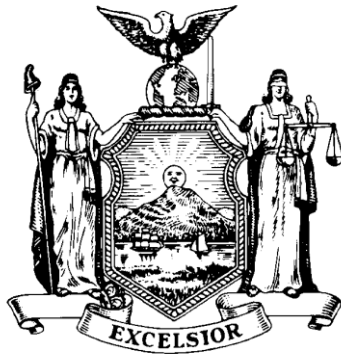


State of New York
Offices of the Inspector General



Investigation of the
New York State
Department of Health
COVID-19 Vaccination Scheduling Website

October 2021

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EXECUTIVE SUMMARY

On January 14, 2021, the Offices of the New York State Inspector General received an allegation that the State's COVID-19 vaccine scheduling website¹ had been prematurely accessed before the State intended it to be made public. This resulted in nearly 20,000 appointments being scheduled at the State University of New York (SUNY) Stony Brook University vaccination site on January 13, 2021, more than 24 hours before the website was scheduled to be available for public access. Similarly, vaccination appointments were prematurely scheduled for State-operated sites in Binghamton, Buffalo, Plattsburgh, Potsdam, and Utica, with some appointments being made before the vaccine sites were accepting reservations. Of those appointments, many were made without first verifying the eligibility of applicants to receive the vaccine.²

Ultimately, more than 28,000 vaccine appointments were canceled by DOH due to the premature access by the public and questions about applicants' eligibility to receive a vaccine. Additionally, during the Inspector General's investigation, allegations arose that vaccination appointment slots designated for certain groups (e.g., employees of the Metropolitan Transportation Authority) were being taken by others and the public was continuing to bypass the eligibility screening.

The Inspector General's investigation included the review of thousands of pages of documents and more than 40 interviews of witnesses from the New York State Department of Health (DOH), Office of Information Technology Services (ITS), Health Research Incorporated (HRI), Executive Chamber, Division of the Budget (DOB), and the professional services firm Deloitte Touche Tohmatsu Limited (Deloitte). The Inspector General found that State website administrators prematurely and unintentionally made links accessible to State-operated vaccination scheduling websites causing appointments to become available for booking before

¹ The New York State Department of Health developed a website that was central to New York's efforts to educate the public and provide resources during the pandemic. (See, <https://coronavirus.health.ny.gov/home>.) The public website links directly to the federal Centers for Disease Control and Prevention (CDC) coronavirus guidance and provides important information about COVID-19, including symptoms and testing locations.

² New York State launched its vaccine appointment scheduler on January 13, 2021, and initially made its limited supply of vaccines available to certain people who were deemed eligible at that time. At the start, eligibility for a COVID-19 vaccine included health care workers and residents and staff of nursing homes and other congregate care facilities. Subsequently, eligibility was expanded to include people 75 and older, first responders, correction officers, teachers/school staff; in-person college instructors, childcare workers, public-facing grocery store workers, transit workers, and people who live/work in homeless shelters, among others. Eligibility criteria was later expanded to include individuals with comorbidities, other classes of workers, and those in younger age groups. See, for example, <https://www.governor.ny.gov/news/governor-cuomo-announces-additional-new-yorkers-individuals-75-and-older-can-begin-scheduling>

the site was supposed to begin taking reservations. Members of the public who made appointments to receive vaccines at dozens of sites across the State then used and shared these links across social media and communications platforms like Facebook, WhatsApp, and community ebulletin boards. This enabled thousands of people to prematurely schedule vaccination appointments without first utilizing the eligibility screening tool on the DOH website.

Although multiple technical issues contributed to the premature availability of these scheduling links and their use by the public, the Inspector General found no evidence that DOH's systems had been compromised by cyber criminals or that State employees or contractors who possessed advanced access to the website scheduling links leaked them to the public.

Since the initial complaint was received by the Inspector General, ITS and DOH have implemented more than 100 technical corrective actions to address deficiencies found in New York State's vaccine scheduling application. Specifically, the corrective actions include enhancements to the vaccine appointment scheduler like security improvements and the creation of firewalls and a virtual waiting room to manage the large online queue. ITS and DOH are also continuing to develop other ways to mitigate the recurrence of any premature accessing of vaccine appointments.

Notably, the Inspector General found that staff of ITS, DOH, and HRI worked ceaselessly and competently during the activation of DOH's COVID-19 vaccine scheduling websites to respond to the unprecedented demand for vaccination appointments and quickly implemented corrective actions when issues were discovered. The deficiencies found in this investigation do not undermine this exceptional response.

This review is particularly timely given the current expansion of vaccine eligibility to include booster shots for the elderly and individuals with certain conditions, the potential for booster shots to be recommended for the public at-large, and the anticipated approval of vaccines for children ages five to 11. Moreover, the integrity and reliability of New York's Vaccine Data System is critical as the State turns to local government resources to administer the continuing vaccination effort.

