UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF PUERTO RICO

RODRÍGUEZ-VÉLEZ et als.

Plaintiff(s)

v.

PIERLUISI-URRUTIA

Defendant(s)

Case No. 21-CV-1366 (PAD)

Plaintiffs' Exhibit List

Presiding Judge	Plaintiffs' Attorneys	Defendants' Attorney
Pedro A. Delgado-Hernández	Arturo V. Bauermeister-Fernández Ilya Shapiro José R. Dávila-Acevedo Víctor M. Rivera-Rios	Joel Torres-Ortiz Idza Diaz-Rivera José R. Cintrón-Rodríguez Juan C. Ramírez-Ortiz
Hearing Date 9/21/2021 – 9/30/2021	Court Reporter Cindy L. Brown	Courtroom Deputy Verónica S. Otero-Rivera

ITEM NO. /LETTER	DATE OFFERED	MARKED AS	ADMITTED INTO EVIDENCE	DESCRIPTION
1	9/21/2021	EXHIBIT 2	9/21/2021	Graph "Share of people vaccinated against COVID-19, Sep 18, 2021" Source: Our World in Data (1 page)
2	9/21/2021	EXHIBIT 3	9/21/2021	Graph "Daily new confirmed COVID-19 cases per million people", Israel, Jordan, and Egypt Comparison; Source: Our World in Data (1 page)
3	9/21/2021	EXHIBIT 4-1	9/21/2021	COVID-19 Vaccination Coverage by Age Group as of September 12, 2021 (1 page)
	9/21/2021	EXHIBIT 4-2	9/21/2021	Percent of the Total Population with at least one dose by state/territory as of September 19, 2021 (1 page)
	9/21/2021	EXHIBIT 4-3	9/21/2021	Doses administered per 100k individuals as of September 19, 2021 (1 page)
	9/21/2021	EXHIBIT 4-4	9/21/2021	Percent of the total population fully vaccinated by state/territory as of September 19, 2021 (1 page)
	9/21/2021	EXHIBIT 4-5	9/21/2021	Testing per 100,000 residents by state/territory as of September 11, 2021 (1 page)
	9/21/2021	EXHIBIT 4-6	9/21/2021	Testing per 100,000 residents in last 30 days by state/territory as of September 11, 2021 (1 page)
	9/21/2021	EXHIBIT 4-7	9/21/2021	Age distribution of Puerto Ricans with COVID-19 testing as of September 11, 2021 (1 page)
	9/21/2021	EXHIBIT 4-8	9/21/2021	Table of total OOP costs per year/month (1 page)
	9/21/2021	EXHIBIT 4-9	9/21/2021	Map of testing facilities (1 page)
	9/21/2021	EXHIBIT 4-10	9/21/2021	Map of testing facilities with same-day results (1 page)
	9/21/2021	EXHIBIT 4-11	9/21/2021	7-day moving average of Confirmed COVID-19 cases since April 1, 2021 (1 page)

	9/21/2021	EXHIBIT 4-12	9/21/2021	First difference of 7 day moving average of confirmed COVID-19 cases since April 1, 2020 (1 page)
	9/21/2021	EXHIBIT 4-13	9/21/2021	Second difference of 7 day moving average of confirmed COVID-19 cases since July 1, 2021 (1 page)
	9/21/2021	EXHIBIT 4-14	9/21/2021	Cases per 100,000 residents by state/territory as of September 11, 2021 (1 page)
	9/21/2021	EXHIBIT 4-15	9/21/2021	Confirmed versus Probable Cases in Puerto Rico as of September 11, 2021 (1 page)
	9/21/2021	EXHIBIT 4-16	9/21/2021	COVID-19 Hospital Bed Utilization Rate since August 1, 2020 (1 page)
	9/21/2021	EXHIBIT 4-17	9/21/2021	COVID-19 ICU Bed Utilization Rate since August 1, 2020 (1 page)
	9/21/2021	EXHIBIT 4-18	9/21/2021	Hospital Bed Utilization by COVID-19 Status since August 1, 2020 (1 page)
	9/21/2021	EXHIBIT 4-19	9/21/2021	ICU Bed Utilization by COVID-19 Status since August 1, 2020 (1 page)
	9/21/2021	EXHIBIT 4-20	9/21/2021	New Admissions of Patients with Confirmed COVID-19, Puerto Rico, Aug 01, 2020 – Sep 09, 2021 (1 page)
	9/21/2021	EXHIBIT 4-21	9/21/2021	7-day moving average of Confirmed COVID-19 Deaths Since April 1, 2020 (1 page)
	9/21/2021	EXHIBIT 4-22	9/21/2021	First difference of 7 day moving average of Confirmed COVID-19 deaths since April 1, 2020 (1 page)
	9/21/2021	EXHIBIT 4-23	9/21/2021	Second difference of 7 day moving average of deaths since July 1, 2021 (1 page)
	9/21/2021	EXHIBIT 4-24	9/21/2021	Deaths of 100,000 Residents by State/Territory as of September 11, 2021 (1 page)
	9/21/2021	EXHIBIT 4-25	9/21/2021	Comparison of Confirmed and Probable Cases and Deaths in Puerto Rico as of September 11, 2021 (1 page)
	9/21/2021	EXHIBIT 4-26	9/21/2021	Table of COVID-19 Case fatality rate by age group (1 page)
	9/21/2021	EXHIBIT 4-27	9/21/2021	Table of Cause of Death by Type, Age group 0-17 years old, from January 1, 2020 to December 31, 2020 and January 1, 2020 to September 4, 2021 (1 page)
4	9/21/2021	EXHIBIT 1	9/21/2021	Screenshot of Letter "List of Humacao District Employees who are not yet vaccinated" (1 page) (in the Spanish Language)
5	9/22/2021	EXHIBIT 5	9/22/2021	Photo taken by witness Cynthia Avellanet showing Turn #243 for Fixed Point COVID-19 test (1 page)
6	9/22/2021	EXHIBIT 6	9/22/2021	Screenshot of photo taken by Juan Carlos Fenollal and message re: COVID-19 test line dated September 6, 2021 (1 page) (in the Spanish Language)
7	9/23/2021	EXHIBIT 7	9/23/2021	Certified translation of Photograph of E-mail from Sheyla Jusino to Leila G. Ginorio re: evidence of COVID vaccine (2 pages)
8	9/23/2021	EXHIBIT 8	9/23/2021	Certified translation of Leila Ginorio's letter to Human Resources and Labor Affairs re: request to work remotely, August 8, 2021 (3 pages)
9	9/23/2021	EXHIBIT 9-1	9/23/2021	Screenshot of photograph taken by Viviana Santos re: drive-thru for COVID-19 test at Fixed Point (No date) (1 page)

10	9/23/2021	EXHIBIT 9-2	9/23/2021	Screenshot of photograph taken by Viviana Santos re: drive-thru for COVID-19 test at Fixed Point (No date) (1 page)
11	9/23/2021	EXHIBIT 9-3	9/23/2021	Screenshot of photograph taken by Viviana Santos re: drive-thru for COVID-19 test at Fixed Point (No date) (1 page)
12	9/27/2021	EXHIBIT 10-1	9/27/2021	Daily count of confirmed cases and daily count of probable cases, July 1st, 2021– September 25th, 2021 (1 page)
	9/27/2021	EXHIBIT 10-2	9/27/2021	Daily count of confirmed cases and daily count of probable cases, July 1st, 2021– September 1st, 2021 (1 page)
13	9/27/2021	EXHIBIT 11	9/27/2021	Comparison of Ct value by day of illness between unvaccinated and vaccine breakthrough (1 page)
14	9/27/2021	EXHIBIT 12	9/27/2021	Study "Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study" (21 pages)
15	9/27/2021	EXHIBIT 13-1	9/27/2021	Screenshot of the Puerto Rico Health Department COVID-19 Dashboard under vaccination category, July 1, 2021 to July 7, 2021 (1 page) (in the Spanish Language)
	9/27/2021	EXHIBIT 13-2	9/27/2021	Screenshot of the Puerto Rico Health Department COVID-19 Dashboard under vaccination category, July 8, 2021 to July 14, 2021 (1 page) (in the Spanish Language)
	9/27/2021	EXHIBIT 13-3	9/27/2021	Screenshot of the Puerto Rico Health Department COVID-19 Dashboard under vaccination category, July 15, 2021 to July 21, 2021 (1 page) (in the Spanish Language)
	9/27/2021	EXHIBIT 13-4	9/27/2021	Screenshot of the Puerto Rico Health Department COVID-19 Dashboard under vaccination category, July 22, 2021 to July 28, 2021 (1 page) (in the Spanish Language)
	9/27/2021	EXHIBIT 13-5	9/27/2021	Screenshot of the Puerto Rico Health Department COVID-19 Dashboard under vaccination category, July 29, 2021 to September 25, 2021 (1 page) (in the Spanish Language)
16	9/27/2021	EXHIBIT 14	9/27/2021	Puerto Rico Health Department Cases Report, April 23, 2021 (37 pages) (in the Spanish Language)
17	9/28/2021	EXHIBIT 15	9/28/2021	Newspaper article dated August 16, 2021 titled "En estado de alerta los hospitales" (6 pages) (in the Spanish Language)
18	9/28/2021	EXHIBIT 16	9/28/2021	Study "Outbreak of SARS-CoV-2 Infections, Including COVID-19 Vaccine Breakthrough Infections, Associated with Large Public Gatherings — Barnstable County, Massachusetts, July 2021", August 6, 2021 (7 pages)
19	9/28/2021	EXHIBIT 17-1	9/28/2021	COVID-19 tests through time with moving average (PCR), May 28, 2021 – July 27, 2021 (1 page) (in the Spanish Language)
	9/28/2021	EXHIBIT 17-2	9/28/2021	COVID-19 tests through time with moving average (Antigen), May 28, 2021 – July 27, 2021 (1 page) (in the Spanish Language)
	9/28/2021	EXHIBIT 17-3	9/28/2021	COVID-19 tests through time with moving average (PCR), July 28, 2021 – September 25, 2021 (1 page) (in the Spanish Language)
	9/28/2021	EXHIBIT 17-4	9/28/2021	COVID-19 tests through time with moving average (Antigen), July 28, 2021 – September 25, 2021 (1 page) (in the Spanish Language)

20	9/28/2021	EXHIBIT 18	9/28/2021	Article "Understanding Percent Positivity" from the Public Health Madison and Dade County, October 1, 2020 (3 pages)
21	9/28/2021	EXHIBIT 19	9/28/2021	Article "The Problem with the Positivity Rate" from New York Magazine/Intelligencer, December 7, 2020 (5 pages)
22	9/28/2021	EXHIBIT 20-1	9/28/2021	Data Table for Cumulative COVID-19 Nucleic Acid Amplification Tests (NAATs) Performed per 100k by State/Territory, as of September 24, 2021 (1 page)
	9/28/2021	EXHIBIT 20-2	9/28/2021	Data Table for COVID-19 Nucleic Acid Amplification Tests (NAATs) Performed in last 30 days per 100k by State/Territory, as of September 24, 2021 (1 page)
23	9/28/2021	EXHIBIT 21	9/28/2021	Graphs re: Infective reproductive number (Rt) for Puerto Rico (July 28, 2021, August 11, 2021, August 16, 2021, September 24, 2021), Source: covidestim.org (1 page)
24	9/28/2021	EXHIBIT 22	9/28/2021	Newspaper article "El 90% de empleados públicos están inoculados contra el COVID-19" from Noticel, September 23, 2021 (2 pages) (in the Spanish Language)
25	9/28/2021	EXHIBIT 23-1	9/28/2021	Percentage of inpatient beds in use in the United States, Source: U.S. Department of Health and Human Services Protect Inpatient Bed Dashboard, as of September 27, 2021 (1 page)
	9/28/2021	EXHIBIT 23-2	9/28/2021	Percentage of inpatient beds in use in Puerto Rico, Source: U.S. Department of Health and Human Services Protect Inpatient Bed Dashboard, as of September 27, 2021 (1 page)
26	9/28/2021	EXHIBIT 24	9/28/2021	New Admissions of Patients with Confirmed COVID-19, Puerto Rico, Aug 01, 2020 – Sep 24, 2021 (1 page)
27	9/28/2021	EXHIBIT 25	9/28/2021	Study "Comparing SARS COV-2 natural immunity to vaccine-induced immunity: reinfections versus breakthrough infections" (32 pages)
28	9/27/2021	EXHIBIT 26	9/27/2021	Puerto Rico Department of Health Administrative Order Number 467, October 19, 2020 (5 pages) (in the Spanish Language)

Mi Amor
10 de septiembre 12:49 p. m.

GOBIERNO DE PUERTO RICO
DEPARTAMENTO DE SEGURIDAD PUBLICA
Negociado del Cuerpo de Bomberos

ALEXIS TORRES
SECRETARIO

IVAN MORENO CORDERO
COMISIONADO A INCENDIO

8 de septiembre de 2021

Listado de Empleados del Distrito de Humacao que faltan por vacunar

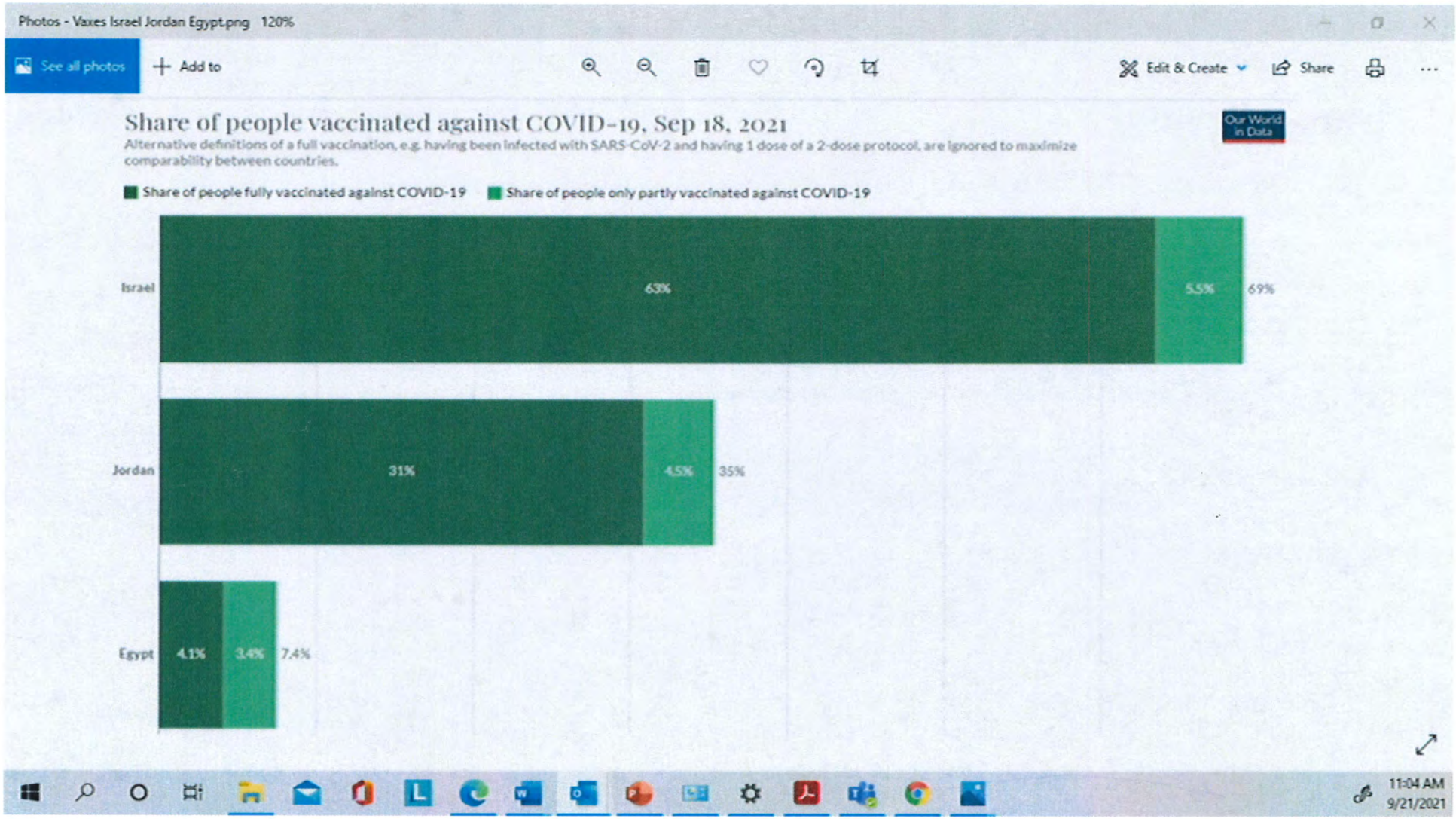
		Firma
Estación Humacao		
Turno A		
1.	Eric Carrasquillo Quiñonez	
2.	Miguel Román Medina (Licencia Regular 20/09/21)	
3.	Jeffrey Burgos Rodriguez	
Estación Palmas del Mar		
4.	Ivan Cruz Maldonado	
5.	Alexis Torres Rivera	
6.	Elizabdi Giménez Carrasquillo (LR 20/09/21)	
7.	Julio R. López Sánchez	
Estación Yabucoa		
8.	José A. Casanova González (LR 20/09/21))	
Estación Ceiba		
9.	Cesar Soto Olmeda	
Total: 9 Empleados Bomberos		

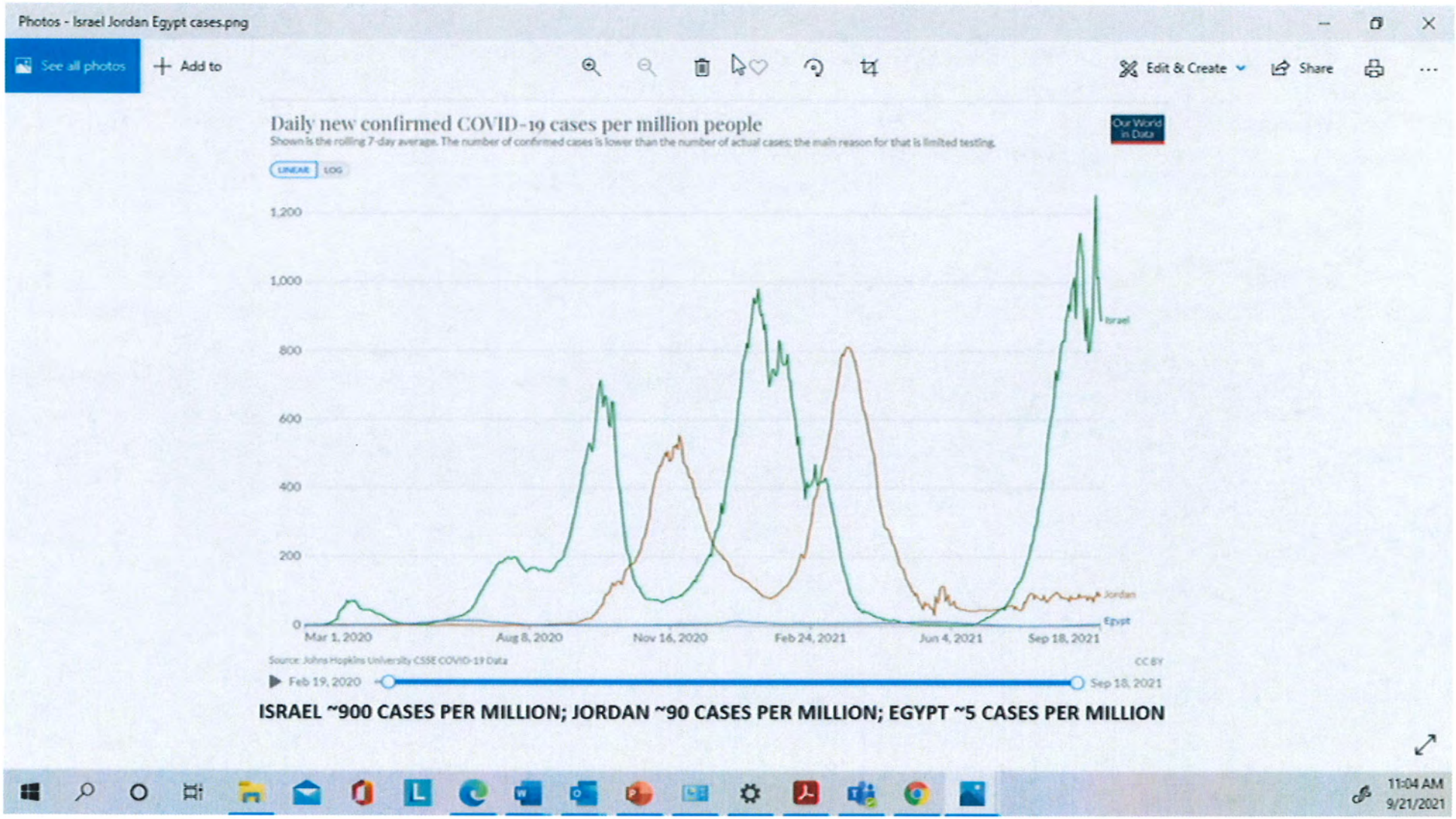
A todo el personal antes mencionado, por instrucciones de la Oficina de Recursos Humanos, deberán completar el documento de excepción (Carta Normativa Especial Num. 2-2021 que contiene los formularios que el empleado utilizara para solicitar excepción por no estar vacunados, según la situación que aplique (religiosa o médica); para que este documento sea radicado a la Oficina de Distrito y a su vez a la Oficina del Comisionado para la evaluación correspondiente. Luego se refiere al Departamento de Recursos Humanos para notificar al empleado si su solicitud fue o no aprobada, y entonces es que el empleado procederá a entregar semanalmente el resultado negativo de su prueba molecular, conforme lo establece las Guías de la Carta Normativa Especial y la Orden Administrativa Num. #508 del Departamento de Salud. Los resultados se entregarán los lunes de cada semana, ya que ese día es que comienza nuestra jornada semanal de trabajo. La prueba no puede ser de mas de 72 horas de recopilada. Empleado que no cumpla con este señalamiento continuará por Licencia de Tiempo Compensatorio conforme lo establecido.

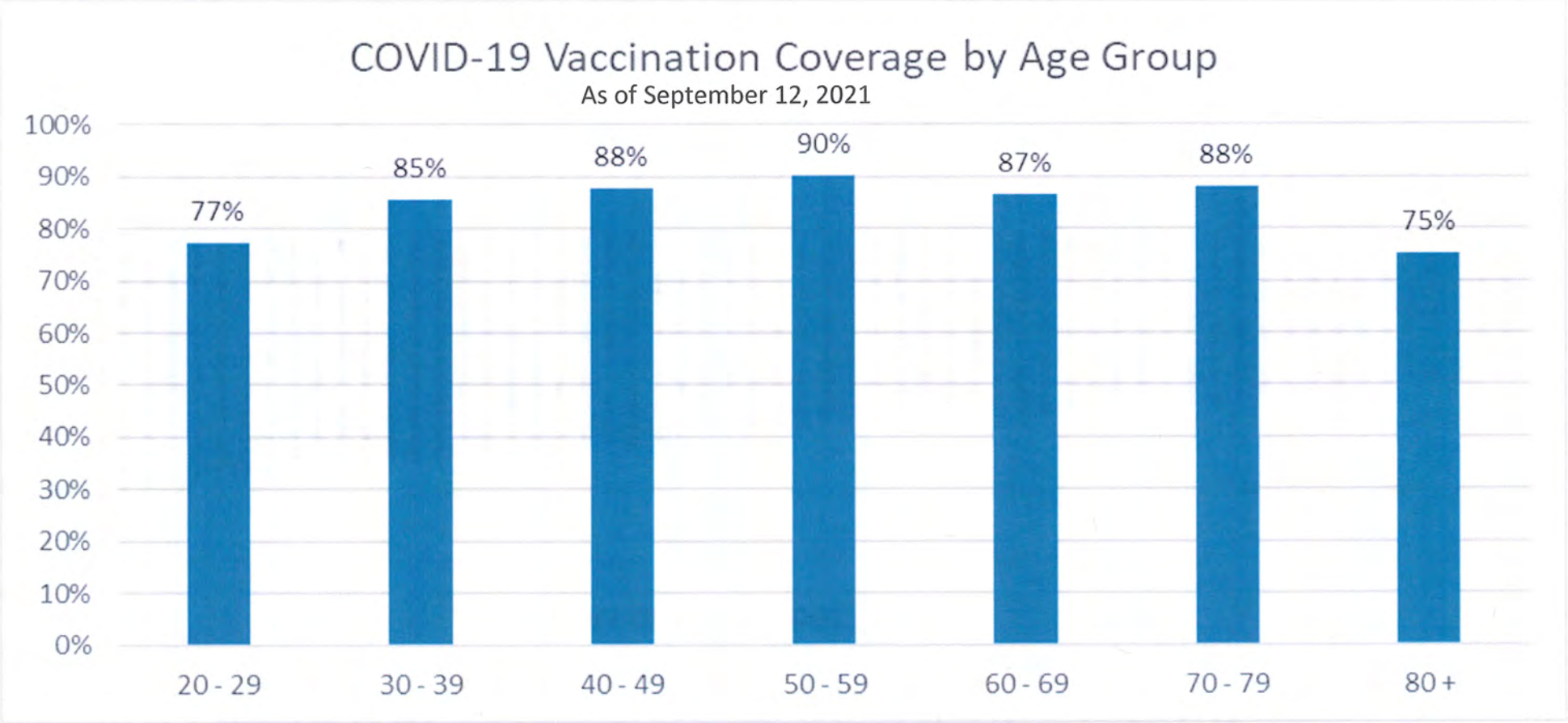
Tnte. Miguel A. Carrasquillo Negrón
Jefe Distrito Humacao Interino

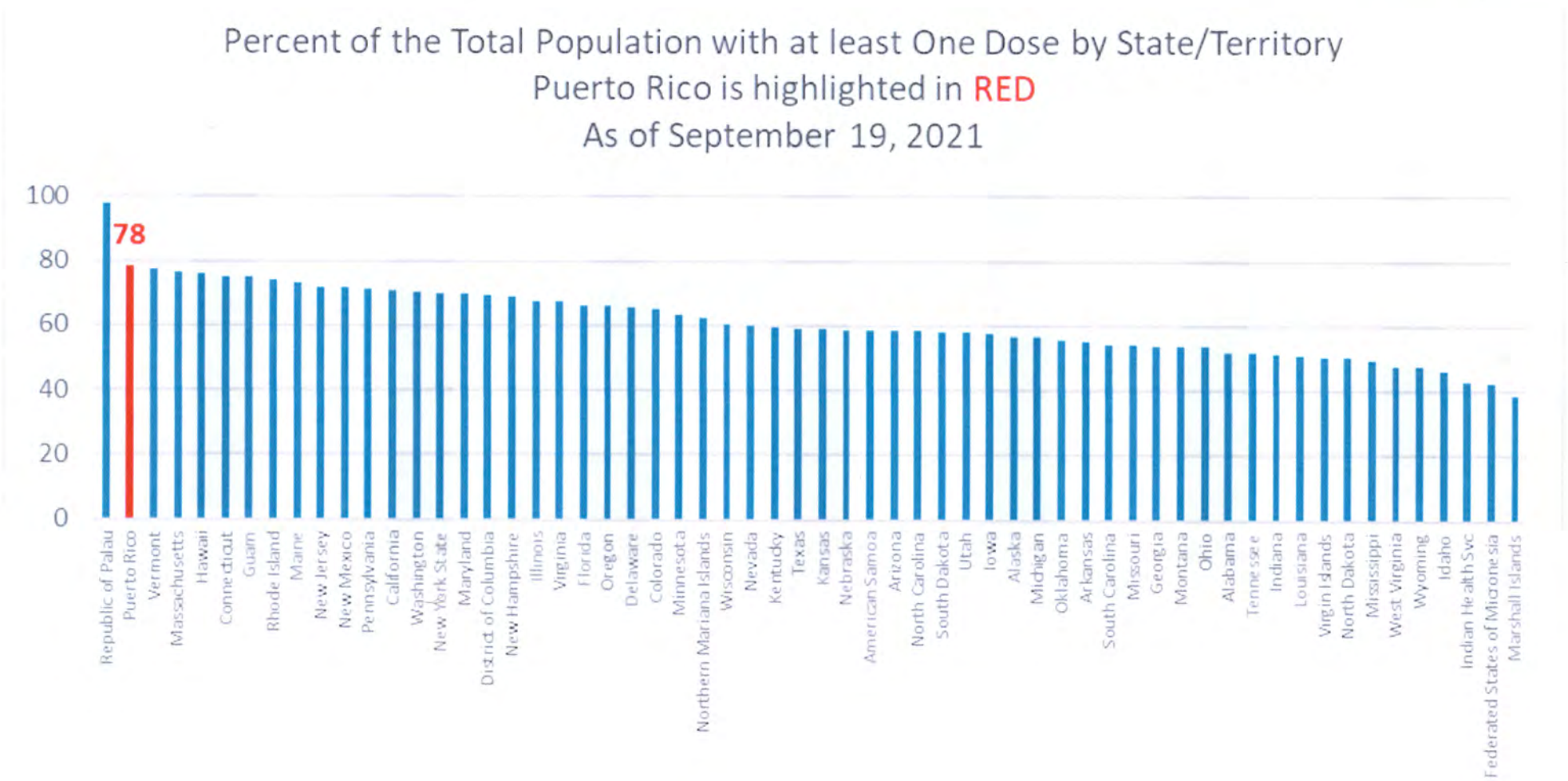
Cc. Comandante Luis A. Ortiz Mendoza
Jefe de Zona Caguas-Humacao
Cc. Insp. Carlos Ramirez Torres
Delegado

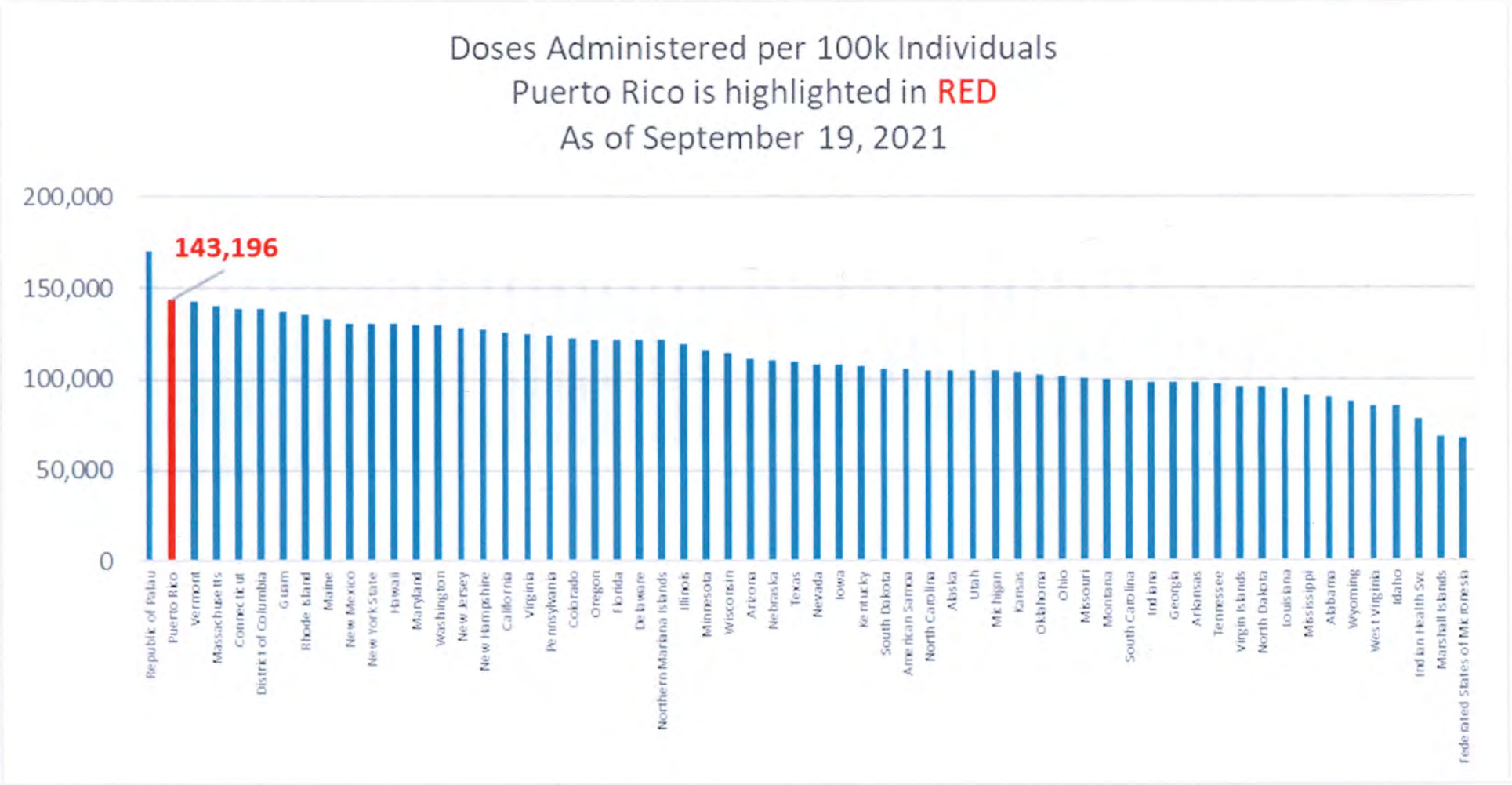
P.O. BOX 13325 | SAN JUAN PR 00908-3325



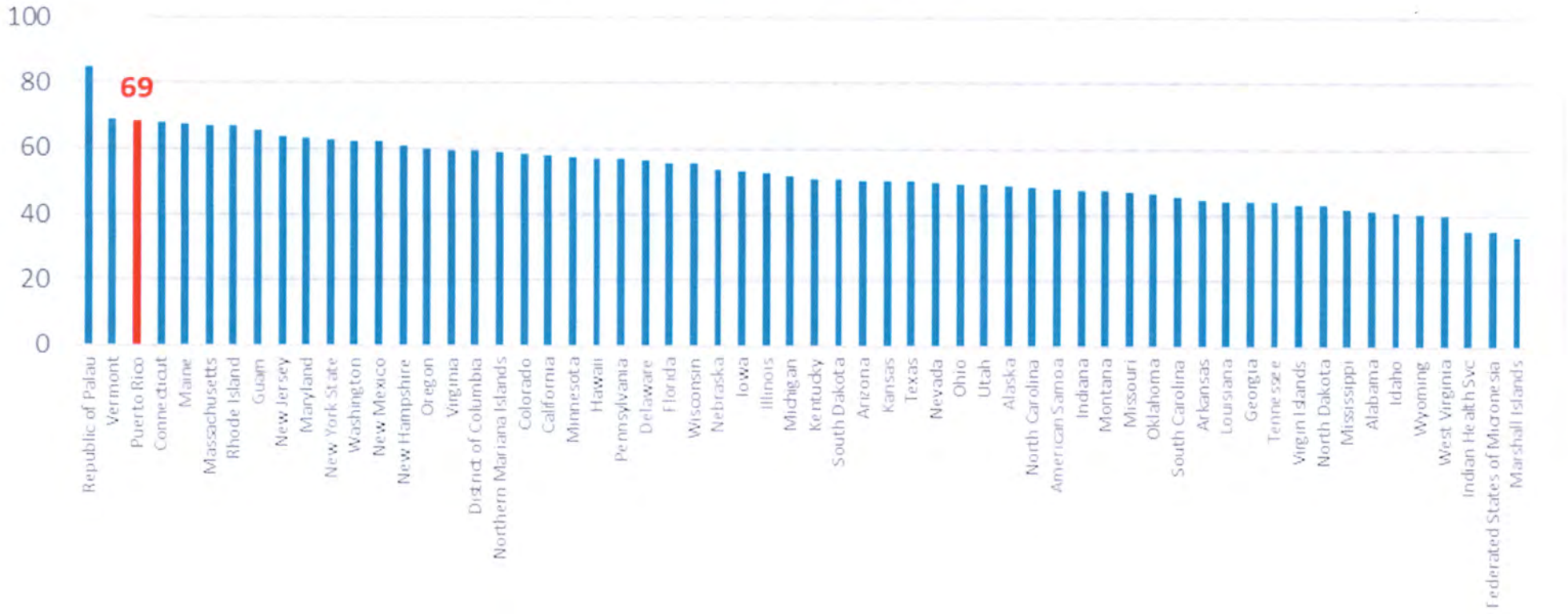


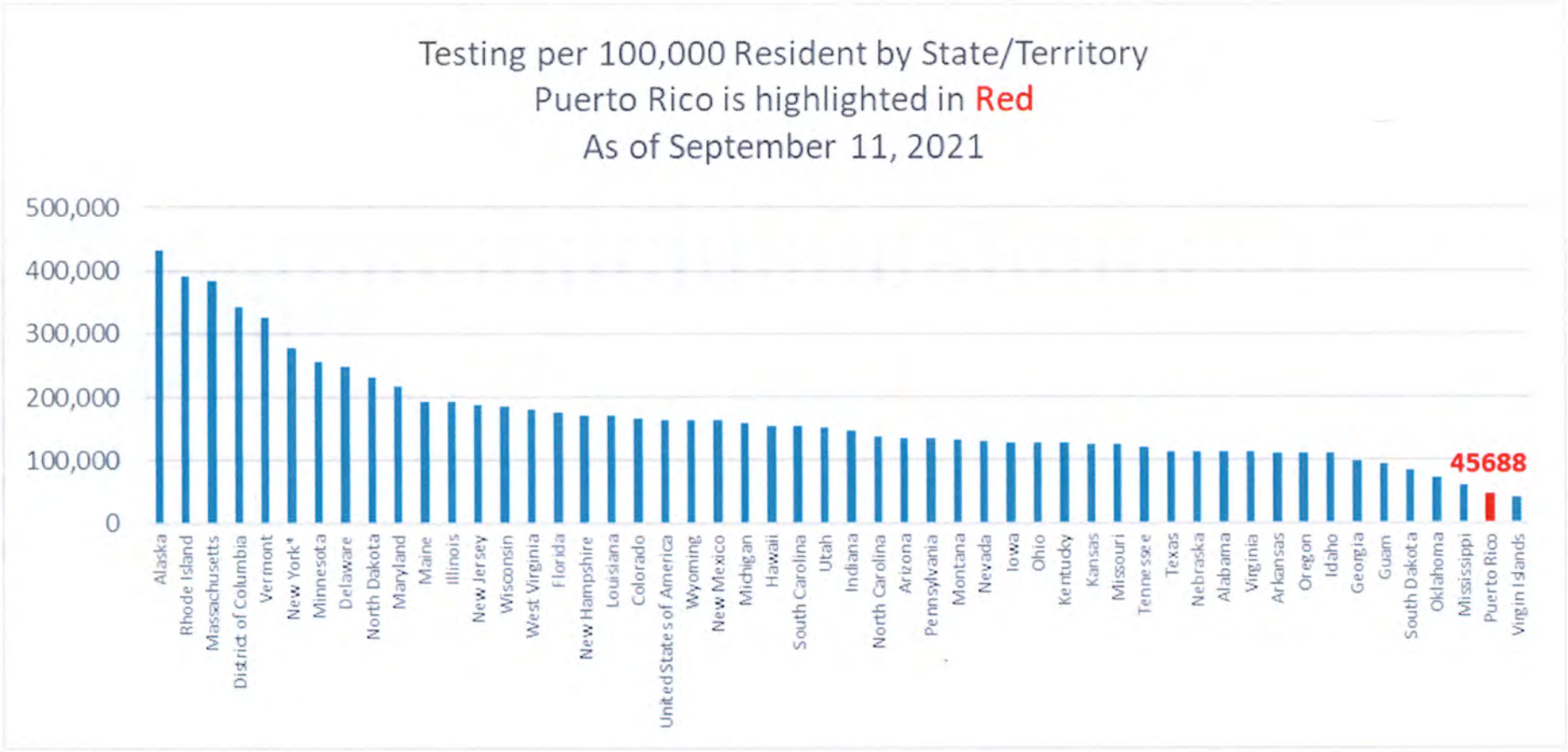


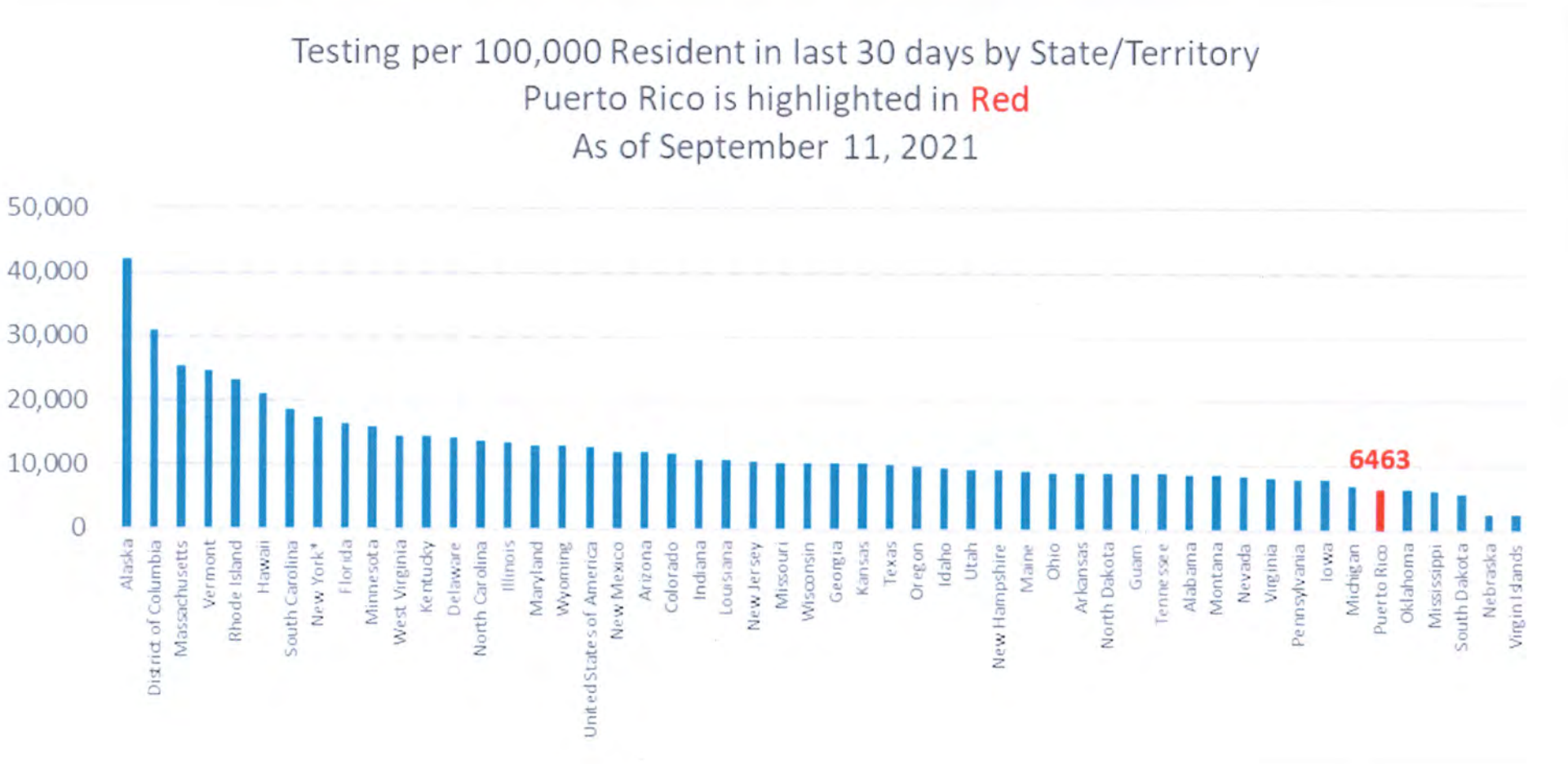


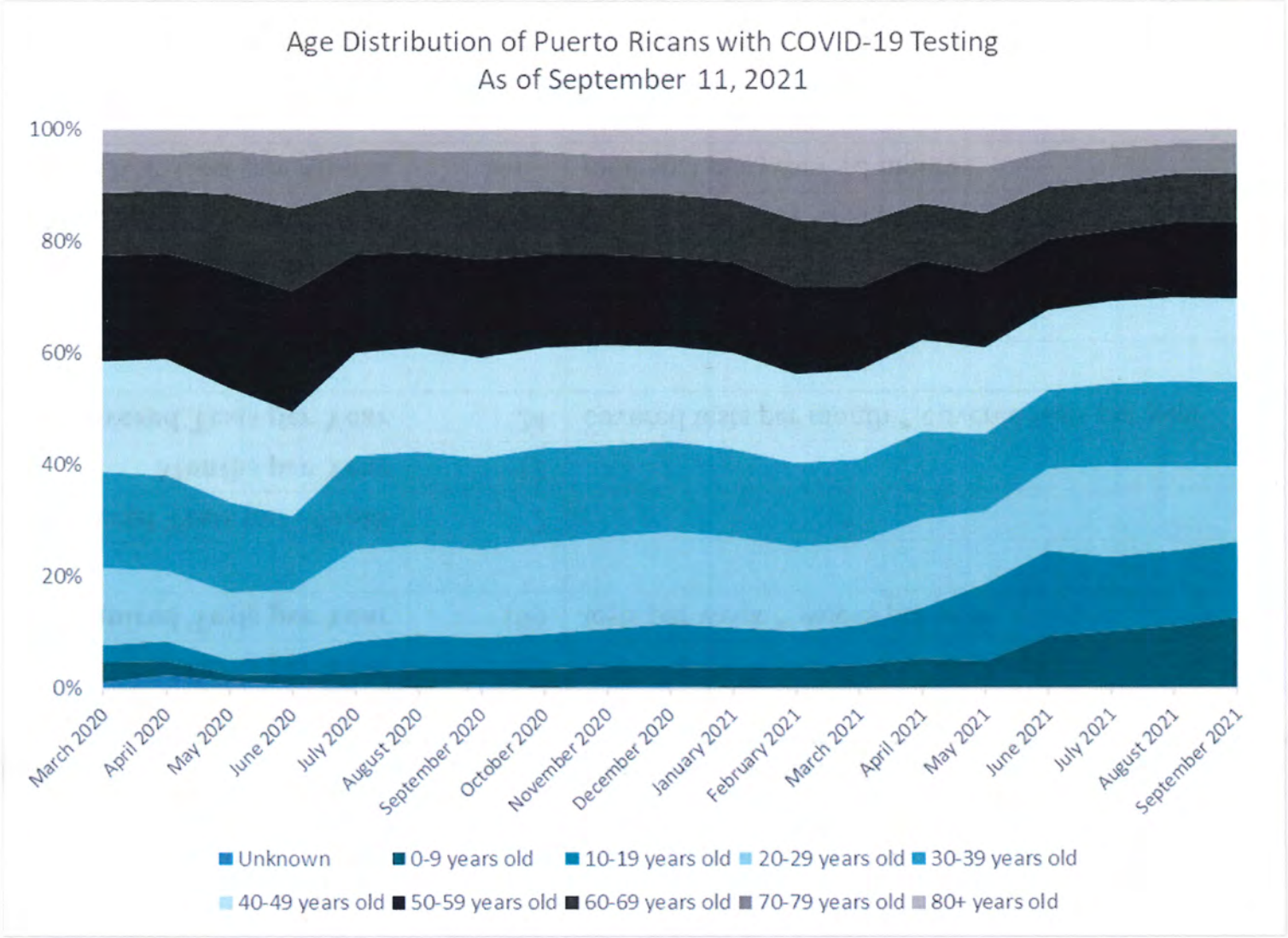


Percent of the Total Population Fully Vaccinated by State/Territory
Puerto Rico is highlighted in RED
As of September 19, 2021



