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RAPID ASSESSMENT OF THE MOH COVID-19 VACCINATION INFORMATION SYSTEM IN PERU

Local Health System Sustainability Project

USAID Integrated Health Systems IDIQ Task Order 1

Local Health System Sustainability Project

The Local Health System Sustainability Project under USAID's Integrated Health Systems IDIQ contract assists low- and middle-income countries in transitioning to sustainable, self-financing health systems as a means to support access to universal health coverage. The project works with partner countries and local stakeholders to reduce financial barriers to care and treatment, ensure equitable access to essential health services for all people, and improve the quality of health services. Led by Abt Associates, the five-year, \$209 million project will build local capacity to sustain strong health system performance, supporting countries on their path to self-reliance and prosperity.

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USAID Contract No.: 7200AA18D00023/7200AA19F00014

Recommended citation: Local Health System Sustainability Project under USAID's Integrated Health Systems IDIQ. April 2022. Rapid Assessment of the MOH COVID-19 Vaccination Information System in Peru. Rockville, MD: Abt Associates.

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Acronyms

DGIESP	Dirección General de Intervenciones Estratégicas en Salud Pública (General Directorate of Strategic Public Health Interventions)
DIRESA	Dirección Regional de Salud (Regional Health Directorate)
DIRIS	Dirección de Redes Integradas de Salud (Directorate of Integrated Health Networks)
DMUNI	Dirección Ejecutiva de Inmunizaciones del MINSa (Executive Directorate of Immunization of the MOH)
DNI	Documento Nacional de Identidad (National Identity Document)
ESAVI	Evento Supuestamente Atribuido a la Vacunación e Inmunizaciones (Event Suspected To Be Attributed to Vaccination and Immunization)
EsSalud	Seguro Social de Salud (Social Health Insurance)
HIS	Sistema de Información de Salud (Health Information System)
MINSa	Ministerio de Salud (Ministry of Health)
MOH	Ministry of Health
OGTI	Oficina General de Tecnología de la Información (General Office of Information Technology)
PAHO	Pan American Health Organization
RENIEC	Registro nacional de Identificación y Estado Civil (National Registry for Identification and Civil Status)
REUNIS	Repositorio Único Nacional de Información en Salud (Single National Health Information Repository)
SISMED	Sistema Integrado de Suministro de Productos Farmacéuticos, Dispositivos Médicos y Productos Sanitarios (Integrated System for the Supply of Pharmaceutical Products, Medical Devices, and Health Products)
SRNV	Sistema de Registro Nominal de Vacunación (Nominal Vaccination Registration System)
UNICEF	United Nations Children's Fund

Executive Summary

Objective

Provide clear recommendations aimed at strengthening the Ministry of Health's (MOH's) functional capabilities and operational capacities to generate and use information for effective deployment of COVID-19 vaccination.

Methodology

The Local Health System Sustainability Project used field visits to vaccination points; interviews with health staff, MOH officials, and other stakeholders; and desk review of vaccination guidelines, processes, and tools to understand the various approaches and materials the MOH used to manage COVID-19 vaccination information. In particular, the assessment aimed at understanding the Sistema de Registro Nominal de Vacunación (SRNV, Nominal Vaccination Registration System). We evaluated three dimensions:

- The regulatory conditions for the SRNV, including the existing regulations for its development and operation, connectivity, computer infrastructure, and interoperability
- The functionality of the system, including operational functions, usability, and data security
- Data quality including timeliness, accuracy, and consistency

Data were collected in three regions, across which 17 vaccination centers were visited: 5 intramural centers¹ and 12 extramural centers. Forty-three informants were interviewed (health staff, government employees, and international cooperation officers). Based on the combined findings, the Local Health System Sustainability Project generated targeted recommendations for each dimension analyzed.

Key Findings

About operations (functionality, usability, and security)

The local team must analyze the SRNV database to generate consolidated coverage reports. These can take up to three days to produce, and require the production of parallel physical forms, which must be consolidated and manually tabulated to provide the data sets needed for reports to the national program.

Current jurisdictional data separation within the SRNV platform prevents immunization staff from knowing whether a person in their jurisdiction was vaccinated elsewhere. Accessing this information requires a search by the person's name, which conflicts with the protection of personal health information and the confidentiality laws.

Lack of clear operational protocols, and limited regulations guiding use of the SRNV, have led to uncontrolled use of alternative vaccine tracking systems. Thus, key informants reported the use of other computerized registration systems, identification data search websites, and diverse analysis programs.

The SRNV lacks interoperability with other existing national information systems. The current platform does not operationally communicate with the existing supply chain management or cold chain systems or with surveillance of Eventos Supuestamente Atribuidos a la Vacunación e

MOH definitions

Intramural

COVID-19 vaccination service provided within an established health facility

Extramural

COVID-19 vaccination service provided at a location different than an established health facility (e.g., a park, school, parking lot)

¹ Rimac, in North Lima; Gerardo Gonzales Villegas, Zorritos, and Aguas Calientes, in Tumbes; and Moronacocho, in Loreto.

Inmunizaciones (ESAVIs, Events Suspected to Be Attributed to Vaccination and Immunization). This lack of interoperability limits actions aimed at reducing vaccine losses, and pharmacovigilance, and this prevents the MOH and other stakeholders from effectively tracking vaccines beyond the central warehouses of the Dirección Regional de Salud (DIRESA, Regional Health Directorate).

There is no evidence of plans to evaluate the technological capacity of the SRNV in the context of the pandemic, nor are there guidelines to update it comprehensively using new technological platforms.

In terms of data security, internal users consider the SRNV to be secure. It is accessed with unique personal passwords and allows the calculation of the productivity of the staff who enter the data and staff who carry out the vaccination.

Internal users appreciate the SRNV's vaccination card feature. The system enables the creation of a vaccination card accessed online, and if the record is incomplete, it can be updated.

About data quality:

Discrepancies exist in the number of doses administered as recorded in manual records versus the SRNV. This results in inconsistencies in actual vaccination coverage by jurisdiction and nationally.

Paper records generated at vaccination centers follow a diverse route to digitization. Manually digitizing all records effectively is not always feasible, mainly due to data recording errors, incomplete information, or lack of unique identification data, as in the case of persons without ID cards and migrants not registered in official databases.

The requirement to enter vaccination records within 24 hours is not feasible in vaccination centers without internet or with poor connectivity. This is particularly problematic in Amazon and border areas.

Additional operating costs are associated with physically transferring manual records from outlier centers to vaccination centers with internet connectivity. Risk of loss, deterioration of physical records, and/or breaches of confidentiality are all of concern.

About conditions for implementation (regulations, infrastructure, and connectivity):

The current legal framework² has allowed the development of the SRNV for COVID-19 as an extension of the Sistema de Información de Salud (HIS, Health Information System). The HIS has been in use since 1993 and was updated in 2014 to allow the recording of routine vaccination of adults and children in the Immunization Module, which contains the SRNV.

The use of the SRNV as the primary method for the electronic registration of COVID-19 vaccines begins with Health Directive No. 129-MINSA [Ministerio de Salud (Ministry of Health)]/2021/ Dirección General de Intervenciones Estratégicas en Salud Pública (DGIESP, General Directorate of Strategic Public Health Interventions), "Health Directive for vaccination against COVID-19 in the health emergency situation due to the pandemic in Peru," approved by Ministry Resolution No. 161-2021/MINSA.

Regulatory precision is required to improve operational processes and data quality. Key informants and those familiar with the SRNV outlined several current limitations that could be addressed to improve the functionality and effectiveness of the system.

There is no specific guideline outlining the flow of information from data recording to electronic registration to generation of outputs. Custody of physical records and their entry and uploading to the SRNV are being handled differently among health staff because this task is not supported by a standardized guideline.

² Some of the most important regulations of the legal framework are Law 30421, Telehealth Framework Law, and Legislative Decree 1303, which optimize processes related to telehealth, both from 2016; Legislative Decree 1412, which approved the Digital Government Law, from 2018; several Ministerial Resolutions approved between 2002 and 2012 to strengthen information systems and the use of information and communication technologies in the health sector; and Emergency Decree 009-2021, which approved extraordinary measures to create and manage the National Vaccination Register against COVID-19.

Computer infrastructure and connectivity are deficient, particularly in Amazon and border areas. Staff are using their own phones, computers, and applications such as WhatsApp for internal communication, and electronic data registration can vary from 8 to 48 hours in extramural centers and from 48 hours to 1 month in intramural centers.

Recommendations:

Based on the findings above, the following recommendations are proposed.

To improve functionality, usability, and security:

- Adapt the functionality of the Repositorio Único Nacional de Información en Salud (REUNIS, Single National Health Information Repository) data dashboard to create automatic reports that include performance management indicators for the supply chain at all levels (stock and loss factor at the local level).
- Prepare and approve a procedures manual for the functionality of the SRNV; manage the allocation of incentives homogeneously for staff hired under emergency decrees and for staff who have other contracts.
- Update the SRNV using technological platforms that enable interoperability.
- Reduce the number of non-standardized forms generated at vaccination centers.
- Strengthen the registration process in existing supply management systems.
- Provide the operational level with access to information on the vaccination status of the population under its jurisdiction that was vaccinated at an external site.

To improve data quality:

- Establish procedures or mechanisms for data flow, data quality control, and feedback of information from the time it is recorded, as well as field supervision.
- Strengthen physical and electronic filing practices and custody of physical formats.
- Implement information and communication technologies to automate the collection of identifying information for the single registry.

To improve system infrastructure, connectivity, and regulations:

- Call for investment projects to implement high-capacity networks in rural and border areas; systematize lessons learned from previous projects to improve terms of reference; propose innovative mechanisms, such as computer infrastructure services according to technological demand; and develop regional plans for preventive measures and corrective maintenance of computer infrastructure.
- Define and regulate data management processes in places without online network infrastructure; identify local data input centers with proper connectivity and computer infrastructure for contingency in case of failures; enable offline SRNV and viable technologies in rural and border areas.
- Develop directives regulating the sharing of sensitive SRNV data on social networks.

Peru has implemented the SRNV against COVID-19 as an extension of its pre-existing system, which serves to monitor progress in coverage and make decisions at the MOH level. The assessment has identified several aspects that need to be improved to provide timely and accurate information to decision makers at the national and local levels as well as to assure data security. Recommendations are provided on these issues.

I. Introduction

The COVID-19 pandemic has claimed the lives of 6.2 million people worldwide, of which 39 percent of the cases and 48 percent of the deaths occurred in the Americas.³ In Peru, 212,328 deaths have been reported, with a case fatality rate of 5.9 percent.⁴

Preventive immunization is the most successful health strategy against COVID-19; it has been shown to prevent severe cases, hospitalization, and death. However, the success of immunization campaigns depends heavily on vaccine access, acceptance, and the degree of equitable vaccination program coverage.

The official MOH source on national vaccine coverage indicates that 71.59 percent of people aged five years and older have received at least two doses of the COVID-19 vaccine, while 58.52 percent of people aged 40 years and older have received three doses. The departments of Loreto, Ucayali, Amazonas, Puno, and Madre de Dios reported the lowest jurisdictional vaccination coverage.⁵

The Pan American Health Organization (PAHO) defines nominal vaccination registries as “those registries where the vaccination data of each person are identified, and access to their vaccination history is allowed to facilitate active recruitment, as well as to support the monthly planning of those who should be vaccinated and to follow up on those who are delayed or did not attend.”

