

# Thailand Health Information System Improvement Through Universal Health Coverage Implementation

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## Abstract

It is important for countries to have integrated health information system in order to have accurate and timely information for health system and health policy assessment. Although some countries may have enough information for the jobs, data collection burdens from fragmented systems are mount. Developing interoperable health information system is promised to solve the problem. An integrated national health information system (NHIS) is complex and composed by multiple specific information systems. A country will need not only a good frameworks but also commitments and supports from stakeholders to implement NHIS. A long history of health reform and development in Thailand may be a catalyst to improve health information system in the country. An organization either selected

from the existing organizations or a new organization established with agreement from the stakeholders to be responsible on the central health information system management so the routine processes can be done without interruption from other jobs would be an option to optimize the NHIS implementation. However, Structures and governance of related organization at national level for sustainability should also be clearly discussed.

**Key words:** National Health Information, Thailand, HIS, NHIS, UCS, SSS, CSMBS, public health insurance

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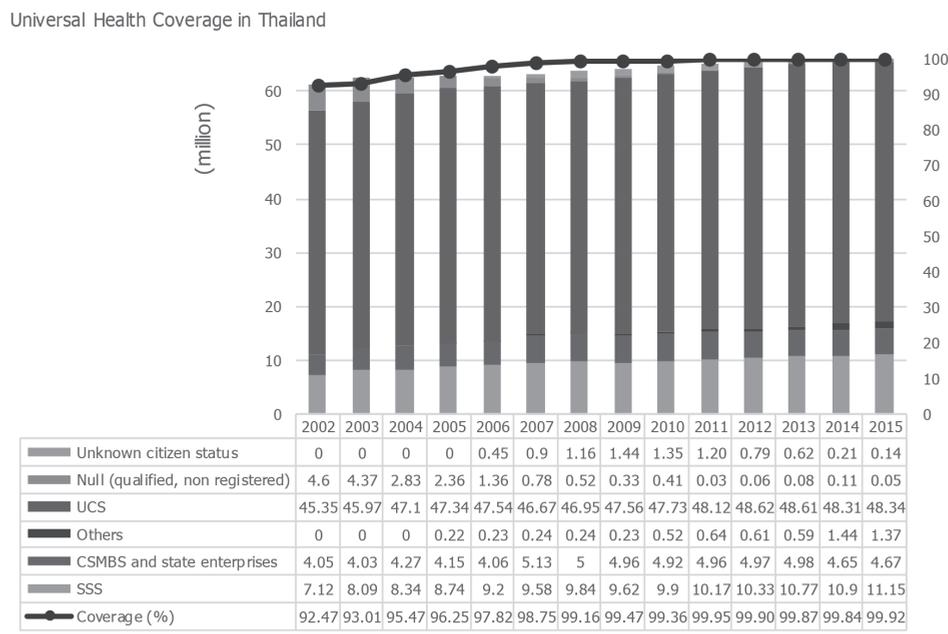
### Thailand Universal Health Coverage

All Thai citizens have been insured by the universal health coverage (UHC) since the National Health Security Act was passed by the parliament in November 2002. There are currently three main health insurance schemes in Thailand provided by the government, i.e., the Civil Servant Medical Benefit Scheme (CSMBS), the Social Security Scheme (SSS), and the Universal Coverage Scheme (UCS). The main organizations governed each of the schemes are the Comptroller General's Department (CGD) under the ministry of finance, the Social Security Office (SSO) under the ministry of labor, and the National Health Security Office (NHSO) under the National Health Security Board chaired by the public health minister, respectively. There are other public health insurance schemes managed by state enterprises to provide health care coverage to their employees. These schemes have provided compatible benefit packages to the CSMBS. Therefore, they are counted as the CSMBS beneficiaries.

The universal health coverage in Thailand has been increased from 92.47% in 2002 to 99.92% in 2015. Details are shown in **figure 1**.

