



Fifteen Lessons from Fifteen Years of the Health Intervention and Technology Assessment Program in Thailand

Yot Teerawattananon, Saudamini Vishwanath Dabak, Anthony Culyer, Anne Mills, Pritaporn Kingkaew & Wanrudee Isaranuwatthai

To cite this article: Yot Teerawattananon, Saudamini Vishwanath Dabak, Anthony Culyer, Anne Mills, Pritaporn Kingkaew & Wanrudee Isaranuwatthai (2023) Fifteen Lessons from Fifteen Years of the Health Intervention and Technology Assessment Program in Thailand, *Health Systems & Reform*, 9:3, 2330974, DOI: [10.1080/23288604.2024.2330974](https://doi.org/10.1080/23288604.2024.2330974)

To link to this article: <https://doi.org/10.1080/23288604.2024.2330974>



© 2024 Health Intervention and Technology Assessment Program (HITAP), Ministry of Public Health, Thailand. Published with license by Taylor & Francis Group, LLC.



Published online: 07 May 2024.



Submit your article to this journal [↗](#)



Article views: 135









View related articles [↗](#)



View Crossmark data [↗](#)

Fifteen Lessons from Fifteen Years of the Health Intervention and Technology Assessment Program in Thailand

Yot Teerawattananon ^{a,b}, Saudamini Vishwanath Dabak ^a, Anthony Culyer ^c, Anne Mills ^d,
Pritaporn Kingkaew ^a, and Wanrudee Isaranuwatchai ^{a,e}

^aHealth Intervention and Technology Assessment Program (HITAP), Ministry of Public Health, Nonthaburi, Thailand; ^bSaw Swee Hock School of Public Health, National University of Singapore, Singapore, Singapore; ^cDepartment of Economics & Related Studies, and Centre for Health Economics, University of York, London, UK; ^dLondon School of Hygiene and Tropical Medicine (LSHTM), London, UK; ^eInstitute of Health Policy, Management and Evaluation, University of Toronto, Toronto, ON, Canada

ABSTRACT

The Health Intervention and Technology Assessment Program (HITAP) was established in 2007. This article highlights 15 lessons from over 15 years of experience, noting five achievements about what HITAP has done well, five areas that it is currently working on, and five aims for work in the future. HITAP built capacity for HTA and linked research to policy and practice in Thailand. With collaborators from academic and policy spheres, HITAP has mobilized regional and global support, and developed global public goods to enhance the field of HTA. HITAP's semi-autonomous structure has facilitated these changes, though they have not been without their challenges. HITAP aims to continue its work on HTA for public health interventions and disinvestments, effectively engaging with stakeholders and strategically managing its human resources. Moving forward, HITAP will develop and update global public goods on HTA, work on emerging topics such as early HTA, address issues in digital health, real-world evidence and equity, support HTA development globally, particularly in low-income settings, and seek to engage more effectively with the public. HITAP seeks to learn from its experience and invest in the areas identified so that it can grow sustainably. Its journey may be relevant to other countries and institutions that are interested in developing HTA programs.

ARTICLE HISTORY

Received 3 July 2023
Revised 8 December 2023
Accepted 12 March 2024

KEYWORDS

Health Technology Assessment (HTA); institutionalization; low- and middle-income countries (LMICs); organizational development; Thailand

Introduction

Thailand's Universal Coverage Scheme was introduced in 2002 to provide financial protection to 47 million of the 70 million people who were not eligible for coverage under the existing public health insurance schemes. At the time, the Civil Servant Medical Benefit Scheme covered approximately four million government and state enterprise employees and their dependents, and the social security scheme covered ten million private sector employees. In the same year, the National Institute for Health and Care Excellence (NICE) in the UK celebrated its third anniversary. At the time, no one in Thailand could have imagined that the country would shortly have a NICE-like "cost-effectiveness watchdog," partly because health economics was a relatively new discipline in Thailand, and partly because there was no prior experience of using economic evidence in health resource allocation.

In 2006, the lead author of this paper returned from his postgraduate studies in the UK where he had explored the feasibility of using health economic evaluation for the

reimbursement of health care services in Thailand.¹ The Health Intervention and Technology Assessment Program (HITAP) was established the following year to conduct policy relevant research with a seed grant of one million USD from the Thai Health Promotion Foundation.² Since then, the organization has expanded from 12 to almost 80 full-time staff, with an annual budget of approximately three million USD. HITAP has since been recognized as a leading Health Technology Assessment (HTA) agency in a low- and middle-income country (LMIC), and other countries have observed and studied its journey.³ HITAP has also supported HTA development in more than 20 LMICs, and was one of the founding members of the International Decision Support Initiative (iDSI).⁴

This article summarizes HITAP's strengths and areas for improvement and discusses the future of HITAP, which may be relevant to HTA agencies in other LMICs. The article details HITAP's journey as it engages with stakeholders to set the agenda for policy making in health. The article serves as a critical self-examination

CONTACT Saudamini Vishwanath Dabak  Saudamini.d@hitap.net  Department of Health, Ministry of Public Health, Health Intervention and Technology Assessment Program (HITAP), 6th Floor, 6th Building, Tiwanon Rd., Muang, Nonthaburi 11000, Thailand

© 2024 Health Intervention and Technology Assessment Program (HITAP), Ministry of Public Health, Thailand. Published with license by Taylor & Francis Group, LLC. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

from the collective and direct experiences of its founding member, current executives, and also incorporates the viewpoints of global experts in health economics and health systems research, who were closely involved in HITAP's inception and development.

Five Things that HITAP Did Well

Building HTA Capacity by Training Analysts and Empowering Stakeholders

Capacity building for HTA has been recognized internationally as one of the most important and challenging tasks when developing an HTA institution.^{5,6} Because of the intrinsic multi-disciplinary and multi-professional nature of HTA, agencies need to hire and train talent from diverse academic and professional fields. Since HTA is a relatively new educational and research field in LMICs, capacity building can be seen as a challenge. Due to intermittent funding, HTA positions are often temporary (e.g., consultants, interns, and contract workers), and there is uncertainty around promotion prospects and long-term positions. Moreover, there are few agencies dedicated to HTA in LMICs so young researchers may be reluctant to specialize in a field that could limit their job opportunities as opposed to growing health research disciplines such as epidemiology, health financing, and clinical research.

HITAP's approach has been to recruit new graduates from varied educational backgrounds; it has been most successful in recruiting pharmacists due to the excess supply of pharmacists in Thailand, compared to other professions such as medicine, dentistry, and nursing.⁷ Currently, HITAP employs over 80 staff members—and since its inception has employed 400 staff members. Almost all members of staff, excluding the founder and current Program Leader, required HTA training upon joining. In addition to Thai staff members, HITAP employs about ten international staff, and when including alumni of HITAP, just under 30 international staff have worked at HITAP since its inception.⁷

There is now more formal training in HTA principles and health economic evaluation in Thailand. For example, pharmacoeconomics has been introduced in undergraduate and postgraduate pharmacy curricula. Additionally, the Thai Royal College of Surgeons has added HTA to basic academic training for surgeons in 2022, with contributions from HITAP. Although on-the-job training is at the heart of its capacity building activities, HITAP has created opportunities for formal training through scholarships for master's and doctoral study within and outside of Thailand (Table 1), which

Table 1. Number of staff who were awarded scholarships by or through HITAP.

