



มูลนิธิสาธารณสุขแห่งชาติ (มสช.)  
National Health Foundation



# **2023 Progress Update and 2024 Action Plan for Convergence of Digital Health Platforms and Health Information Systems (HIS) Implementation in Thailand (ConvergeDH)**

## **Under WHO-RTG Country Cooperation Strategy (2022-2026)**

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Version: 29 February 2024

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## **Introduction**

The Convergence of Digital Health Platforms and Health Information Systems (HIS) Implementation in Thailand (ConvergeDH) is a one of the priority areas of the World Health Organization and Royal Thai Government Country Cooperation Strategy (WHO-RTG CCS) for the period 2022-2026. The overarching objective of the program is to create a collaborative digital health governance mechanism to support the development of Thailand's digital health and integrated health information systems, which will be achieved through the focus areas: (1) landscape of digital health and health information systems (HIS) in Thailand; (2) standards and interoperability of datasets; (3) open data policy for research and policy support in Thailand; and (4) virtual hospitals and telemedicine in Thailand. The document provides an overview of the progress made in 2023 and outlines the plan for the upcoming year, 2024.

## **Landscape of digital health and health information systems (HIS) in Thailand**

### *Progress update for 2023*

#### **Activities**

The first convergence workshop (Digital Health forum) was held in year 2.

#### **Outputs/outcomes**

A conference with 500 attendances from Ministry of Public Health, Thailand, was held, and the current state of digital health were shared among the stakeholders.

#### **Challenges and opportunities**

The establishment of digital health committee was held, and it is expected that the committee will be considered main governance mechanism for digital health in Thailand.

### *Plan for 2024*

#### **Proposed activities**

- Digital Health Forum
- Hackathon (Dynamic Consent Form)

#### **Focus area leads**

- Dr. Surakameth Mahasirimongkol, Director, ICT, Information and Communication Technology Center, Office of Permanent Secretary, Ministry of Public Health (MOPH)
- Dr. Withita Jangiam, Strategy and Planning Division, Ministry of Public Health (MOPH)
- Dr. Songyos Chayaninporamate, Deputy Director, Bureau of Digital Health, Ministry of Public Health (MOPH)
- Dr. Supharek Thawillarp, Deputy Director, Communication Technology Center, Ministry of Public Health (MOPH)

#### **Partner:**

- Professor Alain Bernard Labrique, Director, Department of Digital Health & Innovation, WHO

## Timeline for 2024

Table 1: 2024 timeline for focus area "landscape of digital health and health information systems (HIS) in Thailand"

Proposed milestones: Year 3 (2024)	Targeted duration in 2024			
	Q1	Q2	Q3	Q4
1. Digital Health forum <ul style="list-style-type: none"> <li>• Prepare for Digital Health Forum               <ul style="list-style-type: none"> <li>- Draft plan/agenda/indicators for Convergence Workshop</li> <li>- Include gaps identification and proposed standard mechanism</li> <li>- Inviting International partners/stakeholders (TUC/Global Fund/WHO etc.)</li> <li>- Host forum</li> </ul> </li> </ul>				
2. Arrange Medinfo Hackathon in Phuket Thailand				

### Expected outputs/outcomes

This hackathon has the potential to revolutionize research practices in Asia by creating a platform for ethical data use and participant empowerment in digital health research through a standardized digital health framework and a dynamic consent form.

## Standards and interoperability of datasets

### Case study 1: Road Traffic Injuries

#### *Progress update for 2023*

##### **Activities**

1. Established a group of experts called the "Data Standard Action Team," comprising data experts, road safety specialists, and representatives from central and relevant local authorities to define minimal data sets and interoperable data-sharing mechanisms.
2. Identified key stakeholders and requirements for essential data and information needs related to Road Traffic Incidents/Road Safety (RTI/RS) in Phuket.
3. Explored existing data in available databases concerning road safety in Phuket.
4. Contacted database managers to obtain permission for data access.
5. Developed a draft for the data standard and distribute it to stakeholders for consideration and feedback.
6. Conducted meetings and workshops among stakeholders and the Data Standard Action Team to discuss the proposed data standard and reach a consensus. Two one-day workshops were held in Phuket. The working group travelled from the base (i.e., Bangkok/Nonthaburi) one day earlier for preparation.
7. Developed the minimum standard data set or metadata from related data sources in Phuket.
8. Established data governance procedures for the data set.

##### **Outputs/outcomes**

1. The scope of the road safety data standard is outlined based on the 12 global targets for road safety and the four strategies of the National Road Safety Plan, incorporating insights from two workshops.
2. Information gathered from stakeholder interviews was compiled to create a comprehensive list of data elements that need to be included in the road safety data standard.
3. Data formats and types were specified based on the most user-friendly database available.
4. At the conclusion of the workshop, the main discussion revolved around practical data sharing. Consequently, the project decided to develop the data standard at the level of data elements and their variables without prescribing a specific way to input the data. The developed data standard, focusing on issues of interest for Phuket province, is summarized in the full report.
5. The project successfully formulated a comprehensive data standard that facilitates interoperable data sharing across multiple sectors related to road safety. This standardized approach ensures seamless communication and collaboration among various entities involved in road safety initiatives.
6. The project has fostered improved collaboration and coordination among stakeholders from diverse sectors, including government agencies, law enforcement, transportation authorities, and technology providers. This collaborative effort ensures a holistic and unified approach to addressing road safety challenges.
7. This data standard will serve as input and guidance for the upcoming project, "Innovative Data to Innovative Solutions" which will be conducted in year 2024-25 under budget support by Road Safe Fund.
8. By standardizing data practices, the project has empowered decision-makers with valuable insights, enabling data-driven processes for resource optimization, intervention strategies, and policy formulation. Success underscores the importance of collaboration and innovation in achieving road safety goals.

Recommendations include continuous refinement of the data standard, ongoing investment in road safety technologies, and sustained stakeholder commitment for long-term success. The project not only met its objectives but also laid a foundation for ongoing advancements in national road safety practices.

Findings will be applied in the next project, "Innovative Data to Innovative Solutions," focusing on analyzing accident data to formulate preventive measures and regulations in Phuket Province.

Moreover, the information technology and road safety development practices from the project will be scaled up to other provinces through collaboration of multiple sectors in Thailand road safety program.

