: Digital Health Leadership and Governance Structure

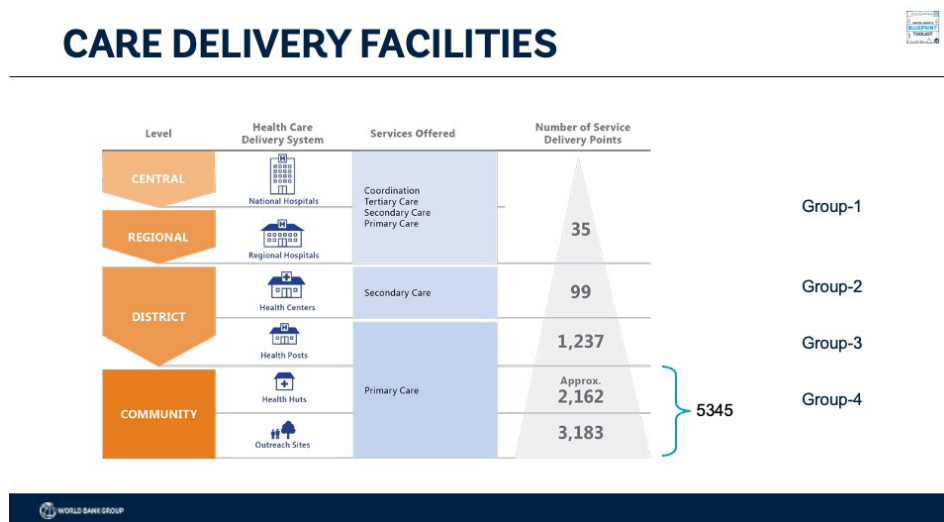
The implementation of digital health shall be led by the Directorate of Quality Management and Digital Health in the Ministry of Health.

Within the directorate, the Digital Health Division will be the responsible implementation unit. The head of the division shall report to the Director for Quality Management and Digital health who in turn shall report to the Secretary for Health.

The QMD shall work hand in hand with the departments and programs within the Ministry to ensure alignment and integration of digital health interventions.

- Content related to the information needed to drive the implementation and Investment Rationale planning should be presented in a short set of summary slides in the *current contextual metrics* section. An example is shown in Figure 24.

Figure 24 - Example of contextual planning information



Except for these “context” slides – few other edits should be necessary on the Workshop-4 PPT deck. The TWG members’ discussions will be the key success factor for Workshop-4. The summaries of the pre-read content, plus some of the pedagogical slides related to global best-practices related to governance and implementation science, will inform the working group interactions. The collected set of results from the real-time questionnaires is what should drive the group discussions.

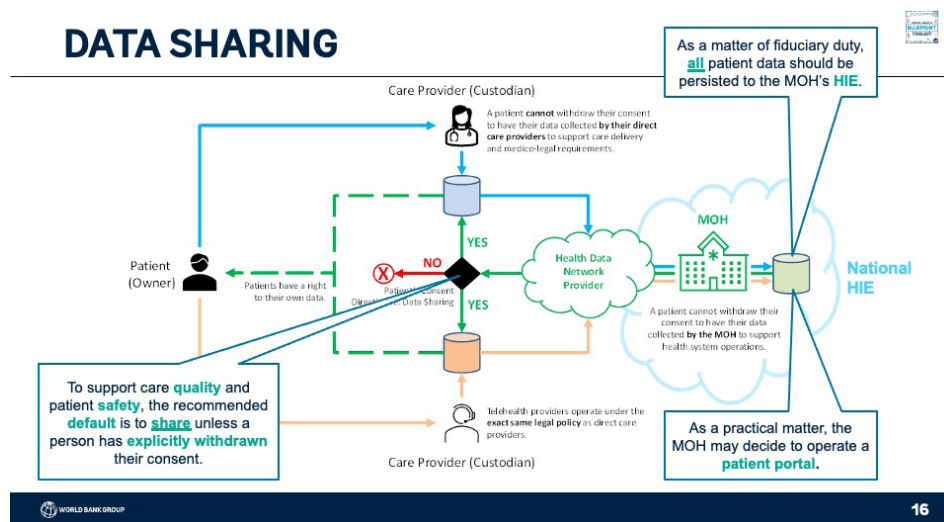
Of course, where there are plans to deviate from the toolkit’s underlying assumptions, edits should be made to the deck (and to the questionnaire forms) to reflect these.

EDITING THE GOOGLE FORMS (WS-4)

Form 4.1 is intended to elicit TWG members’ views regarding the degree of “coverage” of existing data protection and data sharing laws and whether / how changes to the existing policy framework should be operationalized. Personal rights, such as data protection rights, can vary quite widely from country to country. For this reason, it may be important to speak very plainly about the idea of data ownership and what the implications of it are. In particular, the analogy of the **paper-based health record** is helpful. It is very commonly and easily understood that a person may share their paper-based health record (if they have it in their hands) with whomever they please. Ownership of a facility-held record really illustrates the point. If the **facility** can share a person’s record with whomever they please (no matter whether the person wants them to, or not) ... then they (the facility’s organization) are exerting ownership. NOTE: Specific mention should also be made regarding the legal basis for AI training data sets – especially if there was a strong interest in the value of AI conveyed by the

TWG's responses in **Interaction 2.3**. The sharable link for Form 4.1 should be generated and pasted to the header of the **Interaction 4.1** slide in the Workshop-4 PPT deck.

Figure 25 – Readily-implementable data sharing policy recommendation



Form 4.2 is intended to elicit TWG members' understanding of the present data sharing policies and to gather ideas about how / whether these may be evolved, if necessary. This questionnaire also seeks to gather information about the MOH's ability to exert governance over the private sector. This is a challenge in many countries, where sometimes the MOH's theoretical ability to exert governance is not directly aligned with their practical ability to do so. The questions in **Form 4.2** are aligned to the pedagogy and recommendations in the template Workshop-4 PPT deck (e.g. Figure 25). Special mention may be warranted related to the **default** data sharing paradigm vs the **exceptions** which may need to be operationalized (for example, to *specifically* secure the health data of military personnel or key political figures, etc.). As noted on the "Systems Engineering" slide in the Workshop-4 template PPT deck, the system needs to be designed for the default case – and exceptions should not break this design. Where there have been changes to the PPT deck to reflect differing philosophies / recommendations, these philosophies need to be also be reflected in edits to **Form 4.2**. The sharable link for **Form 4.2** should be generated and pasted to the header of the **Interaction 4.2** slide in the Workshop-4 PPT deck.

Figure 26 - Underlying PMO governance principles

UNDERLYING PRINCIPLES



- As a practical matter of **cost-efficiency**, it is important to **coordinate** the efforts of all relevant digital health stakeholders.
- As a practical matter of **HIE governance**, all digital health initiatives need to be **adherent** to the national digital health **norms** and **standards**.
- As a matter of **sovereignty**, initiatives should serve the national health and digital health **strategies** (noting the Paris Declaration on AID Effectiveness).

Form 4.3 is intended to elicit TWG members' views regarding funding streams, pooling of funds across disparate projects / donors, the programme management of multiple disparate digital health projects, and practical questions related to who should have responsibility for a national digital health PMO. The questions in Form 4.3 are well aligned to the underlying principles described in the Workshop-4 template PPT – specifically those related to cost-effectiveness, governance, and sovereignty (Figure 26). Where these principles are modified or edited, it will be appropriate to similarly edit the questions in **Form 4.3**. The sharable link for **Form 4.3** should be generated and pasted to the header of the **Interaction 4.3** slide in the Workshop-4 PPT deck.

Form 4.4 is intended to elicit TWG members' views regarding alternatives for deploying the national data sharing infrastructure, options for issuing the population with unique IDs for health, and a range of options for accelerating the national HIE deployment effort and hence the time-to-value. TWG feedback related to implementation time will be employed to help drive the project planning and Investment Rationale phase. It should be pointed out to TWG members that, across a multi-year national deployment, the pace of implementation can be expected to decrease dramatically from what is was at the outset of the initiative. Where the Workshop-4 PPT deck has been modified, appropriate changes must also be made to Form 4.4 to remain consistent with these modifications. The sharable link for **Form 4.4** should be generated and pasted to the header of the **Interaction 4.4** slide in the Workshop-4 PPT deck.

The primary objective of Workshop-4 is to provide helpful guidance to TWG members regarding evidence-informed thinking in **implementation science** and to surface issues related to the country's national HIE effort that could significantly impact project **risk**. Some of these risks relate to areas of **government policy** that can sometimes be awkward to discuss. It is expected that the use of anonymous questionnaires can be helpful in raising these issues – but workshop facilitators will need to be sensitive to situations where government representatives do not want certain questions to be even asked.

The first section of the Workshop-4 PPT deck is employed to educate TWG members regarding **existing data protection and personal privacy laws** and policy frameworks germane to the HIE initiative. Following the landscape analysis – which should faithfully describe the as-is case – a set of conceptual actors are introduced: health data **owners**; **custodians**, and **network providers** (data processors). **Interaction 4.1** will begin to elicit feedback from the TWG regarding how the existing legislative framework maps to this conceptual framework. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 4.1** should be discussed with the group. The hoped-for outcome:

This feedback may surface situations where the existing legal / policy framework does not yet well support the collection and pooling of personal health data at a national scale. If yes – this is a useful and important finding and points the MOH toward legislative actions that should precede the national HIE “go-live”.

