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Field Epidemiology Training Program, Division of Epidemiology
Department of Disease Control, Ministry of Public Health, Thailand
Tel: +6625903894, Fax: +6625903845, Email: osireditor@osirjournal.net, http://www.osirjournal.net

# Results and Policy Implications of a COVID-19 Vaccine Post-introduction Evaluation in Thailand, May 2022

Chawetsan Namwat[1], Prabda Praphasiri[2,3]*, Chakrarat Pittayawonganon[4], Kriengkrai Prasert[3,5], Sutthichai Nakphook[3,4], Thanawadee Thantithaveewat[6], Aree Moungsookjareoun[7], Monica Fleming[8], Margaret Hercules[8], Ann C. Moen[8], Anthony Mounts[9], Patranuch Sapchookul[2], Darunee Ditsungnoen[2], James D. Heffelfinger[2,8], William W. Davis,[2,8] Sopon Iamsirithaworn[6]

1 Division of Disease Control in Emergency Situations, Department of Disease Control, Ministry of Public Health, Thailand

2 Thailand MOPH-US CDC Collaboration, Thailand

3 Faculty of Public Health, Kasetsart University, Chalermprakiat Sakon Nakhon Province Campus, Thailand

4 Division of Epidemiology, Department of Disease Control, Ministry of Public Health, Thailand

5 Nakhon Phanom Provincial Hospital, Thailand

6 Department of Disease Control, Ministry of Public Health, Thailand

7 WHO Country Office, Thailand

8 U.S. Centers for Disease Control and Prevention, USA

9 Task Force for Global Health, USA

*Corresponding author email: hpu3@cdc.gov

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**Abstract**

Thailand initiated a COVID-19 vaccine campaign in February 2021, and by March 2022, approximately 72% of residents over 5 years of age had received two doses of vaccine. We evaluated Thailand's COVID-19 vaccine campaign in Bangkok and in four additional provinces using the World Health Organization COVID-19 post-immunization evaluation (cPIE) protocol. Strengths of the vaccine program included close coordination between different levels and sectors of the Royal Thai Government, close community engagement, and use of national data systems. Areas of the campaign that needed interventions included reviewing cold chain practices, standardizing data forms and addressing bottlenecks in data systems.

**Keywords:** SARS CoV-2, vaccination, campaign, cPIE, evaluation, Thailand

Thailand initiated a COVID-19 vaccine campaign in February 2021, and administered over 129 million doses in 14 months. Initially, the target population was adults over age 18. In August 2021, children ages 12–18 years were added, while children 5–12 were added in February 2022 and children 2 months to 5 years were added in August 2022. High-priority populations targeted for vaccination included healthcare providers, older adults (over 60 years), people in areas with high COVID-19 incidence, pregnant women, people with comorbidities and children. An estimated 50,256,348 people, or 72% of the total population in the country, received at least two doses by March 2022.[1] To plan for transitioning to an endemic phase of COVID-19 response, the Ministry of Public Health (MOPH) required more

data on booster dose delivery, vaccine hesitancy and vaccine rollout logistics and decided that an evaluation of the vaccine program was needed. The MOPH's Department of Disease Control, together with the Thailand MOPH-US CDC Collaboration (TUC) and the World Health Organization (WHO) Country Office for Thailand implemented a COVID-19 vaccine post-introduction evaluation (cPIE). The cPIE is a tool developed by WHO to identify challenges, recommend corrective actions, and understand best practices in COVID-19 vaccine program implementation.[2]

The WHO cPIE protocol and questionnaires were implemented over a ten-day period.[2] Briefly, five provinces from different regions of the country where TUC had strong partnerships with provincial health staff (Nakhon Phanom, Chiang Rai, Chanthaburi, Surat Thani and Bangkok) were selected to participate. In Bangkok, provincial health officers selected one government health facility in each of six health zones; in the remaining provinces, health officers selected two sub-district health facilities in each of two districts. So that, best practices and also gaps might be identified, two of the health facilities in each province with low vaccine coverage and two with high vaccine coverage in their catchment populations were selected. Key informants who had knowledge of the vaccination program implementation process, as well as vaccine recipients (including members of high-priority groups that were targeted for vaccination), were interviewed using semi-structured questionnaires. The interviews focused on 10 domains: regulatory preparedness, planning and coordination, service delivery, costing/funding, supply chain and waste management, human resources, vaccine demand, vaccine safety, monitoring and evaluation and COVID-19 surveillance. Quantitative data were entered into a Microsoft Access database and descriptive analyses were performed using Microsoft Excel. Content analysis of quantitative data was used to identify themes around best practices and to identify areas that needed improvement.

