

New York State Public Health System Response to Hurricane Sandy: An Analysis of Survey Feedback

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ABSTRACT

Objective: The objective was to provide a broad spectrum of New York State and local public health staff the opportunity to contribute anonymous feedback on their own and their agencies' preparedness and response to Hurricane Sandy, perceived challenges, and recommendations for preparedness improvement.

Methods: In 2015, 2 years after Hurricane Sandy, public health staff who worked on Hurricane Sandy response were identified and were provided a link to the anonymous survey. Quantitative analyses were used for survey ratings and qualitative content analyses were used for open-ended questions.

Results: Surveys were completed by 129 local health department (LHD) staff in 3 counties heavily impacted by Sandy (Nassau, Suffolk, and Westchester) and 69 staff in the New York State Department of Health who supported the LHDs. Staff agreed that their Hurricane Sandy responsibilities were clearly defined and that they had access to adequate information to perform their jobs. Challenges were reported in the operational, communication, service interruptions, and staff categories, with LHD staff also reporting challenges with shelters.

Conclusions: New York local and state public health staff indicated that they were prepared for Hurricane Sandy. However, their feedback identified specific challenges and recommendations that can be addressed to implement improved preparedness and response strategies. (*Disaster Med Public Health Preparedness*. 2016;10:454-462)

Key words: hurricane, survey, emergency preparedness, public health, disaster planning, public health workforce, local health departments, state health agencies, staff perceptions

Disasters can disrupt the delivery of public health services for extended periods of time and place stress on programs and staff.¹ Hurricane Sandy is an example of one such disaster that caused severe disruption in New York State (NYS) beginning on October 29, 2012. The recovery efforts of Sandy continue even today.²⁻⁴ Using applied epidemiology methods in disaster settings can provide actionable information for planners and decision-makers.⁵

Several factors impacted the provision of public health services in NYS during Hurricane Sandy. Flooding played a major role in the interruption and inaccessibility of services as well as causing harmful environmental exposures to some residents.² The resulting lack of power from the significant flooding halted public transportation,³ which had an impact on health care and public health care workers' ability to reach their jobs. Lack of power also impacted clinical laboratories during Hurricane Sandy owing to the inability to refrigerate specimens after long power outages.⁶ Although agencies may have had backup

generators, the tremendous flooding during Hurricane Sandy caused many generators to fail.³

Hurricane Sandy contributed to limited access to public health services,⁷ and hospital closures limited the access to medical services.^{8,9} Additionally, the surge of evacuated patients and community residents overwhelmed the support that was provided at emergency shelters.^{3,10-12}

Other studies on the response of the NYS Department of Health (NYSDOH) and NYS local health departments (LHDs) to Hurricane Sandy revealed the disruption of communication, challenges with managing emergency response shelters, and the need for increased coordination, a process for information sharing, and increased training and preparedness.^{13,14} These studies analyzed feedback from NYS public health executives collected through emergency reports¹³ and interviews.¹⁴ National workforce studies have found significant differences between executives and lower-level health department staff in the importance that they place on workforce skills.¹⁵

Thus, the current study used a survey to ascertain from a broader level of public health staff their perceptions of the impact of Hurricane Sandy on their work and their agencies, their current training and preparedness, and their preparedness recommendations for future disasters.

METHODS

Study Population and Data Collection

A Hurricane Sandy Guidance Team was formed among state and local agencies in NYS to provide guidance to Sandy-related studies. The 52 members of the Guidance Team represented local and state health departments, offices of emergency management, and public health providers impacted by Hurricane Sandy. A study protocol to collect anonymous feedback from LHD and state staff using surveys was developed with Guidance Team input and was approved by the NYSDOH Institutional Review Board (IRB). The survey of LHD staff included 40 questions and the survey of NYSDOH staff included 36 questions. Each instrument underwent review by Guidance Team members and pilot testing, with subsequent revisions. Final questions were used to develop 2 web-based surveys using SurveyMonkey software (SurveyMonkey, Palo Alto, CA).

The target counties within NYS selected for inclusion were Westchester, Nassau, and Suffolk as these areas were located in the declared disaster area and their health directors indicated that they had been impacted. Six more northern counties within the declared disaster area were excluded as the result of information provided by their directors that they were not actually directly impacted (however, those counties continued to contribute to the Guidance Team). The LHD representatives on the Guidance Team from the 3 target counties developed a list of staff members who were involved during Hurricane Sandy, and 357 LHD staff were invited on the basis of their employment with Westchester, Nassau, or Suffolk County LHDs during the defined Hurricane Sandy preparedness, response, and recovery period of October 26, 2012, through November 21, 2012. For the NYSDOH, 409 staff were invited on the basis of a group list for a NYSDOH Commissioner's award related to Hurricane Sandy.

