

COVID-19 vaccination program in Cambodia: Achievements and remaining challenges

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Abstract: Since Cambodia has been recognized as one of the low- and middle-income countries with a successful COVID-19 vaccine program, its program approaches were reviewed based mainly on press articles and announcements from the Ministry of Health. From the beginning, the government's proactive approach to securing vaccines and its flexibility prior to WHO Emergency Use Listing (EUL) contributed greatly to the success of the program. Vaccines were provided by COVAX and other countries, but more than half of the vaccines secured were Chinese vaccines purchased with government funds. The rollout of the vaccine has also been flexible, moving from a strategy of prioritizing risk groups and essential workers to one of expanding the campaign from population centers to rural areas, as well as gradually expanding the target age group, eventually targeting the population age 3 and older. As a result of this high level of commitment by the government and its flexible response, Cambodia has achieved 95% primary series coverage of the entire population, including those not eligible for vaccination. Although the sixth booster is now being administered in Cambodia and vaccination every six months was recommended, several challenges might be anticipated in continuing this program, including the lack of clear global guidance on how to sustain and modify the COVID-19 immunization program and vaccine fatigue after COVID-19 outbreaks have been controlled. How these challenges are overcome and how the COVID-19 vaccine program remains need to be carefully observed into the future.

Keywords: Cambodia, COVID-19, vaccination, policy

Introduction

Cambodia is considered one of the countries with successful COVID-19 vaccination, having achieved the vaccination targets of the World Health Organization (WHO) Global COVID-19 Vaccination Strategy in a Changing World (1): 100% of health care workers, 100% of the high-risk population, and 70% of the general population (2).

Reviewed here are the progress of and changes in the program, with a focus on information released by the Ministry of Health and reported in the press, and the factors that contributed to its success and the remaining challenges are also discussed.

Selection and securing of vaccines

The Cambodian Government has consistently been proactive in securing vaccines and announced its budgetary commitment to purchase them early on (3,4). At the beginning of December 2020, the government had publicly announced its policy of using only vaccines approved by the WHO (5,6), but by mid-January 2021

the policy had changed (7). Since there were no WHO-approved vaccines at the time, some countries had begun to use vaccines produced in China, and infections were increasing among migrant workers and others returning from Thailand. The government decided to introduce Chinese-made vaccines (8,9), an idea that had been proposed (10), and began vaccinations in February 2021 (11-13). Afterwards, according to information shared at the March 2022 Health Partners Group meeting, government purchases, donations from other countries, and procurement through the COVAX Facility (14) have been actively pursued, and 44,454,860 doses had been successfully procured as of the end of March 2022 (Table 1). Of these, 64.1% were government purchases, all of which were from China. In addition, the initial policy was to introduce vaccines that could be stored at refrigerated temperatures, since maintaining an ultra-cold chain would be difficult in Cambodia, but equipment has been upgraded and vaccines that require an ultra-cold chain, such as Pfizer and Moderna, have also been introduced (15). Most of the vaccines were two primary series, but some J&J vaccines with a single primary series were procured (16), and they were used primarily

Table 1. Vaccine availability in Cambodia as of March 25, 2022

Source of vaccine	Name of vaccine	Doses received
(A) Procurement by RGC		
China	Sinovac (CoronaVac)	24,500,000
China	Sinopharm (BBIBP-CorV)	4,000,000
Total (A)		28,500,000
(B) Donation		
China	Sinopharm (BBIBP-CorV)	3,800,000
China	Sinovac (Coronavac)	4,500,000
UK	AZ (Vaxzevria)	415,040
Australia	Pfizer-BioNTech (Comimaty)	2,350,530
Poland	AZ (Vaxzevria)	300,000
Hungary	AZ (Vaxzevria)	523,100
Total (B)		11,888,670
(C) COVAX Facility and dose sharing		
COVAX Facility	SII (COVISHIELD)	324,000
	AZ (Vaxzevria)	324,000
	Sinovac (Coronavac)	424,800
	Moderna (Spikevax)	188,160
Dose sharing	AZ (Vaxzevria) -Japan	1,315,500
	AZ (Vaxzevria) -Netherlands	290,400
	J&J (Ad26.COV-S) - US	1,060,100
Total (C)		3,926,960
(D) ASEAN allocation		
ASEAN allocation	Pfizer-BioNTech (Comimaty)	139,230
Total (D)		139,230
Grand total (A+B+C+D)		44,454,860

Data source: WHO Cambodia, UNICEF Cambodia, (Mar 31, 2022) Update on COVID-19 vaccination roll-out in Cambodia [Meeting Presentation] Health Partner Group Meeting, Phnom Penh, Cambodia.

for vaccination in rural areas where access was difficult.