Between 18–27 Apr 2022, five teams comprising MOPH, TUC and WHO staff visited 22 health facilities, observed 32 vaccine storage facilities, visited 19 vaccination sites and interviewed 44 health care workers and 62 persons in targeted groups who received COVID-19 vaccines.

Key findings included the importance of close coordination at the national, provincial, district and sub-district levels, including close engagement in planning and implementation of vaccine deployment by provincial governors and extensive use of public-private partnerships. Communication between provincial MOPH offices and district and sub-district clinics, as well as between provinces, facilitated sharing resources. For example, sending staff from one province to another to help with the initial vaccine campaigns helped staff to quickly gain experience; 82% of health workers interviewed reported feeling confident in their ability to communicate with patients and address their questions and concerns about COVID-19 vaccines. Coordination extended to sharing vaccines between districts and provinces. Enabling supplies to be positioned in areas where demand was greatest likely promoted higher coverage and lower wastage. Staff at sub-district health facilities were able to share resources without needing provincial approval, which likely reduced the time needed to acquire vaccine doses. The private sector gave extensive support for vaccination programs, including donations of equipment, food and water for staff and volunteers, nonmedical staff at vaccination sites, and venues for vaccination sites.

Approximately 96% of health facilities reported having a sufficient number of trained vaccinators, and 73% reported no vaccine stock outs in the prior six months. All health facilities visited had procedures in place to detect and report adverse events following immunization (AEFIs), as well as appropriate strategies and guidelines for managing AEFIs. Clinics used mobile units that deployed to places people frequented (e.g., temples, markets, long-term care facilities). Province-level experts were available to respond to questions about AEFIs, and regularly monitored AEFI trends. A national committee of experts reviewed each reported AEFI case, and patients were reimbursed through the national insurance scheme for medical care required for AEFIs.

Health facilities had strong community engagement. Ninety percent of facilities reported having activities in place to generate acceptance and demand of COVID-19 vaccines. They worked through community networks (e.g., community and religious leaders) to deliver messages addressing misinformation and vaccine hesitancy. District and sub-district level staff were empowered to adapt approaches to best fit the needs of their populations. Influenza programs that targeted the same high-risk adults that COVID-19 affected were successfully leveraged to improve COVID-19 vaccine distribution.

There was extensive use of centralized electronic databases, including a standalone application and database for COVID-19 called "Mor Prom" that linked testing and vaccination data with national IDs (or

assigned IDs for foreigners); this enabled timely program monitoring. MOPH used existing public health reporting mechanisms to report on COVID-19 vaccination coverage, including using data on registered persons (e.g., Thai citizens and registered migrant workers) and unregistered persons. Data from all populations were used to inform coverage estimates and vaccine deployment. Since February 2021, vaccine coverage data were updated daily and available for subdistrict-level catchment populations, allowing tracking in real-time. Data were reviewed by teams at district and sub-district levels to assess coverage. Approximately 91% of facilities reported using electronic recording and reporting systems, 87% of facilities reported they could track more than one vaccine product for a given individual, 83% reported tracking defaulters (if 2-dose regimens were used), and 69% of healthcare facilities could track uptake of vaccines by gender, 44% by geographic area, 81% by pregnancy status, and 22% by socioeconomic status.

Thai national policies that created new legal frameworks to support implementation of COVID-19 vaccine enabled faster rollout of vaccines. An agreement (the Confidentiality Undertaking by National Regulatory Authorities) between WHO and the Thai National Regulatory Authority facilitated expedited approval of COVID-19 vaccine. Thailand was one of the first countries to implement a mix-and-match strategy for giving vaccines and booster doses (i.e., using different vaccines for first, second and booster doses).[3] National COVID-19 response policy, endorsed by a decision of the National Communicable Disease Committee, enabled the bypass of standard Thai Food and Drug Administration processes and emergency orders permitting import of available vaccines and mix-and-match dosing. Mix-and-match dosing enabled flexibility in vaccine supply logistics and administration, and may have contributed to higher vaccine uptake.

