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**OPPORTUNITIES AND
CHALLENGES IN DATA
SHARING IN THE THAI
HEALTHCARE SECTOR:
BALANCING RISKS
AND BENEFITS**

**SAVING SCHEMES
FOR THAILAND'S
NEW GENERATION**



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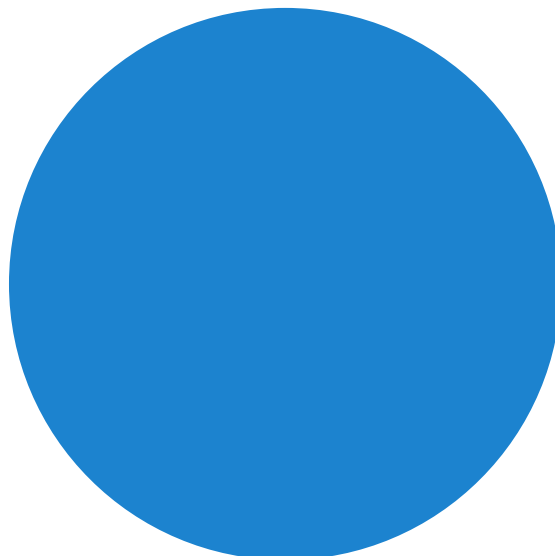
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OPPORTUNITIES AND CHALLENGES IN DATA SHARING IN THE THAI HEALTHCARE SECTOR: BALANCING RISKS AND BENEFITS

Saliltorn Thongmeensuk
Nopphasin Camapaso
Pitchapon Jirawongsapan*

1. INTRODUCTION

Widespread adoption of Big Data and machine learning applications, or in short, Artificial Intelligence (AI), in various sectors is currently the major next step needed for improving or perhaps revolutionizing all industries. The healthcare sector is clearly not isolated from this phenomenon. As a result of the COVID-19 pandemic, many countries across the globe have adopted the use of virtual healthcare systems to provide patients who are inaccessible due to lockdowns with medical consultations.¹ While some doctors have voiced their concern that

telemedicine might reduce the quality of healthcare,² to date the majority of patient consultations are now conducted virtually.³ Consolidating the data shared from telemedicine remains a concern as different hospitals use diverse standards for their electronic medical records (EMR). Establishing a state-wide or regional health information exchange (HIE) would alleviate such concerns while providing an efficient platform for coordinated and comprehensive care.⁴

Moreover, the importance of healthcare data is related not only to conventional technology, such as EMR or online consultation, but also future technology, such as AI. AI is having a massive impact on the healthcare value chain; some even believe it could potentially replace some physicians.⁵ However, the use of AI is aimed at enhancing medical decision-making – serving as an “assistant” to the physician.⁶ Moreover, AI can help alleviate disparity in healthcare accessibility,⁷ because it can provide precise decisions anywhere, if only there is infrastructure to support the technology. Therefore, it has the potential to improve accessibility of rural healthcare in Thailand, where one of the most pressing issues is the distance of hospitals or healthcare centers from underserved areas. A single

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¹ The Lancet, “Virtual health care in the era of COVID-19,” April 11, 2020, [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30818-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30818-7/fulltext).

² Deloitte Insights, “Smart Use of Artificial Intelligence in Health Care,” 2020.

³ Ibid.

⁴ Dale C. Alverson, “Telemedicine and Health Information Exchange: An Opportunity for Integration,” November 25, 2020.

⁵ David Dranove and Craig Garthwaite, “Artificial Intelligence, the Evolution of the Healthcare Value Chain, and the Future of the Physician,” August 30, 2022.

⁶ Ibid.

⁷ Ibid.

trip to the closest health facility may take up to half an hour.⁸ However, AI technology requires adequate data sets to perform such tasks, and if the data sets themselves neglect an undeserved group, AI could in turn amplify the disparity in health outcomes.

The platform for data sharing in healthcare systems is crucial to reinforce the positive potential of medical and health services technology, as digital health technologies alone might not bring about a positive outcome.⁹ However, health data contain notable amounts of sensitive information, such as physical data, records of mental health conditions, and diagnosis of chronic diseases. Even in conventional health services, such sensitive information is known ethically to require secure protection. Failure of stakeholders to adhere to data privacy, where such information is publicly disclosed, may cause indirect discomfort or direct harm to the patient, which could ultimately lead to a lack of trust in medical providers. Consequently, consumers may become reluctant to seek medical treatment or more likely to withhold sensitive information, which could lead to lower health outcomes.¹⁰

This study is divided into five sections. The first section elaborates on the overview of this study. The second part discusses the need for data sharing in the health sector, along with analysis of the pros and cons. The third section depicts factors that

have impacts on the level of success of data sharing in the healthcare sector in Thailand, considering economic and technical factors, organizational and managerial factors, and ethical and legal factors. The fourth part addresses data security, one of the most important prerequisites for promoting data sharing in healthcare. Finally, the fifth part concludes the study and presents a set of recommendations for a health data-sharing framework in Thailand.

This study concludes that stakeholders in the healthcare sector should not avoid or neglect health data sharing, considering the benefits it can contribute to the society. However, sharing data among healthcare providers should be highly secure. If data are used for research and AI training purposes, they should be anonymized and minimized to the extent that they cannot be traced back to individual patients, while still providing enough information for medical research purposes.

2. NEED FOR DATA SHARING IN THE HEALTH SECTOR

Unlike the data collected by major technology companies on their users, a process which is basically unavoidable in this day and age, data in the healthcare sector are much more impactful on the lives of the users, or even generations of people related to them, for example, information on hereditary diseases or genetic defects that are recorded in medical records.

Sharing health data in the health sector can bring numerous benefits. It can improve patient outcomes by providing healthcare providers with a more comprehensive view of a patient's health history, which can help them make well-informed decisions about diagnosis, treatment, and ongoing

⁸ Hiranya Sritart, Kuson Tuntiwong, Hiroyuki Miyazaki and Somchat Taertulakarn, "Disparities in Healthcare Services and Spatial Assessments of Mobile Health Clinics in the Border Regions of Thailand," October 2021.

⁹ Amalia R. Miller and Catherine Tucker, "Frontiers of Health Policy: Digital Data and Personalized Medicine," 2017.

¹⁰ Amalia R. Miller, "Privacy of Digital Health Information," November 2022.

care. Additionally, sharing data can help healthcare providers identify patterns and trends in disease and treatment, enabling them to allocate resources more efficiently and effectively. Data sharing can also accelerate research and lead to the identification of new treatments and cures for diseases. By pooling data from multiple sources, researchers can gain a more comprehensive understanding of a particular disease or condition, which can lead to faster and more effective research. Moreover, sharing data on disease outbreaks and other public health issues can help public health officials respond more quickly and effectively to potential epidemics or other health crises. Overall, data sharing can help improve the quality of care, reduce costs, and accelerate research in the health sector.

In addition to these benefits, data sharing can increase transparency and accountability in the healthcare system. This can help patients make more informed decisions about their care, and can help healthcare providers and policymakers identify areas where improvements are needed. By avoiding duplicative testing and treatments, sharing health data can reduce costs for patients and healthcare systems. Therefore, data sharing in the health sector is crucial and can bring many advantages to healthcare providers, researchers, and patients alike.

Even if a certain healthcare facility opts not to implement AI systems, the availability of data on request would give the medical staff on duty an accurate and detailed report on the patient they are treating, instead of sharing limited written reports among many. This improves the efficiency of patient care and decreases the chances of mishaps, such as wrong prescriptions or treatments. Wrong-site surgery, called a “never event,” although rare, still

happens even in modern hospitals. Amputation of the wrong leg, administering the wrong anesthesia for a surgery patient, all these are major mistakes that could be avoided with data sharing among the medical staff. Having electronic medical records shared among the medical staff responsible for a certain operation would reduce the chances of mishaps as there would be “more eyes” supervising the operation. Furthermore, deciphering handwriting on traditional medical reports would no longer be an issue.

Adopting AI into the healthcare sector, however, will require data sharing with tech companies to facilitate the integration of such technologies into the system, and therein lies the risks of sharing such data. Additionally, having such medical history accessible to the public, or shared without audit, or even for sale, would lead to a rather dystopian outcome. Companies in the private sector would of course be less inclined to hire people with undesirable traits, or appoint them to more important positions, because by the end of the day, they are obligated to generate a profit for their shareholders. Many might argue that having a hereditary disease has no correlation with work efficiency, which is usually true, but there are still other factors, such as healthcare benefits, and in particular, insurance policies. An insurance company would surely charge a higher premium on anyone with higher risk factors, and depending on regional law, companies would have to bear that cost.

