Conjares, Ma. Norma Thea Madeline M. et al.

Working Paper

Strengthening health information systems: Policies, gaps, and a framework for reform

PIDS Discussion Paper Series, No. 2025-31

Provided in Cooperation with:
Philippine Institute for Development Studies (PIDS), Philippines

Suggested Citation: Conjares, Ma. Norma Thea Madeline M. et al. (2025) : Strengthening health information systems: Policies, gaps, and a framework for reform, PIDS Discussion Paper Series, No. 2025-31, Philippine Institute for Development Studies (PIDS), Quezon City

This Version is available at:
https://hdl.handle.net/10419/331531

Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlarang ng Pilipinas

HEALTH ECONOMICS AND FINANCE PROGRAM

PIDS DISCUSSION PAPER SERIES 2025-31

Strengthening Health Information Systems: Policies, Gaps, and a Framework for Reform

Ma. Norma Thea Madeline M. Conjares
Jann Trizia B. Talamayan
Anne Marie T. Rey
Jomelle John Anthony V. Wong
Ida Marie T. Pantig
Aliyah Lou A. Evangelista
Valerie Gilbert T. Ulep

This project was carried out in partnership with the Department of Health.

CONTACT US:

RESEARCH INFORMATION DEPARTMENT
Philippine Institute for Development Studies

18th Floor, Three Cyberpod Centris - North Tower
EDSA corner Quezon Avenue, Quezon City, Philippines

https://www.pids.gov.ph
publications@pids.gov.ph
(+632) 8877-4000

Strengthening Health Information Systems: Policies, Gaps, and a Framework for Reform

Ma. Norma Thea Madeline M. Conjares
Jann Trizia B. Talamayan
Anne Marie T. Rey
Jomelle John Anthony V. Wong
Ida Marie T. Pantig
Aliyah Lou A. Evangelista
Valerie Gilbert T. Ulep

PHILIPPINE INSTITUTE FOR DEVELOPMENT STUDIES

November 2025

Abstract

This paper integrates three studies that collectively assess the current state of the health information system (HIS) in the Philippines and identify strategic directions for its strengthening. In the first paper, we examine the critical role of the HIS across the health system, emphasizing the challenges and opportunities associated with digitalization. Using a mixed-methods approach, we evaluate the HIS through a process-people-product framework in the context of key health sector actors: regulators (government), purchasers (PhilHealth), providers (health workers and facilities), and consumers (patients and communities) – and analyze how these interactions influence data generation, use, and decision-making.

In the second paper, we focus on the technical and technological design of the Department of Health's HIS. Drawing on an extensive review of existing literature and policies, we identify systemic barriers to interoperability and effective data management. Our analysis reveals deficiencies in data standardization, the limited adoption of interoperable platforms, and fragmented data management practices. We recommend the adoption of national data standards, migration towards a centralized data warehouse, and enhancement of data governance to improve accessibility, security, and utility.

Building on these findings, our third paper proposes a monitoring and evaluation (M&E) framework to assess health system performance as a determinant of health. Drawing from international frameworks, we situate the Philippine health system within the context of ongoing universal health care reforms. The proposed framework highlights key performance dimensions, such as quality, efficiency, responsiveness, and equity, and underscores the need for a robust HIS to generate high quality data for continuous system monitoring and accountability.

Keywords: health information system, process-people-product, technological design, data warehouse, interoperability, digitalization, monitoring and evaluation

TABLE OF CONTENTS

A Review of Digitization and Data Management-Related Policies of the Health Information System of the Department of Health

Reimagining the Monitoring and Evaluation (M&E) Framework for Healthcare System Performance in the Philippines: A Proposal

List of Tables

List of Figures

List of Boxes

List of Acronyms

ACSC	Ambulatory Care Sensitive Conditions
BHW	Barangay Health Worker
CPG	Clinical practice guidelines
DOH	Department of Health
DOST	Department of Science and Technology
DPCB	DOH Disease Prevention and Control Bureau
DRG	Diagnosis-Related Groupings
EB	Epidemiology Bureau
eClaims	Electronic Claims
eHealth	Electronic Health
EHR	Electronic Health Record
eLMIS	Electronic Logistics Management Information System
EMBEDS	Evidence-Based Medicine Electronic Decision Support
EMR	Electronic Medical Record
ePCB	Electronic Primary Care Benefit
FHSIS	Field Health Services Information System
HIS	Health Information System
HPB	Health Promotion Bureau
ICD	International Classification of Diseases
iClinicSys	Integrated Clinic Information System
ICNCDRS	Integrated Chronic and Non-communicable Disease Registry System
IT	Information Technology
ITIS	Integrated Tuberculosis Information System
KMITS	Knowledge Management and Information Technology Service
M&E	Monitoring & Evaluation
MNDRS	Maternal and Neonatal Death Reporting System
NARIS	National Rabies Information System
NEDA	National Economic and Development Authority
NEMRS	National Electronic Medical Records System
NHIP	National Health Insurance Program
OLMIS	Online Malaria Information System
P4P	Pay-for-performance
PeHSFP	Philippine eHealth Strategic Framework and Plan
PHIE	Philippine Health Information Exchange
PIDSR	Philippine Integrated Disease Surveillance and Response
RHU	Rural Health Unit
UHC	Universal Health Care
WHO	World Health Organization

Digitalization of Health: Gaps and Challenges of Philippine Health Information Systems

Ma. Norma Thea Madeline M. Conjares, Jann Trizia B. Talamayan, Anne Marie T. Rey, Jomelle John Anthony V. Wong, Ida Marie Pantig, Aliyah Lou A. Evangelista, Valerie Gilbert T. Ulep

Executive Summary

Sound and reliable information is the foundation of decision-making across all health system building blocks. It is essential for health system policy and development and implementation, governance and regulation, health research, human resources development, health education and training, service delivery, and financing. A health information system refers to the system that generates such information for public health decision-making.

Effective health information systems require timely access to all health data from all sources, including sites of direct care (Hammond et al. 2010). In the growing technological age, digitalization of health is a means to strengthen and enhance health information systems. An effective HIS needs to be powered by the advantages of digital transformation and this requires through the establishment of an integrated digital platform that supports every stage of data process – from gathering and processing to sharing and applying information for informed decision-making.

This paper aims to 1) describe the critical function of HIS across the health system and its agents, and 2) discuss the gaps and challenges of HIS, centering on the digitalization of health. We assess HIS using *process (e.g., governance, financing, policies)*, *people (e.g., human resources)*, and *product (e.g., data to information)* framework in the context of the health sector agents, *that is*, regulators (*government*), purchasers (*PhilHealth*), providers (*health workers and facilities*), and consumers (*patients and communities*). We used mixed methods employing qualitative (e.g., key informant interviews, case studies) and quantitative (e.g., analysis of primary and secondary surveys and administrative and records data).

Keywords: health information system, HIS, eHealth, data management, Department of Health, DOH, PhilHealth, Electronic Health Records, EHRs, interoperability, digital health, digitalization

I. Background of study

The Universal Health Care Act of 2019 guarantees all Filipinos a comprehensive, quality, equitable, and affordable healthcare system. The Act introduces system-level reforms aimed at ensuring healthy populations and communities. It focuses on primary and integrated care that provides Filipinos a range of health services with minimal financial risk. For instance, the Act mandates structural changes in how providers are paid through the introduction of Diagnosis-Related Groupings (DRG), global budgets, and the introduction of pay-for-performance to improve the efficiency and quality of healthcare (Dredge et al. 2021). The acceptability of the DRG is based on base rates that reflect the true cost of care adjusted for the complexity of conditions. Pay-for-performance (P4P) effectiveness is based on benchmarked standard quality indicators from health facilities. **Hence, the success of these reforms largely depends on the availability of robust data collected from health information systems (HIS)** (Arslan et al. 2024; Mehmood et al. 2023)**.**

Every part of the health system relies on credible information to make informed decisions. It underpins the shaping and implementation of policies, ensuring good governance and regulation, advancing research, strengthening human resources and education, improving service delivery, and managing financial resources efficiently.**A health information system (HIS) refers to the system that produces such information for public health decision-making.** It possesses four key functions, namely: (1) data generation, (2) data compilation, (3) data analysis and synthesis, and (4) data distribution and the use of data. Given this, the discussion on HIS is broad. It encompasses all forms of data collection and management (i.e., paper-based or electronic) and information generated across the health sector building blocks (i.e., data on health system and related processes [policy and organization, health infrastructure, facilities and equipment, costs, human and financial resources, etc.], health system performance or outputs, health outcomes [mortality, morbidity, disease outbreaks, health status, disability, wellbeing], and health inequities [in terms of determinants, service coverage, etc.]).

Effective health information systems require timely access to all health data from all sources, including sites of direct care (Hammond et al. 2010). Enthusiasm for the uptake of technology and increased investment in digital health solutions have led to many digital HIS interventions (WHO 2021). An effective HIS needs to be powered by the advantages of digital transformation, and this requires the development of a digitalized and integrated data system that encompasses the data life cycle, from collection through to analysis, dissemination, and use to improve decision-making (WHO 2024). Despite the increased growth in digital health solutions, many of the interventions focus on specific disease programs via parallel data systems or on different aspects of the health system (surveillance, billing, or services) without integration, or they are limited to groups of facilities with no shared metadata or data linkage standards (WHO 2024).

The Philippines has shown significant strides in digitalizing health, particularly with patient records. DOH reports that 91% of all primary care facilities and 65% of public use some form of Electronic Health Record or EHR, a system that focuses on patient-level clinical data from health facilities (e.g., hospitals, clinics, and laboratories) (Department of Health 2023). Despite this feat in digitalization, data gathered through these health records are mostly used for PhilHealth-related claims and are not necessarily utilized in health sector decision-making and program planning. In addition, progress has been slow and uneven across the country. EHR

systems remain fragmented; even those developed by DOH operate independently. Health data are gathered, analyzed, organized, and utilized using different standards and processes. This fragmentation presents various challenges, including issues with interoperability and data architecture.

Centering on these developments, this report assesses the gaps and challenges of HIS. Here, we assess HIS using *process (e.g., governance, financing, policies)*, *people (e.g., human resources)*, and *product (e.g., data to information)* framework in the context of the health sector agents, *that is*, regulators (national government), purchasers (PhilHealth), providers (health workers, facilities, and local governments), and consumers (patients and communities) and UHC reforms. We used mixed methods employing qualitative (e.g., key informant interviews, case studies) and quantitative (e.g., analysis of primary and secondary surveys and administrative and records data).

II. Significance and Review of Related Literature

2.1 Role of HIS in the health system

Health information systems are critical for health systems strengthening. As a health system is defined to be all organizations, people and actions whose primary intent is to promote, restore, or maintain health, effective and efficient health systems are those that can connect and coordinate these different actors to maintain and improve health outcomes (WHO 2007). Given this, functional HISs is crucial to strengthening efforts in health systems. It supports policymakers and administrators in ensuring quality service delivery, strategic health financing, maintenance of skilled health workforce, safe medical technologies, and informed leadership and governance (WHO 2007).

Traditional in-country HIS practices hinder health systems' progress. An HIS is one of the six building blocks of a health system that "integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency (Cortez et al. 2023). Since countries utilize information systems to produce data, they are prone to develop systems to serve different functions (e.g., surveillance and routine health information) and disease-specific needs. This leads to system fragmentation, duplication of functions, and inefficiencies that affect decision-making and delivery of health care within the health system (Epizitone, Moyane, and Agbehadji 2023; Nguyen 2023).

Data gathered by HIS steers crucial decision-making in implementing health sector reforms. Many countries recognize the need for a more comprehensive and integrated approach to strengthen health systems (Nutley and Reynolds 2013; Senkubuge, Modisenyane, and Bishaw 2014). In this process, the key to the transformation is the coordinated and efficient use of data across the different components of the health system. Often, the health information system is sometimes equated with monitoring and evaluation. Still, beyond this, "the HIS also serves broader ends, providing an alert and early warning capability, supporting patient and health facility management, enabling planning, supporting and stimulating research, permitting health situation and trends analysis, supporting global reporting, and underpinning communication of health challenges to diverse users" (WHO 2008:2).

Various assessments have demonstrated that countries with functional and effective HIS have reported increased overall health system performance (Koumamba et al. 2021). Table 1 summarizes a few examples of how HIS strengthens health systems.

Table 1.The Role of HIS in Health Systems Strengthening[1]

Health System Building Blocks	Roles of HIS	Country-level Examples
Leadership and governance	Contributes to evidence-based decision-making, planning, and resource allocation by providing timely and reliable data from different levels of government.	The Australian Institute of Health and Welfare (AIHW) implements data integration projects consolidating different datasets and surveys. It expands the understanding of the needs of specific population groups and diseases to help develop targeted interventions for dementia, disability, suicide, and the health of veterans, among other things. These interventions are disseminated and accessed in partnership with other government agencies (Australian Institute of Health and Welfare 2002; Jensen 2022)..
Service delivery	Enables patient-centered and integrated care delivery through easy access to health information.	South Korea improves care delivery and services by empowering patients to be more knowledgeable and control their data through the My HealthWay App. In a single location, the application integrates patient-level data from different sources and institutions, where health insurance records, prescriptions, test results, consultation records, and vaccination histories become easily accessible (Korean Health Information Service n.d.). This establishes access to a patient's comprehensive and longitudinal medical record that can be stored or shared with medical and insurance institutions with their consent.
Health System Financing	Increases efficiency of health insurance agencies by enhancing timeliness and processing of the submission and verification of medical claims	Taiwan's National Health Insurance (NHI) Medical Information System introduced an automated process for the review of claims and a centralized medical record system (Tai and Wu 2022). To providers, the system allows the submission of claims through a digital platform that automates and processes the verification and reimbursement for claims within 60 days of acceptance. It includes the NHI MediCloud System that gives medical professionals access to data on patients' medications, surgeries, laboratory results, allergies, and other relevant information. This resulted in the improved utilization and efficiency of medical resources by reducing rates of overlapping medication and administration of additional tests (Po-Chang Lee 2022; Tai and Wu 2022).
Health Workforce	Aids in the optimization of health human resources by enhancing staff deployment processes	The Canadian Institute for Health Information (CIHI) is managing the Health Workforce Database (HWDB) that collects comprehensive national, provincial, and territorial information on the registration, demographics, geography, education, and employment-related information of healthcare professionals in Canada (CIHI 2022). Specifically, it tracks the types of services provided by physicians, nurses, and other healthcare providers (e.g. pharmacists, occupational therapists, physiotherapists, etc.) to support health workforce planning and policy development.

[1] The table is not a comprehensive assessment of the impact of HIS but seeks to illustrate its influence through a few examples from other countries.

Medical products, vaccines and technologies	Aids in the management and monitoring of products and mitigating the risks of stockouts by providing real-time data on inventory and needs	The Immunization Information Systems of the United States does not only record and store doses administered by providers but also supports outbreak responses by generating automated vaccine reminders and aiding with vaccine supply management (Congressional Research Service, 2022). It has functions where providers can utilize the status of the immunization programs as indicated in the system in determining the number of vaccines to be purchased (Scharf et al. 2021) (Pabst and Williams 2015). Moreover, data collected by IISs can be utilized for resource prioritization as it can provide aggregate data that identifies populations potentially at-risk for vaccine-preventable diseases. Similarly, when vaccines are administered, the provider will input and record information on the patient's demographics, manufacturer, lot number, dosage, and location and the doses used will be removed from the inventory (Bryant 2016).

Source: Authors' tabulation based on desk review

2.2 Functions of HIS across 'agents'

To further elaborate the critical responsibility of HIS in the health system, we enumerate its functions across key agents of the health sector. *Agents* are the main stakeholders or actors influencing and participating in the health system. There are four 'agents' in the health system: (1) *regulators/steward*, (2) *purchasers*, (3) *providers*, and (4) *community or patients.*

2.2.1. Regulators/stewards

The DOH is the *"regulator"* that sets the policies and standards for implementing and monitoring PhilHealth and healthcare providers' programs and services. As part of its stewardship function, the DOH also performs sectoral and routine data-informed functions. The DOH collaborates with other government agencies, institutions, and organizations to harmonize health and health-related data and information to perform its sectoral functions. Table 2 shows the ideal DOH's sectoral functions.

Table 2. Sectoral function of the regulator vis-à-vis HIS relevance

Area	Remarks	Health system examples/models
Disease surveillance	• HIS can expedite disease surveillance and contact tracing, identify risks and comorbidities for early detection and management, determine risk factors and complications, and provide insights into pathophysiological changes and drug repurposing.	• The US CDC's Electronic Laboratory Reporting (ELR) automates the reporting of digital laboratory reports from laboratories to state and local public health departments and the CDC (US CDC 2024). Public health agencies utilize these reports to initiate contact tracing, case interviews, and public health action, particularly for reportable conditions.
Clinical standard setting/regulations	• Clinical practice guidelines (CPGs) are developed to optimize patient care. HIS can support CPG development by collecting information on treatment efficacy and patient outcomes. By analyzing patient journey datasets, health professionals can identify trends and patterns that	• Finland developed its Evidence-Based Medicine Electronic Decision Support (EMBEDS), which integrates health information technology and evidence-based medicine in the provision of care. The EMBEDS service receives information from patient records and produces reminders and recommendations for

	can inform clinical decision-making.	treatment to aid clinical decisions (Duodecim n.d.).
Sectoral performance (local, national, including global commitments)	• Accurate and timely reporting of status of national targets and international commitments (i.e. Sustainable Development Goals) requires functional and effective HIS (Farnham et al. 2020). HIS must have the capacity to generate timely and empirical data on coverage and service delivery that shall form the basis for the progress and performance reviews of the health sector (WHO 2023).	• Sub-Saharan African countries adopted the District Health Information System 2 (DHIS2) software in tracking progress of health indicators and Sustainable Development Goals (e.g. Farnham et al. 2023). DHIS2 is utilized at a national level for aggregating data (e.g. routine health facility data, staffing, disease outbreaks, patient surveys, etc) collected through electronic or paper records from local health facilities (Hagel et al. 2020; Kruk et al. 2018).
Electronic Health Records Incentive Program	• EMRs are source of clinical and financial data which are useful in facilitating services within health facilities. This includes sharing of information among health care providers for diagnosis, treatment intervention, and tracking of patient progress overtime.	• The US Department of Health and Human Services recognized a set of EMR criteria to optimize ambulatory services. This was later on updated and incentivize through their national insurer, the Center for Medicare and Medicaid Services. In 2017, the EHR incentive program focused on improving health u

Source: Authors' tabulation based on desk review

2.2.2 Purchasers

Robust HIS is vital for its function in a health system where the purchaser is separate from the regulator (such as the Philippines). PhilHealth is the mandated national purchaser. It purchases or "commissions" public and private health facilities that provide health services. In this capacity, we focus on its roles in payment rate-setting and ensuring service delivery efficiency (i.e., fraud monitoring and quality of care). With the appropriate data on patient and service costs, PhilHealth can determine and monitor the implementation of provider payment systems and regularly adjust them. Understanding and analyzing data on claims and benefits coverage can help identify mechanisms to improve the quality of care. As an institution, PhilHealth enhances its operations for providers and patients (e.g., timely processing of claims and reimbursements). Table 3 summarizes the role of HIS across purchaser functions.

Table 3. Sectoral function of the purchaser vis-à-vis HIS relevance

Area	Remarks	Health system examples/models
Payment reforms	• HIS can capture itemized costs such as drugs, procedures, diagnostics, etc.). PhilHealth can use this detailed patient information to determine the cost of care. This is important as PhilHealth moves towards more sophisticated payment systems, such as Diagnosis Related Groupings (DRGs). In such a system, clinical data must be collected in a DRG system to group patients into DRGs. At the patient level, cost data is also required to calculate tariffs, base rates and cost weights.	Japan consolidates a patient's administrate data from different healthcare institutions and multiple periods of care to determine the cost of resource use and disease management. Japan's patient classification system utilizes this information to pay its health-care providers (Aljunid et al. 2012).
Quality of care	• The UHC Act is important for its quality of care and pay-for-performance features.	Thailand adopted the Quality and Outcomes Framework (QOF) in

	Without a robust HIS that captures indicators/parameters to measure the quality of care (e.g., readmission, 30-day mortality after surgery), it might be challenging to implement pay-for-performance and other value-based financing programs/interventions. • As PhilHealth implements global budgets to pay for hospitals, quality indicators are useful for global budget models because they ensure that funding allocations are tied to the volume of services and the quality and outcomes of care.	2013 which introduced financial incentives to improve primary care and quality indicators among providers (Health Intervention and Technology Assessment Program 2016). Quality and service indicators include but are not limited to care for diabetes and hypertension, rational use of antibiotics, maternal and child health, and referral of high-risk patients. The status of the indicators is assessed on an annual basis and points acquired will be converted into financial values (Khampang et al. 2017). In the US, The Hospital Inpatient Quality Reporting Program was originally mandated by Section 501(b) of the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003. This section of the MMA authorized CMS to pay hospitals that successfully report designated quality measures a higher annual update to their payment rates.
Efficiency	• Fraud detection is an important function of purchasers/insurers to reduce waste and improve efficiency in the system. As PhilHealth moves towards DRGs, improving the fraud system through robust HIS is even more critical to protect against fraud.	South Korea's Health Insurance Review and Assessment (HIRA) conducts reviews of insurance claims and quality assessment of services (Kim et al. 2017). Specifically, the HIRA ICT System combines real-time processing of claims and pattern analysis to reduce fraudulent claims (HIRA Service n.d.).

Source: Authors' tabulation based on desk review

2.2.3 Providers

Providers refer to the institutions and facilities (e.g., rural health units, barangay health stations, and hospitals) that deliver services to patients according to the policies and guidelines set by DOH and PhilHealth. In the context of the UHC Act, healthcare providers primarily constitute the networks that will be established in provinces and cities nationwide to deliver an integrated and continued continuum of care. As part of its reporting functions to DOH and PhilHealth, providers collect, submit, and share data and information to contribute to the planning and funding of services, case management, and surveillance, processing of claims and reimbursements, reporting of non-communicable, communicable, and other notifiable diseases, and other mandatory reporting requirements for licensing and accreditation.

HIS is vital for providers for their internal planning and operations monitoring. **Table 4** summarizes HIS the role of HIS across provider functions.

Table 4. Sectoral function of the providers vis-à-vis HIS relevance

Area	Remarks	Health system examples/models
Resource allocation/demand forecasting	• HIS can inform facilities about patient demographics, disease trends, case mix, and utilization patterns, allowing them to allocate resources (e.g., HR, equipment, beds) more efficiently or as part of their continuous improvement programs. HIS can be used to predict future demand/disease trends	The Department of Health and Aged Care of Australia developed the Data Strategy for 2022-2025 to support service and health workforce planning (Government of Australia 2023). This builds on existing planning models of many government departments where the current utilization-population ratio determines future service requirements (Lenzen and Birch 2023). With an aging population, the government can maximize digital health interventions to predict increasing demand for aged care services and rehabilitation interventions.
Care coordination	• HIS can integrate data across departments or even multiple facilities; IHIS enables seamless care transitions, such as referrals from PHC to the hospital (and vice versa). HIS is an important component to achieving integrated care.	Ontario, Canada introduced a province-wide framework for adopting an interconnected electronic referral among healthcare providers. The government's eService program includes eConsult and eReferral which are digital services that improve clinical workflows and patient experience (OntarioMD 2017). Specifically, the eReferral service simplifies the referral process by integrating the most common electronic medical records within the region and developing customized forms to ensure expedited referral of patients with their complete information. The eReferral service also includes features such as a map-based directory with information on waiting times and email notifications to patients for instructions and status of their referral (Southeastern Ontario Academic Medical Organization 2024).
Clinical decision support	• Many HIS incorporate alert system, reminders and evidence-based guidelines to physicians in making informed clinic decisions, such as drug control, prescription, disease management (e.g. Clinical Decision Support System or CDSS)	CDSS are commonly administered through EMRs and other computerized clinical workflows. CDSS is endorsed by the US government (Agency for Healthcare Research and Quality 2013), Canadian government laws (Center for Effective Practice, 2024), Many OECD countries also used CDSS in their EMRs.
Administrative/reporting functions (claim submission to PhilHealth and DOH	• Government agencies use information systems to streamline and expedite the reporting and submission process of healthcare	Similarly, other countries such as the United States and Australia report notifiable diseases through their respective surveillance systems

submission of notifiable data/surveillance data)	providers and sub-national units. In addition to the disease-specific information systems, the DOH also uses the Philippine Integrated Disease Surveillance and Response (PIDSR) that standardizes disease reporting from different units nationwide (Philippine Statistics Authority n.d.). Healthcare providers can also submit their claims through the online eClaims service platform to improve turnaround time and operational efficiency in processing payment of claims (PhilHealth n.d.).	(Australian Government 2024; CDC 2024). Specifically, the Department of Health and Aged Care of Australia collects de-identified notification data on select bloodborne, gastrointestinal, vaccine preventable, sexually transmissible, respiratory, and other notifiable diseases (Australian Government 2024). Moreover, the government also developed the EasyClaim or eClaim system for the processing of health service claims.

Source: Authors' tabulation based on desk review

2.2.4 Patients

Patients pertain to all Filipinos who access and receive health services. Under the UHC Act, all Filipinos are automatically enrolled in the National Health Insurance Program (NHIP) and are entitled to services or benefits provided by PhilHealth. Patients have the right to access their personal data and health information safely and securely, compliant with relevant laws and guidelines (DOH 2020). Table 5 summarizes the role of HIS to patients.

Table 5. Sectoral function of the patients vis-à-vis HIS relevance

Area	Remarks	Health system examples/models
Access to personal health information	• Many advanced health systems have developed platforms through their HIS that provide individuals with easy access to their health information/records empower them to be more in control of decisions regarding their health and well-being	The following countries provide the following: Australia (i.e., My Health Records system), Brazil (i.e., meu SUS), Estonia (i.e., EHIS), Canada (i.e. myhealth records), Taiwan (i.e. My Health Bank). In Australia's My Health Record, patients can have access to immunization records, pathology, and diagnostic imaging reports, prescriptions, and hospital discharge summaries, among others (Government of Australia 2023).

Source: Authors' tabulation based on desk review

2.3 Interoperability

Given the vast range of data being collected, along with its multiple functions across the health system agents, a key concept when discussing the digitalization of health is interoperability. Interoperability of information systems is a fundamental requirement to accomplish healthcare goals using timely, complete, and accurate data. The term "interoperability" means the ability to communicate and exchange data accurately among different IT systems, software

applications, and networks (Hammond et al. 2010). Interoperability enables different HISs to work together and across organizational boundaries to advance the health status of individuals and communities and effectively deliver healthcare to them (Healthcare Information and Management Systems Society [HIMSS] 2013). In several low-income countries (LMICs), HIS are still "digitally walled," since their design and infrastructure do not adequately support the secure and accurate exchange of information across systems (MEASURE Evaluation 2017).

For HIS to be interoperable, data must be standardized. Systems interoperability is achieved by developing and implementing data standards recognized by *"standards-developing organizations."* However, overlapping and competing standards can still exist despite the standard setting. Because of this, Hammond et al. (2010) their paper summarizes globally recognized interoperability axioms for health information systems (see Box 1).

Box 1. Axioms of interoperability for HIS (Hammond et al. 2010)

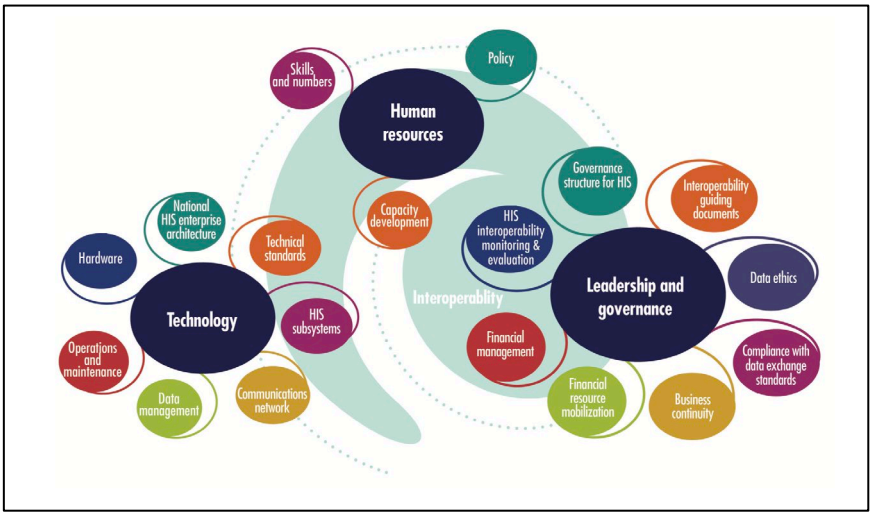
1. Data should be entered only once and should be available for multiple purposes, that is, they should be "reusable".
2. Interoperability requires the cooperation of a group of stakeholders to ensure the application of consistent rules across technical domains. It must also be done with sensitivity to legal, ethical, and societal requirements, including security, privacy, and confidentiality.
3. A single global set of data elements with attributes must become the building blocks of all such systems. Precise and unambiguous definitions of items are mandatory.
4. There will be diverse health information systems, not just one or even several. Yet it is critical to achieve interoperability among all of them.

Source: (USAID, Health Data Collaborative, and MEASURE Evaluation 2019)

Beyond a sophisticated technical design and IT infrastructure, interoperability requires effective leadership and governance and a skilled workforce. Leadership and governance play a key role in harmonizing stakeholders, strengthening collaboration across institutions, and enabling seamless data exchange (MEASURE Evaluation 2017). Integrating the technical and organizational components of a system promotes the creation of safeguards that ensure data security and fosters stakeholder confidence in the adequacy and practicality of these measures (Magnuson and Fu 2014).

For emphasis, interoperability is imperative when discussing the digitalization of health. Frankly put, discussing the digitalization of HIS is only possible if these systems are interoperable. A digitalized but un-interoperable HIS will not be able to perform at its maximum potential and thus will be unable to fulfill the functions the health system envisions for it. Hence, HIS assessments must be able to describe HIS in terms of their interoperability maturity. An HIS interoperability maturity is described through three main domains, namely leadership and governance, human resources, and technology (see Figure 1).

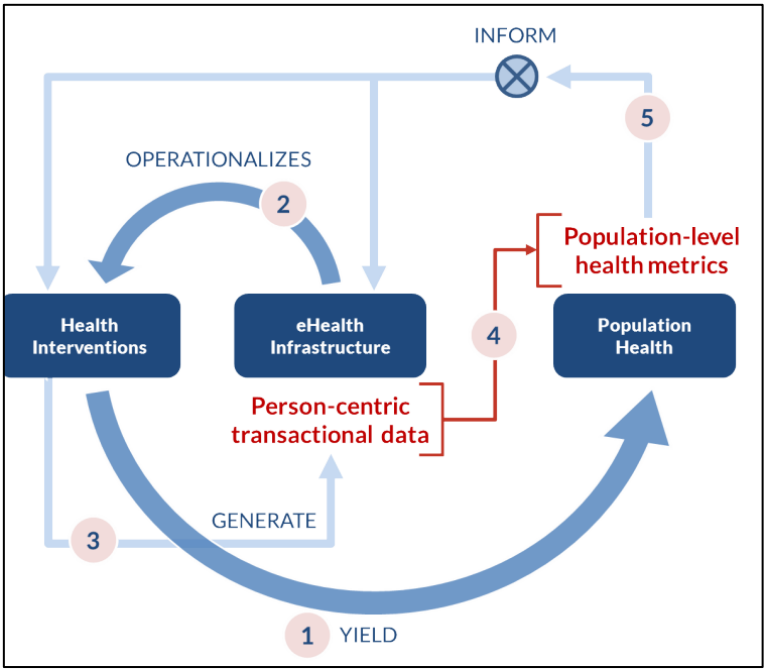
Figure 1. HIS interoperability maturity model domains and subdomains



Source: Health Information Systems Interoperability Maturity Toolkit (MEASURE Evaluation 2017)

To encourage interoperability, its value proposition should be clear and adequately communicated across all agents of the health system. In the diagram below (
Figure 2), health interventions are essential in determining population health. The outcomes of population health provide information on the type, cost, and design of the eHealth software and systems. eHealth infrastructure then operationalizes health system services, which include systems and software being used for care delivery and financial payments. Health interventions then provide person-specific and transactional data that are needed to generate public health data needed in designing new interventions for the health system (Ritz, Althauser, and Wilson 2014).

Figure 2. How eHealth affects health outcomes



Source: Connecting Health Information Systems for Better Health (Ritz et al. 2014)

Without systematic and clear understanding of priority health interventions in a health system, it is impossible to create a robust eHealth infrastructure that will redound to population health. As such, value proposition of the eHealth infrastructure being built could be developed by systematically prioritizing the "test case" for interoperability. It is imperative that the test case be developed under circumstances that the agents of the health system agree with each other or at the very least, demonstrate a holistic roadmap towards the realization of their benefits.

Effective design of interoperability is achieved by improving processes and services when agents contact existing software and systems. Due to the sophistication of this concept, many governments in their nascent digital health maturity have thought of interoperability as simple as connecting one software to the other through interfaces (i.e. application program interfaces, also known as API) to allow flow of information from one system to another. However, interoperability is not only connecting information systems together as it is possible for two systems to be connected but are not fully interoperable (i.e. in the absence of data standardization). It is important to note that interoperability is about creating avenues to which fewer interfaces are created leveraging standard data structures to connect a myriad of information systems without disrupting routine business process of the health system.

III. Objectives

This paper aims to assess the current state of HIS and develop comprehensive data collection and analytical monitoring and evaluation framework. Specifically, it aims to:

i. Describe then contextualize the "ideal" HIS, specifically focusing on its functions across different agents – the Department of Health (regulators), PhilHealth (purchasers), healthcare providers, and patients (consumers);
ii. Critically assess the current state if HIS, examining:
    a. Policies, laws, and governance
    b. Technological design and infrastructure
    c. Acceptability and human resource

IV. Methodology

4.1 Assessment Framework

Given the discussion of interoperability, along with the direction of HIS towards digitalization, we find it appropriate to assess the current state of HIS through similar domains measured for interoperability maturity but focusing less on the technological aspect of HIS and more on its organizational features. As such, we identified a Process, People, and Product Framework (see Table 6). For *Process*, we examined the governance and organizational structure, financing, and data standards. Governance and organizational structure encompass the country's legislative, regulatory, and planning/roadmaps on HIS. Resources include capital investments, particularly in HIS. Data standards are also being processed, which discusses interoperability and how information systems communicate. *People* explore the human resource requirements for operating and managing HIS at the national and local levels. It describes the competencies needed, as well as the barriers experienced when implementing HIS at the subnational level. Lastly, *Product* describes the collected, processed, analyzed, and disseminated data for public health decision-making. It encompasses essential indicators vital for health systems strengthening, data standards, as well as data management of the DOH.

Table 6. Process-People-Product Framework with sub-components

Process	People	Product
HOW HIS comes about (i.e. inputs and resources • Governance and organizational structure • Financing/Budget	***WHO*** are the people in play when operating and managing HIS • Human Resources	***WHAT*** – "DATA" as the product and how this product is used and managed • Indicators • Data standards • Data management

Source: Authors' tabulation

4.2. Project Activities

The mixed-methods study includes reviewing and analyzing available secondary data and conducting primary data collection methods (see
Table 7 for the details). To supplement our quantitative data, we conducted policy scanning, survey, and focus group discussion with HIS users from the healthcare facilities of Bataan. FGD participants include encoders, project managers, nurses, barangay health workers, and municipal health officers.

Table 7. Data collection approaches

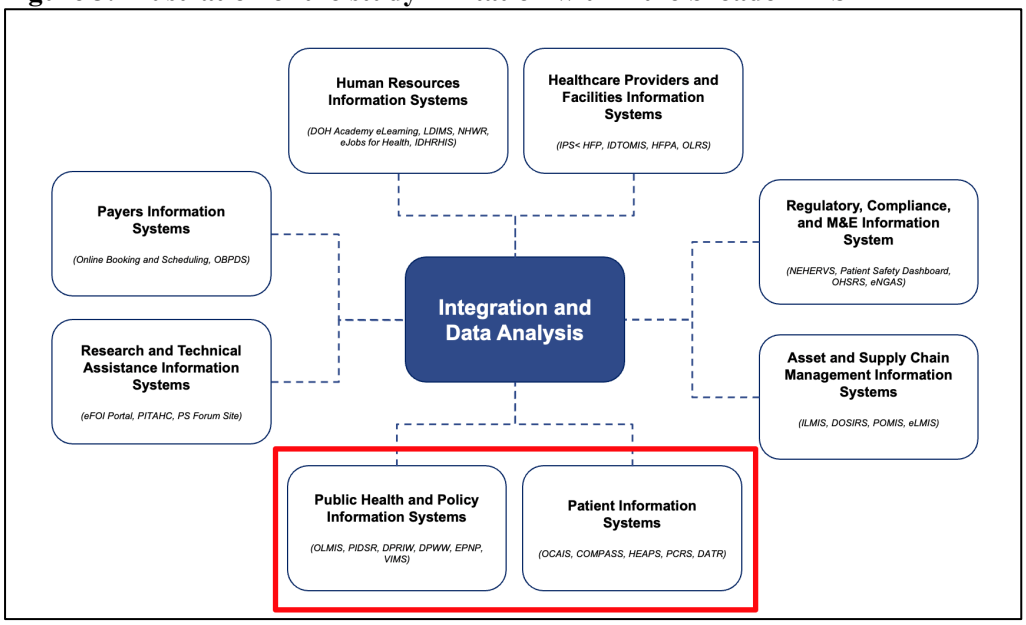
Study and data sources	Overview of collected data and respondents' profile
Data on facility survey from Conda et al. 2025	This survey highlights the differences in the adoption of public and private EMRs across 159 health facilities (128 rural health units, 31 hospitals) in eight provinces (Benguet, La Union, Batangas, Laguna, Aklan, Iloilo, Davao de Oro, and Sarangani). The data collected from the survey and FGD are the following: • Patient data storage • Type of EMR used • Utilization of data from the EMR • List of DOH's HIS used in the facility
RHU Level survey and FGD	The Bataan survey and FGD explore the readiness of health facilities in adopting HIS, focusing on human resources, infrastructure, and practices. Site: 20 Bataan RHUs and 2 Hospitals • Abucay RHU • Bagac RHU • Balanga City RHU I • Balanga City RHU II • Balanga City RHU III • Balanga City RHU IV • Dinalupihan RHU I • Dinalupihan RHU II • Dinalupihan RHU III • Hermosa RHU • Limay RHU • Mariveles RHU I • Mariveles RHU II • Mariveles RHU III • Mariveles RHU IV • Morong RHU • Orani RHU • Orion RHU • Pilar RHU • Samal RHU • Jose C. Payumo Jr. Memorial Hospital • Orani District Hospital

Source: Authors' tabulation based on desk review

The paper focuses solely on systems that collect clinical patient data. Section 36 of the UHC Act describes HIS as a wide range of systems that collect health and health-related data. However, this report only assesses the patient information system that collects individual and clinical-level data capturing patients' interactions and transactions with the health sector. These data are useful for clinical, public health, and policy decision-making (e.g., surveillance, sectoral performance monitoring) and purchasing operations (e.g., claims processing). We will

not examine other forms of HIS, such as Enterprise Resource Planning (ERP) and Human Resource Planning, which use a different framework and data collection system (see Figure 3).

Figure 3. Illustration of the study limitation within the broader HIS



Source: Obtained from a portion of the Health Sector Enterprise Architecture Mapping from Department of Health n.d.

V. Findings

5.1. Process

5.1.1 Governance

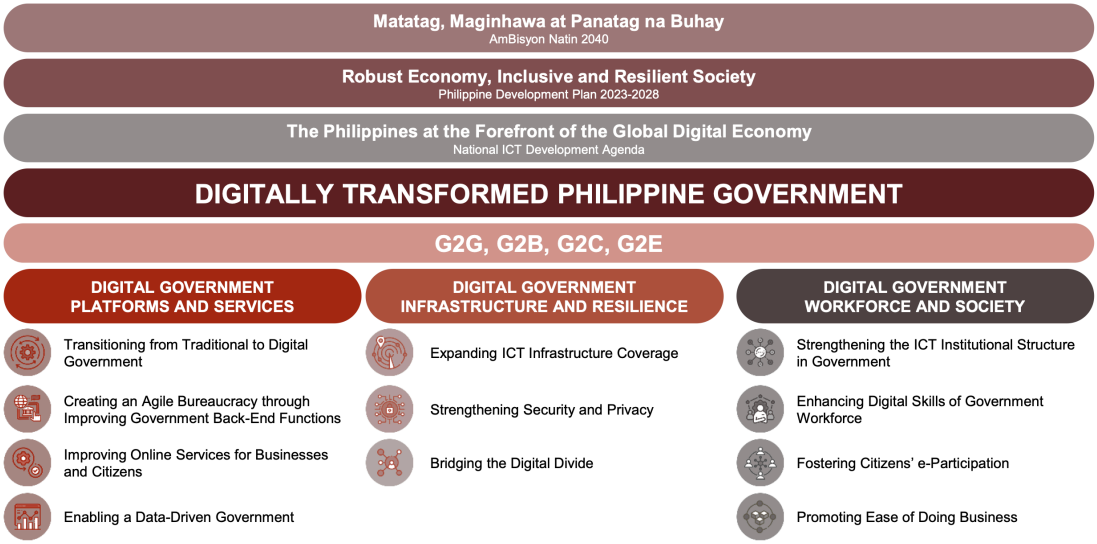
The Philippines has a long history of developing eHealth[2] policy frameworks. Over the past decades, several policy frameworks have been adopted, with some even filing bills in the Philippine Congress to institutionalize eHealth adoption. These policy frameworks aim to address the inefficient practice of collecting health information/data from facilities (i.e., largely paper-based data recording), data silos, and the hierarchical flow of reporting, which led to delays in the submission of reports and exposed data errors and mishandling and decrease its usability (Valdez 2022). These inefficiencies in HIS compromised the delivery of healthcare services effectively and equitably and limited healthcare managers and providers to evidence-based policy and clinical decisions. It also led to inefficient transactions between PhilHealth and providers, exacerbating the onerous reimbursement process (Dayrit et al. 2018; Evio and Bonito 2024).