In its 2014 assessment, the Dirección Ejecutiva de Inmunizaciones del MINSa (DMUNI, Executive Directorate of Immunization of the MOH)⁶ recommended and promoted the implementation of the SRNV as a vital tool for national immunization information management. However, the 2014 report highlighted the need to strengthen interoperability with other national information systems, act on limited connectivity in rural areas, and strengthen fieldwork focused on training and support to improve data timeliness and quality.

With the emergence of the COVID-19 pandemic in early 2020, the SRNV immunization information system was looked to as a tool that could improve the national immunization program’s performance, management, and efficiency, aimed at ensuring optimal coverage of all vaccines, including the COVID-19 vaccine.

The MOH identified the need to assess the COVID-19 vaccination information system and generate recommendations to improve its function and operation. There is a need to understand how the SRNV can be better used to process national vaccination records in the shortest possible time; to generate reports that reflect the situation in real time and strengthen pharmacovigilance; to follow up on vaccination status while maintaining confidentiality and complying with the laws; and to improve vaccine tracking to reduce inequities in access and increase vaccine acceptance. There is also the need to transparently assess the capacity of the current SRNV platform, its technological and functional abilities, and its flexibility to include new vaccines in the future.

³ PAHO. COVID-19 epidemiological update documents. [Internet]; accessed on 03/01/2022]. Available at: <https://www.paho.org/es/documentos/actualizacion-epidemiologica-enfermedad-por-coronavirus-covid-19-22-julio-2021>

⁴ MOH. COVID-19 situation in Peru. [Internet]; accessed on 03/01/2022]. Available at: https://COVID-19.minsas.gob.pe/sala_situacional.asp

⁵ MOH. COVID-19 vaccination coverage. [Internet]; accessed on 27/02/2022]. Available at: <http://www.minsa.gob.pe/reunis/data/vacunas-covid19.asp>

⁶ Report: International Evaluation of Peru’s National Immunization Health Strategy. MOH-Organización Panamericana de la Salud (OPS). 2014 <http://bvs.minsa.gob.pe/local/minsa/3996.pdf>

2. Purpose

In 2021, the MOH's Oficina General de Tecnología de la Información (OGTI, General Office of Information Technology), with the support of Dirección Ejecutiva de Inmunizaciones del MINSA (Executive Directorate of Immunization of the MOH) DMUNI, developed a COVID-19 module within the existing routine vaccination SRNV. It was implemented in 2021 through the Health Directive No. 129-MINSA/2021/DGIESP, "Health Directive for vaccination against COVID-19 in the health emergency situation due to the pandemic in Peru." This directive was approved in the Ministerial Resolution No. 161-2021/MINSA, to provide information that would assist the MOH in monitoring vaccine deployment and assessing vaccine impact on morbidity and mortality in the Peruvian population.

This SRNV assessment coincided with the initiation of COVID-19 vaccination in children aged 5 through 11 years. The purpose of the assessment was to support the MOH by providing recommendations that can help expand coverage, equitable access, and effective delivery of COVID-19 vaccination.

2.1 Operational assessment of the SRNV for COVID-19 vaccines

For the recording and use of COVID-19 vaccination information, PAHO recommends⁷ that countries adapt and strengthen the existing vaccine information system and, if it is not adequate, develop new or complementary information technology tools and recording processes.

Operationally, PAHO gives the general recommendation that the gradual increase of vaccinated people in a country should be accompanied by a proportional increase in the staff in charge of data entry, and the strengthening of their capacities. When faced with an adapted or a new system, it is necessary to verify whether it is flexible, easy to use, and easy to learn. From the point of view of the person receiving a vaccine, the SRNV should allow access to a confidential digital vaccination card and prevent forgery or impersonation.

This assessment of the SRNV considered three dimensions: functionality, usability, and security.

Functionality refers to the operational capabilities that are required and that the SRNV can provide for individual and population decision-making.

Usability refers to the ability of the SRNV to be used quickly, flexibly, and intuitively by the internal user in charge of data entry considering the conditions of use, i.e., in vaccination campaigns, fixed or mobile vaccination centers, areas with low connectivity, and other situations that arise during vaccination.

Data security refers to the ability of the SRNV to ensure confidentiality, privacy, and security of access to data and functionalities.

2.2 SRNV data quality

The quality of the data that feeds into the SRNV is critical to the management and efficiency of the immunization program. The data is expected to reflect or be as close as possible to operational reality.

This evaluation assessed whether the SRNV includes all reported data within the established reporting timeframes, and whether the flow of information from the registration site to the data entry area, the data submission processes, and the consolidation of data help in evaluating data quality. We also

What is the PAHO recommendation for a system based on an Electronic Immunization Registry for COVID-19?

It should allow coverage monitoring integrated with vaccine logistics tracking and ESAVI surveillance.

⁷ Electronic Immunization Registry: Practical Considerations for Planning, Development, Implementation and Evaluation. WDC: PAHO, 2017.

assessed whether the country's flow of information as proposed in regulatory documents is feasible and in line with the country's operational realities as defined by key informants and fieldwork.

Our evaluation of data quality focused on data timeliness and data consistency. Timeliness refers to whether records are available on time within the reporting period, and the amount of time between data entry and the time of vaccination. Data consistency refers to the proportion of vaccination records with legible data and no duplication. Illegible data can lead to underreporting, while duplication generated by multiple data sources, offline systems, or recording errors can lead to inflated coverage reports.

2.3 Conditions for SRNV implementation

Adequate implementation of a nominal immunization registry system requires certain primary conditions: legislation supporting the development and operation of the system; sufficient infrastructure to ensure data connectivity and computer equipment; and a system developed for interoperability with the capacity to be a source and receiver of data from other systems with information relevant to immunizations. This assessment looked at:

Legislation: laws, policies, and regulatory documents issued to support the development and operation of Peru's nominal immunization registry system, including regulations pertaining to how health information should be stored, consulted, and shared by all sectors and geographic areas

Infrastructure: including the physical and technological infrastructure of information and communications that the vaccination centers and data entry areas have and the platforms supporting the exchange of information in the health sector

Connectivity: including the network of computer infrastructure and internet bandwidth required for data transactions and application operation

Computing infrastructure: including the computer equipment, software, and other database access required for SRNV operation at all levels

Interoperability: including the SRNV's capacity to exchange and use data from other information systems of the MOH and/or data coming directly from health care providers that administer COVID-19 vaccines

3. Methods

The assessment was carried out according to the evaluation matrix logic (Annex I), constructed based on a theoretical review and validated by the technical team of DMUNI and the Office of Innovation and Technological Development of the MOH in the context of COVID-19 vaccination. The assessment approach was based on PAHO recommendations for a system based on electronic immunization records.

3.1 Target population

- National and regional government authorities and officials from the MOH and Seguro Social de Salud (Social Health Insurance); international cooperation officials from agencies such as the United Nations Children’s Fund (UNICEF) and USAID.
- Internal users of the SRNV for COVID-19, such as the general coordinator of the vaccination center, the information management coordinator, and the health staff in charge of admission, registration, and data entry. The assessment did not consider the external user, i.e., the general population outside the institution who receive vaccination.

3.2 Geographic scope

The scope of the assessment includes the purposeful selection of strategic vaccination centers in Lima Dirección de Redes Integradas de Salud (DIRIS, Directorate of Integrated Health Networks) Norte, a very densely populated metropolitan area of low and middle socioeconomic status; Tumbes, on the northern border of the country, a point of entry to Venezuelan migrants; and Loreto, an Amazon region with many hard-to-reach areas. These regions were selected with the MOH management team because of the large gap between the vaccinations registered in the SRNV and the vaccines distributed. The vaccination centers in each region were selected with the Diresa and DIRIS management teams according to vaccination demand: they were high-demand centers in urban and peri-urban areas.

3.3 Objectives

General objective:

To provide clear recommendations aimed at strengthening the MOH functional capabilities and operational capacities to generate and use information for effective deployment of COVID-19 vaccination

Specific objectives:

- To analyze the functionality, usability, and security of the SRNV
- To analyze the quality of registry data for timeliness and consistency
- To analyze the context and conditions for implementing the SRNV: legislation, infrastructure (connectivity and computing infrastructure), and interoperability

3.4 Design, instruments, and procedures

The assessment was qualitative and relied on field visits, interviews, and desk review of available sources of information. The content of the evaluation interview questions was based on the SRNV evaluation recommendations of the PAHO technical document titled “Electronic Nominal Vaccination Register: Practical Considerations for its Planning, Development, Implementation, and Evaluation.”

Interviews sought to explore themes and detailed descriptions of the participants’ experiences related to the SRNV. (See Annex II for the Interview Guide, Annex III for the list of key informants, and Annex IV for the testimonials collected on the problems and solutions identified.)

To implement the assessment plan, meetings were held with the technical team of the MOH and representatives from each of the regions involved. A list of key contacts was drawn up, and they were interviewed in Lima, Tumbes, and Loreto.

The procedures are described below according to the dimensions assessed.

3.4.1 Assessment of SRNV operation

- Interviews were conducted with internal users (staff at the vaccination centers) to gather information on functionality, usability, and security.
- Interviews were conducted with technical teams and authorities involved in the information system cycle, from local management teams to regional and national health authorities.

3.4.2 Assessment of data quality

- Vaccination actions were observed, and the vaccination registration process was reviewed and documented from the beginning of the activity to the entry of the information in the system. Gaps in the HIS for COVID-19 vaccination were identified and recommendations were developed.
- Interviews were conducted with internal users to gather information related to the timeliness and consistency of data.

3.4.3 Assessment of the SRNV implementation context

- The MOH's technical documents, regulations, and agreements related to the COVID-19 vaccination process, the HIS for COVID-19 vaccination, and interoperability with other information systems were reviewed.
- We observed the vaccination actions and collected information on the connectivity situation and computer infrastructure related to the vaccination process against COVID-19 in the vaccination and data entry areas.
- We conducted a document review and key informant interviews related to interoperability of the COVID-19 vaccination process at the vaccination and information entry points.

4. Findings

Seventeen health facilities were visited including 5 intramural vaccination centers⁸ and 12 extramural vaccination centers.⁹ There were 43 total respondents: 34 internal users were interviewed in two DIRESAs and one DIRIS, and 9 officials from MOH, UNICEF, and USAID were interviewed.

4.1 Information management and procedures used for the COVID-19 vaccination data registration

The Executive Office of Information Management, part of the OGTI, is charged with providing timely, cost-effective, and clear information to maximize use of information for planning, monitoring, evaluation, communication, and dissemination of health interventions for the benefit of the Peruvian population. The MOH has identified the need for a “collaborative, ethical, transversal, and interoperable digital health system with comprehensive and integrated records of citizens’ health care processes.”¹⁰ REUNIS has a free-access dashboard, which includes reports on vaccination coverage against COVID-19.

DMUNI, based on information generated at the national level, seeks to formulate strategies with a territorial approach to achieve the vaccination objectives for COVID-19. DMUNI has detected discrepancies between the consolidated vaccination data from the quick count of paper records and the electronic REUNIS report, which prevents proper quantification of vaccine coverage. Therefore, it currently must use both sources to effectively analyze achievements of the vaccination program at the national level.

In the activity known as “Friday Talks,”¹¹ the DMUNI has been presenting national coverage data according to the individual data recorded in the SRNV module of the MOH, which are reported in the REUNIS and to the parallel manual registry called “Quick Count” (Table 1).

⁸ Health Centers: Rimac, in North Lima; Gerardo Gonzales Villegas, Zorritos, and Aguas Calientes, in Tumbes; and Moronacochoa, in Loreto.