The section following will progress the TWG's discussion from data custodianship to data **sharing**. This will introduce the concept of a person's **consent** directive and whether it should be assumed that consent to share health data for the purposes of care delivery is given by default (opt-out) or withheld by default (opt-in). This idea is illustrate in Figure 25. There are fundamentally important nuances, here, that the TWG will need to grapple with. From a patient **safety** standpoint – health data **sharing** mitigates what can be a mortal risk (e.g. it is crucial to know if a person is allergic to penicillin; to give it to them can kill them). It is truly rare that such a mortal risk can be associated with a loss of privacy – so, comparatively, to **not** share health data by default appears to be ill advised. That said – many countries have been encouraged by global health privacy guidance documents (including from WHO) to require that informed consent is obtained **before** personal health data is shared. As a practical matter – there is evidence that an opt-in posture can fundamentally undermine the implementability of a national HIE.

Interaction 4.2 is designed to capture the TWG’s opinions regarding what is the present digital health data sharing paradigm and to elicit ideas about whether / how the existing policy framework should be changed. It also captured information about the MOH’s ability to exert governance over the private sector and whether a national patient portal should be stood up. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 4.2** should be discussed with the group. The hoped-for outcome:

This feedback may surface situations where the existing legal / policy framework does not yet well support the sharing of personal health data at a national scale – including by the private sector providers. If yes – this is a useful and important finding and points the MOH toward legislative actions that should precede the national HIE “go-live”.

The next section of Workshop-4 is focused on programme management and the governance structures that should be in place to successfully coordinate disparate implementation efforts (and, potentially, disparate funding sources). A set of slides summarizing existing programme management office (PMO) structures should be presented to the TWG members. This will level-set the workshop attendees regarding what characterizes the as-is context. Following this, a set of underlying principles are introduced (note Figure 26) which are, hopefully, not controversial. Such principles will favour a conceptual PMO structure that operationalizes the MOH’s ability to pool resources and exert governance – including through the conformance-testing of digital health solutions prior to their being permitted access to the HIE (Figure 27).

Figure 27 - Conceptual PMO structure

CONCEPTUAL PMO STRUCTURE



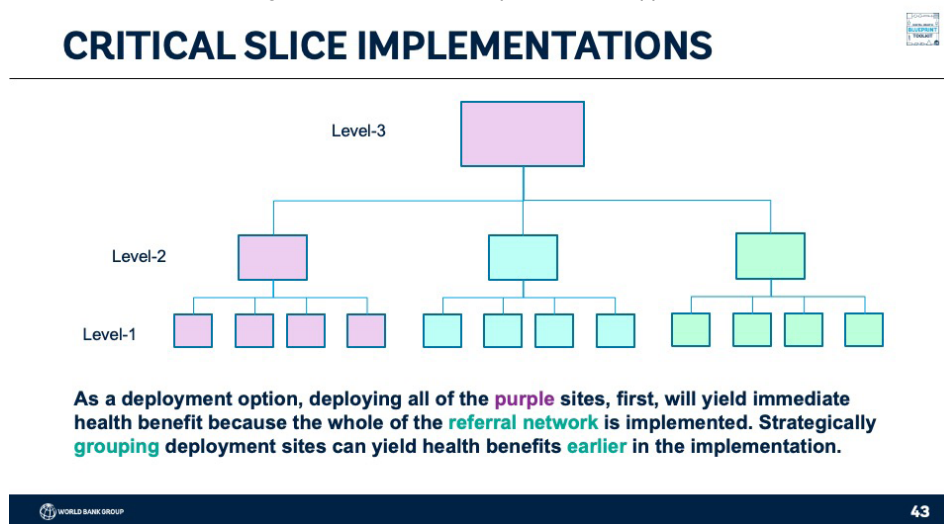
- An agency or department, under the **auspices** of the **MOH**, will **operate** a programme management office (**PMO**).
- The **PMO** will **coordinate** activities of the project managers (**PM**) across **all** stakeholder projects (MOH, private sector, development partner).
- The **PMO** will **govern conformance testing** of digital health deliverables.
- The **MOH** will manage **access permissions** to the HIE.

Interaction 4.3 is designed to capture the TWG’s opinions regarding funding mechanisms for a national-scope HIE initiative and the ability to pool funding streams from multiple development partners and coordinate deployment efforts across disparate projects. It asks for frank input regarding who should operate a PMO for the national HIE project. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 4.3** should be discussed with the group. The hoped-for outcome:

Develop a consensus view within the TWG members of how a national PMO should operate and who should operate it.

The last section of Workshop-4 focuses on details of implementation planning. A set of slides is shared with TWG members regarding important cost-driver metrics that will drive the duration and effort-level of the national HIE rollout. A set of slides then introduces implementation approaches which can be leveraged to drive momentum and accelerate the time-to-value of the HIE project. Deployment options related to digital infrastructure hosting and related to health ID issuing are introduced. A critical slice approach to deployment planning (by contiguous *referral* network) is described (Figure 28).

Figure 28 - Critical slice implementation approach



Interaction 4.4 captures the TWG’s opinions regarding whether a build vs buy approach should be favoured for HIE shared infrastructure and what should be a favoured method for issuing unique IDs for health. Information is also captured

regarding opportunistic data sets that may be leveraged to accelerate the implementation and what “productization” tactics could be employed to make facility rollouts more rapid. Candid input is sought regarding the PMO’s capacity to manage multiple concurrent projects and regarding what should be expected as the level-of-effort (LOE) for small, medium, and large-sized point of service (POS) deployments. Lastly – sensitive to tactics such as the contiguous referral network implementation approach – the TWG is asked to indicate what proportion of facilities they believe will need to be “live” before the HIE investments start to yield value. The questionnaire link should be shared to the meeting attendees via online meeting link or via real-time email to the attendees. After the facilitator closes the data input window, results can be displayed to the meeting attendees by sharing the Google Form “responses” table or by copying and pasting the graphic onto a new PPT slide. These results of **Interaction 4.4** should be discussed with the group. The hoped-for outcome:

Capture key content needed to inform the development of the national-scale HIE implementation plan and Investment Rationale.

EDITING THE PPT DECK – POST-MEETING (WS-4)

As a recommended practice, after each meeting, slides should be created to document the results of submitted real-time questionnaire forms. The relevant graphics and submitted comments should be inserted into the “facilitation” PPT deck immediately following each Interaction slide. For an example of how this may be accomplished, note Figure 5.

WORKED EXAMPLE (WS-4)

For a worked example PPT deck for Workshop-4, refer to the “04 Implementation Science - EXAMPLE” file in the toolkit’s EXAMPLE folder.



WORKSHOP-5

INVESTMENT RATIONALE (OPTIONAL)

This chapter provides a description of the tools and facilitation processes supporting a workshop dedicated solely to the development of an Investment Rationale artefact. It is anticipated that some country partners will want to “unbundle” the Toolkit and leverage only the cost-utility analysis. In such instances, Workshop-5 may be conducted as a standalone workshop, and this is the assumption behind this chapter of the H2G.

PRE-WORKSHOP READING LIST (WS-5)

The following pre-reading materials are suggested for Workshop-5:

- Web links to the country’s Burden of Disease (e.g. IHME metrics) and its digital health readiness (e.g. GDHM index);
- Executive level summaries of national digital health blueprint artefacts and of the progress towards implementing these;
- Executive summary information related to Health System Census documents that would provide insights related to the facilities (by level), health human resources (by cadre) and socio-economic information related to health spending per capita;
- National economic metrics, including GDP per capita and annual inflation rates.

An email containing the relevant links (or attachments, where necessary) should be shared with the TWG members ahead of the workshop and with enough advance notice that it is reasonable for them to have time to do the readings. Of note – to ensure strong uptake of the material, the aggregate pre-reading time commitment should be less than an hour.

EDITING THE PPT DECK – PRE-MEETING (WS-5)

For the benefit of TWG members, key summary information from the pre-reading list, including relevant charts and graphs, should be included in the Workshop-5 PPT deck. NOTE: it is anticipated that WS-5 may be facilitated with or without the benefit of TWG members having been through WS-1 to WS-4 (or their equivalent). For this reason, the content in the WS-5 PPT deck is (potentially) duplicative. At the discretion of the facilitator, any section may be omitted if it will not benefit the TWG members.

- Section 1: key health metrics from the IHME should be captured and included in this section, along with annotations that document the relevance of the metric. For formatting examples, note Section 2 (Burden of Disease) of the WS-1 deck, omitting the Google Form interactions.
- Section 2: key content from GDHM and from the GSMA mobile network coverage website should be included in this section. For formatting examples, note Section 1 (Digital Readiness Assessment) of the WS-1 deck, omitting the Google Form interactions.
- Section 3: key summary information from relevant Health strategy and Digital Health strategy documents should be included here. This section is materially the same as Section 3 of the WS-1 deck, omitting the Google Form interactions.
- Section 4: summary slides describing the country's existing "blueprint" artefacts and the progress of digital health implementation activities should be included in this section.
- Section 5: this section is largely pedagogical. It is important to the investment case exercise the TWG members appreciate the underlying metaphor for the expected impact of digital health on health.
- Section 6: the pedagogical slides in this section introduce the OpenHIE-on-FHIR architecture and are generally consistent with content in Section 2 of the WS-2 PPT deck. Importantly, in this section the actors and transactions defined in the Toolkit infrastructure design are mapped to the target country's digital health blueprint to identify and highlight where there are germane differences between the two.
- Section 7: this section further explores the differences or gaps highlighted in Section 6. For each of these differences, content from Section 3 of the WS-2 deck is leveraged to describe the Toolkit design's assumptions. These are to be noted and flagged; they will need to be addressed when it comes time to develop the Investment Rationale.
- Section 8: this largely pedagogical section will leverage content from the WS-4 PPT deck. Key elements of implementation science will heavily influence the cost-utility of the Investment Rationale model. It is important that TWG members appreciate the implications of the choices that will be reflected in the Investment Rationale tool.
- Section 9: this section of the PPT deck is a placeholder. At this point in the workshop, the facilitator will leverage the Investment Rationale tool in real time to model a cost-utility analysis. If appropriate – a next steps slide should be defined as the last slide of the deck to describe post-workshop follow-up actions.