The recognition of the importance of IT in the health sector in solving these problems can be traced back to the multiple policies issued even by non-health sectors, such as NEDA and DOST, in the past two decades. These policies are part of the broader policy agenda to fast-

[2] "eHealth" is a broad term which encompasses Health Information System. It is defined as "the cost-effective and secure use of information and communications technologies in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research" (WHO n.d).

track digitization in the bureaucracy and attempt to develop the governance structure (see Figure 4). One of the pioneering documents is the Philippine eHealth Strategic Framework and Plan (PeHSFP 2013-2020), developed by DOH and DOST. This document outlines the country's HIS vision and mission and provides a roadmap (including policies/laws, resources, and activities needed) to achieve this vision.

Figure 4. Digital Governance Transformation Architecture Framework



Source: Digital Government Masterplan 2023-2028, Department of Information and Communication Technology

One of the key elements in the PeHSFP is the creation of the Philippine Health Information Exchange (PHIE). Albeit this decade-old vision, it has yet to be fully implemented. The creation of PHIE has been the focus of many DOH eHealth policies (see Table 8) and strategic documents (i.e., Philippine eGovernment Master Plan, Philippine Digital Strategy, Philippine eHealth Strategic Framework & Plan, Integrated Government Philippines [iGovPhil]). PHIE facilitates healthcare data exchange among the DOH, participating healthcare providers, and health insurers such as PhilHealth. PHIE is a platform that allows the exchange of healthcare data such as outpatient consultation, inpatient admissions, and drug utilization among participating facilities/providers (e.g. RHUs, hospitals), insurers (e.g., PhilHealth), ancillaries (e.g., pharmacists), and DOH. In 2016, the first test case for PHIE was created through the integration of DOH's Maternal and Neonatal Death Reporting System (MNDRS) and PhilHealth's Electronic Primary Care Benefit (ePCB). Succeeding test cases have been planned but were not developed due to changes in governance and leadership.

The envisioned PHIE could address the longstanding data challenges in the health sector and facilitate critical elements of health reforms. Creating a mechanism that allows participating health facilities to have a unified real-time database of patient records, facilitates coordination and continuity of care, which is an integral feature of PHC. It improves health system efficiency by reducing duplication of records and minimizing medical errors and unnecessary medical interventions (Dayrit et al. 2018). PHIE will facilitate operations, including faster processing of PhilHealth claims and a more high-quality and real-time submission of health data (Joint Administrative Order No. 2016-003). PhilHealth and DOH have already developed policies to support this vision in the past ten (10) years, but implementing and operationalizing these

policies still needs to be done. Table 8 summarizes the policies of DOH and PhilHealth on PHIE.

Table 8. Policies on the Philippine Health Information Exchange

Policy	Summary
DOH-DOST-PhilHealth Joint Administrative Order No. 2016-0001: Implementation of the Philippine Health Information Exchange	This order addresses the fragmented healthcare system in the Philippines, where limited access to patient information hinders efficient decision-making. The PHIE is envisioned as a secure electronic network facilitating health data exchange between healthcare providers, ultimately leading to better healthcare services for Filipinos. The JAO institutionalizes the adoption of the PHIE in the healthcare system.
DOH-DOST-PhilHealth Joint Administrative Order No. 2016-0002: Privacy Guidelines for the Implementation of the Philippine Health Information Exchange	The JAO establishes privacy guidelines to ensure the secure and ethical implementation of the PHIE. It seeks to balance the protection of patient privacy with the benefits of health information exchange, emphasizing compliance with the Data Privacy Act of 2012 (RA No. 10173) and drawing inspiration from international standards such as the General Data Protection Regulation (GDPR). Central to the JAO are the principles of transparency, legitimate purpose, and proportionality, which ensure that all data processing activities are conducted lawfully, fairly, and in alignment with ethical standards. The guidelines also underscore key considerations such as safeguarding patient rights, obtaining informed consent, and implementing de-identification measures to protect sensitive information while enabling effective health data utilization.
DOH-PhilHealth Joint Administrative Order No. 2016-0003: Adoption of the Philippine Health Information Exchange Lite	The PHIE Lite was adopted to address challenges arising from diverse technology platforms across health information systems, which often result in redundant data entry and difficulties in interoperability and communication between systems. To resolve these issues, the JAO aims to institutionalize the adoption of PHIE Lite by prioritizing the integration of the Department of Health's (DOH) business processes and architectural framework. The initial focus includes the National Electronic Medical Records System (NEMRS) and PhilHealth's eClaims Package, ensuring streamlined data exchange and improved system efficiency.

Source: Authors' tabulation based on desk review

Because the envisioned policy of an interoperable HIS has yet to be realized, the public health sector is forced to contend with multiple HIS platforms managed by the DOH. The DOH operates and manages several HISs, most of which are disease—or program-specific. These systems serve different functions but exist for disease-specific surveillance and as electronic medical records (EMRs), which are real-time clinical records of patient interactions or health system visits. These HISs developed by DOH are fragmented, with varying levels of sophistication, granularity, and adoption of the data standards it sets.

The adoption of these multiple HIS systems of DOH can be attributed to the historical legacy of the "siloed" organizational structure of the agency, which is deeply vertical and programmatic with limited avenues for integration. Most disease-specific HISs for surveillance are owned and operated by vertical program offices within the DOH-Disease Prevention and Control Bureau (DPCB). Without an HIS that captures an individual's or patient's visit to health facilities regardless of the disease or cause, DOH vertical programs must independently produce and manage surveillance data per disease or program. The presence of HIS for a specific disease and the level of sophistication is largely driven by donors, whose technical assistance is programmatic/vertical as well. While the platform provides a system to collect data directly from the facility, it exacerbates inefficiencies. For example, the Pilipinas Shell Foundation, Inc. (PSFI) and the World Health Organization (WHO) developed the Online Malaria Information System (OLMIS). WHO, UNAIDS, and the Global Fund provided technical assistance in developing the One HIV/AIDS Surveillance System (OHASIS).

In addition to the historical legacy, multiple HIS results are based on a "functionalist" view of health service delivery, and some were developed to address the limitations of other HISs with supposed similar functions. The "functionalist" perspective sees the role of the DOH as a regulator responsible for conducting disease surveillance, as mandated by law. This often leads to DOH program offices developing systems to capture information specific to their needs or data format. Several HISs are being developed to address the challenges brought by existing HISs. Other single-purpose HIS are created to fulfill legal mandates (i.e., NARIS was created in fulfillment of RA 9482 "Anti Rabies Act of 2007, which prescribes for the DOH to "develop and maintain a human Rabies surveillance system"). The Online Malaria Information System, or OLMIS, was established in 2021 to have real-time reporting of malaria cases, as mandated by Republic Act No. 11332 or the "Law on Reporting Communicable Diseases". Donor-funded expansion of programs (i.e., immunization, AIDS, tuberculosis, malaria) also contributed to implementing a series of vertical or program-based HIS.

The implications of the practice of maintaining multiple disease-specific HIS are profound, particularly in terms of data collection processes and the usability of the data. Public workers/facilities must use these multiple HIS applications, each with different functions, standards, and quality. Health workers must use systems requiring different data collection approaches (i.e., entry methods, reporting formats, and workflows). The lack of integration of HIS leads to inefficiencies, as health workers use multiple platforms, which can be time-consuming and prone to errors. As indicated in our key informant interview, such a common sentiment was raised. As an example:

> *"The setup seemed to create a burden because it required duplication of work between systems. It's not the HIS, per se, but it's the lack on interoperability of the many HIS and EMRs that the hospital is using. " – AP23*

Our review suggests that the multiple HISs of DOH have varying standards and format requirements that lead to problems in consistency in data collection and analysis. Ambiguous standards (both the data structure and the construct) deter the ability to track an individual patient's journey in the health system, and it cannot follow a patient across different disease contexts. The siloed data makes it hard to comprehensively assess patients' transactions or interactions with the health system. For instance, a patient with TB may have a separate record in the TB-specific HIS, while the same patient's HIV could be recorded in a different HIS. This fragmentation prevents effective patient tracking, prohibits data sharing, and reduces

usability. The challenge of the multiple HIS could be one of the reasons for the low and variable uptake of DOH-developed disease-specific HIS (used for surveillance) in nine provinces that we surveyed.

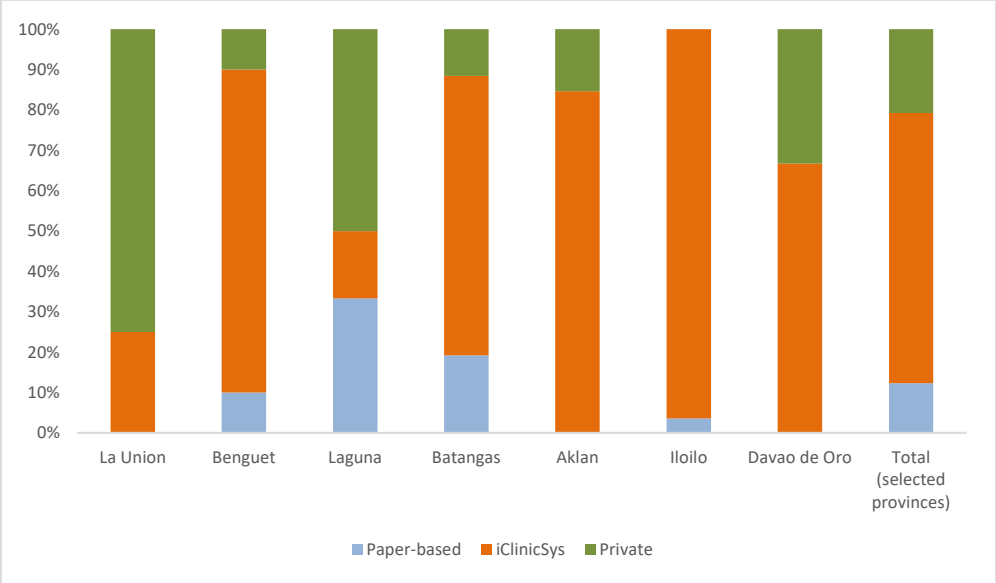
> *"The HIS enables the systematic collection, encoding, and reporting of health data across multiple programs. Systems like DCI, i-ClinicSys, and E-med help manage patient records, program reporting, and meet DOH quotas. However, the lack of synchronization, understaffing, and the need for paper-based backups due to real-time encoding challenges hinder its full potential." – AP14*

DOH-developed EMRs were adopted and endorsed through a policy, but uptake remains low. The DOH-PHIC Joint Administrative Order No. 2021-0001 entitled "Guidelines on the Implementation and Maintenance of an Integrated Health Information System (IHIS)" promotes the use of an integrated HIS such as *iClinicSys* among public clinics (e.g., RHUs) and *iHOMIS* in hospitals. While the national government (through the Department of Health) attempts to set data standards and policies and develop EMRs for health facilities, the health system is highly decentralized, granting LGUs significant discretion and autonomy in service delivery, including HIS. Our facility survey data shows that local governments have adopted *iClinicSys* in a varied way. About 67% of the RHUs use *iClinicSys* and many are also using private HIS. Based on our key informant interviews, the hesitance of public clinics of LGUs on *iClinicSys* and the continued reliance of LGUs on privately owned EMRs or paper-based systems can be attributed to significant technical support challenges in the ground. A major issue cited was the need for more IT support provided for troubleshooting and resolution of issues that may be software and non-software related. For example, many respondents highlighted that resolving system errors in *iClinicSys* often takes more than a week, severely impacting its usability and reliability. Some EMRs were developed with the private sector (e.g., CHITS, *eHatid*) to bridge gaps in implementing DOH-owned systems.

> *"The problem with iClinicSys is that it's always down. The system goes down whenever there's something being fixed. We couldn't use it from September to December [2023]. We were able to use it again only in February. The issue, however, is that even when it's usable, it keeps going down and showing server errors." – AP10*

> *"Unlike EMED, where multiple users can use it, many other systems are exclusive to one user only. So, you cannot maximize it because it is limited." – AP8*

Figure 5. Types of Information Systems used in RHUs by selected provinces



Source: Analysis of health facility survey conducted by PIDS

Table 9. Type of DOH Health Information Systems used in RHUs

DOH Health Information Systems	NORTH & CENTRAL LUZON		SOUTH LUZON		VISAYAS		MINDANAO		TOTAL
	La Union 8 (7.1%)	Benguet 10 (8.8%)	Batangas 29 (25.7%)	Laguna 21 (18.6%)	Iloilo 28 (24.8%)	Aklan 13 (11.5%)	Davao de Oro 3 (2.7%)	Sarangani 1 (0.9%)	113 (100%)
Field Health Service Information System	75%	50%	82%	78%	84%	85%	100%	100%	80%
Vaccine Information Management System	13%	33%	46%	33%	28%	39%	100%	0%	33%
Integrated Tuberculosis Information System	75%	83%	82%	67%	68%	100%	100%	0%	77%
National Anti-Rabies Information System	38%	17%	18%	11%	16%	31%	0%	100%	21%
Online Malaria Information System	38%	50%	55%	11%	16%	0%	50%	0%	24%
Neglected Tropical Diseases Management	0%	17%	0%	0%	4%	0%	0%	0%	3%
Integrated Leprosy Information System	75%	17%	18%	11%	4%	0%	0%	0%	15%
Maternal, Neonatal, and Infant Death Reporting System	25%	33%	27%	0%	0%	0%	50%	0%	11%
Violence Against Women and Children Registry System	13%	17%	18%	11%	0%	0%	0%	0%	7%
Integrated Chronic and Non-Communicable Disease Registry System	13%	17%	27%	0%	4%	0%	0%	0%	8%
Hypertension and Diabetes Registry System	25%	17%	36%	11%	12%	8%	0%	0%	16%
Online National Electronic Injury Surveillance System	0%	17%	27%	0%	4%	0%	0%	0%	7%
Fireworks-Related Injury Surveillance	50%	17%	9%	0%	4%	0%	0%	0%	9%
One HIV/AIDS Surveillance Information System	38%	33%	46%	0%	12%	15%	0%	100%	21%
Community-based Disease Surveillance	38%	17%	27%	0%	0%	0%	0%	0%	9%
Philippine Integrated Disease Surveillance Response	75%	83%	73%	22%	68%	92%	100%	100%	71%
Philippine Renal Disease Registry	0%	17%	18%	0%	0%	0%	0%	0%	4%
Cancer, Supportive Care, and Palliative Care Medicines Access Program e-Registry	0%	17%	18%	0%	0%	0%	0%	0%	4%
Online Event-based Surveillance and Response	75%	67%	64%	44%	44%	69%	50%	100%	57%
Epidemic-prone Disease Case-based Surveillance Info System	50%	67%	55%	33%	32%	15%	50%	0%	37%
COVID-Kaya	13%	50%	46%	11%	20%	15%	0%	0%	23%

Source: Analysis of health facility survey conducted by PIDS

Box 2. The Use of Private EMR in Bataan RHUs

Bataan is among the LGUs leading the implementation of UHC. The province is one of the pilot sites for implementing UHC in Region 3 and is currently focused on delivering healthcare services that are continuing, comprehensive, and coordinated referral systems managed by a primary care provider. Following the UHC's goal of establishing a unified and integrated health information system, Bataan has widely adopted electronic medical records (EMRs), including in rural health units. Health facilities in the province utilized several DOH-managed, free, and open-source EMRs, such as *iClinicSys*, the Integrated Tuberculosis Information System (ITIS), and the Electronic Logistics Management Information System (eLMIS).

However, in recent years, the provincial government entered into a government-to-government agreement with the Development Bank of the Philippines (DPB), which has a joint venture with a private entity that developed an electronic health record for all the RHUs of Bataan. The DBP E-Med, for instance, is the most utilized private software in Bataan and is committed to helping the province successfully implement the UHC Law (Aberin 2023). During the partnership's initial year, DBP provided the EHR free of charge. However, the current agreement includes costs for using the EHR and technical support services.

A case study on RHUs in Bataan revealed that healthcare workers recognize the advantages of private EMRs, citing **ease of use, enhanced functionality, and better support mechanisms** as key motivations for their intent to use. **While users find both public and private EMRs similar in terms of user-friendly design and ease of use, public EMRs often need help with frequent bugs and system errors.** These issues disrupt daily workflows, leading users to believe these systems are counterproductive due to difficulties accessing and working with public-owned HIS.

> *"We don't have problems navigating the system, but the problem with iClinicSys is the constant bugs and errors that slow down our work. If there is any problem, it's with eLMIS since it has little complexities." – AP 10*

System errors might be inevitable, but their impact could be minimized if each HIS provided dedicated, accessible, and reliable technical support. Participants observed a wide gap in the response times between public and private EMRs.

> *"eMED, besides being user-friendly, has technical support available 24/7. While with iClinicSys, two to three weeks is the minimum turnaround time to resolve the issue, and sometimes it would take months." – AP 20*

> *"There are times when the iClinicSys errored in October [2023], and we were only able to use it again by February [2024]." – AP 10*

RHUs' growing interest in private EMRs has been amplified by the lack of training for public HIS software. Comprehensive training empowers health workers to recognize their roles within the broader information system and understand how facility-level data serves as the foundation for higher-level analyses (Stoumpos, Kitsios, and Talias 2023). Without structured and standardized training, users struggle to utilize these tools for efficient workflows and informed decision-making fully.

> *"We don't receive any training for iClinicSys. It was only endorsed to us." – AP 12*
> *"We have trainings for use of eMED [and] I hope we can also have regular support trainings for other systems so we can use every application with proper knowledge." – AP 8*
> *"We also have ITIS but there was no training provided; we learned it through co-nurses." – AP 7*

Strengthening the support system of HIS, including technical infrastructure and user-capacity building, is essential to improving acceptability and intent-to-use among healthcare workers. Enhancing the HIS functionality, ensuring responsive technical support, and institutionalizing consistent training are critical steps in addressing the current gaps in public EMRs. Solutions should either focus on closing these gaps to make

public EMRs more reliable or prioritize fostering interoperability across all EMRs. By doing so, we can create a unified and integrated HIS that effectively supports the goals of UHC.

Three DOH offices are identified as mainly responsible for implementing HIS. The Knowledge Management and Information Technology Service (KMITS) oversees software development, maintenance, management, and capacity building. Disease Prevention and Control Bureau (DPCB) and the Epidemiology Bureau (EB), on the other hand, are responsible for policy development, including the design of the HIS (e.g., identifying variables/indicators to be collected), monitoring and evaluation, and data management. With this structure, KMITS serve as support to offices in the development of information systems than the leader of digitization and optimization of different data collection systems previously deployed in the ground. This is because the KMITS is designed to support services and perform administrative functions than perform a policy or program functions (EO 292 1987) . As such, it is important to note that the needs of the health sector have evolved from mainly digitizing data collection to architecting various data collection systems and seamlessly integrating them on the ground to fast-track services at the point of care. This may necessitate the transitioning of its support and core administrative functions to more of program, policy, and advisory role which eventually may require the evolution of the office.

Ambiguity in the role of relevant units within the DOH (e.g., DPCB, KMITS, and EB) presents a challenge in efficiently collecting and analyzing health data. To illustrate, we use the example of malaria programs. Data for malaria prevalence is collected via two (2) divisions of the EB namely, the Public Health Surveillance Division (PHSD) and Monitoring and Evaluation Division (MED). PHSD monitors imported malaria cases through the Events-Based Surveillance System while MED, on the other hand, collects malaria data through physicians' diagnosis in public primary care facilities, through the Field Health Services Information System (FHSIS). Because the FHSIS of EB is not real-time and only uses aggregated data from health facilities collected from local governments across different levels of administration, they could not be used for the short-term needs of the DPCB program because of timeliness and data quality issues. Official malaria data for decision-making and program planning is generated by the DPCB via the OLMIS, a real-time online surveillance system for malaria cases.

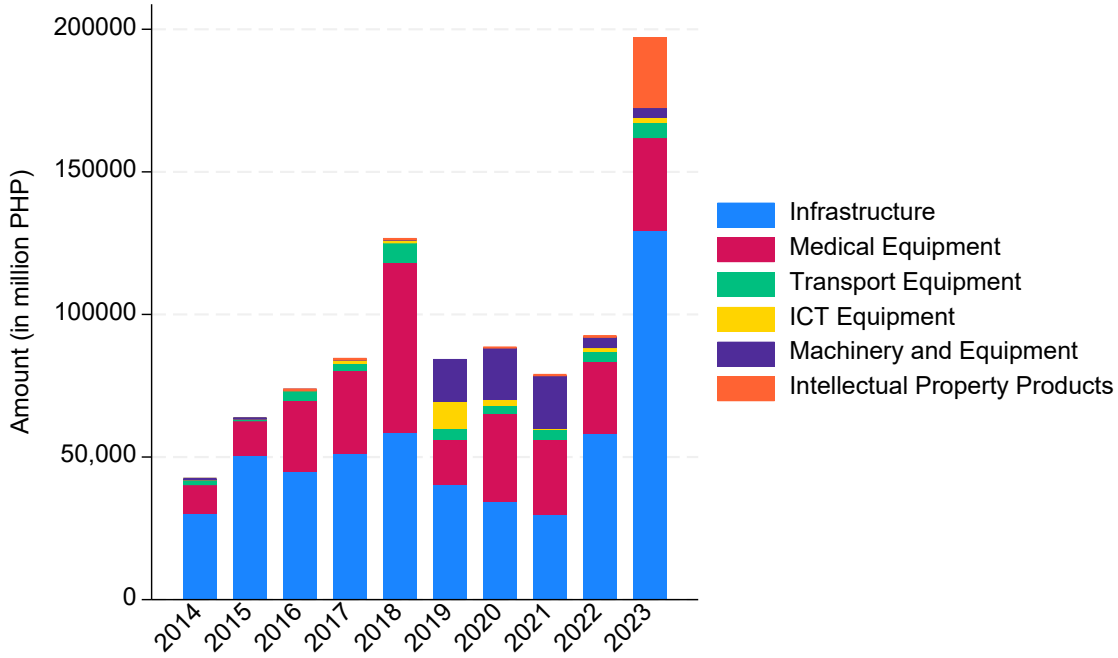
Concurrently developing and regulating HIS may pose audit implications on how government health facilities are spending for HIS. The DOH funds the development and maintenance of multiple HISs that it provides to health facilities for free. At the same time, the DOH implements a certification system to allow other HIS not issued by the DOH, to be procured by health facilities. This practice demonstrates duplication of resource allocation for HIS and encourages the market for private HIS. This also divides the government's focus toward software development and technical oversight. In addition, ensuring that DOH-owned HIS meets the standard that DOH, in itself sets, is counterproductive and may potentially lead to lack of robustness in predisposed certification criteria.

The multiple roles, including setting standards, developing systems, and performing maintenance, of the DOH must be organized under industry-proven IT governance framework. This will enable clarity of roles that will mobilize its stakeholders to perform the functions necessary to successfully implement information systems or possibly, outsource some functions that may be more cost effective to the government in the long term.

5.1.2 Financing

The level of investment in HIS is critical for successful implementation. In the Philippines, estimating HIS-related spending is challenging due to data limitations. The Philippine National Health Account (NHA) captures capital spending on health, which is further disaggregated into infrastructure and ICT-related spending (see Figure 6). However, maintenance and human resources specifically for HIS are not recorded in documents or hospital-level data. From 2014 to 2023, HIS-related capital spending on health accounts for 8% of capital investments. Historically, spending on HIS has been negligible. In 2023, spending on computer software and databases improved from PHP 4.9 billion in 2022 to PHP 28.0 billion in 2023. However, the PNHA does not disaggregate spending by sector (i.e., public or private) or by national or local governments.

Figure 6. Capital spending on health by type



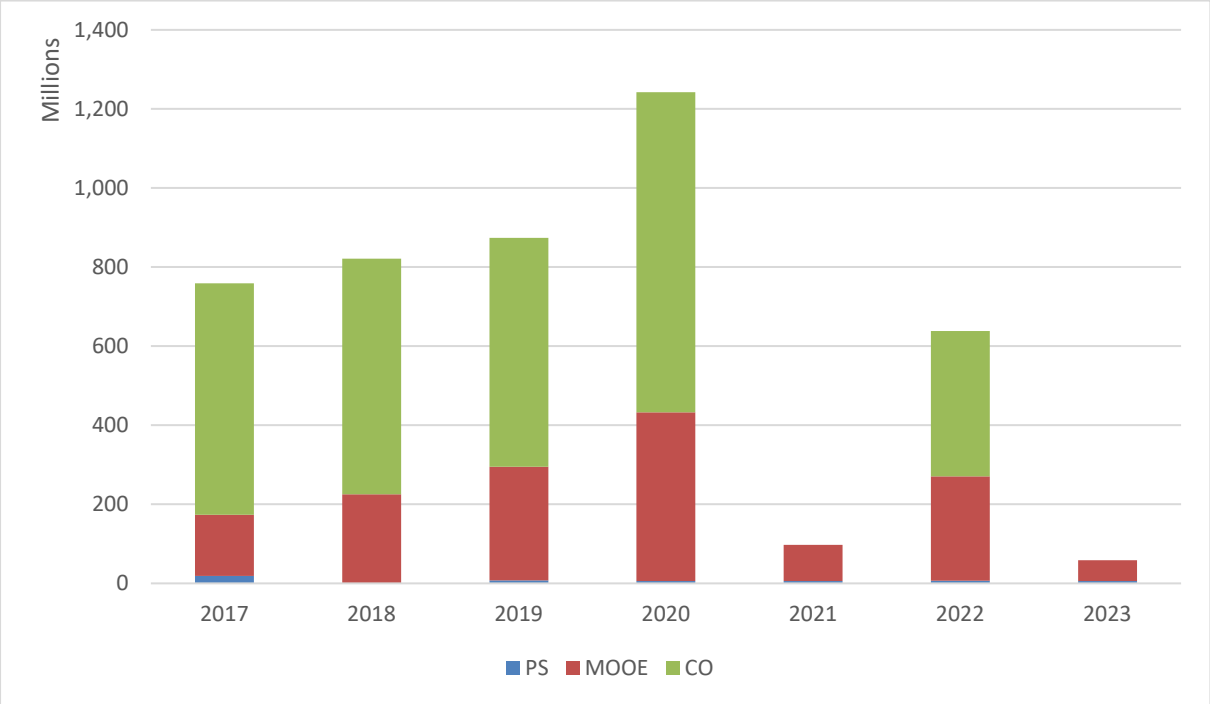
Source: Analysis of Philippine National Health Accounts

Budgetary data indicates that national government spending on HIS is declining. An analysis of the General Appropriations (GAA) from 2017 to 2023 suggests a downward trend. The budget for DOH-KMITS has declined over the past eight years (see Figure 7). During this period, most of the budget was allocated to capital investments to purchase IT infrastructure provided to DOH regional offices to support DOH-owned facilities across the countries. However, post-2020, capital spending has declined. The reduction in the budget could be attributed to various factors, with the low absorptive capacity of the allocated funds being a possible reason for the budget cuts.

While the national government allocates resources to HIS, local governments show no signs of increasing HIS spending (see Figure 8)**.** In a highly devolved health system, LGUs finance and operate their facilities. However, due to the fiscal constraints and varying investment priorities of LGUs, investments in HIS may fall below the optimal. While it is

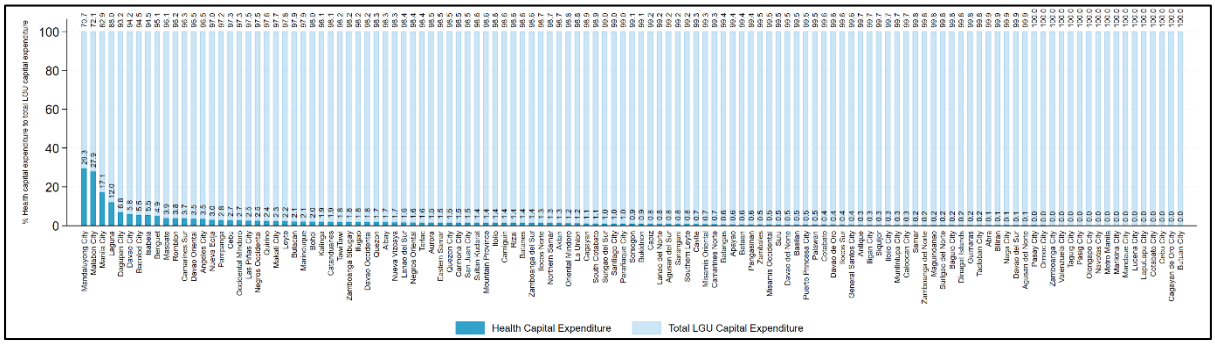
difficult to estimate LGU on HIS given the limited health accounting data in the country, our analysis of LGU capital spending data on health, which should capture a big portion of HIS spending, shows that LGU only allocates less than five percent of their total capital spending on health capital investments, and majority are civil works projects. The national government remains the major source of capital spending on health, while the share of local government remains meager (Solon, Herrin, and Florentino 2017). This low share of LGUs on capital spending on health poses a significant challenge. Even when the DOH provides the systems they developed (e.g., *iClinicSys*) for LGU facilities (e.g., RHU and district hospitals), Without LGU counterpart financing, which is needed to augment IT personnel in local facilities, including their training, and to finance maintenance, the usability of these systems remains challenging. This dilemma highlights the tacit expectation that the national government will shoulder most capital investments (as evidenced by the higher capital spending on health national government), albeit the healthcare delivery function lies with LGUs. The expectation regarding which level of government (i.e., national or local) should bear the responsibility for HIS affects the sustainability of HIS financing in the country.

Figure 7. Budget appropriated to DOH-KMITS



Source: Author's illustration from Department of Budget and Management 2017-2023

Figure 8. Share of capital spending on health by total capital spending of local government



Source: Author's illustration of LGU and HNPC Expenditures from Department of Finance – Bureau of Local Government Finance

Spending on HIS-related investments in health facilities is also difficult to capture. However, the best available data suggests that capital spending on ICT infrastructure is less than 2% of hospital expenditures (see Table 10)**.** Based on an analysis of financial statements from 190 public and private hospitals, the reported spending on ICT limited the share of HIS-related spending in hospitals. Many hospitals should have reported disaggregated capital spending, making it challenging to determine whether the absence of such data indicates zero spending or is a result of non-standardized financial reporting. For hospitals that did provide disaggregated data, HIS-related spending accounted for less than 2%. Capturing capital expenditures on information systems and related operational costs was challenging for most facilities.

Table 10. Share of IT-related expenditure as a share of total hospital expenditure

	Percentage (%) of total hospital expenditures, 2019
Ownership	
Public	3.25 %
Private	1.35 %
Level	
Level 1	1.22 %
Level 2	1.19 %
Level 3	0.08 %

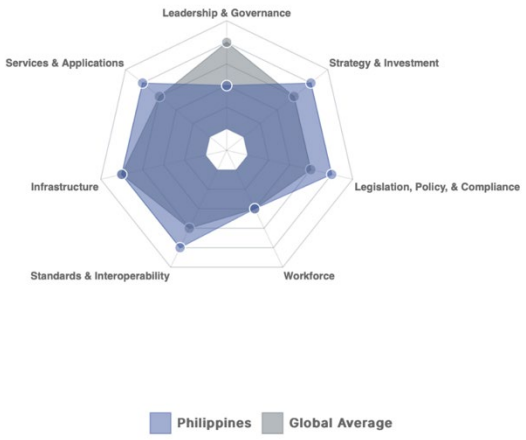
Source: Authors' analysis of hospital financial statements (n=190)

In summary, HIS functionality suffers not from the lack of input but rather from continued fragmentation of the relevant actors and actual information systems involved and the poor roll-out of digital health solutions. It is clear from the presence of multiple policies, strategic documents, and frameworks that the health sector recognizes and values health information systems and their functions. This section discussed the need for clearer accountabilities among HIS actors rooted in and perpetuated by the vertical nature of public health programming. Moreover, the shift to digital health solutions, although envisioned to strengthen HIS through integration and interoperability, continues to be a struggle due to the lack of investments in needed infrastructure and equipment. The next section further illustrates the struggle to uptake the digitalization of health by discussing the human resources involved in HIS implementation.

5.2 People

Investing in building the capacity of the workforce offers a better return than simply investing in technological solutions (Whittaker, Mares, and Rodney 2013). The information generated by even the most sophisticated HIS is only as good as those who operate the system and manage the data. It is well-established in the literature that health systems, especially in LMICs, are facing massive shortages in human resources for health (HRH) (Whittaker et al. 2015). While many capacity-building initiatives have been directed towards solving HRH issues, more activities need to be done on non-clinical competencies, such as data collection and use. The same can be said for competencies in HIS-related reforms, such as the shift to digital health. Among the assessment areas being evaluated by the Global Digital Health Monitor, the Philippines scores lowest in Workforce (see Figure 9), citing the need for more integration of digital health in the curriculum for degree programs of health professionals and health-related support professionals.

Figure 9. Philippine Performance in the Global Digital Health Monitor[3]



Source: Global Digital Health Monitor (2023)

Human resource needs for HIS operations are not clearly defined in the Philippines. Data goes through several stages across different levels of administration to be transformed into information that can inform public health policies and decision-making, thus requiring individuals with different skills and competencies. HIS tasks include paper, or electronic-based functions for data collection (through registries, intake forms, monthly reports, etc.), data storage (bookkeeping, filing, shelving, etc.), data management (compiling, indexing, organizing, etc.), and data analysis, reporting, and use (Whittaker et al. 2013). In addition, due to the wide range of uses and functions of HIS, different types of information are generated across the health system, each with its own set of processes, adding another layer of complexity in identifying appropriate HRH needs. Despite these intricacies in the human resource aspect of HIS, there currently needs to be a workforce strategy, policy, or guide. Even globally, there needs to be more defining competencies for HIS-related processes.

[3] The Global Digital Health Monitor (GDHM) is "an interactive web-based resource that aims to track, monitor, and assess the enabling environment for digital health across the world" (GDHM n.d.)

This lack of information on HRH needs for HIS warrants a system-wide assessment to identify gaps in skills and training. Studies describe an evident phenomenon where HIS-related tasks are seen as a specialist role for epidemiologists and information managers, perpetuating the notion that HIS-related functions are 'additional burdens' for health workers and not strictly part of their role (Whittaker et al. 2013). This can also be observed at the Central Office level, where epidemiologists and information managers are concentrated in specific offices (i.e., EB and KMITS, respectively) and lacking in program offices (i.e., DPCB, HPB) where numerous HISs are being managed. Identifying such gaps in health informatics competencies across the DOH program offices may contribute to addressing issues in system integration and interoperability, data standardization, and duplication in data collection. This is because discrepancies in indicator development for individual program monitoring and evaluation further complicate and perpetuate the vertical nature of health programs.

Meanwhile, at the local level, the operation and management of HIS are left to the discretion of the LGU, leading to the heavy reliance on already overworked health staff rather than experts in data science and informatics. Shortage in specialized staff for HIS increases the workload for nurses, midwives, and other front-line health staff. In Bataan, RHUs largely depend on nurses and midwives to perform HIS-related tasks. However, assessing total staff adequacy per role is a challenge due to the absence of standardized staffing allocations per facility dedicated to HIS.

> *"While the HIS provides useful tools for managing data, it lacks real-time synchronization, primarily due to staffing shortages, which could be the main problem of RHUs in the province. The system is designed to be paperless, but in practice, the understaffing issue forces reliance on paper which delays data entry and thus, makes it inefficient."- AP 16*

> *"Adequate financial support for the HIS would involve funding for hiring additional staff, particularly to handle data entry and program management tasks, but more often than not, hiring is more job order than permanent, and salary is not commensurate."- AP 6*

> *"Maybe for financial support, increase their (encoders) pay, because their salary is very low. It's below 500 per day." - AP 14*

> *"Increasing compensation for staff, such as midwives and nurses, could prevent turnover and ensure that the facility is adequately staffed to meet its operational needs." – AP 9*

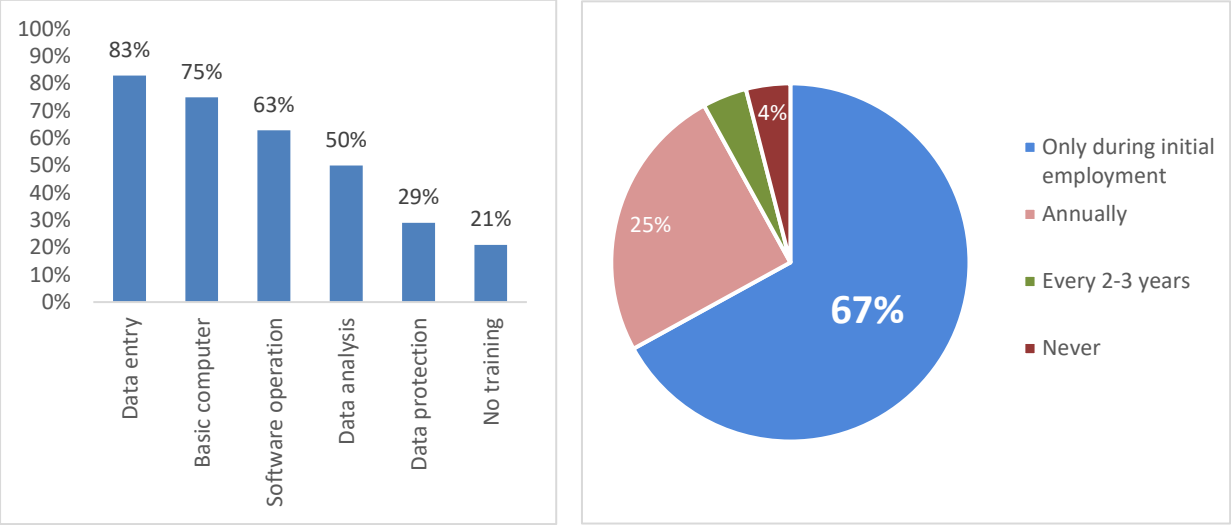
Despite the expectation for HRH to perform HIS-related functions, staff designated to operate, manage, and maintain HIS are not trained to do so; this may be attributed to challenges such limited training opportunities for selected personnel, potential gaps in the competency framework, or the lack of available funding. A significant barrier to HIS implementation is the need for more capacity-building activities to adopt ongoing HIS reforms. While basic training

is typically provided, it is often limited to the period of initial employment (see Figure 10). This misalignment between training frequency and the rapid pace of software updates creates a significant obstacle to the effective implementation and utilization of HIS. Some participants reported that their last training occurred 5–8 years prior, meaning they had not received any refresher courses, and newer staff were left untrained. Existing studies emphasize that inadequate training and the absence of refresher courses significantly hinder users' ability to fully utilize system capabilities fully, thereby undermining the intended outcomes of an integrated information system (Premji, Casebeer, and Scott 2012; Reñosa et al. 2021). Moreover, participants expressed a preference for in-person training, which they believe would better impact their understanding and navigation of the systems.

> *"Overall, while the initial training was quite comprehensive, we need more continuous and formal training, especially during system upgrades. The most important thing is training. Even if we have a lot of equipment, without training, we can't use it. Training is always done only at the beginning or during the implementation of a new system. Our last one was probably back in 2014, but after that, there were no refresher courses or follow-up training." – AP 14*

> *"Based on experience, when we have online training, there are many distractions. You're not sure if they're still listening. So, the benefits of online training are minimal. It doesn't help employees or individuals effectively do what's required in the HIS. I hope there will be face-to-face training." – AP 9*

Figure 10. Level of training received vis à vis training frequency



Source: Authors' illustration of data from the collected data on Bataan survey

Resistance to technology remains a significant barrier to local user experience (see Figure 11), particularly among the older generation, who prefer manual systems due to intimidation with technology. The case study in Bataan highlighted disparities in user acceptance, with older staff often favoring manual methods, unlike younger staff who adapt more readily, even without

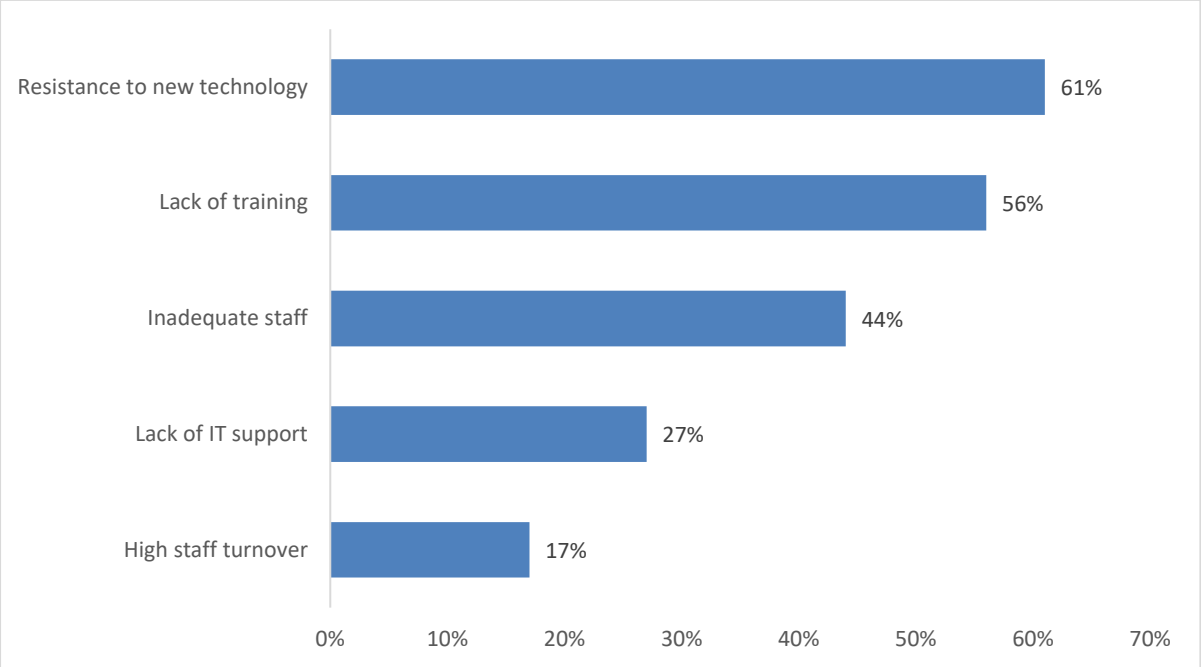
formal training. Targeted interventions are needed to address these gaps, especially for vulnerable groups such as midwives and BHWs, who are often overlooked in training and capacity-building programs. Enhancing digital literacy can foster a positive attitude toward technology adoption, leading to operational efficiency and improved HIS deployment (Edo et al. 2023; Tegegne et al. 2023).