⁹ Schools: José Lerner Tudela, Tupac Amaru, Andrés Araujo Morán, Zoila Tudela de Puell – Zarumilla and Aguas Verdes, in Tumbes; Sagrado Corazón, Sagrada Familia and MORB, in Loreto; the Sinchi Roca Park, in North Lima; and the three headquarters of the DIRESAs Tumbes and Loreto and the DIRIS Lima Norte.

¹⁰ Technical Document: Digital agenda for the health sector 2020-2025 / Ministry of Health. General Office of Information Technologies. Lima: Ministry of Health, 2020.

¹¹ Conversatorio De Los Viernes (Friday Talks). We continue with our talks. The Directorate of Immunizations of the Ministry of Health of Peru. Available on Youtube: [//youtube.com/channel/UC8ADZ6XDLma4NXBnOyjlPCg](https://youtube.com/channel/UC8ADZ6XDLma4NXBnOyjlPCg)

REGIONS	POPULATION 5-11 y	DISTRIBUTION	HIS MINSA	QUICK COUNT	MAX VALUE	COVERAGE	STOCK	% VACCINE USE	DAY'S GOAL
PERÚ	4,201,842	1,981,700	658,630	702,926	764,513	18.2%	1,217,187	38.6%	243,437
MADRE DE DIOS	26,635	11,300	698	670	698	2.6%	10,602	6.2%	2,120
PUNO	145,265	69,300	4,347	5,026	5,026	3.5%	64,274	7.3%	12,855
AYACUCHO	86,658	41,400	5,678	3,213	5,678	6.6%	35,722	13.7%	7,144
AMAZONAS	70,190	41,100	4,986	4,866	4,986	7.1%	36,114	12.1%	7,223
CUSCO	177,961	59,300	3	15,235	15,235	8.6%	44,065	25.7%	8,813
CAJAMARCA	203,168	105,400	17,937	16,615	17,937	8.8%	87,463	17.0%	17,493
TACNA	40,402	16,200	3,381	3,899	3,899	9.7%	12,301	24.1%	2,460
PIURA	280,767	118,200	27,639	23,465	27,639	9.8%	90,561	23.4%	18,112
APURIMAC	55,409	27,600	4,461	5,522	5,522	10.0%	22,078	20.0%	4,416
HUANCAVELICA	52,015	42,600	3,550	5,442	5,442	10.5%	37,158	12.8%	7,432
LORETO	193,660	98,000	22,380	17,783	22,380	11.6%	75,620	22.8%	15,124
PASCO	38,703	18,300	4,991	4,517	4,991	12.9%	13,309	27.3%	2,662
ANCASH	146,109	69,200	18,213	21,944	21,944	15.0%	47,256	31.7%	9,451
SAN MARTIN	136,014	70,300	14,644	21,115	21,115	15.5%	49,185	30.0%	9,837
UCAYALI	102,787	43,400	16,626	14,186	16,626	16.2%	26,774	38.3%	5,355
LAMBAYEQUE	174,797	79,100	15,895	30,530	30,530	17.5%	48,570	38.6%	9,714
TUMBES	33,621	16,300	4,616	6,004	6,004	17.9%	10,296	36.8%	2,059
LIMA CENTRO	311,861	117,300	54,636	56,063	56,063	18.0%	61,237	47.8%	12,247
AREQUIPA	175,799	71,100	26,196	31,821	31,821	18.1%	39,279	44.8%	7,856
MOQUEGUA	20,158	7,900	3,668	3,623	3,668	18.2%	4,232	46.4%	846
LIMA NORTE	335,030	124,100	63,218	59,681	63,218	18.9%	60,882	50.9%	12,176
LA LIBERTAD	260,014	95,600	49,723	51,954	51,954	20.0%	43,646	54.3%	8,729
JUNIN	172,368	83,200	35,451	9,964	35,451	20.6%	47,749	42.6%	9,550
LIMA SUR	273,713	134,000	40,742	56,296	56,296	20.6%	77,704	42.0%	15,541
LIMA ESTE	196,036	72,700	40,234	42,378	42,378	21.6%	30,322	58.3%	6,064

Table I: Immunization coverage in persons aged 5 to 11 years as of February 4, 2022
Source: DMUNI. Friday public virtual discussion on vaccination for COVID-19.

Table I shows that if we compare the records of the HIS Ministerio de Salud (MINS) (SRNV) versus the records of the Quick Count (Conteo Rápido), the records of vaccination coverage in persons aged 5 to 11 years vary in the DIRIS in Lima Norte by 5.5 percent (59,681/63,218), in Tumbes by 23 percent (4,616/6,004), and in Loreto by 21 percent (17,783/22,380).

When analyzing Lima's data, the overall difference between the Quick Count and the SRNV for the 5 to 11 age group, as of February 4, 2022, was 6.3 percent, evidencing a gap in the registration of information between the consolidated records from manual (Quick Count) and electronic (HIS MOH) registers. This gap increases when we analyze data outside the country's capital. Explaining this phenomenon requires following each step of data recording and information handling, i.e., at each vaccination center.

After the arrival of COVID-19 vaccines in Peru, vaccination for COVID-19 began in fixed and mobile extramural centers with a large influx of people, such as zonal parks,¹² parking lots, and selected schools. This successful strategy made it possible to vaccinate in ventilated areas with enough space to maintain distance. In addition, the minimum environmental guidelines described in the sanitary directive for vaccination for COVID-19 were complied with.¹³

Considering the fixed and mobile extramural vaccination centers for COVID-19 as a source of data, the DMUNI defined and approved the function of the "information management coordinator in the vaccination for COVID-19." These individuals are responsible for the daily registration of vaccinated people in the SRNV and for entering the information from the Quick Count in the application designed for this purpose in the HIS MOH system. The data input clerks are responsible for the daily entry of vaccinated persons in the SRNV.¹⁴

¹² In Peru, zonal parks are large green areas located in towns with no access to other recreational areas. SEPAR: <https://www.serpar.gob.pe/clubes-zonales/club-zonal-sinchi-roca/>

¹³ Technical document: Health Guidelines for Vaccination against COVID-19 No. 133-MOH/DGIESP-2021/Ministry of Health. Lima: Ministry of Health, 2021.

¹⁴ Technical document: Health Guidelines for Vaccination against COVID-19 No. 137-MOH/DGIESP-2021/Ministry of Health. Lima: Ministry of Health, 2021.

The responsibilities designated for the information manager and the data input clerk emphasize the need for senior management to have prompt access to accurate data for timely decision-making. However, recording information within 24 hours of vaccine administration is a challenge due to different barriers. The common challenges identified in the project's scope of intervention were:

- Insufficient access to the internet at extramural locations.
- Limited staff available to record vaccination demand (e.g. (personnel were on medical leave for COVID-19 infection)

To deal with staff being on medical leave, and lack of other human resources for health for vaccine programs, in September 2021 an emergency decree was issued authorizing the MOH and regional governments' executing units to hire health care staff and data input clerks to provide COVID-19 vaccination and typing services.¹⁵ The emergency decree defined a higher payment for COVID data input clerks than the one for data entry clerks in health facilities (who had to registry usual care plus COVID vaccination), creating a conflict. This, and the temporary nature of the budget were not adapted to the operational needs of the DIRESAs and DIRIS.

Barriers to the evolution and implementation of the information system from an interactive perspective were not overcome. These include lack of connectivity in rural areas, the multiple records that health staff enter in different immunization systems containing non-interoperable information, and the limited functionality of the SRNV to issue automatic reports on regular immunization.¹⁶

The procedures used to generate and record data were different across the vaccination centers visited for this assessment. Currently, vaccination is carried out at extramural, mobile, and intramural fixed centers (health facilities). The records of the mobile centers can be recorded at the mobile centers themselves or at the designated center from which the vaccination brigade departed. Figure 1 describes the flow of procedures used to record data at fixed extramural vaccination centers.

Vaccine data is generated from the completion of physical forms at all vaccination centers visited. Identity documents are checked at admission. Due to factors such as time, high demand, and internet issues, the vaccination status is not routinely verified against the MOH application Carnet de Vacunación,¹⁷ which contains information on the type and dose of vaccines administered and is linked with patient ID cards.

In the vaccination centers visited for this assessment, the Carnet de Vacunación application is used when the external user (patient) requests information on his/her vaccination status due to the loss of the vaccination card or to file a claim for inaccurate registration of vaccine doses. The use of the "Carnet de Vacunación" application is lower when there is excess demand and poor internet access.

¹⁵ Emergency Decree No. 089-2021. Emergency Decree that authorizes extraordinary measures to continue coordination teams and vaccination brigades, the economic delivery for additional benefits, and vaccination services of the vaccination centers against COVID-19.

¹⁶ Oral source: Executive Director of the Office of Innovation and Technological Development of MOH.

¹⁷ Carnet de vacunación/Vaccination Card app. MOH. <https://carnetvacunacion.minsa.gob.pe/>

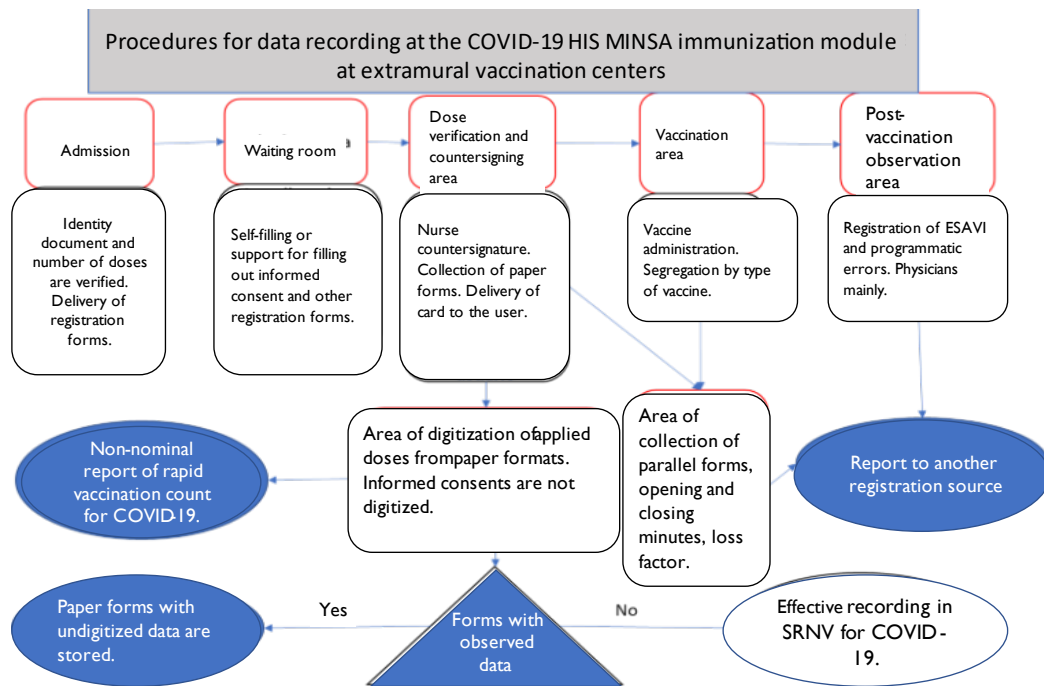


Figure 1: Procedures used for data recording at the COVID-19 HIS MOH immunization module at extramural vaccination centers

Source: Self-elaboration based on MOH information.