PREPARING THE INVESTMENT RATIONALE SPREADSHEET

A proportion of the data elements that drive the Investment Rationale are matters of fact that can be determined ahead of time and pre-entered into the spreadsheet tool. Generally, it can be expected that content for the Summary and CUA tabs on the spreadsheet should be readily available. All other values should be determined during the workshop. NOTE: example data for Botswana is shown, below.

Summary tab

Year-over-year cost escalation (%)	4.6%
# Facilities*	1,628
Annual facility growth rate	1.6%
Population size	2,630,000
Annual population growth rate	1.6%
# Health Workers	13,748
HW population growth rate	1.6%
Annual health expenditure (per capita)	\$ 457.46

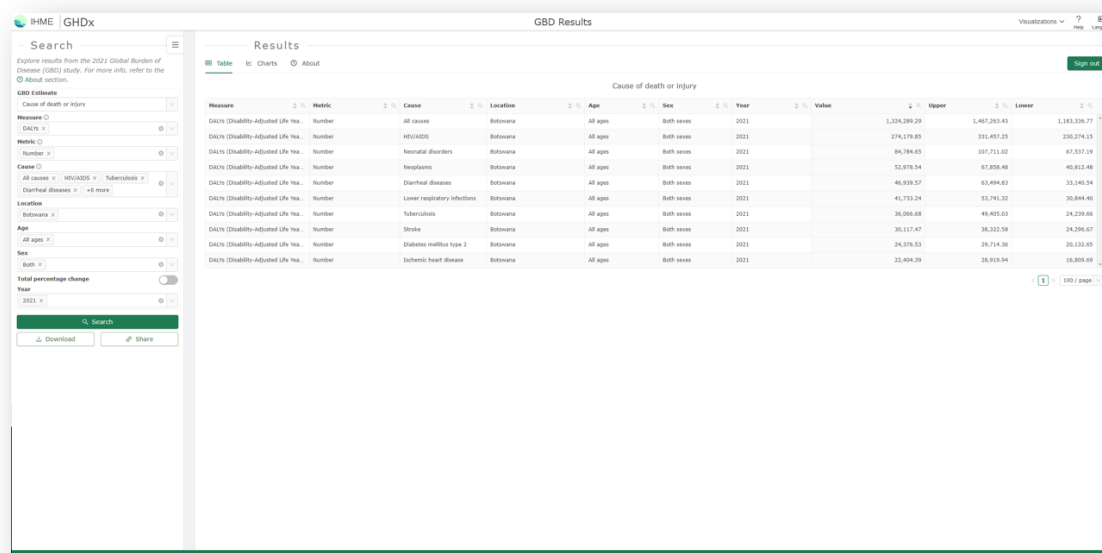
*Note: the total number of facilities is calculated; in the spreadsheet, the facilitator enters the number of facilities of each of **four** types, categorized by their expected digital health implementation cost.

CUA tab

The GDP per capita value (obtained from World Bank website) is recommended as the cost-effectiveness threshold (CET).

To populate the QALYs (averted DALYs) content, it is recommended to obtain the dataset from IHME's GHDx site (<https://vizhub.healthdata.org/gbd-results/>). The query screen is shown in Figure 29.

Figure 29 - GHDx Query of Selected Causes (Botswana example)



The query results data set can be downloaded from the site. An example of the downloaded “top” DALYs for Botswana is shown below. Excel was used to sort from highest to lowest.

Figure 30 - Example Download of GHDx Data Set

measure	location	sex	age	year	cause	val
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	All causes	1,324,289
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	HIV/AIDS	274,180
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Neonatal disorders	84,785
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Neoplasms	52,979
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Diarrheal diseases	46,940
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Lower respiratory infections	41,733
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Tuberculosis	36,067
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Stroke	30,117
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Diabetes mellitus type 2	24,377
DALYS (Disability-Adjusted Life Years)	Botswana	Both	All ages	2021	Ischemic heart disease	22,404

As a starting point, for discussion by the TWG during WS-5, the top-5 DALYs could be used. Finalization of this set, plus all other data elements, should be done during the workshop.

FACILITATING WORKSHOP-5

The primary objective of Workshop-5 is, with the participation of the TWG, to transparently develop a 10-year digital health Investment Rationale by filling in the Toolkit Investment Rationale spreadsheet. The role of the 8 sections of the WS-5 PPT deck is to set up for this activity and to prepare the TWG members so they can succeed at it. For this reason, the facilitator’s focus on these sections (any of which may be omitted if not needed) is to ensure the TWG members are “on the same page” regarding the **assumptions** that underpin the Investment Rationale tool and ways it is leveraged to develop its cost and benefit profiles.

To develop the Investment Rationale, the facilitator should share their screen with the Investment Rationale tool open. The process is to proceed, tab by tab, and to fill in (or edit) the **green** cells on the spreadsheet. NOTE: content should **only** be entered in the **green** cells – the others should not be changed. [NOTE: As a way to avoid unintentionally overwriting cells, the facilitator may choose to temporarily “lock” the spreadsheet. This renders formula and reference cells un-editable.]

It is recommended to begin at the **Summary** tab and to progress to each subsequent tab, in order. The following notes are intended to assist the facilitator in this process:

- 1) There is an adage: “All models are wrong – but some models are useful.” This is the key to a successful workshop. All parties should agree that the overarching goal is **not** to have the precise correct value for each cell, but rather to be “**close enough**”. In any 10-year forecast, it is impossible to be correct. If the values are “close enough”, however, then the calculated cost-utility analysis will be actionable.

- 2) Remind the teammates that the goal is to complete a “first draft” of the digital health Investment Rationale. There will not be time to run through **every** what-if scenario during the workshop – and in fact, the development of an actual budget is a task for the MOH to do in concert with its government colleagues.
- 3) The ***inflation rate*** can have a significant impact on costs over the 10-year horizon. As a starting point, using the prior year’s inflation rate is good. Be cautious however, that if it was an anomalous year, this may not be a good 10-year *average rate* to use.
- 4) Unless there are direct MOH plans that indicate otherwise, the **rate of increase** of the number of facilities and the number of health workers may be set to the same rate as the population is increasing. Of course – if there is presently a shortfall in the ratios, this rate can be higher than the population increase so that the health system can “catch up” and *improve* the ratio of (for example) health workers to citizens.
- 5) The most important information on the **Governance** tab is the **annual budget** for the governance “department” and its ongoing activities (PMO and regular meetings). The other activities are important, but little time should be spent trying to come up with the exact cost for document refresh efforts. Any estimate that is at all reasonable is good. As a general rule, strategic documents should be refreshed at *least* every 5 years.
- 6) The **Datacentre** tab should be kept simple. Encourage the TWG to put in a “set-up” value and an “operating” value and to move on. As long as these are reasonable, the model will be fine. Getting “into the weeds” of detailed budgeting can eat up a huge amount of time and will not materially impact the CUA. If there is a strong desire to be more detailed, encourage the teammates to put in “placeholder” values and come back to this tab at the end. (Such a time management strategy will likely demonstrate that the exercise of trying to be more precise is ultimately not needed).
- 7) Regarding unique IDs, the first question is: will everyone be issued a **health card**? NOTE: the **CR** tab *separately* captures the number that need *digital* IDs from those that need “*physical*” ID cards. If there is a patient registration system that already has a large population in the database, there may be *few* who need *new* digital IDs. If the population already has national ID cards, the number who need new *cards* may be low (only children and non-citizens).