In January 2015 the LHD staff invited to complete the survey received an e-mail explaining the survey purpose, confidentiality provisions, information about the IRB approval, and contact information if they had any questions. The NYSDOH invited staff received the same information in February 2015. Within 1 week of the initial notification, e-mails were sent to ask these staff to complete the web-based survey within 3 weeks. Reminders were e-mailed to increase staff participation. Researchers did not seek IRB or personnel department approval to find other ways to contact non-responding staff to determine if they were still agency employees.

Analysis

Survey topics explored in this analysis included personal and agency preparedness, reported challenges and recommendations, and use of outside support agencies including ServNY, which is a registry of health care and mental health professionals who wish to volunteer during an emergency or major disaster.¹⁶ Staff reported if their responsibilities were clearly defined to them, if they had access to adequate information to perform their job duties, if they received sufficient emergency training in preparation for Hurricane Sandy, and if they had adequate resources to maintain public health services during response.

The Hurricane Sandy response challenges explored were not identical in the 2 surveys because of the differing roles of LHD and NYSDOH staff. Questions defining challenges were grouped into 5 categories for the LHD survey: operational, communication, service interruptions, staffing challenges, and shelter challenges. The NYSDOH survey did not include shelter challenges because NYSDOH staff were not responsible for shelters. For each challenge, participants selected "Yes" or "No" responses. Respondents who selected "Unsure/Don't remember" or who skipped the question were excluded from the analysis of that question. Thus, for all results, smaller denominators are a reflection of those staff who did not answer the specific questions or were unsure of their answer. Responses to these closed-ended survey questions were analyzed by using SAS version 9.2 (SAS Institute, Inc, Cary NC).

Two open-ended questions were included: "Is there anything else that you need to help respond to weather-related emergencies?" and "Are there any additional recommendations related to your LHD or NYSDOH that you would like to make for improving future preparedness, response, and recovery to weather-related disasters?" Feedback to these questions was analyzed by using qualitative content analyses.¹⁷ Responses were reviewed by 2 researchers independently and were grouped by key words. The final set of key words or phrases was agreed upon by the 2 researchers who tallied the total number of times each key word or phrase was mentioned¹⁷ by using NVivo version 10 (QSR International, Melbourne, Australia). By use of a similar process to qualitative analyses of emergency reports¹³ and interviews,¹⁴ key words were then sorted into 1 of 11 Centers for Disease Control and Prevention (CDC) Public Health Preparedness Capabilities.¹⁸ Key words not fitting clearly into one of these CDC Capabilities were sorted into 5 additional study-defined capabilities and a miscellaneous category.¹⁴

RESULTS

A total of 145 LHD staff (41%) and 160 NYSDOH staff (39%) responded to the survey. Of those responding, further screening questions to verify Hurricane Sandy-related work then excluded 16 (11%) of the LHD staff and 91 (57%) of the NYSDOH staff. Thus, a total of 129 LHD staff (89%) and 69 NYSDOH staff (43%) were included in the final analyses.

Survey Participant Demographics

Of the 104 LHD staff and 62 NYSDOH staff who reported their usual job function during the Hurricane Sandy study period, there were 51 (49%) and 33 (53%) in the professional/technical category, respectively. For the other categories, there were 17 (16%) and 12 (19%) administrators, 14 (13%) and 11 (18%) director/coordinators, 13 (13%) and 5 (8%) clerical, 5 (5%) and 1 (2%) fiscal, and 4 (4%) and 0 clinical, respectively. The years working in public health at the time of the survey ranged from 4 to 41 years for LHD respondents and from 3 to 40 years for NYSDOH staff. The median number of years working in public health at the time of the survey was 14 years for LHDs and 13 years for NYSDOH.

Perceptions of Hurricane Sandy Preparedness

Four questions asked staff to rate their perceptions of preparedness for Hurricane Sandy by use of a Likert scale from strongly disagree (1) to strongly agree (5). LHD and NYSDOH staff agreed that their responsibilities were clearly defined (mean = 4) and that they had access to adequate information to perform their jobs (mean = 3.9). The mean scores were midway between “agree” and “neutral” for the preparedness statement that “the existing resources were adequate to maintain services” (3.4 and 3.7 for LHDs and NYSDOH, respectively) and for the preparedness statement that “the emergency training that I received was sufficient preparation” (3.6 and 3.5 for LHDs and NYSDOH, respectively).