Importantly, individuals who bypassed eligibility screening and directly scheduled their vaccination appointments did not always circumvent all eligibility requirements. DOH's final

vaccination scheduling website contained an eligibility attestation, which required people to show proof of their eligibility at vaccination sites prior to receiving the vaccine.

BACKGROUND

In late 2019 and early 2020, the COVID-19 pandemic began across the globe and dramatically changed how people, institutions, and governments functioned on a day-to-day basis. On a scale not seen since World War II, state and local governments mobilized to effectively respond to the international crisis.

As the deadly crisis continued throughout 2020 and into 2021, New York State government continually evolved as the pandemic's characteristics shifted. DOH worked to address possible critical hospital bed and ventilator shortages, therapeutic treatments for the sick, changing symptoms of the illness affecting different populations including children, and testing and vaccine distribution.

In late 2020, pharmaceutical companies, Pfizer, Moderna, and Johnson & Johnson, each finalized production of a vaccine for COVID-19. With initially limited supply allocated to each state and unprecedented demand, New York State had to quickly develop a plan to administer vaccines to a population of more than 19 million. The plan had to consider, among other factors, how vaccines should be allocated and geographically disbursed within the State, the criteria for disbursement, which populations would get first access to the vaccine, and how to ensure equitable access to specific and underserved populations.

New York State, like all other states, had never faced such a complex and unprecedented challenge. Nevertheless, the State addressed the aforementioned logistical questions in short order, culminating with the administration of the nation's first vaccine to Sandra Lindsay, a critical care nurse at Long Island Jewish Medical Center, on December 14, 2020.³

The National COVID-19 Response

The issues found in this investigation are not unique to New York State. In fact, due to exorbitant demand for COVID-19 vaccines and initial limited supply, states, counties, pharmacies, and hospitals, among others, struggled with the implementation and improvement of vaccination scheduling systems and the administration of vaccines. With a United States population over 300 million, almost every aspect of state government was pushed beyond

³ <https://www.northwell.edu/infectious-disease/patient-testimonials/from-the-front-lines-to-the-first-in-line-to-get-the-covid-19-vaccine>.

capacity. The federal government's limited role also presented a particular challenge to the management of this public health crisis.

States were presented with the unique challenges of obtaining, distributing, and administering the fastest-ever developed and approved vaccines in history.⁴ These challenges were compounded by other factors including the short period in which pharmaceutical companies were required to ramp up production and the rapid spread of the virus. Safely storing and transporting the vaccines also presented challenges. Initially, the COVID-19 vaccines had stringent storage temperature requirements, which typical freezers are incapable of reaching. This presented complications for the federal and state governments, which were attempting to distribute vaccines across great distances and to rural areas that lacked such storage abilities.⁵

The CDC, working with Deloitte, developed the Vaccine Administration Management System (VAMS) to schedule vaccination appointments and collect related data. VAMS, an online tool, tracks the vaccine process from receipt of a vaccine by a provider to the administration of a vaccine to a recipient. VAMS was made available at no cost to public health-approved clinics, which includes county departments of health. However, according to reports, when states began using this system, many complained that the software was faulty and instead launched their own systems.⁶

For example, at least 28 states, including Pennsylvania, Massachusetts, Virginia, and Washington, began using the PrepMod system.⁷ Soon after implementation, problems with the PrepMod system were also reported, including crashed servers due to high traffic, and the sharing of vaccination scheduling links through Facebook, which caused overbookings at certain vaccination sites.⁸ Other states, including California, used another computer system, MyTurn, to schedule vaccinations. Here again, issues were reported including the redistribution of special access codes to unintended recipients via text messages and emails, which also caused

⁴ See, UCLA Health, *The fastest vaccine in history*, <https://connect.uclahealth.org/2020/12/10/the-fastest-vaccine-in-history/>, (December 10, 2020).

⁵ See, The Wall Street Journal, *Covid-19 Vaccines Are Slow to Reach Rural America*, <https://www.wsj.com/articles/covid-19-vaccines-are-slow-to-reach-rural-america-11608390001>, (December 19, 2020).

⁶ See, for example, MIT Technology Review, *What went wrong with America's \$44 million vaccine data system?*, <https://www.technologyreview.com/2021/01/30/1017086/cdc-44-million-vaccine-data-vams-problems>.

⁷ See, The New York Times, *Faulty Software Snarls Vaccine Sign-Ups*, (March 12, 2021), <https://www.nytimes.com/2021/03/12/technology/vaccine-sites-technology-problems-covid.html>.

⁸ See, The Philadelphia Inquirer, *Philadelphia COVID-19 vaccine registration can finally keep out line jumpers, officials say*, <https://www.inquirer.com/health/coronavirus/philadelphia-fema-prepmod-software-link-eligible-covid-vaccine-appointment-20210309.html>.

overbookings at certain sites. Other states, municipalities, and organizations like hospitals, pharmacies, and doctors' offices used systems that were unable to communicate with one another, which resulted in additional vaccination scheduling complications.

