

# **A Study on Improving the Vaccination Process of Local Government Units (LGU) in the National Capital Region of the Philippines**

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## **Abstract**

This study determined the problems in the current COVID-19 vaccination process in the National Capital Region (NCR) and proposed improvements to improve the current process. A survey questionnaire to gather information on vaccination experience was created using Google Forms and was deployed to 120 respondents. The current vaccination process was presented using a systems flowchart, while the problems observed in the process were evaluated using a stream diagnostic chart. Findings showed that citizens experienced a delay during vaccination due to the inefficiencies of the online registration system, the first step in the current COVID-19 vaccination process, and insufficient resources in the vaccination site. An improved COVID-19 online registration system was designed to improve the registration process. This improved system will facilitate a more efficient vaccination process and provide more reliable information readily available for LGUs. It is also recommended to increase the workforce available in the vaccination site to assist the citizens seeking the service. An integrated or unified vaccine registration and scheduling system may be studied and created in the future so that all LGUs will have a single system to utilize for COVID-19 vaccination. Future researchers may use the findings in this study to conduct further studies related to the COVID-19 vaccination process. Other areas that may also be explored in the future include facility layout and design of the vaccine centers, simulation studies, and workforce allocation modeling.

## **Keywords**

systems analysis and design, COVID-19 vaccination process, stream diagnostic chart, online registration system

## **1. Introduction**

The COVID-19 vaccination in the Philippines includes the citizen's registration leading to data collection, thus creating an information system. Information systems revolve around databases, applications, and interfaces for end-users. In a traditional view, it also contains systems analysis and designs wherein an existing system can be replaced by modifying its modules or components to satisfy specific requirements. The systems design approach in information systems was applied to improve healthcare processes, most of it in the immunization information systems. In Mozambique, the government identified bottlenecks that demonstrated that the current immunization supply chain could not meet its demands. Using systems design as their approach, they have included a dedicated logistics system with transport loops, level jumping, direct data collection, new provincial logisticians positions, and improved performance - consistently low vaccine stock-outs of less than 5% (Prosser et al., 2016). Another investigated case was in Benin, where the children were not receiving the complete set of recommended vaccinations. The country's Ministry of Health launched a system design study to investigate four different immunization supply chain scenarios, including storage locations, transportation options, and routing. As a result, system design interventions were piloted, including the combined commune stores into a single health zonal store and informed push distribution model and delivery routes for vaccine distribution to health centers (McWhorter et al., 2016). In these cases, the application of systems analysis and design helped identify problems and opportunities for improvement by evaluating and recognizing its strengths and weaknesses.

Currently, the national government focuses on managing the Philippines' health risks while exploring all possible strategies to access COVID-19 vaccines for the safe and effective implementation of the COVID-19 vaccination program. The national deployment and vaccination for COVID-19 vaccines were drafted to provide operational guidelines for the implementation and deployment of the vaccines. The country's officials have developed the guidelines for implementing the vaccine and plant layout (DOH, 2021). Informant interviews were also conducted to understand other perspectives. A permanent fixed-post vaccination strategy is utilized to achieve COVID-19 vaccinations, ensuring facilities have sufficient health resources, capacity, and equipment to respond to some instances immediately. The LGUs will ensure that the implementing units or vaccination posts follow the protocols while non-compliant units do not conduct vaccinations. Cardenas (2021) critically analyzed the urgent need to improve the Philippine government's strategic policymaking, decision-making, and centralization of delegation on the acceleration of the COVID-19 vaccination rollout.

As of May 2021, the Philippines has more than a million fully vaccinated despite starting the vaccination in March of the same year (DOH, 2021). Thus, no studies have been published yet about the system involved in the vaccination process, particularly in local government units. The country's ministry of health, the Department of Health (DOH), has recently created the Vaccine Information Management System - Immunization Registry (VIMS-IR), which will only be used for master listing and as a registry of eligible populations. This study evaluated the vaccination process in the National Capital Region (NCR) as the Philippine government prioritized vaccine rollout in this area where the highest number of COVID-19 cases was posted. At the time of this study, the government has already categorized five (5) vaccine priorities: A1 - healthcare front liners, A2 - senior citizens, A3 - people with comorbidities, A4 - workers in the economic/essential sector, and A5 – indigent population. According to Foy et al. (2021), regardless of the vaccine's efficacy, prioritizing vaccination of 60 years and older individuals leads to a more significant reduction in COVID19 deaths than any other age group. Some cities in the region have successfully distributed vaccines to their priority list, while some struggle with the distribution. This study will help local government (LGU) units improve their vaccination process to avoid delays and misinformation among citizens.

