

New York State Public Health System Response to Hurricane Sandy: Lessons From the Field

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ABSTRACT

Objective: The aim of this study was to conduct interviews with public health staff who responded to Hurricane Sandy and to analyze their feedback to assess response strengths and challenges and recommend improvements for future disaster preparedness and response.

Methods: Qualitative analysis was conducted of information from individual confidential interviews with 35 staff from 3 local health departments in New York State (NYS) impacted by Hurricane Sandy and the NYS Department of Health. Staff were asked about their experiences during Hurricane Sandy and their recommendations for improvements. Open coding was used to analyze interview transcripts for reoccurring themes, which were labeled as strengths, challenges, or recommendations and then categorized into public health preparedness capabilities.

Results: The most commonly cited strengths, challenges, and recommendations related to the Hurricane Sandy public health response in NYS were within the *emergency operations coordination* preparedness capability, which includes the abilities of health department staff to partner among government agencies, coordinate with emergency operation centers, conduct routine conference calls with partners, and manage resources.

Conclusions: Health departments should ensure that emergency planning includes protocols to coordinate backup staffing, delineation of services that can be halted during disasters, clear guidelines to coordinate resources across agencies, and training for transitioning into unfamiliar disaster response roles. (*Disaster Med Public Health Preparedness*. 2016;10:443-453)

Key Words: hurricane, emergency preparedness, public health, disaster planning, interviews

Hurricane Sandy, which struck the northeastern US coastline on October 29, 2012, was one of the most severe weather events in recent memory with storm winds stretching over 900 miles and 6 to 12 inches of precipitation. Hurricane Sandy resulted in 117 deaths due to drowning, trauma, and poisoning (primarily carbon monoxide) and 7 to 8 million customers without power.¹ The New York City (NYC) metropolitan area was particularly vulnerable owing to the dense population, reliance on public transportation, high-rise housing, and energy-dependent infrastructure.² The heavily impacted NYC metropolitan areas included the New York State (NYS) counties closest to the north (Westchester County) and east (Nassau and Suffolk counties on Long Island) of NYC.

Flooding played a major role in the interruption and accessibility of services. The floods and the resulting lack of power caused the New York Metropolitan Transportation Authority to suspend subway, commuter rail, and bus services. Roads were impassable, which impacted the ability to obtain food, clean

water, and health care, as well as the ability of health care and public health workers to reach their jobs.³ Even when workers were able to access worksites with generator backup power, the significant flooding also led to generator failure.

Extreme weather events such as Hurricane Sandy are increasing in frequency, warranting increased attention to emergency preparedness.⁴ Emergency preparedness efforts coordinated by governmental emergency management, health, transportation, and other agencies involve planning activities and other measures, such as stockpiling emergency supplies, and conducting drills and exercises in advance of a disaster to ensure an effective response. A key part of the emergency response process is to conduct “after action” evaluations to learn from each response and to improve preparations for the next emergency.

As noted in a Hurricane Katrina study, a challenge faced by the public health workforce during disasters is the burden of responding to acute public health needs while maintaining critical public health services and

coordinating response efforts with other governmental and nongovernmental agencies.⁵ Beyond maintaining critical services such as public health surveillance, health care and nutrition programs serving vulnerable populations, and environmental quality assurance and regulation, new responsibilities arise in emergencies that are not part of routine operations, including direct provision of medical supplies, patient tracking, population and health care facility evacuation, and emergency shelter operations. Additionally, maintaining clear communication and organization of all elements of a response is difficult.

Natural disasters place additional stress on public health service programs; therefore, understanding public health systems' experience of major weather events and the issues they face in responding to disasters will assist in preparing these systems for future disasters.⁶ Emergency situation reports prepared during the active disaster response phase and after-action reports (AARs) prepared soon after the response provide valuable information but may not always take full advantage of the experiences of public health staff.⁷ Documenting the individual perspectives of staff who respond during disasters can provide valuable additional information on the successes and challenges they face and can suggest ways to address these in future disasters.⁸ The objective of this study was to collect and analyze new "lessons from the field" through individual interviews. This allowed the collection of detailed individual feedback from a larger number of affected local health department (LHD) and NYS Department of Health (NYSDOH) staff than would normally be possible in a standard AAR.

METHODS

Multi-Agency Hurricane Sandy Guidance Team

A multi-agency Hurricane Sandy Guidance Team was created in 2013 to advise on this public health impact assessment and all research activities. The Guidance Team represented affected LHDs, NYSDOH, emergency managers, academia, and several public health programs impacted by Hurricane Sandy (public water system operators, HIV service providers, and Women, Infants and Children [WIC] nutrition program providers). The Guidance Team provided recommendations on all phases of the study, including selection of participants, development of interview questions, and final reports. The NYSDOH Institutional Review Board reviewed and approved all aspects of the study including selection of participants, informed consent, confidentiality, interview questions, data protection and storage, analyses, and reports.

