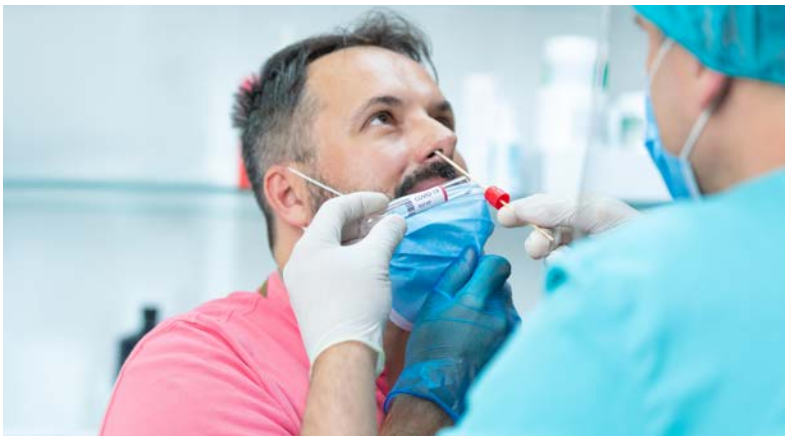
NEW YORK STATE LOCAL HEALTH DEPARTMENT PREPAREDNESS FOR AND RESPONSE TO COVID-19:

AN IN-PROGRESS REVIEW



County Health Officials of New York
Leading the Way to Healthier Communities

MARCH 2021

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FORWARD

This in-progress review (IPR) was written based on research conducted from May 2020 to July 2020. During this time, the COVID-19 infection rate in New York State was decreasing from its initial peak, and the state was in the process of reopening non-essential businesses and easing other COVID-19 related restrictions. Since that time, the status of COVID-19 in New York has changed dramatically: cases began to significantly increase in the fall; Governor Cuomo implemented several new COVID-19 containment measures; schools reopened for in-person instruction; testing availability increased in many areas; and the first COVID-19 vaccines were authorized for emergency use by the U.S. Food and Drug Administration (FDA). As of December 14th, 2020, 784,204 New Yorkers had tested positive for the coronavirus and 27,870 fatalities had been attributed to the virus (1),

Other noteworthy actions and status changes have occurred since July 2020. On October 6th, in response to a rise in the number of COVID-19 cases, Governor Cuomo announced a microcluster initiative to identify areas where outbreaks were occurring and implement targeted restrictions within those areas to curb the spread of COVID-19. These restrictions included closing non-essential businesses, limiting the size of public and private gatherings, and, in some areas, mandating weekly testing of students and staff attending in-person classes (2). During this time period, COVID-19 testing increased substantially as well (due in part to the FDA granting emergency use authorizations (EUAs) for several rapid antibody tests and a saliva test for COVID-19): on July 1st, only 69,945 people had been tested for COVID-19 in New York; on December 1st, that number was 193,551 (1,3).

In this rapidly changing environment, local health departments continued the COVID-19 response activities described in detail in the following pages, navigated new COVID-19 control measures introduced by the State, and developed detailed plans for vaccine distribution — plans that have been coming to fruition since the Pfizer and Moderna COVID-19 vaccines were granted EUAs in December. While this IPR does not reflect the entirety of the COVID-19 pandemic in New York State, it contains important lessons learned from a critical part of the COVID-19 pandemic, the initial surge.

EXECUTIVE SUMMARY

Since its arrival in the United States in January 2020, the 2019 novel coronavirus (COVID-19) has presented a daunting challenge for local health departments (LHDs) fighting the highly infectious and sometimes fatal disease on the front lines in their communities. Since the start of the pandemic, local health officials across the country have worked around the clock, seven days a week, to coordinate PPE distribution, set up testing sites, support persons under quarantine and isolation, inform the public, and much more. In New York State, they faced the additional stressor of working in, or close to, the pandemic's epicenter in New York City.

The state's 58 LHDs had begun preparing for COVID-19 long before the first case was identified in the New York. Most felt ready to defend their communities from the viral threat by implementing emergency protocols and systems they had designed and practiced implementing for such an outbreak. They would investigate cases of the new infectious disease the way they had investigated cases of any other, and they would call on longtime community partners for their support.

Still, in the midst of the crisis, some would realize how much additional preparation their response strategies required — whether that entailed amassing a large stockpile of PPE, developing a comprehensive data management system, or training staff in crisis communications. In reflection, many agreed that the novel coronavirus had brought systemic issues facing LHDs in New York State — including staffing, funding, and their perception by the public — into sharp relief.

This report details the context, process, and findings of an in-progress review of New York State's LHDs' preparedness for, and response to, the COVID-19 pandemic during its early and apex stages, across the state as a whole and by region.* To achieve review aims, a two-phase, mixed-methods, institutional review board (IRB) approved study was developed and conducted, in partnership, by the New York State Association of County Health Officials (NYSACHO), a non-profit membership organization supporting and advocating on behalf of LHDs across the state, and the Region 2 Public Health Training Center (R2PHTC), a Health Resources and Services Administration (HRSA)-funded training and technical assistance resource for the public health workforce in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. The study's online survey and focus groups concentrated on four topic areas: administrative preparedness, public health preparedness systems, epidemiology, and communications.

Lessons learned from this study include:

- The current level of LHD engagement in pandemic response is not sustainable due to depletion of already scarce resources.
- LHDs can expand their operating capacity rapidly during a public health emergency if they cross-train staff in basic communicable disease functions, as well as train staff from other county agencies.
- A multi-year stagnation of state funding support for LHDs has strained their ability to deliver core public health services, especially during the pandemic.
- Flexible and unrestricted funding increases LHDs' agility to respond during a public

- *Borders of the 10 regions referred to throughout this report are defined by the Empire State Development Corporation, an umbrella organization encompassing New York's two principal economic development public-benefit corporations (4).*

health emergency
- Public health preparedness drills are effective in enhancing LHDs' emergency response capabilities.
- LHDs can rely on social services and other county departments to support provision of wraparound services during public health emergencies.
- LHDs, especially those designated as partial service, need assistance enforcing community compliance to state executive orders.
- Building relationships with a broad range of community organizations improves LHDs' capacity for outbreak response.
- LHDs can launch testing sites with not only the assistance of local hospitals, but federally qualified health centers and other clinical partners.
- LHDs faced challenges during roll out of the state's contact tracing software program, CommCare.
- LHDs benefit from a proactive and coordinated approach to communicating with the public during a public health emergency.
- Messaging via social media is a double-edged sword; it has wide reach but is subject to distortion and misinformation.

This report also offers recommendations to strengthen LHDs' continued response to COVID-19 and their responses to future pandemics, informed by the suggestions and accomplishments of study participants and input from NYSACHO staff.

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INTRODUCTION

The Function and Purpose of Local Health Departments in New York State

LHDs in New York State are county government agencies that work closely with the New York State Department of Health (NYSDOH) to provide essential, population-based services promoting and protecting the health of all who live, work, and enjoy recreational activities in New York's 62 counties (5). They defend the public's health in five major ways:

- Preventing, investigating, and controlling the spread of communicable disease
- Developing and maintaining preparedness for public health hazards and emergencies on the individual and community levels
- Promoting healthy lifestyles and preventing chronic disease through outreach and education
- Assessing and regulating environmental health risks and remediating hazards
- Acting as community health strategists and conducting community health assessments by analyzing community health quality data and convening community stakeholders to identify and develop strategies to address the health and prevention priorities in their communities

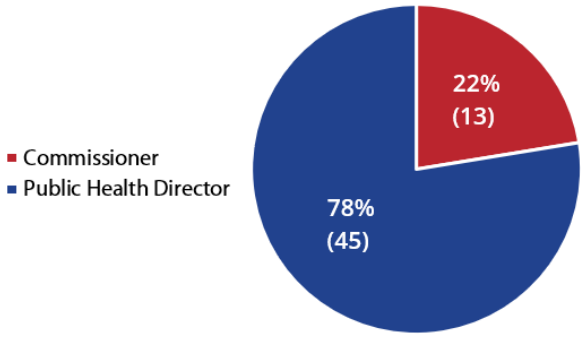
Most importantly, in the context of the current COVID-19 pandemic, LHDs serve as the first line of defense against public health emergencies that threaten their communities' health at large.

Local Health Department Governance

A total of 58 LHDs deliver public health services at the local level in New York State: 57 county health departments, plus the New York City Department of Health and Mental Hygiene (NYC DOHMH), which serves the five boroughs of New York City. As per Article 2 of New York State Public Health Law, Section 206, the LHDs operate under the administrative authority of local governments and the general supervision of the state health commissioner (6). In the majority of counties, the county legislative body wields authority over the LHD. Local administration is critical because LHDs tailor the federal- and state-mandated public health services they deliver to the unique, evolving needs of their communities.

Under Article 3 of NYS Public Health Law and regulations, LHDs require either a full-time Commissioner or Public Health Director. State regulations require that LHDs in counties with more than 250,000 residents be led by a Commissioner of Health, who must have a medical degree, certification by the American Board of Preventive Medicine or a master's degree in public health, and two years of administrative experience in public health (5). To qualify for their roles managing LHDs in the less populated counties, Public Health Directors must have a master's degree in public health and two years of public health experience (7). The majority of current LHD leaders in New York State (78 percent) are directors; the remaining (22 percent) are commissioners (see Figure 1).

Figure 1. **LHDs led by Commissioners vs. Public Health Directors**



Local Health Department Funding

LHDs rely on multiple funding streams: federal, state, and private grants; state aid for general public health work; county property tax levy and/or sales tax revenues; fees to support local public health services; and fines for failing to comply with Public Health Law (5). Federal funding includes money from the Centers for Disease Control and Prevention's (CDC) national Public Health Emergency Preparedness program, which allocated $18.7 million to New York State LHDs in Fiscal Year 2020 in support of programs and activities building and strengthening community preparedness for public health emergencies (8).

Under the authority of Article 6 of Public Health Law, state aid covers LHD expenses for six core service areas: family health, communicable disease, chronic disease, emergency preparedness and response, community health assessment, and environmental health (5). A LHD's base grant funding is dependent on the size of the population it serves and the services it delivers: LHDs in counties with a population of one million or less receive a flat base grant of $650,000; LHDs in counties home to more than one million residents receive 65 cents per person, a per capita rate expected to meet the needs of larger communities (5). Partial-service counties that do not deliver environmental health services, such as facility inspection or permitting, receive a flat base grant of $500,000 (5). New York State reimburses 100 percent of eligible LHD expenses up to the amount of the base grant; when spending exceeds that amount, the state covers 20 percent of eligible expenses in New York City and 36 percent in the rest of the state, leaving the LHD to pay the remaining expenditures and such ineligible costs as employee benefits (5). Reimbursement is calculated based on the net expenses of each LHD, which are determined by subtracting revenues, including fees, grants, and other third-party payments, from a county's total expenditures on public health services (5). As an entitlement program that guarantees certain benefits, Article 6 mandates that the state reimburse LHDs for eligible claims in accordance with the statutory formula regardless of budget allocations for the program in a given year (5).

Of the six core services LHDs must provide to qualify for state funding (see Figure 2), the three most relevant to this report are communicable disease, emergency preparedness and response, and environmental health. To meet the state's expectations in these three areas, LHDs engage in such activities as:

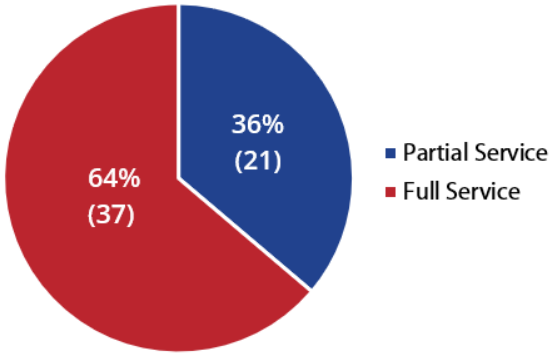
- investigating communicable disease reports and outbreaks;
- providing immunizations directly or connecting individuals to providers who do;
- planning and training for public health crises by preparing medical countermeasures and conducting exercises and drills;
- responding to such emergencies;
- and inspecting and monitoring restaurants, hotels, swimming pools and beaches, camps, and other facilities.

Figure 2. **SIX CORE PUBLIC HEALTH SERVICE AREAS PER ARTICLE 6**

Partial service LHDs, which are located in over one third of rural counties (see Figure 3), do not perform inspections and rely on the State Health Department District Offices for response in this area.

Many LHDs also provide enhanced services. These include emergency medical services, medical examiners, and early intervention administration and service coordination.

Figure 3. **Full- vs. partial-service LHDs**



Reductions in Local Health Department Resources since 2011

To the detriment of public health service capacity across New York's 62 counties, state funding under Article 6 decreased by more than 40 percent from 2011 to 2017 (see Figure 4) (9). In 2011, New York State eliminated all reimbursement for enhanced services, which it had previously compensated at 30 percent (5). The cost of these valuable services is now 100 percent the fiscal responsibility of the counties. The state last approved an increase in base grant funding and the per capita rate in 2013, up from $450,000 and 45 cents per capita for full-service LHDs and $360,000 for partial-service LHDs (5). At hat time, no adjustments were made to the percent reimbursement counties can claim after exceeding the base amount.

Budget reductions have resulted in significant cuts to staffing. Over the five-year period from 2011 to 2017, LHDs (excluding the NYC DOHMH) saw a stunning 33 percent reduction in their workforce, from a total of 4,019 full-time employees in 2011 to 2,703 in 2017 (see Figure 5). (9) Counties under fiscal duress are more likely to trim staff from their LHD than other government agencies because Article 6 funding does not cover the cost of employee benefits.

During this same time period, fiscal constraints, changes in state and federal policies, and

Figure 4. **LHD budget and state appropriation trends 2011-2017 (excluding NYC)**

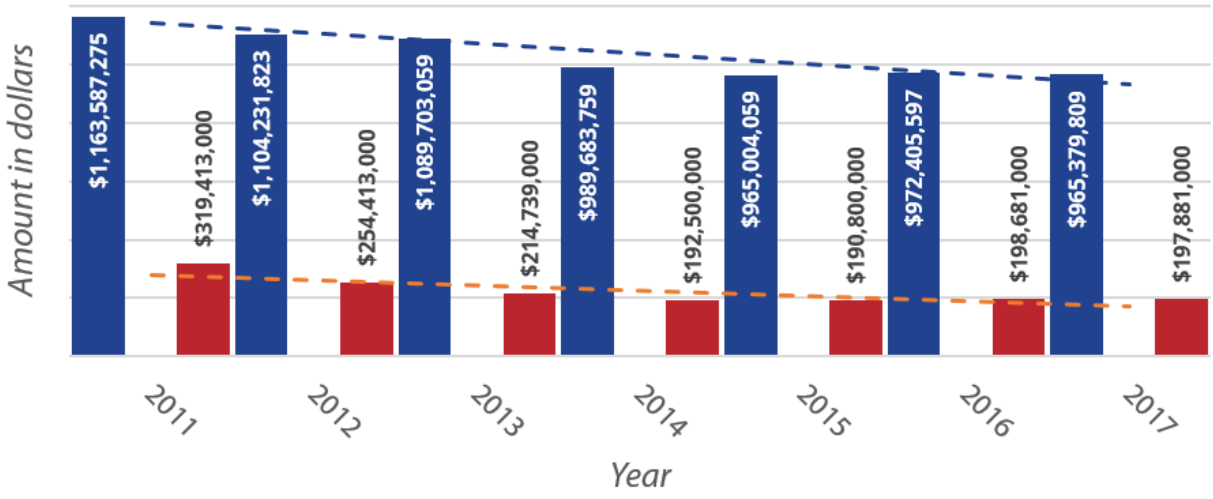
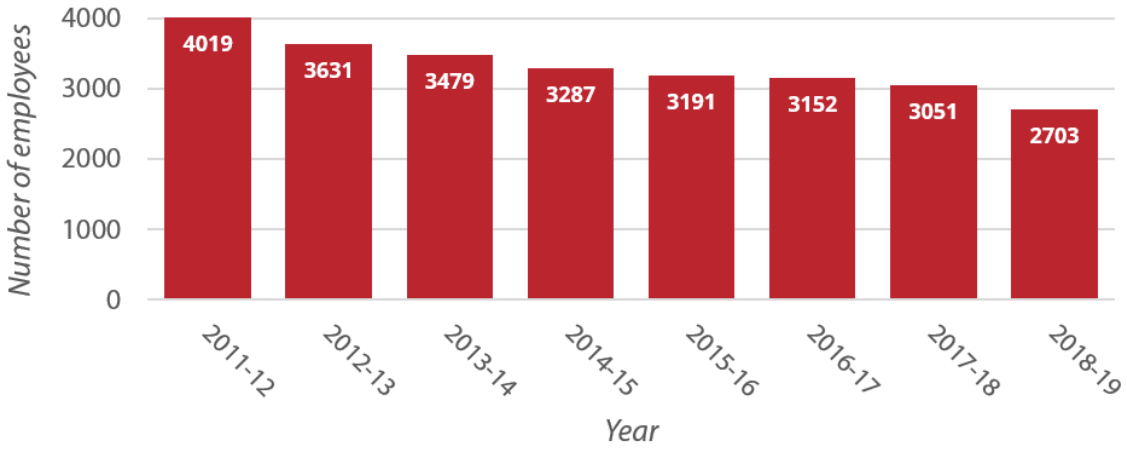


Figure 5. **Total full-time employees in LHDs 2011-2019 (excluding NYC)**



increased access to clinical care in community-based settings led LHDs to transition away from their long-standing role as safety net providers of services like home and primary care for children and pregnant women. Clinically trained, experienced nurses responsible for these services were more often laid off than redeployed to increase capacity for other public health services.

Other factors impacting LHD staffing include high rates of retirement, staff turnover, and low rates of pay satisfaction. A 2017 national survey conducted by the de Beaumont Foundation and the Association of State and Territorial Health Officials found that nearly half of the aging public health workforce — 42 percent of which is age 50 and older — is planning to leave their organization within the next five years (10). Twenty-two percent of workers plan on retiring within that period, and 25 percent plan to leave within the next year for other reasons. Respondents who intended to leave for reasons other than retirement cited pay (46%), lack of advancement (40%), and workplace environment (31%) as their top three motivating factors (10). Employees planning to leave within a year offered unsatisfactory pay as their prime reason. Seventeen percent of the public health workforce in New York City and more than 22 percent in the rest of New York State are eligible for retirement.

Budget and staff reductions have compromised the capacity of local governments to provide core public health services, especially considering new demands on their workload over the last few years, including outbreaks of Zika virus and Legionnaires' disease, requiring LHDs to rely more heavily on volunteer support (11). It is under these limitations that LHDs have faced the COVID-19 pandemic in 2020.

NYSACHO's Role in Supporting Local Health Departments

Organized in 1979, the New York State Association of County Health Officials (NYSACHO) is a 501(c)(3) non-profit membership association of local health officials across the state. NYSACHO represents all 58 local health commissioners and public health directors and the departments they lead; this general membership meets regularly to exchange ideas and experiences. NYSACHO employs a staff of seven and is overseen by a board of 14 directors. Board members — led by a president, president-elect/vice president, and immediate past-president — chair committees on

public health topics, including disease control, environmental health, finance and administration, maternal child health, and emerging issues.

NYSACHO not only convenes LHD leaders to share knowledge and develop health policy priorities but also amplifies their voices through advocacy efforts at the state and federal levels, using legislative visits, media outreach, strategic partnerships, policy papers, and tracking and analysis of legislative and regulatory proposals. In its advocacy work, NYSACHO collaborates with the New York State Association of Counties and a diverse array of other partners, and it serves as a member of the National Association of City and County Health Officials (NACCHO).

NYSACHO also offers its members professional development opportunities via technical assistance, toolkits, leadership development summits, conferences, workshops, calls and webinars on a broad range of public health topics, orientation for new health commissioners and public health directors, national accreditation support, and sponsorship of a variety of regional and statewide immunization and emergency preparedness activities. Contracts with the NYSDOH and other entities support the majority of these services. NYSACHO additionally works with the Region 2 Public Health Training Center at Columbia University Mailman School of Public Health to run a HRSA-funded program meeting the training and workforce development needs of LHDs in New York State.

During the COVID-19 pandemic, the organization has served an essential role as a reliable conduit of information between the NYSDOH and LHDs and an indefatigable resource for local public health leaders.

NYSACHO members at Greek Peak pose with Matthew Penn, JD, MLIS, Director, Office of Public Health Law, CDC's Center for State, Tribal, Local and Territorial Support.

BACKGROUND

The COVID-19 Pandemic in New York State *

The beginning

The story of COVID-19 in New York State begins with the confirmation of the first two U.S. cases in Washington State and Chicago, Illinois on January 17th, when the NYSDOH issued guidance for healthcare facilities and workers encountering any patient with symptoms of the new infectious disease, including fever, a dry cough, and lethargy (13). On January 23rd, the NYSDOH hosted its first weekly COVID-19 webinar for health care providers and LHDs, detailing clinical updates about the disease that is primarily spread person-to-person through aerosols and can be transmitted by asymptomatic carriers (13). Over the next few days, the NYSDOH launched both a coronavirus-specific website and hotline.

In February, the state and local health departments continued preparing for the

- *The two major sources for this account are Governor Andrew Cuomo's executive orders, all available on the New York State website (https://www.governor.ny.gov/executiveorders) and a timeline from Syracuse.com, The Post-Standard's website (12).*

potential widespread transmission of COVID-19 in New York. On the first day of the month, NYSDOH Commissioner Howard Zucker hosted a call with LHDs regarding the federal proclamation temporarily suspending entry of foreign nationals who had traveled to China within the past 14 days. LHDs began regular calls with the NYSDOH about COVID-19 two days later, when U.S. airlines suspended most U.S.-China flights. (While officials were initially concerned about travelers from Asia bringing the virus into the country, a later Mount Sinai study would offer evidence that the low-level circulation of COVID-19 in New York City as early as the first week of February likely arose through untracked transmission between the U.S. and Europe (14,15).) At the end of the month, the FDA approved the state's diagnostic test for the disease.