Challenges

The 24 challenges reported by LHD staff were organized into 5 general categories (communication, operational, service interruptions, staffing challenges, and shelter challenges) and ordered by the proportion of staff citing the challenge within each category (Figure 1). Communication and operational challenges were reported most frequently, with problems getting fuel in the operational category mentioned most often (82/95, 86%). In the other categories, the most frequently reported challenges were issues communicating with external partner agencies (71/84, 85%) within the communication category, the inability of staff to report to work (74/102, 73%) within the staffing challenges category, and problems with maintaining proper supplies (17/34, 50%) within the shelter challenges category. The most frequently reported LHD service interruption was problems with the collection of laboratory samples (9/13, 69%). Other LHD service interruptions included routine environmental services (51/78, 65%), routine food establishment inspections (41/78, 53%), problems with the transportation of laboratory samples (6/13, 46%), and ensuring patient access to oxygen tanks (14/32, 44%).

For the 19 challenges reported by NYSDOH staff, all of the communication challenges were the most frequently reported challenges overall, with issues communicating with other NYSDOH programs, divisions, bureaus, or units as the top one (45/59, 76%; Figure 2). In the other categories, the most

frequently reported challenges were lack of power (25/53, 47%) within the operational challenges category and lack of staff relief (17/53, 32%) within the staffing challenges category. The most frequently reported NYSDOH service interruptions were those considered as “other” (ie, pharmacy services, home health care) (17/32, 53%), followed by assistance to contracted providers (7/32, 22%), disease surveillance (6/32, 19%), fiscal reimbursement/authorization (4/32, 13%), and routine environmental services (4/32, 13%). Because NYSDOH staff were not directly responsible for shelters, there was no shelter category of challenges in their survey.

Outside Agency Support

Only LHDs as the frontline public health responders were asked about the support received from outside agencies. Almost all staff reported that NYSDOH (56/62, 90%) and county Office of Emergency Management (73/77, 95%) support was useful (Table 1). Only 50% of the staff (11/22) reported that the NYS emergency volunteer database (called ServNY)¹⁶ was useful to identify and mobilize volunteer doctors, nurses, and support staff, while 36% (8/22) reported being unaware of this support. Federal Disaster Medical Assistance Teams were reported as being useful by 71% (29/41) of the staff, while 22% (9/41) reported being unaware of this support. The federal Incident Management Assistance Team was reported as being useful by 69% (24/35) of the staff, while 26% (9/35) reported being unaware of this support. The American Red Cross was reported as being useful by 86% of staff (50/58). Additional information about the use of these systems was not provided by the staff.