For the healthcare sector in Thailand to truly maximize the efficiency in the health care sector, data sharing is necessary. Having a robust system that protects such sensitive data while offering all its benefits will be a daunting task that requires

consistent effort and well-calculated steps. Notably, any mishaps on implementation would cause damage in terms of the data subject, and may trigger a public outcry and opposition much more easily, and it certainly could spell doom on the progression of the whole medical industry.

With appropriate network facilities and security protocols established, it would be a waste not to include AI in the next phase of the plan. However, integrating AI systems into the healthcare industry is not as simple as hiring a few programmers to set rules and conditions on the data collected. In fact, machine learning works differently from standard coding practices. Instead of setting rules and conditions for a certain data set and expect answers, machine learning works by feeding answers, or labeled data if necessary, into the program and expecting it to understand the patterns and rules, which enables it to predict the right answer when questioned. This training process is affected by the amount of data available. In general, the more data, the higher would be the accuracy of the prediction, and the better its ability to isolate false positives in its data pool.¹¹ Well-trained AI would be able to assist and decrease the workload of healthcare professionals, and thereby increase efficiency. Being the most common form of medical imaging, X-ray results play a huge role in diagnostic medicine. Well-trained AI would be able to detect anomalies in the results of X-rays far more quickly and accurately than a human radiologist.¹²

¹¹ Rowel Atienza, "Advanced Deep Learning with Tensorflow 2 and Keras," February 28, 2020.

¹² Cem Dilmegani, "AI in X-ray Analysis: Benefits & Challenges in 2023," December 27, 2022, <https://research.aimultiple.com/xray-ai/>.

Of course, medical professionals should make the final judgment calls on the diagnosis and not be overreliant on AI.

It is important to note that AI predictions can be biased when AI is fed only with data that are specific to a certain region/category. For example, if AI is trained to recognize shoes with only images of sport shoes, it would not be able to categorize high heels as shoes too.¹³ This makes it imperative for AI to be trained with data from multiple sources to enable more accurate predictions and self-correction capabilities. Establishing a reliable data-sharing network across multiple regions would further improve the capability of AI in whichever field it is trained.

3. FACTORS THAT HAVE IMPACTS ON THE SUCCESS OF DATA SHARING IN THE HEALTHCARE SECTOR IN THAILAND

For Ministry of Public Health facilities, having EMR is included as one of the sub-indicators in a key performance indicator (KPI) on smart hospital promotion. In 2021, half of public health regions failed the goal of having at least 50 percent of hospitals being considered smart hospitals.¹⁴

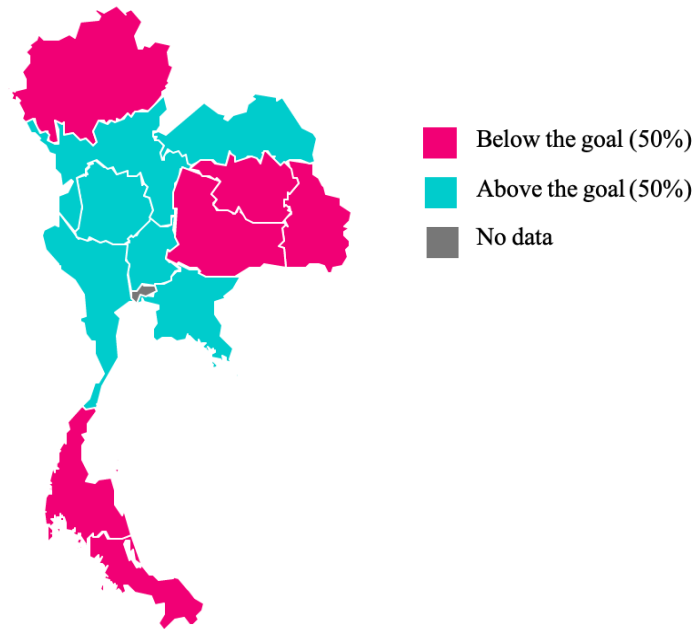
Economic and technical considerations

For a hospital to share medical data, basic computers and simple servers are good enough. In terms of data security, however, doing so would be

¹³ Meredith Broussard, "Artificial Unintelligence – How Computers Misunderstand the World (MIT Press), May 29, 2018.

¹⁴ HealthKPI, "ตัวชี้วัดที่ 068.2: ร้อยละของหน่วยงานบริการที่เป็น Smart Hospital (Smart tools & Smart service) (sw. s-dub F1, F2, F3)," <http://healthkpi.moph.go.th/kpi2/kpi/index/?id=1661>, accessed March 2023.

Figure 1: Percentage of Health Providers Qualified as Smart Hospitals in Each Region of Thailand



Source: Ministry of Public Health, HealthKPI, “ตัวชี้วัดที่ 068.2: ร้อยละของหน่วยบริการที่เป็น Smart Hospital (Smart tools & Smart service) (Sw. ส:ตัว F1, F2, F3),” <http://healthkpi.moph.go.th/kpi2/kpi/index/?id=1661>, accessed March 2023.

woefully insufficient. IT and network specialists, up-to-date server hardware and updated software are necessary for ensuring the security of data in and out of the hospital, thus ensuring the data privacy of the patients. Incorporating these facilities and personnel would be a burden on the hospital’s budget, which in turn might be passed on to the patients instead. Higher medical bills would discourage patients on a return visit, and this could progress into a negative feedback loop. Smaller hospitals or clinics would not have any economic motivation to set up such facilities or expertise as they derive their income from serving patients in a specific region.¹⁵ Data sharing, impressive as it may sound, might

widen the well-being gap of the rich and the poor, or even people of the same income group in different regions.

There would also be a lack of diversity in medical data because everything is clustered in Bangkok.¹⁶ Some people will be neglected by the system, as small hospitals or health service providers in rural areas lack the necessary digital infrastructure and personnel; hence, the health data of those using these services would not be collected.¹⁷ Or if it is collected, it would be in a paper-based form, which would make it more difficult to share.¹⁸

¹⁵ K. Wilkins, P. Nsubuga, J. Mendlein, D. Mercer, M. Pappaioanou, “The Data for Decision Making Project: assessment of surveillance systems in developing countries to improve access to public health information,” September 2008.

¹⁶ YCP Solidiance, “The Future of Smart Hospital in Thailand,” April 2021. <https://ycpsolidiance.com/white-paper/the-future-of-smart-hospitals-in-thailand>

¹⁷ Jing Ni Shane Kishan Jingyan Cao (Sheena) Rajvi Desai, “Market Report 2021: Healthcare Industry,” 2021.

¹⁸ *Ibid.*

The socio-economic gap would only further segregate the less fortunate into becoming “invisible persons” in the digital health market, or even a national plan, which is extremely important, as they are the people whom the policy needs to support the most. The lack of policy might sound out of context in this regard; however, as these small hospitals in rural areas lack financial resources in any sense, the private sector hardly has any interest in them to begin with. They will need someone to nudge them to invest in rural hospitals, which is certainly the government’s role.

If the rural hospitals are not able to adopt smart healthcare solutions, which mostly have a function to collect data automatically and efficiently, it will create a vicious cycle in which the “invisible persons” will become forever invisible. Adoption of AI analytical tools might still happen, but they would be more inclined in using pre-built models instead of training their own, and this would not benefit the growth of the medical industry as there is no reciprocity in data sharing.

Without a proper HIE implemented, there is no entity that can gather all hospital operators both public and private together and order standardization with justified authority. Any attempts to share EMRs when it is the utmost necessity to do so, i.e., when patients are transferred between hospitals in the event of an emergency, there would be a huge risk of data leakage.

Organizational and managerial considerations

Health facilities in Thailand are owned and operated by various entities: a number of public agencies, private companies, and NGOs

(e.g., Red Cross).¹⁹ Within the Ministry of Public Health, as the main ministerial-level agency responsible for healthcare, health facilities are operated by multiple offices, including the Office of the Permanent Secretary, Department of Mental Health, Department of Disease Control, and Department of Public Health.²⁰ Other public agencies also operate health facilities, such as the Ministry of Interior, Ministry of Defense, Ministry of Justice, and some local governments.²¹

The use of shared EMR among health facilities operating under different directives is seemingly rare. As previously discussed (see Figure 1), for Ministry of Public Health facilities, efforts have been made to integrate EMR and data sharing in public health region levels (usually fewer than five provinces).²² The successful Region 10 is praised for data sharing within its own region, utilizing the sharing to realize a smart referral system, but it does not share data with other regions.²³

¹⁹ “平成27年度 医療技術・サービス拠点化促進事業 新興国等におけるヘルスケア市場環境の詳細調査報告書 タイ編 [FY2015 Promoting medical technology and service hub - Detailed study report on market environment of healthcare in emerging markets: Thailand],” (METI, March 2016), https://www.meti.go.jp/policy/mono_info_service/healthcare/iryuu/downloadfiles/pdf/27fy_detailreport_Thai.pdf.