The pandemic did not, however, properly catch New Yorkers' attention until March 1st, when the first patient tested positive for COVID-19 in New York after traveling abroad in Iran. Governor Andrew Cuomo took a number of decisive actions in the following days: on March 2nd he required state health insurers to waive cost sharing associated with COVID-19 testing and announced that New Yorkers on Medicaid would be exempt from co-pays for COVID-19 tests; on March 3rd he signed a $40 million emergency management authorization for the state's coronavirus response, which would give him broad powers to issue directives during the pandemic; and on March 5th he activated a statewide Emergency Operation Center in Albany with two outposts in Westchester.

On March 7th — with a total of 89 cases across the state, including the first two upstate — Cuomo issued an executive order declaring a State of Emergency; the declaration would expedite the procurement of personal protective equipment (PPE) and testing and medical supplies, and expand the field of professionals

TIMELINE OF EVENTS

JAN. 17
0 cases, 0 deaths
First coronavirus cases in the United States; NYSDOH issues guidance for health care facilities and workers, while Port Authority and NYC begin working with CDC to screen visitors from Wuhan, China

FEB. 1
NYS Department of Health Commissioner Howard Zucker hosts a call with LHDs regarding the federal advisory on travelers from China

FEB. 2
As testing expands in New York, NYSDOH launches a hotline for residents to ask COVID-specific questions

FEB. 3
LHDs begin regular calls with the NYSDOH and the CDC on COVID-19

FEB. 29
NYSDOH's coronavirus test is approved by the FDA and testing begins at Wadsworth Lab in Albany

MAR. 1
1 *case, 0 deaths*
First coronavirus case in NYS

MAR. 2
1 *case, 0 deaths*
Cuomo makes COVID-19 tests free in New York

MAR. 3
2 cases, 0 deaths
Cuomo signs emergency management authorization for state's COVID-19 response, giving himself broad powers

permitted to test residents for the virus.

Over the following week, the governor announced that SUNY and CUNY students would learn remotely for the remainder of their spring semester, and issued an executive order banning events with more than 500 attendees and most visitors at nursing homes. At the same time, the East Coast's first drive-through testing facility opened in New Rochelle. At the week's end, COVID-19 claimed its first victim in New York State: an 82-year-old Brooklyn woman with emphysema who died on March 14th.

Two days later, executive orders banned gatherings of 50 people or more and ordered non-essential government workers to work from home. A coalition of the tri-state area (New York, New Jersey, Connecticut) also closed on-site service at all bars and restaurants in their states, and shuttered movie theaters, gyms, and casinos.

March 19th would be a major milestone in the state's COVID-19 response. That day — with 4,161 confirmed cases of COVID-19 and 39 COVID-19-related deaths reported in the state — Cuomo announced he would effectively put New York State "on Pause," issuing an order that instructed individuals to stay at home, closed all non-essential businesses, banned all gatherings, and instituted six-foot social distancing requirements as of that Sunday. On the federal stage, the U.S. president declared a major disaster in New York, thereby allowing the Federal Emergency Management Agency (FEMA) to step in and provide financial aid.

The following sections detail relevant New York State executive orders as they impacted different stakeholders working with LHDs on response activities.

Local Health Departments

While the State developed and issued state-level directives, it was the LHD employees who worked

MAR. 4
22 cases, 0 deaths
Cuomo activates statewide Emergency Operations Centers

MAR. 7
89 cases, 0 deaths
State of Emergency declared

MAR. 11
217 cases, 0 deaths
SUNY and CUNY institutions go virtual for the spring semester

MAR. 12
326 cases, 0 deaths
Large events cancelled; visitors banned from nursing homes; East Coast's first drive-through testing facility opens in New Rochelle

MAR. 14
610 cases, 2 deaths
First coronavirus-related death in New York

MAR. 16
950 *cases, 10 deaths*
Schools closed statewide; gatherings of 50+ banned; eateries, movie theaters, gyms and casinos closed; non-essential government workers start working at home

MAR. 19
4,161 cases 39 deaths
New York State on PAUSE; President Trump declares a major disaster in New York

MAR. 20
7,113 cases, 68 deaths
Evictions and foreclosures suspended

MAR. 22
15,188 cases, 142 deaths
Hospitals ordered to cancel elective surgeries

MAR. 28
53,517 cases, 1,180 deaths
Elections and tax deadlines postponed

on the front lines to protect their communities from exposure to COVID-19. Their responsibilities included: activating and mobilizing emergency preparedness plans; serving as communicable disease experts by conducting investigations, contract tracing, monitoring suspected cases, enforcing isolation and quarantine protocols, and establishing mass clinics; connecting vulnerable or under-resourced individuals to essential resources like housing, nutritious meals, utilities, and health or mental health services; supporting community partners (hospitals, health care providers, colleges, schools, businesses, and community-based organizations) and working hand-in-hand with the NYSDOH and CDC to implement state and federal guidance locally; and keeping community members informed by answering questions, providing up-to-date information about the outbreak and the local community impact, and offering recommendations for how best to protect one's family from exposure.

As this report will elaborate in greater detail, the magnitude of the state's COVID-19 response required the re-deployment of public health staff from core public health services and employees from other county agencies to work solely on pandemic-related activities. Meanwhile, workforce challenges (as described above), compounded by little opportunity for time off, made it challenging for LHD leaders to protect the morale of their staff.

It should be noted that while New York Public Health Law and the State Sanitary Code assigns primary control of the management of disease outbreak activities to local health departments and county health officials, the State Health Commissioner does have the power to step in and exercise an active role when local intervention requires additional support (16). The Commissioner exerted this authority on April 17th, when an executive order announced that

APR. 3
103,689 cases, 3,716 deaths
NYS launches its own COVID-19 data tracking website

APR. 7
141,703 cases, 7,185 deaths
All executive orders extended a month; permission granted to shift medical equipment and PPE between facilities according to need; failing to comply with social distancing can result in $1000 fine

APR. 9
162,036 cases, 9,166 deaths
New Yorkers granted permission to vote by absentee ballot in primary election

APR. 12
191,425 cases, 12,116 deaths
Employers required to provide masks for essential employees; eligibility of antibody testing for workers expanded

APR. 15
217,130 cases, 14,937 deaths
NY on Pause extended; public required to wear masks as of April 17

APR. 16
225,761 cases, 15,669 deaths
Nursing homes required to notify residents' next of kin of positive COVID-19 tests

APR. 17
233,293 cases, 16,473 deaths
NYSDOH announces intention to establish a single, statewide coordinated testing prioritization process for all state labs; new executive order says LHDs must consult with the NYSDOH before taking action

APR. 19
7,113 cases, 68 deaths
New York State starts planning for large-scale antibody testing

APR. 20
251,608 cases, 18,412 deaths
Cuomo announces a "Reimagine NY" task force to plan reopening downstate

"no local government or local department of health shall take any actions that could affect public health without consulting with the state department of health" and "no local government official shall take any action that could impede or conflict with any other local government actions, or state actions, with respect to managing the COVID-19 public health emergency" (17). LHDs remained responsible for enforcement, but they often felt guidance was received beyond the time it was needed for critical decision-making purposes.

Schools

Throughout the first few months of the pandemic, LHDs supported school superintendents and faculty by providing instruction in risk mitigation and the application of communication strategies to encourage student, staff, parent, and family compliance with public health guidance. The state first encouraged schools to seek direction from local public health authorities on March 14th, when school districts were instructed to consult with their local health department before shutting down. Closings began the next day in New York City, Westchester, Nassau, and Suffolk counties, and an executive order the following day closed all schools statewide until April 1st, instructing districts to develop plans for remote education. Executive orders on March 27th, April 6th, and April 16th continued to extend school closures until May 1st, when the governor announced schools would remain closed through the end of the academic year but should begin developing plans for reopening with safeguards for faculty, staff, and students.

In mid-May, Cuomo announced the creation of an advisory panel of leaders from primary, secondary, and higher education that would help districts reopen safely, improve virtual learning, and supplement face-to-face education. To the delight of graduating seniors and their families, Cuomo said that the state would permit outdoor

APR. 22
261,591 cases, 19,647 deaths
New York State announces its contact tracing plan

APR. 23
267,932 cases, 20,212 deaths
NYSDOH starts investigating nursing homes; antibody study suggests 2.7 million have been infected statewide

APR. 24
276,218 cases, 20,759 deaths
NYSDOH Health Commissioner is authorized to suspend or revoke operating certificates of non-compliant nursing homes and adult care facilities

APR. 25
286,901 cases, 21,326 deaths
Pharmacists authorized to order diagnostic or antibody tests for COVID-19

APR. 26
292,914 cases, 21,804 deaths
Cuomo outlines NY Forward reopening plan

APR. 29
304,994 cases, 23,287 deaths
Hospitals may perform elective surgeries and procedures under certain criteria

MAY 1
13,575 cases, 23,841 deaths
New York schools ordered to remain closed for the rest of the academic year

MAY 5
326,659 cases, 25,028 deaths
New details about reopening released

MAY 10
340,657 cases, 26,798 deaths
More reopening details released; nursing and adult care facilities staff must be tested for COVID-19 twice a week, with results reported to the NYSDOH

MAY 15
350,951 cases, 27,755 deaths
North Country, the Southern Tier, Finger Lakes, Central New York, and Mohawk Valley begin Phase 1 reopening

graduations of up to 150 people beginning on June 26th. On July 13th, the NYSDOH, New York State Education Department, and the Reimagine Education Advisory Council issued state guidelines determining that schools could reopen in the fall if a region was in its last phase of reopening, and its daily infection rate remained below 5 percent using a 14-day average after August 1st. Schools would close again if the regional infection rate rose above 9 percent on a seven-day average.

Businesses

While the majority of businesses faced multiple extensions of mandated closures, essential businesses such as pharmacies, healthcare offices, utility providers, and businesses in the shipping, media, warehousing, grocery and food production industries, continued to operate.

Reopening guidelines laid out by the governor at an event on May 4th, and officially issued the next day, dictated which industries could resume operations during each of the four phases of reopening, starting with construction and manufacturing and ending with entertainment and recreation (18). Business owners restarting their operations would be expected to enforce state rules for adjusted workplace hours, social distancing, strict cleaning standards, and continuous health screenings, while local officials would be responsible for ensuring business compliance. LHDs played a central role in communicating with and guiding business owners who needed clarification on the statewide guidelines for reopening.

On May 28th, the governor signed an executive order granting businesses the right to deny entry to individuals defying the state's mandate that New Yorkers wear face coverings in public places. A subsequent order on June 6th authorized businesses to conduct temperature checks prior to admitting customers. On June 14th, Cuomo threatened to reinstate closings and revoke liquor

MAY 19
357,757 cases, 28,437 deaths
Capital District and Western New York begin Phase 1 reopening; state allows for Memorial Day gatherings of 10 or fewer people

MAY 21
267,932 cases, 20,212 deaths
Gatherings of 10 people or fewer are permitted provided that social distancing, cleaning protocol adhered to

MAY 26
276,218 cases, 20,759 deaths
Mid-Hudson region begins Phase 1 reopening

MAY 27
369,801 cases, 29,339 deaths
Long Island begins Phase 1 reopening

MAY 28
371,559 cases, 29,438 deaths
New York State authorizes businesses to deny entry to anyone not wearing a face covering

JUNE 5
381,019 cases, 30,066 deaths
Special education services and instruction can be provided in person for school summer term

JUNE 7
382,879 cases, 30,183 deaths
In-person graduation ceremonies with 150 people or fewer allowed beginning June 26

JUNE 8
326,659 cases, 25,028 deaths
New York City begins Phase 1 reopening; Long Island enters Phase 4

JUNE 9
384,281 cases, 30,309 deaths
Non-essential employees are allowed to return to work two weeks after a region enters Phase 2

JUNE 19
384,281 cases, 30,309 deaths
Bars and restaurants ordered to comply with open container laws, social distancing protocols and ensuring staff and customers wear masks

licenses in areas like Manhattan and the Hamptons, where police were failing to enforce social distancing, and bars and restaurants were violating reopening guidelines (19). The governor issued an executive order five days later stipulating that businesses selling alcohol be compliant with open container ordinances, social distancing protocols, and ensuring staff and customers wear face coverings.

Full-service LHDs dedicated significant time and resources to investigating community member complaints about non-compliant businesses and initiating dialogue with offenders. They took a partnership approach including education about the goals of social distancing protocols, only enforcing penalties when a business blatantly and repeatedly violated public health law.

Hospitals and healthcare providers

On March 20th, New York began gathering ventilators from across the state to dispatch to the most critical areas, and two days later, Cuomo ordered hospitals to cancel all elective and non-critical surgeries to expand their capacity for COVID-19 patients. An executive order on March 23rd gave the New York State Commissioner of Health permission to designate a healthcare facility a trauma center and power to suspend or revoke the operating license of any general hospital that refused to increase its capacity. In early April, the governor authorized the state to redistribute ventilators and PPE among hospitals based on their need. LHDs worked closely with hospitals and clinicians to address PPE supply shortages and stressed that healthcare workers receive supplies first.

Throughout March and April, Cuomo expanded the healthcare workforce to meet the surge of COVID-19 cases by abbreviating various training requirements, allowing medical students to begin practicing several months early, permitting out-of-state providers to practice in New York, and expanding the eligibility of workers (including

JUNE 25
357,757 cases, 28,437 deaths
Visitors from states with high COVID-19 infections rates instructed to quarantine for 14 days when they enter the tri-state region; Cuomo announces gyms, movie theaters will not open during Phase 4

JUNE 26
395,972 cases, 31,075 deaths
Central New York, the Finger Lakes, Mohawk Valley, the North County and the Southern Tier enter Phase 4

JUNE 30
398,142 cases, 31,776 deaths
Western New York enters Phase 4

JULY 1
398,770 cases, 31,791 deaths
Capital District enters Phase 4

JULY 6
402,338 cases, 31,911 deaths
Increase in mask and social distancing violations attributed to out-of-state travelers

JULY 7
402,928 cases, 31,934 deaths
Mid-Hudson region enters Phase 4

JULY 8
403,619 cases, 31,945 deaths
Long Island enters Phase 4

JULY 10
404,997 cases, 32,004 deaths
State guidelines for school reopening issued

JULY 16
409,476 cases, 32,133 deaths
Bars and restaurants required to sell food with alcohol

JULY 20
412,034 cases, 32,203 deaths
New York City enters Phase 4

pharmacists) who could conduct testing.

On April 29th, hospitals recovered their rights to perform elective procedures — under specific criteria, including the patient testing negative for COVID-19. Hospital metrics would play a highly influential role in reopening the state. To begin reopening, regions would require at minimum a 14-day decline in total COVID-19 hospitalizations based on a three-day rolling average, an availability of 30 percent of total hospital and ICU beds, and a 90-day stockpile of PPE.

In some counties, hospitals and federally qualified health centers (FQHCs) worked with LHDs to increase local COVID-19 testing capacity, as this report will illuminate in greater detail.

Nursing homes

LHDs do not have responsibility to regulate or inspect nursing home facilities. However, some became involved in educating nursing home administrators on public health measures to mitigate community spread and in answering questions about disinfection, testing, and housing during the pandemic, due to their role as community health strategists within their jurisdiction.

On April 16th, more than a month after visitation was suspended in nursing homes, a new executive order required nursing home staff to notify the next of kin of residents who tested positive for COVID-19, or risk a $2000 fine. On May 10th, New York State instituted a rule requiring all skilled nursing and adult care facilities to test their staff for COVID-19 twice a week and relay any positive results to the NYSDOH (20). A month later, the governor halved that testing requirement.

Diagnostic and antibody testing

Availability of COVID-19 testing proved a monumental challenge for New York State's pandemic response since it began. To increase testing accessibility, Cuomo issued an executive order on April 12th expanding the eligibility of workers permitted to conduct COVID-19 diagnostic and antibody tests. At a press conference three days later, he declared that the state would prioritize healthcare providers, first responders, and essential workers for testing (21). Knowing the state would first have to tackle the unreliability of the testing reagent supply chain, the NYSDOH announced on April 17th its intention to establish a single, statewide testing prioritization process for all in-state labs. LHDs did their part by working with local providers, hospitals, FQHCs, businesses, congregate settings, and other entities to direct them to available testing, advocate for greater testing and laboratory capacity, and in some cases administer testing.

The state launched a large-scale antibody testing campaign in late April to help determine what percentage of the population had been exposed to the virus and facilitate the state's reopening. It began by collecting 3,000 samples from 40 locations in 19 counties, over a two-day period at grocery stores and other shopping areas (21). The prevalence of antibodies ranged widely, from 3.6 percent in the majority of upstate counties to 21.1 percent in New York City.

Diagnostic testing rates would factor into the state's formula for the timing of regional reopenings. A region should aim for at least 30 tests conducted for every 1,000 residents, according to CDC standards. By May 5th, one million New Yorkers had been tested, and by May 22nd, more than 670 testing sites were operating statewide. The state continued revising its testing criteria to become more inclusive until July 1st, when testing opened to all New Yorkers, having already conducted four million tests in total.

Reopening

New York State began planning for its reopening in April. On April 20th, the governor's office publicized the creation of a "Reimagine NY" Task Force to improve systems in downstate New York when lockdown ended. Governor Cuomo first outlined the state's four-phase reopening plan on April 26th, with a two-week monitoring period between each phase to capture any negative consequences. On May 5th, Cuomo explained the CDC guidelines informing reopening. The first regions — defined by the Empire State Development Corporation, an umbrella organization encompassing New York's two principal economic development public-benefit corporations (4) — to meet the criteria were the North Country, the Southern Tier, Finger Lakes, Central New York, and Mohawk Valley on May 15th. The Capital District and Western New York joined the group on May 19th, Hudson Valley on May 26th, Long Island on May 27th, and New York City on June 8th. Regions began entering Phase 4 in late June, with New York City entering last on July 20th (22).

LHDs were intimately involved in the local details and guidelines of reopening. While they were not officially responsible for approving business reopening plans, they received many inquiries and spent countless hours helping businesses adhere to state guidance.

Contact tracing

With decades worth of experience in contact tracing, LHDs set to work immediately identifying the contacts of confirmed COVID-19 cases and organizing logistics to provide the basic necessities they needed under quarantine or isolation, such as housing, medications, and meals. Contact tracing programs also established HIPAA-compliant systems to relay the location of quarantined and isolated individuals to first responders, alerting them to the necessity of wearing PPE upon entrance.

While LHDs relied on their own staff and cross-trained employees from other county agencies for contact tracing during lockdown, state leadership saw a statewide program as foundational to New York's reopening effort. On April 22nd, Governor Cuomo and former New York City Mayor Mike Bloomberg announced the immediate launch of a contact tracing program in partnership with New Jersey and Connecticut, which would assemble "an army of people" to trace each person who tested positive, determine who had they contacted, and then quarantine them, according to Cuomo (23). As part of the effort, Johns Hopkins' Bloomberg School of Public Health would build an online curriculum and training program for candidates recruited by the NYSDOH and Bloomberg Philanthropies. Meanwhile, the global public health organization Vital Strategies would develop call center protocols and digital tools. Funding for the initiative was provided in part by Bloomberg's foundation ($10.5 million) and the federal government ($1.3 billion). The program aspired to train at least 30 contact tracers per 100,000 New York State residents, adhering to CDC guidelines.

As of July 15th, the NYS Contact Tracing Program (distinct from New York City's Test & Trace Corps) touted an 86 percent success rate in reaching and interviewing COVID-19 positive New Yorkers since it launched in mid-May, according to a Cuomo advisor overseeing the effort (24).

General public

New Yorkers had to process conflicting information and follow rapidly evolving guidance from March through July. Many were working from home while taking care of their children throughout the school day; others were newly unemployed and anxious about paying basic cost-of-living expenses. Of the numerous executive orders issued from March to July, the most impactful for the public may have been those announcing New York on Pause, mandating

that all New Yorkers over the age of two wear face masks in public when within six feet of other people (following a new CDC recommendation that people wear homemade cloth or fabric face coverings in public places to protect others), and heralding the reopening of their own region (25).

Many residents to their local health departments for reliable, accurate information and reassurance during the height of the crisis. To meet this need, many county health officials spoke at daily press briefings with county leadership, while staff answered multitudes of community member calls about new mandates or announcements made by the Governor. This report will describe the communication strategies that LHDs employed to keep the public calm and informed during the first few months of the pandemic.

Statewide and regional trends in COVID-19 deaths, average daily hospitalizations, confirmed cases, and diagnostic testing

The charts on the following two pages (Figures 7-11) illustrate the impact of the COVID-19 pandemic on New York State as a whole and on individual regions over a five-month period beginning March 1st. (See maps portraying these same trends in Appendix D.) Y-axes appear on logarithmic scales to capture broad ranges of values.

In New York State (see Figure 7), average daily hospitalizations hit 9,164 in March and peaked in April at 15,833, before declining to 746 in July. The state saw cumulative deaths increase by more than 1,000 percent between March (1,312) and April (21,850); cumulative deaths increased by 34 percent (29,303) over the next month.

Cumulative confirmed cases of COVID-19 quadrupled from March 31st to April 30th, increasing by 20 percent the next month and six percent the following month. Meanwhile, tests per month peaked at 2.4 million in June, having launched at only 220,934 in March.

