Managing Immunization Supply Chain in Indonesia
SMILE ANNUAL REPORT 2021

A partnership between UNDP Indonesia and the Ministry of Health of the Republic of Indonesia

CHAPTER I.
INTRODUCTION

Indonesia's population of 270 million people and its vast geographical areas spanning more than 17,000 islands make vaccination a highly challenging task. To address this issue, UNDP has developed SMILE (*Sistem Monitoring Imunisasi dan Logistik Secara Elektronik*) or Electronic Immunisation and Logistics Monitoring System. SMILE is an application and software that was initially piloted based on the Electronic Vaccines Intelligence Network (eVIN) application from India. It is a cloud-based digital solution that strengthens the immunisation supply chain system in Indonesia by providing a customised end-to-end tracking of vaccine inventory, from the central storage point to the 'last mile' at the primary care level and has contributed significantly to the data flow within the 'One Data' system. SMILE was first initiated in 2018 and its implementation has been expanded to reach all areas in Indonesia.

The mobile and web-based application initiative has been implemented by the Ministry of Health (MoH) since 2018 and has grown rapidly as an application that enables real-time visibility of vaccine cold chain logistics by digitising stock supplies and storage temperature across vaccine cold chain points. This digitalisation will eventually eliminate stock abnormalities, especially stock-out and over stock due to old data, minimise vaccine wastage and degradation due to temperature excursion during storage, and reduce time consumed for gathering information to create reports from all levels of vaccine managers. Real-time data from the temperature data logger installed in the refrigerator is sent to the SMILE server every 10 minutes and inventory reports from the lower level will be processed by the SMILE system and can easily be viewed on a dashboard based on which data is needed at each level (Figure 1).

THE MOBILE AND WEB-BASED APPLICATION INITIATIVE HAS BEEN IMPLEMENTED BY THE MINISTRY OF HEALTH (MOH) SINCE 2018 AND HAS GROWN RAPIDLY AS AN APPLICATION THAT ENABLES REAL-TIME VISIBILITY OF VACCINE COLD CHAIN LOGISTICS BY DIGITISING STOCK SUPPLIES AND STORAGE TEMPERATURE ACROSS VACCINE COLD CHAIN POINTS.

Picture 1. What SMILE records

Before being used thoroughly in all provinces in Indonesia to support the COVID-19 vaccination, SMILE has been used by the MoH to help answer routine immunization problems. With a birth cohort of nearly five million per year, the number of Indonesian children who need to be vaccinated is the fourth largest in the world. SMILE boosts operational efficiencies, brings cost savings for government health providers and addresses inequities in vaccine coverage. Moving forward, UNDP has now been asked by the Government of Indonesia to expand SMILE implementation to further include 600 health facilities in 12 additional provinces. The final intent is to expand the SMILE implementation to all cold chain points in Indonesia in a phase wise rollout during 2020-2024.
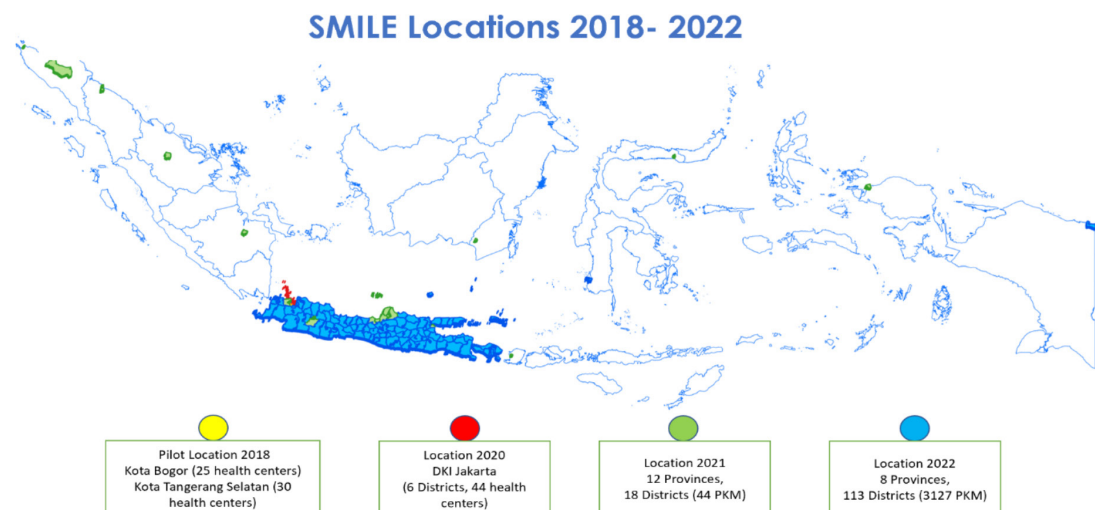
This report was made to provide an overview of the development and expansion of SMILE as well as expectations for SMILE in the future.

CHAPTER II.
SMILE INTERVENTION AREAS 2018-2024

SMILE was first introduced in two districts, Bogor in West Java Province and South Tangerang in Banten Province. Supported by UNDP, a SMILE pilot project was initiated to track vaccine storage temperature through SIM-enabled temperature loggers attached to the cold chain equipment. In July 2018, the system was set up in 54 Community Health Centres (*Puskesmas*) in the two provinces. The project engaged stakeholders at all levels: Ministry of Health (MoH), Provincial Health Office (PHO) and District Health Office (DHO). Because of its success, in 2020 the use of SMILE was gradually expanded to six provinces and 12 districts in Indonesia (Table 1). As of 2021, 12 additional provinces were selected to use SMILE for their routine immunisation programs to achieve UNDP's goal to roll out the system across 34 provinces, 514 districts and 10,000 *Puskesmas*. Those provinces were Aceh, North Sumatra, South Sumatra, Bangka Belitung, DI Yogyakarta, East Java, Bali, West Nusa Tenggara, East Kalimantan, South Sulawesi, Papua and West Papua. In the past two years, UNDP facilitated the immunisation sub-directorate on the use of technology and capacity development for vaccine store (pharmacy) and immunisation program officers to optimise vaccine delivery.

In the midst of COVID-19 pandemic, SMILE usage for vaccination program became essential as it can be used to ensure an effective vaccine distribution. Realising the importance of a centralised data system to manage information supporting the COVID-19 vaccination program, the Government of Indonesia decided to use SMILE to specifically support the mass deployment of COVID-19 vaccines and ensure timely delivery of vaccines across the archipelago since 2020 .

SMILE Locations 2018- 2022

| Pilot Location 2018 Kota Bogor (25 health centers) Kota Tangerang Selatan (30 health centers) | Location 2020 DKI Jakarta (6 Districts, 44 health centers) | Location 2021 12 Provinces, 18 Districts (44 PKM) | Location 2022 8 Provinces, 113 Districts (3127 PKM) |

Picture 2. SMILE locations 2018 - 2022

2.1 SMILE Project Intervention Areas for Routine Immunisation

There was an increase in the number of entities using SMILE for routine immunisation program from 2018 to 2021 (Figure 2). As mentioned in the previous paragraph, the first pilot project was initiated in West Java Province (Bogor) and Banten Province (South Tangerang). In 2020, the SMILE intervention was expanded to four provinces and 12 districts, bringing a total of 6 provinces, 14 districts, and 331 *Puskesmas* which applied SMILE. In 2021, 12 additional provinces and 13 districts were included in the intervention areas, so a total of 19 provinces and 27 districts use SMILE for routine immunisation programs (Table 1). A series of SMILE trainings were also carried out in several districts in Indonesia since September 2021, attended by PHO, DHO and *Puskesmas* officers.
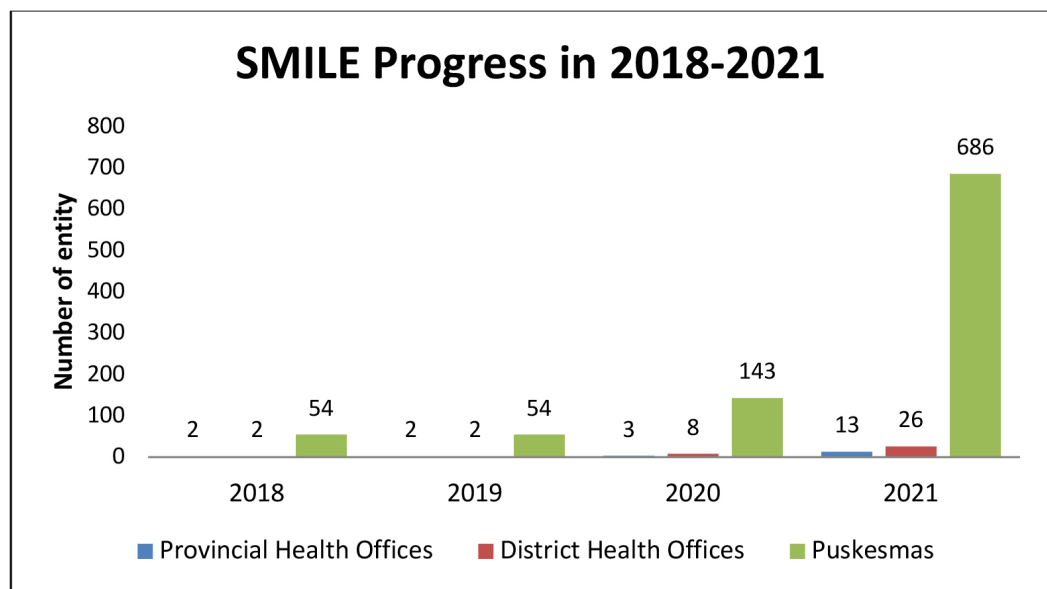

Figure 2. SMILE progress for routine immunisation in 2018-2021

Table 1. Provinces and districts included in routine immunisation intervention areas 2018-2021

Year	Province	District/City
2018	Banten	South Tangerang City
	Jawa Barat	Bogor City
2019	-	-
2020	DKI Jakarta	Thousand Islands District
		Central Jakarta
		North Jakarta
		West Jakarta
		South Jakarta
		East Jakarta
2021	Banten	Tangerang District
	West Java	Bandung District
	Central Java	Semarang City
		Magelang District
		Pati District
		Kudus District
		Demak District
		Kendal District
	Riau	Pekanbaru City
	Gorontalo	Gorontalo City
	South Sumatera	Palembang City
	North Sumatera	Medan City
	Aceh	Central Aceh District
		City of Banda Aceh
	East Java	Surabaya City
	West Nusa Tenggara	Mataram City
	South Kalimantan	Banjarmasin City
	West Papua	Sorong City

2.2 SMILE Project Intervention Areas for COVID-19 Vaccination

The Government of Indonesia decided to use SMILE to record the supply chain of COVID-19 vaccines, as per Joint Decrees of Ministry of Health and Ministry of Communications and Information No. HK.03.01/MENKES/53/2021 and No. 5 of 2021 regarding the National One Data Information System. SMILE is now widely used in 34 provinces, 514 districts, and 10,377 Puskesmas throughout Indonesia (Table 2)..

Table 2. Number of entities using and registered in the SMILE App

Entity	Unit/Total Number
Ministry of Health, Republic of Indonesia	Directorate General of Pharmaceutical and Medical Devices, Directorate General of Disease Prevention and Control, Health Crisis Centre (under development process)
Provincial Health Offices	34
District Health Offices	514
Primary Health Care (**Puskesmas**)	10,047
Hospitals	147
Port Health Offices (KKP)	50
Armed Forces (TNI)	714
Police (POLRI)	556
State Intelligence Agency (BIN)	1

SMILE WAS FIRST INTRODUCED IN TWO DISTRICTS, BOGOR IN WEST JAVA PROVINCE AND SOUTH TANGERANG IN BANTEN PROVINCE. SUPPORTED BY UNDP, A SMILE PILOT PROJECT WAS INITIATED TO TRACK VACCINE STORAGE TEMPERATURE THROUGH SIM-ENABLED TEMPERATURE LOGGERS ATTACHED TO THE COLD CHAIN EQUIPMENT.

2. 3 Routine Immunisation and COVID-19 Transactions Recorded in SMILE

SMILE recorded all types of transactions for routine immunisation since it was deployed in 2018 and for COVID-19 which began in 2020. Those transactions were stock count, vaccine allocation, vaccine issued, vaccine discarded, return from health facility, vaccine return, opened vial transaction and others (Table 3). The number of routine immunisation transactions (on average) increased over the past four years: 77,913 transactions in 2018, 137,535 transactions in 2019, 145,902 transactions in 2020 and 823,000 transactions in 2021.

Table 3. Number of transactions recorded in SMILE in 2018-2021

Number of transactions	2018	2019	2020	2021
Routine Immunisation	Average in 1 year: 77,913 transactions	Average in 1 year: 137,535 transactions	Q1: 29,284 Q2: 28,380 Q3: 41,628 Q4: 46,610 Transactions decreased in March, April, and May due to COVID-19	Q1: 30,000 Q2: 79,000 Q3: 249,000 Q4: 465,000
COVID-19	-	-	No transactions (N/A)	Q1: 490,000 Q2: 840,000 Q3: 1,230,000 Q4: 2,400,000

CHAPTER III.
MONITORING THE USE OF SMILE

3.1 SMILE Feature Improvements

Since the launch of the SMILE application in 2018, the following features were added to the application to improve its usage, particularly for monitoring the distribution of COVID-19 vaccines to all provinces in Indonesia.

3.1.1 Interoperability between SMILE with SMDV

SMDV system is a distribution information system of Biofarma (a large state-owned pharmaceutical company) in Indonesia which was assigned by the MoH to distribute vaccines from the pharmaceutical storage to the province level. SMILE application receives data of vaccines (batch number, quantity and expiration date) distributed by the pharmaceutical storage from SMDV system through Application Programming Interface (API). Once the vaccines arrive at the provincial health office, the vaccine logistics manager/SMILE operator will confirm the digital proof of vaccines sent by Biofarma in SMILE according to the vaccines received.

With interoperability between systems, human error can be prevented, as no data entry is required by the SMILE operators when receiving the vaccines.

3.1.2 Vaccine Return (Transfer Across Health Facilities)

There may be cases of vaccine transfer between health facilities, from a health facility with excess vaccines to a health facility with vaccine shortage. This practice is not allowed according to the SOP of routine immunisation, however, it may be necessary under COVID-19 circumstances. SMILE has taken this into consideration and an option has been added to ensure that all vaccine transfers are well-recorded and traceable.

SINCE THE LAUNCH OF THE SMILE APPLICATION IN 2018, THE FOLLOWING FEATURES WERE ADDED TO THE APPLICATION TO IMPROVE ITS USAGE, PARTICULARLY FOR MONITORING THE DISTRIBUTION OF COVID-19 VACCINES TO ALL PROVINCES IN INDONESIA.
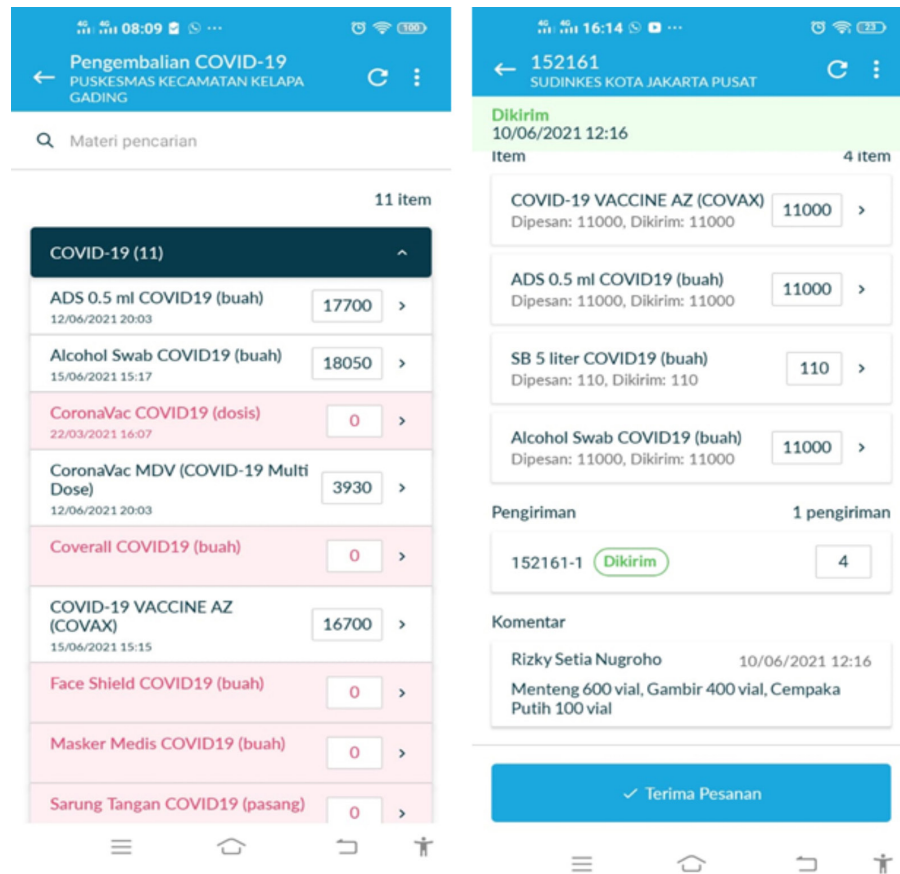
Figure 3. Vaccine transfer across Puskesmas

3.1.3 Tagging of Funding Source

Tags of type/model, series number, year of production and procurement, and funding source for assets (vaccine storages) monitored in the SMILE application were added in the Asset Management menu. These data are cross tabulated with the frequency and duration of excursions to evaluate the performance of the respective assets by model, production year, and other categories.

Figure 4. Tagging of Funding Source of Assets

3.1.4 Filing of Non-vaccine Material Logistics from the Pharmacy Centre of Ministry of Health

There are essential supplies for vaccination namely Auto-Disable Syringe (ADS), Safety Box, and alcohol swab. In the near future, the MoH will expand the types of material (including consumable medical supplies) to be recorded in SMILE.

Figure 5. Additional feature for non-vaccine material logistics

3.1.5 Annual Vaccine Planning

There is a standardised method for forecasting materials including vaccines, diluent, droppers, and essential supplies for vaccination. The target recipients of vaccination by age-group and usage rate in 2022 will be used to produce a year 2023 vaccine forecast. Currently, the system automatically calculates and records the projection for each health facility for each material in the vaccination forecast. By having consumption rate and projection calculation data down to the Puskesmas level in one system, the relevant entity at the national level will be able to easily track and evaluate the performance and produce a more reliable target setting.

Figure 6. Annual planning feature on SMILE App

3.1.6 Dashboard on Consumed Vaccines

The consumption dashboard reflects the information on the total vaccine consumption, including logistics in specific areas based on the geographic location, material name, batch, and expiry date.