The user's forms on **admission** include an informed consent form and a COVID-19 information sheet. The informed consent form is filled out in the **waiting room**, and the vaccination centers usually have trained staff to assist patients. However, in some centers, the informed consent form is signed after the vaccine has been administered. In other cases, patients do not receive the information sheet and are instructed to sign the informed consent form without verifying they understand the content.

In the **Dose Verification and Endorsement Area and Vaccination Area**, the vaccination brigade is installed, typically made up of two registered nurses. A professional in the **Dose Verification and Endorsement Area** oversees: informed consent gathering, verifying the authenticity of the physical vaccination card provided by the patient, generating new physical vaccination cards, and verifying identification documents to approve the appropriate dose.

The identity, dose, and type of vaccine are countersigned with the nurse's stamp and signature. Not all the centers visited carry out the approval by verifying the patient's vaccination status in the Carnet de Vacunación app. That generates the risk of impersonation, revaccination, and subsequent problems in the unique identification record of the patient.

In addition, the nursing staff manually register data from the eligibility criteria form for the administration of the vaccine, and the consolidated manual registration of personal data and the vaccine administered; and indicate the opening and closing minutes of the vaccination day. In the **vaccine area**, the second nurse provides information about the vaccine to the patient and administers the vaccine; they keep custody of the vaccine carrier and ensure procedures to maintain the cold chain.

After being vaccinated, people spend 10 to 15 minutes in the **observation room**, where the identified ESAVIs are recorded and given indications and recommendations.

Only in DIRIS Norte and in one vaccination site of DIRESA Tumbes were there physical forms provided by the Dirección General de Medicamentos, Insumos y Drogas (General Directorate of Medicines, Supplies and Drugs) for ESAVI registration. The ESAVI history in the case of previously vaccinated users is not routinely recorded. Only one vaccination center in DIRIS Norte and DIRESA

Tumbes provided information on how to proceed in the presence of ESAVIs or programmatic errors¹⁸ after leaving the vaccination center.

In the extramural centers, where there are data input clerks and computer equipment, under the coordination of the information manager, all forms are collected at pre-established cut-off times in the data input area. The rapid count of doses administered is reported to the statistics center based on what is collected. The Quick Count is the consolidation of the information on doses administered by type of vaccine for COVID-19 from manually counting forms.

Subsequently, the forms are entered into the SRNV. However, forms that cannot be entered due to problems with the identity document or incorrect dose are separated to “correct the observations.” If the data on the “observed” forms cannot be entered, they are stored without being entered. Informed consent forms are not digitized and are stored within each facility.

There is also a **collection area** for vaccination forms by the nursing staff, which collects physical forms for nominal attendance records and opening and closing acts containing occurrences, and vaccine loss factors.¹⁹

According to the updated sanitary directive for COVID-19 vaccination, the flow chart of the fixed vaccination site proposes an area for opening, admission, clinical and epidemiological evaluation, vaccination, observation/monitoring, and closing. There is no evidence that additional records are generated in the admission and clinical and epidemiological evaluation areas.

At vaccination sites where pre-vaccination medical evaluation (asking about signs and symptoms of COVID-19, risk factors for vaccination, and comorbidities) is performed, the highlights of the patient’s anamnesis are noted on the back of the informed consent forms.

It is important to highlight that the vaccination centers visited did not have clear guidelines or protocols for data registration and handling of forms. Therefore, in 60 percent of the fixed centers visited, staff use additional forms to register similar data increasing the workload unnecessarily.

Each vaccination center tries to optimize the data recording processes, identifying data input centers with better access to internet, equipment, and staff for data input. The physical forms are moved from where they are generated to where they are finally entered. This process can lead to the loss or deterioration of forms.

Identifying key centers for data input, and transporting the forms to these data input centers, overcomes infrastructure and connectivity barriers. However, there are other challenges, such as the security of information, because when doing this, clerks need to share access codes to enter the SRNV. In addition, budget constraints make it difficult to pay a data entry clerk if he or she has moved from one facility to another.

At the intramural level, the flow shown in Figure I is reduced to three areas:

- The admission area is located at the entrance of the health facility, where security or technical staff hand out the forms to be filled out.
- In a second area, a nurse countersigns, further fills out the forms, completes the data on the vaccination card, administers the vaccine, and observes the just-vaccinated patients to inform the doctor on duty in case of ESAVIs.
- A third area is the statistics office, where the staff in charge of data input collect the forms and enter the non-observed forms. Usually, the staff in charge of data input at the intramural vaccination centers perform this work in addition to other functions.

¹⁸ Events related to operational problems of the program. These are events caused in the vaccine use cycle by an error in storage, preparation, handling, or administration. They are preventable by the vaccinator.

¹⁹ MOH technical document “Updated protocol for managing the loss factor in open multidose vials of COVID-19 vaccine, 2022.”

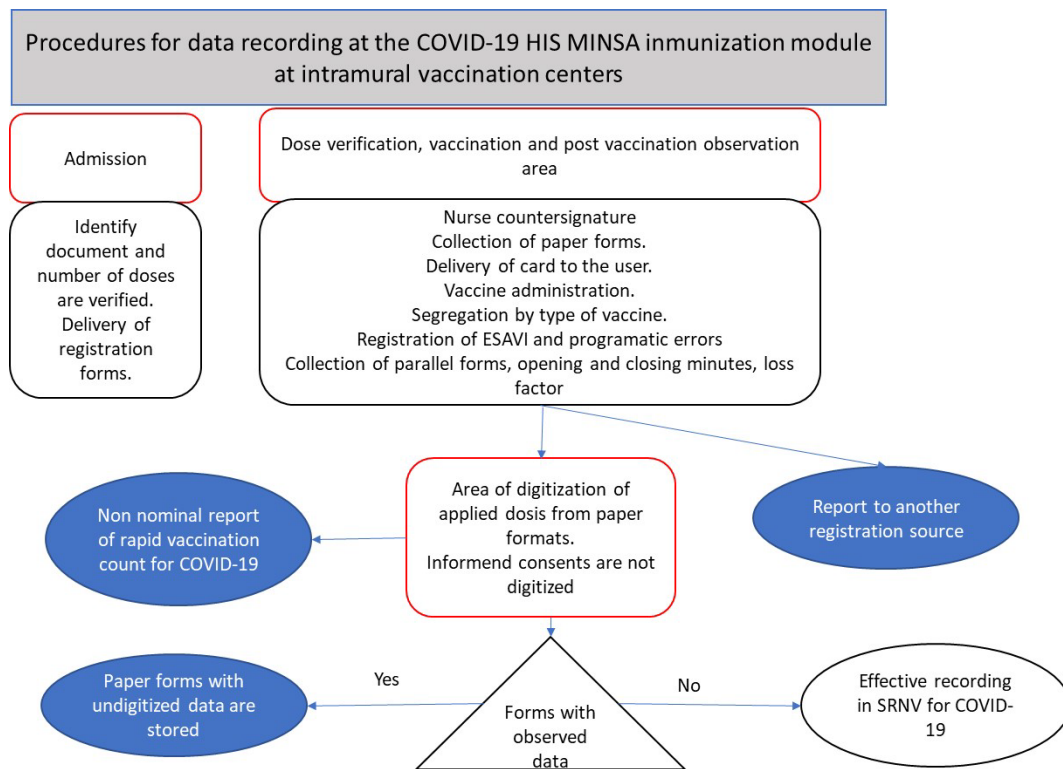


Figure 2: Procedures for data recording at the COVID-19 HIS MINSa immunization module at intramural vaccination centers

4.2 SRNV: Functionality, usability, and security

Functionality, usability, and security are all areas in which the assessment identified opportunities for improvement.

Functionality

- External and internal users of the SRNV can access reports on vaccination coverage by age group and other epidemiological data consolidated in the MOH's REUNIS, managed by the OGTI. The SRNV does not allow the automatic calculation of vaccination coverage. Obtaining vaccination coverage information involves analyzing the nominal database of administered doses generated by the SRNV and comparing it with the numerical target planned by the DMUNI. The OGTI does the coverage calculation comparing the nominal data generated by the SRNV with the nominal target assigned to each region.
- If an individual receives the first dose of any of the vaccines distributed in the country at the vaccination site where they are registered according to the Registro Nacional de Identificación y Estado Civil (National Registry for Identification and Civil Status), it is possible to track the vaccination status if the additional dose(s) are administered at the same vaccination site where the first dose was received. The SRNV provides the number of times the external user (patient) has received a dose of vaccine for COVID-19, but does not issue alerts or reminders on vaccination status.
- The MOH's senior management recognizes that the SRNV does not allow traceability of vaccines at the health facility level. The Centro Nacional de Abastecimiento de Recursos Estratégicos de Salud (National Center for the Supply of Strategic Health Resources) of the MOH delivers vaccines to the warehouses of the DIRESAs; the Dirección Regional de Medicamentos, Insumos y Drogas (Regional Directorate of Medicines, Supplies, and Drugs) oversees the cold chain and the distribution of vaccines in the region.
- The information the MOH uses to make decisions on traceability comes from management reports that contain non-standardized analyses of various sources of information and

forms. As a result, this information is not reliable, and this affects the planning of activities (campaigns to close gaps, procurement of vaccines or supplies).

- SRNV operators perceive that the system is limited in its ability to identify external users (patients) without identification documents. This, plus the need to generate reports for the central level, added to the current multiple regulations, translates to work overload.
- The Sistema Integrado de Suministro de Productos Farmacéuticos, Dispositivos Médicos y Productos Sanitarios (SISMED, Integrated System for the Supply of Pharmaceutical Products, Medical Devices, and Health Products) contains information on vaccines and vaccination-related supplies, including the stock of vials at each health facility. However, it is estimated that only 30 percent of facilities in this assessment have up-to-date information in the SISMED. In the absence of information on vaccine stock at the health facility level, the programming of vaccine distribution is not accurate and creates a risk of understock or overstock and of loss of vials due to expiration. Most of the interviewees believe that the SISMED should be strengthened so that information on vaccine consumption and traceability could be provided using this system.
- To counteract the weaknesses of the SRNV and SISMED concerning vaccine traceability, the nurses in charge of regular vaccination make phone calls, send WhatsApp messages, and issue formal documents to those in charge of vaccination in health facilities to collect information on vaccine stock. None of the regions visited had the statistics unit analyze the gap between doses received and doses administered.
- The SRNV database accommodates reports from each entry data point on the doses administered by each vaccinator, down to the district level. The statistics unit processes mainly the data on doses administered, with which it calculates vaccination coverage for COVID-19 by the health facility. The coordinator of COVID-19 vaccination of the DIRESA processes data to generate reports, processes vaccine reception data, consolidates information on vaccine stock in the warehouse and in the health facilities and analyzes the loss factor and the doses applied in the health facilities.
- Staff expect that the SRNV provide the address and cell phone number of people vaccinated, report by vaccination centers, report on latecomers, and include the vaccination timeline. Also, that the records of the “Vamos a tu encuentro” strategy²⁰ allow identify the coverage provided by the mobile brigades so their output is not added to the fixed vaccination center output.
- The SRNV does not have helpful reports for the local level because it does not automatically allow the calculation of values or indicators. Because of that, users use alternative analysis systems: Microsoft Excel, SQL server, SPSS, and Google Drive.
- When the SRNV does not enable them to verify someone’s identity, the staff use web pages such as <https://www.dateas.com/es>, https://www.dateas.com/es/consulta_venezuela, General Consulate of Peru in Caracas <http://www.consulado.pe/es/Caracas/tramite/Paginas/Dni/dni-mayores-de-edad.aspx>, EsSalud <http://portal.essalud.gob.pe/>, and DNI.com <https://eldni.com/>
- The SRNV does not provide the reports that the local level should send to the national level, so staff generate alternative forms and keep their own records to registry coverage and vaccine movements. It can take up to three days to prepare these reports for the national immunization program. This increases the workload and can affect job performance.
- At the operational level, we found discrepancies between coverage according paper records and coverage reported from the SRNV records.
- Staff involved in vaccination perceive physical forms as necessary for an adequate legal defense if they are involved in events requiring physical evidence. They do not trust that a 100 percent digital form can serve as a legal defense.

