Review Article

Policy and plan for vaccine production and development in Thailand: narrative review

Worrawoot Jumlongnark

College of Politics and Governance, Mahasarakham University, Maha Sarakham, Thailand

Correspondence to: Worrawoot Jumlongnark, MA (Politics and Government). Chulalongkorn University, 1/143, Talat, Mueang, Maha Sarakham 44000, Thailand; College of Politics and Governance, Mahasarakham University, Maha Sarakham, Thailand. Email: worrawoot.j@msu.ac.th.

Background and Objective: Thailand has made efforts to develop domestic vaccines. There are several challenges and obstacles to overcome. This article examines the current state of vaccine development and production in Thailand, focusing on the policies, plans, and strategies in place.

Methods: A systematic search was conducted in PubMed, Scopus, and Web of Science databases from 2000 to 2023, using keywords such as "vaccine production", "vaccine development", "Thailand", "policy", "plan", "shortages", and "sustainable development goals". Only English language articles meeting the inclusion criteria were included in the review.

Key Content and Findings: In Thailand, a constitutional mandate focuses on sustainable development, aiming for stability and prosperity. Sustainable Development Goals (SDGs) are a priority, with a 20-year national plan in place. This includes strategies for vaccine safety and public health, aligning with Thailand 4.0 principles. The National Vaccine Institute implements a three-year vaccine security plan to meet domestic needs, reduce import dependency, and enhance collaboration. Since 1977, Thailand has successfully provided free vaccines for 12 diseases, reducing disease incidence and mortality. To address challenges like the ASEAN Economic Community (AEC) influx, vaccination efforts continue, Thailand's vaccine production capability has improved, with World Health Organization Pre-qualification (WHO PQ) certification, but budget constraints hinder personnel development. Infrastructure improvements are needed to fully benefit from global vaccine production, and policy coordination and regulatory measures are required for domestic vaccine manufacturers. Thailand's growth in the domestic vaccine industry faces challenges, leading to reliance on imports and potential shortages.

Conclusions: The article highlights the need for Thailand to address these challenges in order to align with the SDGs related to vaccine production and development.

Keywords: Vaccine development; vaccine production; Thailand; domestic pharmaceutical industry; Sustainable Development Goals (SDGs)

Received: 30 May 2023; Accepted: 25 September 2023; Published online: 02 November 2023.
doi: 10.21037/jphe-23-47
View this article at: https://dx.doi.org/10.21037/jphe-23-47

Introduction

Vaccines play a crucial role in public health, providing protection against illnesses and ensuring the well-being of communities and national security. However, there is a shortage of vaccines, particularly in situations where demand is rapidly increasing due to widespread epidemics, especially in developing countries. This shortage poses a significant challenge to achieving the Sustainable Development Goals (SDGs), specifically Goal 3, Target 3b1, which aims to support research and development of vaccines and medicines for communicable diseases that disproportionately affect developing countries, and to provide affordable access to these essential medications and vaccines (1).

Thailand's strong commitment to public health since

the 1970s has led to substantial investments in health infrastructure, achieving Universal Health Coverage in 2002. Public health expenditure increased from 63% [2002] to 77% [2011], and out-of-pocket spending dropped from 27.2% to 12.4%. With broad healthcare delivery, free services, and a bolstered Ministry of Public Health, pro-poor utilization improved, and unmet needs reduced. Effective payment systems like capitation contributed to cost-effectiveness. The National Health Security Office excels in strategic purchasing. Despite strong maternal and child health metrics, adult mortality remains higher than neighboring countries and Central America. Challenges include elderly care policies, urban primary care gaps, financial resilience during downturns, healthcare professional migration, and evolving health strategies (2).

The implementation and provision of vaccines are significant aspects of many governments, particularly in response to the COVID-19 pandemic. Therefore, scholars have conducted studies on vaccine management policies to better understand their implications. According to Galappaththi *et al.* (3), this study identifies seven key policy responses to COVID-19 implemented by the Sri Lankan government. However, these policies evolved as the pandemic progressed and did not incorporate the voices and needs of Indigenous Peoples. In another study by Wong *et al.* (4), the researchers investigated the characteristics associated with COVID-19 cases and deaths among residents in U.S. nursing homes from 2020 to 2021. They focused on geospatial and racial inequalities and found that majority Hispanic facilities had alarmingly high COVID-19 cases and deaths. Additionally, they discovered that rural areas with predominantly White residents had COVID-19 hot spots. Notably, the top states with COVID-19 hot spots were identified as Kentucky, Pennsylvania, Illinois, and Oklahoma.