Figure 7. Feature on consumed vaccines

3.1.7 SMILE Monitoring and Evaluation (Monev) Dashboard

The SMILE Monev dashboard provides information on vaccine distribution and return data that have not been received by the Provincial Health Offices, District/City Health Offices, and Health Facilities. The analysis of immunisation data is continuously enhanced to meet the evolving needs of stakeholders/main users of SMILE.
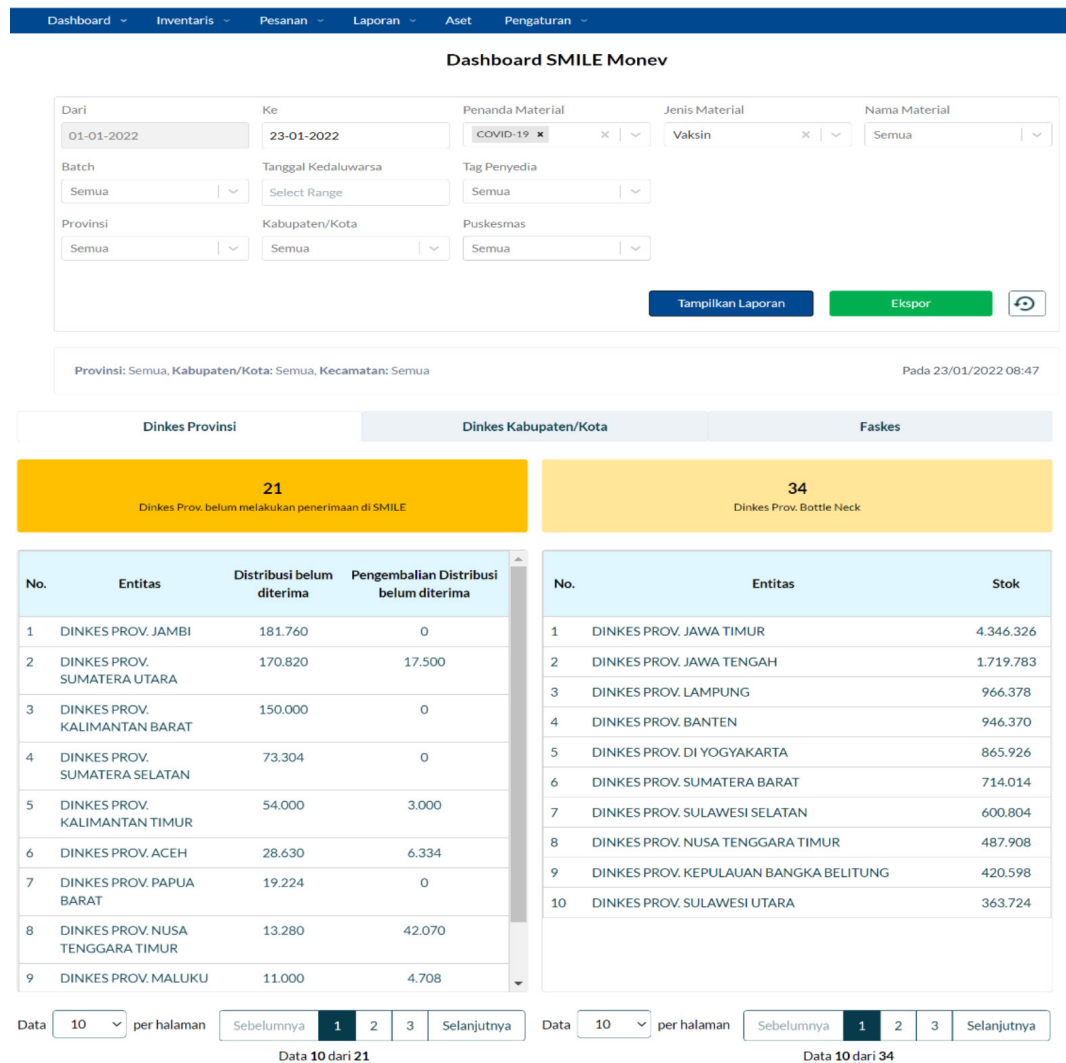
Figure 8. SMILE Monev dashboard

3.1.8 Stock-taking Feature

The stock-taking feature has the function to cross-check vaccine receipt, allocation, consumption, disbursement, disposal and final stock data against the actual condition or real data and correction from the health facility. This stock-taking feature has been implemented by each facility as instructed by the Inspectorate General of the MoH for COVID-19 vaccination, and will be continued for routine immunisation campaign purposes.

Figure 9. Stock-taking feature on SMILE App

3.1.9 Reconciliation of vaccines record vs actual transactions

The data reconciliation is intended to compare and synchronise vaccine stock data with the recorded data on SMILE with more refined details. Health Offices can now access the history of data reconciliation that have been made by health facilities, as a way to improve data validity and monitor consistency of operators in inputting data into the system.

| Dashboard ⌄ | Inventaris ⌄ | Pesanan ⌄ | Laporan ⌄ | Aset | Pengaturan ⌄ |

Daftar Rekonsiliasi

Laporan Aktivitas Rekonsiliasi   Daftar Rekonsiliasi   Tambah Rekonsiliasi

Material	Periode Dari	Periode Ke	Dilakukan dari
Material ⌄	dd/mm/yyyy	dd/mm/yyyy	dd/mm/yyyy

Dilakukan hingga	Lihat Transaksi Pelanggan	Tag Entitas	Provinsi
dd/mm/yyyy	Ya ⬤	Semua Tag ⌄	Ketik untuk mencari ⌄

Kabupaten/Kota	Puskesmas		
Ketik untuk mencari ⌄	Puskesmas ⌄	Cari Ekspor	↻

No.	Nama Entitas	Material	Periode		Penerimaan dikurangi Pengembalian		Alokasi dikurangi Penerimaan Pengembalian		Konsumsi dikurangi Pengembalian Faskes		Pembuangan		Sisa		Dilakukan Pada	Dilakukan Oleh	Aksi
			Dari Ke	Ke	SMILE	RIII	SMILE	RIII	SMILE	RIII	SMILE	RIII	SMILE	RIII			
1	PUSKESMAS SIKANCING	CORONAVAC @ 2 DOSIS, ISI 40 VIAL	22/01/2022	22/01/2022	0	0	0	0	2	2	0	0	214	214	22/01/2022 20:58	USER IMUNISASI PUSKESMAS SIKANCING	Lihat Alasan dan Aksi Lihat Riwayat
2	PUSKESMAS LONG BANG	VAKSIN COVID MODERNA 10 DS	01/01/2021	31/12/2021	70	70	0	0	40	40	0	0	30	30	22/01/2022 10:06	BAYU WANDIRA, S.Farm, Apt	Lihat Alasan dan Aksi Lihat Riwayat
3	PUSKESMAS LONG BANG	COVID-19 VACCINE MODERNA	01/01/2021	31/12/2021	322	322	0	0	322	322	0	0	0	0	22/01/2022 10:04	BAYU WANDIRA, S.Farm, Apt	Lihat Alasan dan Aksi Lihat Riwayat
4	PUSKESMAS LONG BANG	VAKSIN COVID-19 10 DS (CoronaVac MDV)	31/12/2020	31/12/2021	3.830	3.530	0	0	2.010	2.010	0	0	1.820	1.820	22/01/2022 09:45	BAYU WANDIRA, S.Farm, Apt	Lihat Alasan dan Aksi Lihat Riwayat

Figure 10. Data reconciliation menu on SMILE App

3.1.10 Download Report

The download report menu contains information in the form of Excel sheet that provides information on list of entities that have and have not received vaccine stock, stock of materials, consumption and expired materials. This feature can help the Ministry of Health and local health offices to monitor and remind health facilities to receive stock in the SMILE application. Besides that, this nearly real-time report is updated every two hours to ensure better decision-making.

Figure 11. Download report feature on SMILE App

3.1.11 Online Proof of Delivery (POD)

Users are able to export and customise standard POD documents from SMILE to improve data accuracy and reduce the administrative workload of pharmacies and health facilities.

Figure 12. Feature of online POD

3.1.12 Ticketing for user support

Ticketing can be used by the Provincial Health Offices and/or District Health Offices to tackle shipping errors and improve shipping accuracy from Biofarma by transforming and updating vaccine receipt operations through the SMILE system.

Figure 13. Ticketing for user support

3.1.13 Total Vaccines Administered

The feature of total vaccine administered records the total COVID-19 and Routine Immunisation (in specific areas only) vaccine doses that have been administered, whether the first vaccine, second vaccine or booster COVID-19 vaccine.

Figure 14. The feature of total vaccine administered

3.1.14 Integration of SMILE with other Stakeholders (BPOM, KPCPEN, BPKP, and DTO)

SMILE is integrated to send daily transaction data, including reception, distribution, disposal, consumption, stock and other data through the API (Application Program Interface) to:

- KPCPEN (COVID-19 Response and National Economic Recovery Committee): SMILE data is used within the KPCPEN Portal/Dashboard Tower for Vaccine Distribution.

- DTO (Digital Transformation Office) of the Ministry of Health: Daily SMILE transaction data are used for analysis of vaccine distribution and logistics by the DTO team, which will then be assessed and published in the Vaccine Portal of the Ministry of Health.

- BPOM (National Food and Drug Supervisory Agency): Daily SMILE transaction data are imported into the BPOM Vaccine Gateway for further vaccine safety monitoring.

- BPK/BPKP (The Supreme Audit Board/National Government Internal Auditor): Daily SMILE transaction data are used to audit vaccine distribution and logistics.

- Inspectorate General of the MoH (Ministry of Health Internal Auditor): Daily SMILE transaction data are used to audit vaccine distribution and logistics.

3.2 Infrastructure and Used Data Storage of SMILE

An application can contribute highly to stakeholders in cases where it can provide high-quality data that can be further analysed. To enrich the existing data, SMILE has to be able to accommodate high frequency usage. The indicator of SMILE application usage can be determined not only through the usage frequency during transaction and the increase in the number of transactions itself, but also through the used storage capacity available. The more active the users and the higher the number of transactions, the higher storage capacity is needed. With the increasing storage need, the safety and availability of data storage space needs to be ensured by the Centre of Data and Information (Table 4 and Table 5).

Table 4. Infrastructure and Capacity of Data Storage of SMILE

Type	2020	2021	2022	2023	2024
Production Servers at Data Centre of the Ministry of Health	**Application & Database Server:** 6 CPU 20 GB RAM 105 GB HD	**Application & Database Server:** Openshift 5 Workers CPU: 5 x 8 CPU RAM: 5 x 32 GB HD: 5 x 160 GB Total: 40 CPU, 160 GB RAM, 800 GB HD **Backup Database VM Server:** 8 CPU, 32 GB RAM, Storage: 1 TB	**Application Server:** Openshift 5 Workers CPU: 5 x 8 CPU RAM: 5 x 32 GB HD: 5 x 160 GB Total: 40 CPU, 160 GB RAM, 800 GB HD **Database VM Server:** VM1 OLTP: 16 CPU, 64 GB RAM, 1024 GB HD VM2 CRON: 16 CPU, 64 GB RAM. 1024 GB HD VM3 OLAP: 8 CPU, 32 GBRAM, 1024 GB HD **IOT Platform VM Server** 2 CPU, 16 GB RAM, 100 GB HD **Backup Database VM Server** 8 CPU, 32 GB RAM, Storage: 1 TB	**Application Server:** Openshift 5 Workers CPU: 5 x 16 CPU RAM: 5 x 64 GB HD: 5 x 300 GB Total: 80 CPU, 320 GB RAM, 1500 GB HD **Database VM Server:** VM1 OLTP: 32 CPU, 128 GB RAM, 2048 GB HD VM2 CRON: 32 CPU, 128 GB RAM. 2048 GB HD VM3 OLAP1: 32 CPU, 128 GBRAM, 2048 GB HD VM4 OLAP2: 32 CPU, 128 GBRAM, 2048 GB HD **IOT Platform VM Server** 8 CPU, 64 GB RAM, 1024 GB HD **Backup Database VM Server** 16 CPU, 64 GB RAM, Storage: 2 TB	**Application Server:** Openshift 5 Workers CPU: 5 x 24 CPU RAM: 5 x 96 GB HD: 5 x 512 GB Total: 120 CPU, 480 GB RAM, 2560 GB HD **Database VM Server** VM1 OLTP: 48 CPU, 192 GB RAM, 3072 GB HD VM2 CRON: 48 CPU, 192 GB RAM. 3072 GB HD VM3 OLAP1: 48 CPU, 192 GB RAM, 3072 GB HD VM4 OLAP2: 48 CPU, 192 GB RAM, 3072 GB HD **IOT Platform VM Server** 16 CPU, 128 GB RAM, 2048 GB HD **Backup Database VM Server:** 32 CPU, 128 GB RAM, Storage: 3 TB

Type	2020	2021	2022	2023	2024
Staging Server and Backup on Cloud Hosting	**Kubernetes 4 nodes** CPU: 4 x 4 CPU RAM: 4 x 8 GB RAM HD: 4 x 50 GB Total: 16 CPU, 32 GB RAM	**Kubernetes 7 nodes** CPU: 7 x 4 CPU RAM: 7 x 8 GB RAM HD: 7 x 50 GB Total: 24 CPU, 56 GB RAM	**Kubernetes 7 nodes** CPU: 7 x 8 CPU RAM: 7 x 32 GB RAM HD: 7 x 100 GB Total: 56 CPU, 224 GB RAM	**Kubernetes 8 nodes** CPU: 8 x 16 CPU RAM: 8 x 32 GB RAM HD: 8 x 200 GB Total: 128 CPU, 256 GB RAM	**Kubernetes 10 nodes** CPU: 10 x 16 CPU RAM: 10 x 32 GB RAM HD: 10 x 200 GB Total: 160 CPU, 320 GB RAM
Load testing conducted and its success rate	1,000 concurrent users Success rate: 99%	2,000 concurrent users Success rate: 99%	3,000 concurrent users Success rate: 99%	4,000 concurrent users Success rate: 99%	5,000 concurrent users Success rate: 99%

Table 5. Average utilisation of the infrastructure compared to the number of transactions and total users registered for COVID-19 and Routine Immunisation in one year

Server	Average CPU Utilised Yr 2021	Average Memory Utilised Yr 2021	Average Hard Disk Utilised Yr 2021	Highest Daily Transaction per Dec 2021	Users Registered per Dec 202
Worker 1	22%	48%	10%	110,130 transactions	33,997 users
Worker 2	22%	31%	11%		
Worker 3	34%	39%	33%		
Worker 4	20%	33%	17%		
Worker 5	20%	33%	10%		

3.3 Remote Temperature Monitoring Logger

Temperature loggers with the function to monitor and record asset temperature were installed in several health facilities. A total of 86 temperature logger units were installed in 2018 and increased to 714 loggers in 2020. The temperature logger installed and currently functioning records any temperature excursions, including the extreme increase and decrease of temperature of a particular asset.

SMILE records the temperature logger activities that can be filtered to specific dates. The data can be obtained in the form of a graph and can be downloaded for further analysis of vaccine refrigerators conditions and procurement.

Temperature excursion is a situation where a vaccine is exposed to temperatures outside of the acceptable range. Excursion events may occur due to several factors, including electricity black out, flooding, or damaged assets on the weekend. With the connection of temperature logger to the SMILE system, temperature excursions that occur during the weekend or business hours can be accessed and downloaded into the SMILE dashboard. This feature helps healthcare staff to ensure vaccine quality and reduce vaccine disposal due to vaccine storage temperature that is not in accordance with the SOP.

In 2021, there were 853 assets experiencing temperature excursions with roughly 843 assets experiencing the excursions on weekdays and 567 assets experiencing excursions during the weekend.

There are several logger installations in ILR and UCC (for Pfizer vaccine) as documented in Figure 16 and 17.
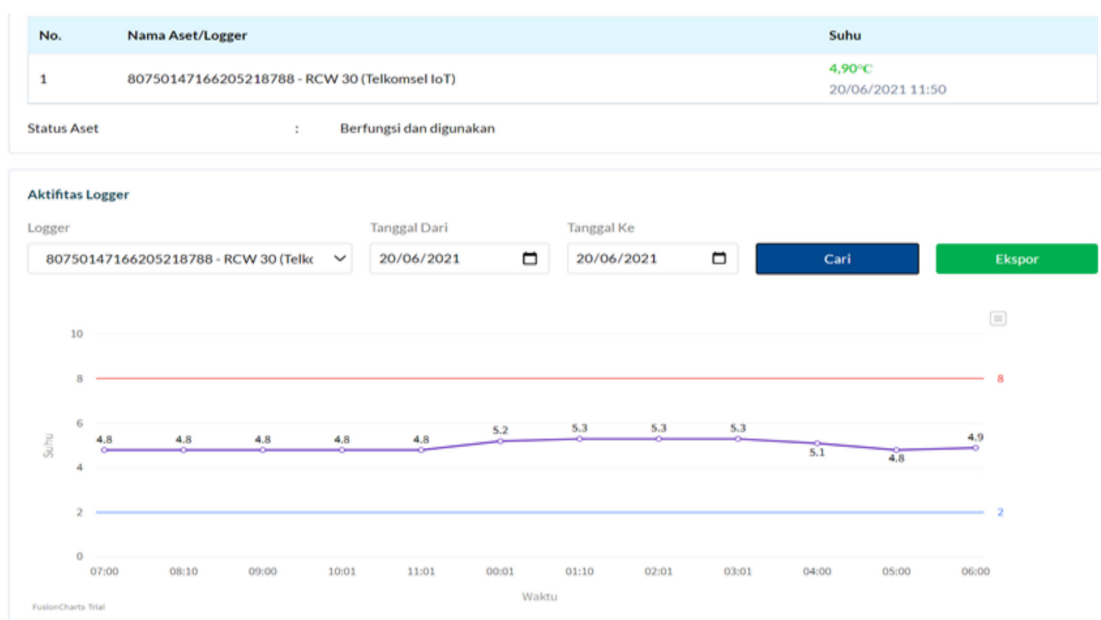
Figure 15. Graph of temperature logger monitoring

Figure 16. Temperature logger installation for vaccine storage 2-8^{0}C

Figure 17. Temperature logger installation for Pfizer vaccine with a temperature of -90^0 in Lampung City

3.4 Capacity Building for Users of SMILE for COVID-19 and Routine Immunisation

3.4.1 Series of Trainings on SMILE for COVID-19 Vaccination

The training of SMILE for COVID-19 vaccination was conducted online, attended by Provincial Health Offices, District Health Offices and Puskesmas. This training aimed to increase the usage of SMILE application in recording COVID-19 vaccination processes by health workers (Figure 18).
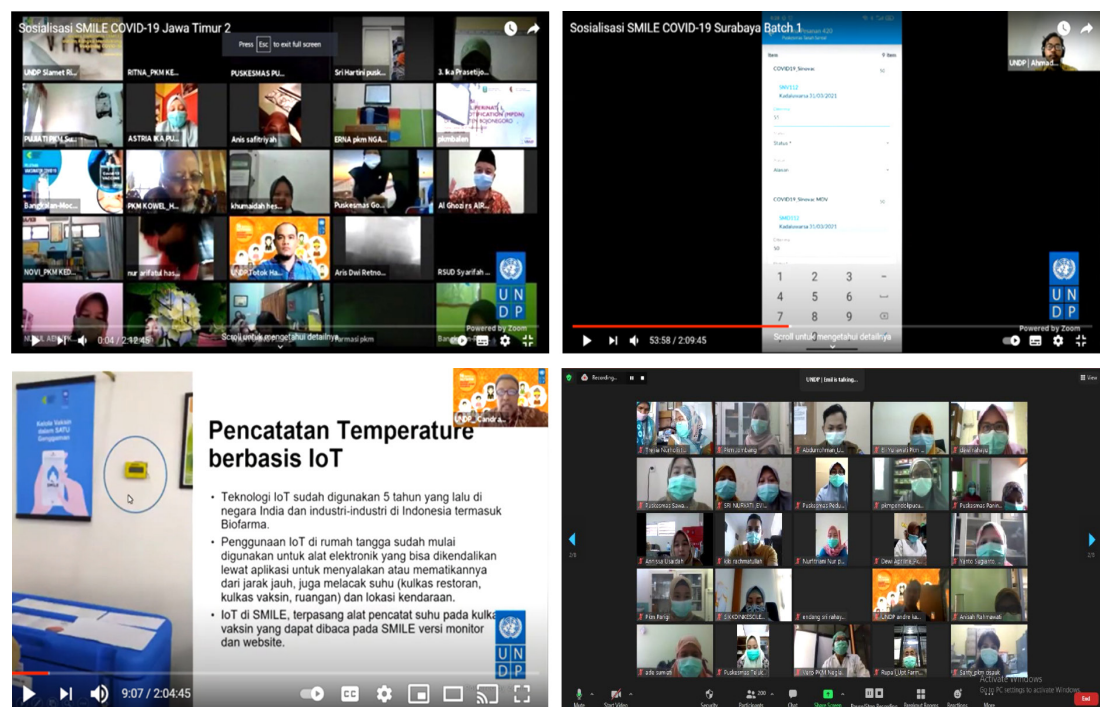
Figure 18. Training of SMILE for COVID-19 Vaccination

3.4.2 Utilisation of SMILE for COVID-19 Vaccination by TNI/Polri (Armed Force/ Police)

Dissemination of SMILE for COVID-19 vaccination for the TNI/Polri was conducted online, in which more than 1,000 personnel contributed. Other than that, offline dissemination and meetings were also attended by personnel from the Army and Police Headquarters (Figure 19).