### **Challenges and opportunities**

The constraints in human resource capacity have resulted in a minor challenge in handling routine workloads. The limitations in the available workforce have contributed to a situation where the management of day-to-day tasks and responsibilities is met with a degree of difficulty. This constraint underscores the importance of addressing human resource needs to ensure smoother and more efficient workflow in managing routine duties. The meeting cost and transportation cost were not spent due to some participants joining the workshop remotely through online channel because of their busy schedule. This should not be counted as a problem, but we will learn to deal with this type of budget expenditure in the future.

### *Plan for 2024*

#### **Proposed activities**

The proposed activities for the year 2024 are to:

- Integrated Accident Data Analysis Project to determine prevention guidelines and measures for regulating road users and passenger transport providers in Phuket province
- Data gathering and management
- Data inter-connection platform development
- Advance data analytics
- Modeling of provincial road safety data information for road safety management by design thinking concept
- Conduct a workshop with stakeholders
- Conduct an expert meeting and drafting the standard of data

#### **Focus area leads**

- Phathai Singkham MD MPH, Director of Innovation and Research Division, Department of Disease Control, MOPH
- Vorasith Sornsrivichai MD PhD, Prince Songkhla University

#### **Team members:**

- Phuket Road Safety workforce
- Department of Disease Control, Division of Injury Prevention staff
- Prince of Songkla University staff

#### **Potential collaborators**

- Phuket City Data Analytic
- Big Data Institute
- Phuket Road Safety Committee
- TDRI
- Royal Thai Police
- Ministry of Public Health
- Ministry of Transport
- Ministry of Interior
- Insurance company
- WHO-RTG on Road Safety
- Thailand Road Safety Working Group (RSWGs)

### Timeline for 2024

Table 2: 2024 timeline for case study 1 under the focus area “standards and interoperability of datasets”

Proposed milestones: Year 3 (2024)	Targeted duration in 2024			
	Q1	Q2	Q3	Q4
Stakeholder meeting				
Data gathering and management				
Data Interconnection platform development for interoperations				
Data Analytics				
Data synthesis for Road safety intervention improvement (2025)				

### Expected outputs/outcomes

#### 2024

1. Analytical reports on the situation, indicators, and in-depth problems related to road safety for road users related to tourism activities in Phuket Province
2. Advance data analysis from integrated data linked from databases related to research studies
3. An information technology system for integrated data management and exchange between



agencies, supporting in-depth analysis and situation forecasting

## **2025**

1. Guidelines for supervising travel behavior and passenger transport services related to tourism in Phuket Province that are consistent with the mission of the Department of Land Transport, especially the supervision of road users and passenger transport operators, supervision of driver behavior through the demerit point system, and raising the standards of driving license issuance

### **Potential risks and risk management**

1. Financial management: work closely with funding agency
2. Collaboration of data sharing between organizations: work closely with road safety committee, local & national level

## Case study 2: Genomics

### *Progress update for the second year (Year 2)*

#### **Activities**

- Specified the data to be exchanged in the system and the stakeholders involved
- Developed a standard system for exchanging pharmaceutical data
- Developed a system for pharmaceutical test data exchange to allow patients to access their own information and for healthcare professionals to access patient information for prevention and treatment planning

#### **Outputs/ outcomes**

For data sharing through Phukphan application, the users include both patients and clinicians. Patients have the capability to access their own lab results and present them to clinicians. Clinicians, in turn, can request access to a patient's pharmacogenetics profile, and they will be able to view the results only when granted permission by the patient. This approach ensures a secure and controlled flow of pharmacogenetics data between patients and their healthcare providers. Additionally, the application will incorporate a consent mode to assist patients in managing the list of hospitals and even clinicians with whom they wish to share their data. This mode emphasizes that patients agree to retain their data within the PGx database, contributing to an enhanced level of transparency and control over the sharing of their pharmacogenetics information.

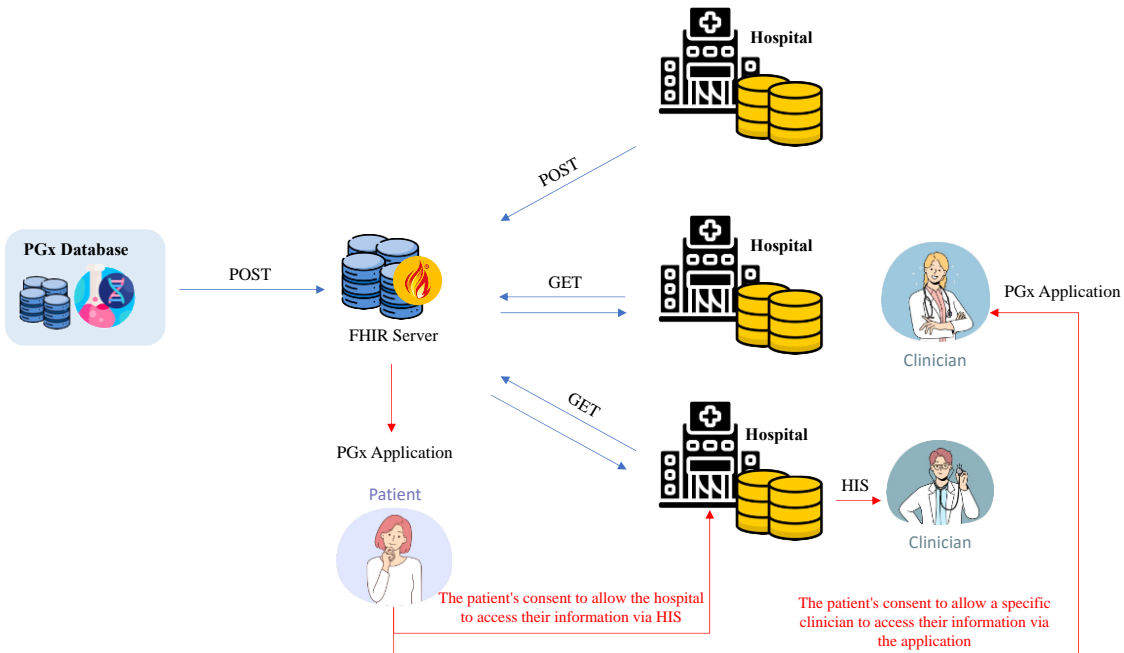


Figure 1: The data exchange architecture.