Selected LHD staff from the 3 most heavily impacted counties, Nassau, Suffolk, and Westchester counties, were invited to interview. A separate study was conducted by the NYC Department of Health and Mental Hygiene; thus, that geographic area was excluded from this study. NYSDOH staff were included in the interview process because they served

important coordinative, technical assistance, and backup functions for the LHDs during the disaster response.

Target Population and Recruitment

To be invited for an interview, staff had to have worked as part of the Hurricane Sandy response at Nassau, Suffolk, or Westchester County LHDs or NYSDOH during the defined period of October 26 to November 21, 2012. Staff who worked during the defined study time period but were no longer working for their agency at the time of the interviews were not included owing to resource limitations to locate them.

The Hurricane Sandy Guidance Team was provided with a list of key frontline staff roles so that they could identify a purposive sample of staff who served in those roles during the Sandy response. For both LHDs and NYSDOH, the targeted roles were as follows: commissioner/public health director, preparedness director, epidemiologist, communicable disease director, public affairs staff, attorney, environmental health director, drinking water program director, HIV/STD director, director of administration, director of data systems, and WIC director. These roles were selected because of their relevance to Hurricane Sandy preparedness, response, and recovery, representing the potential input of additional frontline staff beyond the small number of staff with more limited roles contributing to the development of emergency reports. Based on this list of roles, the Guidance Team prepared a list of 34 LHD staff from the 3 study counties to be invited for the interviews.

For the NYSDOH, the Guidance Team identified an initial list of staff who fulfilled the roles of interest, which was expanded when the interviewees helped to identify additional staff in the key roles (similar to a snowball recruitment method). The total number of NYSDOH staff invited for interviews was 24.

Interview Question Development

Table 1 lists the interview questions that were posed to LHD and NYSDOH staff. These questions were developed on the basis of key issues identified through previous Hurricane Sandy feedback. The previous staff feedback included 51 emergency reports prepared by a small number of staff during or soon after Hurricane Sandy,⁷ a January 17, 2013, recorded roundtable discussion with LHD leaders and emergency response coordinators,⁹ and 2 NYSDOH focus groups conducted in July 2014 with a total of 11 staff. None of these feedback mechanisms had allowed staff to contribute their individual perceptions of Hurricane Sandy's impact in a confidential manner. The emergency reports, roundtable, and focus groups revealed that health department staff had challenges with their public health operations, communication, coordination with external agencies, changes in staff roles, flexibility in regulations, and transitioning back to

TABLE 1

Sandy Response Interview Questions for Local and State Health Department Staff

How were public health functions/operations impacted by Hurricane Sandy?

How were communications impacted during the disaster?

What were the information needs that resulted from the disaster?

Describe any efforts to coordinate with other agencies.

Please explain any planning, training, or exercising that was conducted to prepare for the disaster.

How were staff roles impacted during the disaster?

Describe any community engagement that occurred as a result to the disaster.

What was the influence of policy and legal authority during the disaster?

What was your agency's approach to resuming regular business operations?

Is there any additional feedback that you would like to provide for issues not yet addressed?

regular business operations. Interview questions were developed specifically to further explore these topics as well as to allow an opportunity for staff to share their personal perceptions of the public health impact of Hurricane Sandy.

Data Collection

Interviews with LHD staff were conducted from July until October 2014 and with NYSDOH staff from August until September 2014. Individual interviews were conducted over the phone (with the exception of one conducted in person owing to confidentiality concerns) and were each scheduled for 1 hour. Responses to the interview questions were transcribed verbatim in real time during the interview and were recorded to ensure transcription accuracy. The recorded interview was later used to help proofread and complete each final written transcript. Interviewees were assured that their results would not be reported using their job titles to help ensure confidentiality.

Data Analysis

The study protocol included the same qualitative analysis methods as those applied to a prior analysis of emergency reports.⁷ The qualitative analyses were based on grounded theory and the inductive approach, where open coding was used for grouping of concepts to form categories.¹⁰ This includes the conventional presentation of qualitative data with quotations.¹¹ All interview transcripts were reviewed by 2 researchers independently (AS and SM) to reduce subjectivity in coding. Each researcher grouped text by key words and tallied the total number of times each key word was mentioned, with NVivo version 10 software (QSR International, Melbourne, Australia). For each report, the intercoder reliability was determined by using percentage agreement and the Cohen's Kappa Coefficient (kappa) statistic. Any assigned key word with percentage agreement

lower than 80% or a kappa value lower than 0.7 was reexamined and negotiated (a kappa value of 1 indicates complete agreement).

Key words were then sorted into 1 of 11 Centers for Disease Control and Prevention (CDC) Public Health Preparedness Capabilities¹² (Table 2). Key words not fitting clearly into one of these CDC Capabilities were sorted into 5 additional study-defined capabilities used in the previous analyses of emergency reports.⁷ For the interviews, a few key words required the use of an additional miscellaneous category.