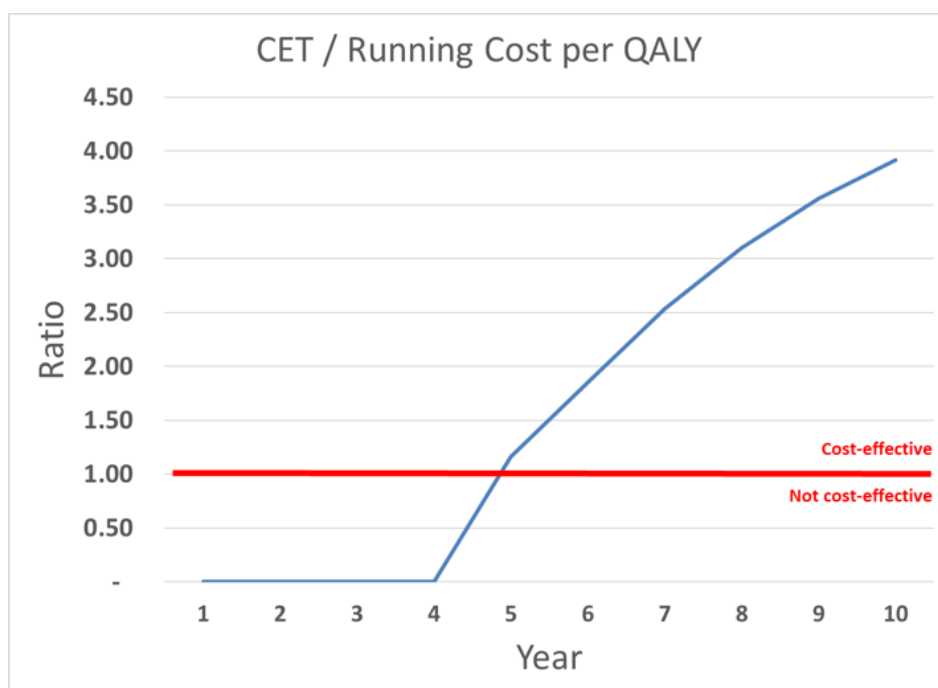
- 8) After deciding on the proportions that will need health ID cards, the key drivers are “how sophisticated should they be” and “how many sites will be able to issue them”. TWG members should appreciate that this should be treated as a trade-off. A **simple** ID card (e.g. pre-printed barcoded cardboard cards) can be issued by **many** sites – and this has positive cost and time implications for onboarding a large population. A less simple, more **expensive** ID (e.g. with a photo, or with an RFID chip) will likely benefit from a **centralized** issuing approach. This can have negative implications for going to scale – and may not have a strong value proposition unless the extra features can be readily leveraged at the point of care. Some simple and quick what-if scenarios can illustrate the impact of this “trade-off”.
- 9) In the **ILR-FR** tab, the first thing to establish is: “how many sources of facility content (e.g. underlying directories) are there?”. There *should* be a government regulatory database in the country that contains information regarding the operating license for each health facility (public and private sector). If there is, a connector to this source database is needed. For every place where there is an underlying facility directory (military, faith-based institutions, etc.), a connector is needed. Importantly – this approach does not unseat the existing governance over these underlying databases.
- 10) The other key cost driver for facilities is the “interaction” cost. This budgets for a regular survey contact of each facility by the MOH. This is used to keep the data up to date and to augment content that may not be in the original data feed (e.g. list of services offered, operating hours, etc.).
- 11) The content on the **ILR-HWR** tab is directly analogous to that on the ILR-FR tab. There should be regulatory “Colleges” for each of the care cadres (e.g. College of Physicians, College of Nurses, College of Pharmacists, etc.). A database connector is needed to the membership rosters of each of these regulatory bodies. [Note: the MOH may have a human resources (HR) system and this could also be employed, and de-duplicated against the data obtained from the Colleges.] Similar to the ILR-FR tab – an interaction cost budgets for a regular survey contact with each health worker. This refreshes and augments each health worker’s demographic information.
- 12) The **SHR** tab is typically the most impactful cost driver for the model. The first cost driver activity is to establish connectivity between point of service (POS) solutions and the HIE. As an example – if the MOH operates a set of digital health POS solutions that need to connect to the HIE, then a budget needs to be established to develop and maintain these interfaces.

- 13) The next activity has a *very large impact* on overall costs. It is to **segregate** the overall list of facilities (public and private) into four categories based on their expected implementation and operating costs (high, medium-high, medium, low). Generally, we can expect that large hospitals will be high, district hospitals will be medium-high, clinics and labs and pharmacies will be medium, and small clinics and community outposts will be low.
- 14) The implementation cost and operating cost estimates for high, medium-high, medium and low do not need to be at all precise. Examples from previous efforts may help illuminate the budget values, here – but with a caution: there will be **economies of scale** on a *national* project. A pilot project that implemented *one* clinic may have been *much* more expensive than should be expected when 100 clinics are to be implemented.
- 15) The next task is to establish the proportion of care sites that the MOH is paying for – and the proportion of these that already *have* digital health solutions in place. Of course, the *most conservative* estimate is to say MOH is responsible for 100% of sites and that 0% are already digitally enabled. Unless there is data supporting otherwise, these are good values to start with.
- 16) The **rollout period** for each cost type is important. The TWG must appreciate that most population health *benefits* will not start to accrue until entire care networks are in place and guideline-adherence is being systemically operationalized. [NOTE: this speaks to the value of “critical slice” implementation techniques described in Section 8 of the WS-5 PPT deck.] The rollout period defines the timeframe within which all of the facilities will be implemented. Implementation and operating costs are prorated over this timeframe.
- 17) The last notable cost element on the **SHR** tab is to model the regular interactions between the MOH and the digital health installations at each facility. This interaction is leveraged by MOH to govern the solution implementations and ensure (for example) local copies of terminologies are kept up to date and security measures are being properly adhered to, etc.
- 18) Modeling the costs on the TS tab is made simpler by thinking in terms of one-time and recurring costs, whether or not the terminologies themselves have a license fee. For the recurring “interaction” costs, the idea is that each of the MOH-supported digital health solutions will need to refresh its terminology on a regular basis. This cost needs to be modeled. [NOTE: **every** digital health solution will need to regularly refresh its terminologies – but the MOH does not (necessarily) bear the costs for private sector stakeholders to do this.]

- 19) The first activity on health management information system (**HMIS**) tab is driven by the number of HMIS solutions implemented by the MOH. For each of these, a software “bridge” is needed from the HIE’s shared health record repository to the HMIS. This bridge must be developed and maintained. The second activity is simply the interaction cost of having facilities regularly submit reportable indicators directly to the HMIS. Over time, it is hoped that the first data pipeline (the SHR bridge) will slowly replace the second pipeline (direct indicator submission).
- 20) The **HRH Capacity** tab models costs associated with two activities:
 - (1) educating the health workforce regarding data use; and
 - (2) establishing and operating academic programmes in health informatics. For activity-1, the model is that every one of the country’s *existing* health workers would receive data use education in year one and every *new* health worker would be educated in their “starting year” over the 10-year horizon. Each health worker would receive an annual “refresher” starting the year after their initial course.
- 21) The timing of introducing new academic programmes is noted over the 10-year horizon in row 18 on the HRH Capacity tab. The number of newly launched programmes is noted in the column for its “startup” year. This drives the one-time costs in that year plus the operating costs for each year thereafter.
- 22) The cost-utility analysis (**CUA**) tab is used to model the *benefits* of the digital health Investment Rationale. WHO’s rule of thumb is that a cost-per-QALY (or cost per averted-DALY) less than three GDP per capita represents a “good buy” and a cost less than one GDP per capita represents a “great buy”. It is recommended that **one** GDP per capita be used as the cost-effectiveness threshold (**CET**).
- 23) The QALYs gained (DALYs averted) are estimated based on the latest IHME values. A set of up to five target diseases is chosen to drive the Investment Rationale model. These targets should represent a significant burden of disease (noting Section-1 of the WS-5 PPT deck) *and* be amenable to having their outcomes improved by leveraging digital health to increase the adherence to guideline-based care. For each target disease:
 - (1) the total “available” QALYs are entered;
 - (2) the time-to-benefit offset is noted; and
 - (3) the amelioration impact is noted.

The most conservative time-to-benefit offset is to use the maximum ICT rollout period (row 17) from the **SHR** tab. This is a good place to start and can be used across all five target diseases. The most conservative amelioration impact is that the digital health infrastructure will improve guideline-adherence enough to make a 1% impact on the disease burden. This is also a good starting place; it can be used across all five target diseases.

Figure 31 - Example CUA diagram



24) The **Ratio CET to Cost-per-QALY** tab displays in real-time a diagram driven by the content on the CUA tab. The red line should be dragged to align with 1.0 on the y-axis; this is the point where the CET = the Cost-per-QALY. The text box can be dragged so that it correctly labels the area above and below this horizontal line. The key takeaways from such a diagram (noting the example shown in Figure 31) can be described to the TWG:

- Per the “offset” on the CUA tab, no benefits are realized until after year-4
- In year-5, the digital health investment “breaks even”... the investments in digital health yield cumulative QALYs (averted DALYs) equal in “economic value” to the cumulative amount that has been spent.
[NOTE: the *economic value* of improved health is based on the notion that one QALY is worth one GDP per capita (the CET). Conceptually, the math works; one can think of the annual GDP as being comprised of the economic output of the “healthy” population at a rate of one CET per QALY.]
- By year-10, every invested dollar in digital health is yielding a “return” of four dollars of economic value.

25) **Reality check:** what is the **ICT as a percent of total health expenditure** value (cell B32 on the Summary tab)? Many OECD countries spend ~5% of total health expenditure (THE) on ICT. How does cell B32 compare to this? Is it a defensible proportion of THE?

- 26) With the model in place – sensitivity analyses can be conducted. Some suggestions:
- Many published papers indicate that improving guideline-adherence can reduce disease burden by 20-30% or more. Try adjusting the **Benefit realization** (row 7) on the **CUA** tab to 2%, 5% or 10%.
 - What if the **benefit offset time** (row 6 on the CUA tab) is reduced by one or two years for some of the target diseases (leveraging the “critical slice” implementation idea)? What if it is increased?
 - What if the implementation and/or operating costs (**SHR** tab) are substantially **higher**? Is the model economically viable... and if yes, at what benefit realization rate?
 - What if the **inflation rate** is substantially higher... or lower?

WORKED EXAMPLE (WS-5)

For a worked example PPT deck for Workshop-5, refer to the “05 Investment Rationale - EXAMPLE” file in the toolkit’s EXAMPLE folder.