As the above process shows, the Chinese vaccines, as the first to be introduced in Cambodia and the pillar of the vaccination program since then, were introduced prior to the WHO Emergency Use Listing (EUL) recommendation. The Date of EUL Recommendation for Sinopharm was May 7, 2021 and that for Sinovac was June 1, 2021 (17). In addition, the Cambodian Government has expanded the target age group to include children, as described below, even though the WHO did not recommend the use of the vaccine for children in order to prioritize the elderly due to an insufficient vaccine supply (18). At the time, the only vaccine that had a WHO EUL recommendation for children age 12 and older was Pfizer, and even that was limited to use in children with comorbidities that put them at significantly higher risk of serious COVID-19 (19). The target age was subsequently expanded to include children age 3 and older in Cambodia (20). The Sinopharm vaccine, which had received regulatory approval for children age 3 and older in China, the country of production (21), was also not recommended under the EUL for use in children under the age of 18 (22). However, the Cambodian Government seems to have decided to adopt the Sinopharm vaccine, which had received regulatory approval in China for use in children over the age of 3 and which had relatively few reports of adverse

reactions, for the vaccination of children; this was eventually expanded to children over the age of 3 partly because of the difficulty in obtaining a sufficient quantity of Pfizer's vaccine to cover about 5 million children ages 3–17, which account for 30% of the national population (23).

These proactive approaches by the government are considered to have played a significant role in the success of the COVID-19 vaccination program in Cambodia. In addition, the government plans to establish a domestic production capacity in cooperation with the Chinese company Sinovac as part of its long-term strategy to secure vaccines (24).

Changes in the strategic plan for vaccination, including target populations

The Cambodian Government initially developed a "National Deployment and Vaccination Plan for COVID-19 Vaccines" under the auspices of the National Immunization Program of the Ministry of Health, with support from the WHO (25). The formulation of a Deployment Plan is also a condition for application to the COVAX Facility and is based on the premise of how to effectively use vaccines in insufficient quantities. The strategy was to prioritize health care workers, essential service providers such as the military and police, and the elderly (Table 2). When the first batch of the vaccine arrived in the country in February 2021, vaccination of priority populations was initiated according to this plan. The consistent policy since the program's beginning has been that vaccination is voluntary and free of charge (26). However, during serious outbreaks measures were taken to require the presentation of a vaccination card in order to enter public spaces (27).

In March 2021, the "Master plan for COVID-19 vaccine deployment throughout the Country" was issued at the initiative of the Ministry of Health's National Committee for COVID-19 Vaccination, which expanded the vaccination coverage to 10 million people age 18 and older, perhaps because of the prospect of procuring sufficient quantities of the vaccine (28).

Around that time, Cambodia also experienced serious community outbreaks of COVID-19, forcing many cities to lock down in May 2021. In response, the Cambodian Government, led by the Supreme National Economic Council, launched the "Strategic Plan for the COVID-19 Vaccination Campaign to Build Socio-economic Immunity in Cambodia by 2021" (29), also known as the "Blossom Plan." This introduced a new geographical prioritization system that promotes mass vaccination campaigns in metropolitan areas starting with Phnom Penh and other major cities (30). This campaign was expanded to cover more areas, eventually covering the entire country.

As a result of these successful efforts, the nationwide expansion of the vaccination program progressed faster

Table 2. Priority groups and target populations in the National Deployment and Vaccination Plan for COVID-19 Vaccines

No.	Priority groups	Total target population	Vaccination strategies
1	Health care workers including auxiliary workers	36,894	At fixed sites (health care facilities)
2	Essential government staff including the army and police to maintain law and government services	289,721	At fixed sites (health care facilities) and army barracks and police stations
3	Village Health Support Group (Volunteers) and those involved in the immunization and health program	50,074	At fixed sites (health care facilities)
4	Elderly population (over the age of 65)	944,932	At fixed sites (health care facilities) and in villages
5	High-risk adults from 18-64 years of age (with diabetes, hypertension, etc.)	1,521,426	At fixed sites (health care facilities) and in villages
6	Garment factory workers	621,275	Vaccination at factories