Figure 19. Dissemination of SMILE for COVID-19 Vaccination to TNI/Polri

3.4.3 SMILE Utilisation by the Financial and Development Supervisory Agency (BPKP) and Corruption Eradication Commission (KPK)

Dissemination and training of SMILE for COVID-19 Vaccination for BPKP was conducted offline (Figure 20). During this dissemination event, a Focus Group Discussion (FGD) was also conducted, which resulted in an agreement to harmonise data between SMDV, SMILE and PCARE, and BPKP's commitment to collaborate in the regulation and monitoring of the safety of local vaccine logistics through SMILE and PCARE.

In several discussions with the Ministry of Health, BPKP and KPK, the SMILE team also provided detailed information regarding vaccine and logistics monitoring by the entities responsible for vaccine logistics through the various features of SMILE. The national audit entity, and the anti-corruption agency acknowledged SMILE's role and accountability. These stakeholders also encouraged consistency, harmonisation and mutual relationship, particularly within the Ministry of Health and Health Facilities. BPKP and KPK continuously consulted the UNDP SMILE team and Ministry of Health regarding various features of SMILE to enable them to independently conduct monitoring of SMILE users.

Figure 20. Dissemination of SMILE for COVID-19 Vaccination to BPKP

3.4.4 Expansion of SMILE for Routine Immunisation in 12 Additional Provinces

Dissemination of SMILE for routine immunisation was conducted online, which was attended by representatives of the Ministry of Health, Provincial Health Office and UNDP. SMILE will be used for routine immunisation in 12 additional provinces, including Aceh, North Sumatra, South Sumatra, Bangka Belitung, Yogyakarta, East Java, Bali, NTB, East Kalimantan, South Sulawesi, Papua and West Papua. In addition, trainings were conducted in the additional provinces (Figure 21; Table 6).

*Figure 21. Dissemination and training of SMILE for Routine Immunisation in 12
additional provinces*

THE TRAINING OF SMILE FOR COVID-19
VACCINATION WAS CONDUCTED ONLINE,
ATTENDED BY PROVINCIAL HEALTH OFFICES,
DISTRICT HEALTH OFFICES AND PUSKESMAS.
THIS TRAINING AIMED TO INCREASE THE USAGE
OF SMILE APPLICATION IN RECORDING COVID-19
VACCINATION PROCESSES BY HEALTH WORKERS.

Table 6. Training of SMILE for routine immunisation 2018-2022

| No	Province	City/District	Training Date	Total *Puskesmas*	Total Participants			Fundings Source	Phase
					Provincial Health Officer	District Health Officer	Puskesmas Officer		
1	West Java	Bogor City	28-29 June 2018	29	2	5	26	UNDP/ BRH	Pilot
2	Banten	South Tangerang City	25-26 June 2018	25	2	4	28	UNDP/ BRH	Pilot
3	DKI Jakarta	Thousand Island District	18-20 February 2020	2	4*	12*	88*	APBD	Phase 1
		Central Jakarta	18-20 February 2020	8	4*	12*	88*	APBD	Phase 1
		North Jakarta	18-20 February 2020	6	4*	12*	88*	APBD	Phase 1
		West Jakarta	18-20 Februari 2020	8	4*	12*	88*	APBD	Phase 1
		South Jakarta	18-20 February 2020	10	4*	12*	88*	APBD	Phase 1
		East Jakarta	18-20 February 2020	10	4*	12*	88*	APBD	Phase 1
4	Banten	Tangerang District	25-26 March 2021	45	3	2	43	UNDP/ GAVI	Phase 1
5	West Java	Bandung District	10 March 2021	62	-	6	130	UNDP/ GAVI	Phase 1
6	Central Java	Semarang City	17-18 February 2021	37	3	3	33	UNDP/ GAVI	Phase 1
		Magelang District	27 May 2021	29	-	4	58	APBD	Phase 1
		Kendal District	19 November 2021	31	2	2	60	UNDIP/ UNICEF	Phase 2
		Demak District	6 December 2021	28	4	4	50	UNDIP/ UNICEF	Phase 2

*Total of all participants for DKI Jakarta Province in 6 Cities/Districts

No	Province	City/ District	Training Date	Total Puskesmas	Total Participants			Fundings Source	Phase
					Provincial Health Officer	District Health Officer	Puskesmas Officer		
		Kudus District	7 December 2021	20	4	4	34	UNDIP/ UNICEF	Phase 2
		Pati District	9 December 2021	30	4	4	54	UNDIP/ UNICEF	Phase 2
		Grobogan District	7 February 2022	30	4	4	60	APBD	Phase 2
7	Riau	Pekanbaru City	4 March 2021	21	5	7	41	UNDP/ GAVI	Phase 1
8	Gorontalo	Gorontalo City	13 March 2021	10	4	10	20	UNDP/ GAVI	Phase 1
9	South Sumatera	Palembang City	14-15 September 2021	41	8	11	42	UNDP/ GAVI	Phase 2
10	North Sumatera	Medan City	21-23 September	41	3	3	33	UNDP/ GAVI	Phase 2
11	West Papua	Sorong City	3 September 2021	10	2	2	22	UNDP/ GAVI	Phase 2
12	East Java	Surabaya City	12-13 October	63	1	2	65	UNDP/ GAVI	Phase 2
13	West Nusa Tenggara	Mataram City	14 October	11	2	3	24	UNDP/ GAVI	Phase 2
14	Aceh	Aceh Tengah District	28 October 2021	17	6	8	32	UNDP/ GAVI	Phase 2
		Banda Aceh City	25 October 2021	11	3	3	24		Phase 2
15	South Kalimantan	Banjarmasin City	23 October 2021	26	7	7	55	UNDP/ GAVI	Phase 2

3.5 SMILE Boot Camp

Monitoring of SMILE application is conducted on a biweekly basis by UNDP, in collaboration with BADR Interactive as the software developer. This event aims to analyse the processes of SMILE feature development. In addition, a bootcamp is conducted by UNDP and BADR Interactive annually to review the work plan for SMILE improvements (Figure 22). To help users in rural areas that might have difficulties in operating SMILE, UNDP and BADR Interactive recruited human resources for providing assistance and/or support in six regions in Indonesia (Central Java and Yogyakarta; East Java and Bali; DKI Jakarta; West Java and Banten; Sumatera; Kalimantan and Sulawesi; NTB, NTT, Maluku, and Papua).

Figure 22. Boot camp activity of UNDP and software developer

3.6 e-Learning

To familiarise the SMILE application with users in 34 provinces in Indonesia, we developed an e-Learning platform to provide introductory lessons. The platform also served as a medium to promote activities (including training and dissemination) related to SMILE and an information hub for health workers. It also facilitates active participation through interactive learning and access to capacity building. The features of the e-Learning include a 24-hour Help Desk, SMILE lessons (user guide, technical guide, and courses), and updated news article on SMILE from various media. The SMILE e-learning can be accessed at https://elearning.smile-indonesia.id/.

3.7 SMILE Publications

A series of SMILE-related publications and articles were published to provide information and educate the public.

1. https://indonesia.un.org/en/170105-undps-smile-application-helps-health-workers-accelerate-vaccine-distribution-ambon

2. https://www.undp.org/indonesia/news/across-archipelago-indonesian-vaccinators-tap-smile

3. https://www.undp.org/indonesia/news/improving-digital-literacy-among-women-can-help-enhance-health-care-nation

4. https://www.undp.org/indonesia/news/smile%E2%80%99s-e-learning-platform-aims-enhance-vaccination-services-across-indonesia

5. https://www.undp.org/indonesia/news/digitalizing-indonesia%E2%80%99s-health-sector-critical-step-towards-sdgs-achievement

6. https://www.id.emb-japan.go.jp/about_id_amb_jakpost2021_3.html

7. https://aptika.kominfo.go.id/2021/01/tiga-aplikasi-integrasikan-satu-data-vaksinasi-covid-19/

8. https://today.line.me/id/v2/article/yE2Q9o
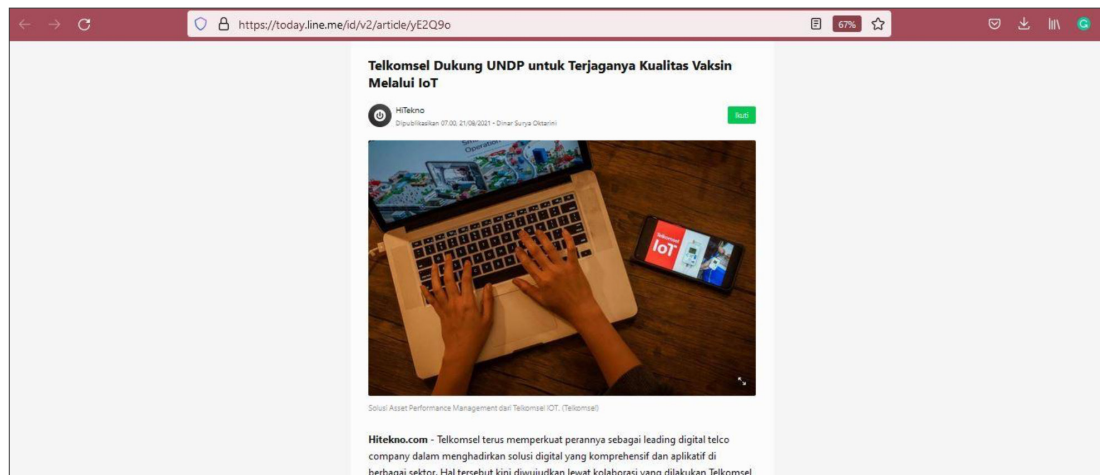
3.8 SMILE Active Rate and Transaction

The use of SMILE as an application that monitors the flow of vaccine logistics distribution for routine immunisation and COVID-19 vaccination has eased health workers workload in the recording and reporting process. With SMILE, human error and inefficient use of time during manual recording processes are minimised.

3.8.1 COVID-19 Inventory Dashboard

SMILE inventory dashboard records any transaction including total COVID-19 doses that have been distributed across the country, total vaccines discarded, total vaccines consumed, etc. In 2021, the total COVID-19 vaccines that were distributed and recorded in SMILE was 336,123,264 doses.

THE USE OF SMILE AS AN APPLICATION THAT MONITORS THE FLOW OF VACCINE LOGISTICS DISTRIBUTION FOR ROUTINE IMMUNISATION AND COVID-19 VACCINATION HAS EASED HEALTH WORKERS WORKLOAD IN THE RECORDING AND REPORTING PROCESS. WITH SMILE, HUMAN ERROR AND INEFFICIENT USE OF TIME DURING MANUAL RECORDING PROCESSES ARE MINIMISED.

Dashboard Inventory Covid-19

Dari	Ke	Kegiatan	Jenis Material	Nama Material
01-01-2021	31-12-2021	COVID-19 ⌄	Vaksin × ⌄	Semua ⌄
Batch	Tanggal Kedaluwarsa	Tag Penyedia		
Semua ⌄	Select Range	Semua ⌄		
Provinsi	Kabupaten/Kota	Puskesmas		
Semua ⌄	Semua ⌄	Semua ⌄		

[Tampilkan Laporan] [Eksport] [↻]

Dari: 27/06/2022 Ke: 27/06/2022 Kegiatan: COVID-19 Jenis Material: Vaksin Nama Material: Semua Batch: Semua Tanggal Kedaluwarsa: Semua Tag Penyedia: Semua Provinsi: Semua Kabupaten/Kota: Semua Puskesmas: Semua   Pada 27/06/2022 12:24

Kemenkes RI	Gudang Vaksin	Dinkes Prov	Dinkes Kako	Puskesmas	RS/KKP/TNI/Polri	Semua

Total Penerimaan	Penerimaan Pengembalian	Total Distribusi	Total Pengembalian Distribusi	Total Pembuangan	Total Konsumsi	Sisa
0	0	336.123.264	0	0	0	0

No.	Penerima	Stok Awal	Penerimaan	Penerimaan Pengembalian	Distribusi	Pengembalian	Konsumsi	Pembuangan	Stok Akhir
1	Kemenkes RI	0	0	0	336.123.264 Lihat Detil	0	0	0	0
2	Kemenkes RI (Gudang Vaksin Percetakan Negara)	0	59.187.464 Lihat Detil	1.728.026 Lihat Detil	58.778.600 Lihat Detil	0	2.000.000 Lihat Detil	0	136.890

Figure 23. Total COVID-19 vaccines (doses) distributed and recorded in SMILE

3.8.2 User Activity

SMILE records user activity, particularly *Puskesmas* (health facility) weekly transactions. Figure 24 reflects the percentage of *Puskesmas* activity for routine immunisation and COVID-19 transactions. Through the graph, the percentage of *Puskesmas* activity are shown to increase every month. As of December, the percentage of activity reached 66.9%. This low percentage on the routine immunisation may be caused by health workers who were being reassigned to support the COVID-19 vaccination during the pandemic, decreasing other immunisation activities. In addition, the low percentage of *Puskesmas* transactions may be due to:

● delayed data input to the SMILE system by health workers administering the vaccination and health workers working in pharmacies;

● SMILE team member working alone in health facility causing inadequate flow of data input;

● turnover of health workers, new staff may not have received instructions on data input from previous health workers.

On the other hand, the utilisation of SMILE by *Puskesmas* was high for COVID-19 vaccinations. Until the end of the fourth quarter, SMILE recorded a high utilisation of the systemby as much as 85%.

User Activity for Routine Immunization

User Activity for COVID-19 Vaccination
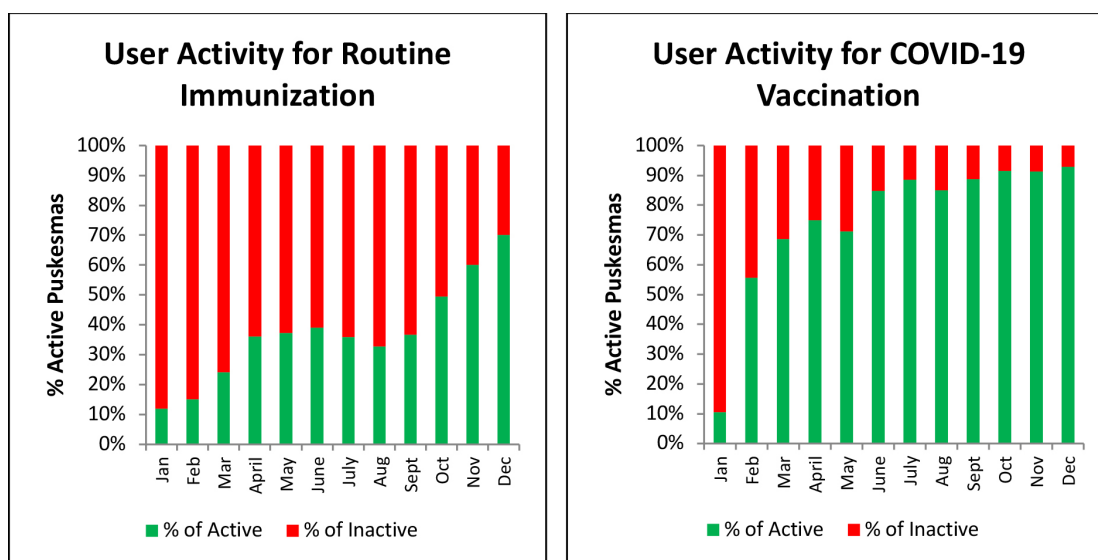
Figure 24. User activity of SMILE for COVID-19 Vaccination and Routine Immunisation