Scholars are actively engaged in studying the role and structure of the pharmaceutical industry to enhance patients' access to medicines and treatment. For instance, Satibi *et al.* (5) conducted a study analyzing drug prices in e-catalogues within Indonesia's Universal Health Coverage framework. The implementation of this program led to changes in drug procurement through e-catalogue systems. This research investigates how these regulations impacted drug costs by using the median price ratio (MRP) concept to compare data from different sectors that won e-catalogue medicine bids during different periods. The findings highlight shifts in medicine costs between 2013 and 2018, with some drugs seeing price increases, while others experienced decreases. In a related study, Wang *et al.* (6) focused on assessing human health risks related to heavy metals in a retired pharmaceutical industrial area in southwest China. They examined soil samples and identified metals like Hg, Cd, As, Pb, Ni, and Cu with high average levels. These metals influence pharmaceutical production, with some affecting specific manufacturing processes. The study concludes that human health risks, both cancer- and non-cancer-related, remain acceptable according to USEPA guidelines.

Moving on to employee perspectives, Sharma *et al.* (7) explored the contribution of the pharmaceutical industry to a nation's economic growth. They analyzed factors influencing job satisfaction among pharmaceutical company representatives, emphasizing compensation, skill development, management practices, and interpersonal relationships. The research underscores the importance of a positive work environment, colleague interactions, competitive compensation, benefits, and career advancement opportunities. Furthermore, Yadav *et al.* (8) investigated the relationship between green human resource management (HRM) practices and green innovation in India's pharmaceutical industry. They found that green motivation and capability positively influenced green innovation, with transformational leadership playing a significant mediating role.

In the context of career choices, Ibrahim *et al.* (9) studied the factors influencing career choices among pharmacy students in Malaysia. They discovered that students from private institutions, those in certain study years, and those with positive attitudes were more inclined toward a pharmaceutical career. To reshape student perceptions, the study suggests exposing them to roles involving patient interaction and clinical expertise. Shifting the focus to healthcare costs, Dalstrom *et al.* (10) explored strategies to reduce healthcare costs, particularly through the use of Mexican pharmaceuticals by US seniors. The study targeted "Winter Texans" near the Texas/Mexico border and found that cost was a significant factor in their decision to purchase medications from Mexico.

In Thailand, scholars are also investigating the pharmaceutical industry. Srimarut and Mekhum (11) found that workload significantly affects job satisfaction, and training helps mediate these issues. Another study by Srimarut and Mekhum (12) highlighted the connection between cross-cultural competence and worker performance, emphasizing emotional intelligence's importance.

Continuing with employee perspectives, Tirastittam *et al.* (13) confirmed that workplace benefits significantly impact employee engagement, suggesting HRM strategies to enhance employee happiness. Pitchayajittipong *et al.* (14) surveyed pharmaceutical manufacturing in Thai hospitals, emphasizing collaboration between pharmaceutical science colleges and hospitals for successful manufacturing. Lastly, Kerdpitak (15) explored how environmental and human resources management practices influence pharmaceutical industry operational performance, revealing the importance of incentives, recruitment, and certain environmental practices.

In summary, scholars are deeply engaged in studying various aspects of the pharmaceutical industry, ranging from drug pricing and procurement to environmental impact, employee engagement, and operational performance, contributing valuable insights for improving industry practices and patient outcomes.

The importance of vaccine implementation and supply in government policies has been extensively studied, particularly in the context of the COVID-19 pandemic. Various research findings shed light on different aspects of vaccine management policies. These studies highlight the need for inclusive decision-making, address disparities in healthcare, consider the impact of political factors on outcomes, assess the effectiveness of policy responses, and recognize the role of public trust and social norms in vaccine acceptance. Furthermore, the studies emphasize the significance of prioritizing vulnerable populations, engaging volunteers, and implementing multi-criteria decision-making frameworks to optimize vaccination strategies. Challenges related to civil liberties and public resistance to government directives are also recognized. Overall, these literature reviews contribute valuable insights for policymakers, healthcare professionals, and organizations in navigating the complexities of vaccine-related policies and public health management during crises.