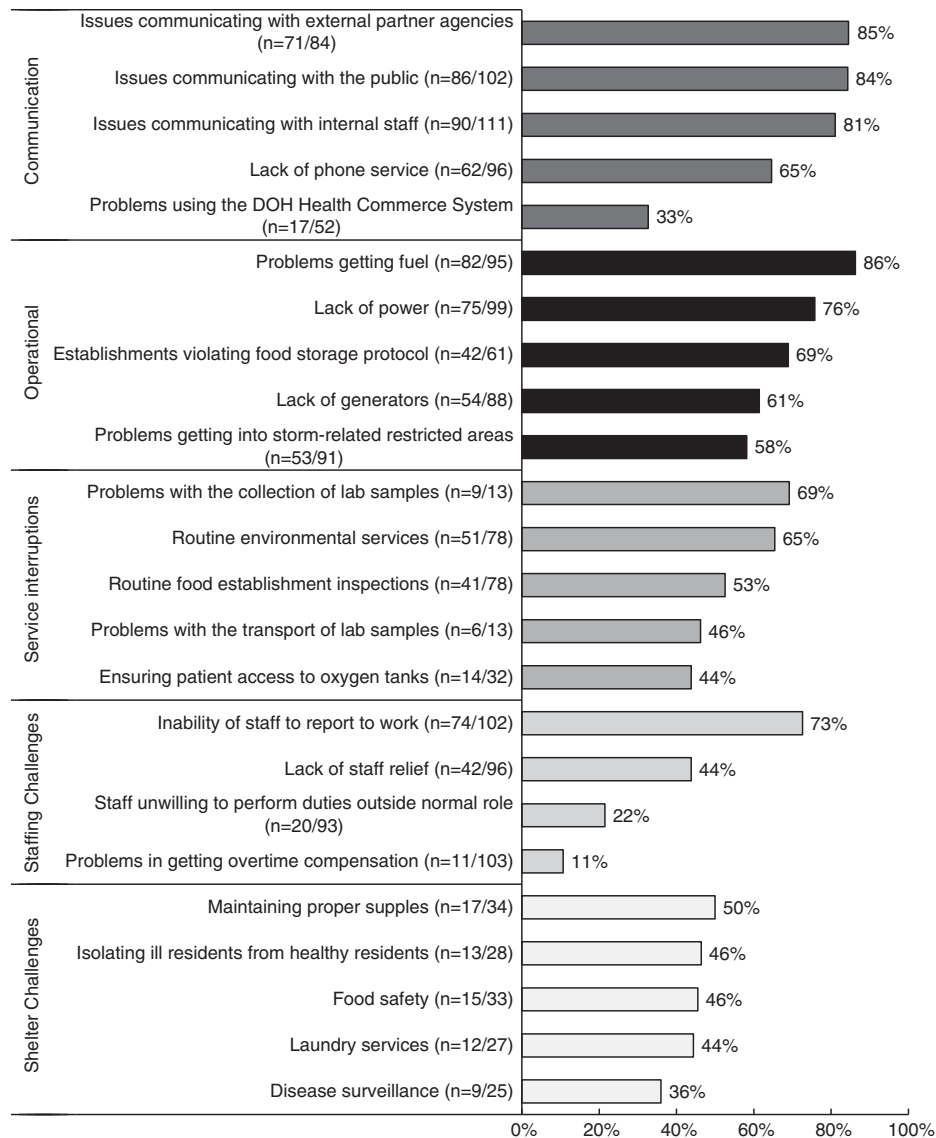
Current Training and Preparedness

In response to questions about current (2015) training for weather-related emergencies, 56% (59/106) of LHD staff reported having no annual emergency training and 55% (58/105) reported no practice of their current emergency plan between October 2012 and February/March 2015 (Figure 3). For NYSDOH staff, 73% (45/62) reported having no annual emergency training and 63% (39/62) reported no practice of their current emergency plan since Hurricane Sandy.

For perceptions of current level of preparedness, 74% of LHD staff (78/106) reported currently feeling “somewhat” or “very” prepared as an employee and 68% (71/105) reported feeling “somewhat” or “very” prepared as a health department for future weather-related emergencies (Figure 4). Ten percent or fewer staff reported being “somewhat unprepared” or “not at all prepared” as an employee (11/106) or as a health department (8/105). For NYSDOH, 79% of staff (49/62) reported currently feeling “somewhat” or “very” prepared as an employee, but this was lower for their program, bureau, unit, or division (36/62, 58%) and health department (36/61, 59%). Again, 10% or fewer staff reported being “somewhat unprepared” or “not at all prepared” as an employee (6/62) and as a health

FIGURE 1

New York State Local Health Department Staff Most Frequently Reported Challenges by Category, 2015 Staff Surveys.



Abbreviation: DOH, Department of Health.

department (6/61), but 15% (9/62) reported being unprepared in their program, bureau, division, or other work unit.

Recommendations

In qualitative analyses of the open-ended responses using the 17 preparedness capabilities, the most frequently cited recommendations by LHD staff to better prepare for future disasters fell into the following preparedness capability categories: training and preparedness (11/57, 19%), information sharing (11/57, 19%), planning (10/57, 18%), emergency operations coordination (9/57, 16%), flexibility (6/57, 11%), and mass care (3/57, 5%) (Figure 5). Specific recommendations included the need for more practical training such as