The unknown citizen status group and the qualified non-registered group are not included in premium calculation, so no government budget allocated for these groups. However, when these groups show up at any healthcare facilities and they are verified as Thai citizen; they will be qualified as the UCS beneficiaries but required to register to the UCS scheme. The number of beneficiaries under each of the schemes is frequently fluctuated depending on employment situation of the population. It is, therefore, important to routinely update the health insurance status of the population by closed collaboration among related organizations. Health insurance benefit status of the population has been routinely updated twice a month by the NHSO.

When Thai citizen, either sick or healthy, accesses to care at any healthcare facilities, they will have to present their citizen identification card to the healthcare provider. The provider then check the citizen health insurance schemes through the available websites provided by each of the schemes. However, the NHSO's website has provided population data linked from the ministry of interior and routinely update the health



**Figure 1** Universal health coverage in Thailand from 2002 to 2015

Source: Bureau of Registration Administration, NHSO

Employment	Contributions, Coverage	Entry Condition (s)	Health Insurance scheme	type of payment	Benefit package	Claim, reimbursement	Related organizations or systems	Note
Government employees and their dependents (parents, spouse and up to 3 children < 21 year old.)	Government 5 mil. People (8%)*	-	CSMBS	Fee-for-service Diagnostic-related-group (DRG) method for inpatient (IP) Per item with ceiling for outpatient (OP)	OP and IP services at any public health care facilities, except for PP services	1. when direct payment was set up, Hospital claim through the CSMBS 2. without direct payment setup, the patients can reimburse through their affiliated office.	1. Hospitals 2. Central office of Health Information (CHI) 3. CSMBS 2. patients' affiliated office 3. GFMS system 4. CSMBS	Service cost reimbursement at private health facilities is limited and only for accident or emergency threaten to life.
Formal private employees	Government, Employers, and Employees 9.6 mil. People (15%)*	>= 3-month of contributions, and up to 6-month after unemployed	SSS	Capitation DRG method with global budget for IP except for PP services	OP and IP services at main contractor or sub contractors, or refer as need, except for PP services	1. no reimbursement for basic package included in capitation. 2. reimbursement for IP and additional vertical programs	1. Hospitals 2. SSO provincial branch office 3. SSO	Service cost reimbursement at private health facilities is limited and only as needed.
		less than 7-month of contributions	UCS for pregnancy			3. patient reimburses for emergency services out of service network.	1. patients 2. SSO provincial branch office 3. SSO	
		Within the first 3-month of contributions	UCS			All claim and reimbursements are managed under the UCS scheme.		
Unemployed, or other informal sector workers	Government 47.6 mil. People (76%)* + Non-registered qualified citizens	do not have any other government health benefit.	UCS	Capitation DRG method with global budget for IP	OP and IP services at primary care contractors, or refer as need Health promotion and disease prevention (PP) programs for all citizens	1. no reimbursement for basic package included in capitation. 2. reimbursement for IP and additional vertical programs	1. Hospitals 2. Central office of Health Information (CHI) on some vertical programs 3. The ministry of public health (MOPH) on PP programs 4. National Health Security Office (NHSO)	When they are eligible to UCS, the first service is covered and register is required at the health facilities.  (only registered UCS are count for government budget allocation.)

Figure 2 Basic characteristics of the three main public health insurance schemes.<sup>1</sup>

insurance status of the citizen with other health insurance schemes so the providers can use this website as the first site before verifying to each of the schemes only when needed. In some case, i.e., for the SSS and UCS scheme, the citizen will have to first access to care at their registered providers, excepted for accident and emergency cases. The register providers can refer the patient to the upper level of care when needed.

Government employees and their dependents are covered under the CSMBS scheme since the

employment started. In the SSS scheme, restrictions are applied. Health benefit under the SSS scheme is start after 3 months of contributions and the benefit will be continued up to 6 months after unemployed. Exception is also applied to pregnancy in the first six months of contributions. Thai citizens who do not have any health benefits provided by government as well as the exceptional groups of the SSS scheme are eligible to the UCS scheme. Basic characteristics of the main public health insurance schemes in Thailand are shown in figure 2.