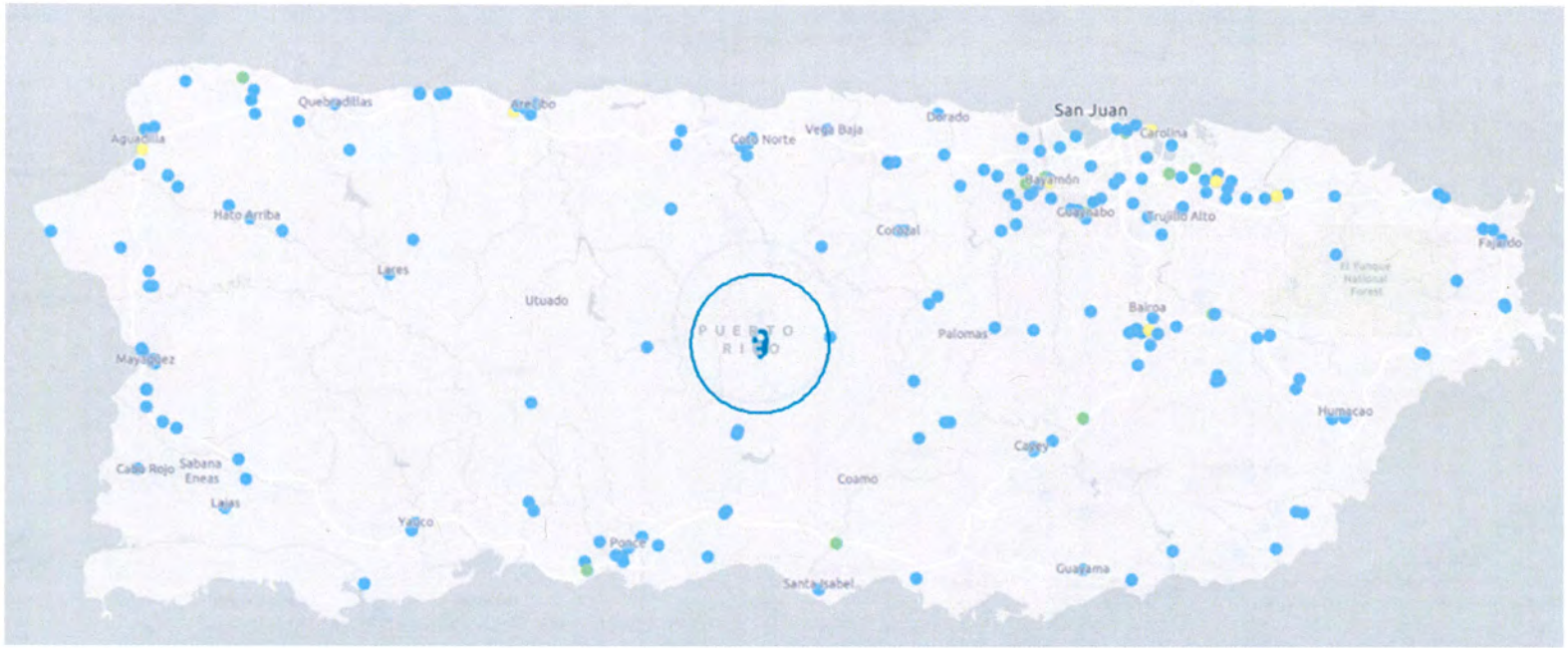




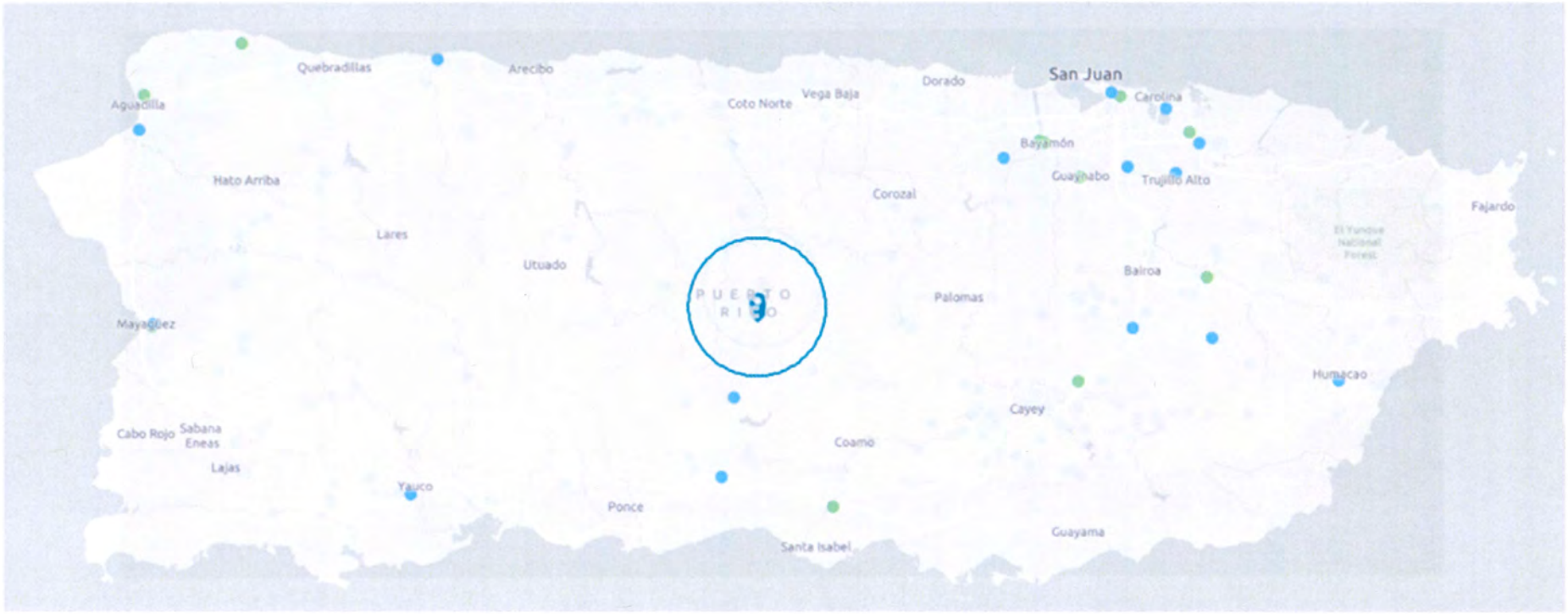


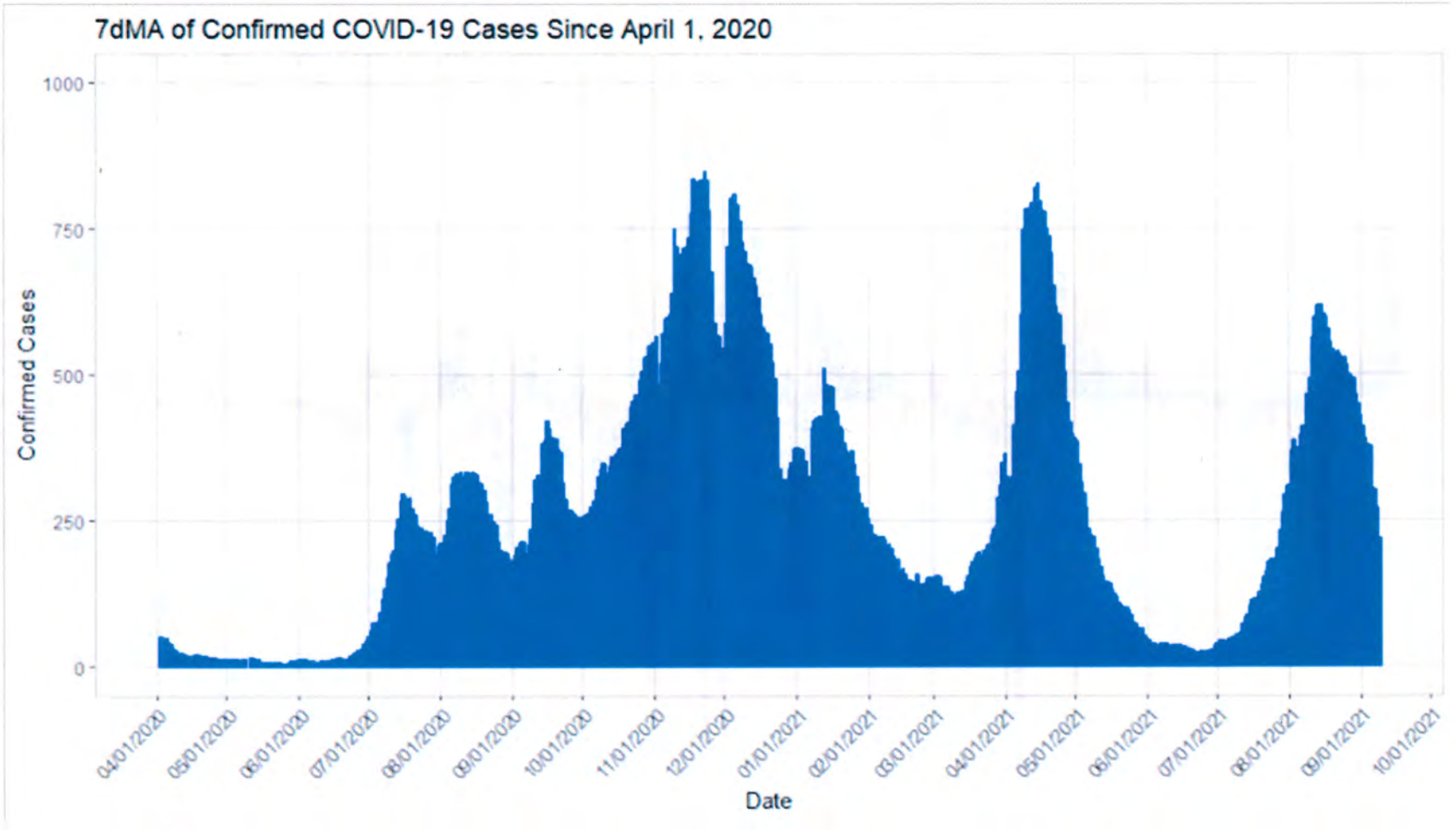
Line Item	Value	Reference or Calculation
Required Tests per Week	2	
Weeks per Year	52	
Required Tests per Year	104	tests per week * weeks per year
Covered Tests per Month	2	
Months per Year	12	
Covered Tests per Year	24	covered tests per month * covered tests per year
OOP Tests per Year	80	required - covered tets per year
OOP Cost per Test	$100	per Counsel
Total OOP Cost per Year	$8,000	OOP tests * OOP cost per test
Total OOP Cost per Month	$667	total cost per year / 12 months

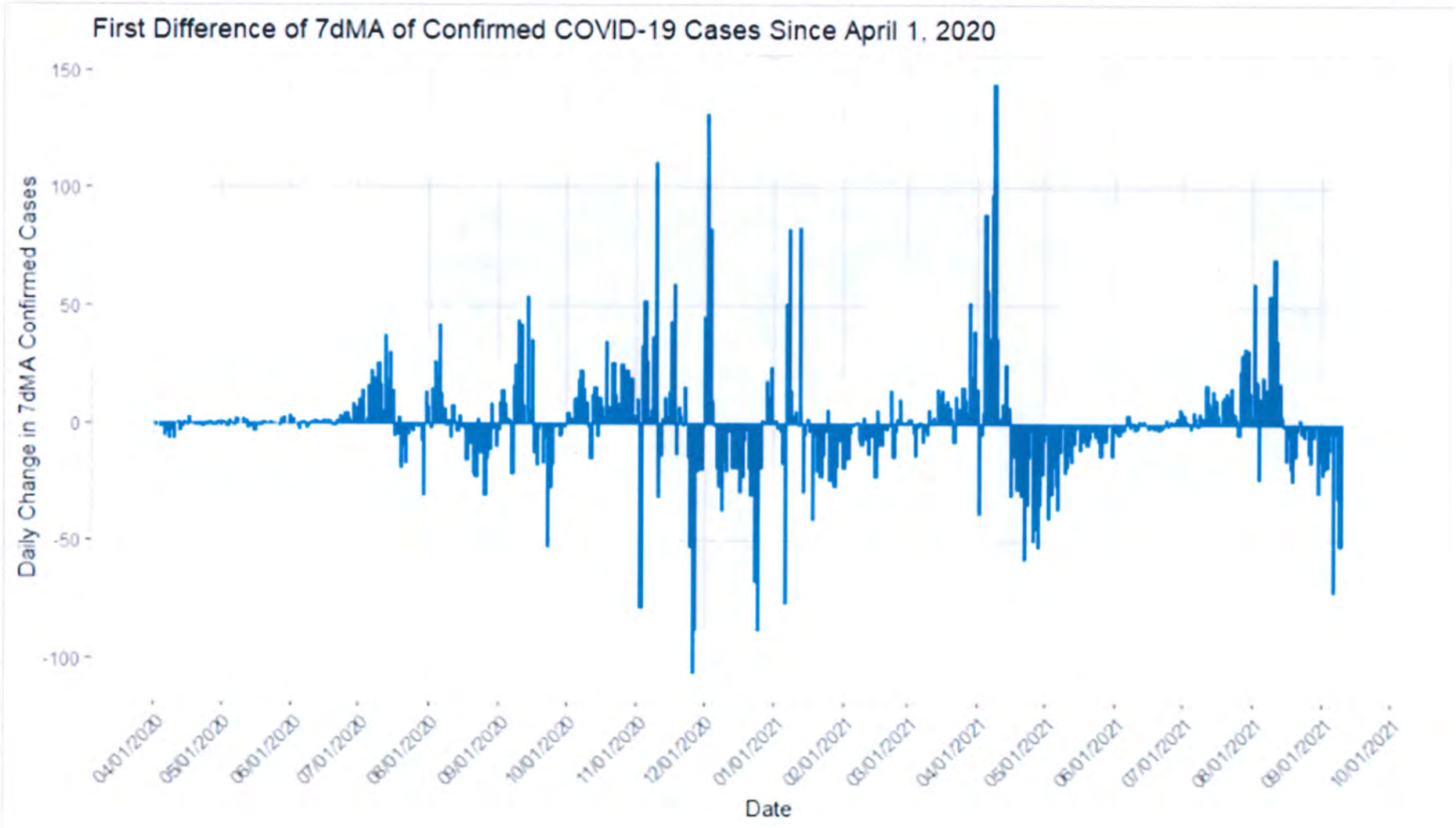
Testing Facilities

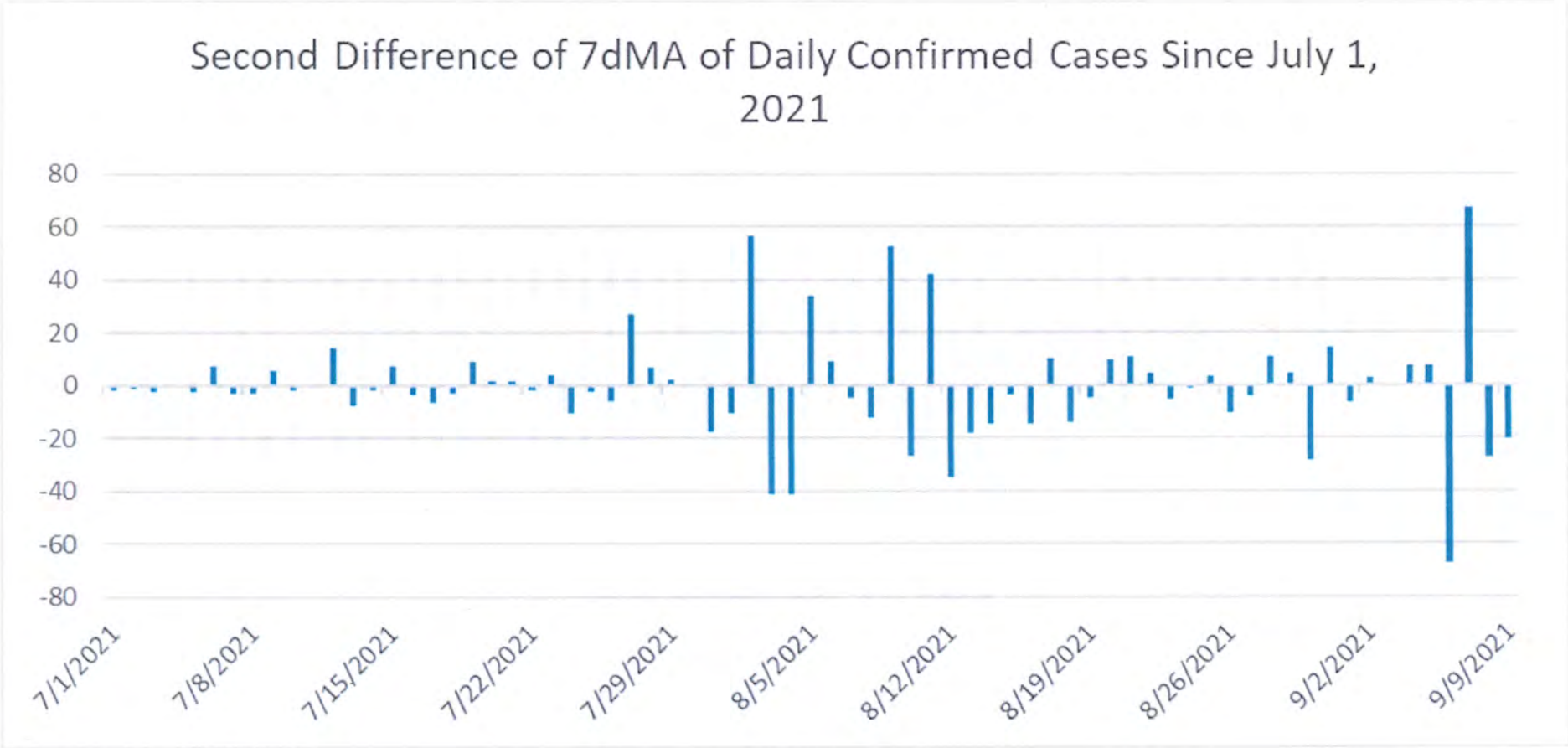


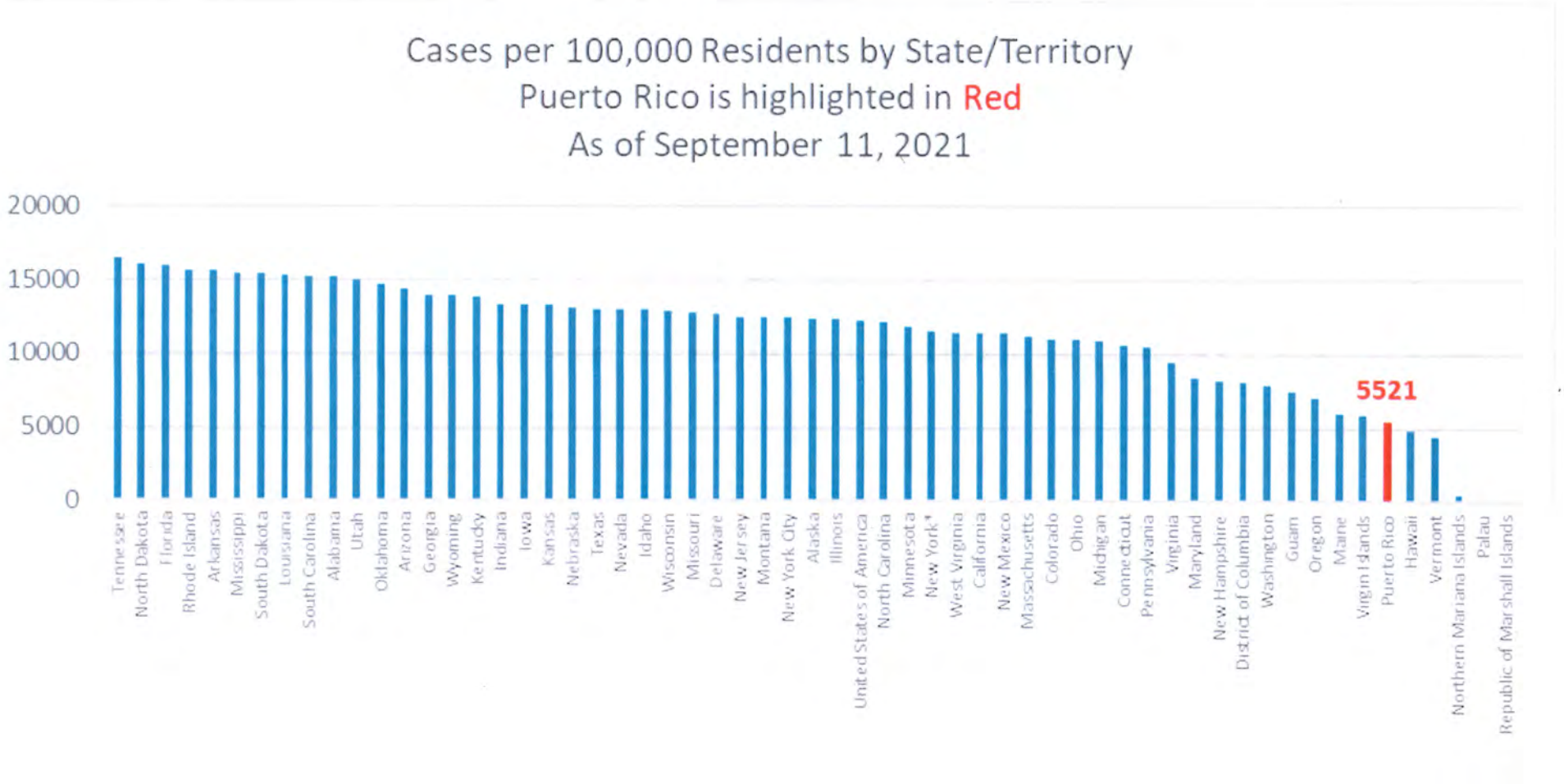
Testing Facilities
w/ Same-day results

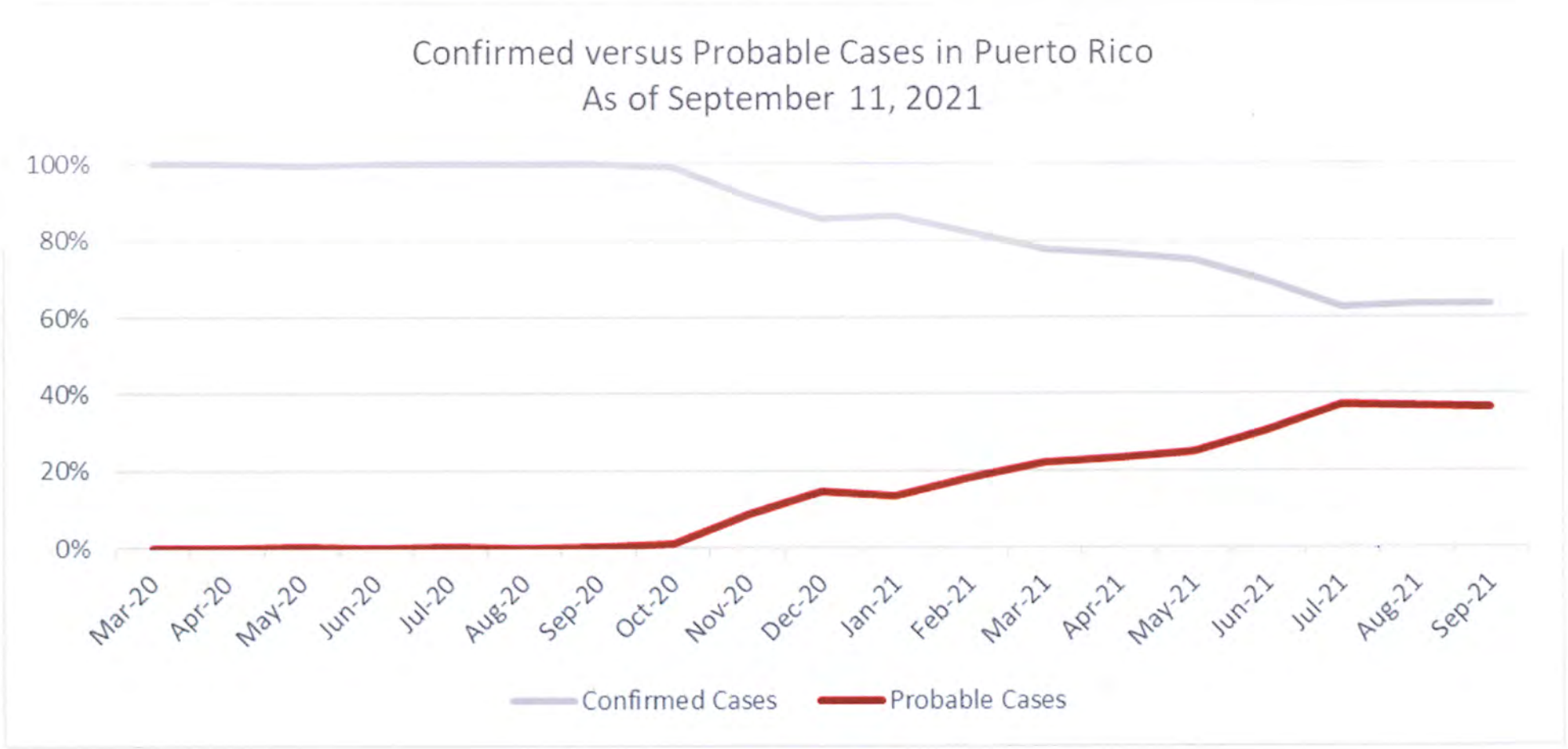


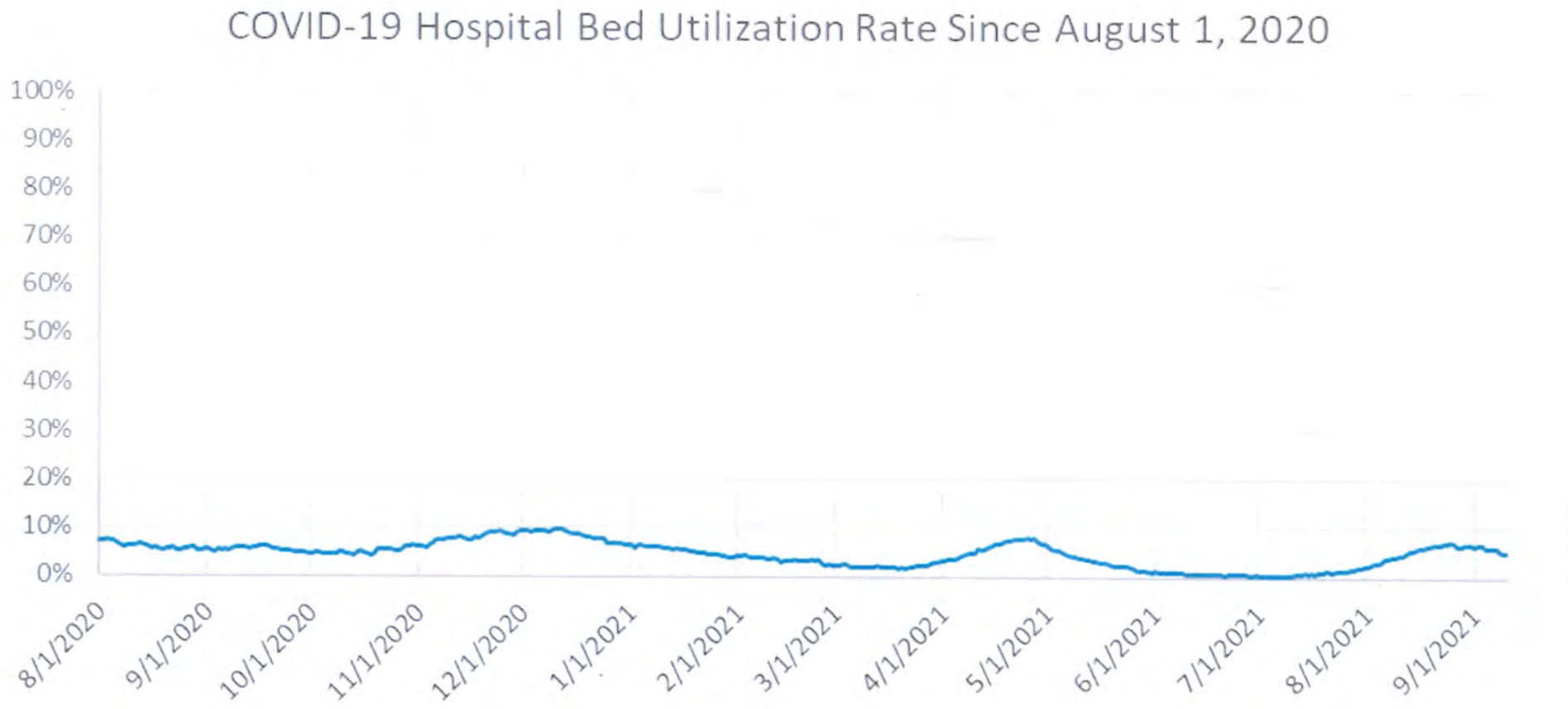


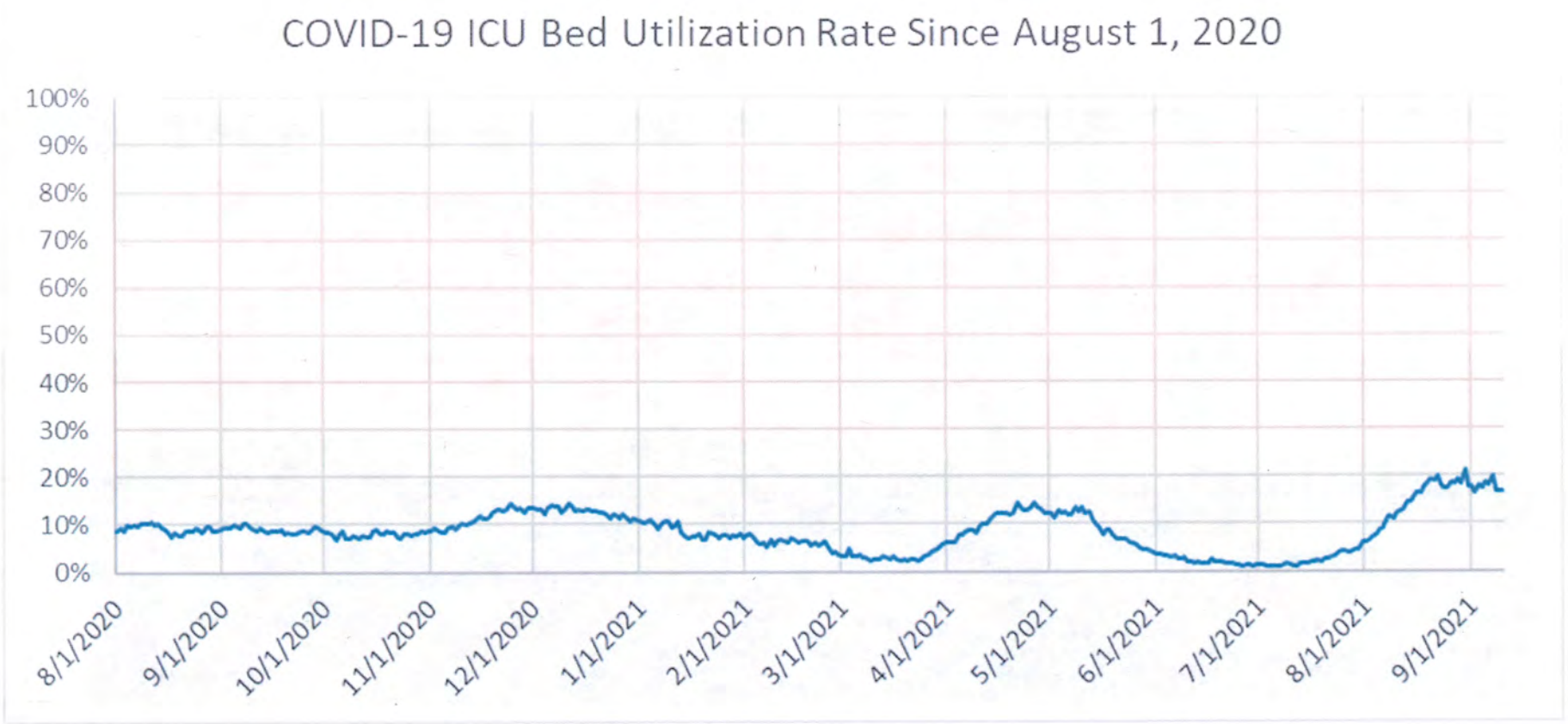


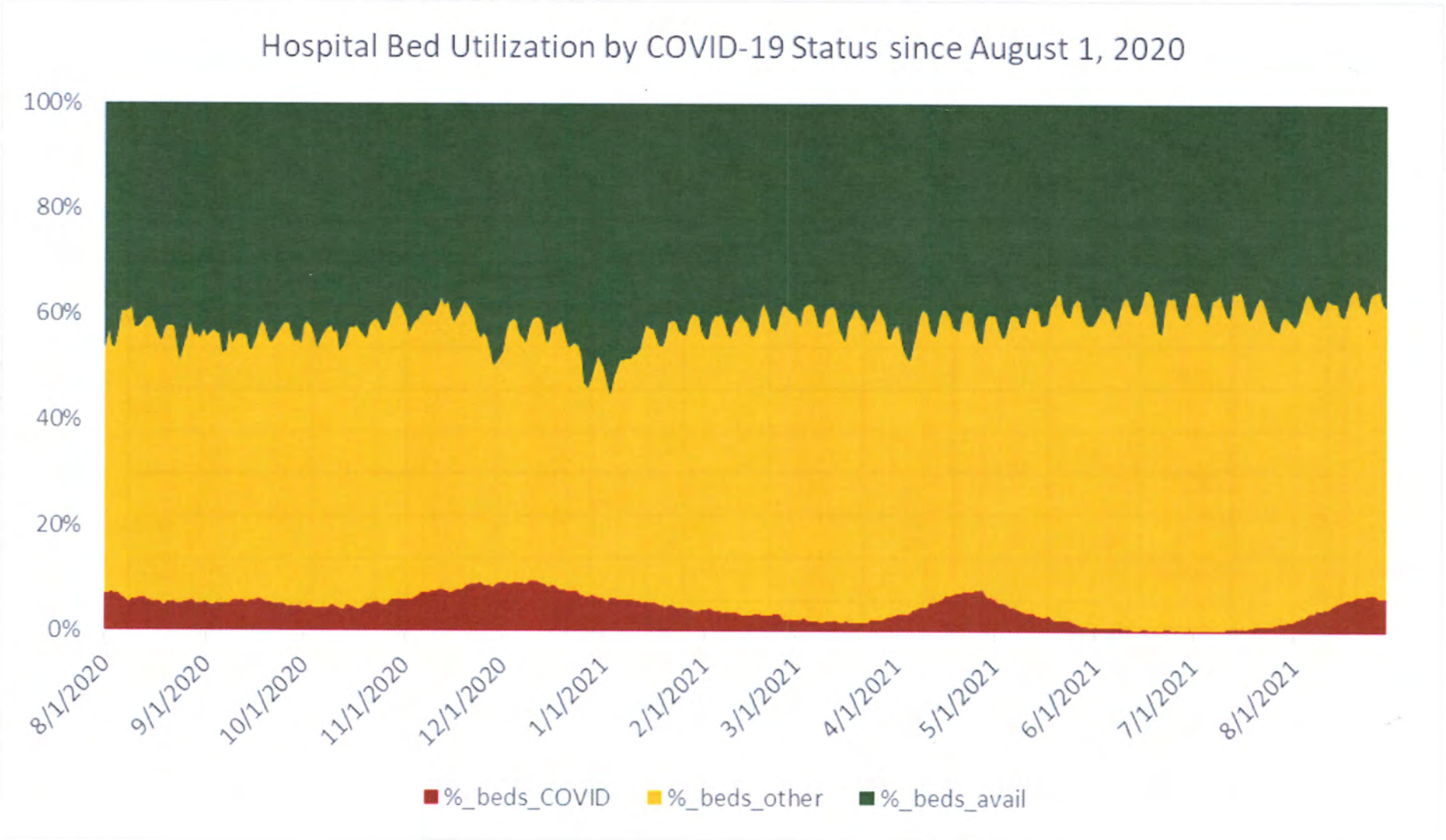


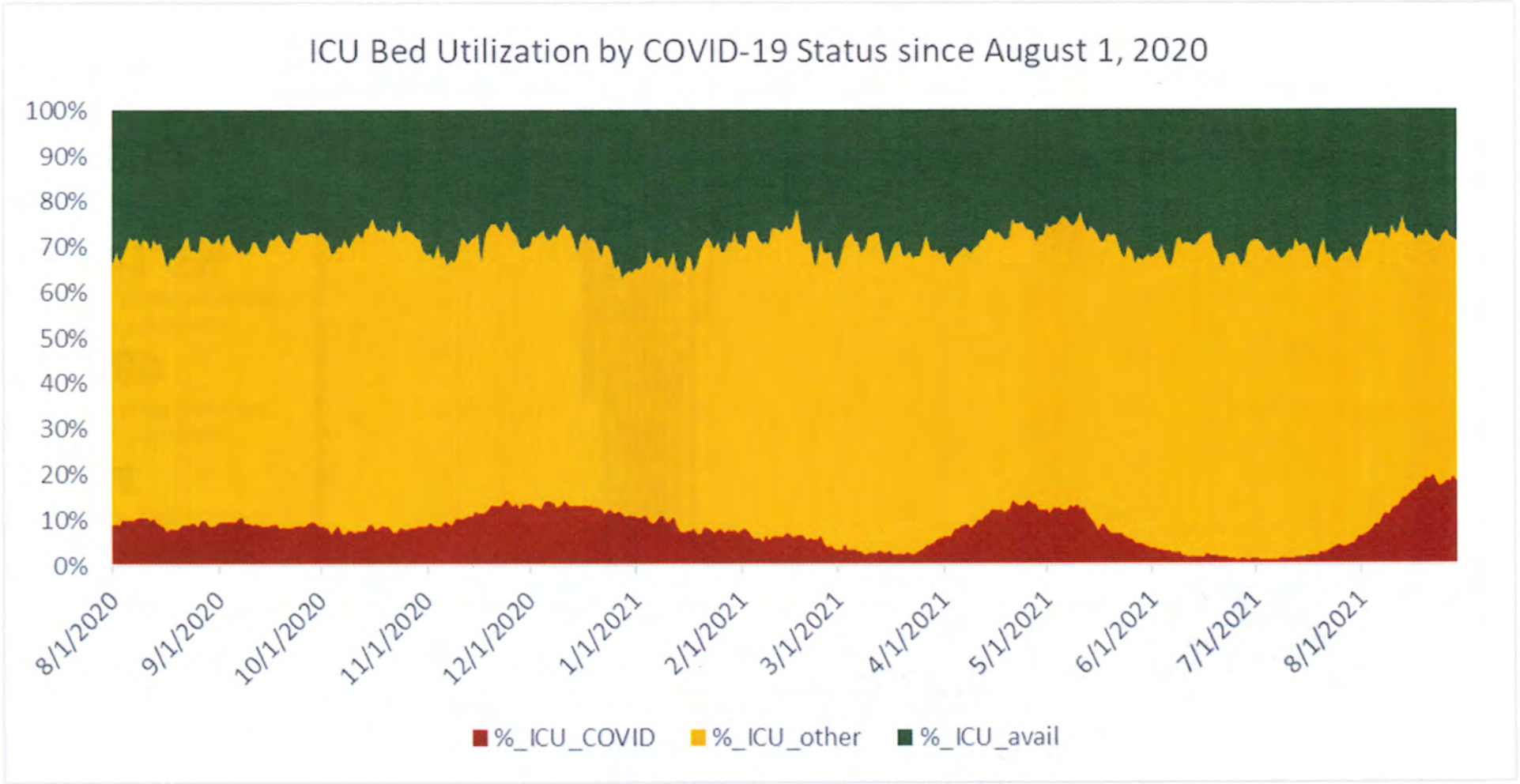












New Admissions of Patients with Confirmed COVID-19, Puerto Rico

Aug 01, 2020 - Sep 09, 2021

13,022
Total Admissions
Aug 01, 2020 - Sep 09, 2021

19
Current 7-Day Average
Sep 03, 2021 - Sep 09, 2021

24
Prior 7-Day Average
Aug 27, 2021 - Sep 02, 2021

189
Peak 7-Day Average
Nov 04, 2020 - Nov 10, 2020

-21.6%
Percent change from prior 7-day avg. of Aug 27, 2021 - Sep 02, 2021

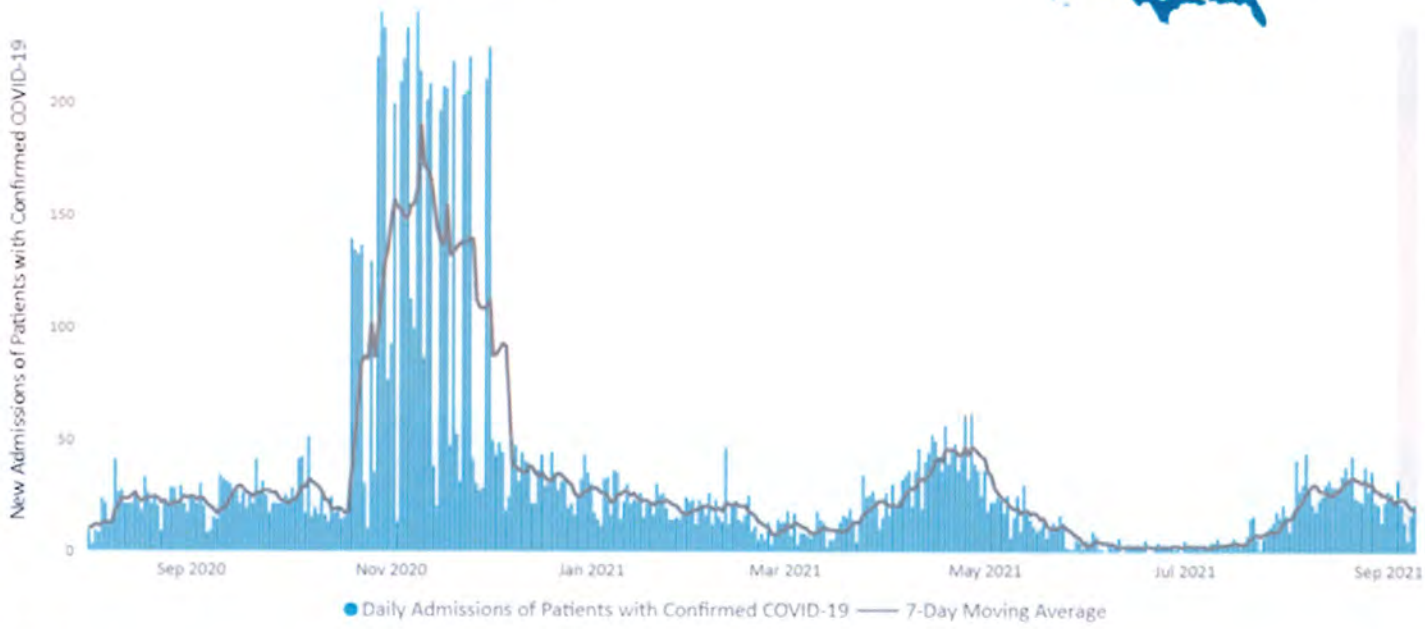
-90.1%
Percent change from peak 7-day avg. of Nov 04, 2020 - Nov 10, 2020