Data source: Cambodian Ministry of Health. National Deployment and Vaccination Plan for COVID-19 Vaccines. Jan 29, 2021. Phnom Penh, Cambodia.

than expected and was likely to reach the originally planned population of 10 million over the age of 18 by November 2021 (31). Therefore, in July 2021, the Cambodian Government, led by the Commission for COVID-19 Vaccination Nationwide, launched the "Action plan on COVID-19 vaccination for children and teens ages 12 to 18" to expand the target age group from age 12 and older (32,33). Since the government set the vaccination coverage target at more than 90% of the total population including children (32) and vaccination was included as a condition for reopening schools (34,35), the target age group for vaccination was subsequently expanded, ultimately encompassing individuals 3 years and older (36).

In addition, reports of infections among vaccinated people in neighboring countries have led to discussions of the need for additional vaccinations (37). In Cambodia, an "Action Plan for the COVID-19 Booster to Increase Immunity against COVID-19" was formulated in September 2021 (38), and boosters were initiated. In the earlier cases in neighboring countries such as Thailand and Indonesia, AstraZeneca and other Western-made vaccines were used for additional vaccinations because infection continued among health care workers and others who had completed the primary series with the vaccines produced in China. In Cambodia, where Chinese vaccines were also mainly used, a "mixed and harmonized vaccination regime" or a "same type of vaccine regime" was instituted, and vaccination with available vaccines was recommended 4–6 months after the completion of primary series vaccination. As of December 2022, the 6th booster of the COVID-19 vaccine had just started (39).

Monitoring progress

To monitor the progress of this vaccine program, the Cambodian Government introduced a new online data system at the beginning of the program (40). There were apparently some glitches in the beginning, but after fixes the system is still able to report progress daily, broken down by target age, gender, type of vaccine received, and how many booster shots (Table 3). This progress

has been reported daily on the Ministry of Health's social media account, together with epidemiological information such as the number of COVID-19 cases and deaths (41). Information about adverse reactions to the vaccine was also collected, but there seemed to be a bias since few people had bothered to report reactions after they returned home. Despite some challenges, such as an immunization coverage rate exceeding 100% for some groups due to an inaccurate denominator for the target group caused by an incomplete national registration system and a migrant population, this system has been recognized as a successful national example in digital health care. The potential for further development, including expansion to routine immunization and linkage with other health care-related data systems, is being discussed.

Achievements and remaining challenges

As described above, the high level of commitment by the Cambodian Government and its flexible response have been successful. As a result, Cambodia has achieved 95% primary series coverage of the entire population, including those not eligible for vaccination (under the age of 3), in combination with the effects of public health and social measures such as mask wearing, physical distancing, and hand hygiene, which have so far been successful in preventing serious outbreaks of COVID-19 in the country (2). This has also contributed to the recovery of socioeconomic activity, with the country ranking 4th in the Nikkei COVID-19 Recovery Index, which evaluates more than 120 countries and regions in terms of infection management, vaccine rollouts, and social mobility (42).

One of the challenges for the future is how to continue the COVID-19 vaccination program. The US, as a new step in the country's recovery, has issued a recommendation to incorporate the COVID-19 vaccine into the routine immunization schedule (43). This is to streamline clinical guidance for health care providers by including all currently licensed, approved, and routinely recommended vaccines in one document. However, despite the clear statement that inclusion of the

Table 3. COVID-19 Vaccination Program Report posted on the Ministry of Health's Facebook account on December 31, 2022