Year of award	No. of scholarships awarded
2007	1
2008	1
2009	2
2011	3
2012	3
2013	1
2014	1
2016	1
2017	3
2019	1
2022	2
Total	19

One staff member received a scholarship for a master's and subsequently, a PhD program; hence, number of scholars is 18 while the number of scholarships provided is 19

have grown from zero at the time of HITAP's establishment to more than ten today. Before the establishment of these programs, HITAP sent staff to train in the UK and the Netherlands.

HITAP has further developed a conducive working environment, with opportunities to work in other countries, publish work in academic journals (Table 2), and participate in policy discussions and technical forums. HITAP has also recruited international staff, who add to the diversity of skills and experiences and help to establish HITAP as an international center of excellence.

In addition to researchers and educators, HITAP has sought to empower key stakeholders in the HTA process, including health decision makers, health professionals, civil society, patient groups, manufacturers, and the public. Capacity building for these groups can take a variety of forms, including technical assistance, in-depth consultations, virtual and in-person training sessions, online learning options, guidance materials in the form of knowledge products, skills-based courses, coaching, and mentoring.

Table 2. Number of publications in international and domestic peer-reviewed journals.

Year	International	Domestic
2007	6	1
2008	11	12
2009	11	4
2010	9	5
2011	8	8
2012	17	6
2013	10	1
2014	14	11
2015	18	8
2016	22	4
2017	12	3
2018	11	7
2019	10	5
2020	20	6
2021	24	0
2022	22	0
Total	225	81

In accordance with the national HTA process guidelines, two stakeholder meetings are held during each HTA study conducted by HITAP. The aim of the first meeting is to get agreement among all relevant stakeholders about the scope, policy, research questions, methodological approach, data sources, and timeline. The aim of the second is to verify and validate preliminary results and fine-tune policy recommendations to ensure their validity, relevance, and ability to be implemented.

HITAP has also provided training to mid-to-high level officials from the Ministry of Public Health over the past ten years. Over one thousand people at the deputy director level of tertiary hospitals have now been trained in HTA. This effort has increased awareness and understanding of HTA. Furthermore, HITAP has invested heavily in developing and disseminating communication materials (e.g., policy briefs for decision makers and infographics for the public). In designing and implementing all capacity building and knowledge translation activities, HITAP considers the type of audience and the information needed.

More generally, HITAP staff contribute to a range of training programs in Thailand and internationally to increase awareness on HTA among a range of stakeholders.

Linking HTA Research to Policy, Practice, and Pricing

The establishment of HITAP built upon previous attempts to institutionalize HTA in Thailand.⁸ Given the challenge of linking research to policy, the inclusion of stakeholders at the start of topic selection, evidence generation, and funding recommendations was identified as a key strategy to ensure HTA aligned with country priorities.

In the early days, when there was no formal mechanism linking HTA research to policy, HITAP and its partners conducted an annual topic nomination and prioritization process by inviting health care payers, national health program managers, medical associations, academia, and civil society to submit topics for HTA.^{7,9} Offering good quality evidence without incurring the cost of research served to incentivize collaboration for those who nominated ideas. This collaboration was possible thanks to the seed grant that HITAP received from the Thai Health Promotion Foundation during its first six years. Moreover, those who nominated and prioritized topics were able to participate as researchers in the HTA studies with HITAP, thus gaining professional experience.

More than half the prioritized topics were related to medicines and vaccines. Nominators hoped for their inclusion in the National List of Essential Medicines (NLEM), which serves as the national reimbursement list for all three public health insurers, emphasizing value-for-money.¹⁰ The NLEM was established in 1979 and the first edition was published in 1981. In 2008, the Health Economics Working Group was established as part of the NLEM process to support and perform quality assurance for all HTA studies conducted to inform the NLEM.¹¹ The NLEM is a list of medications and other substances that are essential to the prevention and control of health conditions in Thailand. The medications included in this list are reimbursed by all three public health insurance schemes, which collectively cover the entire population. In addition to health and safety, one category comprising high-cost medicines is also reviewed for cost-effectiveness and budget impact. HITAP was involved in the development of the NLEM, which proved to be an effective collaboration as it was the first time that HTA, especially economic evaluation and budget impact analysis, was an important input in considering the inclusion of high-cost medicines and vaccines in the NLEM, a practice that has since been integrated into the manual for the development of the NLEM.¹⁰

In terms of national policy impact, HTAs have successfully supported price negotiations of medicines for inclusion in the NLEM.^{12,13} The use of HTAs goes beyond consideration of the existing price of a product in the local market. Manufacturers and marketers of medicines under HTA consideration may submit price quotations that reflect the economies of scale that would follow if the product was deemed to be reimbursable. Additionally, if an HTA shows that the incremental cost-effectiveness ratio exceeds a certain threshold (approximately 160,000 Thai baht (THB) per Quality-Adjusted Life-Year (QALY) gained), then price negotiations would ensue to reach a price acceptable to all parties. HITAP is currently undertaking a study to assess the impact of changing the threshold on manufacturer behavior given that Thailand had increased its threshold—first from 100,000 THB/QALY to 120,000 THB/QALY in 2010, and then again to 160,000 THB/QALY in 2013.¹⁴ Initial study findings suggest that even though the threshold was increased, the price of medicines has not increased, indicating that manufacturers respond reasonably in terms of pricing. Thus, the Thai HTA process has led to price interventions aimed at ensuring the affordability of essential medicines and access under public health insurance schemes.¹⁴

Since 2009, HTA has been used to inform the development of the non-pharmaceutical health benefits

package under the Thai universal coverage benefit package (UCBP).¹⁵ Unlike the NLEM, a broader set of stakeholders, including members of the public, were invited to nominate health problems or interventions to be part of the development of the UCBP. The UCBP was supported by a partnership between HITAP and the International Health Policy Program (IHPP), a semi-autonomous entity which focuses on broader health systems issues such as human resources, health financing, and burden of disease, among others. This approach to topic nomination has been widely praised by national and international players as a good example of a participatory and evidence-informed policy process. By supporting the decision-making process through price negotiations and strategic purchasing for interventions, the HTA processes have saved the Thai government upwards of 188 million USD.¹⁶

Being embedded in the health system, having an arms-length relationship with policy makers, developing institutional capacity in the policy development process for medicines and vaccines as well as having champions, have all been beneficial in facilitating this linkage. Importantly, HITAP has always sought to conduct policy-relevant research, engaging stakeholders during the process.

Mobilizing Global and Regional Support for HTA

HTA is regarded by some as a luxury in LMICs.⁵ Hiring international health economists to carry out HTA research is expensive, so only high-income countries are able to afford HTAs. On reducing disease burden, Wikler has argued that prioritization is more important in LMICs as it can increase the availability of resources.¹⁷ There remains a misconception among some practitioners that HTA is less relevant in countries where there are limited resources, whereas the truth is that such settings have more to gain from reducing any misallocation of resources.⁵

Viewing HTA as a luxury did not help in promoting its use to inform policy in Thailand. Through HITAP's capacity building work in Bhutan, Myanmar, and the Philippines, it learned that global recognition and support were vital to the success of HTA in any country. With support from a HITAP board member who was a senior official at the Thai Ministry of Public Health (MoPH), HITAP was able to work with several World Health Organization (WHO) Member States to deliver the 67th World Health Assembly's resolution on Health Intervention and Technology Assessment in support of Universal Health Coverage (UHC).¹⁸ Two years before this resolution, HITAP was part of the Thai delegation that attended the Executive Board and the World Health

Assembly to draft the resolution and help convince colleagues to adopt it. The resolution urged WHO Member States to consider establishing national systems of health intervention and technology assessment and link them with health technology regulation and management. The resolution also requested WHO to integrate HTA concepts and principles into the relevant strategies and areas of work and to provide technical support to Member States, especially LMICs, to strengthen HTA capacity.