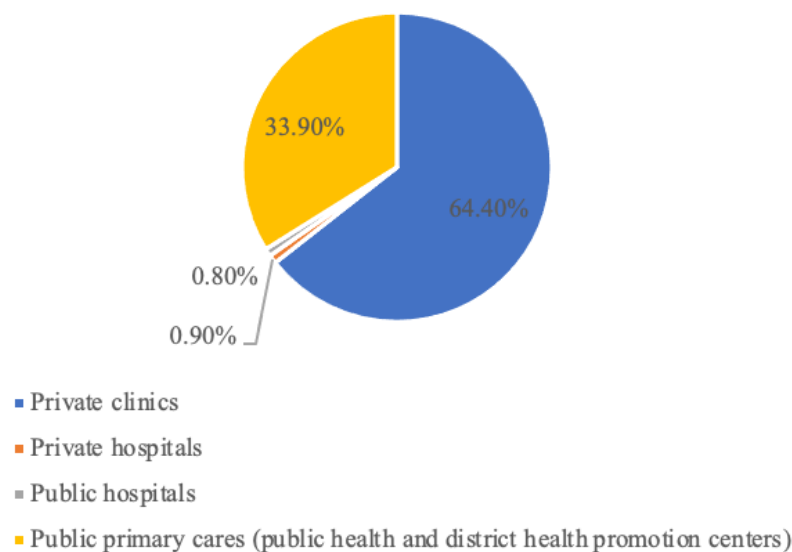
²⁰ *Ibid.*

²¹ Pongpisut Jongudomsuk et al., “The Kingdom of Thailand Health System Review,” (Manila: World Health Organization, Regional Office for the Western Pacific, 2015), https://apps.who.int/iris/bitstream/handle/10665/208216/9789290617136_eng.pdf?sequence=1&isAllowed=y.

²² HealthKPI, “ตัวชี้วัดที่ 068.2: ร้อยละของหน่วยงานบริการที่เป็น Smart Hospital (Smart tools & Smart service) (sw. ระดับ F1, F2, F3),” <http://healthkpi.moph.go.th/kpi2/kpi/index/?id=1661>, accessed March 2023.

²³ สุทธิย์ โรจนศักดิ์โสธร, “การพัฒนาระบบรับ – ส่งต่อผู้ป่วย (Smart Refer) เขตสุขภาพที่ 10,” *วารสารวิจัยและพัฒนาด้านสุขภาพ* 8, no. 1 (September 27, 2022): 125–134.

Figure 2: Number of Healthcare Facilities in Thailand



Source: Krung Sri Bank, “Industry Outlook 2020-2022: Private Hospital,” September 2020.

At the same time, private hospitals, such as those in the Bangkok Dusit Medical Services group (BDMS) (51 health facilities), share only patient medical records within its health facilities under its company group, using their EMR system,²⁴ and to network health providers²⁵ with their electronic Personal Health Record system.²⁶ Under these circumstances, even if EMR is fully introduced, they are structurally unlikely to be shared between public and private facilities, and even unlikely to be shared among public facilities under different agencies. This makes the effort to share data between hospitals more difficult.

Ethical and legal considerations

Thailand generally implements rather restrictive policies on the use of the data because of privacy concerns.²⁷ However, the lack of access to such data can impede important healthcare activities, such as pandemic monitoring and regional pharmaceutical requirements.

According to a research group in Thailand that conducted a qualitative study on data sharing among various stakeholders within their research settings, it was found that the stakeholders generally acknowledged the advantages of sharing data. However, they also expressed concerns about potential harm that could be caused to research participants,²⁸ their communities, and the researchers themselves. Experts in the ethics of human research

²⁴ Technology Promotion Association (Thailand-Japan), “เบื้องหลังนวัตกรรม Mobile Workforce โรงพยาบาลกรุงเทพ [Behind the Mobile Workforce Innovation of Bangkok Hospital],” *Technology & InnoMAG*, 2012, https://www.tpa.or.th/publisher/pdfFileDownloadS/tn222B_p049-52.pdf.

²⁵ “Patient Privacy Notice Bangkok Dusit Medical Services Public Company Limited | Bangkok Hospital,” accessed March 30, 2023, <https://www.bangkokhospital.com/en/page/privacy-policy>.

²⁶ “BDMS Health Passport Application | Bangkok Hospital,” accessed March 30, 2023, <https://www.bangkokhospital.com/en/content/bdms-health-passport-application>.

²⁷ Forum for Ethical Committees in Thailand (FERCIT), “The Ethical Guidelines for Research on Human Subject in Thailand,” 2017.

²⁸ *Ibid.*

noted that the issue of data sharing is often framed as one of individual rights versus societal benefit.²⁹

Personal health data are considered sensitive personal data under Thailand's Personal Data Protection Act (PDPA). These data include any personal data relating to an individual's physical or mental health or medical treatment, including any genetic data or biometric data that is processed for the purpose of uniquely identifying an individual.³⁰ Under the PDPA, the processing of sensitive personal data requires explicit consent from the data subject, unless processing is necessary for a specific purpose, such as public health or medical treatment.³¹ In such cases, the processing of sensitive personal data must be carried out in accordance with the relevant laws and regulations, and appropriate measures must be taken to protect the confidentiality and security of the data.

A study that reviewed data access from national databases in Thailand and other countries in the Asia-Pacific region also noted that the issues of data sharing in Thailand and other Asia-Pacific countries have been compounded by the issue of privacy protection such that researchers and academics can access the data files only through certain application processes, which are sometimes unclear and complicated.³²

The balance between privacy protection and utilizing shared data for research, planning, and development purposes will in time need to

catch up with technological development and use cases. Currently, IBM Watson for Oncology has been introduced for cancer diagnosis and treatment suggestion by Bumrungrad Hospital (private)³³ and Chulabhorn Hospital (public, under supervision of the Office of the Prime Minister).³⁴ Bumrungrad Hospital emphasises that all operations using IBM Watson and related data are to be conducted in-house, without transferring data to third-party vendors for data processing "to ensure [they] maintain GDPR HIPAA compliance and satisfy all PHI (personal health information) regulations."³⁵ The emphasis reflects concerns over the risk and severity of consequences of data leakage or wrongful data sharing.

Meanwhile, the Ministry of Public Health recently developed an AI use case for Opisthorchiasis detection in cooperation with Khon Kaen University, Suranaree University of Technology, and National Electronics and Computer Technology Center (NECTEC).³⁶ Currently, no objections or concerns have been raised about the Opisthorchiasis use case potentially violating PDPA regulations; if there is, the concerns are not acknowledged to the public. However, the potential barriers for this and other

²⁹ *Ibid.*

³⁰ PDPA, section 23.

³¹ *Ibid.*

³² SM Aljunid, S, Srithamrongsawat, W Chen, SJ Bae, F Pwu, L Xu, "Health care data collecting, sharing, and using in Thailand, China mainland, South Korea, Taiwan, Japan, and Malaysia," 2012.

³³ Dr. Teeradache Viangteeravat, "AI & Medical Imaging: Artificial Intelligence Provides Added Support for Patient Diagnosis," Bumrungrad International Hospital, March 31, 2020, <https://www.bumrungrad.com/en/health-blog/march-2020/ai-medical-imaging>.

³⁴ Chulabhorn Hospital, "Chulabhorn adopt AI to boost efficiency in combatting cancers," June 23, 2020.

³⁵ Viangteeravat, "AI & Medical Imaging."

³⁶ "AI ตรวจวินิจฉัยพยาธิใบไม้ตับรื้อกัน ป้องกัน ภัยหา OV-CCA ค่ายราชวิถีเสิร์จ รวบรวมบริการภาครัฐ ระดับดี - NECTEC: National Electronics and Computer Technology Center," September 12, 2022, <https://www.nectec.or.th/news/news-pr-news/ai-hall-offame-22.html>.

use cases in the future would likely be similar to the case of IBM Watson for Oncology.³⁷ The lack of trust between a data provider and user could give rise to such issues as misinterpretation of intent, or the misuse and abuse of data.³⁸

It is worth noting that consolidating data from different hospitals that use different systems and protocols would be a time-consuming mission if it is handled by humans alone. However, with the use of AI, it would be possible to rearrange data formats of EMRs from different hospitals to a consistent format. The BigQuery ML and the Vertex AI platform service provided by Google Cloud could assist in extracting data from different EMRs and rearrange them to whichever format is required.³⁹ As for the different programming languages used in different devices, it is actually possible to convert them from one another quickly without a coding expert, by using the latest iteration of ChatGPT.⁴⁰

4. ADDRESSING DATA SECURITY

There are multiple ways to address the complications that might arise from unsupervised data sharing, by limiting the data shared, ensuring

the anonymity of the data, or having sufficient data encryption or security. Limiting the data shared would prevent excessive damage should a data breach occur, but with limited data it would be much more difficult to train the AI in the various tasks involved. This would reduce the accuracy and efficiency of the AI and severely limits its functions.