### Challenges and opportunities

Table 3: Challenges and opportunities identified from the past year

Challenges	Opportunities
Data Privacy and Security Breaches	Implement encryption methods, access controls, and compliance with regulations.
Lack of Interoperability Standards	Adopt standardized formats, collaborate for standards, and invest in interoperability platforms.
Data Integrity and Accuracy Issues	Establish validation processes, data governance, and normalization techniques.
Legal and Ethical Compliance	Stay compliant, ensure informed consent, and engage with review boards.
Developer or Programmer Skill Level	Assess qualifications, provide training, mentorship, and code review processes.

### Plan for the third year (Year 3)

#### Proposed activities:

- Promote the use of the "Phukpan" system to the general public, physicians, and pharmacists, making it easier for everyone to access pharmacogenomic test results
- Integrate the "Phukpan" Database with at least one Personal Health Record (PHR) application, such as Doctor Ready, H4U, or Health Link, to provide individuals with the option to access their data through the PHR they use

- Expanding the scope of test result datasets within the “Phukpan” system by adding additional tests, such as Thalassemia screening and BRCA1/BRCA2 breast cancer screening, will advance personalized medicine
- Facilitating data exchange with Hospital Information Systems (HIS) or other supporting systems to enable information sharing between hospitals is a concept that promotes more efficient and convenient healthcare services

**Focus area leads**

- Department of Medical Sciences (DMSc), Ministry of Public Health, Thailand
- ICT, Information and Communication Technology Center, Office of Permanent Secretary, Ministry of Public Health (MOPH), Thailand

**Potential collaborators**

- Hospitals which want to exchange PGx data
- Regional Medical Science Centers (RMSc)
- Pharmacogenetics Laboratories

**Timeline for Year 3 (2024)**

Table 4: 2024 timeline for case study 2 under the focus area “standards and interoperability of datasets”

Proposed milestones Year 3 (2024)	2023	Targeted Duration in 2024			
	Q4	Q1	Q2	Q3	Q4
1. Design publication materials for the system					
2. Onsite dissemination activity of the system to the hospitals (incl. obtaining user feedback on their needs and problems likely to occur)					
3. Online user training with hospital staff and medical personnel					
4. Summarise user inputs and plan for system improvement					
5. Develop terms of reference for system improvement					
6. System improvement and update					
7. Summary of usage results					

**Expected outputs/ outcomes**

Allowing patients and physicians to access genetic testing data to guide medication selection and dosage. This aims to prevent severe drug allergies from recurring within the public healthcare system, streamlining care by eliminating redundant testing for patients with prior examinations at MOPH labs or network facilities.

**Potential risks and risk management**

Table 5: Potential risks and risk management

Potential Risks	Risk Management Strategies
Data Security Breaches	- Ensure your system complies with industry security standards
	Provide hospitals with clear guidelines for secure data exchange
	Encrypt data during transmission and storage
	Implement multi-factor authentication for access control
	Regularly update and patch system vulnerabilities
Lack of Compatibility	Provide comprehensive documentation for integration
	Offer technical support and assistance during integration process
	Develop adapters or middleware for smoother integration
	Test compatibility with different hospital systems
Data Privacy Concerns	Obtain explicit consent from hospitals for data sharing
	Implement data anonymization and de-identification techniques
	Establish data access controls based on user roles and permissions
	Comply with relevant data protection regulations
	Conduct privacy impact assessments
Disruption of Hospital Workflows	Provide training and resources to hospital staff for system use
	Offer support during transition to minimize workflow disruptions
	Customize integration to align with hospital workflows
	Communicate clearly about changes and expected impacts
	Conduct pilot testing before full deployment
System Downtime and Failures	Implement redundancy and failover mechanisms
	Perform regular system maintenance and updates
	Have a robust disaster recovery plan in place
	Monitor system performance and respond to issues promptly

### Case study 3: Migrant health

*Progress update for 2023*

#### **Activities**

The data standard for migrant health, focusing on infectious diseases data such as tuberculosis and COVID-19 was established and implemented in a pilot area.

### Outputs/outcomes

The data model and standardization implementation have been completed.

### Challenges and opportunities

The cabinet approved that Thai Red Cross should be the organization responsible for migrant health identification system. This includes the data standardization. The model developed will be integrated into Red Cross system and send for approval by the National Digital Health Committee.

### Plan for 2024

#### Proposed activities

- Prepare the details in the certificate and order processing in Health Data Center (HDC) system. The certificate will be sent to the EGAT and technology center
- Develop a draft guide to preparing health data for transnational populations through a workshop
- Develop and distribute a handbook for public health personnel working with migrant workers

#### Co-Leads

- Dr. Surakameth Mahasirimongkol, Director, ICT, Information and Communication Technology Center, Office of Permanent Secretary, Ministry of Public Health (MOPH)
- Dr. Boonyawee Aueasiriwon, Health Systems Research Institute (HSRI)

### Timeline for 2024

Table 6: 2024 timeline for case study 3 under the focus area “standards and interoperability of datasets”

Proposed milestones Year 3 (2024)	2023	Targeted Duration in 2024			
	Q4	Q1	Q2	Q3	Q4
1. Prepare certificate details					
2. Workshop and drafting the guide for preparing health data of transnational population					
3. Draft discussion and dissemination of the handbook handbook for public health personnel involved in migrant worker health.					

### Expected outputs/outcomes

- Acceptance of the migration health data standard
- Implementation of the migrant health data standard

# Open data policy for research and policy support in Thailand

*Progress update for 2023*

## Activities

- Open Data Day's Webinar
- Policy Briefs in Thai and English version
- Create a community of practice (CoP) meeting “the exchange and dissemination of health information” Data owner group 1st time, Friday, October 27, 2023. Such members include DGA, GBDi, DMS, etc.
- Data user group 2nd time, Friday 1 December 2023 meeting with two groups
- Members include Director of the Division of Noncommunicable Diseases, President of the Community Pharmacy Association, Startup etc.