States Experienced Significant Problems with Vaccine Distribution

Nearly every state in America faced challenges involving vaccination administration and distribution, with issues reported as being largely related to technology, access, or supply limitations.⁹

- At least six states failed to even create statewide vaccination appointment websites as of March 2021¹⁰
- At least 14 states had unauthorized weblinks shared among ineligible populations¹¹
- At least 16 states and Washington D.C. suffered crashed servers and were not equipped to handle the high traffic¹²
- At least 12 states canceled scheduled vaccination appointments due to system exploits and other related issues¹³
- In at least eight states and Washington D.C., available appointments were filled within a few hours of scheduling website links and telephone lines going live¹⁴
- In at least 10 states and Washington D.C., citizens complained of frustrations with telephone vaccination scheduling systems, which included dropped calls, excessive wait times, language barriers, and the inability to speak to human operators¹⁵

⁹ See, The New York Times, *The Problem With Vaccine Websites*, (Jan. 12, 2021), <https://www.nytimes.com/2021/01/12/technology/the-problem-with-vaccine-websites.html>; Associated Press News, *Expanded vaccine rollout in US spawns a new set of problems*, (Jan. 14, 2021), <https://apnews.com/article/us-coronavirus-vaccine-problems-24cc4724457f3f682b7c3e8414deb565>; and, The San Diego Union-Tribune, *As with much of the COVID response, California's vaccine appointment website is glitchy*, (Mar. 5, 2021), <https://www.sandiegouniontribune.com/news/health/story/2021-03-05/californias-vaccine-appointment-website-glitches>.

¹⁰ Arkansas, Colorado, Louisiana, Maine, Nevada, and Wisconsin did not create statewide vaccination sites.

¹¹ Alaska, California, Georgia, Illinois, Maryland, Massachusetts, Michigan, Missouri, Nevada, New Mexico, Pennsylvania, Rhode Island, Texas, and Virginia had unauthorized weblinks shared among ineligible populations.

¹² Florida, Georgia, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Jersey, Ohio, Oregon, Tennessee, Washington, and Washington D.C. suffered crashed servers and were not equipped to handle the high traffic.

¹³ Florida, Illinois, Kentucky, Louisiana, Maryland, Minnesota, Missouri, Nevada, Ohio, Pennsylvania, Rhode Island, and Virginia canceled scheduled vaccination appointments due to system exploits and other related issues.

¹⁴ In Alabama, Alaska, Arizona, Florida, Maryland, Nebraska, Oklahoma, Tennessee and Washington D.C., available appointments were filled within a few hours of scheduling website links and telephone lines going live.

¹⁵ In Alabama, Arizona, Connecticut, Idaho, Iowa, Mississippi, North Carolina, Ohio, Tennessee, Utah and Washington D.C., citizens complained of frustrations with telephone vaccination scheduling systems.

Additionally, other logistical challenges further compounded these issues. For example:

- In South Carolina, high demand and short supply of vaccines led to the canceling of 6,000 vaccination appointments at a hospital after the hospital was notified that expected vaccine doses would not be arriving¹⁶
- In California, San Francisco health officials complained of difficulty in scheduling appointments due to uncertainty about the timely arrival of expected vaccine shipments¹⁷
- In Georgia, a health official echoed the same concerns, noting that appointments were scheduled based on anticipated deliveries of vaccine doses without any confirmation that the vaccines would be received¹⁸
- In New York City, Mayor Bill de Blasio announced the postponement of approximately 23,000 vaccination appointments due to shipping delays, advising at the time that New York City's supply would soon be exhausted¹⁹

Despite these challenges, as of October 13, 2021, the CDC reported that 404,371,247 vaccine doses had been administered in the United States, and 187.9 million people—more than 56.6 percent of the population of the United States—was fully vaccinated.²⁰

New York State's COVID-19 Response

In mid-December 2020, New York State began receiving its first allocations of vaccine doses. By mid-January 2021, New York State began operating State vaccination sites and administering vaccinations. These sites were located throughout New York including SUNY campuses, the Javits Center, Aqueduct Racetrack, Jones Beach, sports arenas, malls, and churches, among other sites. Numerous additional “pop-up” sites were established across the State at locations including religious and community facilities, and public housing.²¹ The State partnered with other municipal governments and interest groups to distribute vaccines to the

¹⁶ See, The New York Times, *Thousands of Vaccine Appointments Canceled as Supply Lags*, (February 1, 2021), <https://www.nytimes.com/live/2021/01/20/world/covid-19-coronavirus>.

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ Ibid and see, Gothamist, *NYC Cancels 23,000 Vaccine Appointments After Delay in Moderna Shipment*, (January 20, 2021), <https://gothamist.com/news/nyc-cancels-23000-vaccine-appointments-after-delay-moderna-shipment>.

²⁰ <https://covid.cdc.gov/covid-data-tracker/#vaccinations>.