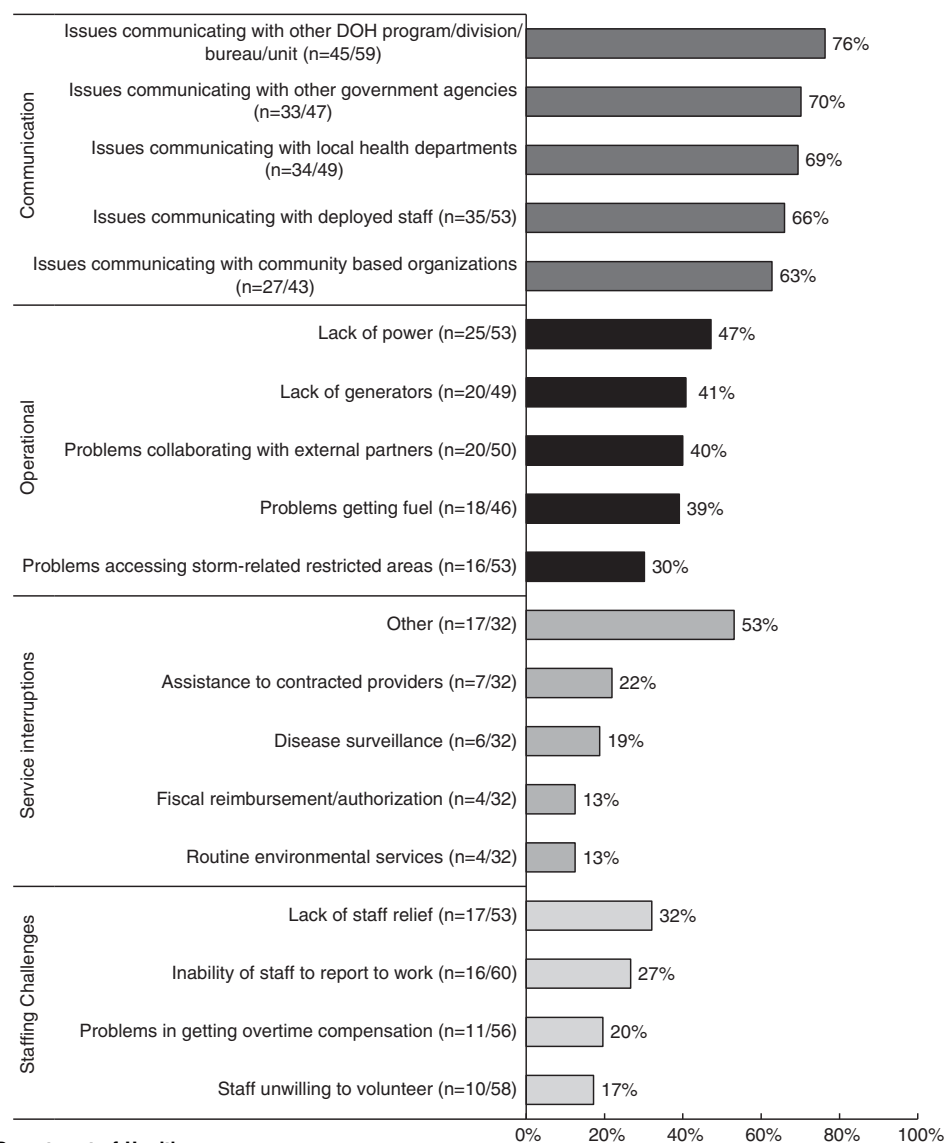
drills and exercises. The importance of information sharing was emphasized by one LHD respondent:

Start reaching outside the comfort zone on the govt. offices and get to the public [before an event]. Sport events, etc. to distribute information...People in the hurricane knew nothing of any services available from Health Services because the information did not get out there...Senior Centers all over the county is another place to advise the elderly public. Visit the nursing homes, drug stores. Get out in the public.

The most frequently cited recommendations by NYSDOH staff to prepare for future disasters fell into the following capability

FIGURE 2

New York State Department of Health Staff Most Frequently Reported Challenges by Category, 2015 Staff Surveys.



Abbreviation: DOH, Department of Health.

categories: training and preparedness (8/42, 19%), planning (8/42, 19%), emergency operations coordination (7/42, 17%), flexibility (6/42, 14%), information sharing (5/42, 12%), and roles and responsibilities (4/42, 10%) (Figure 5). Specific recommendations included having a bulleted procedure list for actions to be taken by staff and agencies during an emergency and an in-service to practice this procedure, facilitation of communication between staff in the field and in-office staff, and provision of flexibility for telecommuting or adjusted work schedules. With training being the top recommendation for NYSDOH staff, one respondent recommended:

Require all staff to take basic ICS [Incident Command System] training as part of their list of annual mandated

staff trainings. Develop, communicate and then operationalize a true Continuity of Operations plan that identifies essential and non-essential activities and staff so that it is crystal clear to all what can cease temporarily and those staff can then be redeployed to emergency response activities.