Breaking down the numbers by region, New York City — the epicenter of the COVID-19 pandemic in the United States during March and April — led regions in cumulative deaths (Figure 8), average hospitalizations per day (Figure 9), cumulative confirmed cases (Figure 10), and tests per month between March and July (Figure 11). Notably, tests per month peaked at 1.4 million in May, before dipping to 905,007 in July. Among the state's other nine regions, Long Island was the hardest hit, with its average daily hospitalizations topping out at 3,382 in April. The region reported cumulative deaths increasing by a factor of 25 between March (116) and April (2,877), as well as cumulative confirmed cases more than quadrupling (from 15,257 to 69,518) and tests per month more than tripling (from 41,705 to 149,171). Less impacted have been counties in the North Country, which had a peak of an average 17 daily hospitalizations in April, 661 confirmed COVID-19 cases and a total of 15 COVID-19-related deaths over the five-month period from March to July. The North Country region accordingly conducted less testing overall, although it did see one of the sharpest increases in the period between April and May, increasing from 4,195 to 23,773 tests.

The following sources provided data for analysis: the governor's New York Forward website, which offers guidance on reopening (daily average hospitalizations); the NYSDOH via USAFacts, a not-for-profit, nonpartisan civic initiative providing a comprehensive and understandable source of government data (COVID-19-related deaths and confirmed cases); and the NYSDOH health data portal, Health.data.gov.ny (tests per month).(26,27,28) (See Appendix B for data limitations and considerations.)

Figure 7. **NYS COVID-19 metrics (March - July 2020)**

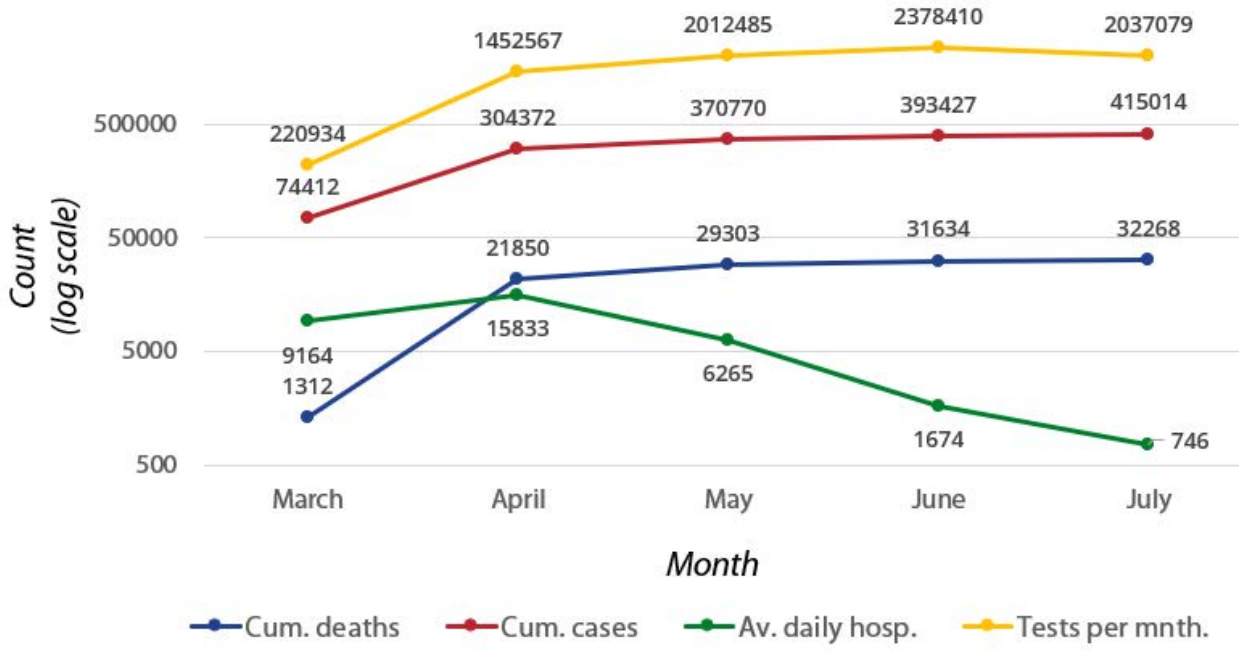


Figure 8. **Cumulative COVID-19 deaths by date, by NYS region (March - July 2020)**

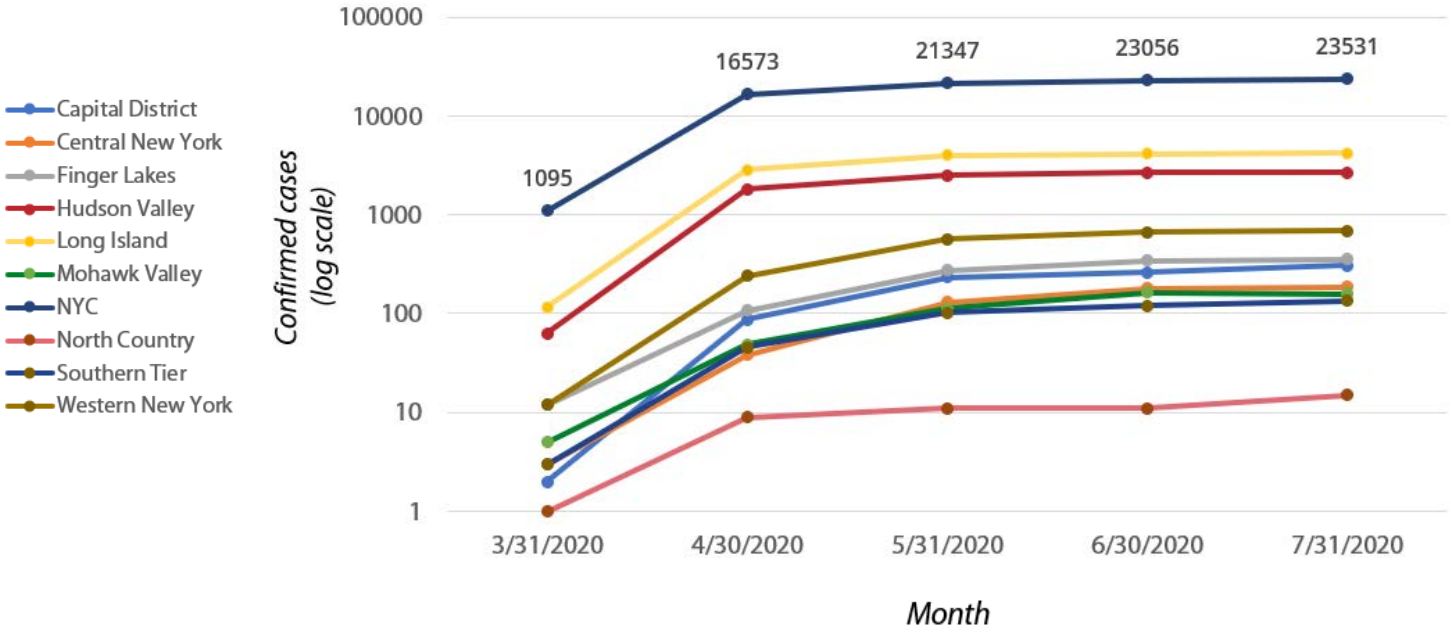


Figure 9. **Average daily COVID-19 hospitalizations by month, per NYS region (March - July 2020)**

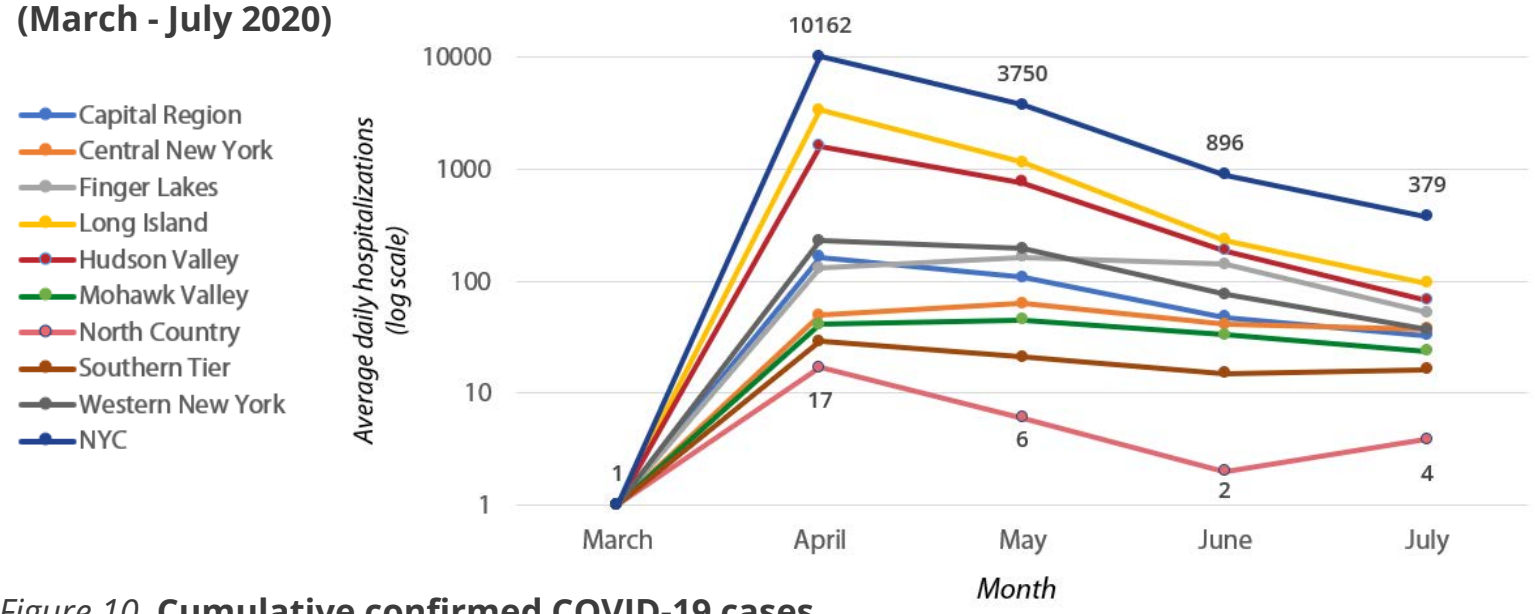


Figure 10. **Cumulative confirmed COVID-19 cases by date, by NYS region (March - July 2020)**

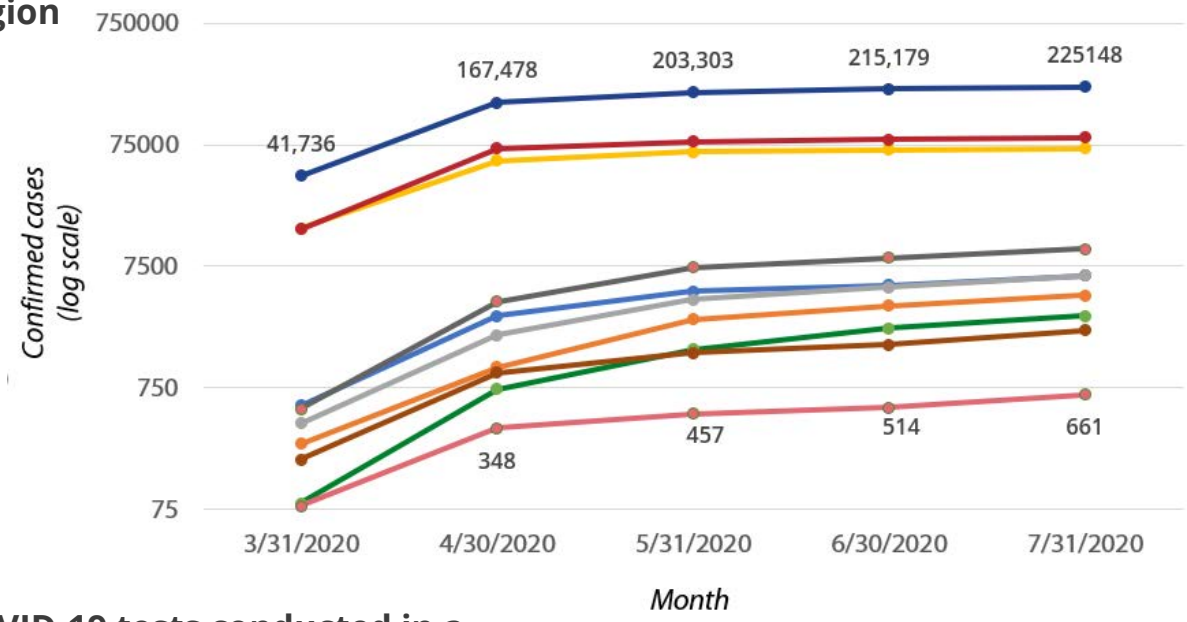
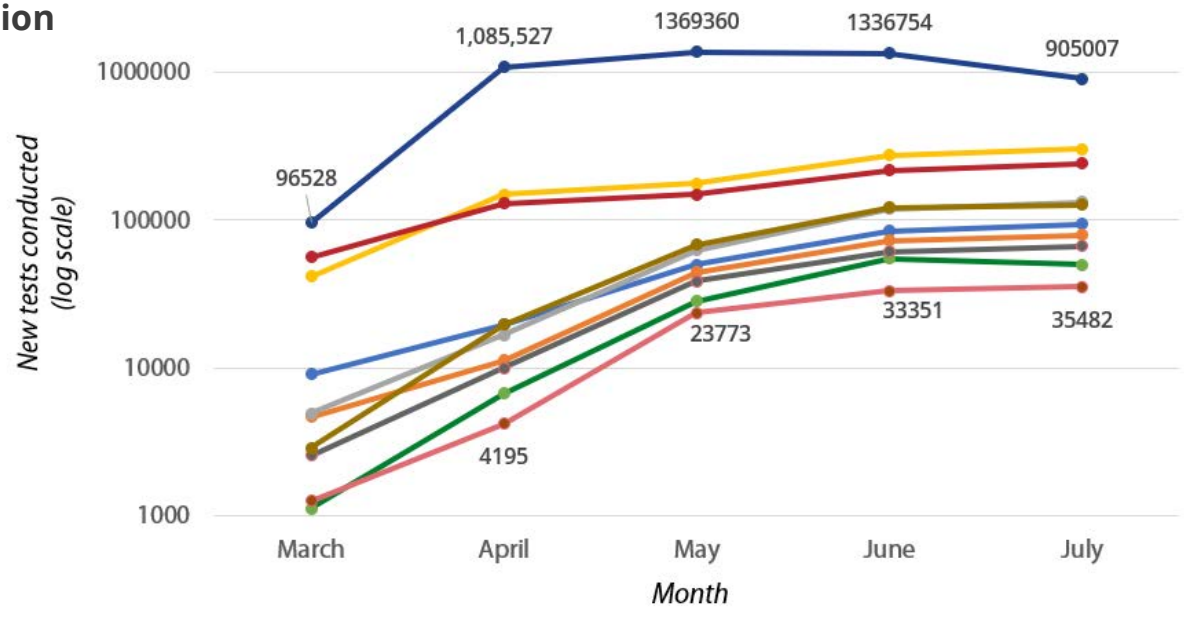


Figure 11. **Total COVID-19 tests conducted in a month, by NYS region**



METHODOLOGY

This report describes the results of a two-phase, mixed-methods study developed and executed by NYSACHO and the R2PHTC. The study's aims were to assess LHD emergency preparedness capabilities and capacities, describe lessons LHDs learned during the early and apex stages of the COVID-19 pandemic across the entire state and by region, and identify LHD workforce training needs. Study instruments were developed collaboratively, and the study protocol (IRB-AAAT0829) received approval from the IRB at Columbia University Irving Medical Center.

Figure 12. **SURVEY AND FOCUS GROUP TOPIC AREAS**

Phase 1

In the first study phase, the NYSACHO team distributed a 15-minute online survey (see Appendix A) via email invitation to commissioners and/or directors from 57 LHDs in New York State on May 18th.* The Qualtrics survey requested participant consent before asking LHD leaders, or delegates they selected to participate in their stead, to rate the effectiveness of their department's capabilities and capacities as demonstrated during the previous two months of the COVID-19 pandemic on a five-point Likert scale in four categories: administrative preparedness (defined by NACCHO as "the process of ensuring that the fiscal, legal, and administrative practices that govern funding, procurement, contracting, and hiring are appropriately integrated into all stages of emergency preparedness and response"(29)), public health preparedness systems, epidemiology, and communications (see Figure 12). Survey topics under each of the four categories were informed by an outbreak hotwash tip sheet from the Colorado Integrated Food Safety Center of Excellence, a situation manual for an infectious disease outbreak investigation tabletop exercise conducted by the Arizona Department of Health Services, an after-action report on the Texas Department of State Health Services' response to the novel H1N1 pandemic influenza, and a facilitator's script for an Ebola in-progress review developed by NACCHO (30,31,32).

Open-ended questions invited participants to identify areas of particular concern or ideas for improvement in each category, as well as department training needs for specific infection prevention and control activities and the provision of essential public health services.

The survey also collected identifiable information about each respondent, including their name and title, the population size of the county their LHD serves, and the region to which it belongs. (NYSACHO and the R2PHTC agreed that participants' highly visible roles as representatives of their government agencies negated any need for anonymity in this phase of the study.)

- *NYSACHO elected to exclude the NYC DOHMH from the sample due to its unique governance and structure and sensitivity to their bandwidth to participate.*

Quantitative survey results were analyzed in Excel by two researchers. Open-ended answers were analyzed thematically in Dedoose by a team of three coders.

Phase 2

In the second phase of this study, the NYSACHO team invited leaders at all 57 LHDs to participate in one-hour focus groups — one for each region except New York City, and the 10th as a make-up session for commissioners and directors who were unable to attend their region's designated focus group. Moderated by NYSACHO staff, the ten focus groups were conducted virtually via Zoom over a one-month period starting on June 23rd. Participants, whose consent was obtained verbally, answered five questions with respect to the four topic areas described above. These covered: their departments' most and least effective strategies and resources for responding to the COVID-19 pandemic; past and future methods of addressing any gaps and challenges identified during the pandemic; and potential systemic changes that could improve their departments' outbreak management and emergency response capabilities. NYSACHO assured participants it would protect their anonymity and asked that they refrain from relaying their colleagues' remarks to third parties, in order to create a trusting, safe environment for honest observations and commentary.

Video recordings of the focus groups were transcribed by two researchers. The same coders from Phase 1 analyzed the resulting de-identified transcripts using a codebook they had developed during survey analysis. Codes included the four main topic areas, their subcategories, and additional themes that emerged from the text.

Findings subject to greatest variation in interpretation were validated with members of resonance with their experiences.

Limitations

In its assessment of LHD capabilities and capacities in the context of the COVID-19 pandemic, this study collected the majority of its data — including ratings of LHD effectiveness in various pandemic-related areas — from LHD leaders who comprise the ranks of NYSACHO's most visible members. These participants offered a unique, vital and often-overlooked perspective that NYSACHO was uniquely positioned to capture and amplify, but their inevitably biased perceptions do not represent an objective account of LHD preparedness and performance during the pandemic. A more accurate assessment would have necessitated the recruitment of participants from all ranks of LHD staff, the NYSDOH, the governor's office, county leadership, other local agencies, the general public, businesses, and various community partners; unfortunately, such a comprehensive study would require funding beyond NYSACHO and the R2PHTC's means and much more time, which would have substantially delayed the dissemination of any results. We attempted to compensate for this study limitation by incorporating secondary data and news reports in findings sections that we felt called for a broader context and a more balanced overview of the issues.

Limitations of the survey include focus area subcategories that may have been subject to some variability in interpretation among participants; small sample sizes from each region, which precluded the possibility of hypothesis testing for associations between regions; and the non-participation of one region (New York City).

With respect to the qualitative research conducted, a general limitation of focus groups is

their susceptibility to the influence of group dynamics; the direction of any group discussion can be affected by those participants who have the strongest opinions and are the most vocal about them. In addition, the inter-rater reliability of the final coding analysis, according to a test of several excerpts conducted in Dedoose, met the standards for only moderate agreement (Cohen's kappa = 0.41-0.60). This can be attributed in part to the limitations of the Dedoose test itself, a less than ideal shared understanding among coders of such abstract codes as "visibility of public health," and a lack of time to complete a third round of coding.

FINDINGS

Study participants

Survey

A total of 38 respondents, representing 66.7 percent of LHDs in New York State, participated in the online survey (see Figure 13). The vast majority (73.7 percent) were Public Health Directors; Commissioners of Health comprised 13.2 percent of respondents. About 45 percent of respondents represented LHDs from small counties with fewer than 75,000 residents, while 28.9 percent represented LHDs from medium-sized counties with residents numbering between 75,000 and 200,000, and 26.3 percent represented LHDs in large or extra-large counties with more than 200,000 residents. Of the nine regions invited to participate, North Country and Mohawk Valley had the highest participant rates. Southern Tier had the lowest with only 37.5 percent of counties responding.

Focus groups

Focus groups attracted a larger number of participants (n=49) than the survey, despite the longer time commitment (see Figure 14). This more robust attendance can be attributed to the wider array of representatives from all levels of the departmental hierarchy and multiple representatives from several counties: while commissioners and directors comprised the majority of focus group participants (62 percent),

Figure 13. **Survey participant characteristics (n=38)**

Participant title	Count
Public Health Director	28
Commissioner of Public Health	5
Assistant/Deputy Commissioner	2
Director of Epidemiology	1
Patient Services Director	1
Supervising Public Health Nurse	1

Region (excluding NYC)	Count/Total
Southern Tier	3/8
Western New York	4/5
Finger Lakes	4/9
Hudson Valley	5/7
Central New York	4/5
Capital District	6/8
North Country	6/7
Mohawk Valley	5/6

County Size	Count
Small (<75,000)	17
Medium (75,000-199,999)	11
Large (200,000-499,999)	7
Extra-Large (>500,000)	3

a program coordinator and an epidemiologist also partook, and as many as three participants from one county attended a single focus group. A total of 43 LHDs (75.4 percent) participated in Phase 2 of the study, and groups ranged in size from three to seven people.

