

WHO-CCS 2022-2026 Program Proposal

1. Title of the Proposal

Convergence of Digital Health Platforms and Health Information Systems (HIS) Implementation in Thailand (ConvergeDH)

2. Executive Summary

Digital health and Health Information Systems (HIS) are dramatically altering the landscape for health. Thailand achieved Universal Health Coverage (UHC) in 2002. However, the delivery of health services relies heavily on manpower without digitisation, and the COVID-19 pandemic has exposed the lack of adequate digital health platforms in the country. Remedying this issue requires convergence across the health, digital economy, industrial and innovation sectors and collaboration with the private and the non-governmental actors. Thailand has made progress in the application of digital interventions for health, a process accelerated during the COVID-19 pandemic by the need for timely and reliable data and public health issues like tuberculosis, migrant worker's health, and road traffic injuries. Notwithstanding these advancements, there remain areas in need of further development. These include overcoming fragmentation in digital health systems and strengthening an integrated approach to health through digital interventions.

The World Health Organisation (WHO) and the Thai Ministry of Public Health, along with a range of stakeholders and partners are in the process of developing a Country Cooperation Strategy (2022-26) to identify and focus on priority areas of engagement. Digital health and HIS has been identified as one of the priority areas for the WHO-CCS (2022-26) years. As part of this programme, this proposal seeks to create a national level collaborative digital health governance mechanism to support the development of Thailand's digital health and integrated health information systems with the support from the WHO, through technical support and advocacy, in the following five focus areas: I. Landscape analysis for digital health and health information systems in Thailand; II. Standards and interoperability of datasets for migrant workers; III. Framework for health data management and data sharing with data protection in Thailand; IV. Open data catalytic initiative for research and policy support in Thailand; and V. Virtual hospitals and telemedicine in Thailand.

This proposal will be implemented by a range of partners in Thailand that are involved in digital health and HIS initiatives, and the team will seek to enlist other relevant stakeholder over the course of the programme. The proposal aims to support the continued growth and development of this field in the country through technical and policy-oriented outputs. Monitoring and Evaluation (M&E) approaches will be embedded in the programme to foster learning and knowledge management will be utilised to engage broader stakeholders and to sustain efforts. The objectives of the proposal are aligned with the Thai Ministry of Public Health's digital health strategy and builds on current initiatives to provide targeted support. WHO's support, through its social and intellectual capital, as well as its ability to source technical expertise and cross-country collaborations will be a key partner in this process.

3. Background/Rationale/Conceptual Framework

Background

Digital health and Health Information Systems (HIS) have become a powerful and indispensable resource for providing and managing health systems effectively as digital technology and data availability for health has expanded. Digital Health has been defined as “the field of knowledge and practice associated with the development and use of digital technologies to improve health[1]. HIS aids decision-making through data generation, compilation, analysis, synthesis, communication and use [2]. Such a system collects data from the health and non-health sectors in a manner that is timely, relevant and reliable [2]. Among its many uses, HIS aids the identification of resource needs, management of patient outcomes, as well as monitoring and evaluation of health programmes. These can be used to inform and formulate health policies strategically. The role of digital health and HIS has become even more prominent in the age of COVID-19.

In a study conducted by the Thai Ministry of Public Health (MoPH) and the World Health Organisation (WHO) Thailand [3, 4], four challenges were identified for Thailand to overcome in order to establish an integrated effective national eHealth and HIS. The four challenges relate to: 1) establishing multi-stakeholders, national-level, eHealth/digital health/HIS governance system; 2) developing health information standards and interoperable health data systems; 3) promulgating and implementing health data security and privacy law and regulations; and 4) build and strengthen digital health/HIS human resources. The Global Digital Health Index (GDHI), which ranks countries on indicators related to digital health, found Thailand to have scores above the global average on several indicators with an overall maturity level of 4 out of 5 [5]. Areas that were below the global average (as of August 2018) were those related to legal provisions for supporting digital health applications, training on digital health for health personnel and having few priority areas supported by digital health in the country.

Although, in the past two decades, many digital health and HIS programmes and projects have been initiated and implemented to fill the four challenge gaps, Thailand’s digital health and HIS remain fragmented and are not able to fully support the country’s health care, public health, and health systems as much as they could. The WHO’s Global Strategy on Digital Health 2020–2025, endorsed at the 73rd World Health Assembly (WHA73) in 2020, calls for member states to prioritise developing and implementing integrated digital health and HIS to support primary health care and Universal Health Coverage (UHC) [1]. In Thailand, the government has taken steps to identify the potential areas for addressing these areas. The Thai MoPH has articulated an e-health strategy (2017-2026) which seeks to “improve quality of life through inclusive access to eHealth services sustainably” [6]. In 2019, the Thai government passed the Personal Data Protection Act (PDPA) and the Cyber Security Act [7]. Both laws are general laws that cover digital data from all sectors including the health sector. However, the implementation of the laws and the country’s e-health strategy to achieve integrated HIS has not been fully realised and is still at a nascent stage of development and implementation.

Rationale

There is an urgent need to create a collaborative digital health governance mechanism to lead the development of the country’s digital health and integrated HIS. The development of national health information architecture and data standards is essential to integrate and enable interoperability in the current system which is fragmented. Another important area concerns the role of legislation, PDPA and Cyber Security Law, on health data management and data sharing. Compliance with the PDPA legislative requirements has been delayed due to COVID-19 but, once enforced, will require all stakeholders to set-up and update systems for data security including ensuring adequate technical

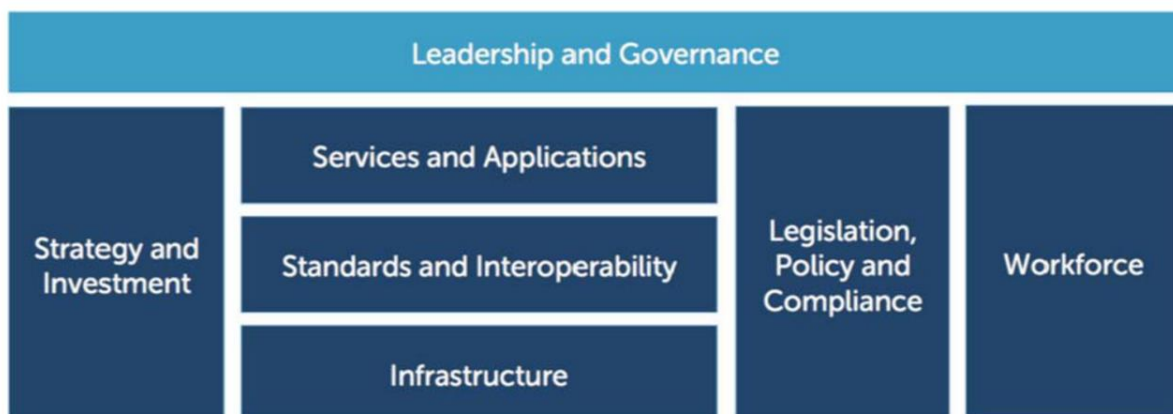
capacity and financial resources. Additionally, the availability of data to conduct research and enable knowledge discovery is important for informing decisions and policies in areas such as healthcare service, public health, and health management. Thailand has committed to an open data policy. However, integrating, accessing, securing, and sharing health data while protecting people’s privacy remains an area that needs to be developed and supported further in the country. There are multiple data custodians in the health sector, and each institution has its own policy for managing data. The issue of effective access to and use of data is compounded by the multi-sectoral nature of health, and data emanating from health and non-health sectors may need to be investigated further to explore potential for linkages which will support realising the full potential of data.

The WHO and Thai MoPH are in the process of developing a Country Cooperation Strategy (CCS) and identifying areas of engagement. Digital Health and HIS could be a new policy area in the WHO-CCS for Thailand. This proposal offers an opportunity for the WHO to support an area that multiple partners in Thailand deem to be important and has the potential to bring existing partners together, while attracting new partners to work on this priority in the “new normal” era. The proposal offers an opportunity to support better health in Thailand by understanding the current practices, collaborating with various stakeholders within the country as well as international experts and establishing a mechanism for digital health and HIS to improve health systems and health policy in Thailand.

Conceptual Framework

The rationale for improving health information systems and processes is multi-faceted, though the overarching purpose is to allow practitioners, policymakers, and researchers to improve health outcomes. There are several frameworks that delineate the approach for strengthening health information systems such as the Health Metrics Network, which shows how improvements in HIS and processes can lead to: i) Better measurements of health; ii) Reduced fragmentation of health data; iii) Improved monitoring and evaluation procedures for health; and iv) Harmonisation of standards and facilitated comparisons, locally and internationally [8]. The WHO Global Strategy on Digital Health 2020-25 emphasises collaboration, implementation of digital health strategies and governance of the system, as well as a taking a human-centred approach to the health system [1]. The National eHealth Strategy Toolkit developed by WHO and the International Telecommunication Union (ITU) has organised the various elements into seven components which can serve as building blocks for a digital health system, as shown in Figure 1, and will be used to frame this proposal.