## **2. Literature Review**

Several studies on vaccination process assessment have been conducted worldwide. Before the COVID-19 pandemic, Diamenu (2015) reviewed the relevant documents and reports on practical vaccine management assessments for 2010 and 2014 in Ghana. His recommendation includes installing electronic temperature monitoring devices in the vaccination sites to monitor the citizens' temperature to ensure health and safety. In another study, Chen et al. (2010) improved the approximation guarantee for finding the best vaccination strategy and analyzed nodes on which area should be vaccinated, while Wang and Aydin (2020) stated that using epidemiological models within a geographic context to map the spread of the novel SARS-CoV-2 virus will help in making decisions regarding state-wide interventions and allocating hospital resources.

The drive to vaccinate against COVID-19 started in December 2020 with participating countries from Europe, the Middle East, and North America. Paltiel et al. (2021) studied and examined the thresholds of each vaccine's efficacy with the different levels of implementation effectiveness. The study identified the factors related to implementation that will contribute to the success of the vaccination programs. Applying simulation, outcomes include infections, hospitalizations, and deaths. The study revealed the need for health officials to invest more in vaccine production and distribution programs since the vaccine benefits decline as the manufacturing or the delays in deployment. Health officials were also advised to promote the COVID-19 vaccines to increase public confidence and continue to support the vaccines.

Hasan et al. (2021) reviewed all the available English-language guidelines and research related to mass vaccination for COVID-19 to observe the potential to reduce the incidence of cases and attain "herd immunity". The review was done through Preferred Reporting Items for Systematic Review, and Meta-Analysis (PRISMA) guidelines and policies were summarized according to the WHO framework for mass vaccination. The results showed that the policies prioritized the front-line health workers and elderly. The data also showed the reduction of COVID-19 cases, hospitalization, and death.

## **3. Methods**

A survey questionnaire, created using Google Forms, was deployed to 120 respondents through email and various social media platforms in one month, from June 15 to July 15, 2021, to gather data on the experiences of individuals

in the current COVID-19 vaccination process in the Philippines. The respondents were COVID-19 vaccinated and unvaccinated citizens aged 18 and above. The first section of the questionnaire included demographic information such as age, gender, group/category, and city. The second section included questions about the online vaccine registration process experience, while the last section, which is for vaccinated respondents, included the vaccination process experience and overall comments or suggestions. A systems flowchart was developed To present and assess the current and proposed vaccination process, while a stream diagnostic chart was also created to illustrate the problems observed in the current process. Finally, to illustrate the improvements made on the current COVID-19 vaccination process, particularly on the registration process, an information system was designed to show the procedure, and the corresponding user interface for each step in the process.

## **4. Results and Discussion**

### **4.1 Current COVID-19 Vaccination Process**

The vaccination process of LGUs in NCR presented in Figure 1 follows the Department of Health (2021) recommendation in the COVID-19 Vaccination Plan. The first step in the process is online registration. During registration, the information asked are priority group/category, name, age, address, existing illness or medication, and allergies. After registration, a text message containing the registration details will be sent to the registrant as a sign of confirmation. The same information is posted on the LGU's public webpage for public awareness. Then, the individual may proceed to the vaccination site during the scheduled date and time. Upon arrival at the vaccination site, the individual shall fill up a health declaration form for contact tracing and then proceed to the registration section to validate his profile in the database. Depending on the group/category, other requirements may also be asked depending on the group/category, such as identification cards and medical certificates. Once confirmed, the individual may proceed to the screening area, and a medical professional will check vital signs like blood pressure and heart rate to check for the safety of receiving the COVID-19 vaccine. Once cleared, the individual may proceed to the vaccination area to get the shot of the available vaccine. After receiving the vaccine, the individual must proceed to the post-vaccination room and stay for at least 15 minutes to observe the vaccine's possible side effects. Once cleared, the individual will be given a vaccination card bearing the name, age, the indication of first or second dose, the brand of vaccine granted, and the person who administered the vaccine.