This effort had a significant impact on HITAP and the HTA community as WHO became an HTA advocate and conducted two global surveys on HTA in 2015 and 2021.^{19,20} WHO regional and country offices have provided support for HTA activities in Asia, Africa, and Latin America.^{21–23} Since then, HTA has been viewed as an integral part of the UHC movement.²⁴ There is now an increased level of awareness of HTA, thus helping to ensure that explicit policy objectives and targets are impactful.

Two other significant contributors to the development of HTA in LMICs are iDSI and HTAsiaLink. iDSI is a global network to support HTA, funded by the Bill and Melinda Gates Foundation, the Rockefeller Foundation, and the UK's Foreign and Commonwealth Development Office. HTAsiaLink is a regional network of HTA agencies from across the Asia–Pacific region, wherein each organization brings its own resources for network activities. HITAP was a co-founder of both iDSI and HTAsiaLink.^{25–27} iDSI seeks to provide on-the-job training for researchers in LMICs to be able to make evidence-informed resource allocation decisions for health. HTAsiaLink provides a platform for knowledge sharing on the use of HTA for the development of health benefit packages and HTA institutionalization among HTA agencies, and builds technical and institutional capacity for HTA in the region. The flagship activity of HTAsiaLink is an annual conference which serves as a platform to engage on topics relevant to HTA and offers junior researchers an opportunity to present their work at an international conference and receive feedback from experts.

Producing Global Public Goods

Global public goods are goods and services which are available to all.²⁸ The quality of publicness is especially true of knowledge products, such as understanding the best ways to create HTA agencies, publishing systematic reviews, or identifying the most suitable methodologies for conducting HTAs. COVID-19 has increased the demand for global public goods in health.

Since its inception, HITAP has been committed to making all its work publicly accessible, allowing it to scale-up its efforts to institutionalize HTA. This has been achieved through open access publication of research proposals, meeting minutes, HTA reports, and academic publications, as well as making HTA tools and materials available online.²⁹ As part of iDSI, HITAP has produced a handful of public goods in English, including contributing to a well-known handbook for designing health benefits packages for UHC, “What’s In, What’s Out” and developing the Guide to Economic Analysis and Research (GEAR) (<https://www.gear4health.com>).^{30,31} The GEAR online platform has a repository of more than 40 national guidelines for conducting HTA, and has become a source for researchers assessing these guidelines.^{32–34} HITAP has also produced knowledge products such as “Non-communicable Disease Prevention Best Buys, Wasted Buys and Contestable Buys” (<https://www.buyitbestn.cd.health>), which was commissioned as part of the Prince Mahidol Award Conference in 2019.³⁵

Having Semi-Autonomous Status as a Research Unit within The Ministry of Public Health

One of the first characteristics of a successful HTA agency, identified by leaders from HTA agencies in Asia, is independence.²¹ Independence means that there should be no political pressure influencing the process and outcome of an HTA. This is not easily achieved given that HTA guides public health investment, which produces winners and losers in the health care market. It is, however, enhanced by exclusively involving people of integrity and who have esteem in HTA processes; and by having mechanisms for identifying conflicts of interest and procedures for managing any that arise. In this regard, HITAP does not accept funding from the for-profit sector. In terms of governance, HITAP is overseen by an independent board comprising eminent individuals in Thailand who are independent of the government and not directly involved in politics.

Another HTA agency within the Thai MoPH is the Institute of Medical Research and Technology Assessment (IMRTA) which aims to improve clinical effectiveness and clinical practice in tertiary hospitals, which may require investments in expensive medical technology. HITAP, on the other hand, focuses on increasing the prominence of economic evaluations to inform coverage of health services. Both HTA agencies would prefer to be independent, but this was not feasible for IMRTA, which operates within existing bureaucratic structures, since it relies solely on government funding

and civil servant support. HITAP is considered semi-autonomous, overseen by the MoPH but with a substantial degree of autonomy. Although HITAP is officially a research unit under IHPP, a separate foundation was established to allow for more flexibility and support the independent funding of HITAP. Through its foundation, HITAP can receive funding from organizations other than the MoPH, including from other government sources, international agencies, and not-for-profit organizations. With regards to human resources, HITAP can recruit and retain its staff under the foundation and can even host civil servants to work at HITAP on secondments through IHPP. HITAP maintains policy relevance by being part of the government set-up and having strong links with the government, while its status as a foundation protects its scientific integrity and independence. The strengths in its funding and staffing, and its independence of a semi-autonomous structure, may have allowed for greater success as an HTA agency compared to those with more restricted functioning.³⁶

While HITAP’s semi-autonomous structure has allowed it to operate successfully, being entirely autonomous would enable it to operate as an independent organization, receiving a budget from the government and not as a nonprofit foundation. It would also improve risk management. While HITAP is unlikely to face lawsuits (it supports rather than makes decisions), if it did have the authority to make decisions, being a public organization could help in getting the backing and full support of the government system. In 2015, HITAP’s leadership drafted a Royal Decree that would have made HITAP an autonomous public organization under the Public Organization Act, B.E. 2542.³⁷ It sought to make HITAP a distinct entity from the MoPH, but with an institutional link to the government apparatus that would have allowed HITAP to perform HTA with a certain degree of autonomy. Currently, there are 34 autonomous public organizations in Thailand including the National Vaccine Institute in the Thai MoPH. This initiative was, however, unsuccessful because, after the change in government in 2014, the Cabinet limited the creation of new public organizations and increased supervision of existing ones.

HITAP could have taken a more proactive approach in becoming a public organization in 2010–11 when there was government support. However, it did not pursue this course, given that the current semi-autonomous status was seen to be well-functioning and self-sustaining without relying on annual government budget. This has continued to be the case, even during the COVID-19 pandemic. HITAP has shown that it is able to maintain this semi-autonomous status along with relevant benefits

(e.g., maintaining its independence and staying engaged with policy makers) while also balancing the limitations (e.g., uncertainty in financing of the organization). For example, HITAP has built relationships with various funding agencies around the world to support its organization; these relationships represent one of the building blocks of a sustainable institution. If another opportunity to apply for public organization status were to open, this would be an option to ponder and deliberate.

Five Things That HITAP Is Addressing

Evaluating Public Health Interventions

HITAP has produced only a few HTAs on public health interventions during the past 15 years. Examples include a cluster randomized trial, economic evaluation alongside provider-initiated HIV counseling, and testing in public health facilities in Thailand. Other examples include an assessment of the feasibility and accuracy of a refractive error screening program conducted by school teachers in pre-primary and primary schools in Thailand, and a cluster randomized trial of a multi-component short-break intervention to reduce sitting time and increase physical activity among office workers in Thailand.^{38–40} Each of these studies required a substantial research grant and at least three years to complete.

There has been limited activity in this sphere despite a consistent demand from the MoPH, the National Health Security Office (NHSO), and other stakeholders to strengthen the formal evaluation of public health interventions. The Thai government has earmarked at least 10% of its budget for UHC for disease prevention and health promotion, with the intent of increasing this budget. However, for HTA of non-pharmaceutical products, the topics for assessment are determined through the involvement of multiple stakeholders. Given a somewhat more challenging and longer process for evidence generation, some stakeholders have preferred to focus on topics related to disease diagnosis and treatment rather than public health interventions. Reasons may include lack of knowledge about the availability and effectiveness of these public health interventions and concerns about transferability of results across settings. Evidence to support the value for money of public health interventions is less abundant than for disease diagnosis and treatment, which represents another opportunity for conducting HTAs of public health interventions. To ensure more public health

intervention evaluations at the topic selection stage, a quota for selecting public health interventions has been created.