Figure 1: Building blocks for digital health



Source: WHO and International Telecommunication Union (ITU), 2012

Each of these components has a role to play in developing the digital health system in a country, creating an enabling environment for digital health to flourish [9]. Leadership provides the vision for the system and helps organise and coordinate among various stakeholders. Strategy and investment in the system transforms the vision into action, aligning priorities, resources among internal and external stakeholders. There are three technology-related components: services and applications, which are the digital interventions used by various parties; standards and interoperability, which allows applications and data systems to communicate with one-another; and infrastructure, the devices and networks that enable the functioning of the system. Legislation, policies, and compliance provide the necessary policies and regulations for facilitating implementation of digital health. Finally, the workforce whose capability needs to be strengthened to adapt to the digital age. These components support the identification and planning of the chosen focus areas for this WHO-CCS, which will be described in Section 5 of this proposal.

Proposed plan for WHO Country Cooperation Strategy in Thailand

The scope of this programme is to strengthen a collaborative mechanism for digital health and HIS in Thailand. The proposed activities under the WHO-CCS have been crafted for Thailand, informed by the WHO and ITU's building blocks for digital health. The overarching block of leadership and governance is critical and in the context of Thailand, will need to be collaborative to bring together different stakeholders, within and across ministries as well as from other sectors. The foundation provided in the sphere of leadership and governance can facilitate the development of standard or minimum datasets, under the pillar of Standards and Interoperability. Virtual or telemedicine, a concept that has gained prominence during COVID-19, will build on the pillars of infrastructure as well as services and applications. There is a need for a suitable legislative framework for the entire country's digital health needs as well as an open data policy that can be used by researchers to conduct the analysis. A cross-cutting theme is that of building capacity for the health workforce at all decision-making levels to effectively implement the vision for digital health in the country through collaborations with various stakeholders including the other WHO-CCS programmes for the next five years.

This proposal seeks to build on existing efforts and will focus on key areas where incremental advancements can be made with the support of WHO and partners involved in the CCS, that can then be utilised by the broader digital health and HIS community. The proposed topic of digital health and HIS is one of interest to many, and the groundwork has been laid over the past years. The COVID-19 pandemic has accelerated the utilisation of data systems to be able to respond in a timely manner, even as crucial steps remain to be taken. A starting point for this programme is to coalesce key stakeholders around a shared vision for digital health and HIS through a convergence workshop that will inform activities in the areas of focus. The focus areas identified to understand the digital health landscape, standards, legislation, open data policy and virtual and telemedicine, are areas of interest that will aim to produce outputs that are both technical in nature and policy oriented and will seek to inform the design of a collaborative governance mechanism for digital health and HIS. Overall, the outcomes from this programme can improve Thailand's healthcare system and population health.

WHO will be an important partner in this process. WHO Thailand, with its connections to the WHO SEARO and the WHO Headquarters, will be able to link the team with international experts, as well as other partners in the region and globally. It will also be able to facilitate sharing of lessons between countries. Building on its reservoir of knowledge in this field, the WHO can offer its intellectual capital towards this effort and provide support in terms of training and capacity building as identified during the project period. Furthermore, given Thailand's current partnerships with the global health community, we expect that Thailand will be able to make demonstrable progress over the course of the CCS, and share its experience with other countries in the region and beyond, with the support of the WHO. Moreover, Thailand could be an example of implementing the WHO Global Strategy on Digital Health 2020-2025, which will guide the activities under the CCS [1].

4. Guiding Principles, specific for each program

This section describes the guiding principles for this overall project which will apply to the focus areas:

Effective communication and trust

Transparency refers to the disclosure of government information to the public and civil society so that individuals and organisations can access and monitor information and government operations. To achieve transparency, effective communication and trust must be created and maintained. If successful, this approach can reinforce accountability, further increase trust, and provide opportunities for systems improvements.

It is important that an environment is created to allow patients to share more information on their health safely. For this purpose, the development of verified identities and trusted relationships is necessary, particularly when it comes to use of virtual and telemedicine. These are not only for doctors and patients but also among the system providers to ensure confidentiality and data security. Effective and comprehensive communication is also needed to allow patients to understand their health matters.

In addition, there is scope for inclusive participatory governance. Open government data allows citizens the opportunity to participate in governance processes more actively such as decision-making and policy/advocacy. Open data initiatives such as online data portals offer stakeholders the ability to be more informed and better able to make evidence-informed decisions.

Standardisation of digitalisation efforts

There is a need to harmonise datasets across systems within and outside the health sector to allow for meaningful use of the data. Minimum data standards can help to ensure consistency in the description and measurement of data and can be used to improve both: 1) the qualification criteria that data should meet; and 2) the technical specifications of data to ensure consistency and interoperability or usability of data across different systems, sources, and users. For the first, there are standards that can be implemented for healthcare data collection [10]. There are numerous components of data systems that can be standardised, ranging from data types and identifiers, to application programming interfaces [11]. As part of this project, stakeholder engagement and mapping exercises will be conducted, subject to agreement from the steering committee, to understand the needs for, and feasibility of, developing different minimum data standard components. This principle will support the other efforts to move towards becoming a digitalised community.

Collaborations within and outside Thailand

The guiding principle underscoring all other principles is to build and foster collaborations across agencies and sectors in digital health and HIS, given the multi-dimensional nature of health. In addition, being under the WHO-CCS, there is an opportunity to learn from regional and global practices and forge technical collaborations with experts. These collaborations will be critical in furthering the development of digital health and HIS in the country.

A patient-centred approach will also be important as the chief beneficiaries of the health system are patients, with the aim of having good health. Therefore, focusing on their experiences and needs in the system will be important to achieve such goal. However, perspectives from the service providers will also not be neglected.

To ensure successful implementation of any digital health programme and HIS, it is imperative that the health workforce is able to deliver on its promises. This infrastructure will be important in supporting the competitiveness of the health system in Thailand and make it fit for the digital age including enhancing Thailand's competency in the human and institutional levels in digital health. To be effective, a health system needs to address the needs of the entire population group including vulnerable groups such as the elderly, migrant groups and others. This approach not only means designing health interventions that cover these groups, but also designing systems to be inclusive for example, ability to use different languages (regional dialects or those of migrant groups) as well as ensuring that privacy needs are appropriately met. Collaborations across stakeholders and sectors will be required to support our work for an effective and efficient health system.

Data security and risk management

"Information is power" is an age-old adage that has relevance in the digital age. It is important to ensure safety of the data collected and implement a participatory process to govern its use. It is important to engage stakeholders so as to have ownership of this process together. This approach can reduce the risk of the efforts in advancing digital health jeopardising or at the cost of the social, ethical, and other considerations as well as ensuring that the work generated through this work programme are utilised. Information has social and commercial value and is an important resource for innovation and public disclosure of data is one source that can spur improved efficiency, innovation, and entirely new services.

Value addition of programme to existing efforts

There are several ongoing efforts by stakeholders within Thailand to advance the digital health and HIS agenda in the country. The WHO-CCS programme will seek to target specific areas where the partners involved can produce relevant outputs and begin to build consensus on areas that can be developed further. The programme will seek to utilise the WHO's social and intellectual capital and draw on its network with other countries in the region and globally.

5. Goal and Strategic Objectives

The overarching goal of this proposal is **to create a collaborative digital health governance mechanism to lead the development of Thailand's digital health and integrated health information systems with the support of WHO**. This goal will be achieved through five focus areas, which are based on the seven building blocks of a digital health system and align with the priorities outlined by the Thai MoPH in its eHealth strategy. The focus areas and objectives are listed below:

Table 1: Focus areas, objectives and proposed focus area leads

Focus areas	Objective	Proposed focus area lead
I. Landscape analysis for governance mechanism for digital health and health information systems in Thailand	To increase the understanding of the landscape for digital health in Thailand	Thai Health Information Standards Development Center, Health Systems Research Institute (HSRI); Ministry of Public Health (MoPH): The Strategy and Planning Division (SPD) and Information and Communication Technology (ICT) Center Government Big Data Institute (GBDi)
II. Standards and interoperability of datasets for road traffic injuries, migrant workers and genomics	To design a standard dataset for use in the cases of road traffic injuries, migrant workers and genomics	Ministry of Public Health (MoPH): Department of Disease Control (DDC) and The Strategy and Planning Division (SPD)
III. Framework for health data management and data sharing with data protection in Thailand	To build consensus and implement a framework, as appropriate, for health data management and data sharing in Thailand in a secured manner, while protecting people's privacy	Thai Health Information Standards Development Center, Health Systems Research Institute (HSRI); Ministry of Public Health (MoPH): The Strategy and Planning Division (SPD)
IV. Open data catalytic initiative for research and policy support in Thailand	To summarise and share information on availability and accessibility of data in Thailand	National Health Foundation (NHF); Ministry of Public Health (MoPH): Health Intervention and Technology Assessment Program (HITAP)
V. Virtual hospitals and telemedicine in Thailand	To understand the current context of virtual hospital and telemedicine in Thailand and explore patients' experiences upon services	Ministry of Public Health (MoPH): Information and Communication Technology (ICT) Center and Health and the Health Intervention and Technology Assessment Program (HITAP)

Description of proposed focus areas:

I. Landscape analysis for digital health and health information systems in Thailand

The rapid advancement of digital technology and spread of internet connectivity has led to many changes in Thailand's health information systems. There are several organisations, both in the health and digital technology sectors, which are involved in developing HIS, digital health applications and tools in Thailand, and each operates with its own institutional mandate. The landscape of HIS and digital health studied by the Thai MoPH and WHO Thailand a decade ago needs to be updated, especially the national HIS and digital health governance mechanism which remains a major challenge for Thailand's health system. There is therefore a need to understand the existing structures and processes in to build on current capabilities across the systems.