Anonymity on data would provide a safe database to train the AI in diagnosing diseases and assisting doctors in identifying false positives, reducing the workload of healthcare professionals. For patient care though, maintaining anonymity would be a difficult process as doctors will meet with patients physically, and have direct access to their medical records for accurate diagnoses. Even if names are removed from the medical record, it will still be tied to the patient and anyone with enough patience would be able to determine the patient's identity. One way to address this would be the use of synthetic medical reports. This use of AI could generate another non-existent user with similar medical issues, and with synthetic medical data based on the original images. These synthetic reports would not harm any diagnostic AI in their functions, while preserving the anonymity of the patient when the data is added into the databanks.⁴¹ The ability of this AI could, however, be misused by malicious parties to fake insurance claims.⁴²

Ensuring the security of data shared between entities in the medical sector is difficult. Protecting the data with private or public key encryption or

³⁷ *Viangteeravat, "AI & Medical Imaging."*

³⁸ *K. El Emam, J. Mercer, K. Moreau, I. Grava-Gubins, D. Buckeridge, E. Jonker, "Physician privacy concerns when disclosing patient data for public health purposes during a pandemic influenza outbreak," BMC Public Health, 11: 454-10.1186/1471-2458-11-454, 2011.*

³⁹ *Gaurav Saxena, Thibaud Hottelier, "Unifying data and AI to bring unstructured data analytics to BigQuery," October 19, 2022, <https://cloud.google.com/blog/products/data-analytics/how-to-manage-and-process-unstructured-data-in-bigquery>.*

⁴⁰ *Calvin Wankhede, "Can ChatGPT write code? Here's how to use it for software development," March 19, 2023, <https://www.androidauthority.com/chatgpt-write-code-programs-3299922/>.*

⁴¹ *Richard J. Chen, Ming Y. Lu, Tiffany Y. Chen, Drew F. K. Williamson, Faisal Mahmood, "Synthetic data in machine learning for medicine and healthcare, June 2021, <https://www.nature.com/articles/s41551-021-00751-8#Fig1>.*

⁴² *Ibid.*

adding in garbage data can severely discourage any attempts to steal the data.⁴³ Directly decrypting protected data would usually take an inconceivable amount of time, but with quantum computers, this form of protection might be outdated soon.⁴⁴ Of course, any parties interested in acquiring said data would have to figure out how to obtain the data first. Misconceptions about an introvert typing really quickly on a desktop in a basement to hack servers is rather widespread, even though typing speed hardly has anything to do with hacking. There are simpler ways to obtain the same or even better results, and that is by targeting the weakest link in the chain of data security, and that is – people.⁴⁵ Although essentially low-tech, scam calls from fake authority figures are still the prevalent method employed in obtaining user data.⁴⁶ These data could be used to access emails or any accounts with relevant information. Attempts to install surveillance and restrict personnel or patients in a particular area, or from certain systems, could help ensure data security, but it could also create rifts within the medical staffs if mishandled.

5. WAY FORWARD TO PROMOTE DATA SHARING

In summary, the integration of AI-related services and the availability of data for enhanced

⁴³ Hugh Taylor, “Data Encryption 101: A Guide to Data Security Best Practices,” March 29, 2021, <https://preyproject.com/blog/data-encryption-101>.

⁴⁴ Stan Kaminsky, “Will quantum computers break RSA encryption in 2023?” January 9, 2023, <https://www.kaspersky.com/blog/quantum-computers-and-rsa-2023/46733/>.

⁴⁵ “What is Social Engineering?” <https://www.webroot.com/us/en/resources/tips-articles/what-is-social-engineering>.

⁴⁶ *Ibid.*

patient treatment are crucial for the growth and advancement of the healthcare sector. The incorporation of AI or machine learning algorithms necessitates a continual flow of data input to enable training and consistent updating of the system to achieve optimal functionality. Policymakers must consider the potential social benefits associated with the use of AI-related services in healthcare and should not allow fear of new technology to impede the development of new data systems. However, it is imperative that ethical and moral considerations be prioritized to protect patient privacy, security, and welfare, while simultaneously promoting technological innovation. Thus, a balance must be maintained between scientific progress and social benefits, as well as the protection of patient rights, in the implementation of AI-related services in healthcare.

Since the fundamental structural barriers are embedded in Thailand’s public health governance system, solutions to these barriers will require national processes to build consensus and political will. Trust is fundamental in the political process. The lack of trust between a data provider and user could give rise to such issues as misinterpretation of intent, or the misuse and abuse of data.⁴⁷

Additionally, a study conducted in low- and middle-income countries proposed that ethical data-sharing practices should encompass four key considerations: the significance of data sharing; the reduction of harm; the encouragement

⁴⁷ K. El Emam, J. Mercer, K. Moreau, I. Grava-Gubins, D. Buckeridge, E. Jonker, “Physician privacy concerns when disclosing patient data for public health purposes during a pandemic influenza outbreak,” *BMC Public Health*, 11: 454-10.1186/1471-2458-11-454, 2011.

of equity and mutual benefit; and the establishment of trust.⁴⁸ In this regard, for the idea of sharing medical data gathered, whether by governmental or private sector bodies, to be more tolerable for the people, there must be a specific guideline to ensure the adequate safeguards of the sensitive health data, as well as sufficient law enforcement and an appropriate compensation system.

Being the organization that represents and leads the world in healthcare, the World Health Organization (WHO) plays an important role in setting up a proper model. The collection and sharing of data by WHO technical programs must be undertaken in ways that are equitable, ethical, efficient and FAIR.⁴⁹

- Equitable – any approach to the sharing of data should recognize and balance the needs of: participants and researchers who generate and use data; other analysts who might want to reuse those data; and those communities that expect health benefits to arise from research.

- Ethical – all data sharing should balance and protect the privacy of individuals and the dignity of communities while acknowledging the imperative to improve public health through the most productive use of data.

- Efficient – any approach to data sharing should be aimed at enhancing/optimizing the quality and value of the use of those data and enabling

their contribution to improving public health. Data sharing should be done as promptly and in as open a manner as possible, building on existing norms, policies and practices and reducing unnecessary duplication and competition.

- FAIR

- Findable: Metadata are labeled and described sufficiently.

- Accessible: Metadata are retrievable using a standardized protocol, and accessible even when the data are gone. Protocols should also be free and universally implementable.

- Interoperable: Metadata use a formal, accessible, shared, and applicable language for knowledge representation. Metadata should also include qualified references to other metadata.

- Reusable: Metadata are released with clear licenses, richly described with accurate and relevant attributes, associated with detailed provenance and meet domain-relevant community standards.

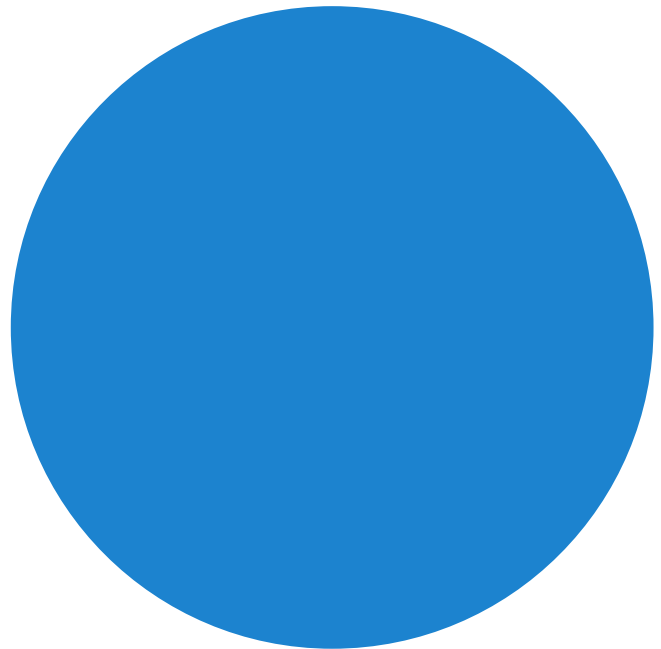
Although Thailand's PDPA provides a framework for protecting personal data in general cases, additional scrutiny is required in handling medical data to ensure that, in the event of a breach, the damage is minimized or negligible. In deciding which data should be shared or have identifying details removed, the equitable principles espoused by WHO comprise a useful guide. Equally importantly, in cases where personal health data are shared between hospitals, the data should be highly secured and detailed to ensure maximum protection. Conversely, when personal health data are used for research purposes, they should be anonymized and minimized to the extent that it

⁴⁸ Jaranit Kaewkungwal, Pornpimon Adams, Jetsumon Sattabongkot, Reidar K. Lie, David Wendler, "Issue and Challenges Associated with Data-Sharing in LMICs: Perspectives of researchers in Thailand," *ASTMH*, 103(1), July 2020.