By Jurisdiction and Age Group | By Jurisdiction

Select a Jurisdiction

Puerto Rico

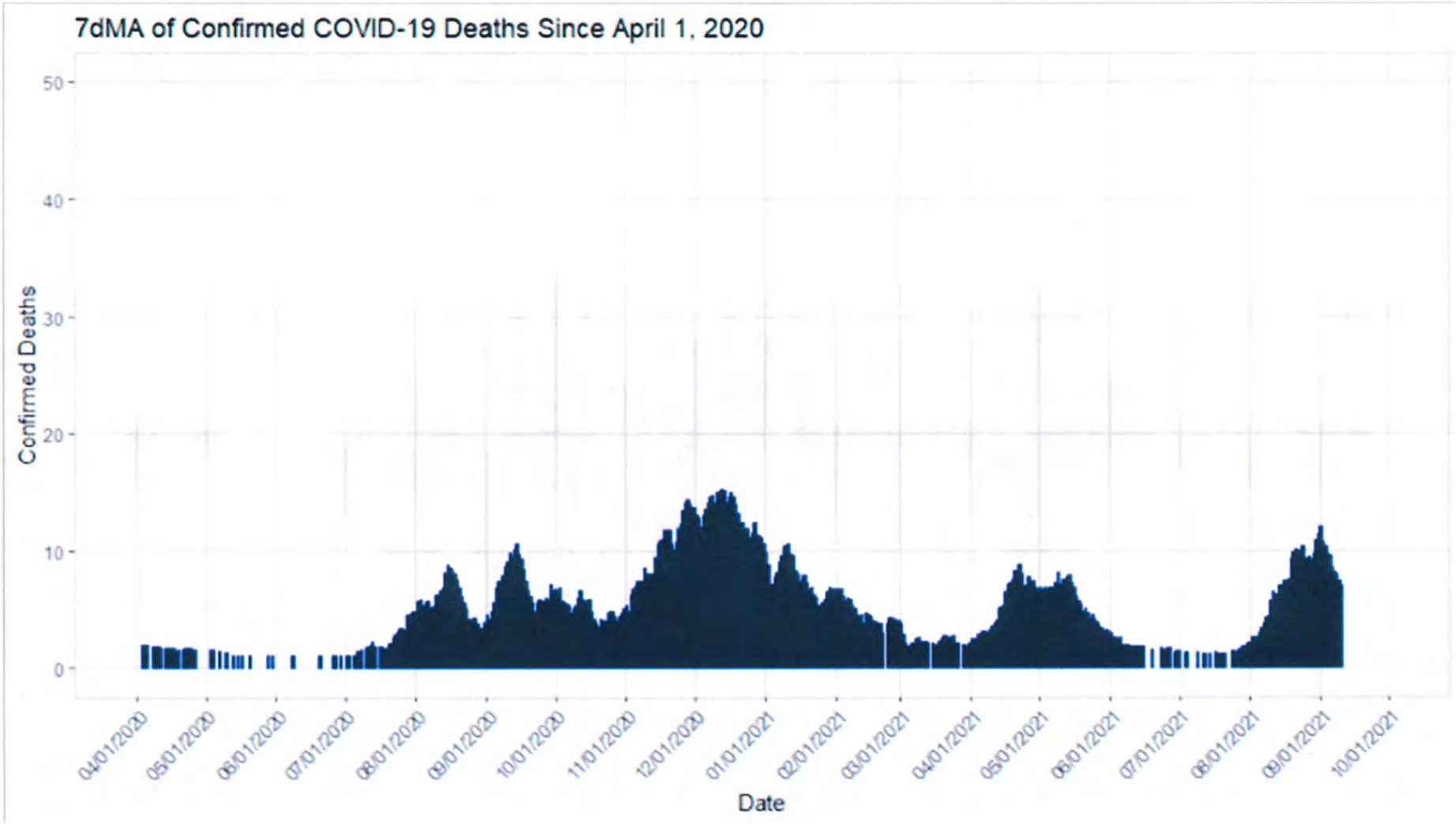
HHS Regions

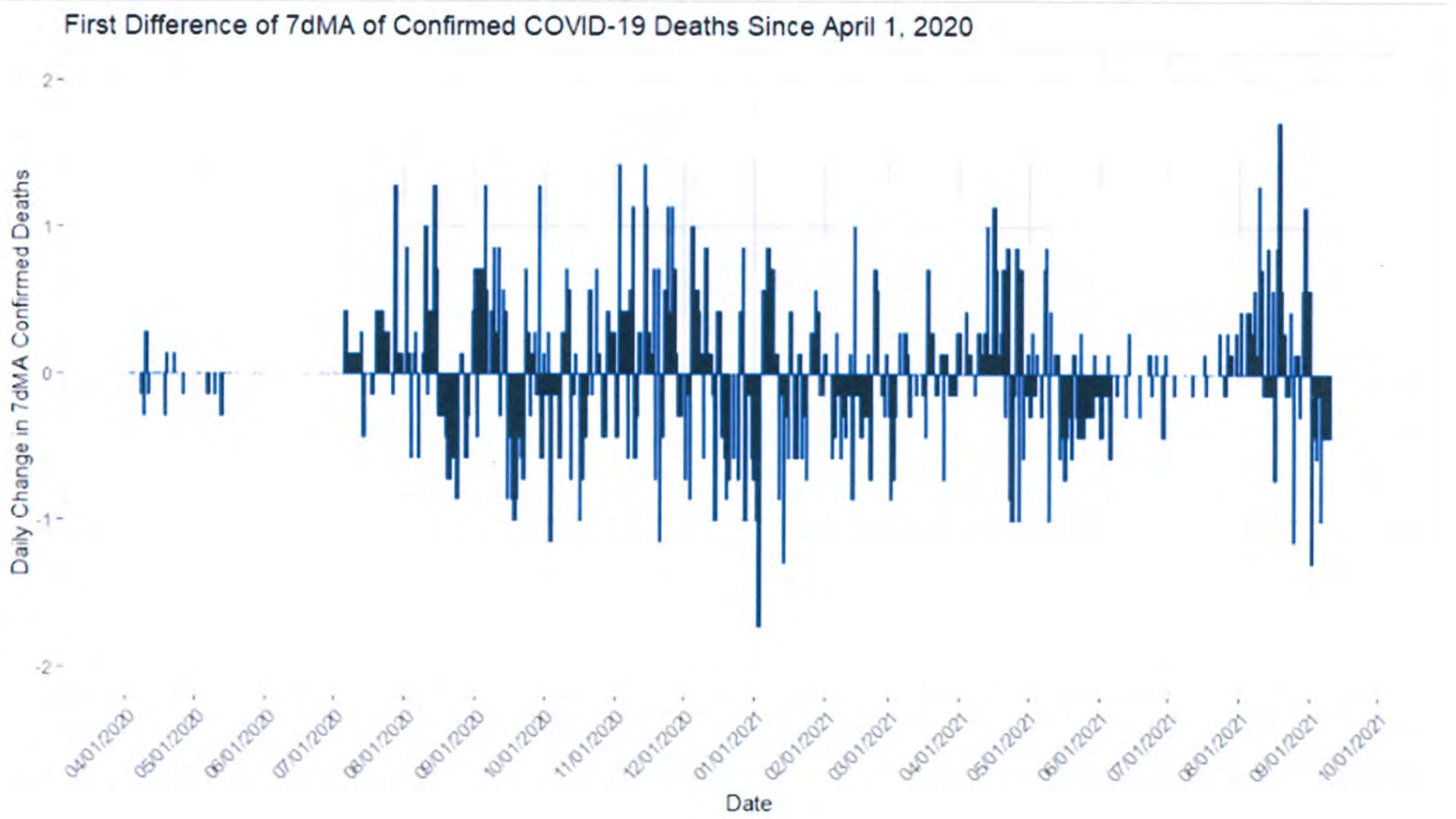


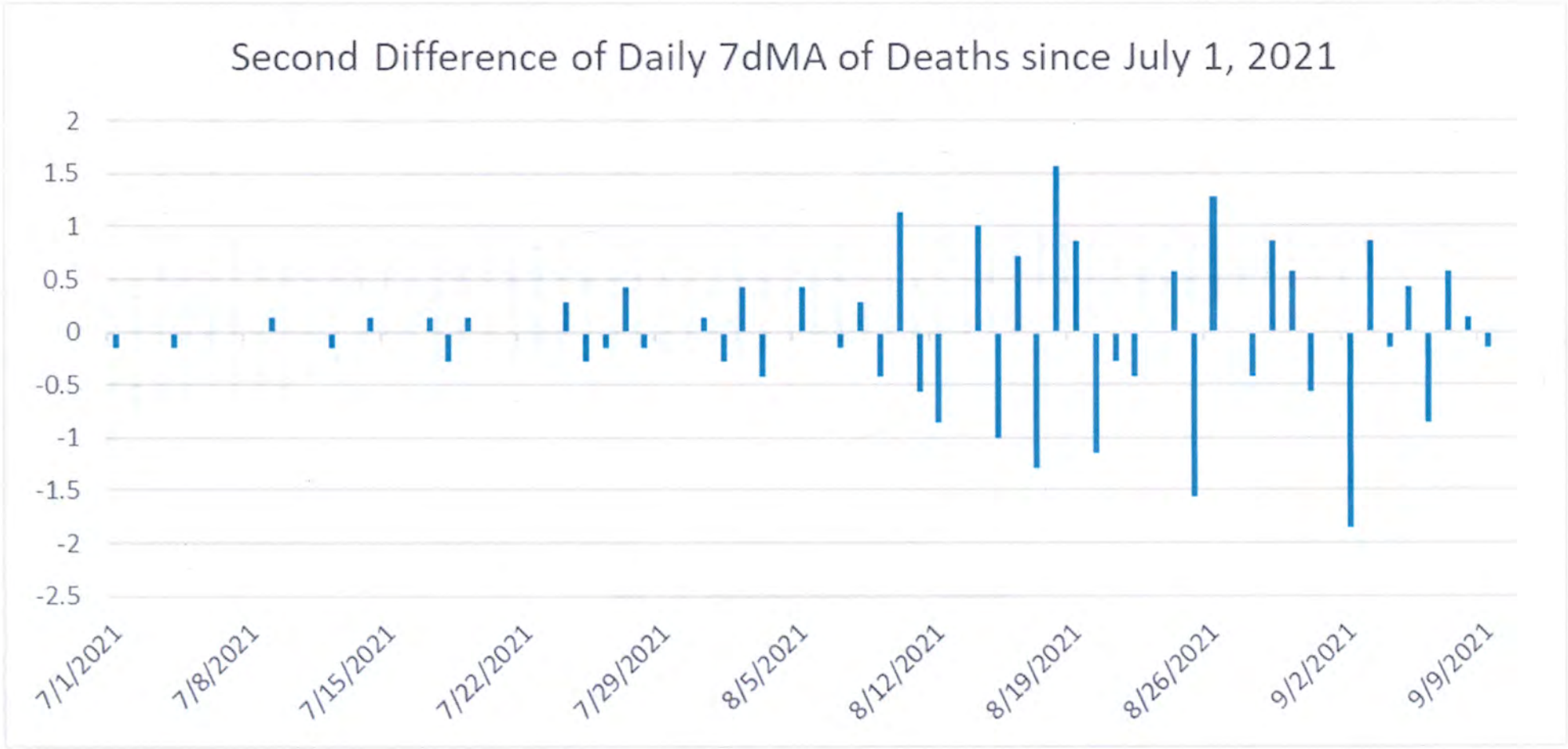
Based on reporting from all hospitals (N=5,253). Due to potential reporting delays, data reported in the most recent 7 days (as represented by the shaded bar) should be interpreted with caution. Small shifts in historic data may occur due to changes in the CMS Provider of Services file, which is used to identify the cohort of included hospitals. Data since December 1, 2020 have had error correction methodology applied. Data prior to this date may have anomalies that are still being resolved. Data prior to August 1, 2020 are unavailable.

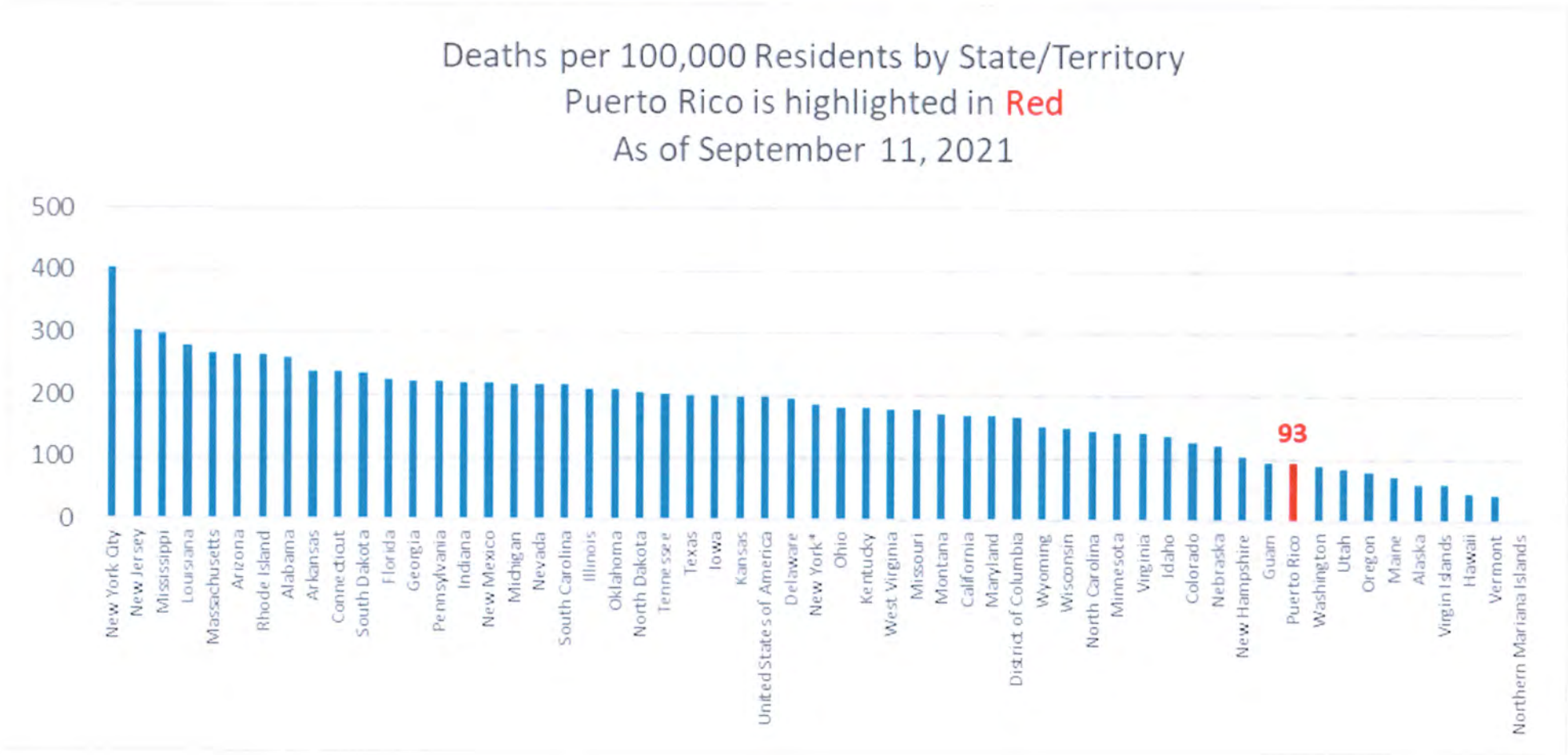
Last Updated: Sep 11, 2021

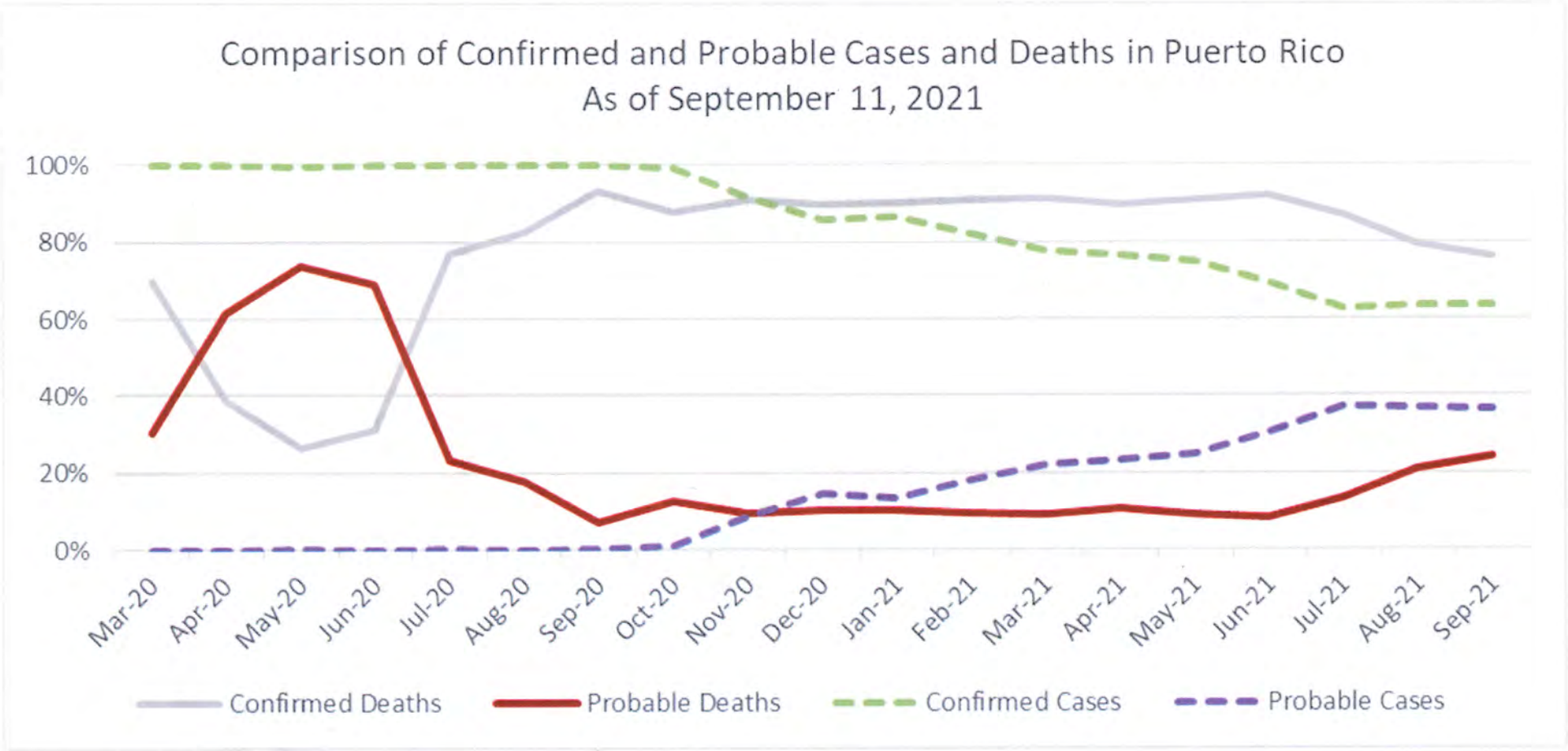
Unified Hospital Dataset, White House COVID-19 Team, Data Strategy and Execution Workgroup







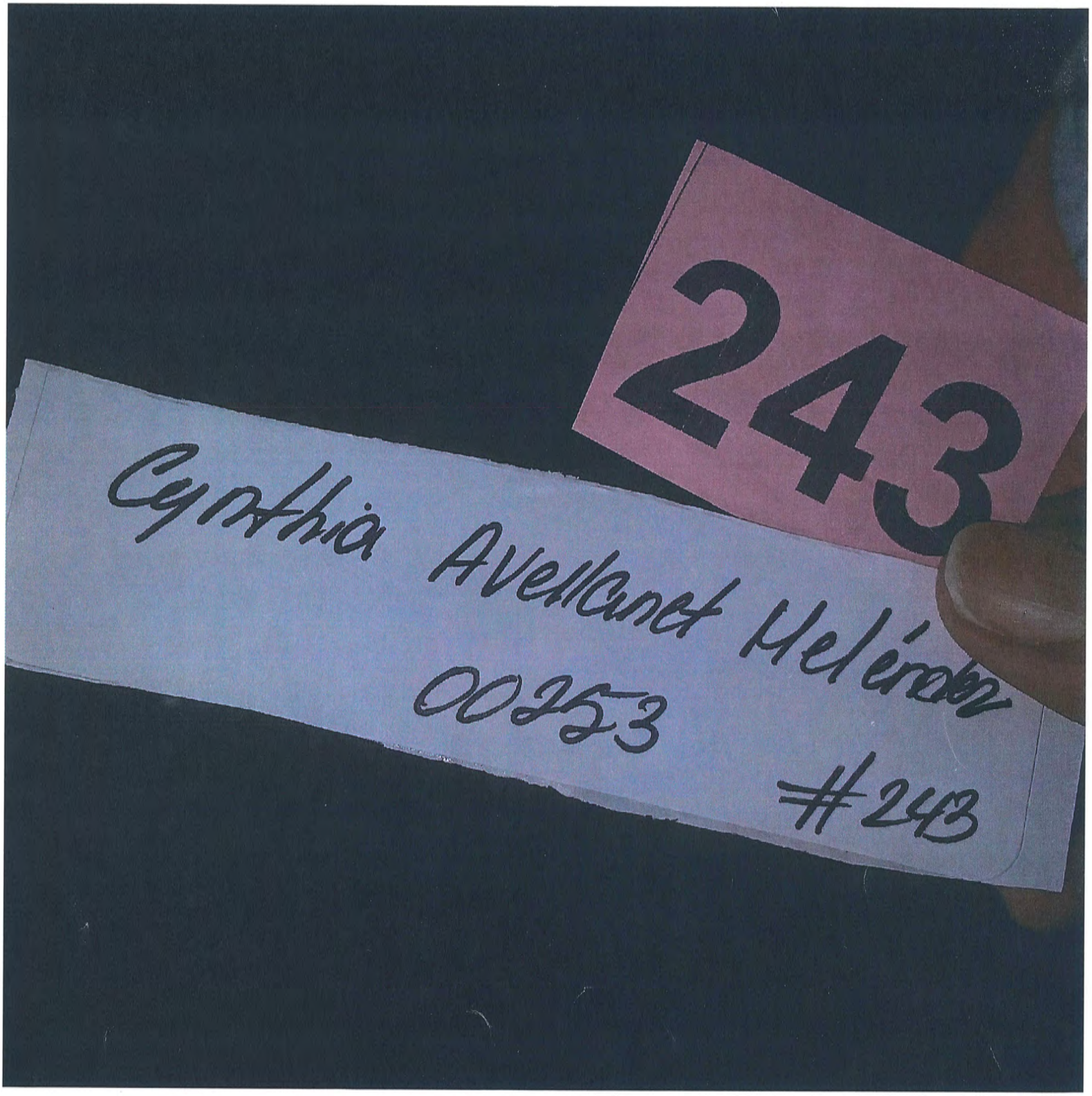




Age Group	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80+
Total CFR	0%[34]	0.03%	0.09%	0.28%	0.78%	2.03%	4.39%	9.72%	21.62%

[34] Due to rounding, this value may be very slightly >0%, but only marginally so.

Cause of Death by Type										
Start Date	End Date	Year	State	Age Group	COVID-19	Total	PNA	PNA and COVID-19	FLU	PNA, FLU, or COVID-19
1/1/2020	12/31/2020	2020	Puerto Rico	0-17 years		218				10
1/1/2021	9/4/2021	2021	Puerto Rico	0-17 years		136			0	



+17873158441

Monday, September 6, 2021

Saludos cordiales, Jorge. Te escribe Juan Carlos Fenollal del área de Ponce. Recibí tu email acerca de las fotos. Aquí te envío una. En mi día libre (feriado) sudando la gota gorda en Canas Medical. La mayoría de estas personas llevan tiempo aquí y siguen llegando. Llegué a la 1:15 y solo Dios sabe

View all

[CERTIFIED TRANSLATION]

File Message Tell me what you want to do...

SHEYLA M. JUSINO VARGAS LEILA G. GINORIO CARRASQUILLO 10

VACCINE

Good morning,

At this time and according to our records, there is no evidence of a COVID vaccine; if you have it, please send evidence of same to this email address.

If you do not have the vaccine but have a medical certificate or any other reason, please provide evidence. Thank you.

Cordially,
Sheyla Jusino Vargas
Administrative Official III

14 Unread: 3 Online with: Microsoft Exchange

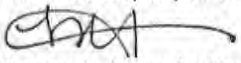
Type here to search

CERTIFICATE OF TRANSLATION
SPANISH TO ENGLISH

DOCUMENT: Email from Sheyla M. Jusino Vargas to Leila Ginorio Carrasquillo
(original Spanish document consisting of 1 page)

The undersigned, Margot A. Acevedo Chabert, USCCI, hereby certifies that she has been actively engaged as a professional translator and interpreter (English <> Spanish) certified by the Administrative Office of the United States Courts since 2006 (Certificate No. 06-001), that she has an MA in Translation from the University of Puerto Rico, and that to the best of her knowledge and understanding, the attached document is a true and correct translation of the original text provided for translation.

In Milwaukee, WI, on September 22, 2021



Margot A. Acevedo Chabert, USCCI

[CERTIFIED TRANSLATION]

August 8, 2021

AUG 9'21 14:20

Angeli López Rodríguez
Employment Security Bureau Director

Atty. Facundo Di Mauro
Assistant Secretary for Worker Benefits

Atty. Ruth Vázquez Juan
Assistant Secretary for Human Resources and Labor Affairs

Dear Directors,

Hello!
As you know, the new executive order OE-2021-058, which requires that all employees working in person be duly vaccinated, will take effect on August 16, 2021. Nevertheless, the order also establishes certain exceptions due to medical and religious reasons. But, in order to comply with some of these exemptions, the Executive Order establishes that any employee who is not able to be vaccinated must submit a negative antigen or NAAT test result on the first workday of every week.

I hereby wish to let you know that I want to make use of the religious exemption. Contrary to general belief, this substance IS NOT a traditional vaccine. Traditional vaccines are crafted so that our body will NATURALLY generate an immune response to defend itself from the invasion of a weakened or inactive virus. The substance that they are attempting to forcefully inject us is drastically different from traditional vaccines. This substance is a sort of intracellular therapy, which intends to penetrate the cell membrane and establish itself inside the cell in order to generate an UNNATURAL immune response. My personal relationship with the Lord prevents me from allowing my body to be injected with this intracellular therapy that will artificially and manipulatively invade the most basic, but essential, unit of the life that God created and that makes me unique.

While assessing the costs of complying with the requirements of the exceptions, I see that they would be burdensome. According to the benefits of my healthcare coverage, the First Medical health insurance plan only covers, with a medical referral, two antigen or NAAT tests per month. In addition to the costs of the two private tests that I would have to get every month, there is also the deductible for the visits to my doctor to obtain the referral. Considering that I am a single mother and that I have financial responsibilities that I need to meet, I believe that the option of taking an unpaid leave of absence would not be feasible either.

I would like to clarify that during the government shutdown in March 2020, given the nature of my duties, the Department of Labor gave me the option of working remotely, which I accepted, understanding the Agency's concern that the services offered to the citizens not be affected. The Department of Labor and

[CERTIFIED TRANSLATION]

Human Resources provided me with all the necessary equipment for me to efficiently carry out my tasks from home. I was able to do my job in this way until the month of April 2021.

For the reasons stated above, and considering that the Executive Order encourages you to be sensible and empathetic when facing each employee's requests, I very respectfully ask that you give me the opportunity to go back to working remotely until this situation returns to normal.

Dear directors, I will appreciate your understanding in this matter and your efforts to look after the well-being of all the employees of the Department of Labor and Human Resources, without affecting the rights of others.

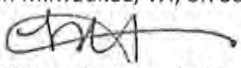
[illegible signature]
Leila G. Ginorio
Interstate Unit
NSE/Unemployment Benefits
10th Floor/National Plaza Building
Cell: 787-320-4016
E-mail: leigri14@gmail.com

CERTIFICATE OF TRANSLATION
SPANISH TO ENGLISH

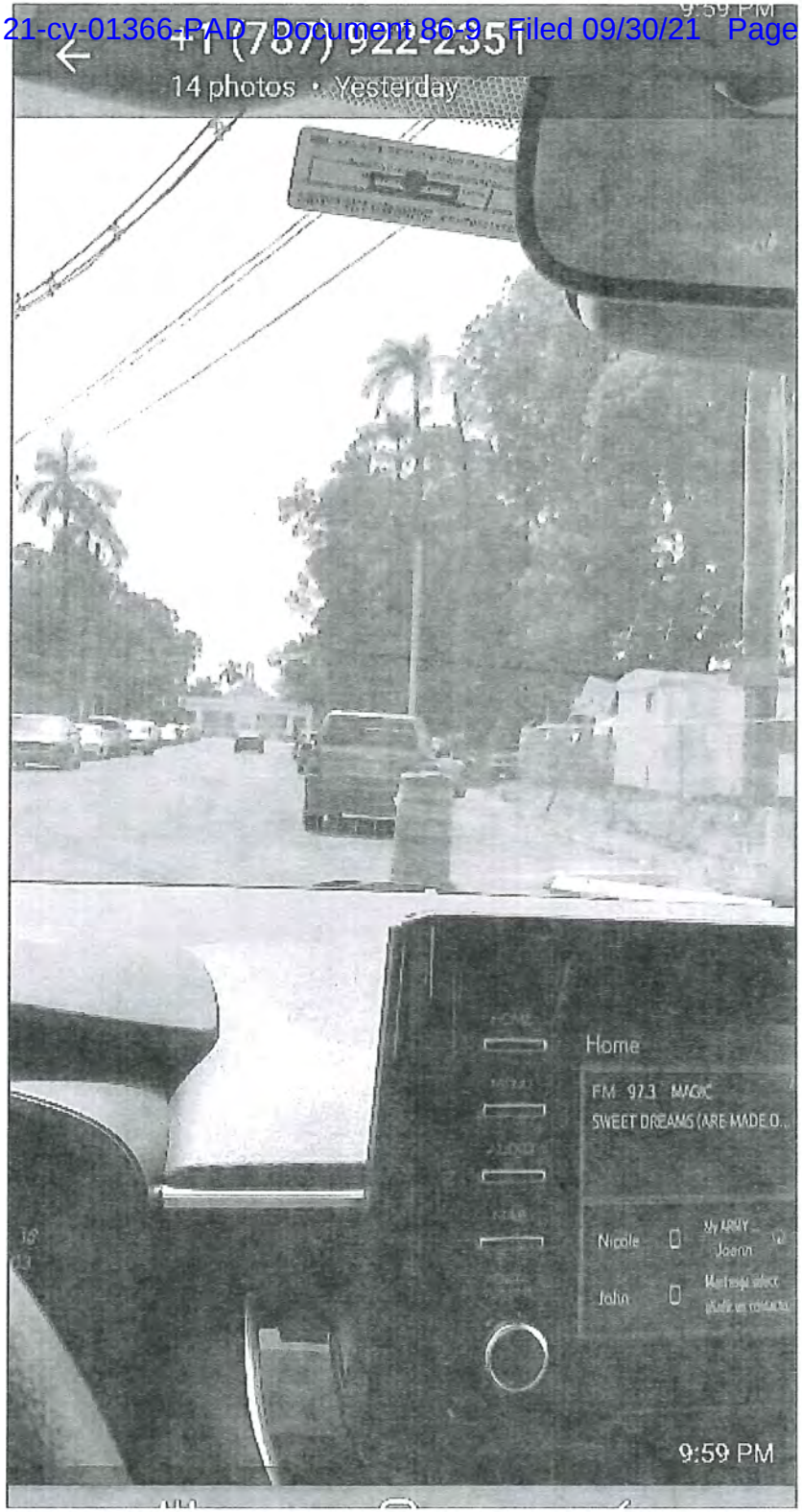
DOCUMENT: Letter of August 8, 2021 from Leila Ginorio requesting to work remotely
(original Spanish document consisting of 2 pages)

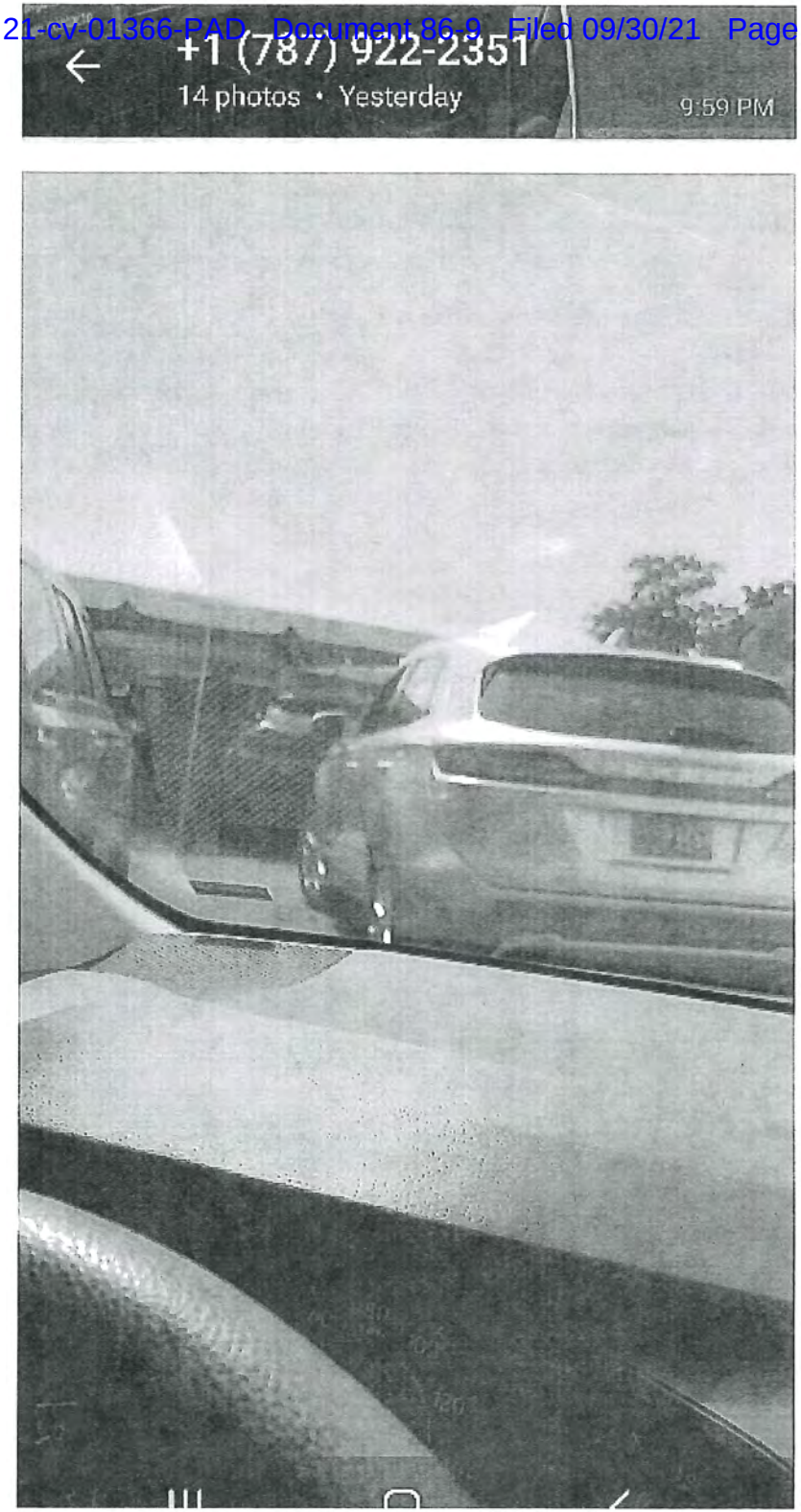
The undersigned, Margot A. Acevedo Chabert, USCCI, hereby certifies that she has been actively engaged as a professional translator and interpreter (English <> Spanish) certified by the Administrative Office of the United States Courts since 2006 (Certificate No. 06-001), that she has an MA in Translation from the University of Puerto Rico, and that to the best of her knowledge and understanding, the attached document is a true and correct translation of the original text provided for translation.

In Milwaukee, WI, on September 22, 2021

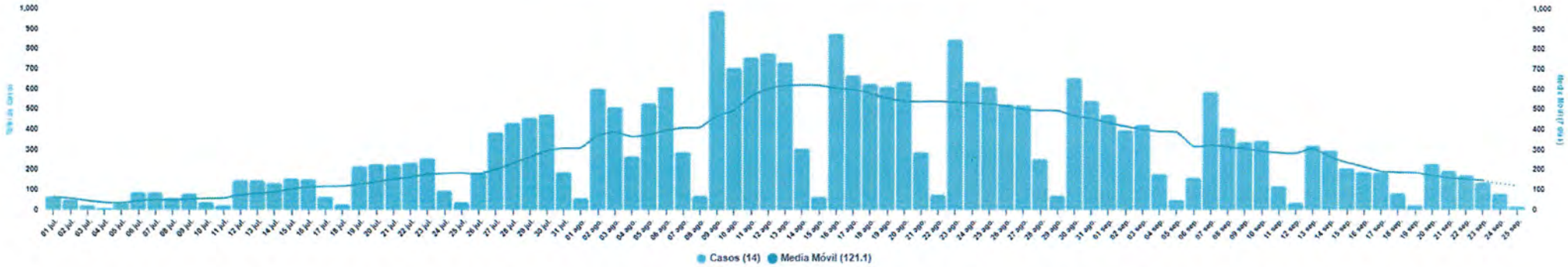


Margot A. Acevedo Chabert, USCCI

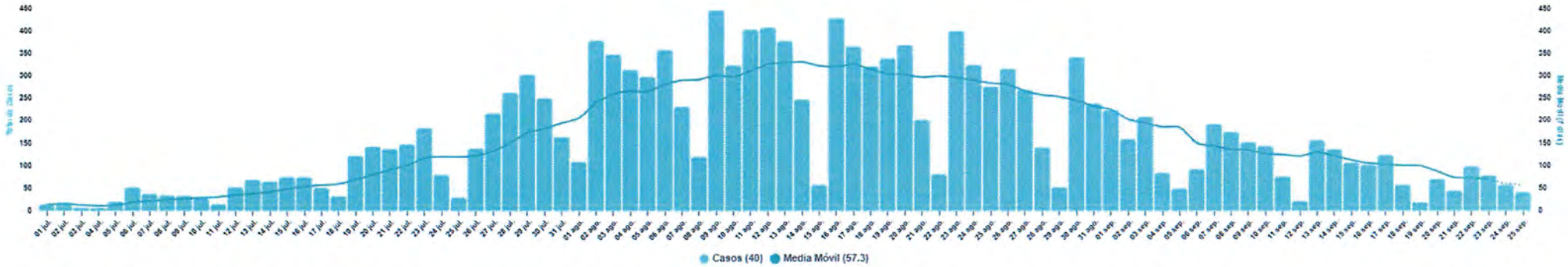




Conteo diario de casos confirmados (PCR) para COVID-19 notificadas por fecha de toma de muestra

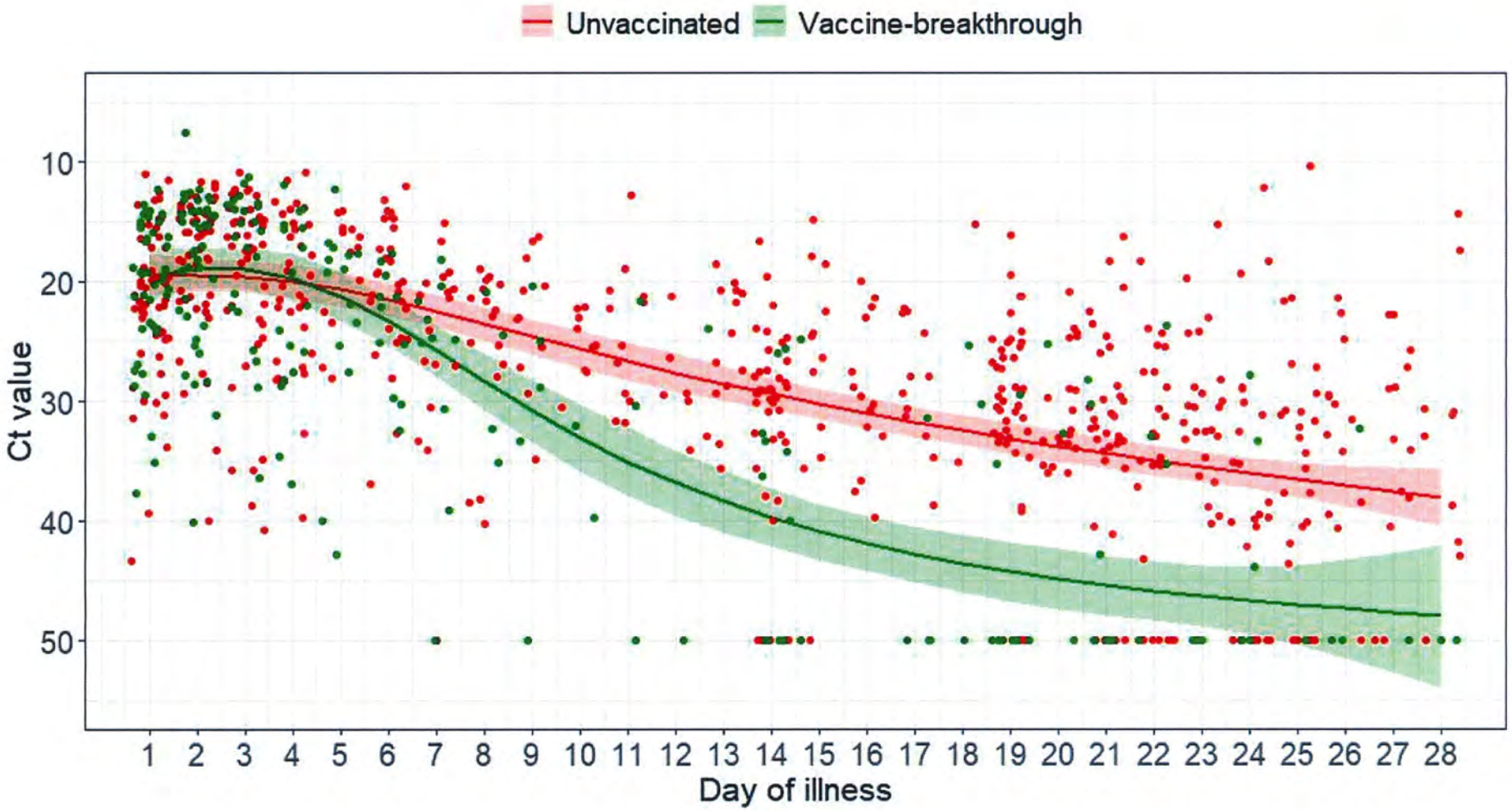


Conteo diario de casos probables (antígeno) para COVID-19 notificadas por fecha de toma de muestra



Source: Puerto Rico Health Department COVID-19 Dashboard, *Casos,* https://covid19datos.salud.gov.pr/#casos

Source: Puerto Rico Health Department COVID-19 Dashboard, *Casos,* https://covid19datos.salud.gov.pr/#casos



Source: medRxiv, *Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study*,(Pg. 16, Line 29)
https://www.medrxiv.org/content/10.1101/2021.07.28.21261295v1.full-text

Virological and serological kinetics of SARS-CoV-2 Delta variant vaccine-breakthrough infections: a multi-center cohort study

Po Ying Chia, MBBS[1,2,4]; Sean Wei Xiang Ong, MBBS[1,2]; Calvin J Chiew, MPH[1,3]; Li Wei Ang, MSc[1]; Jean-Marc Chavatte PhD[1]; Tze-Minn Mak, PhD[1]; Lin Cui, PhD[1]; Shirin Kalimuddin, MPH[5,6]; Wan Ni Chia, PhD[6]; Chee Wah Tan, PhD[6]; Louis Yi Ann Chai, PhD[7,8]; Seow Yen Tan, MBBS[9]; Shuwei Zheng, MBBS[10]; Raymond Tzer Pin Lin, MBBS[1]; Linfa Wang, PhD[6], Yee-Sin Leo, MPH[1,2,4,8]; Vernon J Lee, PhD[3]; David Chien Lye, MBBS[1,2,4,8]; Barnaby Edward Young, MB BChir[1,2,4]

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Running title: Delta VOC: Viral Kinetics for Vaccinated

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Keywords: COVID-19; SARS-CoV-2; breakthrough infection; delta; variants of concern; vaccine breakthrough; vaccination

Background

Availability of effective vaccines against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) within one year of the first report of coronavirus disease 2019 (COVID-19) is remarkable. Phase 3 clinical trials of messenger RNA (mRNA) vaccines have demonstrated 92-95% efficacy in preventing symptomatic infection and severe disease [1-4] and intensive vaccination programs have reduced infection and mortality rates in multiple settings [5-7].

Emerging variants of concern (VOCs), such as B.1.1.7 (Alpha in the World Health Organization classification), B.1.351 (Beta), P.1 (Gamma), and B.1.617.2 (Delta) exhibit varied sequence changes and alteration of amino acid sequences of the spike protein. This has led to concerns of viral immune evasion and decreased vaccine effectiveness. Furthermore, these VOCs have been shown to be more transmissible [8-10], and B.1.1.7 and B.1.617.2 has been associated with increased disease severity and hospitalization [11, 12]. B.1.617.2 has rapidly spread outside India, becoming the most frequently sequenced lineage worldwide by end of June 2021 [13]. Case series of vaccine-breakthrough infections have reported an over-representation by these VOCs [14, 15].

Understanding vaccine effectiveness in the context of VOCs requires granular data: which vaccines were administered, at what time point prior to infection, number of doses, and particularly which VOC has caused the infection. Important VOC-specific vaccination outcomes include severity of infection and vaccine effects on transmission.

The COVID-19 vaccination program was initiated in Singapore on 30 December 2020, with free vaccinations provided to all Singapore residents in phases, beginning with the elderly and those in high-risk occupations such as healthcare workers. Vaccines used are mRNA vaccines, Pfizer/BioNTech BNT162b2 and Moderna mRNA-1273. As of 19 July 2021, 6,837,200 vaccine doses had been administered and ~2,792,430 individuals (47% of the total population) had completed the vaccination course [16]. In May 2021, B.1.617.2 became the dominant circulating variant based on local sequencing data.