Conducting HTA Throughout the Lifecycle of Health Technologies

The field of HTA is no longer just a snapshot assessment, but rather a part of the health technology management system which considers technologies throughout their lifecycle. In addition to supporting the decision-making process for a new technology, an ongoing assessment should be considered to reassess whether that technology is cost-effective over time.

Another important area warranting attention is low-value care (LVC), or patient care that provides little net benefit in specific clinical scenarios. This area has gained increasing interest among health care stakeholders.^{41,42} A number of initiatives, such as “Choosing Wisely,” have been developed in high-income countries, though this does not mean that this phenomenon occurs only in these settings.^{43,44} Waste in health investment can cost more lives in resource-limited settings—a problem that is underappreciated in LMICs.⁴⁵ Further, waste in the system diverts funds from elsewhere, backing the argument for systematic disinvestment criteria. Unfortunately, HITAP has done disproportionately less work on conducting reassessments and LVC compared to HTA for new medical products and services. For example, only a few studies have been conducted, such as stopping screening for Diabetes Mellitus (DM) for young populations in Indonesia and Thailand and identifying potential areas of LVC in Thailand such as overdiagnosis and overtreatment of acute appendicitis which became evident through the reduced number of cases during the COVID-19 pandemic.^{46–48}

Challenges in performing HTA for disinvestment persist, such as a lack of interest and incentives for stakeholders to nominate HTA topics for disinvestment and political challenges in policy implementation. For example, cetuximab was not found to be cost-effective in Indonesia but was nonetheless being used for indications that were not on the Indonesian clinical guidelines.⁴⁹ A HTA study conducted by partners in Indonesia supported its removal from the national formulary with potential savings of nine million USD per year, and resulted in the removal of the drug from public health insurance coverage. However, due to resistance from clinicians, this decision was reversed a year later.⁵⁰ In such situations, it may be helpful to utilize tools for reassessments such as the Ontario reassessment

framework.⁵¹ These are areas that can be explored further in the coming years.

Demonstrating HTA Impact

“You can’t improve what you don’t measure,” said Peter Drucker. This applies to the field of HTA, whereby understanding the mechanisms of the impact of HTA agencies is increasingly requested.⁵² However, measuring causality and the impact of HTA is not straightforward. The main reason for this difficulty is that there are many differences between HTA agencies operating within different systems and having different policy mechanisms. These characteristics can make measuring the impact of HTA in a standardized manner very challenging.

Although HITAP has conducted some case studies on the use of HTA in policy and clinical practice, very little work has been done to assess the impact of HTA on the health of patients and the general population.^{10,53,54} Recent collaboration between HITAP and researchers from Strathclyde Business School resulted in the development of an evaluation framework to assess the impact of HTA agencies, and a simulation model was used to estimate the impact of HTA-informed decisions for prioritization in Thailand.^{55–57} This development is a crucial step for ensuring accountability of the HTA system and encouraging other LMIC governments to invest their scarce resources in an HTA agency. Qualitative approaches, including narrative accounts, may be helpful to assess the impact of HTA activity. Maintaining a database of case studies in a standard format may also assist with cataloging.⁵⁸ The International Network of Agencies for Health Technology Assessment has developed a template for reporting the impact of HTA reports which may also be relevant.⁵⁹ These are potential areas that HITAP could work more on in the future.

Stakeholder Engagement with Patient and Youth Representatives

While HITAP engages stakeholders, there have been difficulties in identifying and effectively involving patient groups, even though they can nominate and select topics for developing the UCBP.⁶⁰ Participation of patient groups is limited due to lack of knowledge of technical terms, as well as the dominance of clinicians in the field. In HITAP’s experience, there are only a few technologies, such as treatments for hearing loss, chronic kidney disease, and HIV where there are strong patient groups. Moreover, there are only a handful of spokespersons for civil society groups, potentially

limiting the diversity of participating patient groups. HITAP is addressing this issue by conducting workshops for the general public and patient groups, especially during the topic nomination process. One important group to engage is youth. They are a key constituency for the future of the health system, but their involvement has not been managed in an intentional or systematic manner. Increased engagement can be achieved by capitalizing on networks with universities and enhancing communication through social media.

Being More Strategic About Human Resource Planning and Management

Although HITAP has been successful in building the capacity of relevant HTA personnel for research, operational, knowledge management, communications, and other aspects of HTA work, strategic planning and managing human resources remain areas of improvement.

During the past 15 years, more than 90% of the well-trained HTA professionals from HITAP have left the organization. Some have taken jobs in industry, international and developmental organizations, and universities within and outside Thailand. Of the 14 staff who received scholarships from or through HITAP to pursue master’s or doctoral degrees in or before 2017, only four remain at HITAP. This hinders progress as HITAP must constantly train young and relatively inexperienced staff. More needs to be done to retain staff and train them adequately to take on the responsibilities of those who leave. This experience highlights the importance of having a succession plan in place at all levels of staff, including leadership, to ensure continuity. Having a clear succession plan is critical to building a sustainable organization.

To address these concerns, HITAP maintains a dynamic work environment and a relatively flat organizational structure that offers staff opportunities to work on topical issues that have policy impact. Compared to its earlier days, HITAP has offered more long-term contracts to provide job security. It also offers flexibility to hire specific expertise on a part-time basis, though this is only a small proportion of staff. To strengthen staff capacity, HITAP has provided training and internal growth opportunities, and increased its usage of performance management tools, offering management and leadership training, and rethinking functions across teams. Other measures to retain staff may need to be designed while ensuring that the values of staff and those of HITAP remain aligned.

While staff turnover may hinder internal capacity, it does add to the pool of professionals in the global health community. In the future, HITAP can leverage its alumni to enhance its network and recruitment.

Five Things That HITAP Will Initiate in the Future

Developing and Updating Public Goods for HTA

Starting an HTA agency or conducting HTA can be daunting, particularly in LMICs where resources are scarce. When HITAP was formed in 2007, it needed to address several methodological gaps in conducting HTA and thus invested early on in building infrastructure for HTA in Thailand. For example, one of the inputs needed for economic evaluation research is a quality-of-life measure; one of the most widely used measures is the EQ-5D. However, it requires a population-wide survey to define a tariff of population preferences, which is context specific. In conducting its initial studies, HITAP used the tariff of the UK, and in parallel, commissioned a study to develop a value set for Thailand, investing in a longer-term strategy to develop a local tariff. Cost data are another context-specific parameter that needs to be collected. To reduce the time researchers spent on collecting common or standard costs, HITAP and its partners developed a standard costs list that is publicly available and used to this day.⁶¹ Additionally, HITAP published the methods guideline for HTA to foster a common understanding of how to report economic evaluations in such a way that they can be considered by policy makers—which was also endorsed in the Royal Gazette.⁶² In addition, HITAP maintained a database of HTA studies so that researchers could access these easily.