Group participant title	Count
Public Health Director	24
Commissioner of Public Health	7
Assistant/Deputy Commissioner	4
Assistant/Deputy Director	3
Other	12

County Size	Count
Small (<75,000)	21
Medium (75,000-199,999)	11
Large (200,000-499,999)	12
Extra-Large (>500,000)	6

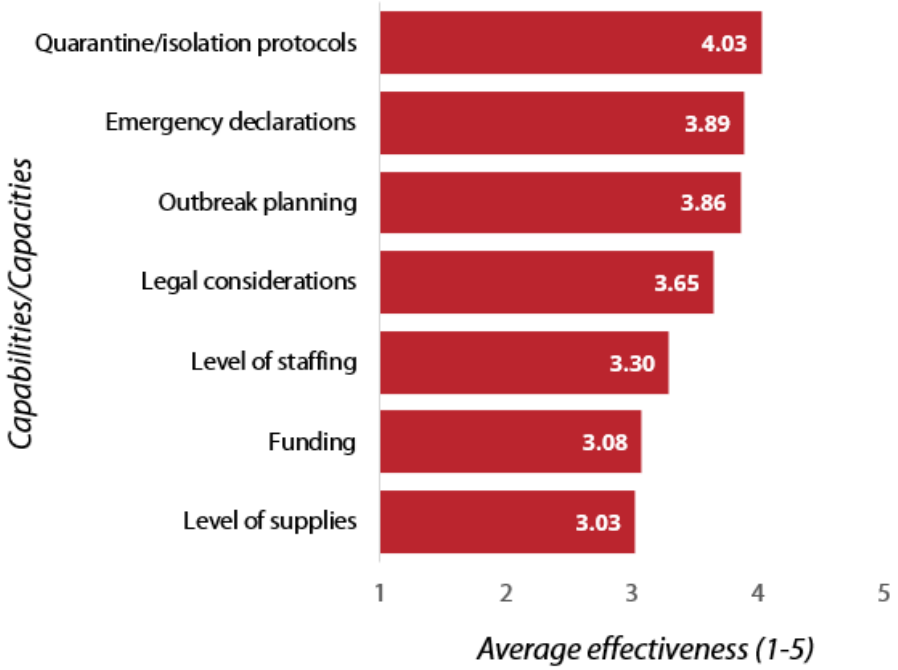
Figure 14. **Focus group participant characteristics (n=49)**

Region (excluding NYC)	Count/Total
Southern Tier	5/8
Western New York	4/5
Finger Lakes	7/9
Hudson Valley	5/7
Central New York	4/5
Capital District	5/8
North Country	7/7
Mohawk Valley	4/6
Long Island	2/2

Administrative preparedness

Administrative preparedness is the process of ensuring that the fiscal, legal, and administrative practices that govern funding, procurement, contracting, and hiring are appropriately integrated into all stages of emergency preparedness and response. Across all regions, survey participants rated the following administrative preparedness capabilities most effective: quarantine/isolation protocols (4.03 out of 5), emergency declarations (3.89), outbreak planning (3.86), and legal considerations (3.65). Participants rated the level of staffing, funding, and supplies least effective, at 3.30, 3.08 and 3.03 respectively.

Figure 15. **Average effectiveness of administrative preparedness capabilities/ capacities for all LHDs (n=38)**



Staffing

In focus group transcripts, staffing and funding limitations were the two themes that appeared with the greatest frequency under the heading of administrative preparedness. LHD leaders expressed immense appreciation for their staff members' dedication and willingness to rise to the occasion: "I had staff that I've interacted with for five, six years who just came out of the woodwork," one leader from the Capital District recounted. "They emerged as leaders, people that I wouldn't necessarily expect. And just extraordinary efforts, so I'm incredibly proud of my folks down here."

At the same time, several participants

noted a shortfall in epidemiological and nursing staff. Shortfalls in epidemiologists exist across the country, according to the Council of State and Territorial Epidemiologists (33). This shortfall is reflected in the overall decline in the size of the public health workforce at state and local levels documented in national studies (34,35).

Focus group participants from medium to extra-large counties expressed the desire to hire more epidemiologists, while participants from small counties reported a shortage of public health nurses. "We just don't have the funds to have two or three or four epidemiologists on staff, but you really do need to have a good, strong public health infrastructure to move forward and be able to address any type of public health issue in the future," one county health official from a large county said.

Many LHD leaders described their staff as working around the clock, seven days a week to fight the pandemic during its early and apex stages in New York State, and expressed concerns about burnout. One estimated their department had spent $100,000 in overtime funding from March through the beginning of June; another recalled their colleagues answering emails until as late as midnight, six or seven days a week. "Eighty percent of my staff is retirement-eligible and exhausted," a Capital District focus group participant lamented. "This has been a tremendous strain on the entire department."

> "In my short time here, it's like they strip away positions. It's 'Do as much as you can with as little as you can.'"
>
> *-Participant, Downstate*

> "I had staff that I've interacted with for five, six years who just came out of the woodwork. They emerged as leaders."
>
> *-Participant, Capital District*

LHD representatives also described re-deploying employees from an unrelated department or project — such as environmental health and early intervention — to their COVID-19 response. For some LHDs this created a sense of unity within their agency and instilled newfound confidence in staff. Other departments had already cross-trained their staff in communicable disease activities and were able to quickly transition to focus on COVID-19 response.

Funding

Staffing levels, sufficient or not, are inextricably tied to funding, participants noted. Two LHDs reported receiving county funding to hire supplemental staff during the pandemic, including doctors, nurses, physician assistants, and student epidemiologists. But for the overwhelming majority, decreases in funding over the years have resulted in understaffed departments with reduced capacity.

"In my short time here, it's like they strip away positions," a focus group participant from downstate New York* said. "It puts a lot of strain and stress on local health departments, and we're trying to do the best we can to keep up with our missions." A fellow participant reported that their department had cut its staff by approximately 80 people from 2013-2020.

One county health official reported that their department has only six communicable disease nurses for more than one million residents: "That's an insane ratio for anytime an outbreak

- *For the purposes of this report, "downstate New York" refers to the Hudson Valley and Long Island regions. They have been combined to protect the identity of participants from Long Island.*

occurs," they said, calling for state legislation to protect LHD funding. Following the state's mandates to provide core public health services, LHD's sizable expenses paid for with county funding subject them to the "chopping block" and the pressure to trim their budgets, said a participant from Western New York. "We are in a house of cards that is underfunded, underpaid, under-supported, under-resourced and this is making it incredibly difficult for us to address this public health challenge," one LHD leader eloquently summarized their department's funding situation. Asked about the gaps and challenges their LHD was facing, a public health nurse put it simply: "Money, money, money, money, money, money, money."

In the current funding environment, retiring workers are a major concern for LHD leadership: "I worry about succession," one LHD leader confessed. "With the fiscal constraints I think we're facing going forward, it's going to be hard to attract staff and retain staff, especially nurses and public health specialty people."

While the overall funding landscape looks bleak, LHD leaders have found some relief during the pandemic in the form of flexible grant funding. The NYSDOH distributed a total of $8.3 million among LHDs for COVID-19 response activities in March, and some county governments expecting FEMA reimbursement provided additional fiscal support (36,37). State emergency funding in one Capital District county covered LHD employee overtime, quarantine housing for individuals without shelter, and PPE for distribution to the public and community partners. In several counties, local governments supplied their LHDs with charge cards to pay for housing, food, and other resources for residents as needed. A charge card relieved one county health official in the North Country of what they described as "the usual purchasing nightmare of going through our purchasing department to get items that we needed to take care of the issue."

Financial flexibility of this kind would benefit other counties, too, focus group participants said. "Give us a pool of money and let us determine how we spend it," requested an LHD leader who expressed frustration over the necessity of securing state and county government permission before taking action. "If you want us to respond," they said, "we should be able to… have access to funds that we, the experts, can spend on our response."

Outbreak planning

LHDs reported benefitting significantly from their outbreak plans and drills, which helped them launch their COVID-19 response efforts quickly and efficiently. "Thank goodness for the testing that we do and the drills and the exercises!" exclaimed the leader of an LHD in a small county. "Although we all cringe at having to do those, it certainly does help us to be prepared for events like COVID."

> "We are in a house of cards that is underfunded, underpaid, under-supported, [and] under-resourced, and this is making it incredibly difficult for us to address this public health challenge."
>
> *-Participant, Capital District*

Exercises may be an annoyance, said the leader of a Southern Tier region LHD, "but the reality is they are important because you can't go from not having any practice and ability to test these things and try to implement… From my perspective, we were successful because we have planned and prepared, and we were ready for it."

Focus group participants cited the anticipatory preparation of an incident command system (ICS) and its deployment as critical for facilitating LHD

mobilization during the pandemic. An ICS provides guidance for organizing assets in response to an incident and processes to manage the response through various stages. Assets fall into five functional areas: command, operations, logistics, administration/finance, and planning, the latter captured by an Incident Action Plan.

> "We were successful because we have planned and prepared, and we were ready for it."
>
> *-Participant, Southern District*

"We immediately went into incident command and had a structure and had leaders," recalled one focus group participant from the Capital District, "and without that, I think it would have been very difficult to coordinate the entire event." Another participant from the same group explained that an ICS saved their department from metaphorically "having to build a boat first — we had it waiting at the dock for us."

Supplies

Focus group participants relayed issues with the supply of testing materials and PPE, including low supply levels, an inequitable distribution among counties, and confusion over LHDs' responsibilities for their dissemination to community partners. "No matter how loud you screamed that you did not have the resources in order to meet the needs of your community, those resources were always sent downstate," said an LHD leader from Western New York. "And I understand that they have the density, but [the State has] to realize that there are others… that also need their attention." (Some departments that did report sufficient supplies credited hospitals in their counties for their preparedness.)

Focus group participants from the Southern Tier and Finger Lakes regions said that their LHDs and their local Offices of Emergency Management had received some supplies from the state without instructions for their dispensation. "We were getting shipments [of testing kits] and we didn't even know they were coming and what they were supposed to be used for, [or] when was the expiration date," recalled one director. "They got thermometers the other day, and they don't even know who they're supposed to provide them to."

Quarantine and isolation protocols

Isolation and quarantine entail the physical separation and confinement of individuals who have been exposed to a highly contagious communicable disease for a period of time that will prevent transmission of the disease; individuals with symptoms are isolated, while those without are quarantined.

While LHDs described the challenge of implementing quarantine and isolation protocols that required daily home visits and the provision of alternative housing during the pandemic, they

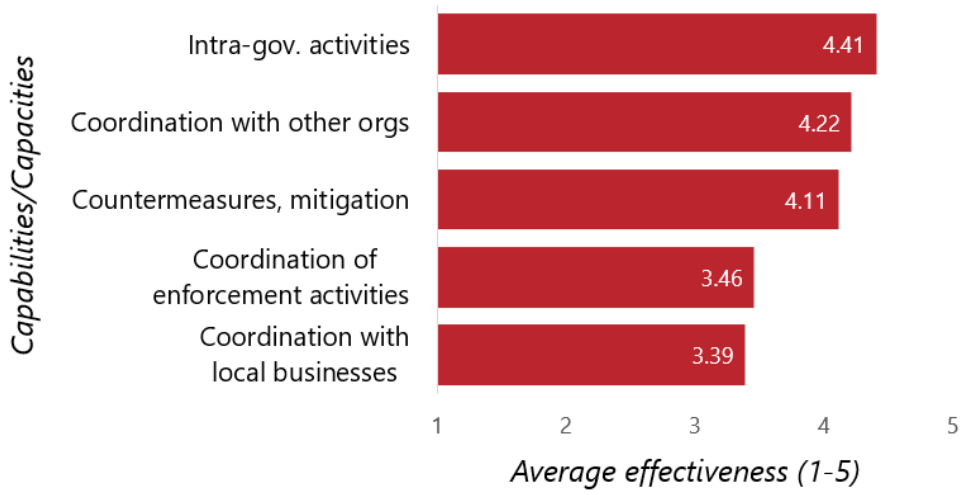
Employees of the Ulster County Department of Health and Mental Health distribute masks to residents. (Credit: Ulster County Department of Health and Mental Health, Facebook)

also shared solutions they had developed with the help of key allies. In downstate regions, the county attorneys who embedded in area LHDs answered all staff questions about and managed the distribution of quarantine and isolation orders. In one downstate region, a county information technology department partnered with an LHD to automate quarantine and isolation orders via an electronic, rather than paper-based, system.

Public health preparedness systems

In 2007, a diverse panel of experts convened by the Rand Corporation defined public health preparedness as "the capability of the public health and health care systems, communities, and individuals, to prevent, protect against, quickly respond to, and recover from health emergencies, particularly those whose scale, timing, or unpredictability threatens to overwhelm routine capabilities."(38) Across New York State, survey participants rated the following public health preparedness systems-related capabilities and capacities as the most effective (see Figure 16): intra-governmental activities (4.41 out of 5), coordination with other organizations (4.22), and countermeasures and mitigation (4.11). They rated coordination of enforcement activities and coordination with local businesses as least effective, 3.46 and 3.39 respectively. While countermeasures and mitigation did not arise as a prominent theme in focus groups, likely because there was no cure or vaccine for COVID-19 at the time this study was conducted, intra-governmental activities, primarily between county agencies, emerged as one of the most common themes.

Figure 16. **Average effectiveness of public health preparedness systems capabilities/capacities for all LHDs (n=38)**



The effectiveness of intra-governmental activities, countermeasures and mitigation, and coordination of enforcement activities were all significantly associated with the effectiveness of outbreak planning, with the effectiveness of each increasing by 0.585, 0.613 and 0.628 for each unit of outbreak planning effectiveness respectively, according to a linear regression analysis. (See Appendix C for more details.)

Intra-governmental activities with county leadership, other county agencies, and other local health departments

Supportive county leadership made a world of difference to LHDs during the early and apex stages of the pandemic, focus group participants said. Pointing to resignations of some of their counterparts around the country, one commissioner described their administration's backing — in strategic, fiscal, and emotional dimensions — as "a vital component to the health department being successful." They recalled driving home late one evening while speaking on the phone with their county executive, when the car began to skid on a fast turn: "She said, 'That's it, you have a police detail picking you up tomorrow'… That's great when you have that kind of support from above." LHD leaders also credited local government officials for helping coordinate the redeployment of employees from other local agencies to their departments.

County leadership involvement, however, came with drawbacks for some LHDs, focus group participants said, when local administrators gave instructions without the necessary public health knowledge, politicized government aid, or worried primarily about the pandemic's economic impact. "Our county just could not get past, 'Nobody knows anything, and everything keeps changing, and we're losing money,'" said a focus group participant from Mohawk Valley. "And to try and kind of steer that really broad picture back to, 'Okay, yes, in the short term, people are losing money, but, you know, if you adopt these behaviors it's actually going to save us money in the long run because we're not going to lose all these workers and all these businesses.'" No clear pattern in the types of LHD governance or characteristics could be detected with respect to the level of county leadership support.

LHD leaders across regions were pleased by the enthusiastic and helpful assistance they received from other agencies in their county, as a part of their ICS or on a more informal basis. Participants described a wide range of departments that contributed to pandemic response efforts, in both intuitive and unexpected ways: social services, aging, mental health, public works, law enforcement, probation, information technology, buildings and grounds, and emergency services. Some agencies dispatched employees for cross-training, some utilized their unique expertise, and others even provided moral support. A social services department in one county, for example, leveraged its relationships with hotels and motels to find places for COVID-19 exposed or positive individuals without shelter, or living in congregate settings, to isolate. (In general, social services departments provided critical wraparound services, including housing, medication pick-up, and food.) Sheriff's departments in more than one county took on the responsibility of delivering packets of information and supplies to individuals in isolation, and various agencies helped lift the burden of driving across counties to check on quarantined and isolated individuals. "That was definitely a bonus for us, you know, that we were able to leverage additional county staff," one LHD leader in the Finger Lakes region said. "It was untested, so to speak. I mean, we talked about it in our planning… and it worked quite well — they were very eager to participate and help out… Overall, I think it was a good collaborative county approach to dealing with the crisis."

An emergency medical technician and clinical supervisor for a mobile COVID-19 antibody clinic in Erie County prepares for a day of specimen collection. (Credit: Erie County Department of Health)

Counties on New York's borders, however, faced the unique challenge of attempting to coordinate their emergency responses with those of out-of-state and/or federal jurisdictions. This was an issue for one county that is home to a tribal nation and borders Canada; the jurisdiction struggled to collect case counts from the nation and discovered that some of its residents had mistakenly reported themselves as living in Ontario.

Coordination of enforcement activities

Coordination of enforcement activities as a public health preparedness system capacity arose most frequently as a theme among participants in the Mohawk Valley focus group, and it was rated as least effective among LHDs serving small counties.

While some county health officials described difficulties with local capacity to enforce public gathering and mask mandates, enforcement activities have been most challenging for partial-service counties, which are normally not required to inspect restaurants, camps, hotels, or other businesses on a regular basis. Leaders from these counties expressed a lack of confidence and described resistance: "I can't tell you how many places I've gone to and said, 'Please, you have just got to enforce that your staff wear a mask and try your best to have all of your patrons coming in… wearing masks,'" one partial-service LHD leader said. "They know that if they claim that they have a medical reason to not wear a mask, I can't ask them any more about it."

Levels of sheriff and police involvement in pandemic-related enforcement activities varied by county. In some, local sheriff's departments fully embodied the role of enforcer, issuing violations and close orders to non-compliant bars and restaurants. In others, sheriffs and local and state police interpreted authoritative and legal ambiguity and cited the volume of other departmental duties as barriers to enforcement. A few study participants speculated that the level of law enforcement involvement in their own counties may have been impacted by conflicts of interest that can arise in small communities. Additionally, the volume of staff needed to enforce such violations was simply unavailable to all departments playing an active role in enforcement efforts.

> "I always say to people, 'When a crisis or an emergency starts, that's not the time to start building the relationships — it's got to happen a lot before that.'"
>
> *-Participant, Western New York*

Coordination with other organizations and relationship building

Multiple LHD leaders who participated in focus groups stressed the importance of building relationships with community partners before an emergency strikes.

"I always say to people, 'When a crisis or an emergency starts, that's not the time to start building the relationships — it's got to happen a lot before that,'" said the leader of an LHD serving a large county. "We're fortunate to have three hospitals in our county, so we deal with them on a weekly, sometimes daily basis. I have the ability to talk with our CEOs of the hospitals, call them whenever we want to. So, I think that those things work well, but they only work well if you have those relationships already built before you need them."

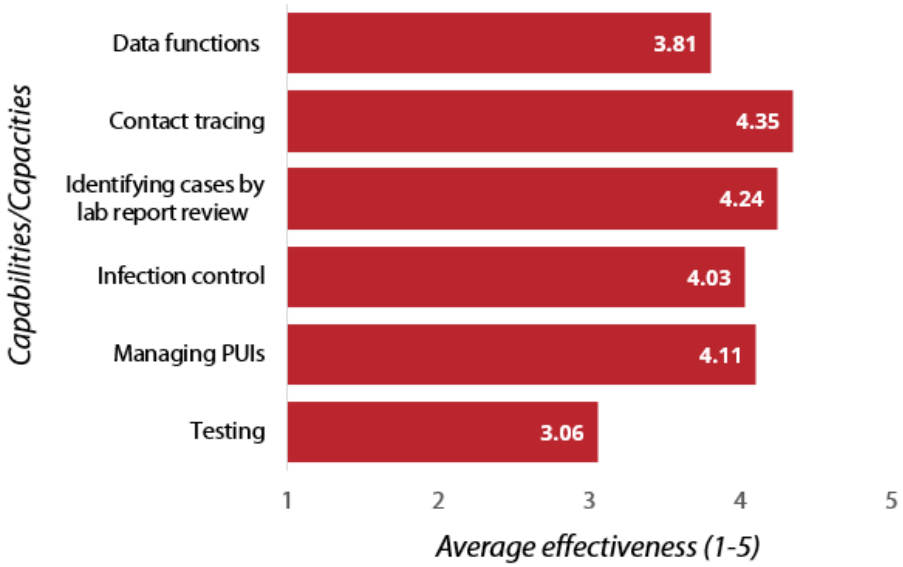
In addition to their relationships with hospitals, LHDs leveraged relationships they had nurtured with schools, colleges, other health care providers, adult care and skilled nursing facilities, group homes for individuals with developmental disabilities, and local businesses to provide information and education, and to coordinate infection control procedures. They also quickly identified the gaps in their networks and took action to fill them.

Epidemiology

Epidemiology is the scientific study of the distribution and determinants of diseases in specified populations, and the application of findings to their control.

Survey respondents across the state rated contact tracing as their most effective epidemiological capability (4.35 out of 5) and testing their least effective (3.06) (see Figure 17). The latter also represented the most common theme arising in focus groups.

Figure 17. **Average effectiveness of epidemiological capabilities/capacities for all LHDs (n=38)**



An LHD's level of supplies had a significant, positive impact on the effectiveness of testing, as did the effectiveness of intra-governmental activities on the effectiveness of contact tracing, per linear regression analyses. (See Appendix C for more details.)

Niagara County Department of Health staff dressed in PPE to conduct COVID-19 testing. (Credit: Niagara County Department of Health, Facebook)

Testing

The initial success of diagnostic testing in a given county seems to have depended on the presence of at least one hospital and their willingness to establish COVID-19 testing sites, according to focus group participants.