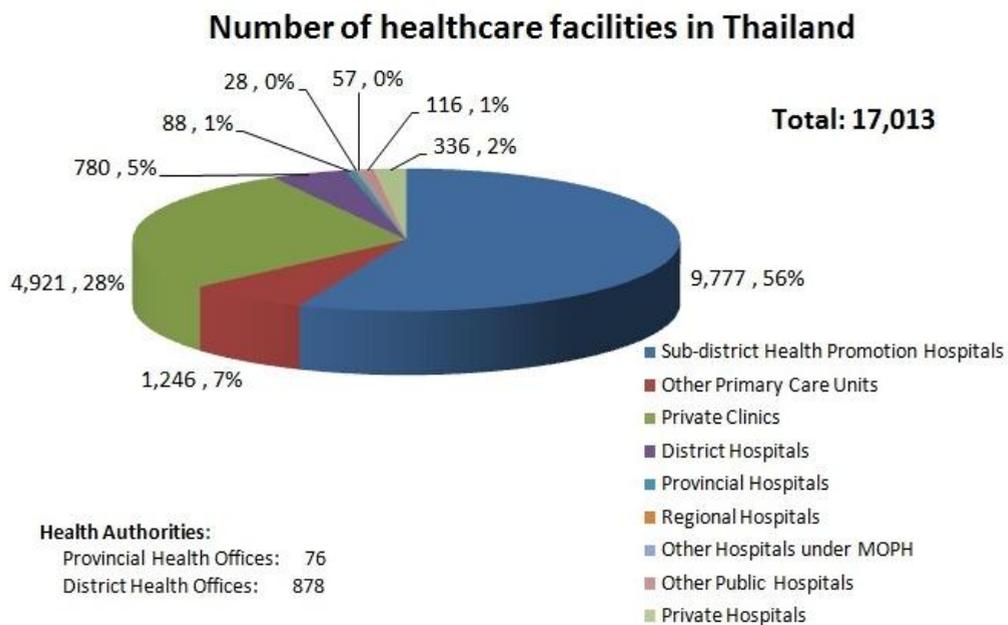
<sup>1</sup> In SSS, foreigners employed in formal private sector in Thailand are also covered.

<sup>2</sup> It has to be noted that most of the health centers and primary care units under the MOPH, during the survey, were using HCIS software developed by the MOPH.

### Healthcare Facilities in Thailand

The majority or 70% of healthcare facilities in Thailand are public. Public healthcare facilities have been provided in every sub-district and district. Most of healthcare facilities and administrators are supervised by the ministry of public health (MOPH). There are provincial health offices and district health offices under the MOPH responsible for administrative health related issues within province and district, respectively.

Currently, there are 17,013 healthcare facilities in the country. About 90% of these facilities are primary care facilities at village or sub district level. Hospitals under the ministry of public health, i.e., sub-district health promotion hospitals or health centers, district hospitals, provincial or general hospital, and regional hospitals are main healthcare service facilities in the country. There are university hospitals or other specialist hospitals at tertiary care level. The number of healthcare facilities classified by type are shown in figure 3.



**Figure 3** Number of healthcare facilities in Thailand, October 2015

Source: Bureau of Policy and Strategy, Ministry of Public Health (accessed October 12, 2015)

## Data Elements and Standards

Data standard has been an important issue in the country for decades, especially on health related data. Efforts to develop and implement data standard in the country have been expanded. Issues on health insurance standard have also been raised since the implementation of the universal health coverage policy.

There are many organizations responsible for managing standard of data used in the country. However, implementation of standard data are varied. Some standards were implemented and used nationwide, while some standards were at the beginning stage of implementation. There have been good signs shown that many relevant organizations had seen the need of implementing standards nationwide, especially when it comes to claims and payments.