Given the multi-dimensional nature of health, a step to involve stakeholders from different sectors within the health sector as well as outside of it is a crucial step. Data collected either through the health system or for administrative purposes may be utilised to enhance system capabilities and improve access to health care. However, these efforts are often fragmented or operating at cross-purposes with one another. There is therefore a need for, what has been referred to as a "Convergence Workshop" whereby stakeholders who have an interest in digital health are brought together to achieve a range of objectives, including reviewing the status of the digital health and HIS in the country, sensitising stakeholders on the importance of digital health and HIS, identifying gaps and priorities and operationalising plans [12]. This approach has been applied in six countries in the region by the Asian Development Bank (ADB), WHO and other partners in 2015-17. The benefit of such workshops has been to engender consensus among stakeholders from multiple sectors, so creating a shared vision, and aligning resources and people, being foundational to engendering commitment to digital health and HIS. The planning and preparation for this workshop will be carried out as per the proposed plan in accordance with the Digital Health Convergence Meeting Tool Kit [12].

In parallel or following the convergence workshop, a landscape analysis will be conducted to understand the status, scope and stakeholders operating in the digital health space. The methods involved will be a desk review and a survey, which may be conducted online and in-depth interviews that will be conducted with key stakeholders. Social Network Analysis (SNA) may be used to understand relationships between various actors in the system, if deemed suitable. The building blocks for the enabling environment of digital health in Figure 1 may be used for this purpose. The results will be summarised as a report or manuscript and will inform the development of the governance system.

To facilitate learning on digital health initiatives across countries, knowledge-exchange activities will be planned, including a study visit to a country, such as Singapore, the United Kingdom, Finland, or Taiwan, where digital health is widely used. Key policy makers will be identified for such a visit to ensure sensitisation to the issues of digital health.

Further, if feasible, the team will plan to support the development of a governance mechanism for Road Traffic Injuries (RTIs), migrant health and genomics, as linked to focus area II on Standards and interoperability of datasets for RTIs, migrant workers, and genomics (see below).

The above activities will be supported by a Working Group, which will be established after confirmation from the Steering Committee, in close partnership with the lead for the focus area.

II. Standards and interoperability of datasets for road traffic injuries, migrant workers, and genomics

Data standards form part of the conceptual framework displayed in Figure 1 and they are integral to maximising the functionality of HIS. Long-term trends (such as increased digitisation of public services) and unforeseen events like COVID-19 have underscored the role that HIS can play. Developing data standards that can be adhered to and increase the interoperability of HIS are essential to responding to this changing environment. However, the healthcare, spatiotemporal and social and community-related information systems cannot be linked and integrated without standards and agreeable interoperability. Information is fragmented due to non-standardisation of the way the data are collected, processed, analysed, used, and distributed across government agencies and private entities. There are currently several templates for datasets, ad hoc code sets and data formats that are not standardised, which prevents the use, comparison, and operationalisation of services across sectors that are working on related topics.

The first stage of this project component is the establishment of a working group by the steering committee to manage the work for this component of the proposal. Subsequently, the working group will oversee the development of a generic framework for identifying data standards and improving interoperability of datasets. Once this framework has been developed, the generic framework will be trialed using several data for one or more case studies, as outlined below:

1) Road Traffic Injuries

Road traffic injuries (RTIs) are the number one cause of mortality among young Thais and the data collected across agencies does not allow the interoperable use across agencies. Years had been spent on integration of RTIs deaths across government agencies and Thailand is still the leading country for mortality on account of RTIs. To use the RTIs data for guiding the policy implementation and traffic law enforcement, near real-time analysis of the RTIs data will be crucial for prevention of mortality from RTIs. This approach may include monitoring activities of risk behaviors which may allow automated law enforcement, such as using red-light and speed camera, which can reduce bias and potentially improve equality in law enforcement. Repeated offenders can be identified and treated for the possible alcoholism and drug use disorder such as marijuana use disorder.

2) Migrant workers

The migrant worker's health relies heavily on access to health insurance and having an identity is a pre-requisite to accessing health insurance or support from the health sectors, as this may not be available for migrant workers. The integration of the spatiotemporal data of public health emergencies (PHE) such as COVID-19 or tuberculosis clusters, could be potentially used to identify the source of migrant health and providing appropriate support mechanisms for migrant health. It is also imperative for the private sector to learn about the potential health-related support required when hiring migrant workers.

3) Genomics

Using information on genomics is becoming crucial in modern medicine. The analysis of genome sequence data allows the tracking of variants of concerns (VOCs) and facilitate understanding of the dynamic of the pandemic based on the evolution of the virus that had never been seen in human history. The analysis of human genome data would allow the identification of at-risk individuals for adverse drug reactions, sudden deaths, and hidden cancers. This information is becoming accessible due to the lower cost of sequencing a human

genome, it is imperative for the advance health system to prepare to use the human genome sequencing data once it is available to the patients. With Thailand aiming to generate 50,000 individual genome data profiles by 2025 and the increasing number of sequenced individuals, establishing standards and interoperability of human genome sequence data as the pilot data set is planned under this programme.

These case studies are tentative proposals that should be confirmed by the steering committee and are subject to change. Many stakeholders, both in and outside of the health sector, are working together to reduce road traffic injuries and improve the conditions of migrant workers. However, healthcare, social and community-related information systems that hold data relating to these issues cannot be linked and integrated. For each of the case studies, stakeholder engagement activities should be conducted so that the need and feasibility for minimum data standards can be assessed. Following the needs assessment, a mapping and landscape analysis of data standards and communities of practice within participating agencies will be conducted. The mapping and landscape analysis will then be supplemented by additional literature reviews where necessary to fill any gaps between the standards and communities of practice identified from the landscape analysis, and the needs identified from the stakeholder engagement activities. An implementation plan will then be agreed based on the findings of the mapping and landscape analyses and supplementary literature review exercises. Finally, minimum data standard components will be developed and implemented for the case study topic area.

III. Framework for health data management and data sharing with data protection in Thailand

Health information architecture, the standardisation of administrative and clinical care data, including law and regulations protecting person information serve as the foundation for sharing and operationalising health data as part of the digital health strategy. Protected and integrated sharable health personal data can ultimately be used to support a healthcare system. The HIS and digital health implementers could benefit from guidance on how to protect, manage and share data in manner in which all stakeholders can benefit.

Building on the initiatives to build consensus around minimum datasets and ensuring their interoperability for specific topics, it is imperative for any health system embarking on the journey to digital health to have legislation to support their appropriate use to ensure that the concerns of every stakeholder in the health system is adequately addressed. Citizens may be concerned about whether their health data is maintained safely, whereas health professionals may be more concerned about the validity of the health records; and researchers, about accessing health data to use it to conduct analysis and potentially inform research. Table 2 illustrates these varying needs by stakeholder and the types of laws that are needed to address them [13]. In addressing the needs of the different stakeholders, lawmakers need to consider issues such as validity of electronic health data, data protection and the rights of patients as well as the rights and obligations of health professionals and others who may use health data.

Table 2: Legislative responses to main concerns of stakeholders regarding digital health

Stakeholders	Main concerns	Laws
Citizens and patients	Access to their health information Health information kept in a safe and readily available way	Access to their health information Data protection and information security
Health professionals	Validity of electronic records and medical orders Validity of telehealth Validity of electronic prescriptions Confidentiality Access to medical information for improving quality and research Interoperability	Content and validity of electronic health records, telehealth, and electronic prescriptions Data protection Secondary uses of health information Use of dictionaries for terminology (CIE 10; SNOMED)
Health centers and hospitals	Secure storage of health information for a set period of time Access to health information for assessment, management oversight, inspection, and quality improvement purposes Interoperability	Purposes of health records and their safekeeping Data protection Secondary uses of health information Use of standards (HL7) for exchanging and storing information (governance for interoperability) Responsibility of the health establishment for its information system, for correctly integrating it, and for communication standards and protocols (like FHIR)
Public health systems	Access to and processing of medical data for public health	Legal requirements for sending data between different centers and services within the health system Secondary uses of health information Data protection Responsibility of public health for its information system, for correctly integrating it, and for communication standards and protocols (like FHIR)
Research centers	Access to health information Intellectual property rights	Secondary uses of health information Data protection Intellectual property laws

Source: *Governance for Digital Health Systems, Inter-American Development Bank (IDB)*

With the launch of the Personal Data Protection Act in Thailand (PDPA), which is yet to be enforced (postponed to 2022, on account of COVID-19), health data are considered sensitive data. The security level of health data in Thailand is at the same level of personal financial data, which most hospitals in Thailand cannot comply with the same level of security standard of ISO 27001.