"Compared to what I heard in other places, I thought testing went well here — and that's because of the healthcare infrastructure that we're very lucky to have," said one county health official. "I understand not every community has the hospital systems that we have here." LHD leaders in rural counties confirmed this major limitation in resources; a few reported the requests they made for the state's assistance in establishing a testing site were denied. (State health departments across the country had their hands tied, experiencing wide scale shortages of laboratory supplies for COVID-19 testing — including viral transport media, extraction kits, reagents, and test swabs — for months(39).)

Several counties without their own hospitals — or with under-resourced, inundated hospitals unable to test the general public — set up their own pop-up clinics to increase testing accessibility, some with the assistance of their local FQHC (40). "Testing was an extremely difficult thing for us to get done for people," said an LHD leader from a more sparsely populated county without a hospital, "so once we started getting the testing supplies and the kits in, we started doing our own pop-up clinics throughout the county. I know it was not easy and it put a lot of stress on our department, but it was an effective way for us to get people tested that needed to be tested." Centrally located drive-through clinics were especially appealing to the public and LHDs because they made both parties feel safer, according to a focus group participant from Western New York.

> "I can have a person who nine days ago had a test, and I'm still waiting for a result. What good is that to me?"
>
> *-Participant, Capital District*

Other testing-related challenges that surfaced during focus groups were a lack of public knowledge about the difference between diagnostic and antibody testing, long turnaround times at laboratories, and the failure of some labs to enter complete patient information in the Electronic Clinical Laboratory Reporting System (ECLRS). "I can have a person who nine days ago had a test, and I'm still waiting for a result," said a director from a large county. "What good is that to me? That doesn't make any sense to me that we aren't having instantaneous test results, you know?"

Data functions and systems

For some focus group participants, the current public health emergency underscored how imperative it was that LHDs update their surveillance data management systems and processes to effectively track disease cases, identify clusters, make decisions, and share their information with the state. "When we had the first few cases and we did it on paper, it was fun — we made our spreadsheet, we had our line list," one commissioner recalled. "But we went from zero to 40,000 cases in eight weeks. You can't have two people managing an Excel spreadsheet of 40,000 cases," they said, citing a lack of government investment in technological advances as the root cause of the issue.

The Countermeasure Data Management System (CDMS) the NYSDOH uses for medical countermeasure response and population management, which requires manual data entry, "was never made for pandemics," said an experienced coordinator of communicable disease, calling for systemic change. (As a case in point, one downstate LHD accumulated boxes of case investigations before entering the data into CDMS.)

Two focus group participants described what form that development might take: a software program that enables LHDs to collect their own local data on communicable disease cases of all kinds but also aggregates data statewide in an easily accessible format. "It makes total sense that that should have already existed" one said.

CommCare, a digital platform that New York State procured to create a unified statewide surveillance system (which qualifies its contact tracing program for federal funding), offers a prototype for such a system.(40) CommCare's customizable mobile app can be used to: (1) quickly identify people infected by COVID-19 with customized screening and triage protocols; (2)

communicate with them directly and securely; (3) trace patients' contacts; (4) track the status of COVID-19 tests; (5) keep tabs on the stock levels of a county's medical supplies; and (6) build reports to identify patterns and disease clusters. (41)

CommCare greatly increased LHDs' capacity to conduct contact tracing, manage persons under investigation, and continue delivering essential public health services, but early implementation was a challenge for many LHDs.

Across the state, LHD leaders agreed that the timing of the program's introduction was unfortunate but unavoidable and the learning curve was steep. One described the implementation of CommCare, while ultimately helpful, as "a significant lift" under the circumstances. Another reported that it "near[ly] tore [their] department apart back there in terms of just the struggle to try and make it work." Multiple survey participants requested more training and technical assistance using CommCare.

General attitudes toward the software program appear to vary based on the rate at which a given county saw its COVID-19 cases increase and the presence or absence of a comprehensive data management system. "We feel strongly that the only reason we're semi-successful with it is because our numbers are pretty low," said one county health official from Central New York. "They're low enough that we've had time to deal with every issue that has come up with CommCare."

An LHD leader whose county was seeing 100 new cases daily when CommCare went live in May characterized the program as their organization's "biggest frustration" because the LHD had already created and implemented its own data management system: "Our IT department had built us something, we were comfortable with it, we had everybody trained in it. And then we had to just blow it up and start over again." Their employees were not entirely comfortable using the product to analyze data for trends and hotspots, but the issues with data management had improved and remains a work in progress.

A number of study participants did express appreciation for the program, which relieved staff from the tedious, time-intensive duty of spreadsheet reporting, offered useful features, and enabled LHD employees to take some much-needed time off: "My staff are finally getting the weekends off and we're rotating people through and getting back to business as we can," said a focus group participant from the Capital District. "The virtual contact tracing team has been helpful. And one of my supervisors is learning how to build [cluster] reports for us — that's very helpful." Another from the Southern Tier expressed gratitude for the NYSDOH's assistance with navigating the new system.

Months later, participants in a member checking session conducted to validate study results broadly agreed that CommCare had served their LHDs well after its bumpy early implementation period. Several thanked the NYSDOH for its responsiveness in incorporating requests for program updates.

> "Our IT department had built us something, we were comfortable with it, we had everybody trained in it. And then we had to just blow it up and start over again."
>
> *-Participant, Downstate*

Contact tracing and case investigation

While the sheer volume of cases became a major

issue in downstate counties, LHDs in general felt highly prepared to conduct contact tracing and case investigations, due to their significant experience with other communicable diseases. "I know contact tracing was a new concept for a lot of folks in the media and at some levels of government, but we've been doing this forever," an LHD leader from the Southern Tier said with pride. "This is what our [communicable disease] team is really good at, and we were actually surprisingly great at scaling it up."

Several LHDs had previously trained staff on other teams, including health education, in contact tracing and case investigation. This made the process of expanding their operations quick and seamless. Another LHD planned on making contact tracing training mandatory for all health department staff going forward.

One concern for some leaders, however, was maintaining their department's contact tracing capacity while resuming other core public health services: "We were doing what I call the A plus level, and now with our staffing and this ongoing… I'm telling staff we kinda have to bring ourselves down to the B level… We can't necessarily put the same effort into every single case that we did when we rolled out."

The state's virtual contact tracing program, which is staffed in part by Public Consulting Group hires, provides LHDs with additional contact tracers outside of their own staff when needed. This program has provided much relief in this regard, focus group participants said. An LHD leader from a downstate region praised the program as "a very successful model" of sharing resources among LHDs. "If I don't have a lot of cases, I don't need people to be contacting and doing case investigation or monitoring, [but] other counties around me may," they said. By assuming a portion of LHDs' contact tracing responsibilities, the program enabled staff to finally take days off: "It's been nice to have a weekend off for our staff that have worked endless hours," an LHD director commented.

> "I know contact tracing was a new concept for a lot of folks in the media and at some levels of government, but we've been doing this forever."
>
> *-Participant, Southern Tier*

Communications

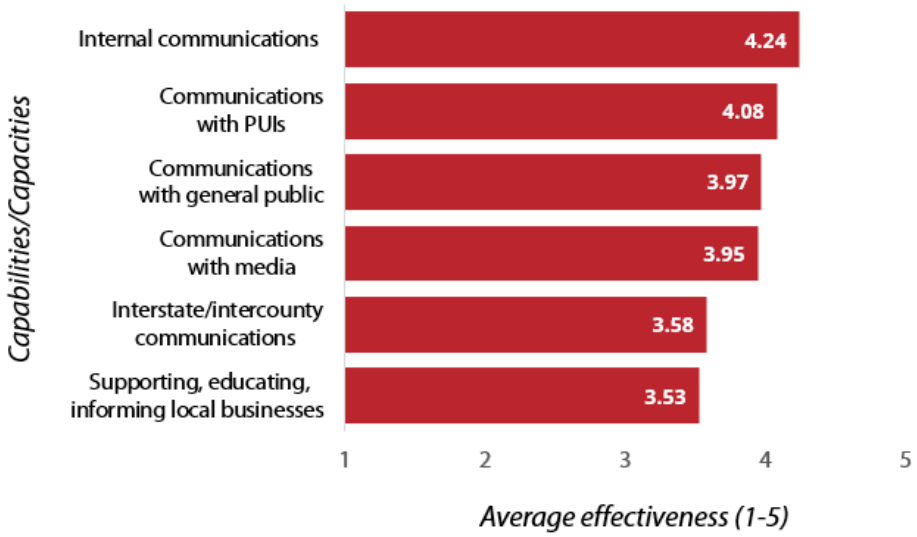
LHDs have the responsibility of communicating with many different audiences and partners. These include their own staff, the general public, the media, persons under investigation, other government entities, and local businesses. In the online survey, participants reported communications within their own organization most effective (4.24 out of 5), and their efforts to support, educate and inform local businesses least effective (3.53) (see Figure 18). In focus groups, participants spoke most frequently about intra-governmental communications, communications with the general public, communications with health care organizations, and communications with the governor's office.

A strong correlation ($r = 0.829$) was found between the effectiveness of communicating with and managing persons under investigation, a moderate correlation ($r = 0.632$) between the effectiveness of coordinating with businesses and supporting, educating and informing them. Linear regression analysis suggests that increases in the effectiveness of an LHD's data functions — including releasing data and tracking and monitoring cases — had a significant, positive effect on both the effectiveness of its communications with the public and intra-governmental communications. (See Appendix C for more details.)

Intra-governmental communications: Communication with local agencies and county leadership, colleagues, and the NYSDOH

Focus group participants discussed four kinds of intra-governmental communication: communications with other local agencies and county leadership and communication with their colleagues, which were within the scope of their control; and communications with the NYSDOH, which were beyond it.

Figure 18. **Average effectiveness of communications capabilities/capacities for all LHDs (n=38)**



Communication with local agencies and county leadership

At the beginning of the pandemic, many LHDs set up daily calls with other local agencies to collaborate on any COVID-19 response efforts. Call participants included representatives from law enforcement, emergency services, social services, and elected officials. Daily conversations facilitated the dissemination of new information, shared decision making, and consistent messaging across agencies, LHD leaders in Western New York and downstate regions said.

> "Any time I picked up the phone, texted or emailed, they always responded. It just means so much when your co-workers in other counties are there for you."
>
> *-Participant, Downstate*

Communication with colleagues

Directors and commissioners in the Capital District, the North Country, and downstate regions also reported conferring frequently with one another through informal channels.

Communication via calls, texts, and emails helped leaders coordinate their messaging to the public, process new state guidance, share innovative ideas, and generally build a sense of solidarity.

"Anytime I picked up the phone, texted, called, emailed, they always responded," one focus group participant said with gratitude for colleagues who willingly traded ideas and templates. "It just means so much when your co-workers in your other counties are there for you... That camaraderie meant more than any of the other stuff to us."

Communication with and from the NYSDOH

Focus group participants expressed a need for more timely, clearer communication from the NYSDOH. The State participated in weekly calls with NYSACHO members, giving LHDs the opportunity to ask questions of experts at the State Department of Health. This effort was greatly appreciated, however sometimes questions required follow up from other state agencies or the Executive Chamber which would create a lag in response time. A number credited NYSACHO for strengthening their lines of communication with the state health department.

"I think the communication that you coordinate with [the Office of Public Health Practice at NYSDOH] really, really is helpful," said a participant from Western New York, referring in part to weekly calls orchestrated by NYSACHO with LHD leaders and NYSDOH officials. NYSACHO's executive director also spoke with a liaison from the NYSDOH's Office of Public Health Practice on a nightly basis during the height of the pandemic, seeking help and guidance. "I think there's always a lot of frustration because it doesn't always get us what we need, but I do think that the connection between local health departments and NYSACHO and the state…is better than it's ever been."

Focus group participants articulated a wish to receive updates before state daily briefings to the public, so as to serve more effectively in their role as the operational arm of the NYSDOH. Many expressed a concern that a lag in communication left them unprepared to answer residents' questions and may have minimized their credibility as public health authorities.

> "Facebook can put out misinformation faster than you could put out the truth. So we are still fighting that today."
>
> *-Participant, Southern Tier*

"We just need, I think, better direction and some alignment around how these activities are supposed to occur so that we can speak more eloquently and with the level of authority that we actually know what we're talking about," said a participant from the Finger Lakes region.

Communication with the general public

LHDs have employed a wide variety of strategies to communicate with the public during the pandemic, including public service announcements, press conferences, call centers, and social media.

LHDs in the Mohawk Valley, Capital District, and downstate regions all reported establishing hotlines or call centers to field inquiries from the community, an approach that distinctly divided departmental responsibilities and allowed contact tracers and case investigators to focus on their tasks at hand.

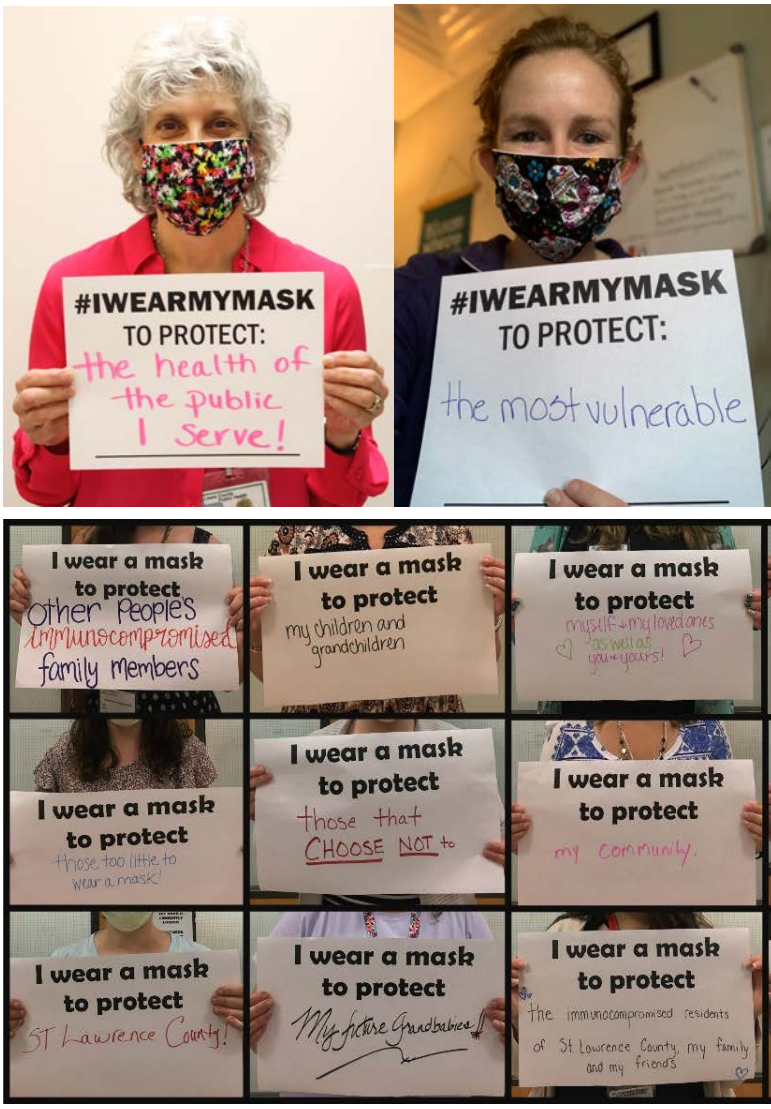
Social media platforms also played a significant role in transmitting information to the public for some LHDs. "I think we've learned the real value of social media during this time," said one participant from Western New York. "It just seems to be a go-to for so many people, and I think it's now going to be our responsibility to have more frequent messaging on our Facebook page and continue to be relevant."

The downside of online platforms like Facebook, LHDs learned, however, is that they can spread false statements quickly. The social networking site, noted one LHD leader, "can put out misinformation faster than you could put out the truth. So we are still fighting that today…We have a social media team that spearheads that...but still we spent a lot of time rehashing the same information, explaining to folks what quarantine means and that we're not going to tell them if their neighbor's positive." The county health official identified their department's social media messaging as an area for improvement, and, like several of their colleagues, illuminated a need for training in crisis communications.

Through their experiences communicating with the public during the pandemic, participants recognized the value of either assembling public information teams or employing a public information officer to handle social media, press releases, requests from the media and daily

briefings. A leader from Central New York identified one of their department's successes as the assignment of its entire health education staff to communications responsibilities: "They are the PIOs [public information officers]; they were in charge of drafting all of the information that we were giving out to legislators, municipalities, business partners, the public in general, the hospital," they explained. "I think that using the staffing in that way was extremely effective. It really also helped make sure that the public and our community partners knew how to reach us. They manned, and they continue to man now, our information line."

LHD leaders also acknowledged the importance of humility and the recognition of uncertainty in their messaging to county residents. "Whenever we didn't have guidance and there were decisions to be made, we made them in the absence of that guidance using best judgment, which was not an easy or comfortable position to be in," one LHD leader explained of their county's approach. "But working with my county administrator, we felt it was our obligation to, in the absence of guidance, give direction. And it worked because we built credibility in that manner, and in the way that we communicated it, saying, 'Look, this is what we know. This is what we're asking you to do, and this is how we're going to move forward.'" Changes in federal and state guidance on interventions like wearing face coverings, reflecting new scientific discoveries about COVID-19 transmission and risk, inevitably exposed LHDs to inconsistencies in their messaging and resulted in avoidable disease transmission. (Findings from a study published as part a series of working papers from the Center for Economic Policy Research in London suggest that the introduction of a uniform national mask mandate for employees of public-facing businesses on April 1 would have reduced the VID-19 death toll in the U.S. by 40 percent as of June 1st, and Cuomo has publicly acknowledged



Lewis and St. Lawrence County LHD employees create and share signs stating why they wear a mask . (Credit: Lewis County Public Health [top], St. Lawrence Department of Health [bottom], Facebook)

that an earlier statewide mask mandate could have made a "dramatic difference" in New York State's fight against the pandemic (43).) "All we can do is give the most recent information," said one LHD leader, expressing some regret for early messaging about the use of face masks by individuals other than healthcare providers. "We did say this is a brand-new virus, and what we're telling you today may be different next week. I said it every single time I spoke in the beginning."

Communications with health care organizations

Many participants described regular communication with their area healthcare facilities; some also connected frequently with individual medical providers. As described earlier, this ongoing communication expedited the distribution of needed supplies, both to and from facilities. It also prepared hospitals to manage any surges in COVID-19 cases, as one LHD leader from Western New York explained: "Monday through Friday we had the public health directors' call that was held by myself and…two hospitals' CEOs and the directors of the various departments of those hospitals, and I issued my daily report to them. We talked basically about their preparation for a particular surge in our community if that was necessary, based on the report that I was issuing, and that was based on the number of individuals that were either isolated and/or those who we were very concerned about, who were identified by our nursing staff as having been very symptomatic, and there was a potential of them having to be transferred to their emergency rooms."

Through established lines of communications, hospitals could also promptly report any issues arising in the delivery of care. When downstate hospitals in one region faced an insufficient supply of body bags, for example, LHDs were capable of leveraging their relationships with partner agencies to address the shortage, thanks to timely communication.

Unique characteristics of LHDs and the communities they serve

LHDs and the communities they serve are diverse and have unique needs, due to various services provided, staff capacities, populations, demographics, health systems, local governments, and health needs. LHDs, as the frontline of public health in their counties, know their communities' specific needs and are in the best position to serve them. Throughout the focus groups, a common theme that arose was the desire for LHDs to have more control over decision making for their communities and the ability to coordinate response efforts they felt appropriate for their communities with the state.

Several LHD leaders said that the varying needs of different counties call for tailored approaches. "It is very frustrating in the state of New York that there is New York City and the surrounding big counties, and then there's the rest of us that are quite often just left out to dry with blanket policies that really are only okay for big city areas, but aren't the way it needs to be here," one county health official said, referring in part to the closing and slow reopening of counties with a very low prevalence of COVID-19 compared to more populous areas of the state.

> "It is very frustrating in the state of New York that there is NYC and the surrounding big counties, and then there's the rest of us that are quite often just left out to dry with blanket policies that really are only okay for big city areas."
>
> *-Participant, Southern Tier*

An LHD leader who took great pride in their team's ability to "pull [themselves] up by [their] bootstraps" during the pandemic made the point that LHDs should make decisions for their own communities, knowing these localities' needs best.

Focus group participants also described the importance of consistent messaging and decision-making across counties: "The regional

control board model," composed of "regional control rooms" which were announced by Governor Cuomo on May 11th (44), operated through the Executive Chamber and Empire State Development, "does help streamline and standardize some of this decision-making and guidance. So, I think if…we'd have taken that approach from the beginning, maybe the outcomes would have been different."

At least one participant advocated on behalf of a compromise between independence and uniformity: "I do believe…the governor and state health department have the ultimate authority, but they should also…let localities make certain decisions because…we are different than New York City," they said, encouraging the state to consider how they can incorporate LHDs into their decision-making process.

Visibility and perceptions of local public health departments

Another theme that emerged from focus group discussions was the visibility and public perceptions of local health departments as they emerged before and during the pandemic.

A couple of participants reported that their departments' responses to COVID-19 and county-level utilization of their public health expertise had attracted the public's attention and increased their recognition. Appearing at daily press conferences with their county executive every day since the start of the pandemic had been helpful, one county health official said, "in that (a) it's put the public health presence out there so people know the health department is part of this, and (b) it's given us a chance to communicate with our public and a lot of people I hear watch these daily press conferences." They added that participating in daily pressers had enhanced their department's credibility and presence because "people don't always understand what health departments do or why they're there, but they've seen us long enough to know." Strangers recognize the commissioner at the supermarket now, they added.