## In Progress

- (Data owner + Data user) 3rd time February 2024

## Outputs/outcomes

- Draft manuscript on situational analysis
- Technical Report

## Challenges and opportunities

- 1. Addressing the Complexity of Health Data with a Standardized Index:** The diversity and complexity of health data in Thailand pose a significant challenge in understanding its current state and potential. A context-specific, standardized evaluation tool that will facilitate a comprehensive understanding of the health data landscape, pinpointing areas for improvement and addressing the issue of uncoordinated data management practices is needed.
- 2. Legal Framework Establishment through Data Sharing Act Study:** The absence of a specific legal framework for health data sharing in Thailand has led to inconsistencies and vulnerabilities. Health Data Sharing Act study that aims to address this by examining the current legislative environment and developing clear, standardized guidelines for ethical and secure data sharing practices is needed. This will enhance data accessibility, foster transparency, and trust, and ensure compliance with national and international data protection standards.
- 3. Enhancing Decision-making and Policy Development:** The dynamic nature of health data underscores its crucial role in policymaking. The Thailand Health Data Sharing Act study and network mobilization will provide invaluable insights for policy development, fostering an environment that supports informed decision-making and innovative approaches in healthcare services.
- 4. Fostering Innovation and Transparency:** The advancement of open health data is pivotal for healthcare innovation. By establishing a robust framework for data sharing and a maturity index, these initiatives will significantly enhance the accessibility and quality of health data, thereby fostering innovation and transparency in healthcare services in Thailand.
- 5. Building Collaborative Networks:** The need for effective collaboration among diverse stakeholders is a major opportunity. The Network Mobilization aspect of these initiatives will create a community of practice, enhancing cooperation and knowledge exchange among government health departments, NGOs, academic institutions, and private sector partners. This collaboration is vital to overcome fragmented efforts and leverage collective expertise for health data system improvement.
- 6. Responding to Technological Advancements and Public Health Emergencies:** The evolution of digital technologies and the urgent need for rapid data sharing during public health emergencies necessitate these initiatives. They will ensure that Thailand's legal frameworks and data sharing practices remain

relevant and capable of addressing new technological challenges and facilitating coordinated responses to public health crises.

### Plan for 2024

#### Proposed activities

- Thailand Index for Measuring Open Health Data Advancement
- Thailand Health Open Data Policy Whitepaper Development

#### Focus area leads

- Thailand National Health Foundation (NHF)

#### Potential collaborators

- ICT, Information and Communication Technology Center, Office of Permanent Secretary, MOPH.
- Digital Government Development Agency (DGA).
- Government health departments and agencies.
- Local and international non-governmental organizations in the health sector.
- Academic and research institutions with expertise in health informatics.
- Private sector partners specializing in data management and analysis.

### Timeline for 2024

Table 7: 2024 timeline for focus area "Open data policy for research and policy support in Thailand"

Proposed milestones for developing a white paper				
Proposed milestones: Year 3 (2024)	Targeted duration in 2024			
	Q1	Q2	Q3	Q4
<ul style="list-style-type: none"> <li>• Stakeholder analysis and engagement</li> <li>• Literature review</li> <li>• Requirement and scope development</li> </ul>				
<ul style="list-style-type: none"> <li>• Research and analysis (survey, interviews, focus groups, COP)</li> </ul>				
<ul style="list-style-type: none"> <li>• Recommendation and best practices/strategy plan development</li> </ul>				
<ul style="list-style-type: none"> <li>• Documentation and reporting</li> </ul>				
Proposed milestones for developing an index to measure open data are				
<ul style="list-style-type: none"> <li>• Project launch</li> <li>• Initial stakeholder engagement</li> </ul>				
<ul style="list-style-type: none"> <li>• Data Assessment</li> </ul>				

<ul style="list-style-type: none"> <li>• Development of Draft Index</li> <li>• Monitoring and Evaluation of Framework</li> </ul>				
<ul style="list-style-type: none"> <li>• Pilot testing and launch of the Index</li> <li>• Stakeholder review</li> </ul>				
<ul style="list-style-type: none"> <li>• Finalisation and launch of the Index</li> <li>• Dissemination and Training</li> </ul>				

### Expected outputs/ outcomes

- **Thailand Index for Measuring Open Health Data Advancement**
  - A validated health data maturity index tailored to Thailand’s context
  - A report detailing the current state of health data maturity in Thailand
  - Recommendations for policy and practice to improve the quality and accessibility of open health data
  - Enhanced capacity among health data stakeholders in utilizing the index for continuous improvement
- **Thailand Health Data Sharing Act (White Paper) Study and Network Mobilization**
  - Research report detailing literature review, data sharing laws current situation and practice, stake holder analysis, policy analysis and findings
  - Collaboration/network of key stake holders or COP
  - Policy recommendations for policymakers addressing legal, technical, procedural and implementation aspects
  - Identification and documentation of best practices serving as a guide or strategic plan for implementation

### Potential risks and risk management

- **Enhancing Data Privacy and Security:** We will implement advanced data encryption and access control mechanisms. Regular security audits will be conducted, and we will align our practices with international data protection regulations like GDPR
- **Active Stakeholder Engagement:** Our plan includes holding regular stakeholder meetings and workshops to ensure continuous alignment and address concerns. We will establish a feedback loop for effective communication with all stakeholders
- **Addressing Technical Data Management Challenges:** We will collaborate with data management experts and provide regular training to our staff. Investment in reliable data management systems will be prioritized to ensure efficient data handling
- **Navigating Policy and Regulatory Landscapes:** Continuous monitoring of legal changes and policy updates will be a key part of our strategy. We will seek guidance from legal experts to ensure compliance with all relevant laws and policies
- **Financial Risk Mitigation:** Diversification of funding sources will be pursued. We will conduct regular budget reviews and make necessary adjustments to align with project needs and objectives
- **Overcoming Cultural and Language Barriers:** Accuracy in translations and cultural sensitivity will



be a focus. Local experts will be engaged to aid in understanding and integrating cultural aspects into our data initiatives

- **Ensuring Data Quality and Consistency:** We will establish and enforce stringent data quality control protocols. Training modules for data collectors and analysts will be developed to maintain high data integrity
- **Adapting to Political and Governmental Changes:** Our plan includes flexibility to adapt to changes in the political climate or government policies. We will actively engage in advocacy and build relationships with key government stakeholders
- **Keeping Pace with Technological Advances:** Regular updates on technological advancements will be part of our strategy. We will plan for timely updates or upgrades to our technical infrastructure to avoid obsolescence
- **Boosting Public Engagement and Awareness:** A comprehensive communication strategy will be developed to effectively engage the public. We will use various platforms and methods for outreach and awareness campaigns

These strategies will form the backbone of our approach in Year 3, ensuring a proactive and responsive management of the project, aimed at successfully advancing open health data in Thailand.