Most of the respondents express satisfaction with their experience of registering online because of the ease of use of the registration website, clarity of instruction, and accessibility. In terms of waiting for vaccine schedule confirmation, 29.20% of the respondents waited about a month before receiving their confirmation, while 25.80% waited only 2 to 3 days. During vaccination, 55.80% of the respondents waited for 2 to 3 hours to get vaccinated while the others received the vaccine within 30 minutes upon arrival at the vaccination site.

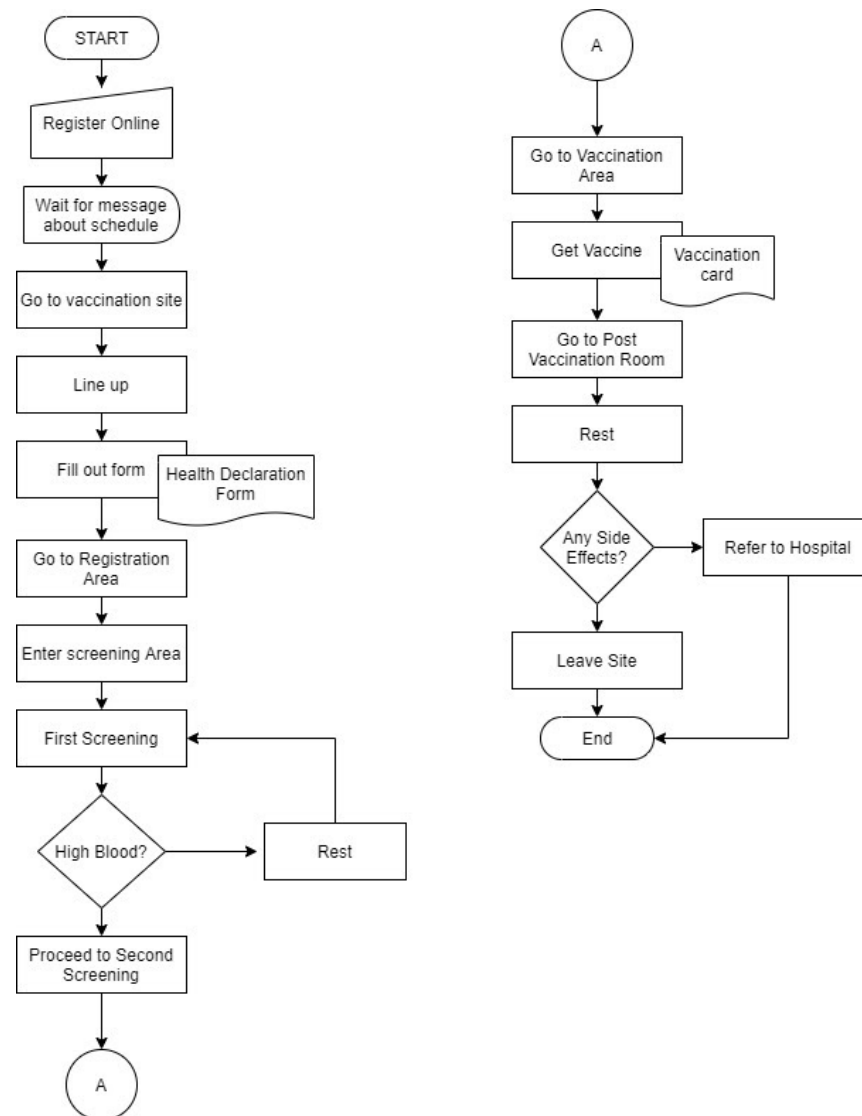


Figure 1. Current Vaccination Process

The stream diagnostic chart presented in Figure 2 shows the problems or issues encountered in the current vaccination process. The issues are categorized into four (4): Man, Methods, Materials, and Environment. The problems related to the Man category are lack of staff or personnel, many walk-ins with unconfirmed schedules, and unresponsiveness of the contact person-in-charge of the vaccination schedule. The increase in the number of walk-ins is related to the unresponsiveness of the contact person increasing in volume of individuals who wish to get the vaccine. Another problem observed was cutting in line of those individuals who knew some of the staff or personnel in the vaccine site, undermining the people lined up and waiting for hours. The issue related to Methods was the delay in the confirmation of the schedule of the online registered patients, thus resulting in a lot of walk-in individuals. In addition, some registrants received the email or text confirmation of the schedule at an inappropriate time. The on-site vaccine process was also observed to take longer, resulting in a long queue. For the Materials, the problems observed were the insufficient supply of vaccines, lack of signages in the vaccine site, and lack of information regarding the vaccine. Lastly, respondents observed the lack of social distancing for the Environment due to the high volume of walk-in individuals and limited area in the vaccine site.