Within each capability, key words were categorized into strengths, challenges, or recommendations. Descriptive statistics were performed by using the Statistical Analysis Software (SAS) package, version 9.2 (SAS Institute Inc, Cary, NC), to determine the frequency of each theme in the interviews. The strengths, challenges, and recommendations for each capability were ordered on frequency of citation in terms of percentages in the interviews for each group (LHDs and NYSDOH), and illustrative interview quotations were identified for major themes.¹¹

RESULTS

Interviews were conducted from July 2014 until February 2015 with the LHD and NYSDOH staff identified by representatives of the Guidance Team. All identified staff were invited for an interview by using work e-mail addresses. Of the 34 LHD staff invited, 21 (62%) were interviewed, and 14 of 24 invited NYSDOH staff (58%) were interviewed. Reasons for failure to interview some staff included primarily that individuals had left their position with the LHD or NYSDOH and were not available for interview.

From the LHD staff interviews, a total of 1430 key words were assigned to the text in the 21 interview transcripts (Table 3). Key words categorized as strengths were most common ($n = 562$, 39%), followed by challenges ($n = 504$, 35%) and recommendations ($n = 364$, 26%). For NYSDOH, a total of 587 key words were assigned to the sections of text from the 14 interviews. Across all NYSDOH interviews, strengths represented the largest proportion ($n = 240$, 41%), followed by challenges ($n = 182$, 31%) and recommendations ($n = 165$, 28%).

What Went Well (Strengths)**LHDs**

For LHDs, *emergency operations coordination* was the most frequently mentioned capability among the strengths, representing 32% of the 562 total strengths (Figure 1). Staff shared their success in maintaining relationships with a diversity of partners during the response. For example:

I think one of the successes is our robust relationship with emergency management office...law enforcement,

TABLE 2

Public Health Preparedness Capabilities Used to Categorize Key Words^a

CDC-Defined Capabilities ^b	Definition
Community Preparedness	Ability of communities to prepare for, withstand, and recover
Community Recovery	Ability to collaborate with community partners to plan and advocate for the rebuilding of public health systems
Emergency Operations Coordination	Ability to direct and support an event or incident with public health or medical implications by establishing oversight, organization, and supervision
Emergency Public Information and Warning	Ability to develop, coordinate and disseminate information, alerts, and notifications to the public and incident management responders
Information Sharing	Ability to conduct multijurisdictional exchange of health-related information and situational awareness data
Mass Care	Ability to coordinate with partner agencies to address public health, medical, and mental/behavioral health needs of those impacted
Medical Countermeasure Dispensing	Ability to provide medical countermeasures
Medical Material Management	Ability to acquire, maintain, transport, distribute, and track medical material during an incident
Medical Surge	Ability to provide adequate medical evaluation and care during events that exceed the limits of the normal medical infrastructure
Public Health Epidemiological Investigation and Surveillance	Ability to create, maintain, support, and strengthen routine surveillance and detection systems and epidemiological investigation processes
Volunteer Management	Ability to coordinate the identification, recruitment, registration, credential verification, training, and engagement of volunteers to support the public health agency's response to incidents of public health significance
Other Capabilities	Definition
Environmental Health Protection	Ability to protect the public from environmental hazards
Flexibility	Ability to respond based on flexibility in funding, reimbursement, regulations, and law
Planning	Plan, implement, and modify current plans/policies/protocols or the ability to develop new plans/policies as needed to respond to the incident
Roles and Responsibilities	Ability to respond efficiently due to leadership, roles, and responsibilities being clearly understood and adhered to
Training and Preparedness	Adequate training initiatives, drills, and/or exercises developed prior to the disaster
Miscellaneous	Remaining items that did not fit into a capability

^aAbbreviation: CDC, Centers for Disease Control and Prevention.

^bFrom Centers for Disease Control and Prevention, Office of Public Health Preparedness and Response.¹²

TABLE 3

Frequency of Themes Found in Staff Interviews

Theme Types	Themes Within Interviews, No. (%)
Local Health Departments, New York State, N = 21	
Strength	562 (39)
Challenge	504 (35)
Recommendation	364 (26)
Total	1430 (100)
New York State Department of Health, N = 14	
Strength	240 (41)
Challenge	182 (31)
Recommendation	165 (28)
Total	587 (100)

the department of social services and the ARC [advocacy for people with intellectual and developmental disabilities].

Interviewees reported specific strengths in several capability categories, including their ability to track and report issues to the emergency operations center (EOC) throughout the response (*emergency operations coordination*), the ability to obtain status reports from preidentified liaisons (*information sharing*), flexibility through the issuance of executive orders (*flexibility*), and agreements to train in local high

schools for their use as shelters (*training and preparedness*). For example:

Approximately 3 days prior to landfall, we contacted them [Regulated Public Water Systems] to make sure they were making necessary preparations. We followed that up with status reports. We contacted them both by email and phone.