## Virtual hospitals and telemedicine in Thailand

### Progress update for 2023

#### Activities

The activities of the year 2023 were carried out in three parts, as detailed below.

#### Part 1: A case study of telemedicine service development and provision in Thailand

The case study approach was used to understand the current situation of telemedicine service development and provision in Thailand. In-depth interviews and group discussions were used as data collection methods, with relevant stakeholders from a sample of 10 healthcare facilities purposively selected by Thailand's policymakers. The criteria for selecting these samples include: 1) healthcare facilities that are providing at least one telemedicine service; 2) government facilities (excluding nursing homes, shelter, elderly care, drug stores, clinics, physical therapy centers, Thai traditional medicine clinic); and 3) agree to participate in the study voluntarily. Snowballing technique was used to identify other key informants. The sample hospitals are detailed in Table 1.

Fifty-seven informants, including 5 hospital administrators, 38 medical personnel, and 14 hospital personnel, were recruited for the study. Interviews and focus group discussions were conducted between May and October 2023 through in-person and online modes. Consent for recording was obtained before the interview started.

Table 8: Sample hospitals included in the study

Hospital Code	Health area of NHSO	Hospital level	Affiliation	Number of beds
T1	District 13, Bangkok	Tertiary (Medical School)	University	1,263
T2	District 13, Bangkok	Tertiary (Medical School)	Department of Medical Services	1,200
SP	District 11 Surat Thani	Tertiary (specialised in psychiatry)	Department of Mental Health	480
SN1	District 11 Surat Thani	Secondary	Office of the Permanent Secretary, Ministry of Public Health	215
SN2	District 1 Chiang Mai	Secondary	Office of the Permanent Secretary, Ministry of Public Health	60
P1 <sup>†</sup>	District 11 Surat Thani	primary	Office of the Permanent Secretary, Ministry of Public Health	-
P2 <sup>‡</sup>	District 1 Chiang Mai	primary	Office of the Permanent Secretary, Ministry of Public Health	-

<sup>†</sup> Data were collected from 3 primary care clinics in District 11, Surat Thani.

<sup>‡</sup> Data were collected from 2 primary care clinics in District 1, Chiang Mai.

Lastly, the table below presents the key policy recommendations aimed at various stakeholders that have emerged from the study

Table 9: Policy recommendations for different stakeholders

Hospital sector	Public Healthcare Payer	Ministry of Public Health (MOPH)	Government
<ul style="list-style-type: none"> <li>• Telemedicine services ought to adopt a patient-centered approach in their design</li> <li>• Hospitals need to facilitate seamless operations among personnel across different units</li> <li>• Implementing strategies to enhance communication and promote telemedicine services to the public is crucial</li> <li>• Regular and comprehensive training programs should be in place for personnel, particularly focusing on digital competency and literacy</li> <li>• Indicators for monitoring and evaluating telemedicine should encompass both quantitative and qualitative outcomes of the services provided</li> </ul>	<ul style="list-style-type: none"> <li>• Clear dissemination of the advantages and reimbursement policies related to telemedicine is essential</li> <li>• Billing and reimbursement guidelines for medical services should be adapted to align with telemedicine practices, transitioning from facility-based to home-based services as necessary</li> <li>• Comprehensive guidelines for billing and compensating medical services within the healthcare system should be formulated. These guidelines should encompass various aspects including communication channels, registration procedures, identity verification, documentation requirements for service compensation, and the use of diverse indicators for monitoring and evaluation</li> </ul>	<ul style="list-style-type: none"> <li>• The Office of the Permanent Secretary at MOPH should prioritize establishing clear and strategic plans for telemedicine or digital health initiative</li> <li>• The Office of the Permanent Secretary should review and adjust staffing frameworks within hospitals as needed, potentially including the addition of operational teams to facilitate the transition and upkeep of digital service provision at all levels of healthcare</li> <li>• Adequate budget allocation should be provided by the Ministry to support the development of information technology systems</li> <li>• The Office of the Permanent Secretary should actively promote the development and utilization of digital health infrastructure such as digital medical records and digital patient registration and identity verification processes</li> </ul>	<ul style="list-style-type: none"> <li>• The Ministry of Interior and the Ministry of Digital Economy and Society must ensure equitable public access to communication infrastructures, extending coverage to all community areas nationwide</li> <li>• The Office of the Prime Minister, along with relevant ministries such as the Ministry of Public Health, Ministry of Digital Economy and Society, Ministry of Interior, Ministry of Social Development and Human Security, Ministry of Higher Education, Science, Research and Innovation, Ministry of Finance, Ministry of Defense, and Ministry of Labour, should foster collaboration both within the government (intragovernmental) and between government and other sectors (intersectoral) to develop and provide digital health services</li> <li>• The Office of the Prime Minister, in coordination with relevant ministries, should work to integrate, leverage, and streamline data silos for enhanced efficiency in digital health service delivery</li> </ul>

## Part 2: A case study of telemedicine service development and implementation in other countries

To understand the telemedicine operationalization in other settings a descriptive case study approach with direct engagement with telemedicine implementors was chosen. An open call for Expression of Interest (EoI) was published and circulated through the Health Intervention and Technology Assessment Program’s (HITAP) networks. All EoIs received were presented to Thailand’s WHO-CCS Steering Committee (SC), a

multi-stakeholder group providing consultation, advice, and supporting digital health policy implementation. Following deliberation, the SC selected two telemedicine case studies for subsequent in-depth analysis based on their relevance to Thailand. The selected case studies include: (1) OneNUHS, Singapore; and (2) eSanjeevani, India.