²⁰ “Vamos a tu encuentro/Let’s meet you” is an MOH strategy to close COVID-19 vaccination gaps. <https://www.gob.pe/institucion/minsa/noticias/520897-minsa-lanza-estrategia-vamos-a-tu-encuentro-vacunate-ya-para-cerrar-brechas-en-la-vacunacion-contra-la-covid-19>

- The address of the Documento Nacional de Identidad (DNI) defines in which DIRESA the vaccination of each person will be scheduled, and their vaccination will be part of the goal of that DIRESA. DIRESA staff have access to the information of those vaccinated at the vaccination points of their own DIRESA only. If the person receives any dose at a vaccination point located in another DIRESA, that data is not available in the DIRESA in which it is scheduled, which affects the monitoring of the vaccination timeline. In addition, this vaccination does not contribute to the fulfillment of the vaccination goal in the DIRESA within which the person is scheduled.

Usability

- One hundred percent of the data input clerks interviewed stated that the SRNV is easy to use and intuitive. It allows the calculation of the data input clerk's productivity.
- Because of geographic dispersion and low demand for vaccination in Loreto and Tumbes, in some vaccination centers, a data input clerk has a maximum production rate of three to five records in a day, which is far from what the MOH calculates in its guidelines for payment for typing production.²¹

Based on the analysis and contrast of information, the personnel in charge of vaccination distrust the national reports, stating that the data "are not the same." That is why they insist on using manual records for the management reports and have stated during the work meetings with DMUNI that they do not want to use the SRNV.

Security

- Access to the SRNV is based on passwords that identify the system's internal users; the level of access for each user is limited to entering and modifying data. The external user can access individual data by entering the ID number, date of birth, and date of issue of the ID, accepting the MOH data processing conditions and providing a security code that verifies that it is not a robotic activity.²²
- The SRNV is perceived as a secure system. The system of user passwords prevents unauthorized access to confidential beneficiary information. The person in charge of the statistics unit has access to modifications in the database when external users accredit a different vaccination status than the one registered, and it is possible to make data changes when typing errors in the informed consent are identified. However, there was no evidence of data modification logs and there was no evidence of reports related to the analysis of the modifications made in the SRNV.

The assessment findings described explain why the SRNV is perceived as a system with limitations for decision-making. At the level of the Senior Management of MINSA, the limitations are mainly that it does not allow the traceability of the vaccine beyond DIRESAs' warehouses. In addition, the database generated from the SRNV needs to be analyzed with parallel software packages to generate charts, graphs, and consolidated information that must be sent from the operational level to the MOH. SRNV reports are not trusted, because of discrepancies between them and the Quick Count data. Immunization managers draw a contrast between SRNV information and alternative registry analysis and parallel systems and prefer the latter two approaches.

4.3 Data quality of the SRNV: consistency and timeliness

Consistent data and timeliness are two fundamental attributes of the quality of an information system. In the case of SRNV, both attributes have significant room for improvement.

Consistent data

²¹ Guidelines to pay for the delivery of services for vaccination against COVID-19. Emergency Decree No. 089-2021. Emergency decree that authorizes extraordinary measures to continue coordination teams and vaccination brigades, and the economic delivery for additional benefits and vaccination services of the vaccination centers against COVID-19.

²² Personal Data Protection Law. Law No. 29733. <https://diariooficial.elperuano.pe/pdf/0036/ley-proteccion-datos-personales.pdf>

- The vaccination sites visited do not have a standardized protocol that allows them to perform adequate quality control of the records. When a form has illegible data or no unique identifier, it is considered an “observed” form. Each vaccination center applies different strategies to verify the information, e.g. accessing web pages where they can confirm the identity data of the vaccinee, or telephoning patients to request additional information or correct the identity document number.
- A special case is that of undocumented migrants that provide inaccurate information, making it hard to identify them for the next doses.
- Other case is that of Venezuelan children who do not have identity documents until they are nine years old, so they go to the vaccination centers without identity documents or birth certificates. Thus, it is not uncommon for the first dose to be recorded with an identification code or number that is not maintained when they return for their next dose.
- Problems also arise when a person goes for the second dose but incorrectly indicates that they are there for the first dose, and, because of inadequate staffing or lack of internet access at the facility, the information on the Carnet de Vacunación app is not verified, and the user is registered as receiving the first dose. The system rejects the registration when this form is entered, because the user has already registered the first dose. At the extramural level, where there are more logistical resources, these cases are resolved by coordinating with the statistics area. At intramural centers, these cases become part of the “observed” forms that are not entered. This is very relevant to understanding the discrepancies between the coverage data from the Quick Count and the SRNV, since the Quick Count does not verify identity or number of doses. Therefore, users perceive that the SRNV has limitations in meeting the challenges of moving from manual to virtual registration.
- In North Lima, it has been estimated that up to 3,000 emails have been received in a month requesting data correction, and it has been estimated that 3 out of 10 records have legibility problems. At an extramural vaccination site of the DIRIS Lima Norte, the nurse’s production (number of doses of COVID-19 vaccine administered in a day) was evaluated on a given date (one month after the visit). According to the manual, called the Quick Count logbook, the nurse administered 240 doses, while the SRNV report showed production of 210 doses, a gap of 30 records. Upon reviewing each physical record and verifying its input into the SRNV, it was found that four of them had not been entered, one had been registered under the name of another nurse, and 25, despite being registered, did not appear in the database downloaded from the SRNV. In DIRESA Tumbes, up to 800 requests for data correction have been received, and the extent of the legibility problem has not been calculated. DIRESA Loreto does not routinely perform data quality control, nor does it keep a record of modification requests.
- In DIRESA Tumbes, there has been evidence of initiatives to improve data quality. A management report emphasized the need for vaccination forms for COVID-19 with “well written and correct” data, and said that those data points considered mandatory should be recorded for a better analysis of the pediatric population’s vaccination processes (Figure 3).

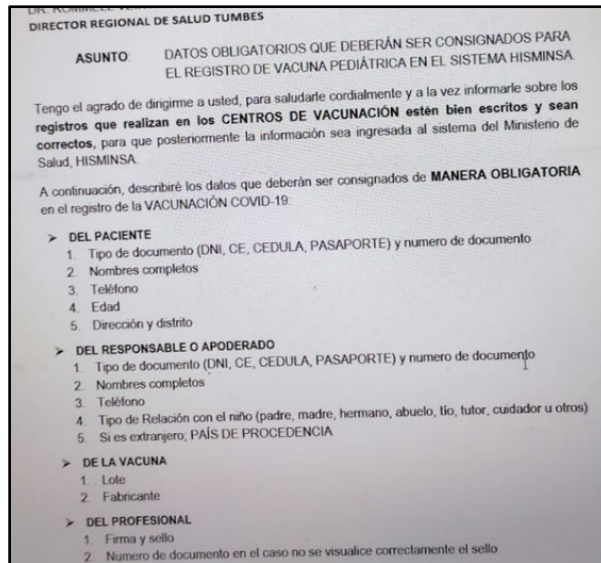


Figure 3: DIRESA Tumbes technical document on mandatory data for pediatric COVID-19 vaccine registration

Source : Technical Document: Report 006-2022/GOB.REG. Tumbes GRDS-DIRESA-OEI.

- Ensuring quality data with manual registration is challenging, especially in locations with high vaccination demand.
- The regions need to have guidelines or protocols that standardize data management and help improve the information quality and reevaluate the computerized registry. For example, if a Venezuelan migrant comes with three different identity documents, which should be prioritized? “If we place a second dose ahead of time and the SRNV does not allow registration, how should the data be handled?”

Timeliness

- The average time interval between the date of vaccination and the registration date varied according to location, human resources, and internet access. In Lima and Tumbes, there is a delay of up to one month in information entry in intramural fixed centers due to a lack of human resources. In Amazonia, delays are mainly driven by poor internet access.
- The immunization technical standard²³ has as a structure indicator: the “Availability of Information System, quality of registration and timeliness,” within the section on evaluation of the implementation of the national immunization schedule to measure the performance of immunizations. Desk research shows no results of the evaluation of this structure indicator for COVID-19 vaccination.

The findings described in this section correlate with the fact that protocols have not been defined nor specific actions implemented for data quality management. This also means that inconsistencies in the form data are not handled in a standard manner, and each information management team executes different strategies to record the data. Consistency issues are best addressed at extramural vaccination sites, as specific human resources, connectivity, and computational resources for COVID-19 vaccination have been provided there. At intramural vaccination sites, the ability to resolve inconsistencies is limited. A major challenge to consistency is the vaccination records of undocumented people, whether they are Peruvian citizens or migrants. Additional weaknesses are related to poor internet connectivity of vaccination centers and delays in data entry to the SRNV. The time interval from the generation of the record to entry into the SRNV has a maximum duration of 48 hours at extramural vaccination centers and up to one month at intramural vaccination centers.

²³ NTS No. 080-MOH/DGSP-V.03: “Technical Health Standard that establishes the National Vaccination Scheme,” which is an integral part of this Ministerial Resolution.

4.4 Conditions for the implementation of the SRNV: Regulations, infrastructure, and interoperability

For the information system to be properly implemented, certain conditions are required, including a regulatory framework that favors its development and improvement; IT infrastructure; and connectivity. These aspects were assessed, and the results are presented below.