The development of such public goods is not limited to the initiation of an HTA agency. It is, on the contrary, a continuous and ongoing process. Lessons from implementation can be addressed and emerging needs in the field tackled early. Recently, HITAP has worked with 14 country partners to form the REAL World Data In Asia for Health Technology Assessment in Reimbursement working group, which published the first non-binding guidance document to generate and use Real-World Data (RWD) and Real-World Evidence (RWE).^{63–65} The quality-of-life measure was developed and subsequently updated in Thailand and HITAP. In addition, to ensure access to this global public good, HITAP, along with partners, made a case to EuroQoL, who developed and owns the EQ-5D instruments, to keep the use of the instruments free for noncommercial use.^{64,66} HITAP also contributed to a study to develop and test

a preference-based measure for the Asian region, which offers a more context-specific instrument for researchers.⁶⁷ Furthermore, HITAP is also developing a reference case for precision medicine together with partners in Singapore, and is creating a guideline to develop HTA methods and process guidelines in a joint partnership between HTAsiaLink, Health Technology Assessment International, and the Professional Society for Health Economics and Outcomes Research.

Exploring and Expanding the Frontiers of HTA

The frontiers of HTA are expanding into new areas, such as early HTA, digital health, and data science. First, HITAP realized that it was a waste of time and money for technology developers to innovate and create new technologies, only for them to be rejected at the reimbursement stage during the HTA process. HTA agencies like HITAP can do more than a passive evaluation if they are aware of technology characteristics and profiles that can make new technologies more impactful and offer better value for money. To this end, HITAP offers early HTA training to technology developers and is requesting funding from the Thailand Science Research and Innovation (TSRI) agency for a sandbox project on early HTA. This project will allow HITAP researchers with specialization in early HTA to work with health technology innovators to conduct HTA at a very early stage in order to set up target product profiles and inform clinical studies, with the hope that this effort will reduce risk and the cost of developing health technologies.⁶⁸

Second, digital health technologies represent a range of interventions that offer innovative options to strengthen health systems.⁶⁹ HITAP has conducted a study on the use of a smoking cessation application and recently, in collaboration with partners, assessed the effectiveness of a conversational Artificial Intelligence (AI) service or, a chatbot, to increase confidence in COVID-19 vaccines.^{58,70} The COVID-19 pandemic has transformed the landscape of the health system, with telehealth being one of the ways of extending care to patients.⁷¹ HITAP is the co-Secretariat for the WHO Country Cooperation Strategy, focusing on digital health, exploring topics on open data and telehealth. This includes potentially supporting the design of the monitoring and evaluation framework of the Thai government's plan to implement a national telehealth program. The digital world has transformed the health sector; HTA must adapt to ensure its relevance and utility—and HITAP has already joined this movement.

Another exploratory focus area at HITAP is RWD and RWE. With the emergence of administrative and other sources of data, there is an opportunity to use data more strategically for decision-making in health. A regional collaboration for providing guidance on the use of RWD and RWE for HTA in Asia has been developed, and HITAP is exploring ways to strengthen its capacity to conduct analysis in this area, including to support policy-making processes and supply model parameters in traditional economic evaluations.^{64,72} Currently, HITAP is working with data custodians such as NHSO, to explore how to use existing administrative data to answer policy relevant questions through research with rigorous methods.

HITAP is learning about practices in other countries in all three emerging areas and is building partnerships with other organizations working in the relevant fields.

Balancing Efficiency and Equity in Health

“Leave no one behind” is one of the key principles of the global UHC movement. This can be achieved through equitable access to health care.⁷³ The issues of equity and ethics are usually raised in criticism of health resource allocation in Thailand and elsewhere. Standard cost-effectiveness analysis (CEA) methods in health do not explicitly incorporate equity considerations, and recently, methods have emerged to address this issue, such as distributional cost-effectiveness analysis (DCEA).⁷⁴ The overall goal of DCEA aligns with CEA in that these methods aim to provide evidence to support the decision-making process, but not to make decisions for policy makers. Information from DCEAs can be used to support several types of decisions, such as designing health benefit packages, purchasing certain health interventions, investing in health care infrastructure, or supporting public health initiatives that enhance both equity and efficiency. Using Hepatitis C as a case study, HITAP will explore how equity considerations can be formally analyzed and incorporated into decision-making given that the disease affects the general population, as well as vulnerable groups such as intravenous drug users and those living with HIV. This study can equip decision makers with the tools to improve health equity as well as comprehend the implications of prioritizing health programs based solely on efficiency gains. HITAP may consider convening a stakeholder meeting to brainstorm the types of inequalities that should be considered in Thailand. These include socioeconomic status, disease areas, or geographical locations, and how they might be measured. Proper measurement and reporting can support the movement toward policy change.

Supporting HTA Capacity Building in Low-And-Middle-Income Countries

Whilst high-income and upper middle-income countries may have led the way in HTA development, low- and lower middle-income settings are increasingly interested in and are using HTA to support health care decision-making. Countries in the latter group potentially have the most to gain from the use of HTA, as the health opportunity cost from misallocating resources in these countries is much higher.

HITAP’s initial focus was on Asia, given the geographic proximity for engagement and contextual familiarity. However, its scope has expanded over time as demand for HTA has grown in other parts of the world, including sub-Saharan Africa. HITAP collaborated with Kenya as part of a Memorandum of Understanding (MoU) between the two ministries of health; and also with Ghana, where HITAP co-hosted a virtual workshop on vaccinology with partners (London School of Hygiene and Tropical Medicine, National University of Singapore, and the Access and Delivery Partnership); hosted a study visit to Thailand; conducted a topic prioritization workshop; and initiated support on an HTA study. HITAP has also worked with partners in Senegal to share experiences on HTA development and has provided trainings to conduct a HTA study. Furthermore, HITAP is engaging with the Africa Centres for Disease Control and Prevention (CDC), which is spearheading a regional program on HTA development. Members from Africa CDC have also joined the HTAsiaLink conference in 2023 to share experiences. HITAP has developed regional and global public goods and plans to develop more avenues for training and capacity building on HTA that are relevant to resource-poor settings in South Asia and Africa. In future, HITAP will also engage with other country partners through official channels, such as the Association of Southeast Asian Nations, where building capacity for HTA has been identified as a priority.³

Educating the Public

Our recent survey on reasons for avoiding the use of HTA reveals that there are misconceptions about HTA, even among respondents in settings with well-established HTA systems.⁵ For example, there were concerns that HTA is only a means of cost control or cost-cutting. There were also concerns that HTA is not relevant for countries with limited budgets and that it pays insufficient attention to equity. Moreover, some respondents suggested that HTA places a “price on life,” revealing that ideological resistance to HTA remains common across settings. Opportunity

costs are a fundamental reality of decision-making when resources are limited. As health care budgets are constrained worldwide, it is incumbent for stakeholders to put pressure on policy makers to make evidence-informed decisions. HITAP may consider organizing a brainstorming session with the public to elicit inputs on how best to navigate this. Collaborations with groups such as the National Health Commission Office, which organizes the National Health Assembly in Thailand, may also be considered, as well as working with other national partners such as NHSO, Thai Health Promotion Foundation, and TSRI.

Communicating the importance of HTA and concepts such as opportunity costs will be critical in demonstrating that HTA is not only a technical exercise, but also a transparent and inclusive process that can accommodate the values and principles that stakeholders affected by priority-setting decisions hold dear. Social media is a powerful tool for expanding the reach of HTA among the public, and HITAP has increased its presence on different social media channels in recent years and will continue to do so.

Conclusion

The past 15 years have been an exciting journey with many lessons—from contributing to policy relevant research to building domestic capacity for HTA and forging partnerships with countries to improve population health. All of these efforts are in pursuit of achieving UHC. As an HTA agency which uses evidence to inform policy, it is important for HITAP to review what went well, understand and learn from the past, and identify the skills, knowledge, resources, and tools that will enable it to progress. We hope that these lessons are useful to others embarking on a similar journey so they can be better informed of the challenges in applying HTA to policy making. HITAP is here today because of the continued support of both existing and new partners. The end goal for HITAP will be to work toward better evidence and better decisions for a healthier society for all; strengthening institutional capacities for sustainable growth in health will be one of the key focus areas. We look forward to continuing our contributions to society and to learning from everyone, as we have done over the past 15 years.