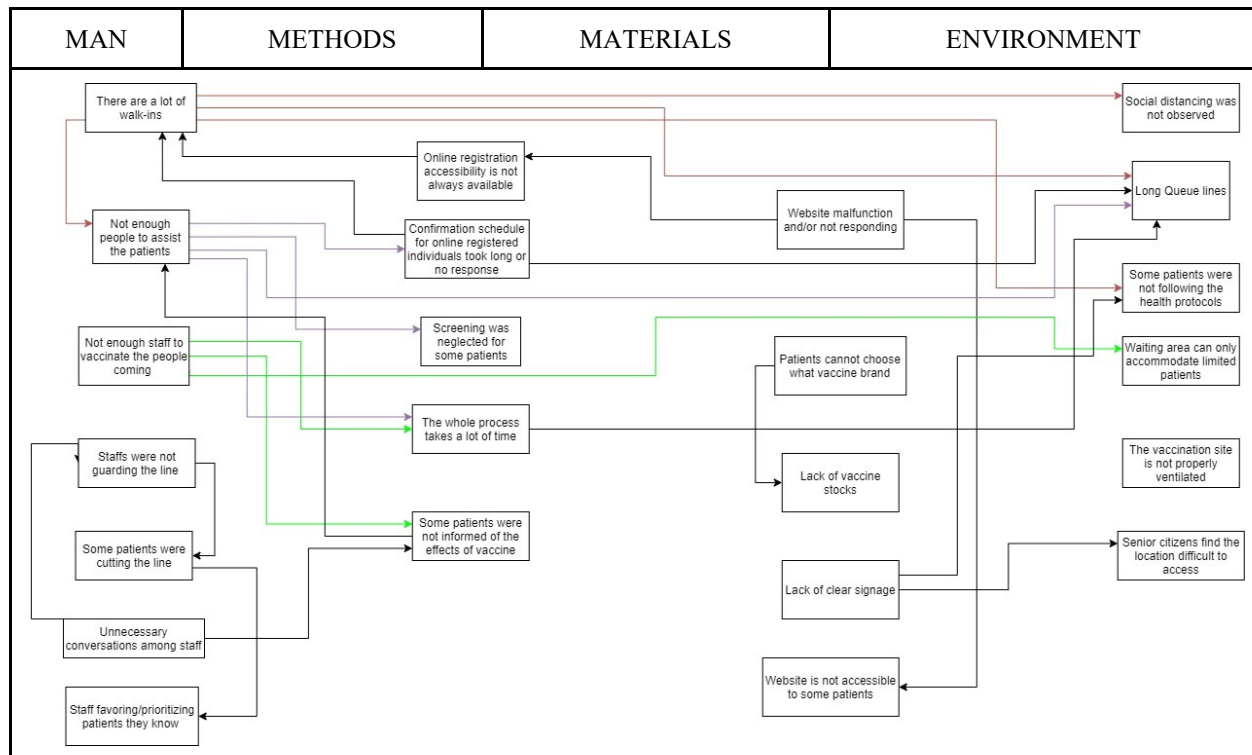


Figure 2. Stream Diagnostic Chart of the Current Vaccination Process

#### 4.2 Proposed Improvements on the COVID-19 Vaccination Process

Figure 3 presents the improvement made on the online registration process, which is the first step in the COVID-19 vaccination process. This process is highlighted in Figure 4, showing the enhanced vaccination system flow chart. The proposed online registration application and user interface allow the user to select his or her preferred vaccination site and date and time of schedule. The online registration begins with the "Basic Information" feature. This feature indicates the personal information such as the priority group where the user belongs, name, sex, contact number, and email that the user needs to fill in. The succeeding requirement is the "Current Address", where the user needs to input the exact place of residence. Then, the "Schedule Information" contains a dropdown list of the nearest vaccination sites available in the city where the user resides. The other information available is the calendar, which shows the available dates and times for an appointment. In this section, color-coding is provided to indicate availability. Green denotes that the selected date and time is available, while red indicates that the selection made is already full in capacity and not available anymore. The next step is to check and finalize the information provided during the registration. Finally, upon successful registration in the system, a confirmation message that indicates the name, vaccination site, date, and time of appointment will be sent on the registered mobile number provided by the user.