²¹ New York partnered with the New York City Housing Authority (NYCHA) to launch a pop-up vaccination site at Middletown Plaza in the Bronx, and New York partnered with community leaders to establish pop-up sites at churches such as Wayside Baptist Church in Brooklyn and Convent Avenue Baptist Church in Manhattan. See, <https://www.governor.ny.gov/news/governor-cuomo-announces-12-community-based-pop-vaccination-sites-coming-online-week-vaccinate>. See also pop-up sites in Brentwood at La Espigueta Soccer Academy, <https://www.newsday.com/news/health/coronavirus/brentwood-high-infection-rates-1.50174465>; and Syracuse, <https://www.syracuse.com/galleries/KVND5Q7ZTZA4PMN3INRRO5QWO4/>.

most vulnerable New Yorkers.²² Non-State operated vaccination sites were also established, which included sites operated by counties, doctors' offices, pharmacies, and hospitals.²³ New York State used both telephone and online systems to schedule appointments for vaccinations.

As of October 13, 2021, per CDC, 64.6 percent of the total population of New York was fully vaccinated, with 26,032,099 vaccine doses having been administered in New York State.²⁴

The DOH Countermeasure Data Management System

New York State uses a DOH-developed program known as the Countermeasure Data Management System (CDMS, hereafter referred to as the Vaccine Data System) when administering vaccines. Developed more than 10 years ago, the web-based Vaccine Data System collects certain information from individuals seeking a vaccine, such as recipient demographic, medical, and visit information related to managing contagious outbreaks (e.g., immunizations, diagnostic testing). The Vaccine Data System underwent a significant technical upgrade in September 2020 in anticipation of supporting the administration of COVID-19 vaccines.

An important feature of the Vaccine Data System is its ability to share information with the New York State Immunization Information System (NYSIIS) and the Citywide Immunization Registry (CIR). Immunization data entered into the Vaccine Data System is automatically transferred into NYSIIS, eliminating duplicate data entry. Part of the COVID-19 vaccination effort included the immediate reporting of immunization data to NYSIIS and CIR.²⁵

Since its inception, the Vaccine Data System has been continually utilized by State, regional, local, and tribal nation health departments for countermeasures involving vaccine distributions like the annual flu shot and planning for a response to an anthrax attack. To

²² For example, New York State partnered with New York City and SOMOS Community Care to launch a vaccination site at Yankee Stadium in the Bronx. New York also partnered with senior centers such as the Mt. Kisco Senior Center in Westchester and the Mulberry House Senior Center in Middletown. Ibid and see, <https://www.governor.ny.gov/news/governor-cuomo-and-mayor-de-blasio-announce-mass-vaccination-site-yankee-stadium-open-friday>.

²³ The operators of non-State vaccination sites independently verified the eligibility of those seeking vaccinations.

²⁴ Note, per CDC, 76.4 percent of the 18-plus population of New York State was fully vaccinated as of this date. <https://covid19vaccine.health.ny.gov/covid-19-vaccine-tracker#:~:text=Eligible%20New%20Yorkers%20can%20also,833%2D697%2D4829>.

²⁵ Pursuant to New York State Public Health Law and New York Codes, Rules and Regulations, as modified by New York State Executive Order No. 202.82, within 24 hours of administration, a record of all statewide (except New York City) COVID-19 immunizations must be entered into NYSIIS and all COVID-19 immunizations occurring in New York City must be recorded in CIR. See, New York State Public Health Law § 2168; New York Codes, Rules and Regulations § 66-1.2; and New York State Executive Order No. 202.82, Governor Andrew M. Cuomo (December 13, 2020).

facilitate the COVID-19 vaccination distribution, the Vaccine Data System expanded its list of providers authorized to use the system to include hospitals, community-based health care providers (Federally Qualified Health Centers), and pharmacies approved by DOH to participate in the COVID-19 vaccine distribution effort. Once access was granted, each site could plan scheduled events to administer vaccines to those members of the public who were deemed eligible according to New York’s phased eligibility plan.

Although other technical options were considered for scheduling COVID-19 vaccination appointments, DOH’s existing vaccination administration program, the Vaccine Data System, was selected due in large part to the many health care providers across the State already familiar with and successfully using the program, and its proven and effective ability to interface with NYSIIS. However, the Vaccine Data System had never before been utilized for such a large-scale vaccination effort.

For the COVID-19 vaccine distribution plan, New York State contracted with Deloitte to create an eligibility screening tool called “Am I Eligible” (hereafter referred to as the Screening Tool), which would appear before the appointment scheduler on the Vaccine Data System. When initially implemented, the Screening Tool asked the following questions of an applicant:

The screenshot shows a web form titled "About You" with a dark blue header. The form contains the following fields and options:

- First Name ***: A text input field.
- Last Name ***: A text input field.
- Date of Birth ***: A date input field with a mask of "MM/DD/YYYY" and a calendar icon.
- Sex ***: A section with four radio button options: "Male", "Female", "Non-Binary", and "Prefer not to answer".