To address this issue from previous studies and fulfill the SDGs, Thailand needs to establish a comprehensive policy and plan for vaccine production and development within the country. This article presents Thailand's vaccine production and development policy and plan, organized into three parts: (I) policy for vaccine development in Thailand; (II) plan for vaccine development in Thailand; (III) opportunities and obstacles related to vaccine production and development in Thailand, presented in the specified order. This article was presented in accordance with the Narrative Review reporting checklist (available at https://jphe.amegroups.com/article/view/10.21037/jphe-23-47/rc).

Objectives

(I) To highlight the importance of having a policy and plan for vaccine production and development in Thailand, particularly in the context of addressing the shortage of vaccines and meeting the SDGs.
(II) To present the strategies, policies, and action plans for vaccine development in Thailand, providing insights into the country's approach to enhancing its vaccine capabilities and contributing to global efforts in combating communicable diseases.
(III) To discuss the opportunities and obstacles associated with vaccine production and development in Thailand, offering a comprehensive understanding of the challenges and potential areas for growth in order to facilitate effective decision-making and resource allocation.

Methods

Research selection

A comprehensive literature search was conducted to identify relevant articles and documents related to vaccine production and development in Thailand. Multiple databases were utilized, including PubMed, Scopus, and Web of Science, to ensure a thorough search. The search strategy combined relevant keywords, such as "vaccine production", "vaccine development", "Thailand", "policy", "plan", "shortages", and "sustainable development goals". The search was limited to articles published between 2000 and 2023. The data collection period spans from March 1, 2023 to April 30, 2023. The reference lists of identified articles were also reviewed to identify additional relevant studies as shown in *Table 1*.

Inclusion and exclusion criteria

Studies were included if they met the following criteria: (I) focused on vaccine production and development in Thailand; (II) addressed policies and plans related to vaccine production and development; (III) discussed strategies to address vaccine shortages; and (IV) highlighted efforts to achieve SDGs. Studies that were not written in English, were not peer-reviewed, or did not meet the topic relevance were excluded.

Table 1 The search strategy summary

Items	Specification
Date of search	March 1, 2023 to April 30, 2023
Databases and other sources searched	PubMed, Scopus, and Web of Science
Search terms used	"vaccine production", "vaccine development", "Thailand", "policy", "plan", "shortages", and "sustainable development goals"
Timeframe	2000 to 2023
Inclusion and exclusion criteria	Inclusion: (I) centered on Thai vaccine production and development; (II) covered vaccine-related policies and plans; (III) tackled strategies for addressing shortages; and (IV) emphasized sustainable development goal endeavors
	Exclusion: studies not in English, lacking peer review, or not aligned with the topic

Data analysis

A narrative synthesis approach was employed to analyze and summarize the findings of the included studies. Themes and key points related to policy and plan for vaccine production and development, strategies to address shortages, and efforts toward achieving SDGs were identified. The findings were organized and presented in a coherent manner to provide a comprehensive overview of the current state of vaccine production and development in Thailand.

Limitations

This review is subject to certain limitations. Firstly, the search was limited to English language articles, potentially excluding relevant studies published in other languages. Secondly, the inclusion of only peer-reviewed articles may have resulted in the omission of grey literature and unpublished studies. Finally, the findings of this review are specific to the context of vaccine production and development in Thailand and may not be generalizable to other countries or settings.

Discussion

Policy of vaccine production and development in Thailand

The Constitution of the Kingdom of Thailand B.E. 2560 [2017], in section 65, stipulates that the state must establish a national strategy for sustainable development. This strategy serves as a framework for creating a plan that will enhance the country's development and achieve the vision of a stable, prosperous, and sustainable developed nation, guided by the principles of the sufficiency economy (16). In 2015, Thailand's Prime Minister announced a sustainable development agenda for 2030, aiming to foster balanced global development, equal opportunities, and prosperity for people of all ages, while ensuring that no one is left behind (17). The responsibility to implement the SDGs was assigned, leading to the formulation of a 20-year national strategy and the Twelfth National Economic and Social Development Plan [2017–2021].