Using the improved online registration system will reduce the number of walk-in individuals since they will pick the time and date that fits their schedules. The LGUs will also get an accurate number of individuals expected to arrive on a given date and time and estimate the total number of vaccines needed for the day. This information can reduce the number of people waiting at the vaccination site. Similarly, improving information systems in healthcare is beneficial to people in general, and because vaccination is the top priority at present, an integrated vaccine registration system for all cities of NCR will be advantageous.

**COVID-19 Vaccination Online Registration**

Instructions: Fill out the form required for vaccine identification. Please provide only true and accurate information.  
Punuan ang lahat nang kaugang impormasyon para sa pagkakakilanlan. Ibigay lamang ang totoo at tamang impormasyon.

**Basic Information**

Priority Group \*

First Name (Pangalan) \*  Middle Name (Gitnang Pangalan)  Surname (Apelyido) \*  Suffix

**Current Address**

Region \*  Province \*  City \*  Barangay \*

Street \*  Bldg. Name  House/Unit No. \*

**Schedule Information**

Site \*

Date  Earliest available day: 15 August 2021

Time

Site	8:00 - 9:00	9:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00	15:00 - 16:00
Available	Full	Full	Full	Full	Full	Full	Full	Full

**Vaccines Information**

Priority Group: A1 Full Name (Pangalan): Juan dela Cruz Jr.  
Sex (Kasarian): Male Mobile Number: 09xx-xxxx-xxxx Email: jdc@gmail.com  
Current Address: NCR, District, City, Barangay, Street, House Number

**Schedule**

Site: Vaccination site  
Date: 15 August 2021 Time: 8:00 - 9:00 AM

☐ I confirm that all the information are correct. (No changes shall be possible after submission)

**Thank you! Please wait for the confirmation text containing your NAME, VACCINATION SITE, DATE, and TIME. Present a valid ID upon arrival at the vaccination site.**

**Vaccines Information**

Priority Group: A1 Full Name (Pangalan): Juan dela Cruz Jr.  
Sex (Kasarian): Male Mobile Number: 09xx-xxxx-xxxx Email: jdc@gmail.com  
Current Address: NCR, District, City, Barangay, Street, House Number