⁴⁹ WHO, "Sharing and reuse of health-related data for research purposes: WHO policy and implementation guidance," April 6, 2022, <https://www.who.int/publications/i/item/9789240044968>.



is not traceable back to individual patients, while still providing sufficient information for medical research or AI training purposes. By following these guidelines, the risk of unauthorized access or misuse of personal health data can be significantly reduced, which is essential for preserving patient privacy and confidentiality while also advancing medical research and improving patient outcomes. Therefore, it is crucial for healthcare organizations to implement appropriate measures to ensure the secure handling of personal health data in accordance with applicable legal and ethical standards.

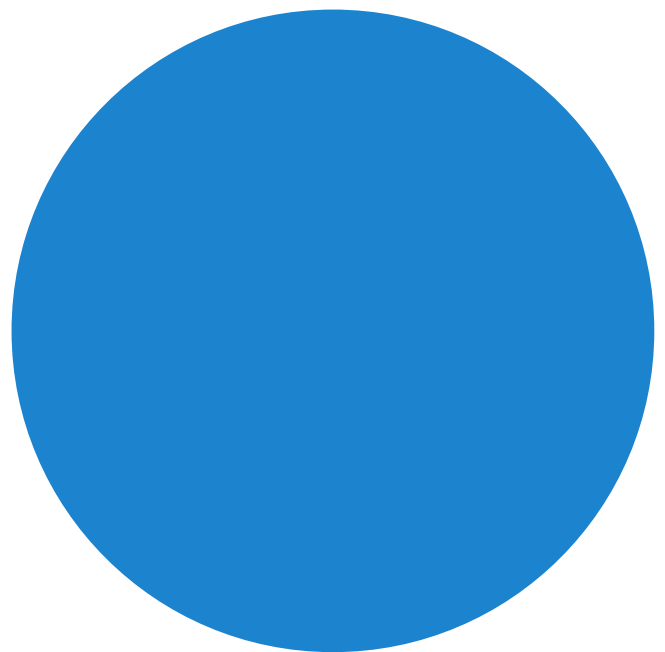


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SAVING SCHEMES FOR THAILAND'S NEW GENERATION*

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1. INTRODUCTION

There currently is a significant lack of financial knowledge when it comes to preparing for retirement, with most of the information that is available targeting middle and middle-upper class Thais. For example, according to retirement planning tips from the Stock Exchange of Thailand (SET), to secure a retirement income of 15,000 baht per month over a period of 20 years, one may need to save at least 4 million baht. To achieve this goal requires having set aside 4,412 baht per month for 30 years, or 9,483 baht per month for 20 years, or 26,466 baht per month for 10 years, including investing the money in various assets to earn an average annual return of at least 6 percent.¹ However, examples such as this are not feasible for individuals living in poverty, while retirement planning for the underprivileged also remains limited.

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¹ Why plan for retirement? by the Stock Exchange of Thailand, <https://www.set.or.th/th/education-research/education/happymoney/pre-retirement> [accessed March 2023].

In addition to the limited financial literacy concerning retirement planning for individuals with low income, the lack of appropriate savings mechanisms also exacerbates the challenge of preparing for retirement. For example, investment vehicles that offer a safe and potentially average annual return of at least 6 percent may be difficult for individuals with limited income and knowledge to access.

The objective of this article is to determine the required amount of savings for individuals earning the lowest minimum wage per day² across varying circumstances, and to propose potential solutions for enhancing the present saving mechanisms.

2. METHODOLOGY AND ASSUMPTIONS

Due to the lack of financial knowledge among individuals with low income, it is important to provide specific guidelines on how much savings they will need for retirement. This study will therefore focus on "individuals earning the minimum wage."

To calculate the required amount of savings for retirement, we have modified Franco Modigliani's "Life-cycle hypothesis," which proposed that individuals plan their consumption and savings decisions over their entire lifetime, while decisions about saving and consumption are also shaped by individuals' expectations about their future income.³ This can be summarized in the following equation:

² Based on the findings of a 2021 survey carried out by the Department of Employment, Ministry of Labour; the minimum daily wage was determined to be 313 baht. (See the Department of Employment, Ministry of Labour (2021). *Wages by Occupation 2020-2021*, https://www.doe.go.th/prd/assets/upload/files/lmia_th/e710b3f8a3ff449164785d00560df06b.pdf [accessed March 2023]).

³ Modigliani, Franco. (1966). "The Life Cycle Hypothesis of Saving, the Demand for Wealth and the Supply of Capital." *Social Research* 33 (2): 160–217.

$$\begin{aligned}
& \sum_{i=0}^{\text{life expectancy} - \text{start saving age}} \frac{(\text{income}_i \times \text{saving rate} - \text{expenses after retirement}_i) \times (1 + \text{return from investments})^i}{(1 + \text{inflation rate})^i} \\
& = \\
& \sum_{i=0}^{\text{life expectancy} - \text{start saving age}} (\text{income}_i \times \text{saving rate} - \text{expenses after retirement}_i) \\
& \quad \times \left(\frac{1 + \text{return from investments}}{1 + \text{inflation rate}} \right)^i \\
& \approx \\
& \sum_{i=0}^{\text{life expectancy} - \text{start saving age}} (\text{income}_i \times \text{saving rate} - \text{expenses after retirement}_i) \\
& \quad \times (1 + \text{return from investments} - \text{inflation rate})^i
\end{aligned}$$

Based on the equation, we have assumed a baseline model for calculating the required amount of savings for individuals, taking into account realistic scenarios as follows:

Income: The baseline calculation assumes the minimum wage per day, which is 313 baht. Assuming individuals work 26 days per month, the monthly income will be 8,138 baht, resulting in an annual income of 97,656 baht.

Start saving age: The age at which individuals should begin saving is determined by a combination of factors, including education level and generation. According to experts we interviewed, individuals with a bachelor's degree are likely to start saving at 25 years of age, while those with a high school diploma may start saving at 20 years of age. In terms of generation, those born between 1981 and 1996 (Generation Y) may start saving late, that is, up to 40 years of age, while the younger generation born between 1997 and 2012 (Generation Z) may start earlier at 25 years of age. Based on these opinions, the probable age at which people start saving is 25, with an option to begin between ages 20 and 40.

Retirement age: The age at which individuals retire or make their last savings contribution. Based on our interviews with experts, those who focus on simple living and rely on social security may retire at 55 years of age. However, the default retirement age globally is typically 60 years of age. Additionally, as the new generation has a higher life expectancy, individuals may work longer, potentially attaining 70-80 years of age.

Saving rate: The rate at which individuals could save according to their income.

Expenses after retirement: The money that individuals will use after retirement. This study assumes that the poverty line represents the minimum income level necessary to meet basic living expenses.

Inflation rate: The rate of inflation in Thailand is reported differently by various sources. The Bank of Thailand reports an average of 1.3 percent annually, while the Consumer Price Index prepared by the Ministry of Commerce reports it at 1.5 percent. For the purposes of this study, we prefer to use the rate of 1.5 percent to ensure inclusivity.

Return from investments: The rate of return from investments, which is adjusted according to risk acceptance by age,⁴ can vary depending on the type of investment. For example, investment returns from the Thailand stock market average at 5 percent, government bonds average at 2.5 percent, and fixed deposit accounts at 0.75 percent, while United States technology stocks may give returns up to 25 percent. In this study, we assume an average return from offshore stocks and real estate at 10 percent and 4 percent, respectively, and combine this with investing portfolio management advice from Siam Commercial Bank.⁵

Life expectancy: The last year that individuals will use the money. According to the United Nations, life expectancy varies among individuals born in different years. In this study, we assumed the highest projected life expectancy of 87 years of age.⁶

3. HOW MUCH SAVINGS ARE NEEDED?

The required amount of savings that individuals may need is calculated under different scenarios, based on their obligations toward their families. The baseline scenario assumes that the individual does not have any caregiving responsibilities toward children or elders.