NOTE: for illustrative purposes, the WS-5 PPT example leverages some example content for Botswana, as noted above. It should be noted that this sample content is from publicly available sources and is not reflective of an actual TWG workshop.



BUILDABLE BLUEPRINT ARTEFACT

DEVELOPING THE ARTEFACT

This How-to Guide uses a **worked example** to illustrate the process of incorporating information from workshop meetings into the blueprint artefact. Content from the EXAMPLE workshop PPT decks is leveraged to populate the EXAMPLE Blueprint artefact (file “**Digital Health Blueprint - EXAMPLE**” in the toolkit’s EXAMPLE folder). For pedagogical benefit, notes regarding *how* this has been done are included in the example document, itself. Reference materials that informed the development of the EXAMPLE blueprint are included in a subdirectory of the EXAMPLE folder.

Of note – the template Blueprint artefact (file “Buildable Digital Health Blueprint (template)” in the toolkit folder) is **highly annotated**. These annotations are intended to assist a blueprint author with helpful instructions and tips regarding what should appear in each section. To avoid redundancy, these annotations are *not* repeated here, in this How-to Guide.

WHAT SHOULD BE DONE WITH THE ARTEFACT?

It needs to be reiterated – the artefacts resulting from the facilitator’s (and TWG’s) efforts, including the Investment Rationale discussed in the following section, are intended to be delivered **to the MOH**. It is the **MOH** who will publish their National Digital Health Blueprint and the Norms and Standards for Digital Health as official documents written in the country’s national language.

Example language is included in the *Conclusion & Next Steps* section of the Toolkit’s template Blueprint artefact document. This example text can help inform potential ways the facilitator’s artefacts may be employed by the MOH. The text in this section must be appropriately contextualized for the target MOH and to their national digital health project plans.

10-YEAR HIE INVESTMENT RATIONALE

ASSUMPTIONS

This section of the H2G augments the chapter: Workshop-5 Investment Rationale (optional). The process described there is the one that should be followed during a facilitated workshop with the TWG. MOH teammates, however, may prefer not to transparently develop their 10-year Investment Rationale – they may prefer to do this work internally. Whether it was done as part of a TWG workshop, or done with a small internal MOH team, or is being done by the facilitator – the steps outlined in the WS-5 chapter are the ones to follow.

In the *Assumptions* section of the **Blueprint** artefact, the data sources and the underlying assumptions from the workshop inputs should be articulated. If a WS-5 (Investment Rationale) was conducted, the results from that workshop will be reflected in the spreadsheet itself. In either scenario, the Investment Rationale assumptions should be documented in the Blueprint artefact's Assumptions section.

The remainder of this chapter of the H2G is pedagogical. It follows the WS-5 steps but leverages the content in the EXAMPLE directory as the source data. In creating this EXAMPLE Investment Rationale, a consistent data set of DALYs and care delivery network resources was selected. For this reason – even though the underlying content for the fictitious EXAMPLE country, **Amalgaland**, has been drawn from a broad range of countries – for the DALY figures and the care network resource assumptions, a single country's data was leveraged.

Typically, the content upon which the Investment Rationale assumptions are based is obtained from desk research and from the Interaction responses provided by TWG workshop attendees or MOH teammates. For the purposes of the EXAMPLE Investment Rationale, all the data comes from the content in the EXAMPLE folder.

Content from the Workshop-4 PPT deck (slides 47-49) was leveraged for the Demographics, Facilities and Economics data.

Figure 32 - Socio-demographic details

KEY SOCIO-DEMOGRAPHIC DETAILS

Population 15.1M (annual growth rate 2.6% est.)
 Annual inflation rate: 9%
 GDP per capita: \$1600 USD
 Annual health expenditures per capita: \$71 USD
 ICT wage est.: \$655 USD / mo. (\$4 / hr.)
 14 medical regions; 78 health districts

WORLD BANK GROUP

Figure 33 - Health Human Resources

HEALTH HUMAN RESOURCES

World Health Statistics data visualizations dashboard

World Health Statistics data visualizations dashboard > SDG Target 3.6 > Health workforce

Data tables
Country data

Filter table | reset table
Last updated: 2023-01-13

Download filtered data as: CSV table | XLS | sample | JSON (sample)
Download complete data set as: CSV table | XLS | CSV table | more...

Country, territories and areas	Year	Medical doctors (per 10 000 population) ¹	Nursing and midwifery personnel (per 10 000 population) ²	Dentists (per 10 000 population) ³	Pharmacists (per 10 000 population) ⁴
Country	2017	0.703	3.781	0.097	0.112 ⁵
	2016	0.782	3.045	0.082 ⁶	0.119 ⁷
	2015		1.949		0.1 ⁸
	2013			0.047 ⁹	
	2008	0.604	4.420	0.086 ¹⁰	0.09 ¹¹

Total health workforce (est.):
 (0.703 +
 3.181 +
 0.08 +
 0.112)
 * 15.1 M total population
 / 10,000
 = **6155**

WORLD BANK GROUP

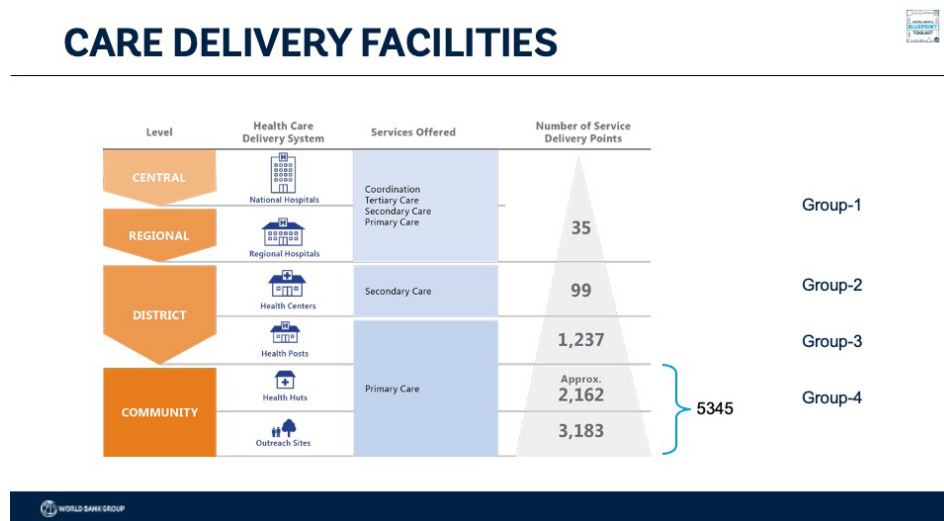
Underlying demographic data for a country is documented in this section of the **Blueprint artefact**. These data are found from many sources. The population data is available from IHME or from the World Bank country data site. To ensure credibility and consistency, annual inflation rate and GDP per capita should be sourced from the World Bank (<https://data.worldbank.org/>) even where these data may differ from those published from domestic sources. This can help ensure there is not disagreement if/when the Investment Rationale is shared with external development partners.

For health human resources, the WHO's World Health Statistics dashboard (<https://apps.who.int/gho/data/node.sdg.3-c-data?lang=en>) can be employed to obtain workforce per 10,000 population data. These can be extended (based on the population value) to generate a total health workforce value comprised of doctors, nurses, dentists and pharmacists. This will underestimate the workforce (lab technicians are not included, for example, and neither are community health workers, CHWs), but it will generate a non-controversial value that can be employed for planning purposes. In practical terms – if there is an expectation (for example) that CHWs will be managed by the MOH as a fully supported cadre, then the CHW population will need to be estimated and this value should be added to the total.

Where there is an expectation that datacentre operations will be explicitly supported by MOH staff, then it is important to be able to develop a contextually reasonable domestic wage rate for ICT professionals. Typically an online search will return figures that can be used for planning purposes (e.g. <https://take-profit.org/en/statistics/wages/>). Of course, a preferred option may be to simplify down to a “set-up” fee plus a monthly “operating” fee. This well models the situation where an MOH chooses to procure a hosted service, for example.