The key takeaways from examining case studies in India and Singapore are as:

- Fostering a conducive regulatory environment is essential to promote the adoption of telemedicine
- To tackle cybersecurity challenges stemming from technical capacity gaps, it's important to establish a clear roadmap for capacity building, leading to the formation of a specialized agency overseeing cybersecurity in healthcare information systems
- For the development of an interoperable telemedicine ecosystem, careful consideration of contextual factors like healthcare infrastructure, geographical factors, and resource constraints is critical

### Part 3: Telemedicine Utilization in Tertiary, Specialized, and Secondary Hospitals in Thailand

A retrospective secondary data analysis was conducted in four hospitals (coded as T1, T2, SP, and SN) that most frequently recorded their telemedicine service in Thailand (Table 3). Data were routinely collected when services were provided and categorized into telemedicine outpatient department (OPD) visits and on-site OPD visits by clinics. Data was retrieved from hospital records on the Hospital Information System (HIS) from 2020 to 2023 and arranged by different time series of each hospital for pre-telemedicine and post-telemedicine OPD onsite visits.

A descriptive analysis was used to describe the characteristics of patients who used telemedicine following demographic data (age, sex), health conditions (primary diagnosis), and service utilization (OPD visits number). Age groups were grouped following the National Health Security Office (NHSO) age group category.<sup>1</sup> The International Classification of Disease and Related Health Problems 10th Revision (ICD-10) (22 chapters) and five specific chapters related to mental and behavioral disorders. The comparison of mean values of OPD onsite visits between pre-telemedicine and post-telemedicine was analyzed by paired t-test.

Lastly, the key findings of the study are detailed below:

- Telemedicine was mostly used by 25-59 years age group except in T1 hospitals where the 60-year-old and above age group was mostly used. The mean age of telemedicine patients from all four hospitals ranged between 47 and 60 years old. Females were more likely to use telemedicine in T1, T2, and SN hospitals than males, whereas males used telemedicine more in the SP hospital
- The trend of telemedicine utilization among 4 hospitals is shown in Figure 2. T1 hospital had the peak of telemedicine utilization in August 2021 during the Delta wave of COVID-19 in Thailand. The SP hospital had the highest number of telemedicine utilization during the omicron wave (December 2021 to March 2022). While T2 and SN hospitals had a telemedicine utilization lower rate compared to T1 and SP hospitals

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<sup>1</sup> Khampang, Roongnapa, Sarayuth Khuntha, Phorntida Hadnorntun, Suthasinee Kumluang, Thunyarat Anothaisintawee, Sonvane Tanuchit, Sripen Tantivess, and Yot Teerawattananon. "Selecting topic areas for developing quality standards in a resource-limited setting." *BMJ Open Quality* 8, no. 1 (2019): e000491.

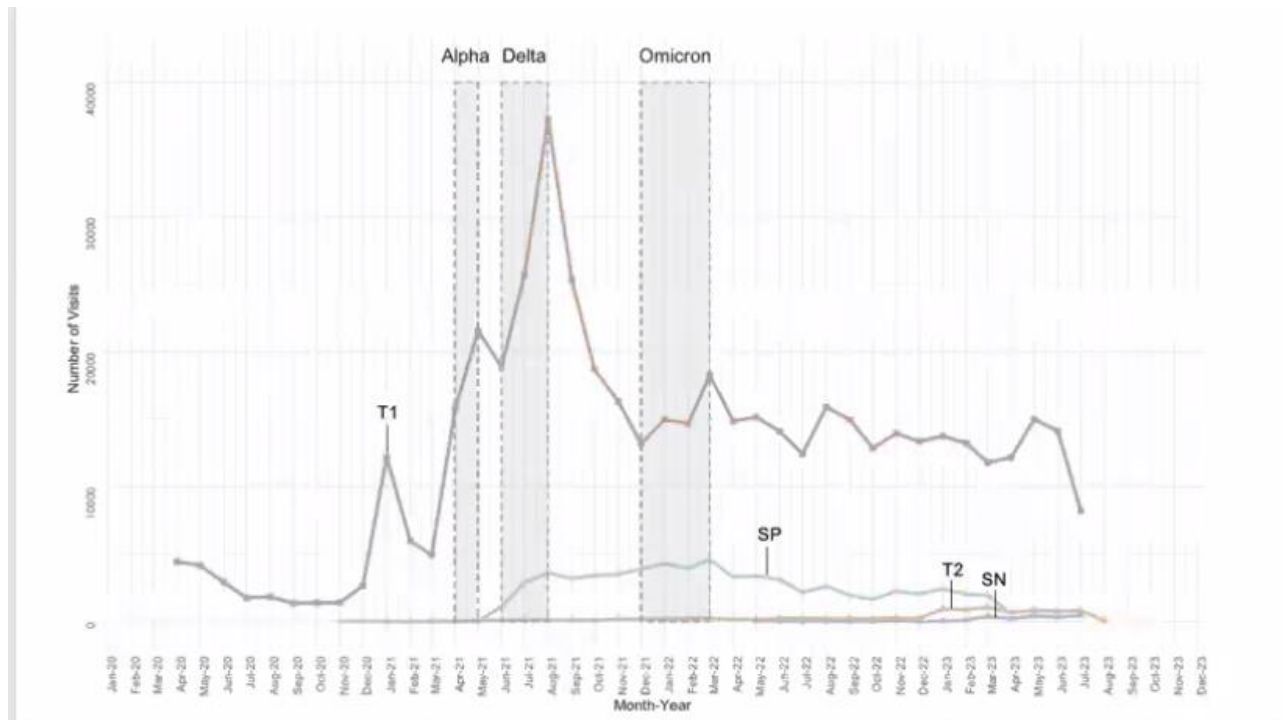


Figure 2: Trend of telemedicine utilization overtime from 4 hospitals (Note: T1: Tertiary care level hospital 1; T2 Tertiary care level hospital 2; SN: Secondary care level hospital, SP: Specialized hospital)

- In Table 4, the changes in onsite OPD visit utilization during pre- and post-telemedicine periods, with the data reported in average 3-month intervals or trimesters are reported. Only 174,336 participants who were recorded 3 months after telemedicine were included in this analysis

Table 10: The pre-post telemedicine utilization per trimester in the outpatient department (OPD) among four hospitals (N=174,336)