The National Strategy [2018–2037] mandates the preparation of a master plan based on six national strategies, which will serve as a driving force for the overall national strategy (18). Consequently, the government has developed a master plan comprising 23 plans aligned with each national strategy to ensure their effectiveness. Following the Royal Command's enactment of the Emblem National Vaccine Security Act B.E. 2561 (19), published in the Government Gazette on November 21, 2018, the National Vaccine Safety Strategy policy and plan were established under Section 10 (1). It emphasizes the importance of promoting and supporting research, development, production, quality control, management, and fair distribution of vaccines. These efforts should be executed systematically and unanimously to address the prevention, control, treatment, and mitigation of diseases, while ensuring continuous immunization and empowering the country. The formulation of these policies and strategic plans includes the participation of the public, vaccine specialists, and relevant agencies from both the public and private sectors (20).

The Ministry of Public Health, responsible for healthcare provision in the country, aligns its objectives with the United Nations' 17 Sustainable Development Goals. Of particular significance is the third goal, which

focuses on ensuring healthy lives and promoting well-being for people of all ages (1). Accordingly, the Ministry of Public Health has established the Twenty-Year National Strategic Plan for Public Health [2017–2036] as a master plan to guide the realization of government policies and the SDGs. This plan outlines four excellence strategies (4E Strategies) which include promoting health and disease prevention, ensuring service excellence, fostering people excellence, and enhancing governance excellence. These strategies are in line with Thailand 4.0, a vision for creating a new economy and addressing the SDGs by 2030. The Twenty-Year National Strategic Plan for Public Health [2017–2036] encompasses 16 plans, 48 projects, 96 strategic indicators, and addresses various aspects related to vaccine development (21).

In short, Thailand has a constitutional mandate for a national strategy focused on sustainable development. The government aims to achieve stability, prosperity, and sustainability through this strategy. They have also prioritized the implementation of the SDGs and developed a 20-year national plan. This includes strategies for vaccine safety and public health, aligned with Thailand 4.0 principles.

Plan of vaccine production and development in Thailand

To align with the master plan, the National Vaccine Institute, acting as the director and secretary of the National Vaccine Board, has implemented the National Vaccine Security Strategy Policy and Plan [2020–2022]. This plan serves as a framework for advancing vaccine stability and ensuring comprehensive and suitable vaccination for all individuals in Thailand over the three-year period. The objective is to meet the country's vaccine requirements under normal and emergency circumstances and foster domestic production to address prevalent public health issues. The aim is to reduce dependency on imports while simultaneously developing vaccine institutions and fostering collaboration and synergy among relevant agencies from all sectors (22).

The Ministry of Public Health envisions a stable vaccine situation in Thailand, where all individuals have access to disease prevention (21). This stability implies that Thailand possesses the necessary vaccines to effectively prevent and control diseases under both normal and emergency circumstances. The vaccine provision system is designed to cater to the country's needs while supporting the domestic vaccine industry. It can provide adequate support for required vaccines, conduct research, develop, and produce essential vaccines for the national immunization plan. This includes addressing present and future emergencies like dengue and influenza, ensuring self-sufficiency and sustainability. Consequently, the health and well-being of all people in Thailand are safeguarded through access to high-quality vaccines, which are administered through a public health service. The vaccines adhere to stringent quality and safety standards, allowing individuals to receive immunization services promptly and securely (22).

The Ministry of Health has implemented an action plan divided into three phases: short-term, medium-term, and long-term. Each phase focuses on specific metrics to accomplish the overall goal.

Table 2 illustrates the three phases of the vaccine development plan aimed at attaining the SDGs.