> *"The transition from paper-based records to a fully electronic system has been abrupt and challenging for the staff. Many of them prefer manual methods, such as using manila paper for presentations instead of PowerPoint, indicating a resistance or difficulty in adapting to the digital tools provided by the HIS."- AP14*

> *"The younger generation of HIS users, despite receiving minimal training, adapt more easily due to better technological literacy and familiarity with digital tools."- AP22*

> *"The process is not fully operational because the midwives at the BHCs are not adept at using the system. One major issue is the lack of training and familiarity among the staff, particularly the midwives, who are generally older and not tech-savvy."-AP7*

Figure 11. Human resource challenges in using HIS



Source: Authors' illustration of data from the collected data on Bataan survey

The lack of training in advanced skills limits healthcare workers' ability to utilize HIS for critical functions. Current training programs focus on basic skills, such as data entry and basic computer operation (see Figure 10). While these are essential, there needs to be more

advanced training, such as data analysis, which prevents users from leveraging HIS for strategic tasks, including decision-making and performance monitoring.

> *"Very basic training and usually it only focuses on data entry or encoding. Users are expected to be computer-literate and to be able to perform everything. We are left with just introducing the software to us and we must figure it out on our own. Also, only encoders usually received the training, our BHWs don't have any training at all so our colleagues initiate to teach them." – AP21*

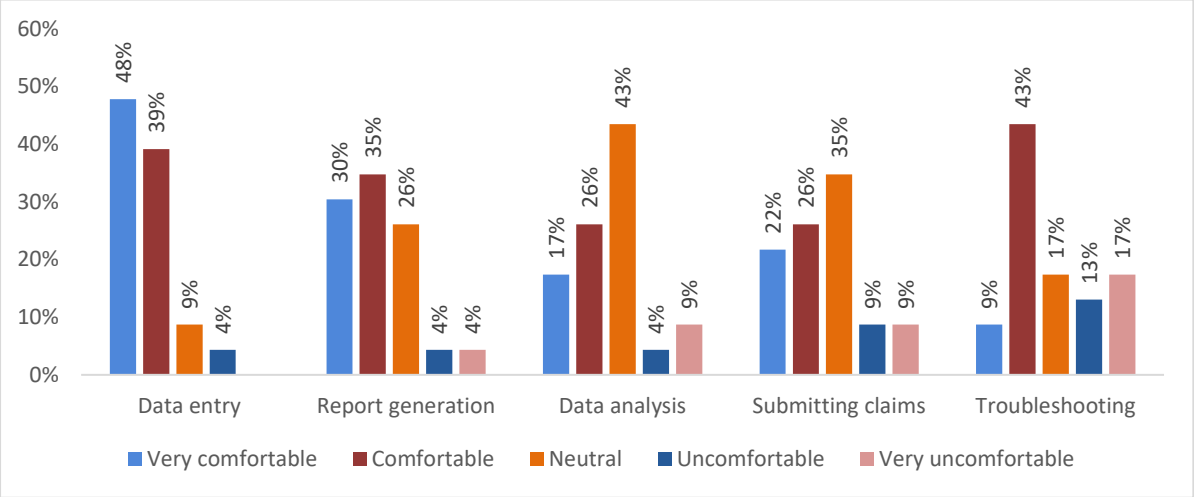
Despite challenges in human resources, most respondents consider themselves competent in using HIS. However, this competence comes from users' familiarization with the system over time through initiative and teamwork, filling the gap left by the absence of learning opportunities. While this demonstrates strong commitment and adaptability, users differ in knowledge and system exposure; hence, implementing structured training programs remains essential to ensure uniform staff competency and enhance system efficiency.

> *"It's not difficult for us to use the system anymore because we've already familiarized ourselves with it. We help each other out." – AP6*

> *"As nurses or encoders, we are competent enough, and we can learn it somehow." – AP15*

When disaggregated by function, confidence levels among HIS users reveal a significant skills gap, particularly in complex tasks. Users exhibit high confidence in routine functions like data entry—likely due to the high training coverage shown in Figure 10—but lack preparedness for technical and analytical tasks such as troubleshooting and data analysis (see Figure 12). It highlights how investments in HRH for HIS, particularly in training, can significantly enhance user competency and improve system utilization. Thus, users' confidence in fulfilling their HIS responsibilities is strongly supported by the availability of structured assistance, underscoring the importance of continuous and well-designed capacity-building efforts (De Mesa et al. 2024).

Figure 12. Self-reported confidence levels in HIS-related functions



Source: Authors' illustration of data from the collected data on Bataan survey

In summary, at the national and subnational level, clearly defining human resource competencies for HIS is fundamental in ensuring optimal HIS function and effective data use. This section discussed the need for a dedicated cadre of staff to manage and operate HIS at the national and sub-national levels. Being able to define HIS-specific competencies will help address this gap and aid in addressing issues of interoperability. The next section deep dives into *data* as a product of HIS and the technical aspects of how data is being managed, further emphasizing the need for data experts and additional competencies in health informatics across the health system levels.

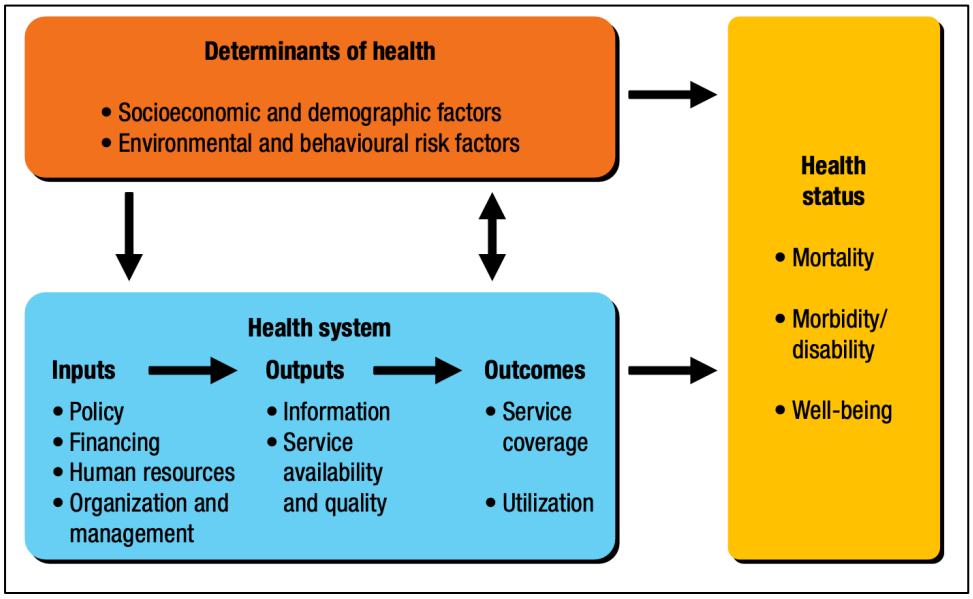
5.3 Product

Data is the ultimate end-product of health information systems. All processes involved in HIS (i.e., data generation, collection, processing, analysis, dissemination, and use) work together to produce complete, timely, and accurate information for public health decision-making and health systems strengthening. In this section, we describe *what* data is essential to be collected and analyzed to monitor health system performance (*indicators)*, *why* data needs to be transformed for interoperability (*data standardization),* and *how* data is being managed and used from the subnational to national level (*data management, use and dissemination)*.

5.3.1 Indicators

The set of health system core indicators is crucial in enabling health systems strengthening. If "carefully selected and regularly reviewed, core indicators are vital to national HIS strengthening. They can be viewed as a backbone of the system, providing the minimum information package needed to support macro and micro health system functions" (Health Metrics Network and WHO 2008:20). The Health Metrics Network defines indicators for HIS under three main domains as health extends beyond the health sector and overlaps with information systems in other fields (see Figure 13).

Figure 13. Domains of measurement for health information systems



Source: Assessing the National Health Information System: An Assessment Tool (HMN 2008)

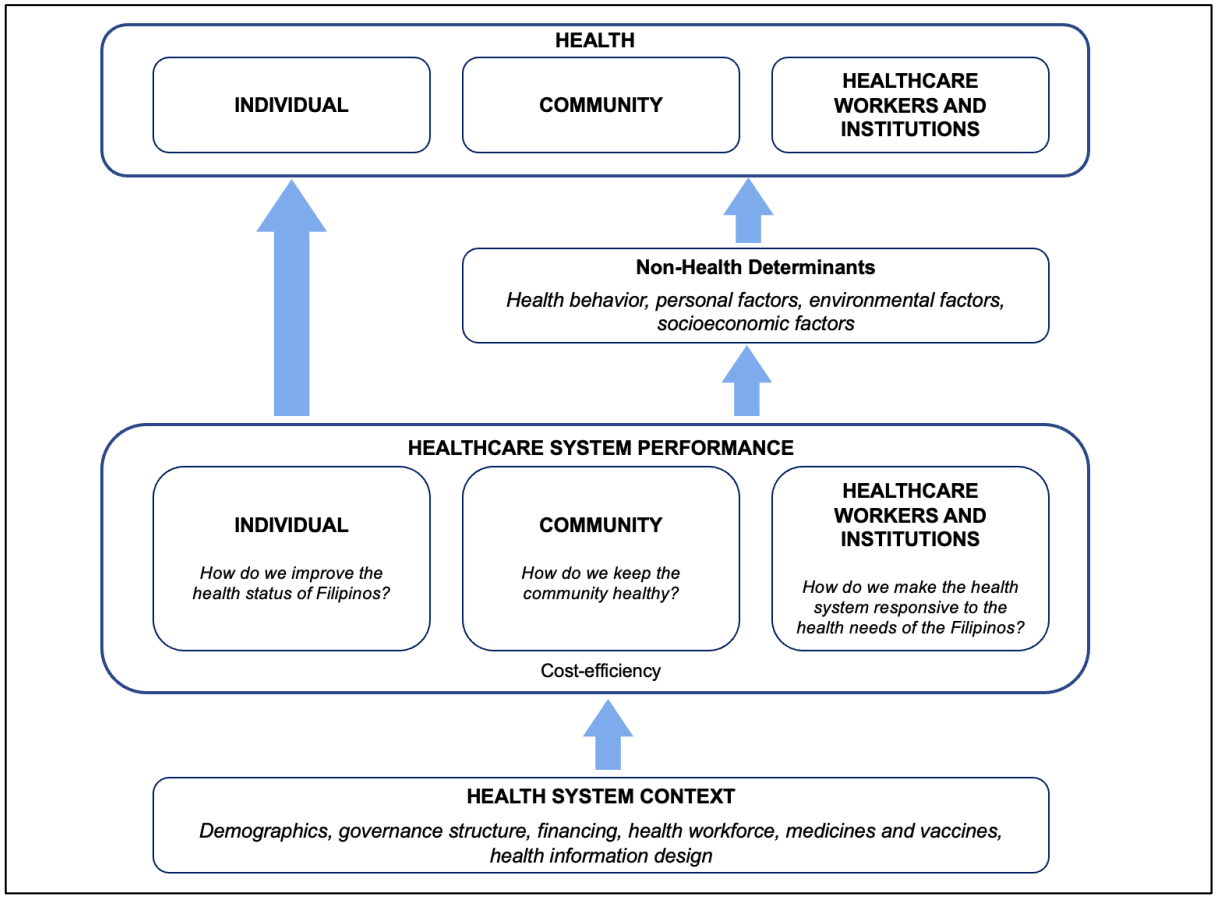
The indicators used to monitor and evaluate health sector performance should adequately assess the ongoing reforms and changes in socio-demographic and epidemiologic contexts. The UHC Act prioritizes primary healthcare and care integration. It also envisions changes in PhilHealth's provider payment and reimbursement mechanisms (e.g., DRG, pay-for-performance, global budget). These changes are expected to profoundly impact the health sector's efficiency and quality of care (Co et al. 2024). Also, the country is experiencing rapid epidemiologic, demographic, and economic transitions characterized by an aging population and increasing prevalence of chronic or non-communicable diseases. These transitions would pose challenges to the effectiveness and efficiency of PHC systems to address these changes (Kruk et al. 2018). The rising income is expected to drive greater demand for high-quality and responsive health systems (Boyce and Brown 2019; Sturmberg and Bircher 2019; World Bank 2024).

Considering these changes, the country's HIS should be able to collect, measure, and present relevant indicators. This capacity of HIS is necessary to guide clinical decision-making and population-level interventions. To illustrate the gap, we developed an M&E framework that could inform the selection and adoption of more effective and responsive indicators (see Figure 14). The country should be able to measure efficiency, safety, patient-centeredness, and timeliness at the healthcare system level, mostly through HIS. However, the DOH should be able to measure non-health determinants of health (mostly captured in non-HIS means, such as surveys (e.g., population surveys on health literacy) and administrative (e.g., WASH) monitoring from other sectors. With every M&E framework put forth, routine data collection and analysis will be necessary to ensure that the framework is operational and responsive to the requirements for evaluating the performance of the health system. This routine data collection and analysis will allow for the identification of areas that need refinement. In addition, regular reporting to targeted audiences will be necessary to put the framework to use. Targeted audiences may include the national and local level health planners who will use the evidence as inputs in their planning, healthcare providers who serve as the

validators of the data being collected, and the general population who are the source of the data that is transformed into evidence.

Using our framework in Figure 14, we reviewed the indicators outlined in official documents that are supposed to track health sectoral performance, such as the National Objectives for Health (NOH), the Philippine Development Plan (PDP), and various program- and disease-specific plans. However, the indicators must capture the reforms and the changing socio-demographic, epidemiologic, and economic contexts. Most indicators are related to maternal and child health obtained through cross-sectional surveys (e.g., Demographic and Health Surveys) and aggregate administrative data from surveillance systems (e.g., FHSIS), which do not represent the entire country as they are only obtained from public facilities (i.e., RHUs). These indicators were chosen because population surveys are the most readily available, and administrative data from surveillance data remains limited and, if available, is questionable quality.

Figure 14. Proposed M&E Framework



Source: Authors' illustration

Most indicators used to monitor health sector performance in advanced health systems are not routinely measured in the Philippines. As our framework outlines, we have identified key indicators of effectiveness, safety, patient-centeredness, timeliness, and cost-efficiency. While these indicators are drawn from various sources, many should be obtained from ER. *Under effectiveness*, for example, many health sectors monitor readmission rates and mortality rates.

Readmission rate is the percentage of patients readmitted to a hospital within a specified period after discharge. High readmission rates for certain tracer disease conditions (e.g., pneumonia and heart failure) signal inadequate care coordination or ineffective treatment (Sjoding and Cooke 2014). While 30-day mortality rates are those who die within 30-90 days post-admission, regardless of whether the patient dies during hospitalization or after discharge, reflects poor quality of care. However, tracking these indicators requires patient-level data recorded in a structured format, i.e., a line list, which is a detailed, row-by-row record where each row corresponds to an individual patient, capturing basic information such as demographic characteristics, diagnosis codes (using standard classification systems like ICD codes), procedure codes (i.e., ICD9-CM/SNOMED) treatment status, and follow-up. This individual data structure enables monitoring of disease progression, treatment adherence, and healthcare outcomes. *Under timeliness*, waiting time for certain is a common efficiency, equity, and patient satisfaction while informing resource allocation, care coordination, and pay-for-performance programs. *Under costs, the* total cost of care, disaggregated by expenditure items such as professional fees, drugs, and diagnostics, is critical for measuring the extent of financial protection (i.e., support value of PhilHealth).

Table 11. Sample performance indicators for healthcare performance across dimensions

	PRIORITY POPULATION		
DIMENSIONS	INDIVIDUAL Improving the health of the Filipinos	COMMUNITY Keeping the community healthy	HEALTHCARE WORKERS/ INSTITUTIONS Ensuring HCWs and institutions are responsive to providing good quality care
EFFECTIVENESS	• 30-day readmission rate • 30-day mortality rates following stroke or acute myocardial infarction • Avoidable deaths from treatable causes • Five-year survival from all cancers • PYLL* from causes considered	• Hospitalization for ambulatory care sensitive conditions (ACSC) • Avoidable hospital admissions and deaths for preventable diseases (e.g., diabetes and COPD) • Cervical, breast and colorectal cancer screening • Visits to ER for conditions	• Net growth in health workforce • Proper regulation practices for medicines and medical devices • Good governance in health facilities • Ratio of nurses to staff • Use of electronic medical records

	amenable to healthcare • Population with controlled hypertension and diabetes	that could be managed in primary care	
SAFETY	• Hospital harm • In-hospital sepsis • Foreign body left in during procedure	• Volume of antibiotics prescribed	• Safe working environment
PATIENT-CENTEREDNESS	• Involvement in decision-making and treatment options • Quality of life after procedure (e.g., ability to climb stairs after hip replacement)	• Patient choice for primary, specialist and hospital care • Health-related quality of life for people with long-term conditions	• Overall hospital experience • Use of patient portals and apps (digital health) to coordinate and discuss care plans between providers and patients • Patient experience of outpatient care; hospital care • Health-related quality of life for carers
TIMELINESS	• ER wait time until disposition decision • ER wait time for inpatient beds • ER wait time: proportion of patients seen on time	• Has a regular health care provider • Population with optimal travel time to health facility • Unmet healthcare needs due to geographic or	•

	• Waiting time for procedures (e.g., bypass surgery, cataract surgery, hip replacement, knee replacement) • Waiting time for MRI scan, radiation therapy, CT scan	waiting time reasons	
COSTS	• Inpatient cost and financial support • Catastrophic health spending • Utilization of generic medicines • Number of C-sections per 1000 livebirths • Treatment adherence and avoided hospitalization	• Unmet healthcare needs due to financial reasons • Potentially avoidable hospital admissions due to chronic diseases	• Good financial management in institutions • Unnecessary bed days prior to discharge (delayed discharges) • Number of day surgeries • Level of food service waste

Source: Conceptualized by authors (see corresponding paper of Pantig and Ulep)

The country barely measures data from individual-level clinical data, which could be aggregated and translated to population health indicators. The lack of indicators could be attributed to various reasons. In our interviews, what is apparent is the limited capacity of the technical offices within DOH to identify which indicators are relevant for DOH, PhilHealth, and providers and how they should be reflected and collected efficiently and correctly as data fields in EHRs. The absence of data standards in structure and meaning exacerbates the problem of collecting individual-level clinical data from facilities, which becomes more problematic when aggregating to population-level indicators. The need to demonstrate the importance of these indicators to health providers in their operations and planning is also critical. For example, the DOH has yet to demonstrate the potential benefit of *iClinicSys,* a government EHR that can aggregate individual and clinical data to population-level data useful for clinical and operational analysis. Because of the lack of demonstrable benefits, many hospitals need to be measuring and reporting standard quality and efficiency indicators, perhaps due to the perceived limited usability of these data (see Table 12). Only 20–30 percent measure inpatient quality indicators used in many health systems globally, such as post-discharge mortality, readmissions, and avoidable admissions.

One of the major challenges is the ambiguity surrounding how individual-level clinical data can be translated into population-level indicators to inform policies. However, a more fundamental challenge is operationalizing individual-level clinical data into a unified system that enables all DOH bureaus/programs to tap and generate the necessary indicators. This would reduce dependency on multiple and fragmented HIS. We argue that the presence of multiple HISs is largely attributed to the ambiguity of how these different data needs of DOH programs are related and how they could be rationalized to capture them in a unified platform. With a clear approach to integrating these constructs, the system can comprehensively capture and organize these interrelated constructs needed for decision-making. For example, instead of having separate systems for NCDs, HIV, and TB, a unified HIS could be used. This approach would allow for more efficient reporting of comparable data, reduce duplication of effort, and reduce unnecessary fields in EHRs.

Table 12. Hospital quality assurance monitoring

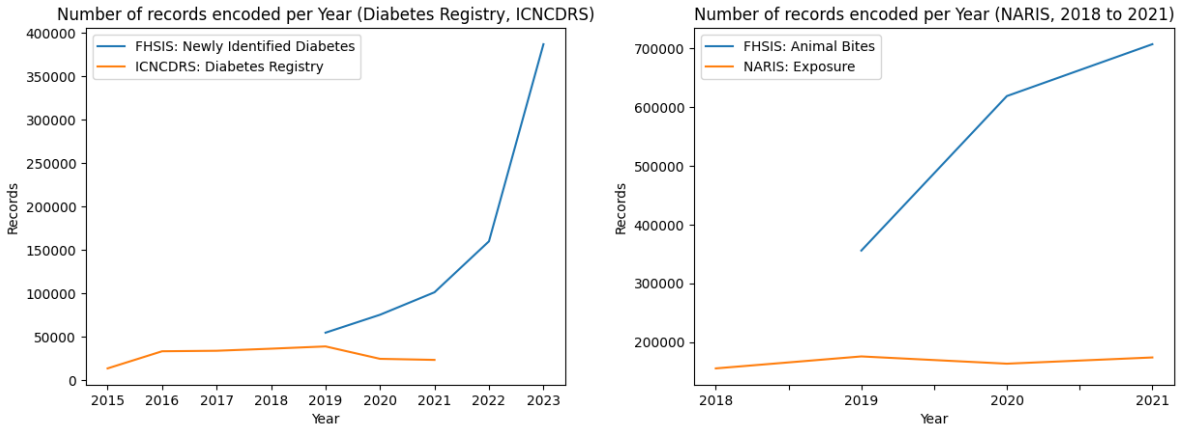
Variable	All Hospitals n=344	National n=29	LGU-Owned n=97	Private n=218
Presence of routine quality systems				
Quality assurance activities	321 (96)	28 (97)	87 (95)	206 (97)
Formal review for inpatient management	268 (82)	27 (93)	71 (77)	170 (82)
Death review for inpatients	233 (71)	26 (93)	63 (68)	144 (70)
Specific Inpatient Quality Indicators				
Hospital Acquired Infections	260 (78)	28 (97)	62 (67)	170 (81)
Bloodstream infections, n (%)	160 (51)	18 (69)	27 (31)	115 (57)
Urinary Tract Infection (UTI), n (%)	178 (58)	21 (84)	36 (42)	121 (61)
Ventilator acquired pneumonia (VAP), n (%)	122 (40)	18 (72)	15 (18)	89 (45)
Inpatient Deaths	269 (83)	26 (96)	71 (77)	172 (83)
Deaths within 30-days Post-discharge	77 (24)	8 (30)	19 (21)	50 (25)
Hospital Readmission within 30-days Post-Discharge	101 (32)	6 (22)	29 (33)	66 (33)
Avoidable Admissions	106 (33)	4 (15)	32 (35)	70 (34)
Surgical / Post-Operative Complications	202 (79)	16 (84)	48 (72)	138 (81)
Mortality	156 (60)	12 (57)	35 (51)	109 (66)

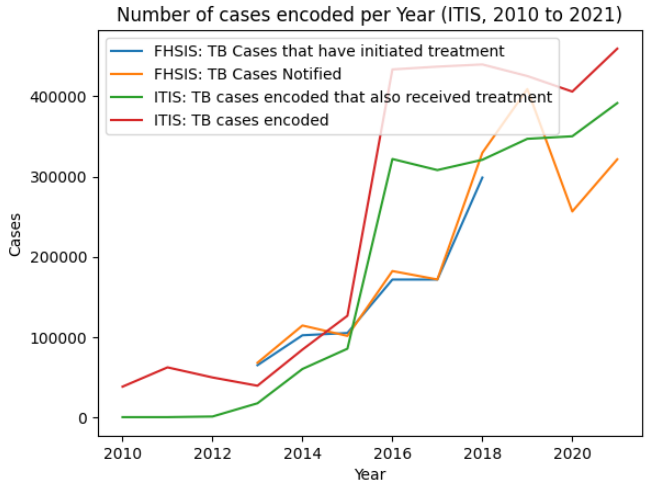
Surgical Wound Infection	155 (61)	9 (43)	35 (51)	111 (66)
Sepsis	150 (59)	8 (38)	33 (49)	109 (65)
Pulmonary Embolism	130 (50)	5 (25)	27 (40)	98 (57)

Source: Assessment of the Service Capability and Readiness of Philippine Hospitals to Provide High Quality Health Care (Ulep et al. 2021)

The quality of HIS indicators arising from DOH-owned HIS is questionable. Analysis of national documents (e.g., NOH and PDP) that contain health system performance indicators suggests the limited use of individual-level and clinical data from EHRs. Most indicators are estimates from national surveys. While valuable in measuring some population-level constructs (e.g., unmet needs, health literacy, etc.), they have limitations. Although some indicators in these documents (e.g., TB, HIV) are obtained from selected HISs (e.g., FHSIS), they may not be useful and potentially are of poor quality. For example, FHSIS relies on aggregated administrative data submitted hierarchically by RHUs to DOH, with LGUs using different approaches to data collection (e.g., some manual, some electronic). Since the data is aggregated, there is no mechanism to validate the accuracy of the data submitted by LGUs. Evidence suggests significant validity issues in the FHSIS. Analyzing tracer indicators in FHSIS suggests implausible values, such as vaccination rates exceeding 100 percent. Also, FHSIS fails to capture the state of health in LGUs, as it has yet to collect data from private healthcare facilities. Given these challenges, FHSIS has never been useful for national planning. The reliance on national surveys (limited to regional disaggregation) and poor administrative data (which is supposed to be extracted from EHR and provide LGU-level disaggregation) hinder targeted planning and LGU benchmarking, critical activities in measuring performance in a highly decentralized system. Figure 15 shows evidence of the comparability issues between FHSIS and other disease-specific FHSIS, suggesting severe quality issues.

Figure 15. Number of records in FHSIS vs. disease-specific HIS





Source: Authors' analysis of DOH data

5.3.2. Data standards

For data to be useful, it must be analyzable. Cornerstone to analyze data are standards which allow it to be shared across various agents regardless of the HIS or digital health solutions that agents are using. Without data standards, it is impossible to achieve comparability and compatibility of reports. This in turn, leads to duplication of data collection from various sources and redundancies in data analysis.

Data standards provide framework to understand language (syntax) and meaning (semantic) in order to send a message. It is fundamental in communicating from one point to the other. In the same way that human conversation cannot occur without shared word definitions, grammar, and context, all interactions of software systems are similarly mediated layer upon layer by rules (Hammond 2005). Due to the absence of human-like capacity to process gray areas of communication (such as the ability to comprehend typographic errors and fill in contextual information), data standards need to be specific and comprehensive for each intended purpose. Data has been standardized through different means such as: (1) metadata, (2) data integration, and (3) data architecture (DAMA 2017). In the earlier section of this paper, the proposed M and E Framework suggests the capture of patient level data in a structured format. Health Level Seven Fast Healthcare Interoperability Resources (HL7 FHIR) is an example of a messaging data standard for healthcare. It has a set of templates, called "resources", for exchanging specific patient level data such as medication, care provision, and claims data. It automates the entry of these data regardless of how they are encoded in the system. To analyze these structured data, semantic standards such as ICD and SNOMED-CT that are used to clarify meaning of health data and can reduce ambiguity of clinical terms. In general, these semantic standards reduce the risk of wrong advice among health care providers. Different semantic standards exist to address different uses of data in health care setting. SNOMED covers clinical findings, signs and symptoms and various clinical procedures which are useful for decision making among health care providers. On the other hand, ICD is used to retrieve diagnostic information for research and epidemiological purposes (WHO Family of International Classifications Network 2013).

Data standardization is necessary to communicate verbose health information, particularly electronic health records. Digitization made it possible to process and transmit

huge amounts of data beyond the capabilities of manual systems. However, unless each segment of a process can seamlessly communicate, the amount of human intervention necessary can diminish the advantages of digitization (Hammond 2005). For example, laboratory information systems that cannot directly communicate with the hospital records system may need an inordinate amount of manual encoding. The increasing demands for data, such as those provided in the Republic Act 11223, or the Universal Healthcare Act, for the establishment of systems for "enterprise resource planning, human resource information, electronic health records, and electronic prescription log" require each system to interoperate in such a way that each electronic prescription log can be electronically matched with the corresponding electronic health record of a patient. This increasing demand for data means that the health information system must not anymore simply produce rates of vaccination. It must now also provide a map of the people who have received those vaccinations and potentially from which healthcare facility the vaccination order originated, a degree of specificity most notably necessitated by the COVID-19 pandemic.

The DOH has developed data standards for healthcare and the health information system. The following written policy constitutes the data standardization published by DOH:

- DOH-PHIC Joint Administrative Order 2021-0002: Mandatory Adoption and Use of National Health Data Standards for Interoperability

The rationale section of JAO 2021-0002 provides that the policy is for achieving health information exchange between healthcare providers and the improved processing of health and health-related public health data. The stated objectives of JAO 2021-0002 are:

- Establish the core set of terminologies, definitions, and structures for data and reports processing, sharing, and exchange;
- Develop reference for market development of eHealth services, products, systems, applications, networks, and technologies; and
- Define the implementation governance to direct and coordinate the adoption and use of national health data standards, ensure alignment with national health systems goals, enable health systems integration, promote awareness and engagement of stakeholders, support and empower the needed change, implementation, and monitoring of results for delivery of expected benefits.

DOH-PHIC JAO 2021-0002 contains regulatory roles and procedures, and an extended annex containing data fields and their corresponding definitions. It is partly a consolidation of all DOH and PhilHealth form data fields as well as an attempt at a standardized model for healthcare delivery data. Table 13,

Table 14, and Table 15 contain excerpts of the data dictionary contained in JAO 2021-0002, for illustration. JAO 2021-0002 provides a meaningful dictionary for what data fields ought to be implemented in various software systems and reasonable semantic standardization for what each of those fields mean. However, JAO 2021-0002 provides limited syntactic information for how implementers will use the data standard. It is important to note that Section 4 of JAO 2021-0002 suggests that such specificity is a forthcoming feature of data standardization.

"Data elements" in DOH-PHIC JAO 2021-0002 are expressed in human-readable form instead of valid variable names for implementers and software. According to Sections 3.1 and 2.3 of the XML specification (a popular format to express structured data), 'attribute' and 'element' names cannot contain whitespaces (Extensible Markup Language (XML) 1.0 2008). Since

variables are expressed in XML through either attributes or elements, the data elements in DOH-PHIC JAO 2021-0002 cannot be expressed in XML format because they contain white spaces. Implementers that translate their dataset into XML for exchange or submission will have to invent XML-appropriate variable names to express the data elements. One system may call the PhilHealth ID as "PHIC_ID" while another may call it "PhilHealth_Identification_MemberDependent". To a human, this is intelligible. To a computer, these are entirely different variables.

The usage context of the data fields is insufficient and is left implicit to the implementer to determine. As seen in Table 13 and

Table 14, other than the use of indentations to signify grouping, there are no additional test case descriptions for the provided data elements. For example, in the case of the encounter log, the general guidelines that delineate what encounters warrant new encounter coding is not specified. It also needs to be clarified if the data dictionary provided is meant to be completely implemented internally by healthcare facilities, or if it is primarily a reference for those healthcare facilities that are mandated to submit reports to the DOH and PhilHealth. In the case of "Encounter Code" in

Table 14, it is unclear if the code is an internal unique but arbitrary coding system specific to the healthcare facility or if the code is an externally defined coding system that the healthcare facility must follow. Insufficient usage context faces the following problem scenarios:

Case 1: Encounter codes intended as an internal and healthcare facility-specific code
In this scenario, such a code has no external meaning aside from uniquely identifying transactions within the context of the specific healthcare facility. Any two healthcare facilities exchanging health records cannot append a particular patient's transaction into a particular encounter log because the other healthcare facility's system would not understand the encounter code used by the other healthcare facility, because the coding scheme is internally defined as unique to healthcare facilities.

Case 2: Encounter codes intended as an externally unique identifier of an encounter
There are an arbitrary number of ways to define and enforce a coding scheme. In this scenario, the coding system is undefined in JAO 2021-0002. For the purposes of this discussion, one example is the use of cryptographic hashes. Cryptographic algorithms such as SHA-2, commonly used in secure internet transactions, by design output very long alphanumeric codes from arbitrary input (say, "JuanDelaCruz1986Feb22") that are statistically unlikely and practically impossible to repeat. JAO 2021-0002 does not define the coding scheme to implement encounter codes.

Some data elements in DOH-PHIC JAO 2021-0002 are defined with insufficient constraint and precision. For example, in

Table 14, the data element "Type of Encounter" is defined as containing the categories of "Outpatient", "Emergency Room", or "Inpatient". However, individual systems may express and consequently communicate in this field very differently. It is unclear whether implementers should provide or store data using these values or if these provided values merely represent the meaning of the provided or stored data. For example, 1 for Outpatient, 2 for ER, etc. The provided 'definition' for encounter types is not labeled as constraint values and are alongside similarly qualitative definitions. In the case of "Hospital Statistics" in Table 15, the "Ten

Leading Causes of Morbidity, Disaggregated" is a compound variable whose contained information require more fields. Although compound fields can be implemented, an underlying format is necessary for standardized communication.

No "endpoints" or electronic interfaces provided. DOH-PHIC JAO 2021-0002 provides for the electronic standardization of health data and DOH-PHIC-DICT JAO 2021-0001 is the regulatory process through which this standardization is tested. However, once implemented by various health IT systems, the practical utility of having complied to the standard is unclear in the written policies. One such practical utility is any electronic interface through which such data might be transmitted to and from. Such electronic interfaces, called Application Programming Interfaces (APIs) or endpoints, are not yet provided in written policies.

APIs help automate the enforcement of data standards. Some of the practical utility of available electronic interfaces from the perspective of the implementers are: (1) endpoints concretely demonstrate the use-case and value proposition for undergoing the investment. Without endpoints, the ensuing health IT systems are analogous to cellular devices without cellular reception. (2) APIs inherently test the correctness of the work being undertaken by the implementers. Like an internet browser responding to subtle mistakes in a URL, APIs provide implementers with real-time direct feedback about the work being undertaken. Therefore, the absence of endpoints from regulators provides uncertainty about the fruitfulness of undergoing investment and serious change management for a "compliant" health IT system.

Table 13. National Health Data Standards (Master Person Data)

DATA ELEMENT		DEFINITION	SOURCE OF DEFINITION
MASTER PERSON DATA			
1	PhilHealth Identification Number (Member or Dependent)	A unique and permanent number issued to any client upon enrolment/ membership registration to the National Health Insurance Program of the Corporation for purposes of identification, eligibility verification, and utilization recording.	1. DOH Administrative Order 2013-0025: National Implementation of Health Data Standards for eHealth Standardization and Interoperability (eHSI Release 001). 2. Captured in PhilHealth Membership Registration and Claims Forms
2	PhilSys Number	A randomly generated, unique, and permanent identification number that will be assigned to every citizen or resident alien upon birth or registration by the PSA.	Republic Act 11055 (Sec.5): Philippine Identification System Act
3	Taxpayer Identification Number	A nine-digit number assigned by the Bureau of Internal Revenue (plus a three-digit branch code, if applicable) to any person, whether natural or juridical, required under the authority of the Internal Revenue Code to make, render or file a return,	Section 236 (i) of the Tax Code.

		statement or other documents for his proper identification for tax purposes	
4	Passport Number	A unique identification code issued by the Philippine government to its citizens and requesting other governments to allow its citizens to pass safely and freely, and in case of need to give him/her all lawful aid and protection.	Republic Act 8329 (Sec.4): Philippine Passport Act of 1996
5	Person with Disability (PWD) Identification Number	A unique identification code issued to any Bonafide person with permanent disability	NCDA Administrative Order No. 001 Series of 2008: Guidelines on the Issuance of Identification Card Relative to Republic Act 9442

Source: Annex B. Release 01 of Mandatory National Health Data Standards for Adoption and Use, DOH-PHIC JAO No. 2021-0002 Mandatory Adoption and Use of National Health Data Standards for Interoperability

Table 14. National Health Data Standards (Encounter Log)

DATA ELEMENT		DEFINITION	SOURCE OF DEFINITION
ENCOUNTER LOG			
1	Encounter Code	Setting and condition in which the encounter takes place. It collectively constitutes health care provider code, PhilHealth identification number of the patient, date and time of encounter, as represented by a code.	PhilHealth Circular 2020-0002: Governing Policies of the Konsultasyong Sulit at Tama (PhilHealth Konsulta) Package: Expansion of the Primary Care Benefit to Cover All Filipinos
2	Health Facility Code	DOH-issued unique health facility code as generated from the National Health Facility Registry (NHFR)	DOH AO 2019-0060: Guidelines on the Implementation of the National Health Facility Registry
3	PhilHealth Identification Number	PhilHealth identification number of patient. A unique and permanent number issued to any client upon enrolment/membership registration to the National Health Insurance Program of the Corporation for purposes of identification, eligibility verification, and utilization recording.	1. DOH Administrative Order 2013-0025: National Implementation of Health Data Standards for eHealth Standardization and Interoperability (eHSI Release 001) 2. PhilHealth Circular 2020-0002: Governing Policies of the Konsultasyong Sulit at Tama (PhilHealth Konsulta) Package: Expansion of the Primary Care Benefit to Cover All Filipinos
4	PhilHealth Claim Series #	PhilHealth Issued Series #	PhilHealth Claims Forms 1-4
5	Hospital Patient ID #	Hospital Patient ID #	1. DOH Hospital Health Information Management Manual 2. PhilHealth Claim Form 4
6	Hospital Registry #	Registry number assigned by the health facility to the patient	
7	Hospital Case #	Primary identifier used by the health facility to identify a patient for each case or incidence	
8	Type of Encounter	Outpatient / Emergency Room / Inpatient	

Source: Annex B. Release 01 of Mandatory National Health Data Standards for Adoption and Use, DOH-PHIC JAO No. 2021-0002 Mandatory Adoption and Use of National Health Data Standards for Interoperability

Table 15. National Health Data Standards (Hospital Statistics)

DATA ELEMENT		DEFINITION	SOURCE OF DEFINITION
HOSPITAL STATISTICS			
29	Ten Leading Causes of Morbidity	The Top Ten Leading Causes of Morbidity as of midnight last day (December 31st) of previous year to the following year (January 1)	1. DOH Hospital Health Information Management Manual 2. DOH AO No. 2012-00012, Annex E: Annual Hospital Statistical Report 3. DOH DM No. 2014-0015, specifically on New Hospital Statistical Report Form
30	Ten Leading Causes of Morbidity / Diseases Disaggregated as to Age and Sex	Top 10 leading causes of Morbidity/Diseases with detailed sub-categories for Age and Sex.	
31	Total Number of Deliveries	Total number of all types of deliveries. Total number of live-birth vaginal deliveries (normal) + Total number of live-birth cesarean (given period of time is January 1 to December 31st of the reporting year)	
32	Number of Outpatient Visits, new patient	Refers to the total number of outpatient first visits that was attended and who received health care services in the facility for a period of time. (given period of time is January 1 to December 31st of the reporting year)	
33	Number of outpatient visits, re-visit	Refers to the total number of outpatient second and subsequent visits that was attended and who received health care services in the health care facility for a period of time. (given period of time is January 1 to December 31st of the reporting year)	
34	Number of outpatient visits, pediatric	Total number of pediatric outpatient visits (Age 0 to 18; before 19th birthday) (given period of time is January 1 to December 31st of the reporting year)	

Source: Annex B. Release 01 of Mandatory National Health Data Standards for Adoption and Use, DOH-PHIC JAO No. 2021-0002 Mandatory Adoption and Use of National Health Data Standards for Interoperability

5.3.3. Data Management

5.3.3.1. Point of Entry: Healthcare Facilities

In general, the data management practices in healthcare facilities vary according to the degree of specificity provided by each HIS process and the degree of the health facility's achievement of digitization. For example, the FHSIS (indicator-based surveillance) and PIDSR (event-based surveillance) have individual Manual of Operating Procedures which are effective instructions for healthcare staff on how to conduct HIS activities. However, the existence of guidelines alone does not necessarily translate to a corresponding up-to-par data management practice as mastery of HIS guidelines (Murai, Ventura, and Gaite 2022) and manufacturing data to meet targets (Tolentino et al. 2005) by primary care staff are some of the practical data management issues afflicting HIS. Values such as percentages that exceed 100% and inconsistent tallies are regular issues that arise in the preparation of the FHSIS annual dataset of the EB, as field service data is propagated from public primary care facilities to the DOH.