Hospital	T1	T2	SN	SP
<b>OPD</b>				
Total number of patient (person)	159,877	3,657	257	10,545
<b>Pre-telemedicine (number of visits)</b>				
Mean [SD] per trimester	1.70 [1.90]	3.46 [4.61]	2.13 [1.48]	1.15 [0.88]
Min	0	0	0	0
Max	55.90	52.50	11.08	19.10
<b>Post –telemedicine (number of visits)</b>				
Mean [SD] per trimester	1.90 [2.40]	2.69 [4.13]	1.07 [1.21]	0.61 [0.61]
Min	0	0	0	0
Max	60.50	66.52	9.49	11.50
P value*	<0.001	<0.001	<0.001	<0.001

### Outputs/outcomes

The outputs that facilitated knowledge translation and dissemination of the of the work conducted in 2023 include:

- Five manuscripts detailing the findings of the study which are being reviewed at international journals
- Three policy briefs highlighting the key lessons and policy recommendations for telemedicine implementation in Thailand. The policy brief detailing the national telemedicine service of India can be accessed [here](#). Additionally, [click here](#) to read the policy brief highlighting the key lessons from the telemedicine service implemented in National University Health System (NUHS), Singapore
- Presented preliminary study results and formulated policy recommendations through various stakeholder consultations. The news article on this work can be accessed [here](#)
- A knowledge exchange session focusing on the development and provision of telemedicine services with experts from India, Singapore and Thailand
- More information on our work can be found [on our project website](#)

### **Challenges and opportunities**

The main challenges encountered were in obtaining ethics approval and accessing data promptly. Additionally, the reliance on bilateral funding brought about tighter timelines and separate reporting requirements was challenging. Despite these challenges, the key lesson learnt was the importance of broadening stakeholder engagement to streamline project implementation and foster collaboration.

### *Plan for 2024*

#### **Proposed activities**

In 2024, three main activities, structured as three different parts, will be conducted. First, qualitative research aimed at exploring the patient and provider's experience of using telemedicine. Second, data analysis of the usage of telemedicine along with its impact on conventional face-to-face visit and the patient clinical outcomes. Lastly, exploring the readiness of hospitals and mapping different reimbursement models for telemedicine. All the three parts will be conducted in consultation with all relevant stakeholders. The objectives and methods of each part are detailed below:

#### Part 1: Telemedicine service recipients' and providers' experience of service usage

**Objectives:** To study the experiences of providers and recipients of telemedicine services in terms of acceptance, satisfaction, accessibility, and usability.

**Methods:** Qualitative approach

- Conduct a document review
- Conduct in-depth interviews using a semi-structured questionnaire
  - Interviews of both telemedicine recipients and providers will be carried out
  - Hospitals that provide all services will be selected. A total of no more than 6 hospitals will be selected and a pre-determined inclusion criteria will be employed to select the hospitals
  - Only telemedicine services for examining, treating, following up, and rehabilitating patients with Non-Communicable Diseases (NCDs), mental health and speech therapy will be considered
  - Conduct content analysis

#### Part 2: Data analytics on the use and provision of telemedicine services and impact on general outpatient services

**Objectives:** To study the use and provision of telemedicine services (utilisation) including their impact on general outpatient services (face-to-face OPD).

**Methods:** Retrospective secondary data analysis

- **Population & Samples:** Individual-level data from patients who received telemedicine services through UCS or a specific hospital and visited OPD and/or IPD are included
- **Data sources:** 43 folders, National Health Security Office's (NHSO's) e-Claim, Hospital databases
- **Data Analysis:** Statistical methods include descriptive analysis, interrupted time series (ITS) analysis and difference-in-difference (DID) analysis
- **Software:** Stata® & R software

### Part 3: Readiness of hospitals and methods of reimbursement of telemedicine service

#### Part 3.1: Readiness of hospitals to provide telemedicine services

**Objectives:** To compare the readiness of medical facilities to provide telemedicine services

**Methods:** Retrospective secondary data analysis

- **Population & Samples:** A set of healthcare facilities in Thailand that provide and do not provide telemedicine services in Thailand
- **Data sources:** 43 folders, NHSO's e-Claim, Hospital databases, [ICT MoPH's survey](#)
- **Data Analysis:** Descriptive data analysis
- **Software:** Stata® & R software

#### Part 3.2: Methods of reimbursement of telemedicine services

**Objectives:**

- To identify and summarise the different reimbursement strategies employed by public payers for telemedicine services
- To synthesise policy recommendations to address the gaps in Thailand's telemedicine reimbursement system

**Methods:** Qualitative approach

- Conduct a scoping review to identify different reimbursement models for telemedicine
- Conduct semi-structured interview with experts from selected counties to dive deeper into telemedicine reimbursement models employed
- Synthesis the qualitative data generated using thematic analysis
- Conduct stakeholder consultations with experts from NHSO Thailand

#### Part 3.3: Unit cost

**Objectives:**

- To estimate the unit cost of telemedicine services under Thailand's context

**Methods:** Unit cost estimation using healthcare provider perspective (Mixed method approach)

- **Population & Samples:** Purposive sampling will be performed to select sample hospitals including tertiary care, secondary care and primary care.
- **Data collection & Analysis:**
  - Conduct literature review to define activities involved in telemedicine services

- Collect cost data (e.g., capital cost, labour cost and material cost) by using data collection form
- Estimate the related unit cost
- Obtain input on the estimates from relevant stakeholders
- Conduct a data analysis
- Organize a consultation meeting with relevant stakeholders in Thailand
- **Software:** Microsoft Excel (Microsoft Corp., Redmond, WA, USA)

**Focus area lead**

Health Intervention and Technology Assessment Program (HITAP)

**Team members**

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**Funding support**

Health Systems Research Institute (HSRI), Thailand

**Timeline for 2024**

Table 11: 2024 timeline for focus area “telemedicine in Thailand”

Proposed milestones Year 3 (2024)	Targeted Duration in 2023			
	Q1	Q2	Q3	Q4
<b>Part 1: Telemedicine service recipients’ and providers’ experience of service usage</b>				
<b>Interview guide development</b> <ul style="list-style-type: none"> <li>● Develop and test interview/group discussion questions.</li> </ul>				
<b>Data collection and analysis</b> <ul style="list-style-type: none"> <li>● Conduct interviews and focus group discussion</li> <li>● Conduct a document review</li> <li>● Conduct content analysis</li> </ul>				
<b>Dissemination</b> <ul style="list-style-type: none"> <li>● Present preliminary results to stakeholders and revise the analysis, if needed</li> <li>● Write a report and draft a policy brief</li> <li>● Submit all draft publications to funders</li> </ul>				
<b>Part 2: Data analytics on the use and provision of telemedicine services and impact on general outpatient services</b>				
<b>Proposal development</b> <ul style="list-style-type: none"> <li>● Develop research proposal</li> <li>● Organise a stakeholders’ meeting for considering proposal and revise proposal</li> </ul>				