Baseline scenario: Individuals without caregiving responsibilities for children and elders

We create the baseline savings needed per month for Individuals without caregiving responsibilities for children and elders by assuming that individuals in this case have a minimum annual income of 97,656 baht,⁷ and are aiming for a retirement income of 2,762 baht per month, which is a threshold of the minimum level of income deemed adequate; according to the current poverty line, they will need to start saving at different ages depending on their desired retirement age.⁸ Specifically, the age to start saving will be 20, 25, 30, or 40 years of age for retirement at 55, 60, 65, or 70 years of age, respectively.⁹ To meet their retirement income goal, they will need to save about 10 percent of their income, which amounts to under 900 baht per month (Table 1).¹⁰

⁴ Investment management needs to be adjusted to compensate for differences in risk acceptance at different ages. On average, a return of around 6 percent is expected throughout one's life. Full information on how we calculate this rate is featured in the research.

⁵ For more information on the advice, see: *How to manage retirement portfolios*, <https://www.scb.co.th/th/personal-banking/stories/how-to-manage-retirement-ports.html> [accessed March 2023].

⁶ For more information on life expectancy projections by the United Nations, see: *World Population Prospects*, <https://population.un.org/wpp/Download/Standard/Mortality/> [accessed March 2023].

⁷ The calculation is based on the assumption of 26 workdays per month, using the minimum daily wage of 313 baht.

⁸ The rate of the annual income before retirement and the retirement income need to be adjusted for inflation at the rate of 1.5 percent per year.

⁹ It should be noted that the ages used as baselines for an adequate start saving age and retirement age are 20 and 55; 25 and 60; 30 and 65; and 40 and 70 years, respectively. This applies to every scenario presented later in this article.

¹⁰ It should be noted that the amount of savings needs to be adjusted for inflation at the rate of 1.5 percent per year. This applies to every scenario presented later in this article.

Table 1: Baseline savings needed per month for individuals without caregiving responsibilities for children and elders

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	854 baht (10.5%)	635 baht (7.8%)	464 baht (5.7%)	326 baht (4.0%)
25	1,147 baht (14.1%)	838 baht (10.3%)	602 baht (7.4%)	415 baht (5.1%)
30	1,562 baht (19.2%)	1,115 baht (13.7%)	781 baht (9.6%)	529 baht (6.5%)
35	2,173 baht (26.7%)	1,489 baht (18.3%)	1,017 baht (12.5%)	675 baht (8.3%)
40	3,158 baht (38.8%)	2,035 baht (25.0%)	1,335 baht (16.4%)	863 baht (10.6%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Given that the baseline scenario is calculated to reach the minimum adequate income according to the poverty line, if individuals aim for a retirement income of 12,000 baht per month, the amount of savings needed to reach that goal will have to be adjusted accordingly. To achieve a higher retirement income, individuals need to save about 45 percent of their income. Those who desire to retire at the age of 55, 60, 65, or 70 years must start saving at 20, 25, 30, or 40 years of age, respectively. However, according to our assumptions for this scenario, if the age of starting to save is 35 or 40 years, it would

be impossible to retire at the age of 55 or 60 years because the amount of savings needed is higher than the person's income, as the requirement is more than 100 percent. The earlier individuals start saving, the less amount of money they will need to accumulate in order to retire. For instance, those who start saving at 20 years of age and plan to retire at 65 or 70 years of age, as well as those who start saving at 25 years of age and plan to retire at 70 years of age, will need to save about 1,500-2,000 baht per month, which is lower than 25 percent of their income (Table 2).

Table 2: Savings needed per month for individuals without caregiving responsibilities for children and elders for a retirement income of 12,000 baht per month

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	3,687 baht (45.3%)	2,751 baht (33.8%)	2,010 baht (24.7%)	1,400 baht (17.2%)
25	4,964 baht (61.0%)	3,638 baht (44.7%)	2,612 baht (32.1%)	1,798 baht (22.1%)
30	6,763 baht (83.1%)	4,818 baht (59.2%)	3,385 baht (41.6%)	2,295 baht (28.2%)
35	9,408 baht (115.6%)	6,437 baht (79.1%)	4,403 baht (54.1%)	2,922 baht (35.9%)
40	13,696 baht (168.3%)	8,813 baht (108.3%)	5,786 baht (71.1%)	3,735 baht (45.9%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Scenario 2: Individuals with caregiving responsibilities for a child or children

Under this scenario, individuals will have additional responsibilities of taking care of a child or children, which will increase the amount of money they need to save, as the average expense for taking care of one child is about 1,886 baht per month, according to the Household Socio-Economic Survey 2019 undertaken by the National Statistical Office of Thailand (NSO). We also assume that the child expenses will start in the fifth year of saving, and that the responsibility for taking care of the child will last for 20 years.¹¹

Hence, the required amount of savings needs to be adjusted by multiplying the baseline savings needed per month by the caregiving expenses.

For individuals with the responsibility of taking care of one child, the amount of savings required increases from the baseline to approximately 25 percent. The earlier that individuals start saving and the longer they prolong their retirement, the lower will be the amount of savings needed per month. For example, those who start saving at 20 years of age and plan to retire at 65 or 70 years of age, as well as those who start saving at 25 years of age and plan to retire at 70 years of age, need to save about 1,300-1,400 baht per month, which is lower than 18 percent of their income (Table 3).

¹¹ The child expenses also need to be adjusted for inflation annually at the rate of 1.5 percent.

Table 3: Saving needed per month for individuals with the responsibility for taking care of one child

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	1,929 baht (23.7%)	1,652 baht (20.3%)	1,432 baht (17.6%)	1,245 baht (15.3%)
25	2,311 baht (28.4%)	1,912 baht (23.5%)	1,611 baht (19.8%)	1,367 baht (16.8%)
30	2,873 baht (35.3%)	2,287 baht (28.1%)	1,855 baht (22.8%)	1,530 baht (18.8%)
35	3,711 baht (45.6%)	2,816 baht (34.6%)	2,197 baht (27.0%)	1,750 baht (21.5%)
40	5,111 baht (62.8%)	3,613 baht (44.4%)	2,686 baht (33.0%)	2,059 baht (25.3%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Likewise, for individuals with the responsibility of taking care of two children, the amount of savings required increases from the baseline to approximately 37 percent. Those who start saving early at 20 years of age and plan to retire late at 65 or 70 years of age, as well as those who start saving at 25 years of age and plan to retire at 70 years of age, need to save about 2,200-2,400 baht per month, which is lower than 30 percent of their income (Table 4).

Scenario 3: Individuals with caregiving responsibilities for an elder or elders

Similar to the second scenario, in this case, individuals will have additional responsibilities of taking care of an elder or elders, while the average expense for taking care of one elder is about 1,911 baht per month, according to the NSO Household Socio-Economic Survey 2019. Under this

condition, we assume that the elderly expense will start in the fifth year of saving, while the responsibility for taking care of an elder will last for 25 years.¹²

Individuals with the responsibility of taking care of one elder will need to increase their savings to approximately 25 percent compared to the baseline scenario. The increased cost of taking care of one elder is close to the cost of taking care of one child but lasts longer. Saving earlier while retiring later will reduce the amount of savings needed. For example, in this case, those who start saving at 20 years of age and plan to retire at 65 or 70 years of age, as well as those who start saving at 25 years of age and plan to retire at 70 years of age, need to save about 1,400-1,600 baht per month, which is lower than 20 percent of their income (Table 5).

¹² The elderly expenses also need to be adjusted for inflation annually at the rate of 1.5 percent.