In the case of hospitals, the Hospital Health Information Management Manual provides data management practice guidelines that address the typical record-keeping work processes and regulatory data requirements of a hospital (Health Facility Development Bureau 2020). The manual provides general guidelines on record-keeping, such as paper-based health record indexing, medico-legal protocols for patient records, and additional instructions for preparing the hospital statistical report. It also contains a conceptual introduction to electronic health records and basic change management guidelines on transitioning away from paper-based record-keeping. The Hospital Health Information Management Manual can standardize hospital information management, positively affecting data quality. In this sense, the manual is the sole general data management guideline the DOH provides. Updating this guideline to include additional data standardization practices and leveraging data on hospital related indicators as measures of quality of care is one avenue at which that will bring value for data standardization and management.

Organizing and transforming health processes for integration and digitization is one systemic solution for data management issues. However, the technical debt of the DOH's health information system comes to the fore at the healthcare facility level. The persistence of competing vertically integrated information systems in every healthcare facility means that healthcare staff either need to be proficient in numerous processes or make a practical decision to prioritize a few (Tolentino et al. 2005). As such, horizontal integration is a must and therefore, must be solved at the level of the data standardization policies of the DOH. Data standardization policies must also be fixed, since it was discussed to contain technical errors that prevent actual implementation. Parallel to these process integration issues are practical issues in the field that are beyond the mandate of the DOH and may require assistance from other line agencies of the government. Infrastructure issues remain a problem in many areas of the country, such as the basic availability of electricity (Francisco and Abrigo 2023) on top of connectivity and equipment. As this, digitization is not a sole solution that can just be imposed onto the health workforce. The earnest adoption of electronic tools requires serious change management to change work cultures and attitudes (Macabasag et al. 2022) and a new way of working that cannot be expected to simply be digested by healthcare staff (Murai et al. 2022).

5.3.3.2. DOH Central Office

The data management practices in the DOH central office varies, even within the same bureau. Current data management practices in the DOH vary for each HIS , with epidemiologic case surveillance adopting a more sophisticated data management practice. To illustrate this variation in practices and the effects of a lack of an overarching policy on data management, the data management practice of PIDSR is contrasted with that of FHSIS.

There is a gap between written and actual data management policy in the DOH. Distinction is being made in the discussion between written and actual data management guidelines or solutions in the central office. Similar to the gap between written and actual HIS processes, there is also a gap between written and actual data management-related policies in the DOH. Written policies such as DOH-PHIC JMC 2021-0001, a specific articulation of Section 35 of the UHC Law, states that there shall be a National Health Data Repository (NHDR) to contain all public health data. The policy provides for a central storage of DOH data and potentially a central hub for electronic health record exchange. However, despite the presence of a strategic framework and investments on data standardization tools, the NHDR is not yet operational and adopted by agents of the health system.

The management of case surveillance data of the DOH is relatively exemplary. The clamor for change during the COVID-19 pandemic led to some improvements in the data management practices of the DOH. Case surveillance data in general of the EB are now stored in structured relational databases, following the need for more robust data management practices due to the sheer volume of COVID-19 case data. This transition led to the upskilling of existing data management staff in the EB. Python scripts have been implemented which automate much of the processing of case surveillance data. There are also on-going efforts to restructure other surveillance datasets such as the Adverse Effects Following Immunization (AEFI) to achieve horizontal integration across the different surveillance databases.

The management of field health service data must be improved. On the other hand, the Field Health Services data (FHSIS) of the EB are exclusively stored and managed as offline spreadsheets. In reality, the FHSIS is only a comprehensive table of tallied services rendered by public primary care facilities. For example, the number of fully immunized children is reported through the FHSIS. Since the data collection for FHSIS are fundamentally paper-based tallies, the underlying dataset of the FHSIS is no more comprehensive than the dataset found in the annual report. The simplicity of the dataset therefore has not prompted the use of more sophisticated data management because simpler tools and practices have proven sufficient. Both the DOH regional offices and the EB generally use spreadsheets to process and store the dataset. However, this practical, albeit crude, approach to data management was only recently addressed (CY 2025) with additional guidelines to strengthen data security. In principle, years' worth of datasets or millions of rows of data on service delivery can be permanently lost due to a single hardware failure. Master datasets are sometimes stored, without redundancy, on personal flash drives or locally in staff computers.

The absence of an overarching data management policy or solution is observable across different DOH datasets. The comparison between PIDSR and FHSIS data management illustrates the spectrum of existing data management practices in the DOH. As mentioned, data management practices in the DOH do vary for each HIS process. In the case of the Annual Hospital Statistical Report of the Health Facilities and Services Regulatory Bureau (HFSRB),

the dataset is prepared by each hospital as a report submitted for regulatory purposes. The lifecycle of the hospital statistics therefore ends at the point of submission of the report to the HFSRB. The utility of the dataset typically does not go beyond the regulatory concerns of HFSRB. In the case of the Integrated Tuberculosis Information System (ITIS), there is no data management process at the DOH level. The quality of the dataset solely depends on the diligence of encoders at the healthcare facilities. Each healthcare facility takes the tuberculosis data from the report generated by ITIS, which is subsequently submitted to the DOH. Therefore, the data management standard for ITIS is limited to whatever ITIS itself can enforce. This goes the same for disease-based registries where data end-up in rows and individual-based interventions are not tracked nor monitored for continuity of care. To solve this issue, there is a need to review people, processes, and technology, and data within the DOH to determine how each of these mentioned components form a holistic whole for data stakeholders.

5.3.4. Dissemination and Use

The data management practices and the degree of horizontal integration of the HIS in the DOH central office affects how the public accesses public health data. The poor achievement of horizontal integration fragments the way the datasets are accessed. Rudimentary data management practices further provide a technological barrier. The offline and unstructured storage of datasets such as FHSIS cannot be readily connected to a data dissemination website that uses dynamic queries. For example, the public needs help to query tuberculosis-related data over the past ten (10) years. They will need to gather the FHSIS reports over that period and browse the seven hundred- (700) page documents to gather their dataset. The task is made further tedious in the case of sub-national data. In addition, since data sets are not machine-readable, trend or any type of analysis is almost impossible.

Simple data management practices exchange convenience for robustness. Such crude, albeit practical, data warehousing has traded the accessibility of spreadsheet tools over the additional burden of upskilling, leading to unnecessary clerical work to accommodate bespoke data requests from the public. Unsuspecting students and researchers resort to directly requesting data from the DOH through mechanisms such as the Freedom of Information (FOI) channels, which unnecessarily disrupts the work of technical staff. Since the underlying dataset of the FHSIS is stored as spreadsheets in someone's work on a computer, requests that are essentially historical time-series data require unearthing rarely used spreadsheet archives from a specific staff computer or portable storage device. It is paramount that FOI requests for data are studied and analyzed to strategically position resources for ensuring data is available for public consumption as its collection was purely funded by the government, and therefore, must be used by the greater population.

The DOH has a demonstrable capacity to implement robust data management solutions. This contrasts with the DOH's COVID-19 dashboard, which is directly connected to a Big Query relational database. Data management practices import cleaned data into the central relational database without needing a separate process to prepare data for the public dashboard. Updating the main database, therefore, immediately leads to an updated public dashboard. The creation of this dashboard proved that it is possible to update data management strategies and projects within the DOH when the need and test case are clear and communicated.

In summary, three (3) technical areas of concern are identified in this discussion: (1) the deficiencies in the data standardization policies of the DOH, how these deficiencies contribute

to (2) the underachievement of the HIS, as shown by the relative immaturity of data in DOH-owned health IT, and finally, the need to address (3) the broader data management practices in the DOH to achieve data security and enable auxiliary systems that rely on structured data.

VI. Conclusions and Recommendations

This report used the *process-people-product* framework to identify the gaps and challenges in HIS. Key challenges were found in governance and organizational structures, financing, health human resources, and standards and data management issues. Based on these findings, we put forward recommendations with the hope of improving HIS across *agents* in the health system, including regulators and stewards (i.e., DOH), purchasers (i.e., PhilHealth), providers (i.e., health facilities, healthcare providers, and local governments), and patients.

Our recommendations include clarifying the role of health sector institutions and reimagining the strategic roles of DOH offices.

6.1. Rationalize the data governance framework

6.1.1. Clarifying the role of health sector institutions

One of the critical challenges in the governance structure highlighted in this report is the ambiguity of roles among institutions in the HIS. While this ambiguity may seem like a macro-level issue, it is a major source of implementation bottlenecks and inefficiencies within the system. We propose, therefore, the following:

- The DOH, particularly KMITS, should prioritize its role as the primary authority for setting data standards that all EHRs, including private providers, should abide by. This function includes establishing clear and enforcing data and interoperability standards across the health sector. The DOH should bolster its IT project planning strategies to be able to assess which systems to be developed or outsourced on the basis of cost effectiveness and long-term software viability at par with industry standards. This may require abandoning its role as a 'system developer' and technical support provider. With this, it also follows the need to relinquish regulatory activities that unnecessarily restrict the market for HIS and instead, incentivize adoption of data standards that will bring value to health services through the PhilHealth. With this shift, the DOH can re-align and rationalize its existing HR capacity towards strategic roles, improving its ability to nurture interoperable HIS, reduce operational redundancies, and enable private sector developers and other health system actors to have a well-defined regulatory framework.

- Reimagining PhilHealth's strategic role in HIS. The UHC Act is clear. Under Section 31 of the Act, PhilHealth is authorized to hold patient-level clinical data, which can be utilized for population-level analysis and health system planning. This unique position allows PhilHealth to leverage its capacity to incentivize and mandate providers through value-based financing.

> **Section 31: "***All public and private, national and local health-related entities shall be required to submit health and health-related data to PhilHealth, including, among others, administrative, public health, medical, pharmaceutical and health financing data: Provided That PhilHealth shall furnish the DOH a copy of the health data:"*

This provision in the UHC Act highlights the strategic role of PhilHealth in strengthening the HIS. With the standards set by DOH, PhilHealth can promote interoperability as a central repository for patient-level clinical data. As the country's purchaser, it can mandate or incentivize health facilities to submit standard and high-quality data, including key quality and efficiency indicators. This is a straightforward need as it implements DRGs, which rely on standard indicators for effective implementation. However, this requires addressing adaptive and technical challenges within PhilHealth, particularly limited HR and ICT infrastructure, to ensure data integrity, privacy, and security.

Box 3. Value-based financing: Paying for data

The Hospital Inpatient Quality Reporting (IQR) Program is a pay-for-reporting program for acute care hospitals. Under this program, CMS requires subsection (d) hospitals to submit data on quality measures to CMS each year. Subsection (d) hospitals are acute care hospitals that are paid under the Inpatient Prospective Payment System. Subsection (d) hospitals exclude the following types of hospitals: children's, inpatient psychiatric, long-term care, rehabilitation hospitals and the 11 Prospective-Payment System Exempt cancer hospitals.

Data collected under the Hospital IQR Program is publicly available to consumers and providers on the Care Compare website at: https://www.medicare.gov/care-compare/?providerType=Hospital. This data transparency helps consumers make more informed decisions about healthcare options and encourages hospitals and clinicians to improve the quality of inpatient care provided to all patients.

The Hospital Inpatient Quality Reporting Program was originally mandated by Section 501(b) of the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) of 2003. This section of the MMA authorized CMS to pay hospitals that successfully report designated quality measures a higher annual update to their payment rates. Initially, the MMA provided for a 0.4 percentage point reduction in the annual market basket (the measure of inflation in costs of goods and services used by hospitals in treating Medicare patients) update for hospitals that did not successfully report. The Deficit Reduction Act of 2005 increased that reduction to 2.0 percentage points. This was modified by the American Recovery and Reinvestment Act of 2009 and the Affordable Care Act of 2010, which provided that beginning in fiscal year (FY) 2015, the reduction would be by one-quarter of such applicable annual payment rate update if all Hospital Inpatient Quality Reporting Program requirements are not met.

Source: (Centers for Medicare & Medicaid Services 2025)

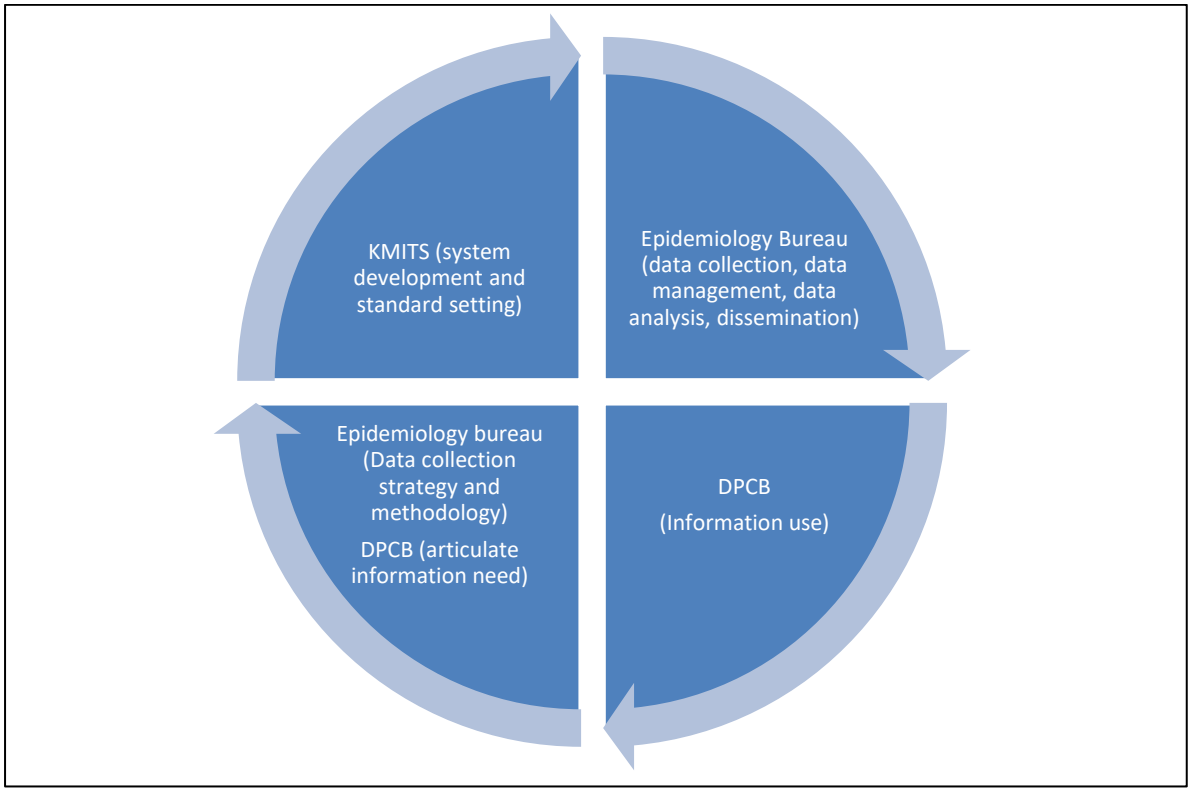
6.1.2. Clarify the roles of offices within DOH

To address longstanding inefficiencies, streamline the data governance framework within DOH and clarify the roles of DPCB, KMITS, and EB.

Figure 16 shows the possible roles of data governance and data process. EB should be the lead steward from collection to information distribution. As lead steward, EB ensures data is

collected, managed, and analyzed properly. It is EB's responsibility to produce quality information for DPCB. Therefore, EB is responsible for ensuring that no unnecessary data collection is performed and that no useless data fields are implemented. While EB should facilitate proposed analysis, as the information generator, EB decides what information and data are worth adopting and releasing. As a stakeholder, DPCB should agree with EB on methodology and how information is produced. This ensures stakeholder confidence in the quality of information and the integrity of the data process. EB orients DPCB on the current data collection, inventory, and processing state. This ensures that DPCB understands what EB can and cannot do and where changes can be made for both EB and DPCB. Knowing the concrete limitations of data collection, DPCB should adjust its indicators to represent reliable public health measures. Long-term investments in data generation can be targeted, and grand HIS plans can be tempered. The health sector should veer away from the fragmented ownership of data and temper the tendency of DPCB offices to create new and fragmented data collection systems.

Figure 16. Data governance framework within DOH



Source: Authors' illustration

6.2. Make interoperability a reality

Operationalize and streamline the implementation of national health data standards as outlined in DOH-PHIC JAO 2021-0002 (National Health Data Standards). DOH, as part of its stewardship function, private developers of EHR systems must ensure that all required data elements are captured, both in terms of semantics and structure. Upon reviewing the JAO, we observed that many data elements remain program and disease-specific, a feature a well-

designed HIS should avoid. These elements should be consolidated into standard diagnostic fields. For example, hypertension, diabetes, tuberculosis, and maternal and child health profiles can be converted to the "Diagnosis" field and must use ICD-10 coding. The JAO also contains unnecessary data fields that may not be necessary and must be rationalized or at least prioritized. We argue that DOH rationalizes data fields that capture and calculate continuity and quality of care. PhilHealth also needs critical data fields, including secondary diagnosis and procedural codes (e.g., using ICD9-CM or SNOMED), as it transitions to DRGs. In prioritizing which data elements in the JAO must be rationalized, they must be grouped and ranked according to their use and priority.

DOH should develop a clear and manageable approach for EHR developers and health facilities/providers. Test cases of interoperability should demonstrate value for patients and health care providers. For the longest time, submission of data from the ground only benefits central mandate (DOH and PhilHealth). It is high time for the government to strongly show utility of costly data collection over the years on how it impact patient care. For an instances, insetead of monitoring cases, EHR data should be able to show performance for reduced readmission rates for certain tracer conditions, medication dispensing and consumption, and 30-90 day post admission and mortality data. This can be done by translating national clinical practice guidelines to digital health solutions that will maximize the use of EHRs for true longitudinal care.

Lastly, following countries' approaches in encouraging providers to implement standard data elements, the DOH and PhilHealth should develop a level-of-compliance program for developers and facilities that provides corresponding cash and non-cash incentives which health facilities and developers could use to improve practices, leverage operations, and innovate solutions for improved patient care.

VII. Implementation Considerations for Future Activities of the Sentinel Sites Program

As the Sentinel Sites Program continues to support public health monitoring and evidence-based decision-making in the Philippines, addressing operational, technical, and systemic challenges is essential to maximize its impact. Building on the policy recommendations above, which emphasized HIS governance, institutional roles, and interoperability, these implementation considerations focus on the operational gaps and challenges identified using the process-people-product framework. Insights from the data collected among the sentinel sites in Bataan reveal persistent challenges that hinder full potential of HIS. The following considerations translate these insights into actionable measures, guiding the DOH and LGUs to optimize HIS operations, unify indicators, build workforce capacity, and ensure sustainable implementation. These measures aim to ensure that sentinel sites remain responsive, efficient, and capable of generating reliable, actionable information for health system planning, and local decision-making.

- HRH adequacy for system functionality

  The DOH and LGUs should develop a comprehensive workforce strategy that defines human resource needs specific to HIS operations across national, regional, and local levels. This includes establishing standardized staffing allocations for HIS functions in

RHUs and program offices. Capacity building must go beyond one-time orientation and deliver regular, needs-based training and refresher courses that align with system updates. Implementation should prioritize in-person and blended learning modalities as health workers report these to be more effective than purely online approaches. Investments in a competency framework, dedicated HIS positions, and sustained training resources will help ensure the effective use and long-term sustainability of HIS reforms.

- Sustainable financing and resource allocation

  Sustainable financing for an integrated health information system requires urgent coordinated action from both national and local governments. National allocations to HIS have steadily declined, often due to low absorptive capacity, while LGUs devote less than 5 percent of health capital spending to HIS, leaving critical ICT needs underfunded (see **Figure 8**). The government must enforce LGU counterpart financing for DOH-provided systems, link HIS support to performance-based grants, and integrate HIS costs within existing programs. Strengthening absorptive capacity and demonstrating effective fund utilization will secure sustained and increased investment, ensuring that HIS can support comprehensive, high-quality health service delivery.

- Capacity for data use and decision making

  Collecting data alone is insufficient. The health system must actively use information to drive decisions and improve outcomes. National and local staff must be equipped to analyze, interpret, and apply HIS outputs to planning, resource allocation, and service delivery. In Bataan, RHU personnel often enter data but rarely leverage it for local health planning. Addressing this gap will maximize the impact of HIS investments and ensure that sentinel site data directly informs decisions at all levels of the health system.

- Unified Indicator System

  Strengthening health system monitoring requires a coherent and standardized indicator framework that draws from individual-clinical data as the backbone of performance measurement. Institutionalize clear data standards for EHRs to ensure indicators are consistently defined and comparable across facilities and programs. A unified indicator system would enable systematic measurement of effectiveness, patient-centeredness, and efficiency, moving beyond the current heavy reliance on fragmented surveys and aggregated FHSIS reports. Aligning DOH bureaus and program offices under a single performance monitoring framework and expanding reporting to include both public and private facilities, will provide a more accurate, comprehensive picture of system performance.

- Public access and data transparency

  Data management practices and the limited horizontal integration of DOH information systems directly shape how the public can access health data. Weak integration fragments datasets and complicates retrieval. For instance, FHSIS stores data offline and in unstructured formats, preventing linkage to modern dissemination platforms with dynamic queries. Current practices trade robustness for convenience. Storing

FHSIS data as spreadsheets may ease internal use but creates clerical burden and forces the public to rely on FOI requests, diverting staff time and resources. Given that FHSIS is publicly funded, such limited accessibility undermines accountability and public value.

Yet the DOH has already shown that stronger systems are possible. The COVID-19 dashboard, built on Big Query relational database, enabled automatic real-time updates without extra processing. This underscores the need for DOH to institutionalize such approaches beyond emergency contexts, ensuring that modern, consistent data management practices become the standard for improving efficiency and transparency.

VIII. References

Aberin, Kim. 2023. "Bataan, an Epitome on Health Care." https://bataan.gov.ph/news/bataan-an-epitome-on-health-care/.

Agency for Healthcare Research and Quality. 2013. "Clinical Decision Support." https://www.ahrq.gov/cpi/about/otherwebsites/clinical-decision-support/index.html.

Aljunid, Syed Mohamed, Samrit Srithamrongsawat, Wen Chen, Seung Jin Bae, Raoh-Fang Pwu, Shunya Ikeda, and Ling Xu. 2012. "Health-Care Data Collecting, Sharing, and Using in Thailand, China Mainland, South Korea, Taiwan, Japan, and Malaysia." *Value in Health* 15(1):S132–38. doi:10.1016/j.jval.2011.11.004.

Arslan, I. G., R. A. Verheij, K. Hek, and L. Ramerman. 2024. "Lessons Learned from a Pay-for-Performance Scheme for Appropriate Prescribing Using Electronic Health Records from General Practices in the Netherlands." *Health Policy* 149:105148. doi:10.1016/j.healthpol.2024.105148.

Australian Government. 2024. "National Notifiable Diseases Surveillance System (NNDSS)." Australian Government Department of Health and Aged Care. https://www.health.gov.au/our-work/nndss.

Australian Institute of Health and Welfare. 2002. "Australia's Health 2002." https://www.aihw.gov.au/reports/australias-health/australias-health-2002/contents/table-of-contents.

Bagherian, Hossein, and Mohammad Sattari. 2022. "Health Information System in Developing Countries: A Review on the Challenges and Causes of Success and Failure." *Medical Journal of the Islamic Republic of Iran* 36:111. doi:10.47176/mjiri.36.111.

Boyce, Tammy, and Brown. 2019. "Economic and Social Impacts and Benefits of Health Systems: Report." https://www.who.int/europe/publications/i/item/9789289053952.

Braa, Jørn, Ole Hanseth, Arthur Heywood, Woinshet Mohammed, and Vincent Shaw. 2007. "Developing Health Information Systems in Developing Countries: The Flexible Standards Strategy." *MIS Quarterly* 31(2):381–402. doi:10.2307/25148796.

Bryant, Amanda. 2016. "Electronic Health Records and Immunization Information Systems Interoperability: Measuring Impact on Immunization Outcomes." doi:10.57709/7934207.

CDC. 2024. “Electronic Laboratory Reporting (ELR).” https://www.cdc.gov/electronic-lab-reporting/php/about/index.html.

Center for Effective Practice,. 2024. “Canadian Best Practices for the Development of Effective Clinical Decision Support Systems for the Management of Chronic Pain in Primary Care.” https://cep.health/clinical-products/chronic-non-cancer-pain/.

Centers for Medicare & Medicaid Services. 2025. “Hospital Inpatient Quality Reporting Program | CMS.” https://www.cms.gov/medicare/quality/initiatives/hospital-quality-initiative/inpatient-reporting-program.

CIHI. 2022. “Health Workforce Database Metadata | CIHI.” https://www.cihi.ca/en/health-workforce-database-metadata.

Co, Pura Angela, Ileana Vîlcu, Denese De Guzman, and Eduardo Banzon. 2024. “Staying the Course: Reflections on the Progress and Challenges of the UHC Law in the Philippines.” *Health Systems & Reform* 10(3):2397829. doi:10.1080/23288604.2024.2397829.

Cortez, Joey Ernehst, Jorge Kenneth Ishii, Angelica Mae Ongkiko, Clinton Ortega, Bernardino Malang, and Florinda Vigonte. 2023. “Health Information System Users in Public Health Facilities: A Descriptive Analytics.” https://www.researchgate.net/publication/367287436_Health_Information_System_Users_in_Public_Health_Facilities_A_Descriptive_Analytics.

DAMA. 2017. “DMBoK - Data Management Body of Knowledge.” https://www.dama.org:443/cpages/body-of-knowledge.

Dayrit, M. M., L. P. Lagrada, O. F. Picazo, M. C. Pons, and M. C. Villaverde. 2018. “The Philippines Health System Review.” *Health Systems in Transition* 8(2). https://iris.who.int/handle/10665/274579.

De Mesa, Regine Ynez H., Cara Lois T. Galingana, Carol Stephanie C. Tan-Lim, Mark Anthony U. Javelosa, Janelle Micaela S. Panganiban, Noleen Marie C. Fabian, Ysabela Calderon, Mia P. Rey, Nannette Bernal-Sundiang, Josephine T. Sanchez, Leonila F. Dans, Ray U. Casile, and Antonio L. Dans. 2024. “Facing the Digital Frontier: Exploring User Acceptance of Electronic Health Records in an Urban, Rural and Remote Setting in the Philippines.” *BMJ Open Quality* 13(2):e002621. doi:10.1136/bmjoq-2023-002621.

Department of Health. 2023. “UHC Implementation Report as of June 2023.” https://drive.google.com/file/d/1VQWPfMkSrHirdwAxErGZA60MPgxXdAiT/view?usp=sharing&usp=embed_facebook.

Dredge, Robert, Christian Edward Nuevo, and Antonio Ramon Paterno. 2021. “Policy and Implementation Insights on Provider Payment Reforms of the Philippine Health Insurance Corporation.” https://thinkwell.global/provider-payment-policy-reforms-philippines/.

Duodecim. n.d. “The Evidence-Based Medicine Electronic Decision Support (EBMEDS).” Retrieved December 16, 2024. https://www.duodecim.fi/english/products/ebmeds/.

Edo, Onome Christopher, David Ang, Egbe-Etu Etu, Imokhai Tenebe, Solomon Edo, and Oladapo Ayodeji Diekola. 2023. “Why Do Healthcare Workers Adopt Digital Health Technologies - A Cross-Sectional Study Integrating the TAM and UTAUT Model in a Developing Economy.” *International Journal of Information Management Data Insights* 3(2):100186. doi:10.1016/j.jjimei.2023.100186.

EO 292. 1987. *Administrative Code of 1987*.

Epizitone, Ayogeboh, Smangele Pretty Moyane, and Israel Edem Agbehadji. 2023. “A Systematic Literature Review of Health Information Systems for Healthcare.” *Healthcare (Basel, Switzerland)* 11(7):959. doi:10.3390/healthcare11070959.

Evio, Bettina, and Sheila Bonito. 2024. “Formative Evaluation of the Implementation of eHealth in the Philippines: A Qualitative Study | Acta Medica Philippina.” https://actamedicaphilippina.upm.edu.ph/index.php/acta/article/view/9289.

Extensible Markup Language (XML) 1.0. 2008. “Extensible Markup Language (XML) 1.0 (Fifth Edition).” https://www.w3.org/TR/2008/REC-xml-20081126/.

Farnham, Andrea, Georg Loss, Isaac Lyatuu, Herminio Cossa, Alexandra V. Kulinkina, and Mirko S. Winkler. 2023. “A Roadmap for Using DHIS2 Data to Track Progress in Key Health Indicators in the Global South: Experience from Sub-Saharan Africa.” *BMC Public Health* 23(1):1030. doi:10.1186/s12889-023-15979-z.

Farnham, Andrea, Jürg Utzinger, Alexandra V. Kulinkina, and Mirko S. Winkler. 2020. “Using District Health Information to Monitor Sustainable Development.” *Bulletin of the World Health Organization* 98(1):69–71. doi:10.2471/BLT.19.239970.

Francisco, Kris, and Michael Abrigo. 2023. “Electricity Supply Interruptions and Its Impact on Local Economies.”

Government of Australia. 2023. “Department of Health and Aged Care Data Strategy 2022–25.” Australian Government Department of Health and Aged Care. https://www.health.gov.au/resources/publications/department-of-health-and-aged-care-data-strategy-2022-25?language=en.

Hagel, Christiane, Chris Paton, George Mbevi, and Mike English. 2020. “Data for Tracking SDGs: Challenges in Capturing Neonatal Data from Hospitals in Kenya.” *BMJ Global Health* 5(3). doi:10.1136/bmjgh-2019-002108.

Hammond, W. Ed. 2005. “The Making And Adoption Of Health Data Standards.” *Health Affairs* 24(5):1205–13. doi:10.1377/hlthaff.24.5.1205.

Hammond, W. Ed, Christopher Bailey, Philippe Boucher, Mark Spohr, and Patrick Whitaker. 2010. “Connecting Information to Improve Health.” *Health Affairs (Project Hope)* 29(2):284–88. doi:10.1377/hlthaff.2009.0903.

Health Facility Development Bureau. 2020. “Hospital Health Information Management Manual, 4th Edition.”

Health Intervention and Technology Assessment Program. 2016. “HITAP: มูลนิธิเพื่อการประเมินเทคโนโลยีและนโยบายด้านสุขภาพ The Quality and Outcomes Framework (QOF) in Thailand.” https://www.hitap.net/en/176574.

Health Metrics Network and WHO. 2008. “Assessing the National Health Information System : An Assessment Tool.” 73.

HIRA Service. n.d. “HIRA ICT System < Overview < What We Do < HIRA.” Retrieved December 12, 2024. https://www.hira.or.kr/dummy.do?pgmid=HIRAJ010000005002.

Jensen, Linda R. 2022. “Using Data Integration to Improve Health and Welfare Insights.” *International Journal of Environmental Research and Public Health* 19(2):836. doi:10.3390/ijerph19020836.

Joint Administrative Order. 2016. *Adoption of Philippine Health Information Exchange (PHIE) Lite*.

Khampang, Roongnapa, Yot Teerawattananon, Sripen Tantivess, Francoise Cluzeau, Rachel Foskett-Tharby, and Paramjit Gill. 2017. “Developing and Testing Quality Indicators for the Thai Quality and Outcomes Framework.” *Safety in Health* 3(1):14. doi:10.1186/s40886-017-0065-6.

Kim, Jee-Ae, Yoon Seokjun, Log-Young Kim, and Dong-Sook Kim. 2017. :: “:: JKMS :: Journal of Korean Medical Science.” https://jkms.org/DOIx.php?id=10.3346/jkms.2017.32.5.718.

Korean Health Information Service. n.d. “Personal Health Record.” Retrieved December 16, 2024. http://www.k-his.or.kr.

Koumamba, Aime Patrice, Ulrick Jolhy Bisvigou, Edgard Brice Ngoungou, and Gayo Diallo. 2021. “Health Information Systems in Developing Countries: Case of African Countries | BMC Medical Informatics and Decision Making | Full Text.” https://bmcmedinformdecismak.biomedcentral.com/articles/10.1186/s12911-021-01597-5.

Kruk, Margaret, Anna Gage, Catherine Arsenault, Kelly Jordan, Hannah Leslie, Sanam Roder-DeWan, Adeyi, and Pierre Barker. 2018. “High-Quality Health Systems in the Sustainable Development Goals Era: Time for a Revolution - The Lancet Global Health.” https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(18)30386-3/fulltext.

Lenzen, Sabrina, and Stephen Birch. 2023. “From Population Numbers to Population Needs: Incorporating Epidemiological Change into Health Service Planning in Australia.” *Social Science & Medicine* 328:115972. doi:10.1016/j.socscimed.2023.115972.

Macabasag, Romeo Luis A., Eunice Mallari, Patrick Joshua Pascual, and Portia Grace Fernandez-Marcelo. 2022. “Normalisation of Electronic Medical Records in Routine Healthcare Work amidst Ongoing Digitalisation of the Philippine Health System - PubMed.” https://pubmed.ncbi.nlm.nih.gov/35797835/.

Magnuson, J. A., and Paul C. Fu, eds. 2014. *Public Health Informatics and Information Systems*. Health Informatics. London: Springer.

MEASURE Evaluation. 2017. “Health Information Systems Interoperability Maturity Toolkit: Users’ Guide — MEASURE Evaluation.” https://www.measureevaluation.org/resources/publications/tl-17-03a.html.

Mehmood, Asim, Zafar Ahmed, Khalid Ghailan, Sushil Dohare, Joe Varghese, and Fahad Khan Azeez. 2023. “Implementation of Healthcare Financing Based on Diagnosis-Related Group in Three WHO Regions; Western Pacific, South East Asia and Eastern Mediterranean: A Systematic Review.” *Journal of Health Management* 25(3):404–13. doi:10.1177/09720634231168250.

Murai, Shinsuke, Ray Justin C. Ventura, and Julita T. Gaite. 2022. “Timeliness of Reporting Process in the National Routine Health Information System: The Case of 19-Year Experience of Field Health Services Information System in Palawan, the Philippines.” *PloS One* 17(2):e0264681. doi:10.1371/journal.pone.0264681.

Nguyen, Thanh Ngoc. 2023. “Developing Health Information Systems in Developing Countries: Lessons Learnt from a Longitudinal Action Research Study in Vietnam.” https://onlinelibrary.wiley.com/doi/10.1002/isd2.12268.

Nutley, Tara, and Heidi W. Reynolds. 2013. “Improving the Use of Health Data for Health System Strengthening.” *Global Health Action* 6:20001. doi:10.3402/gha.v6i0.20001.

OntarioMD. 2017. “Provincial eReferral Initiative.”

Pabst, Laura J., and Warren Williams. 2015. “Immunization Information Systems.” *Journal of Public Health Management and Practice : JPHMP* 21(3):225–26. doi:10.1097/PHH.0000000000000202.

PhilHealth. n.d. “Electronic Claims Submission System | PhilHealth.” Retrieved December 12, 2024. https://www.philhealth.gov.ph/services/eclaims/.

Philippine Statistics Authority. n.d. “Content | Philippine Statistics Authority | Republic of the Philippines.” Retrieved December 12, 2024. https://psa.gov.ph/statistics/technical-notes/167315.

Po-Chang Lee. 2022. “Introduction to the National Health Insurance of Taiwan.” Pp. 1–15 in *Digital Health Care in Taiwan: Innovations of National Health Insurance*, edited by P.-C. Lee, J. T.-H. Wang, T.-Y. Chen, and C. Peng. Cham: Springer International Publishing.

Premji, Shainur, Ann Casebeer, and Richard E. Scott. 2012. “Implementing Electronic Health Information Systems in Local Community Settings: Examining Individual and Organisational Change Experiences in the Philippines.” *Electronic Journal of Information Systems Evaluation* 15(2):pp187-198-pp187-198.

Reñosa, Mark Donald C., Kate Bärnighausen, Sarah L. Dalglish, Veronica L. Tallo, Jhoys Landicho-Guevarra, Maria Paz Demonteverde, Carol Malacad, Thea Andrea Bravo, Mary Lorraine Mationg, Socorro Lupisan, and Shannon A. McMahon. 2021. “‘The Staff Are Not Motivated Anymore’: Health Care Worker Perspectives on the Integrated Management of Childhood Illness (IMCI) Program in the Philippines.” *BMC Health Services Research* 21(1):1–13. doi:10.1186/s12913-021-06209-6.

Ritz, Derek, Caren Althauser, and Kate Wilson. 2014. “Connecting Health Information Systems for Better Health: Leveraging Interoperability Standards to Link Patient, Provider, Payor, and Policymaker Data.” *PATH and Joint Learning Network for Universal Health Coverage*.

Scharf, Lynn Gibbs, Rebecca Coyle, Kafayat Adeniyi, Janet Fath, LaTreace Harris, Stuart Myerburg, Mary Beth Kurilo, and Elizabeth Abbott. 2021. “Current Challenges and Future Possibilities for Immunization Information Systems.” *Academic Pediatrics* 21(4, Supplement):S57–64. doi:10.1016/j.acap.2020.11.008.

Senkubuge, Flavia, Moeketsi Modisenyane, and Tewabech Bishaw. 2014. “Strengthening Health Systems by Health Sector Reforms.” *Global Health Action* 7:23568. doi:10.3402/gha.v7.23568.

Sjoding, Michael W., and Colin R. Cooke. 2014. “Readmission Penalties for Chronic Obstructive Pulmonary Disease Will Further Stress Hospitals Caring for Vulnerable Patient Populations.” *American Journal of Respiratory and Critical Care Medicine* 190(9):1072–74. doi:10.1164/rccm.201407-1345LE.

Solon, Orville Jose, Alejandro Herrin, and Jhiedon Florentino. 2017. “Health Care Financing.”

Southeastern Ontario Academic Medical Organization. 2024. “eReferral | Southeastern Ontario Academic Medical Organization.” https://www.seamo.ca/programs-resources/digital-health/ereferral.

Stoumpos, Angelos I., Fotis Kitsios, and Michael A. Talias. 2023. “Digital Transformation in Healthcare: Technology Acceptance and Its Applications.” *International Journal of Environmental Research and Public Health* 20(4):3407. doi:10.3390/ijerph20043407.

Sturmberg, Joachim P., and Johannes Bircher. 2019. “Better and Fulfilling Healthcare at Lower Costs: The Need to Manage Health Systems as Complex Adaptive Systems.” *F1000Research* 8:789. doi:10.12688/f1000research.19414.1.

Tai, Hsueh-Yung, and Shwu-Huey Wu. 2022. “Infrastructure of the Medical Information System.” Pp. 111–28 in *Digital Health Care in Taiwan: Innovations of National Health Insurance*, edited by P.-C. Lee, J. T.-H. Wang, T.-Y. Chen, and C. Peng. Cham: Springer International Publishing.

Tegegne, Masresha Derese, Binyam Tilahun, Adane Mamuye, Hailemariam Kerie, Fedlu Nurhussien, Endalkachew Zemen, Aragaw Mebratu, Girma Sisay, Redet Getachew, Henok Gebeyehu, Abiy Seyoum, Selamsew Tesfaye, and Tesfahun Melese Yilma. 2023. “Digital Literacy Level and Associated Factors among Health Professionals in a Referral and Teaching Hospital: An Implication for Future Digital Health Systems Implementation.” *Frontiers in Public Health* 11:1130894. doi:10.3389/fpubh.2023.1130894.

Tolentino, Herman, Alvin Marcelo, Portia Marcelo, Marie Irene Sy, Marvin Yoingco, Ariel Betan, and Inocencio Maramba. 2005. “The Evolution of a Community-Based Child

Injury Surveillance Project: Media Asia: Vol 32, No 3." https://www.tandfonline.com/doi/abs/10.1080/01296612.2005.11726793.

Ulep, Valerie, Jhanna Uy, Lyle Casas, and Christian Nuevo. 2021. "Assessment of the Service Capability and Readiness of Philippine Hospitals to Provide High-Quality Health Care."

USAID, Health Data Collaborative, and MEASURE Evaluation. 2019. *Health Information Systems Interoperability Maturity Toolkit: Users' Guide Version 1.0*.

Valdez, Crispinita. 2022. "eHealth Philippines."

Whittaker, Maxine, Nicola Hodge, Renata E. Mares, and Anna Rodney. 2015. "Preparing for the Data Revolution: Identifying Minimum Health Information Competencies among the Health Workforce." *Human Resources for Health* 13(1):17. doi:10.1186/s12960-015-0002-x.

Whittaker, Maxine, Renata E. Mares, and Anna Rodney. 2013. "Mapping Health Information System Competencies for Health Workers in Low- and Middle-Income Countries."

WHO. 2007. "Everybody's Business: Strengthening Health Systems to Improve Health Outcomes: WHO's Framework for Action." https://iris.who.int/handle/10665/43918.

WHO. 2008. "Toolkit on Monitorign Health Systems Strengthening: Health Information Systems."

WHO. 2021. "Global Strategy on Digital Health 2020-2025." https://www.who.int/publications/i/item/9789240020924.