Serum samples from a subset of vaccine-breakthrough patients who had separately consented for specimen collection were additionally tested with a newly developed multiplex-sVNT assay using the Luminex platform. Further details can be found in the supplementary information.

Viral RNA sequencing and VOC determination

SARS-CoV-2 PCR was performed using various commercially available assays in different clinical laboratories. As part of active genomic surveillance, whole genome sequencing (WGS) by National Public Health Laboratory is performed for all patients in Singapore with SARS-CoV-2 detected by RT-PCR with a Ct value less than 30. Pangolin COVID-19 Lineage Assigner and CoVsurver were used to assign lineage to each sequence. For individuals with PCR confirmed infection without available sequencing results, lineage was inferred based on epidemiological investigations by the Singapore Ministry of Health (MOH), and likely B.1.617.2 infections were included (i.e., clear epidemiologic link with patients with sequencing confirmed B.1.617.2 infection).

Clinical Management

All individuals with confirmed COVID-19 (including asymptomatic cases) in Singapore are admitted to hospital for inpatient evaluation and isolation. Individuals with pneumonia requiring supplemental oxygen are treated with intravenous remdesivir, while dexamethasone and other agents were reserved for progressive infections per national guidelines [19]. Disease severity was stratified into asymptomatic, mild (no pneumonia on chest radiography), moderate (presence of pneumonia on chest radiography), severe (requiring supplemental oxygen), or critical (requiring intensive care unit [ICU] admission or mechanical ventilation). Collection of clinical data was censored on discharge from hospital.

Statistical Analysis

For descriptive analysis, data were presented as median (interquartile range (IQR)) for continuous parameters and frequency (percentage) for categorical variables. Chi-square and Fisher's exact tests

146 2012/00917). Informed consent for retrospective data collection at National Centre for Infectious
147 Diseases (NCID) was waived (NHG-DSRB reference number 2020/01122).

148 **Results**

149 218 B.1.617.2 infections were identified across the five study sites (Supplementary Figure S1). Of
150 these, 71 met the definition for vaccine-breakthrough. An additional 13 only received one dose ≥14
151 days prior to disease onset or received both doses but within 14 days of disease onset, while four
152 had received a non-mRNA vaccine overseas. Majority of participants meeting study definition for
153 vaccine-breakthrough had received two doses of BNT162b2 (n=66, 93%).

154 **Clinical Features**

155 In line with Singapore's national vaccination strategy wherein older adults were prioritized for
156 vaccination, our vaccine-breakthrough cohort was of significantly older age; median age of 56 years
157 (IQR:39-64) versus 39.5 (IQR:30-58) (p<0.001) (Table 1). Other baseline demographics were similar.

158 Vaccine-breakthrough patients were significantly more likely to be asymptomatic (28.2% versus
159 9.2%, p<0.001); and if symptomatic, had fewer number of symptoms (Table 1). Unvaccinated
160 individuals had worse levels of known biomarkers associated with increased COVID-19 severity
161 including lymphocyte count, C-reactive protein [CRP], lactate dehydrogenase [LDH] and alanine
162 transferase [ALT]. Correspondingly, a higher proportion of the unvaccinated cohort had pneumonia,
163 required supplementary oxygen and ICU admission compared with the vaccinated cohort. A broader
164 analysis comparing unvaccinated versus those who had received at least one dose of vaccine (i.e.
165 both vaccine-breakthrough and incomplete vaccination) demonstrated similar findings
166 (Supplementary Table T1).

167 Multivariate logistic regression analysis for development of severe COVID-19 (defined by
168 supplementary oxygen requirement) demonstrated that vaccination was protective with an adjusted
169 odds ratio (aOR) of 0.073 (95% confidence interval [CI]):0.016-0.343) (p=0.001) (Table 2). Analysis

193 testing by the multiplex sVNT assay, titres were significantly higher against wildtype virus compared
194 with B.1.617.2 and other VOCs (Figure 3). sVNT titres were lowest against B.1.617.2 and P.1 VOCs.

195 **Discussion**

196 In this study, we found that fully vaccinated patients had significantly lower odds of moderate or
197 severe outcomes following infection by the SARS-CoV-2 VOC B.1.617.2. Vaccination was associated
198 with lower peak measures of systemic inflammation, fewer symptoms, including more asymptomatic
199 infection, and better clinical outcomes. Notably, in contrast to existing studies that showed lower
200 viral load in vaccinated patients [22], initial viral load indicated by PCR Ct values was similar between
201 vaccinated and unvaccinated patients with B.1.617.2. However, vaccinated patients appeared to
202 clear viral load at a faster rate. Our serologic data suggest an early rapid rise in neutralizing and
203 binding antibodies indicated by C-Pass and Roche anti-S antibodies, which may be evidence of
204 memory immunity to COVID-19 vaccination on challenge with a breakthrough infection with
205 B.1.617.2.

206 As part of active case finding and surveillance in Singapore, all patients with fever or respiratory
207 symptoms, close contacts of confirmed cases, and newly arrived travelers are screened for COVID-19
208 using PCR. Additionally, high-risk individuals in frontline occupations or congregate settings are
209 tested as part of routine surveillance. All confirmed COVID-19 cases are reported to MOH and
210 admitted to a hospital for initial evaluation. As such, our hospitalized cohort uniquely captures the
211 entire spectrum of disease severity of COVID-19 infection and provides granular data even for mild
212 and asymptomatic vaccine-breakthrough infections, giving us the opportunity to analyze virologic
213 and serologic kinetics of these patients.

214 The finding of diminished severity with B.1.617.2 infection in vaccinated individuals is reassuring and
215 corroborates emerging data from the United Kingdom which have found that mRNA vaccination
216 remains protective against symptomatic and severe disease[12, 23]. An observational cohort study
217 conducted in Scotland suggested that ≥14 days after the second dose, BNT162b2 vaccine offered

identification of most COVID-19 cases, the first available serologic result was at a median of 2 (IQR:1-3) days of illness and antibody levels are likely to already have been boosted by natural infection. We thus could not evaluate the underlying immunologic mechanisms behind vaccine-breakthrough infection, e.g., diminished neutralizing antibody level or impaired cellular immunity. Further study should compare similarly exposed vaccinated individuals who develop breakthrough infection with those who do not, to elucidate the underlying drivers of susceptibility, which may enlighten us on how to optimize protection (e.g., through enhanced/boosted dosing schedules).

Thirdly, PCR testing was not standardized in a centralized laboratory, and instead conducted at each centre using different validated commercial assays. Ct values are only a surrogate measure of viral load and shedding. We did not evaluate viability of shed virus via viral culture. In addition, we only evaluated participants with mRNA vaccination, and thus our findings are restricted to mRNA vaccines and not all COVID-19 vaccines.

Conclusion

mRNA vaccines against COVID-19 are protective against symptomatic infection and severe disease by the B.1.617.2 variant. Vaccinated individuals had a more rapid decline in viral load, which has implications on secondary transmission and public health policy. Rapid and widespread implementation of vaccination programs remains a key strategy for control of COVID-19 pandemic. Further studies should elucidate immunologic features driving vaccine-breakthrough infection to improve vaccine-induced protection.

287

288

	Unvaccinated n = 130	Vaccinated n = 71	*p*-value
Median age (IQR), years	39.5 (30-58)	56 (39-64)	<0.001
Male (%)	67 (51.5)	27 (38)	0.067
Median Charlson Comorbidity Index (IQR)	0 (0-1)	0 (0-0)	0.125
Diabetes mellitus (%)	28 (21.5)	5 (7.0)	0.008
Hypertension (%)	28 (21.5)	14 (19.7)	0.762
Hyperlipidaemia (%)	32 (24.6)	18 (25.4)	0.908
Median Ct value on diagnosis (IQR)*	18.8 (14.9-22.7)	19.2 (15.2-22.2)	0.929
Asymptomatic	12 (9.2)	20 (28.2)	<0.001
Symptom onset after Diagnosis (%)	11 (9.3)	11 (21.6)	0.030
Median day of illness symptoms start (IQR)	2 (2-3)	3 (2-3)	0.715
Median Ct values for Symptom Onset After (IQR)	21.87 (18.8-31.2)	19.2 (16.6-21.5)	0.279
Median Sum of Symptoms Reported (IQR)	2 (1-3)	1 (0-2)	<0.001
Fever (%)	96 (73.9)	29 (40.9)	<0.001
Cough (%)	79 (60.8)	27 (38)	0.002
Shortness of Breath (%)	17 (13.1)	1 (1.4)	0.004
Runny Nose (%)	31 (23.9)	27 (38)	0.034
Sore Throat (%)	43 (33.1)	18 (25.4)	0.255
Diarrhoea (%)	8 (6.2)	0	0.052
Median highest Neutrophil (IQR) × 10^9/L	4.50 (3.07-5.92)	4.33 (3.52-5.43)	0.117
Median lowest Lymphocyte (IQR) × 10^9/L	0.95 (0.65-1.50)	1.36 (1.02-1.87)	<0.001
Median highest C-Reactive Protein (IQR), mg/L	24.7 (6.9-84.8)	12.6 (6.5-22.5)	<0.001
Median highest Lactate Dehydrogenase (IQR), U/L	486 (365-672)	373 (314-421)	0.062
Median highest Alanine Transferase (IQR), U/L	35	19	<0.001

292

	Univariable model		Multivariable model	
	Crude OR (95% CI)	*p*-value	Adjusted OR (95% CI)	*p*-value
Vaccinated	0.111 (0.025-0.480)	0.003	0.073 (0.016-0.343)	0.001
Age group				
<45 years old	1	-	1	-
45-64 years old	6.19 (1.90-20.2)	0.003	8.29 (2.29-30.0)	0.001
>64 years old	13 (3.90-42.9)	<0.001	13.5 (2.66-68.8)	0.002
Male	0.913 (0.414-2.01)	0.821	1.09 (0.418-2.85)	0.857
Diabetes	6.18 (2.59-14.7)	<0.001	2.24 (0.785-6.41)	0.132
Hypertension	4.8 (2.09-11.0)	<0.001	1.62 (0.509-5.18)	0.413
Presence of other comorbidities, if any	3.96 (1.66-9.44)	0.002	0.897 (0.262-3.07)	0.862

293

294 **Table 2:** Odds ratio of candidate risk factors for development of severe COVID-19 for completed

295 mRNA vaccination COVID-19 B1.617.2 infected patients. CI, confidence interval; OR, odds ratio

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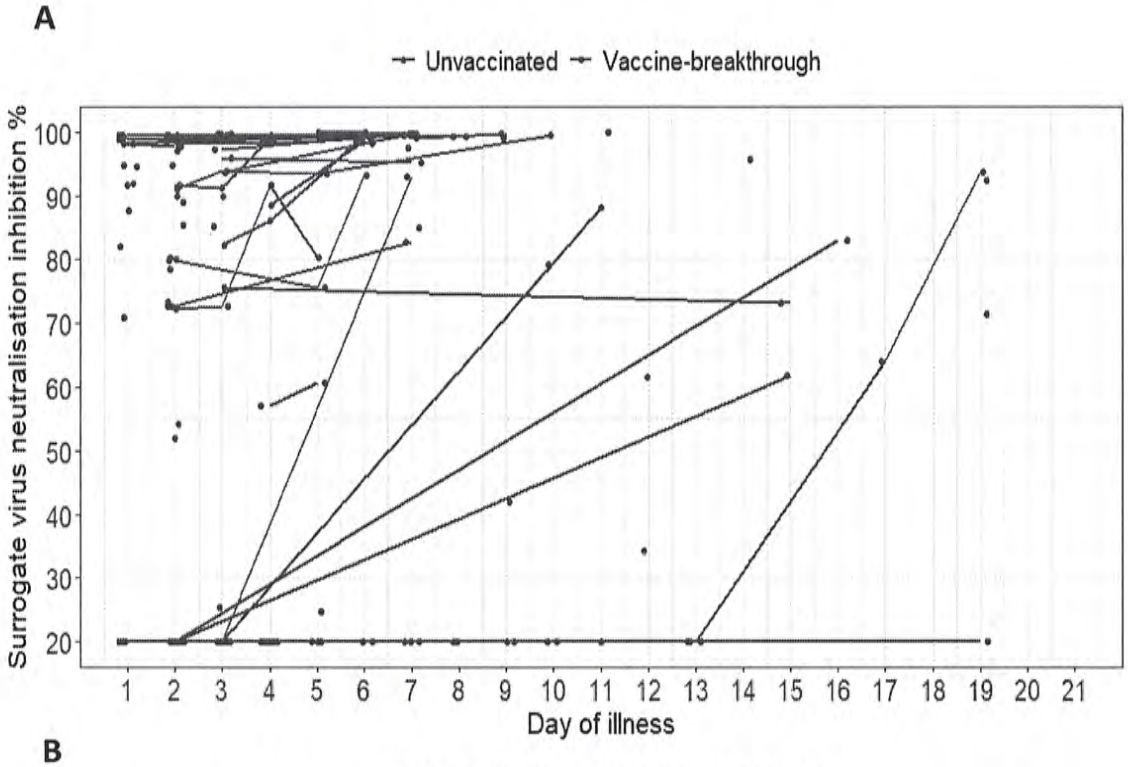

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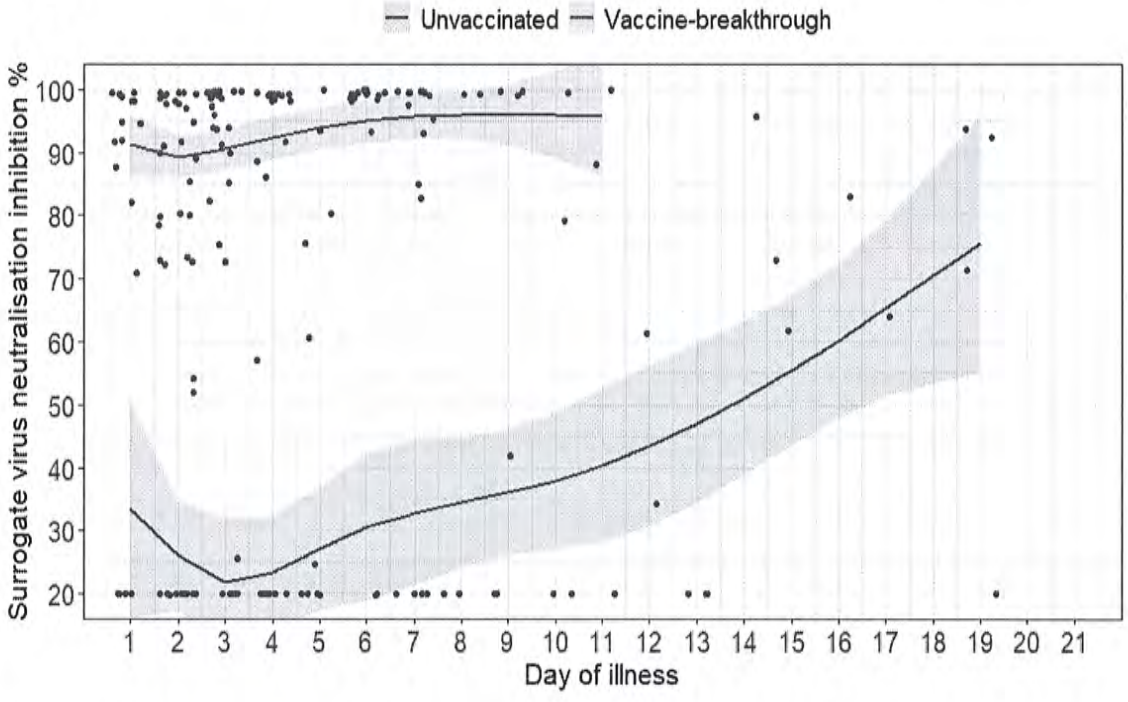

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310 **Figure 2:** (A) Spaghetti plot of surrogate virus neutralisation (sVNT) inhibition % as measured by

311 cPass; (B) Scatterplot of sVNT inhibition % and marginal effect of day of illness by vaccine-

312 breakthrough and unvaccinated groups of COVID-19 B1.617.2 infected patients with 95% confidence

References

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426

¿Quiénes se han vacunado?

07/01/2021 — 07/07/2021

12/02/2020 09/25/2021

Datos de Puerto Rico

Datos reportados al 25/09/2021

Personas aptas (12 años o más) con al menos una dosis	27,307 1% de 2,848,293

Manufacturero	Personas aptas (12 años o más) con al menos una dosis
Janssen	2,350
Moderna	5,811
Pfizer	19,146
Total	**27,307**

¿QUÉ VEO EN ESTE DIAGRAMA?

Personas aptas (12 años o más) con serie de vacunas completadas	31,590 1.1% de 2,848,293

Datos obtenidos del Puerto Rico Electronic Immunization System (PREIS)

Grupos de edad | Sexo

Grupo de edad	Personas aptas (12 años o más) con a dosis de vacunas
12 - 15	3,805
16 - 19	2,647
20 - 29	5,279
30 - 39	4,173
40 - 49	3,748
50 - 59	3,282
60 - 69	2,253

Source: Puerto Rico Health Department COVID-19 Dashboard, *Vacunacion,* https://covid19datos.salud.gov.pr/#vacunacion

¿Quiénes se han vacunado?

07/08/2021 — 07/14/2021

12/02/2020 09/25/2021

Datos de Puerto Rico

Datos reportados al 25/09/2021

Personas aptas (12 años o más) con al menos una dosis	32,517 1.1% de 2,848,293

Manufacturero	Personas aptas (12 años o más) con al menos una dosis
Janssen	3,574
Moderna	6,092
Pfizer	22,851
Total	**32,517**

¿QUÉ VEO EN ESTE DIAGRAMA?

Personas aptas (12 años o más) con serie de vacunas completadas	26,980 0.9% de 2,848,293

Datos obtenidos del Puerto Rico Electronic Immunization System (PREIS)

Grupos de edad | Sexo

Grupo de edad	Personas aptas (12 años o más) con dosis de vacunas
12 - 15	4,562
16 - 19	2,909
20 - 29	5,872
30 - 39	5,018
40 - 49	4,526
50 - 59	3,989
60 - 69	2,881

Source: Puerto Rico Health Department COVID-19 Dashboard, *Vacunacion,* https://covid19datos.salud.gov.pr/#vacunacion

¿Quiénes se han vacunado?

07/15/2021 — 07/21/2021

12/02/2020

Datos de Puerto Rico

Datos reportados al 25/09/2021

Personas aptas (12 años o más) con al menos una dosis	19,461 0.7% de 2,848,293

Manufacturero	Personas aptas (12 años o más) con al menos una dosis
Janssen	1,189
Moderna	3,831
Pfizer	14,441
Total	**19,461**

¿QUÉ VEO EN ESTE DIAGRAMA?

Personas aptas (12 años o más) con serie de vacunas completadas	21,540 0.8% de 2,848,293

Datos obtenidos del Puerto Rico Electronic Immunization System (PREIS)

Grupos de edad | Sexo

Grupo de edad	Personas aptas (12 a
12 - 15	
16 - 19	
20 - 29	
30 - 39	
40 - 49	
50 - 59	

Source: Puerto Rico Health Department COVID-19 Dashboard, *Vacunacion,* https://covid19datos.salud.gov.pr/#vacunacion

07/22/2021 — 07/28/2021

12/02/2020

Datos de Puerto Rico

Datos reportados al 25/09/2021

Personas aptas (12 años o más) con al menos una dosis	21,507 0.8% de 2,848,293

Manufacturero	Personas aptas (12 años o más) con al menos una dosis
Janssen	1,270
Moderna	3,987
Pfizer	16,250
Total	**21,507**

¿QUÉ VEO EN ESTE DIAGRAMA?

Personas aptas (12 años o más) con serie de vacunas completadas	22,149 0.8% de 2,848,293

Datos obtenidos del Puerto Rico Electronic Immunization System (PREIS)

Grupos de edad | Sexo

Grupo de edad	Personas aptas (12 añ
12 - 15	
16 - 19	
20 - 29	
30 - 39	
40 - 49	
50 - 59	

Source: Puerto Rico Health Department COVID-19 Dashboard, *Vacunacion,* https://covid19datos.salud.gov.pr/#vacunacion

¿Quiénes se han vacunado?

07/29/2021 — 09/25/2021

12/02/2020 — 09/25/2021

Datos de Puerto Rico

Datos reportados al 25/09/2021

Personas aptas (12 años o más) con al menos una dosis	237,832 8.3% de 2,848,293

Manufacturero	Personas aptas (12 años o más) con al menos una dosis
Janssen	11,434
Moderna	48,005
Pfizer	178,393
Total	**237,832**

¿QUÉ VEO EN ESTE DIAGRAMA?

Personas aptas (12 años o más) con serie de vacunas completadas	227,243 8% de 2,848,293

Datos obtenidos del Puerto Rico Electronic Immunization System (PREIS)

Grupos de edad | Sexo

Grupo de edad	Personas aptas (12 años o más) con al menos una dosis de vacunas
12 - 15	27,139
16 - 19	17,616
20 - 29	47,611
30 - 39	41,879
40 - 49	34,852
50 - 59	28,674
60 - 69	20,278

Source: Puerto Rico Health Department COVID-19 Dashboard, *Vacunacion*, https://covid19datos.salud.gov.pr/#vacunacion

DEPARTAMENTO DE SALUD

DEPARTAMENTO DE SALUD

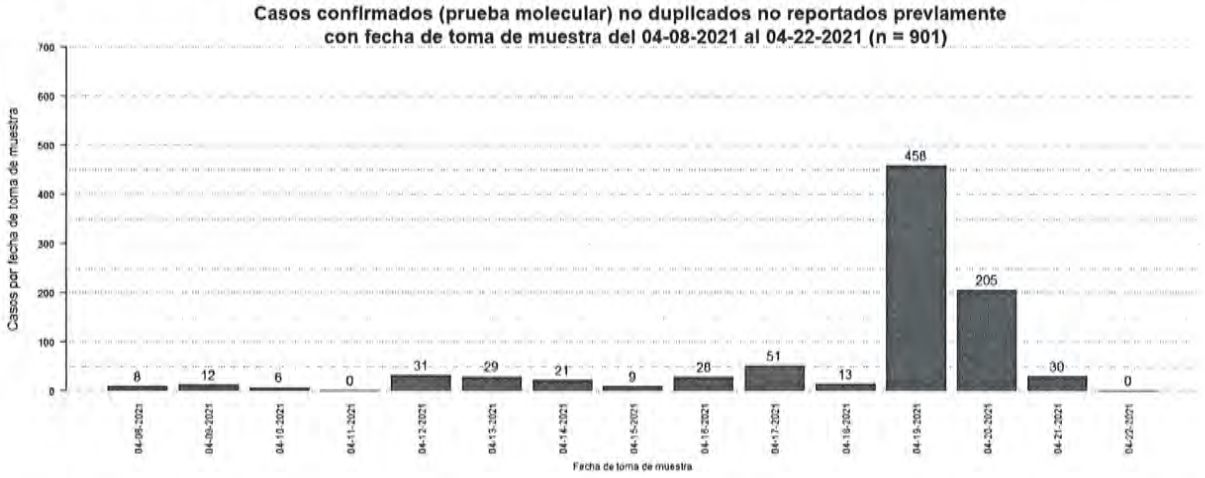
INFORME DE CASOS COVID-19

Fecha de actualización de datos: 23 de abril de 2021

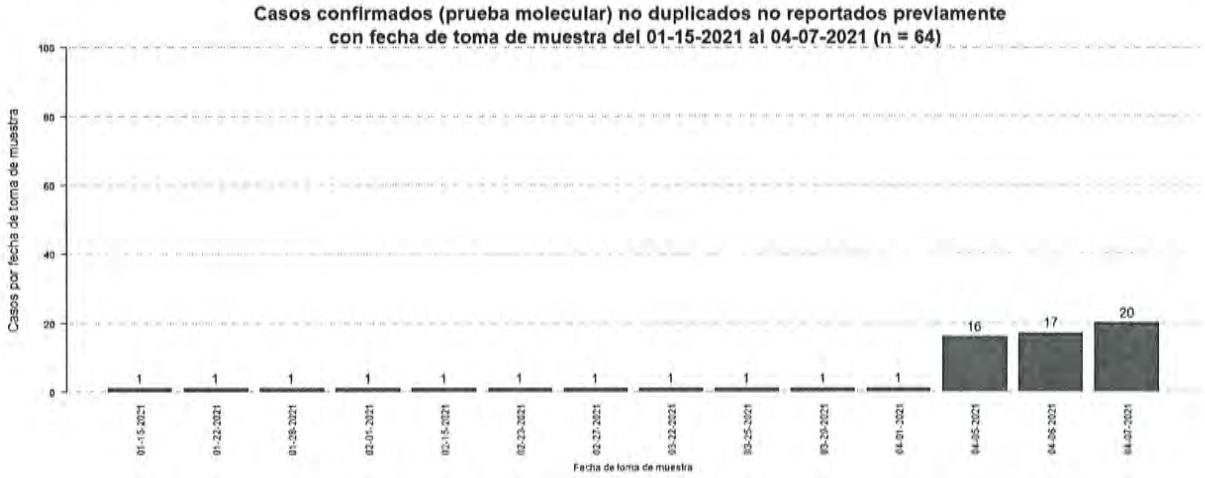
[1]Total de casos confirmados (molecular) adicionales (no duplicados)		**901**
* Total de casos confirmados acumulados[2]	112,294	
[3]Total de casos probables (antígenos) adicionales (no duplicados)		**316**
* Total de casos probables acumulados[4]	15,156	
[5]Total de casos sospechosos (anticuerpos) adicionales (no duplicados)		**911**
* Total de casos sospechosos acumulados[6]	112,189	
[7]Total de muertes (adicionales) COVID-19 (no duplicadas)		17
* Total de muertes COVID-19 acumuladas[8]	2,263	

*Muertes confirmadas[9]	1,931
*Muertes probables[9]	332
*Muertes sospechosas[9]	0

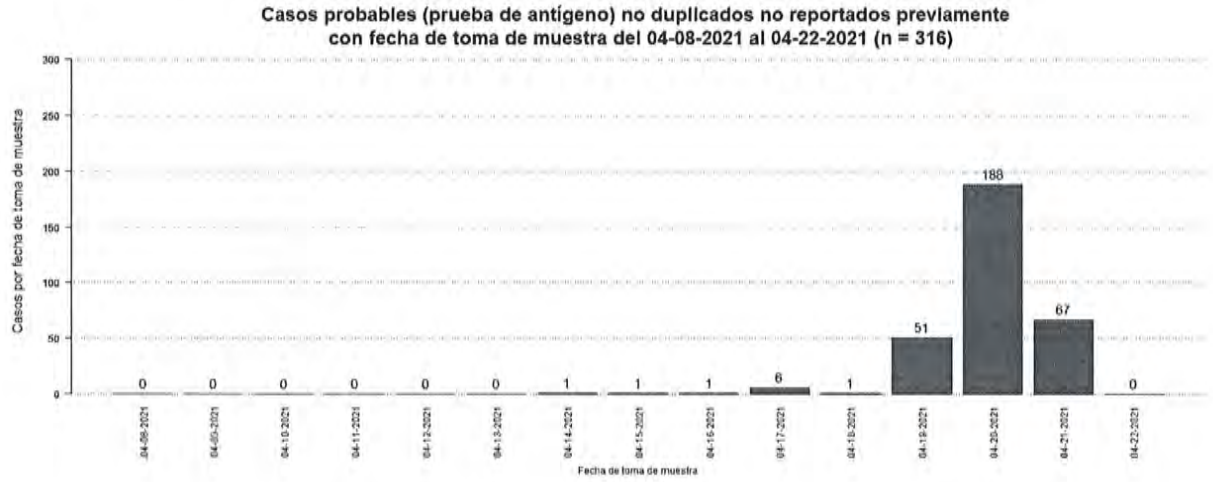
[1]Los casos confirmados son casos con una prueba molecular (RT-PCR) positiva. El número de casos confirmados adicionales desde el último informe no implica que estos casos corresponden a las últimas 24 horas. El total incluye casos con muestras tomadas del 8 de abril de 2021 al 22 de abril de 2021. La gráfica muestra la distribución de los 901 casos adicionales por la fecha de toma de la muestra.



[2]El total acumulado de casos confirmados fue ajustado. Se sumaron sesenta y cuatro (64) casos previos al 8 de abril de 2021. Por otro lado, se restaron diecinueve (19) casos duplicados.

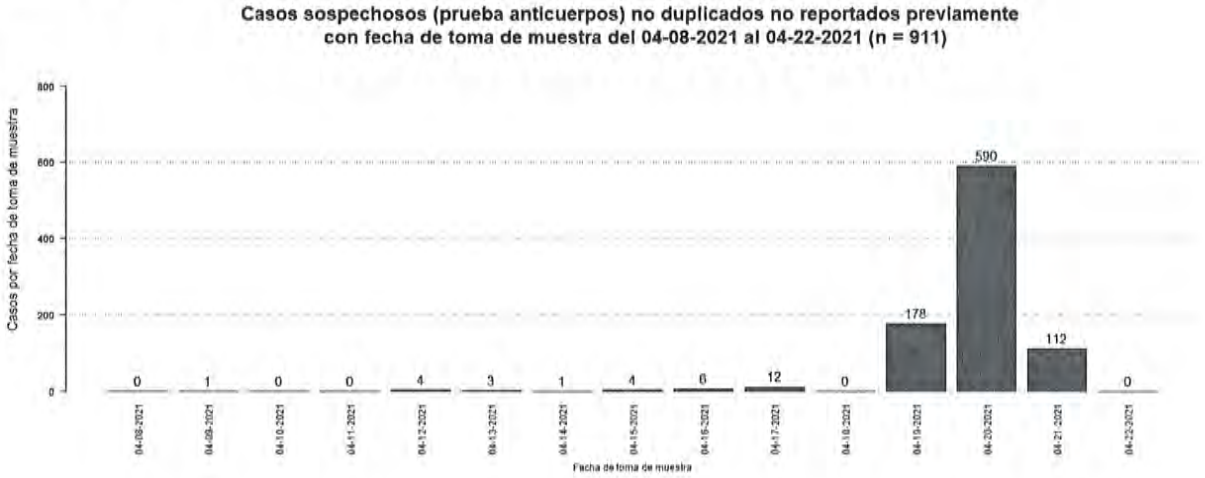


[3]Los casos probables son casos con una prueba de antígenos positiva. El número de casos probables adicionales desde el último informe no implica que estos casos corresponden a las últimas 24 horas. El total incluye casos con muestras tomadas del 8 de abril de 2021 al 22 de abril de 2021. La gráfica muestra la distribución de los 316 casos adicionales por la fecha de toma de muestra.

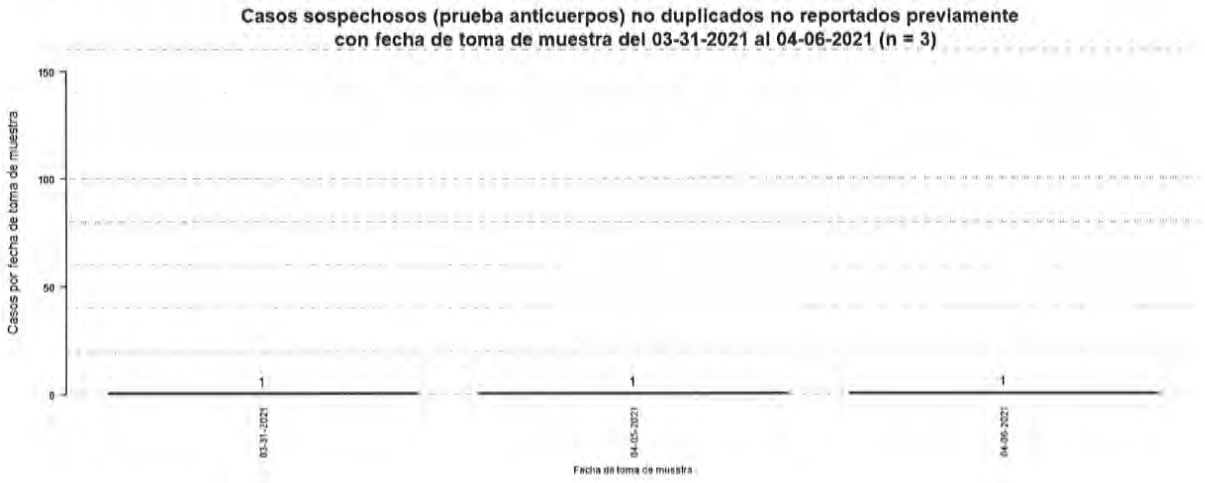


[4]El total acumulado de casos probables fue ajustado. Se restaron ciento noventa y un (191) casos que tuvieron una prueba molecular positiva posteriormente. Por otro lado, se restaron cinco (5) casos duplicados.

[5]Los casos sospechosos son casos con una prueba serológica positiva. El número de casos sospechosos adicionales desde el último informe no implica que estos casos corresponden a las últimas 24 horas. El total incluye casos con muestras tomadas del 8 de abril de 2021 al 22 de abril de 2021. La gráfica muestra la distribución de los 911 casos adicionales por la fecha de toma de muestra.

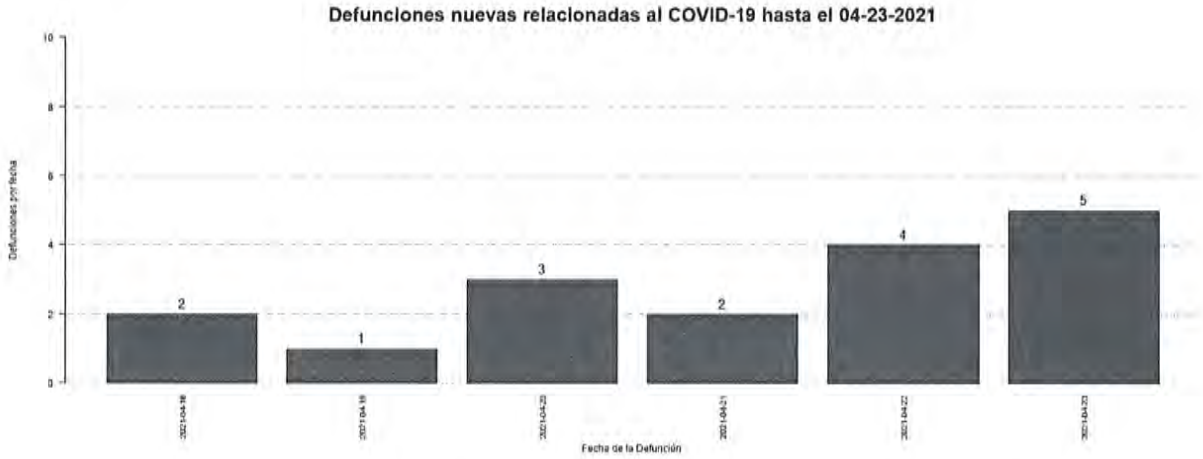


[6]El total acumulado de casos sospechosos fue ajustado. Se restaron cincuenta y dos (52) casos que tuvieron una prueba molecular positiva posteriormente, y nueve (9) casos que tuvieron una prueba probable (antígeno) positiva posteriormente. Adicionalmente, se sumaron tres (3) casos previos al 8 de abril de 2021. Por otro lado, se restaron once (11) casos duplicados.



[7]El número de muertes adicionales no debe interpretarse como que éstas hayan ocurrido en las últimas 24 horas. De igual forma, es importante señalar que el total de muertes puede variar en la medida en que se dan los procesos de registro y codificación de las causas de muerte, lo que puede tomar varios días.

La gráfica muestra la distribución de las diecisiete (17) muertes adicionales reportadas hoy, 23 de abril de 2021, por la fecha de defunción.



[8]El total acumulado de muertes puede ser ajustado de acuerdo con el protocolo establecido por el Departamento de Salud, en consonancia con las pautas establecidas por CDC/NCHS y los criterios de estadísticas vitales de una defunción asociada con COVID-19, para la revisión de las muertes asociadas a COVID-19.

[9]Muertes confirmadas COVID-19 son muertes de personas con una o más pruebas moleculares positivas. Muertes probables por COVID-19 incluye muertes de: 1) Personas que reúnen los criterios clínicos y la evidencia epidemiológica según definida por el CSTE, sin pruebas de confirmación para COVID-19; 2) Personas con una prueba de antígenos positiva y que reúnen los criterios clínicos o la evidencia epidemiológica según definida por el CSTE; y 3) Muertes que cumplen con los criterios de estadísticas vitales en las cuales no se realizaron pruebas de confirmación para COVID-19. Muertes sospechosas por COVID-19 incluye muertes de personas en las que se detecta un anticuerpo específico en suero, plasma o sangre, o se detecta un antígeno específico por inmunocitoquimica en un espécimen de autopsia, que no fueron reportadas como casos confirmados o probables de COVID-19. Esto de acuerdo con las recomendaciones provisionales del "Council of State and Territorial Epidemiologists" (CSTE) y del "National Center for Health Statistics" de los Centros para el Control y la Prevención de Enfermedades (CDC). El cambio en el número de muertes no debe interpretarse como que éstas hayan ocurrido en las últimas 24 horas. De igual forma, es importante señalar que el total de muertes puede variar en la medida en que se dan los procesos de registro y codificación de las causas de muerte, lo que puede tomar varios días.

Desglose Casos Confirmados (Prueba Molecular)

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR MUNICIPIO DE RESIDENCIA:

Característica	Frecuencia (n)	Porciento (%)
* Adjuntas	417	0.4
* Aguada	964	0.9
* Aguadilla	1156	1.1
* Aguas Buenas	990	0.9
* Aibonito	495	0.5
* Añasco	605	0.6
* Arecibo	2566	2.4
* Arroyo	228	0.2
* Barceloneta	651	0.6
* Barranquitas	941	0.9
* Bayamón	8624	7.9
* Cabo Rojo	628	0.6
* Caguas	5273	4.8
* Camuy	979	0.9
* Canóvanas	1573	1.4
* Carolina	7323	6.7
* Cataño	1052	1.0
* Cayey	931	0.9
* Ceiba	208	0.2
* Ciales	662	0.6
* Cidra	1031	0.9
* Coamo	670	0.6
* Comerío	584	0.5
* Corozal	1254	1.2
* Culebra	30	0.0
* Dorado	1686	1.5
* Fajardo	675	0.6
* Florida	418	0.4
* Guánica	154	0.1
* Guayama	694	0.6
* Guayanilla	282	0.3
* Guaynabo	3722	3.4
* Gurabo	1793	1.6
* Hatillo	953	0.9
* Hormigueros	317	0.3
* Humacao	1542	1.4
* Isabela	956	0.9
* Jayuya	249	0.2
* Juana Díaz	915	0.8
* Juncos	1696	1.6
* Lajas	244	0.2
* Lares	666	0.6
* Las Marías	153	0.1
* Las Piedras	1237	1.1
* Loíza	984	0.9
* Luquillo	477	0.4
* Manatí	1186	1.1
* Maricao	82	0.1
* Maunabo	247	0.2
* Mayagüez	1440	1.3
* Moca	1091	1.0
* Morovis	1187	1.1
* Naguabo	706	0.6
* Naranjito	1228	1.1
* Orocovis	791	0.7
* Patillas	257	0.2
* Peñuelas	401	0.4
* Ponce	2664	2.4
* Quebradillas	630	0.6
* Rincón	366	0.3
* Rio Grande	1451	1.3
* Sabana Grande	279	0.3
* Salinas	588	0.5
* San Germán	402	0.4
* San Juan	15736	14.4
* San Lorenzo	1386	1.3
* San Sebastián	953	0.9
* Santa Isabel	374	0.3
* Toa Alta	3241	3.0
* Toa Baja	3216	3.0
* Trujillo Alto	2482	2.3
* Utuado	783	0.7
* Vega Alta	1438	1.3
* Vega Baja	2458	2.3
* Vieques	43	0.0
* Villalba	649	0.6
* Yabucoa	852	0.8
* Yauco	650	0.6
* Otro lugar fuera de PR	250	
* No disponible	3139	
* Total	112294	

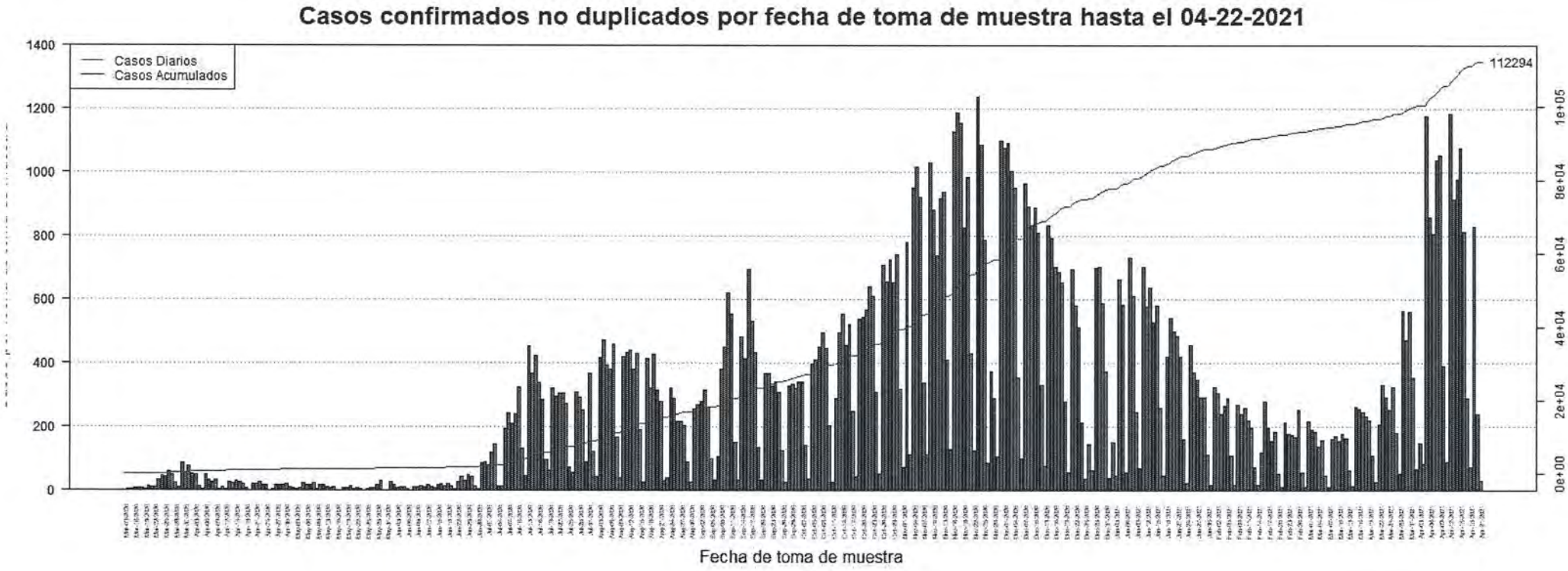
Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR REGION DE SALUD

Región de Salud	Frecuencia (n)	Porciento (%)
* Arecibo	13141	12.1
* Bayamón	24056	22.1
* Caguas	18179	16.7
* Fajardo	2884	2.6
* Mayagüez	9634	8.8
* Metro	31819	29.2
* Ponce	9192	8.4
* Fuera de PR	248	
* No disponible	3141	

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR GRUPOS DE EDAD Y GÉNERO:

Grupo de edad (años)	Femenino		Masculino		Total	
	(n)	(%)	(n)	(%)	(n)	(%)
< 10	3447	5.8	3465	6.6	6912	6.2
10 – 19	5661	9.5	5369	10.2	11030	9.8
20 – 29	11038	18.5	9164	17.5	20202	18.0
30 – 39	9767	16.4	8686	16.6	18453	16.5
40 – 49	9734	16.3	8723	16.6	18457	16.5
50 – 59	8857	14.8	7747	14.8	16604	14.8
60 – 69	5673	9.5	4807	9.2	10480	9.3
70 – 79	3465	5.8	2968	5.7	6433	5.7
≥ 80	2087	3.5	1501	2.9	3588	3.2
No Disponible	72	-	63	-	135	-
Total	**59801**	**100.0**	**52493**	**100.0**	**112294**	**100.0**


Casos confirmados no duplicados por fecha de toma de muestra hasta el 04-22-2021
Casos Diarios
Casos Acumulados
112294
1400
1200
1000
800
600
400
200
0
1e+05
8e+04
6e+04
4e+04
2e+04
0e+00
Fecha de toma de muestra

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR FECHA:

Fecha	Frecuencia (n)	Acumulada (n)
Mar-09	2	2
Mar-13	3	5
Mar-14	3	8
Mar-16	9	17
Mar-17	7	24
Mar-18	6	30
Mar-19	5	35
Mar-20	14	49
Mar-21	12	61
Mar-22	10	71
Mar-23	34	105
Mar-24	48	153
Mar-25	43	196
Mar-26	60	256
Mar-27	49	305
Mar-28	24	329
Mar-29	12	341
Mar-30	87	428
Mar-31	57	485
Apr-01	75	560
Apr-02	52	612
Apr-03	50	662
Apr-04	15	677
Apr-05	3	680
Apr-06	49	729
Apr-07	33	762
Apr-08	27	789
Apr-09	34	823
Apr-10	3	826
Apr-11	12	838
Apr-12	4	842
Apr-13	27	869
Apr-14	24	893
Apr-15	32	925
Apr-16	26	951
Apr-17	22	973
Apr-18	9	982
Apr-19	2	984
Apr-20	21	1005
Apr-21	20	1025
Apr-22	27	1052
Apr-23	17	1069
Apr-24	17	1086
Apr-25	1	1087
Apr-26	3	1090
Apr-27	16	1106
Apr-28	17	1123
Apr-29	19	1142
Apr-30	21	1163
May-01	10	1173
May-02	6	1179
May-03	3	1182
May-04	7	1189
May-05	24	1213
May-06	19	1232
May-07	16	1248
May-08	25	1273
May-09	4	1277
May-11	16	1293
May-12	17	1310
May-13	10	1320
May-14	9	1329
May-15	11	1340
May-16	2	1342
May-17	2	1344
May-18	7	1351
May-19	8	1359
May-20	14	1373
May-21	5	1378
May-22	9	1387
May-23	3	1390
May-24	2	1392
May-25	5	1397
May-26	6	1403
May-27	8	1411
May-28	19	1430
May-29	29	1459
May-30	2	1461
May-31	1	1462
Jun-01	26	1488
Jun-02	17	1505
Jun-03	9	1514
Jun-04	11	1525
Jun-05	10	1535
Jun-06	5	1540
Jun-07	2	1542
Jun-08	12	1554