3.8.3 Number of Transactions

Since the implementation of SMILE for routine immunisation within the district/city in April, SMILE recorded a total of 30,000 transactions during the month. Towards the end the third quarter, the total transaction of routine immunisation decreased to 20,000 transactions in August. This may be caused by the implementation of PPKM (restriction of community activities) during the COVID-19 pandemic which caused *Puskesmas*to close and restrict health services for routine immunisation. In addition, the increased positive cases of COVID-19 Delta variant caused *Puskesmas* to divert their focus to support the COVID-19 vaccination. Towards the end of the fourth quarter, there was an increase in the number of routine transactions to 230,000, reflecting an increase of 70% from 160,000 transactions in November. Meanwhile, the transaction for COVID-19 vaccination significantly increased each month, with the total number of transactions reaching 900,000 in December (Figure 25). Most of the transactions for routine immunisation from January until December were disbursement/consumption transaction, reception, and add stock. Meanwhile, for COVID-19 vaccination, most of the transactions were disbursement/consumption, reception, and stock count (Figure 26).
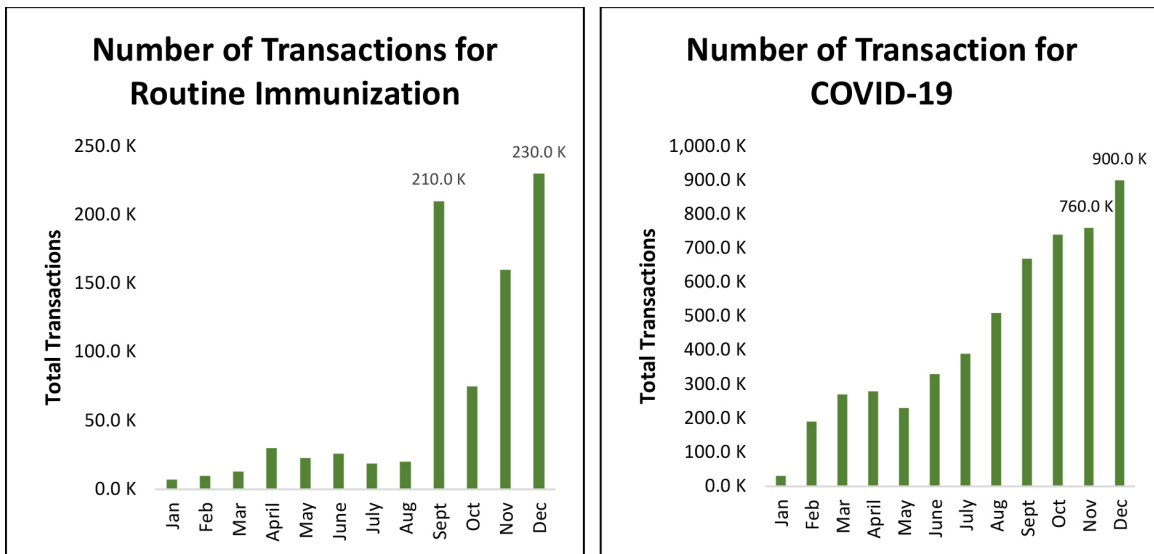
Figure 25. Total transaction for routine immunisation and COVID-19 vaccination
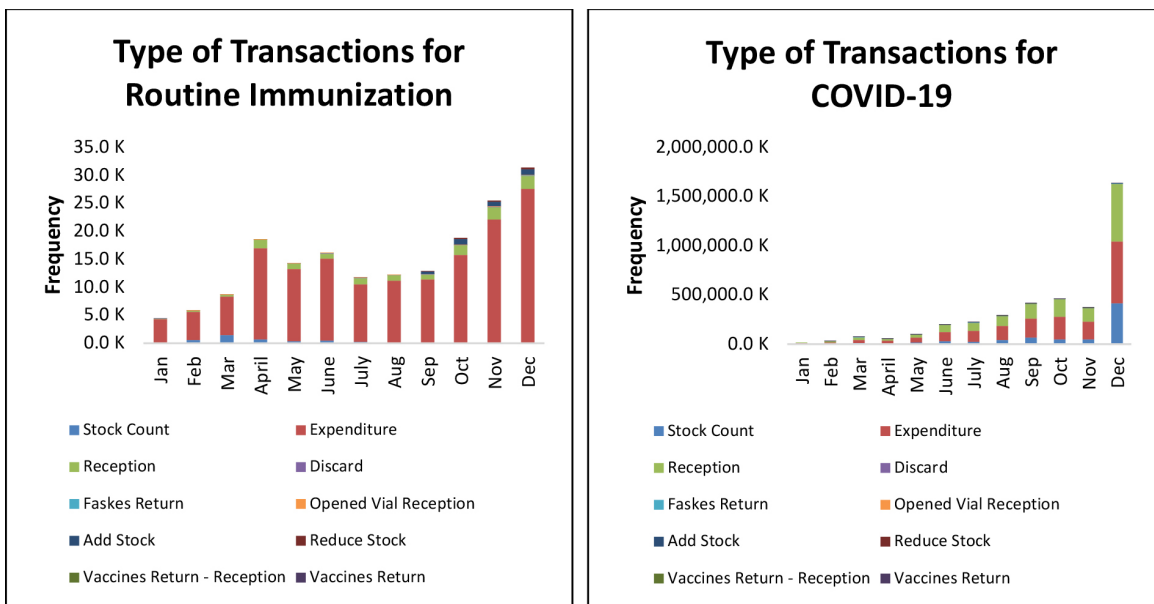
Figure 26. Transaction types for routine immunisation and COVID-19

3.8.4 Stock Availability

The vaccine availability index for routine immunisation almost reached 100% except in the month of January, where the stock availability only reached 93.59%. The vaccine availability index that has reached more than 90% is aligned with the minimum threshold that GAVI has set. Towards the end of the fourth quarter, the stock availability for routine vaccination reached 95.61%, while availability index for COVID-19 vaccination reached 77.89% (Figure 27). Furthermore, Figure 28 reflects routine immunisation experiencing stock-out in the month of January until December, which included JE (Japanese Encephalitis) Routine and Measles Routine. On the other hand, COVID-19 vaccines that were in stock from January until December were the CoronaVac COVID-19 and COVID-19 10 DS Vaccine (CoronaVac MDV).
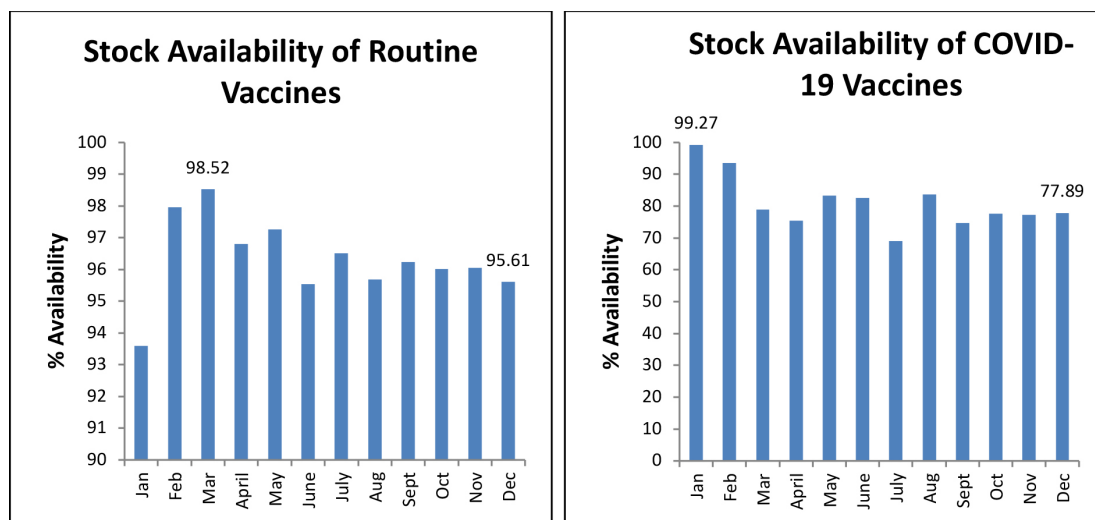
Figure 27. Stock availability of routine and COVID-19 vaccines

Stock Availability of Routine Vaccines Jan - Dec

Stock Availability of COVID-19 Vaccines Jan - Dec
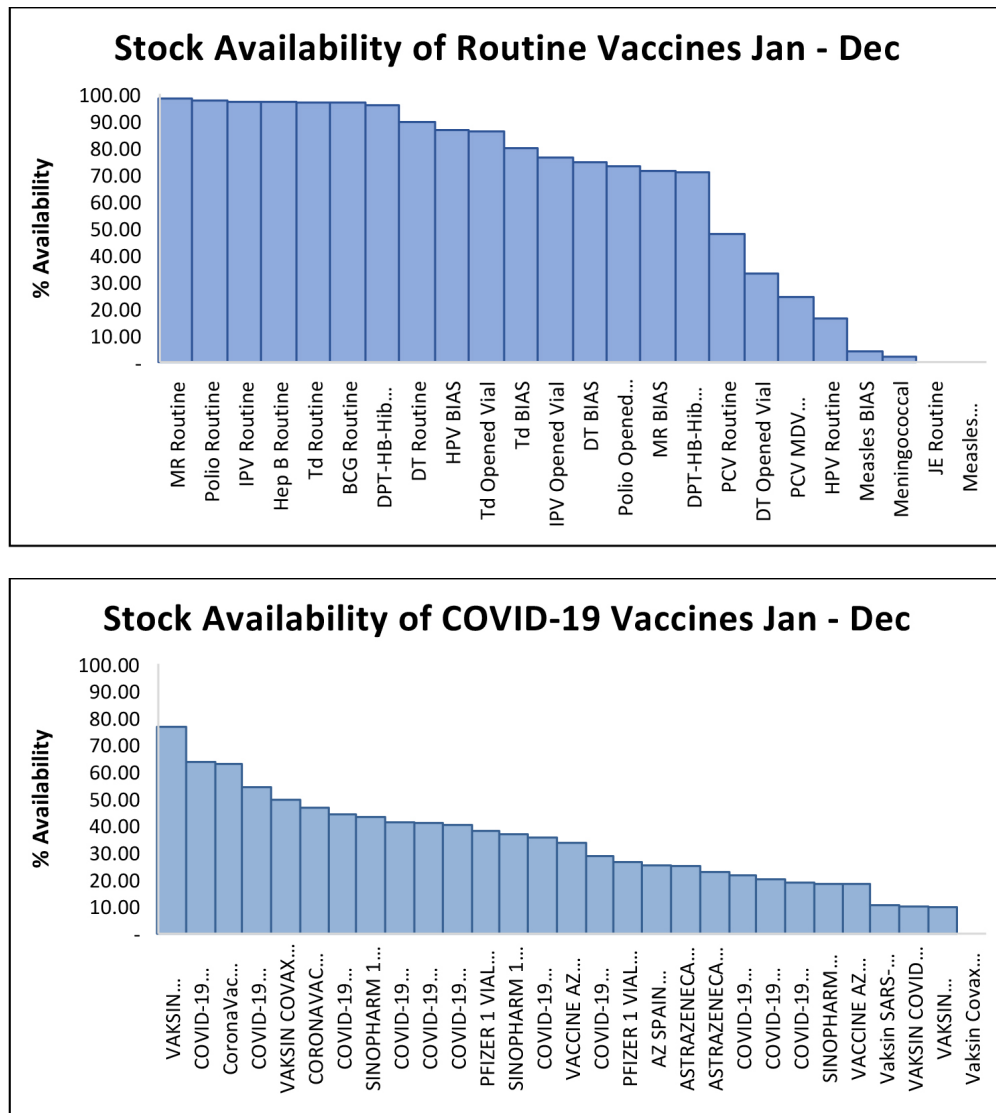
Figure 28. Types of routine and COVID-19 vaccines that were available in Jan – Dec 2021

3.8.5 Order Response Time

Prior to the use of SMILE, the vaccine distribution and logistics processes were typically complicated and time consuming. However, SMILE has improved the flow and timeline of distribution, in which data can be accessed electronically. The order response time is the time taken to process a vaccine order. Technically, it takes 5 days to create an order until the vaccine is received (Figure 29). The graph shows a positive trend for order response time for COVID-19 vaccine. The number of days needed from order until reception of vaccines has dramatically decreased. This may

be caused by system reminders from SMILE application in the form of SMS and push notification. Furthermore, the presence of monitoring activity by Bina Wilayah (*Binwil*) also helps reduce the order response time. In addition, the decreasing response time for routine immunisation may be caused by WhatsApp group notification, transparency practices of Health Offices and effective utilisation of SMILE both by users and managers.
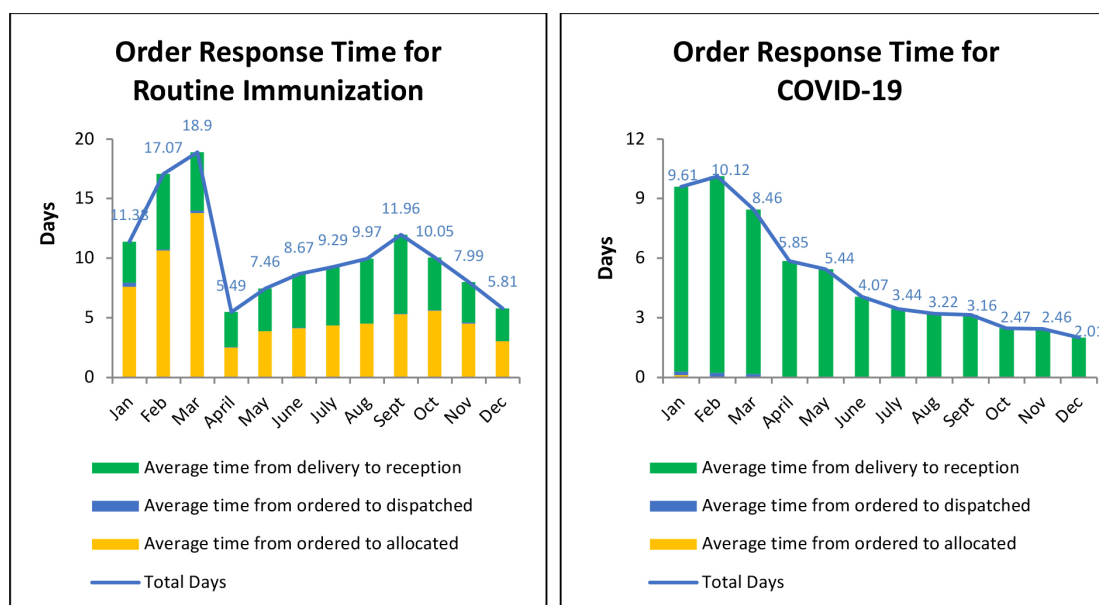
Figure 29. Order response time for routine immunisation and COVID-19 vaccination

3.8.6 Refilling Stocks Up to Normal Limit

SMILE records the time needed to restock vaccines to the normal threshold. This feature has made the task of healthcare workers easier due to the notification that the SMILE system provides when vaccine stock starts to decline from the threshold that has been recommended. Figure 30 shows that the longest time needed to refill the vaccine stock is 1.98 days for routine vaccines. The graph also reflects a fluctuating trend that shows the stock refill threshold is not impacted by the use of SMILE. This may be due to the centralised procurement of vaccines in rural areas, which results in vaccine availability in rural areas which are close to the centre. Furthermore, the maximum and minimum number of vaccines and its logistics need to be confirmed. Figure 31 shows the type of routine vaccines that needed more than five days to have the stock refilled until the normal recommended threshold. These vaccines include TD Opened Vial, Polio Opened Vial, IPV Opened Vial, IPV Opened Vial, DPT-HB-HiB Opened Vial, Td BIAS, MR BIAS, HPV BIAS, DT BIAS and DT Routine. District

Health Offices with replenishment time of more than five days include Banjarmasin City, Pekanbaru City, South Tangerang City, Central Jakarta, East Jakarta, and North Jakarta (Figure 32).
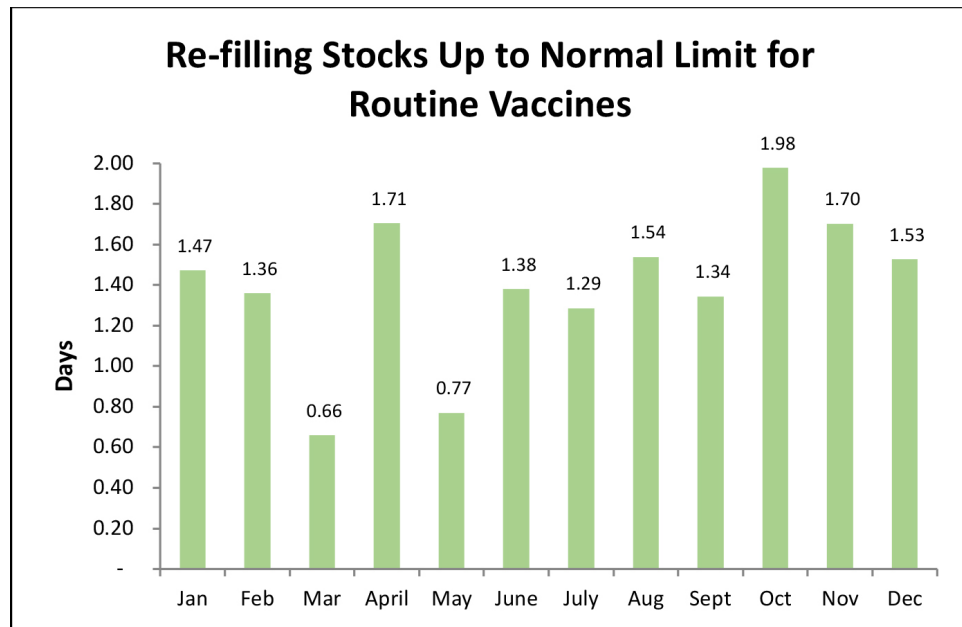
Figure 30. Routine vaccine stock refill
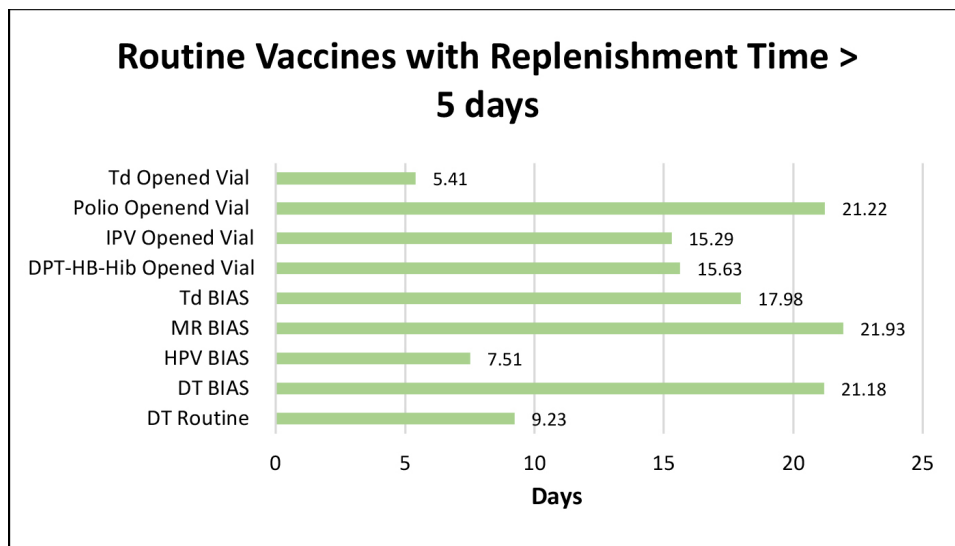
Figure 31. Routine vaccines with replenishment time of more than 5 days
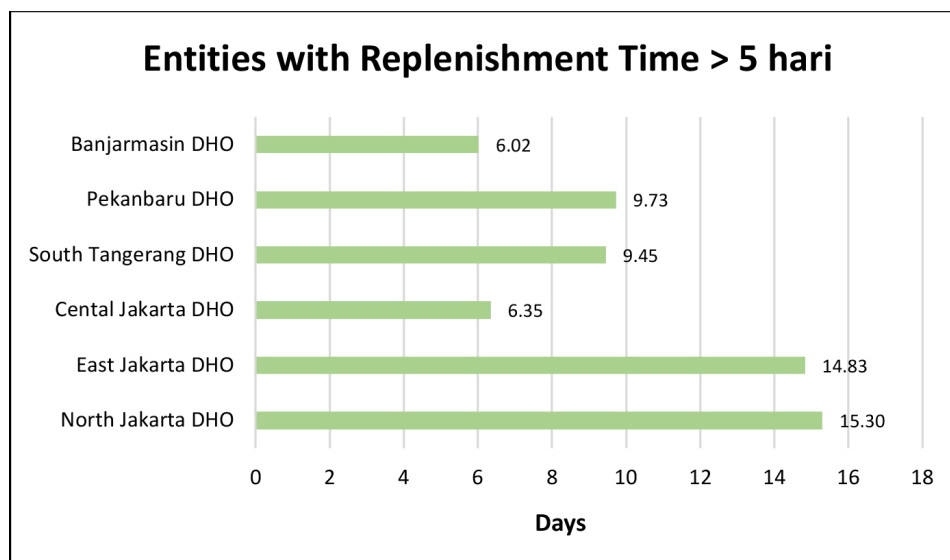
Figure 32. Entities with replenishment time of more than 5 days