Proposed milestones Year 3 (2024)	Targeted Duration in 2023			
	Q1	Q2	Q3	Q4
<b>Data collection and analysis</b> <ul style="list-style-type: none"> <li>Request for dataset or access to dataset</li> <li>Perform data wrangling and analysis</li> </ul>				
<b>Dissemination</b> <ul style="list-style-type: none"> <li>Present preliminary results to stakeholders and revise the analysis, if needed</li> <li>Write a report and draft a policy brief</li> <li>Submit all publications to funders</li> </ul>				
<b>Part 3: Readiness of hospitals and methods of reimbursement of telemedicine service</b>				
<b>Sub-topic 1: Readiness of hospitals to provide telemedicine services</b>				
<b>Proposal development</b> <ul style="list-style-type: none"> <li>Develop research proposal</li> <li>Organise a stakeholders' meeting for considering proposal and revise proposal</li> </ul>				
<b>Data collection and analysis</b> <ul style="list-style-type: none"> <li>Request for dataset or access to dataset</li> <li>Perform data wrangling and analysis</li> </ul>				
<b>Dissemination</b> <ul style="list-style-type: none"> <li>Present preliminary results to stakeholders and revise the analysis, if needed</li> <li>Write a report and draft a policy brief</li> <li>Submit all draft publications to funders</li> </ul>				
<b>Sub-topic 2: Methods of reimbursement of telemedicine services</b>				
<b>Scoping review</b>				
<b>Develop and finalise a research proposal.</b>				
<b>Data identification and extraction</b> <ul style="list-style-type: none"> <li>Search databases</li> <li>Filter reference list</li> <li>Screen articles based on the inclusion criteria</li> <li>Data extraction</li> </ul>				

Proposed milestones Year 3 (2024)	Targeted Duration in 2023			
	Q1	Q2	Q3	Q4
<b>Dissemination</b> <ul style="list-style-type: none"> <li>• Present preliminary results to stakeholders and reviserecommendations, if needed</li> <li>• Write a report and draft a policy brief</li> <li>• Submit draft publications to funders</li> </ul>				
<b>Key informant interview</b>				
<b>Interview guide development</b> <ul style="list-style-type: none"> <li>• Develop and test interview/group discussion questions</li> </ul>				
<b>Data collection and analysis</b> <ul style="list-style-type: none"> <li>• Conduct Key Informant Interviews (KIIs)</li> <li>• Conduct content analysis</li> </ul>				

Note: From the Steering Committee’s suggestion, a study visit to South Korea or India could be very informative to learn in detail about their telemedicine’s reimbursement system. However, currently there is no funding available for this activity. If there were to be funding available, we may revisit the feasibility of having this study visit.

### Expected outcomes/outputs

#### Part 1: Telemedicine service recipients’ and providers’ experience of service usage

The expected outcome of this part is to provide recommendations for improving the implementation of universal telemedicine program in Thailand.

#### Part 2: Data analytics on the use and provision of telemedicine services and impact on general outpatient services

The expected outputs/outcomes of this part include:

- Patterns and trends of telemedicine utilisation including description of telemedicine users (who, what, where, when).
- Potential impact of telemedicine on clinical outcomes among diabetic patients.

#### Part 3: Readiness of hospitals and methods of reimbursement of telemedicine service

##### Part 3.1: Readiness of hospitals to provide telemedicine services

The expected outputs/outcomes of this part include:

- Enhanced understanding of telemedicine landscape in terms of the:
  - extent of telemedicine service availability in health facilities;
  - presence of cyber security systems at healthcare facilities; and
  - impact on the volume of outpatient services with or without telemedicine implementation.

### Part 3.2: Methods of reimbursement of telemedicine services

The expected outputs/outcomes of this part include:

- Enhanced understanding of telemedicine reimbursement landscape
- Policy recommendations, developed collaboratively with NHSO, for Thailand to reimburse telemedicine services

### **Potential risks and risks management**

Table 12: Risks and risks mitigation activities

<b>Risk description</b>	<b>Mitigation activities</b>
There are limited partners that are willing to share their policy documents on reimbursement	<ul style="list-style-type: none"> <li>• Proactively engage with established networks, such as HTAsiaLink, to collaboratively connect with pertinent stakeholders</li> </ul>
Representatives from NHSO are not engaged in the process	<ul style="list-style-type: none"> <li>• Approach and engage with the policymakers during the design stage of the study.</li> <li>• Setting up regular meetings with NHSO throughout the research period</li> </ul>
Time and resource constraints	<ul style="list-style-type: none"> <li>• Plan the review timeline carefully, allocate resources efficiently, and be realistic about what can be achieved within the available constraints</li> <li>• Recruit or hire extra personnels to the team</li> </ul>
Delayed timeline due to research ethical approval process	<ul style="list-style-type: none"> <li>• Submit all documents as soon as possible and request for exemption of review</li> </ul>
Limited access to relevant documents and other information	<ul style="list-style-type: none"> <li>• Engage potential participants/informants through stakeholders' meetings</li> <li>• Request for cooperation/authorisation through stakeholders' meetings</li> </ul>
Refusal to participate or provide information of key informants/ institutions	<ul style="list-style-type: none"> <li>• Engage potential participants/informants through stakeholders' meetings</li> <li>• Request for cooperation/authorisation through stakeholders' meetings</li> <li>• Adjust sample size for anticipated dropouts</li> </ul>
Limited access to data and/or inadequate data for data analytics	<ul style="list-style-type: none"> <li>• Adjust sample size for anticipated dropouts</li> </ul>
Different data structure according to different organisations/ institutions	<ul style="list-style-type: none"> <li>• Create standardised data request form, and analyse each hospital's data separately, if necessary</li> </ul>