HTA agencies still need to learn and improve, as they do not work alone, but operate in a dynamic policy environment. Being evaluators, they too must engage in self-evaluation and reflection. Institutionalizing HTA in LMICs is not easy; and this article provides insights into the non-technical issues and institutionalization activities. We encourage other HTA agencies to share their own

lessons so that we may all benefit from each other's experiences.

Disclosure Statement

The authors include current employees of the organization as well as global health experts associated with HITAP. The authors have no other competing interests to declare.

Funding

The Health Intervention and Technology Assessment Program (HITAP), a semi-autonomous research unit in the Ministry of Public Health, Thailand, supports evidence-informed priority-setting and decision-making for health care. HITAP is funded by national and international public funding agencies. HITAP's international work is supported by the International Decision Support Initiative (iDSI), with the aim of providing technical assistance on health intervention and technology assessment to governments in low-income and middle-income countries. iDSI is funded by the Bill & Melinda Gates Foundation [OPP1202541], the UK's Department for International Development (now, Foreign, Commonwealth & Development Office or FCDO), and the Rockefeller Foundation. The HITAP is also supported by the Access and Delivery Partnership (ADP), which is hosted by the United Nations Development Programme and funded by the Government of Japan, the Rockefeller Foundation and the Health Systems Research Institute (HSRI). The findings, interpretations and conclusions expressed in this article do not necessarily reflect the views of the funding agencies. The guest editors of this special issue reported funding from the Bill and Melinda Gates Foundation (OPP1202541).

ORCID

Yot Teerawattananon  <http://orcid.org/0000-0003-2217-2930>

Saudamini Vishwanath Dabak  <http://orcid.org/0000-0001-6161-6165>

Anthony Culyer  <http://orcid.org/0000-0002-8896-8491>

Anne Mills  <http://orcid.org/0000-0001-9863-9950>

Pritaporn Kingkaew  <http://orcid.org/0000-0003-2626-7806>

Wanrudee Isaranuwatthai  <http://orcid.org/0000-0002-8368-6065>

Data Availability Statement

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

References

1. Teerawattananon Y. Assessing the feasibility of using economic evaluation in reimbursement of health care services in Thailand. United Kingdom: University of East Anglia; 2006.

2. Culyer A, Podhisita C, Santatiwongchai B. A star in the east: history of HITAP. *F1000Research*. 2017;6(487):487.
3. Sharma M, Teerawattananon Y, Dabak SV, Isaranuwatthai W, Pearce F, Pilasant S, Sabirin J, Mayxay M, Guerrero M, Phueng NK, et al. A landscape analysis of health technology assessment capacity in the Association of South-East Asian Nations region. *Health Research Policy And Systems*. 2021;19:1–13. doi:10.1186/s12961-020-00647-0.
4. Tickell S, Scabbiolo ZJF. International decision support initiative (iDSI). *Findings On Stakeholder Engagement*. 2019;8(802):802.
5. Teerawattananon Y, Painter C, Dabak S, Ottersen T, Gopinathan U, Chola L, Chalkidou K, Culyer AJ. Avoiding health technology assessment: a global survey of reasons for not using health technology assessment in decision making. *Cost Eff Resour Alloc*. 2021;19(1):1–8. doi:10.1186/s12962-021-00308-1.
6. Kim T, Sharma M, Teerawattananon Y, Oh C, Ong L, Hangoma P, Adhikari D, Pempa P, Kairu A, Orangi S, et al. Addressing challenges in health technology assessment institutionalization for furtherance of universal health coverage through south-south knowledge exchange: lessons from Bhutan, Kenya, Thailand, and Zambia. *Value Health Reg Issues*. 2021;24:187–92. doi:10.1016/j.vhri.2020.12.011.
7. Tantivess S, Teerawattananon Y, Mills A. Strengthening cost-effectiveness analysis in Thailand through the establishment of the health intervention and technology assessment program. *Pharmacoeconomics*. 2009;27(11):931–45. doi:10.2165/11314710-000000000-00000.
8. Teerawattananon Y, Tantivess S, Yothasamut J, Kingkaew P, Chaisiri K. Historical development of health technology assessment in Thailand. *Int J Technol Assess Health Care*. 2009;25(S1):241–52. doi:10.1017/S0266462309090709.
9. Yothasamut J, Udomsuk K, Sinthitichai K, Yot Teerawattananon M. A determination of topics for health technology assessment in Thailand: making decision makers involved. *A Special Articles*. 2008;91(2):S100–9.
10. Teerawattananon Y, Tritasavit N, Suchonwanich N, Kingkaew P. The use of economic evaluation for guiding the pharmaceutical reimbursement list in Thailand. *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*. 2014;108(7):397–404. doi:10.1016/j.zefq.2014.06.017.
11. Leelahavarong P, Doungthipsirikul S, Kumluang S, Poonchai A, Kittiratchakool N, Chinnacom D, Suchonwanich N, Tantivess S. Health technology assessment in Thailand: institutionalization and contribution to healthcare decision making: review of literature. *Int J Technol Assess Health Care*. 2019;35(6):467–73. doi:10.1017/S0266462319000321.
12. Teerawattananon Y, Tritasavit N. A learning experience from price negotiations for vaccines. *Vaccine*. 2015;33:A11–2. doi:10.1016/j.vaccine.2014.12.050.
13. Wirtz VJ, Hogerzeil HV, Gray AL, Bigdeli M, de Joncheere CP, Ewen MA, Gyansa-Lutterrodt M, Jing S, Luiza VL, Mbindyo RM, et al. Essential medicines for universal health coverage. *Lancet*. 2017;389(10067):403–76. doi:10.1016/S0140-6736(16)31599-9.
14. Isaranuwatthai W, Nakamura R, Wee HL, Sarajan MH, Wang Y, Soboon B, Lou J, Chai JH, Theantawee W, Laoharuangchaiyot J, et al. What are the impacts of increasing cost-effectiveness threshold? a protocol on an empirical study based on economic evaluations conducted in Thailand. *PLoS One*. 2022;17(10):e0274944. doi:10.1371/journal.pone.0274944.
15. Mohara A, Youngkong S, Velasco RP, Werayingyong P, Pachanee K, Prakongsai P, Tantivess S, Tangcharoensathien V, Lertiendumrong J, Jongudomsuk P, et al. Using health technology assessment for informing coverage decisions in Thailand. *J Comp Eff Res*. 2012;1(2):137–46. doi:10.2217/cer.12.10.
16. Tangcharoensathien V, Limwattananon S, Patcharanarumol W, Thammatacharee J, Jongudomsuk P, Sirilak S. Achieving universal health coverage goals in Thailand: the vital role of strategic purchasing. *Health Policy and Planning*. 2015;30(9):1152–61. doi:10.1093/heapol/czu120.
17. Wikler D. Why prioritize when there isn't enough money? *Cost Effective Resour Alloc*. 2003;1(1):1–3. doi:10.1186/1478-7547-1-5.
18. Organization WH. Health intervention and technology assessment in support of universal health coverage. The Sixty-Seventh World Health Assembly. 2014:24.
19. Organization WH. 2015 global survey on health technology assessment by National Authorities. Main findings. 2015.
20. Organization WH. Health benefit packages survey 2020/21: Main findings. 2021. <https://www.who.int/teams/health-systems-governance-and-financing/economic-analysis/health-technology-assessment-and-benefit-package-design/survey-homepage>.
21. Organization WH. Factors conducive to the development of health technology assessment in Asia: impacts and policy options. 2015.
22. Kriza C, Hanass-Hancock J, Odame EA, Deghaye N, Aman R, Wahlster P, Marin M, Gebe N, Akhwale W, Wachsmuth I, et al. A systematic review of health technology assessment tools in sub-saharan Africa: methodological issues and implications. *Health Res Policy Sys*. 2014;12(1):1–13. doi:10.1186/1478-4505-12-66.
23. Lessa F, Caccavo F, Curtis S, Ouimet-Rathé S, Lemgruber A. Strengthening and implementing health technology assessment and the decision-making process in the region of the Americas. *Rev Panam Salud Publica*. 2018;41:1–10. doi:10.26633/RPSP.2017.165.
24. Chalkidou K, Glassman A, Marten R, Vega J, Teerawattananon Y, Tritasavit N, Gyansa-Lutterrodt M, Seiter A, Kieny MP, Hofman K, et al. Priority-setting for achieving universal health coverage. *Bull World Health Organ*. 2016;94(6):462. doi:10.2471/BLT.15.155721.
25. Tantivess S, Chalkidou K, Tritasavit N, Teerawattananon Y. Health technology assessment capacity development in low-and middle-income countries: experiences from the international units of