3.8.7 Consumption Level

Until the end of the fourth quarter, vaccine consumption was at its peak in December, which was 1,229,853 doses. For COVID-19 vaccine, the graph reflects that there is an increase of consumption each month. In December, the total vaccine consumption was 47,845,421 (Figure 33).
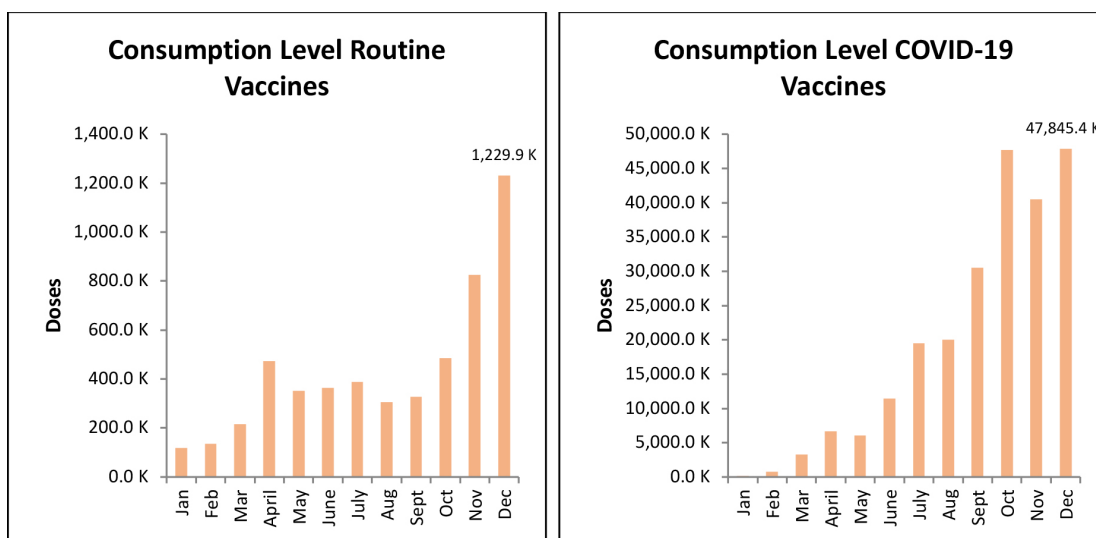
Figure 33. Consumption level for routine and COVID-19 vaccines

3.8.8 Vaccines Disposal

Vaccine disposal may occur due to various reasons, including broken vaccine vial, no presence of label in vial, leaks, deficient doses, frozen vaccine, damaged vaccine, expired vaccine, and lack of FDA tested label. In Figure 34, vaccine disposal for routine vaccines occurred most frequently in August due to a total of 107,000 vaccine doses being expired. For COVID-19 vaccines, disposal was mostly due to expired vaccines, with the highest amount of disposal in November (263,673 doses) and December (784,443 doses). Meanwhile, damaged vaccines in those months reached a total of 67,763 and 140,579 doses respectively.
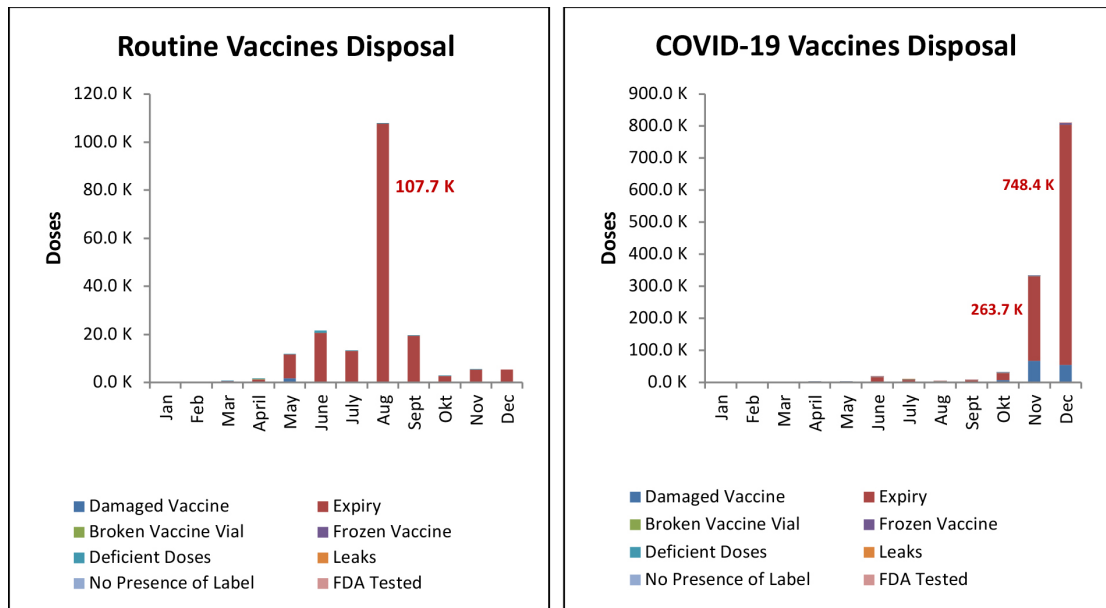
Figure 34. Routine vaccines and COVID-19 vaccines disposal

Furthermore, the types of routine vaccines that expired in August included DT BIAS, TD Routine, TD BIAS, and MR BIAS whilst COVID-19 vaccines that expired in the month of December included Pfizer Bilateral, Pfizer Covax, Moderna, AstraZeneca UK, and AstraZeneca France (MFC – Italy) (Figure 35). Most of the routine vaccine disposals were in DKI Jakarta and Riau provinces, followed by West Java, Banten and Gorontalo (Figure 36).
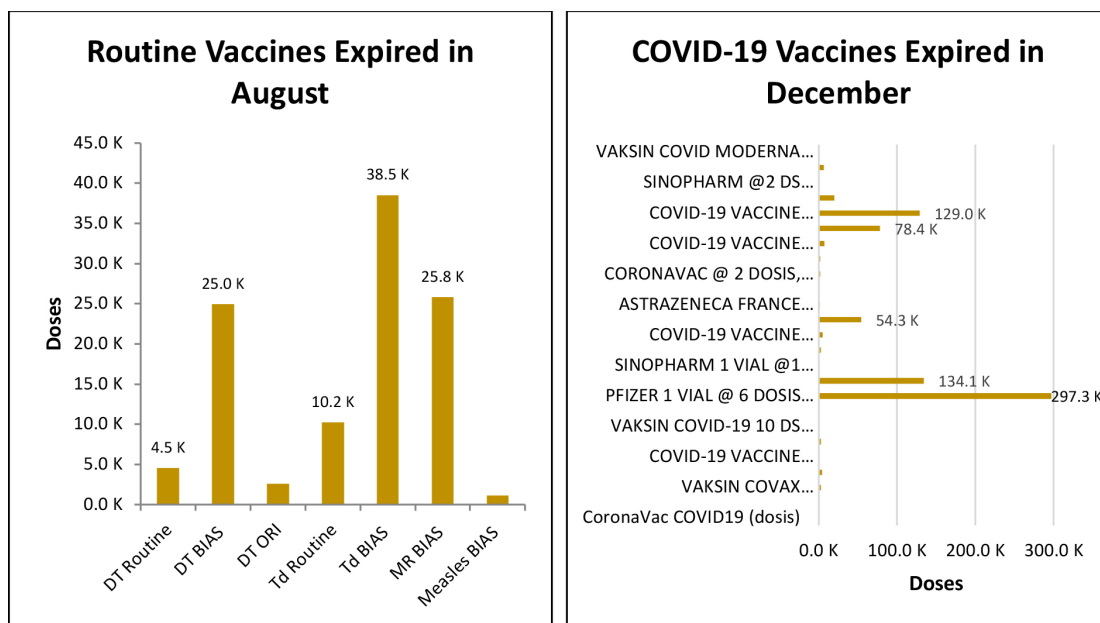
Figure 35. Types of expired routine and COVID-19 vaccines
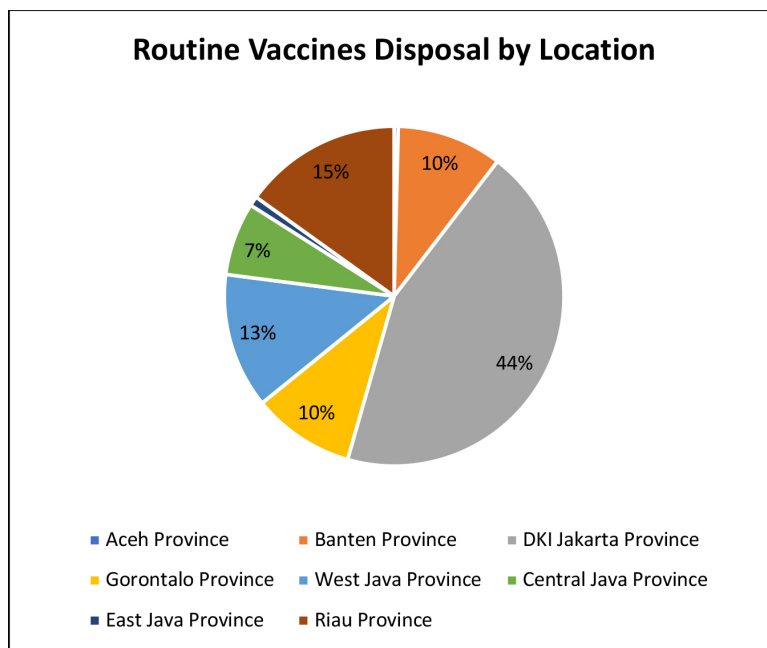
Figure 36. Routine vaccine disposal by location

3.8.9 Stock-out Frequency

Stock-out of routine immunisation and COVID-19 vaccines occurred most frequently in December, with a frequency of 640 and 41,850 times respectively (Figure 37).
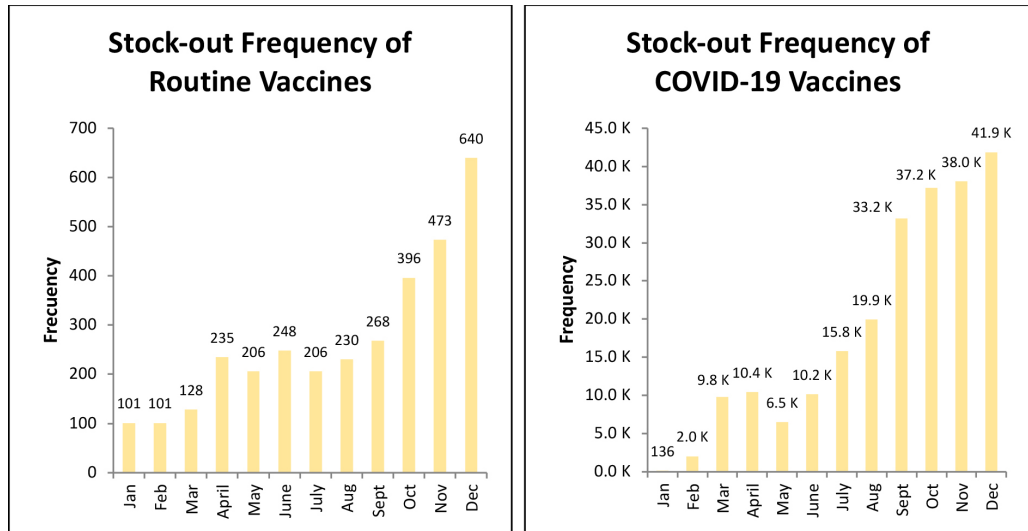
Figure 37. Stock-out frequency for routine and COVID-19 vaccines

3.8.10 Stock-out Duration

Figure 38 shows that the longest duration of stock-out is 1.54 days for routine vaccines and 3.89 days for COVID-19 vaccines. For COVID-19 vaccines, the stock-out duration decreased significantly towards the end of the fourth quarter.
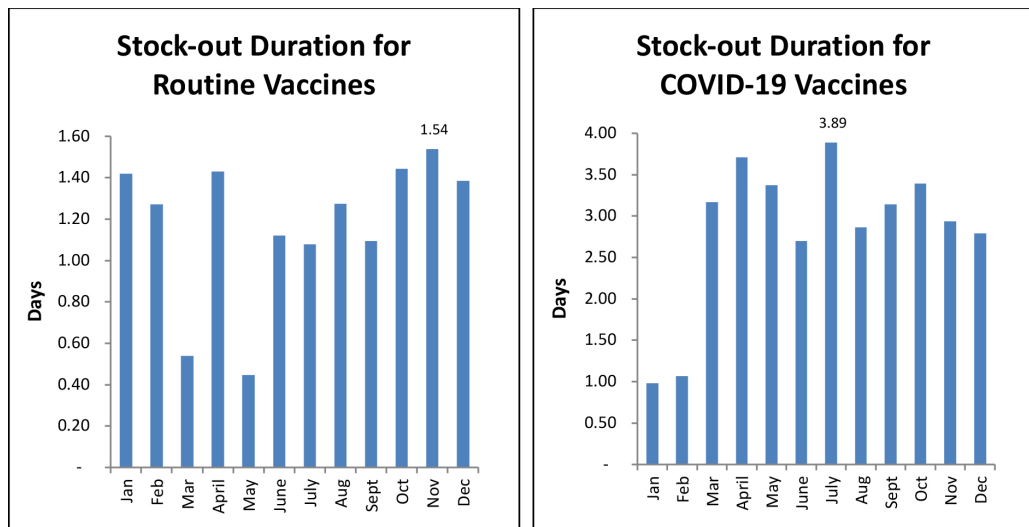
Figure 38. Stock-out duration for routine and COVID-19 vaccines

3.8.11 Top Four Stock-out Materials for Routine Vaccines

Graph below depicts the top four routine vaccines that experienced stock-out during 2021. BCG stock-out mostly occurred throughout the year whilst DPT-Hb-Hib vaccine stock-out can be seen in Q2-Q4 2021.
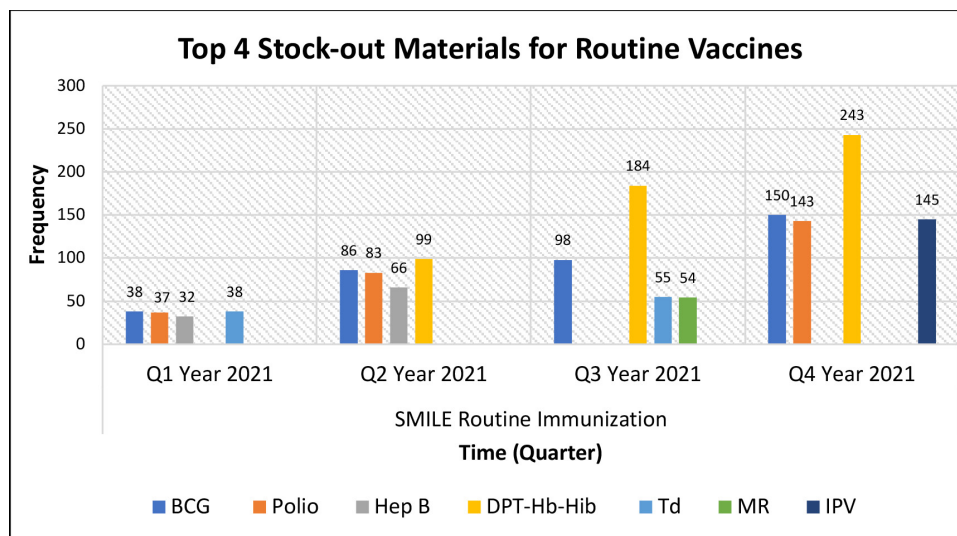
Figure 39. Top four stock-out materials for routine vaccines

3.8.12 Stock Above Maximum (Excess Stock)

Real time analysis conducted by SMILE has increased the accuracy of need-based planning of consumption that is reflected by the availability of vaccine stock. From January until December, the frequency of stock being above the recommended maximum level shows a positive trend, which means there is a decrease of unnecessary stock above the level needed. Figure 40 shows the event of overstock that occurred mostly in April and has decreased significantly since then until the fourth quarter. It can also be seen that BCG, IPV, MR, and Polio vaccines experienced excess stock throughout the year (Figure 41)..

Routine Vaccines Above Maximum
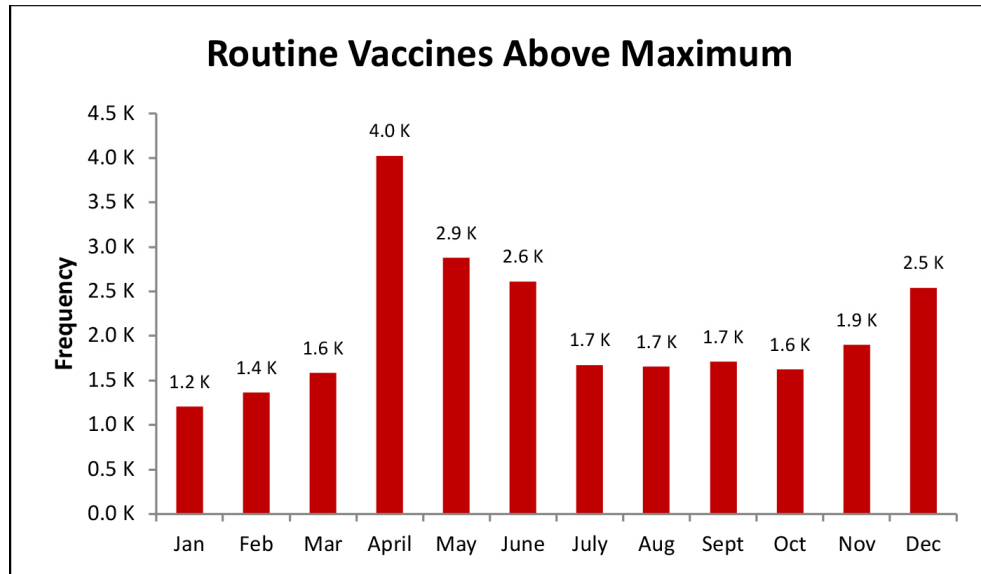
Figure 40. Overstock frequency of routine vaccine above the maximum level

Top 4 Excess Materials for Routine Vaccines
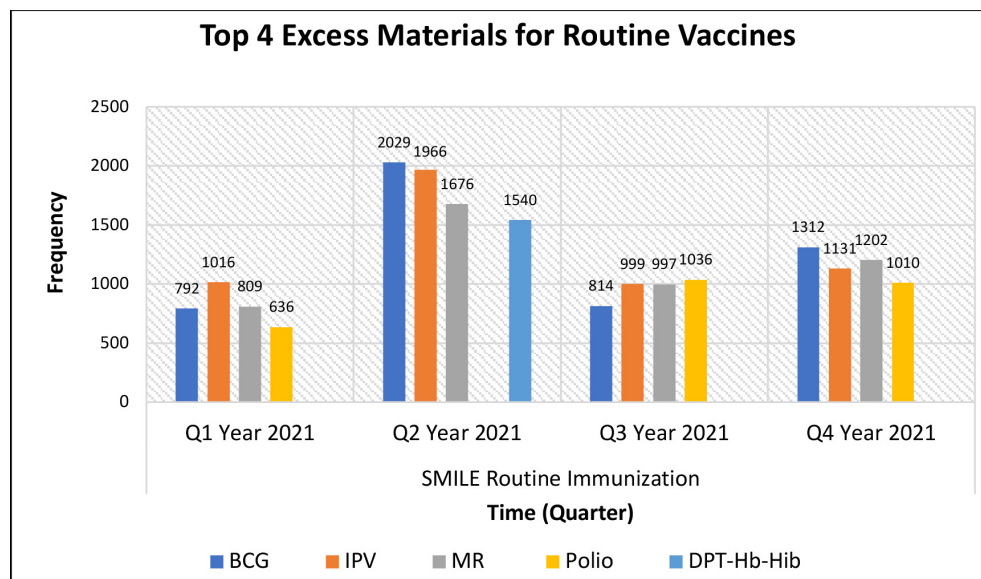
Figure 41. Top four excess materials for routine vaccines

3.8.13 Stock Count, Stock Addition, and Stock Reduction

Stock counting is the transaction that is performed as the first step to input stock data into the system, or to reset stock data when mistakes upon entry occur, and/or there is unmatched data between the system and stock count. SMILE data shows that stock counting for routine vaccines occurred mostly in April (the first go-live), which reached 1,050,709 doses. The addition and reduction of stock occurred initially in September, due to inadequate stock counting monitoring system. Monitoring of stock addition and reduction data need to be performed to ensure that the data in the system matches those of the physical stock. Figure 42 shows the stock addition and reduction data input which occurred mostly in West Java province, due to audit purposes.