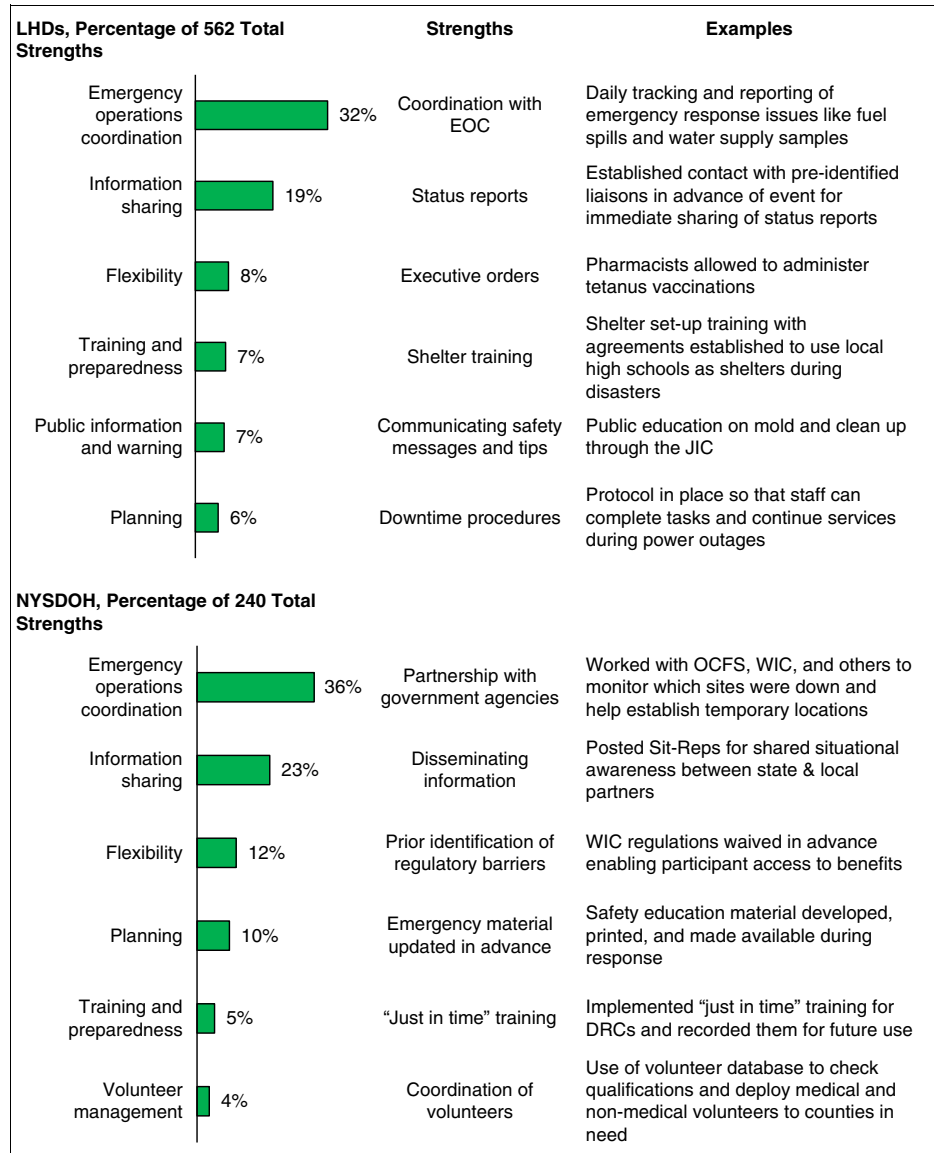
NYSDOH

For NYSDOH, *emergency operations coordination* was the most frequently mentioned capability among the strengths, representing 36% of the 240 total strengths (Figure 1). This capability was demonstrated by partnerships with other government programs, including the WIC nutrition programs. For example:

We had a running list of WIC programs or specific sites operated by WIC programs that were down because of damage. Over time we were working with them to establish temporary sites that clients could go to get their benefits checks and to eventually work with each of them to get them back and running...in many cases we were involved with providing them [WIC programs] with new hardware and software and restoring systems and providing replacement check [WIC voucher] stock.

FIGURE 1

What Went Well in Preparedness and Response: Most Cited Strengths By Capability, 2014 Staff Interviews.



Abbreviations: LHD, local health department; NYSDOH, New York State Department of Health; EOC, Emergency Operations Center; JIC, Joint Information Center; OCFS, Office of Children and Family Services; WIC, Women Infants and Children; Sit-Reps, Situation Reports; DRC, Disaster Recovery Center.

Another strength reported by NYSDOH staff was within the *information sharing* capability, as demonstrated by the broad dissemination of situational awareness information with partner agencies (Figure 1).