To this end, a Working Group will be established, with confirmation from the Steering Committee, to support the lead for the focus area. A study based on the legal framework in Thailand will be conducted and the proposed support for the implementation of PDPA for the health data will be carried out. These activities will include researchers with expertise in law and information and communications technology to review a legal framework and develop a plan that can be proposed for adoption by the Thai MoPH, Ministry of Digital Economy and Society, Ministry of Higher Education, Science and Innovation, private sections and non-government actors to support the implementation of PDPA. This analysis will include a review by a legal expert to shed light on the legislative aspects of the law. Should it be deemed important by stakeholders, a survey and in-depth interviews with key stakeholders will be conducted. Further, knowledge exchange activities with legal experts or practitioners may be facilitated with countries in Asia and other regions as well. The findings will be summarised in the form of a report and will be used to inform the legislative process in Thailand.

IV. Open data catalytic initiative for research and policy support in Thailand

In our current digital age, the power of data can be vital in bringing about positive social, economic, and environmental change. Particularly in the COVID-19 pandemic time, the world and our region have seen first-hand the value of accessing open data to inform effective public health response and recovery strategies. For example, governments have used open access data to assist in a range of different health response efforts, from monitoring (tracking) COVID-19 cases to examining national hospitalisation and mortality rates to forecasting the economic and health impacts of the global pandemic[14-16]. Open data has the potential to provide invaluable insights for health system response and recovery during times of unprecedented uncertainty and can be leveraged to support our communities as we are heading in to the “new” normal era.

Open data are data that anyone can freely access, use and share [17, 18]. Open data initiatives can support availability and accessibility of data in an easy-to-use and safe manner [19, 20].¹ Governments are one of the largest producers and collectors of data across numerous domains and have the ability to establish policies, standards, and infrastructure including to ensure that de-identified data are accessible for all.

In Thailand, open government data efforts have been underway since 2016 through a Cabinet resolution. There currently exists an Open Government Data Center accessible at data.go.th under the Digital Government Development Agency [21]. This portal is designed to be the center of access to open government information for Thailand and data is available for several topics [22]. Although there is a need to maintain the integrity of data, it is equally important to make data readily available with interoperable standards to ensure transparency and so that researchers have access to support health system research in the country. In this current focus area, there is potential to catalyse the open government data movement in Thailand to provide access to these data to support policy formulation which ultimately may accelerate health systems improvement and social good for all.

The themes below will guide the activities for this focus area. They will be refined and prioritised over time depending on what is uncovered from the convergence workshop, guidance from the Working Group and Steering Committee, stakeholder consultation meetings, and landscape analysis:

- *Power of data*: why do we need open access health data sources?
- *Data access*: what data are available (e.g. open digital health data) and existing mechanisms on how to access?
- *Data ownership and management*: who is/are managing what and how?
- *Data infrastructure*: what are the underlying infrastructure and capacity needs to access and analyse the de-identified open data?
- *Data sharing/linkage*: how are we considering data sharing policies and practices, and are open data linkable?
- *Data release*: what standards and protocols for formal release or publishing open data need to be established?
- *Data privacy*: how do we ensure confidentiality, security and privacy of open data?
- *Equitable access*: how do we ensure equitable access, management and handling of open data for the benefit of everyone?
- *Monitoring and evaluation*: what is the process to monitor and evaluate the overall effectiveness and impact of these efforts?

¹ This interaction will build on focus area 2 on interoperability as data across diverse systems and organisations should work together to enable integration of different datasets.

V. Virtual hospitals and telemedicine in Thailand

COVID-19 has challenged the traditional mode of healthcare delivery. The “new normal” requires our healthcare system to adapt to the virtual world while continuing to provide the right care at the right time.

Opportunity and reality of virtual hospitals and telemedicine in Thailand

Smart services of virtual hospitals and telemedicine, which is a means of delivering care at a distance using information and communication technology, is increasingly seen as an option of care for patients [23, 24]. This includes medical services (diagnosis, follow-up or consultation visits, treatments and among others) that are delivered virtually and can be accessed from remote areas, using an online application or technology [25]. During the COVID-19 pandemic, non-pharmaceutical interventions such as lockdowns, social distancing and among other restrictions prompted the adoption of virtual modes of healthcare visits. This is an opportunity to remove geographical barriers to healthcare access and virtual hospitals and telemedicine have the power to offer more convenient, accessible healthcare services for patients, including consultations, diagnoses, and other forms of care. These are particularly useful for patients who have mobility issues or are unable or unwilling to visit medical professionals on-site, including those who prefer shorter waiting times when seeing their specialists.

In addition, these virtual models have the potential to prevent hospitals from getting overwhelmed by incoming patients, reducing congestion and lowering the risk of transmission of infectious diseases. Simultaneously, these model of care (virtual hospitals and telemedicine) could be a way to prioritise patient cases, as only those who cannot be diagnosed or treated remotely will be referred to designated sites of cares.

In Thailand, it is not only private hospitals adopting these models; several public hospitals such as Ramathibodi hospital and King Chulalongkorn Memorial hospital have also implemented telemedicine systems [26, 27]. Moreover, the Thai MoPH announced plans to pilot a virtual system of video calling and post mail for medications in 27 hospitals [28]. At Ramathibodi the adoption of telemedicine has seemed to be rather successful: in its outpatient ward, the telemedicine system has helped cut the number of visits by approximately 30% of roughly 4,000 visits per day by chronic disease patients [29]. Another example of success is that virtual hospital systems have enabled long-distance therapy for patients with Obstructive Sleep Apnoea (OSA). With a video call, it has helped guide OSA patients and allows them to understand how to use a continuous positive airway pressure (CPAP) device [29].

Remarkably, as of July 8, 2020, the National Health Security Office (NHSO) approved a proposal to provide financial aid to hospitals for COVID-19 social distancing, for which the support has been available from October 1, 2020 [30]. The financial support applies to telemedicine and telehealth which covers health promotion activities for patients cover under the Universal Coverage Scheme (UCS) [31].

Potential caveats

Smart services such as virtual hospitals and telemedicine may help promote access to care for patients living in remote or rural areas; however, they can also introduce an inaccessibility paradox. For instance, these services require technical training and equipment that certain patients may lack. There can be infrastructural challenges in certain areas of Thailand and digital literacy issues among people in certain age groups, including technological distributions and accessibilities such as smart devices [32, 33].

During the pandemic, virtual modes of healthcare services can be helpful in reduce human contact and thus limiting the spread of COVID-19. While in-person patient-doctor interactions may also be kept minimal, these types of visits are valuable and indispensable in many circumstances, as not all care procedures can be delivered virtually, as indicated in the guideline from the Thailand Medical Council [34]. This shows that virtual modes of services should be used to supplement regular visits, without compromising medical standards and ethics.

The effectiveness of virtual care or telemedicine is yet to be decisively demonstrated. A Canadian evaluative study of an integrated care of virtual ward during a non-pandemic year 2014 [35]. This study pointed out that there was no significant clinical outcome between high-risk discharge patients who had been assigned to the virtual ward and those in the control, in terms of hospital re-admission rate or death [35]. This may be due to factors such as the lack of unified electronic health record systems and fragmented healthcare systems.

Another potential challenge is about building a secured system of data storage, sharing and coordination [32]. During the initial procedure for consultations and diagnoses, patients are required to provide their personal and medical information. Following that, doctors can access their patient's records as part of the service process. There are therefore concerns over information leaks that may arise, and data sharing rules and regulations will need be emphasised.

Proposed activities

This focus area aims to assess the current application of virtual hospital and telemedicine in Thailand including to examine their usage and advantages and disadvantages. A Working Group will be set up, under the aegis of the Steering Committee, to support this work. Information on these themes can support the National eHealth Strategies and ensuring that people can access the right care at the right place in a timely manner. A literature review will be conducted and survey methods will be applied to collect data on the research question, which will be determined through stakeholder consultations. Results of the assessment will be disseminated widely to ensure that the findings can be utilised at the hospital, provincial or national levels, as appropriate, for piloting or implementing initiatives informed by this effort.

Cross cutting area: Strengthening human resources for health

Across the five focus areas, namely, *I. Landscape analysis for digital health and health information systems in Thailand; II. Standards and interoperability of datasets for migrant workers; III. Framework for health data management and data sharing with data protection in Thailand; IV. Open data catalytic initiative for research and policy support in Thailand; and V. Virtual hospitals and telemedicine in Thailand*, there remains a need to arm healthcare workers and decision makers with the skills and equipment to prepare for the digital age in health. WHO, in its Global Strategy for Digital Health 2020-2025, identified having an adaptable health workforce as a core component of implementing national digital health plans[1]. Further, digital health can be a disruptive process and it is important to have a change management process for staff in the health system. Capacity building of the workforce must be prepared before introducing a digital health intervention, during the implementation process including hiring for new roles.

Capacity building activities for digital health should take into account the multi-disciplinary nature of the field and include topics related to information and communication technology as well as health delivery, finance and management, among others. This activity may be a mix of short-term and long-term investments in the education system and development of curricula as well as development of

fit-for-purpose competencies for health professionals to reflect these changes [36]. Professional development of the workforce on an on-going basis will be necessary, as health technologies are constantly evolving. This needs to be done not only at the decision-making level, but throughout the delivery process. In addition, capacity building programmes will also need to address attitudes and skills for a digital health system. A study on e-Health in Thailand in 2010 had found that while of tertiary institutes and the Thai MoPH offered courses on the topic, there were no degree courses on the biomedical sciences or health informatics in the country. With advancements in this field over the past decade, there is a need to re-assess the needs for building capacity for digital health in Thailand.