WHO. 2023. "Strategy for Optimizing National Routine Health Information Systems: Strengthening Routine Health Information Systems to Deliver Primary Health Care and Universal Health Coverage." https://www.who.int/publications/i/item/9789240087163.

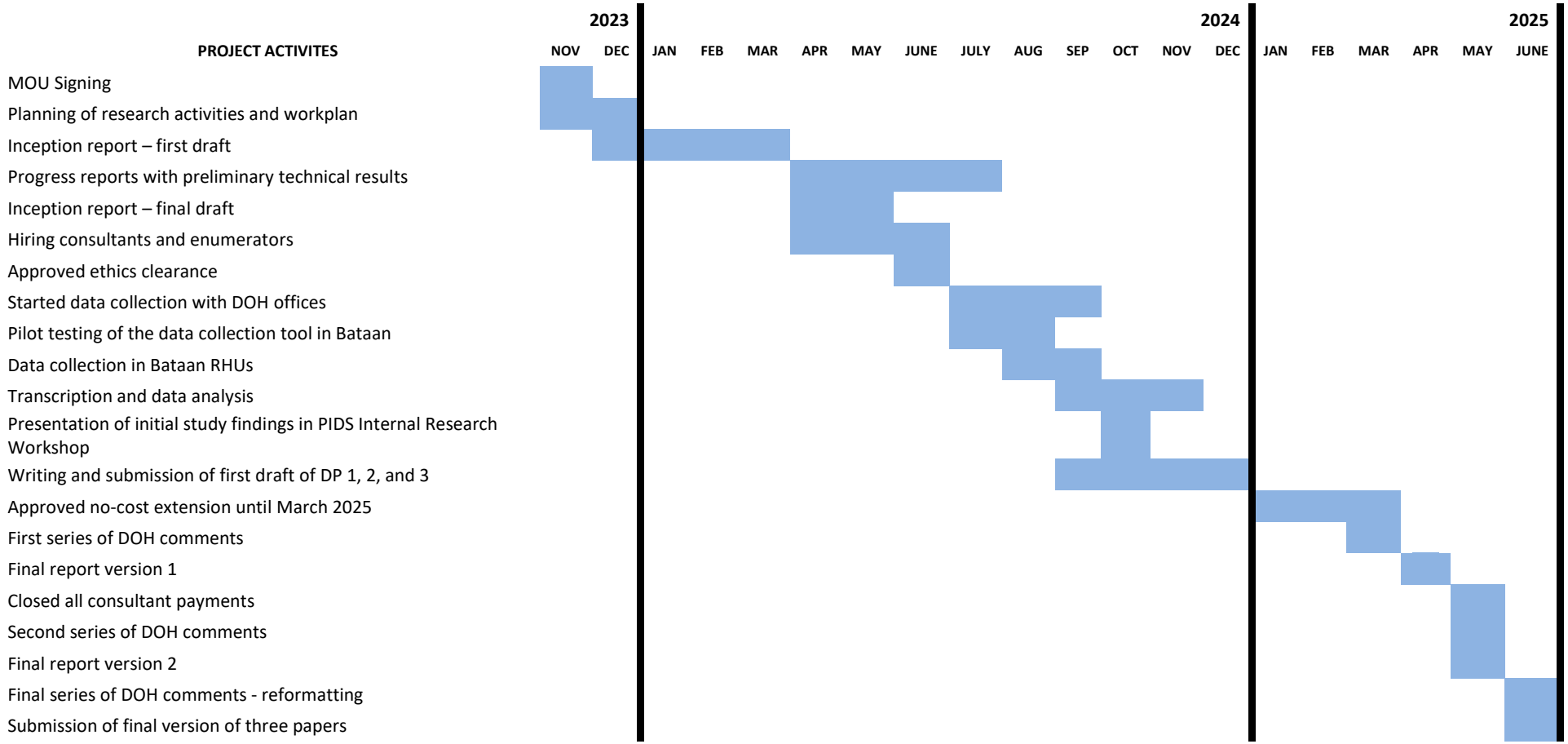
WHO. 2024. "Enhancement and Digitalization of Health Information Systems in the Countries of the Eastern Mediterranean Region: A Regional Strategy (2024-2028)." http://www.emro.who.int/about-who/rc71-presentations/enhancement-and-digitalization-of-health-information-systems-in-the-countries-of-the-eastern-mediterranean-region-a-regional-strategy-2024-2028.html.

WHO Family of International Classifications Network. 2013. "International Classification of Diseases (ICD) and Standard Clinical Reference Terminologies: A 21st Century Informatics Solution."

World Bank. 2024. "Universal Health Coverage." https://www.worldbank.org/en/topic/universalhealthcoverage.

IX. Annexes

Annex A. Gantt Chart



Annex B. Relevant outputs and materials

Annex B.1 Informed consent form

INFORMED CONSENT FORM for KEY INFORMANT INTERVIEWS

Read to respondent. No Sections should be omitted. (Basahin sa makaka-panayam. Walang maaaring hindi basahin.)

I. ABOUT THE STUDY/ TUNGKOL SA PAGSUSURI

Good morning/ afternoon/ evening! My name is_____, and I am working with the Philippine Institute for Development Studies (PIDS). We are conducting a study on the state of the country's health information systems (HIS) by examining its: (a) policies, laws, and governance structure; (b) technical design and infrastructure; and (c) acceptability. Along with Key Informant Interviews, we are also collecting secondary data from other government offices and agencies.

Magandang umaga/ hapon. Ako po si_____, mula sa Philippine Institute for Development Studies (PIDS). Sa kasalukuyan, kami ay nagsasaliksik ng estado ng mga health information systems (HIS) sa bansa sa paraan ng pagsuri ng mga (a) patakaran, batas, at istraktura ng pamamahala; (b) teknikal na disenyo at imprastraktura; at (c) pag- tanggap ng mga HIS. Bukod sa Key Informant Interviews, kami ay nangongolektang secondary data galing sa ibang opisina at ahensiya ng gobyerno.

II. DETAILS OF THE PARTICIPATION/ MGA DETALYE NG PAGLAHOK

Participant Selection: You were chosen to take part in this research because you play a direct role in the decision-making process in relation to the creation and management of HIS or if you have direct experience with its use through the input of data to the system or by sharing your details that are to be recorded.

Pagpili sa Kalahok: *Napili kayo na lumahok sa pag-aaral na ito dahil kayo ay pangunahing gampanin sa mga proseso ng paggawa ng desisyon ukol sa paglikha at pamamahala sa paggamit ng HIS o kaya kayo ay mayroong karanasan sa paggamit ng sistema o sa pagbigay ng inyong detalye na itatala.*

Procedures and Duration: Your participation will involve an in-depth interview that will take approximately 1 to 1.5 hours. Your interview may be done online (if you have access to internet), through a phone call, or face-to-face depending on what you prefer at a time convenient to you. All interviews regardless of method will be audio-recorded.

Pamamaraan at Panahong Gugugulin: *Bilang kalahok, kayo ay hihilinging sumali sa interview na maaring abutin ng 1 hanggang 1.5 na oras. Ang inyong panayam ay maaaring gawin online (kung kayo ay may internet), gamit ang telepono, o harapan (depende sa inyong kagustuhan) sa oras na naayon sa iskedule niyo. Lahat ng interview gamit ang kahit anumang paraan ay audio-recorded.*

Benefits and Risks of the Study: Your answers will greatly help policy makers, program managers, and researchers develop policies and interventions that may improve the creation, maintenance, and use of HIS in the country. We also expect that you may be inconvenienced because of the length of the interview of 1.5 hours. Lastly, you may perceive some questions as sensitive as they relate to the performance of government offices or agencies and LGUs. You may skip them if you are not comfortable answering them. If you choose to answer, rest assured that your name will not be shared to your superiors or in any study report/ publication.

Mga Benepisyo at Panganib: *Magiging mahalaga ang inyong mga sagot para sa opisyal, program managers, at mga mananaliksik upang guamwa ng mga polisiya at programa na maaaring makabuti sa paglikha, pagpapanatili, at paggamit ng HIS sa bansa.*

Maaaring maabala rin kayo dahil sa 1.5 oras na panayam. Huli, maaaring may mga tanong na sa tingin ninyo ay sensitibo dahil tungkol sila sa pagtupad ng mga serbisyo ng iba't ibang ahensya ng gobyerno at ibang mga pampublikong opisina o kaya naman ng mga LGU. Maaring hindi ninyo saguting ang mga tanong na ito kung kayo ay hindi komportable.
Gayunman, kung pipiliin ninyong suamgot, sisiguraduhin naming hindi naming ibabahagi sa inyong mga nakatataas o sa anumang mga report ang inyong pangalan.

Voluntary Participation: Your participation in this survey is voluntary. You are free to decline to answer or skip any questions you find sensitive or are not comfortable answering. You may refuse to take part in the research or stop the survey at any time without penalty. Non-participation will not affect your standing with officials and managers at higher administrative levels.

Boluntaryong Pakikilahok: *Ang inyong partisipasyon sa pananaliksik na ito ay boluntaryo. Maari ninyong piliing hindi sumagot sa mga katanungang sa tingin ninyo ay sensitibo o kung kayo ay hindi palagay sa pagsagot. Maaari niyong piliing hindi sumali, umatras, o huminto sa paglahok sa pananaliksik na ito sa kahit ano mang oras o punto. Gayundin, hindi maapektuhan ng inyong paglahok ang inyong katayuan sa mga kapwa-opisyal at namamahala.*

Incentives: If you decide to participate, I would like to stress that you or your office will not receive any compensation for your time in answering the questions. However, we will give you refreshments and a light snack for your time and participation.

Insentibo: *Nais naming ipaalam na wala po kayong matatanggap na kabayaran para sa inyong oras sa paglahok sa pananaliksik na ito. Kayo ay mabibigyan lamang ng merienda bilang aming munting pasasalamat sa inyong oras at partsipasyon.*

Confidentiality and Use of Information: Any information you provide that identifies you will be kept strictly confidential. The information will only be used for research purposes. Your name will not be provided in any reports or material. We will use only pseudonyms or control numbers in transcripts or reports. Any reports that use data from this interview will be in aggregate form so that you cannot be personally identified. After all identifier information relating to your identify is removed, then the remaining information you provide may be shared publicly with third parties for further analyses or journal publication, without additional informed consent from you or your legal representative.

Pangangalaga sa Datos ng Kalahok at Paggamit sa mga Datos: *Anumang impormasyon ng pagkakakilanlan ninyo ay mananatiling kompidensyal. Ang impormasyon na inyong ibabahagi ay gagamitin para lamang sa layunin ng pananaliksik. Hindi ibabahagi kaninuman o sa kahit na anong report ang pangalan ninyo at gagamit kami ng numero o pseudonym sa halip ng inyong tunay na pangalan sa mga tala ng panayam. Ang anumang reports ng mga mananaliksik na gagamit ng datos mula sa panayam na ito ipapakita lamang kabilang ang iba pang mga panayam na kasali sa pag-aaral para tiyakin na hindi kayo matutukoy o makikilala. Kapag natanggal na ang lahat ng impormasyon ng pagkakakilanlan ninyo, ang natitirang impormasyon ay maaaring maisapubliko, na di na kakailangain pa ng adisyonal na pahintulot mula sa iyo o sa iyong legal representative.*

Responsibilities of Respondents, Investigators, and PIDS (sponsor): Participants are expected to ask about and understand the study purpose, risks, and benefits, and procedures such that they give informed decision to join, not join, or withdraw from the study. Investigators are expected to conduct the study in accordance with the protocol and ethical standards, ensuring that the rights of participants are protected, and that informed consent is achieved. PIDS, as the sponsor, is tasked to monitor and provide quality assurance to ensure the research team complies to technical and ethical standards as specified in the protocol and ICFs.

Responsibilidad ng kalahok, mga mananaliksik, PIDS (sponsor): *Inaasahan na ang mga kalahok ay magtatanong at iintindihin ang dahilan para sa pag-aaral, ang mga panganib at benepisyo nito, at ang mga pamamaraan at panahong gugugulin nila bago nagdesisyon sa pagsali, hindi pagsali, o pag-atras sa pag-aaral. Tungkulin ng mga mananaliksik na gawin ang pag-aaral sang-ayon sa protocol at pamantayan pang-etikal para marespeto ang mga karapatan ng mga kalahok at makakuha ng informed consent. Ang PIDS, bilang sponsor ng pag-aaral, ay may tungkulin na subaybayan at panatilihin ang kalidad ng pag-aaral para tiyakin na ginagawa ng mga mananaliksik ang pag-aaral sang-ayon sa teknikal at ethical standards na nakasulat sa protocol at ICFs."*

Contact: The principal investigator is Dr. Valerie Gilbert T. Ulep (vulep@pids.gov.ph; *(+632)* 8- 877-4000 loc. 4050). For inquiries, you may contact Therese Jules Tomas (ttomas@pids.gov.ph; *(+632)* 8-877-4000 loc. 2101).

This study has been approved by the Single Joint Research Ethics Board (SJREB) of the Department of Health. For questions about your rights as a study participant or grievances, you may contact SJREB at *(+632)* 8651-7800 loc. 1326 or 1328 or at sjreb.dog@gmail.com.

Sino ang Maaring Tanungin: *Ang namumuno sap ag-aaral na ito ay si Dr. Valerie Gilbert T. Ulep (vulep@pids.gov.ph; (+632) 8-877-4000 loc. 4050). Para sa mga katanungan or klaripikasyon tungkol sa pananaliksik, maaaring i-contact si Therese Jules Tomas (ttomas@pids.gov.ph; (+632) 8-877-4000 loc. 2101).*

Ang pag-aaral n aiyo ay nabigyan na ng pahintulot ng Single Joint Research Ethics Board (SJREB) ng Department of Health. Para sa mga katanungan tungkol sa iyong mga Karapatan bilang kalahok o kung may hinaing, maaaring i-contact ang SJREB sa (+632) 8651-7800 loc. 1326 o 1328 o sa sjreb.dog@gmail.com.

III. CONSENT FORM

I voluntarily agree to participate in the research project being conducted by the Philippine Institute for Development Studies (PIDS).

Ako ay kusang-loob na pumapayag na makibahagi sa pagsasaliksik na isinasagawa ng Philippine Institute for Development Studies (PIDS).

I have understood the objectives of the project and the relevance of my participation as discussed to me/ as stated in the letter provided by the PIDS researcher. I have also been given the opportunity to ask questions about the project.

Nauunawaan ko ang mga layunin ng proyekto at ang kahalagahan ng pakikibahagi ko rito, ayon sa tinalakay sa akin/ nakasaad sa liham na ibinigay ng mga kawani ng PIDS. Ako ay binigyan ng pagkakataon na amgtanongh tungkol sa proyekto.

I understand that I may withdraw and discontinue my participation at any time and will not be penalized for doing so.

Nauunawaan ko na maaari kong bawiin at hindi na ipagpatuloy ang pakikibahagi ko sa proyekto sa anumang oras/ sandal, at hindi ako papatawan ng anumang kaparusahan kung ako ay magpasyang hindi na makibahagi sa proyekto.

I understand that the personal and sensitive personal information that will be collected by PIDS will be kept strictly confidential and will be used only for the purpose of research analysis. PIDS will not identify me in any reports, publications, or presentations, but I understand and consent that I may be counted as a data figure in the general population based on my race, sex, civil status, educational attainment, work, or religious belief in line with the research and analysis.

Nauunawaan ko na ang datos na makakalap ng PIDS ay pananatilihing kompidensyal at gagamitin lamang sa pananaliksik. Ang pagkakakilanlan ko ay hindi isisiwalat sa mga ulat, publikasyon presentasyon, subalit nauunawaan ko na ako ay mabibilang bilang bahagi ng populasyon ayon sa akin lahi, kasarian, civil status, natapos na antas ng edukasuon,

trabaho o relihiyon.

I agree to / sumasang-ayon ako na:

☐ Participate in this research / *makibahagi sa pagsasaliksik*

☐ Audio recording of this interview / *i-audio record ang panayam*

Name and Signature of Participant ***Pangalan at Pirma ng Kalahok***	**Name and Signature of Enumerator** ***Pangalan at Pirma ng Mananaliksik***	**Date** ***Petsa***

(STUDY COPY)

I agree to / sumasang-ayon ako na:

☐ Participate in this research / *makibahagi sa pagsasaliksik*

☐ Audio recording of this interview / *i-audio record ang panayam*

Name and Signature of Participant ***Pangalan at Pirma ng Kalahok***	**Name and Signature of Enumerator** ***Pangalan at Pirma ng Mananaliksik***	**Date** ***Petsa***

Annex B.2 Data collection tool for Coordinators

INTERVIEW SCHEDULE

INTERVIEWEE RECORD	
Full Name	
Institution or Office	
Title of Position	
Number of Years in Position	
E-mail	
Phone Number	

INTERVIEWER RECORD				
Interviewer Name		**Time Start**	**:**	**AM/PM**
Date of Interview		**Time End**	**:**	**AM/PM**

Good <morning/ afternoon>! My name is_____, a researcher from the Philippine Institute of Development Studies. The purpose of this interview is to obtain information on the current practices and standards regarding the Philippines' health information systems (HIS). Health Information Systems are systems for communication and processing of health and health-related data and reports that are needed for operations and delivery of different health services. Examples of HIS may include but are not limited to electronic health/medical records, electronic prescription and dispensing, telemedicine, among many others. This project will help us to determine how to make our HIS produce timely data that is relevant to the functions of its users.

Before anything, do you have any questions about the study? <answer any questions> Thank you again for choosing to participate in our study, May we proceed with the interview?

Magandang <umaga/hapon>! Ako po si_____, isang mananaliksik mula sa Philippine institute for Development Studies. Ang layunin ng panayam na ito ay ang kumuha ng impormasyon ukol sa kasulukuyang patakaran ng mga Philippine health information systems (HIS). Ang Health Information Systems ay mga sistema para sa komunikasyon at pagproseso ng data at mga report na may kaugnayan at kinakailangan para sa paghahatid ng iba't ibang serbisyong pangkalususgan. Ang mga halimbawa ng HIS ay maaaring kabilang ngunit hindi limitado sa mga elektronikong medical record at reseta, telemedicine,

at marami pang iba.

Itong proyektong ito ay makakatulong para masigurado kung paano makakapagbigay ang ating HIS ng napapanahong data na may kaugnayan sa mga function ng gumagamit nito.

Bago tayo magsimula, kayo po ba ay may katanungan tungkol sa pag-aaral?

Muli, maraming salamat sa pakikilahok sa aming pag-aaral. Maari na po ba tayong magsimula?

- Effectiveness and Appropriateness/Pagiging epektibo at angkop
    - How does the HIS support your unit's ability to collect, analyze and report data?

    Paano sinusuportahan ng HIS ang kakayahan ninyo na mangolekta, magsuri at mag- ulat ng data?

    - Is the data provided by HIS adequate for you to fulfill its functions?

    Sapat ba ang data na ibinigay ng HIS para sa iyong opisina upang matupad ang mga tungkulin nito?

    - What are the limitations of our HIS that hinder your overall capacity to collect, analyze and report data?

    Ano ang mga limitasyon ng ating HIS na humahadlang sa iyong pangkalahatang kapasidad na mangolekta, magsuri at mag-ulat ng data?

    - What could be improved with the current system?

    Paano pa mapapabuti ang kasalukuyang sistema?

- Data Quality, Timeliness, and Efficiency
    - Given the current data collection process for the HIS, are you able to collect the data needed to perform your functions?

    Gamit ang kasalukuyang proseso sa pangolekta ng data sa HIS, nakukuha niyo ba ang data na iyong kinakailangan para maisagawa ang iyong mga tunkulin?

    - What processes are currently in place to validate data within the HIS?

    Ano ang mga proseso para patunayan na wasto ang data sa HIS?

    - What barriers do you face in terms of data quality, timeliness, and efficiency?

    Ano ang mga humahadlang ukol sa data na may mabuting kalidad,

napapanahon, at nakukuha sa mabisang oras?

- How does your office use the gathered data?

Papaano ginagamit ng iyong tanggapan ang nakolektang data?

- What is the status of EMR implementation in the province, and how does it contribute to patient tracking and health financing?

Ano ang status ng implementasyon ng EMR sa inyong probinsiya at paano ito nakatutulong sa patient tracking at health financing?

- *Interoperability*
  - Is there a functional referral system in place?

Mayroon ba kayong sistema para sa pag-refer ng mga pasyente sa ibang health facility?

- What strategies are used to make sure that HIS are interoperable?

Ano ang mga estratehiya na ginagamit para masigurado na ang mga HIS ay magkatugma?

Annex B.3 Data collection tool for Enumerators

Rural Health Unit (RHU) Health Information System (HIS) Infrastructure Survey

Section 1: General Information

Name of RHU:

Municipality:

Name of Respondent:

Position of Respondent:

Date of Survey:

Section 2: Computer Hardware

1. Does your RHU have dedicated computers for managing health information?

   ☐ Yes

☐ No

2. How many computers are available for HIS operations?

No.: _____

3. Do you have any peripheral devices? (Check all that apply)

☐ Printer
☐ Scanners
☐ Barcode reader
☐ Other (please specify): _____

4. Does your RHU have a stable internet connection?

☐ Yes
☐ No

5. What type of internet connection is used?

☐ DSL
☐ Fiber-optic
☐ Mobile data
☐ Satellite
☐ Other (please specify): _____

6. What is the average internet speed in your RHU?

☐ Less than 1 Mbps
☐ 1-5 Mbps
☐ 5-10 Mbps
☐ More than 10 Mbps

7. How reliable is your internet connection?

☐ Always available
☐ Frequently interrupted
☐ Rarely available

8. Is the current internet connection sufficient for HIS needs?

☐ Yes
☐ No

Section 3: Power Supply

9. How reliable is your RHU's power supply?

☐ Very reliable (rarely experiences outages)
☐ Somewhat reliable (occasional outages)
☐ Unreliable (frequent outages)

10. Does your RHU have a backup power source (e.g., generator, UPS)?

☐ Yes
☐ No

11. How often do power outages occur at your RHU?

☐ Rarely (less than once a month)
☐ Occasionally (once or twice a month)
☐ Frequently (more than twice a month)

Section 4: Software and Systems

12. What type of software is used for managing health information? (Check all that apply)

☐ Electronic Medical Records (EMR) system
☐ Excel/Spreadsheet
☐ Paper-based records
☐ Custom-built software (please specify): _____
☐ Other (please specify): _____

Name the specific health information system (including all HIS mandated by DOH)	**What system (EMR, Excel, paper-based)?**

Section 5: Technical Support

13. Is there dedicated IT support available for your RHU?

- ☐ Yes, in-house IT staff
- ☐ Yes, external IT support service
- ☐ No

14. How often is IT support needed to manage HIS?

- ☐ Regularly (weekly/monthly)
- ☐ Occasionally (quarterly/annually)
- ☐ Rarely (only for major issues)

15. What common technical issues does your RHU face? (Check all that apply)

- ☐ Hardware failure
- ☐ Software issues
- ☐ Internet connectivityproblems
- ☐ Power supplyissues
- ☐ Data loss or corruption
- ☐ Other (please specify): _____

16. How responsive is the technical support team when issues arise?

- ☐ Very responsive (issues addressed immediately)
- ☐ Responsive (issues addressed within a few hours)
- ☐ Somewhat responsive (issues addressed within a day)
- ☐ Slow (issues addressed within a few days)
- ☐ Very slow (issues take more than a few days to address)

17. On average, how long does it take to resolve a technical issue?

- ☐ Less than 1 hour
- ☐ 1-3 hours
- ☐ 3-6 hours
- ☐ 6-12 hours

☐ 12-24 hours
☐ More than 24 hours

18. What types of technical issues are most common? (Check all that apply)

☐ Hardware failures (e.g., computers, printers)
☐ Software malfunctions (e.g., HIS software crashes)
☐ Network/Internet connectivity issues
☐ Data loss or corruption
☐ Power supply problems
☐ Other (please specify): _____

19. How often do you need to contact technical support for HIS-related issues?

☐ Daily
☐ Weekly
☐ Monthly
☐ Less than once a month
☐ Rarely (only for major issues)

Section 6: Data Entry Practices

20. How is health data entry performed at your RHU? (Check all that apply)

☐ Manually using paper-based forms
☐ Manually entered into an electronic system (e.g., Excel, EMR software)
☐ Automatically using integrated electronic systems (e.g., devices that directly input data into the system)
☐ Combination of manual and electronic entry
☐ Other (please specify): _____

21. Who is responsible for data entry at your RHU? (Check all that apply)

☐ MHO
☐ Nurses/Midwife
☐ Administrative Staff
☐ Data Entry Clerks
☐ IT Staff
☐ Other (please specify): _____

22. How often is health data entered into the system?

- ☐ Immediately after patient interaction
- ☐ At the end of each day
- ☐ Weekly
- ☐ Monthly
- ☐ Other (please specify): _____

In qualitative form, how is data entry performed; describe the process:

Section 7. Data Use

23. For what purposes do you use the data generated from your HIS? (Check all that apply)

- ☐ Generation of reports for DOH/FHIS
- ☐ Internal performance monitoring
- ☐ Procurement planning and management
- ☐ Resource allocation and budgeting
- ☐ Strategic planning and decision-making
- ☐ Patient care management and follow-up
- ☐ Other (please specify): _____

In qualitative form, explain how it is being used (all checks):

24. Do you use HIS data in strategic planning and decision-making of the RHU?

- ☐ Yes
- ☐ No

25. How does the HIS data contribute to your RHU's strategic planning? (Check all that apply)

- ☐ Identifying health trends and needs in the community
- ☐ Allocating resources effectively
- ☐ Setting health priorities and goals
- ☐ Monitoring and evaluating program effectiveness
- ☐ Other (please specify): _____

26. What challenges do you face in using HIS data for these purposes? (Check all that apply)

- ☐ Data is incomplete or inaccurate
- ☐ Difficulty in accessing specific data reports
- ☐ Lack of training on how to use HIS data effectively
- ☐ System is not user-friendly
- ☐ Technical issues with the HIS software
- ☐ Other (please specify): _____

Section 8: Human Resources and Skills

27. What is the total number of staff involved in managing or using the HIS at your RHU?

- ☐ None
- ☐ 1-2
- ☐ 3-5
- ☐ More than 5

28. What roles do the staff involved in HIS management hold? (Check all that apply)

- ☐ MHO
- ☐ Nurses
- ☐ Midwives
- ☐ Administrative Staff
- ☐ Data Entry Clerks
- ☐ IT Specialists
- ☐ Health Information Officers

☐ Other (please specify): _____

29. What is the level of training received by staff on HIS usage? (Check all that apply)

☐ Basic computer skills
☐ HIS software operation
☐ Data entry and management
☐ Data analysis and reporting
☐ Cybersecurity and data protection
☐ No formal training received
☐ Other (please specify): _____

30. How would you rate the overall competency of your staff in using HIS?

☐ Very competent
☐ Competent
☐ Neutral
☐ Incompetent
☐ Very incompetent

31. Are there any specific areas where additional training is needed? (Check all that apply)

☐ Data entry accuracy
☐ Report generation
☐ Data analysis and interpretation
☐ Advanced software features
☐ Data security and privacy
☐ Troubleshooting technical issues
☐ Other (please specify): _____

32. How often is training provided to staff on HIS usage?

☐ Annually
☐ Every 2-3 years
☐ Only during initial employment
☐ Never

33. Do you have sufficient IT support staff to manage the HIS effectively?

☐ Yes

☐ No
☐ IT support is outsourced

34. How comfortable are the different users in your RHU with performing the following tasks using HIS?

Task	Very comfortable	Comfortable	Neutral	Uncomfortable	Very Uncomfortable
Data entry	☐	☐	☐	☐	☐
Report generation	☐	☐	☐	☐	☐
Data analysis	☐	☐	☐	☐	☐
Submitting claims (eg. PhilHealth)	☐	☐	☐	☐	☐
System troubleshooting	☐	☐	☐	☐	☐

35. What challenges do you face with human resources in managing and using HIS? (Check all that apply)

☐ Lack of sufficient training
☐ High staff turnover
☐ Inadequate staffing levels
☐ Resistance to adopting new technology
☐ Lack of IT support
☐ Other (please specify): _____

Section 9: Budget and Financing for HIS

36. Is there a dedicated budget allocated for managing and maintaining the HIS in your RHU?

☐ Yes
☐ No
☐ Not sure

37. If yes, what percentage of the RHU's total budget is allocated to HIS (in 2023)?

Please itemize	Amount	Source (Municipality, Province, National, another private sector)

Capital outlay/hardware		
1. 2. 3.		
Maintenance/Operations 1. 2. 3.		
Salaries 1. 2. 3.		

38. What is the total budget of your RHU for 2023?

PHP _____

39. How sufficient is the current budget for covering HIS-related expenses?

- ☐ Very sufficient
- ☐ Sufficient
- ☐ Neutral
- ☐ Insufficient
- ☐ Very insufficient

Section 10: Integrated Care and Coordination

40. **Does your RHU participate in integrated care networks involving hospitals, specialists, and other healthcare providers?**

- ☐ Yes
- ☐ No

☐ In progress

Explain how:

41. How often does your RHU coordinate care with hospitals for chronic disease management?

☐ Regularly (e.g., monthly)
☐ Occasionally (e.g., quarterly)
☐ Rarely
☐ Never

42. Is there a system in place for shared patient records among different healthcare providers?

☐ Yes, fully integrated
☐ Partially integrated
☐ No

43. How does your RHU ensure continuity of care for patients with chronic conditions? (Check all that apply)

☐ Regular follow-up appointments
☐ Care coordination with other healthcare providers
☐ Patient-held health records
☐ Use of telemedicine for follow-up care

Section 11: Quality Improvement and Patient Safety

44. **Does your RHU have a formal quality improvement program?**

☐ Yes
☐ No
☐ In development

45. How are clinical guidelines and protocols for treatment and care delivery implemented in your RHU?

- ☐ Strictly followed with regular audits
- ☐ Partially followed
- ☐ Not systematically followed

46. How frequently does your RHU review and update clinical practices based on the latest evidence?

- ☐ Annually
- ☐ Every 2-3 years
- ☐ Only when new guidelines are released
- ☐ Never

47. Do you use patient feedback (e.g., satisfaction surveys, complaints) to drive quality improvement initiatives?

- ☐ Yes, regularly
- ☐ Occasionally
- ☐ No

48. How is patient safety monitored and improved at your RHU? (Check all that apply)

- ☐ Incident reporting system
- ☐ Root cause analysis of adverse events
- ☐ Regular staff training on patient safety
- ☐ Implementation of safety protocols (e.g., hand hygiene, medication safety)
- ☐ Others _____

49. How do you use health data to improve patient outcomes? (Check all that apply)

- ☐ Data-driven decision-making
- ☐ Predictive analytics for risk stratification
- ☐ Monitoring of health trends and outcomes
- ☐ Feedback to healthcare providers for performance improvement
- ☐ Others _____

50. Is telemedicine used in your RHU to enhance access to care?

- ☐ Yes, widely used
- ☐ Yes, but limited use
- ☐ No, not used

51. How does your RHU manage population health, especially for high-risk groups? (Check all that apply)

- ☐ Risk stratification and targeted interventions
- ☐ Community outreach and health education
- ☐ Chronic disease registries
- ☐ Collaboration with public health agencies

52. Do you have a proactive approach to preventive care (e.g., screenings, immunizations)?

- ☐ Yes, with regular outreach and follow-up
- ☐ Yes, but only during patient visits
- ☐ Others

53. How does your RHU address social determinants of health (e.g., housing, nutrition, income)?

- ☐ Through partnerships with social services
- ☐ Incorporation into care plans
- ☐ Referral to external agencies
- ☐ Not addressed

54. How does your RHU use data to track and improve population health outcomes? (Check all that apply)

- ☐ Regular population health reports
- ☐ Data dashboards for real-time monitoring
- ☐ Analysis of health disparities
- ☐ Feedback loops to adjust interventions

55. Do you collect and monitor/analyze the following using your <u>current HIS</u>

TOR	Collect	Analyzed and monitored (how; what indicator do you use?)
1. Diabetes Management (e.g., HbA1c levels, complications)	☐ Yes ☐ No	
2. Hypertension Management (e.g., blood pressure control)	☐ Yes ☐ No	
TOR	**Collect**	**Analyzed and monitored (how; what indicator do you use?)**

3. Tuberculosis (e.g., active cases, treatment completion)	☐ Yes ☐ No	
4. Maternal Health (e.g., antenatal visits, maternal mortality rate)	☐ Yes ☐ No	
5. Child Health (e.g., immunization coverage, under-5 mortality rate)	☐ Yes ☐ No	
6. Family Planning (e.g., contraceptive use rate)	☐ Yes ☐ No	
7. HIV/AIDS (e.g., new cases, ART coverage)	☐ Yes ☐ No	
8. Malaria (e.g., incidence, treatment coverage)	☐ Yes ☐ No	
9. Dengue Fever (e.g., reported cases, case fatality rate)	☐ Yes ☐ No	
10. Nutritional Status (e.g., underweight children, anemia prevalence)	☐ Yes ☐ No	
11. Chronic Respiratory Diseases (e.g., asthma, COPD management)	☐ Yes ☐ No	
12. Cancer Screening (e.g., cervical, breast cancer screenings)	☐ Yes ☐ No	
13. Mental Health (e.g., depression, anxiety cases)	☐ Yes ☐ No	
14. Infectious Diseases (e.g., measles, hepatitis)	☐ Yes ☐ No	
15. Preventive Care (e.g., routine check-ups, wellness visits)	☐ Yes ☐ No	
16. Patient Satisfaction (e.g., satisfaction surveys, complaints resolution)	☐ Yes ☐ No	
TOR	**Collect**	**Analyzed and monitored (how; what indicator do you use?)**
17. Health Service Utilization (e.g., OPD visits, emergency cases)	☐ Yes ☐ No	

18. Referrals (e.g., referrals to higher-level care, referral follow-up)	☐ Yes ☐ No
19. Health Insurance Coverage (e.g., PhilHealth enrollment rate)	☐ Yes ☐ No
20. Health Workforce (e.g., staffing levels, training and skill development)	☐ Yes ☐ No
21. Facility Operations (e.g., bed occupancy rate, equipmentfunctionality)	☐ Yes ☐ No
22. Financial Indicators (e.g., budget utilization, cost perpatient)	☐ Yes ☐ No
23. Environmental Health (e.g., waste management, water and sanitation)	☐ Yes ☐ No
24. Drug Supply Management (e.g., stock levels, expiration tracking)	☐ Yes ☐ No
25. Antibiotic Use Adherence (e.g., adherence to prescribed regimens)	☐ Yes ☐ No

Annex C. List of participants and other stakeholders

Sentinel Sites Participants

- Abucay RHU
- Bagac RHU
- Balanga City RHU I
- Balanga City RHU II
- Balanga City RHU III
- Balanga City RHU IV
- Dinalupihan RHU I
- Dinalupihan RHU II
- Dinalupihan RHU III
- Hermosa RHU
- Limay RHU
- Mariveles RHU I
- Mariveles RHU II
- Mariveles RHU III
- Mariveles RHU IV
- Morong RHU

- Orani RHU
- Orion RHU
- Pilar RHU
- Samal RHU
- Jose C. Payumo Jr. Memorial Hospital
- Orani District Hospital

List of Stakeholders

Role	Stakeholder
Regulator	Department of Health
Purchaser	PhilHealth
Provider	• Hospital (Public and private) • Rural Health Unit • Health Workforce (Doctors, Nurses, Midwives, Barangay Health workers, Encoders, Coordinators)
Consumer	• Patients • Communities
Other stakeholders	• Local Government Units • Provincial Health Office • Other government agencies (DICT, DOST, NNC, etc.) • Development Partners and Donors (e.g., WHO, UNICEF, USAID, World Bank) • Private Sector Technology Providers (e.g., IT vendors, software developers, telecoms)

A Review of Digitization and Data Management-Related Policies of the Health Information System of the Department of Health

Jomelle John Anthony V. Wong

Executive Summary

Health information systems (HIS) are foundational to public health. The demands on and the complexity of HIS has been growing through policies such as RA 11223 (UHC Law). For example, Section 36 of RA 11223 calls for the implementation of an HIS that can support enterprise resource planning, human resource information, electronic health records, and an electronic prescription log, which shall be electronically uploaded interoperability.

However, the HIS of the Department of Health (DOH) faces several systemic technical challenges: (1) There are technical deficiencies in the data standardization policies of the DOH. These deficiencies prevent the actual implementation of long-standing data standard policies. (2) The digitization efforts by the DOH of the health information system was shown to have achieved limited success. This limited success is partly attributed here to the deficiencies in data standardization. Evidence was presented that challenges the intuitive attribution to poor IT availability as the bottleneck to digitization. (3) The data management practices in the DOH central office is crude, albeit practical. However, these data management practices have important implications not only to data security but also in the maximization of these publicly-funded public health datasets.

To solve these issues, (1) the DOH must address the technical deficiencies in its data standards. This may be achieved by releasing a country-level Fast Healthcare Interoperability Resources (FHIR) implementation guide, in lieu of the current house-made standard. Creating a functional data standard facilitates the progress of digitization of the HIS. (2) The DOH must transition its datasets into a relational database and adopt a central office-wide data warehouse. This data warehouse will enable a suite of auxiliary tools that will maximize the utility of DOH datasets. Consequently, the data management practices of DOH offices must transition towards integration with the central data warehouse. The National Health Data Repository (NHDR) of PhilHealth is an example of a central data warehouse for this purpose.

I. Background, Significance, and Review of Related Literature

1.1 What are health information systems?

Health information systems (HIS) are defined as a system for information generation to support public health decision-making (Gissler et al. 2006; Health Metrics Network and World Health Organization 2008b; Rechel et al. 2019; World Health Assembly 2007). Using this definition, HIS is not simply about the production of data nor is it reducible to any specific tool or software application. The effective operation of the health information system requires an orchestration of multiple agents, tools, and processes (Rechel et al. 2019). Health information systems can simultaneously adopt formal and informal policies, electronic and paper-based tools, and structured and unstructured processes.

HIS is the foundation of public health (AbouZahr and Boerma 2005). The World Health Assembly in 2007 adopted resolution WHA60.27 on strengthening health information systems. The resolution states: "Acknowledging that sound information is critical in framing evidence-based health policy and making decisions, and fundamental for monitoring progress towards internationally agreed health-related development goals, including those contained in the United Nations Millennium Declaration; ... [the World Health Assembly] URGES Member States to mobilize the necessary scientific, technical, social, political, human and financial resources" to strengthen their health information system (World Health Assembly 2007:1). The resolution is an open call to all health ministries to strengthen their respective health information systems and improve the monitoring of international and domestic health-related development goals.

1.2 Health information system in the Philippines

Evidence generation through a health information system is enshrined in national legislation. Section 36 of RA 11223 states that "all health service providers and insurers shall each maintain a health information system". Section 31 further states that health and health-related data shall be submitted to PhilHealth and DOH to be used for generating information to guide research and policy-making. Republic Act 11223 (UHC), Executive Order 352, s. 1996 (FHSIS), and Republic Act 11332 (Disease Surveillance) constitute the major legislation for the health information system in the Philippines. These laws together provide for the collection of public health service delivery, non-communicable disease, and infectious disease data by the Philippine government.

Digitization is an increasingly emphasized policy agenda of the Department of Health. One major driver for digitization is national laws, such as in Section 36 of the UHC Law (RA 11223). However, digitization of public health and healthcare delivery as a policy agenda was already a core element of the nascent efforts for universal healthcare. For example, DOH AO 2015-0028 on the guidelines for the implementation of a UHC strategy identifies the role of electronic data tools in supporting UHC. This increasing emphasis is reflected in the regulatory requirements for healthcare facilities. Licensing requirements for hospitals were amended in 2018 to include the requirement of "validated electronic medical records" (Department of Health 2012; 2018). Primary care facilities were subsequently required in 2020 to implement a "validated" electronic medical record system (Department of Health 2020). These were made as requirements for the approval of healthcare facilities' license to operate. The DOH has

increasingly leveraged healthcare facility licensing to implement health IT policies (Department of Health and Philippine Health Insurance Corporation 2021).

Data on digitization in healthcare is generally sparse. According to a PSA survey, 94.9% of surveyed general establishments use some form of computer, with 42.7% of their surveyed employees using a computer for their work. (Philippine Statistics Authority 2019) This suggests that digitization of work processes in broader society is generally common. This is corroborated by DOH data that 91% of all primary care facilities and 65% of public hospitals in 2023 have some kind of electronic medical record system available (Department of Health 2023). These figures suggest a considerable level of at least basic digitization in healthcare facilities.

Digitization policies are coupled with the health information system. Health information systems need not be electronic and exist primarily to provide evidence for decision-making. However, digitization and its related written policies are strongly coupled with the design and operation of the health information system. Reviewing digitization policies is therefore necessary to understand the health information system. The relevant administrative policies that constitute the set of digitization policies of the DOH are organized in Table 16.