What Needs Improvement (Challenges)

LHDs

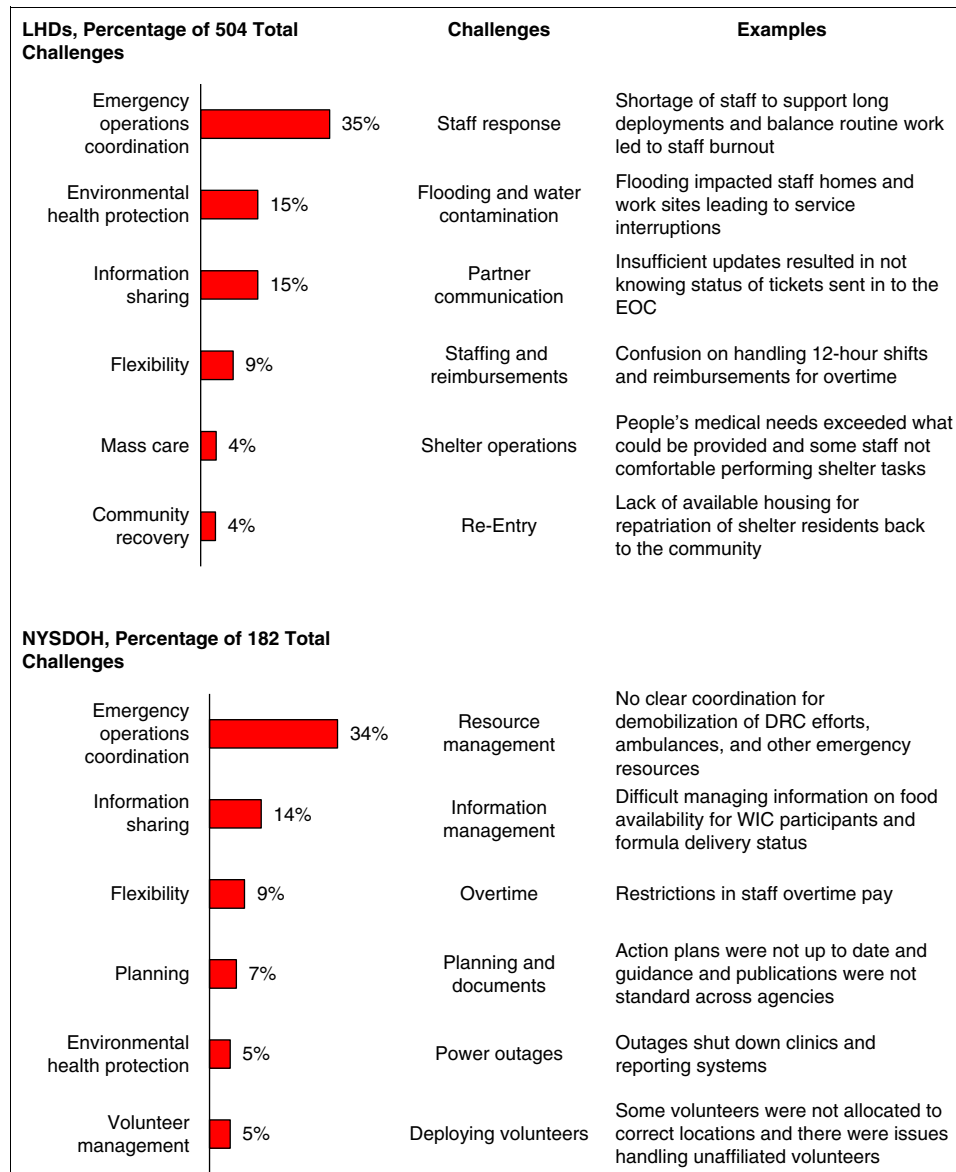
Emergency operations coordination was the most frequently mentioned capability among the challenges, representing 35% of the 504 total challenges (Figure 2). *Emergency operations coordination* included staffing challenges such as the

lack of relief, long working hours, and emergency shelter operations. Emergency shelter operations caused staff to be diverted from their routine duties for extended amounts of time with minimal relief. For example:

...the gap is that after a certain amount of time they [staff] have to go back to regular duties. Can't keep serving food. Helping people toilet [in emergency shelters]. Can't keep serving as runners in the shelters, act as shelter managers, to act as nursing leads, medical consultants. Had to get back to their own jobs...We do not have enough people in the health department to support long events like Sandy.

FIGURE 2

What Needs Improvement: Most Cited Challenges by Capability, 2014 Staff Interviews.



Abbreviations: LHD, local health department; NYSDOH, New York State Department of Health; EOC, Emergency Operations Center; DRC, Disaster Recovery Center; WIC, Women Infants and Children.

LHD staff reported that during their operation of shelters they were asked to perform unfamiliar and uncomfortable tasks including shelter food service and assisting residents with limited mobility. "We had an incident where someone fell and this was with an employee escort. We aren't trained for that...I'm not a nurse but I am executive staff."

NYSDOH

Emergency operations coordination was the most frequently mentioned capability among the challenges, representing

34% of the 182 total challenges (Figure 2). Resource management was one of the aspects of *emergency operations coordination* that interviewees shared as a challenge. Specifically, they expressed their confusion with knowing which of the services they provide were essential and which should be halted during emergency response. For example:

I didn't see that we designated which [public health] activities were ok to stop. We really had to figure out ourselves how to tap into our resources to cover the extra work. There was no unified effort.