Since 1977, the Ministry of Public Health has implemented a comprehensive immunization plan, providing free basic vaccines to the targeted population. Currently, it covers 11 diseases, including tuberculosis, diphtheria, whooping cough, tetanus, hepatitis, polio, measles, mumps, rubella, Japanese encephalitis, and human papillomavirus (HPV). The plan also includes administering diphtheria-tetanus vaccines to pregnant women and adults above 20 years old, as well as seasonal flu vaccines to public health officials and vulnerable individuals. Consequently, the incidence and mortality rates of vaccine-preventable diseases have significantly declined. Adequate vaccine availability has led to a projected reduction of at least 51,500 patients per year and 5,500 deaths per year from domestically preventable diseases which mean situations or issues that can be avoided or mitigated within a country's own boundaries through appropriate actions, policies, or interventions. In this context, it implies that the mentioned deaths or negative outcomes could be minimized or prevented through measures taken within the country itself, without relying on external factors. However, due to the influx of foreign workers and children, both legally and illegally, as a result of the AEC, it has become necessary to enhance disease immunity by providing vaccinations. This measure aims to prevent the spread of diseases to the Thai population and ensure protection for all individuals residing in Thailand (22).

The Ministry of Public Health in Thailand has implemented a successful immunization plan since 1977, providing free vaccines for 12 diseases. This plan has significantly reduced disease incidence and mortality rates. Efforts are ongoing to protect the population, including pregnant women, adults, and vulnerable individuals, and

Table 2 Three phases of the vaccine development plan

Phase/year	Focus	Details
(I) Short term [2017]	3.8 The objective is to attain comprehensive health insurance that safeguards individuals from financial risks. This encompasses ensuring access to essential health services, as well as promoting the availability of high-quality and safe essential medicines and vaccines	3.8.1 The coverage rate of essential health services, which encompasses reproductive, maternal, newborn, and child health, as well as the management of infectious diseases (such as full vaccination in children, antiretroviral therapy, and tuberculosis treatment), is measured through an average service coverage definition based on treatment tracking. Additionally, the indicator 3.8.2 assesses the extent to which the population is covered by insurance or the public health system, measured per 1,000 people
(II) Medium term [2018–2021]	As per the Doha Declaration on Trade and Public Health, objective 3.b aims to promote research and manufacturing of vaccines and medicines for communicable diseases that have a significant impact on developing countries. The goal is to ensure affordable access to these essential medicines and vaccines, thereby addressing the healthcare needs of these nations	In line with objective 3.b, there are two sub-points to consider: 3.b.1: the purchase price is determined based on the principle of sustainability, taking into account the long-term viability of the pricing structure 3.b.2: official development grants contribute to the total net ODA specifically allocated for basic medical and health research
(III) Long term [2022–2030]	Objective 3.5 focuses on enhancing efforts to prevent and treat substance misuse, which encompasses both drug misuse and excessive alcohol consumption that poses risks to individuals' well-being and health	Objective 3.b aims to promote the development and widespread distribution of vaccines to the general public, ensuring broad access to these crucial medical interventions

Source: summarized from Ministry of Public Health (20). ODA, official development assistance.

to strengthen disease immunity in response to the influx of foreign workers and children. The goal is to ensure the protection of all individuals residing in Thailand through vaccination.

Opportunity and obstacles of vaccine production and development in Thailand

Extensive research has been conducted on the production of domestic vaccines in Thailand, encompassing laboratory studies, preclinical animal research, and human clinical trials (23-25). In the past, scaling up the production of developed vaccines on an industrial level was not feasible (26). Currently, Thailand has the capability to manufacture various vaccines, including smallpox, cholera, typhoid, diphtheria, tetanus, tuberculosis (Bacillus Calmette-Guérin vaccine, BCG), and Japanese encephalitis vaccines. Some vaccines, such as polio, influenza, rabies, and encephalitis, are imported in bulk and either developed or packaged by GPO-MBP Pharmaceutical Co., Ltd. The Thai Red Cross, established in 2013, has been involved in vaccine production, specifically for rabies and Japanese encephalitis. The Government Pharmaceutical Organization also produces infectious influenza vaccines to support seasonal and epidemic usage, with the seasonal flu vaccine being registered in 2020 and available in 2021 (22).

The National Regulatory Authority (NRA), which includes various organizations such as the Food and Drug Administration, the Institute of Biological Products, the Department of Medical Sciences, the Bureau of Epidemiology, and the Department of Disease Control under the Ministry of Public Health, has successfully passed the assessment by the World Health Organization (WHO) since 2008. This achievement provides an opportunity for vaccine manufacturers in Thailand to pursue production and obtain WHO Pre-qualification (WHO PQ) certification, which is essential for selling vaccines to the United Nations (22).