A study of Dr. Wansa Paoin has provided suggestion to have a responsible organization to organize and to maintain health data standard. Objectives of the study were to find appropriated health data standard organization setting options for Thailand by group discussion with experts and representatives from 33 related stakeholders both in public and private sectors, and by reviewing experiences from other countries, i.e., the United State, Australia and Canada. The study has proposed four options of central organization to maintain and manage health related standard codes. All options are very similar in term of sources of fund, its mission and responsibilities. The organization should be autonomous office. The difference of these options is its affiliated office during its beginning period, i.e., the Health System Research Institute (HSRI), The National health Security Office (NHSO), Bureau of Policy and Strategy of the MOPH, and the public organization under the MOPH. Thailand is now in the process of establishing the organization.

Data standards are important in health information system. In Thailand, there are some national standards implemented as follow:

### 1) Population data identification

Population database from the ministry of interior (MOI) has been used as the big basket for the population in the country. Standard unique 13-digit personal identification implemented by the MOI since 1980s has been used to identify population. New born, death, immigrated or emigrated data has been updated in the database daily.

The population database is now considered as a completed and trusted nationwide database to check health insurance status of the population. Standard procedures and work flows among all related agencies and organizations were set to update the registered status of the populations. When a patient access to healthcare facilities and found that their health insurance scheme was not correct, the healthcare facilities can follow the standard procedure to correct the data and get a claim code for the patient while the healthcare service can be continued.

### 2) Hospital identification

The standard hospital codes have been assigned by the Bureau of Policy and Strategy, MOPH. There were assigned as 5-digit running number for every legally registered healthcare facilities. This 5-digit code had been transformed to 9-digit code to include its type and its supervision agency. The bureau of policy and strategy manage the hospital identification database. However, the health insurance schemes and other agencies also have its hospital database and managed separately. Some organizations might not use the same hospital identification, but it is possible to map to the hospital identification before submit the data to other organizations. However, mapping the hospital identification at the national level may time consuming. The pattern of spelling of hospital name

from different sources may not be the same, one source may include hospital title in the same field, one source may put the hospital title name in the last, and another source may not include the hospital title at all. Incorrect spelling has made the mapping situation worst.

Because the database of hospital is so little comparing to the population database, there is easily to duplicate the data into any sub-systems. There is now many hospital databases scattered in many systems. Errors could be occurred when updating new hospital identifications.

### 3) Medical service data

There were two standard dataset called a "12-files system" and an "18-files system" introduced by the MOPH in order to gather the medical service data from healthcare facilities. The 12-files system is a set of tables containing all transaction of individual outpatient and inpatient service data from hospitals. The 18-files system is a set of tables containing all transaction of individual outpatient data and health promotion and illness prevention services provided by primary care units (PCUs) and health centers. However, the 18-files dataset has been revised to include more health data, e.g., referral data, accident and emergency data, so there are more tables included in the dataset. Therefore, the dataset has been later revised into 35-files, and 43-files dataset, respectively.

Only the International standard data implemented nationwide are the ICD-10-TM (International Classification of Disease version 10-Thai Modification) and the ICD-9-CM (Clinical Modification) that have been used for coding diagnosis and health service intervention, respectively. Other standard that are implementing or used in a few big

hospitals are HL7 messaging and LOINC (Logical Observational Identifiers Names and Codes)-a laboratory coding standard. DICOM (Digital Imaging and Communication in Medicine), a standard for handling, storing, printing, and transmitting information in medical imaging, is used in many healthcare facilities in the country usually where PACS (Picture Archiving and Communication Systems) are implemented. Other data, e.g., medical device coding standards, survey metadata standards, indicators standards are at various stages of development.<sup>2</sup>

A national standard announced in 2009 was the 24-digit national drug code. Many new systems or a revised version of some software applications have been tried to integrate the national drug code standard into the applications. However, the national drug code has later be revised to Thai Medicines Terminology (TMT) in 2013.