The other most frequently mentioned capabilities among the challenges were *information sharing*, *flexibility*, and *planning* (Figure 2). As an example of the *flexibility* capability, staff expressed their challenges with the unanticipated change in their job functions and the lack of practice of their emergency plans prior to the disaster. *Flexibility* challenges in responding included:

...staff support with logistics and approval, travel approval, and setting up hotel rooms [was lacking]. That didn't exist during Sandy. People were on their own making their own arrangements.

Some interviewees noted that although they needed to be flexible in performing job functions, including providing overtime, they were confused on their eligibility for overtime compensation, particularly for positions with certain funding sources and in some job classifications. One interviewee stressed that not understanding overtime compensation guidelines may have an impact on staff willingness to volunteer during future emergencies. Many interviewees recommended making provisions for overtime compensation flexibility during emergencies for staff who normally are not eligible for compensation.

How to Improve Future Responses (Recommendations)

LHDs

Emergency operations coordination and *information sharing* were the most frequently mentioned capabilities among the recommendations, each representing 23% of the 364 total recommendations (Figure 3). Under the *information sharing* capability, staff emphasized the importance of communication not only during an event but prior to the disaster. An interviewee suggested that "proactively, we need to keep those lines of communication open...we need to meet on a sunny day, not when the storm happens."

The *emergency operations coordination* capability also includes plans for staff transitions:

...a system [needs to be] in place for passing the baton even if it's right in the middle of a disaster. If a person needs to sleep they need to sleep. Need to have that in place in the early days of a disaster.

Having their own internal EOC within each agency, in addition to a statewide EOC, was recommended to improve coordination:

...a department operations center back at home base that stays in constant contact with people in the EOC and people at the home base [is needed].

NYSDOH

Planning was the most frequently mentioned capability among the recommendations, representing 22% of the 165 total recommendations (Figure 3). Other frequently reported

capabilities were *emergency operations coordination*, *information sharing*, and *training and preparedness*. An example of *emergency operations coordination* was the recommendation to prearrange partnerships between counties, so that staff in unaffected counties are prepared to assist staff in affected counties during a disaster:

...[tap into] partners that are not in...[the affected] geographical regions. So that they can plan with them to take them [staff in unaffected counties] to a non-affected area.

Among the *information sharing* recommendations, an interviewee suggested:

...have a list of people that we can reach out and pull a group of people very quickly.

Although *medical surge* was one of the less frequently mentioned capabilities (3% of 165 total recommendations), it represents an action that NYSDOH is already implementing. Under this capability, NYSDOH interviewees highlighted ongoing investments to strengthen public health infrastructure including surge capacity:

We've pre-identified some of the supplies that health care facilities need in NYC to increase their medical surge. So say a hospital can surge maybe 50 patients, but if they have supplies (linens, staff, IV tubes) they could surge to 100.

DISCUSSION

The primary finding was that health department staff need preparation and training to perform nonroutine roles during disasters. Provision of clear guidelines on overtime compensation, remote access, and partnerships can support staff willingness to respond. The study also exemplifies that formal qualitative analysis of staff interviews can be beneficial to the after action process.