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR FECHA (continuación:

Fecha	Frecuencia (n)	Acumulada (n)
Jun-09	12	1566
Jun-10	14	1580
Jun-11	12	1592
Jun-12	17	1609
Jun-13	12	1621
Jun-14	7	1628
Jun-15	17	1645
Jun-16	21	1666
Jun-17	14	1680
Jun-18	21	1701
Jun-19	15	1716
Jun-20	4	1720
Jun-22	27	1747
Jun-23	44	1791
Jun-24	31	1822
Jun-25	49	1871
Jun-26	45	1916
Jun-27	15	1931
Jun-28	3	1934
Jun-29	85	2019
Jun-30	89	2108
Jul-01	80	2188
Jul-02	119	2307
Jul-03	144	2451
Jul-04	14	2465
Jul-05	15	2480
Jul-06	195	2675
Jul-07	244	2919
Jul-08	212	3131
Jul-09	240	3371
Jul-10	325	3696
Jul-11	131	3827
Jul-12	48	3875
Jul-13	454	4329
Jul-14	367	4696
Jul-15	423	5119
Jul-16	339	5458
Jul-17	286	5744
Jul-18	97	5841
Jul-19	64	5905
Jul-20	321	6226
Jul-21	296	6522
Jul-22	306	6828

Fecha	Frecuencia (n)	Acumulada (n)
Jul-23	305	7133
Jul-24	274	7407
Jul-25	73	7480
Jul-26	56	7536
Jul-27	310	7846
Jul-28	293	8139
Jul-29	252	8391
Jul-30	90	8481
Jul-31	368	8849
Aug-01	122	8971
Aug-02	44	9015
Aug-03	416	9431
Aug-04	473	9904
Aug-05	394	10298
Aug-06	380	10678
Aug-07	459	11137
Aug-08	167	11304
Aug-09	40	11344
Aug-10	422	11766
Aug-11	432	12198
Aug-12	441	12639
Aug-13	381	13020
Aug-14	431	13451
Aug-15	190	13641
Aug-16	27	13668
Aug-17	413	14081
Aug-18	322	14403
Aug-19	426	14829
Aug-20	317	15146
Aug-21	281	15427
Aug-22	30	15457
Aug-23	39	15496
Aug-24	323	15819
Aug-25	289	16108
Aug-26	217	16325
Aug-27	216	16541
Aug-28	204	16745
Aug-29	89	16834
Aug-30	26	16860
Aug-31	255	17115
Sep-01	269	17384
Sep-02	278	17662
Sep-03	314	17976
Sep-04	263	18239

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Sep-05	100	18339
Sep-06	34	18373
Sep-07	106	18479
Sep-08	380	18859
Sep-09	450	19309
Sep-10	619	19928
Sep-11	555	20483
Sep-12	152	20635
Sep-13	34	20669
Sep-14	483	21152
Sep-15	413	21565
Sep-16	696	22261
Sep-17	533	22794
Sep-18	435	23229
Sep-19	136	23365
Sep-20	33	23398
Sep-21	367	23765
Sep-22	369	24134
Sep-23	329	24463
Sep-24	341	24804
Sep-25	310	25114
Sep-26	127	25241
Sep-27	26	25267
Sep-28	328	25595
Sep-29	335	25930
Sep-30	321	26251
Oct-01	342	26593
Oct-02	342	26935
Oct-03	141	27076
Oct-04	36	27112
Oct-05	399	27511
Oct-06	412	27923
Oct-07	450	28373
Oct-08	497	28870
Oct-09	447	29317
Oct-10	203	29520
Oct-11	27	29547
Oct-12	291	29838
Oct-13	496	30334
Oct-14	556	30890
Oct-15	458	31348
Oct-16	521	31869
Oct-17	250	32119

Fecha	Frecuencia (n)	Acumulada (n)
Oct-18	44	32163
Oct-19	537	32700
Oct-20	544	33244
Oct-21	569	33813
Oct-22	639	34452
Oct-23	609	35061
Oct-24	309	35370
Oct-25	52	35422
Oct-26	710	36132
Oct-27	658	36790
Oct-28	726	37516
Oct-29	654	38170
Oct-30	743	38913
Oct-31	319	39232
Nov-01	74	39306
Nov-02	780	40086
Nov-03	111	40197
Nov-04	952	41149
Nov-05	1016	42165
Nov-06	922	43087
Nov-07	337	43424
Nov-08	113	43537
Nov-09	1030	44567
Nov-10	884	45451
Nov-11	738	46189
Nov-12	920	47109
Nov-13	937	48046
Nov-14	412	48458
Nov-15	129	48587
Nov-16	1128	49715
Nov-17	1187	50902
Nov-18	1153	52055
Nov-19	827	52882
Nov-20	985	53867
Nov-21	431	54298
Nov-22	124	54422
Nov-23	1235	55657
Nov-24	1087	56744
Nov-25	786	57530
Nov-26	87	57617
Nov-27	373	57990
Nov-28	290	58280
Nov-29	105	58385
Nov-30	1100	59485

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Dec-01	1076	60561
Dec-02	1093	61654
Dec-03	1004	62658
Dec-04	952	63610
Dec-05	354	63964
Dec-06	99	64063
Dec-07	964	65027
Dec-08	891	65918
Dec-09	835	66753
Dec-10	890	67643
Dec-11	811	68454
Dec-12	332	68786
Dec-13	76	68862
Dec-14	832	69694
Dec-15	793	70487
Dec-16	703	71190
Dec-17	687	71877
Dec-18	652	72529
Dec-19	278	72807
Dec-20	56	72863
Dec-21	697	73560
Dec-22	581	74141
Dec-23	513	74654
Dec-24	215	74869
Dec-25	38	74907
Dec-26	146	75053
Dec-27	64	75117
Dec-28	698	75815
Dec-29	701	76516
Dec-30	588	77104
Dec-31	376	77480
Jan-01	39	77519
Jan-02	152	77671
Jan-03	48	77719
Jan-04	664	78383
Jan-05	583	78966
Jan-06	57	79023
Jan-07	733	79756
Jan-08	611	80367
Jan-09	248	80615
Jan-10	70	80685
Jan-11	703	81388
Jan-12	577	81965

Fecha	Frecuencia (n)	Acumulada (n)
Jan-13	636	82601
Jan-14	528	83129
Jan-15	580	83709
Jan-16	260	83969
Jan-17	48	84017
Jan-18	419	84436
Jan-19	543	84979
Jan-20	498	85477
Jan-21	486	85963
Jan-22	422	86385
Jan-23	162	86547
Jan-24	23	86570
Jan-25	456	87026
Jan-26	371	87397
Jan-27	347	87744
Jan-28	294	88038
Jan-29	293	88331
Jan-30	111	88442
Jan-31	16	88458
Feb-01	324	88782
Feb-02	306	89088
Feb-03	241	89329
Feb-04	266	89595
Feb-05	288	89883
Feb-06	110	89993
Feb-07	19	90012
Feb-08	271	90283
Feb-09	240	90523
Feb-10	261	90784
Feb-11	219	91003
Feb-12	196	91199
Feb-13	73	91272
Feb-14	18	91290
Feb-15	118	91408
Feb-16	278	91686
Feb-17	196	91882
Feb-18	154	92036
Feb-19	185	92221
Feb-20	54	92275
Feb-21	12	92287
Feb-22	213	92500
Feb-23	177	92677
Feb-24	174	92851
Feb-25	169	93020

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS CONFIRMADOS (PRUEBA MOLECULAR) POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Feb-26	254	93274
Feb-27	58	93332
Feb-28	11	93343
Mar-01	217	93560
Mar-02	190	93750
Mar-03	186	93936
Mar-04	138	94074
Mar-05	158	94232
Mar-06	46	94278
Mar-07	12	94290
Mar-08	162	94452
Mar-09	173	94625
Mar-10	154	94779
Mar-11	178	94957
Mar-12	166	95123
Mar-13	63	95186
Mar-14	13	95199
Mar-15	262	95461
Mar-16	256	95717
Mar-17	247	95964
Mar-18	234	96198
Mar-19	221	96419
Mar-20	110	96529
Mar-21	27	96556
Mar-22	207	96763
Mar-23	332	97095
Mar-24	292	97387
Mar-25	253	97640
Mar-26	326	97966
Mar-27	180	98146
Mar-28	55	98201
Mar-29	564	98765
Mar-30	473	99238
Mar-31	562	99800
Apr-01	356	100156
Apr-02	66	100222
Apr-03	147	100369
Apr-04	83	100452
Apr-05	1177	101629
Apr-06	861	102490
Apr-07	808	103298
Apr-08	1036	104334
Apr-09	1053	105387
Apr-10	391	105778
Apr-11	91	105869
Apr-12	1183	107052
Apr-13	916	107968
Apr-14	976	108944
Apr-15	1076	110020
Apr-16	814	110834
Apr-17	290	111124
Apr-18	72	111196
Apr-19	829	112025
Apr-20	239	112264
Apr-21	30	112294

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

Desglose Casos Probables (Prueba Antígeno)

DISTRIBUCIÓN DE LOS CASOS PROBABLES (PRUEBA DE ANTÍGENOS) POR MUNICIPIO DE RESIDENCIA:

Característica	Frecuencia (n)	Porciento (%)
* Adjuntas	32	0.2
* Aguada	235	1.6
* Aguadilla	253	1.7
* Aguas Buenas	95	0.7
* Aibonito	121	0.8
* Añasco	144	1.0
* Arecibo	186	1.3
* Arroyo	32	0.2
* Barceloneta	58	0.4
* Barranquitas	181	1.2
* Bayamón	989	6.8
* Cabo Rojo	203	1.4
* Caguas	506	3.5
* Camuy	129	0.9
* Canóvanas	173	1.2
* Carolina	614	4.2
* Cataño	62	0.4
* Cayey	235	1.6
* Ceiba	128	0.9
* Ciales	60	0.4
* Cidra	177	1.2
* Coamo	149	1.0
* Comerío	98	0.7
* Corozal	160	1.1
* Culebra	3	0.0
* Dorado	168	1.2
* Fajardo	369	2.5
* Florida	51	0.4
* Guánica	26	0.2
* Guayama	83	0.6
* Guayanilla	30	0.2
* Guaynabo	284	2.0
* Gurabo	153	1.1
* Hatillo	95	0.7
* Hormigueros	52	0.4
* Humacao	276	1.9
* Isabela	258	1.8
* Jayuya	77	0.5
* Juana Díaz	103	0.7
* Juncos	393	2.7
* Lajas	133	0.9
* Lares	88	0.6
* Las Marías	31	0.2

Característica	Frecuencia (n)	Porciento (%)
* Las Piedras	280	1.9
* Loíza	138	1.0
* Luquillo	149	1.0
* Manatí	96	0.7
* Maricao	7	0.0
* Maunabo	47	0.3
* Mayagüez	300	2.1
* Moca	212	1.5
* Morovis	133	0.9
* Naguabo	206	1.4
* Naranjito	233	1.6
* Orocovis	46	0.3
* Patillas	67	0.5
* Peñuelas	99	0.7
* Ponce	344	2.4
* Quebradillas	175	1.2
* Rincón	96	0.7
* Rio Grande	428	2.9
* Sabana Grande	58	0.4
* Salinas	100	0.7
* San Germán	144	1.0
* San Juan	1182	8.1
* San Lorenzo	213	1.5
* San Sebastián	255	1.8
* Santa Isabel	39	0.3
* Toa Alta	401	2.8
* Toa Baja	346	2.4
* Trujillo Alto	293	2.0
* Utuado	38	0.3
* Vega Alta	134	0.9
* Vega Baja	210	1.4
* Vieques	77	0.5
* Villalba	67	0.5
* Yabucoa	145	1.0
* Yauco	63	0.4
* Otro lugar fuera de PR	17	
* No disponible	625	
* Total	15156	

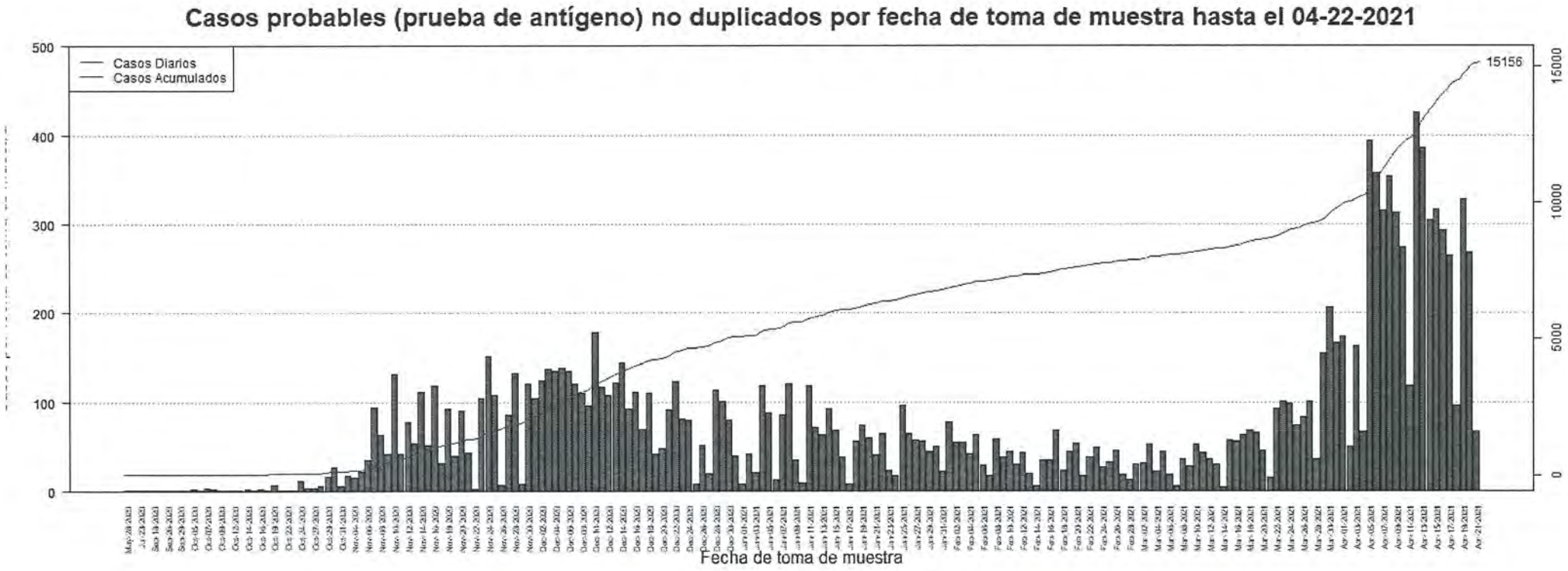
Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS PROBABLES (PRUEBA DE ANTÍGENOS) POR REGION DE SALUD:

Región de Salud	Frecuencia (n)	Porciento (%)
* Arecibo	1319	9.1
* Bayamón	2818	19.4
* Caguas	2847	19.6
* Fajardo	1154	8.0
* Mayagüez	2381	16.4
* Metro	2684	18.5
* Ponce	1311	9.0
* Fuera de PR	17	
* No disponible	625	

DISTRIBUCIÓN DE LOS CASOS PROBABLES (PRUEBA DE ANTÍGENOS) POR GRUPOS DE EDAD Y GÉNERO:

Grupo de edad (años)	Femenino		Masculino		Total	
	(n)	(%)	(n)	(%)	(n)	(%)
< 10	650	8.1	651	9.2	1289	8.6
10 – 19	897	11.2	939	13.2	1821	12.1
20 – 29	1446	18.0	1332	18.7	2745	18.3
30 – 39	1298	16.2	1141	16.0	2413	16.1
40 – 49	1214	15.1	1110	15.6	2305	15.4
50 – 59	991	12.4	875	12.3	1866	12.4
60 – 69	673	8.4	528	7.4	1187	7.9
70 – 79	398	5.0	292	4.1	694	4.6
≥ 80	455	5.7	244	3.4	694	4.6
No Disponible	8	-	14	-	22	-
Total	**8030**	**100.0**	**7126**	**100.0**	**15156**	**100.0**


Casos probables (prueba de antígeno) no duplicados por fecha de toma de muestra hasta el 04-22-2021
Casos Diarios
Casos Acumulados
15156
500
400
300
200
100
0
15000
10000
5000
0
Fecha de toma de muestra

DISTRIBUCIÓN DE LOS CASOS PROBABLES (PRUEBA DE ANTÍGENOS) POR FECHA:

Fecha	Frecuencia (n)	Acumulada (n)
May-28	1	1
Jul-20	1	2
Jul-23	1	3
Sep-05	1	4
Sep-18	1	5
Sep-25	1	6
Sep-26	1	7
Sep-28	1	8
Sep-29	1	9
Oct-01	1	10
Oct-05	3	13
Oct-06	2	15
Oct-07	4	19
Oct-08	3	22
Oct-09	1	23
Oct-10	1	24
Oct-12	2	26
Oct-13	2	28
Oct-14	3	31
Oct-15	1	32
Oct-16	3	35
Oct-18	1	36
Oct-19	7	43
Oct-21	2	45
Oct-22	1	46
Oct-23	2	48
Oct-24	12	60
Oct-26	4	64
Oct-27	4	68
Oct-28	6	74
Oct-29	17	91
Oct-30	27	118
Oct-31	6	124
Nov-02	18	142
Nov-04	15	157
Nov-05	23	180
Nov-06	35	215
Nov-07	94	309
Nov-08	64	373
Nov-09	43	416
Nov-10	132	548
Nov-11	42	590
Nov-12	78	668

Fecha	Frecuencia (n)	Acumulada (n)
Nov-13	54	722
Nov-14	111	833
Nov-15	52	885
Nov-16	119	1004
Nov-17	32	1036
Nov-18	93	1129
Nov-19	40	1169
Nov-20	91	1260
Nov-21	44	1304
Nov-22	3	1307
Nov-23	105	1412
Nov-24	151	1563
Nov-25	108	1671
Nov-26	7	1678
Nov-27	86	1764
Nov-28	133	1897
Nov-29	8	1905
Nov-30	121	2026
Dec-01	105	2131
Dec-02	124	2255
Dec-03	137	2392
Dec-04	135	2527
Dec-05	138	2665
Dec-06	135	2800
Dec-07	121	2921
Dec-08	110	3031
Dec-09	96	3127
Dec-10	178	3305
Dec-11	117	3422
Dec-12	108	3530
Dec-13	122	3652
Dec-14	144	3796
Dec-15	93	3889
Dec-16	111	4000
Dec-17	69	4069
Dec-18	110	4179
Dec-19	43	4222
Dec-20	48	4270
Dec-21	92	4362
Dec-22	123	4485
Dec-23	81	4566
Dec-24	80	4646
Dec-25	9	4655
Dec-26	52	4707

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS PROBABLES (PRUEBA DE ANTÍGENOS) POR FECHA:

Fecha	Frecuencia (n)	Acumulada (n)
Dec-27	20	4727
Dec-28	114	4841
Dec-29	101	4942
Dec-30	80	5022
Dec-31	40	5062
Jan-01	8	5070
Jan-02	42	5112
Jan-03	21	5133
Jan-04	118	5251
Jan-05	88	5339
Jan-06	13	5352
Jan-07	86	5438
Jan-08	121	5559
Jan-09	35	5594
Jan-10	10	5604
Jan-11	119	5723
Jan-12	72	5795
Jan-13	63	5858
Jan-14	93	5951
Jan-15	68	6019
Jan-16	39	6058
Jan-17	9	6067
Jan-18	57	6124
Jan-19	74	6198
Jan-20	60	6258
Jan-21	41	6299
Jan-22	65	6364
Jan-23	24	6388
Jan-24	18	6406
Jan-25	96	6502
Jan-26	65	6567
Jan-27	58	6625
Jan-28	56	6681
Jan-29	45	6726
Jan-30	51	6777
Jan-31	23	6800
Feb-01	78	6878
Feb-02	55	6933
Feb-03	55	6988
Feb-04	43	7031
Feb-05	64	7095
Feb-06	30	7125
Feb-07	18	7143

Fecha	Frecuencia (n)	Acumulada (n)
Feb-08	59	7202
Feb-09	39	7241
Feb-10	45	7286
Feb-11	31	7317
Feb-12	44	7361
Feb-13	20	7381
Feb-14	6	7387
Feb-15	35	7422
Feb-16	36	7458
Feb-17	68	7526
Feb-18	24	7550
Feb-19	45	7595
Feb-20	54	7649
Feb-21	18	7667
Feb-22	39	7706
Feb-23	50	7756
Feb-24	27	7783
Feb-25	33	7816
Feb-26	46	7862
Feb-27	19	7881
Feb-28	13	7894
Mar-01	31	7925
Mar-02	32	7957
Mar-03	53	8010
Mar-04	23	8033
Mar-05	45	8078
Mar-06	19	8097
Mar-07	6	8103
Mar-08	37	8140
Mar-09	28	8168
Mar-10	53	8221
Mar-11	44	8265
Mar-12	37	8302
Mar-13	31	8333
Mar-14	5	8338
Mar-15	58	8396
Mar-16	57	8453
Mar-17	64	8517
Mar-18	68	8585
Mar-19	66	8651
Mar-20	46	8697
Mar-21	15	8712
Mar-22	93	8805
Mar-23	101	8906

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS PROBABLES (PRUEBA DE ANTÍGENOS) POR FECHA:

Fecha	Frecuencia (n)	Acumulada (n)
Mar-24	99	9005
Mar-25	74	9079
Mar-26	83	9162
Mar-27	101	9263
Mar-28	37	9300
Mar-29	155	9455
Mar-30	206	9661
Mar-31	167	9828
Apr-01	173	10001
Apr-02	51	10052
Apr-03	163	10215
Apr-04	67	10282
Apr-05	394	10676
Apr-06	357	11033
Apr-07	315	11348
Apr-08	354	11702
Apr-09	313	12015
Apr-10	274	12289
Apr-11	119	12408
Apr-12	425	12833
Apr-13	385	13218
Apr-14	305	13523
Apr-15	316	13839
Apr-16	293	14132
Apr-17	265	14397
Apr-18	96	14493
Apr-19	328	14821
Apr-20	268	15089
Apr-21	67	15156

Fecha	Frecuencia (n)	Acumulada (n)

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

Desglose Casos Sospechosos (Prueba Anticuerpos)

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA ANTICUERPOS) POR MUNICIPIO DE RESIDENCIA:

Característica	Frecuencia (n)	Porciento (%)
* Adjuntas	296	0.3
* Aguada	930	0.9
* Aguadilla	1367	1.3
* Aguas Buenas	572	0.5
* Aibonito	460	0.4
* Añasco	681	0.6
* Arecibo	2320	2.2
* Arroyo	564	0.5
* Barceloneta	628	0.6
* Barranquitas	1347	1.3
* Bayamón	7386	6.9
* Cabo Rojo	1161	1.1
* Caguas	4149	3.9
* Camuy	1037	1.0
* Canóvanas	1260	1.2
* Carolina	5613	5.2
* Cataño	882	0.8
* Cayey	999	0.9
* Ceiba	292	0.3
* Ciales	634	0.6
* Cidra	970	0.9
* Coamo	1316	1.2
* Comerío	474	0.4
* Corozal	1281	1.2
* Culebra	16	0.0
* Dorado	1642	1.5
* Fajardo	1087	1.0
* Florida	640	0.6
* Guánica	317	0.3
* Guayama	1114	1.0
* Guayanilla	674	0.6
* Guaynabo	3283	3.1
* Gurabo	1224	1.1
* Hatillo	1065	1.0
* Hormigueros	354	0.3
* Humacao	1729	1.6
* Isabela	887	0.8
* Jayuya	379	0.4
* Juana Díaz	1086	1.0
* Juncos	1020	1.0
* Lajas	513	0.5
* Lares	1272	1.2
* Las Marías	255	0.2
* Las Piedras	1005	0.9
* Loíza	669	0.6
* Luquillo	573	0.5
* Manatí	1315	1.2
* Maricao	128	0.1
* Maunabo	360	0.3
* Mayagüez	1998	1.9
* Moca	1068	1.0
* Morovis	907	0.8
* Naguabo	551	0.5
* Naranjito	1276	1.2
* Orocovis	856	0.8
* Patillas	533	0.5
* Peñuelas	424	0.4
* Ponce	3215	3.0
* Quebradillas	675	0.6
* Rincón	478	0.4
* Rio Grande	1329	1.2
* Sabana Grande	450	0.4
* Salinas	1249	1.2
* San Germán	649	0.6
* San Juan	13969	13.0
* San Lorenzo	945	0.9
* San Sebastián	1690	1.6
* Santa Isabel	836	0.8
* Toa Alta	2587	2.4
* Toa Baja	2816	2.6
* Trujillo Alto	2336	2.2
* Utuado	726	0.7
* Vega Alta	1361	1.3
* Vega Baja	1826	1.7
* Vieques	193	0.2
* Villalba	547	0.5
* Yabucoa	1114	1.0
* Yauco	1254	1.2
* Otro lugar fuera de PR	823	
* No disponible	4282	
* Total	112189	

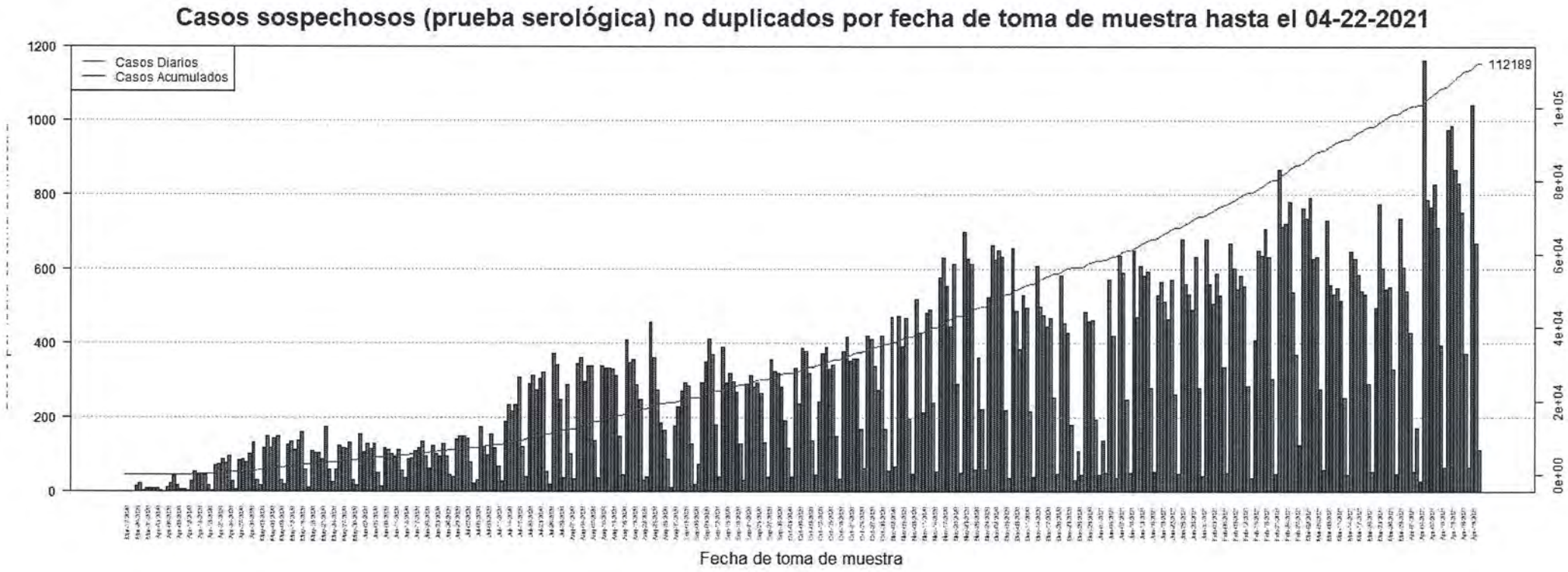
Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA DE ANTICUERPOS) POR REGION DE SALUD:

Región de Salud	Frecuencia (n)	Porciento (%)
* Arecibo	13046	12.2
* Bayamón	21908	20.5
* Caguas	15098	14.1
* Fajardo	3490	3.3
* Mayagüez	12609	11.8
* Metro	27130	25.3
* Ponce	13804	12.9
* Fuera de PR	823	
* No disponible	4281	

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA ANTICUERPOS) POR GRUPOS DE EDAD Y GÉNERO:

Grupo de edad (años)	Femenino		Masculino		Total	
	(n)	(%)	(n)	(%)	(n)	(%)
< 10	2045	3.1	2037	4.3	4082	3.6
10 – 19	4073	6.3	3502	7.5	7575	6.8
20 – 29	10711	16.5	7543	16.1	18254	16.3
30 – 39	9978	15.3	6625	14.1	16603	14.8
40 – 49	10383	16.0	7049	15.0	17432	15.6
50 – 59	9910	15.2	6932	14.8	16842	15.0
60 – 69	8476	13.0	6422	13.7	14898	13.3
70 – 79	6177	9.5	4703	10.0	10880	9.7
≥ 80	3332	5.1	2088	4.5	5420	4.8
No Disponible	111	-	92	-	203	-
Total	**65196**	**100.0**	**46993**	**100.0**	**112189**	**100.0**


Casos sospechosos (prueba serológica) no duplicados por fecha de toma de muestra hasta el 04-22-2021
Casos Diarios
Casos Acumulados
112189
1200
1000
800
600
400
200
0
0e+00
2e+04
4e+04
6e+04
8e+04
1e+05
Fecha de toma de muestra

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA ANTICUERPOS) POR FECHA:

Fecha	Frecuencia (n)	Acumulada (n)
Mar-17	1	1
Mar-19	1	2
Mar-20	1	3
Mar-26	16	19
Mar-27	23	42
Mar-30	3	45
Mar-31	9	54
Apr-01	8	62
Apr-02	8	70
Apr-03	9	79
Apr-04	3	82
Apr-05	1	83
Apr-06	13	96
Apr-07	24	120
Apr-08	43	163
Apr-09	17	180
Apr-10	7	187
Apr-11	6	193
Apr-12	3	196
Apr-13	29	225
Apr-14	55	280
Apr-15	47	327
Apr-16	48	375
Apr-17	46	421
Apr-18	17	438
Apr-19	3	441
Apr-20	70	511
Apr-21	74	585
Apr-22	89	674
Apr-23	78	752
Apr-24	95	847
Apr-25	28	875
Apr-26	7	882
Apr-27	85	967
Apr-28	88	1055
Apr-29	80	1135
Apr-30	101	1236
May-01	133	1369
May-02	32	1401
May-03	18	1419
May-04	120	1539
May-05	151	1690
May-06	119	1809

Fecha	Frecuencia (n)	Acumulada (n)
May-07	145	1954
May-08	150	2104
May-09	33	2137
May-10	20	2157
May-11	126	2283
May-12	135	2418
May-13	112	2530
May-14	138	2668
May-15	161	2829
May-16	59	2888
May-17	12	2900
May-18	109	3009
May-19	106	3115
May-20	106	3221
May-21	88	3309
May-22	175	3484
May-23	60	3544
May-24	25	3569
May-25	60	3629
May-26	125	3754
May-27	119	3873
May-28	116	3989
May-29	133	4122
May-30	32	4154
May-31	17	4171
Jun-01	154	4325
Jun-02	107	4432
Jun-03	131	4563
Jun-04	117	4680
Jun-05	129	4809
Jun-06	50	4859
Jun-07	14	4873
Jun-08	118	4991
Jun-09	114	5105
Jun-10	103	5208
Jun-11	93	5301
Jun-12	112	5413
Jun-13	56	5469
Jun-14	38	5507
Jun-15	87	5594
Jun-16	92	5686
Jun-17	109	5795
Jun-18	119	5914
Jun-19	137	6051

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA ANTICUERPOS) POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Jun-20	95	6146
Jun-21	63	6209
Jun-22	124	6333
Jun-23	103	6436
Jun-24	95	6531
Jun-25	131	6662
Jun-26	96	6758
Jun-27	46	6804
Jun-28	40	6844
Jun-29	140	6984
Jun-30	149	7133
Jul-01	150	7283
Jul-02	144	7427
Jul-03	80	7507
Jul-04	22	7529
Jul-05	32	7561
Jul-06	174	7735
Jul-07	123	7858
Jul-08	98	7956
Jul-09	155	8111
Jul-10	120	8231
Jul-11	67	8298
Jul-12	30	8328
Jul-13	189	8517
Jul-14	234	8751
Jul-15	218	8969
Jul-16	235	9204
Jul-17	307	9511
Jul-18	121	9632
Jul-19	39	9671
Jul-20	289	9960
Jul-21	314	10274
Jul-22	273	10547
Jul-23	303	10850
Jul-24	321	11171
Jul-25	55	11226
Jul-26	21	11247
Jul-27	372	11619
Jul-28	341	11960
Jul-29	248	12208
Jul-30	38	12246
Jul-31	287	12533
Aug-01	102	12635
Aug-02	34	12669
Aug-03	343	13012
Aug-04	361	13373
Aug-05	295	13668
Aug-06	339	14007
Aug-07	338	14345
Aug-08	138	14483
Aug-09	37	14520
Aug-10	339	14859
Aug-11	331	15190
Aug-12	331	15521
Aug-13	330	15851
Aug-14	313	16164
Aug-15	149	16313
Aug-16	47	16360
Aug-17	409	16769
Aug-18	345	17114
Aug-19	354	17468
Aug-20	287	17755
Aug-21	248	18003
Aug-22	31	18034
Aug-23	39	18073
Aug-24	455	18528
Aug-25	361	18889
Aug-26	273	19162
Aug-27	186	19348
Aug-28	166	19514
Aug-29	89	19603
Aug-30	13	19616
Aug-31	179	19795
Sep-01	228	20023
Sep-02	271	20294
Sep-03	293	20587
Sep-04	284	20871
Sep-05	130	21001
Sep-06	21	21022
Sep-07	75	21097
Sep-08	292	21389
Sep-09	348	21737
Sep-10	410	22147
Sep-11	370	22517
Sep-12	180	22697
Sep-13	39	22736
Sep-14	388	23124

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA ANTICUERPOS) POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Sep-15	293	23417
Sep-16	318	23735
Sep-17	295	24030
Sep-18	268	24298
Sep-19	130	24428
Sep-20	32	24460
Sep-21	289	24749
Sep-22	312	25061
Sep-23	281	25342
Sep-24	293	25635
Sep-25	264	25899
Sep-26	133	26032
Sep-27	40	26072
Sep-28	356	26428
Sep-29	323	26751
Sep-30	318	27069
Oct-01	281	27350
Oct-02	191	27541
Oct-03	120	27661
Oct-04	41	27702
Oct-05	331	28033
Oct-06	237	28270
Oct-07	385	28655
Oct-08	378	29033
Oct-09	318	29351
Oct-10	138	29489
Oct-11	46	29535
Oct-12	243	29778
Oct-13	372	30150
Oct-14	389	30539
Oct-15	330	30869
Oct-16	342	31211
Oct-17	149	31360
Oct-18	35	31395
Oct-19	378	31773
Oct-20	416	32189
Oct-21	353	32542
Oct-22	357	32899
Oct-23	358	33257
Oct-24	170	33427
Oct-25	62	33489
Oct-26	420	33909
Oct-27	410	34319
Oct-28	337	34656
Oct-29	272	34928
Oct-30	419	35347
Oct-31	168	35515
Nov-01	58	35573
Nov-02	470	36043
Nov-03	67	36110
Nov-04	472	36582
Nov-05	391	36973
Nov-06	467	37440
Nov-07	197	37637
Nov-08	48	37685
Nov-09	519	38204
Nov-10	429	38633
Nov-11	215	38848
Nov-12	480	39328
Nov-13	490	39818
Nov-14	239	40057
Nov-15	55	40112
Nov-16	576	40688
Nov-17	631	41319
Nov-18	554	41873
Nov-19	445	42318
Nov-20	612	42930
Nov-21	289	43219
Nov-22	52	43271
Nov-23	699	43970
Nov-24	627	44597
Nov-25	614	45211
Nov-26	59	45270
Nov-27	360	45630
Nov-28	224	45854
Nov-29	59	45913
Nov-30	524	46437
Dec-01	663	47100
Dec-02	625	47725
Dec-03	650	48375
Dec-04	633	49008
Dec-05	219	49227
Dec-06	38	49265
Dec-07	656	49921
Dec-08	486	50407
Dec-09	384	50791
Dec-10	530	51321

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA ANTICUERPOS) POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Dec-11	495	51816
Dec-12	216	52032
Dec-13	40	52072
Dec-14	608	52680
Dec-15	497	53177
Dec-16	476	53653
Dec-17	444	54097
Dec-18	467	54564
Dec-19	253	54817
Dec-20	49	54866
Dec-21	582	55448
Dec-22	452	55900
Dec-23	428	56328
Dec-24	182	56510
Dec-25	32	56542
Dec-26	111	56653
Dec-27	45	56698
Dec-28	483	57181
Dec-29	460	57641
Dec-30	462	58103
Dec-31	195	58298
Jan-01	47	58345
Jan-02	139	58484
Jan-03	51	58535
Jan-04	571	59106
Jan-05	418	59524
Jan-06	36	59560
Jan-07	635	60195
Jan-08	592	60787
Jan-09	247	61034
Jan-10	52	61086
Jan-11	649	61735
Jan-12	469	62204
Jan-13	608	62812
Jan-14	583	63395
Jan-15	593	63988
Jan-16	280	64268
Jan-17	55	64323
Jan-18	530	64853
Jan-19	566	65419
Jan-20	513	65932
Jan-21	464	66396
Jan-22	572	66968

Fecha	Frecuencia (n)	Acumulada (n)
Jan-23	261	67229
Jan-24	48	67277
Jan-25	682	67959
Jan-26	559	68518
Jan-27	531	69049
Jan-28	490	69539
Jan-29	633	70172
Jan-30	278	70450
Jan-31	42	70492
Feb-01	680	71172
Feb-02	559	71731
Feb-03	507	72238
Feb-04	589	72827
Feb-05	530	73357
Feb-06	336	73693
Feb-07	50	73743
Feb-08	670	74413
Feb-09	603	75016
Feb-10	547	75563
Feb-11	582	76145
Feb-12	553	76698
Feb-13	284	76982
Feb-14	37	77019
Feb-15	408	77427
Feb-16	650	78077
Feb-17	636	78713
Feb-18	710	79423
Feb-19	634	80057
Feb-20	303	80360
Feb-21	48	80408
Feb-22	868	81276
Feb-23	715	81991
Feb-24	724	82715
Feb-25	782	83497
Feb-26	536	84033
Feb-27	370	84403
Feb-28	126	84529
Mar-01	764	85293
Mar-02	737	86030
Mar-03	794	86824
Mar-04	626	87450
Mar-05	633	88083
Mar-06	277	88360
Mar-07	60	88420

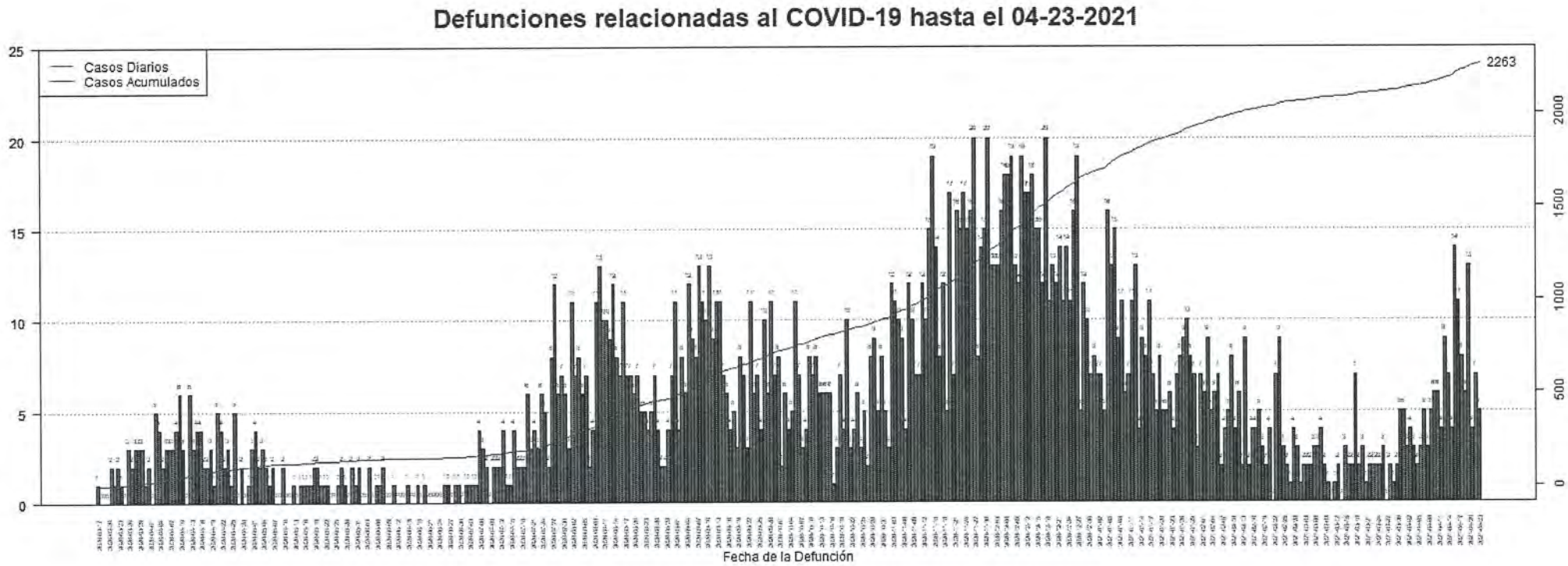
Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LOS CASOS SOSPECHOSOS (PRUEBA ANTICUERPOS) POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Mar-08	731	89151
Mar-09	557	89708
Mar-10	533	90241
Mar-11	549	90790
Mar-12	515	91305
Mar-13	253	91558
Mar-14	45	91603
Mar-15	648	92251
Mar-16	627	92878
Mar-17	585	93463
Mar-18	541	94004
Mar-19	531	94535
Mar-20	290	94825
Mar-21	53	94878
Mar-22	495	95373
Mar-23	776	96149
Mar-24	601	96750
Mar-25	545	97295
Mar-26	551	97846
Mar-27	329	98175
Mar-28	49	98224
Mar-29	736	98960
Mar-30	606	99566
Mar-31	541	100107
Apr-01	429	100536
Apr-02	53	100589
Apr-03	173	100762
Apr-04	29	100791
Apr-05	1164	101955
Apr-06	787	102742
Apr-07	767	103509
Apr-08	829	104338
Apr-09	711	105049
Apr-10	394	105443
Apr-11	65	105508
Apr-12	976	106484
Apr-13	988	107472
Apr-14	869	108341
Apr-15	832	109173
Apr-16	755	109928
Apr-17	373	110301
Apr-18	66	110367
Apr-19	1042	111409
Apr-20	668	112077
Apr-21	112	112189

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

Desglose Defunciones


Defunciones relacionadas al COVID-19 hasta el 04-23-2021
Casos Diarios
Casos Acumulados
2263
25
20
15
10
5
0
2000
1500
1000
500
0
Fecha de la Defunción

DISTRIBUCIÓN DE LAS DEFUNCIONES POR FECHA:

Fecha	Frecuencia (n)	Acumulada (n)
Mar-17	1	1
Mar-18	0	1
Mar-19	0	1
Mar-20	0	1
Mar-21	2	3
Mar-22	1	4
Mar-23	2	6
Mar-24	1	7
Mar-25	0	7
Mar-26	3	10
Mar-27	2	12
Mar-28	3	15
Mar-29	3	18
Mar-30	3	21
Mar-31	1	22
Apr-01	2	24
Apr-02	0	24
Apr-03	5	29
Apr-04	4	33
Apr-05	2	35
Apr-06	3	38
Apr-07	3	41
Apr-08	3	44
Apr-09	4	48
Apr-10	6	54
Apr-11	3	57
Apr-12	0	57
Apr-13	6	63
Apr-14	3	66
Apr-15	4	70
Apr-16	4	74
Apr-17	2	76
Apr-18	2	78
Apr-19	3	81
Apr-20	1	82
Apr-21	5	87
Apr-22	4	91
Apr-23	2	93
Apr-24	3	96
Apr-25	1	97
Apr-26	5	102
Apr-27	0	102
Apr-28	2	104

Fecha	Frecuencia (n)	Acumulada (n)
Apr-29	0	104
Apr-30	1	105
May-01	3	108
May-02	4	112
May-03	2	114
May-04	3	117
May-05	2	119
May-06	1	120
May-07	2	122
May-08	0	122
May-09	0	122
May-10	2	124
May-11	0	124
May-12	0	124
May-13	1	125
May-14	0	125
May-15	1	126
May-16	1	127
May-17	1	128
May-18	1	129
May-19	2	131
May-20	2	133
May-21	1	134
May-22	1	135
May-23	1	136
May-24	0	136
May-25	0	136
May-26	1	137
May-27	2	139
May-28	1	140
May-29	0	140
May-30	2	142
May-31	1	143
Jun-01	2	145
Jun-02	0	145
Jun-03	0	145
Jun-04	2	147
Jun-05	0	147
Jun-06	1	148
Jun-07	1	149
Jun-08	2	151
Jun-09	0	151
Jun-10	0	151
Jun-11	1	152