Stock Count for Routine Vaccines

Stock Addition for Routine Vaccines

- COVID-19 Allocation
- Other
- Audit
- Local Government Budget (APBD)
- Wrong Batch Number/Expiry Date
- Moved to ORI/BIAS
- Unmatched Stock
- Input Error
- Moved from BIAS
- Moved from Routine
- Moved to Routine/BIAS
- Moved from ORI
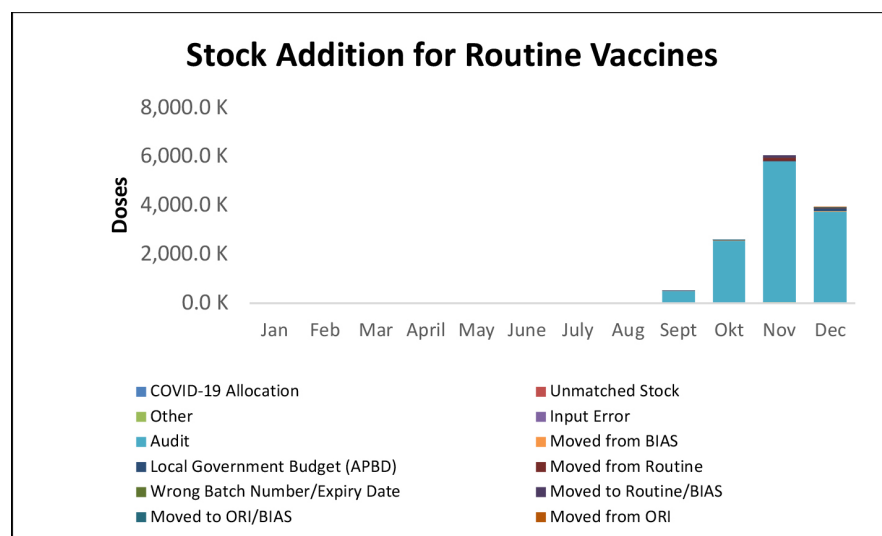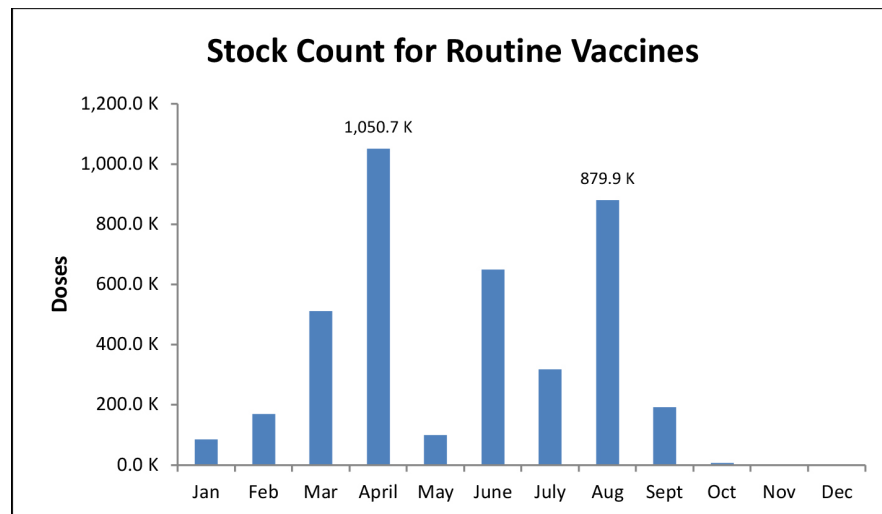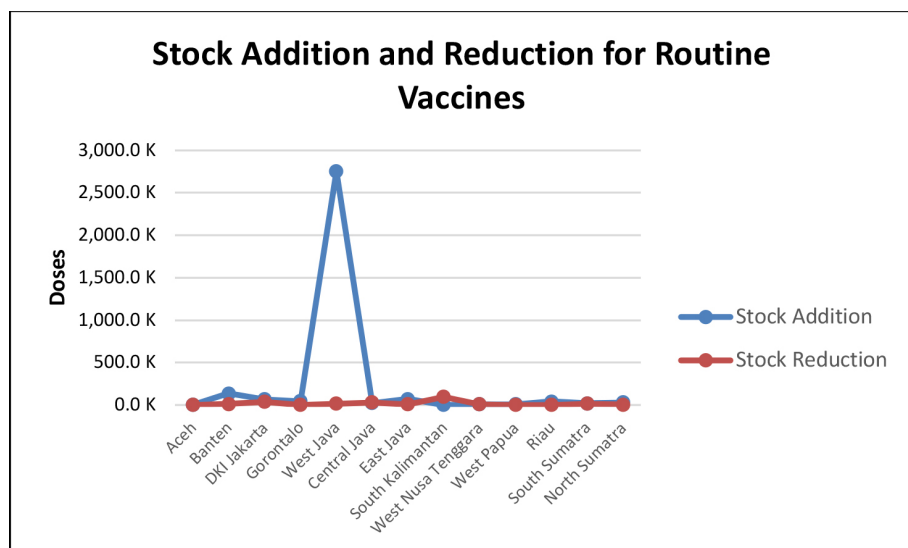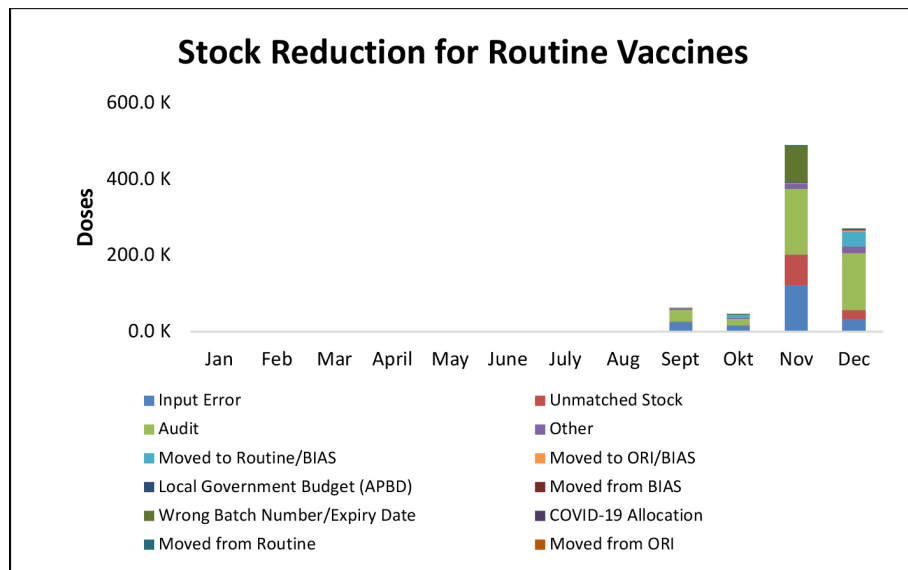
Figure 42. Stock counting, addition, and reduction of routine vaccines

3.8.14 Over and Under Supply in Distribution Chain for Routine Immunisation

SMILE helps to closely monitor inventory in each step of the distribution supply chain, starting from the order, distribution, and refill (Figure 43). The graph shows the strength and limitation of the routine vaccine supply chain in the distribution, which is an important function to optimise vaccine distribution. The difference in the supply chain distribution processes can be identified, reported, analysed, and resolved in an efficient and timely manner.
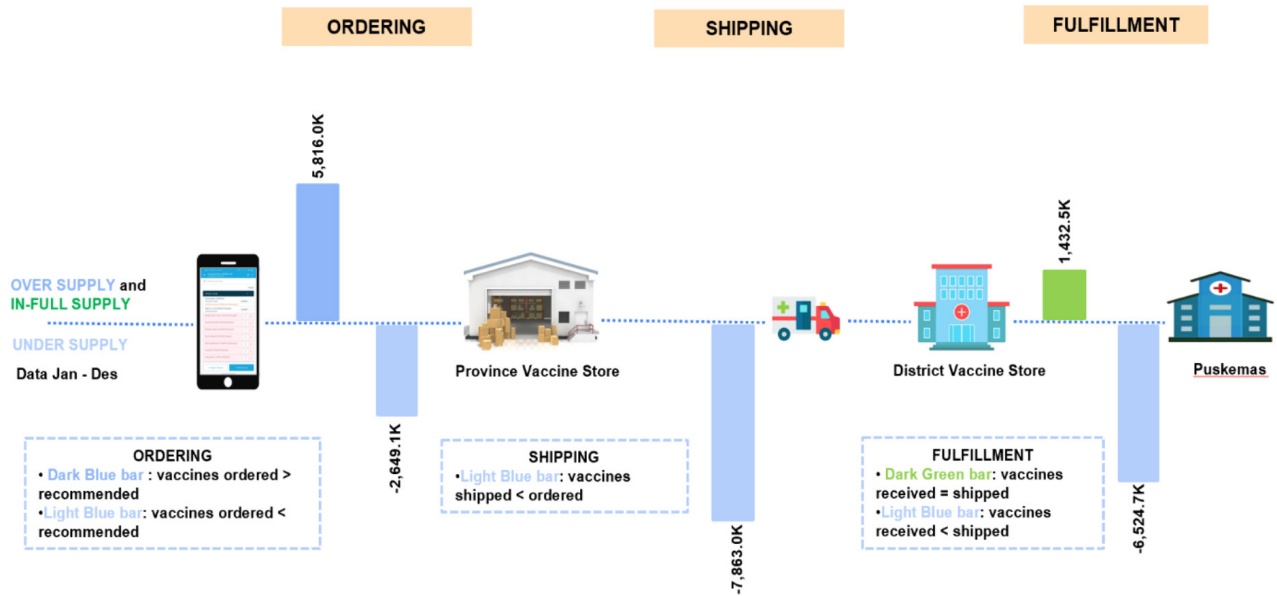
Figure 43. Over and under supply in distribution chain for routine immunisation

3.9 Wastage Rate

Some of the benefits SMILE are accurate stock visibility and fast and automated user transactions. However, the system has to be updated by the users. To determine if the system reflects the latest update, data on SMILE are compared with those on PCARE which records total doses of vaccines administered. This is done with the basic logic that the output value on the system will be equal or slightly higher than the number of people vaccinated, both for the first and second doses. The comparison method enables a more accurate recording and reduced the difference between the output value and the total vaccine consumption recorded in both SMILE and PCARE from 1.5% to 0.5% (Figure 44).

VACCINATION ACHIEVEMENTS IN THE LAST 42 WEEKS
Weekly Comparison between Dashboard PCARE and SMILE
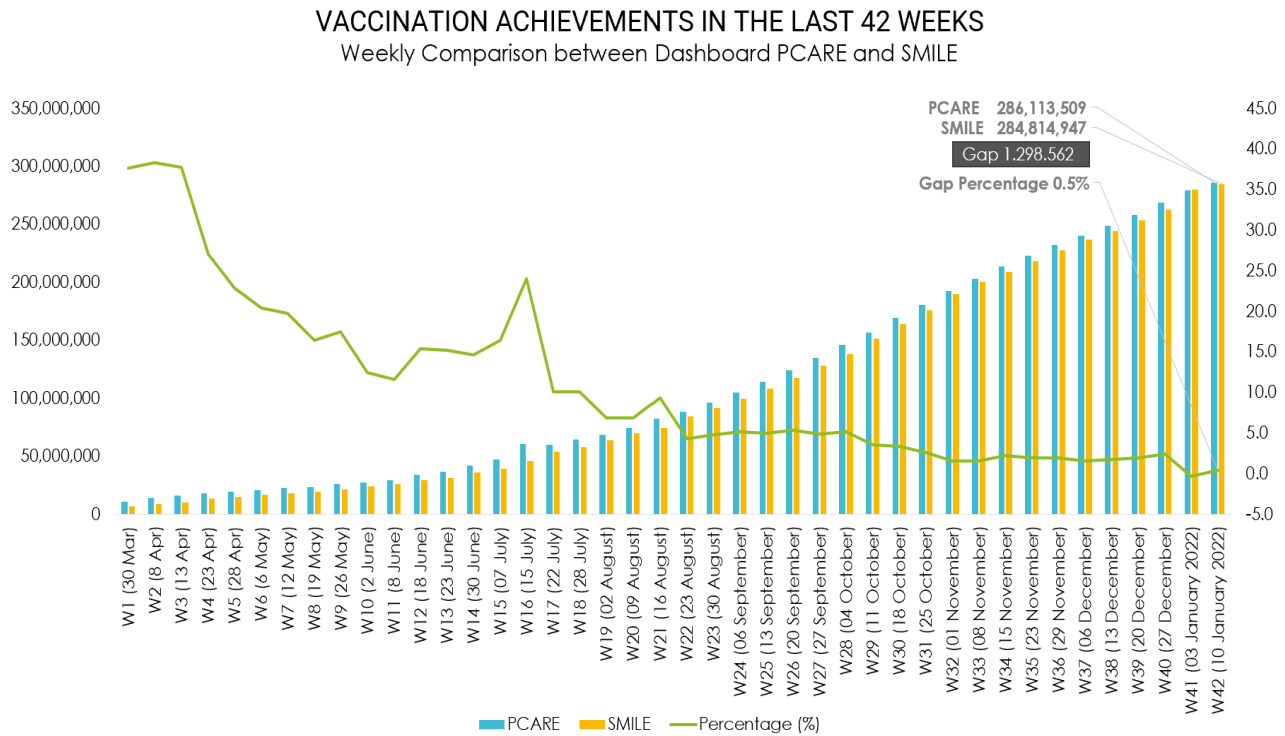
Figure 44. Total vaccine consumption (Source: SMILE) compared to total vaccine administered (Source: PCARE) updated 10 Jan 2022

The vaccination coverage in Indonesia for the 1st, 2nd, and 3rd dose reached 137% compared to the baseline target of vaccination participation. SMILE contributed to 137% of the vaccine distribution (Table 7), which is higher than the number of target participants in the national vaccination program. DKI Jakarta, Bali, and Yogyakarta are among the provinces with high coverage and logistical output, as the achievement reached more than 100% of the baseline target. Data in PCARE shows vaccine output data to reach 128%, 103% and 98% in these provinces respectively. From the analysis, there are three provinces with a high percentage of data discrepancy when the data between PCARE and SMILE are compared. These provinces include North Maluku (7%) and Riau Island (5%).