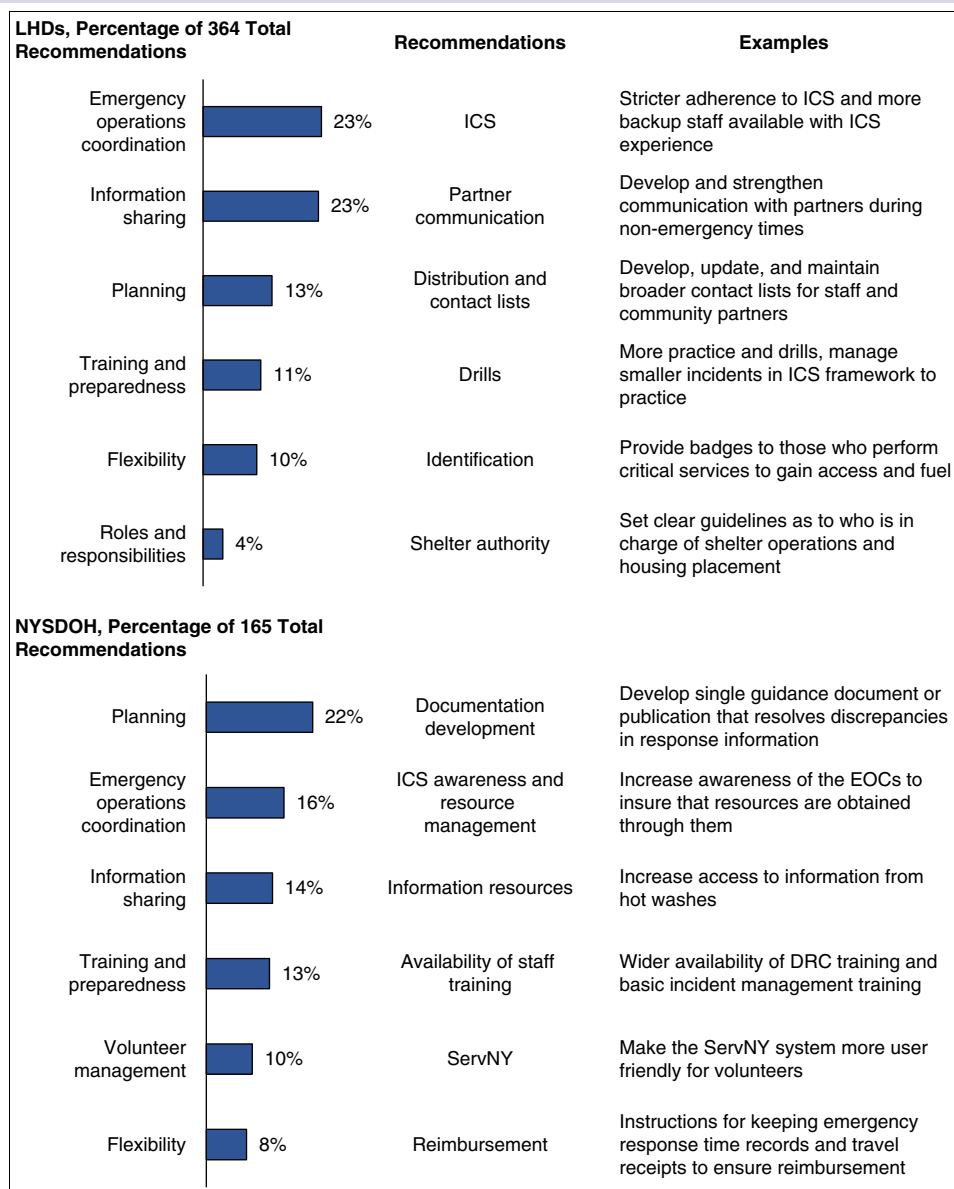
Studying response and recovery activities provides insights that allow public health and emergency response agencies to improve planning and preparedness.¹³ Natural disasters are unpredictable, planning for them can be challenging, and formal analysis using individual staff interviews is rarely done. Individual interviews conducted in a safe, confidential manner can provide public health staff in diverse roles the opportunity to contribute their unique perspectives to augment information in emergency reports.

Comparison with Previous NYS Sandy Feedback

Prior analysis of emergency reports⁷ revealed that *emergency operations coordination* was either the first or second most cited preparedness capability; it was also the first or second most cited capability in the staff interviews. However, there were notable differences in results. In emergency reports, *environmental health protection* and *community recovery* were top challenges, compared to *flexibility* and *planning* in the interviews.

FIGURE 3

How to Improve Future Responses: Most Cited Recommendations by Capability, 2014 Staff Interviews.



Abbreviations: LHD, local health department; NYSDOH, New York State Department of Health; ICS, Incident Command System; EOC, Emergency Operations Center; DRC, Disaster Recovery Center.

The *flexibility* capability was defined as the “ability to respond based on flexibility in funding, reimbursement, regulations and law.” *Flexibility* challenges included the lack of opportunity to work remotely, inability to modify protocols during response, and rigidity of adhering to regulations during the disaster. The need for flexibility is a challenge that may have become clearer as time passed when staff reflected on what could have been improved. Both LHD and NYSDOH interviewees also reported the *flexibility* capability as a top strength, related to changes that were implemented during

Hurricane Sandy such as the executive order allowing pharmacists to administer tetanus vaccinations.

Shared electronic systems, needs for equipment, and information resources were emphasized in NYSDOH emergency reports, and generators and call-in numbers were emphasized in LHD emergency reports.⁷ NYSDOH interviews clarified need for improvements to the statewide electronic volunteer management system and streamlined guidance documents. LHD interviewees reported needs for shelter management

guidelines and access to fuel to maintain critical services during response. Formal analysis of interviews with staff, therefore, allowed different issues and recommendations to be included in the lessons learned.

Most Cited Strengths

The strengths most cited by LHD and NYSDOH interviewees included *emergency operations coordination* and *information sharing*. LHD staff stressed the importance of relationships that existed prior to the storm and how that facilitated information sharing. They also emphasized the need to maintain regular communication before and during the response. NYSDOH interviewees emphasized strengthening agency and community partnerships for the purposes of stronger *emergency operations coordination* and a successful response.

Planning, Staffing, and Training

As in other studies,¹³ LHD and NYSDOH staff emphasized developing plans before a disaster. Pre-planning is particularly important for response roles that are not part of routine public health functions. Our study found that shelter operations posed a major burden for LHD staff given lack of training and staff relief, as well as the need to forgo routine operations. Previous studies have suggested that health departments prioritize planning for nonroutine functions such as shelter operations and disease surveillance of shelter residents.¹⁴ The challenges encountered when performing emergency tasks for which staff members had little training were highlighted in this and other studies.¹⁵ For NYS LHDs, the *mass care* capability was the fifth most frequently reported challenge that included shelter operations. Many LHD interviewees had higher-level routine management roles, and during Hurricane Sandy were charged with unfamiliar responsibilities such as operating emergency response shelters.