Items	1 st dose		2 nd dose		3 rd dose		4 th dose		5 th dose	
	Total	Female	Total	Female	Total	Female	Total	Female	Total	Female
1.Sinopharm	3,748,614	1,838,225	3,596,389	1,770,169	178,926	99,125	22,232	11,608	8,536	4,977
2.AstraZeneca (Covishield)	165,656	79,867	157,736	77,392	57,354	30,063	124,064	66,366	82,500	38,963
3.AstraZeneca (Japan)	184,061	89,710	176,786	82,904	965,356	434,510	6,881	2,389	0	0
4.AstraZeneca (UK)	452	133	81	36	414,507	136,526	0	0	0	0
5.Sinovac (≥18)	5,229,149	2,724,659	5,059,944	2,609,828	3,329,573	1,822,178	153,169	84,597	92,449	48,978
6.Janssen (Johnson & Johnson)	1,053,151	549,307	0	0	0	0	0	0	0	0
7.AstraZeneca (KR)	0	0	0	0	320,639	177,068	116	46	0	0
8.Moderna	0	0	2	1	217,119	113,874	135,517	57,263	0	0
9.AstraZeneca (Netherlands)	0	0	2	1	268,295	139,097	16,119	6,515	0	0
10.Pfizer	252	29	410	30	433,770	230,018	1,801,009	909,530	712,931	359,815
11.AstraZeneca (Poland)	0	0	0	0	240,045	126,849	53,233	23,585	0	0
12.AstraZeneca (Hungary)	0	0	0	0	237,674	125,575	231,202	150,626	0	0
13.AstraZeneca (Italy)	0	0	0	0	270,409	146,531	650,903	388,852	122,115	33,564
Age ≥ 18	10,381,335	5,281,930	10,044,501	5,089,668	6,930,667	3,581,414	3,194,445	1,701,377	1,018,531	486,297
Sinovac (12-18)	1,849,480	914,787	1,795,280	891,880	1,218,791	649,599	57,694	31,794	32,939	18,305
Pfizer (12-18)	0	0	1	0	424,984	214,788	765,087	425,134	177,274	98,676
Sinovac (6-12)	2,095,130	1,031,452	2,067,637	1,022,907	1,440,609	735,211	227,765	119,633	0	0
Sinovac (5)	428,662	216,578	377,640	192,068	88,313	45,942	14,594	7,429	0	0
Sinovac (3-5)	487,362	248,394	322,021	164,635	68,859	35,289	4	3	0	0
Pfizer Pediatric (6-12)	0	0	1	0	195,729	100,604	473,117	248,858	3	0
Pfizer Pediatric (5)	1	1	0	0	57,000	29,570	34,825	17,886	0	0
Grand total	15,241,970	7,693,142	14,607,081	7,361,158	10,424,952	5,392,417	4,767,531	2,552,114	1,228,747	603,278

Vaccination progress compared to the population of 16 million (grand total): **95.26%**

Vaccination progress compared to the target population of 10 million (age ≥18): 103.81%	Vaccination progress compared to the target population of 1,827,347 (ages 12-18): 101.21%	Vaccination progress compared to the target population of 1,897,382 (ages 6-12): 110.42%	Vaccination progress compared to the target population of 303,317 (age 5): 140.86%	Vaccination progress compared to the target population of 610,730 (ages 3-5): 79.80%
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Data source: Ministry of Health Cambodia, Facebook account at <https://web.facebook.com/MinistryofHealthofCambodia>

COVID-19 vaccine would not supersede state regulations on immunization requirements for school children, there has been much discussion, including opposition from the Republican Party (44). In Cambodia, administration of the sixth booster has begun and vaccination every 6 months will be recommended, but several challenges might be anticipated in continuing the program.

First, there is still no clear global guidance on how to sustain and modify the COVID-19 immunization program. In Cambodia, the tentative plan seems to be to continue with the currently available vaccine every 6 months. However, there is insufficient evidence on the frequency, timing, target age groups, and types and combinations of vaccines for additional vaccinations, while there are recommendations such as including the COVID-19 vaccine in routine immunization (45), and COVID-19 boosters will likely be recommended periodically for high-risk groups (46). The hope is that evidence will be assembled and global guidance such as WHO position papers on COVID-19 vaccines will be issued.

Second, there is the need to secure vaccines.

Cambodia has partnered with Sinovac to produce vaccines domestically, but some reports indicate that Chinese-made vaccines such as those from Sinopharm and Sinovac are less effective against the omicron variant than mRNA vaccines and other vaccines (47,48). Although the WHO EUL recommendation for bivalent vaccines against the omicron variant has been issued and some countries are beginning to introduce them (17), they are not yet available in Cambodia. Difficult decisions will presumably be required regarding which vaccines are most effective and how to use them to combat a virus that continues to mutate.

Third, immunization coverage targets need to be determined and maintained. Cambodia has not seen the vaccine hesitancy that has often been observed in other countries, the COVID-19 epidemic has begun to subside in Cambodia, and people's sense of urgency and concern about the disease has begun to decline, hampering the expansion of vaccination with booster doses (49).

In conclusion, Cambodia has so far successfully implemented a COVID-19 vaccination program with a high level of government commitment and flexibility in

securing vaccines, determination of target populations according to susceptibility and vaccine availability, and implementing an online data system. How the Cambodian Government overcomes the aforementioned challenges to continuing and maintaining its COVID-19 vaccine program will need to be observed.

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