Contact Information

Address Line 1 * Address Line 2 City *

State * Zip *

Preferred Contact Language * Preferred Method of Contact *

Enter a phone number or email address that we can contact you at below. Providing a phone number or email address will allow you to come back later and update your information.

Email Address Mobile Phone Number

I would like to receive text messages or emails regarding my participation in the administration of the COVID-19 Vaccination. *

Yes No

Additional Information

Are you a worker in a patient-facing healthcare setting or a congregate living setting? *

Yes No

Which of these settings do you primarily work in? *

Required Field

Are you currently living in a congregate setting? *

Yes No

Which of these congregate settings do you live in? *

Required Field

Acknowledgement

Consent to Disclose:
This screening tool, and the information provided herein ("Eligibility Screening Tool"), will be used for the sole purpose of determining eligibility for receiving a COVID-19 vaccination.

The information collected on the Eligibility Screening Tool through this website and/or application and the disclosure of such information for the purpose stated above are subject to the requirements of the New York State Internet Security and Privacy Act.

Information collected on the Eligibility Screening Tool is subject to disclosure only with the consent of the applicant. Your completion and submission through this Eligibility Screening Tool results in the disclosure of personal information and constitutes your consent to the collection and disclosure of such information by NYS for the administration of the COVID-19 vaccination.

NYS may disclose personal information without applicant consent if the collection or disclosure is: (1) necessary to perform the statutory duties of NYS, or necessary for NYS to operate a program authorized by law, or authorized by state or federal statute or regulation; (2) made pursuant to a court order or by law; (3) for the purpose of validating the identity of the applicant; or (4) of information to be used solely for statistical purposes that is in a form that cannot be used to identify any particular person.

Any information collected through the Screening Tool is also subject to the New York State Freedom of Information Law and the Personal Privacy Protection Law.

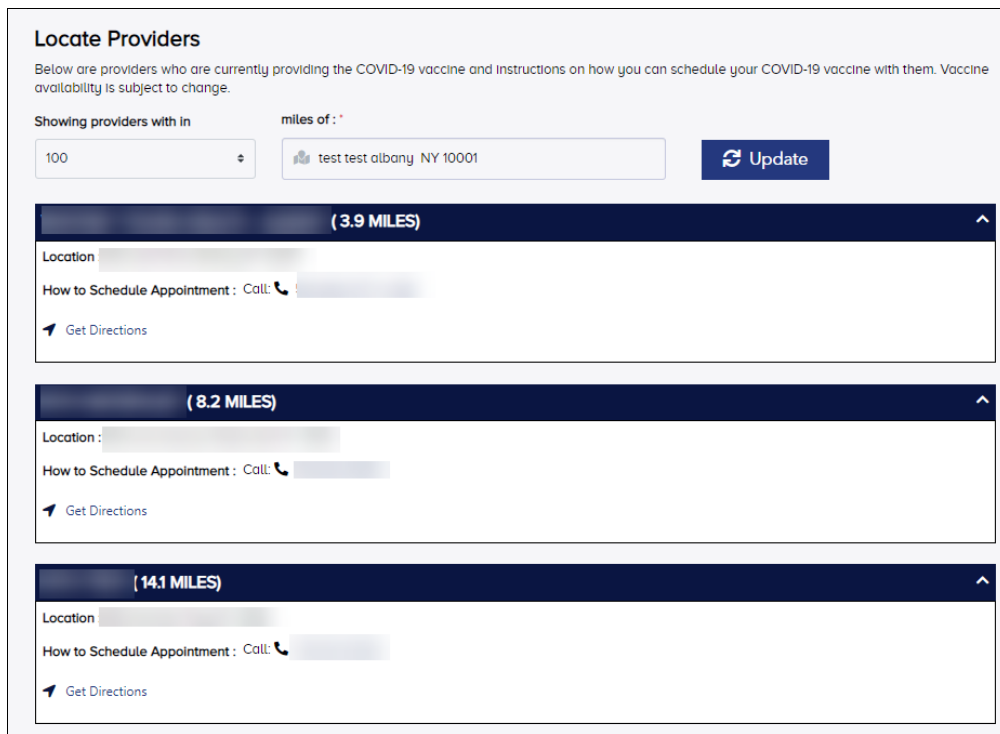
NYS will enforce its rights against any unauthorized access or attempted unauthorized access to NYS information technology assets or against any other inappropriate use of this website.

I consent

[Back](#) [Submit](#)

In order to schedule an appointment at a State-operated vaccination site when the phased distribution plan was still in place, a person first had to verify their eligibility to receive a vaccine by answering a series of questions within the Screening Tool. If found to be eligible, the person

was permitted to schedule an appointment on the Vaccine Data System. If used properly, the transition from the Screening Tool to the Vaccine Data System appointment scheduling website was seamless. The user would not know that they were actually moving from one computer application to another. The Vaccine Data System appointment scheduling website assisted in the location of providers:



For non-State operated vaccination sites, such as those operated by counties, doctors' offices, pharmacies, and hospitals, the public did not use the Screening Tool. Instead, they contacted their health care provider directly to make an appointment. Each pharmacy, doctor's office, hospital, and county was responsible for developing an internal process to verify a person's eligibility to receive a vaccine.