Moreover, “information literacy” or awareness of digital health at the population level is important so that patients can be empowered to adapt to technological changes in the system. This movement will facilitate a patient-centred approach to health and will require engagement with civil society groups.

The advent of COVID-19 has also required that health professionals are able to provide information to the public rapidly and in an effective manner to combat misinformation as it arises. Technological capabilities are important to address in this respect, for example, Thailand developed the Mor Prom application as part of the Thai MoPH’s COVID-19 response efforts as well as the creation of a chatbot on Facebook that ThaiHealth and Thai MoPH collaborated on to provide information on COVID-19 including vaccines [37, 38]. Development of system to support initiatives such as vaccination certificates also requires an understanding of the technological needs for responding to public health emergencies. Given the above, efforts will be made to incorporate human resource considerations in each of the focus areas.

6. Activities, Outputs, and Timeline

This proposal includes five areas of focus: I. Landscape analysis for digital health and health information systems in Thailand; II. Standards and interoperability of datasets for migrant workers; III. Framework for health data management and data sharing with data protection in Thailand; IV. Open data catalytic initiative for research and policy support in Thailand; and V. Virtual hospitals and telemedicine in Thailand.

As part of the programme management, a Steering Committee will be established to oversee the governance of the programme. The Steering Committee will confirm the Working Groups that will be set up for each focus area, to support the work of the lead for the focus area. Both the Steering Committee and the Working Groups will help shape the scope of activities that will be covered in each focus area, as well as identifying relevant players/stakeholders. The outputs of each of these focus areas will involve the following activities in close collaboration with WHO: (i) conduct research as relevant to the focus area; (ii) convene relevant stakeholders domestically for consultation; and (iii) solicit inputs from international experts. The outputs developed may either be technical in nature or oriented towards policy and have been indicated as such. Together, the outputs will be used to inform the movement towards a collaborative digital health system in Thailand.

Specifically, activities of the five focus areas are outlined below:

Table 3 A high-level list of action plan: Proposed activities and outputs for focus area:

Key activities	Outputs/milestones	Duration				
		Year 1	Year 2	Year 3	Year 4	Year 5
6.1. Landscape analysis for digital health and health information systems in Thailand						
Steering committee to propose and confirm a working group for focus area	Policy-oriented output: <ul style="list-style-type: none"> Working group established 					
Convergence workshop of relevant Thai stakeholders and experts	Policy-oriented outputs: <ul style="list-style-type: none"> Meeting held Meeting summary Consensus agreement 					
Landscape analysis of digital health and health information systems in Thailand	Technical output: <ul style="list-style-type: none"> Report 					
Consultation meeting on findings from the landscape analysis strategic plans and scope of work for sub-focus areas in consecutive years	Technical output: <ul style="list-style-type: none"> Report 					
A country/academic conference visit (tentative)	Policy-oriented outputs: <ul style="list-style-type: none"> Visit summary Lesson learned shared to stakeholders 					
Supporting the governance mechanisms to approve the standards and interoperability (RTI)	Policy-oriented outputs: <ul style="list-style-type: none"> Meeting held Meeting summary Consensus agreement 					

Key activities	Outputs/milestones	Duration				
		Year 1	Year 2	Year 3	Year 4	Year 5
Supporting the governance mechanisms to approve the standards and interoperability (Migrant health)	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary ○ Consensus agreement 					
Supporting the governance mechanisms to approve the standards and interoperability (Genomics)	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary ○ Consensus agreement 					
6.2 Development of national health information architecture, standards, and interoperability						
Steering committee to propose and confirm a working group for focus area	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Working group established 					
Generic project structure for case studies (<i>each to be conducted sequentially</i>)						
Stakeholder engagement for assessing needs and feasibility for minimum data standards	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary ○ Consensus agreement 					
Mapping and landscape analysis of data standards and communities of practice within participating agencies	Technical output: <ul style="list-style-type: none"> ○ White paper 					
Supplementary literature review to fill gaps between standards and communities of practice identified from the landscape analysis and the needs identified from stakeholder engagement meeting	Technical output: <ul style="list-style-type: none"> ○ White paper 					
Stakeholder engagement meeting to decide upon the implementation plan based on the findings of the	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary 					

Key activities	Outputs/milestones	Duration				
		Year 1	Year 2	Year 3	Year 4	Year 5
mapping and landscape analyses and literature review exercises	Technical output: <ul style="list-style-type: none"> Data standards framework actions agreed 					
Development and implementation of minimum data standard components using standards identified from the landscape analysis and literature review	Technical output: <ul style="list-style-type: none"> Data standards framework 					
6.3 Framework for health data management and data sharing with data protection in Thailand						
Steering committee to propose and confirm a working group for focus area	Policy-oriented outputs: <ul style="list-style-type: none"> Working group established to guide and support the team 					
PDPA act implementation research questions identified by expert meeting	Policy-oriented outputs: <ul style="list-style-type: none"> Meeting held Meeting summary Consensus agreement 					
Commission research team (legal team)	Technical outputs: <ul style="list-style-type: none"> Research proposal selection Research results review 					
Research dissemination activities	Technical outputs: <ul style="list-style-type: none"> Reporting to steering committee and governance mechanism Advocacy to the relevant stakeholders Policy-oriented outputs:					

Key activities	Outputs/milestones	Duration				
		Year 1	Year 2	Year 3	Year 4	Year 5
	<ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary ○ Advocacy to relevant stakeholders 					
Public announcement as part of RD	Policy-oriented output: <ul style="list-style-type: none"> ○ Participating in the public meeting by stakeholders (THF/HSRI/MOPH/MHESI/MDES) 					
Knowledge exchange activities (tentative)	Policy-oriented output: <ul style="list-style-type: none"> ○ Webinars/meetings 					
6.4 Open data catalytic initiative						
Formation of a working group for this focus area	Policy-oriented output: <ul style="list-style-type: none"> ○ Working group established 					
Situation analysis of the current state of the open data movement globally and nationally including the gaps in current movement (where this initiative can support)	Technical output: <ul style="list-style-type: none"> ○ Situation analysis 					
First stakeholder consultation meeting on the proposed plan with information from the preliminary situational analysis	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary 					
Qualitative interviews or a focus-group discussion on open data movements (and themes mentioned above) in Thailand	Policy-oriented output: <ul style="list-style-type: none"> ○ Interviews/focus groups conducted Technical output:					

Key activities	Outputs/milestones	Duration				
		Year 1	Year 2	Year 3	Year 4	Year 5
	<ul style="list-style-type: none"> ○ Draft of preliminary findings 					
Second stakeholder consultation on preliminary findings	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary 					
Knowledge dissemination activities	Technical outputs: <ul style="list-style-type: none"> ○ Manuscript/report ○ Policy brief 					
6.5 Virtual hospitals and telemedicine						
Formation of a working group for this focus area	Policy-oriented output: <ul style="list-style-type: none"> ○ Working group established 					
Literature review <ul style="list-style-type: none"> • Virtual hospital and telemedicine Tele-consultation, health, and pharmacy	Technical outputs: <ul style="list-style-type: none"> ○ White paper 					
First consultation on preliminary findings from the white paper	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary 					
Data collection <ul style="list-style-type: none"> • Qualitative interviews or a focus-group discussion on patient experience of virtual hospital and telemedicine • Online survey on experiences and perspectives of virtual hospital and telemedicine for service providers 	Technical outputs: <ul style="list-style-type: none"> ○ Survey launched ○ Interview/group discussion conducted ○ A draft of preliminary findings 					

Key activities	Outputs/milestones	Duration				
		Year 1	Year 2	Year 3	Year 4	Year 5
Second consultation on preliminary findings from patients' experiences	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Meeting held ○ Meeting summary 					
Write-up and other activities of knowledge dissemination	Policy-oriented outputs: <ul style="list-style-type: none"> ○ Report ○ Policy brief ○ Experience sharing workshop 					

7. Expected Outcomes, Milestones, and Impacts

Over the five-years of CCS support, Thailand will seek to inform the design of a collaborative governance mechanism for digital health and HIS with relevant stakeholders, by describing the landscape and taking incremental steps in areas of health data standards, health data security and privacy, open data policy, and virtual hospitals and telemedicine.

Creating a shared vision

The milestones at the start of the programme, forming a Steering Committee as well as arranging a national convergence workshop, will aim to consolidate personal visions, bringing in diverse perspectives to create a shared vision among workshop participants as an outcome[39]. Such a shared vision will articulate mutual understanding of rationales and needs for a collective plan of actions, including expectations and benefits which this programme can initiate. Having this shared vision is expected to help promote commitment of partners towards continuing with improving digital health and HIS.

Demonstrating concepts on standards and legislative requirements and exploring open data policy

This would also facilitate the establishment of a coherent and integrated approach for digital health and HIS in Thailand. Setting minimum datasets would enable implementation of an integrated, interoperable systems which are secure, sharable, and usable among relevant stakeholders. Importantly, through the WHO-CCS, a case study approach will be used to show the impact of using the digital infrastructure to provide appropriate care to a group that is excluded from the formal health system such as migrant workers or to improve systems to better deliver care for RTI and genomics.