DISCUSSION

Assessments are needed to evaluate the factors that inhibited effective response during Hurricane Sandy to understand the influences of disaster resilience and develop management plans to enhance them.¹⁹ Much of the feedback provided in after action reports and evaluation documents for other

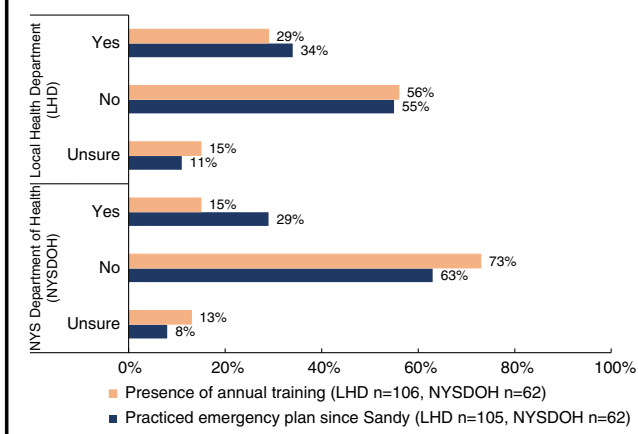
TABLE 1

Local Health Department Staff Perception of Outside Agency Support, 2015 Staff Surveys^a

Was Support From the Following Entity Useful?	Useful, No. (%)	Not Useful, No. (%)	Unaware of Prior to Hurricane Sandy, No. (%)
NYSDOH (n = 62)	56 (90)	5 (8)	1 (2)
County OEM (n = 77)	73 (95)	3 (4)	1 (1)
ServNY (n = 22)	11 (50)	3 (14)	8 (36)
DMAT (n = 41)	29 (71)	3 (7)	9 (22)
MRC (n = 48)	39 (81)	3 (6)	6 (13)
IMAT (n = 35)	24 (69)	2 (6)	9 (26)
American Red Cross (n = 58)	50 (86)	6 (10)	2 (4)

^aAbbreviations: DMAT, Disaster Management Assistance Team; IMAT, Incident Management Assistance Team; MRC, Medical Reserve Corps; NYSDOH, New York State Department of Health; OEM, Office of Emergency Management.

FIGURE 3

Percentage of Respondents Reporting Presence of Annual Training and Practicing of Response Plan Since Hurricane Sandy, 2015 Staff Surveys.

disasters may not include a broad spectrum of individual worker needs.^{13,20} Other studies have shown that perceptions of required workforce skills can differ among top executives and other staff.¹⁵ The additional NYS feedback provided through this survey, which included administrative, director/coordinator, clerical, fiscal, and clinical staff, gave the opportunity to expand on our understanding of the impacts of Hurricane Sandy and on recommendations compared to existing emergency reports¹³ and executive interviews.¹⁴

Use of an anonymous survey facilitated local and state public health staff to honestly share their perceptions of the Sandy-associated challenges, areas for improvement, and potential solutions to improve future response and recovery planning and implementation. Overall, LHD and NYSDOH staff were most concerned about the adequacy of emergency training

and having resources to maintain their services. The challenges shared by staff exemplified lack of resources such as fuel, phone service, power/generators, and shelter supplies, which contributed to the interruption of laboratory, disease surveillance, and routine environmental services.

Our findings suggest that there are areas that can be improved to address the existing gaps in preparation for future disasters. Increasing awareness of statewide volunteer databases, such as ServNY in NYS,¹⁶ may make this type of resource more useful for future disasters. Measures will need to be taken to assist public health staff to access resources such as fuel and proper supplies to maintain emergency shelters. Collaboration with partners will be necessary to ensure staff have proper relief or accommodations for flexible work schedules and locations during response and to prevent the interruption of normal public health services such as collecting laboratory samples.

Fortunately, about three-quarters of the LHD and NYSDOH staff reported feeling somewhat or very prepared for future disasters, although more than half reported no annual training or practice of their plan. Training and practicing of the plan is probably prioritized for staff who are more likely to be involved in emergency response, but the staff who rarely participate in emergency response may feel less prepared. Only 19% of the staff provided specific open-ended recommendations that were classified into the training and preparedness capability. Other studies have indicated the importance of having practical hands-on drills and exercises for training.²¹ It is important to note that many of the recommendations shared by NYS staff to address policies and infrastructure are already in place, which indicates the need for increased awareness and training to ensure staff understand existing policies, resources, and accommodations that are available to them during future disasters.