Table 7. Total vaccine consumption (Source: SMILE) compared to total vaccine administered (Source: PCARE) per province, updated 10 January 2022

	Health Workforce Vaccination Participants	Elderly Vaccination Participants	Public Officer Vaccination Participants	Teenagers	Phase III	Participants in Phase I , II & III Vaccination	Target for Vaccination	Total vaccination dosage 1 and 2	Total Achievements (Dashboard)	Total vaccination dosage 1 and 2 (SMILE)	Total Achievements (SMILE)	Rank
Dki Jakarta	112.301	761.279	1.982.757	1.000.121	4.538.969	8.395.427	16.790.854	21.424.323	128%	21.175.741	126%	1
Bali	36.843	454.904	338.389	397.239	2.177.755	3.405.130	6.810.260	7.021.283	103%	6.887.567	101%	2
Yogyakarta	33.799	472.852	334.754	311.596	1.726.698	2.879.699	5.759.398	5.623.379	98%	5.625.584	98%	3
Kepulauan Riau	14.121	87.128	128.893	207.663	1.143.230	1.581.035	3.162.070	2.896.399	92%	2.765.237	87%	4
Central Java	164.917	3.681.475	2.214.637	3.371.070	19.295.707	28.727.806	57.455.612	41.653.379	72%	41.445.877	72%	5
Kepulauan Bangka Beli	11.099	95.863	89.573	151.433	789.856	1.137.824	2.275.648	1.645.431	72%	1.674.838	74%	6
North Kalimantan	7.091	33.254	60.229	77.891	367.207	545.672	1.091.344	780.081	71%	804.225	74%	7
East Java	189.907	4.335.549	2.070.774	3.586.141	21.643.835	31.826.206	63.652.412	44.545.774	70%	43.173.351	68%	8
East Kalimantan	28.218	189.533	284.193	397.462	1.974.995	2.874.401	5.748.802	3.945.214	69%	3.887.809	68%	9
West Nusa Tenggara	27.638	368.117	326.283	533.491	2.655.109	3.910.638	7.821.276	5.351.105	68%	5.483.481	70%	10
Jambi	23.714	222.250	236.609	364.233	1.839.387	2.686.193	5.372.386	3.646.733	68%	3.790.167	71%	11
Banten	45.566	643.607	456.150	1.207.002	6.877.059	9.229.384	18.458.768	12.461.610	68%	11.972.146	65%	12
West Java	181.701	3.408.940	2.195.338	4.867.047	27.254.788	37.907.814	75.815.628	50.272.289	66%	50.285.253	66%	13
North Sumatera	71.058	1.093.446	879.798	1.586.864	7.788.393	11.419.559	22.839.118	14.751.551	65%	14.703.176	64%	14
Bengkulu	15.471	133.450	164.190	206.643	1.034.038	1.553.792	3.107.584	1.996.540	64%	1.955.386	63%	15
Gorontalo	8.569	76.882	105.095	127.071	620.792	938.409	1.876.818	1.191.628	63%	1.227.668	65%	16
Lampung	35.601	704.246	409.854	880.203	4.615.322	6.645.226	13.290.452	8.424.802	63%	8.650.286	65%	17
North Sulawesi	21.782	259.465	194.979	245.339	1.359.120	2.080.685	4.161.370	2.623.019	63%	2.481.635	60%	18
Central Kalimantan	19.927	141.016	198.975	283.576	1.392.610	2.036.104	4.072.208	2.544.373	62%	2.473.597	61%	19
South Sumatera	49.007	597.071	439.477	846.683	4.370.858	6.303.096	12.606.192	7.748.810	61%	7.796.521	62%	20
Riau	32.923	322.466	349.418	684.190	3.451.350	4.840.347	9.680.694	5.937.461	61%	5.905.073	61%	21
South Sulawesi	58.858	753.919	694.477	978.890	4.571.997	7.058.141	14.116.282	8.248.514	58%	8.244.401	58%	22
West Kalimantan	25.020	350.692	291.654	569.699	2.635.412	3.872.477	7.744.954	4.493.186	58%	4.506.622	58%	23
South Kalimantan	26.575	258.552	319.779	402.121	2.154.110	3.161.137	6.322.274	3.648.885	58%	3.550.305	56%	24
West Sumatera	32.391	489.575	400.274	589.723	2.896.546	4.408.509	8.817.018	5.023.406	57%	5.087.663	58%	25
East Nusa Tenggara	32.221	405.566	402.222	582.844	2.408.586	3.831.439	7.662.878	4.197.956	55%	3.985.718	52%	26
Central Sulawesi	24.596	196.628	225.263	314.609	1.374.811	2.135.907	4.271.814	2.338.449	55%	2.274.095	53%	27
Southeast Sulawesi	20.436	157.296	247.006	296.410	1.281.431	2.002.579	4.005.158	2.132.233	53%	2.006.068	50%	28
West Sulawesi	9.445	89.146	111.643	163.725	715.281	1.089.240	2.178.480	1.158.495	53%	1.124.015	52%	29
Aceh	56.470	339.125	478.489	577.015	2.577.792	4.028.891	8.057.782	4.202.045	52%	3.967.337	49%	30
North Maluku	9.151	74.323	115.045	145.842	609.731	954.092	1.908.184	972.274	51%	836.350	44%	31
Maluku	14.255	127.308	174.705	215.890	885.532	1.417.690	2.835.380	1.262.510	45%	1.173.393	41%	32
West Papua	8.564	50.834	116.328	127.914	493.762	797.402	1.594.804	679.683	43%	683.109	43%	33
Papua	19.529	177.361	289.919	407.850	1.689.112	2.583.771	5.167.542	1.270.689	25%	1.211.253	23%	34
Gudang Vaksin P2P										2.000.000		
Grand Total	1.468.764	21.553.118	17.327.169	26.705.490	141.211.181	208.265.722	416.531.444	286.113.509	137%	284.814.947	137%	

Based on the total vaccine consumption and total vaccine administered, we are able to count the wastage rate in the form of percentage of vaccine disposed (both opened vials and unopened vials). The formula to count the wastage rate is as follows.

$$\text{Vaccine usage rate} = \frac{\text{total vaccine administered}}{\text{total vaccine consumed}}$$

$$\text{Vaccine wastage rate} = 100 - \text{vaccine usage rate}$$

Therefore, the average wastage rate of vaccine in Indonesia for 2021 was 1% (assuming 1 vial = 10 doses). When analysed according to each province, the wastage rate in each province for 2021 is as follows (Table 8):

Table 8. Wastage rate per province in 2021

Data SMILE-PCARE per 2 Jan 2022

Province Code	Province	1st Dose	2nd Dose	3rd Dose for Health Workers	Total Vaccine Doses Administered (PCARE)	Total Vaccine Doses Consumed (SMILE)	Usage Rate (asume 1 vial = 10 doses)	Wastage Rate (doses)	Wastage Rate (percentage)
11	PROV. ACEH	2,714,910	1,194,799	38,400	3,948,109	3,723,471	10.6	-	0%
12	PROV. SUMATERA UTARA	8,607,715	5,627,625	61,457	14,296,797	14,299,973	10.0	0.0	0%
13	PROV. SUMATERA BARAT	3,008,273	1,900,089	27,422	4,935,784	5,020,954	9.8	0.2	2%
14	PROV. RIAU	3,689,767	2,014,768	26,706	5,731,241	5,762,967	9.9	0.1	1%
15	PROV. JAMBI	2,064,343	1,479,529	17,655	3,561,527	3,756,663	9.5	0.5	5%
16	PROV. SUMATERA SELATAN	4,809,241	2,697,383	37,844	7,544,468	7,639,979	9.9	0.1	1%
17	PROV. BENGKULU	1,171,146	761,084	10,062	1,942,292	1,895,224	10.2	-	0%
18	PROV. LAMPUNG	5,066,314	3,067,634	29,283	8,163,231	8,365,820	9.8	0.2	2%
19	PROV. KEPULAUAN BANGKA BELITUN	917,097	674,733	9,934	1,601,764	1,634,355	9.8	0.2	2%
21	PROV. KEPULAUAN RIAU	1,602,673	1,223,773	13,831	2,840,277	2,714,875	10.5	-	0%
31	PROV. DKI JAKARTA	11,822,257	9,304,363	118,413	21,245,033	21,060,081	10.1	-	0%
32	PROV. JAWA BARAT	28,810,786	20,179,288	170,843	49,160,917	49,839,833	9.9	0.1	1%
33	PROV. JAWA TENGAH	22,798,085	17,299,505	173,047	40,270,637	40,248,847	10.0	-	0%
34	PROV. DI YOGYAKARTA	2,932,033	2,568,229	38,396	5,538,658	5,572,847	9.9	0.1	1%
35	PROV. JAWA TIMUR	25,071,657	18,150,327	199,612	43,421,596	42,605,795	10.2	-	0%
36	PROV. BANTEN	7,251,930	4,899,817	44,210	12,195,957	11,752,113	10.4	-	0%
51	PROV. BALI	3,837,266	3,101,476	40,349	6,979,091	6,853,341	10.2	-	0%
52	PROV. NUSA TENGGARA BARAT	3,120,985	2,099,846	20,516	5,241,347	5,428,058	9.7	0.3	3%
53	PROV. NUSA TENGGARA TIMUR	2,704,689	1,351,726	24,757	4,081,172	3,925,174	10.4	-	0%
61	PROV. KALIMANTAN BARAT	2,631,555	1,693,521	24,250	4,349,326	4,423,177	9.8	0.2	2%
62	PROV. KALIMANTAN TENGAH	1,552,700	897,169	18,378	2,468,247	2,410,975	10.2	-	0%
63	PROV. KALIMANTAN SELATAN	2,317,083	1,239,045	24,038	3,580,166	3,500,514	10.2	-	0%
64	PROV. KALIMANTAN TIMUR	2,209,949	1,605,968	28,661	3,844,578	3,832,689	10.0	-	0%
65	PROV. KALIMANTAN UTARA	438,105	319,889	6,030	764,024	791,872	9.6	0.4	4%
71	PROV. SULAWESI UTARA	1,582,382	973,666	16,296	2,572,344	2,436,116	10.6	-	0%
72	PROV. SULAWESI TENGAH	1,479,874	763,542	14,147	2,257,563	2,222,906	10.2	-	0%
73	PROV. SULAWESI SELATAN	5,068,269	2,886,953	36,712	7,991,934	8,025,991	10.0	0.0	0%
74	PROV. SULAWESI TENGGARA	1,391,643	659,829	13,242	2,064,714	1,916,504	10.8	-	0%
75	PROV. GORONTALO	724,089	433,044	5,143	1,162,276	1,203,792	9.7	0.3	3%
76	PROV. SULAWESI BARAT	710,616	404,732	5,421	1,120,769	1,110,665	10.1	-	0%
81	PROV. MALUKU	812,403	384,616	6,448	1,203,467	1,149,291	10.5	-	0%
82	PROV. MALUKU UTARA	654,659	290,895	3,791	949,345	826,712	11.5	-	0%
91	PROV. PAPUA	726,185	522,190	7,017	1,255,392	1,202,903	10.4	-	0%
92	PROV. PAPUA BARAT	410,607	252,496	3,124	666,227	664,978	10.0	-	0%
	P2P Vaccine Warehouse					2,000,000		-	
					278,950,270	279,819,455	10.0	-	
							10.1	0.1	1%

3.10 Lateral Transfer of COVID-19 Vaccines between Provinces

SMILE provided information on vaccine stockpiles and helped the MoH to reallocate vaccines from one region to another. Reallocation of doses from provinces with excess vaccine stocks/low vaccination rate to provinces with vaccine shortages/high vaccination rate has been done to combat COVID-19 and prevent future pandemic. Figure 45 shows the top three provinces which reallocated COVID-19 vaccines were Banten, Yogyakarta, and West Java, whilst the recipient provinces were Central Java, East Java, and South Sumatera.
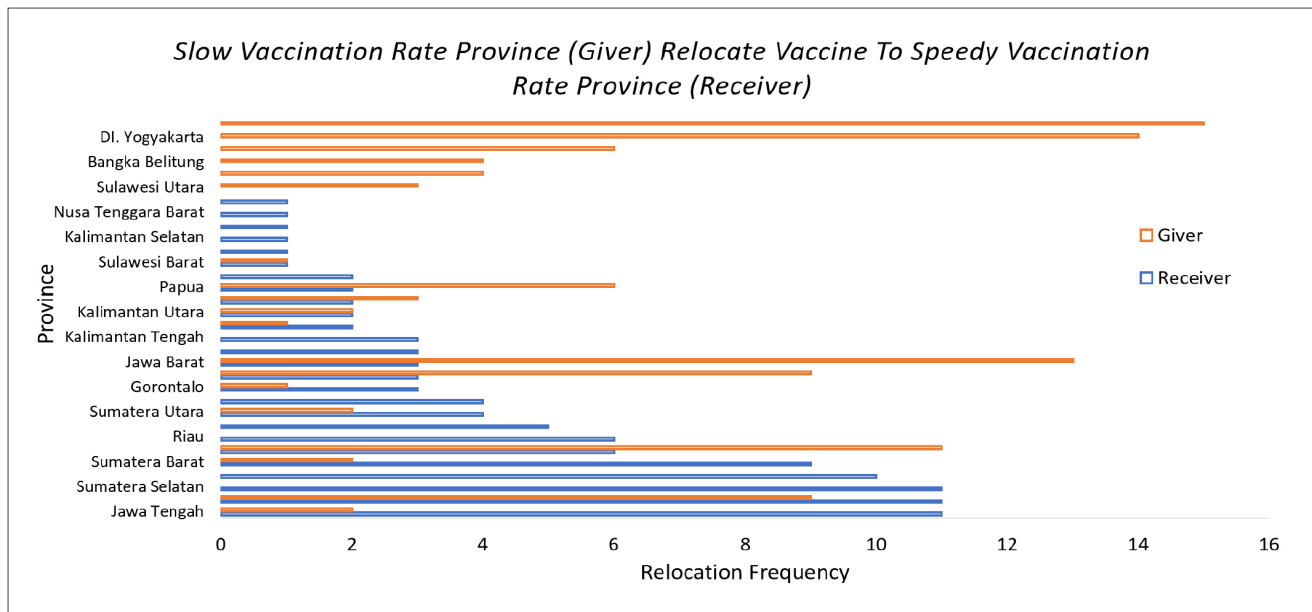
Figure 45. Lateral transfer between provinces

3.11 SMS and Email Notification

The SMILE alarm system is another strength of the application. This reminder makes it easier for users to ensure quality of vaccines, as well as to take actions needed to prevent vaccine spillage and/or delayed order in response to potential stockout in health facilities (Figure 46). The SMS notifications from SMILE include notification for stock below minimum threshold, stockout, expired vaccine, stock above the maximum threshold, stock being on the normal level, order being shipped, and event reporting (Report Incident ticketing menu). The SMS notification is sent to the provincial health office and district/city health office so that actions may be taken within health facilities. While this notification cost money, the cost is relatively small compared to the potential risk of events that might affect vaccine quality (Table 9).
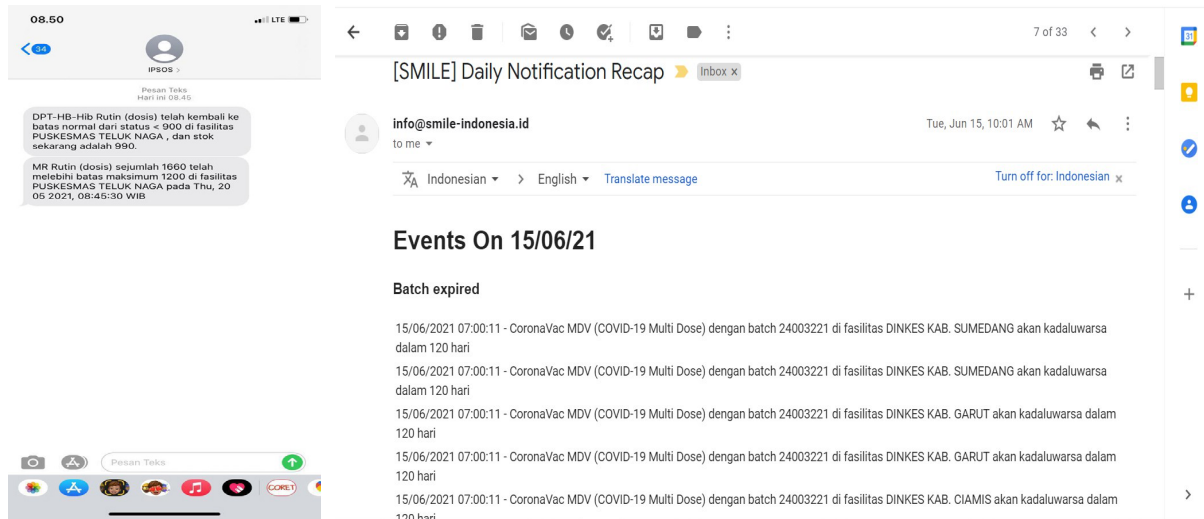
Figure 46. SMS and Email Notification

Table 9. SMS and Email notification needs

Type	2020	2021	2022	2023	2024
SMS (Number of SMS and Price in IDR	75,600 SMS	324,000 SMS	648,000 SMS	864,000 SMS	1,080,000 SMS
	IDR 40,824,000	IDR 174,960,000	IDR 349,920,000	IDR 466,560,000	IDR 583,200,000
Email (Number of emails and Price in IDR)	25,200 emails	108,000 emails	216,000 emails	288,000 emails	360,000 emails
	IDR 75,600	IDR 324,000	IDR 648,000	IDR 864,000	IDR 1,080,000

*Assessment need for 9 SMS and 3 Emails per one Puskesmas and Health Department. Price per SMS: IDR 540 per SMS: (https://www.gosmsgateway.com/prices.php (Masking for Broadcast). Price per email: IDR 3,000 per 1000 emails (https:// aws.amazon.com/ses/pricing/)

CHAPTER IV.
SMILE USER SATISFACTION ASSESSMENT

4.1 Success, Impression, and Expectation of SMILE

The SMILE Project invited several representatives from Provincial Health Offices and the Ministry of Health in a series of end-of-year meetings that were held offline on 21st–27th November 2021. The meetings served as a forum for the relevant agencies to convey their impressions and expectations of SMILE. During an FGD, one of the important points expressed by Provincial Health Offices as SMILE users was that SMILE successfully carried out tasks which were previously performed manually by health workers. General inputs such as network quality, need for better UI/UX development, and other technical inputs were related to routine application development cycles. In addition, SMILE needs to be fully integrated with other supporting information systems. Testimonials from Health Offices may be accessed at the following link https://drive. google.com/file/d/1IS2LYj3i0ISXdCyVILSN3-LzIYR--7TR/view.

4.2 SMILE Evaluation Using the Technology Acceptance Model (TAM)

The SMILE survey using TAM aims to determine user behaviour/user satisfaction with the SMILE application. This activity will be carried out in 2022 using existing funding sources in that year.

CHAPTER V.
ASSESSMENT ON IMPROVEMENT OF NATIONAL VACCINATION COVERAGE

5.1 SMILE for Auditors

SMILE is used by the Supreme Audit Agency (BPK) to monitor real/physical data of COVID-19 vaccines in all provinces in Indonesia. The designation of SMILE for COVID-19 vaccines recording has made SMILE a credible application, and its validity can be accounted for because the data recorded are updated in real-time.

5.2 Payment on Delivery for Biofarma Service Based on SMILE Data

The vaccine payment made by the Ministry of Health to the COVID-19 vaccines distributor, Biofarma, was based on Biofarma's distribution data. The audit results of the Inspectorate General of the Ministry of Health found that there was a discrepancy between distribution data recorded in SMILE and SMDV (Biofarma application). Since October 2021, the Inspectorate General recommended that vaccine payment to Biofarma must be made in accordance with the "Vaccine received" status from Health Offices based on SMILE data (Payment on Delivery), not based on Biofarma's application.

5.3 SMILE Project End-of-Year Meetings

The SMILE Project end-of-year meetings were conducted offline on 21–27 November 2021 and included the participation of high-level stakeholders from MoH and health agencies at provincial level. The meetings addressed challenges and opportunities, handover strategies, and commitments to be followed up. The specific objectives were: (1) capturing feedback and expectations from high level stakeholders in MoH and health agencies at provincial level as users; (2) identifying technical issues for improvements and hand over strategies milestones; and (3) defining benefits and challenges to create a vision for SMILE for 2022-2024. An FGD with provincial Health Offices was successfully carried out with the aim of listening to and accommodating expectations and feedback of the SMILE App. Several new features on the app and transition strategy in 2022 were also introduced and presented at the meeting (Figure 47).

Figure 47. SMILE End-of-Year Meeting 21-27 November 2021

SMILE IS TRUSTED TO BE USED AS AN AUDIT
TOOL BY THE SUPREME AUDIT AGENCY (BPK RI)
TO MONITOR REAL/PHYSICAL DATA OF COVID-19
VACCINES IN ALL PROVINCES IN INDONESIA.

5.4 UNDP Indonesia's Resident Representative Visited SMILE Project Site in Lombok

Mr. Norimasa Shimomura as the Resident Representative of UNDP Indonesia inspected the reconstruction of Labuhan Lombok Community Health Centre in Central Lombok on 28 November 2021. He also paid a visit to the temporary Community Health Centre to monitor the utilisation of the application for COVID-19 vaccines. He met the head of the primary health care facility and the SMILE operator to hear their thoughts and expectations of SMILE. Following his visit to Central Lombok, Mr. Norimasa also visited the mass vaccination site in Pondok Pasri District, Ampenan (Figure 48).