An LHD leader who recorded public service announcements for their county's local radio stations said they received positive feedback from people who appreciated hearing their voice over the radio, telling them to wash their hands and wear their masks — "just to have the real local spin on things where they really could trust, I guess, what we were telling them."

Other participants anticipated that the public health response to the COVID-19 pandemic would call New Yorkers' attention to the regular contributions LHDs make to their communities, if not yet, then in the future. "I think this has really given us that foothold, again, to say, 'Yes, we're here, and, yes, we're experts in what we do, and you need to really trust and give us some credence for doing that," said a leader from a downstate region. Another from a downstate region expressed hopefulness that the work LHDs have done during the pandemic so far will remind county residents how important and effective their local government is: "It did really, to me, shed light on what we're able to do with such limited resources, and what we could have done had we had that ability to better prepare ourselves," they said.

Many participants, however, voiced their frustrations over what they perceived as the continued invisibility of public health at a local level.

"I realize we're not taking care of the patients in the hospitals and stuff, but man, we're boots on the ground doing it out here in the community to try and prevent people from getting to that point," said one county health official. "And if it wasn't for local public health, we would be in a lot worse shape than we are, and there's just not that recognition. "

"I still think there's a lot of people out there that don't know what we are doing through this whole thing," a county health official said. "For me to say to someone, 'I work in a local health department,' and then for someone to say, 'Oh, well, were you guys home on quarantine through all this?'… People don't understand still, and I don't know how, despite all the work that we're doing." One of the reasons, they hypothesized, is that LHDs' contributions were infrequently acknowledged during state press conferences.

"Sometimes, the state does not put the local health department in the center of things," said a county health official who argued that public health should be "the key driver, not the follower" during a pandemic response.

Chautauqua County officials provide an update on COVID-19 on May 29. (Credit: Chautauqua County Department of Health and Human Services, Facebook)

RECOMMENDATIONS AND BEST PRACTICES

The following recommendations and best practices aimed to bolster LHDs' response to COVID-19 and future pandemics are informed by suggestions and successes shared by study participants and vetted by NYSACHO. A number of these strategies have already been implemented by individual LHDs and should be scaled across departments, as deemed appropriate by the commissioner or director in that jurisdiction. Some recommendations propose changes that LHDs can implement themselves, others require changes that must be executed by county or state governments.

Administrative Preparedness

(Outbreak planning, funding, emergency declarations, quarantine/isolation protocols, staffing, supplies, legal considerations)

We recommend that LHDs continue to:

- Coordinate emergency preparedness activities with not only hospital partners, but also schools, colleges, businesses, and other community partners where appropriate.
- Actively engage partners in coordinated planning and infrastructure development to prepare for all hazards and public health emergencies.
- Expand the LHD response team by training all LHD employees, including clerical staff, in

contact tracing and basic public health functions. It is important to consider the fiscal implications of staff time associated with such cross training; flexible federal or state funding should be allocated to such activities.
- As deemed appropriate by department leadership, improve the work-from-home capabilities of LHD employees via IT support.

We recommend that the state:

- Negotiate federal and remove state-level spending restrictions to give LHDs the flexibility to spend funding to meet their community and agency needs at all times, but especially during public health emergencies.
- Match fiscal resources to LHD needs to ensure sustainable operations and response capabilities. This can be achieved by raising Article 6 base grants from $650,000 to $750,000 in full-service LHDs and from $500,000 to $550,00 in partial-service LHDs, and increasing the per-capita reimbursement rate from $0.65 to $1.30 in large counties.
- Re-evaluate ineligible expenses as defined by Article 6 Public Health Law. Public health response requires public health professionals to do the work. Maintaining that fringe and other employment benefits are ineligible for state aid reimbursement is counterproductive to our statewide ability to respond to public health emergencies.
- Distribute PPE and testing supplies equitably among counties based on infection rates, deaths, and populations, and keep these supplies well-stocked in each county.
- Provide full information transparency to LHDs during vaccine distribution in their counties and provide them with the staffing needed to administer Points of Dispensing sites* when the time arrives.

Public Health Preparedness Systems

(Intra-governmental activities, coordination with other organizations, implementing countermeasures and mitigation, coordination of enforcement activities, coordination with local businesses)

We recommend that LHDs continue to:

- Plan and coordinate the delivery of wraparound services to residents in collaboration with social services or other intra-governmental departments and community-based organizations that have the capacity to support individuals in quarantine and isolation.
- Expand existing relationships with other regional LHDs and community partners in advance of a crisis. Such relationships and specific contacts facilitate timely and effective communications during an emergency.
- Establish, in partnership with county government officials, which local agencies will be responsible for the enforcement of statewide executive orders mandating such behaviors as self-quarantine and mask-wearing.

We recommend that the state:

- Provide funding to support the training of county agency staff from various departments in essential public health skills, so they can provide immediate assistance during public health emergencies.
- Establish a statewide public health mutual aid statute to address costs, liability and mutual aid for counties working under designated emergency scenarios.

- *Points of Dispensing are community locations in which state and local agencies dispense medical countermeasures to the public during a public health emergency (45).*

- Train professionals working in congregate settings such as nursing homes, prisons, and facilities run by The Office for People With Developmental Disabilities — where the risk of communicable disease transmission is greatest — on disease infection and control measures including proper PPE use.

Epidemiology

(Testing, managing PUIs, infection control, identifying cases through lab reports, contact tracing, data functions)

We recommend that LHDs continue to:

- Establish, or assure availability of, community testing including drive-through testing sites and mobile clinics, which keep potentially infected individuals out of healthcare settings and LHD offices. This strategy reduces the public's hesitance to seek care for other medical conditions and keeps LHD employees safer. Prioritize testing for the most vulnerable, marginalized communities in order to address health disparities.

We recommend that county governments continue to:

- Provide resources and funding in the form of supplies, technology, and staff to counties where there are limited resources for community testing sites.
- Enlist other local government agency employees, who would be otherwise underutilized or furloughed during a pandemic, to help LHDs manage persons under investigation, by checking in regularly with quarantined and isolated individuals and ensuring compliance.

We recommend that the state:

- Ensure health care providers, pharmacists, and labs understand and adhere to guidelines that mandate they report testing results to LHDs through ECLRS, including providing complete demographic information.
- Provide ongoing training in and technical assistance for CommCare.
- Increase the transparency of state surveillance data -- specifically by identifying its source and formulas -- on contact tracing, diagnostic testing, hospital capacity, and positivity rates.
- Expand Commcare to collect and share data trends on all cases of communicable disease in each county so that it is viewable by all localities. The platform should be created or customized with input from local stakeholders.

Communications

(Internal communications, external communications with general public, external communications with media, external communications with PUIs, interstate/intercounty communications, supporting, education and informing local businesses)

We recommend that LHDs continue to:

- Expand when necessary a public information team and call center staffed by employees, including health educators, to field inquiries from the public, businesses, and the media and refer them to other agencies as necessary. All employees expected to work in this capacity should be trained in crisis communication. A hotline for general questions ensures that case investigators and contact tracers are able to focus on disease control activities.

- Enhance their department's presence on social media, where the public often seeks information. During a public health emergency, LHDs should post frequent updates on their social media channels to keep residents informed.
- Create and maintain a database of contacts at community organizations, such as businesses, hospitals, and schools, so they can be reached promptly during an emergency.
- Expand when necessary ongoing conference calls with community partners (e.g. health care systems and county leadership) to provide updates and coordinate pandemic response activities.

We recommend that the state:

- Establish and offer crisis communication training to professionals working within local health departments.
- Share all data and information used at the state level to communicate with local businesses, hospitals, and schools with the localities to ensure all parties have the most up to date contact information.
- Create an intranet or cloud-based online storage system for file sharing between LHDs, to facilitate the distribution of helpful pandemic-related templates and information.
- Ensure LHDs receive press releases and forthcoming guidance from the governor's office well in advance of press conferences. These updates could be transmitted through the NYSDOH's regional offices and embargoed until planned release.

CONCLUSION

With the fight to control COVID-19 far from over, LHDs in New York State have much work to do over the coming months as the operational arm of the NYSDOH and vanguard defenders of the public's health. Every new executive order from the Governor's office requires LHDs to think and act with agility to meet the needs of their many stakeholders, including businesses, schools, healthcare providers, elected officials, and individual community members. LHDs now face major challenges immunizing New Yorkers against COVID-19 in the largest mass vaccination effort in U.S. history (46).

Health departments are preparing for the future in the areas of administrative preparedness, public health preparedness systems, epidemiology, and communications — using lessons learned over the past few months and, we hope, some of the best practices presented in this report. In response to a set of high-profile, state-mandated responsibilities and the public's heightened attention, LHDs, county government, and lawmakers can make a compelling case for increased investment in public health infrastructure, as well as strengthen community trust in their essential services.

LHDs in New York State, and around the country, may be operating in an underfunded, under-resourced, under-supported, and under-recognized house of cards, but we can build a firmer foundation and structure if we start now.

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APPENDIX A: Study Instruments

Online survey

1. Respondent Name: _____
2. Email: _____
3. Title: _____
4. County Size (number of residents)
   - Small (<75,000)
   - Medium (75,000-199,999)
   - Large (200,000-499,999)
   - Extra-Large (>500,000)
5. Region
   - Western New York (Niagara, Erie, Chautauqua, Cattaraugus, Allegany)
   - Finger Lakes (Orleans, Genesee, Wyoming, Monroe, Livingston, Wayne, Ontario, Yates, Seneca)
   - Southern Tier (Steuben, Schuyler, Chemung, Tompkins, Tioga, Chenango, Broome, Delaware)
   - Central New York (Cortland, Cayuga, Onondaga, Oswego, Madison)
   - North Country (St. Lawrence, Lewis, Jefferson, Hamilton, Essex, Clinton, Franklin)
   - Mohawk Valley (Oneida, Herkimer, Fulton, Montgomery, Otsego, Schoharie)
   - Capital District (Albany, Columbia, Greene, Warren, Washington, Saratoga, Schenectady, Rensselaer)
   - Hudson Valley (Sullivan, Ulster, Dutchess, Orange, Putnam, Rockland, Westchester)
   - New York City (New York, Bronx, Queens, Kings, Richmond)
   - Long Island (Nassau, Suffolk)
6. Administrative Preparedness is the process of ensuring that the fiscal, legal, and administrative practices that govern funding, procurement, contracting, and hiring are appropriately integrated into all stages of emergency preparedness and response. This first series of survey items is about your local health department's administrative preparedness during the COVID-19 pandemic. On a scale from 1 to 5 (1 being "Extremely Effective," 5 being "Not Effective At All"), please rate your department's capacities and capabilities in the following seven areas of administrative preparedness as demonstrated over the last two months:
   a. Outbreak planning: 1 2 3 4 5
   b. Funding: 1 2 3 4 5
   c. Emergency declarations: 1 2 3 4 5
   d. Quarantine/isolation protocols: 1 2 3 4 5
   e. Level of staffing: 1 2 3 4 5
   f. Level of supplies: 1 2 3 4 5
   g. Legal considerations: 1 2 3 4 5
   h. Response Optional: If there are areas of particular concern, or ideas you have for improvement within any of these areas, please comment here:_____
7. This series of questions is about your local health department's preparedness systems during the COVID-19 pandemic. On a scale from 1 to 5 (1 being "Extremely Effective," 5 being "Not Effective At All"), please rate your department's management of the following five areas of preparedness systems as demonstrated over the last two months:

a. Intra-governmental activities (coordination with other county agencies: 1 2 3 4 5
b. Coordination with other organizations (hospitals, labs, other agencies): 1 2 3 4 5
c. Implementing countermeasures and mitigation: 1 2 3 4 5
d. Coordination of enforcement activities: 1 2 3 4 5
e. Coordination with local businesses: 1 2 3 4 5
f. Response Optional: If there are areas of particular concern, or ideas you have for improvement within any of these areas, please comment here:_____

8. This series of questions is about your local health department's surveillance and epidemiological activities during the COVID-19 pandemic. On a scale from 1 to 5 (1 being "Extremely Effective," 5 being "Not Effective At All"), please rate your department's management of the following six areas of surveillance and epidemiological investigation over the last two months:

a. Testing: 1 2 3 4 5
b. Managing PUIs: 1 2 3 4 5
c. Infection control: 1 2 3 4 5
d. Identifying cases through review of lab reports: 1 2 3 4 5
e. Contact tracing: 1 2 3 4 5
f. Data functions (release of data, tracking and monitoring cases): 1 2 3 4 5
g. Response Optional: If there are areas of particular concern, or ideas you have for improvement within any of these areas, please comment here: _____

9. This series of questions is about your local health department's communication activities during the COVID-19 pandemic. On a scale from 1 to 5 (1 being "Extremely Effective," 5 being "Not Effective At All"), please rate your department's management of the following six areas of emergency communications over the last two months:

a. Internal communications (within your local health department) : 1 2 3 4 5
b. External communications with general public: 1 2 3 4 5
c. External communications with media: 1 2 3 4 5
d. External communications with PUIs: 1 2 3 4 5
e. Interstate/intercounty communications: 1 2 3 4 5
f. Supporting, educating, and informing local businesses (Essential/non-essential): 1 2 3 4 5
g. Response Optional-If there are areas of particular concern, or ideas you have for improvement within any of these areas, please comment here: _____

10. The next two questions are specific to your training needs as they relate to the COVID-19 pandemic:

a. Please describe your training needs for specific infection prevention and control activities as we move into this next phase of COVID-19: _____
b. Including and beyond COVID-19, what are your training needs for providing essential public health services? _____

Focus group discussion guide

Welcome/Introduction

I'd like to start by thanking you for taking time out of your busy schedules to participate in this focus group. NYSACHO is currently in the process of hosting one focus group per New York State ESD region. These focus groups are the second phase of an In-Progress Review we're conducting to identify and describe lessons learned by New York's local health departments in response to the initial and apex stages of the COVID-19 pandemic. The outcome of these focus groups will be a professionally developed and IRB approved whitepaper and a PowerPoint presentation template that you can customize and use to present to stakeholders in your area. This will help us tremendously in our advocacy and visibility efforts. This project is brought to you by NYSACHO and our partners at Columbia University, Region 2 Public Health training center.

Now, if everyone could take a moment to introduce themselves. I'm Sarah Ravenhall, Executive Director at NYSACHO.

Guidelines

Before we launch into the conversation, I just want to ask that only one person speaks at a time so we can clearly capture what everyone says. Everyone on this call, including NYSACHO staff and Columbia Region 2 Public Health Training Center staff, will keep everything that is said completely confidential and we ask you all to do the same and not share anything discussed in this focus group with anyone outside of this session. We encourage you to be as honest as possible and assure you that your comments will be de-identified. This session is being recorded for transcription purposes, but that recording will be deleted once transcribed.

I also ask that you refrain from using the chat box to make comments for today's session since we are transcribing and want to make sure we capture everything. If there are resources we need to share, we will add them to the chat box.

This one-hour focus group will be recorded and transcribed, and then de-identified before the transcript is analyzed by a team at Columbia University.

Before I begin asking questions, I'll give you a brief overview of our survey findings. You may recall responding to a survey a few weeks ago. [Most and least effective capabilities/capacities for all LHDs and LHDs in the region.]

As a reminder, the main COVID-19 response categories we want to focus on today are within administrative preparedness, public health preparedness systems, epidemiology, and communications. The questions I'll be asking pertain to the work done by your department and under your department and/or county control.

Questions and prompts

1. What strategies and/or resources have been most effective in your department's COVID-19 response (specifically related to subtopics within administrative preparedness, public health preparedness

systems, epidemiology, and communications)?

a. Why did they succeed?

b. What impact did they have?

2. Which strategies and/or resources have been the least effective or even counterproductive in your department's COVID-19 response (specifically related to subtopics within administrative preparedness, public health preparedness systems, epidemiology, and communications)?

a. Why do you think they failed?

3. How has your department addressed any challenges and/or gaps you've encountered during the pandemic?

4. For those challenges and gaps that remain unresolved, what action steps do you think your department should take in the future?

a. During this pandemic?

b. During future public health emergencies?

5. What systemic changes, beyond the scope of your department, would help your agency improve its outbreak management and emergency response (specifically to subtopics within administrative preparedness, public health preparedness systems, epidemiology, and communications)?

a. Overall, what would you say are the most important lessons your department has learned from dealing with the COVID-19 pandemic so far?

Closing remarks

Thank you so much for joining us for this focus group today. We've learned so much from you all, and we're grateful for your time. As I said before we started, NYSACHO is in the process of conducting several other focus groups right now, but we've already begun analyzing the information and we'll be sharing our work with you for feedback, and in its final form. If you have any questions at all in the meantime, please call at 518-475-8905 or email me at sarah@nysacho.org.

APPENDIX B: Graph and Map Data Limitations and Considerations

USA Facts (Case Counts and Deaths)

https://usafacts.org/articles/detailed-methodology-covid-19-data/

USA Facts collects its data from the NYSDOH website (coronavirus.health.ny.gov/home). If a lab enters an individual's address incorrectly, the NYS tracker codes the case to the county where the test was taken. If the case is later transferred to the county of residence, the COVID-19 tracker does not reconcile the county transferring the case. This has resulted in differences between state and county numbers. USA Facts assigns cases to where the person was diagnosed, not their residence, and counts presumed positive cases as confirmed cases.

NY Forward (Hospitalizations)

https://forward.ny.gov/daily-hospitalization-summary-region

The New York State website does not specify if hospitalization is by county of residence or county of hospitalization. This likely had the largest impact on Long Island's hospitalization numbers, since many New York City residents visit hospitals on Long Island.

NY Health Data (Testing)

https://health.data.ny.gov/Health/New-York-State-Statewide-COVID-19-Testing/xdss-u53e

Nursing home executive order 202.30 went into effect on May 10, 2020 requiring all nursing home staff to be tested two times per week and inflating testing numbers in May without representing higher community testing. On June 10, 2020, executive order 202.40 amended this requirement to testing once per week for nursing home employees for regions in Phase 2 of reopening. This will slightly inflate the testing numbers in June-July compared to what was available to the community (but not as inflated as in May). The state assigned testing counts to a county based on this order of preference: (1) the patient's address, (2) the ordering healthcare provider's address, or (3) the ordering facility's address. This means that if a patient did not provide their address or provided an invalid address, the county their test was assigned to may not be accurate. If a person had multiple specimens tested on one day, those were counted one time, so testing numbers may be lower than the number of actual specimens collected. (However, if a person was tested twice, each on different days, that would be counted as two separate tests.)

The New York Times (Case Counts and Deaths in Timeline)

https://github.com/nytimes/covid-19-data

Case and death counts include probable deaths (deaths where COVID-19 is listed on the death certificate as the cause of death or a significant contributing condition, but where there has been no positive confirmatory laboratory test) from New York City. On April 14, the New York City Health Department announced an additional 3,700 deaths presumed to have been caused by COVID-19. These cases were added to the totals based on date of death.When the federal government arranged flights to the United States for Americans exposed to the coronavirus in China and Japan, those cases were recorded in the states where the patients were treated. As a result, some non-NYS residents were included in case counts.Death counts include people who died in NYS, even if they were not a resident, and NYS residents who died out of state were not counted towards the state's death counts.Cases and deaths are counted on the date they are first announced. If there were delays in reporting cases and/or deaths, counts for a subsequent day may be inflated.