Thailand has a pool of experts, professors, academics, and well-trained staff with extensive knowledge and experience in vaccine research, development, production, quality assurance, control, and immunization. The National Vaccine Institute and the Vaccine Network have collaborated to establish a comprehensive plan for the development of vaccine personnel. However, budget constraints have hindered the planned production of vaccine workers, prompting the need to enhance both the

quantity and quality of personnel dedicated to vaccine research, development, and production (27). Motivating and supporting vaccine personnel in their work is crucial to ensure long-term vaccine development in the country (22).

While Thailand possesses a diverse infrastructure for vaccine development across various public and private sectors, it has yet to meet all the required WHO PQ certification. There is a need to establish the necessary systems and protocols to ensure compliance and efficient functioning. This will enable Thailand to fully benefit from global vaccine production. Additionally, leveraging this infrastructure can be done in tandem with the development of other scientific and biotechnological advancements (28).

Although Thailand has implemented its first national vaccine policy and strategy, which was approved by the cabinet in 2005, the announcement of the National Vaccine Agenda in 2011 aimed to establish a comprehensive plan for achieving self-reliance and vaccine security in the country. However, it has been found that there is insufficient coordination between key agencies at the executive level to effectively implement policies and strategic plans. As a result, research, development, and production of vaccines are not aligned in a cohesive manner. Additionally, the evaluation of the implementation of the vaccine agenda has revealed delays in certain projects (29). Due to budget constraints and policy instability, some projects have had to be terminated. Changes in leadership within the responsible agencies have had a consistent and challenging impact on vaccine implementation. Currently, there is a lack of regulations or procurement measures that effectively support domestic vaccine manufacturers. This exposes them to risks associated with vaccine distribution and potential dumping by import companies. Specifically, there is a need for measures that cater to the unique requirements of vaccine manufacturing businesses, such as income tax relief aligned with the vaccine development period and fair allocation of benefits between the public and private sectors (22). The growth of the domestic vaccine industry has been challenging, leading to difficulties in meeting the demand for vaccines in Thailand's national immunization programs. The country heavily relies on imported vaccines, both for regular use and to address outbreaks. The procurement rules for vaccines are carried out annually and are limited to a few companies, which poses a risk of vaccine shortages for disease control purposes.

According to data from the World Integrated Trade Solution (30) for the year 2019, Thailand had to import vaccines with a total value of $123,394,140. The main source countries for Thailand's vaccine imports were France (24.79%), the United States (20.67%), Belgium (15.37%), China (15.02%), Ireland (9.17%), India (4.55%), The Netherlands (3.57%), Germany (2.51%), and several other countries.

Limitations

This narrative review has certain limitations that should be acknowledged. Firstly, the search was limited to English language articles, which may have resulted in the exclusion of relevant studies published in other languages. This language restriction could introduce a potential bias in the findings. Secondly, the review focused on peer-reviewed articles, potentially overlooking relevant grey literature or unpublished studies. This could limit the comprehensiveness of the findings. Additionally, the review is specific to the context of vaccine production and development in Thailand, and the findings may not be directly applicable to other countries or regions.

Quality of research reviewed

The quality of the research reviewed varied across the included studies. Different study designs were encountered, including observational studies, qualitative research, and policy analyses. The quality assessment allowed for a critical evaluation of the included studies and their potential impact on the findings of this review.

The findings of this narrative review highlight the need for future research in several areas related to vaccine production and development in Thailand. Firstly, there is a need for rigorous evaluation of the impact and effectiveness of existing policies and plans to inform evidence-based decision-making. Secondly, further research is necessary to explore innovative strategies to address vaccine shortages, including understanding the root causes and evaluating potential solutions. Additionally, investigating the alignment of vaccine production and development with the SDGs can guide efforts toward achieving relevant targets. Lastly, comparative studies between Thailand and other countries can provide valuable insights and best practices to inform policy development and implementation.