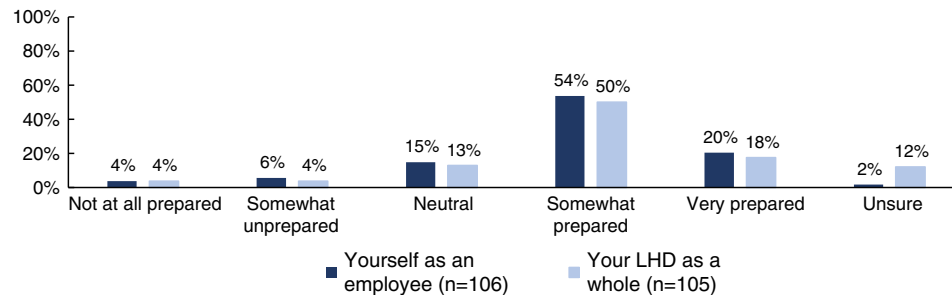
Although more trained staff are needed for future response, studies have found that the continued decrease in state and local public health workers has been exacerbated by the reductions in state and federal emergency preparedness funding.^{22,23} These reductions impact capacity as exemplified by the challenges to staff emergency shelters at the local level during Hurricane Sandy. This reality creates major vulnerabilities as identified in this research and threatens the ability of the health infrastructure to deliver an effective and efficient response when required. This study identified ServNY as a resource that can be better utilized to address staff shortages with available emergency volunteers.¹⁶

The extensive list of specific challenges reported by the public health staff should be helpful in agency planning for future preparedness. With communication challenges reported by most staff, it is critical to ensure that nontraditional methods of communicating with partners and the public are in place and practiced in advance of the emergency. This preparation and planning will familiarize the public with communication

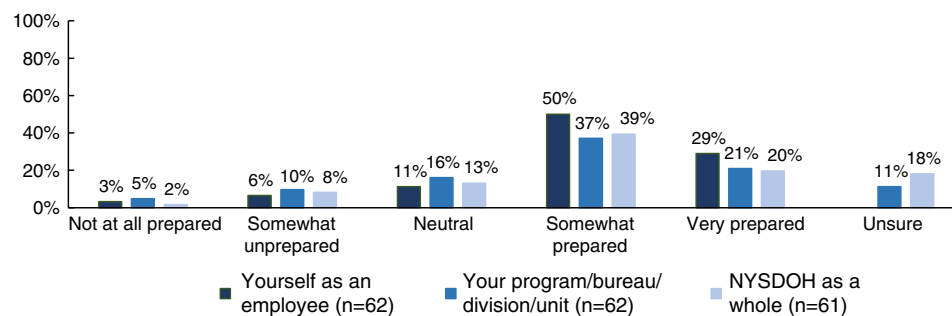
FIGURE 4

New York State Local Health Department and New York State Department of Health Staff Perception of Preparedness for Future Weather-Related Emergencies, 2015 Staff Survey.

Local Health Department (LHD) staff



New York State Department of Health (NYSDOH) staff



channels to use and access information during an event. Operational challenges and interruptions to vital services were also reported by most staff, which require mobilizing of resources ahead of the emergency.

Limitations

The study goal was to provide a platform for staff from all sectors of the impacted health departments to share their experiences during Hurricane Sandy, and staff representing multiple job functions were successfully included. However, it is possible that there were other staff who worked during the hurricane who were not included on the invited respondent lists and thus were not provided the opportunity to participate. Recall also may have been a problem as this survey was conducted 2 years after Hurricane Sandy.

The initial list of potential NYSDOH survey recipients appears to have problems because 56% excluded themselves from survey completion by indicating that they were not involved in Hurricane Sandy-related response efforts. The list had been generated for a recognition ceremony. Upon receiving the invitation to the survey, many may have perceived that they really did not contribute to the Hurricane Sandy response. Some may also have excluded themselves because their response efforts were initiated after the study-defined response period.