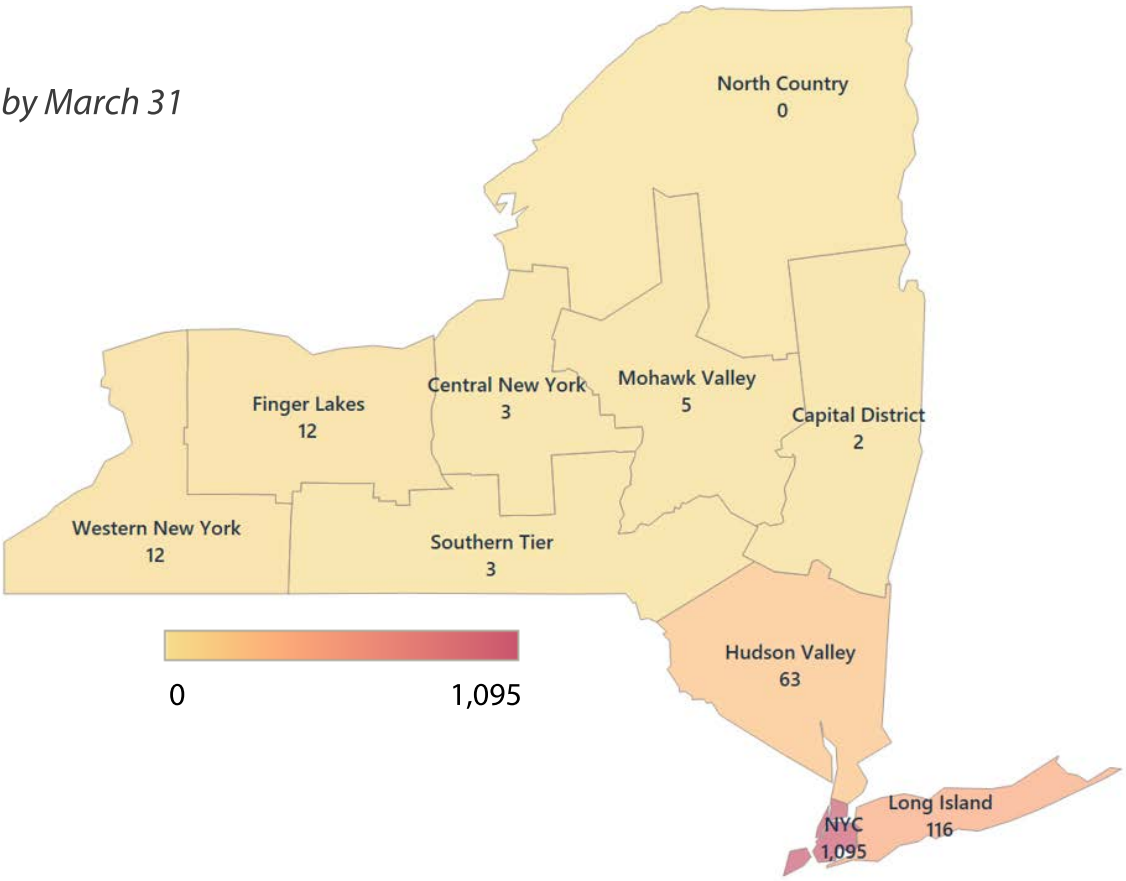
APPENDIX C: Linear Regression Analysis Models

Independent variable	Dependent variable	Coefficient (Beta)	Significance (P-value)	95.0% CI for β	Variance (R2)
Outbreak planning	Intragovernmental activities	0.585	0.001	(0.264, 0.906)	0.282
Outbreak planning	Countermeasures and mitigation	0.613	0.002	(0.287, 0.938)	0.308
Outbreak planning	Coordination of enforcement activities	0.628	0.011	(0.156, 1.099)	0.172
Data functions	Communications with the public	0.378	0.004	(0.127, 0.629)	0.211
Data functions	Intragovernmental communications	0.508	<0.000	(0.251, 0.765)	0.316
Intragovernmental activities	Coordination of enforcement activities	0.681	0.002	(0.268, 1.094)	0.237
Intragovernmental activities	Contact tracing	0.856	<0.000	(0.522, 1.190)	0.429
Supply level	Testing	0.568	0.004	(0.193, 0.943)	0.213
Communications with the public	Contact tracing	0.382	0.034	(0.031, 0.733)	0.119