Implementing the ICD-10-TM and the ICD-9-CM for coding diagnosis and health service intervention in the country has been a key factor to achieve the implementation of the Diagnosis Related Group (DRG) inpatient classification system for inpatient payment mechanism. The DRG concept requires a minimum data set of diagnosis, operating room procedure, age, and discharge status. The work on DRG in Thailand was started in about 1993 and funded by the HSRI to be expected to implement for claim under the Traffic Accident Protection Act 1992, instead of using the traditional fee-for-service reimbursement. Electronic inpatient records have been used to group DRG since 1996. DRG Grouper has been developed to use at central ministry and hospital levels. The DRG grouper is current on version 5. The DRG concept has been continued to improve and adopted to use in all health insurance schemes in the country.

#### 4) Financing and claim data

Study of Krit Pongpirut founded that improving administration works such as reporting and responding to provincial or national policy were major reasons for hospitals to computerize their health information system instead of improving quality of care. Many efforts were put into preparing data for administration and billing. Reimbursement base on individual service data and auditing system help reduce false claim and increase quality of data. This in turn has created national medical service data to be used for other concerns, although quality and interoperability may have to be reviewed.

Although financing and claim data has been developed and implement nationwide, there are still no national standard and all are run on different flows and processes for each of the health insurance schemes.

### Thailand Health Information System

In the past decades, health information system in Thailand has continued to improve. Although most of health data in Thailand are computerized and most of decision-makers at all levels of health system are able to access to health information system as needed, timeliness and completeness as well as quality of data are still be issues. Data collection in most of health facilities is not integrated into clinical processes and workflows. Data are usually collected for entering into system later. There are significant fragmentation and duplication in data collections and data managements causing burdens on administrative workloads to health workers. By having multi health insurance schemes that have different benefit packages have cause the situation worst since the healthcare providers have to manage many sub-systems for claim and reimbursement from each of the schemes.

Studies and surveys in the past decade that interested in health information system in Thailand found that information system is a fundamental

infrastructure for hospital information system, most of health information systems are more concentrated on administration data than clinical data, most of hospitals and health facilities have hospital information systems, coordination and the utilization of data collected from the central level is not sufficient, cooperation among central organizations are inefficient, duplicated of data entry in hospitals is considered to cause burden to health workers.<sup>4,5,6,7</sup> According to the unpublished NHSO survey in 2008, there are almost 100 hospital information system applications are used in hospitals. It also founded that 6 out of 10 respondents stated that the records of service data for outpatient and inpatient curative care (OP/IP), and health promotion and illness prevention care (PP) were separated and using different applications. The most popular software application used to record OP/IP curative care by hospitals are HOSxP (30%), MIT-NET (10%), STAT (6%), Hospital-OS (5%), HI (4.7%) and MRECORD (4%), respectively. While the most popular software application used to record PP care by hospitals are HCIS(39%)<sup>2</sup>, HosXP-PCU(15%), Hospital-OS(4%), HIMPro (3%), and CM\_POP (2.9%), respectively. However, the varieties of the applications are dramatically changed in the past few years, many institutions not only hospitals but also other institutes both at local and national level have sought solutions to handle data collection burden and the lack of information for decision making at every level.