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LAS DEFUNCIONES POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Jun-12	0	152
Jun-13	0	152
Jun-14	0	152
Jun-15	1	153
Jun-16	0	153
Jun-17	0	153
Jun-18	1	154
Jun-19	0	154
Jun-20	1	155
Jun-21	0	155
Jun-22	0	155
Jun-23	0	155
Jun-24	0	155
Jun-25	0	155
Jun-26	1	156
Jun-27	1	157
Jun-28	0	157
Jun-29	1	158
Jun-30	1	159
Jul-01	0	159
Jul-02	1	160
Jul-03	1	161
Jul-04	1	162
Jul-05	1	163
Jul-06	2	165
Jul-07	3	168
Jul-08	2	170
Jul-09	1	171
Jul-10	3	174
Jul-11	2	176
Jul-12	2	178
Jul-13	5	183
Jul-14	0	183
Jul-15	1	184
Jul-16	4	188
Jul-17	2	190
Jul-18	2	192
Jul-19	1	193
Jul-20	6	199
Jul-21	3	202
Jul-22	3	205
Jul-23	5	210
Jul-24	6	216
Jul-25	5	221
Jul-26	2	223
Jul-27	8	231
Jul-28	12	243
Jul-29	6	249
Jul-30	7	256
Jul-31	6	262
Aug-01	5	267
Aug-02	10	277
Aug-03	6	283
Aug-04	7	290
Aug-05	6	296
Aug-06	7	303
Aug-07	2	305
Aug-08	4	309
Aug-09	10	319
Aug-10	14	333
Aug-11	10	343
Aug-12	9	352
Aug-13	9	361
Aug-14	14	375
Aug-15	7	382
Aug-16	8	390
Aug-17	10	400
Aug-18	8	408
Aug-19	7	415
Aug-20	6	421
Aug-21	6	427
Aug-22	5	432
Aug-23	5	437
Aug-24	5	442
Aug-25	6	448
Aug-26	6	454
Aug-27	4	458
Aug-28	1	459
Aug-29	2	461
Aug-30	5	466
Aug-31	8	474
Sep-01	10	484
Sep-02	4	488
Sep-03	9	497
Sep-04	7	504
Sep-05	12	516
Sep-06	9	525

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LAS DEFUNCIONES POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Sep-07	8	533
Sep-08	11	544
Sep-09	11	555
Sep-10	9	564
Sep-11	14	578
Sep-12	8	586
Sep-13	14	600
Sep-14	10	610
Sep-15	7	617
Sep-16	5	622
Sep-17	3	625
Sep-18	6	631
Sep-19	3	634
Sep-20	8	642
Sep-21	7	649
Sep-22	3	652
Sep-23	11	663
Sep-24	6	669
Sep-25	7	676
Sep-26	4	680
Sep-27	10	690
Sep-28	6	696
Sep-29	11	707
Sep-30	7	714
Oct-01	8	722
Oct-02	2	724
Oct-03	6	730
Oct-04	4	734
Oct-05	5	739
Oct-06	11	750
Oct-07	7	757
Oct-08	3	760
Oct-09	4	764
Oct-10	8	772
Oct-11	7	779
Oct-12	8	787
Oct-13	6	793
Oct-14	6	799
Oct-15	6	805
Oct-16	6	811
Oct-17	1	812
Oct-18	3	815
Oct-19	7	822
Oct-20	4	826
Oct-21	10	836
Oct-22	3	839
Oct-23	4	843
Oct-24	6	849
Oct-25	3	852
Oct-26	5	857
Oct-27	2	859
Oct-28	8	867
Oct-29	9	876
Oct-30	5	881
Oct-31	8	889
Nov-01	5	894
Nov-02	3	897
Nov-03	12	909
Nov-04	11	920
Nov-05	10	930
Nov-06	9	939
Nov-07	4	943
Nov-08	12	955
Nov-09	10	965
Nov-10	7	972
Nov-11	7	979
Nov-12	12	991
Nov-13	10	1001
Nov-14	15	1016
Nov-15	19	1035
Nov-16	14	1049
Nov-17	8	1057
Nov-18	12	1069
Nov-19	5	1074
Nov-20	17	1091
Nov-21	7	1098
Nov-22	16	1114
Nov-23	15	1129
Nov-24	17	1146
Nov-25	15	1161
Nov-26	16	1177
Nov-27	20	1197
Nov-28	8	1205
Nov-29	14	1219
Nov-30	15	1234
Dec-01	20	1254
Dec-02	13	1267

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LAS DEFUNCIONES POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Dec-03	13	1280
Dec-04	13	1293
Dec-05	16	1309
Dec-06	18	1327
Dec-07	18	1345
Dec-08	19	1364
Dec-09	13	1377
Dec-10	12	1389
Dec-11	19	1408
Dec-12	17	1425
Dec-13	17	1442
Dec-14	18	1460
Dec-15	15	1475
Dec-16	15	1490
Dec-17	12	1502
Dec-18	20	1522
Dec-19	11	1533
Dec-20	13	1546
Dec-21	12	1558
Dec-22	14	1572
Dec-23	11	1583
Dec-24	14	1597
Dec-25	11	1608
Dec-26	16	1624
Dec-27	19	1643
Dec-28	5	1648
Dec-29	12	1660
Dec-30	10	1670
Dec-31	7	1677
Jan-01	8	1685
Jan-02	7	1692
Jan-03	7	1699
Jan-04	5	1704
Jan-05	16	1720
Jan-06	13	1733
Jan-07	15	1748
Jan-08	9	1757
Jan-09	11	1768
Jan-10	6	1774
Jan-11	7	1781
Jan-12	11	1792
Jan-13	13	1805
Jan-14	4	1809

Fecha	Frecuencia (n)	Acumulada (n)
Jan-15	9	1818
Jan-16	8	1826
Jan-17	11	1837
Jan-18	7	1844
Jan-19	5	1849
Jan-20	8	1857
Jan-21	5	1862
Jan-22	5	1867
Jan-23	6	1873
Jan-24	4	1877
Jan-25	7	1884
Jan-26	8	1892
Jan-27	9	1901
Jan-28	10	1911
Jan-29	8	1919
Jan-30	7	1926
Jan-31	3	1929
Feb-01	7	1936
Feb-02	6	1942
Feb-03	9	1951
Feb-04	5	1956
Feb-05	6	1962
Feb-06	7	1969
Feb-07	2	1971
Feb-08	4	1975
Feb-09	5	1980
Feb-10	8	1988
Feb-11	4	1992
Feb-12	6	1998
Feb-13	2	2000
Feb-14	9	2009
Feb-15	2	2011
Feb-16	4	2015
Feb-17	4	2019
Feb-18	5	2024
Feb-19	3	2027
Feb-20	2	2029
Feb-21	4	2033
Feb-22	0	2033
Feb-23	7	2040
Feb-24	9	2049
Feb-25	3	2052
Feb-26	2	2054
Feb-27	1	2055

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

DISTRIBUCIÓN DE LAS DEFUNCIONES POR FECHA (continuación):

Fecha	Frecuencia (n)	Acumulada (n)
Feb-28	4	2059
Mar-01	3	2062
Mar-02	1	2063
Mar-03	2	2065
Mar-04	2	2067
Mar-05	2	2069
Mar-06	3	2072
Mar-07	3	2075
Mar-08	4	2079
Mar-09	2	2081
Mar-10	1	2082
Mar-11	0	2082
Mar-12	1	2083
Mar-13	2	2085
Mar-14	0	2085
Mar-15	3	2088
Mar-16	2	2090
Mar-17	2	2092
Mar-18	7	2099
Mar-19	2	2101
Mar-20	3	2104
Mar-21	1	2105
Mar-22	2	2107
Mar-23	2	2109
Mar-24	2	2111
Mar-25	2	2113
Mar-26	3	2116
Mar-27	0	2116
Mar-28	2	2118
Mar-29	1	2119
Mar-30	2	2121
Mar-31	5	2126
Apr-01	5	2131
Apr-02	3	2134
Apr-03	4	2138
Apr-04	3	2141
Apr-05	2	2143
Apr-06	3	2146
Apr-07	5	2151
Apr-08	3	2154
Apr-09	5	2159
Apr-10	6	2165
Apr-11	6	2171

Fecha	Frecuencia (n)	Acumulada (n)
Apr-12	4	2175
Apr-13	9	2184
Apr-14	7	2191
Apr-15	4	2195
Apr-16	14	2209
Apr-17	11	2220
Apr-18	8	2228
Apr-19	6	2234
Apr-20	13	2247
Apr-21	4	2251
Apr-22	7	2258
Apr-23	5	2263

Nota: La información suministrada por fuentes externas al Departamento de Salud podría variar una vez sea finalizado el proceso de corroboración de los datos por parte de la agencia.

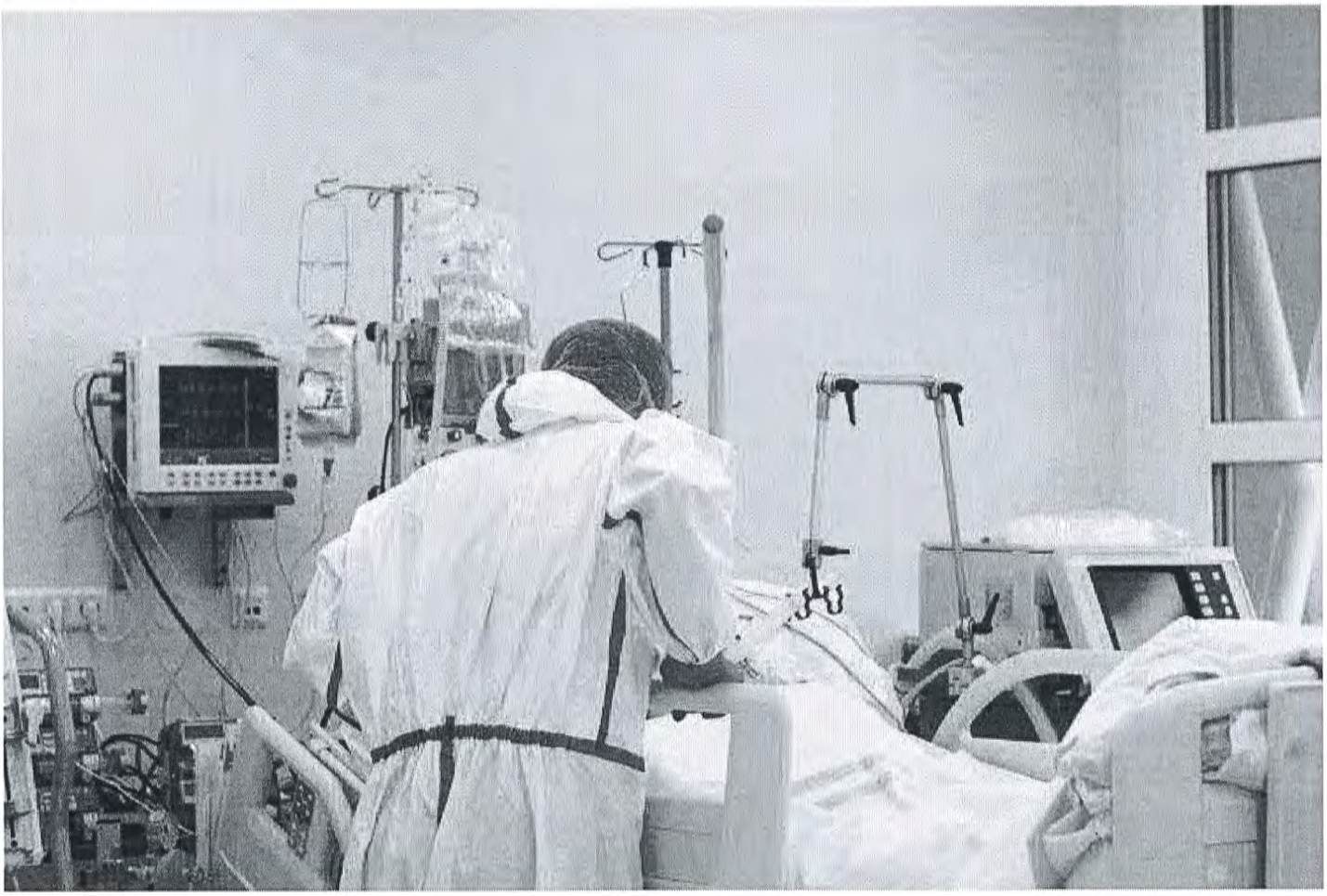
https://www.elvocero.com/economia/otros/en-estado-de-alerta-los-hospitales/article_3363670c-fe00-11eb-97f1-fb8badc7ec5d.html

SPOTLIGHT

En estado de alerta los hospitales

Temen al impacto económico que se pueda generar en la industria si se prolonga la crisis sanitaria y no reciben dinero adicional

Brenda A. Vázquez Colón, EL VOCERO
16/08/2021

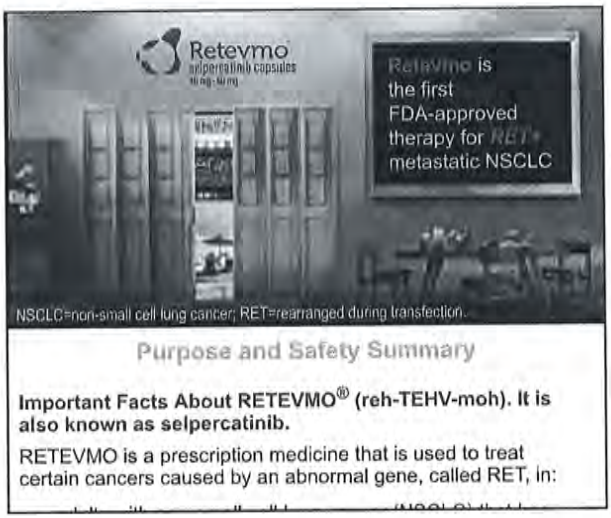


PatrikSlezak

La crisis provocada por el repunte del coronavirus (covid-19) debido a la llegada de la variante delta, ha comenzado a socavar las finanzas de la industria hospitalaria del País, lo que genera preocupación sobre el futuro de los hospitales ante la posibilidad de prolongarse la pandemia.

Así lo expuso a **EL VOCERO**, Jaime Plá, presidente de la Asociación de Hospitales de Puerto Rico.

Según explicó, a medida que incrementan los contagios, los ingresos y las visitas a los hospitales comienzan a reducirse, ya que los pacientes se abstienen de visitar la sala de emergencia, los consultorios médicos y también de realizarse cirugías electivas, segmentos que resultan ser los más rentables para la industria.



Esta situación hace que los ingresos de los hospitales comiencen a mermar, mientras las responsabilidades financieras mensuales permanecen intactas.

Hace un año, cuando el número de contagios en la Isla alcanzaba cifras significativas, los hospitales estaban perdiendo alrededor de $3.3 millones por día. Al impacto económico se unió el deterioro que estaban experimentando en la rentabilidad, impulsado en parte por el huracán María y los terremotos.

“La realidad es que los hospitales no han podido recuperarse y volver a los censos que tenían previo a la pandemia. Antes los hospitales podían estar en un 100% y otros tenían menos. El promedio normal era entre 77% y 82% de ocupación. Ahora todavía están en el 60%, cerca de 20% menos”, indicó Plá.

El ejecutivo puntualizó que sigue presente la preocupación económica de los hospitales, que tiene efecto directo en la operación hospitalaria. “Suben las estadísticas de pacientes de covid-19, pero estos son casos muy costosos para los hospitales. Los tratamientos son muy fuertes y caros; por ejemplo, tratar a un paciente con el medicamento Remdesivir, por tres o cuatro días, cuesta entre $6,000 y $7,000. El tratamiento de anticuerpos monoclonales también es muy alto”, detalló.

El escenario económico podría complicarse aún más si el patrón de casos sigue en aumento como se ha visto por varias semanas consecutivas, lo que ha provocado que la tasa de positividad llegue al 11%.

"Si los casos siguen subiendo se va complicando más la utilización de los recursos, al igual que la adquisición de más equipo de protección personal", agregó el ejecutivo.

"Se tendrían que abrir los cuartos ya cerrados en el área de covid-19 y se complican las operaciones de los hospitales. También sube el uso de intensivo, donde la atención es constante y las estadías largas", añadió.

Ayuda recibida

Los hospitales de Puerto Rico han recibido cerca de $125 millones del Departamento de Salud federal mediante el programa Coronavirus Aid, Relief, and Economic Security, conocido como Cares Act. Esta cifra significa cerca del 1% de lo que se distribuyó a nivel de salud en Estados Unidos —mayormente a los hospitales— que ronda los $150,000 millones.

Los hospitales han hecho préstamos a la Administración de Pequeños Negocios (SBA), con $81 millones de fondos federales distribuidos entre 6,000 proveedores y hasta el 9 de abril de 2021, habían recibido $315 millones del gobierno estatal.

"Esta cifra es muy baja para los servicios que brindamos. Por ejemplo, Nueva York recibió el 12% de los fondos del Care Act. Aunque esto tiene que ver con la fórmula que usaron. Le pagaron más a los que tenían mayor número de pacientes de covid-19, y en ese estado llegaron a tener 20,000

pacientes, lo que nosotros nunca hemos tenido", aclaró Plá añadiendo que en la Isla también se han desembolsado los fondos a los hospitales según la necesidad y cantidad de casos de covid-19.

Explicó, además, que estas ayudas federales se han estado distribuyendo en los hospitales, las clínicas, centros 330 y otras organizaciones de salud que utilizan el dinero para pagar la nómina de empleados cuando no hay pacientes en los hospitales, además de equipos de seguridad y tratamientos para los pacientes.

En cuando a la cubierta de los planes médicos, aunque estos han estado cubriendo gran parte de los tratamientos por mandato del gobierno federal, la porción adicional se ha estado pagando en Estados Unidos, contrario a Puerto Rico.

"El gobierno federal aprobó un 20% adicional en el pago por atender a estos pacientes, pero esto no ocurre en Puerto Rico. Los planes médicos no necesariamente han adoptado esa política de pago porque para ellos no es opcional, porque sus acuerdos están por contrato. Es un "issue" de contrato, no de mala fe. Por ejemplo, el gobierno federal te obliga a pagar $7.25 la hora y luego te da permiso para que pagues $8.50, pero el contrato dice $7.25 y sigues pagando eso", explicó.

De los cerca de 45,000 empleados en los hospitales de la Isla, la mayoría sigue en sus puestos de trabajo cobijados por las ayudas federales, que según adelantó Pla a **EL VOCERO**, podrían aumentar, ya que están en la búsqueda de fondos adicionales.

"Al principio hubo un recorte de empleados cuando se vaciaron los hospitales, porque no había dinero, pero en términos generales la mayoría de esos empleados han regresado a trabajar. Sobre las ayudas, estoy por reunirme con la Autoridad de Asesoría Financiera y Agencia Fiscal (Aafaf) para verificar si hay algún otro fondo disponible para los hospitales", puntualizó Plá.

Según datos suministrados por la firma Birling Capital, aunque Estados Unidos —incluido Puerto Rico— está entre los lugares con mayor gasto sanitario 'per cápita', también ocupa el último lugar de entre 11 países desarrollados en cuanto al desempeño del sistema de salud.

Indican que del gasto total para la atención de la salud, solo el 38% va hacia los hospitales y aseguran que ha sido así durante los últimos 50 años.

Las cifras apuntan que la industria hospitalaria representa en Puerto Rico el 13.4% de la fuerza laboral del País, que utiliza el 13% del Producto Interno Bruto (PIB) en la atención médica.

El alcalde de Sabana Grande pide a Educación posponer el inicio del semestre escolar presencial

El Departamento de Salud intensifica la campaña de vacunación

Brenda A. Vázquez Colón

CDC Centers for Disease Control and Prevention

Weekly / August 6, 2021 / 70(31);1059-1062

On July 30, 2021, this report was posted online as an MMWR *Early Release.*

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View suggested citation

Summary

What is already known about this topic?

Variants of SARS-CoV-2 continue to emerge. The B.1.617.2 (Delta) variant is highly transmissible.

What is added by this report?

In July 2021, following multiple large public events in a Barnstable County, Massachusetts, town, 469 COVID-19 cases were identified among Massachusetts residents who had traveled to the town during July 3–17; 346 (74%) occurred in fully vaccinated persons. Testing identified the Delta variant in 90% of specimens from 133 patients. Cycle threshold values were similar among specimens from patients who were fully vaccinated and those who were not.

What are the implications for public health practice?

Jurisdictions might consider expanded prevention strategies, including universal masking in indoor public settings, particularly for large public gatherings that include travelers from many areas with differing levels of SARS-CoV-2 transmission.

During July 2021, 469 cases of COVID-19 associated with multiple summer events and large public gatherings in a town in Barnstable County, Massachusetts, were identified among Massachusetts residents; vaccination coverage among eligible Massachusetts residents was 69%. Approximately three quarters (346; 74%) of cases occurred in fully vaccinated persons (those who had completed a 2-dose course of mRNA vaccine [Pfizer-BioNTech or Moderna] or had received a single dose of Janssen [Johnson & Johnson] vaccine ≥14 days before exposure). Genomic sequencing of specimens from 133 patients identified the B.1.617.2 (Delta) variant of SARS-CoV-2, the virus that causes COVID-19, in 119 (89%) and the Delta AY.3 sublineage in one (1%). Overall, 274 (79%) vaccinated patients with breakthrough infection were symptomatic. Among five COVID-19 patients who were hospitalized, four were fully vaccinated; no deaths were reported. Real-time reverse transcription–polymerase chain reaction (RT-PCR) cycle threshold (Ct) values in specimens from 127 vaccinated persons with breakthrough cases were similar to those from 84 persons who were unvaccinated, not fully vaccinated, or whose vaccination status was unknown (median = 22.77 and 21.54, respectively). The Delta variant of SARS-CoV-2 is highly transmissible (*1*); vaccination is the most important strategy to prevent severe illness and death. On July 27, CDC recommended that all persons, including those who are fully vaccinated, should wear masks in indoor public settings in areas where COVID-19 transmission is high or substantial.* Findings from this investigation suggest that even jurisdictions without substantial or high COVID-19 transmission might consider expanding

prevention strategies, including masking in indoor public settings regardless of vaccination status, given the potential risk of infection during attendance at large public gatherings that include travelers from many areas with differing levels of transmission.

During July 3–17, 2021, multiple summer events and large public gatherings were held in a town in Barnstable County, Massachusetts, that attracted thousands of tourists from across the United States. Beginning July 10, the Massachusetts Department of Public Health (MA DPH) received reports of an increase in COVID-19 cases among persons who reside in or recently visited Barnstable County, including in fully vaccinated persons. Persons with COVID-19 reported attending densely packed indoor and outdoor events at venues that included bars, restaurants, guest houses, and rental homes. On July 3, MA DPH had reported a 14-day average COVID-19 incidence of zero cases per 100,000 persons per day in residents of the town in Barnstable County; by July 17, the 14-day average incidence increased to 177 cases per 100,000 persons per day in residents of the town (*2*).

During July 10–26, using travel history data from the state COVID-19 surveillance system, MA DPH identified a cluster of cases among Massachusetts residents. Additional cases were identified by local health jurisdictions through case investigation. COVID-19 cases were matched with the state immunization registry. A cluster-associated case was defined as receipt of a positive SARS-CoV-2 test (nucleic acid amplification or antigen) result ≤14 days after travel to or residence in the town in Barnstable County since July 3. COVID-19 vaccine breakthrough cases were those in fully vaccinated Massachusetts residents (those with documentation from the state immunization registry of completion of COVID-19 vaccination as recommended by the Advisory Committee on Immunization Practices,† ≥14 days before exposure). Specimens were submitted for whole genome sequencing§ to either the Massachusetts State Public Health Laboratory or the Broad Institute of the Massachusetts Institute of Technology and Harvard University. Ct values were obtained for 211 specimens tested using a noncommercial real-time RT-PCR panel for SARS-CoV-2 performed under Emergency Use Authorization at the Broad Institute Clinical Research Sequencing Platform. On July 15, MA DPH issued the first of two Epidemic Information Exchange notifications to identify additional cases among residents of U.S. jurisdictions outside Massachusetts associated with recent travel to the town in Barnstable County during July 2021. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.¶

By July 26, a total of 469 COVID-19 cases were identified among Massachusetts residents; dates of positive specimen collection ranged from July 6 through July 25 (Figure 1). Most cases occurred in males (85%); median age was 40 years (range = <1–76 years). Nearly one half (199; 42%) reported residence in the town in Barnstable County. Overall, 346 (74%) persons with COVID-19 reported symptoms consistent with COVID-19.** Five were hospitalized; as of July 27, no deaths were reported. One hospitalized patient (age range = 50–59 years) was not vaccinated and had multiple underlying medical conditions.†† Four additional, fully vaccinated patients§§ aged 20–70 years were also hospitalized, two of whom had underlying medical conditions. Initial genomic sequencing of specimens from 133 patients identified the Delta variant in 119 (89%) cases and the Delta AY.3 sublineage in one (1%) case; genomic sequencing was not successful for 13 (10%) specimens.

Among the 469 cases in Massachusetts residents, 346 (74%) occurred in persons who were fully vaccinated; of these, 301 (87%) were male, with a median age of 42 years. Vaccine products received by persons experiencing breakthrough infections were Pfizer-BioNTech (159; 46%), Moderna (131; 38%), and Janssen (56; 16%); among fully vaccinated persons in the Massachusetts general population, 56% had received Pfizer-BioNTech, 38% had received Moderna, and 7% had received Janssen vaccine products. Among persons with breakthrough infection, 274 (79%) reported signs or symptoms, with the most common being cough, headache, sore throat, myalgia, and fever. Among fully vaccinated symptomatic persons, the median interval from completion of ≥14 days after the final vaccine dose to symptom onset was 86 days (range = 6–178 days). Among persons with breakthrough infection, four (1.2%) were hospitalized, and no deaths were reported. Real-time RT-PCR Ct values in specimens from 127 fully vaccinated patients (median = 22.77) were similar to those among 84 patients who were unvaccinated, not fully vaccinated, or whose vaccination status was unknown (median = 21.54) (Figure 2).

Transmission mitigation measures included broadening testing recommendations for persons with travel or close contact with a cluster-associated case, irrespective of vaccination status; local recommendations for mask use in indoor settings, irrespective of vaccination status; deployment of state-funded mobile testing and vaccination units in the town in Barnstable County; and informational outreach to visitors and residents. In this tourism-focused community, the Community Tracing Collaborative¶¶ conducted outreach to hospitality workers, an international workforce requiring messaging in multiple languages.

The call from MA DPH for cases resulted in additional reports of cases among residents of 22 other states who had traveled to the town in Barnstable County during July 3–17, as well as reports of secondary transmission; further analyses are ongoing. As of July 3, estimated COVID-19 vaccination coverage among the eligible population in Massachusetts was 69% (*3*). Further

investigations and characterization of breakthrough infections and vaccine effectiveness among this highly vaccinated population are ongoing.

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Discussion

The SARS-CoV-2 Delta variant is highly transmissible (*1*), and understanding determinants of transmission, including human behavior and vaccine effectiveness, is critical to developing prevention strategies. Multipronged prevention strategies are needed to reduce COVID-19–related morbidity and mortality (*4*).

The findings in this report are subject to at least four limitations. First, data from this report are insufficient to draw conclusions about the effectiveness of COVID-19 vaccines against SARS-CoV-2, including the Delta variant, during this outbreak. As population-level vaccination coverage increases, vaccinated persons are likely to represent a larger proportion of COVID-19 cases. Second, asymptomatic breakthrough infections might be underrepresented because of detection bias. Third, demographics of cases likely reflect those of attendees at the public gatherings, as events were marketed to adult male participants; further study is underway to identify other population characteristics among cases, such as additional demographic characteristics and underlying health conditions including immunocompromising conditions.*** MA DPH, CDC, and affected jurisdictions are collaborating in this response; MA DPH is conducting additional case investigations, obtaining samples for genomic sequencing, and linking case information with laboratory data and vaccination history. Finally, Ct values obtained with SARS-CoV-2 qualitative RT-PCR diagnostic tests might provide a crude correlation to the amount of virus present in a sample and can also be affected by factors other than viral load.††† Although the assay used in this investigation was not validated to provide quantitative results, there was no significant difference between the Ct values of samples collected from breakthrough cases and the other cases. This might mean that the viral load of vaccinated and unvaccinated persons infected with SARS-CoV-2 is also similar. However, microbiological studies are required to confirm these findings.

Event organizers and local health jurisdictions should continually assess the need for additional measures, including limiting capacity at gatherings or event postponement, based on current rates of COVID-19 transmission, population vaccination coverage, and other factors.§§§ On July 27, CDC released recommendations that all persons, including those who are fully vaccinated, should wear masks in indoor public settings in areas where COVID-19 transmission is high or substantial. Findings from this investigation suggest that even jurisdictions without substantial or high COVID-19 transmission might consider expanding prevention strategies, including masking in indoor public settings regardless of vaccination status, given the potential risk of infection during attendance at large public gatherings that include travelers from many areas with differing levels of transmission.

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[1]Massachusetts Department of Public Health; [2]CDC COVID-19 Response Team; [3]Broad Institute, Cambridge, Massachusetts; [4]Barnstable County Department of Health and the Environment, Massachusetts; [5]Community Tracing Collaborative, Commonwealth of Massachusetts.

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* https://www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated.html

† As of May 2021, ACIP recommended that all adults aged ≥18 years receive any of the three COVID-19 vaccines available in the United States via Emergency Use Authorization from the Food and Drug Administration, including Pfizer-BioNTech, Moderna, and Janssen; persons aged ≥12 years are eligible to receive the Pfizer-BioNTech COVID-19 vaccine. Full vaccination is defined as receipt of 2 doses of the Pfizer-BioNTech or Moderna COVID-19 vaccines or 1 dose of Janssen COVID-19 vaccine ≥14 days before exposure.

§ Genomic sequencing was performed using Illumina NovaSeq using the NEB LunaScript RT ARTIC SARS-CoV-2 Kit. Novel mutations were not identified in the spike protein of the cluster-associated genomes compared with genomes collected during the same period from ongoing genomic surveillance efforts at Broad Institute. Raw and assembled genomic data are publicly available under NCBI BioProject PRJNA715749.

¶ 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect.241(d); 5 U.S.C. Sect.552a; 44 U.S.C. Sect.3501 et seq.

** COVID-like symptoms were based on the Council of State and Territorial Epidemiologists surveillance case definition for COVID-19. https://ndc.services.cdc.gov/case-definitions/coronavirus-disease-2019-2020-08-05/

†† https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html

§§ One vaccinated, hospitalized COVID-19 patient had received the Pfizer-BioNTech vaccine and three had received the Janssen vaccine.

¶¶ The Community Tracing Collaborative is a multiorganization partnership that has supported COVID contact tracing and outbreak investigation in Massachusetts. https://www.mass.gov/info-details/learn-about-the-community-tracing-collaborative

*** A preliminary analysis matching cluster-associated COVID-19 cases with the state HIV case surveillance data identified 30 (6%) cases with verified HIV infection; all were virally suppressed, and none were hospitalized as a result of infection with SARS-CoV-2.

††† https://www.cdc.gov/coronavirus/2019-ncov/lab/faqs.html

§§§ https://www.cdc.gov/coronavirus/2019-ncov/community/large-events/considerations-for-events-gatherings.html

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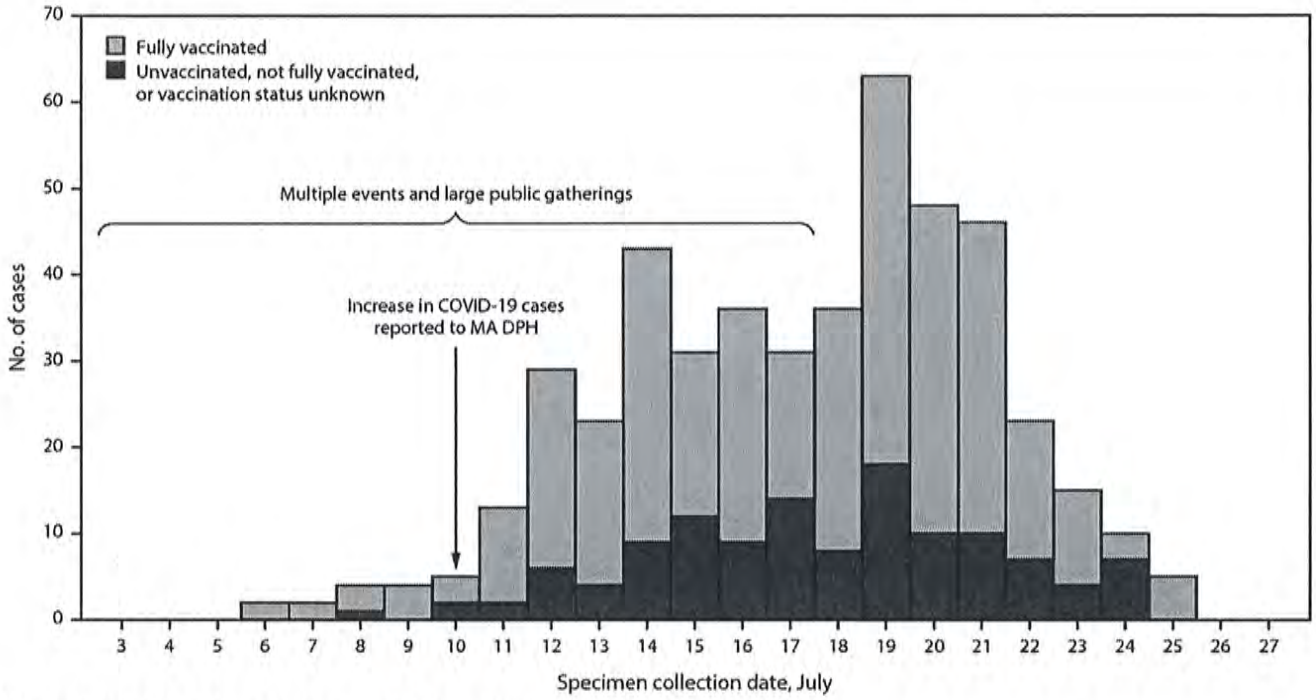
FIGURE 1. SARS-CoV-2 infections (N = 469) associated with large public gatherings, by date of specimen collection and vaccination status* — Barnstable County, Massachusetts, July 2021



Abbreviation: MA DPH = Massachusetts Department of Public Health.

* Fully vaccinated was defined as ≥14 days after completion of state immunization registry–documented COVID-19 vaccination as recommended by the Advisory Committee on Immunization Practices.

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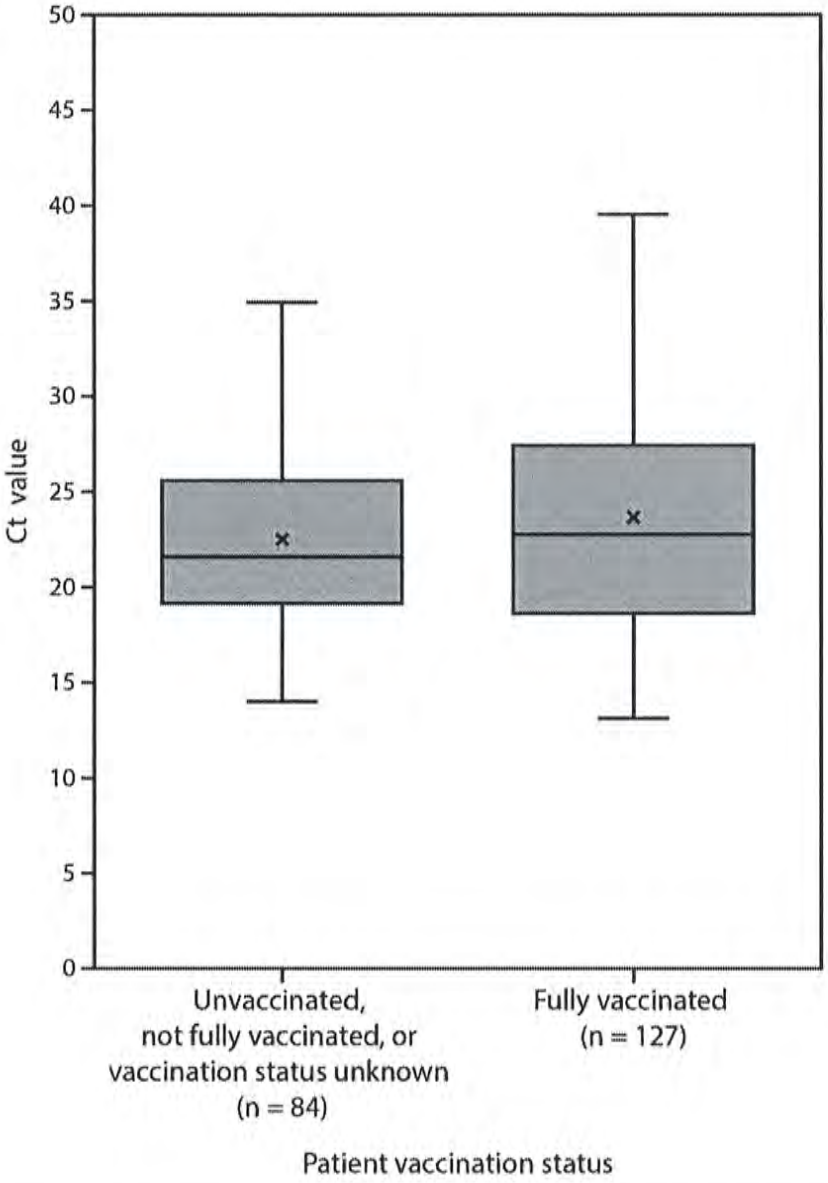
FIGURE 2. SARS-CoV-2 real-time reverse transcription–polymerase chain reaction cycle threshold values* for specimens from patients with infections associated with large public gatherings, by vaccination status† — Barnstable County, Massachusetts, July 2021§



Abbreviations: Ct = cycle threshold; RT-PCR = reverse transcription–polymerase chain reaction.

* Specimens were analyzed using a noncommercial real-time RT-PCR panel for SARS-CoV-2 performed under Emergency Use Authorization at the Clinical Research Sequencing Platform, Broad Institute of the Massachusetts Institute of Technology and Harvard University.

† Fully vaccinated was defined as ≥14 days after completion of state immunization registry–documented COVID-19 vaccination as recommended by the Advisory Committee on Immunization Practices.

§ Whiskers represent minimum and maximum observations; top of box represents the third quartile (Q3), bottom represents the first quartile (Q1), and box height represents the interquartile range. Midline is the median; "x" is the mean.

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Suggested citation for this article: Brown CM, Vostok J, Johnson H, et al. Outbreak of SARS-CoV-2 Infections, Including COVID-19 Vaccine Breakthrough Infections, Associated with Large Public Gatherings — Barnstable County, Massachusetts, July 2021. MMWR Morb Mortal Wkly Rep 2021;70:1059-1062. DOI: http://dx.doi.org/10.15585/mmwr.mm7031e2 .

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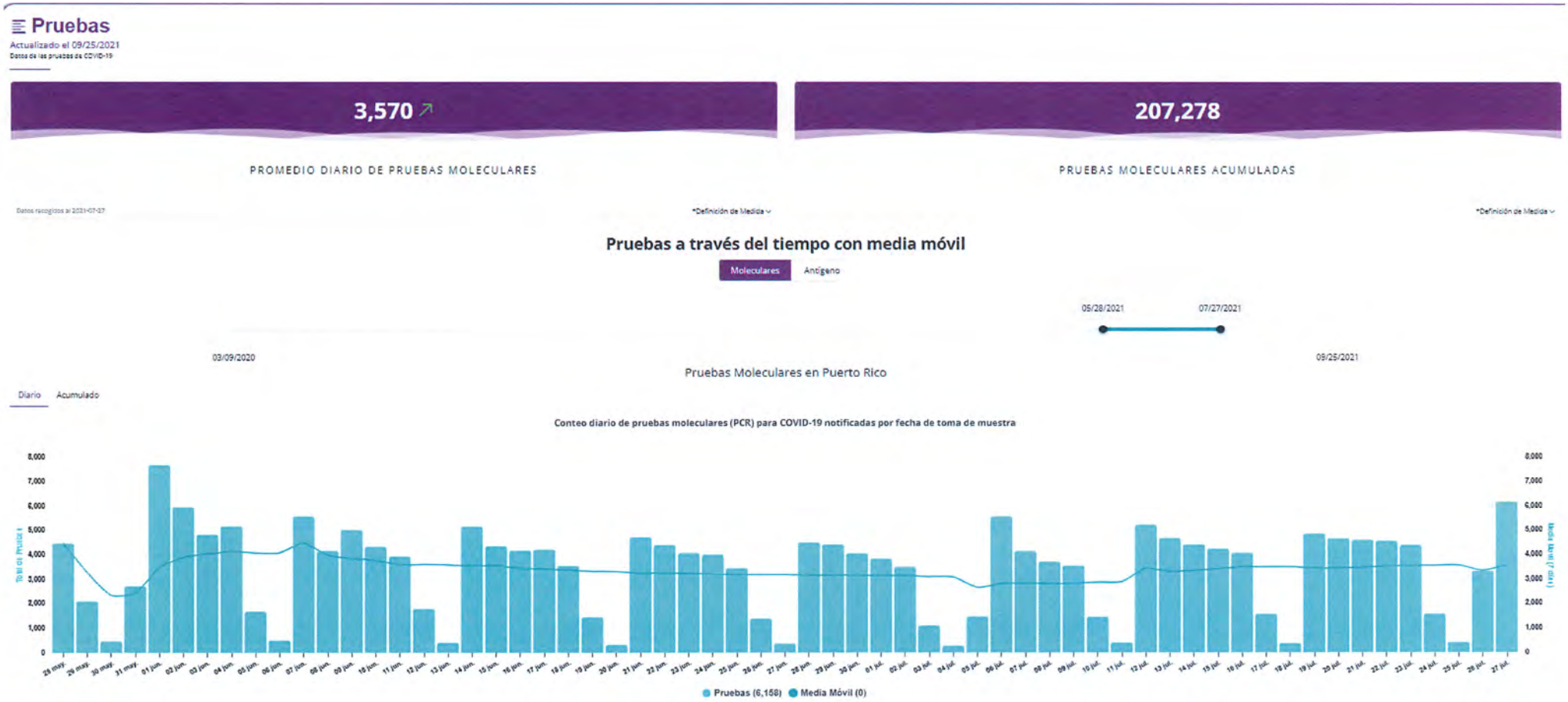
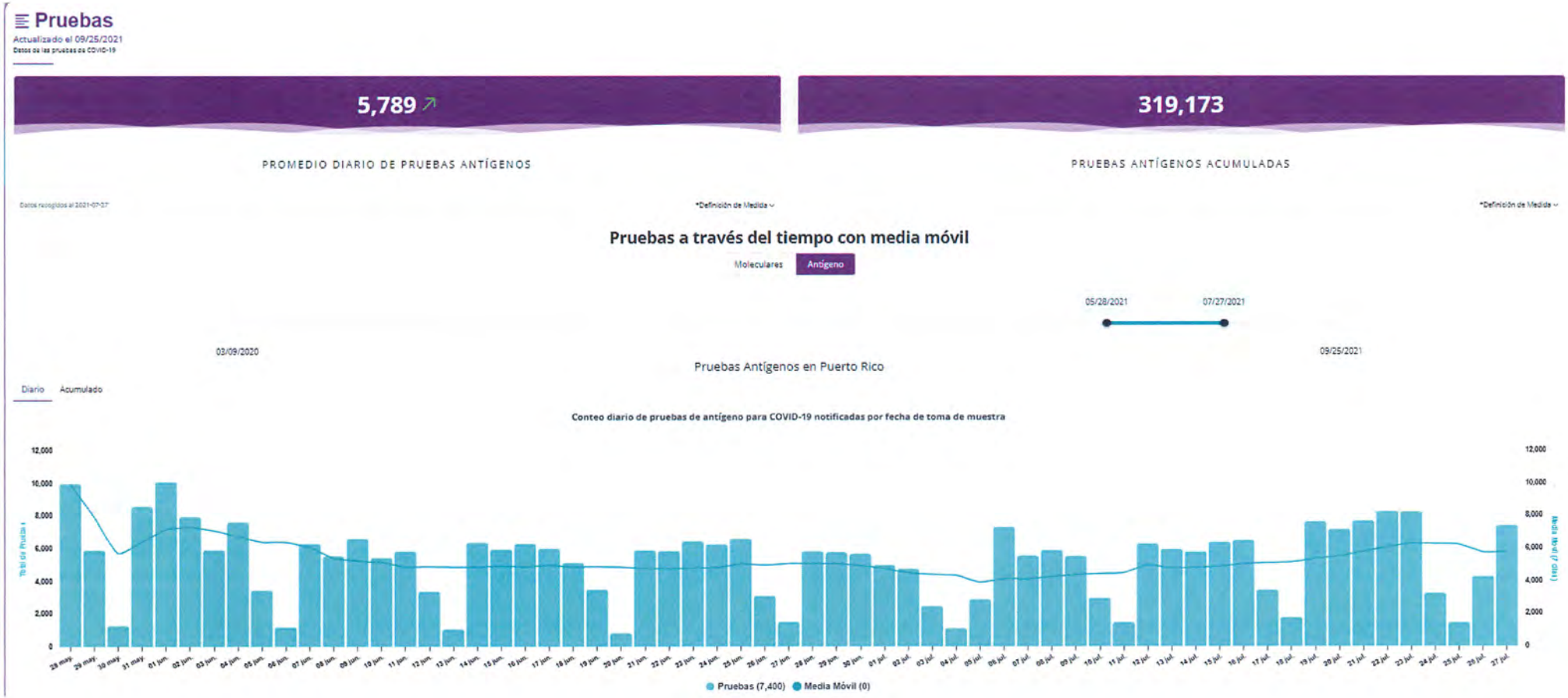
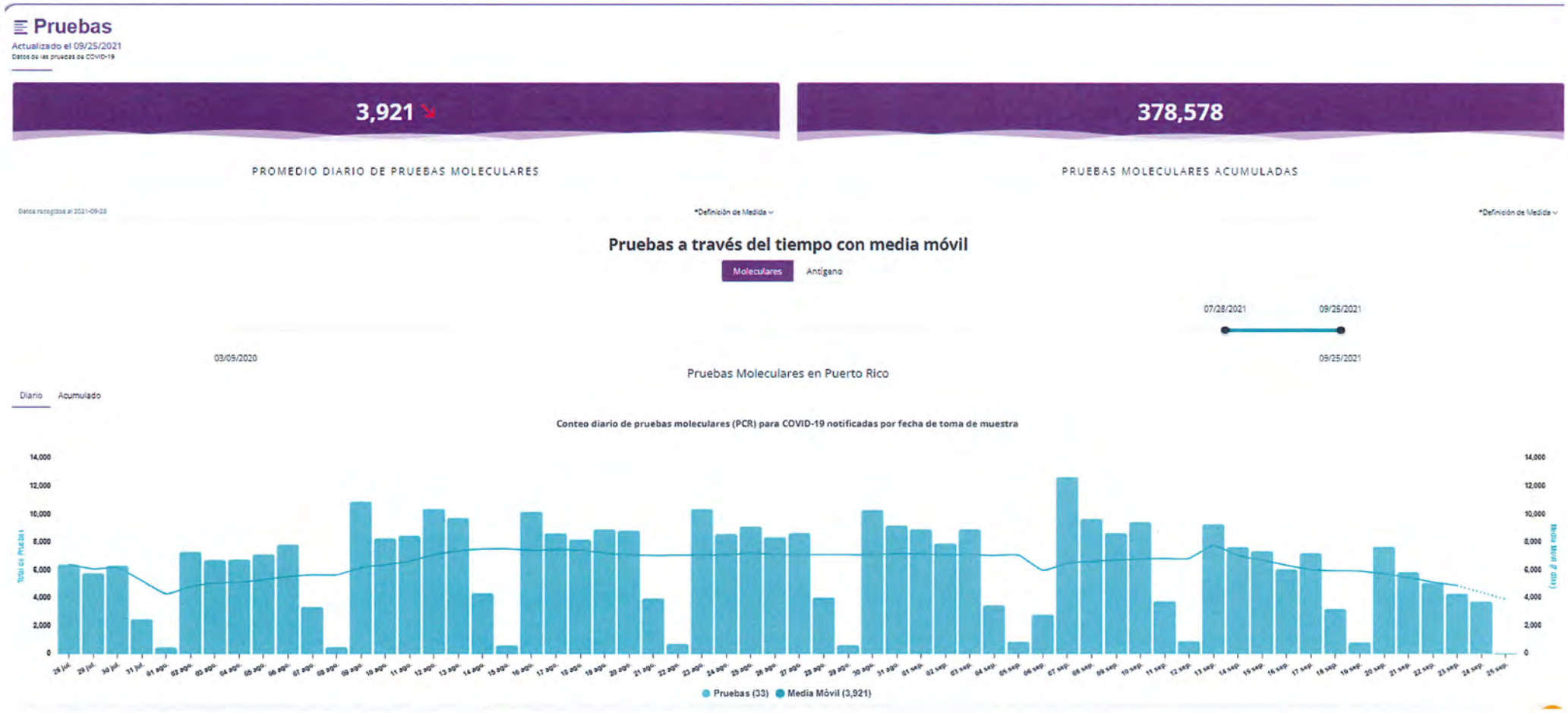
Page last reviewed: August 5, 2021