Conclusions

Thailand has established policies, plans, and strategies to

develop vaccines within the country. There are vaccine development agencies that receive funding from both the government and the private sector. International cooperation is also sought to ensure access to vaccines for the population. However, there are significant challenges and obstacles to overcome. Thailand's production of self-use vaccines, especially modern vaccines, is limited due to budgetary constraints and difficulties in vaccine procurement. The country is not yet fully equipped to develop new vaccines. The domestic pharmaceutical industry primarily focuses on producing regular medicines and faces constraints due to international agreements that restrict the production of generic drugs and reliance on imported raw materials. Importing prototype vaccines from abroad can be costly. Therefore, in order to align with the SDGs goal, Thailand needs to effectively manage the opportunities and obstacles associated with its policies and plans for vaccine production and development. Future research in vaccine production and development in Thailand should focus on evaluating the impact of existing policies and plans, exploring innovative strategies to address vaccine shortages, and assessing the alignment with SDGs. This research will provide insights into the effectiveness of current approaches, identify areas for improvement, and guide evidence-based decision-making. Additionally, comparative studies with other countries can offer valuable lessons and best practices to inform policy development and implementation.

Acknowledgments

Funding: None.

Footnote

Reporting Checklist: The author has completed the Narrative Review reporting checklist. Available at https://jphe.amegroups.com/article/view/10.21037/jphe-23-47/rc

Peer Review File: Available at https://jphe.amegroups.com/article/view/10.21037/jphe-23-47/prf

Conflicts of Interest: The author has completed the ICMJE uniform disclosure form (available at https://jphe.amegroups.com/article/view/10.21037/jphe-23-47/coif). The author has no conflicts of interest to declare.

Ethical Statement: The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

References

1. UNDP. Goal 3: Good health and well-being. 2020. [Cited 2023 Mar 12]. Available online: https://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-3-good-health-and-well-being.html
2. Asia Pacific Observatory on Health Systems Policies. The Kingdom of Thailand health system review. 2023. [Cited 2023 Mar 11]. Available online: http://www.searo.who.int/entity/asia_pacific_observatory/publications/hits/hit_thailand/en/
3. Galappaththi EK, Perera CD, Dharmasiri IP, et al. Policy responses to COVID-19 in Sri Lanka and the consideration of Indigenous Peoples. Environ Sci Policy 2023;144:110-23.
4. Wong S, Ponder CS, Melix B. Spatial and racial covid-19 disparities in U.S. nursing homes. Soc Sci Med 2023;325:115894.
5. Satibi S, Kirana PLK, Aziza PM, et al. Analysis of e-catalogue drug prices in the era of Universal Health Coverage in the Indonesian pharmaceutical industry. Pharmacia 2022;69:555-62.
6. Wang S, Ma Z, Yue G, et al. Spatial Distribution and Assessment of the Human Health Risks of Heavy Metals in a Retired Pharmaceutical Industrial Area, Southwest China. Bull Environ Contam Toxicol 2022;109:808-16.
7. Sharma V, Annam V, Gupta T, et al. Factors affecting employee job satisfaction in the Indian pharmaceutical industry. J Pharm Negat Results 2022;13:483-9.
8. Yadav M, Yadav R, Vihari NS. Green HRM and green innovation in Indian pharmaceutical industry: mediating role of transformational leader. J Pharm Negat Results 2022;13:1059-65.
9. Ibrahim NFD, Hatah E, Aziz SAA, et al. Explaining the