For example, in January 2021, the Walgreens pharmacy chain offered COVID-19 vaccinations to people who met state-specific eligibility criteria, which at that time were typically based on age, field of employment, and pre-existing health conditions. Walgreens screened people for these eligibility requirements by requiring a vaccination authorization form, valid identification, and proof of employment in healthcare or as an essential/frontline worker, when applicable.²⁶ Likewise, CVS pharmacies required people receiving vaccinations to attest

²⁶ See, Newsweek, *Walgreens COVID Vaccine Registration Details and How to Book an Appointment*, (January 26, 2021), <https://www.newsweek.com/walgreens-covid-vaccine-registration-details-how-book-appointment-1564459>.

that all eligibility information provided during their appointment registration was accurate and truthful.

THE INSPECTOR GENERAL’S INVESTIGATION AND FINDINGS

Vaccine Scheduling Websites Were Prematurely Accessible to the Public and Widely Shared

The Inspector General’s investigation found that links to vaccination scheduling websites were prematurely accessible to the public. Specifically, the webpages through which people scheduled vaccination appointments at various locations were operational and appointments could be scheduled before event organizers intended them to be available. This led vaccination event appointments to nearly fill or be full before vaccination event administrators had publicly announced or distributed links to a targeted audience.

The first and most significant factor was the immediate and unintentional accessibility to the scheduling websites once an event was created in the Vaccine Data System.²⁷ This immediate activation and publication of scheduling website information was due to a misunderstanding about a function of the program that was held by most of the Vaccine Data System architects, programmers, and website administrators.²⁸ After identifying this issue, ITS recoded certain features of the Vaccine Data System to prevent unintended activation and publication of web page addresses on the internet for use by the public to schedule vaccination appointments.

A second factor was a vulnerability that was created by the sequential numbering of links to vaccination scheduling websites. These numbers appear at the end of each website address for a vaccination event. By altering the numbers in a known website address—a technique known as URL rewriting—an individual could discover a different vaccination scheduling website that had not yet been published. This technique can be performed by the skilled and unskilled alike—

²⁷ To establish a vaccination “event,” a website administrator creates a schedule, which includes an event name, location, date, times of operation, and capacity (number of appointments per time slot).

²⁸ The investigation found the website administrators unintentionally activated vaccination scheduling websites when they believed they were merely creating registration schedules. According to a Vaccine Data System developer, this deficiency existed since the Vaccine Data System was developed but there has been no indication that it has been exploited prior to the mass COVID-19 vaccine distribution.

average citizens could easily employ this strategy by simply guessing the next numbers in a specific sequence. Moreover, because the scheduling websites were immediately accessible by the public, people could guess a non-public scheduling website address and subsequently book a coveted vaccination appointment. For example, although a vaccination scheduling website link for a vaccination event at the Times Union Center in Albany on January 14, 2021 was never activated, the link was accessed by the general public to schedule vaccination appointments. Within 20 minutes, more than 700 individuals registered through this link.²⁹ It is believed that this improper access at this Albany County vaccination site was due to such URL rewriting.

A third factor was that users of the Screening Tool were able to view the address of a vaccination scheduling website in their internet browser. For State-operated vaccination sites, individuals must first utilize the Screening Tool to ensure their eligibility before being redirected to the appropriate Vaccine Data System website to schedule a vaccination appointment. However, once scheduling websites were identified by way of an internet browser, individuals were able to directly access those sites by simply copying and pasting the address into the address bar to schedule appointments, thereby bypassing the Screening Tool.

A fourth factor that exacerbated the situation was that once a link to a scheduling website had been identified by a user through any of the aforementioned means, it could be widely disseminated and used by others. For example, the Inspector General spoke with an elderly couple from Long Island who were eligible to receive vaccinations in mid-January 2021 but at that time encountered numerous problems when using a scheduling link that had been electronically circulated among friends. This link, which bypassed the Screening Tool, allowed the couple to schedule vaccination appointments, however, their appointments were subsequently canceled by DOH. Out of desperation, the couple advised they would contact pharmacies for their vaccinations. Another couple reported to the Inspector General that using a link circulated in online chat rooms, they too scheduled vaccination appointments (bypassing the Screening Tool), which were later canceled by DOH.