Table 4: Savings needed per month for individuals with the responsibility for taking care of two children

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	3,011 baht (37.0%)	2,669 baht (32.8%)	2,393 baht (29.4%)	2,173 baht (26.7%)
25	3,475 baht (42.7%)	2,987 baht (36.7%)	2,612 baht (32.1%)	2,311 baht (28.4%)
30	4,175 baht (51.3%)	3,459 baht (42.5%)	2,930 baht (36.0%)	2,523 baht (31.0%)
35	5,249 baht (64.5%)	4,142 baht (50.9%)	3,377 baht (41.5%)	2,824 baht (34.7%)
40	7,056 baht (86.7%)	5,192 baht (63.8%)	4,036 baht (49.6%)	3,255 baht (40.0%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Table 5: Savings needed per month for individuals with the responsibility for taking care of one elder

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	2,108 baht (25.9%)	1,815 baht (22.3%)	1,587 baht (19.5%)	1,400 baht (17.2%)
25	2,515 baht (30.9%)	2,100 baht (25.8%)	1,782 baht (21.9%)	1,530 baht (18.8%)
30	3,117 baht (38.3%)	2,507 baht (30.8%)	2,059 baht (25.3%)	1,717 baht (21.1%)
35	4,012 baht (49.3%)	3,076 baht (37.8%)	2,425 baht (29.8%)	1,961 baht (24.1%)
40	5,501 baht (67.6%)	3,931 baht (48.3%)	2,962 baht (36.4%)	2,295 baht (28.2%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Table 6: Savings needed per month for individuals with the responsibility for taking care of two elders

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	3,361 baht (41.3%)	2,995 baht (36.8%)	2,710 baht (33.3%)	2,466 baht (30.3%)
25	3,882 baht (47.7%)	3,361 baht (41.3%)	2,962 baht (36.4%)	2,637 baht (32.4%)
30	4,663 baht (57.3%)	3,898 baht (47.9%)	3,328 baht (40.9%)	2,897 baht (35.6%)
35	5,859 baht (72.0%)	4,663 baht (57.3%)	3,841 baht (47.2%)	3,247 baht (39.9%)
40	7,845 baht (96.4%)	5,835 baht (71.7%)	4,582 baht (56.3%)	3,735 baht (45.9%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Correspondingly, if individuals have the responsibility of taking care of two elders, the amount of savings required increases from the baseline to approximately 41 percent. Hence, individuals who save early at 20 years of age and plan to retire late at 65 or 70 years of age, or who start saving at 25 years of age and plan to retire at 70 years of age, need to save about 2,500-2,700 baht per month, which is lower than 33.3 percent of their income (Table 6).

Scenario 4: Individuals with caregiving responsibilities for children and elders

Under this scenario, we considered that individuals will have caregiving responsibilities for children and elders simultaneously. The expenses for taking care of children and elders are the same

as under scenario 2 and 3 (1,886 and 1,911 baht per month), and we assume that taking care of children and elders will each last for 20 and 25 years, respectively.

If individuals have to take care of one child and one elder, they will need to save about 40 percent of their income to reach their savings goal, compared to the baseline saving scenario. Earlier savings and late retirement help reduce the required amount of savings. For example, those who start saving at 20 years of age and plan to retire at 65 or 70 years of age, as well as those who start saving at 25 years of age and plan to retire at 70 years of age, will need to save about 2,300-2,500 baht per month, which is lower than 31 percent of their income (Table 7).

Table 7: Savings needed per month for individuals with the responsibility for taking care of one child and one elder

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	3,182 baht (39.1%)	2,832 baht (34.8%)	2,547 baht (31.3%)	2,319 baht (28.5%)
25	3,678 baht (45.2%)	3,174 baht (39.0%)	2,783 baht (34.2%)	2,474 baht (30.4%)
30	4,419 baht (54.3%)	3,678 baht (45.2%)	3,125 baht (38.4%)	2,710 baht (33.3%)
35	5,558 baht (68.3%)	4,443 baht (54.6%)	3,605 baht (44.3%)	3,035 baht (37.3%)
40	7,821 baht (96.1%)	5,518 baht (67.8%)	4,313 baht (53.0%)	3,491 baht (42.9%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

To take care of two children and two elders, the amount of savings will change to about 68 percent from the baseline scenario. Therefore, individuals who save early at 20 years of age and plan to retire late at 65 or 70 years of age, or who start saving at 25 years of age and plan to retire at 70 years of age, need to save about 4,300-4,600 baht per month, which is lower than 57 percent of their income (Table 8).

4. IMPROVING SAVING SCHEMES FOR THAILAND'S NEW GENERATIONS

Effective saving schemes should operate under two assumptions: first, they should not create a financial burden for the government, and second, they should focus their support on people who

actually need it. Hence, in order to improve the saving schemes, these two assumptions must be taken into consideration.

Nevertheless, according to the NSO Household Socio-Economic Survey 2019, each household had an average income of about 6,000-9,000 baht. The survey also found that households earning the minimum wage had a savings rate of 19.20 percent of their income after debt payments were made.

Given that our baseline scenario shows that individuals without caregiving responsibilities for children and elders, who retire at an appropriate age and save adequately (as shown in Table 1), need to save only about 10 percent of their income to reach the baseline retirement income. However, there are

Table 8: Savings needed per month for individuals with the responsibility for taking care of two children and two elders

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	5,518 baht (67.8%)	5,029 baht (61.8%)	4,639 baht (57.0%)	4,313 baht (53.0%)
25	6,209 baht (76.3%)	5,509 baht (67.7%)	4,964 baht (61.0%)	4,541 baht (55.8%)
30	7,284 baht (89.5%)	6,242 baht (76.7%)	5,477 baht (67.3%)	4,891 baht (60.1%)
35	8,944 baht (109.9%)	7,406 baht (91.0%)	6,201 baht (76.2%)	5,395 baht (66.3%)
40	12,476 baht (153.3%)	8,992 baht (110.5%)	7,284 baht (89.5%)	6,128 baht (75.3%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

three cases in which individuals may not follow this saving pattern, requiring them to save more than 20 percent of their income. These cases are: starting to save at 35 years of age and retiring at 55 years of age; starting to save at 40 years of age and retiring at 55 years of age; and starting to save at 40 years of age and retiring at 60 years of age.

Therefore, if the government can encourage people to save money for retirement according to our minimum retirement plan and offer an option to extend working ages, it can reduce the financial burden of providing welfare. This is because the government would need to support only people who cannot save money according to the plan.

On the other hand, when considering individuals who have caregiving responsibilities for both children and elders, the savings scenarios have shown that they are often unable to save enough money to reach their savings goals, as the required amount of savings is often more than half of their income. In such cases, it is important for the government to provide support for these individuals to help them save. This support should compensate for their inability to save, which typically amounts to 20 percent of their income. Adequate support funds from the government, which compensates for individuals' inability to save, are presented in Table 9.

Table 9: Adequate government support funds, by various circumstances

Age to start saving (years)	Desired retirement age (years)	Individuals who have caregiving responsibilities					
		One child (baht)	Two children (baht)	One elder (baht)	Two elders (baht)	One child and one elder (baht)	Two children and two elders (baht)
20	55	301	1,383	480	1,733	1,554	3,890
25	55	684	1,847	887	2,254	2,051	4,582
30	55	1,245	2,547	1,489	3,035	2,791	5,656
35	55	2,083	3,621	2,384	4,232	3,931	7,316
40	55	3,483	5,428	3,874	6,217	6,193	10,848
20	60	24	1,042	187	1,367	1,204	3,402
25	60	285	1,359	472	1,733	1,546	3,882
30	60	659	1,831	879	2,271	2,051	4,614
35	60	1,188	2,515	1,449	3,035	2,816	5,778
40	60	1,986	3,564	2,303	4,207	3,890	7,365
20	65	-	765	-	1,082	920	3,011
25	65	-	985	155	1,335	1,156	3,337
30	65	228	1,302	431	1,701	1,497	3,849
35	65	570	1,750	798	2,214	1,978	4,574
40	65	1,058	2,409	1,335	2,954	2,686	5,656
20	70	-	545	-	838	692	2,686
25	70	-	684	-	1,009	846	2,913
30	70	-	895	90	1,270	1,082	3,263
35	70	122	1,196	334	1,619	1,408	3,768
40	70	431	1,628	667	2,108	1,864	4,500

Source: Calculated by the authors.

Note: The support funds need to be adjusted for inflation at the rate of 1.5 percent per year.

Investment vehicles can also help improve the saving schemes, as the saving scenario calculated in this article assumes that individuals can earn a return on their investments throughout their life at rates between 6.98 percent and 2.99 percent.¹³ However, given that the individuals discussed in this article are supposed to be earning the lowest minimum wage per day, it may be difficult for these people to invest with minimal risk, especially considering their lack of access to proper investment vehicles. Furthermore, if individuals are unable to achieve a return on investment of approximately 6 percent annually, they will need to save a larger amount to make up for it.

For this example, we considered a fixed deposit as a savings vehicle that allows individuals to save their money with the lowest possible risk. Most banks offer a deposit interest rate of about 0.75 percent per year. Using the fixed deposit interest rates for calculation, the results have shown that to reach the baseline retirement income, individuals will need to start saving earlier, while the amount of savings required will be significantly higher (Table 10).

Consequently, it is important for the government to improve the savings scheme by creating risk-free investment vehicles that people can access.