Table 16. Relations of DOH digitization policies

<table>
<tr><td colspan="3">DOH AO 2012-0012
DOH AO 2020-0047
Healthcare facility licensing policies</td></tr>
<tr><td colspan="3">DOH-PHIC-JAO 2021-0001
Promotes and manages the adoption of health IT</td></tr>
<tr><td rowspan="2">DOH-PHIC JAO 2021-0002
DOH-PHIC-DOST-DICT JAO 2017-0001
Standardization of content</td><td rowspan="2">DOH-PHIC-DICT JAO 2021-0001
DOH-PHIC-DOST-DICT JAO 2017-0001
Validation of standardization</td><td>DOH-PHIC JMC 2021-0001
DOH-DOST-PHIC JAO 2016-0001
DOH-PHIC JAO 2016-0003
DOH DC 2020-0037
Exchange of content</td></tr>
<tr><td>DOH-DOST-PHIC JAO 2016-0002
Privacy of exchange</td></tr>
</table>

Data standards address the semantic (meaning) and syntactic (structure) compatibility of communication between any two agents, including humans. In the same way that human conversation cannot occur without shared definitions, grammar, and context, all interactions of software systems are similarly mediated by layer upon layer of rules (Hammond 2005). In the absence of human intelligence that can parse gray areas of communication (such as parsing typographic errors), data standards need to be specific and comprehensive for the intended purpose. Data has many facets which are standardized through different means such as: (1) metadata, (2) data integration, and (3) data architecture (DAMA International 2017).

Data standardization is necessary to share a lot of health information, particularly electronic health records. Digitization made it possible to process and transmit huge amounts

of data beyond the capabilities of manual systems. However, unless each segment of a process can seamlessly communicates, the amount of human intervention necessary can diminish the advantages of digitization (Hammond 2005). For example, laboratory information systems that cannot directly communicate with the hospital records system may need an inordinate amount of manual encoding. The increasing demands for data, such as those provided in RA 11223 (Sec. 36), for the establishment of systems for "enterprise resource planning, human resource information, electronic health records, and electronic prescription log" require each system to interoperate. This increasing demand for data means that the health information system must not anymore simply churn out rates of vaccination. It must now also provide a map of the people who have received those vaccinations and potentially from which healthcare facility the vaccination order originated, a degree of specificity most notably necessitated by the COVID-19 pandemic.

APIs help automate the enforcement of data standards. APIs concretely demonstrate the use-case and value proposition for undergoing the investment. Without APIs, the ensuing health IT systems are analogous to cellular devices without cellular reception. APIs also inherently test the correctness of the work being undertaken by the implementers. Similar to an internet browser responding to subtle mistakes in a URL, APIs provide implementers real-time direct feedback about the work being undertaken. The absence of end-points from regulators, therefore, provides a level of uncertainty about the fruitfulness of undergoing investment and serious change management for a "compliant" health IT system.

However, the health information system of the Philippines faces many systemic challenges. Vertical integration of programs and processes is one area of relative success for digitization. It is shown in the results section the extent to which at least some programmatic health IT tools have achieved relative popularity. However, horizontal integration has proven more difficult to achieve. One key reason for this limited success is due to the technical content of the policies. This paper discusses the technical deficiencies of the data standardization policies which consequently stifle the horizontal integration within HIS and the relative underutilization of select DOH-owned health IT (Tolentino, Marcelo, Marcelo, Sy, et al. 2005). In addition to DOH policies, basic resource constraints such as electrification remain to be a persistent barrier to the earnest digitization of workplace processes (Francisco and Abrigo 2023). There is further a need to overcome established workplace practices through decisive change management (Macabasag et al. 2022; Brieux et al. 2017; Tolentino, Marcelo, Marcelo, and Maramba 2005). The broader mandate provided by the UHC Law in the Philippines requires a health information system that monitors the health system beyond conventional disease-based programs. Implementing the HIS-related mandates provided in RA 11223 requires overcoming the technical debt of the DOH health information system.

II. Project Objectives

This study aims to achieve the following **general objectives**:

- To assess the technical and technological design of the health information system of the Department of Health
- To develop results and recommendations with sufficient specificity that may lead to targeted interventions

These objectives are restated here as policy and research questions. The **main policy question** for the study is:

- How can the information generation of the health information system of the Department of Health be improved?

To answer this policy question, the **main research question** for the study is:

- What are the technical and technological design barriers of the health information system of the Department of Health?

This main research question is answered through the following **research sub-questions**:

- What are the processes and tools used to move and manage data across the health information system?
- To what extent are key ICT infrastructure available and utilized across the health information system?
- To what extent are data standards available and implemented across the health information system?

The empirical base of the discussion was developed from literature and policy reviews, simple time-series analysis of select DOH-owned health IT data, publicly available health statistics, and professional experience of unwritten DOH policies (participant observation). Care was taken to avoid construing opinion with fact about unwritten policies. A draft of the discussion was provided to the DOH for feedback and possible revisions.

This discussion uses downstream data on the actual content of the databases of select DOH-owned health IT systems. The underlying database of these tools is used to show the volume of data as proxy for utilization. The Integrated Chronic Non-Communicable Disease Registry System (ICNCDRS), National Rabies Information System (NARIS), and the Integrated Tuberculosis Information System (ITIS) are used here for illustrative comparison.

Judgement was made to determine which among the many tables in the database best represent the utilization pattern of the system. In the case of ICNCDRS, this is the table containing individuals for each NCD. For NARIS, this is the table containing the rabies exposure records which contains more records than its patient registry. For ITIS, this is the table containing the tuberculosis cases which also contains more records than its patient registry. The degree of utilization of these systems may be approximated by comparing the number of records to the incidences reported in the FHSIS annual report. The underlying dataset for all systems only spans until 2022, the year in which the data was requested and accessed.

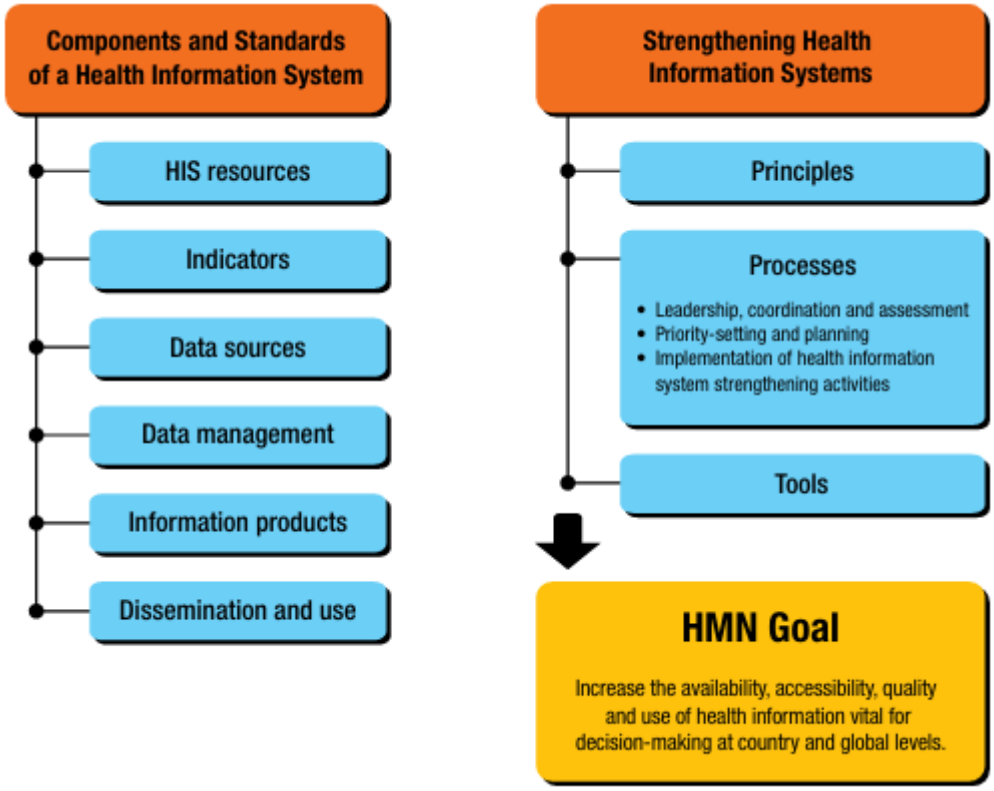
III. Methodology

3.1 Conceptual Framework

The Health Metrics Network (HMN) Health Information Systems Framework contains an accessible outline of key health information system components and a corresponding survey tool to conduct the assessment with (see Figure 17). Health Metrics Network is a pioneer global partnership of stakeholders that aims to improve health information in low and low-middle income countries. Together with the WHO, the Health Metrics Network developed an assessment framework that addresses high-level and program-related issues for health information systems (Health Metrics Network and World Health Organization 2008b). The HMN framework was used to guide the discussion. Compared to other HIS frameworks such as IS4H by the Pan American Health Organization and PRISM by USAID, the HMN

Framework is more concise and easier to communicate to non-specialists. This makes it a better suited framework to structure the discussion.

Figure 17. The HMN Framework



3.2 Limitations of existing assessment frameworks

There is a need to go beyond normative frameworks and to address context-specific factors about the HIS in the Philippines (Marcelo 2017). Frameworks such as HMN, PRISM, and IS4H are normative. That is, they list 'must haves' about a country's health information system. However, the success or failure of information systems in general is context-specific and contingent (Heeks 2002). As will be shown in the discussions, some of these key policies in fact exist and are in circulation.

High-level and general HIS assessment tools such as HMN, PRISM, and IS4H are not able to explain precisely why a country HIS performs poorly. For example, on the policy dimension, the HMN assessment provides a Likert scale for questions such as: "There is a written HIS strategic plan in active use addressing all the major data sources described in the HMN Framework (censuses, civil registration, population surveys, individual records, service records and resource records) and it is implemented at the national level" (Health Metrics Network and World Health Organization 2008a). However, such questions do not address the issues in the event that these policies are not effective. For this reason, the assessment tool accompanying the HMN Framework was not used for this paper.

3.3 Study Limitations

This study focuses on addressing the technical and technological design issues of the health information system within the domain of the Department of Health. The discussion will not individually address the many health IT tools managed by DOH.

The policies related to the health information system are a mixed web of legislation and administrative policies that have enjoyed varying levels of institutionalization. Written policies do not necessarily translate to actual HIS processes. Although the study endeavors to provide a complete picture of the technical and technological design of the HIS, the sheer gap between what there is and what there should be is too wide. A balance has been made with addressing major HIS policies and "institutionalized" HIS processes. The following HIS processes within the scope of the DOH are considered in this discussion:

- Philippine Integrated Disease Surveillance and Response (PIDSR)
- Field Health Service Information System (FHSIS)
- Integrated Tuberculosis Information System (ITIS)
- Hospital Statistics

These processes were identified based on observed levels of effort exerted by DOH offices, international development partners, and healthcare facilities on these processes, as well as the general prevalence of their information products. PIDSR, FHSIS, and by extension ITIS constitute the majority share of publicly-reported DOH health statistics. The Annual Hospital Statistical Report does not produce a public information product. However, the report is uniquely able to collect routine statistics from all hospitals.

The outlined processes are not the totality of the health information system. Other systems that enjoy institutionalized use were excluded. For example, the Philippine Registry for Persons with Disabilities (PRPWD) is the registration system for the PWD ID Card. However, PRPWD does not produce an information product. Systems such as the Online National Electronic Injury Surveillance System (ONEISS) which produces descriptive reports and seasonally features fireworks-related injury data in the news were excluded due to limited time for coordination and analysis.

Other health IT systems were analyzed for illustrative comparisons. The choice of which system to conduct comparisons with was based on convenience. These systems are:

- Integrated Chronic Non-Communicable Disease Registry System (ICNCDRS); and
- National Rabies Information System (NARIS)

Surveys are not discussed because they largely rely on budgeted input for field enumerators and do not reflect the broader HIS landscape.

IV. Results and Discussion

4.1 HIS Resources: Data standardization policies

The DOH has developed health information system data standards. The following written policy constitutes the data standardization published by DOH:

- DOH-PHIC Joint Administrative Order 2021-0002: Mandatory Adoption and Use of National Health Data Standards for Interoperability

The rationale section of JAO 2021-0002 provides that the policy is for achieving health information exchange between healthcare providers and the improved processing of health and health-related public health data. The stated objectives of JAO 2021-0002 are:

- Establish the core set of terminologies, definitions, and structures for data and reports processing, sharing, and exchange;
- Develop reference for market development of eHealth services, products, systems, applications, networks, and technologies; and
- Define the implementation governance to direct and coordinate the adoption and use of national health data standards, ensure alignment with national health systems goals, enable health systems integration, promote awareness and engagement of stakeholders, support and empower the needed change, implementation, and monitoring of results for delivery of expected benefits.

DOH-PHIC JAO 2021-0002 contains regulatory roles and procedures, and an extended annex for metadata. The policy is partly a consolidation of DOH and PhilHealth form data fields. For example, Table 17 shows verbatim keywords from the Annual Hospital Statistical Report data fields. The policy is also an attempt at creating a standardized model for healthcare delivery data. For example, Table 18 contains fields that are not part of any other DOH and PhilHealth data-related policies and utilizes 'primary key'-type fields. Although JAO 2021-0002 is comprehensive, the policy provides limited syntactic information for exactly how implementers will use the data standard. However, Section 4 of JAO 2021-0002 cites that such specificity is a forthcoming feature of the data standardization.

"Data elements" in DOH-PHIC JAO 2021-0002 are expressed in human-readable form instead of valid variable names for implementers and software. The level of detail required by a data standard is illustrated using the XML specification. XML is a popular format to move electronic data. According to Sections 3.1 and 2.3 of the XML specification, 'attribute' and 'element' names cannot contain whitespaces. ('Extensible Markup Language (XML) 1.0' 2008) In XML, variables are expressed either as attributes or elements. The data elements in DOH-PHIC JAO 2021-0002 cannot be expressed in XML format because they contain white spaces. Implementers that translate their dataset into XML for exchange or submission will have to invent XML-appropriate variable names to express the data elements. One implementor may call the PhilHealth ID as "PHIC_ID" while another may call it "PhilHealth_Identification_MemberDependent". To a human, this is intelligible. To a computer, these are entirely different variables.

Table 17. Excerpt from JAO 2021-0002

	DATA ELEMENT	DEFINITION	SOURCE OF DEFINITION
MASTER PERSON DATA			
1	PhilHealth Identification Number (Member or Dependent)	A unique and permanent number issued to any client upon enrolment/membership registration to the National Health Insurance Program of the Corporation for purposes of identification, eligibility verification, and utilization recording.	1. DOH Administrative Order 2013-0025: National Implementation of Health Data Standards for eHealth Standardization and Interoperability (eHSI Release 001). 2. Captured in PhilHealth Membership Registration and Claims Forms.
2	PhilSys Number	A randomly generated, unique, and permanent identification number that will be assigned to every citizen or resident alien upon birth or registration by the PSA.	Republic Act 11055: Philippine Identification System Act
3	Taxpayer Identification Number	A nine-digit number assigned by the Bureau of Internal Revenue (plus a three-digit branch code, if applicable) to any person, whether natural or juridical, required under the authority of the Internal Revenue Code to make, render or file a return, statement or other documents for his proper identification for tax purposes	Section 236 (i) of the Tax Code.
4	Passport Number	A unique identification code issued by the Philippine government to its citizens and requesting other governments to allow its citizens to pass safely and freely, and in case of need to give him/her all lawful aid and protection.	Republic Act 8239: Philippine Passport Act of 1996.
5	Person with Disability (PWD) Identification Number	A unique identification code issued to any bonafide person with permanent disability.	NCDA Administrative Order No. 001 Series of 2008: Guidelines on the Issuance of

The usage context of the data fields are insufficient and left implicit for the implementer. Because JAO 2021-0002 is also an attempt at a data model for electronic health records, it is important to specify in which contexts the fields should be used. Currently, no additional use-case descriptions are given for the data elements (see **Table 17** and **Table 18**). Two (2) consequences are illustrative. (1) In the case of the 'Encounter Log' group, the general guidelines that delineate what encounters warrant new encounter coding is not specified. For example, whether an encounter is determined by an episode of illness or every patient visit. (2) It is unclear if the data dictionary provided is meant to be completely implemented internally by healthcare facilities, or if it is primarily a reference for those healthcare facilities that are mandated to submit reports to the DOH and PhilHealth (also called an interoperability layer). For example, it is unclear if "Encounter Code" is an internal unique but arbitrary coding system specific to the healthcare facility or if the code is an externally defined coding system that the healthcare facility must follow:

Case 1: Encounter codes intended as an internal and healthcare facility-specific code
Such a code has no external meaning aside from uniquely identifying transactions within the context of the specific healthcare facility. Any two healthcare facilities exchanging health records cannot connect a patient's transaction into a particular encounter because the other healthcare facility's system would not understand the encounter code used by the other healthcare facility. All because the coding schemes are internally defined unique to healthcare facilities.

Case 2: Encounter codes intended as an externally unique identifier of an encounter
In this scenario, the coding system is undefined in JAO 2021-0002. Likened to a mobile phone number, an external system may generate this code to enforce uniqueness. JAO 2021-0002 does not define the coding scheme to implement encounter codes.

Table 18. Excerpt from JAO 2021-0002

ENCOUNTER LOG			
1	Encounter Code	Setting and condition in which the encounter takes place. It collectively constitutes health care provider code, PhilHealth identification number of the patient, date and time of encounter, as represented by a code.	PhilHealth Circular 2020-0002: Governing Policies of the Konsultasyong Sulit at Tama (PhilHealth Konsulta) Package: Expansion of the Primary Care Benefit to Cover All Filipinos
2	Health Facility Code	DOH-issued unique health facility code as generated from the National Health Facility Registry (NHFR).	DOH AO 2020- 2019-0060: Guidelines on the Implementation of the National Health Facility Registry
3	PhilHealth Identification Number	PhilHealth identification number of patient. A unique and permanent number issued to any client upon enrolment/membership registration to the National Health Insurance Program of the Corporation for purposes of identification, eligibility verification, and utilization recording.	1. DOH Administrative Order 2013-0025: National Implementation of Health Data Standards for eHealth Standardization and Interoperability (eHSI Release 001) 2. PhilHealth Circular 2020-0002: Governing Policies of the Konsultasyong Sulit at Tama (PhilHealth Konsulta) Package: Expansion of the Primary Care Benefit to Cover All Filipinos
4	PhilHealth Claim Series #	PhilHealth Issued Series #	PhilHealth Claims Form 1-4
5	Hospital Patient ID #	Hospital Patient ID #	1. DOH Hospital Health Information Management Manual 2. PhilHealth Claim Form 4
6	Hospital Registry #	Registry number assigned by the health facility to the patient	
7	Hospital Case #	Primary identifier used by the health facility to identify a patient for each case or incidence	
8	Type of Encounter	Outpatient / Emergency Room / Inpatient	

Some data elements in DOH-PHIC JAO 2021-0002 are defined with insufficient constraint. Data standards involve specifying the 'allowed values'. In JAO 2021-0002, the data element "Type of Encounter" is simply defined as containing the categories of "Outpatient", "Emergency Room", or "Inpatient". This may be sufficient logically. However, individual systems may express and consequently communicate this field very differently. For example, the field may be coded as 1 for Outpatient, 2 for ER, and so on (see **Table 18**). In the case of "Hospital Statistics", the format for the "Ten Leading Causes of Morbidity, Disaggregated" is also unspecified (see **Table 19**). Simply, the provided 'definition' of each data field is overloaded with meaning and additional columns should be included that define allowed values, data types, field length, and so on.

No "end-points" or electronic interfaces provided. Once implemented by various health IT systems, the practical utility of having complied with the standard is unclear in the written policies. Although DOH-PHIC JAO 2021-0002 provides for the standardization of health data and DOH-PHIC-DICT JAO 2021-0001 provides the regulatory process through which this standardization is tested, the actual mechanism that utilizes the data is not available. Application Programming Interfaces (APIs) or end-points, are not yet provided in written policies of the DOH for this data standard.

Table 19. Excerpt from JAO 2021-0002

29	Ten Leading Causes of Morbidity	The Top Ten Leading Causes of Morbidity as of midnight last day (December 31st) of previous year to the following year (January 1)
30	Ten Leading Causes of Morbidity/Diseases Disaggregated as to Age and Sex	Top 10 leading causes of Morbidity/ Diseases with detailed sub-categories for Age and Sex.
31	Total Number of Deliveries	Total number of all types of deliveries. Total number of live-birth vaginal deliveries (normal) + Total number of live-birth cesarean section deliveries + Total number of other deliveries (given period of time is January 1 to December 31st of the reporting year)
32	Number of Outpatient Visits, new patient	Refers to the total number of outpatient first visits that was attended and who received health care services in the health care facility for a period of time. (given period of time is January 1 to December 31st of the reporting year)
33	Number of outpatient visits, re-visit	Refers to the total number of outpatient second and subsequent visits that was attended and who received health care services in the health care facility for a period of time. (given period of time is January 1 to December 31st of the reporting year)
34	Number of outpatient visits, adult	Total number of adult outpatient visits (Age 19 years old and above)

4.2 Data Sources: Perpetually-in-pilot DOH-owned health IT

Despite numerous health IT tools to input data into the HIS, many healthcare facilities still do not use these tools. Poor horizontal integration is a key point of failure for health information systems (Tolentino et al. 2005). Simply, there are only so many hands in healthcare facilities to manage the multitude of competing vertically integrated HIS processes and health IT tools. This leads to an environment where numerous systems vying for the limited attention of healthcare staff do not reach widespread adoption. This section will show through comparison how long-standing health IT systems of the DOH have not been able to meet the level of utilization of existing paper-based HIS processes.

Table 20. Descriptions of selected DOH-owned health IT

Application Name	Description
Integrated Chronic Non-Communicable Disease Registry System (ICNCDRS)	A registry of persons afflicted with specified non-communicable diseases such as diabetes, coronary disease, and blindness.
National Rabies Information System (NARIS)	A reporting platform for persons with exposure to animal bites and rabies cases.
Integrated Tuberculosis Information System (ITIS)	A case management tool used by DOTS providers to manage patients and register TB cases.

Parallel health IT tools have been unable to produce a similar volume of data compared to paper-based health information systems. In general, paper-based systems continue to out-perform electronic systems. Consider ICNCDRS and NARIS. In ICNCDRS, Diabetes comprises the largest share in volume of data (see Figure 21). Over the period 2016-2019, the number of new diabetes patients encoded into the ICNCDRS was consistent. However, this volume is far exceeded by the number of diabetes patients observed through FHSIS. This is important considering that FHSIS only represents a fraction of healthcare facilities due to the FHSIS primarily receiving data from public primary care facilities (**Figure 23**). Similarly, the data in NARIS is far outpaced by the reported health statistics of the DOH. Figure 22 shows the number of animal exposure records in NARIS. The number of animal bite exposure encoded in NARIS is far outpaced by the reported animal bites by the FHSIS. Additionally, **Figure 24** shows the rabies cases encoded in NARIS. The National Rabies Information System does not contain any rabies case data for 2018 to 2021. **Figure 24** and **Figure 25** suggests that the actual reporting of rabies-related public health data does not typically use NARIS. In the case of confirmed rabies cases, the epidemiologic surveillance system (EDCS) is the most utilized reporting system for rabies.

The difference in volume of data may also be due to some regions simply not using health IT systems. Variability in the geographic utilization of the select systems is used here to show issues with system use. Figure 21 and Figure 23 disaggregates the number of records encoded in ICNCDRS by region. In general, with some variation, morbidity can be reasonably expected to scale with population size. That is, all things being equal, larger populations tend to have more sick people. Figure 21 shows a sorted population graph by region alongside the number of records in ICNCDRS. The proportionality of morbidity/case records with population does not hold for ICNCDRS. As population size gets smaller, the number of records does not. Outlier highs (Region XI and Region XII) and lows (Region V and BARMM) may be observed in the data. This utilization pattern is more likely a reflection of the geographic prioritization of DOH in deploying the system. However, this pattern challenges the utility of systems like ICNCDRS to produce public health data. For example, the registry contains almost twice (2x) as many observations in Region XI (Davao) than in NCR despite the population of NCR being over twice (2x) as much as that of Region XI (Davao). Additionally, BARMM has eight times (8x) less observations compared to Region XI (Davao) despite neighboring and similar populations. Taken at face value, this leads to the unlikely conclusion that Region XI (Davao) has four times (4x) higher prevalence than NCR, and eight times (8x) higher prevalence than neighboring BARMM. Figure 29 visualizes this observation using the records per capita (analogous to a 'prevalence rate').

In contrast, the Integrated Tuberculosis Information System (ITIS) is a more successful implementation of HIS digitization. The adoption of the Integrated Tuberculosis Information System (ITIS) was able to mature to the extent of providing usable public health data. ITIS is currently the authoritative source of tuberculosis data in the country. compares the number of cases/observations contained in ITIS and those reported in FHSIS. Although the volume of data in ITIS was relatively low from its inception until 2014 such that the reported data in FHSIS is greater, the utilization of ITIS has since risen dramatically. The current FHSIS report cites ITIS as the data source of its TB-related statistics. The ITIS database analyzed contains entries from 3,657 healthcare facilities during the period from 2010 to 2021. If it is assumed that, operationally, only DOTS providers input into ITIS, then ITIS has been able to achieve 94% (3,657 / 3,882) adoption with the 3,882 total current DOTS providers (hospitals and RHUs). Compared to the geographic utilization of ICNCDRS seen in **Figure** 23, the pattern for

ITIS shown in Figure 28 shows a corresponding tapering off along with population size. This signals that ITIS has some level of representativeness relative to the population. This observation is visualized in where the 'prevalence' has some level of consistency. For example, neighboring Regions X, XI, XII, and XIII have per capita figures within earshot of one another (reflecting similarities in contexts), with Region XI (Davao) possessing the lowest figure (reflecting the effect of greater resources in Metro Davao).

However, ITIS still has space to improve its geographic reach. It is worth stressing that prevalence will always vary per condition and place to place. However, on the part of the HIS, all things being equal, some level of proportionality may reasonably be expected between prevalence and the population size. Figure 27 and Figure 28 disaggregates the number of records in ITIS by region. Despite the consistency of ITIS data on the whole, Figure 27 and Figure 28 shows BARMM to be a clear outlier.

Health data reflects not only the nature of the disease but also the nature of the data collection. Disease prevalence will always vary per condition and place to place. However, data must still be reported through some mechanism. The nature of the data is just as much affected by the nature of the disease as it is affected by the way it is collected. In the case of health IT, internet connectivity, working computer units, and trained personnel must all first exist before any data can be reported. The existence of data from certain regions necessarily means that some level of internet connectivity, working computer units, and trained personnel already exist for that region.

Health information systems have many moving parts which make problems difficult to find. The HMN Framework shown in Figure 1 outlines the different components that need to come together for an HIS. The issues known to arise in HIS are discussed in the introduction but are briefly summarized here:

- Competing systems and excessive staff hours (Tolentino, Marcelo, Marcelo, Sy, et al. 2005);
- Ministry governance and policies (Marcelo 2017);
- Work culture change (Macabasag et al. 2022; Brieux et al. 2017; Tolentino, Marcelo, Marcelo, and Maramba 2005); and
- Physical infrastructure (Francisco and Abrigo 2023).

The following discussion helps to motivate policy interest towards horizontal integration (Tolentino, Marcelo, Marcelo, Sy, et al. 2005), HIS governance (Marcelo 2017), and workplace change management (Macabasag et al. 2022) over IT-focused recommendations to address HIS issues.

The geographic utilization of ICNCDRS compared to ITIS may provide an alternative to the intuitive explanation that IT availability is the primary bottleneck for HIS digitization. The geographic pattern between ICNCDRS, ITIS, and FHSIS is used here to triangulate alternative explanations to IT availability as the source of HIS issues. In Figure 16, Region XIII and Region IV-B (MIMAROPA) are able to report comparable per capita ITIS figures to the highest reporting regions. Despite being among the lowest populated regions and consequently among the lowest absolute number of records encoded in ITIS shown in Figure 27, the per capita records in Figure 29 shows that Region XIII and Region IV-B (MIMAROPA) are among the most capable regions in reporting to ITIS. In other words, higher per capita records signal not only that the region might be less healthy, it also demonstrates

that the region is able to report the fact. This observation is contrasted against the per capita figures for ICNCDRS shown in Figure 9 where Region XIII and Region IV-B (MIMAROPA) are among the outlier lowest figures. These conflicting observations suggest that in one system (ITIS) some regions are among the most able to report while in one system (ICNCDRS) they are among the least able. However, internet connectivity, working computers, and trained personnel cannot be spontaneously unavailable for some systems. This observation may provide an alternative explanation to the intuitive explanation that attributes HIS issues to IT availability. This observation is corroborated by case study results that cite work attitudes and conflicting national reporting systems as barriers to digitization (Macabasag et al. 2022; Tolentino et al. 2005).

Figure 18. Number of records in the ICNCDRS for each NCD registry

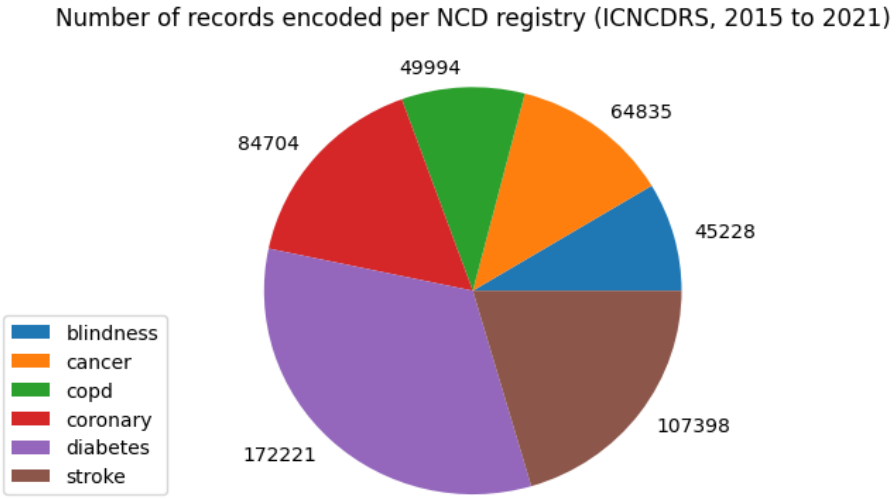


Figure 19. Number of records in ICNCDRS for every region

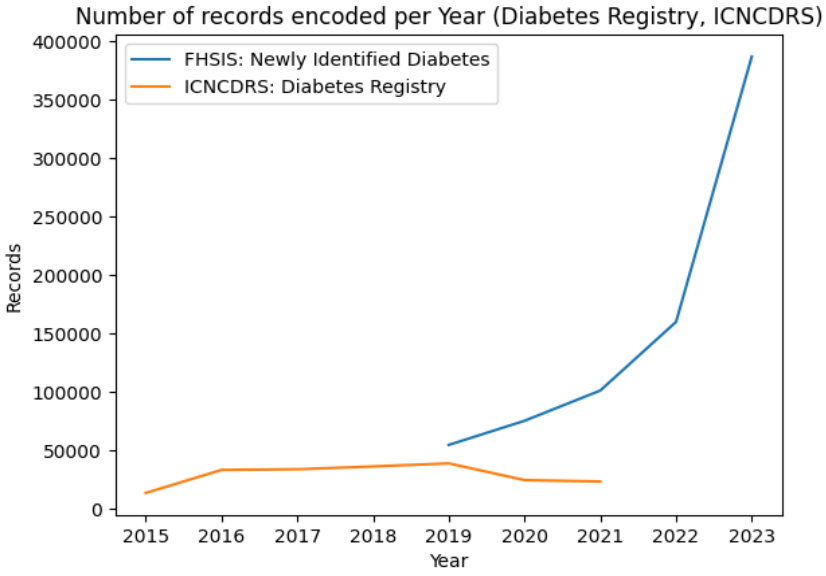


Figure 20. Number of records in ICNCDRS compared to FHSIS data

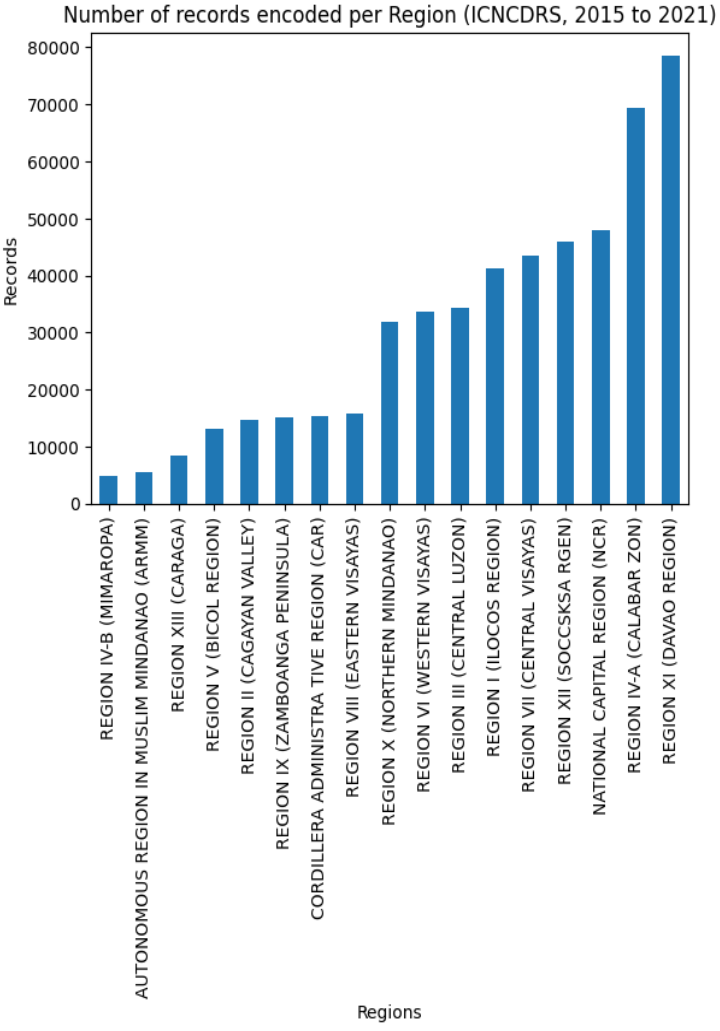


Figure 21. Number of records in ICNCDRS against population, sorted by population size

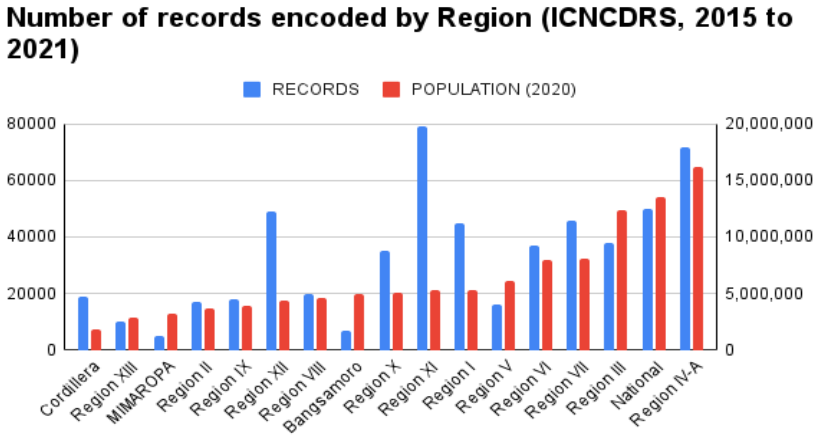


Figure 22. Number of records in NARIS compared to FHSIS data

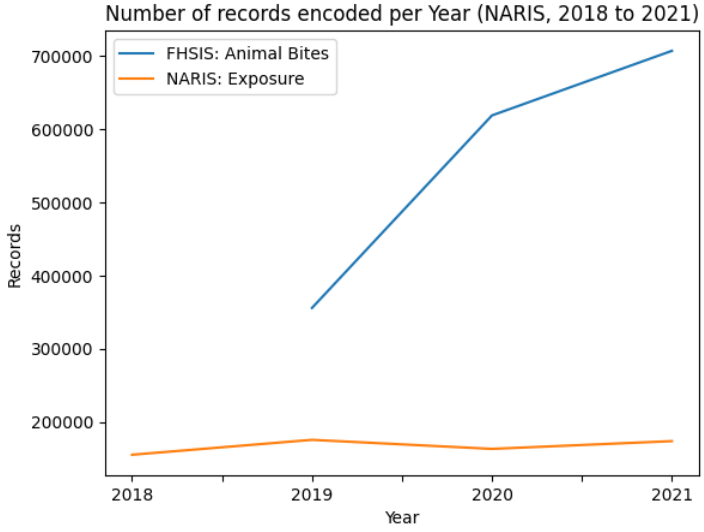


Figure 23. Records in ICNCDRS per capita against population, sorted by population size

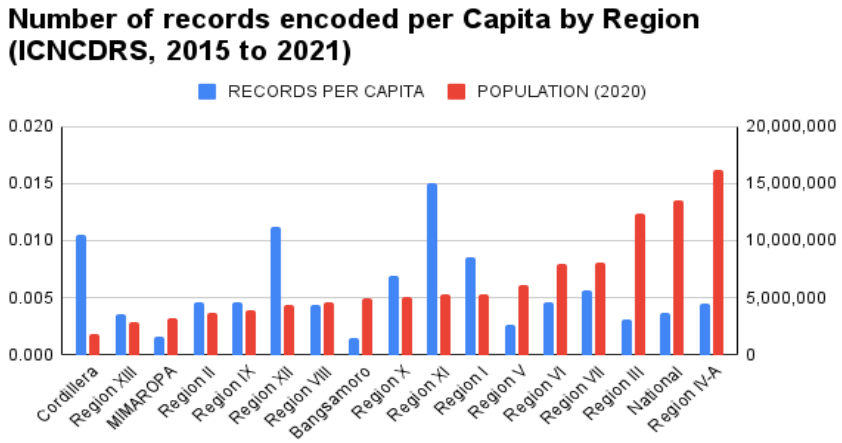


Figure 24. Records in NARIS compared to FHSIS and PIDSR

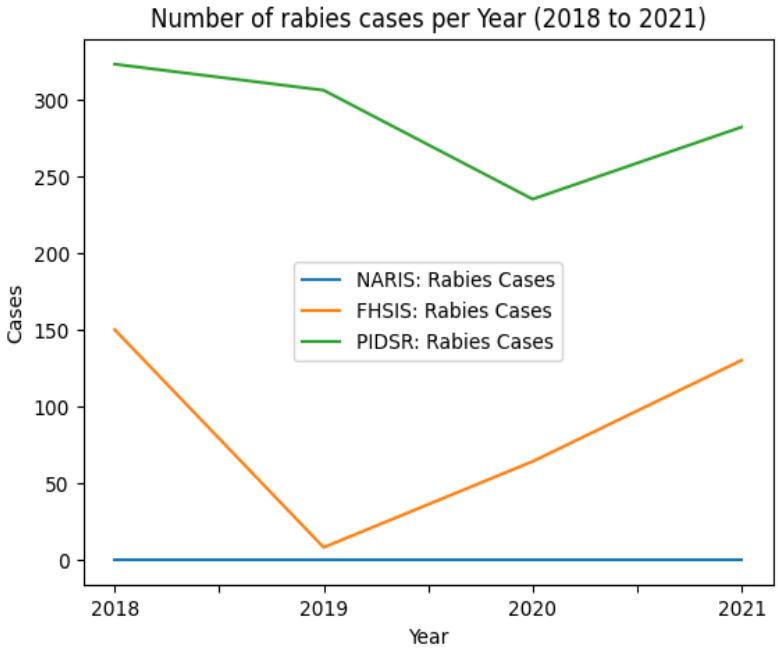


Figure 25. Number of records in NARIS for every region

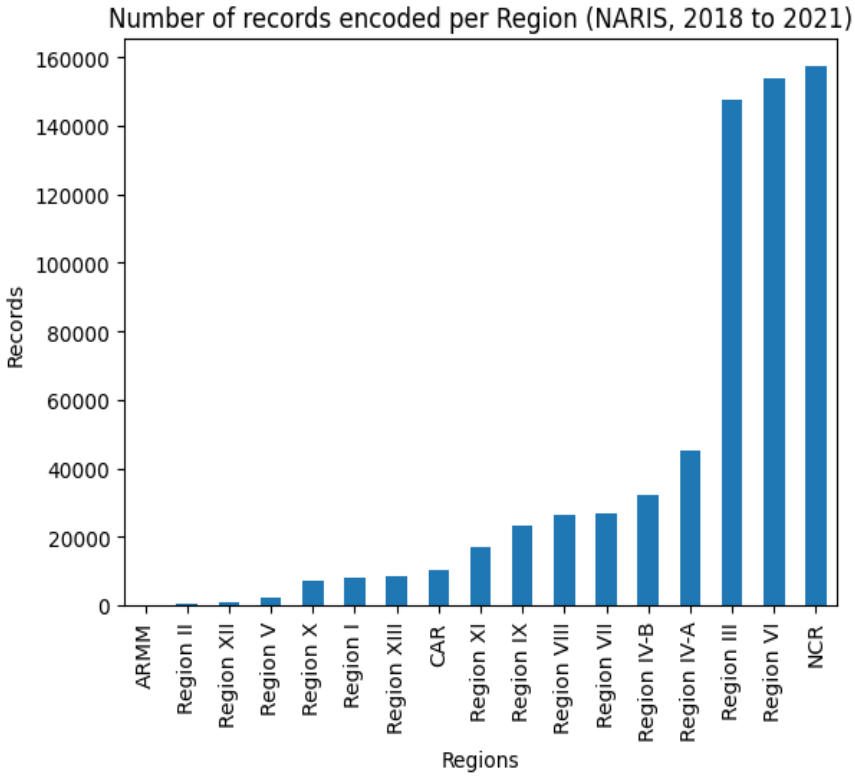


Figure 26. Number of records in ITIS compared to FHSIS data

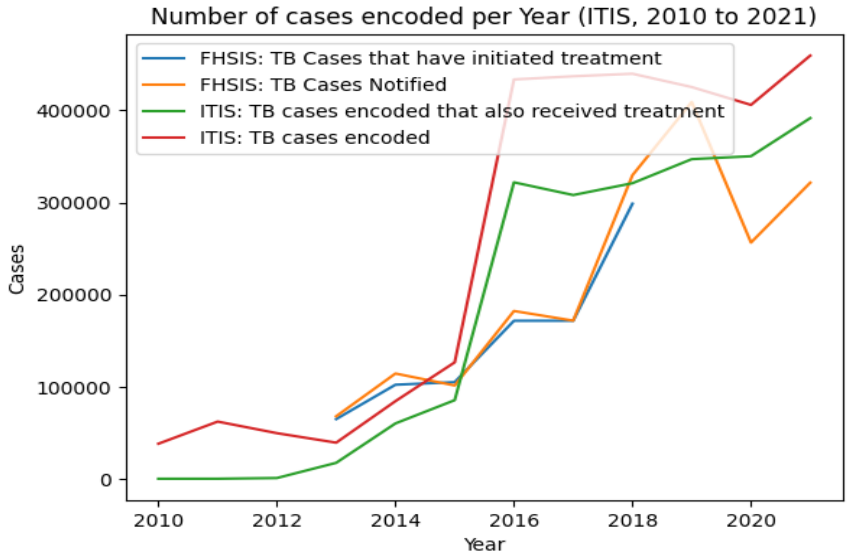


Figure 27. Number of records in ITIS for every region

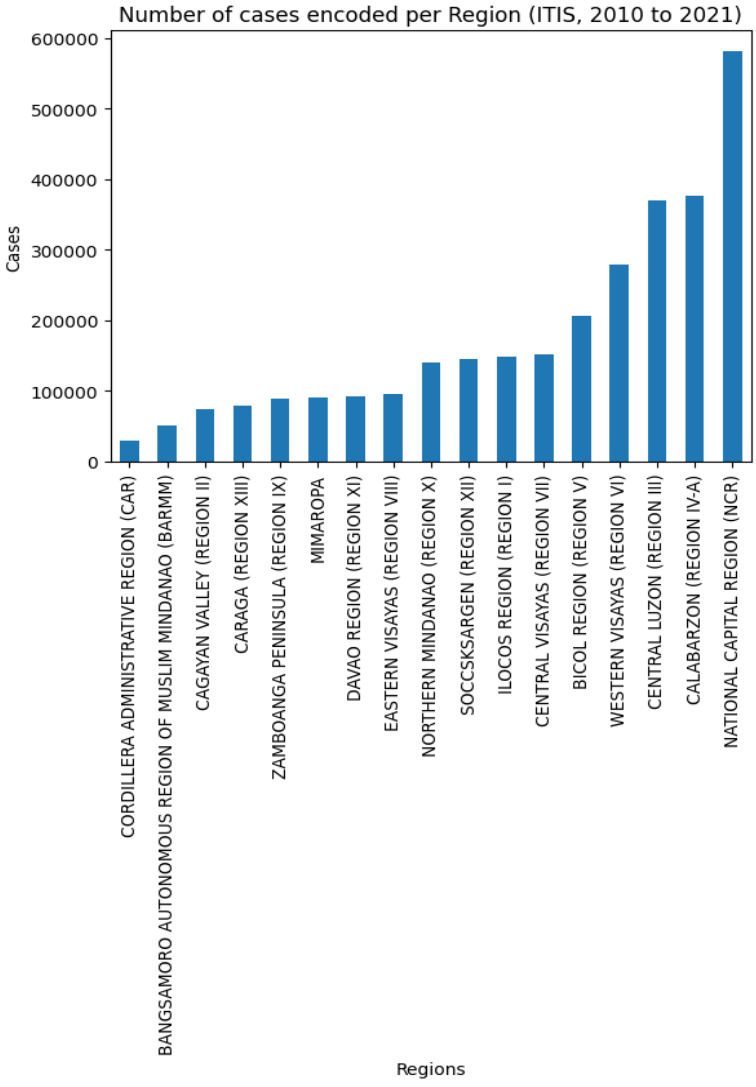


Figure 28. Number of records in ITIS against population, sorted by population size