In fact, the State-scheduling website links used on January 10-14 and again on February 15, 2021 were found to be quickly and extensively circulated through both private and public internet forums, social media sites including Facebook and WhatsApp Groups, and

²⁹ The Vaccine Data System help desk also received reports from St. Francis Hospital in Roslyn on January 12, Lewis County on January 13, Livingston and Monroe Counties on January 14, and Niagara Falls Memorial Medical Center and Lewis County General Hospital on January 15, that individuals were using Vaccine Data System webpage links that had not yet been activated by an administrator to register for vaccine appointments.

through social circles via public Google documents. Counties, school districts, union leaders, and religious communities were also found to have widely distributed the premature links through mass email distribution lists. In minutes, an individual could simply copy and paste website links into text messages or emails and distribute them to individuals or groups of people. The investigation found many of these end users were unaware they were prematurely utilizing website links or that they were bypassing the required Screening Tool.

Even websites created exclusively for training purposes were accessed and used by the general public. To train administrators and users on the Vaccine Data System, mock websites were created to simulate the registration and scheduling process. Although these websites were clearly identified as merely training modules, they were accessed and used by people to sign up for appointments that did not in fact exist. For example, on January 12, 2021, Albany County notified DOH that a person had accessed its mock training website and booked an appointment on a fictitious schedule of vaccination slots. Of note, it is unknown if the addresses of these training websites were given out or if they were discovered by the manipulation of sequentially numbered website addresses.

Importantly, people who bypassed the Screening Tool and directly accessed vaccination scheduling websites did not always circumvent all eligibility requirements as the Vaccine Data System website contained an eligibility attestation and proof of eligibility was required at vaccination sites.

Notably, although the investigation identified multiple State and contract employees who had access to the Vaccine Data System addresses prior to formal activation, no evidence was found that these employees improperly shared the website links to the public. The investigation also found no evidence that DOH's COVID-19 website had been accessed by cyber criminals who disseminated website links to the public.

The Vaccine Data System Initially Struggled to Accommodate Demand - Prompted System Upgrades

The Inspector General found that when the Vaccine Data System website was made available to the public in early January 2021 for scheduling of COVID-19 vaccination appointments, the application struggled to handle the high public demand. Soon after launching on January 13, 2021, the Vaccine Data System was pushed to its limits by the volume

of users and its servers began to crash.³⁰ In fact, ITS internet traffic logs indicate that at one point, approximately 45,000 users attempted to access the Vaccine Data System website in a 30-minute period. Throughout this period, ITS staff members were required to work on the application on a constant basis to prevent a total system failure.

Further, the investigation found that pre-launch testing of the Vaccine Data System website was insufficient and did not adequately address the accessibility of the website. Although ITS also conducted testing to address concerns about the Vaccine Data System's scalability—its ability to support expanded load/volume of traffic—this too did not reveal vulnerabilities. On or about January 10, 2021, the weekend before the vaccination scheduling website was first utilized for State-operated sites, a load test operation was run to assess the program's ability to handle the anticipated volume of users. Based on this testing, it was believed that the Vaccine Data System would be able to handle the anticipated traffic from the general public. However, in retrospect, it is apparent that the load test did not sufficiently evaluate system load caused by the simultaneous scheduling of multiple vaccination appointments at a number of vaccination sites.³¹

On January 12 and 13, 2021, ITS moved the Vaccine Data System program to another location to better handle the anticipated load on the system. The move and upgrades made at the time provided the Vaccine Data System with improved capacity to handle more users at one time, increased system reliability, and employed greater security measures, making it less susceptible to crashing. After working on an ongoing basis to address the initial overloading, staff from ITS, DOH and HRI stabilized the Vaccine Data System on January 16, 2021.

Remedial Measures

Despite challenging demands, ITS and DOH staff and State contractors have continued to institute remedial measures to address vulnerabilities and ongoing deficiencies, and continually collaborate to improve the vaccine scheduling system. To date, more than 100 technical improvements have been made to the Vaccine Data System to increase its ability to handle

³⁰ The Vaccine Data System program began crashing as soon as the first State-operated sites—Westchester, Jones Beach, SUNY Albany, the Javits Center, and the State Fairgrounds—were launched in early January.

³¹ For example, the load test evaluated the system's ability to handle 10,000 users attempting to schedule appointments at one vaccination site but did not evaluate the system's ability to handle 10,000 users attempting to schedule appointments at multiple vaccination sites.

unprecedented vaccination demands created by the COVID-19 pandemic. These corrective actions include but are not limited to:

- Establishing unique links to minimize premature access to vaccination scheduling websites and eliminate sequential numbering
- Creating a virtual firewall for State vaccination sites to block direct access to the appointment scheduler and redirect users to the Screening Tool
- Establishing virtual waiting room in Vaccine Data System websites for scheduling vaccine appointments to control user traffic by establishing an online queue

Unique Links Created to Access Scheduling Websites

On January 25, 2021, to minimize premature access of Vaccine Data System websites by the public, ITS replaced their sequential numbering system with a unique number. This change, which was applied to the scheduling website links of all vaccination sites, blocked users from employing techniques to discover non-public vaccination scheduling website addresses in order to schedule coveted appointments. Of note, although Vaccine Data System scheduling websites were now uniquely numbered, this change had no impact on the public's ability to share identified scheduling website addresses or bypass the Screening Tool.