- The regulations for COVID-19 vaccination establish general and specific provisions on the organizational and strategic aspects of the vaccination process including information management. The SRNV was developed as a new module of the MOH HIS, which was first implemented in 1993 and has since undergone successive expansions. Despite these updates, it still does not meet the information needs and requirements of senior management.
- There is no evidence of policy initiatives or approved national plans to evaluate the technological capacity of the SRNV in the context of the pandemic or to provide guidelines to comprehensively update the SRNV using new technological platforms. Such platforms would also allow interaction with other sectors using SRNV data, such as the Ministry of Development and Social Inclusion.
- Implementing the SRNV requires adequate computer infrastructure and connectivity. Ninety percent of the staff at the vaccination centers included in this assessment said the computer equipment they have is insufficient or too outdated to carry out the required work, and they prefer to use their personal equipment. Additionally, there are problems with the network infrastructure required for the SRNV to operate online—even in urban areas, but especially in fixed sites outside Lima. In Amazonian regions such as Loreto, it can take 30 minutes to one day for a single record to be entered at vaccination centers, and functionality depends on weather conditions. Vaccination centers without internet have hundreds of paper forms stored in boxes without being entered into the SRNV. These then must be transferred to other locations that do have internet to be entered, which is costly for the facilities and may end up not getting done. Registration in the system within 24 hours of vaccination, as established by current regulations, is unfeasible in these areas.
- Only in DIRESA Tumbes was there evidence of plans to expand the data network; an updated equipment inventory; and the development of applications to overcome the functional weaknesses of the SRNV.²⁴ The plan to expand the data network aims to increase access to a greater number of internet megabytes gradually. Currently, 32 health facilities of DIRESA Tumbes have fiberoptic internet, and an agreement has been signed with the Regional Directorate of Education for internet access at fixed vaccination centers in schools, especially for vaccinating children from 5 to 11 years of age. The main challenge in Tumbes to expanding the number of establishments with adequate broadband internet is the lack of computer equipment, despite the progress made with the purchase of computer equipment with funds from the Integrated Health Insurance.
- One hundred percent of the locations evaluated lack an internal network system (intranet), so communication via WhatsApp is preferred as an internal network. Internal communication and data exchange are carried out through WhatsApp groups of private cellphones. Private cell phones have plans of approximately 300 megabytes, which allows a fluid exchange of vaccination information for COVID-19. There is a regulatory gap in exchanging sensitive and identifying vaccination information for COVID-19 via WhatsApp, which represents a risk to the confidentiality and privacy of patient data.
- Interoperability is a crucial aspect of the adequate functionality of the SRNV. Figure 4 shows the systems that manage information relevant to DMUNI decision-making and that

²⁴ App to track vaccination status, <https://svacunacovid.Diresatumbes.gob.pe/>, and app to identify vaccinated people, <https://vacunados.Diresatumbes.gob.pe/>.

are not interoperable with the SRNV. The SRNV is interoperable with the vaccinator's APP, in which 33 percent of the data at the national level is recorded, and with the immunization module for COVID-19 in the HIS MOH that was implemented by EsSalud and the armed forces health facilities. The SRNV also receives information from the Registro Nacional de Identificación y Estado Civil (National Registry of Identification and Civil Status) nominal census, which allows the establishment of the numerical and nominal target up to the district level.

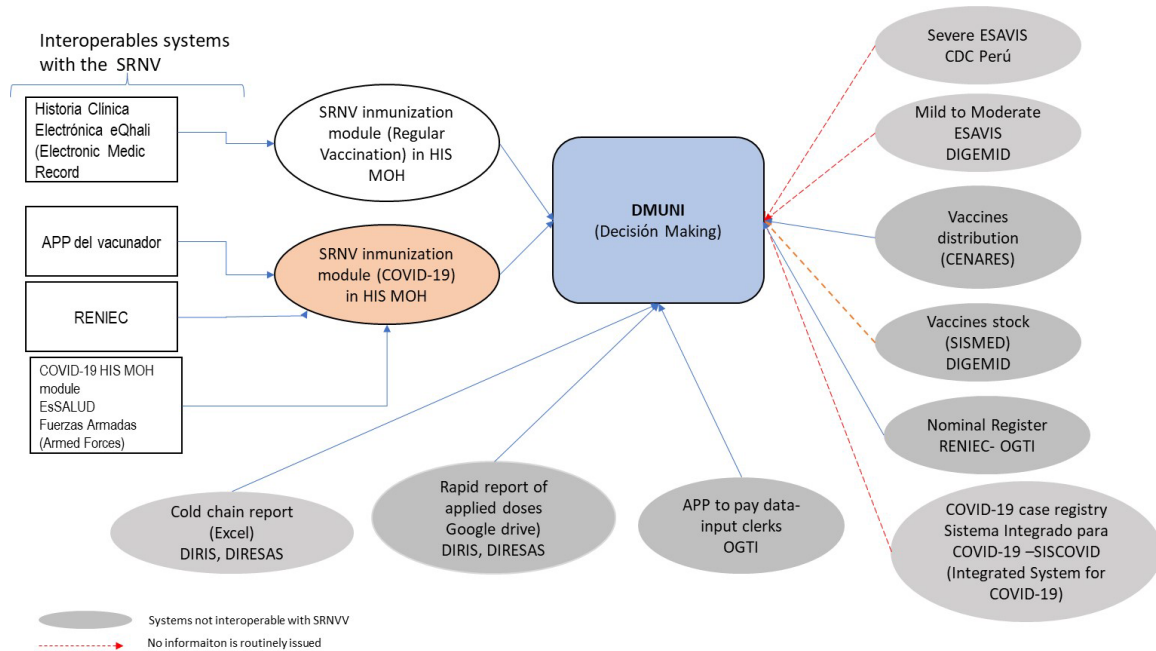


Figure 4: Graphical representation of the MOH's immunization information systems interoperability.

Source: Author's creation

- In 2019, the MOH issued the Administrative Guideline that regulates interoperability in health care information systems.²⁵ This guideline states that information systems will share information among themselves and must ensure the consistent exchange of data to provide management- and operational-level relevant information from patients to ensure safe, efficient, and effective decision-making. Interoperability with private health facilities is a challenge to be considered, especially considering the possibility that in the future private health facilities may be able to finance, purchase, and administer COVID-19 vaccines, as is done with other vaccines in the MOH's regular vaccination schedule.

The legal context in which the SRNV has been implemented allows updates and improvements, especially in the interoperability component with public and private systems. However, there are regulatory gaps related to data management, data quality management, the use of social networks to exchange sensitive data, the analysis of sensitive data on personal computers, the use of software and web pages that handle identification data, and the development of applications that collect information on vaccines. The IT infrastructure available at the vaccination points is insufficient and outdated, which affects the proper functioning of the SRNV. And connectivity is weak or non-existent in several parts of the country, without alternatives having been generated to deal with these circumstances—circumstances that, in addition, make it unfeasible to comply with the registration opportunity regulations, and generate additional operating costs due to the need to transfer manual registrations to points with connectivity, with the risk of loss and deterioration of physical records.

²⁵ Administrative Guideline No. 266-MOH/2019/OGTI: Administrative Guideline That Regulates the Interoperability in the Health Care Information Systems.

Information is the main element that sustains all aspects of vaccination actions, from research, planning, and monitoring and evaluation through to decision-making. Given the rapid development of technologies at a global level, PAHO recommends that countries prepare themselves to face challenges with innovations such as “predictive and prescriptive analysis, which evaluates future scenarios, the internet of things, which allows all health care resources to be connected to the internet, cloud computing, analysis of massive data and artificial intelligence.” In the same vein, the pandemic has led to unprecedented digital literacy and exponential use of Tecnologías de la Información y Comunicación (Information and Communication Technologies) at all levels.

In Peru, the SRNV for COVID-19 was implemented at the beginning of the pandemic by adapting the MOH HIS software. The information systems in the country, including those containing immunization information, were developed as an immediate solution to isolated needs, and not under an integrative logic that would allow the SRNV to become a governance mechanism. It is perceived that the SRNV and other systems with information relevant to immunizations use outdated technology or limited functionalities for internal users’ needs at all levels. In addition, there are still problems with computer infrastructure, limited functionality and interoperability, and little flexibility in moving data from manual to electronic records.

5. Recommendations

COVID-19 vaccines will soon be considered part of routine vaccination. If so, COVID-19 vaccination will be carried out almost entirely at health facilities. As a result, health facilities must expand their capabilities for data recording and handling, data entry, data analysis, and storage of paper and virtual forms, as well as improve their internet connectivity.

This assessment identified opportunities for strengthening the SRNV and generated specific, feasible recommendations for the SRNV as well as general recommendations for storing information in the HIS MOH.

The recommendations were developed based on the evaluation dimensions; the planning of the recommendation considered the justification, effects, and feasibility of the recommendation.

EVALUATED DIMENSION: OPERATION OF THE SRNV

RI. For the OGTI: To evaluate the feasibility of updating the capabilities of the MOH HIS to exchange information with other immunization systems and improve its functionality.

This recommendation is justified by the impact that interoperability has on the proper functioning of the SRNV. In the current technological context, countless resources are available to update systems without losing previously recorded data. It is possible to migrate to digital platforms to enable the HIS MOH to expand its interoperability with other systems. The interoperability of the SRNV is may take longer to implement compared to an expansion of the information contained in the REUNIS data dashboard. Therefore, in the short term, it is expected that the REUNIS data dashboard will be adapted to the information and consolidated reporting needs of the MOH and those responsible for immunization at the regional level.

The implementation of this recommendation would reduce the workload related to data processing to generate reports. It would reduce the generation of parallel forms and software for data analysis. The feasibility of the recommendation is based on the ability of the REUNIS to include facility-level vaccine traceability data and ESAVI reports in its dashboard.

The REUNIS currently has an immunization data dashboard for COVID-19, which can generate graphs and charts at the district level and segregate information by epidemiological variables. It allows downloading and printing of disaggregated charts and graphs. It is necessary to evaluate whether the REUNIS can automatically generate the charts and graphs that it must report to the MOH. It is also necessary to assess whether the REUNIS consolidated information containing the new data is useful

and whether it is reliable for decision-making. In the longer term, it is expected that the HIS MOH will migrate to a digital platform that will allow it to update its current capabilities.

The recommended actions for the OGTI are as follows:

- Adapt the functionality of the REUNIS data dashboard to generate automatic reports for the MOH and the operational level in the short term.
- Develop a procedure manual for the SRNV operation, supported by an Administrative Guideline.
- Adapt the functionality of the REUNIS data dashboard to generate automatic reports for the MOH and the operational level in the short term.
- Develop a procedure manual for the SRNV operation, supported by an Administrative Guideline.
- Manage the allocation of incentives homogeneously for staff hired under emergency decrees and for staff who have another type of contract.
- In the longer term, update the SRNV using technological platforms that allow interoperability that will have a favorable impact on the functionality of the SRNV.

R2. For DMUNI: It is recommended that the general coordinator of the vaccination center promote the reduction of non-standardized forms.

Currently, there is a tendency to generate parallel forms to collect immunization data for later analysis. Likewise, EsSalud has its formats, which should be unified. The recommendation seeks to reduce the workload and improve the quality of the registration of the standard forms: Form A and the informed consent of the current technical standard for vaccination for COVID-19. Work overload in vaccination activities may affect the performance of staff, and actions aimed at reducing work overload need to be implemented.

The recommended action for DMUNI is to reduce the number of non-standard forms generated at vaccination centers.

R3. For DIRESA: Carry out the necessary actions to ensure that vaccination data are updated in SISMED.

SISMED allows traceability of the vaccine at the health facility level; however, this information is generally outdated, and the software is not implemented in all health facilities. We recommend updated information on vaccine traceability in category I-4 and I-3 health facilities that command vaccination activities in the short term, most of which have a pharmaceutical chemist in charge of SISMED. The challenges of SISMED and other supply systems need to be evaluated.

The recommended action for the DIRESAs is to strengthen the process of recording vaccine data in previously implemented vaccine delivery systems.

R4. For MOH OGTI: Provide the operational level with access to information on the vaccination status of the population under its jurisdiction who were vaccinated at an external center.

The use of information on vaccination status to estimate nominal coverage of their jurisdiction is considered of utmost importance for the micro-planning of vaccination actions. Thanks to the security level of the SRNV, it is possible to provide access to the vaccination status of members attached to health facilities or to reach agreements between the OGTI and DIRESA on the feedback process from the main level. This recommendation would allow the operational level to plan gap closure, follow up, and know the nominal target's vaccination status. The MOH regulates access to different levels of nominal information. This regulation prevents changes and unauthorized access.

The recommended action for OGTI is then to allow the general coordinator of the vaccination center access to information on the vaccination status of the vaccinated population in another jurisdiction.

EVALUATED DIMENSION: DATA QUALITY

R5. For DIRESAs, Health Networks and health facilities: It is recommended that the coordinator of information management, and health staff in charge of admission, registration, and data input, promote and strengthen actions to improve data quality at all levels of the information flow.