influence behind Malaysia's pharmacy students' career choices within the pharmaceutical industry. Pharmacy Education 2022;22:1-9.
10. Dalstrom M, Chung R, Castronovo LM. Strategies to reduce healthcare costs: what medical conditions are US seniors treating with Mexican pharmaceuticals? J Pharm Health Serv Res 2021;12:87-9.
11. Srimarut T, Mekhum W. The influence of workload and co-worker attitude on job satisfaction among employees of pharmaceutical industry in Bangkok, Thailand: The mediating role of training. Sys Rev Pharm 2020;11:603-11.
12. Srimarut T, Mekhum W. The relationship between cross-cultural competency and employee performance in the organization: A case of Thailand's pharmaceutical industry. Sys Rev Pharm 2020;11:595-602.
13. Tirastittam P, Sirikamonsin P, Li H, et al. The influence of work-related supports on employee engagement in the pharmaceutical industry in Thailand. Sys Rev Pharm 2020;11:576-85.
14. Pitchayajittipong C, Sriboon S, Kulmee S, et al. An Overview of Pharmaceutical Production in Thai Hospitals. Hosp Pharm 2021;56:265-75.
15. Kerdpitak C. The effects of environmental management and HRM practices on the operational performance in Thai pharmaceutical industry. Sys Rev Pharm 2020;11:555-65.
16. Constitution Drafting Commission. Constitution of The Kingdom of Thailand (B.E. 2560 (2017)). 2020. [Cited 2023 Feb 9]. Available online: https://cdc.parliament.go.th/draftconstitution2/more_news.php?cid=128
17. UN News Centre. Prime Minister applauds 2030 Agenda, pledges work towards a sustainable Thailand. 2015. [Cited 2023 Mar 15]. Available online: https://news.un.org/en/story/2015/09/510622-prime-minister-applauds-2030-agenda-pledges-work-towards-sustainable-thailand
18. NESDB. National Strategy 2018-2037. 2020. [Cited 2023 Jan 21]. Available online: http://nscr.nesdc.go.th/wp-content/uploads/2019/10/National-Strategy-Eng-Final-25-OCT-2019.pdf
19. Ministry of Public Health. Royal Command's Emblem National Vaccine Security Act B.E. 2561 (2018). 2018. [Cited 2023 Feb 11]. Available online: http://nvi.go.th/index.php/files/large/208f6bc83adf0bd
20. Ministry of Public Health. 3 Good health and well-being. 2020. [Cited 2023 Mar 15]. Available online: http://www.nbhospital.go.th/10704nbh/images/download/SDGs_Moph.pdf
21. Ministry of Public Health. Twenty-Year National Strategic Plan for Public Health (2017-2036). 2018. [Cited 2023 Mar 14]. Available online: http://164.115.27.97/digital/files/original/2ddc0ac1ececa4c666af70165c23e011.pdf
22. National Vaccine Institute. National Vaccine Security Strategy Policy and Plan (2020-2022). 2020. [Cited 2023 Mar 14]. Available online: http://nvi.go.th/index.php/files/large/b5966ec4e02d15c
23. Tharmaphornpilas P, Jiamsiri S, Boonchaiya S, et al. Evaluating the first introduction of rotavirus vaccine in Thailand: Moving from evidence to policy. Vaccine 2017;35:796-801.
24. Pitisuttithum P, Choopanya K, Rerk-Ngnam S. HIV-vaccine research and development in Thailand: evolution and challenges. Vaccine 2010;28 Suppl 2:B45-9.
25. Prasert K, Patumanond J, Praphasiri P, et al. Effectiveness of trivalent inactivated influenza vaccine among community-dwelling older adults in Thailand: A two-year prospective cohort study. Vaccine 2019;37:783-91.
26. Thapinta D, Jenkins RA. Starting from scratch: program development and lessons learned from HIV vaccine trial counseling in Thailand. Contemp Clin Trials 2007;28:409-22.
27. Mantel C, Chu SY, Hyde TB, et al. Seasonal influenza vaccination in middle-income countries: Assessment of immunization practices in Belarus, Morocco, and Thailand. Vaccine 2020;38:212-9.
28. Hombach J, Barrett AD, Cardosa MJ, et al. Review on flavivirus vaccine development. Proceedings of a meeting jointly organised by the World Health Organization and the Thai Ministry of Public Health, 26-27 April 2004, Bangkok, Thailand. Vaccine 2005;23:2689-95.
29. Surichan S, Wirachwong P, Supachaturas W, et al. Development of influenza vaccine production capacity by the Government Pharmaceutical Organization of Thailand: addressing the threat of an influenza pandemic. Vaccine 2011;29 Suppl 1:A29-33.
30. World Integrated Trade Solution. Thailand Vaccines; for human medicine imports by country in 2019. [Cited 2023 Mar 15]. Available online: https://wits.worldbank.org/trade/comtrade/en/country/THA/year/2019/tradeflow/Imports/partner/ALL/product/300220#

doi: 10.21037/jphe-23-47
Cite this article as: Jumlongnark W. Policy and plan for vaccine production and development in Thailand: narrative review. J Public Health Emerg 2023;7:27.