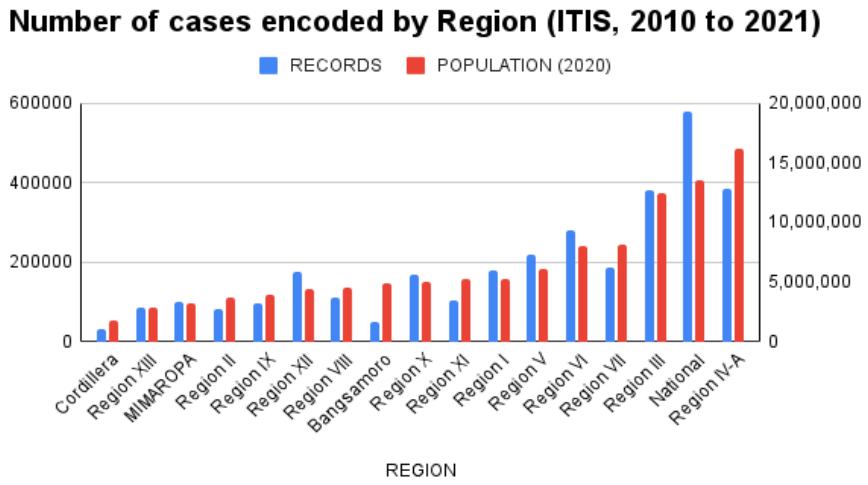
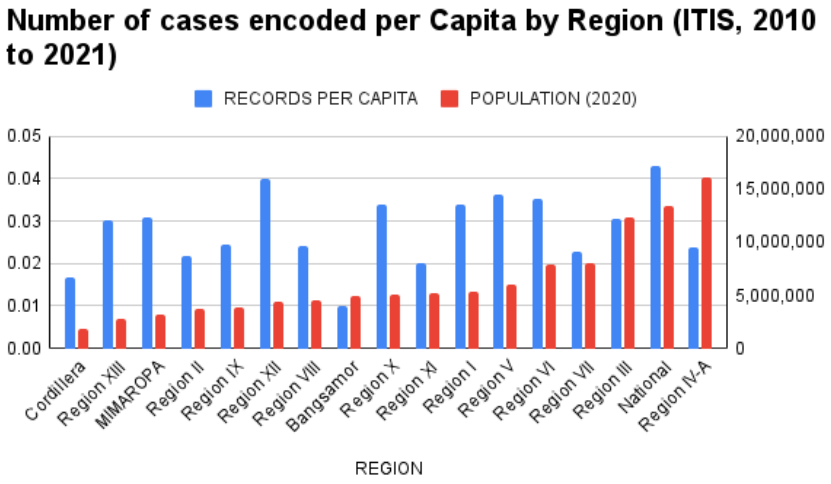


Figure 29. Number of records in ITIS per capita against population, sorted by population size



4.3 Data Management: Point of Entry

In general, the data management practices in healthcare facilities vary according to the degree of specificity provided by each HIS process and the degree of the health facility's achievement of digitization. For example, the FHSIS (field health services) and PIDSR (epidemiology) have individual Manual of Operating Procedures which are instructions for healthcare staff on how to conduct HIS activities. However, the existence of guidelines by themselves does not necessarily translate to a corresponding up-to-par data management practice. For example, mastery of HIS guidelines (Murai, Ventura, and Gaite 2022) and manufacturing data to meet targets (Tolentino, Marcelo, Marcelo, Sy, et al. 2005) by primary care staff are some of the practical data management issues afflicting HIS. Percentages that exceed 100% and inconsistent tallies are regular issues that arise in the preparation of the FHSIS annual dataset in the Epidemiology Bureau, as field service data is propagated from public primary care facilities to the DOH. These issues may be attributed to inherent limitations of top-down policy guidelines such as MOPs.

In the case of hospitals, the Hospital Health Information Management Manual provides data management practice guidelines that address typical record-keeping work processes and regulatory data requirements of a hospital (Health Facility Development Bureau 2020). The manual provides general guidelines on record-keeping such as paper-based health record indexing, medico-legal protocols for patient records, and additional instructions for preparing the hospital statistical report. It also contains a conceptual introduction to electronic health records and basic change management guidelines on how to transition away from paper-based record-keeping. The Hospital Health Information Management Manual aims to standardize the information management in hospitals which in turn has a positive effect on data quality. The manual is the only general data management guideline issued by the DOH.

4.4 Dissemination and Use

Data management practices and horizontal integration of the HIS in the DOH central office affects how the general public accesses public health data. The poor achievement of horizontal integration fragments the way the datasets are accessed. Rudimentary data management practices further provide a technological barrier. The offline and unstructured storage of datasets such as FHSIS cannot be readily connected to a data dissemination website which uses dynamic queries. For example, the general public cannot simply query for tuberculosis-related data over the past ten (10) years. They will need to gather the FHSIS reports over that period and browse the seven hundred- (700) page documents to gather their dataset. The task is made further tedious in the case of subnational data.

Simple data management practices exchange convenience for robustness. Crude, albeit practical, data warehousing has traded the accessibility of spreadsheet tools over the additional burden of upskilling which leads to unnecessary clerical work to accommodate bespoke data requests from the general public. Unsuspecting students and researchers resort to directly requesting data from the DOH which lead to an inordinate amount of menial labor. Since the underlying dataset of the FHSIS is stored as spreadsheets in staff computers, requests that are essentially historical time-series data requires unearthing rarely-used spreadsheet archives from a specific staff computer or portable storage device.

V. Conclusion

There are three (3) technical areas of concern identified in this discussion: (1) the deficiencies in the data standardization policies of the DOH. These deficiencies contribute to (2) the underachievement of digitization of the HIS, shown using the relative immaturity of data in DOH-owned health IT. Finally, there is a need to address (3) the broader data management practices in the DOH to achieve not only data security but also to enable support systems that rely on the structured data.

IT availability may not be a significant barrier to the HIS as conventionally thought. By comparing the volume of utilization between FHSIS, NARIS, ICNCDRS, and ITIS, it was shown that the underutilization of systems such as NARIS and ICNCDRS is not due to poor IT availability because regions wherein NARIS and ICNCDRS performed poorly were among the regions that utilized ITIS the most. Rather, barriers to health IT utilization are more likely characterized by poor horizontal integration leading to competing and redundant systems. Furthermore, the current status of ITIS as the primary source for tuberculosis data demonstrates that regions are in fact able to utilize health IT. These observations challenge conventional explanations that IT availability is the primary barrier to the HIS, which lead to solutions that amount to IT dole outs. Instead, this study shows that the technical design of the HIS (horizontal integration, valid data standards, data management policies) may be a more productive channel for improving the health information system.

VI. Recommendations to the DOH

The deficiencies in the data standardization policy of the DOH must be addressed. The data standardization policy of the DOH was shown to have deficiencies that prevent actual implementation. In general, the specification does not comply with common IT conventions nor does it provide sufficient detail for when and how to use the specification. The DOH must develop the policy to be read by implementers as the target audience rather than its public health managers. Finally, the specification should provide an outlet towards which the standardized data is ultimately bound. APIs are an effective way to enforce data standardization because the receiving system can flag basic errors in the submission, as well as provides a concrete outlet which motivates the adoption of the data standard. The DOH may adopt existing tools and develop a country-specific version of the Fast Healthcare Interoperability Resources (FHIR) framework, as an example.

There are two (2) ways to help address the horizontal integration of the DOH HIS. Firstly, in the process of addressing the technical deficiencies of the data standards, the ensuing specification must also be able to harmonize the data needs of the various DOH offices. DOH program offices cannot be reasonably expected to express their needs in terms of sound data standards. One challenge that must be overcome is the conflict between maintaining the established HIS requirements in healthcare facilities while preparing for the transition to electronic health records. Simply, healthcare facilities cannot abandon existing HIS requirements in favor of new technology without the certainty that the transition will satisfy what is required of them. The onus therefore is on the data standards that the health IT tools will use. As seen in Figure 4, the data standard need not contain a field for the number of outpatient visits. This may be computed based on the totality of encounters marked as outpatient. As mentioned, such dysfunctions in the data standard arise because health programs

are unreasonably expected to be able to express their needs in terms of a data standard, and conversely that the office preparing these data standards receive these requirements from programs uncritically. This field was included uncritically because this is a verbatim field in the HFSRB hospital statistical report. Secondly, health programs should enhance discretion in using the health information system as a job aid for healthcare staff. Programmatic health IT modules should not be used as a crutch for hiring and training HRH. This practice overloads the health information system with data fields that, due to their sheer volume, compete with one another which results in poor data for everyone.

A central, DOH-wide, relational data repository must be implemented for all DOH-owned public health data. Data must be treated as an asset. The way data is managed is a basic reflection of how an organization views its data. Current data management practices in the DOH for HIS data erode after the publication of the requisite reports. The data follows a more linear rather than a circular lifecycle. The relatively poor data warehousing in the DOH is a systemic barrier to both the security of the data which belongs to Filipinos and the potential of the datasets to have a life beyond the publication of the report. The data warehousing must use a relational database whenever the dataset allows. Relational databases facilitate a whole suite of support systems which connect to the data such as live dashboards, customized user queries, and systematic user searches. To achieve this, the DOH must undergo the exercise of identifying its valuable datasets and label them with metadata. Most importantly, the DOH must appropriately restructure the data in such a way that maximizes their utility in a relational database. For example, available levels of disaggregation are lost when subgroupings are embedded instead of separated from variable names in indicators such as "Number of children given deworming drugs aged 1-4 years old". Consequently, data management processes in each DOH bureau must adjust to a new way of working that utilizes the benefits of a centralized data warehouse. The current prospective and ambitious candidate for this solution is the National Health Data Repository of PhilHealth. The DOH may also assess the experience of the epidemiology program in transitioning its case surveillance data into relational databases to motivate a department-wide transition. The Chief Information Officer of the DOH must initiate organizational reforms that strengthen data governance and improve data management in the DOH.

VII. Implementation Considerations for the Sentinel Sites Program

Developing a country-level health data standard is a considerable technical and governance activity. It is by itself a major policy. Aside from developing the standard itself, the institution and its stakeholders outside must be convinced of the utility and merit of the data standard which outside stakeholders will also commit considerable resources to follow. For the Sentinel Sites Program, this may serve as an opportunity to begin a kernel of early adopters that will facilitate wider standards acceptance.

As discussed in the recommendations, pre-existing standards may be adopted to help relieve the effort of developing a new data standard. Standards such as the Fast Healthcare Interoperability Resources (FHIR) come with a general implementation specification that may be used as the initial version for the DOH health data standard. Once this policy direction has been decided, the data needed from the Sentinel Sites may be translated into the language of FHIR. The DOH may then begin to develop end points (APIs) to receive this dataset, and

Sentinel Sites may begin to enlist technical services to translate their EMR data into the language of FHIR and submit the required data to DOH end points.

VIII. Bibliography

AbouZahr, Carla, and Ties Boerma. 2005. 'Health Information Systems: The Foundations of Public Health.' *Bulletin of the World Health Organization* 83 (8): 578–83.

Brieux, H.-F. Mandirola, S. Benitez, Carlos Otero, D. Luna, Jakir Hossain Bhuiyan Masud, Alvin Marcelo, M. Househ, et al. 2017. 'Cultural Problems Associated with the Implementation of eHealth'. In *MEDINFO 2017: Precision Healthcare through Informatics*, 1213. IOS Press.

DAMA International. 2017. *Data Management Body of Knowledge*. 2nd ed. Basking Ridge, New Jersey: Technics Publications.

Department of Health. 2012. 'DOH Administrative Order 2012-0012: Rules and Regulations Governing the New Classification of Hospitals and Other Health Facilities in the Philippines'. Department of Health.

———. 2018. 'DOH Department Circular 2018-0131: Revised Licensing Assessment Tools for Hospitals'. Department of Health.

———. 2020. 'DOH Administrative Order 2020-0047: Rules and Regulations Governing the Licensure of Primary Care Facilities in the Philippines'. Department of Health.

———. 2023. 'Republic Act No. 11223: Universal Health Care Act Implementation Report - Status as of June 2023'. Manila, Philippines: Department of Health. www.doh.gov.ph.

Department of Health and Philippine Health Insurance Corporation. 2021. 'DOH-PHIC Joint Administrative Order 2021-0001: Guidelines on the Implementation and Maintenance of an Integrated Health Information System'. Department of Health.

'Extensible Markup Language (XML) 1.0'. 2008. W3C. https://www.w3.org/TR/2008/REC-xml-20081126/.

Francisco, Kris A., and Michael R.M. Abrigo. 2023. 'Electricity Supply Interruptions and Its Impact on Local Economies'. *Philippine Institute for Development Studies*, PIDS Discussion Paper Series, , December.

Gissler, Mika, Anca Dumitrescu, Véronique Addor, and World Health Organization. Regional Office for Europe. 2006. 'Improving the Performance of National Health Information Systems : The 2002-2003 Reform in Finland from an International Perspective / by Mika Gissler, Anca Dumitrescu and Véronique Addor', no. EUR/04/5046412. https://iris.who.int/handle/10665/107685.

Hammond, W. Ed. 2005. 'The Making And Adoption Of Health Data Standards'. *Health Affairs* 24 (5): 1205–13. https://doi.org/10.1377/hlthaff.24.5.1205.

Health Facility Development Bureau. 2020. 'Hospital Health Information Management Manual, 4th Edition'. Department of Health.

Health Metrics Network and World Health Organization. 2008a. Assessing the National Health Information System: An Assessment Tool, Version 4.0. 4th edn. World Health Organization. https://iris.who.int/handle/10665/43932.

Health Metrics Network and World Health Organization. 2008b. Framework and Standards for Country Health Information Systems. 2nd edn. World Health Organization. https://iris.who.int/handle/10665/43872. Heeks, Richard. 2002. 'Information Systems and Developing Countries: Failure, Success, and Local Improvisations'. *The Information Society* 18 (2): 101–12. https://doi.org/10.1080/01972240290075039.

Macabasag, Romeo Luis A., Eunice U. Mallari, Patrick Joshua C. Pascual, and Portia Grace H. Fernandez-Marcelo. 2022. 'Normalisation of Electronic Medical Records in Routine Healthcare Work amidst Ongoing Digitalisation of the Philippine Health System'. *Social Science & Medicine* 307 (August):115182. https://doi.org/10.1016/j.socscimed.2022.115182.

Marcelo, Alvin B. 2017. ‘Understanding Local Policy and the National eHealth Strategy’. In *Global Health Informatics: Principles of eHealth and mHealth to Improve Quality of Care*, 91–100. MIT Press Cambridge.

Murai, Shinsuke, Ray Justin C. Ventura, and Julita T. Gaite. 2022. ‘Timeliness of Reporting Process in the National Routine Health Information System: The Case of 19-Year Experience of Field Health Services Information System in Palawan, the Philippines’. Edited by Karen A. Grépin. *PLOS ONE* 17 (2): e0264681. https://doi.org/10.1371/journal.pone.0264681.

Philippine Statistics Authority. 2019. ‘Survey on Information and Communication Technology 2019 (SICT 2019)’. www.psa.gov.ph/psada.

Rechel, Bernd, Nicole Rosenkoetter, Marieke Verschuuren, and Hans Van Oers. 2019. ‘Health Information Systems’. In *Population Health Monitoring*, edited by Marieke Verschuuren and Hans Van Oers, 11–34. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-76562-4_2.

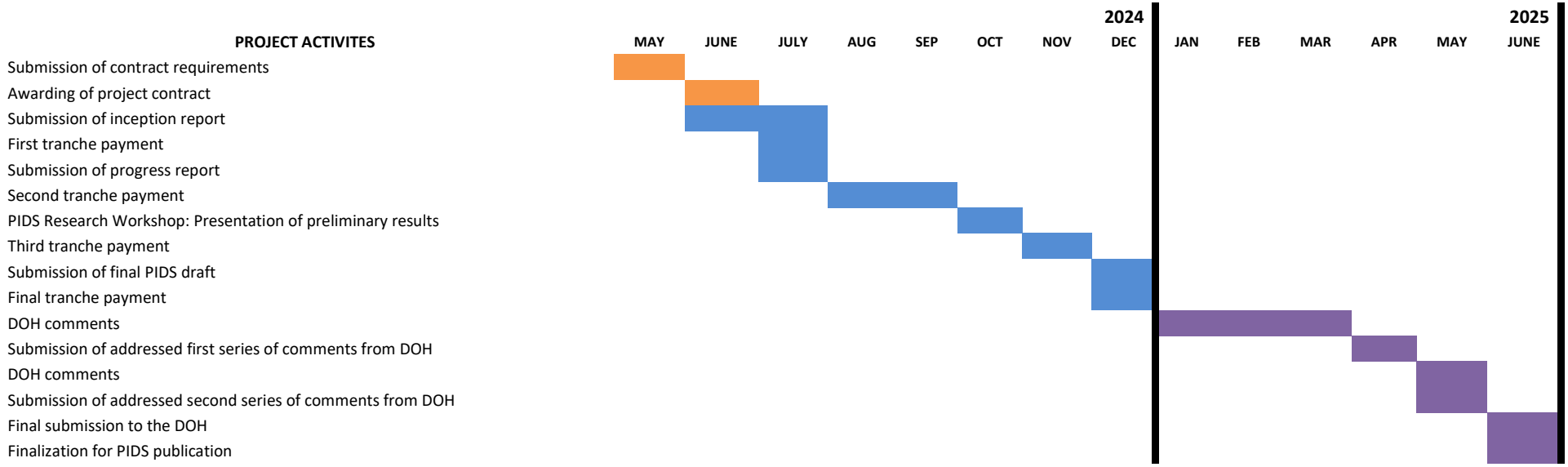
Tolentino, Herman, Alvin Marcelo, Portia Marcelo, and Inocencio Maramba. 2005. ‘Linking Primary Care Information Systems and Public Health Information Networks: Lessons from the Philippines’. In *Connecting Medical Informatics and Bio-Informatics*, 955–60. IOS Press.

Tolentino, Herman, Alvin Marcelo, Portia Marcelo, Marie Irene Sy, Marvin Yoingco, Ariel Betan, and Inocencio Maramba. 2005. ‘The Evolution of a Community-Based Child Injury Surveillance Project’. *Media Asia* 32 (3): 174–79. https://doi.org/10.1080/01296612.2005.11726793.

World Health Assembly, 60. 2007. ‘Strengthening of Health Information Systems’. Geneva: World Health Organization. WHO IRIS. https://iris.who.int/handle/10665/22604.

IX. Annex

Annex A. Gantt Chart



Reimagining the Monitoring and Evaluation (M&E) Framework for Healthcare System Performance in the Philippines: A Proposal

Ida Marie T. Pantig and Valerie Gilbert T. Ulep

Executive Summary

Globally, health systems have been evolving with reforms such as primary health care, integrated care, and value-based care at their helm. Advanced health systems have been adopting and integrating these reforms not only in health service delivery but also in their monitoring and evaluation framework. Advanced health systems such as Australia, Canada, and United Kingdom have developed and continuously improved their monitoring and evaluation frameworks to accommodate new indicators that are more indicative of the performance of the healthcare system. In the Philippines, universal health care reforms run parallel with developments in advanced health systems. Priority reforms include primary care benefit packages, integrated healthcare systems through the health care provider networks, and innovative provider payment mechanisms that are directed towards value-based care. With the Philippines' current direction, it is appropriate to develop a monitoring and evaluation framework that is responsive to current data needs that are truly reflective of the healthcare system performance.

This paper proposes a monitoring and evaluation framework that focuses on healthcare system performance as a determinant of health. The experiences and practices of advanced health systems were explored, such as the OECD Health System Performance Assessment Framework which puts people's needs and preferences at its core, the Australian Health System Conceptual Framework which highlights core elements such as health system context, determinants of health, health system, and health status, the Canadian Health System Performance Measurement Framework which adds the social determinants of health dimension, and the Dutch model which emphasizes an outcome-based framework. As part of the development of the M&E framework for the country's health system, several dimensions are explored such as effectiveness, safety, responsiveness and patient-centeredness, timeliness, and cost-efficiency.

The role of existing M&E frameworks in the Philippine healthcare system is also recognized. The proposed framework aligns with recent reforms in health (e.g., primary health care, integrated care, and value-based care), which will serve as the overall objective of the framework. In addition, the framework should also recognize both health and non-health determinants consistent with the Philippine Development Plan 2023-2028, where one of its goals is to improve the social determinants of health. These include socioeconomic factors, health behaviors, personal biomedical factors, and environmental factors, among others. We consider and recognize the National Objectives for Health 2023-2028 serves as the basis for identifying the priority policy agenda for health, which includes strategies for *individuals* (ensuring safe, high-quality, and patient-centered services)*, community* (promoting health, addressing health determinants)*,* and *healthcare workers (HCWs) and institutions* (HCW's well-being and rights, and strengthening institutions)*.*

Building on the Canadian, Australian, and OECD models, this framework espouses that health is determined by both health and non-health factors. The framework builds on the health system

context as its foundation. One of the key factors to consider is the demographics, as healthcare systems seem to expand based on the evolving healthcare needs and projected demands of its population. In addition, the framework also rests on the WHO health system building blocks, including governance and leadership, health financing, health workforce, medicines and vaccines, and health information design (World Health Organization 2010). Non-health determinants include health behavior, personal factors, environmental factors, and socioeconomic factors. In the proposed framework, healthcare system performance influences how non-health determinants affect health. This is mainly due to how the individual integrates both factors, i.e., how income and employment will influence healthcare use. Health-related determinants are mainly based on the performance of the healthcare system. The healthcare system consists of healthcare services including activities such as curative care, long-term care, mental health care, palliative care, preventive care, and health promotion activities (i.e., screening, vaccination, and public health campaigns) (OECD 2024). Their impact on priority populations, e.g., *individual, community, and healthcare workers and institutions*, depends on how the healthcare system addresses their major health concerns. For the individual, the main objective is to improve the health status of the Filipinos; for the community, the goal is to ensure that the entire group is kept healthy. As for the healthcare workers and institutions, the goal is to equip them with the right structure and environment to ensure their responsiveness to the health needs of the Filipinos.

This paper also presents novel performance indicators to be used in the country with a focus on quality indicators. The indicators will zero in on healthcare performance with focus on measuring how the goals of the major health reforms are attained. Recall that the priority populations in the national health agenda may correspond to each of the new reforms in health: primary health care reforms center on ensuring that communities are healthy and that they have access to quality and appropriate care when needed; integrated care ensures that individuals get the patient-centered, safest and appropriate care with the least direct and indirect costs, and; healthcare workers and institutions incentivized for providing effective and quality care.

Lastly, recognizing how the current health information system might be unable to capture the proposed indicators, this paper also suggests appropriate features of the health information system that is required to enable the proper capturing and processing of data. It will be important to ensure the quality of data collected, data collection platform, and systems for data aggregation. This section proposes the features of the health information system that will ensure the proper estimation of the sample performance indicators. The appropriateness, accuracy, and completeness of data collected at every patient encounter is critical for the accurate estimation of performance indicators.

This proposed M&E framework puts forth a novel way of assessing healthcare system performance by directing our attention to health outcomes. The framework focuses on key dimensions of effectiveness, safety, responsiveness and patient-centeredness, timeliness, and cost-efficiency. Quality of care is embedded in how effective the healthcare system provides its services, how services are being delivered safely, and how responsive the healthcare service is to the needs and preferences of the patient. Quality healthcare will be at the core of healthcare systems moving forward, and with the new health system reforms in our midst, the development and operationalization of this framework provides a relevant and timely platform to review and assess how we look at healthcare system performance. A requisite for these reforms to take place is to restructure how data is being collected and aggregated. This means reviewing how our existing data collection systems and platforms will collect and process the

information to produce the novel indicators proposed in this framework and the longitudinal data needed to monitor and assess populations following the life stages approach currently promoted by the DOH.

I. Background, Significance, and Review of Related Literature

Globally, health systems have been evolving to adapt to demographic and socioeconomic transformations. One of the key health developments is the longer life expectancy where people now are healthier and live longer compared to 30 years ago. While this phenomenon is desirable, it has led to the exponential growth of the population. On the other hand, economic development has made people richer, and rapid urbanization has resulted in problems such as chronic illnesses, behavioral changes, and traumatic injuries, to name a few. Non-health determinants affecting health outcomes have also been established to influence health inequities, where economies with lower socioeconomic position have worse health outcomes (Durrani 2016, World Health Organization n.d.). Examples of social determinants of health which may positively or negatively affect health include income and social protection, education, unemployment, and job insecurity, working life conditions, food insecurity, housing, early childhood development, social inclusion and non-discrimination, structural conflict, and access to affordable health services of decent quality (World Health Organization n.d.). In parallel, healthcare systems have been evolving to adapt to new challenges of health care delivery security. One notable challenge brought about by the larger population is the health workforce crisis. According to the World Health Organization (WHO), a shortage of 4.3 million doctors, midwives, nurses, and other health workers was estimated in 2006 and is projected to increase to 12.9 million by 2035 following the population growth (World Health Organization 2009). This is said to be caused by years of underinvestment in health worker education, training, wages, working environment, and management (Durrani 2016).

As health systems adopt to new environments, reforms such as primary health care, integrated care, and value-based care have emerged. These reforms aim at making health care delivery more efficient and effective while addressing the needs of the population. Advanced health systems have prioritized primary health care, where the health needs of the population are addressed at the community level and encompasses the continuum of care (e.g., promotion, prevention, testing and diagnosis, treatment, and rehabilitation). Evidence shows that investment in primary health care and having a primary health care-based foundation has resulted in improved clinical outcomes, increased efficiency, better quality of care, and enhanced patient satisfaction (World Health Organization 2022). In addition, primary health care is said to be the key driver of universal health care as it ensures equity and cost containment (van Weel and Kidd 2018). While these positive outcomes are evident on a macro level, the unfortunate realities of inequitable and poor distribution of primary care services persist (Leyso and Umezaki 2024, Naria-Maritana, et al. 2020, Serafica, et al. 2025). Another major health system reform is the emphasis on integrated care. Under this strategy, treatment and management is done on a per condition basis, and not by specialization or facility type. In Germany, for example, migraine treatment consultation is done in one physical setting, where all concerned clinical and allied medical health professionals are available and without leaving the patient required to go to different facilities with different specialties (Hazarika and Purdy 2015). Lastly, value-based care focuses on maximizing health outcomes per money spent, and not on cost reduction per se. Building on the migraine treatment consultation example, value-based care comes in when medical teams are built around the condition in a dedicated facility and that information exchange and coordination among all providers takes place. Measuring value-based care focuses on outcome-based metrics, such as survival, quality of life, effective care, and positive patient and health worker experience, among others. This happens on top of the practice of measuring processes, such as number of patient encounters, compliance with clinical practice guidelines, and fee-for-service payments (Porter, Larsson and Lee 2016).

The Philippine experience is no different. Life expectancy was at 59 in the 1960s and jumped to 72 in 2022 and the population has increased four-fold since 1960. In addition, GDP per capita has tripled compared to 30 years ago (The World Bank n.d.). Effects of rapid population and economic growth are demonstrated in the triple burden of disease, with noncommunicable diseases, communicable diseases, and trauma and injuries as leading causes of mortality (Ulep and Casas 2021). While economic growth in the country has been promising, health outcomes in the Philippines are some of the lowest in Southeast Asia, trailing behind Thailand, Malaysia and Indonesia (Ulep and Casas 2021). Chronic underinvestment, poor planning, and loose M&E in the country's healthcare system, particularly its health workforce, has contributed to its poor health outcomes despite the increasing total health spending at the national level. In response to these challenges, the Universal Health Care (UHC) Law has embedded the major health reforms that move towards primary health care, integrated care, and value-based care. Primary care benefit packages have been developed and are being rolled out to the population, providing services encompassing the continuum of care. This primary care benefit package ensures improved access and equity of health service delivery. In addition, the UHC Law also provides for the creation of health care provider networks within province- and city-wide health systems as the first step towards integrated care. Under this system, primary, secondary, and tertiary care providers are linked and integrated for a more efficient delivery of health care compared to the current setup. Lastly, innovative payment mechanisms through diagnosis related group (DRG)-based global budget for hospitals and blended payment schemes (e.g., capitation and pay-for-performance) for primary care providers are incorporated in service delivery—strategies towards value-based care—are being implemented with UHC related reforms.

While it is recognized that the UHC Law was passed in 2019 and reforms have only started rolling out in the past five years, reforms and strategies from past administrations and their impact should have already contributed to improving the health of the Filipinos. On one hand, the country's economy has seen unprecedented growth in the past decade which could have been translated to health gains. Despite the rapid economic growth and the multitude of reforms in the past, why is it that the country's health outcomes remain poor? A good question to ask is, "are we properly assessing our health outcomes to ensure that Filipinos are satisfied with how the healthcare system is performing?" With the UHC Law reforms consistent with the current health reforms in advanced health systems, it is high time that a high-level monitoring and evaluation (M&E) framework that aligns with these reforms be developed and put forth. While health system M&Es are currently in use (e.g., National Objectives for Health, Local Health System Maturity Level, and Philippine Development Plan), majority of the indicators are associated with medium-term policy agenda and are usually updated every six years, while other indicators respond to rules, processes, and policies (i.e., reimbursement for procedures, number of HCPNs, etc.). Thus, there is a need to develop a forward-looking, outcome-based M&E framework for health system performance that aligns with advanced health system reforms and steers away from measuring processes.

II. Project Objectives

The objective of this paper is to propose an M&E framework for health system performance aligned with reforms in advanced health systems. Taking from the experience of advanced health systems with established innovative M&E frameworks, we propose and develop the same for the Philippines. This proposed M&E framework will identify outcome indicators that

assess and determine healthcare system performance. This paper will also describe the features of the health information system that will enable the processing and estimation of the indicators proposed.

III. Methodology

In the development of the proposed framework, a literature review will be done. Specifically, the M&E framework of advanced health systems, the WHO, and the OECD will be reviewed and used as reference in developing the country's own framework. The Philippine health system experience on M&E will also be reviewed as this serves as the starting point for moving towards a novel M&E framework. In addition, documents from the WHO on M&E will also be reviewed to serve as guide in defining the scope of the framework. Lastly, features of the health information system that allows for accurate estimation of proposed indicators will be described

This paper is structured as follows: section two reviews the literature on M&E framework development in advanced health systems and international guidelines; section three presents how the proposed Philippine health system performance M&E is developed and the sample indicators; section four presents the needed features of the HIS to operationalize the M&E framework; and section five concludes.

IV. Results

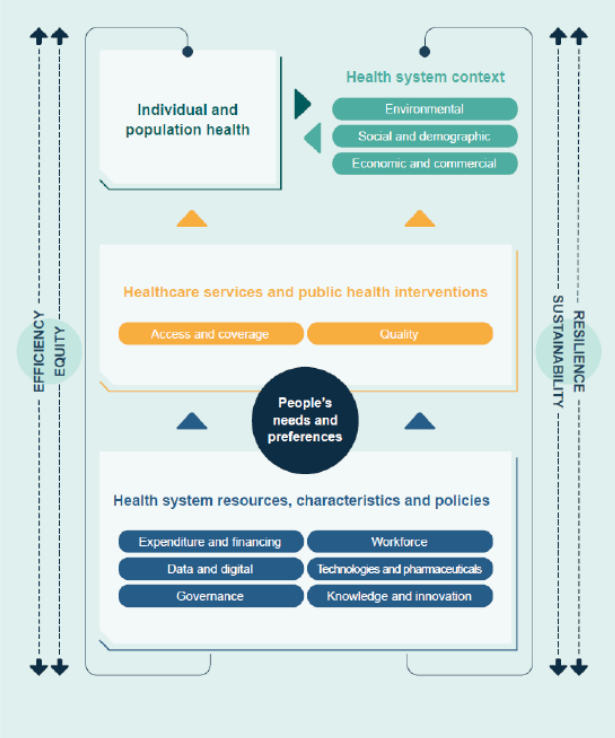
4.1 Healthcare system M&E framework: global experience

With the evolution of health systems and adoption of health reforms, advanced health systems have incorporated new ways of assessing and measuring healthcare performance. Majority of OECD countries and their health systems have gone forward and updated their M&E frameworks to keep up with the reforms. In a comparative analysis done by Braithwaite, et al. (2017), they noted that the performance frameworks of select OECD countries are in the domains of safety, effectiveness, and access (see Annex A). According to disease group, cardiovascular, surgery, and mental health were the most reported (Braithwaite, et al. 2017). In this comparative analysis, the purpose of the M&E framework by country is compared, and it is worth noting that each M&E framework's purpose varies across countries, such as tracking health outcomes, for transparency and accountability, and for short- and long-term planning. With this, some countries have multiple M&E frameworks designed for each purpose. Some countries also identified specific organizations in-charge of the M&E framework, such as Australia's National Health Performance Authority, and the United States' Department of Health and Human Services-Agency for Healthcare Research and Quality.

Majority of the M&E framework from these countries are based on the renewed OECD Health System Performance Assessment Framework (Figure 30). The OECD framework is based on the "input – process – outcome" trio, where resources and policy serve as inputs to health services and intervention, thus producing the outcomes. This framework also recognizes the socio-economic, demographic, and environmental factors that are determinants of health. With individual and population health as outcomes, the health system resources, characteristics and

policies serve as inputs, while the healthcare services and public health interventions serve as the processes. At the core of the framework is the focus on people's needs and preferences. Lastly, cross-cutting dimensions of efficiency, equity, resilience, and sustainability traverse the entirety of the framework (OECD 2024).

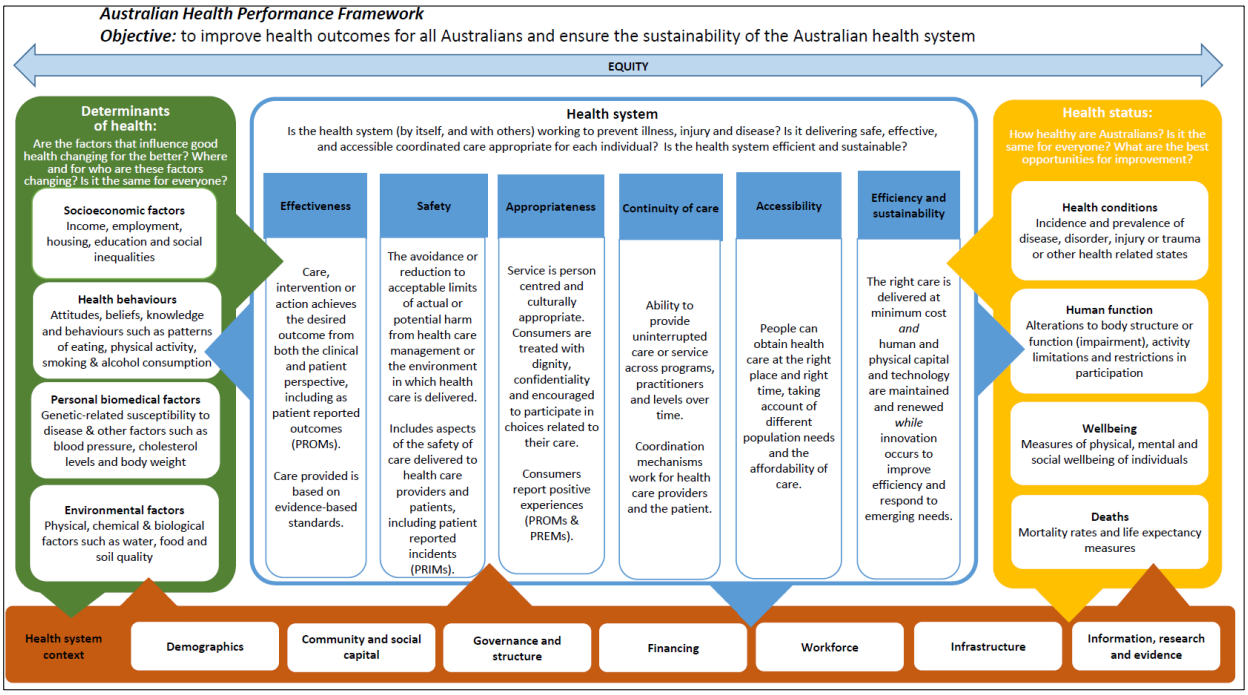
Figure 30. Renewed OECD Health System Performance Assessment Framework



Source: Image from OECD (2024), Rethinking Health System Performance Assessment: A Renewed Framework, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/107182c8-en.