Since the implementation of the universal health coverage, efforts and investments in health information systems have been increased not only by health insurances but also hospitals and health facilities to develop or improve their information system in order to speed claim and reimbursement processes. Software vendors have seen the opportunities to promote the hospital information system packages by adding special features such as abilities to exporting or preparing reports to meet requirements from all of the three major health insurance schemes. Other features are included administrative reports for the ministry of public health (MOPH), data analysis for

other health or disease management programs, and integrating data at district or provincial levels. Some provinces have invested millions of Thai Baht (in hundreds of thousands of US\$) to implement provincial data center as a plug-in feature from the hospital information systems at the hospital level. The feature allows the provincial health offices to collect data from all health facilities within their provinces and to manage health data at provincial level before submitting the data to the health insurance schemes. In these provinces, some of claim data can be submitted by the provinces. The hospitals only have to transfer the health data through the software package linked with its provincial health office. Information technology (IT) staffs at the provincial health office can perform basic data verification and validation for all hospitals before transferring to the health insurances. The health managers at district and provincial levels seem very satisfied that they are not only have immediate access to reports and indicators but also have data available for special analysis. Further cost-benefit studies on the investments could be pursued to evaluation the actual outcomes and benefit to health system.

### **Integrated National Health Information System**

Although activities and processes regarding to health insurances and health information system at a national level seem to be similar, integrating these activities and processes at national level is challenge for any country. Developing of shared services across central government in the United Kingdom<sup>8</sup>, and the introduction of "health infostructure"<sup>9</sup> to the development and adoption of modern systems of information and communications technologies (ICTs) in the Canadian health care system have shown coordination and effort to centralize services and processes to improve services at national level.

In Thailand, the following evidences have shown that integrated activities and procedures as well as

investment in health and information system at national level can improve effectiveness and efficiency of the activities.

#### **Integrated beneficiary database system:**

According to the law, it is important for the NHSO to be able to identify Thai citizens who qualify for the UCS scheme by integrating beneficiary data of other government schemes. Health insurance benefit status of the population has been routinely updated twice a month by the NHSO. By using the citizen identification number of patients, registrar staffs of hospitals can be able to verify the public health insurance scheme of the patients at their service point.

#### **Integrated claims and reimbursement processes:**

Although claim and reimbursement processes of public health insurance schemes do not completely integrated, process of claim and reimbursement has been part of harmonization policy of the government to reduce administration burden of health providers. Other integrated issues or processes to support the harmonization policy include benefit package development, financial mechanism development, medical audit system, health information system, and registration.

#### **Central Procurement:**

According to the secretary general of the NHSO, medical instrument reimbursements for heart disease in 2008 were as high as 1,235 million Baht and coronary stents reimbursement were the highest. Centralized procurement has dramatically reduced in cost of coronary stents. In 2009, the NHSO can reduce cost of the stents from 35,000 Baht to 6,800 Baht for bare-metal stents (BMS) and from 85,000 Baht to 30,000 Baht for drug-eluting stent (DES), respectively.<sup>10</sup>

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<sup>2</sup> It has to be noted that most of the health centers and primary care units under the MOPH, during the survey, were using HCIS software developed by the MOPH.

**Health insurance over-use or fraud detection**

**from central database:** In 2009, high claims and reimbursement of the CSMBS scheme have urged the government to closer audit the claims. According to high executives in ministry of public health (MOPH) and the CGD,<sup>11,12</sup> the claims were about 60 percent higher than the estimated budget. Eighty percent of the claims were for the out-patient treatments. The CGD has coordinated with the Office of Public Sector Anti-Corruption Commission (PACC) to monitor unusual claims. The preliminary results found that there are 7 people having very high claims (1-2 million Baht per year) by seeking to the same health service at different hospitals every week. There are about 1,800 people that are under monitoring. The centralized data management on individual health service transaction has allowed the audit at the national level possible.

**Integrated primary care data:** Since the SSS and CSMBS schemes only cover curative care, other prevention and promotion care (PP) are covered by the UCS scheme. Capitation payments had been applied to most of PP services. Since 2008, some PP services have been benefited from incentives or on-top payments. The 18-files data set<sup>3</sup> of primary care service implemented in the country has played important role in estimating the budgets and reimbursements for the services, regardless its quality that have to be improved. Data management of the 18-files data set has been collaborated between the MOPH and the NHSO since 2007. All health centers submit the data set to the MOPH through their provincial health offices (PHO). The PP service data from hospitals are submitted to the NHSO. Data from the health centers and hospitals are integrated at the NHSO for claims and other analysis at national level. The standard data set has been revised by the ministry of public health in order

to include more requirements from related stakeholders. The revised version of PP service data had been introduced as the 21-file data set and the 43-file data set, respectively. Turn over time from one version of the standard data set to another version was depending on readiness of related organizations. However, most of hospital information systems are able to export both the 21-file and the 43-file version.