FACILITIES

Figure 34 - Facility details



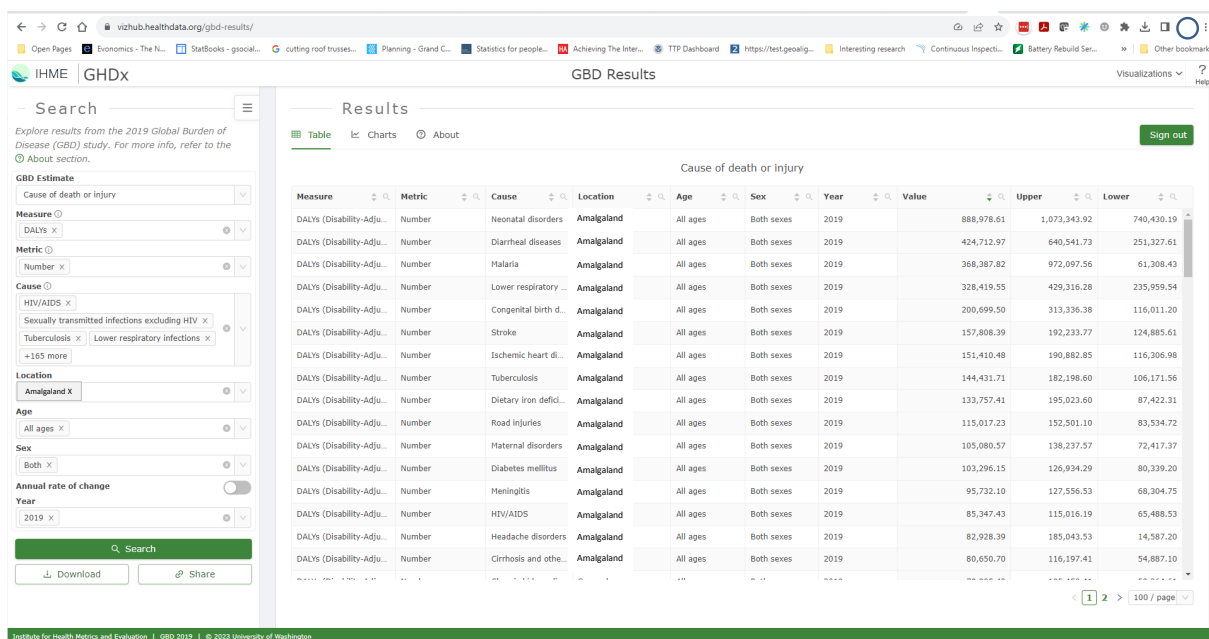
The sources of facility data for the Investment Rationale are documented in the Facilities section of the **Blueprint** artefact. Facilities should be grouped into cost categories / buckets. Notionally, the facilities in the same bucket can be assumed to have an implementation level of effort (LOE) that is similar. This grouping is purely used for planning purposes. Up to four categories may be modeled using the spreadsheet tool. As noted in the EXAMPLE Investment Rationale (see Figure 34), four buckets have been created: (1) hospitals; (2) health centres; (3) health posts; and (4) health huts and outreach sites.

Note *Figure 32*.

The economic assumptions for the Investment Rationale are documented in the *Economics* section of the **Blueprint** artefact.

THEORETICAL DALYS

Figure 35 - Theoretical DALYs per Disease



This section of the **Blueprint** artefact is used to document the “target benefits” that will drive the cost utility analysis of the Investment Rationale. The IHME site includes a data visualization hub (<https://vizhub.healthdata.org/gbd-results/>). This hub can be employed to delve into the underlying data sets from which the IHME graphics were generated. To obtain the detailed values for theoretical DALYs, create a search based on the following:

- GBD Estimate: Cause of death or injury
- Measure: DALYs
- Metric: Number
- Cause: “Select all level 3 causes”
(this will auto-generate a large list of 100+ diseases/causes)
- Location: choose the country from the drop-down list
- Age: All ages
- Sex: Both
- Year: most recent year available

To execute the query, click the **Search** button. The results of the search are returned in a table that can be sorted by any column. Click on the **Value** column to sort from highest to lowest DALYs. The example result is shown in Figure 35.

These DALY figures are crucial to developing the cost-utility analysis for the Investment Rationale. Candidates from the top-10 list should be leveraged to populate the maximum theoretical DALYs that can be averted by successful healthcare interventions. Of course, achieving 100% aversion of the population DALYs for health conditions is never possible. But at the heart of the digital health Investment Rationale is the premise that digital health can be employed to systemically narrow the gap between the best-evidence care pathways and the current care practices. Choosing a set of up to five of the top-10 DALYs sets up the opportunity to conduct sensitivity analysis and employ the Investment Rationale tool to explore what-if scenarios. These scenarios can explore questions like “what if the broad adoption of digital health could increase guideline adherence for malaria and, in so doing, reduce DALYs by 20%... or 10%... or 2%?” “What if the DALYs for neonatal disorders could be reduced by 5%... or for ischemic heart disease... or for TB?” Such what-if scenarios are at the heart of the Investment Rationale for digital health.

INVESTMENT RATIONALE MODEL (EXAMPLE)

The Investment Rationale tool is designed to be easily filled in. There are annotations beside every fillable field to explain what they mean and/or how they will drive the model. All **fillable** fields in the spreadsheet are **bold green text font** and the cells are **shaded light green**. [NOTE: **only** the **light green shaded cells** are designed to be filled in. To avoid inadvertently overwriting content, the spreadsheet can be temporarily locked. Doing so will render equation and reference cells un-editable.]

As a word of caution: the spreadsheet tool is filled with equations that drive the calculations over the 10-year planning horizon. Some of these equations are complicated. All are completely editable – but if the tabs are linked to each other, and it is possible to “break” the tool by making edits to equations that have follow-on effects that may not be obvious. It is highly recommended to make a copy of the spreadsheet before attempting to alter any of the equations.

SUMMARY

This section of the **Blueprint artefact** describes the content that was entered into the **Summary** tab on the Investment Rationale tool.

In the **Summary** tab of the investment tool, the following data is to be entered:

- Inflation rate (B2)
- Number of facilities of each type or cost bucket (C5, D5, E5, F5)
- Annual facility growth rate (B6)
- # health regions (B7)
- # operational districts (B8)
- Country population (B9)
- Population growth rate (B10)
- # health workers (B11)
- Health worker growth rate (B12)
- Annual total health expenditure (THE) per capita (B30)

As a rule of thumb, it may be useful to have the health worker population growth rate track the population growth rate. Of course, if the MOH plans aggressive facility construction or health worker expansion plans, then these should be reflected in the B6 and B12 values. Note, however, that these values will be used as averages over the **entire** 10-year planning horizon; the model is not designed to model a temporary surge.

It should also be noted that the value calculated and shown in cell B14 is not part of the 10-year plan. This value denotes the budget for activities that should be undertaken **before** the launch of the initiative (based on what is entered in the Governance tab). These are anticipated as pre-requisite tasks.

GOVERNANCE

This section of the **Blueprint** artefact is used to document the content in the **Governance** tab in the Investment Rationale tool.

The role of the **Governance** tab is to budget for strategy and blueprint and governance and standards-setting activities and for the ongoing maintenance and refreshing of these artefacts over the 10-year life of the Investment Rationale. Cost drivers are entered for each of five broadly defined activities:

1. Digital Health Strategy setting
2. Digital Health Blueprint development
3. eHealth Norms and Standards setting (which may be part of blueprint development, or may be a separate effort to draft and enact relevant MOH policies or legislation)
4. Health Data Sharing Policy development
5. Digital Health Governance

The first four activities are modeled as time-bounded, “workshop-based” activities. To develop a cost profile for each, the model looks for the number of funded effort days by an advisor external to the MOH (and the advisor’s per diem), the number of facilitated workshops (and the estimated cost for each of these), and the number of regional meetings that would be leveraged as part of a “road-show” to elicit feedback and build national consensus (multiplied by the cost of hosting each meeting). As a reminder, the data fields for which values should be entered are shown in **bold green**.

Activity five – Digital Health Governance – is not modeled as a time-bounded workshop-based activity. Rather, this budget item is intended to cover the ongoing operation of a national digital health entity (including a programme management office, PMO) and its activities as a permanent national governance body. The cost drivers for this entity are the annual cost of a dedicated department or committee, the cost of regular (e.g. weekly) programme management meetings, and the cost of regular (e.g. quarterly) national-level meetings at which key decisions will be agreed to.

To drive the recurring nature of these costs, spreadsheet rows 5, 11, 17, and 23 are employed. Recall, the relevant data entry areas are **shaded light green**. To indicate that an activity should be done prior to the launch of the project, a 1 is entered in column F for each relevant activity. For example – if the Digital Health Strategy needs to be refreshed **before** the HIE implementation project can even begin, a 1 is placed in cell F5. If the strategy should be refreshed every 5 years, then a 1 should also be entered in cell K5 and cell P5. Of note – it is expected that the PMO will operate **continuously** (a 1 appears across F29-P29, inclusively).

The model can be “played with” by altering the cost drivers for each activity and, in concert with this, denoting which activities should be refreshed in which years of the 10-year plan. Edits to the values will be reflected in real time in the **annual** and **running total** costs, shown in row 35 and row 36 of the **Governance** tab, respectively. These values are also reflected, in real time, on the **Summary** tab.

DATA CENTRE

This section of the **Blueprint** artefact is used to document the content in the **Datacentre** tab in the Investment Rationale tool.

The role of the **Datacentre** tab is to develop a budget line for the set-up and operation of the hosted HIE infrastructure. The tab can be used in one of two ways:

1. Enter hourly installer/implementer and operator wage rates in cells B2 and B3 and a software annual maintenance rate (%) in cell B4. Enter separate one-time software license fees, virtual machine set-up fees, and implementation effort-hours for each HIE actor (enter values in cells B10:D16). Enter monthly operating costs for each HIE actor, broken down by virtual machine operating costs and support effort-hours (enter values in cells C22:D28). This option reflects a “do-it-yourself” approach for procuring and operating an HIE.

2. Enter an “all-in” set-up cost for the HIE in cell B17 and an “all-in” monthly operating cost in cell B29. This option reflects an “infrastructure as a service” (IaaS) approach for an HIE.

A special note should be made of how open-source software costs should be modeled, if using these in option-1. Even for open-source software, there will always be an implementation cost. To appropriately reflect that open-source software must be maintained and updated just like closed-source software, it is useful to assume an annual maintenance fee (expressed as a % value, in cell B4) is applied to the open-source software implementation cost. To use the model this way for open-source products, the implementation costs can be entered in cells B10:B16. In this way, if \$1 million is spent customizing and implementing a suite of open-source products in a do-it-yourself approach, an ongoing budget of \$150k per year will be calculated as an ongoing expense for keeping this software stack updated and maintained. Such modeling will ensure appropriate budget is allocated to maintaining the “license-free” open-source software.