- HITAP and NICE. F1000Research. 2017;6(6):2119. doi:10.12688/f1000research.13180.1.
26. Li R, Hernandez-Villafuerte K, Towse A, Vlad I, Chalkidou K. Mapping priority setting in health in 17 countries across Asia, Latin America, and sub-saharan Africa. *Health Syst Reform*. 2016;2(1):71–83. doi:10.1080/23288604.2015.1123338.
 27. Teerawattananon Y, Luz K, Yothasuttra C, Pwu R-F, Ahn J, Shafie AA, Chalkidou K, Tantivess S, Santatiwongchai B, Rattanavipapong W, et al. Historical development of the HTAsiaLink network and its key determinants of success. *Int J Technol Assess Health Care*. 2018;34(3):260–6. doi:10.1017/S0266462318000223.
 28. Global public goods for health: the report of working group 2 of the commission on macroeconomics and health. World Health Organization; 2002.
 29. HITAP website. <https://www.hitap.net/en/>.
 30. Adeagbo CU, Rattanavipapong W, Guinness L, Teerawattananon Y. The development of the guide to economic analysis and research (GEAR) online resource for low-and middle-income countries' health economics practitioners: a commentary. *Value Health*. 2018;21(5):569–72. doi:10.1016/j.jval.2017.10.003.
 31. Glassman A, Giedion U, Smith PC. What's in, what's out: designing benefits for universal health coverage. United States: Brookings Institution Press; 2017.
 32. Avşar TS, Yang X, Lorgelly PJP. How is the societal perspective defined in health technology assessment? Guidelines from around the globe. *PharmacoEconomics*. 2022;41(2):1–16. doi:10.1007/s40273-022-01221-y.
 33. Daccache C, Rizk R, Dahham J, Evers SM, Hiligsmann M, RJIjotaihc K. Economic evaluation guidelines in low-and middle-income countries: a systematic review. *International Journal Of Technology Assessment In Health Care*. 2022;38(1):e1. doi:10.1017/S0266462322000186.
 34. Williams AO, Rojanasart S, McGovern AM, Kumar AC. A systematic review of discounting in national health economic evaluation guidelines: health-care value implications. *Journal Of Comparative Effectiveness Research*. 2022;12(2). doi:10.2217/cer-2022-0167.
 35. Isaranuwachai W, Archer RA, Teerawattananon Y, Culyer AJ. Non-communicable disease prevention: best buys, wasted buys, contestable buys. Cambridge, UK: Open Book Publishers; 2019.
 36. Vlad I. Establishing Health Technology Assessment (HTA) in middle-income countries: a comparative analysis of the path towards institutionalisation in Thailand and the Philippines. United Kingdom: London School of Hygiene & Tropical Medicine; 2020.
 37. Inpa Y. Autonomous Public Organisations in Thailand: an exploration of their effectiveness. United Kingdom: University of Manchester; 2020.
 38. Teerawattananon Y, Leelukkanaveera Y, Thavorncharoensap M, Hanvoravongchai P, Ingsrisawang L, Tantivess S, Chaikledkaew U, Mohara A, Lertpiriyasuwat C, Pimsawan N, et al. Provider-initiated HIV/AIDS counselling and testing at healthcare facilities in Thailand: a cluster-randomisation trial. *J Dev Effect*. 2009;1(4):450–69. doi:10.1080/19439340903373976.
 39. Teerawattananon K, Myint C-Y, Wongkittirux K, Teerawattananon Y, Chinkulkitnivat B, Orprayoon S, Kusakul S, Tengtrisorn S, Jenchitr W. Assessing the accuracy and feasibility of a refractive error screening program conducted by school teachers in pre-primary and primary schools in Thailand. *PloS One*. 2014;9(6):e96684. doi:10.1371/journal.pone.0096684.
 40. Akksilp K, Koh JJE, Tan V, Tong EH, Budtarad N, Xueying G, Dieterich AV, Tai BC, Müller AM, Isaranuwachai W, et al. The physical activity at work (PAW) study: a cluster randomised trial of a multicomponent short-break intervention to reduce sitting time and increase physical activity among office workers in Thailand. *The Lancet Regional Health-Southeast Asia*. 2022;8:100086. doi:10.1016/j.lansea.2022.100086.
 41. Mafi JN, Parchman M. Low-value care: an intractable global problem with no quick fix. United Kingdom: BMJ Publishing Group Ltd; 2018. pp. 333–36.
 42. Schwartz AL, Landon BE, Elshaug AG, Chernew ME, McWilliams J. Measuring low-value care in Medicare. *JAMA Internal Medicine*. 2014;174(7):1067–76. doi:10.1001/jamainternmed.2014.1541.
 43. Levinson W, Kallewaard M, Bhatia RS, Wolfson D, Shortt S, Kerr E. 'Choosing wisely': a growing international campaign. *BMJ Quality & Safety*. 2015;24(2):167–74. doi:10.1136/bmjqs-2014-003821.
 44. Colla CH, Morden NE, Sequist TD, Schpero WL, Rosenthal M. Choosing wisely: prevalence and correlates of low-value health care services in the United States. *Journal of General Internal Medicine*. 2015;30(2):221–28. doi:10.1007/s11606-014-3070-z.
 45. Isaranuwachai W, Archer RA, Teerawattananon Y, Culyer AJ. Non-communicable disease prevention: best buys, wasted buys, contestable buys. Cambridge, UK: Open Book Publishers; 2019.
 46. Rattanavipapong W, Luz ACG, Kumluang S, Kusumawardani N, Teerawattananon Y, Indriani C-I, Primastuti PA, Rivai LB, Idaiani S, Adhie U, et al. One step back, two steps forward: an economic evaluation of the PEN program in Indonesia. *Health Systems & Reform*. 2016;2(1):84–98. doi:10.1080/23288604.2015.1124168.
 47. Teerawattananon Y, Kingkaew P, Koopitakkajorn T, Youngkong S, Tritasavit N, Srisuwan P, Tantivess S. Development of a health screening package under the universal health coverage: the role of health technology assessment. *Health Economics*. 2016;25(S1):162–78. doi:10.1002/hec.3301.
 48. Sukmanee J, Butchon R, Sarajan MH, Saeraneesopon T, Boonma C, Karunayawong P, Teerawattananon Y, Isaranuwachai W. Estimating the potential overdiagnosis and overtreatment of acute appendicitis in Thailand using a secondary data analysis of service utilization before, during and after the COVID-19 lockdown policy. *PLoS One*. 2022;17(11):e0270241. doi:10.1371/journal.pone.0270241.
 49. Putri S, Saldi SRF, Khoe LC, Setiawan E, Megraini A, Santatiwongchai B, Nugraha, RR, Permanasari, VY, Nadjib, M, Sastroasmoro, S, Armansyah, A.