Several areas in Thailand's COVID-19 vaccine rollout were identified for improvement need. First, although shifting vaccines between health facilities could reduce wastage, it was not clear if a system was in place for keeping records on the total length of time vaccines were stored at 2–8°C. Second, early in the pandemic, national and sub-district databases were not connected, making it difficult to determine vaccine coverage at the sub-district level. As a result, some districts developed their own separate databases. There were also difficulties merging Ministry of Labor databases of registered migrant workers with the MOPH vaccine database. Third, though vaccine coverage was high, some people remained hard to reach. Fourth, vaccine hesitancy for booster doses was a frequently reported problem among all populations, especially among older adults. And lastly, some provinces noted that they did not have access to national data on AEFIs and could not share risks with the public. Some provinces noted that AEFI investigations took a long time to complete.

Achieving 2-dose COVID-19 vaccine coverage of 72% of the Thai population in 14 months was made possible by a number of facilitators, including a high degree of organization, strong cooperation between different levels of the health system, widespread use of public-private partnerships, and close engagement with communities. This achievement and these facilitators were the result of decades of investments in the Thai public health system, including seasonal influenza vaccine programs.[4,5] Cold chain and data management processes would benefit from specific recommendations from a more in-depth assessment, and community outreach and communication efforts should be continued to increase coverage of booster doses.

Recommendations from the evaluation of the mass vaccination campaign include:

- Review cold chain requirements and practices for all vaccines, and evaluate the time vaccines are stored at 2–8 °C and ensure the time at 2–8 °C does not exceed 30 days, or temperature exceed 8 °C, especially when vaccines are transported and shared between facilities.
- Standardize data entry forms for immunization monitoring systems and ensure all levels of the health system have access to immunization coverage data in real time.
- Increase vaccine coverage (including for booster doses) for target groups, especially older adults.
- Have a data management expert assess data flow including for vaccination, infection, and AEFI databases and devise solutions as appropriate.

This evaluation has several limitations. It was intended to be a rapid evaluation of a vaccination campaign and, as such, we were not able to fully explore all areas of inquiry in order to make comprehensive recommendations. In addition, the participating provinces were a convenience sample and not necessarily representative of all provinces in the country. Also, it is possible that some key data specific to provinces were not collected, thus could not inform the evaluation.

As Thailand shifts from a pandemic to an endemic phase of COVID-19 response, it will be important to ensure that vaccines are accessible to everyone, especially target populations. Thailand's cPIE

identified best practices that should be continued and areas that need improvement to achieve these goals.

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## Author Contributions

Concept and design (CN, PP, CP, JH, WD, SI), Acquisition of data (PP, KP, SN, TT, AM, MF, MH, ACM, AM, PS, DD, JH, WD), Analysis and interpretation of data (PP, KP, SN, TT, AM, MF, MH, ACM, AM, PS, DD, JH, WD), Drafting of the manuscript (WD), Critical revision of paper for important intellectual content (CN, PP, CP, KP, SN, TT, AM, MF, MH, ACM, AM, PS, DD, JH, WD, SI), Obtaining funding (CN, PP, WD), Administrative, technical, or logistic support (PP, PS, DD), Supervision (CN, PP, CP, JH, WD, SI)

## Disclosure Statement

The authors have nothing to disclose.

## Ethics and Consent

The Thai MOPH considered this a program evaluation and waived IRB requirements. This activity was reviewed by the Centers for Disease Control and Prevention (CDC) and was conducted consistent with applicable federal law and CDC policy.

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## Paper Context

Thailand administered over 129 million doses of COVID-19 vaccine in 14 months. Previous studies have documented facilitators of pandemic influenza vaccine programs over a decade ago, but few have focused on recent COVID-19 campaigns. We identified several facilitators of COVID-19 vaccination programs including strong existing health infrastructure, coordination and management between government entities, and adoption of new technologies to improve data collection. Countries should consider these for COVID-19 vaccine campaigns and in pandemic preparedness planning.

## Disclaimer

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