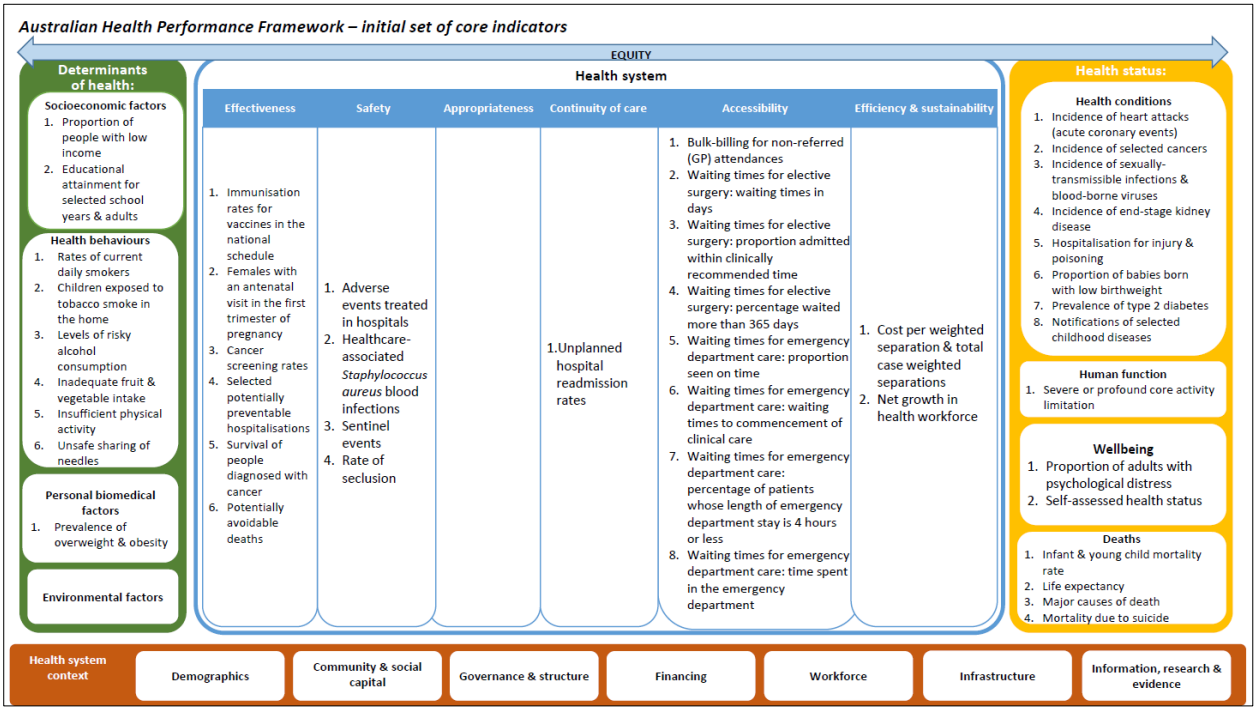
The Australian Health System Conceptual Framework follows the same "input-process-output" concept, with all four elements—health system context, determinants of health, health system, and health status—interrelated and affecting each other (**Figure 31**). The framework further identifies indicators on health conditions such as incidence of heart attacks, hospitalization for injury and poisoning, severe or profound core activity limitation, self-assessed health status, and life expectancy, among others. Indicators for the framework are in **Figure 32** (National Health Information and Performance Principal Committee 2017).

Figure 31. Australian Health System Conceptual Framework



Source: Image from National Health Information and Performance Principal Committee 2017

Figure 32. Initial set of indicators for the Australian Health Performance Framework

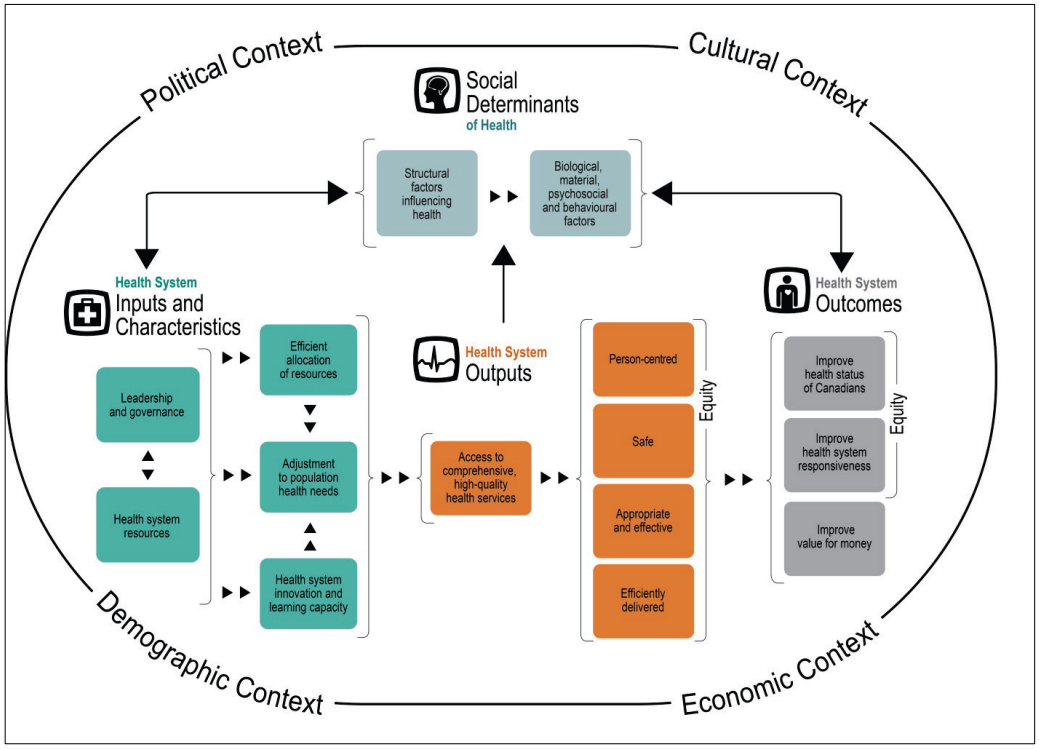


Source: Image from National Health Information and Performance Principal Committee 2017

The Canadian framework follows the same pattern, as shown in Figure 33. Again, emphasis is on the inputs, processes, outputs, and outcomes, with the reiteration of social determinants of

health. Their framework also considers political, cultural, demographic, and economic contexts as determinants of health.

Figure 33. Canadian Institute for Health Information's Health System Performance Measurement Framework



Source: Canadian Institute for Health Information. A Performance Measurement Framework for the Canadian Health System. Ottawa, ON: CIHI; 2013.

Following a different strand, the Dutch model looks at outcome-based healthcare for its latest iteration of M&E in 2018-2022. For the Dutch, outcome-based healthcare focuses on improving patient quality of life and increasing job satisfaction for healthcare providers. It also veers away from a master plan, looking away from absolute certainty but instead looking at working quickly while learning (Ministry of Health, Welfare and Sports, The Netherlands 2018). Their framework employs a four-pronged approach: more insight into outcomes, more shared decision-making, more outcome-based organization and payment, and better access to relevant and up-to-date outcome information (

Figure 34). At the core of their framework is the participation of the patient through patient-reported outcomes, and how this drives healthcare service delivery towards improved overall outcomes.

Figure 34. Dutch Outcome-based Healthcare Framework

Source: Image from Ministry of Health, Welfare and Sports, The Netherlands (2018)

Apart from global experience in M&E framework development, we also consider the recent developments in WHO medium-term priorities. Based on the WHO general program of work for 2025-2028, there are six strategic objectives related to climate change, health determinants and root causes of ill health, primary health care approach and essential health system capacities, health service coverage and financial protection, risk mitigation, and effective response to health emergencies (World Health Organization 2024). Details of the strategic objectives and joint outcomes are in **Annex B**.

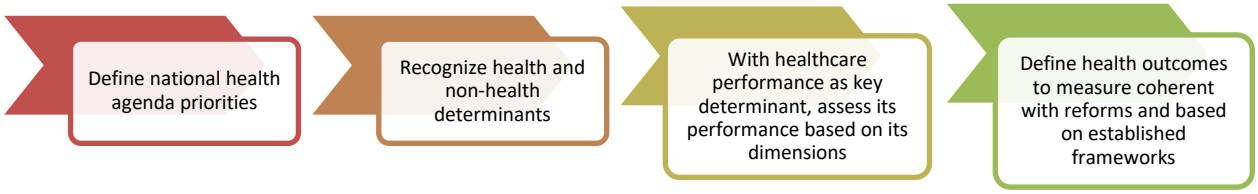
4.2 Developing the M&E framework for Philippine healthcare system performance

The purpose of this proposed M&E framework for healthcare system performance is to assess the level of health outcomes in the country and to determine how the recent reforms contributed to their attainment. This framework also aligns with recent developments in M&E as advanced health systems move towards outcome-based frameworks. Given this, a good starting point for the development of the framework is to identify the relevant health outcomes related to recent reforms in health (e.g., primary health care, integrated care, and value-based care), which will serve as the overall objective of the framework. In addition, the framework should also recognize both health and non-health determinants consistent with the Philippine Development

Plan 2023-2028, where one of its goals is to improve the social determinants of health. These include socioeconomic factors, health behaviors, personal biomedical factors, and environmental factors, among others.

Zooming in on health, the National Objectives for Health 2023-2028 serves as the basis for identifying the priority policy agenda for health, which includes strategies for *individuals* (ensuring safe, high-quality, and patient-centered services), *community* (promoting health, addressing health determinants), and *healthcare workers (HCWs) and institutions* (HCW's well-being and rights, and strengthening institutions). The healthcare sector is key to improving health outcomes in the country. With a focus on health care determinants, healthcare performance is concerned with the healthcare delivery system and the level and distribution of personal and public health care (Arah, et al. 2006). Healthcare performance, therefore, is a key determinant of health. In describing healthcare performance, definable and measurable attributes of the system such as effectiveness, appropriateness, safety, efficiency, continuity, accessibility, equity, responsiveness, patient-centeredness, timeliness, and acceptability are some of the commonly used dimensions in select countries and agencies[4] (Arah, et al. 2006). Lastly, the health outcomes to be measured will be identified while ensuring its coherence with health reforms and established frameworks. The development process for the M&E framework for healthcare system performance is summarized in **Figure 35**.

Figure 35. M&E framework development process



Source: Author's illustration

The proposed framework is presented in **Figure 36**. Building on the Canadian, Australian, and OECD models, this framework espouses that health is determined by both health and non-health factors. The framework builds on the health system context as its foundation. One of the key factors to consider is the demographics, as healthcare systems seem to expand based on the evolving healthcare needs and projected demands of its population. In addition, the framework also rests on the WHO health system building blocks, including governance and leadership, health financing, health workforce, medicines and vaccines, and health information design (World Health Organization 2010). Non-health determinants include health behavior, personal factors, environmental factors, and socioeconomic factors. *Health behavior*, or health-related behavior, are actions by individuals that are directly related to their health and mortality. These actions can either be intentional or unintentional and may positively or negatively affect one's health or the health of others. Examples of such behavior include physical activity level, smoking, diet, healthcare seeking behavior, and treatment adherence, among others. While health behaviors are usually measured at the individual level, social factors influence how these behaviors come about (Short and Mollborn 2015). *Personal factors* encompass determinants such as genetics (e.g., the individual's lifespan, likelihood to contract certain diseases, and

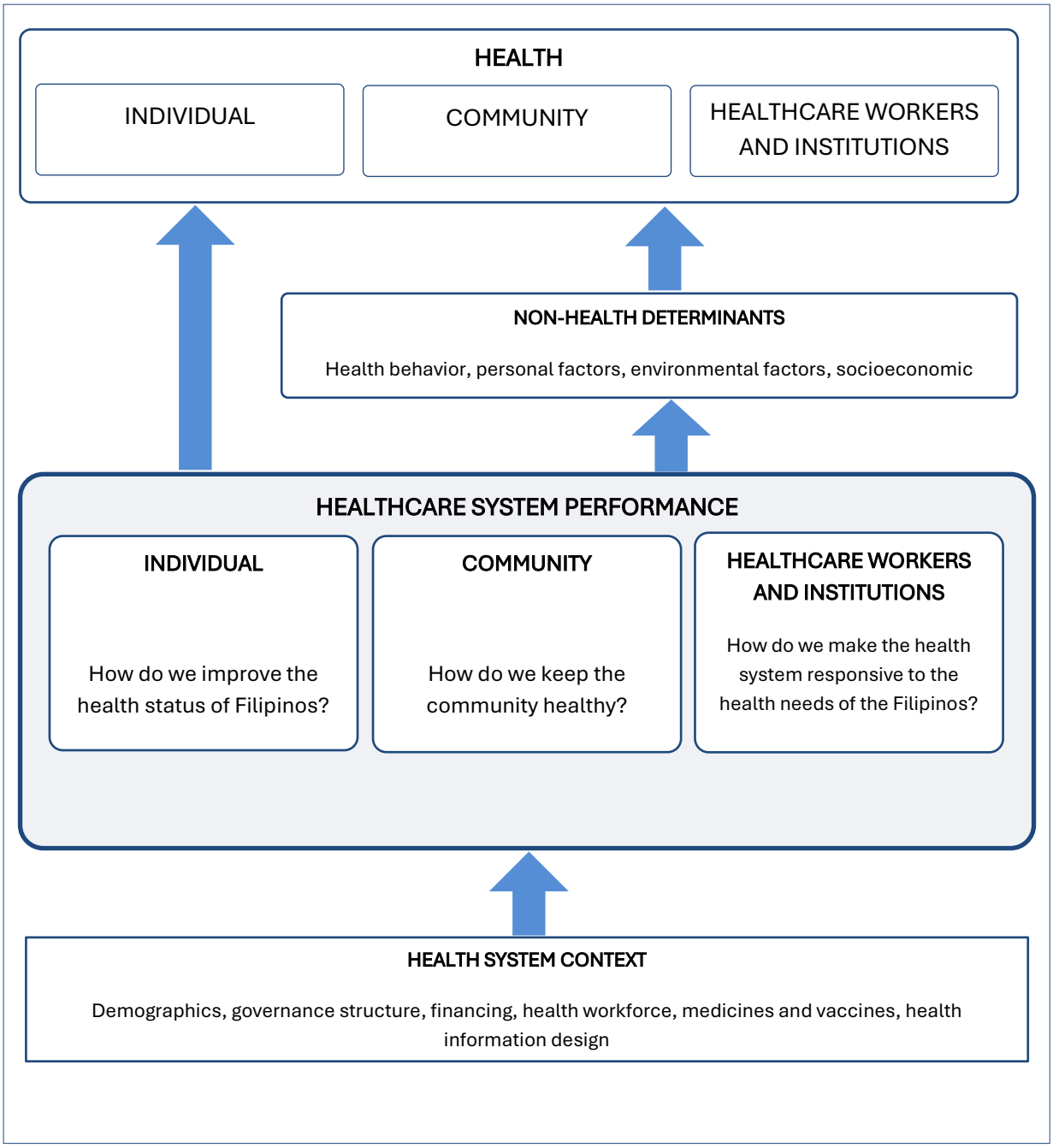
[4] Countries included in the study by Arah et al. (2006) include UK, Canada, Australia, European Community Health Indicators (ECHI), Commonwealth Fund, World Health Organization (WHO) and Organization for Economic Cooperation and Development (OECD).

overall health), gender (e.g., diseases can be gender-specific), and biosocial processes (e.g., biological incorporation of societal and ecological context from social and physical worlds of the individual) (Short and Mollborn 2015, World Health Organization 2024). *Environmental factors* such as access to safe water and clean air, healthy workplaces, safe houses, communities and roads determine health (World Health Organization 2024). *Socioeconomic factors* include social support networks, community and family beliefs, customs and traditions, education, employment and working conditions, income, and social status all contribute to the individual's level of health (World Health Organization 2024). In the proposed framework, healthcare system performance influences how non-health determinants affect health. This is mainly due to how the individual integrates both factors, i.e., how income and employment will influence healthcare use. Health-related determinants are mainly based on the performance of the healthcare system. The healthcare system consists of healthcare services including activities such as curative care, long-term care, mental health care, palliative care, preventive care, and health promotion activities (i.e., screening, vaccination, and public health campaigns) (OECD 2024). Their impact on priority populations, e.g., *individual, community, and healthcare workers and institutions*, depends on how the healthcare system addresses their major health concerns. For the individual, the main objective is to improve the health status of the Filipinos; for the community, the goal is to ensure that the entire group is kept healthy. As for the healthcare workers and institutions, the goal is to equip them with the right structure and environment to ensure their responsiveness to the health needs of the Filipinos.

The performance of the healthcare system will be assessed according to the following dimensions: effectiveness, safety, responsiveness and patient-centeredness, timeliness, and cost-efficiency. *Effectiveness* refers to having healthcare systems that allow for longer life of patients (lo Sorto and Goncharuk 2017), or the "degree of achieving desirable outcomes, given the correct provision of evidence-based health care services to all who could benefit but not to those who would not benefit" (Arah et al. 2006:8). *Safety* looks at how the system delivers healthcare services without causing harm to the user, provider, or environment (Arah, et al. 2006).

Responsiveness refers to how the patient's legitimate non-health expectations are met by the health system (World Health Organization 2000) while *patient-centeredness* refers to how the patient is at the center of health care delivery (Arah, et al. 2006). *Timeliness* refers to reducing the waits and delays for both of those who receive and give care (Harder 2020). And lastly, *cost-efficiency* entails the use of right level of resources to ensure that the expenditure or cost yields maximum outputs, benefits or results (Arah, et al. 2006). Further, inefficient use of inputs may lead to waste, sacrificing the level of benefits that could have been achieved (Cylus, Papanicolas and Smith 2016). While quality is not part of the dimensions in the framework, it is worth noting that the dimensions such as *effectiveness, safety, and responsiveness* reflect a health system that provides quality care. Effective healthcare is quality healthcare when evidence-based healthcare is provided to those who need care; safe healthcare is quality healthcare when no harm is done to the patient and the healthcare work during healthcare delivery; and responsive and people-centered healthcare is quality healthcare as it responds to the patient's needs, preferences, and values (World Health Organization n.d.).

Figure 36. Proposed M&E Framework for Healthcare Performance Assessment



Source: Author's illustration

To illustrate how the healthcare performance will be measured, we provide sample indicators to demonstrate the framework. The indicators will zero in on the healthcare performance with

focus on measuring how the goals of the major health reforms are attained. Recall that the priority populations in the national health agenda may correspond to each of the new reforms in health: primary health care reforms center on ensuring that communities are healthy and that they have access to quality and appropriate care when needed; integrated care ensures that individuals get the patient-centered, safest and appropriate care with the least direct and indirect costs, and; healthcare workers and institutions incentivized for providing effective and quality care. A categorization of proposed health outcomes is presented in Table 21**.** In identifying these outcomes, quality indicators remain as focus as we attempt to veer away from measuring processes. In identifying the indicators, performance metrics from the Australian, Canadian, OECD, and European Union were used as reference.

Table 21. Sample performance indicators for healthcare performance across dimensions

	PRIORITY POPULATION		
DIMENSIONS	**INDIVIDUAL** Improving the health of the Filipinos	**COMMUNITY** Keeping the community healthy	**HEALTHCARE WORKERS/ INSTITUTIONS** Ensuring HCWs and institutions are responsive to providing good quality care
EFFECTIVENESS	30-day readmission rate 30-day mortality rates following stroke or acute myocardial infarction Avoidable deaths from treatable causes Five-year survival from all cancers PYLL* from causes considered amenable to healthcare Population with controlled hypertension and diabetes	Hospitalization for ambulatory care sensitive conditions (ACSC) Avoidable hospital admissions and deaths for preventable diseases (e.g., diabetes and COPD) Cervical, breast and colorectal cancer screening Visits to ER for conditions that could be managed in primary care	Net growth in health workforce Proper regulation practices for medicines and medical devices Good governance in health facilities Ratio of nurses to staff Use of electronic medical records
SAFETY	Hospital harm In-hospital sepsis Foreign body left in during procedure	Volume of antibiotics prescribed	Safe working environment
PATIENT-CENTEREDNESS	Involvement in decision-making and treatment options Quality of life after procedure (e.g., ability to climb stairs after hip replacement)	Patient choice for primary, specialist and hospital care Health-related quality of life for people with long-term conditions	Overall hospital experience Use of patient portals and apps (digital health) to coordinate and discuss care plans between providers and patients Patient experience of outpatient care; hospital care Health-related quality of life for carers
TIMELINESS	ER wait time until disposition decision ER wait time for inpatient beds	Has a regular health care provider	

	ER wait time: proportion of patients seen on time Waiting time for procedures (e.g., bypass surgery, cataract surgery, hip replacement, knee replacement) Waiting time for MRI scan, radiation therapy, CT scan	Population with optimal travel time to health facility Unmet healthcare needs due to geographic or waiting time reasons	
COSTS	Catastrophic health spending Utilization of generic medicines Number of C-sections per 1000 livebirths Treatment adherence and avoided hospitalization	Unmet healthcare needs due to financial reasons Potentially avoidable hospital admissions due to chronic diseases	Good financial management in institutions Unnecessary bed days prior to discharge (delayed discharges) Number of day surgeries Level of food service waste

*Potential years of life lost

Source: OECD 2024, UK NHS 2015, National Health Information and Performance Principal Committee 2017, OECD/European Union 2018

4.3 Operationalizing the M&E framework: Features of the health information system

To estimate the sample indicators under the proposed framework, it will be important to ensure the quality of data collected, data collection platform, and systems for data aggregation. This section proposes the features of the health information system that will ensure the proper estimation of the sample performance indicators. The appropriateness, accuracy, and completeness of data collected at every patient encounter is critical for the accurate estimation of performance indicators. In terms of appropriateness, the type of data being collected is critical. For example, in estimating the number of patients with controlled hypertension or diabetes, it is important to use metrics such as HbA1c values less than 6% collected every six months instead of identifying or counting people with or without diabetes; it will be prudent to use the blood pressure reading to tag patients with controlled hypertension based on the systolic blood pressure (BP) <140 mmHg and diastolic BP < 90 mmHg.[5] Accuracy of data collected refers to the tools being used to code illnesses and procedures and how the health worker is trained to interpret and code. Without proper coding, no accurate picture of health status can be portrayed (**Box 1** further illustrates challenges in coding practices in the country). This is important in terms of identifying ACSCs and comparing this against the volume of avoidable hospitalizations. Currently, PhilHealth uses ICD-10 for medical cases and RVS for surgical/procedural and diagnostic services, which presents a bottleneck in measuring ACSC and other important indicators. This can be remedied through well-accepted crosswalk protocols from RVS to ICD-10. Completeness of data not only looks at completing the identified data fields for every patient encounter but looking at the collection of longitudinal data to correspond with the health system's focus on life stages. Longitudinal data will allow for better monitoring and analysis of patient's health and progress and possible identification of preventable illnesses. For longitudinal data collection to be possible, line listing will be required. Each patient visit will be recorded as an event under the patient's record, and not

[5] Based on references from Abalos, et al. 2024.

under the facility's record. This will also ensure that patient records will be interoperable and portable across the referral network and the entire health system.

With every M&E framework put forth, routine data collection and analysis will be necessary to ensure that the framework is operational and responsive to the requirements for evaluating the performance of the health system. This routine data collection and analysis will allow for the identification of areas that need refinement. In addition, regular reporting to targeted audiences will be necessary to put the framework to use. Targeted audiences may include the national and local level health planners who will use the evidence as inputs in their planning, healthcare providers who serve as the validators of the data being collected, and the general population who are the source of the data that is transformed into evidence.

Box 4. Identified challenges in disease coding practices

The Philippine Institute for Development Studies (PIDS) had assessed the data quality of PhilHealth claims data, particularly disease coding practices in the country, and we highlight two major challenges.

1. The high level of garbage and invalid ICD codes (approximately 10%) suggests the poor quality of the coding system in the Philippines.
2. We observed a high level of claims cases with no complexity and co-comorbidities, which is extremely high, approximately 80%. We examined the codes with no comorbidities and complexities and observed a high variation in length of stay and charges, which suggests disease coding error. Currently, there is no incentive for providers to include all the ICD-10 codes related to diseases.

Reporting of comorbidities and complications in PhilHealth claims

All inpatient claims												
ICD Code Classification	2018		2019		2020		2021		2022		2023	
Invalid ICDs	506,403	6.07%	552,479	6.37%	448,285	7.52%	374,883	7.75%	462,599	8.00%	504,546	7.43%
Blanks	1,167	0.01%	762	0.01%	2,111	0.04%	5,108	0.11%	2,103	0.04%	2,154	0.03%
Garbage Codes	101,840	1.22%	110,001	1.27%	85,693	1.44%	83,272	1.72%	93,157	1.61%	115,012	1.69%
TOTAL INPATIENT CLAIMS	8,338,176	100.00%	8,679,490	100.00%	5,964,646	100.00%	4,834,629	100.00%	5,784,271	100.00%	6,790,706	100.00%

Reporting of comorbidities and complications in PhilHealth claims

CCL	Description	N (%) of Claims with CCs						
		All Years	2018	2019	2020	2021	2022	2023
0	No CCs	26,645,365 (81.60%)	5,827,246 (84.62%)	5,933,306 (83.44%)	3,632,298 (82.25%)	2,890,809 (81.32%)	3,862,177 (78.98%)	4,499,529 (77.62%)
1	Mild CCs	2,560,172 (7.84%)	484,812 (7.04%)	561,641 (7.27%)	315,622 (7.15%)	249,006 (7.00%)	442,005 (9.04%)	552,086 (9.52%)
2	Moderate CCs	1,512,963 (4.63%)	278,222 (4.04%)	313,278 (4.40%)	210,823 (4.77%)	172,327 (4.85%)	240,152 (4.91%)	298,161 (5.14%)
3	Severe CCs	1,528,063 (4.68%)	245,429 (3.56%)	286,985 (4.04%)	203,073 (4.60%)	185,108 (5.21%)	263,555 (5.39%)	343,913 (5.93%)
4	Catastrophic CCs	408,659 (1.25%)	50,447 (0.73%)	60,742 (0.85%)	54,246 (1.23%)	57,697 (1.62%)	82,355 (1.68%)	103,172 (1.78%)

V. Conclusion

This proposed M&E framework puts forth a novel way of assessing healthcare system performance by directing our attention to health outcomes. The framework focuses on key dimensions of effectiveness, safety, responsiveness and patient-centeredness, timeliness, and cost-efficiency. Quality of care is embedded in how effective the healthcare system provides its services, how services are being delivered safely, and how responsive the healthcare service is to the needs and preferences of the patient. Quality healthcare will be at the core of healthcare

systems moving forward, and with the new health system reforms in our midst, the development and operationalization of this framework provides a relevant and timely platform to review and assess how we look at healthcare system performance. A requisite for these reforms to take place is to restructure how data is being collected and aggregated. This means reviewing how our existing data collection systems and platforms will collect and process the information to produce the novel indicators proposed in this framework and the longitudinal data needed to monitor and assess populations following the life stages approach currently promoted by the DOH.

VI. Policy Recommendations for DOH

Moving forward, a new M&E framework that adapts to new ways of evaluating health system performance is expected to be implemented. Advanced health systems have been evaluating their performance by exploring outcome-based indicators as determined by a multitude of perspectives while keeping processes in check. Such direction is expected to be operationalized in order to achieve the health system goals while keeping people's needs and preferences at the core of health service delivery. With such, policy recommendations for the DOH include:

- **Stock-taking of various M&E tools and how their indicators feed into policymaking**. Recognizing that various M&E tools are already in place, and that these tools correspond to various requirements or commitments, it would be worth assessing if the indicators being collected serve as evidence and feed into policymaking. While monitoring is integral, the actual use of data collected is essential in ensuring that the country's health system becomes an instrument in ensuring that quality and responsive health services are being provided to the people.

- **Explore the adoption of the proposed M&E framework and assess its integration into DOH's M&E system**. This proposed framework could serve as a stepping stone towards developing a novel M&E framework that aligns with more responsive health performance indicators. Recognizing the availability of different M&E tools, integrating the existing with the novel elements and aligning with current health sector reforms and thrusts will enable the health system to produce more relevant indicators. These new data shall feed into a well-planned and evidence-based policy making in the country.

- **Establish data collection, integration, and analysis platforms that will enable the collection of appropriate, accurate, and complete data**. Implementing an effective M&E system will entail a review of the entire data collection and management system. Crucial components include data collection and validation as the quality of the evidence for policy and planning will only be as good as the data being collected and processed. For this, a review of current health information systems and how a compatible and integrated health information system can be developed will aid in implementing the M&E framework.

VII. Implementation Considerations for Future Activities of the Sentinel Sites Program

Aligning with the operationalization of the M&E framework and policy recommendations, the following should be considered:

- Defining the health system reforms and direction and aligning with the proposed M&E framework (or other M&E frameworks that may be proposed by the DOH)
- Taking stock of the current M&E tools and how they can feed into the new M&E framework
- Consultation with all stakeholders, e.g., data encoders, patients, medical professionals, planners, researchers, and policymakers, among others
- Capital and human resource investments from planning and implementation stage

VIII. References

Abalos, Jeofrey B, Yasuhiko Saito, Miguel A Ramos Jr, and Grace T Cruz. 2024. "Prevalence, Awareness, Treatment, and Control of Hypertension Among Older Adults in the Philippines." *The Journals of Gerontology: Series A, Biological sciences and medical sciences* glad155.

Arah, Onyebuchi A, Gert P Westert, Jeremy Hurst, and Niek S Klazinga. 2006. "A conceptual framework for the OECD Health Care Quality Indicators Project." *International Journal for Quality in Health Care* 5-13.

Braithwaite, J, P Hibbert, B Blakely, J Plumb, N Hannaford, J. C Long, and D. Marks. 2017. "Health system frameworks and performance indicators in eight countries: a comparative international analysis." *SAGE open medicine.* doi:10.1177/2050312116686516.

Cylus, Jonathan, Irene Papanicolas, and Peter C. (eds) Smith. 2016. "Health system efficiency: How to make measurement matter for policy and management." Health Policy Series, No. 46. , Copenhagen.

Durrani, Hammad. 2016. "Healthcare and healthcare systems: inspiring progress and future prospects." *Mhealth.* doi:https://doi.org/10.3978/j.issn.2306-9740.2016.01.03.

Grépin, K, M Song, L Lazuardi, T Marthias, RFR Sarmiento, and et al. 2023. *Use of routine health information systems for policy-making towards universal health coverage in decentralized countries: a comparative analysis of strategies used in Indonesia and Philippines.* Edited by K Grépin. New Delhi: World Health Organization Regional Office for South-East Asia.

Harder, Stephen J., Chu, Eugene S. 2020. "Timeliness of Care." In *The Patient and Health Care System: Perspectives on High-Quality Care*, by P., Weber, S., Snyder, A., Kirk, L., Reed, W., Hardy-Decuir, B. (eds) Sreeramoju, 109-122. Springer.

Hazarika, Rishi, and Sarah Purdy. 2015. "Integrated care: demonstrating value and valuing patients." *Future Healthcare Journal* 132-136.

lo Sorto, C, and Anatoliy G. Goncharuk. 2017. "Efficiency vs effectiveness: a benchmarking study on European healthcare systems." *Economics and Sociology* 102-115.

Ministry of Health Ghana. 2014. *Ghana Health Sector Monitoring and Evaluation Framework.*

Ministry of Health, Welfare and Sports, The Netherlands. 2018. "Outcome-based health care 2018-2022." Accessed October 24, 2024. https://www.government.nl/documents/reports/2018/07/02/outcome-based-healthcare-2018-2022.

National Health Information and Performance Principal Committee. 2017. "The Australian Health Performance Framework."

OECD. 2024. *Glossary of Key Terms in Evaluation and Results-Based Management for Sustainable Development (Second Edition).* Paris: OECD Publishing. doi:https://doi.org/10.1787/b98b182b-ar-en-fr.

OECD. 2024. *Rethinking Health System Performance Assessment: A Renewed Framework.* Paris: OECD Health Policy Studies, OECD Publishing.

OECD/European Union. 2018. "Strategies to reduce wasteful spending: Turning the lens to hospital and pharmaceuticals." In *Health at a Glance: Europe 2018*, by OECD/European Union, 45-77. Paris, Brussels: OECD Publishing, European Union.

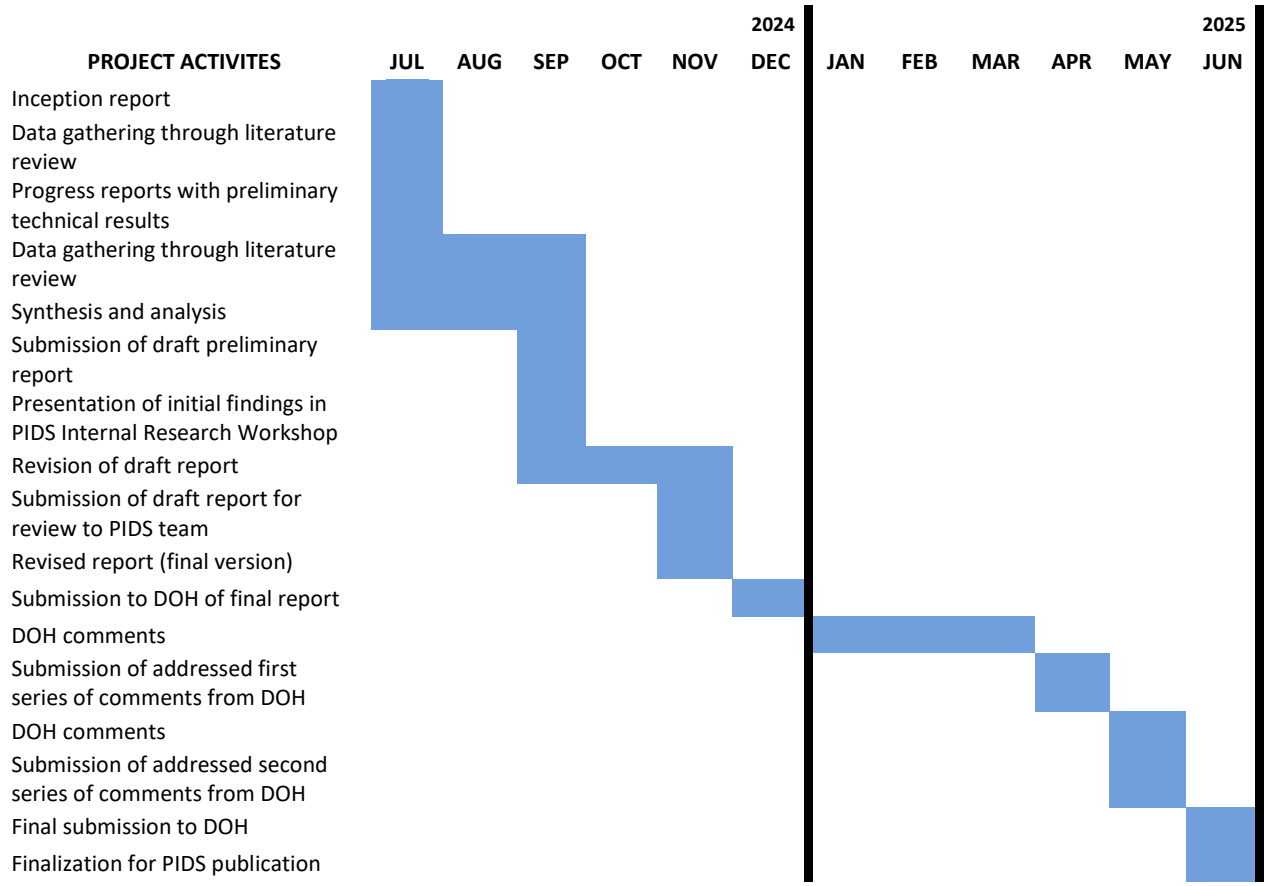
Porter, Michael E, Stefan Larsson, and Thomas H Lee. 2016. "Standardizing Patient Outcomes Measurement." *New England Journal of Medicine* 504-6.

Republic of Kenya Ministry of Health. n.d. *Guidelines for the Institutionalization of Monitoring and Evaluation (M&E) in the Health Sector.* Nairobi: Division of

Monitoring and Evaluation, Health Research Development and Health Informatics, Ministry of Health.
Short, Susan E, and Stefanie Mollborn. 2015. "Social Determinants and Health Behaviors: Conceptual Frames and Empirical Advances." *Current opinion in psychology* 78-84.
The World Bank. 2004. *Monitoring & Evaluation: Some Tools, Methods & Approaches.* Washington D.C.: World Bank.
—. n.d. *World Bank Open Data.* Accessed October 23, 2024. https://data.worldbank.org/indicator/SP.DYN.LE00.IN?locations=PH.
UK NHS. 2015. *NHS Outcomes Framework 2014/15.* UK NHS.
Ulep, Valerie Gilbert T., and Lyle Daryl D. Casas. 2021. "Regional health integration and cooperation in the Philippines." *PIDS Discussion Paper Series No. 2021-16.*
USAID. 2014. *Monitoring and Evaluation: Capacity Development Resource Guide.*
van Weel, Chris, and Michael R Kidd. 2018. "Why strengthening primary health care is essential to achieving universal health coverage." *Canadian Medical Association Journal* E463-E466.
World Health Organization. 2024. *Determinants of health.* October 4. Accessed November 15, 2024. https://www.who.int/news-room/questions-and-answers/item/determinants-of-health.
World Health Organization. 2024. *Draft fourteenth general programme of work, 2025-2028: Report by the Director-General.* World Health Organization.
—. 2009. *Health workforce: the health workforce crisis.* June 24. Accessed October 23, 2024. https://www.who.int/news-room/questions-and-answers/item/q-a-on-the-health-workforce-crisis.
World Health Organization. 2010. *Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies.* Geneva: World Health Organization.
—. 2022. *Primary health care.* August 11. Accessed October 23, 2024. https://www.who.int/news-room/questions-and-answers/item/primary-health-care.
—. n.d. *Quality of care.* Accessed November 20, 2024. https://www.who.int/health-topics/quality-of-care#tab=tab_1.
—. n.d. *Social determinants of health.* Accessed October 23, 2024. https://www.who.int/health-topics/social-determinants-of-health#tab=tab_1.
World Health Organization. 2000. *The World Health Report 2000. Health Systems: Improving Performance.* Geneva: WHO.

IX. Annexes

Annex A. Gantt Chart



Annex B. Relevant outputs and materials

Annex B.1 Domains of performance indicators, by country (Braithwaite, et al. 2017)

	Australia – PAF	Australia – ROGS	England – High Quality Care for All	England – NHS Outcomes Framework	Canada – Canadian Health Indicator Framework	The Netherlands – dimensions of healthcare performance	The Netherlands – healthcare needs	Scotland – Quality Measurement Framework	United States – Agency for Healthcare Research and Quality	United States – Commonwealth Fund	OECD	Total
Effectiveness	X	X	X	X	X	X			X		X	8
Access	X	X			X	X		X		X	X	7
Safety	X		X	X	X	X			X		X	7
Efficient	X	X			X			X ('Efficiency and governance')			X	5
Quality	X	X				X		X				4
Appropriateness	X	X			X			X				4
Outcomes of care/health improvement				Three domains relate to outcomes			Four domains relate to outcomes	X		X		4
Patient-centred/experience			X	X					X		X	4
Cost						X				X	X	3
Equity	X	X									X	3
Responsiveness	X					X					X	3
Competence/capability	X				X							2
Continuity	X				X							2
Timely									X			1
Acceptability					X							1
Sustainability	X											1
Avoidable hospital use										X		1

PAF: Performance and Accountability Framework; ROGS: Report on Government Services; NHS: National Health Service; OECD: Organisation for Economic Co-operation and Development.

Source: Lifted from Braithwaite, et al. (2017)

Annex B.2 Draft general program of work (GPW) 14, WHO 2024

IMPACT					
More people, everywhere, attain the highest possible standard of health and well-being.					
DRAFT GPW 14 OVERARCHING GOAL					
To promote, provide and protect health and well-being for all people, everywhere.					
STRATEGIC OBJECTIVES AND JOINT OUTCOMES					
Respond to **climate change**, an escalating health threat in the 21st century.	Address **health determinants** and the **root causes of ill health** in key policies across sectors.	Advance the **primary health care approach and essential health system capacities** for universal health coverage.	Improve **health service coverage and financial protection** to address inequity and gender inequalities.	**Prevent, mitigate and prepare** for risks to health from all hazards.	Rapidly **detect and sustain an effective response** to all health emergencies.
1.1. More **climate-resilient health systems** are addressing health risks and impacts. 1.2. **Lower-carbon health systems and societies** are contributing to health and well-being.	2.1. Health inequities reduced by acting on social, economic, environmental and other **determinants of health**. 2.2. **Priority risk factors** for noncommunicable and communicable diseases, violence and injury, and poor nutrition, reduced through multisectoral approaches. 2.3. Populations empowered to control their health through **health promotion programmes** and community involvement in decision-making.	3.1. The **primary health care** approach renewed and strengthened to accelerate universal health coverage. 3.2. Health and care **workforce, health financing** and **access to quality-assured health products** substantially improved. 3.3. Health **information systems** strengthened, and **digital transformation** implemented.	4.1. Equity in access to quality services improved for **noncommunicable diseases, mental health conditions,** and **communicable diseases,** while addressing **antimicrobial resistance**. 4.2. Equity in access to **sexual, reproductive, maternal, newborn, child, adolescent and older person health and nutrition services and immunization coverage** improved. 4.3. **Financial protection** improved by reducing financial barriers and out-of-pocket health expenditures, especially for the most vulnerable.	5.1. **Risks of health emergencies** from all hazards reduced and impact mitigated. 5.2. **Preparedness, readiness and resilience** for health emergencies enhanced.	6.1. **Detection of and response** to acute public health threats is rapid and effective. 6.2. **Access to essential health services during emergencies** is sustained and equitable.
WHO CORPORATE OUTCOMES (CROSS-CUTTING)[b]					
1. Effective WHO health leadership through **convening, agenda-setting, partnerships and communications** advances the draft GPW 14 outcomes and the goal of leaving no one behind. 2. Timely delivery, expanded access and uptake of **high-quality WHO normative, technical and data products** enable impact at country level. 3. WHO **tailored country support and cooperation** accelerates progress on health. 4. A **sustainably financed and efficiently managed WHO**, with **strong oversight and accountability and strengthened country capacities** better enables its workforce, partners and Member States to deliver the draft GPW 14.					

Source: Lifted from World Health Organization 2024