Based on the approach chosen, and the values entered, the annual costs and running total costs for datacentre operations are calculated and shown on rows 33 and 34 of the **Datacentre** tab and updated in real time on the **Summary** tab.

CR (CLIENT REGISTRY)

This section of the **Blueprint** artefact is used to document the content in the **CR** tab in the Investment Rationale tool.

The role of the Client Registry (CR) tab is to develop a cost profile for issuing (and refreshing) unique health IDs for the served population. The cost drivers are:

- Digital ID provisioning cost – the cost of establishing a unique ID in the client registry, which may be near-zero or may include costs such as unique PKI certificates, etc.
- ID card provisioning cost – the cost of creating a “wallet ID” or a biometric record for each person-centric demographic record in the client registry. As an example – for a simple pre-barcode cardboard card to which is added the relevant demographic content, plus a laminate or plastic sleeve – the cost per ID can be very low. In contrast, for a plastic card with photo or for a biometric such as a fingerprint or iris scan, the cost per ID can be one or two orders of magnitude higher.
- ID renewal period – the “expiry period” of an ID will determine how regularly cards, or other IDs, need to be re-issued.

- ID churn rate – the number of issued cards (expressed as a %) that need to be re-issued because they are lost or damaged and the client can no longer use them.
- ID issuing facilities – the number of facilities that will need to be set up with the ID-generating equipment for creating IDs (e.g. card printer, laminator, fingerprint reader, etc.).
- ID establishment set-up cost – the one-time installation costs for setting up facility to be an ID-generating location.
- ID establishment operation cost – the monthly cost for consumables or operating fees necessary to conduct ID-issuing activities.
- Proportion that need digital IDs – there may already be a national ID that can be leveraged as the health ID. If this is the case, new digital IDs **for health** may only need to be generated for a subset of the overall population (those that are non-citizens, for example). Note – it is a best practice for a unique ID for health to be generated as an independent ID from *any* wallet ID#, including a national ID#, so it is typical for this proportion to be 100%.
- Proportion that need cards (%) – similar to the situation above, there may be a plan to leverage an existing national ID card as the health card. In such a case, new cards will only need to be issued for those who will not already have a national ID card (e.g. foreign nationals who reside in the country and receive care).

It should be noted that the MOH can leverage the CR tab to weight policy choices that trade-off between establishing a large number of sites that can be used to generate a low-cost health card / identifier or a centralized model that is used to generate a relatively high-cost card / identifier. It is foundational that every person needs to have a unique ID for health. How this is operationalized, at **scale**, has huge implications for the success of the digital health initiative.

Based on the choice of IDs, a profile of cost driver values will be leveraged to calculate a 10-year set-up and operating profile related to unique IDs for health. The 10-year costing plan for IDs will display on rows 27 and 28 of the **CR** tab and on row 20 of the **Summary** tab.

ILR-FR (INTERLINKED FACILITY REGISTRY)

This section of the **Blueprint artefact** is used to document the content in the **ILR-FR** tab in the Investment Rationale tool.

The role of the Interlinked Registry – Facility Registry (**ILR-FR**) tab is to generate a cost profile for supporting the ingestion of content from a set of underlying facility directories into the ILR. The cost drivers for this are:

- The number of underlying facility directory databases that need to be interfaced to the ILR.
- The cost of developing a façade or other integration software for connecting each source directory to the HIE’s FHIR-based ILR.
- The annual software maintenance fee (expressed as a % of the initial API development cost) for each façade.
- The number of times per year the MOH will need to contact each facility to refresh the content in the facility directories (e.g. contact person details, infrastructure details including water point, electricity, etc., services offered, operating hours, and other pertinent details).
- The cost for each MOH contact to refresh the facility data (e.g. an SMS exchange could be very inexpensive, a phone call slightly more expensive, and a site visit could be rather costly).

The cost drivers are leveraged to calculate the 10-year profile for maintaining up-to-date facility data in the HIE’s interlinked registry. This is reported on rows 18 and 19 of the **ILR-FR** tab and on the **Summary** tab.

ILR-HWR (INTERLINKED HEALTH WORKER REGISTRY)

This section of the **Blueprint artefact** is used to document the content in the **ILR-HWR** tab in the Investment Rationale tool.

The role of the Interlinked Registry – Health Worker Registry (**ILR-HWR**) tab is to generate a cost profile for supporting the ingestion of content from a set of underlying health worker directories into the ILR. The cost drivers for this are:

- The number of underlying health worker directory databases (such as membership databases for the College of Physicians, College of Nurses, etc.) that need to be interfaced to the ILR.

- The cost of developing a façade or other integration software for connecting each source directory to the HIE’s FHIR-based ILR.
- The annual software maintenance fee (expressed as a % of the initial API development cost) for each façade.
- The number of times per year the MOH will need to contact each health worker to refresh the content in the source directories (e.g. contact details, work sites, training sessions completed, certifications, and other pertinent details).
- The cost for each MOH contact to refresh the health worker data (e.g. an SMS exchange could be very inexpensive, a phone call slightly more expensive, and an in-person visit could be rather costly).

The cost drivers are leveraged to calculate the 10-year cost profile for maintaining up-to-date health worker data in the HIE’s interlinked registry. This is reported on rows 18 and 19 of the **ILR-HWR** tab and on the **Summary** tab.

SHR (SHARED HEALTH RECORD REPOSITORY)

This section of the **Blueprint artefact** is used to document the content in the **SHR** tab in the Investment Rationale tool.

The role of the Shared Health Record (SHR) repository tab is to develop a cost profile for two key implementation activities:

1. Developing and maintaining a software façade for each point of service (POS) digital health solution that will be supported by the MOH to connect to the HIE; and
2. Implementing POS digital health solutions across all the MOH-supported facilities that are not yet “digitally enabled” and maintaining and operating these deployed solutions over the 10-year planning horizon.

To develop the cost profile for activity one, the following data are needed:

- The number of POS solutions for which a set of software façades must be developed.
- The cost of each façade.
- The annual API maintenance cost (expressed as a % of the API development cost).

To develop the cost profile for activity two, the following data are needed for each facility “cost bucket”:

- The proportion of the total facilities in each segregated cost category that are supported by the MOH;
- The one-time set-up cost for hardware and POS software at the facility, inclusive of training;
- The annual POS solution operating cost, inclusive of electricity, network connectivity, hardware and software maintenance fees, new employee training, technical support, etc.
- The starting point; the number of facilities in this cost bucket (expressed as a %) that are already digitally-enabled at the start of the HIE project.
- The rate of digital adoption (expressed as the number of rollout years) for facilities in this cost bucket. As an example, all the type-1 facilities may be implemented over a 2-year period, but the other facility types may require a 4-year deployment plan.
- The number of MOH contacts with each facility in this cost bucket on an annual basis. These touch points could be to audit security compliance, to refresh the POS with new code lists, etc.
- The cost of each MOH contact. For example, a multi-day site visit could be quite expensive whereas a phone call could be relatively inexpensive.

Based on the values entered as cost drivers, a POS implementation uptake and cost profile will be developed for each type of facility and extended over the 10-year planning horizon. These facility type cost profiles, plus the POS software façade costs, will be summarized on rows 53 and 54 of the **SHR** tab and on the **Summary** tab.

TS (TERMINOLOGY SERVICE)

This section of the **Blueprint artefact** is used to document the content in the **TS** tab in the Investment Rationale tool.

The role of the Terminology Service (**TS**) tab is to generate a cost profile for supporting the ingestion of terminologies into a terminology service and cross mapping between these, sub setting, and nationalizing, as necessary. The cost drivers for this are:

- The cost of acquiring and ingesting the code list databases such as SNOMED, ICD, ICHI, LOINC, etc. NOTE: for many LMICs there will be no license fee for the code lists databases – but this does not mean

there is no cost to setting up the terminology service. This “set-up” cost, inclusive of professional service and advisory fees (where applicable), should be entered into cell B3 so that a reasonable annual maintenance fee can be calculated by the model.

- The annual maintenance fee, expressed as a % of the initial set-up cost.
- The number of times per year the MOH will publish updated national code lists.
- The cost associated with each code list publication, including the costs of POS conformance testing (if applicable) to ensure each of the supported POS solutions has correctly ingested and operationalized the new code lists. NOTE: this is contemplated to be a solution-based test effort (as per cell B2 on the SHR tab) and not a *facility*-based test effort. There is already a cost carried for regular facility touch-points on the SHR tab.

The cost drivers are leveraged to calculate the 10-year cost profile for setting up and maintaining the national normative code lists and regularly publishing these to the ecosystem of HIE-connected POS solutions. This cost profile is reported on rows 18 and 19 of the **TS** tab and on the **Summary** tab.

HMIS (HEALTH MANAGEMENT INFORMATION SYSTEM)

This section of the **Blueprint artefact** is used to document the content in the **HMIS** tab in the Investment Rationale tool.

The role of the Health Management Information System (**HMIS**) tab is to generate a cost profile for supporting the ingestion of reportable indicators and/or de-identified person-centric content from point of care (facility) installations and/or from the SHR traffic. The cost drivers for this are:

- The number of HMIS instances for which integration or façade software must be developed.
- The cost of developing a façade or other integration software for connecting inbound SHR traffic (the T-junction) or batch extracts from the SHR into each HMIS instance.
- The annual software maintenance fee (expressed as a % of the initial API development cost) for each façade.