In this case, data have shown that world-class fund managers can likely generate about a 20 percent

return from investments.¹⁴ If the government can create strong-performing fund managers in Thailand, aiming for only a 10 percent return from investment to reduce the risk, the savings requirement for individuals can be significantly reduced.

The increasing returns from investments that strong-performing fund managers may generate can reduce the amount of savings required for the baseline scenario to less than 5 percent of their income, which is lower than 350 baht (Table 11).¹⁵

When making a comparison between the potential annual return from investment between the baseline scenario at about 6 percent, fixed deposit return rate at 0.75 percent, and high return rate from strong-performing fund managers at about 10 percent, it is clearly that adequate investment vehicles can ease the burden of saving by individuals (Table 12).

5. POLICY RECOMMENDATIONS

It is crucial for the government to provide individuals with sufficient retirement support. Nevertheless, if people understand the importance of saving for their retirement and accumulate enough funds for it, not only will they reap the benefits, but the government will also benefit as the financial burden of supporting elders will be reduced.

¹³ *The rate of return from investments varies due to differences in risk acceptance at different ages. At a younger age, individuals can take higher risks in their investments, which can potentially result in higher returns. Conversely, as individuals age, their risk acceptance tends to decrease, which leads to lower returns. Full information on how we calculate this rate is featured in the research.*

¹⁴ *Decoding the investment returns of legendary fund managers, <https://www.siamquant.com/the-greatest-stock-investors-performance-study/> [accessed March 2023].*

¹⁵ *Except for individuals who start saving at 35 years of age and want to retire at 55 years of age, and individuals who start saving at 40 years of age and want to retire at 55 or 60 years of age, who will need to save about 7-11 percent, which is about 545-592 baht.*

Table 10: Savings needed per month for individuals without caregiving responsibilities for children and elders, based on a fixed deposit return rate

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	3,174 baht (39.0%)	2,352 baht (28.9%)	1,701 baht (20.9%)	1,188 baht (14.6%)
25	3,621 baht (44.5%)	2,629 baht (32.3%)	1,880 baht (23.1%)	1,294 baht (15.9%)
30	4,240 baht (52.1%)	2,995 baht (36.8%)	2,100 baht (25.8%)	1,424 baht (17.5%)
35	5,151 baht (63.3%)	3,507 baht (43.1%)	2,393 baht (29.4%)	1,595 baht (19.6%)
40	6,632 baht (81.5%)	4,264 baht (52.4%)	2,799 baht (34.4%)	1,815 baht (22.3%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Table 11: Savings needed per month for individuals without caregiving responsibilities for children and elders, under strong-performing fund managers

Age to start saving (years)	Desired retirement age (years)			
	55	60	65	70
20	146 baht (1.8%)	98 baht (1.2%)	57 baht (0.7%)	41 baht (0.5%)
25	228 baht (2.8%)	138 baht (1.7%)	90 baht (1.1%)	57 baht (0.7%)
30	350 baht (4.3%)	220 baht (2.7%)	130 baht (1.6%)	81 baht (1.0%)
35	570 baht (7.0%)	342 baht (4.2%)	203 baht (2.5%)	122 baht (1.5%)
40	952 baht (11.7%)	545 baht (6.7%)	317 baht (3.9%)	187 baht (2.3%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Table 12: Comparison of saving needed per month for individuals without caregiving responsibilities to children and elders based on different return rates

Age to start saving (years)	Desired retirement age (years)	With return from strong-performing fund managers	Baseline scenario	With return based on fixed deposit return rate
20	55	146 baht (1.8%)	854 baht (10.5%)	3,174 baht (39.0%)
25	55	228 baht (2.8%)	1,147 baht (14.1%)	3,621 baht (44.5%)
30	55	350 baht (4.3%)	1,562 baht (19.2%)	4,240 baht (52.1%)
35	55	570 baht (7.0%)	2,173 baht (26.7%)	5,151 baht (63.3%)
40	55	952 baht (11.7%)	3,158 baht (38.8%)	6,632 baht (81.5%)
20	60	98 baht (1.2%)	635 baht (7.8%)	2,352 baht (28.9%)
25	60	138 baht (1.7%)	838 baht (10.3%)	2,629 baht (32.3%)
30	60	220 baht (2.7%)	1,115 baht (13.7%)	2,995 baht (36.8%)
35	60	342 baht (4.2%)	1,489 baht (18.3%)	3,507 baht (43.1%)
40	60	545 baht (6.7%)	2,035 baht (25.0%)	4,264 baht (52.4%)
20	65	57 baht (0.7%)	464 baht (5.7%)	1,701 baht (20.9%)
25	65	90 baht (1.1%)	602 baht (7.4%)	1,880 baht (23.1%)
30	65	130 baht (1.6%)	781 baht (9.6%)	2,100 baht (25.8%)
35	65	203 baht (2.5%)	1,017 baht (12.5%)	2,393 baht (29.4%)
40	65	317 baht (3.9%)	1,335 baht (16.4%)	2,799 baht (34.4%)
20	70	41 baht (0.5%)	326 baht (4.0%)	1,188 baht (14.6%)
25	70	57 baht (0.7%)	415 baht (5.1%)	1,294 baht (15.9%)
30	70	81 baht (1.0%)	529 baht (6.5%)	1,424 baht (17.5%)
35	70	122 baht (1.5%)	675 baht (8.3%)	1,595 baht (19.6%)
40	70	187 baht (2.3%)	863 baht (10.6%)	1,815 baht (22.3%)

Source: Calculated by the authors.

Note: The numbers inside parentheses refer to percentage of monthly income that needs to be saved per month.

Based on our study, individuals without caregiving responsibilities for children or elders, who retire at an appropriate age, have access to decent saving or investing options, and save regularly, can save enough for retirement. Therefore, to reduce the government's financial burden and enhance the effectiveness of saving schemes, the government should encourage people to save for retirement and create a robust, risk-free investment platform.

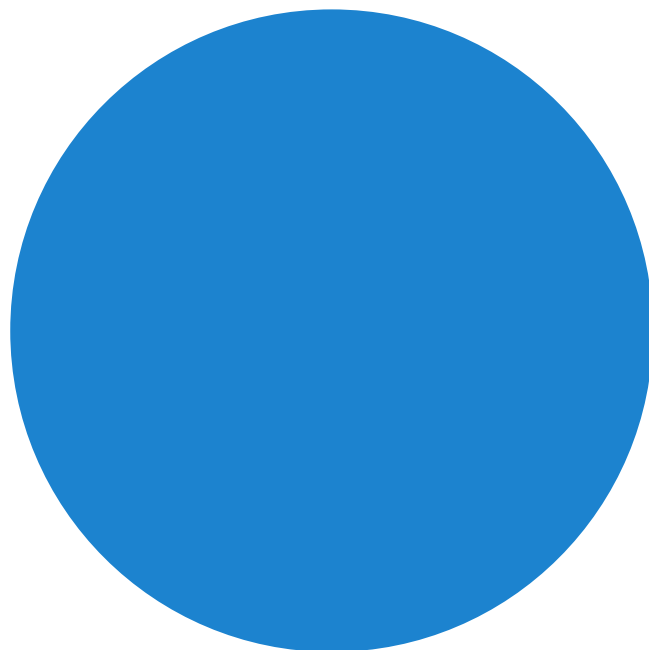
In this regard, the following policy options are recommended:

First, the government needs to encourage people to save for retirement by providing financial literacy education. This should not only emphasize the importance of financial preparation for retirement, but also provide specific guidelines for saving. For example, people should be informed about how much money they need to save per month, how much income they are likely to have upon retirement, investment knowledge, access to risk-free or low-risk savings and investment vehicles, and unnecessary expenses that could be reduced to save money.¹⁶

Second, to support individuals who cannot save enough money for retirement due to important obligations, such as those who have caregiving responsibilities for both children and elders, the government needs to provide support to help them save. According to our study, the government should: (a) provide financial support of 1,000 baht per month to households with caregiving responsibilities for both a child and an elder; (b) give specific support, similar to a state welfare card, to households with an income lower than the minimum daily wage in order to subsidize their living costs.

Third, to enhance the effectiveness of saving schemes, the government needs to create an environment that enables individuals to save for retirement. According to our study, the government should:

- (1) Develop effective saving schemes by creating strong-performing fund managers who can potentially generate decent returns from investments with lower risks or risk-free options. This may involve revising rules that may hinder such potential. It is also important to ensure that people can easily access these schemes for their retirement savings.
- (2) Raise the retirement age to provide people who wish to continue working beyond 60 years of age as an additional option to generate income for a longer period of time.



¹⁶ Our prototype guideline for saving for retirement is featured in the research.





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