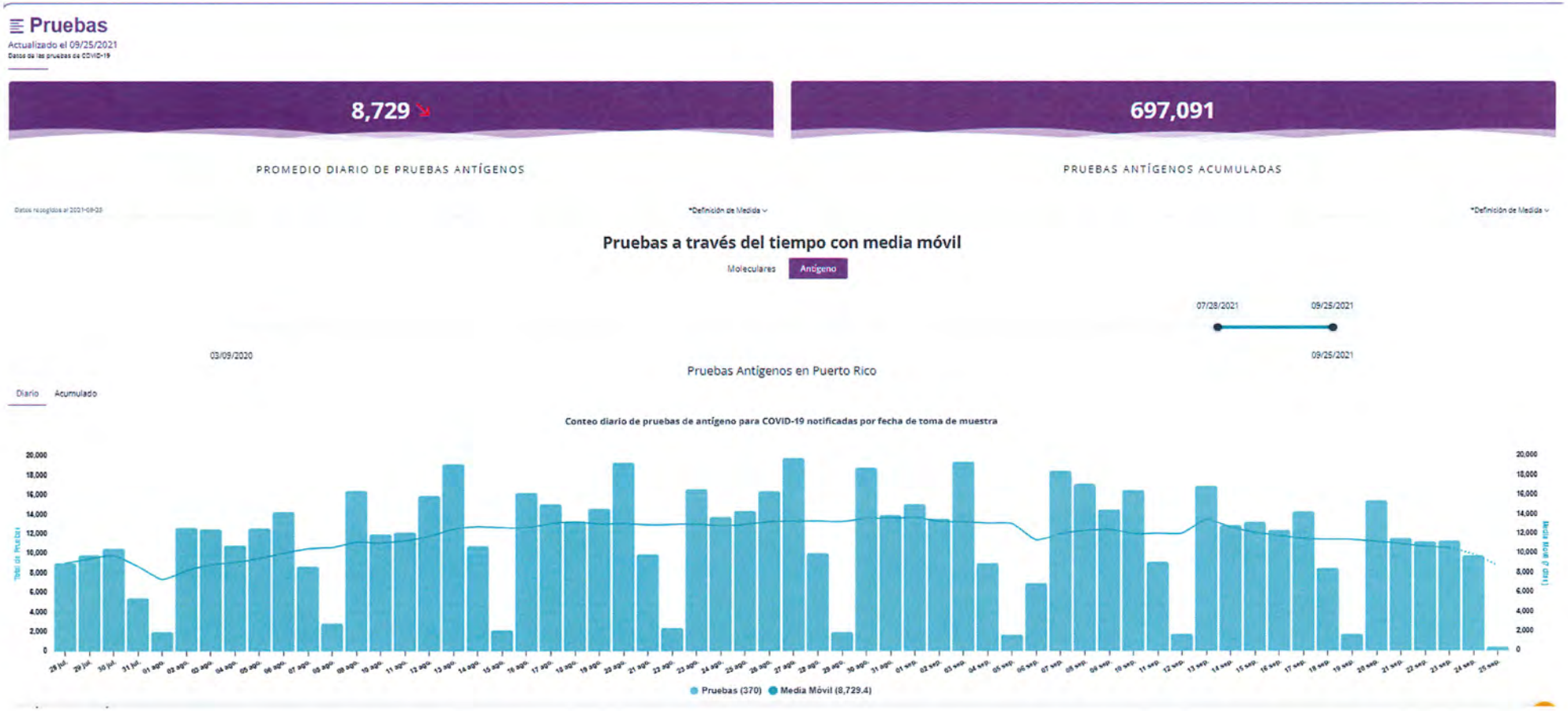
Source: Puerto Rico Health Department COVID-19 Dashboard, *Pruebas,* https://covid19datos.salud.gov.pr/#pruebas



Source: Puerto Rico Health Department COVID-19 Dashboard, *Pruebas,* https://covid19datos.salud.gov.pr/#pruebas



Source: Puerto Rico Health Department COVID-19 Dashboard, *Pruebas,* https://covid19datos.salud.gov.pr/#pruebas



Source: Puerto Rico Health Department COVID-19 Dashboard, *Pruebas,* https://covid19datos.salud.gov.pr/#pruebas

Understanding Percent Positivity

Posted on Thursday, Oct. 1, 2020 at 10:19 am

During the course of the pandemic, new or unfamiliar terms have swirled around all of us: contact tracing, case incidence, confirmed vs. probable cases, public health orders. Perhaps the most widely mentioned—and misunderstood—term is percent positivity. Percent positivity helps us assess disease spread in our community, but it is influenced by factors like who is able to get tested and lab timeliness. This can make it difficult to interpret percent positivity without more context.

To further complicate things, there are multiple ways to calculate it. Let's take a deeper look into how percent positivity can be calculated and what it can tell us.

Calculating Percent Positivity

There are three ways to calculate percent positivity, and CDC does not recommend (https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/calculating-percent-positivity.html) any particular calculation over another. Each method creates a fraction of "positives" (either people or tests) over a total (either total people tested or total number of tests).

Test Over Test

CDC uses this method. To calculate it, take the number of all positive tests and divide by the number of total tests (both positive and negative), then multiply by 100 to make a percentage.

This method counts duplicates—people who are tested multiple times. For example, if one person is tested three times, with two tests being positive and one test being negative, those two positive tests are both counted. This isn't a big deal if most people are only getting tested once. But as testing availability has increased and people are getting tested multiple times, this method makes less sense to use at this phase in the pandemic. This might be the only option for an entity, like CDC, that doesn't have person-level data that can be deduplicated.

People Over Test

Public Health Madison & Dane County uses this method. With this method, the number of new people with positive tests is divided by the total number of tests (both positive and negative), then multiplied by 100 to make a percentage.

The advantage of this method is that it accounts for all retests taken in the denominator but only counts a positive test once in the numerator. In other words, a positive person is only counted once.

As of September 30, in Dane County, 202,984 people have been tested for COVID-19, and there have been 366,896 tests. This means many people have been tested multiple times, which is good: we want people, especially those in high-risk groups and the people who work with them, to be tested more than once. We include all those tests in our calculations to gauge the spread of the virus and to know whether there is enough testing happening.

This method of calculation will yield the lowest percent positivity of the three methods.

People Over People

Prior to September 30, this is the sole method the Wisconsin Department of Health Services (https://www.dhs.wisconsin.gov/covid-19/data.htm) used. As of September 30, DHS displays 7-day percent positive by both People Over People and People Over Test. The visualization DHS provides on their website illustrates how these values can diverge over time as more people get tested more than once.

To calculate the People Over People method, the number of new people with positive tests is divided by the total number of people tested (both positive and negative), then multiplied by 100 to make a percentage.

This method does not count duplicates, but it also does not account for retesting. For example, if someone tests negative, they are counted as a unique person. Nothing would be added to the numerator, but a count of one would be added to the denominator. If they come back and test negative two more times, nothing would happen to the percent positivity; they've already been counted as a unique person.

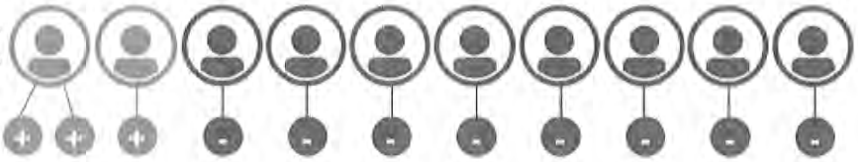
But say that same person who tested negative later comes back and tests positive twice. A count of one would be added to the numerator as a new positive person but the denominator wouldn't change since they were already counted as unique person being tested. If we have enough people who test positive after having a negative test, this can increase the percent positivity because the numerator is increasing but the denominator is staying the same.

Example 1

This simple example outlines how 10 total people (2 positive and 8 negative) with 11 total tests (2 positive from one person, one positive from another person) would be calculated with each method:

10 Total People
2 people positive, 8 people negative

11 Total Tests
3 tests positive, 8 tests negative



Test Over Test
(number positive tests/number total tests)*100

$$\frac{\text{3 positive tests}}{\text{11 total tests}} \times 100 = 27\%$$

People Over Test
(number unique positive people/number total tests)*100

$$\frac{\text{2 positive people}}{\text{11 total tests}} \times 100 = 18\%$$

People Over People
(number unique positive people/number total people tested)*100

$$\frac{\text{2 positive people}}{\text{10 people tested}} \times 100 = 20\%$$

Example 2

This example is a little more complicated, with more people being tested multiple times, and one of them having tested negative once then positive later. Notice how People Over Test can start to look quite different from People Over People method.

10 Total People
3 people positive, 7 people negative

13 Total Tests
4 tests positive, 9 tests negative

Test Over Test
(number positive tests/number total tests)*100

$$\frac{\text{4 positive tests}}{\text{13 total tests}} \times 100 = 31\%$$

People Over Test
(number unique positive people/number total tests)*100

$$\frac{\text{3 positive people}}{\text{13 total tests}} \times 100 = 23\%$$

People Over People
(number unique positive people/number total people tested)*100

$$\frac{\text{3 positive people}}{\text{10 people tested}} \times 100 = 30\%$$

What Can Impact Percent Positivity?

No matter the method used, the reason we calculate percent positivity is to give us some sense of disease spread in our community.

What makes percent positivity go up?

Say percent positivity in Badger County is 20%. That's high! This could mean there are widespread infections in the community.

But then you might wonder, well who is able to get tested? If only people who are hospitalized with symptoms of COVID-19 are able to get tested, it's likely a good chunk of the people we test will test positive (this is why early in the pandemic, when testing was hard to come by, our percent positivity was high). This doesn't necessarily mean there are widespread infections in the community; it could just mean we don't have enough testing to really get a good picture of COVID-19 in our community.

Reporting processes and delays can also impact percent positivity, which is why it's important to look at trends in percent positivity, such as over a 7-day or 14-day average, instead of day by day.

What makes percent positivity go down?

If the number of infections in a community goes down or testing is expanded to more people who are not infected, percent positivity will decline. We would expect percent positivity to go down as more people are screened in non-outbreak settings (such as routine screening in schools, long-term care facilities, and workplaces) and the results are reported on time. Keep in mind this isn't foolproof: if a community has widespread transmission and testing becomes more accessible, testing might find *more* people who are infected and percent positivity will go up.

Does Percent Positivity Give Us a Complete Picture of COVID-19 in Dane County?

Percent positivity tells us some information about spread, but as noted above, it can also depend on factors like how it's calculated, testing accessibility, and lab timeliness. No one metric can give us a complete picture of COVID-19 spread in our community. That's why we look at percent positivity along with eight other metrics (https://publichealthmdc.com/coronavirus/data#Snapshot) each week. When comparing percent positivity across different communities, we recommend paying attention to the trends, rather than only focusing on the numbers. Ask, "What patterns am I seeing over time? What could be driving these patterns?" A great way to stay up-to-date—and find answers to these types of questions!—is to subscribe to our blog posts (https://publichealthmdc.com/blog/tag/covid-19). Each Thursday we release Data Notes for the week. To read more about percent positivity, visit the CDC's website (https://www.cdc.gov/coronavirus/2019-ncov/lab/resources/calculating-percent-positivity.html).

Category: Health & Wellness (/Blog/Category/Health-Wellness)

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COVID-19 | DEC. 7, 2020

The Problem With the Positivity Rate

By Robin Lloyd

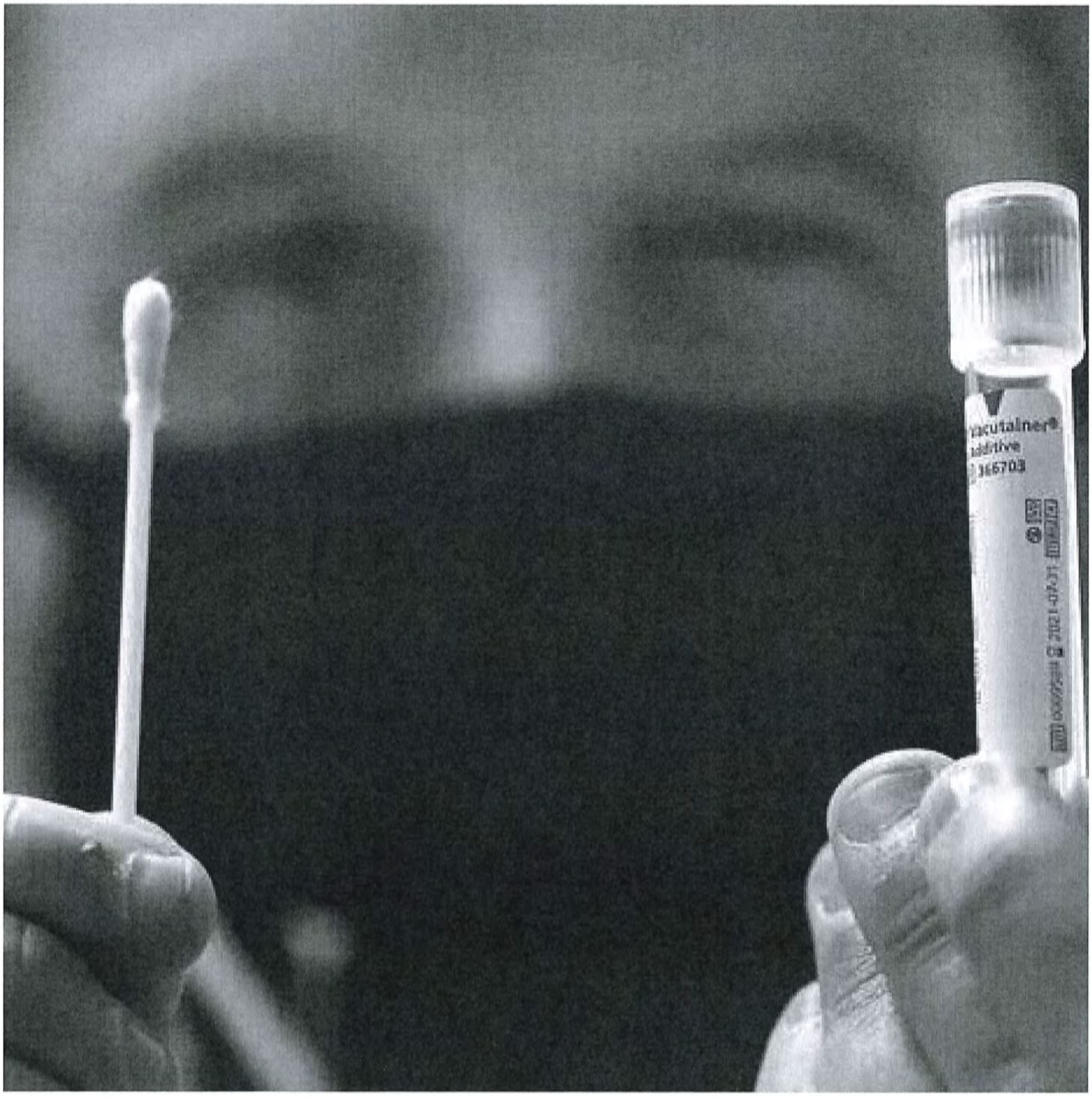


Photo: John Tlumacki/The Boston Globe via Getty Images

On November 18, Mayor Bill de Blasio announced he was temporarily closing the nation's largest public-school system on the basis of one coronavirus statistic: the positivity rate. The city's average rate exceeded 3 percent for the first time since June, which was taken to indicate that the virus's spread could soon spiral dangerously out of control. Now, on December 7, de Blasio will reopen public elementary schools regardless of the fact that the city's average positivity has climbed above 5 percent. The shift hints at the troublesome nature of a coronavirus statistic that heavily influences major decisions surrounding the pandemic in numerous states, counties, and school districts nationwide.

The number is deceptively basic. It's the percentage of positive virus tests among all virus tests performed, both positives and negatives. It may reflect the level of disease transmission in a community, but a sudden rise in a particular location could mean an increase in infections coupled with a need for more testing of the general population, among whom the rate is probably lower. The positivity rate statistic grew popular this spring during an early, catastrophic lack of testing. As tests became more available, a large portion came back positive, indicating there was not enough testing to keep up with the explosive spread of the virus. In May, the World Health Organization recommended that governments use a positivity rate of 5 percent or lower lasting for two weeks as a threshold for reopening.

"From then on, there have always been these statements about the percent positivity," says William Hanage, an associate professor of epidemiology at the Harvard Chan School of Public Health. "And really, it's just a sort of post-traumatic stress disorder, focusing back on the early stages of the pandemic."

encer

With the Positivity Rate

…kers to directly

…e things got sticky.

Under the current nonrandom, voluntary testing that prevails in the U.S., interpreting a positivity rate as an indicator of the spread of an infection is a little like assuming that a pond is well-stocked with fish after catching a few in a large mesh net swept through the water here and there. The positivity rate is an accurate indicator of spread in a community only if tests are taken by a group of people that is representative of an entire community, experts say.

But in nearly all U.S. cities and towns, tests are predominantly taken by people who feel sick, people who have a reason to be worried about being infected, or people who are already sick in the hospital. You'll get more positives from all those people than you would in the general community, so it can be dicey, especially over longer periods of time, to assume that these inflated positivity rates indicate the level of an infection's spread. In addition, many people who want a test often cannot get one due to long lines, lack of access to free testing, and limitations on who can receive a test in many parts of the U.S.

"Virtually nowhere is doing this random testing of people on the street," says Hanage. "And as a result of that, the test positivity statistic is almost meaningless in isolation from other things," including the raw number of people who test positive for the virus.

Indeed, most researchers avoid relying on any single number such as the positivity rate to understand the status of a community's outbreak, preferring to examine it alongside other statistics, such as the number of and trend direction for positive coronavirus cases in a community — is the number rising or falling? It's also crucial nowadays in the U.S. to look at these trends in the context of whether local hospitals have available beds, the extent of testing, and the average age at which people get infected, says Boston University epidemiologist Matthew Fox.

"You sort have to make an educated guess," Fox says. "And I think that's why there's so much frustration, because what we want is a scientific approach that tells us that if you hit this number, then it triggers action and we know that that is going to save lives. And we're just not there. This [virus] is something we're newly grappling with."

For instance, it would be misleading to base policy on South Dakota's 448 new infections reported on December 1 without also looking at its eye-popping positivity rate of 42.5 percent. Together these numbers start to paint a picture of a runaway outbreak and insufficient testing. By contrast, New York state on the same day reported over 16 times more new infections (7,413). In the context of the state's 3.7 percent positivity rate that day, it could suggest a more controlled outbreak and enough testing to inform efforts to control or respond to transmission. But it is not ideal to base policies on these two figures in the absence of community-wide random testing and other data such as local hospital capacities and available beds, equipment, and staffing.

Youyang Gu, an independent data scientist, has used the positivity rate to estimate the actual or true prevalence of coronavirus infections, pegging the national figure at 16 percent, as of November 18. Without commenting directly on Gu's work, Fox was cautious about the

approach. "To get prevalence, you don't want people coming to you [for testing] because they have symptoms, or because they have a reason to test. You want to just do a random sample of people," Fox says.

Meanwhile, the positivity rate statistic is so inconsistently calculated and reported across U.S. states that the COVID Tracking Project, one of the nation's trusted aggregators and reporters of coronavirus data and trends, doesn't publish it, says Jessica Malaty Rivera, the science communication lead with the project. An October blog post co-authored by Malaty Rivera called positivity rate figures in the U.S. "a mess" and stated that she and her team "emphatically recommend against over-reliance" on it to justify changes in policy.

And it's problematic to compare coronavirus positivity rates across communities because calculation methods vary, Malaty Rivera says. Some states take the standard approach, dividing the total number of tests taken by the number of tests that came up positive for the virus. But other states divide the total number of tests taken by the number of *people* who test positive. That approach gives you lower positivity rates because some people test more than once within a few days, say when they have symptoms or have recently been exposed to someone with the virus. You're only counting them once in this second approach, but you would count them each time they tested in the standard approach, yielding a higher percentage of positivity.

More recently, COVID Tracking Project data collectors have noticed that states are including the results of less accurate, less expensive so-called antigen tests, which look for pieces of the virus, not the whole virus, instead of the results of widely used PCR tests for the entire virus, Malaty Rivera says.

"For that reason, I feel especially pessimistic about the future of this calculation," Malaty Rivera says. "Because if we do see testing increase dramatically, it will be because of an influx in antigen testing. It really should just be PCR testing to determine this. And when we combine units, it's going back to basic fractions, right? You don't combine your apples and oranges when you're doing a math equation."

None of this means we should entirely discard the positivity rate as a statistic. We just need to evaluate it in the context of who is testing and how much testing is conducted in a community, says Fox. If the number of tests performed over a span of two or three weeks remains more or less constant, he says, and the positivity rate increases, it's reasonable to interpret that more as increased transmission in that community, and not just as an increased shortage of testing.

And to be fair to Mayor de Blasio, that is what the city's recent positivity data has looked like. Positive test numbers and COVID-19 hospitalizations in the city also have been rising.

Fox says he doesn't envy decision-makers during the pandemic, given the economic and epidemiologic complexity of the problem and the extremely limited experience all of us have with this coronavirus, beyond the past several months. "We are learning and adapting and learning and adapting," he says. "And you learn from successes, but you also learn from failures. And there is no easy, right answer in front of us."

TAGS: COVID-19 LOCKDOWNS

Data Table for Cumulative COVID-19 Nucleic Acid Amplification Tests (NAATs) Performed per 100k by State/Territory

CDC | Data as of: September 24, 2021 12:38 PM ET. Posted: September 24, 2021 1:50 PM ET

State	Cumulative Tests Performed per 100K	Cumulative Percent Positivity
Alaska	417,990.96	5-7.9%
Rhode Island	408,820.22	5-7.9%
Massachusetts	399,313.6	3-4.9%
District of Columbia	365,086.31	3-4.9%
Vermont	340,224.59	< 3%
New York*	286,574.43	5-7.9%
Minnesota	263,846.97	5-7.9%
Delaware	254,779.8	5-7.9%
North Dakota	236,907.36	5-7.9%
Maryland	223,859.73	8-9.9%
Illinois	200,734.86	5-7.9%
Maine	198,440.72	3-4.9%
California	196,026.59	5-7.9%
New Jersey	194,545.65	5-7.9%
Wisconsin	193,416.55	8-9.9%
West Virginia	190,522.49	8-9.9%
Florida	182,751.95	10-14.9%
New Hampshire	177,569.5	3-4.9%
Louisiana	175,469.77	8-9.9%
Colorado	171,619.55	5-7.9%
Wyoming	170,577.91	5-7.9%
New Mexico	169,183.04	8-9.9%
South Carolina	166,575.71	10-14.9%
Michigan	162,535.1	5-7.9%
Utah	156,578.84	10-14.9%
Indiana	152,292.43	10-14.9%
North Carolina	143,416.64	8-9.9%
Pennsylvania	138,795.47	8-9.9%
Arizona	138,228.62	10-14.9%
Montana	138,089.86	10-14.9%
Nevada	134,282.52	10-14.9%
Kentucky	133,281.64	10-14.9%
Iowa	133,241.99	10-14.9%
Ohio	132,557.31	8-9.9%
Kansas	131,412.71	10-14.9%
Missouri	129,831.05	10-14.9%
Nebraska	120,249.76	10-14.9%
Texas	118,504.05	10-14.9%
Virginia	116,699.57	10-14.9%
Idaho	116,031.93	15-19.9%
Alabama	116,029.27	10-14.9%
Arkansas	115,756.03	8-9.9%
Oregon	115,588.64	5-7.9%
Guam	104,606.38	5-7.9%
Georgia	102,874.07	10-14.9%
South Dakota	86,289.97	10-14.9%
Oklahoma	73,779.24	20-24.9%
Mississippi	61,218	10-14.9%
Puerto Rico	48,463.72	5-7.9%
Virgin Islands	41,213.4	8-9.9%
American Samoa	N/A	N/A
Connecticut	N/A	N/A
Federated States of Micronesia	N/A	N/A
Hawaii	N/A	N/A
New York (Level of Community Transmission)*	N/A	N/A
New York City*	N/A	N/A
Northern Mariana Islands	N/A	N/A
Palau	N/A	N/A
Republic of Marshall Islands	N/A	N/A
Tennessee	N/A	N/A
Washington	N/A	N/A

Source: CDC, *Data Table for Cumulative COVID-19 Nucleic Acid Amplification Tests (NAATs) Performed per 100k by State/Territory*, https://covid.cdc.gov/covid-data-tracker/#cases_testsper100k

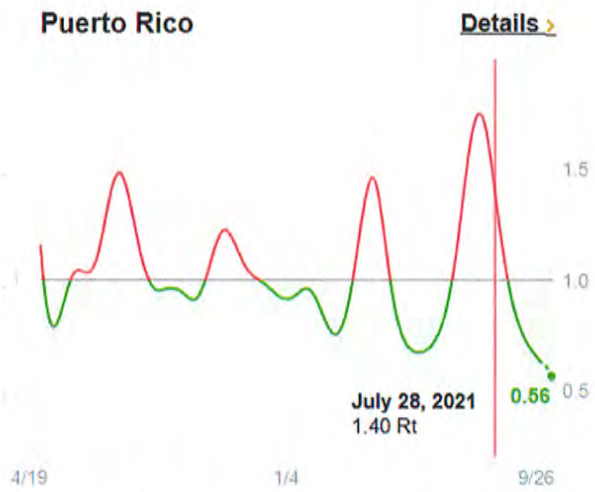
Data Table for COVID-19 Nucleic Acid Amplification Tests (NAATs) Performed in Last 30 Days per 100k by State/Territory

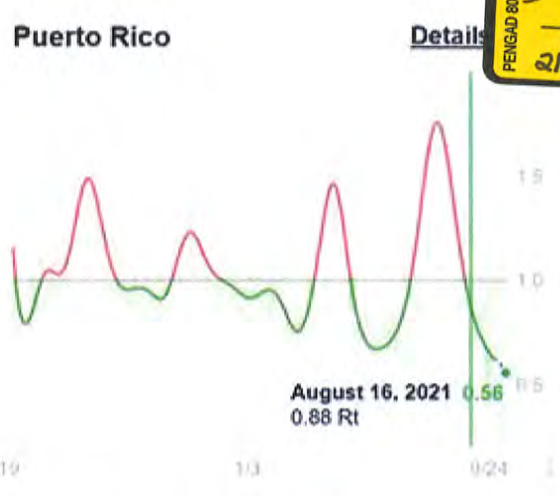
CDC | Data as of: September 24, 2021 12:38 PM ET. Posted: September 24, 2021 1:50 PM ET

Download Data

State	# Tests Performed Last 30 Days per 100K	30-day Percent Positivity
District of Columbia	41,671.61	3-4.9%
Rhode Island	31,602.64	< 3%
Massachusetts	30,349.98	< 3%
Vermont	29,975.37	3-4.9%
Alaska	23,552.89	8-9.9%
California	22,472.24	3-4.9%
South Carolina	21,286.75	10-14.9%
West Virginia	19,243.34	10-14.9%
New York*	19,177.57	3-4.9%
Guam	18,392.95	10-14.9%
Minnesota	17,878.45	5-7.9%
Illinois	16,340.23	3-4.9%
Delaware	15,998.23	8-9.9%
Kentucky	15,638.1	15-19.9%
North Carolina	15,484.19	10-14.9%
Wyoming	15,260.07	10-14.9%
Florida	15,145.41	10-14.9%
Maryland	14,478.37	5-7.9%
Colorado	13,622.69	5-7.9%
Wisconsin	13,568.72	8-9.9%
New Mexico	12,651.39	8-9.9%
New Jersey	12,574.79	5-7.9%
Idaho	12,223	20-24.9%
New Hampshire	11,901.65	5-7.9%
Kansas	11,836.07	10-14.9%
Indiana	11,589.76	10-14.9%
North Dakota	11,546.17	8-9.9%
Montana	11,204.67	15-19.9%
Maine	11,063.43	5-7.9%
Utah	10,987.23	10-14.9%
Arizona	10,969.89	10-14.9%
Missouri	10,704.48	10-14.9%
Texas	10,581.74	10-14.9%
Ohio	10,553.61	10-14.9%
Virginia	9,880.78	10-14.9%
Pennsylvania	9,833.92	8-9.9%
Oregon	9,785.39	10-14.9%
Georgia	9,762.33	15-19.9%
Iowa	9,628.47	10-14.9%
Louisiana	9,283.66	8-9.9%
Michigan	9,113.62	8-9.9%
Nevada	8,765.66	10-14.9%
Alabama	8,634.22	15-19.9%
Arkansas	8,382.29	10-14.9%
South Dakota	7,363.52	20-24.9%
Nebraska	6,361.33	10-14.9%
Oklahoma	6,297.82	15-19.9%
Puerto Rico	6,250.35	8-9.9%
Mississippi	5,219.6	15-19.9%
Virgin Islands	1,953.79	10-14.9%
American Samoa	N/A	N/A
Connecticut	N/A	N/A
Federated States of Micronesia	N/A	N/A
Hawaii	N/A	N/A
New York (Level of Community Transmission)*	N/A	N/A
New York City*	N/A	N/A
Northern Mariana Islands	N/A	N/A
Palau	N/A	N/A
Republic of Marshall Islands	N/A	N/A
Tennessee	N/A	N/A
Washington	N/A	N/A

Source: CDC, *Data Table for COVID-19 Nucleic Acid Amplification Tests (NAATs) Performed in Last 30 Days per 100k by State/Territory,* https://covid.cdc.gov/covid-data-tracker/#cases_testsper100k30day





Yale SCHOOL OF PUBLIC HEALTH
Epidemiology of Microbial Diseases

HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH
Department of Global Health and Population

Stanford MEDICINE

This project was supported by Cooperative Agreement NU38OT000297 from the Centers for Disease Control and Prevention (CDC) and the Council of State and Territorial Epidemiologists (CSTE), and does not necessarily represent the views of CDC or CSTE.

The effective reproductive number (R_t) is an important metric of epidemic growth. R_t is the average number of people that an individual infected on day t is expected to go on to infect. When R_t is above 1, we expect cases to increase in the near future. When R_t is below one, we expect cases to decrease in the near future.

Calculating R_t from the reported number of reported cases is complicated. People are typically diagnosed after they have already spread the disease, and many are not diagnosed at all. As diagnostic guidelines loosen and testing availability improves, we expect to see more cases, though the underlying incidence of disease may or may not have changed. Lags in diagnosis, diagnostic delays, and changing diagnostic guidelines will all impact case reports, and bias estimates of R_t.

We can avoid these biases by estimating R_t from the number of new infections each day. We estimate new infections using a statistical model that combines information about reported cases, reported deaths, the percentage of the population vaccinated, disease stage duration, and disease severity and mortality risks. **Our infections metric takes into account the delays mentioned above, and includes individuals who haven't tested positive.** Once we estimate the number of new infections each day, we can use that number to produce a more robust estimate of R_t. **Present-day estimates of R_t are highly uncertain, and can change dramatically over time.** We feel most confident about results for dates which are at least 14 days in the past. Additionally, R_t is easy to misinterpret. In many cases, we expect users will find our *Infections per capita* metric to be more useful. See here for a discussion of the pitfalls of R_t.

Contributors to this project include: Melanie H. Chitwood, Ted Cohen, Kenneth Gunasekera, Joshua Havumaki, Fayette Klaassen, Nicolas A. Menzies, Virginia E. Pitzer, Marcus Russi, Joshua Salomon, Nicole Swartwood, Joshua L. Warren, and Daniel M. Weinberger.

Compute and computational support provided by the Yale Center for Research Computing. We use Nextflow for orchestration.

Original site built by Mike Krieger, with thanks to Ryan O'Rourke and Thomas Dimson.

Visualizations built using d3 and react-vis; site built using Next.js.

Ahora

El 90 % de empleados públicos están inoculados contra el Covid-19

De acuerdo con los datos recopilados de las entidades gubernamentales, de un total de 104,108 trabajadores, 93,594 cuentan con la serie completa de la vacuna.

Por: EFE
Publicado: Sep 23, 2021 03:01 PM
Actualizado: Sep 23, 2021 03:01 PM

Un hombre recibe la vacuna contra el Covid-19 .
Foto: EFE

El 90 % de los empleados públicos de la isla están ya inoculados contra el Covid-19, según informó este jueves a través de un comunicado la directora de la Oficina de Administración y Transformación de los Recursos Humanos del Gobierno de Puerto Rico (Oatrh), Zahira Maldonado.

Indicó que, de acuerdo con los datos recopilados de las entidades gubernamentales, de un total de 104,108 empleados públicos, 93,594 cuentan con la serie completa de la vacuna contra el Covid-19.

Con la primera dosis de la vacuna hay 6,498 empleados, lo que corresponde al 6 %.

Asimismo, la titular de Oatrh indicó que hay 3,467 empleados no vacunados, lo que representa el 3 %.

"Puerto Rico está número dos en las estadísticas de vacunación en toda la nación -Estados Unidos- y el 90 % de nuestros empleados públicos forman parte de esas estadísticas que reflejan que vamos por buen camino", sostuvo Maldonado.

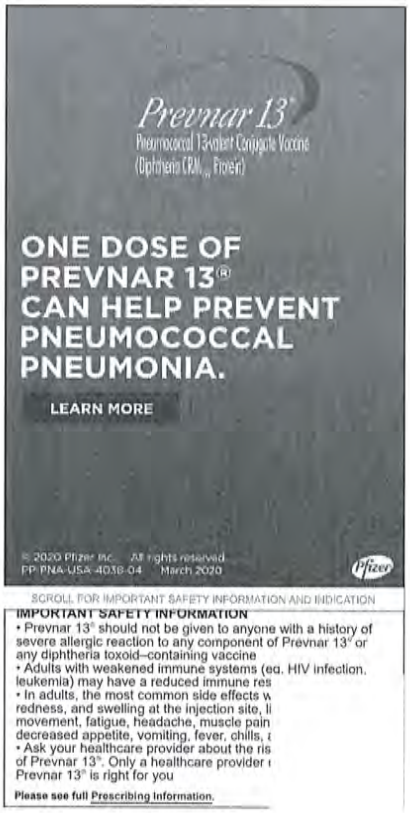
"Estamos cumpliendo con la política pública del gobernador de Puerto Rico, Pedro Pierluisi, porque existe un compromiso genuino por parte de nuestros servidores públicos para prevenir, controlar y erradicar la pandemia ocasionada por la covid-19", concluyó Maldonado.

A finales del pasado mes de julio, el gobernador firmó la orden ejecutiva 2021-058 en la que dictaminó que desde el pasado 16 de agosto las agencias deben requerir a todos sus empleados que trabajen de forma presencial estar debidamente vacunados.

El Departamento de Salud reportó hoy cuatro nuevas muertes por Covid-19, lo que eleva a 3,109 el total acumulado en ese apartado.

La tasa de positividad del virus en la isla se sitúa en el 5.4 %, mientras que en el conjunto de la población más del 55 % ha recibido el ciclo completo de vacunación.

EFE



HHS Protect Public Data Hub | Hospital Utilization | Hospital Reporting | Therapeutics | National Testing

HHS Protect Inpatient Bed Dashboard

State/Territory
Please select from the list

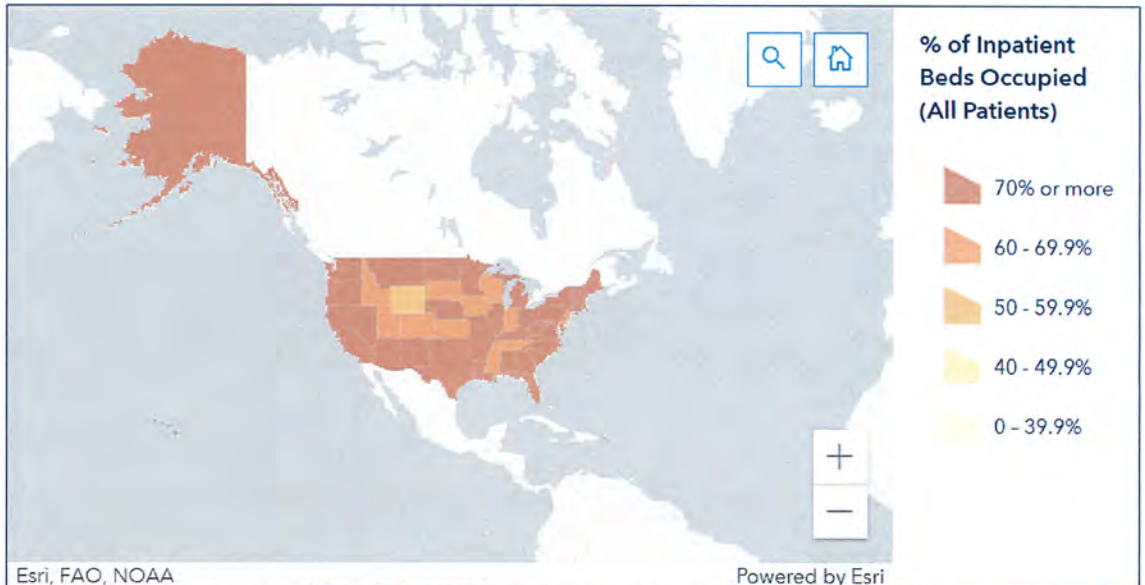
780,225
Inpatient Beds
6,172 Hospitals Reporting

591,831
Inpatient Beds in Use
6,155 Hospitals Reporting

81,106
Inpatient Beds in Use for COVID-19
5,973 Hospitals Reporting

75.99%
of Inpatient Beds in Use
6,155 Hospitals Reporting

10.64%
of Inpatient Beds in Use for COVID-19
5,972 Hospitals Reporting



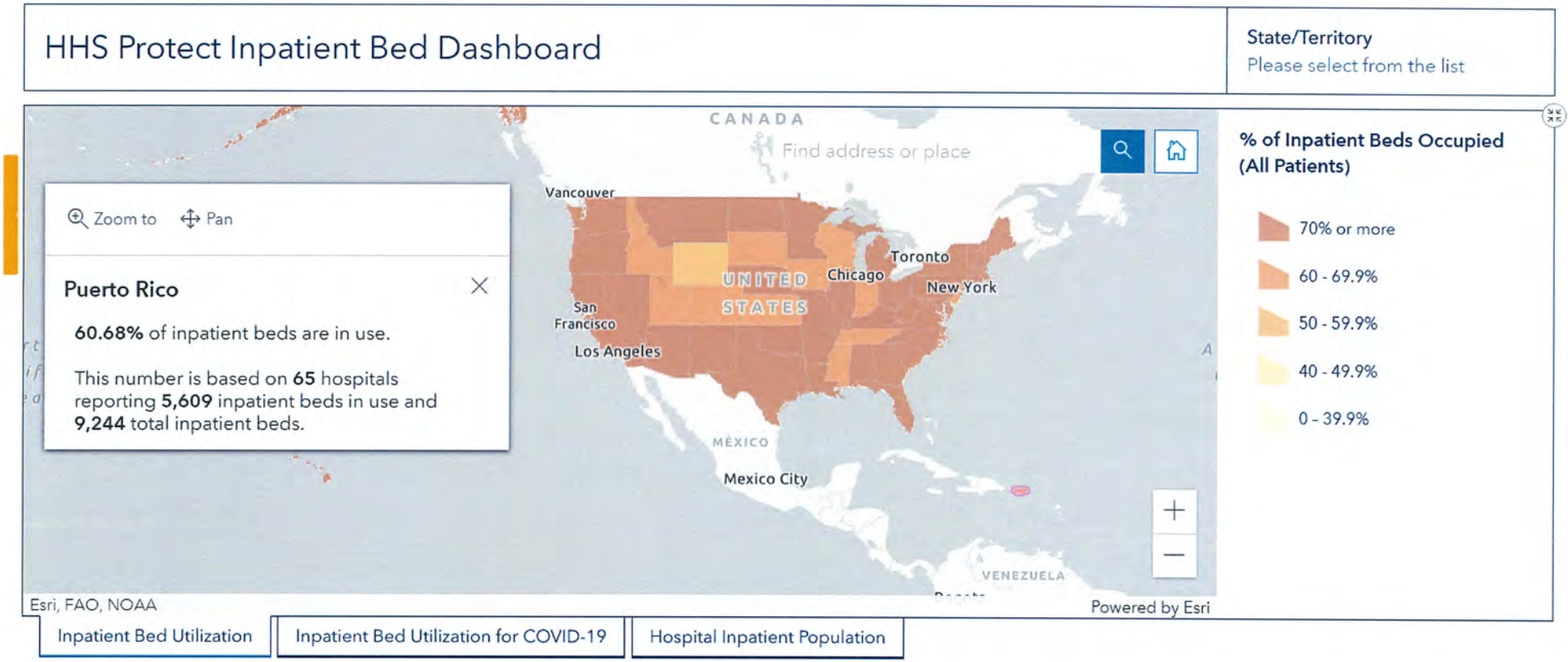
Inpatient Bed Utilization | Inpatient Bed Utilization for COVID-19 | Hospital Inpatient Population

Last Updated 9/27/2021

US Dept. of Health and Human Services, *HHS Protect Inpatient Bed Dashboard*, https://protect-public.hhs.gov/pages/hospital-utilization

HHS Protect Public Data Hub | Hospital Utilization | Hospital Reporting | Therapeutics | National Testing

Select your State or Territory from the dropdown on the right to see information on inpatient bed utilization.