- Cetuximab as first-line treatment for metastatic colorectal cancer (mCRC): A model-based economic evaluation. 2022.
50. Sharma M, Teerawattananon Y, Luz A, Li R, Rattanavipapong W, Dabak S. Institutionalizing evidence-informed priority setting for universal health coverage: lessons from Indonesia. *INQUIRY: The Journal Of Health Care Organization, Provision, And Financing*. 2020;57:0046958020924920. doi:10.1177/0046958020924920.
 51. Paprica PA, Culyer AJ, Elshaug AG, Peffer J, Sandoval G. From talk to action: policy stakeholders, appropriateness, and selective disinvestment. *International Journal of Technology Assessment in Health Care*. 2015;31(4):236–40. doi:10.1017/S0266462315000392.
 52. Drucker J. You Are What You Measure: Forbes. 2018. <https://www.forbes.com/sites/theyec/2018/12/04/you-are-what-you-measure/?sh=3a88c6632075>.
 53. Tantivess S, Velasco RP, Yothasamut J, Mohara A, Limprayoonyong H, Teerawattananon Y, Littlejohns P. Efficiency or equity: value judgments in coverage decisions in Thailand. *J Health Organ Manag*. 2012;26(3):331–342. doi:10.1108/14777261211238972.
 54. Tantivess S, Werayingyong P, Chuengsamarn P, Teerawattananon Y. Universal coverage of renal dialysis in Thailand: promise, progress, and prospects. *BMJ*. 2013;346. doi:10.1136/bmj.f462.
 55. Millar R, Morton A, Bufali MV, Engels S, Dabak SV, Isaranuwatthai W, Chalkidou K, Teerawattananon Y. Assessing the performance of Health Technology Assessment (HTA) agencies: developing a multi-country, multi-stakeholder, and multi-dimensional framework to explore mechanisms of impact. *Cost Eff Resour Alloc*. 2021;19(1):1–14. doi:10.1186/s12962-021-00290-8.
 56. Barlow E, Morton A, Dabak S, Engels S, Isaranuwatthai W, Teerawattananon Y, Chalkidou K. What is the value of explicit priority setting for health interventions? A Simulation Study. 2022;25(3):460–83. doi:10.1007/s10729-022-09594-4.
 57. Kingkaew P, Budtarad N, Khuntha S, Barlow E, Morton A, Isaranuwatthai W, Teerawattananon Y, Painter C. A model-based study to estimate the health and economic impact of health technology assessment in Thailand. *International Journal of Technology Assessment in Health Care*. 2022;38(1). doi:10.1017/S0266462322000277.
 58. Kingkaew P. Optimising the development of effective mobile health behaviour change interventions. United Kingdom: The University of Leeds; 2018.
 59. INAHTA Impact Framework. <https://www.inahta.org/hta-tools-resources/briefs/>.
 60. HTAsiaLink Editorial Team. 10th HTAsiaLink newsletter: patient involvement on HTA. Thailand: Health Intervention and Technology Assessment Program (HITAP); 2017.
 61. Riewpaiboon AJVi H. PRM3 standard cost list for economic evaluation in Thailand. *Value In Health*. 2012;15(7):A645. doi:10.1016/j.jval.2012.08.255.
 62. Teerawattananon Y, Teerawattananon YJJotMAoT. Thai health technology assessment guideline development. *Journal of the Medical Association of Thailand*. 2011;91(6):11.
 63. NUS Saw Swee Hock School of Public Health and the Health Intervention and Technology Assessment Program (HITAP) T. Use of real-world data and real-world Evidence to support drug reimbursement decision-making in Asia (Version 1.1). Singapore: Saw Swee Hock School of Public Health, National University of Singapore. 2023.
 64. Lou J, KC S, Toh KY, Dabak S, Adler A, Ahn J, Bayani DBS, Chan K, Choiphel D, Chua B, et al. Real-world data for health technology assessment for reimbursement decisions in Asia: current landscape and a way forward. *Int J Technol Assess Health Care*. 2020;36(5):474–80. doi:10.1017/S0266462320000628.
 65. KC S, Lin LW, Bayani DBS, Zemlyanska Y, Adler A, Ahn J, Chan K, Choiphel D, Genuino-Marfori AJ, Kearney B, et al. What, where, and how to collect real-world data and generate real-world evidence to support drug reimbursement decision-making in Asia: a reflection into the past and a way forward. *Int J Health Policy Manag*. 2023. doi:10.34172/ijhpm.2023.6858.
 66. Pattanaphesaj J, Thavorncharoensap M, Ramos-Goñi JM, Tongsiri S, Ingsrisawang L, Teerawattananon Y. The EQ-5D-5L valuation study in Thailand. *Expert Review of Pharmacoeconomics & Outcomes Research*. 2018;18(5):551–58. doi:10.1080/14737167.2018.1494574.
 67. Shirowa T, Murata T, Ahn J, Li X, Nakamura R, Teerawattananon Y, Kun Z, Shafie AA, Valverde H, Lam H, et al. Developing a new region-specific preference-based measure in East and Southeast Asia. *Value Health Reg Issues*. 2022;32:62–9. doi:10.1016/j.vhri.2022.07.002.
 68. Wang Y, Rattanavipapong W, Teerawattananon Y. Using health technology assessment to set priority, inform target product profiles, and design clinical study for health innovation. *Technol Forecast Soc*. 2021;172:121000. doi:10.1016/j.techfore.2021.121000.
 69. World Health Organization. Global strategy on digital health 2020–2025. Geneva: World Health Organization. 2021.
 70. Lee KY, Dabak SV, Kong VH, Park M, Kwok SL, Silzle M, Rachatan C, Cook A, Passanante A, Pertwee E, et al. Effectiveness of chatbots on COVID vaccine confidence and acceptance in Thailand, Hong Kong, and Singapore. *NPJ Digit Med*. 2023;6(1):96. doi:10.1038/s41746-023-00843-6.
 71. Monaghesh E, Hajizadeh A. The role of telehealth during COVID-19 outbreak: a systematic review based on current evidence. *BMC Public Health*. 2020;20(1):1–9. doi:10.1186/s12889-020-09301-4.
 72. Lin LW, Ahn J, Bayani DBS, Chan K, Choiphel D, Isaranuwatthai W, Kearney B, Lou J, Adler A, Nakamura R. Use of real-world data and real-world evidence to support drug reimbursement decision-making in asia.
 73. Assefa Y, Hill PS, Van Damme W, Dean J, Gilks CF. Leaving no one behind: lessons from implementation of policies for universal HIV treatment to universal health coverage. *Global Health*. 2020;16(1):1–9. doi:10.1186/s12992-020-00549-4.
 74. Asaria M, Griffin S, Cookson R. Distributional cost-effectiveness analysis: a tutorial. *Med Decis Making*. 2016;36(1):8–19. doi:10.1177/0272989X15583266.