Case studies will also be used to demonstrate the ability of the developed frameworks to transform the working relationship and compatibility of HIS areas as they relate to the legislative process for digital health. This activity will demonstrate the value of these working practices and consequently ensure that these methods continue to be implemented beyond the project period. Knowledge exchange and related activities will increase awareness among relevant stakeholders on the importance and potential use of digital health and HIS in the country.

Building on the efforts of the focus areas on understanding the landscape of the country, developing standards and interoperability, and framework for data management and sharing, key themes on the focus area on open data policy will aim to address key themes in facilitating access to data. The expected outcomes from the activities is an enabling environment for utilising data for decision-making and to increase transparency and accountability in health decisions.

Understanding the potential for virtual hospitals and telemedicines

Developing an operational policy for virtual hospitals and telemedicine could potentially be a game-changer in the delivery of healthcare. Especially, with lowered need to travel, it helps reduce burden and cost for patients. The knowledge outputs of this programme will help inform and fill the gaps of digital health and HIS in the context of virtual hospitals and telemedicine. If funding is available, prototypes of the recommendations will be piloted in province(s) with joint service plan, over the course of the WHO-CCS to determine their feasibility. Notably, health personnel as well as non-health professionals who support the health system, would also benefit from these activities and be able to participate in digital health effectively. Prominently, in terms of the medium- to long-term impact, virtual hospitals will be critical in improving human resource management, prioritising patients,

tackling overcrowding in hospitals, and freeing more of healthcare personnel at healthcare facilities. Indeed, these may also improve patients' symptoms, clinical outcome, and satisfaction.

Converging partners and building capacity for lasting impact

The proposed programme builds on decades of initiatives and digital health experts from WHO and local wisdom. COVID-19 is accelerating the process and provides a promising window of opportunity to bring together the various strands of activities and operationalise the vision for an integrated health information system in Thailand. The programme will seek to address not only the technological issues but also the capacity to effectively utilise digital and informational technologies to improve the health and well-being of people in Thailand.

The outputs from this programme, summarised above, will provide analytical inputs, guidance documents and demonstrated feasibility of initiatives through implementation in selected provinces. These outputs could provide a blueprint for the way forward, through a collaborative effort of practitioners, researchers, and decision-makers in the country as well as through learning from international experts. Knowledge management will be important in disseminating the outputs of the programme and ensuring continued – and broadened – engagement with stakeholders. Building capacity of health professionals and relevant stakeholders in this area will also require continued investment. These elements will be critical in sustaining the success of the programme efforts in the long term.

This programme has the potential to benefit from being part of the WHO-CCS 2022-2026 for Thailand. The demand for digital health and HIS is strong and the support from the WHO-CCS could be a catalyst to bring multiple partners together who will implement the activities and seek to bring about consensus among a diverse set of relevant, stakeholders in the country to forge the path ahead and to actualise the foundation for this programme. This collaboration, based on a shared vision, would be the mechanism which promotes an integrated approach to health policy in the country and ensures sustainability in the long-term. The proposed programme, with the support of WHO, will therefore be critical in making Thailand fit for its ambitions for a thriving digital system for health, improving processes and promoting better health for its population. Strengthening this component of the health system will also enable it to share its experiences with other countries that are in the process of developing their health information systems, together supporting the goals of achieving UHC.

8. Involvement of Multi-Stakeholders

This proposal will involve partners from various institutions in Thailand that are involved in digital health and HIS. Selected stakeholders are listed below:

- a) Strategy and Planning Division (SPD), Ministry of Public Health
- b) Information and Communication Technology (ICT) Center, Ministry of Public Health
- c) Department of Disease Control (DDC), Ministry of Public Health
- d) National Health Foundation (NHF)
- e) Thai Health Information Standards Development Center, Health Systems Research Institute (HSRI)
- f) Digital Economy Promotion Agency (DEPA)/Government Big Data Institute (GBDI)
- g) WHO-FIC Collaborating Center, Thailand
- h) National Health Security Office (NHSO) – To be confirmed
- i) National Health Commission Office (NHCO) – To be confirmed
- j) Thai Health Promotion Foundation (ThaiHealth)
- k) Health Intervention and Technology Assessment Program (HITAP), Ministry of Public Health

This is an initial list of partners and the team will plan to reach out to other relevant stakeholders in addition to the ones provided above. Inputs will be sought from experts and other stakeholders through consultation and convergence meetings on whom to involve in the programme. For instance, when supporting the governance mechanisms to approve the standards and interoperability of RTI, key players such as the Ministry of Transport (MoT) and Police Department will be sought. Also, for the case of migration health, relevant stakeholders such as Ministry of Interior (MoI), Ministry of Foreign Affairs (MoFA), and Ministry of Labour (MoL) will be considered. Additionally, to increase understanding in terms of demands and how data are currently being used in the real world, representatives from start-ups and research academia, for example, may be included.

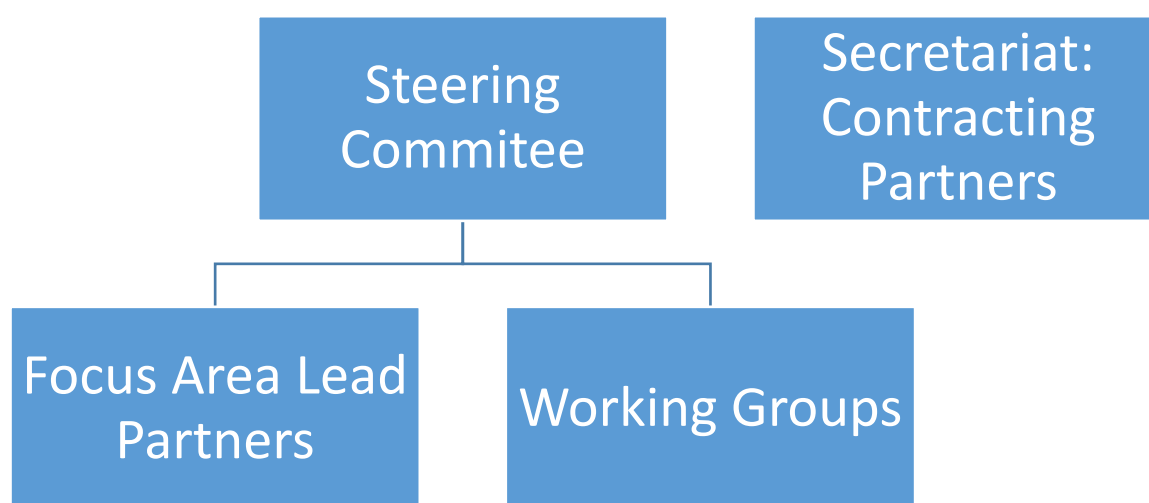
Each stakeholder, from both the health and non-health sectors, brings with them extensive experience and knowledge in the movement to build and continue digital health and HIS transformation in Thailand. Their involvement will broaden the perspective and engender ownership and legitimacy of the programme among stakeholders in Thailand. It is also anticipated that success of the proposed convergence workshop will showcase the feasibility and elucidate the benefits of participating in the WHO-CCS programme, which may draw more stakeholders and partners for collaboration. In addition, the team will work closely with WHO to tap into technical experts at the country, regional and global levels, including the Division of Data, Analytics and Delivery for Impact. The WHO will be an important partner providing social and intellectual capital in collaborating with other governments to share lessons and build partnerships internationally.

9. Program Governance and Program Management Structure

The programme will be managed by partners and coordinated by the contracting agencies, SPD and HITAP, together. A Steering Committee will be established to guide the overall work programme. Each focus area will be led by one of the partners under the WHO-CCS and specific Working Groups may be established to draw on experts and key stakeholders.

A strategy for communication will also be employed to ensure awareness on the programme among key stakeholders across Thailand on each focus area as well as for dissemination of results.