**Integrated administrative provincial budget:**

Most of health budget through the health insurance schemes are directly transferred to health facilities. Reimbursements to some activities especially for health promotion and disease prevention that are not easily to identify to any beneficiary at any health facility. Therefore, some funding for non-health service or indirect health service to promote health status in provinces are integrated and managed through the provincial health offices (PHO). The PHO can mobilize the fund to promote health status based on health needs in the province which may be different than other provinces.

**Integrated application for HIV/AIDS patients:**

Since 2006, the antiviral drug treatment for HIV/AIDS patients has been included in benefit package for UCS. The first national HIV/AIDS committee established from all stakeholders has good vision on health information system. The established budget for health information system development was set for both hardware and software application. Lesson learned from the National Access to Antiretroviral Programs for PLWHA (NAPHA) project; good health team network at facility-, provincial-, and regional-level; as well as the energetic of the pioneer central management team together have helped accelerating the development processes. The first version of a health information system for HIV/AIDS treatment called NAP (National AIDS Program) can be

deployed within a year. Design of the NAP program has cover services and treatment not only for HIV/AIDS patients but also voluntary counseling treatment for high risk group. Antiviral drug dispensing data are transferred to the Vendor Managed Inventory (VMI) of the Government Pharmaceutical Organization (GPO) daily. The dispensing transactions are collected in the VMI system daily waiting for health facilities to reorder the medicines to refill their stock. There were separated information-systems for HIV/AIDS services claims in each of the health insurance schemes. Regardless redundant data collections during the first phase of implementation, most of district hospitals that have less than thirty cases of HIV/AIDS patients tend to voluntary record service data for all of the patients regardless to health insurance status of the patients to the NAP program. However, HIV/AIDS services of all patients under the three main government health insurance schemes have been submitted through the NAP application since 2012. Therefore, HIV/AIDS service data including general follow-up data, laboratory tests and results, and ART formula are integrated at national level while privacy and confidentiality of the patients can also be protected.

### **Moving Forward**

Although universal health coverage (UHC) implementation has increased both service and administrative burdens to health providers, demands for more accurate and reliable health information have induced more investment in health information system. Health information system in Thailand has been improved dramatically both in term of quantity and quality since the UHC implementation. However, it is important to continue to improve especially in interoperability, health information exchange and meaningful use.

Integrating national health information system is gradual and iterative process that required extensive of time and resources as well as high political supports and commitments from stakeholders. Each stakeholder should have role and responsibilities in the process to create sense of ownership.

It is important to response to health information system problems emerged from the existing fragmented information system. Without any intervention, the problems will continue to raise and create burden to stakeholders especially data collectors at local and sub-national levels. Resource limitations should not be an excuse to continue to develop small fragmented information systems. Even when technology and financial resource are not an issue; fragmented information systems may also be occurred if there is no national strategic plan.

Furthermore, there should also be an organization either selected from the existing organization or new organization established with agreement from the stakeholders to be responsible on the central health information system management so the routine processes can be done without interruption from other jobs. Structures and governance of related organization at national level for sustainability should also be discussed.

Ideally, all agreed input data should be collected to data warehouse. Any analysis and reports would be done in the data warehouse. All stakeholders would access to the same data. The most important concept is that data should be entered only once and should be interoperable, reusable and timely.

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<sup>3</sup> There are two groups of data set, i.e., 12-file data set for outpatient and inpatient services, and 18-file data set for PP services. They are now in transitional phase to an integrated national data set.

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