The data flow starts where the data is entered. It involves recognizing the form used to capture the information that is ultimately recorded in the SRNV. Estimating how much data is illegible, and how to handle it, and ensuring that the data is entered on time, are all imperative to ensure data quality. Data management is not protocolized, which allows each team in the charge of an information manager to apply different strategies for data correction and identification of unique identifier codes. In some cases, these activities involve improper handling of patient identification data. It is expected that this recommendation will:

- Reduce data consistency errors that make it impossible for the record to be entered into the SRNV
- Strengthen the team's capacity to improve data quality and highlight the benefits of consistent data in public health strategies
- Influence good practices to ensure data quality and ethical treatment of identifying data

The SRNV has the option of exceptions, which allow the entry of persons who do not have an identity document with a unique registration. However, most of the records that are not entered into the system belong to undocumented persons (country nationals and migrants). In extramural centers with more-significant human and computational resources, the resolution of data quality problems is easily compared to in intramural centers. It is necessary to evaluate why records are not entered despite the SRNV having an “exceptions” option. It is expected that the SRNV data management protocols formulated by the MOH will contain data quality management guidelines in the short term.

The recommended actions for DIRESAs, Health Networks and health facilities are as follows:

- Establish procedures or mechanisms for data flow, data quality control, and information feedback.
- Supervise, monitor, and evaluate records and data quality in the field; strengthen the paper and electronic archiving practices and custody of physical formats.
- Implement information and communication technologies to automate the collection of identifying information for the single registry.

EVALUATED DIMENSION: CONDITIONS FOR IMPLEMENTATION

R6. For the MOH: Coordinate with regional governments and other sectors on digital connectivity.

The timely recording of data in the SRNV is difficult for health facilities. Without connectivity, any attempt to implement an online system is unfeasible. The MOH must respond to the challenges of implementing innovative technologies in rural and remote areas of Tumbes, Loreto, and other regions, where vaccination points do not have connectivity. The feasibility of the recommendation requires prioritizing budget allocation for the initiative under a legal framework that ensures the project's sustainability. Projects to improve access to connectivity in remote areas of Loreto have been implemented.

The recommended actions for the MOH are:

- Call for public projects to implement high-capacity networks in rural areas.
- Systematize the lessons learned from previous projects to improve the terms of reference of the calls for proposals.

R7. For the MOH, DIRIS and DIRESAs: Have mechanisms to regulate data management at vaccination sites without internet access.

Based on the lessons learned, it is recommended that the MOH regulate and that DIRIS and DIRESAs implement directives to control the processes related to the management and custody of paper and

electronic data in vaccination sites without internet access. If the recommendation is implemented, information on vaccination coverage in remote areas will be available. Data management processes would be protocolized for vaccination sites without internet access, including the custody and digitalization of informed consent forms at the national level. Likewise, these protocols can be expanded to include data modification flows, changelogs, regulation of data analysis software, web pages, and institutional licenses. The feasibility of the recommendation is based on the steering role of the MOH, through the OGTI, to regulate data management processes.

The recommended actions for MOH, DIRIS, and DIREsAs are:

- Prioritize and regulate processes related to data handling in locations without network infrastructure for an online system.
- Identify key local data entry centers with adequate connectivity and computer infrastructure as a contingency plan in the event of connectivity problems with the SRNV registry.
- Focus on localities at risk of connectivity issues, and on program activities to strengthen the SRNV specifically for these locations, such as enabling offline SRNV and the use of viable technologies in line with facility capabilities.

R8. For the MOH: Regulate the exchange of SRNV identification data in social networks.

The WhatsApp groups have become the main means of internal data networking. There must be guidelines that regulate information sharing through this platform to ensure the confidentiality and privacy of the data. This action can be extended to other social networks, private accounts, and information analysis with identifying data on personal computers. Likewise, HR capabilities should be strengthened in the proper use of sensitive data following current regulations. The feasibility of the recommendation is based on the leading role of the MOH through OGTI in regulating sensitive data exchange processes. The School of Public Health has platforms for online education to complement regulatory actions.

The recommended actions for the MOH:

- Define and regulate the exchange of sensitive data in alternative means to institutional ones.
- Train staff in the proper use of sensitive data following current regulations.

R9. For the MOH and regional governments: Propose innovative mechanisms for project execution to ensure computer infrastructure in accordance with technological demand.

The constant advance of technology is a challenge for the computer infrastructure of the vaccination centers. Investment in equipment generates direct and indirect costs related to implementation, including infrastructure costs, connectivity requirements, preventive and corrective maintenance of equipment, and insurance against theft and damage that regional governments must assume. The technological context has highlighted that all equipment must have internet access; a clear example is the universalization of the smartphone with internet connectivity. In this logic, if the recommendation is implemented, there would be a computer infrastructure following the technological needs for the proper functioning of the SRNV. Projects that seek to improve digital connectivity should include a computer infrastructure component as an additional service that is adapted to the technological requirements of the SRNV and is flexible in the face of future challenges.

The recommended actions for the MOH are:

- Call for public projects to implement high-capacity networks in rural areas of Loreto, Tumbes, and other regions with a high percentage of rural areas. These projects should include the computational infrastructure necessary for the operation of the SRNV.
- Develop regional plans for preventive and corrective maintenance of the computer infrastructure.

6. Conclusion

The findings of the rapid assessment were presented to the officials of the bureau of the Vice Minister of Public Health, the General Directorate of Strategic Interventions in Public Health, the General Directorate of Information Technologies, and the Executive Directorate of Immunizations of MINSa. In each of the three regions in which field work took place, results of the evaluation were presented to the Director General of Health and their technical team.

The implementation of these recommendations will generate adjustments to strengthen the SRNV in the three evaluated system performance dimensions: functionality, usability, and security. This should improve the timeliness and quality of information so that decisions about vaccination, at all levels of the system, will be based on a closer approximation to reality. It will be possible to achieve better immunological protection coverage for the population. In addition, it is expected that the improvements will not be restricted to vaccination against COVID-19 but will also benefit vaccination efforts against other diseases in Peru.

Bibliography

- Operational guidance: COVID-19 vaccination data and information management, including monitoring of vaccine effectiveness. 2021. Copenhagen: WHO Regional Office for Europe.
- Pan American Health Organization. 2017. Electronic nominal immunization registry: practical considerations for its planning, development, implementation, and evaluation. Washington, D.C.: PAHO.
- Pan American Health Organization. 2019. Plan of action for strengthening health information systems 2019-2023. Board of Directors 71st session of the WHO regional committee for the Americas. 2019. Washington, D.C., USA, September 30 to October 4, 2019. Available at: <https://iris.paho.org/bitstream/handle/10665.2/51617/CD57-9-s.pdf?sequence=2&isAllowed=y>
- Resolución Ministerial No. 389-2021-MOH. Aprueban el Padrón Nacional de Vacunación contra la COVID-19. Perú, 17 marzo 2021.
- Resolución Ministerial No. 1119-2021/MINSA. Lineamientos para el pago de la entrega económica por prestaciones adicionales para la vacunación contra la COVID-19. Perú, 24 setiembre 2021.
- Resolución Ministerial No. 1169-2021/MINSA. Directiva Sanitaria para la vacunación con la COVID-19. Perú, 19 octubre 2021.
- Revoredo J, Cavalcanti J. 2014. “Una experiencia de implementación del registro médico electrónico en Perú. Revista Panamericana de Salud Pública. 2014; 35:365-70.
- Thompson MG, Stenehjem E, Grannis S, et al. 2021. Effectiveness of Covid-19 Vaccines in Ambulatory and Inpatient Care Settings. N Engl J Med. 2021; 385:1355.

Annex I: Evaluation Matrix

General Objective	Evaluate the SRNV for MOH's COVID-19 in Lima, Loreto, and Tumbes.	
Specific Objective I	<i>Analyze the legislation governing the nominal vaccination registry system, infrastructure (connectivity and computational infrastructure), and interoperability.</i>	
Activities	Indicators	Means of verification
Analysis of MOH documents, regulations and agreements related to the vaccination process against COVID-19	Current documents analyzed	Laws, policies and regulatory documents issued by MOH to support the development and operation of the system
Collect information on the connectivity situation related to the COVID-19 vaccination process.	Current status of the connectivity network infrastructure Existence of the required network infrastructure to operate an online system Scope of the institution's internal data network (intranet) Existence of plans to expand the data network	Interview report with the person in charge of connectivity Management reports Direct observation
Collect information on the status of the computer infrastructure related to the COVID-19 vaccination process.	Existence of equipment inventory and software available for implementation Availability of the required computer equipment Existence of protocols for data management, including backups	Interview with the person in charge of computer infrastructure Management reports Direct observation
Collect information on the interoperability of the Nominal Vaccination System for COVID-19.	Interoperability with other systems containing vaccination information for COVID-19	Interview with the person in charge of the SRNV development Review of public data dashboards Direct observation

Specific Objective 2		<i>Analyze the functionality, usability, and security of the SRNV.</i>
Activities	Indicators	Means of verification
Collect information on the functionality of the SRNV related to the vaccination process against COVID-19.	<p>Calculation and reporting of vaccination coverages</p> <p>Report management</p> <p>Traceability of the biological products</p> <p>Individual scheme follow-up</p> <p>Access to information for external stakeholders</p>	<p>Interview with SRNV users</p> <p>Coverage reports</p> <p>Management reports</p> <p>Direct observation</p>
Collect information on the usability of the SRNV related to the COVID-19 vaccination process.	<p>Difficulty level for users with no previous experience.</p> <p>It allows the calculation of user productivity.</p> <p>It allows the calculation of values automatically without mathematical or other operations.</p> <p>Use of alternative registration systems.</p>	
Collect information on the safety of SRNV related to the COVID-19 vaccination process.	<p>It prevents partial changes to the database, which can cause more problems than rejecting the entire form.</p> <p>It prevents unauthorized access to confidential beneficiary information.</p> <p>It keeps the change log.</p>	

Specific Objective 3		<i>Analyze the quality of registry data from the perspective of timeliness and consistency.</i>
Activities	Indicators	Means of verification
Collect information on the timeliness of data related to the COVID-19 vaccination process.	Time interval between the date of vaccination and date of registration	<p>Interview with information managers and data input clerks</p> <p>Reports</p>
Collect information on the consistency of data related to the COVID-19 vaccination process.	<p>Percentage of duplicate data</p> <p>Percentage of unreadable data</p>	Direct observation

Annex II: Interview guide

The interview guide for people involved in the vaccination process at the MOH, DIRIS, and DIRESA is composed of general and specific questions related to the evaluated dimension. It was also applied according to the role of the persons in the vaccination actions.

Date:

Location where the interview takes place:

Start time:

End time:

First and last name:

Position held:

Presentation:

Greetings and thanks for their willingness to answer short questions. Introduction of the interviewer and explanation of the objectives of the evaluation. Given the roles the person plays in the vaccination actions, we consider their opinions, perceptions, and experience concerning the SRNV to be critical to complement the information obtained and to formulate recommendations.

General questions

What is your current position?

What is your responsibility in the vaccination actions?

What are the vaccination centers you oversee?

Specific questions

Questions addressed to national and regional governmental authorities and officials of MOH and the Seguro Social de Salud.

Opening meeting: What is your opinion and perception of the SRNV for vaccination actions?

Meeting at the end of fieldwork, feedback, and presentation of preliminary results: Opinion and perception of preliminary results and recommendations?