- The number of times per year the MOH will need each facility to submit reportable indicators to the HMIS. For monthly submissions, as an example, the value would be 12 times per year.
- The cost for each facility to make its regular reportable indicator submission, inclusive of labour and other costs.

The cost driver values are leveraged to calculate the 10-year cost profile for facility reporting to the HMIS and the costs of establishing digital “bridges” to the SHR so that automated submissions can also be operationalized. This cost profile is reported on rows 18 and 19 of the **HMIS** tab and on the **Summary** tab.

HRH CAPACITY (HUMAN RESOURCES FOR HEALTH CAPACITY-BUILDING)

This section of the **Blueprint artefact** is used to document the content in the **HRH Capacity tab** in the Investment Rationale tool.

The role of the Human Resources for Health Capacity-building (**HRH Capacity**) tab is to generate a cost profile for supporting the capacity-building activities necessary for a successful adoption of digital health by the health worker community. It is expected that three key main areas of investment are needed:

1. Education for every health worker regarding data use and the important ways digital health solutions can benefit them in their day-to-day work;
2. Training for health workers on the particular digital health software solutions they will employ at their places of work (NOTE: this cost is included as part of the implementation and operating costs defined on the SHR tab);
3. Establishment and operation of academic programmes that will provide a steady stream of health informatics professionals to meet the ongoing domestic demand for such expertise.

The cost drivers for this are:

- The initial cost of educating each healthcare worker regarding data use. This cost is expressed as an average per worker. It should reflect the anticipated mode (e.g. enrollment in 3rd party courses, in-service classroom training, online courses, etc.).
- The cost of annual refresher courses as part of continuing education for health workers.

- The initial set-up cost for establishing a new academic programme in health informatics. This cost could include developing a new programme from scratch at a domestic institution or the partnership costs of pairing a domestic school with an international one that already offers such programmes.
- The ongoing operating costs of the academic programme, net of student tuition fees, that will be covered by the government.

The cost driver values are leveraged to calculate the 10-year cost profile for HRH capacity building. This cost profile is reported on rows 25 and 26 of the **HRH Capacity** tab and on the **Summary** tab.

CUA (COST UTILITY ANALYSIS)

This section of the **Blueprint artefact** is used to document the content in the **CUA** tab in the Investment Rationale tool.

The role of the Cost-Utility Analysis (**CUA**) tab is to leverage the 10-year cost profile expressed on the **Summary** tab and use it as the *numerator* in a cost-per-QALY calculation. The *denominator* in this calculation is developed using the values gathered from the IHME (review the Theoretical DALYs section) as illustrated in Figure 35. NOTE: for purposes of this analysis, a DALY averted is assumed to be materially equivalent² to a QALY gained.

The model will accommodate up to five axes of intervention to address diseases or conditions for which DALY figures have been obtained. The calculation of the QALYs (averted DALYs) is based on the following parameters, for each disease or condition:

- The potential impact (the total DALYs lost, which if averted, would be QALYs gained). For example, if the annual DALYs lost to malaria is **368,388** life-years, then this figure would be entered in the relevant cell as the potential QALYs that could be gained if the burden of disease from malaria could be 100% mitigated.
- The lead time before the benefits of digital health will be realized (expressed in ordinal years). This value should be generally consistent with the “rollout period” values entered on the **SHR** tab. So – if the rollout were expected to progress over **2** years (on the SHR tab), the digital health implementation could be expected to start to deliver **benefits** after **2** years.

2 <https://jech.bmj.com/content/58/4/354.2>

- The benefit realization (expressed as a %). For example – if the broad adoption of digital health across the national care delivery network could be expected improve guideline adherence and therefore reduce DALYs (generate QALYs) due to malaria by 10%, then **10%** would be entered in the relevant benefit realization cell.

The cost per QALY is calculated for each year in the 10-year plan by using a total digital health cost value from the **Summary** tab and dividing into this numerator the aggregate estimated QALYs gained. In the same way a running total of costs is calculated (row 25), year by year, so too a running total of QALYs gained is totaled (row 23). Dividing row 23 into row 25 gives a running (annual) cost per QALY value; this running total cost is shown in row 27.

Conceptually, it is important to be able to establish a **cost-effectiveness threshold (CET)** so that it is possible to determine at what cost per QALY the digital health investment is a “good” investment. WHO has suggested that a QALY that costs less than *three* GDP per capita is a “good buy” and a QALY that costs less than one GDP per capita is a “great buy”. In cell B2 the target cost/QALY (CET) is entered. To be conservative, it is *strongly* recommended that one GDP per capita be used as the CET (note Figure 32).

Figure 36 - Dimensional analysis and the β ratio

$$\begin{array}{ccc}
 \text{CET (annual GDP per capita): } \frac{\$}{\text{Life-year}} & & \text{Running total cost/QALY: } \frac{\$}{\text{Life-year}} \\
 \\
 \frac{\text{CET (annual GDP per capita)}}{\text{Running total cost/QALY}} : \frac{\$}{\text{Life-year}} * \frac{\text{Life-year}}{\$} = \beta
 \end{array}$$

A country’s GDP is the economic value that results from the efforts of its population. The rate of economic value creation is **one** GDP per capita per year (dimensionally expressed as \$ per life year).

Where the running total cost/QALY is *lower* than the CET, a life-year has been “purchased” for less than it is “worth” to the national economy. Each QALY gained will return one GDP per capita in value, and the economic return-on-investment (**ROI**) from this recovered life-year will be **positive**. How much ROI is reflected by the β metric. A β of 2 means the ROI is *double* the investment.

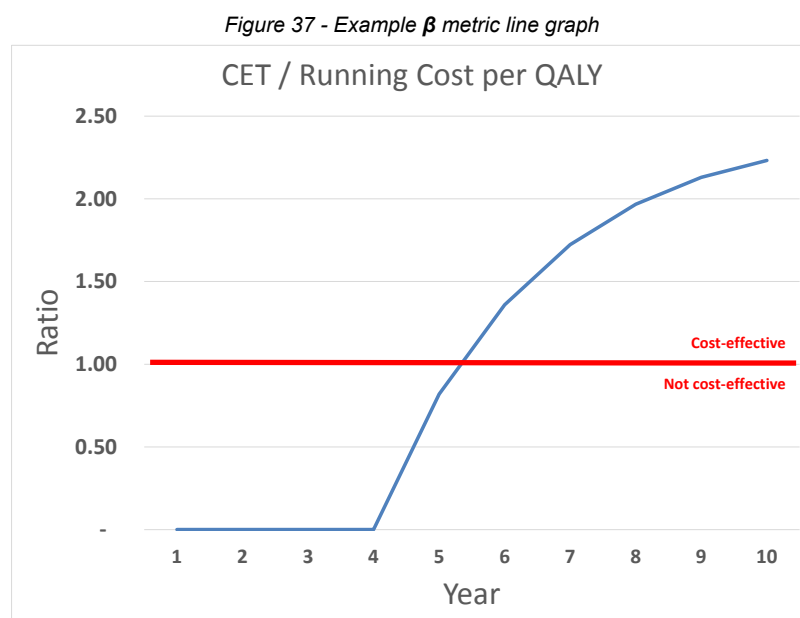
Dividing the CET by the running cost/QALY yields a metric (which we can call β) that supports evaluating the “opportunity cost” of digital health investments (Figure 36). A β of 2 indicates that a digital health investment is contributing to the economic wellbeing of the nation at a rate twice that of the overall economy. The β metric is shown in row 30 of the **CUA** tab. NOTE: because *running* total costs are being used, the β value will be ≤ 1 until all the “sunk costs” are *recovered* via QALYs gained.

On the CUA tab, a **sensitivity analysis** can be easily made by altering the time to benefit values (row 6) and/or the benefit realization values (row 7). Such sensitivity analyses can show the impact of accelerating or decelerating the implementation pace or the impact of realizing 1%, 2%, 5%, 10%, 20% QALY gains from care quality improvements attributable to the digital health implementation. Alteration of **any** of the activity-based budgeting tabs will also be immediately reflected on the CUA tab. This can be used to conduct sensitivity analysis related to implementation costs (SHR tab) or health ID costs (CR tab), etc.

RESULTS

This section of the **Blueprint artefact** is used to faithfully report the results of the Investment Rationale and to report on the outcomes from sensitivity analyses related to implementation time and expected benefits realization.

In the Investment Rationale tool, the **Ratio CET to Cost-per-QALY** tab shows a line graph of the β metric over the 10-year planning horizon. This graph can be annotated to show that, where $\beta \geq 1$, the digital health investment is cost-effective, and where it is less than 1 it is not economically cost-effective (based on the choice of CET). This simple graph can help a decision-maker see when the “payback” point is reached for a digital health investment and what the economic benefit ratio is once the cost-effectiveness threshold is reached.



An example of such a β graph is shown in Figure 37. As is evident from this example graph, this version of the Investment Rationale model is “cost effective” in year 5 and by year 8 the economic value of the digital health investment is more than “double” the CET. In economic terms – the digital health investments return \$2 per dollar invested.

DISCUSSION

It is here in the **Blueprint artefact** where comments and observations about the β metric graph are articulated. If there is a business case for the national HIE digital health investment, this is where this business case is made. Based on the sensitivity analyses – and on observations and inputs from the many workshops – implementation risks can be surfaced, here, and potential mitigation strategies can be described (where appropriate).