National trends in reduction of full-time LHD staff¹⁶ were highlighted by NYS LHD staff who reported that low staff levels and lack of staff relief during shelter operations exacerbated the challenge of responding, particularly in the face of disaster impacts on their personal lives. The NYS study and other studies¹⁶ have found that inconsistent or unclear compensation policies have also negatively influenced staff willingness to contribute. However, as one NYS LHD staff member indicated, "It was a challenge and a challenge that I'm proud of staff to have stepped up to...I think all in all we did an admirable job and it was relying on people volunteering."

Both LHD and NYSDOH staff shared that staff response was compromised by burnout from long hours. LHD interviewees reported that *emergency operations coordination* was made difficult due to insufficient surge capacity for 12-hour shifts,¹⁷ long deployments, and the time constraints of having to complete routine work. The LHD respondent cited above

also expressed that "...staffing is at minimal levels and all those people are already maxed out. When you bring in another variable, especially something like Hurricane Sandy, it makes it difficult."

Studies indicate that interjurisdictional training and development of partnerships have positive impacts on staff willingness to participate.¹⁶ In the NYS interviews, the need for more training to improve preparedness was frequently cited as a recommendation by LHD and NYSDOH staff. Many training suggestions were for exercises that involved more staff and collaboration across agencies.

Resources to address training gaps included the Public Health Preparedness and Response Core Competency Model to prepare midlevel public health workers for disasters.¹⁸ The NYSDOH Office of Public Health Practice and Office of Health Emergency Preparedness have collaborated to provide a Learning Management System to access free preparedness and public health courses from local, regional, and national content providers including the NYSDOH, regional preparedness educational resource centers, Centers for Public Health Preparedness, the CDC, and the Federal Emergency Management Agency.¹⁹

Most Cited Challenges

The study results emphasized the top 6 most cited preparedness capabilities of the 16 used in the study, indicating issues that impacted the broad range of work functions represented by the interviewees. Additional challenges of importance to a smaller number of LHD staff as indicated by being among the 10 most cited capabilities included *emergency public information and warning*, *training and preparedness*, *planning*, *public health investigation and surveillance*, and *roles and responsibilities*. LHD staff also shared their challenges with communicating with the public and not feeling that they had adequate training to respond appropriately.

For NYSDOH staff, additional challenges within the top 10 preparedness capabilities included *public health investigation and surveillance*, *training and preparedness*, *mass care*, and *community recovery*. Less frequently reported NYSDOH staff challenges also included patient tracking and sheltering and the interruption of laboratory protocols including the newborn screening program.

Preparedness Recommendations

Analyses of NYS staff interviews highlight the importance of some key CDC public health preparedness capability guidance recommendations.¹² To address challenges within the *emergency operations coordination* capability, such as not having enough staff to support long deployments, balance routine work, or ensuring staff know where to report during a response, we recommend that health departments implement achievable steps such as ensuring that staff are aware of which

services are essential to maintain during a response and who is needed to report to work to carry out those services prior to an event.¹²

To address challenges within the *mass care* capability, such as shelter patients with medical needs greater than could be provided for and staff not comfortable performing shelter tasks, we recommend that health departments pre-identify locations that can be used as shelters and develop plans for sanitation, housekeeping, and surveillance.¹² Based on the findings of this and previous studies, we also recommend that resource investments be coordinated across multiple local and state agencies to share equipment, supplies, infrastructure and training.²⁰ These investments include enhancing the pool of emergency volunteers through local medical reserve corps, increasing the availability of in-person trainings and drills, and developing agreements with agencies for staff sharing during disasters.^{21,22}

Study Limitations

One study limitation was the time period for interviewing being approximately 2 years after Hurricane Sandy, which may have impacted staff memories of the event details. Also, some staff initially identified to be interviewed were no longer employed at NYSDOH or the LHDs. However, this time period allowed staff members a period of reflection beyond the imminent stress of the disaster, to filter and determine which perceptions and lessons learned were most important to share moving forward. An additional limitation was that interviewees may have been guarded in their responses despite confidentiality assurances because anonymity could not be established for the interview process.

CONCLUSION

In individual interviews, New York health department staff at both the local and state levels reported that *emergency operations coordination* was a primary strength and challenge during their response to Hurricane Sandy and the area of focus most recommended for future disaster preparedness. Important recommendations were also provided for *information sharing, planning, and training and preparedness*. Health departments should ensure that emergency planning includes protocols to coordinate backup staffing, delineation of services that can be halted during disasters, clear guidelines to coordinate resources across agencies, and training for transitioning into unfamiliar disaster response roles. Public health planners can benefit from the additional detailed insights gained by analyzing feedback shared directly by individual public health staff. This methodology can be used more routinely to lead to the translation of data into action.

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