**Schedule**

Site: Vaccination site  
Date: 15 August 2021 Time: 8:00 - 9:00 AM

Figure 3. Proposed Online Vaccination Registration Interface

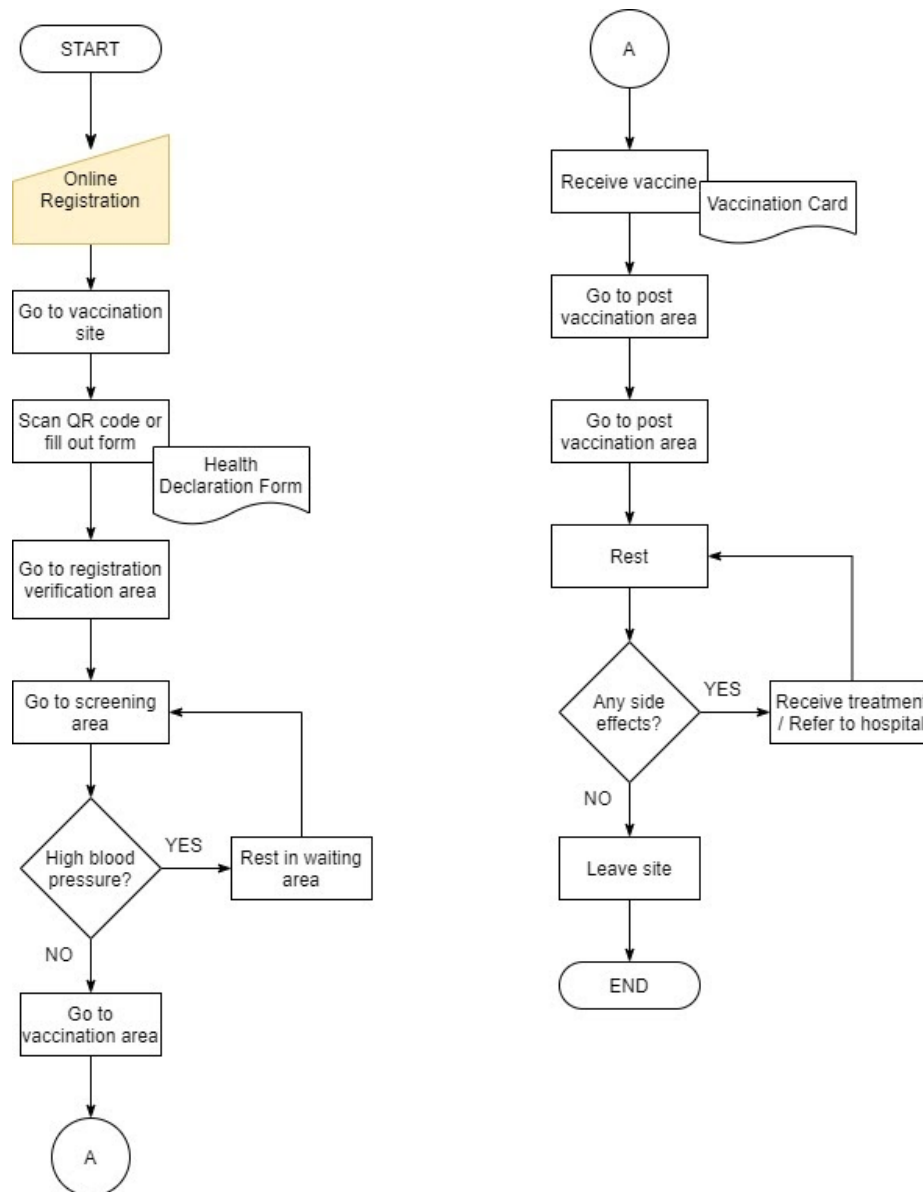


Figure 4. Improved Vaccination Process

## 5. Conclusion

This study aims to improve the current vaccination process of LGUs in the National Capital Region. The stream diagnostic chart identified that the primary root cause of the problem is the inefficiency of the current vaccine online registration process. The website is sometimes inaccessible due to an internal error, and individuals who registered online experience delays in receiving the text confirmation of the schedule. The delays forced individuals to walk in on vaccination sites in the hope of getting the vaccine. It is therefore recommended to improve the information system used by LGUs, especially for online registration. Allowing individuals to choose their preferred schedule and location of vaccination will be very helpful as this will prevent long waiting times and enable the individuals to get vaccinated at their most convenient time. Additionally, walk-ins, people cutting in line, delays, and disruption in the process may be prevented, and safety protocols such as social distancing may be properly executed. Improving the information system for online registration of COVID-19 vaccination will facilitate a more efficient vaccination process and provide much information readily available for LGUs. Future researchers may use this information in conducting further studies related to COVID-19 vaccination. Other areas not covered in this study may also be explored in the future, such as facility layout and design of the vaccine centers, simulation studies, and workforce allocation modeling.

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## Biographies

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