Figure 2: Management of grant

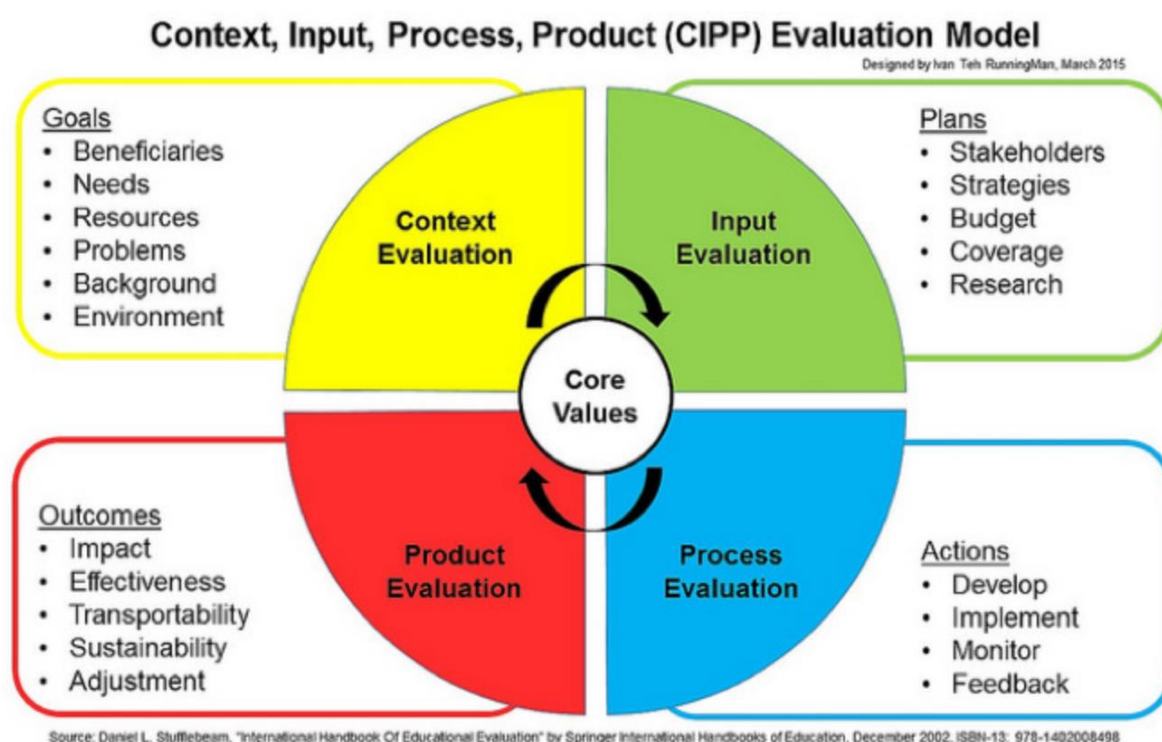


Role	Number of people
1. Program manager	2
2. Financial and accounting officer	2
3. Coordinators	2
4. Program Advisors	6
5. Other program officers (e.g., researchers, assistant researchers, etc.)	18
Total	30

10. Monitoring & Evaluation

The programme will employ the Context, Input, Process and Product (CIPP) model to evaluate the WHO-CCS programme. This approach focuses on continuous improvement looking at the overall goal (context), the plans and resources required (inputs); the activities and progress (process); and outcomes (product)[40]. The four parts of the model seek to answer the questions: “What needs to be done? How should it be done? Is it being done? Did it succeed?”[41]. The model was first designed in the 1960s and has evolved over time to encompass issues related to impact, effectiveness, sustainability and transportability (or, generalisability) [41]. The key elements of the model are depicted in Figure 3 below.

Figure 3: CIPP Model



Application of this evaluation approach will allow for flexibility and mid-course corrections depending on the policy needs. The activities and deliverables will be tracked over the course of the programme and will include the number of consultations, involvement of stakeholders as well as other items.

11. Estimated Budget

The estimated total budget for the five-year duration is 15,688,662 baht, summarised in the table below. The details budget is provided in Annex 2.

	Item lists/activity plans	Budget (Baht)
1	Personnel cost (secretariat/main contracting partner)	4,342,320
2	Operational cost	9,020,100
2.1	Establishing a steering committee	767,500
2.2	Focus area I: Development of collaborative national digital health and HIS governance mechanism	1,816,080
	A country/academic conference visit = 600,000 baht	
2.3	Focus area II: Development of national health information architecture, standards, and interoperability	2,052,720
2.4	Focus area III: Create and implement a framework for health data management and data sharing in Thailand in a secured manner, while protecting people's privacy	1,164,240
2.5	Focus area IV: Open data policy in Thailand	1,199,240
2.6	Focus area V: Virtual hospitals and telemedicine	1,770,320
3	Management cost	900,000
Total cost 1-3		14,262,420
Overhead cost (10% of the total cost)		1,426,242
Total proposed budget of the project		15,688,662

12. Contracting Agencies:

Dr. Surakameth Mahasirimongkol and Dr. Wanrudee Isaranuwachai

Health Intervention and Technology Assessment Program (HITAP)

Email: wanrudee.i@hitap.net

Annexures

1. About partners to the proposal

a) Strategy and Planning Division (SPD), Ministry of Public Health

The Strategy and Planning Division (SPD) is a division under the Ministry of Public Health (MoPH) Thailand. Its overall responsibility is to design the National Strategic Plan for Public Health. It also provides guidance for public health agencies in order to implement a health system which aligns with the National Strategic Plan, as well as other National Health reform plans. Website: https://bps.moph.go.th/new_bps/

b) Information and Communication Technology (ICT) Center, Ministry of Public Health

The Information and Communication Technology (ICT) Center in the Ministry of Public Health is responsible for managing health information systems in Thailand, developing competency of health personnel in ICT and developing health information networks in the country. Website: <https://ict.moph.go.th/th>

c) Department of Disease Control (DDC), Ministry of Public Health

The Department of Disease Control focuses on academic and technical leadership in disease prevention and control in Thailand. Website: <https://ddc.moph.go.th/en/index.php>

d) National Health Foundation (NHF)

The National Health Foundation (NHF) is committed to its mission of supporting the creation, management, and application of public health knowledge in order to support effective decision-making, planning and implementation leading to health systems improvements in key priority health areas as an independent Foundation. NHF focuses its efforts on the following strategic issues: Non-Communicable Diseases (NCDs); Youth Health and Gambling Addiction; Road Safety; Active Ageing; Medical Cannabis Use; Positive Health Disruptor Fellowship program; and the International Decision Support Initiative (iDSI). Websites: <https://thainhf.org/en/>; <https://thesapphire.health/>

e) Thai Health Information Standards Development Center, Health Systems Research Institute (HSRI)

Thai Health Information Standards Development Center (THIS) has been established with the overall objective of developing standards and practice guideline of health information systems in Thailand, streamlining systems to meet international standards. This goal is in line with the overarching goal of this WHO-CCS programme. In addition, THIS also promotes continuation of capacity building activities, knowledge sharing, and expanding network on health informatics. Website: <https://www.this.or.th/index.php>

f) Digital Economy Promotion Agency (DEPA)/Government Big Data Institute (GBDI)

The Digital Economy Promotion Agency (DEPA) was established under the Digital Development for Economy and Society Act in 2017 with the aim of driving Thailand's journey towards becoming a digital economy. The Government Big Data Institute (GBDi) is a unit under DEPA and was set-up to respond to the implementation of the Big Data initiatives and to support big data analytics for decision-making.

Websites: <https://www.depa.or.th/en/home>; <https://gbdi.depa.or.th/>

g) WHO-FIC Collaborating Center, Thailand

The WHO Collaborating Centre for the Family of International Classifications (FIC) is located in the Thai Health Standard Coding Center, Bureau of Policy and Strategy Office of the Permanent Secretary, Ministry of Public Health. The works of WHO Collaborating Centre are related to classifications of diseases and health informatics, including statistics, measurement, and trend assessment. It also provides support, in terms of training, education, standardisation of nomenclature and terminology and among others.

h) National Health Security Office (NHSO) – to be confirmed

The National Health Security Office (NHSO) is an autonomous agency that manages the Universal Coverage Scheme (UCS) in Thailand, covering three-quarters of the Thai population. It is one of the principal data custodians for health and has a vision of providing health to all when needed.

Website: <https://eng.nhso.go.th/view/1/Home/EN-US>

i) National Health Commission Office (NHCO) – to be confirmed

The National Health Commission Office (NHCO) is an autonomous government agency established under the National Health Act in 2007. It aims to enhance a participatory public policy process for the national health system. Website: <https://en.nationalhealth.or.th/>

j) Thai Health Promotion Foundation (ThaiHealth)

The Thai Health Promotion Foundation (ThaiHealth) is an autonomous institution which aims to enable good health for Thai society. It is funded by a 2 percent surcharge on excise taxes on tobacco and alcohol. It conducts a range of health promotion activities including road safety and disaster management, health promotion plans for the vulnerable populations, among others. Website: <https://en.thaihealth.or.th/>

k) Health Intervention and Technology Assessment Program (HITAP), Ministry of Public Health

The Health Intervention and Technology Assessment Program (HITAP) is a semi-autonomous research institute in the Ministry of Public Health (MoPH), Thailand. HITAP conducts health technology assessment (HTA) to generate evidence to define the benefits package for Thailand's Universal Coverage Scheme (UCS) and the National List of Essential Medicines (NLEM). In addition, HITAP has a diverse set of skills in the sphere of health systems research and collaborates with partners globally to promote the use of evidence in healthcare decision-making. It has conducted economic evaluations of health technologies such as vaccines, drugs and devices. As part of its international work, HITAP has supported the development of HTA in India, Indonesia, Vietnam, the Philippines, Bhutan and Kenya, among others. Building on its technical expertise in HTA, HITAP has conducted program evaluations and health service research commissioned by domestic and international agencies in Thailand, Myanmar, Timor Leste and the Democratic People's Republic of Korea (DPRK). During the past year, HITAP has been supporting the COVID-19 response and has also been conducting research using big data to assess, among other topics, high and low-value care. More information is available at these websites: <https://www.hitap.net/en/> ; <https://thesapphire.health/>

2. Budget

The details of the budget for this CCS programme are provided below:

	Item lists/activity plans	Budget (Baht)
1	Personnel cost	4,342,320
1.1	Program staff: secretariate/main contracting partner	4,342,320
	Program manager 2 persons * salary 150,000 baht * 0.2 FTE * 60 months = 3,600,000 baht Researcher 1 person * salary 45,000 baht * 0.1 FTE * 60 months = 270,000 baht Research Assistant 2 persons * salary 19,680 baht * 0.2 FTE * 60 months = 472,320 baht	
2	Operational cost	9,020,100
2.1	Establishing a steering committee	767,500
	Primary work to establish a national steering committee Annual steering committee meeting (5 years) - Honorarium for a chairperson * 2000 baht * 5 years = 10,000 baht - Honorarium for members 20 persons * 1000 baht * 5 years = 100,000 baht - Breaks and refreshment (food & beverage) 30 persons * 800 baht * 5 years = 120,000 baht - Travel 15 persons * 500 baht (Bangkok and surrounding sub-urban areas) * 5 years = 37,500 baht	500,000 267,500
2.2	Focus area I: Development of collaborative national digital health and HIS governance mechanism	1,816,080
	Key activities include 1. Digital health and HIS Convergence workshop 2. Landscape analysis and stakeholder mapping of digital health and health information systems in Thailand 3. Stakeholder consultation meeting: presenting findings from the landscape analysis and discussing on strategic plans and scopes of work for sub focus areas in consecutive years 4. Promoting technical and intellectual capitals of Information and Communications Technology (tentative)	
	2.2.1 Program advisor/focus area lead partner	1,216,080
	Researcher 1 person salary 150,000 baht * 0.25 FTE * 12 months = 450,000 baht Research assistant 2 persons salary 19,680 baht * 0.25 FTE * 12 months = 118,080 baht HIS Convergence workshop facilitated by representatives of the steering committee and WHO (3 full days) - Honorarium for a chairperson * 2000 baht * 3 days = 6,000 baht - Speakers 5 persons * 10000 baht * 3 days = 150,000 baht - Honorarium for members 50 persons * 1000 baht * 3 days = 150,000 baht - Breaks and refreshment (food & beverage) 70 persons * 1200 baht * 3 days = 252,000 baht - Travel 30 persons * 500 baht (Bangkok and surrounding sub-urban areas) * 3 days = 45,000 baht	

	Item lists/activity plans	Budget (Baht)
	<p>Stakeholder consultation meeting: presenting findings from the landscape analysis and discussing on strategic plans and scopes of work for sub focus areas in consecutive years</p> <ul style="list-style-type: none"> - Honorarium for members 20 persons * 1000 baht = 20,000 baht - Breaks and refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	
	<p>2.2.2 Promoting technical and intellectual capitals of Information and Communications Technology (tentative)</p> <p>A country/academic conference visit = 600,000 baht</p>	600,000
2.3	<p>Focus area II: Development of national health information architecture, standards, and interoperability</p>	2,052,720
	<p>Key activities include</p> <ol style="list-style-type: none"> 1. Formation of working group 2. Stakeholder consultation meeting 3. Landscape analysis and stakeholder mapping of data standards and communities of practice within participating agencies 4. Supplementary literature review to fill gaps between standards and communities of practice identified from the landscape analysis and the needs identified from stakeholder engagement meeting 	
	<p>2.3.1 Program advisor/focus area lead partner</p> <p>Research fellow 1 person salary 80,000 baht * 0.25 FTE * 36 months = 720,000 baht</p>	720,000
	<p>2.3.2 Standard dataset from a case study of Road Traffic Injuries (RTI) data</p> <p>Research assistant 2 persons salary 19,680 baht * 0.25 FTE * 36 months = 354,240 baht</p> <p>1st Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht <p>2nd Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	444,240
	<p>2.3.3 Standard dataset from a case study of migrant worker data</p> <p>Research assistant 2 persons salary 19,680 baht * 0.25 FTE * 36 months = 354,240 baht</p> <p>1st Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht 	444,240
	<ul style="list-style-type: none"> - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	

	Item lists/activity plans	Budget (Baht)
	<p>2nd Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	
	<p>2.3.4 Standard dataset from a case study of genomics data</p> <p>Research assistant 2 persons salary 19,680 baht * 0.25 FTE * 36 months = 354,240 baht</p> <p>1st Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht <p>2nd Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	444,240
2.4	<p>Focus area III: Create and implement a framework for health data management and data sharing in Thailand in a secured manner, while protecting people's privacy</p>	1,164,240
	<p>Key activities include</p> <ol style="list-style-type: none"> 1. Formation of working group 2. Stakeholder consultation for scope and research questions for PDPA 3. Primary work, research, and knowledge syntheses of the area (Law researcher) 	
	<p>2.4.1 Subcontracting to support primary work, research and/or knowledge syntheses of the area (Law researcher)</p> <p>Law research fellow 1 person wage 80,000 baht * 0.25 FTE * 36 months = 720,000 baht</p> <p>Research assistant 2 persons wage 19,680 baht * 0.25 FTE * 36 months = 354,240 baht</p>	1,074,240
	<p>2.4.2 Stakeholder consultation for scope and research questions for PDPA</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	45,000
	<p>2.4.3 Stakeholder consultation for discussing the findings</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	45,000
2.5	<p>Focus area IV: Open data policy in Thailand</p>	1,199,240

	Item lists/activity plans	Budget (Baht)
	<p><i>Key activities include</i></p> <ol style="list-style-type: none"> 1. Formation of a working group 2. Stakeholder consultation meetings 3. Landscape analysis of current open data policy *Building on work from NHF 4. Qualitative data collection 	
	<p>2.5.1 Subcontracting to support primary work, research and/or knowledge syntheses of the area</p> <p>Research fellow 1 person salary 80000 baht * 0.25 FTE * 36 months = 720,000 baht</p> <p>Research assistant 2 persons salary 19,680 baht * 0.25 FTE * 36 months = 354,240 baht</p>	1,074,240
	<p>2.5.2 First Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	45,000
	<p>2.5.3 Data collection</p> <ul style="list-style-type: none"> - Ethics committee application at IHRP = 10,000 baht <p>Qualitative interviews or a focus-group discussion</p> <ul style="list-style-type: none"> - Remuneration for participants 1000 baht * 10 persons (organisation representatives) = 10,000 baht - Interview transcription and translation 600 baht * 25 hours = 15,000 baht 	35,000
	<p>2.5.4 Second Stakeholder consultation</p> <ul style="list-style-type: none"> - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht 	45,000
2.6	Focus area V: Virtual hospitals and telemedicine	1,770,320
	<p><i>Key activities include</i></p> <ol style="list-style-type: none"> 1. Formation of a working group 2. Stakeholder consultations 3. Literature review 4. Qualitative data collection 5. Pilot a prototype (model) of virtual hospitals and telemedicine in one health region (7-8 provinces) 	
	<p>2.6.1 Subcontracting to support primary work, research and/or knowledge syntheses of the area</p> <p>Research fellow 1 person salary 80000 baht * 0.25 FTE * 36 months = 720,000 baht</p>	1,074,240

	Item lists/activity plans	Budget (Baht)
	Research assistant 2 persons salary 19,680 baht * 0.25 FTE * 36 months = 354,240 baht	
	2.6.2 First consultation on preliminary findings from the white paper - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht	45,000
	2.6.3 Data collection - Ethics committee application at IHRP = 10,000 baht Qualitative interviews or a focus-group discussion on patient experience of virtual hospital and telemedicine - Remuneration for participants 500 baht * 20 persons (patients/service users) = 10,000 baht - Remuneration for participants 1000 baht * 10 persons (doctors/service providers) = 10,000 baht - Interview transcription and translation 600 baht * 30 hours = 18,000 baht Online survey on experiences and perspectives of virtual hospital and telemedicine for service providers - Online survey platform fee = 150,000 baht - Advert and campaign to promote the survey = 50,000 baht	248,000
	2.6.4 Second consultation on preliminary findings - Remuneration 20 persons* 1000 baht = 20,000 baht - Refreshment (food & beverage) 25 persons * 800 baht = 20,000 baht - Travel 10 persons * 500 baht (Bangkok and surrounding sub-urban areas) = 5,000 baht	45,000
	2.6.5 Pilot a prototype (model) Coordinator 2 persons salary 19,680 baht * 0.25 FTE * 12 months = 118,080 baht Primary work to build capacity for virtual hospital and telemedicine (2 full days) - Honorarium for a chairperson * 2000 baht * 2 days = 4,000 baht - Speakers 3 persons * 10000 baht * 2 days = 60,000 baht - Honorarium for participants 30 persons * 1000 baht * 2 days = 60,000 baht - Breaks and refreshment (food & beverage) 40 persons * 1200 baht * 2 days = 96,000 baht - Travel 20 persons * 500 baht (Bangkok and surrounding sub-urban areas) * 2 days = 20,000 baht	358,080
2.7	Activities of knowledge dissemination Policy brief/booklets/factsheet 5 topics * 500 pieces per each topic * 100 baht = 250,000 baht	250,000
3	Management cost	900,000
3.1	Photocopies = 5,000 baht * 60 months	300,000

	Item lists/activity plans	Budget (Baht)
3.2	<i>Telephone bills for communication and coordination = 5,000 baht * 60 months</i>	300,000
3.3	<i>Office materials (e.g., stationary, papers, printing ink, envelopes, etc.) = 5,000 baht * 60 months</i>	300,000
Total cost 1-3		14,262,420
Overhead cost (10% of the total cost)		1,426,242
Total proposed budget of the project		15,688,662

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