Virtual Firewalls Installed on Vaccine Data System

On or about January 15, 2021, to prevent both premature access to Vaccine Data System scheduling links and the bypassing of the Screening Tool, ITS placed a virtual firewall on Vaccine Data System scheduling links for State-operated vaccination sites.³² Firewalls are network security devices that monitor incoming and outgoing traffic and permit or block users from gaining access to a website based on a set of security rules. Here, the firewalls initially block a Vaccine Data System website from public view until officially activated. Since the installation of the firewalls, the Inspector General is unaware of any reported claims of premature access to State vaccination websites.³³

Around February 15, 2021, the firewalls were enhanced to prevent individuals from bypassing the Screening Tool. The modification redirected users who directly accessed the

³² This measure was implemented in response to the premature access of links to SUNY Stony Brook's vaccination scheduling website by thousands of individuals.

³³ On February 15, 2021, some members of the public bypassed the Screening Tool, gained access to vaccine appointment waiting rooms, and subsequently disseminated links on social media allowing others to do so. This was due to an ITS oversight, which was immediately fixed once discovered. Notably, this was not due to a failure of the State firewall.

Vaccine Data System back to the Screening Tool to determine if they were eligible for a vaccination. Only individuals referred by the Screening Tool (or from a designated “waiting room,” discussed later) were granted access to the Vaccine Data System to schedule an appointment. This redirect feature also minimized the benefit of sharing State-operated scheduling links, instead encouraging the public to appropriately share the website address of the Screening Tool.

ITS Developed a Waiting Room to Prevent the Vaccine Data System from Crashing Due to Traffic

On February 14, 2021, ITS implemented a virtual waiting room to manage the flow of internet traffic on the Vaccine Data System and prevent its servers from being overwhelmed by users simultaneously scheduling vaccination appointments at State-operated sites. Users who were determined to be eligible for a vaccination via the Screening Tool were then placed in a virtual waiting room if the Vaccine Data System program exceeded a threshold number of users. Once the total number decreased, users were allowed access to the Vaccine Data System to schedule a vaccination appointment on a first-come, first-served priority basis.³⁴ Subsequently, as demand abated, this feature was disabled.

RECOMMENDATIONS

Based on the above findings, the Inspector General recommends that ITS, DOH, and HRI work collaboratively to effectuate the following corrective actions:

- Evaluate the Vaccine Data System to ensure it is technically capable of meeting the needs for future mass vaccination efforts and the more immediate expanded eligibility categories related to boosters and vaccinations for children five to 11.
- Ensure systematic and routine testing of the Screening Tool and the Vaccine Data System. This should include robust testing of any system improvements which have been put in place to handle increased loading.
- Ensure the complete functionality of the Vaccine Data System after modifications are implemented.
- Review emergency testing protocols to ensure their functionality during disasters and emergencies and ensure these protocols are followed.

³⁴ The establishment of a virtual waiting room had an unanticipated consequence. When first implemented, users placed in the virtual waiting room who abandoned their wait were unable to be cleared, delaying, or preventing others from scheduling vaccination appointments. Once discovered, this issue was addressed.

- Promulgate written guidance for agencies involved in Vaccine Data System activities concerning the confidentiality of scheduling links and system vulnerabilities. This guidance should be disseminated to New York State employees, volunteers, contractors, and local departments of health involved in accessing, creating, modifying, or testing vaccine website links.
- Consider the feasibility of eliminating or minimizing the display of actual website addresses in training modules and materials.

CONCLUSION

New York's experience was not unique, and the nation witnessed other states navigate similar issues as government tried to grapple with an unparalleled public health crisis. New York State chose to use its pre-existing data system to manage the State's COVID-19 vaccine registration program in the interest of expediency and fiscal efficiency. The impact of the unprecedented volume rapidly overwhelmed the system and laid bare undiscovered vulnerabilities. Consequently, thousands were able to circumvent eligibility screening and improperly obtain vaccination appointments while others experienced difficulties using the system or were unable to timely schedule vaccination appointments. Since the discovery of the system vulnerabilities, ITS, DOH and HRI have worked collaboratively to address the issues and secure the vaccine registration process. Given these corrective measures, the streamlining of the vaccine registration system, and the increase in vaccine supplies; vaccines are now readily available to New Yorkers.

Despite these obstacles, as of October 13, 2021, per CDC, 64.6 percent of the total population of New York was fully vaccinated, with 26,032,099 vaccine doses having been administered in New York State.

New York should evaluate its Vaccine Data System to handle heavy internet traffic and maintain enhanced cyber security. Its effectiveness is particularly important given the expansion of vaccine eligibility to include booster shots for the elderly and individuals with certain conditions, the potential for booster shots to be recommended for the public at-large, and the anticipated approval of vaccines for children ages five to 11. Moreover, the integrity and reliability of the Vaccine Data System is critical as New York State turns to local government resources to administer the continuing vaccination effort and encourages all New Yorkers to get vaccinated.