Questions addressed to international cooperation officials such as representatives of UNICEF and USAID to obtain their opinions related to the SRNV for COVID-19.

Opening meeting and presentation of results: Discussion on critical evaluation points and results, and knowledge exchange based on lessons learned.

What is your opinion on the assessed dimensions of the SRNV?

What is your opinion on the preliminary results of the SRNV evaluation?

Closing meeting and presentation of preliminary recommendations: What are your opinions, recommendations, and perceptions concerning the preliminary results and recommendations of the SRNV evaluation?

Questions addressed to internal SRNV users concerning the SRNV and COVID-19 (addressed to general coordinator of the vaccination center, information management coordinator, and health staff in charge of admission, registration, and typing)

1. What is your opinion on the current status of the connectivity network infrastructure?
2. Does the current internet network allow adequate online operation of the SRNV?
3. What is the scope of the internal data network in the institution?
4. Do you have plans for the expansion of the data network? (Observe and document.)
5. Do you have an inventory of equipment available for the SRNV?
6. Do you consider that the required computer equipment for the SRNV is available?
7. Do you have protocols for data management and backup? (Document.)
8. Do you consider that the SRNV exchanges data between systems? (If yes, please ask 9.)
9. Concerning question 8: which systems or software programs exchange data with the SRNV?
10. Do you consider that the SRNV can communicate with different technologies and applications?
11. In your experience, does the SRNV allow the calculation and reporting of vaccination coverage: by type of vaccine, dose, age, geographic area, risk condition? By vaccination strategy (intramural, extramural, etc.)?
12. Regarding question 11. What additional report, now missing, would you like the SRNV to provide you with?
13. In your experience, does the SRNV allow predefined programmatic reports (coverage, attrition rate, vaccination timeliness), special reports (cohort follow-up), and monitoring of programmatic errors, etc.?
14. Regarding question 12. What additional predefined report would you like the SRNV to provide you with?
15. In your experience, does the SRNV allow traceability of the biological by expiration date, batch number, facility, or vaccinator?
16. Does the SRNV allow access to the vaccination card and consolidated reports to the external user?
17. Do you consider the SRNV easy to learn and use?
18. Does the SRNV allow you to perform calculations without performing additional operations?
19. Does the SRNV prevent partial database changes or unauthorized access, and keep a change log?
20. What is the average time interval from the date of vaccination to the typing date? It varies according to the vaccination center (intramural, extramural). List the centers of the registration route.
21. How much duplicate or eligible data do you estimate daily? It varies by vaccination center (intramural, extramural). Detail and document.
22. Do you use any information system parallel to the SRNV? Explain.

Annex III. Key informants

Scope	Location/vaccination places	Key informants
DIRIS Lima Norte	<p>DIRIS Norte headquarters</p> <p>COVID-19 Command Center (where the statistical unit for COVID-19 is located)</p> <p>Sinchi Roca Park</p> <p>Rimac Health Facility</p> <p>(The programmed visit to Zapallal and Puente Piedra health facilities could not be carried out due to the outbreak of cases of the third wave of COVID-19.)</p>	<ol style="list-style-type: none"> 1. DIRIS Norte Director 2. Responsible for the integrated health care office 3. Immunization Coordinator 4. Responsible for statistics 5. Systems and technology manager 6. Data input clerk 1 7. Data input clerk 2 8. General coordinator of the vaccination center 9. Information manager 1 10. Data input clerk 1 11. Data input clerk 2 12. Information manager
DIRESA Tumbes	<p>Headquarters</p> <p>Gerardo Gonzales Villegas health facility</p> <p>Zorritos health facility</p> <p>Aguas Calientes health facility</p> <p>José Lerner Tudela School</p> <p>Tupac Amaru School</p> <p>Andrés Araujo Morán School</p> <p>Zoila Tudela de Puell School – Zarumilla</p> <p>Aguas Verdes School</p>	<ol style="list-style-type: none"> 13. Regional Health Director 14. Director of Personal Health 15. Director of Epidemiology 16. Director of the Office of Information and Statistics 17. Responsible for immunization coordination 18. Director of Health Promotion 19. Head of the Regional Directorate of Medicines and Medical Devices. 20. General coordinator of the vaccination center 1 21. Information manager 1 22. Data input clerk 1 23. General coordinator of the vaccination center 2 24. Information manager 2

		<ul style="list-style-type: none"> 25. Data input clerk 2 26. Nurse in charge of Vaccination Center 1 27. Nurse in charge of Vaccination Center 2
DIRESA Loreto	<p>Headquarters</p> <p>Mariscal Oscar R. Benavides School</p> <p>Sagrado Corazón School</p> <p>Sagrada Familia School</p> <p>Moronacocha health facility</p>	<ul style="list-style-type: none"> 28. Regional Health Director 29. Assistant Director of Health 30. Head of the Directorate of Integrated Health Care 31. Regional Immunization Coordinator 32. Regional Cold Chain Coordinator 33. General coordinator of EsSalud's vaccination center 34. Information management coordinator at EsSalud's vaccination center
MOH	<p>Face-to-face opening meeting at MOH</p> <p>Meeting for presentation and discussion of preliminary findings via the Zoom virtual platform</p>	<ul style="list-style-type: none"> 1. Vice Minister of Public Health 2. Advisor to the Vice Ministry of Public Health 3. Advisor to the Vice Ministry of Public Health 4. General Manager of OGTI 5. Representative of the DMUNI technical team 6. Director General of DGIESP
UNICEF	<p>Meeting for presentation and discussion of preliminary findings and recommendations via the Zoom virtual platform</p>	<ul style="list-style-type: none"> 7. Immunization Officer UNICEF, Peru 8. Team member: one specialist in information and communication technologies and immunization data analysis
USAID	<p>Meeting for presentation and discussion of preliminary findings and recommendations via the Zoom virtual platform</p>	<ul style="list-style-type: none"> 9. Director of the Regional Office for Migration and Health, USAID Peru

Annex IV. Testimonials of identified problems and solutions

Scope	Testimony of problems	Testimony of solutions
DIRIS Lima Norte	<p>“The internet goes away when we want to do reports.”</p> <p>“The comparison of consolidated vaccination with HIS MOH is not successful.”</p> <p>“We had 8 megabytes connectivity and now 20 megabytes, the problem is the equipment, we work via WhatsApp.”</p> <p>“HIS delays on the same day, we don't know why, and it freezes.”</p> <p>“We would like to know if the people in our target have been vaccinated in Ayacucho ... to learn and deduct it from our target.”</p> <p>“When I want to see nominal roll number, I can only see mine and not all.”</p> <p>“Follow-up coverage is not possible.”</p> <p>“We have difficulty with foreigners ... there is no way to check if they have made their ID.”</p> <p>“We have received up to three thousand emails asking for data correction.”</p> <p>“We keep the traceability record in the notebook or whiteboard.”</p> <p>“From August 24 to September 23, 2021, there were no data input clerks ... It represents 6,000 pending records. The digitization accumulated in the weeks that the data input clerks did not have a contract.”</p> <p>“Not all of them fill out the Drive, and it does not match with the HIS MOH register” (referring to the information in the daily vaccination campaign closing minutes).</p>	<p>They bring their telephone and computer equipment to the work center, and they complete their work at home, where they have better internet access.</p> <p>They ask the central level to strengthen the speed of HIS MOH and to allow a quick registration.</p> <p>They request that the central level allow monitoring of the vaccination of DIRIS members at the national level.</p> <p>They move the records to places with more data input clerks.</p> <p>They keep the physical opening and closing minutes used at the vaccination centers for their control.</p> <p>They make changes to the SRNV on demand after verifying the identity of the external user.</p>

	<p>“When the system freezes, we use our cell phone.”</p> <p>“The HIS MOH does not recognize people who are undocumented or have other types of nonstandard documentation, and we have incomplete reports.”</p> <p>“They are asked for a hard copy of the identification card in the case of Venezuelans.”</p> <p>“Foreigners are not listed in the Ministry's database.”</p> <p>“The internet in the park is not good; it freezes.”</p> <p>“The consolidation we record with the HIS MOH report is different.”</p>	<p>They search other sources on the internet to verify the identity of foreign persons.</p> <p>MOH should indicate which ID to use (in case foreigners have more than one) and which other sources to verify to obtain the identity number.</p> <p>They ask the MOH to verify inconsistencies between the consolidated registry data and HIS MOH reports.</p> <p>Registrars buy their mobile data.</p>
	<p>“Follow-ups are not allowed” (concerning people vaccinated with the first dose)</p> <p>“There are not enough people to digitize; they haven't told us how to store the informed consents ... they are there.”</p> <p>“We haven't registered since Christmas.”</p>	<p>They plan to receive follow-up training.</p> <p>They follow up with phone calls, especially when they find inconsistencies in the data. Generally, they report progress via WhatsApp.</p> <p>They have coordinated with the head of statistics of DIRIS Norte the transfer of records to be digitized.</p>
<p>DIRESA Tumbes</p>	<p>“We use DIRESA's data registry so that the patient is not left without his/her record” (referring to the management of observed data).</p> <p>“We keep separate influenza and HPV vaccination records.”</p> <p>“The biggest problem is the foreigners without documents.”</p>	<p>The information and statistics office develops alternative systems to ensure the registration of all doses administered and proper identification of the external user.</p> <p>They choose vaccination centers that are centrally located to avoid electricity and connectivity problems.</p> <p>They use personal computers and internet data from their cell phones.</p>

	<p>“We are asked for a lot of data to reset passwords. Security is very cumbersome; we waste time.”</p> <p>“When there is no electricity in the school, the data input clerk doesn’t come.”</p> <p>“All systems are separate to contrast. Traceability is all work.”</p> <p>“We need the SRNV to allow for individual interconnectedness and causality.”</p> <p>“There are many isolated systems of records, and they are no good for immuno-preventable outbreaks.”</p> <p>“We have no information on people who have been vaccinated in Piura or abroad.”</p> <p>“A feedback matrix is needed.” [referring to the amount of information they request from different sectors]</p> <p>“ESAVI sheets are not available.”</p> <p>“We also keep a daily pattern format for recording doses and a record of staff attendance and additional hours by type of vaccine (a consolidated monthly report).”</p> <p>“Data input clerks with COVID-19 working from home.”</p>	
<p>DIRESA Loreto</p>	<p>“Internet is the main problem in recording vaccination data.”</p> <p>“We have not conducted a gap analysis of coverage and stock data since last year.”</p> <p>“We need more data input clerks. Currently, I don’t know if other executing units need data input clerks.”</p> <p>“We do not have a paper format storage plan.”</p> <p>“In EsSalud, we are up to date [referring to records] although they freeze access to our accounts due to problems at the national level.”</p> <p>“The system does not allow you to enter data if you are days away from your second dose.”</p>	<p>Brigades move to locations where they identify large quantities of undigitized records to assist in the registration.</p> <p>EsSalud’s greater logistical and computational capacity is used to improve records.</p> <p>They consider it a priority to resume actions to improve the process of recording vaccination data for COVID-19 and the traceability of vaccines.</p>

	<p>“We have found fake IDs, and the app is better.”</p> <p>Regarding the average time to enter data into the SRNV:</p> <p>“It varies; if it is a city, it is generally faster; if it is a peripheral area, it takes longer because of internet access, lack of equipment and staff.”</p> <p>“Regarding the brigades, depending on the days of return, it is immediate in the vaccination centers, and it can take up to 48 hours in the health facility.”</p>	
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