US Dept. of Health and Human Services, *HHS Protect Inpatient Bed Dashboard*, https://protect-public.hhs.gov/pages/hospital-utilization

New Admissions of Patients with Confirmed COVID-19, Puerto Rico

Aug 01, 2020 - Sep 24, 2021

13,242
Total Admissions
Aug 01, 2020 - Sep 24, 2021

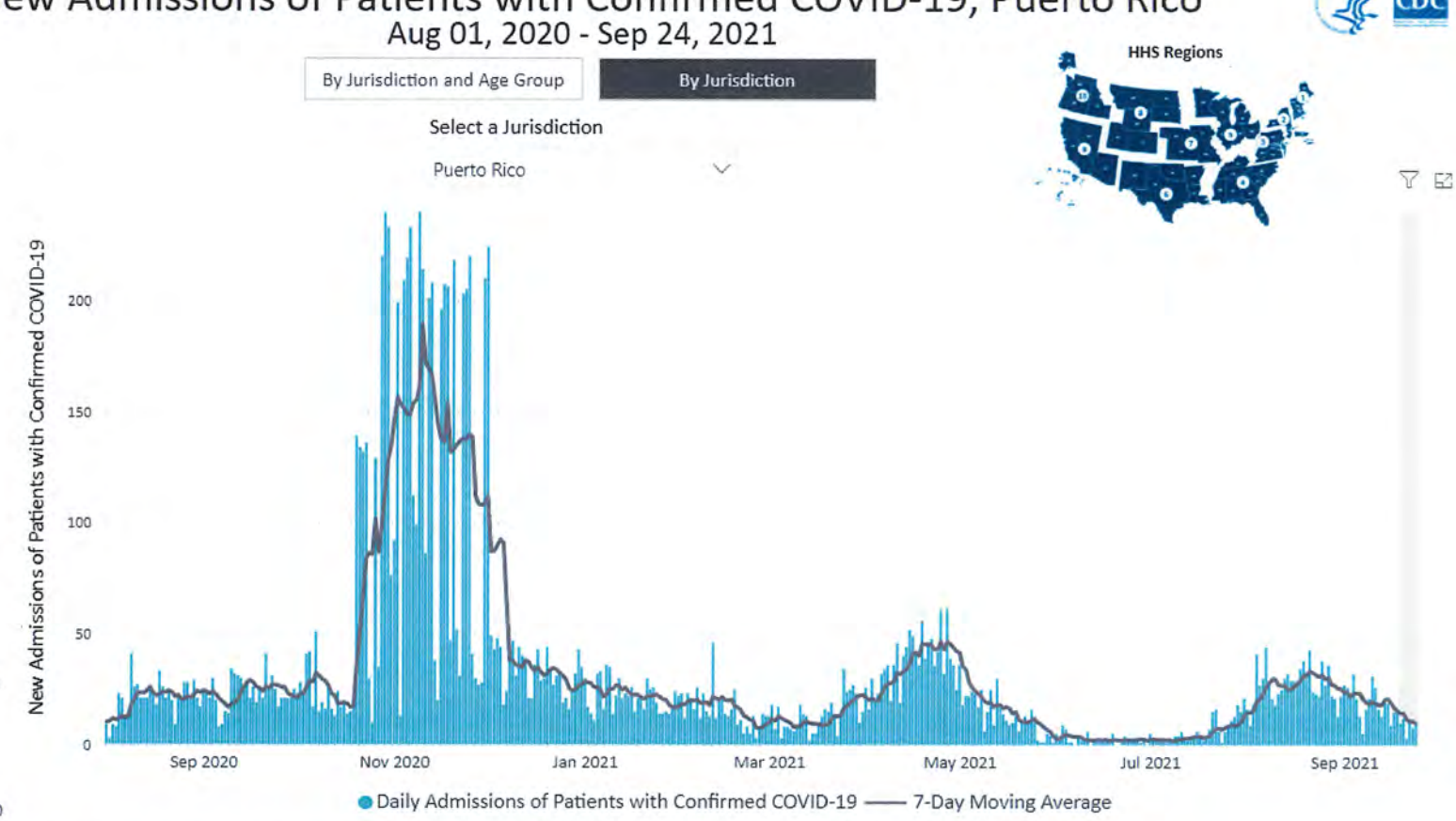
10
Current 7-Day Average
Sep 18, 2021 - Sep 24, 2021

17
Prior 7-Day Average
Sep 11, 2021 - Sep 17, 2021

189
Peak 7-Day Average
Nov 04, 2020 - Nov 10, 2020

-41.2%
Percent change from prior 7-day avg. of Sep 11, 2021 - Sep 17, 2021

-94.7%
Percent change from peak 7-day avg. of Nov 04, 2020 - Nov 10, 2020



Based on reporting from all hospitals (N=5,256). Due to potential reporting delays, data reported in the most recent 7 days (as represented by the shaded bar) should be interpreted with caution.
Small shifts in historic data may occur due to changes in the CMS Provider of Services file, which is used to identify the cohort of included hospitals. Data since December 1, 2020 have had error correction methodology applied. Data prior to this date may have anomalies that are still being resolved. Data prior to August 1, 2020 are unavailable.

Last Updated: Sep 26, 2021

Unified Hospital Dataset, White House COVID-19 Team, Data Strategy and Execution Workgroup

Source: CDC, *New Hospital Admissions*, https://covid.cdc.gov/covid-data-tracker/#new-hospital-admissions

Title page

Comparing SARS-CoV-2 natural immunity to vaccine-induced immunity: reinfections versus breakthrough infections

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The authors declare they have no conflict of interest.

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Abstract

Background:

Reports of waning vaccine-induced immunity against COVID-19 have begun to surface. With that, the comparable long-term protection conferred by previous infection with SARS-CoV-2 remains unclear.

Methods:

We conducted a retrospective observational study comparing three groups: (1)SARS-CoV-2-naïve individuals who received a two-dose regimen of the BioNTech/Pfizer mRNA BNT162b2 vaccine, (2)previously infected individuals who have not been vaccinated, and (3)previously infected *and* single dose vaccinated individuals. Three multivariate logistic regression models were applied. In all models we evaluated four outcomes: SARS-CoV-2 infection, symptomatic disease, COVID-19-related hospitalization and death. The follow-up period of June 1 to August 14, 2021, when the Delta variant was dominant in Israel.

Results:

SARS-CoV-2-naïve vaccinees had a 13.06-fold (95% CI, 8.08 to 21.11) increased risk for breakthrough infection with the Delta variant compared to those previously infected, when the first event (infection or vaccination) occurred during January and February of 2021. The increased risk was significant ($P<0.001$) for symptomatic disease as well. When allowing the infection to occur at any time before vaccination (from March 2020 to February 2021), evidence of waning natural immunity was demonstrated, though SARS-CoV-2 naïve vaccinees had a 5.96-fold (95% CI, 4.85 to

7.33) increased risk for breakthrough infection and a 7.13-fold (95% CI. 5.51 to 9.21) increased risk for symptomatic disease. SARS-CoV-2-naïve vaccinees were also at a greater risk for COVID-19-related-hospitalizations compared to those that were previously infected.

Conclusions:

This study demonstrated that natural immunity confers longer lasting and stronger protection against infection, symptomatic disease and hospitalization caused by the Delta variant of SARS-CoV-2, compared to the BNT162b2 two-dose vaccine-induced immunity. Individuals who were both previously infected with SARS-CoV-2 and given a single dose of the vaccine gained additional protection against the Delta variant.

Introduction

The heavy toll that SARS-CoV-2 infection has been taking on global health and healthcare resources has created an urgent need to estimate which part of the population is protected against COVID-19 at a given time in order to set healthcare policies such as lockdowns and to assess the possibility of herd immunity.

To date, there is still no evidence-based, long-term correlate of protection[1]. This lack of correlate of protection has led to different approaches in terms of vaccine resource allocation, namely the need for vaccine administration in recovered patients, the need for booster shots in previously vaccinated individuals or the need to vaccinate low-risk populations, potentially previously exposed.

The short-term effectiveness of a two-dose regimen of the BioNTech/Pfizer BNT162b2 mRNA COVID-19 vaccine was demonstrated in clinical trials[2] and in observational settings[3,4]. However, long term effectiveness across different variants is still unknown, though reports of waning immunity are beginning to surface, not merely in terms of antibody dynamics over time[5–7], but in real-world settings as well[8].

Alongside the question of long-term protection provided by the vaccine, the degree and duration to which previous infection with SARS-CoV-2 affords protection against repeated infection also remains unclear. Apart from the paucity of studies examining long-term protection against reinfection[9], there is a challenge in defining reinfection as opposed to prolonged viral shedding[10]. While clear-cut cases exist, namely two separate clinical events with two distinct sequenced viruses, relying solely on these cases will likely result in an under-estimation of the incidence of reinfection. Different criteria based on more widely-available information have been suggested[11]. the Centers for Disease Control and Prevention's (CDC) guidelines refer to two positive SARS-CoV-2 polymerase chain reaction (PCR) test results at least 90 days

apart.[12] Using similar criteria, population-based studies demonstrated natural immunity[13,14] with no signs of waning immunity for at least 7 months, though protection was lower for those aged 65 or older[9].

The Delta (B.1.617.2) Variant of Concern (VOC), initially identified in India and today globally prevalent, has been the dominant strain in Israel since June 2021. The recent surge of cases in Israel[15], one of the first countries to embark on a nationwide vaccination campaign (mostly with the BioNTech/Pfizer BNT162b2 vaccine), has raised concerns about vaccine effectiveness against the Delta variant, including official reports of decreased protection[16]. Concomitantly, studies have demonstrated only mild differences in short-term vaccine effectiveness[17] against the Delta variant, as well as substantial antibody response[18]. Apart from the variant, the new surge was also explained by the correlation found between time-from-vaccine and breakthrough infection rates, as early vaccinees were demonstrated to be significantly more at risk than late vaccinees[8]. Now, when sufficient time has passed since both the beginning of the pandemic and the deployment of the vaccine, we can examine the long-term protection of natural immunity compared to vaccine-induced immunity.

To this end, we compared the incidence rates of breakthrough infections to the incidence rates of reinfection, leveraging the centralized computerized database of Maccabi Healthcare Services (MHS), Israel's second largest Health Maintenance Organization.

Methods

Study design and population

A retrospective cohort study was conducted, leveraging data from MHS' centralized computerized database. The study population included MHS members aged 16 or older who were vaccinated prior to February 28, 2021, who had a documented SARS-CoV-2 infection by February 28, 2021, or who had both a documented SARS-CoV-2 infection by February 28, 2021 *and* received one dose of the vaccine by May 25, 2021, at least 7 days before the study period. On March 2, 2021, The Israeli Ministry of Health revised its guidelines and allowed previously SARS-CoV-2 infected individuals to receive one dose of the vaccine, after a minimum 3-month-interval from the date of infection

Data Sources

Anonymized Electronic Medical Records (EMRs) were retrieved from MHS' centralized computerized database for the study period of March 1, 2020 to August 14, 2021.

MHS is a 2.5-million-member, state-mandated, non-for-profit, second largest health fund in Israel, which covers 26% of the population and provides a representative sample of the Israeli population. Membership in one of the four national health funds is mandatory, whereas all citizens must freely choose one of four funds, which are prohibited by law from denying membership to any resident. MHS has maintained a centralized database of EMRs for three decades, with less than 1% disengagement rate among its members, allowing for a comprehensive longitudinal medical follow-up. The centralized dataset includes extensive demographic data, clinical measurements, outpatient and hospital diagnoses and procedures, medications

dispensed, imaging performed and comprehensive laboratory data from a single central laboratory.

Data extraction and definition of the study variables

COVID-19-related data

COVID-19-related information was captured as well, including dates of the first and second dose of the vaccine and results of any polymerase chain reaction (PCR) tests for SARS-CoV-2, given that all such tests are recorded centrally. Records of COVID-19-related hospitalizations were retrieved as well, and COVID-19-related mortality was screened for. Additionally, information about COVID-19-related symptoms was extracted from EMRs, where they were recorded by the primary care physician or a certified nurse who conducted in-person or phone visits with each infected individual.

Exposure variable: study groups

The eligible study population was divided into three groups: (1)fully vaccinated and SARS-CoV-2-naïve individuals, namely MHS members who received two doses of the BioNTech/Pfizer mRNA BNT162b2 vaccine by February 28, 2021, did not receive the third dose by the end of the study period and did not have a positive PCR test result by June 1, 2021; (2) unvaccinated previously infected individuals, namely MHS members who had a positive SARS-CoV-2 PCR test recorded by February 28, 2021 and who had not been vaccinated by the end of the study period; (3) previously infected *and* vaccinated individuals, including individuals who had a positive SARS-CoV-2 PCR test by February 28, 2021 and received one dose of the vaccine by May 25, 2021, at least 7 days before the study period. The fully vaccinated group was the comparison (reference) group in our study. Groups 2 and 3, were matched to the

comparison group 1 in a 1:1 ratio based on age, sex and residential socioeconomic status.

Dependent variables

We evaluated four SARS-CoV-2-related outcomes, or second events: documented RT-PCR confirmed SARS-CoV-2 infection, COVID-19, COVID-19-related hospitalization and death. Outcomes were evaluated during the follow-up period of June 1 to August 14, 2021, the date of analysis, corresponding to the time in which the Delta variant became dominant in Israel.

Covariates

Individual-level data of the study population included patient demographics, namely age, sex, socioeconomic status (SES) and a coded geographical statistical area (GSA, assigned by Israel's National Bureau of Statistics, corresponds to neighborhoods and is the smallest geostatistical unit of the Israeli census). The SES is measured on a scale from 1 (lowest) to 10, and the index is based on several parameters, including household income, educational qualifications, household crowding and car ownership. Data were also collected on last documented body mass index (BMI) and information about chronic diseases from MHS' automated registries, including cardiovascular diseases[19], hypertension[20], diabetes[21], chronic kidney disease[22], chronic obstructive pulmonary disease, immunocompromised conditions, and cancer from the National Cancer Registry[23].

Statistical analysis

Two multivariate logistic regression models were applied that evaluated the four aforementioned SARS-CoV-2-related outcomes as dependent variables, while the study groups were the main independent variables.

Model 1– previously infected vs. vaccinated individuals, with matching for time of first event

In model 1, we examined natural immunity and vaccine-induced immunity by comparing the likelihood of SARS-CoV-2-related outcomes between previously infected individuals who have never been vaccinated and fully vaccinated SARS-CoV-2-naïve individuals. These groups were matched in a 1:1 ratio by age, sex, GSA and time of first event. The first event (the preliminary exposure) was either the time of administration of the second dose of the vaccine *or* the time of documented infection with SARS-CoV-2 (a positive RT-PCR test result), both occurring between January 1, 2021 and February 28, 2021. Thereby, we matched the "immune activation" time of both groups, examining the long-term protection conferred when vaccination or infection occurred within the same time period. The three-month interval between the first event and the second event was implemented in order to capture reinfections (as opposed to prolonged viral shedding) by following the 90-day guideline of the CDC.

Model 2

In model 2, we compared the SARS-CoV-2 naïve vaccinees to unvaccinated previously infected individuals while intentionally *not* matching the time of the first event (i.e., either vaccination or infection), in order to compare vaccine-induced immunity to natural immunity, regardless of time of infection. Therefore, matching

was done in a 1:1 ratio based on age, sex and GSA alone. Similar to the model 1, either event (vaccination or infection) had to occur by February 28, to allow for the 90-day interval. The four SARS-CoV-2 study outcomes were the same for this model, evaluated during the same follow-up period.

Model 3

Model 3 examined previously infected individuals vs. previously-infected-and-once-vaccinated individuals, using "natural immunity" as the baseline group. We matched the groups in a 1:1 ratio based on age, sex and GSA. SARS-CoV-2 outcomes were the same, evaluated during the same follow-up period.

In all three models, we estimated natural immunity vs. vaccine-induced immunity for each SARS-CoV-2-related outcome, by applying logistic regression to calculate the odds ratio (OR) between the two groups in each model, with associated 95% confidence intervals (CIs). Results were then adjusted for underlying comorbidities, including obesity, cardiovascular diseases, diabetes, hypertension, chronic kidney disease, cancer and immunosuppression conditions.

Analyses were performed using Python version 3.73 with the stats model package. $P < 0.05$ was considered statistically significant.

Ethics declaration

This study was approved by the MHS (Maccabi Healthcare Services) Institutional Review Board (IRB). Due to the retrospective design of the study, informed consent was waived by the IRB, and all identifying details of the participants were removed before computational analysis.

Data availability statement

According to the Israel Ministry of Health regulations, individual-level data cannot be shared openly. Specific requests for remote access to de-identified community-level data should be directed to KSM, Maccabi Healthcare Services Research and Innovation Center.

Code availability

Specific requests for remote access to the code used for data analysis should be referred to KSM, Maccabi Healthcare Services Research and Innovation Center.

Results

Overall, 673,676 MHS members 16 years and older were eligible for the study group of fully vaccinated SARS-CoV-2-naïve individuals; 62,883 were eligible for the study group of unvaccinated previously infected individuals and 42,099 individuals were eligible for the study group of previously infected and single-dose vaccinees.

Model 1 – previously infected vs. vaccinated individuals, with matching for time of first event

In model 1, we matched 16,215 persons in each group. Overall, demographic characteristics were similar between the groups, with some differences in their comorbidity profile (Table 1a).

During the follow-up period, 257 cases of SARS-CoV-2 infection were recorded, of which 238 occurred in the vaccinated group (breakthrough infections) and 19 in the previously infected group (reinfections). After adjusting for comorbidities, we found a statistically significant 13.06-fold (95% CI, 8.08 to 21.11) increased risk for breakthrough infection as opposed to reinfection ($P<0.001$). Apart from age ≥60 years, there was no statistical evidence that any of the assessed comorbidities significantly affected the risk of an infection during the follow-up period (Table 2a).

As for symptomatic SARS-COV-2 infections during the follow-up period, 199 cases were recorded, 191 of which were in the vaccinated group and 8 in the previously infected group. Symptoms for all analyses were recorded in the central database within 5 days of the positive RT-PCR test for 90% of the patients, and included chiefly fever, cough, breathing difficulties, diarrhea, loss of taste or smell, myalgia, weakness, headache and sore throat. After adjusting for comorbidities, we found a 27.02-fold risk (95% CI, 12.7 to 57.5) for symptomatic breakthrough infection as

opposed to symptomatic reinfection (P<0.001) (Table 2b). None of the covariates were significant, except for age ≥60 years.

Nine cases of COVID-19-related hospitalizations were recorded, 8 of which were in the vaccinated group and 1 in the previously infected group (Table S1). No COVID-19-related deaths were recorded in our cohorts.

Model 2 –previously infected vs. vaccinated individuals, without matching for time of first event

In model 2, we matched 46,035 persons in each of the groups (previously infected vs. vaccinated). Baseline characteristics of the groups are presented in Table 1a. Figure 1 demonstrates the timely distribution of the first infection in reinfected individuals. When comparing the vaccinated individuals to those previously infected at any time (including during 2020), we found that throughout the follow-up period, 748 cases of SARS-CoV-2 infection were recorded, 640 of which were in the vaccinated group (breakthrough infections) and 108 in the previously infected group (reinfections). After adjusting for comorbidities, a 5.96-fold increased risk (95% CI, 4.85 to 7.33) increased risk for breakthrough infection as opposed to reinfection could be observed (P<0.001) (Table 3a). Apart from SES level and age ≥60, that remained significant in this model as well, there was no statistical evidence that any of the comorbidities significantly affected the risk of an infection.

Overall, 552 symptomatic cases of SARS-CoV-2 were recorded, 484 in the vaccinated group and 68 in the previously infected group. There was a 7.13-fold (95% CI, 5.51 to 9.21) increased risk for symptomatic breakthrough infection than symptomatic reinfection (Table 3b). COVID-19 related hospitalizations occurred in 4 and 21 of the reinfection and breakthrough infection groups, respectively. Vaccinated

individuals had a 6.7-fold (95% CI, 1.99 to 22.56) increased to be admitted compared to recovered individuals. Being 60 years of age or older significantly increased the risk of COVID-19-related hospitalizations (Table S2). No COVID-19-related deaths were recorded.

Model 3 - previously infected vs. vaccinated and previously infected individuals

In model 3, we matched 14,029 persons. Baseline characteristics of the groups are presented in Table 1b. Examining previously infected individuals to those who were both previously infected and received a single dose of the vaccine, we found that the latter group had a significant 0.53-fold (95% CI, 0.3 to 0.92) (Table 4a) decreased risk for reinfection, as 20 had a positive RT-PCR test, compared to 37 in the previously infected and unvaccinated group. Symptomatic disease was present in 16 single dose vaccinees and in 23 of their unvaccinated counterparts. One COVID-19-related hospitalization occurred in the unvaccinated previously infected group. No COVID-19-related mortality was recorded.

We conducted a further sub-analysis, compelling the single-dose vaccine to be administered *after* the positive RT-PCR test. This subset represented 81% of the previously-infected-and-vaccinated study group. When performing this analysis, we found a similar, though not significant, trend of decreased risk of reinfection, with an OR of 0.68 (95% CI, 0.38 to 1.21, *P*-value=0.188).

Discussion

This is the largest real-world observational study comparing natural immunity, gained through previous SARS-CoV-2 infection, to vaccine-induced immunity, afforded by the BNT162b2 mRNA vaccine. Our large cohort, enabled by Israel's rapid rollout of the mass-vaccination campaign, allowed us to investigate the risk for additional infection – either a breakthrough infection in vaccinated individuals or reinfection in previously infected ones – over a longer period than thus far described.

Our analysis demonstrates that SARS-CoV-2-naïve vaccinees had a 13.06-fold increased risk for breakthrough infection with the Delta variant compared to those previously infected, when the first event (infection or vaccination) occurred during January and February of 2021. The increased risk was significant for a symptomatic disease as well.

Broadening the research question to examine the extent of the phenomenon, we allowed the infection to occur at any time between March 2020 to February 2021 (when different variants were dominant in Israel), compared to vaccination only in January and February 2021. Although the results could suggest waning natural immunity against the Delta variant, those vaccinated are still at a 5.96-fold increased risk for breakthrough infection and at a 7.13-fold increased risk for symptomatic disease compared to those previously infected. SARS-CoV-2-naïve vaccinees were also at a greater risk for COVID-19-related-hospitalization compared to those who were previously infected.

Individuals who were previously infected with SARS-CoV-2 seem to gain additional protection from a subsequent single-dose vaccine regimen. Though this finding corresponds to previous reports[24,25], we could not demonstrate significance in our cohort.

The advantageous protection afforded by natural immunity that this analysis demonstrates could be explained by the more extensive immune response to the SARS-CoV-2 proteins than that generated by the anti-spike protein immune activation conferred by the vaccine[26,27]. However, as a correlate of protection is yet to be proven[1,28], including the role of B-Cell[29] and T-cell immunity[30,31], this remains a hypothesis.

Our study has several limitations. First, as the Delta variant was the dominant strain in Israel during the outcome period, the decreased long-term protection of the vaccine compared to that afforded by previous infection cannot be ascertained against other strains. Second, our analysis addressed protection afforded solely by the BioNTech/Pfizer mRNA BNT162b2 vaccine, and therefore does not address other vaccines or long-term protection following a third dose, of which the deployment is underway in Israel. Additionally, as this is an observational real-world study, where PCR screening was not performed by protocol, we might be underestimating asymptomatic infections, as these individuals often do not get tested.

Lastly, although we controlled for age, sex, and region of residence, our results might be affected by differences between the groups in terms of health behaviors (such as social distancing and mask wearing), a possible confounder that was not assessed. As individuals with chronic illness were primarily vaccinated between December and February, confounding by indication needs to be considered; however, adjusting for obesity, cardiovascular disease, diabetes, hypertension, chronic kidney disease, chronic obstructive pulmonary disease, cancer and immunosuppression had only a small impact on the estimate of effect as compared to the unadjusted OR. Therefore, residual confounding by unmeasured factors is unlikely.

This analysis demonstrated that natural immunity affords longer lasting and stronger protection against infection, symptomatic disease and hospitalization due to the Delta variant of SARS-CoV-2, compared to the BNT162b2 two-dose vaccine-induced immunity. Notably, individuals who were previously infected with SARS-CoV-2 and given a single dose of the BNT162b2 vaccine gained additional protection against the Delta variant. The long-term protection provided by a third dose, recently administered in Israel, is still unknown.

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Tables and figures

Table 1a. Characteristics of study population, model 1 and 2.

	Model 1 – with matching of time of first event		**Model 2 – without matching of time of first event**	
Characteristics	Previously infected (n=16,215)	Vaccinated individuals (n=16,215)	Previously infected (n=46,035)	Previously infected *and* vaccinated (n =46,035)
Age years, mean (SD)	36.1 (13.9)	36.1 (13.9)	36.1 (14.7)	36.1 (14.7)
Age group – no. (%)				
16 to 39 yr	9,889 (61.0)	9,889 (61.0)	28,157 (61.2)	28,157 (61.2)
40 to 59 yr	5,536 (34.1)	5,536 (34.1)	14,973 (32.5)	14,973 (32.5)
≥60 yr	790 (4.9)	790 (4.9)	2,905 (6.3)	2,905 (6.3)
Sex – no. (%)				
Female	7,428 (45.8)	7,428 (45.8)	22,661 (49.2)	22,661 (49.2)
Male	8,787 (54.2)	8,787 (54.2)	23,374 (50.8)	23,374 (50.8)
SES, mean (SD)	5.5 (1.9)	5.5 (1.9)	5.3 (1.9)	5.3 (1.9)
Comorbidities – no. (%)				
Hypertension	1,276 (7.9)	1,569 (9.7)	4,009 (8.7)	4,301 (9.3)
CVD	551 (3.4)	647 (4.0)	1,875 (4.1)	1830 (4.0)
DM	635 (3.9)	877 (5.4)	2207 (4.8)	2300 (5.0)
Immunocompromised	164 (1.0)	420 (2.6)	527 (1.1)	849 (1.8)
Obesity (BMI ≥30)	3,076 (19.0)	3,073 (19.0)	9,117 (19.8)	8,610 (18.7)
CKD	196 (1.2)	271 (1.7)	659 (1.4)	814 (1.8)
COPD	65 (0.4)	97 (0.6)	218 (0.5)	292 (0.6)
Cancer	324 (2.0)	636 (3.9)	1,044 (2.3)	1,364 (3.0)

SD – Standard Deviation; SES – Socioeconomic status on a scale from 1 (lowest) to 10; CVD – Cardiovascular Diseases; DM – Diabetes Mellitus; CKD – Chronic Kidney Disease; COPD – Chronic Obstructive Pulmonary Disease.

Table 1b. Characteristics of study population, model 3.

Characteristics	Previously infected (n=14,029)	Previously infected and single dose vaccinated (n=14,029)
Age years, mean (SD)	33.2 (14.0)	33.2 (14.0)
Age group – no. (%)		
16 to 39 yr	9543 (68.0)	9543 (68.0)
40 to 59 yr	3919 (27.9)	3919 (27.9)
≥60 yr	567 (4.0)	567 (4.0)
Sex – no. (%)		
Female	7467 (53.2)	7467 (53.2)
Male	6562 (46.8)	6562 (46.8)
SES, mean (SD)	4.7 (1.9)	4.7 (1.9)
Comorbidities		
Hypertension	892 (6.4)	1004 (7.2)
CVD	437 (3.1)	386 (2.8)
DM	529 (3.8)	600 (4.3)
Immunocompromised	127 (0.9)	145 (1.0)
Obesity (BMI ≥30)	2599 (18.5)	2772 (19.8)
CKD	137 (1.0)	162 (1.2)
COPD	30 (0.2)	53 (0.4)
Cancer	241 (1.7)	267 (1.9)

SD – Standard Deviation; SES – Socioeconomic status on a scale from 1 (lowest) to 10; CVD – Cardiovascular Diseases; DM – Diabetes Mellitus; CKD – Chronic Kidney Disease; COPD – Chronic Obstructive Pulmonary Disease.

Table 2a. OR for SARS-CoV-2 infection, model 1, previously infected vs. vaccinated

Variable	Category	ß	OR	95%CI	P-value
Induced Immunity					
	Previously infected	Ref			
	Vaccinated	2.57	13.06	8.08 – 21.11	<0.001
SES		0.04	1.04	0.97 – 1.11	0.251
Age group, yr.					
	16-39	Ref			
	40-59	0.05	1.05	0.78 - 1.4	0.751
	≥60	0.99	2.7	1.68 – 4.34	<0.001
Sex					
	Female	Ref			
	Male	-0.03	0.97	0.76 – 1.25	0.841
Comorbidities					
	Obesity (BMI≥30)	0.01	1.01	0.73 – 1.39	0.967
	Diabetes mellitus	-0.36	0.7	0.39 – 1.25	0.229
	Hypertension	0.1	1.11	0.72 – 1.72	0.641
	Cancer	0.37	1.44	0.85 – 2.44	0.171
	CKD	0.53	1.7	0.83 – 3.46	0.146
	COPD	-0.46	0.63	0.15 – 2.66	0.529
	Immunosuppression	-0.1	0.91	0.42 – 1.97	0.803
	Cardiovascular diseases	0.26	1.3	0.75 – 2.25	0.343

OR – Odds Ratio; SES – Socioeconomic status on a scale from 1 (lowest) to 10; CVD – Cardiovascular Diseases; CKD – Chronic Kidney Disease; COPD – Chronic Obstructive Pulmonary Disease.

Table 2b. OR for Symptomatic SARS-CoV-2 infection, model 1, previously infected vs. vaccinated

Variable	Category	ß	OR	95%CI	P-value
Induced Immunity	Previously infected	Ref			
	Vaccinated	3.3	27.02	12.7 – 57.5	<0.001
SES		0.04	1.04	0.96 – 1.12	0.312
Age group, yr.					
	16-39	Ref			
	40-59	0.19	1.21	0.88 – 1.67	0.25
	≥60	1.06	2.89	1.68 – 4.99	<0.001
Sex					
	Female	Ref			
	Male	-0.19	0.82	0.62 – 1.1	0.185
Comorbidities					
	Obesity (BMI≥30)	0.02	1.02	0.71 – 1.48	0.899
	Diabetes mellitus	-0.31	0.73	0.37 – 1.43	0.361
	Hypertension	0.12	1.13	0.69 – 1.85	0.623
	Cancer CKD COPD	0.37 0.1 -0.78	1.45 1.1 0.46	0.8 – 2.62 0.42 – 2.87 0.06 – 3.41	0.217 0.846 0.445
	Immunosuppression	-0.37	0.69	0.25 – 1.89	0.468
	Cardiovascular diseases	0.03	1.03	0.52 – 2.03	0.941

OR – Odds Ratio; SES – Socioeconomic status on a scale from 1 (lowest) to 10; CVD – Cardiovascular Diseases; CKD – Chronic Kidney Disease; COPD – Chronic Obstructive Pulmonary Disease.

Table 3a. OR for SARS-CoV-2 infection, model 2, previously infected vs. vaccinated

Variable	Category	ß	OR	95%CI	P-value
Induced Immunity					
	Previously infected	Ref			
	Vaccinated	1.78	5.96	4.85 – 7.33	<0.001
SES		0.07	1.07	1.03 – 1.11	<0.001
Age group, yr.					
	16-39	Ref			
	40-59	0.06	1.06	0.9 – 1.26	0.481
	≥60	0.79	2.2	1.66 – 2.92	<0.001
Sex					
	Female	Ref			
	Male	-0.01	0.99	0.85 - 1.14	0.842
Comorbidities					
	Obesity (BMI≥30)	0.12	1.13	0.94 – 1.36	0.202
	Diabetes mellitus	-0.15	0.86	0.61 – 1.22	0.4
	Hypertension	-0.12	0.89	0.67 – 1.17	0.402
	Cancer	0.2	1.22	0.85 – 1.76	0.283
	CKD	0.3	1.35	0.85 – 2.14	0.207
	COPD	0.48	1.62	0.88 – 2.97	0.121
	Immunosuppression	-0.03	0.98	0.57 – 1.66	0.925
	Cardiovascular diseases	0.08	1.09	0.77 – 1.53	0.638

OR – Odds Ratio; SES – Socioeconomic status on a scale from 1 (lowest) to 10; CVD – Cardiovascular Diseases; CKD – Chronic Kidney Disease; COPD – Chronic Obstructive Pulmonary Disease.

Table 3b. OR for Symptomatic SARS-CoV-2 infection, model 2, previously infected vs. vaccinated

Variable	Category	ß	OR	95%CI	P-value
Induced Immunity	Previously infected	Ref			
	Vaccinated	1.96	7.13	5.51 – 9.21	<0.001
SES		0.07	1.07	1.02 – 1.12	0.003
Age group, yr.					
	16-39	Ref			
	40-59	0.09	1.1	0.9 – 1.33	0.35
	≥60	0.8	2.23	1.61 – 3.09	<0.001
Sex					
	Female	Ref			
	Male	-0.02	0.98	0.82 – 1.16	0.785
Comorbidities					
	Obesity (BMI≥30)	0.16	1.18	0.95 – 1.46	0.133
	Diabetes mellitus	-0.11	0.89	0.61 – 1.32	0.571
	Hypertension	-0.01	0.99	0.72 – 1.35	0.943
	Cancer	0.08	1.09	0.7 – 1.69	0.71
	CKD	0.13	1.14	0.65 – 1.98	0.654
	COPD	0.5	1.65	0.82 – 3.31	0.162
	Immunosuppression	0	1	0.54 – 1.85	0.999
	Cardiovascular diseases	0	1	0.67 – 1.5	0.99

OR – Odds Ratio; SES – Socioeconomic status on a scale from 1 (lowest) to 10; CVD – Cardiovascular Diseases; CKD – Chronic Kidney Disease; COPD – Chronic Obstructive Pulmonary Disease.

Table 4a. OR for SARS-CoV-2 infection, model 3, previously infected vs. previously infected and single-dose-vaccinated

Variable	Category	ß	OR	95%CI	P-value
Induced Immunity					
	Previously infected	Ref			
	Previously infected and vaccinated	-0.64	0.53	0.3 – 0.92	0.024
SES		0.11	1.12	0.98 – 1.28	0.096
Age group, yr.					
	16-59	Ref			
	≥60	-0.81	0.44	0.06 – 3.22	0.422
Comorbidities					
	Immunosuppression	0.72	2.06	0.28 – 15.01	0.475

SES – Socioeconomic status on a scale from 1 (lowest) to 10

Table 4b. OR for Symptomatic SARS-CoV-2 infection, model 2. previously infected vs. previously infected and vaccinated

Variable	Category	β	OR	95%CI	P-value
Induced Immunity	Previously infected	Ref			
	Previously infected and vaccinated	-0.43	0.65	0.34 – 1.25	0.194
SES		0.06	1.06	0.9 – 1.24	0.508
Age group, yr.					
	16-59	Ref			
	≥60	-16.9	0	0.0 – inf	0.996
Comorbidities					
	Immunosuppression	1.15	3.14	0.43 – 23.01	0.26

OR – Odds Ratio; SES – Socioeconomic status on a scale from 1 (lowest) to 10.

Table S1. OR for COVID-19-related hospitalizations, model 1, previously infected vs. vaccinated

Variable	Category	ß	OR hospitalized	95%CI	*P*-value
Induced Immunity					
	Previously infected	Ref			
	Vaccinated	2.09	8.06	1.01 – 64.55	0.049
SES		0.05	1.05	0.72 – 1.53	0.81
Age ≥60 yrs (16-39, ref)		5.08	160.9	19.91 – 1300.44	<0.001

OR – Odds Ratio; SES – Socioeconomic status on a scale from 1 (lowest) to 10

Table S2. OR for COVID-19-related hospitalizations, model 2, previously infected vs. vaccinated

Variable	Category	ß	OR hospitalized	95%CI	*P*-value
Induced Immunity					
	Previously infected	Ref			
	Vaccinated	1.95	7.03	2.1 – 23.59	0.002
SES		-0.07	0.93	0.74 – 1.17	0.547
Age ≥60 yrs (16-39, ref)		4.3	73.5	25.09 – 215.29	<0.001

OR – Odds Ratio; SES – Socioeconomic status on a scale from 1 (lowest) to 10

Figure 1. Time of first infection in those reinfected between June and August 2021, model 2.

GOBIERNO DE PUERTO RICO

DEPARTAMENTO DE SALUD

ORDEN ADMINISTRATIVA NÚM. 467

PARA ACLARAR EL REQUISITO DE OBTENER UNA ORDEN MÉDICA PREVIA PARA LA ADMINISTRACIÓN DE PRUEBAS PARA DETECTAR EL CORONAVIRUS (COVID-19) CLASIFICADAS COMO "*EXENTAS*" POR LA ADMINISTRACIÓN DE DROGAS Y ALIMENTOS FEDERAL ("*FOOD AND DRUG ADMINISTRATION*", FDA, POR SUS SIGLAS EN INGLÉS) DURANTE LA VIGENCIA DEL ESTADO DE EMERGENCIA EXISTENTE

POR CUANTO: El 12 de marzo de 2020 se declaró un estado de emergencia de salud en Puerto Rico por el impacto del COVID-19 mediante la Orden Ejecutiva Núm. OE-2020-020 de la Gobernadora de Puerto Rico.

POR CUANTO: El referido estado de emergencia continúa en efecto y las medidas implementadas para este se han promulgado mediante varias Órdenes Ejecutivas subsiguientes.

POR CUANTO: El Departamento de Salud fue creado según lo dispuesto en la Ley Número 81 de 14 de marzo de 1912, según enmendada (**Ley Núm. 81**), y elevado a rango constitucional el 25 de julio de 1952, en virtud de lo dispuesto en el Artículo IV, Sección 6 de la Constitución del Estado Libre Asociado de Puerto Rico.

POR CUANTO: Las secciones 5 y 6 del Artículo IV de la Constitución de Puerto Rico, así como la Ley Núm. 81 disponen que el Secretario de Salud será el jefe del Departamento de Salud y tendrá a su cargo todos los asuntos que por ley se encomienden relacionados con la salud, sanidad y beneficencia pública, excepto aquellos que se relacionen con el servicio de cuarentena marítima.

POR CUANTO: La Ley Núm. 81 dispone que en caso de alguna epidemia que amenazaré la salud del pueblo de Puerto Rico, el Secretario de Salud tomará las medidas que juzgue necesarias para combatirla.

POR CUANTO: La Constitución y las leyes de Puerto Rico facultan a la Rama Ejecutiva a tomar medidas de emergencia cuando se consideren indispensables para proteger la salud y seguridad de Puerto Rico. Según lo expresado por el Tribunal Supremo de Puerto Rico, "el concepto 'emergencia' no necesariamente se limita a una circunstancia imprevista, sino que comprende un suceso o combinación y acumulación de circunstancias que exigen inmediata

actuación. 'Emergencia' es sinónimo de 'urgencia', 'prisa'." Meléndez v. Valdejully, 120 D.P.R. 1, 32 (1987) (citas omitidas).

POR CUANTO: A nivel federal, las operaciones de los laboratorios clínicos se rigen por las disposiciones de la Ley Pública 100-578 (*Public Law 100-578, 100th Congress, 1988, to amend the Public Health Service Act*) y la reglamentación adoptada a su amparo, conocida como: "*Clinical Laboratory Improvement Amendments of 1988*" (**CLIA**), donde se establecen los estándares de calidad para las pruebas de laboratorio realizadas en muestras tomadas a seres humanos, tales como muestras de sangre, de fluidos corporales o de tejidos, con el propósito de evaluar la salud o de diagnosticar, prevenir o tratar enfermedades.

POR CUANTO: A nivel local, los laboratorios clínicos se rigen por las disposiciones de la Ley Núm. 97 del 25 de junio de 1962, según enmendada, conocida como Ley de Laboratorios de Análisis Clínicos, Centros de Plasmaféresis, Centros de Sueroféresis y Bancos de Sangre (**Ley Núm. 97**) y el *Reglamento Núm. 120 del Secretario de Salud Para regular el Establecimiento y Operación de los Laboratorio Clínico de Análisis Clínico, Laboratorios de Patología Anatómica y Bancos de Sangres en Puerto Rico*, Reglamento Núm. 7189 del 4 de agosto de 2006, según registrado en el Departamento de Estado de Puerto Rico y según enmendado por el *Reglamento de la Secretaria de Salud Núm. 120A*, Reglamento Núm. 8785 del 9 de agosto de 2016, según registrado en el Departamento de Estado de Puerto Rico (**Reglamento Núm. 120**).

POR CUANTO: El 31 de enero de 2020, el Departamento de Salud y Recursos Humanos federal ("*Department of Health and Human Services*", **DHHS**, por sus siglas en inglés) declaró una emergencia de salud pública, bajo la sección 319 del *Public Health Service Act* (42 U.S.C. 247d) en respuesta a la propagación COVID-19. Basado en esta declaración, el 4 de febrero de 2020, el Secretario del DHHS estableció que existían las circunstancias para justificar la Autorización de Uso de Emergencia ("*Emergency Use Authorization*", **EUA**, por sus siglas en inglés) de pruebas para la detección y/o diagnóstico del virus de COVID-19.

POR CUANTO: La FDA tiene la autoridad de aprobar y otorgar clasificaciones a los sistemas de pruebas que se utilizan en los laboratorios clínicos. En términos generales, la FDA clasifica las pruebas aprobadas como exentas ("*waived*") o no exentas ("*non-waived*"). Se consideran pruebas exentas las de venta directa al público y aquellas pruebas

que, conforme a la Sección 353(d) (3) del "*The Public Health Service Act*" federal (42 U.S.C. §§ 201-291n), se definen como pruebas con una metodología simple y exacta, con un riesgo insignificante de error, que no suponen daño a la salud del paciente si la misma se realiza de forma incorrecta. Las pruebas de complejidad moderada o alta clasifican como pruebas No Exentas.

POR CUANTO: Las pruebas exentas se pueden administrar en laboratorios clínicos debidamente licenciados, al igual que en localidades de cuidado al paciente denominadas como un "*Point of Care*", que hayan obtenido una Certificación CLIA para realizar pruebas exentas.

POR CUANTO: El 9 de abril de 2020 la FDA emitió una determinación donde se establece que ciertas pruebas de COVID-19 autorizadas mediante EUA serían clasificadas como exentas por el periodo de duración de la presente emergencia de salud pública.

POR CUANTO: Actualmente, las pruebas autorizadas por la FDA que se clasifican como exentas incluye tanto pruebas moleculares, como pruebas de antígenos.

POR CUANTO: El Artículo 3 del Capítulo VIII del Reglamento Núm. 120 establece que: "*se procesarán pruebas solamente mediante una orden escrita o en forma electrónica de un médico autorizado…*". Por lo que, de ordinario, toda prueba a procesarse requiere que una orden médica previa.

POR CUANTO: Por otro lado, las disposiciones de reglamentación federal aplicables a la administración de pruebas exentas por laboratorios clínicos (42 CFR 493.15) no **establecen como requisito** que exista una orden médica previa para el procesamiento de una prueba exenta.

POR CUANTO: La propagación acelerada y el aumento en contagios de COVID-19 representa una amenaza continua a la salud de los ciudadanos de Puerto Rico. La respuesta requerida para lidiar con el presente estado de emergencia gira en torno a la detección del virus mediante la administración de pruebas de la manera más eficiente posible. Tomando en consideración el desarrollo de la normativa aplicable y estado de emergencia actual, corresponde aclarar el requisito de necesitar una orden médica previa para administrar pruebas exentas de COVID-19. Por lo que, el Departamento de Salud del Gobierno de Puerto Rico determina que es prudente, indispensable y necesario tomar las medidas establecidas a continuación para implementar, de manera directa e inmediata, mayor celeridad y accesibilidad en la administración de pruebas de COVID-19.

POR TANTO: **YO, LORENZO GONZÁLEZ FELICIANO, MD, MBA, DHA, SECRETARIO DE SALUD DEL GOBIERNO DE PUERTO RICO, EN VIRTUD DE LA AUTORIDAD QUE ME CONFIERE LA CONSTITUCIÓN Y LEYES DE PUERTO RICO, ORDENO COMO SIGUE:**

PRIMERO: Los laboratorios clínicos de Puerto Rico que estén debidamente licenciados y certificados, podrán realizar **pruebas exentas** de COVID-19 sin la necesidad de una orden médica previa. Esto aplica tanto a las pruebas exentas moleculares, como pruebas exentas de antígenos que cuenten con la autorización correspondiente de la FDA.

SEGUNDO: Esto no exime a los laboratorios clínicos de continuar cumpliendo con todas la reglamentación local y federal aplicable, incluyendo las disposiciones correspondientes del Reglamento Núm. 120 relacionadas con la administración de pruebas autorizadas. En particular, se deberá garantizar la calidad y manejo de las pruebas, verificar los requisitos del personal autorizado de los laboratorios, y asegurar la confiabilidad de la información de la persona que se haga la prueba de COVID-19 para permitir que se realice el tracto y rastreo efectivo de los resultados positivos.

TERCERO: Todos los laboratorios clínicos debidamente licenciados y certificados tendrán que completar y conservar una hoja de solicitud para cada paciente que se haga una prueba exenta de COVID-19. Cada laboratorio será responsable de preparar su propia hoja de solicitud, asegurándose que se haga constar toda la información pertinente del paciente para realizar cualquier seguimiento que haga falta.

CUARTO: Los laboratorios clínicos están obligados a comunicar todo resultado de prueba positiva al médico primario del paciente, según sea informado por éste en la hoja de solicitud de prueba exenta. En los casos que un paciente no tenga o no informe su médico de cabecera, los laboratorios clínicos estarán obligados a coordinar una comunicación entre el paciente y el consultor clínico del laboratorio, con el propósito de asegurar el seguimiento y tratamiento necesario que proceda. El laboratorio documentará y conservará toda comunicación realizada en estos casos.

QUINTO: Conforme a la Orden Administrativa Núm. 440 del 17 de abril de 2020 (**OA 440**), los laboratorios que administren y/o procesen pruebas de COVID-19 rendirán los informes correspondientes a la División de Epidemiología del Departamento de Salud. Para

propósitos informativos, se reitera que la facilidad que realice la prueba de COVID-19 tiene la responsabilidad de cumplir con las disposiciones de la OA 440 y reportar todos los resultados, negativos y positivos, en el BioPortal del Departamento de Salud dentro de un periodo de veinticuatro (24) horas de obtener el resultado final de la prueba. El incumplimiento con los requisitos relacionados al proceso de reportar resultados expone a la facilidad a penalidades que incluyen, entre otras, la imposición de multas administrativas.

SEXTO: Esta Orden Administrativa será efectiva inmediatamente y se mantendrá en vigor mientras subsista el estado de emergencia o que esta Orden Administrativa sea revocada por una orden posterior, lo que ocurra antes. Todos los memorandos y órdenes administrativas previamente emitidos por cualquier Secretario de Salud en la medida que sus disposiciones sean incompatibles con las disposiciones de esta Orden quedarán sin efecto legal alguno durante la vigencia de esta Orden Administrativa.

Y PARA QUE ASÍ CONSTE, firmo la presente Orden y hago estampar en ella el sello del Departamento de Salud del Gobierno de Puerto Rico, hoy 19 de octubre de 2020, en San Juan, Puerto Rico.

LORENZO GONZÁLEZ FELICIANO, MD, MBA, DHA
SECRETARIO DE SALUD