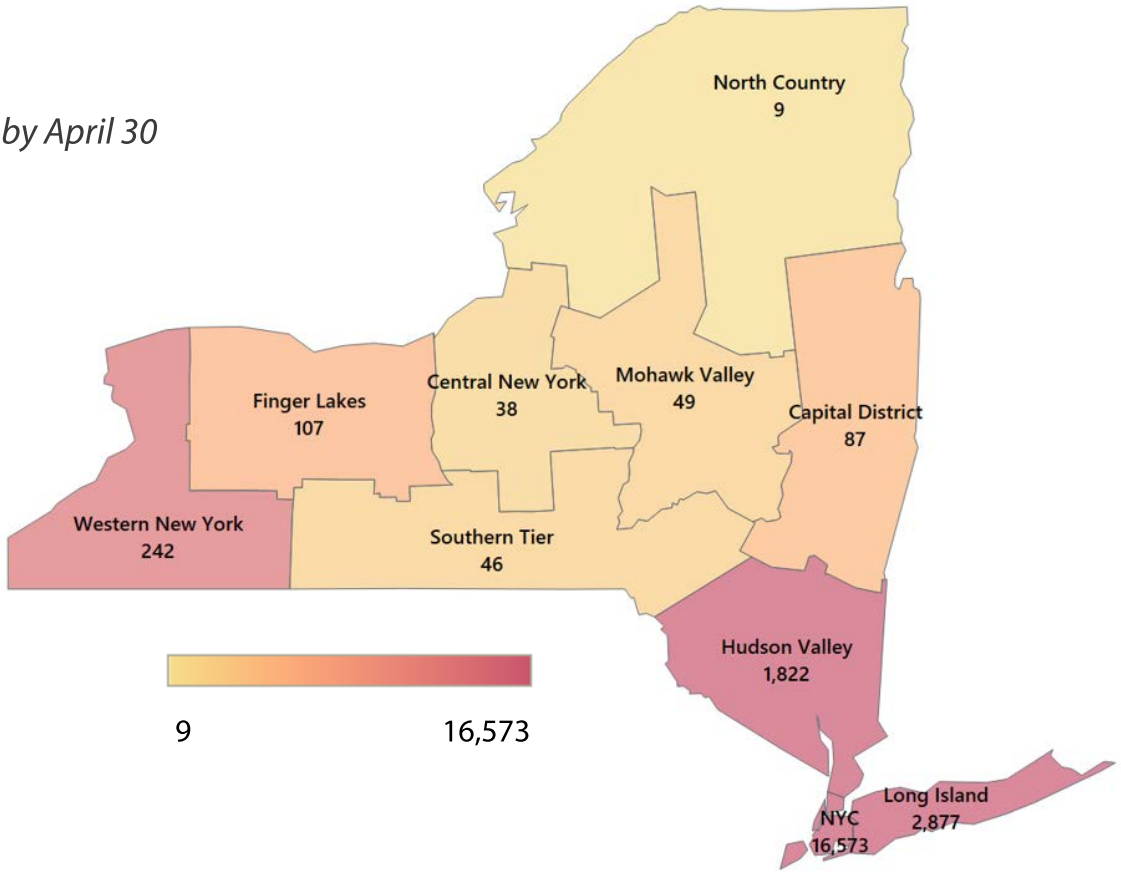
APPENDIX D: Maps

Cumulative COVID-19 deaths in NYS

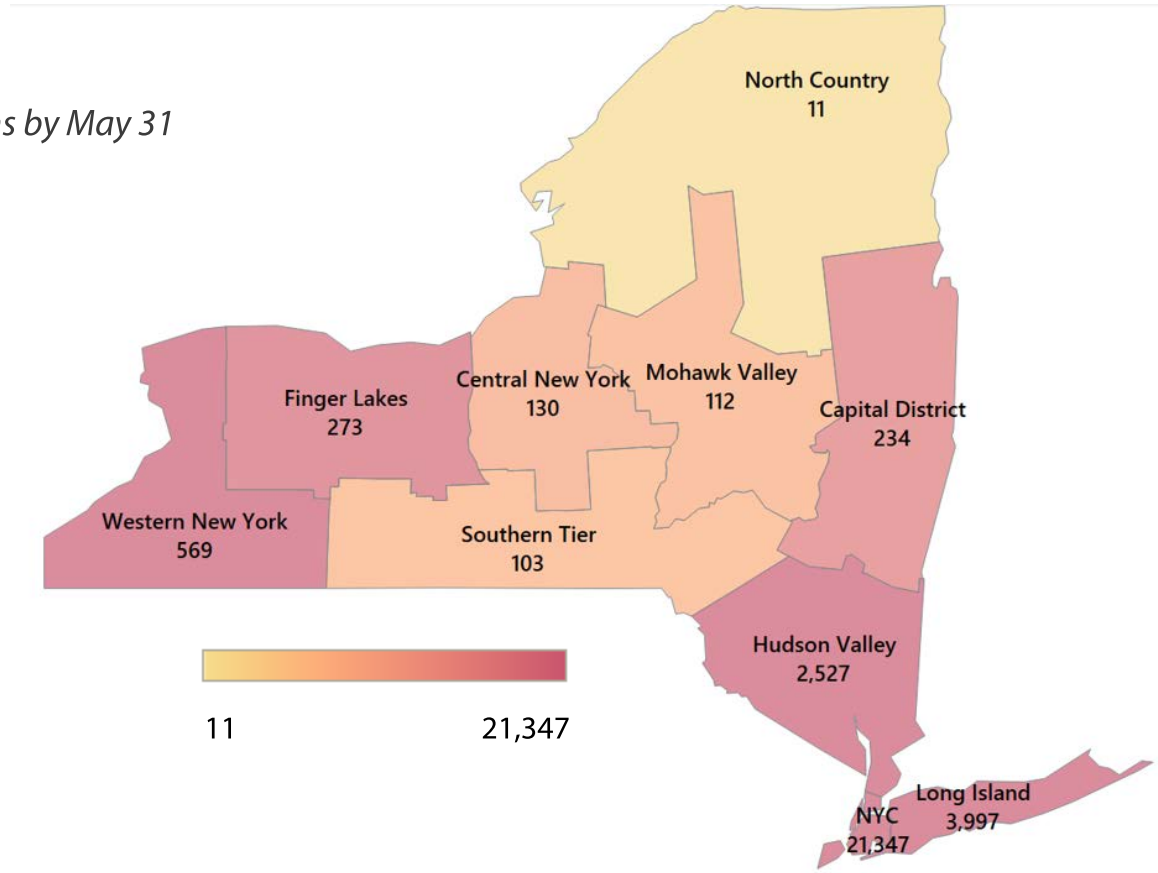
Total deaths by March 31



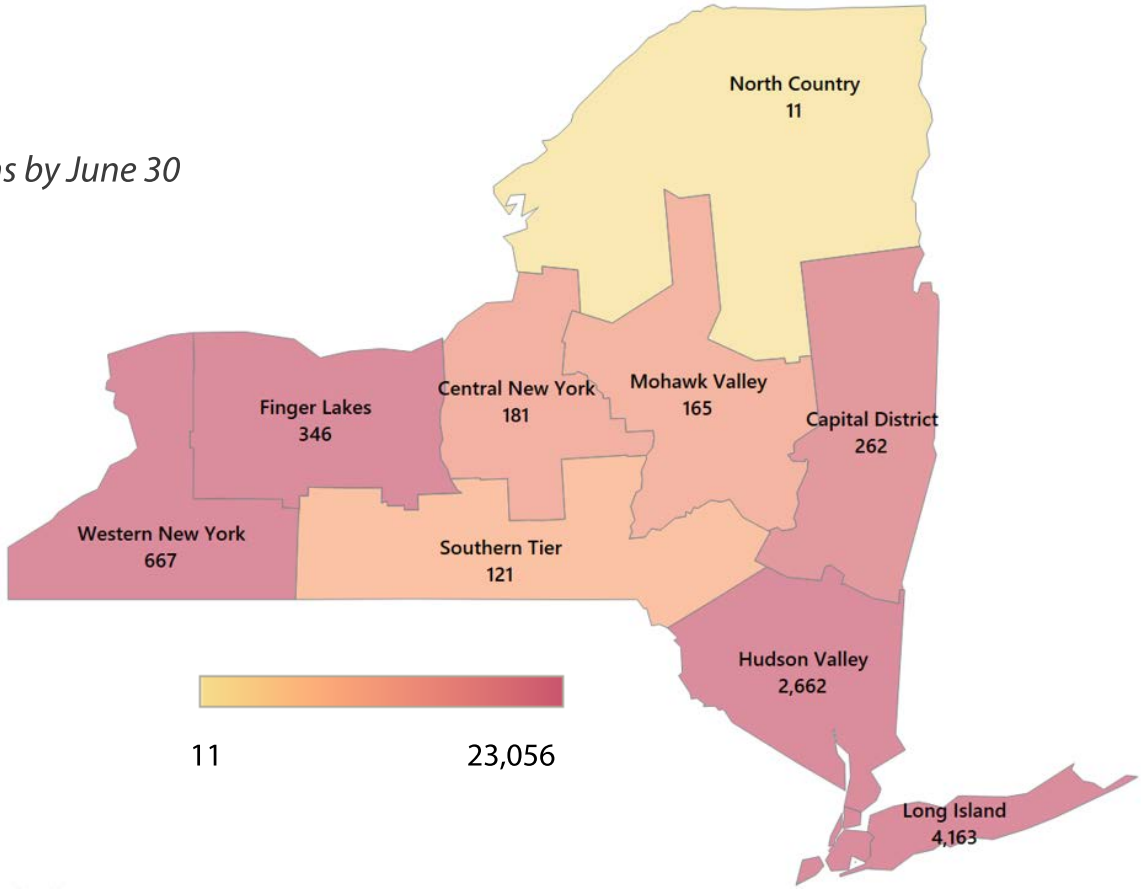
Total deaths by April 30



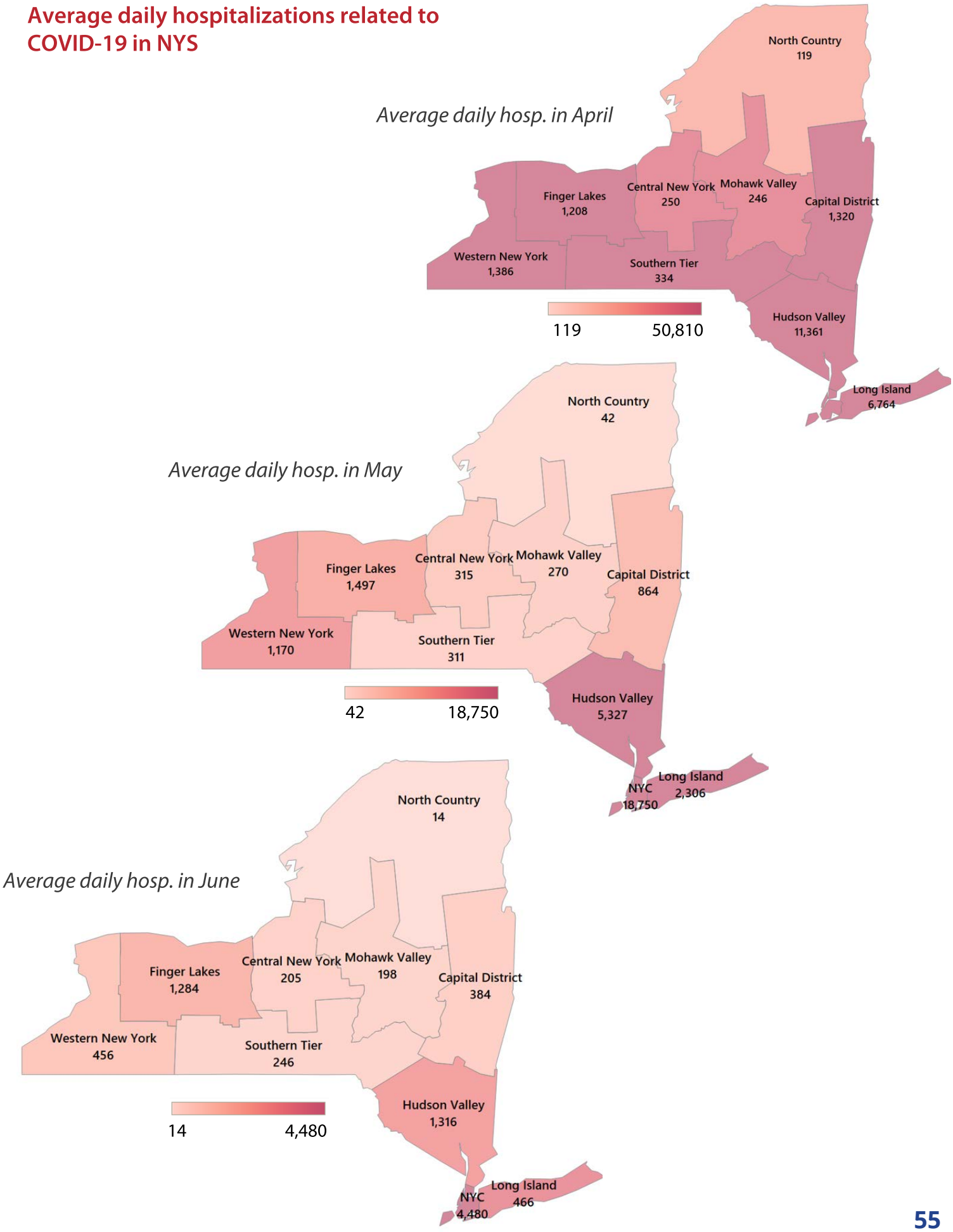
Total deaths by May 31



Total deaths by June 30

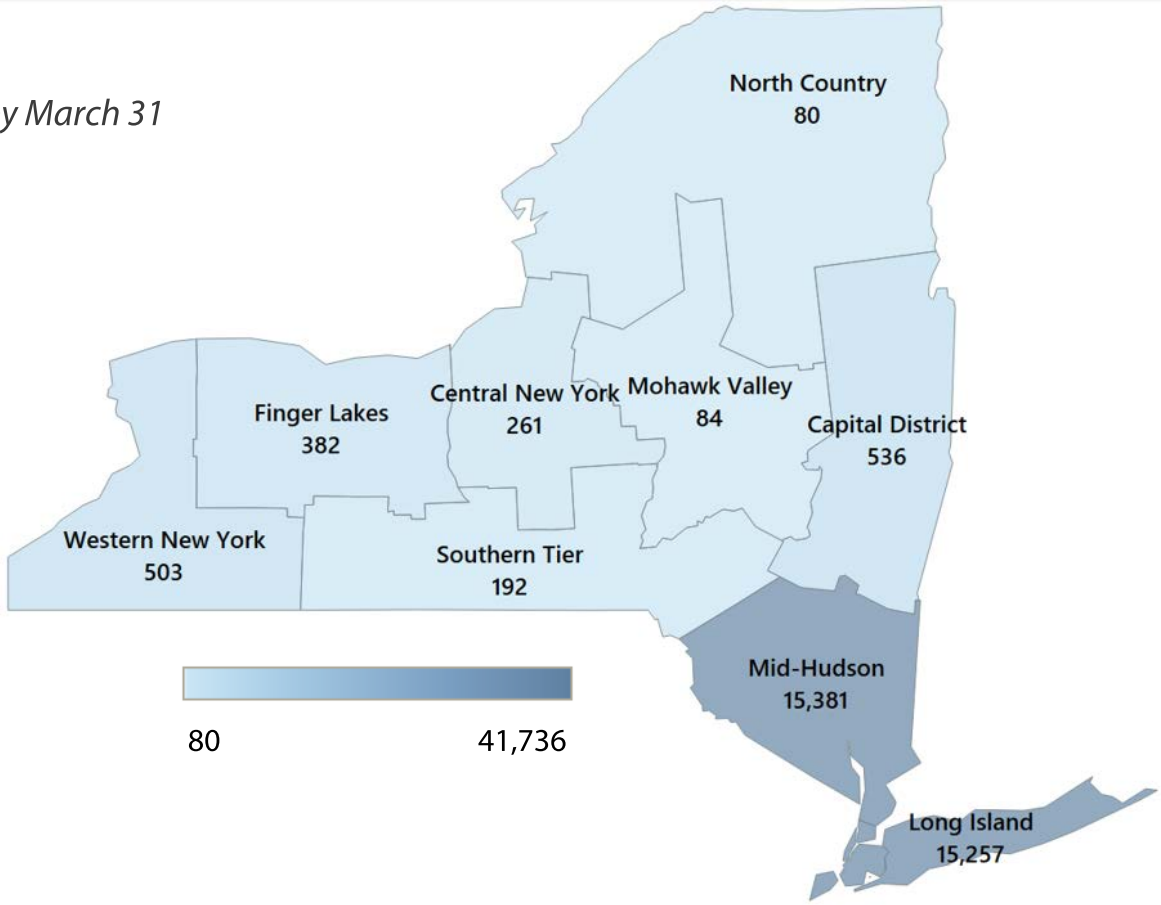


Average daily hospitalizations related to COVID-19 in NYS

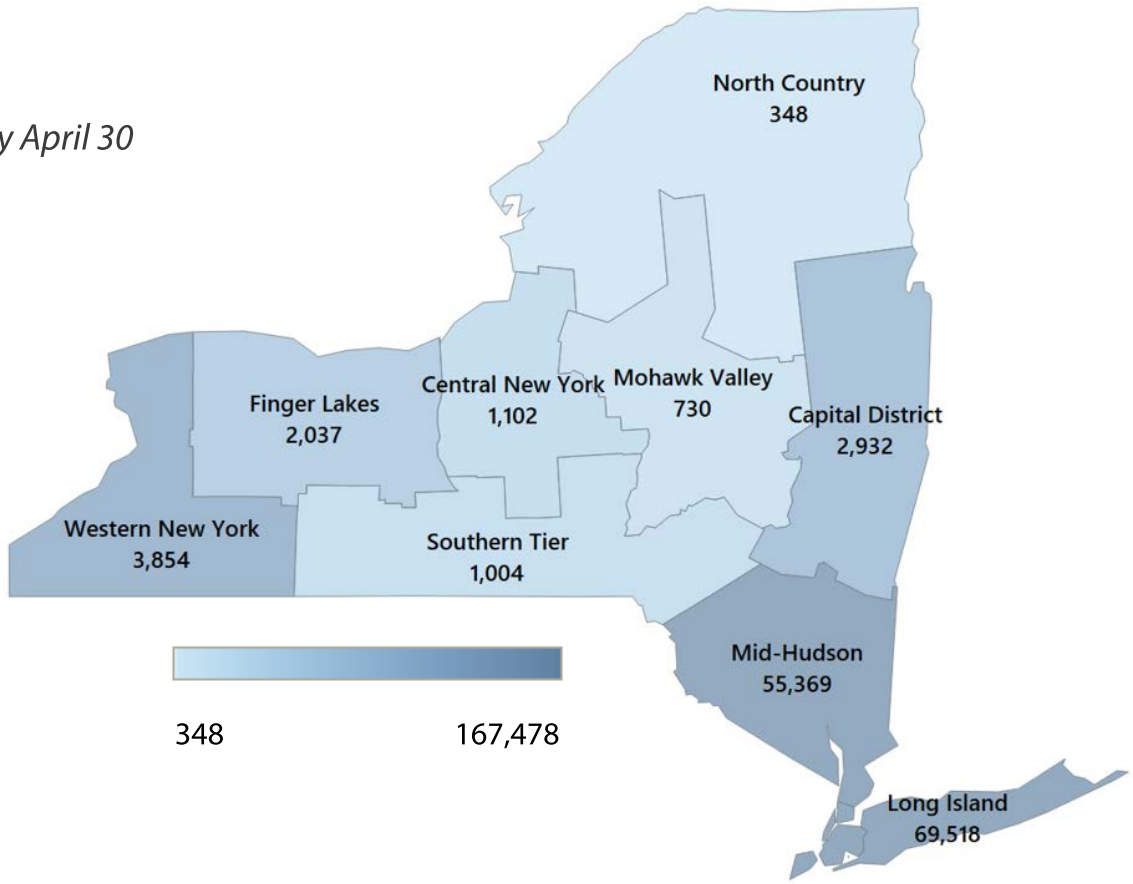


Cumulative confirmed COVID-19 cases in NYS

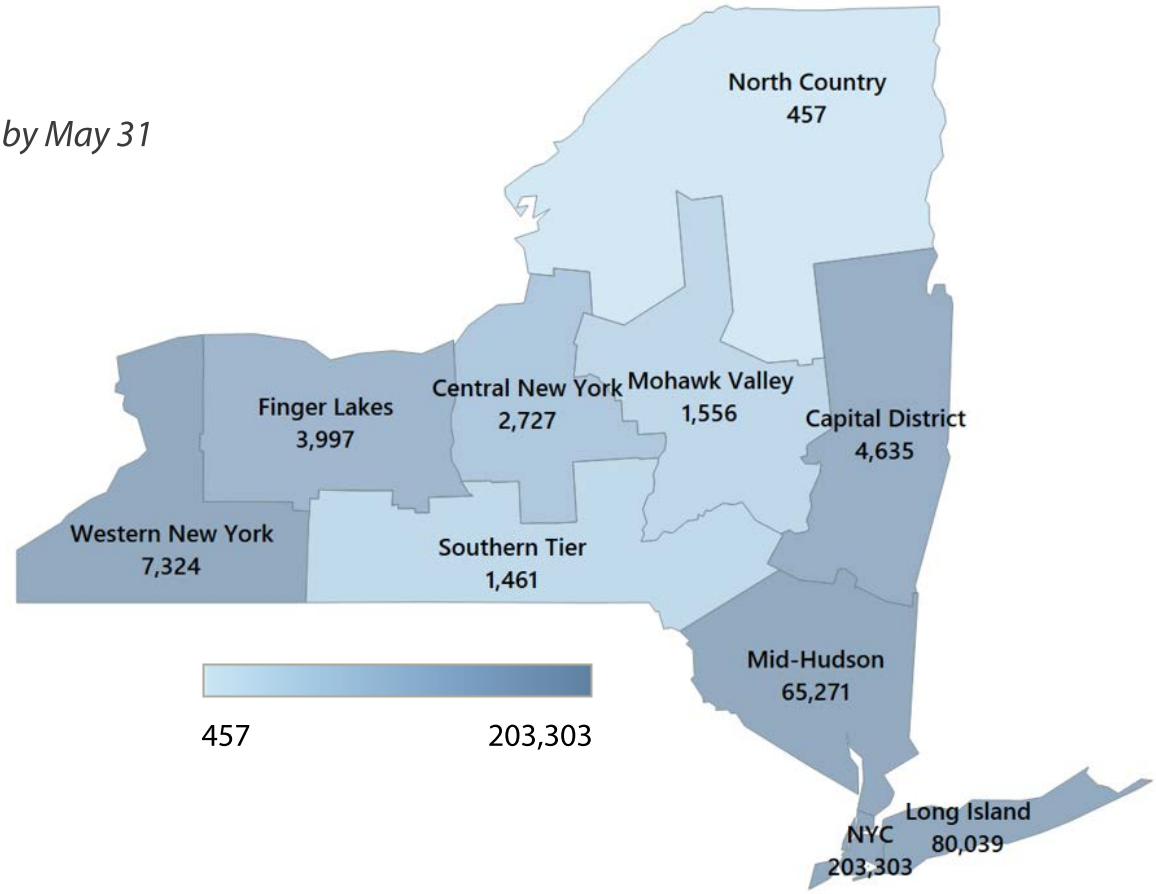
Total cases by March 31



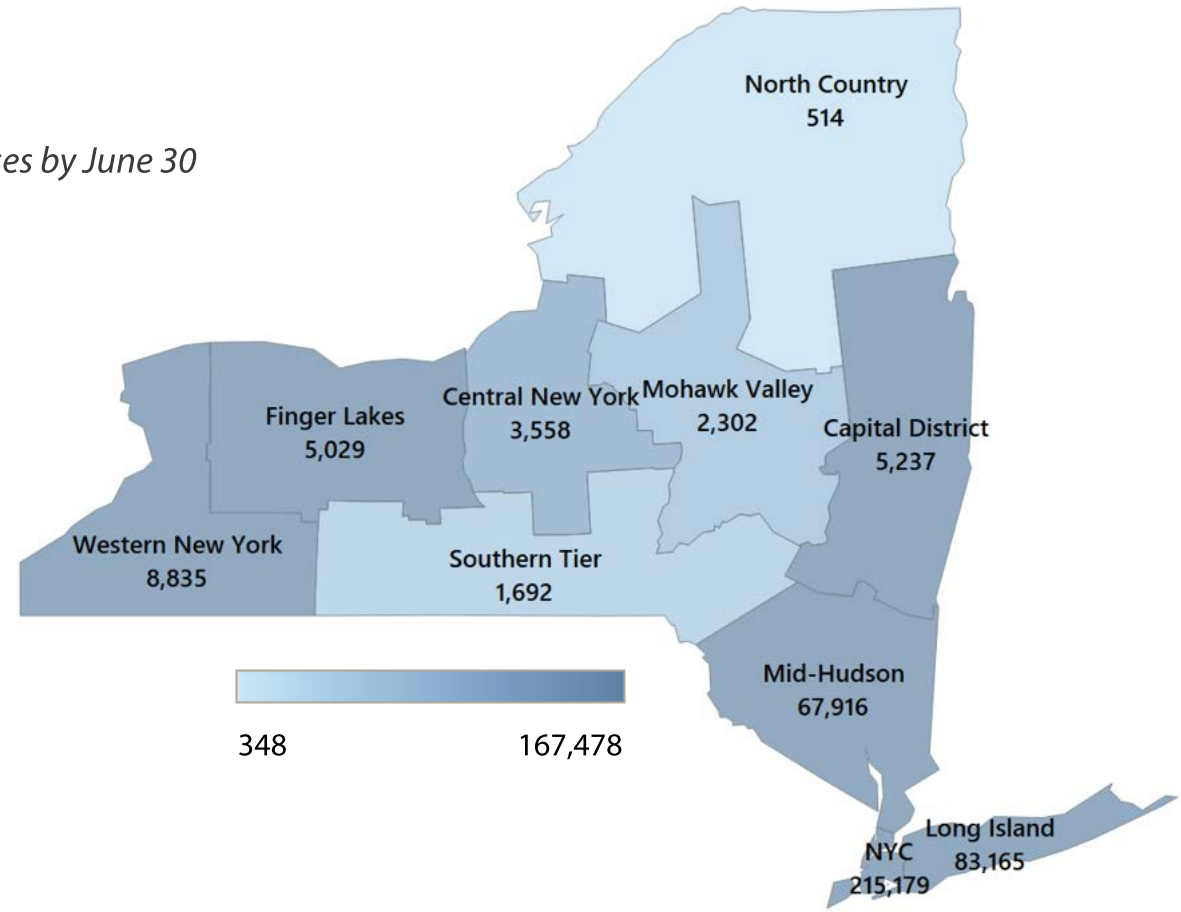
Total cases by April 30



Total cases by May 31

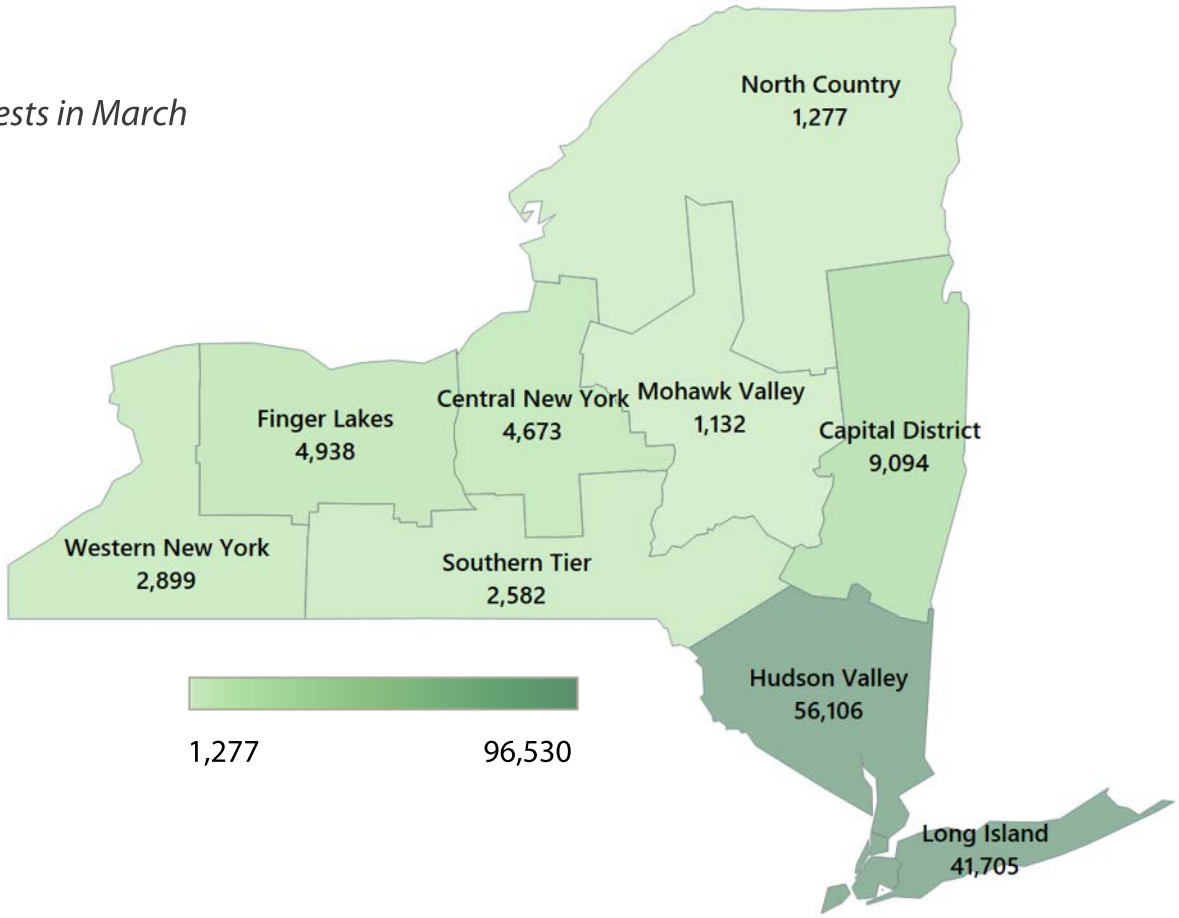


Total cases by June 30

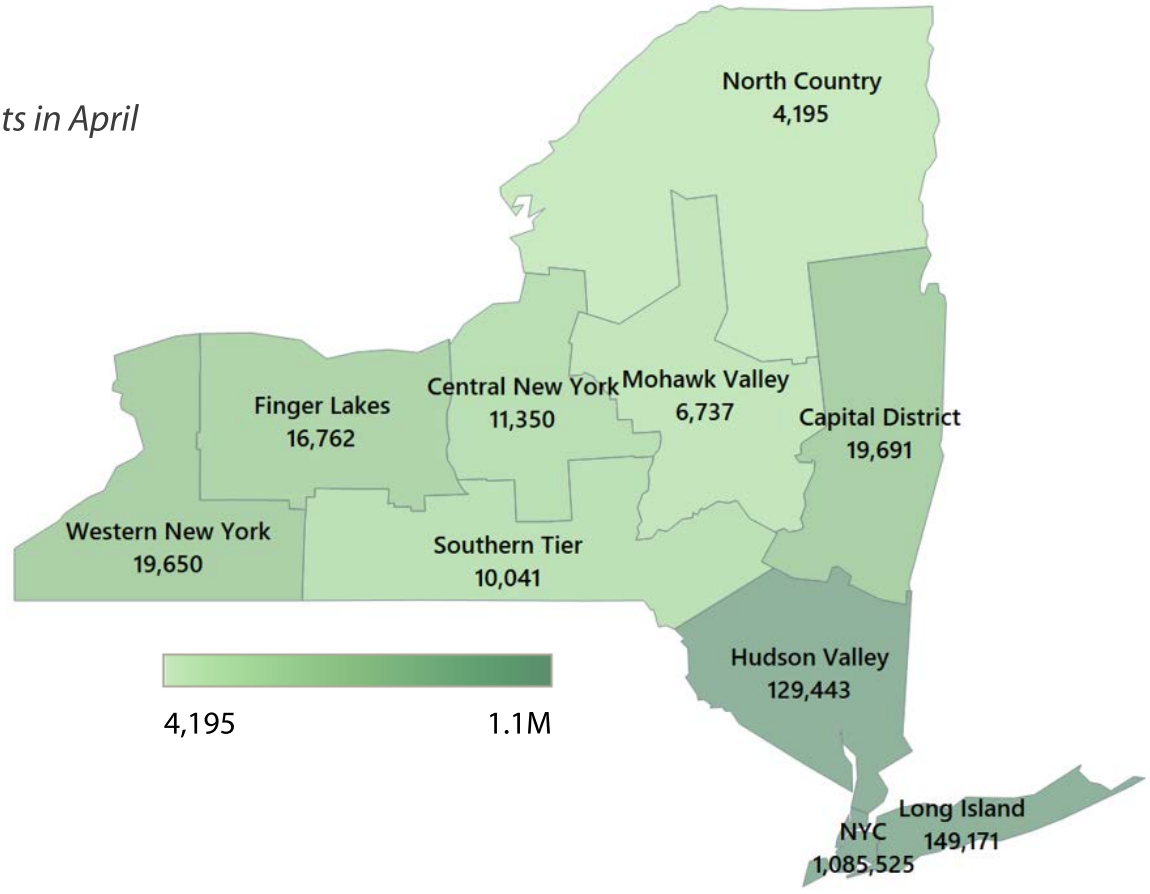


Diagnostic COVID-19 testing in NYS

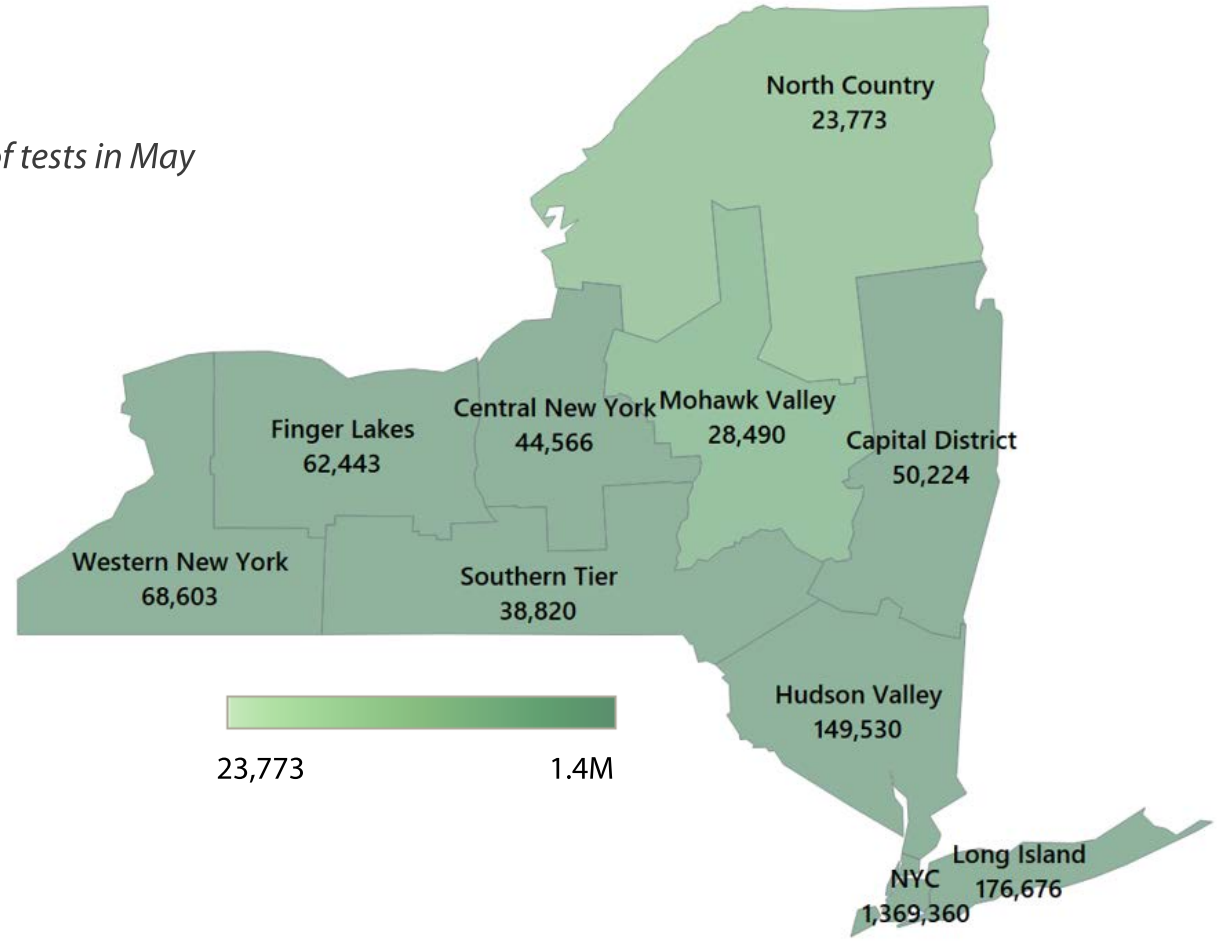
Number of tests in March



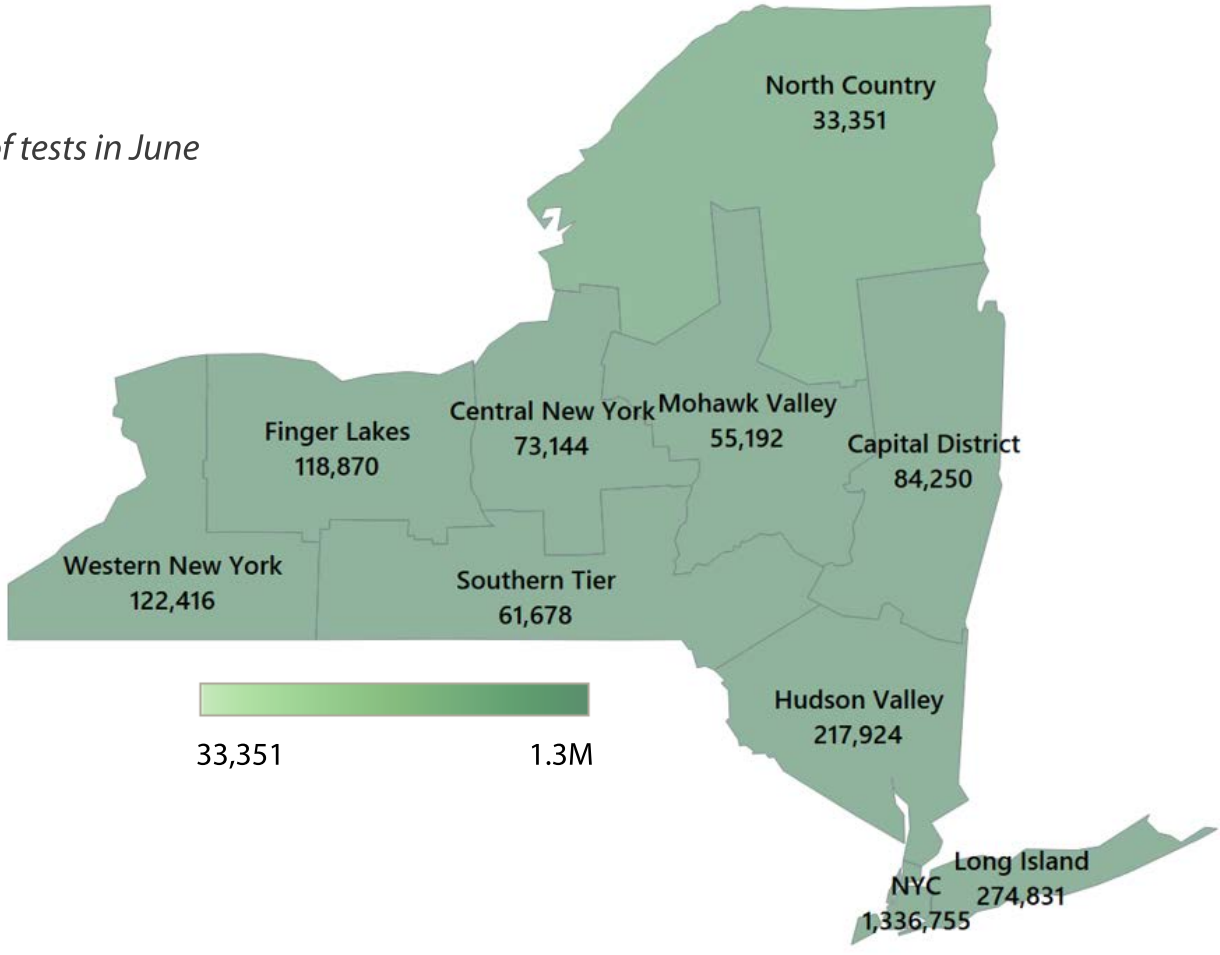
Number of tests in April



Number of tests in May



Number of tests in June



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