Figure 48. UNDP Indonesia's Resident Representative visit to Lombok

5.5 Joint Monitoring Between Multilateral Health Cooperation Bureau of the Ministry of Health and UNDP Indonesia in Four Locations

TThe Multilateral Health Cooperation Bureau is one of UNDP's main counterparts. The bureau, together with the Ministry of Foreign Affairs, are in charge of supervising cooperation with foreign parties and the United Nations. The bureau has the duty to monitor the progress and actual work of each ongoing project, including SMILE. For this reason, it selected four locations (Solo, Medan, Mataram, and Ambon cities) that represent SMILE intervention areas (Figure 49). Based on their visits,

the bureau appreciated UNDP SMILE Project contributions, especially the real-time vaccine planning and monitoring, and felt that this was the first time digitalisation could reach and be sustainable throughout Indonesia, even in difficult areas like in eastern part of Indonesia (Figure 50) and SMILE Story in Ambon (https://indonesia.un.org/en/170105-undps-smile-application-helps-health-workers-accelerate-vaccine-distribution-ambon).

Figure 49. Joint monitoring between Multilateral Health Cooperation Bureau of the Ministry of Health and UNDP Indonesia at Setabelan Primary Health Care Facility, Surakarta.

Figure 50. A health worker carrying a vaccine cool box and using SMILE App.

5.6 COVID-19 Vaccines Data Validation and Reconciliation with Biofarma

No matter how good the integration between two systems, data discrepancies may still occur. Likewise, with the Biofarma SMDV system and SMILE, after being implemented for two years, a data gap was found and it required reconciliation and further investigation by both SMDV and SMILE teams. Furthermore, the completeness of supporting documents needed to be confirmed at Health Offices at provincial, city, and district levels. To overcome this issue, the SMILE and Biofarma team had validation and reconciliation meetings on 26–30 December 2021. As a result, both SMDV and SMILE data were verified and validated (Figure 51). During the meetings, SMILE team also provided refresher training to Biofarma on responding to complaints from SMILE users quickly in the event of data discrepancies. Biofarma must now respond and take follow up actions immediately on the "Report Incident" tickets sent by SMILE users (Figure 52).
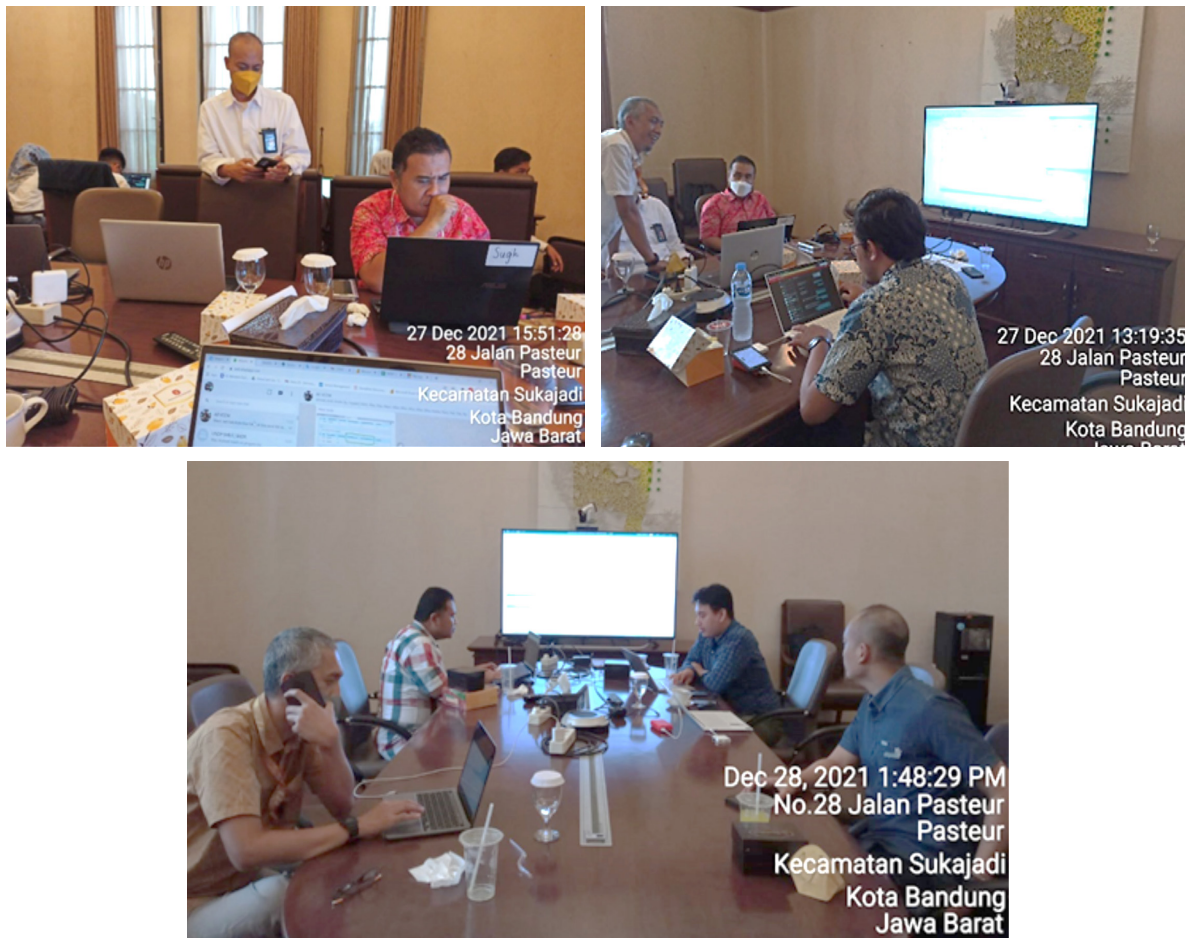
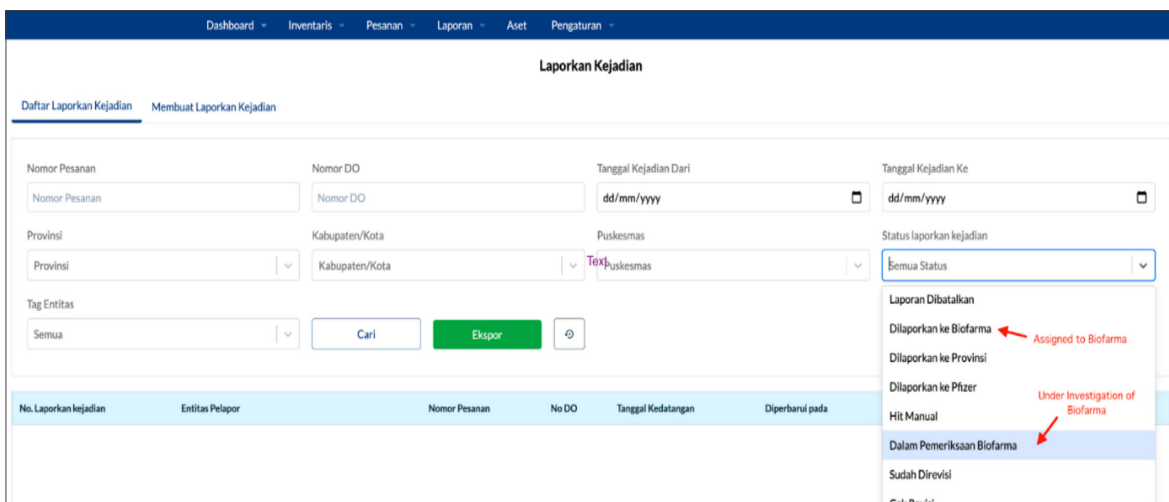*Figure 51. COVID-19 vaccine data reconciliation with Biofarma*

Figure 52. "Report Incident" ticket needs to be responded immediately by Biofarma

5.7 COVID-19 Vaccines Stock-taking

Stock-taking or inventory checking is the physical verification of the quantities and condition of COVID-19 vaccines at Health Offices and health care facilities. A more structured and systematic stock-taking was carried out using SMILE application as requested by the Inspector General of the Ministry of Health and the Financial and Development Supervisory Agency (BPKP), which resulted in a well-documented and accountable stock-taking. If data discrepancies were found between SMILE data and real vaccine records, it is the responsibility of the entities to conduct an independent investigation to fix their data. It is hoped that frequent stock-taking and better record keeping could minimise data discrepancies that commonly occur both at the national and sub-national levels.

Stock-taking event closing on 4 January 2022 was attended by 9,021 health facilities (70% of health facilities already had SMILE accounts). It was found that the number of COVID-19 vaccines recorded in the SMILE App was 46,246,499 doses while the physical checks of COVID-19 vaccines was only 43,310,072 doses (difference: 2,936,427 doses). This difference was acknowledged by health facilities participating in the stock-taking. The most common reason for the discrepancy was that health facilities had not updated their records in the SMILE App. Several other reasons were as follows:

- TNI/Polri were not aware that they had SMILE accounts,
- health care workers were on Christmas and New Year leave and did not participate in stock– taking events, and
- misinterpretation of vaccine data input related to vials and dosage unit on the SMILE App.

The figure below shows the gap and number of entities participating in the stock-taking (Figure 53).
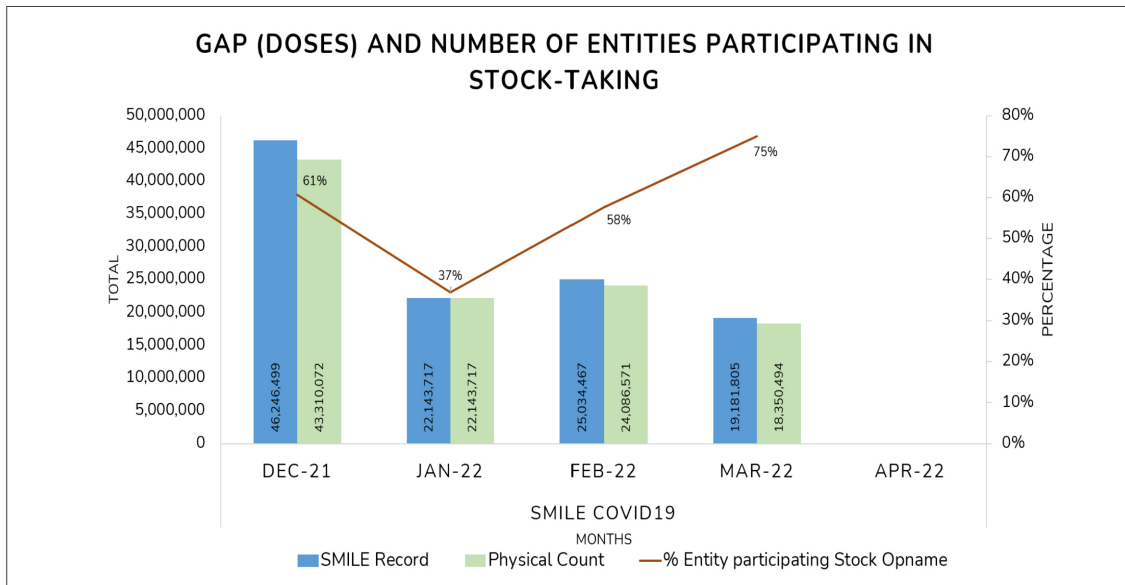
Figure 53. Gap and number of entities participating in stock-taking in Dec 2021- Mar 2022

Figure 54. COVID-19 vaccines and logistics stock-taking

CHAPTER VI.
CONCLUSION

6.1 Financial Use of GAVI Funds

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United Nations Development Programme
Interim Financial Report to the GAVI
As of 31 December 2021

Contributions reference no:
Country: **UNDP Indonesia**
Project: **00106768 - Health Governance Initiative (HEART)**
Output: **00119509 - Resp. Procurement**
Output status: **On Going**
Fund: **Programme Cost Sharing**

(in United States dollars)

	Prior years	2021	Cumulative to 2021
	(1)	(2)	(3)
Income/Revenue			
Annual Contributions Revenue[a]	2,365,959.00	-	2,365,959.00
Other Revenue[b]	-	-	-
Transfer to/from other funds	-	-	-
Refunds to donors	-	-	-
Total - Income/Revenue	2,365,959.00	-	2,365,959.00
Expenses			
Staff and other personnel costs	9,904.52	28,382.09	38,286.61
Supplies, commodities, materials	-	698.08	698.08
Equipment, vehicle and furniture including depreciation	15,944.41	45,478.62	61,423.03
Contractual services	282,143.93	478,976.38	761,120.31
Travel	2,215.90	24,012.32	26,228.22
Transfers and grants to counterparts	-	-	-
General operating and other direct costs	91,775.52	794,186.61	885,962.13
Subtotal	401,984.28	1,371,734.10	1,773,718.38
Programme support costs[c]	32,115.41	109,965.28	142,080.69
Total Expenses	434,099.69	1,481,699.38	1,915,799.07
Balance[d]	1,931,859.31	450,159.93	450,159.93
Future Expenses[e]			
Balance of un-depreciated assets & inventory purchased	-	-	-
Commitments	284,404.84	183,139.87	183,139.87
Subtotal	284,404.84	183,139.87	183,139.87
Receivables Past due, less advance receipts[e]			
Less: Contributions receivable from donors	-	-	-
Available Resources[f]	1,647,454.47	267,020.06	267,020.06
Total Contributions Revenue[g]	2,365,959.00	-	2,365,959.00
Total Contributions Revenue Received[h]	2,365,959.00	-	2,365,959.00
Total Receivables[i]	-	-	-
Deferred Revenue and Advance Receipts[j]	-	-	-

a. Contributions represent recognized revenue based on the payment schedule dates of signed agreements.
b. Other Revenue represents revenue resulting from miscellaneous activities.
c. Programme support (indirect) cost is calculated based on the expenses excluding amounts of foreign exchange gain/loss.
d. Balance in column (2) is inclusive of balance in column (1).
e. Amounts in column (2) are the balances outstanding as of the report date which are included in the available resources. Amounts in column (1) are shown for information purpose only.

f. Balance after future expenses, and contributions receivable from donors (i.e. amounts past due) have been accounted for.
g. Total value of donor contribution as per the signed date of the agreement.
h. Total cash received to-date.
i. Total outstanding amount due from donors, comprising both past due and future due receivables.
j. Contributions that have been received from donors but yet to be recognized as revenue in future years when payment schedules are realized.

This is to certify that the above statement of revenue, expenses and available resources is correct and that the expenses were incurred in connection with the approved projects for which funds have been received.

Norimasa Shimomura

10-Mar-2022

Name: Norimasa Shimomura
Title: Resident Representative

(Date)

United Nations Development Programme

Schedule of commitments
Details by expense category - 31 December 2021
(in United States Dollars)

Fund	Country	Category	Amount
GAVI	UNDP Indonesia	Contractual services	10,838.39
GAVI	UNDP Indonesia	Equipment, vehicle and furnitur including depreciation	641.92
GAVI	UNDP Indonesia	General operating and other direct costs	171,659.56
GAVI	UNDP Indonesia	Total	183,139.87

6.2 Planned Activities in the First Quarter of 2022

1. Preparation meeting on the implementation of SMILE for Routine Immunisation in Java-Bali region

In accordance with the implementation of Logistics Management Information System [LMIS] for Immunisation Program in Indonesia 2020-2024, the Ministry of Health and UNDP will finalise the application for Logistics Monitoring Information System with the decision maker and program managers, as well as the SMILE user at each level. SMILE will be enhanced with improved reporting and analysis format for routine immunisation and COVID-19 vaccination, and annual vaccine projection for all vaccine materials.

In this meeting, the SMILE team will not only finalise the features for routine immunisation, but also assist the MoH in evaluating the implementation of Stock-taking menu during 2021 to be incorporated and launched for the upcoming National Stock-taking. The SMILE team will also help the MoH to list and present the benefits of having Internet of Things as temperature loggers to monitor cold chain temperature to ensure vaccine quality.

2. SMILE scale-up for Routine Immunisation in Java-Bali region

SMILE is expected to increase the efficiency and transparency of relevant agencies and health centres in terms of vaccines and logistics recording and reporting through menus that can facilitate independent reporting and monitoring processes, to ensure that the vaccines are always well-tracked. Through SMILE scale-up for routine immunisation in Java-Bali, Provincial and District Health Offices in Java-Bali region will be able to understand and operate SMILE for routine immunisation, especially on:

- annual planning,

- vaccine allocation to city/district,

- vaccine order feature,

- monitoring and evaluation of vaccines report by utilising the reporting menu in SMILE, and

- self-monitoring and self-reporting by managing stock–taking and ticketing system if the number of vaccines received does not match the SMILE data.

3. Supportive supervision of the SMILE team and the Ministry of Health in several districts

This supportive supervision is expected to improve the COVID-19 vaccine and routine immunisation vaccines record keeping practices, especially in the areas with poor record keeping, such as Bali Province, East Java, Riau Islands, West Nusa Tenggara, East Nusa Tenggara, West Java, Sulawesi and Aceh.

4. Procurement of 4,000 temperature loggers IoT that connect with SMILE App

SMILE plans to procure 4,000 temperature loggers to ensure the quality of vaccines and minimise loss due to incorrect storage procedures.

5. Series of meetings for a robust development of SMILE App

Series meetings on the development of SMILE's new features such as, annual vaccine projection for routine immunisation, stock-taking, and mobile monitoring app will be held regularly.

6. Joint economics study on the effectiveness of SMILE App

To ensure that SMILE continues improving the vaccine cold chain logistics system, UNDP in partnership with ADP and the World Bank are planning to conduct research on cost effectiveness of supply-chain digitisation for immunisation programs at national and sub-national levels. One of the outputs of the study is to propose recommendations to the Ministry of Health to refine the SMILE business model and scale-up based on research findings.

7. Drugs and medical devices integrated into SMILE

In the future, SMILE will not only record the COVID-19 and Routine Immunisation vaccines, but will also integrate drugs and medical devices in an e-catalogue.

6.3 Sustainability Challenges

Lack of organisational capacity and commitment from Provincial/District Health Offices and Primary Health Care Facilities (Puskesmas)

Despite the increasingly tiered sub-national coordination mechanism related to SMILE, users at provincial, local, and Puskesmas levels have varying and inadequate

competence in several technical and strategic areas. This may cause issues that are often escalated to the national level. It is clear that SMILE provides rich data and analysis showing gaps and possible solutions. However, bottlenecks due to low compliance of Puskesmas staff in updating the SMILE data are still identified, and follow up on data discrepancies would take time to get responses. The bottlenecks may also be caused by communication issues or lack of understanding of the business process of digital and real-time recording. The users may not be aware of the full benefits of informed decision-making based on vaccine stock management and logistics data. On the other hand, it is imperative to have committed leaders, PIC/manager and operators who are especially assigned for system operation to implement the vision of SMILE.

6.4 Recommendations

1. Policy support to improve SMILE usage

One of the concerns is the activeness, updates, and accuracy of SMILE which can be monitored either directly through supportive supervision activities or independently by each health facility. The SMILE operators should receive a special assignment from the Health Offices and their respective health facilities. To improve accuracy and update, it is recommended that stock taking activities are carried out regularly by health facilities and checked by the Health Office or Ministry of Health.

2. Sustainability

As SMILE is expected to grow bigger - not only in scale but in complexity - it is advisable for the Ministry of Health to take more strategic roles and start to systematise and/ or outsource highly repetitive tasks. Given the experience gathered so far, it is now possible to develop an AI-enabled logistics management to perform repetitive tasks, for example the verification of stocks optimum capacity by identifying epidemic and demographics traits that fall into predetermined criteria and indicators.