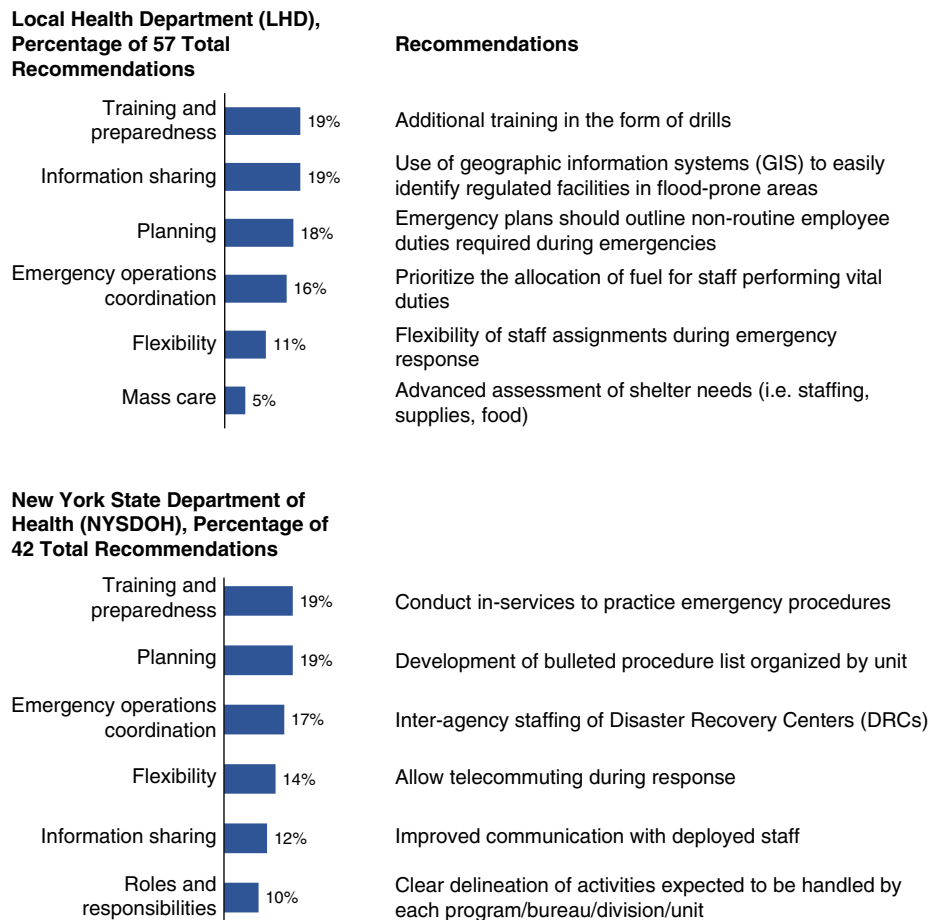
The proportion of staff providing answers to some questions was low. For example, only 24 to 26 of the 69 NYSDOH staff participating in the survey (35-38%) provided information about their degree of agreement with the 4 statements concerning preparedness and training, in contrast to 106 to 108 of the 129 LHD staff (82-84%). Some potential influences on this response rate may include staff concerns about providing feedback because the results would reflect on their agency. The LHD response rate was possibly better because the names of the specific LHDs were not singled out. Another reason for the low response rate could be a conflicted perception about how to respond when questions reflected overall experiences and lacked specificity.

CONCLUSIONS

Local and state health staff in NYS generally agreed that they were prepared and found a number of state and local resources useful to them during the disaster, although many have not participated in training and practicing of an emergency response plan since Hurricane Sandy. The staff preparedness recommendations for improvement most frequently were in the training and preparedness capability, although staff frequently reported communication, operational, service interruption, and staffing challenges, as well as shelter challenges at the local level. Staff recommended that trainings

FIGURE 5

What To Do Next Time: Most Cited Recommendations by Capability, 2015 Staff Survey.



should be interactive, and that coordination and planning activities should occur and be practiced prior to an emergency event.

LHD and NYSDOH staff feedback was collected to assess perceptions of preparedness and challenges during the Hurricane Sandy response period. This study differed from standard after action efforts because it occurred 2 years after the event, thus providing the opportunity for anonymous feedback and more time for reflection. This study is additionally unique because it involved more systematic collection of data on questions of interest and included specific input from staff representing all levels within health departments.

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REFERENCES

1. Lenaway D, Halverson P, Sotnikov S, et al. Public health systems research: setting a national agenda. *Am J Public Health*. 2006; 96(3):410-413. <http://dx.doi.org/10.2105/AJPH.2004.046037>.

2. Greenberg MR, Weiner MD, Noland R, et al. Public support for policies to reduce risk after Hurricane Sandy. *Risk Anal.* 2014;34(6):997-1012. <http://dx.doi.org/10.1111/risa.12203>.
3. Adalja AA, Watson M, Bourri N, et al. Absorbing citywide patient surge during Hurricane Sandy: a case study in accommodating multiple hospital evacuations. *Ann Emerg Med.* 2014;64(1):66-73. <http://dx.doi.org/10.1016/j.annemergmed.2013.12.010>.
4. Powell T, Hanfling D, Gostin LO. Emergency preparedness and public health: the lessons of Hurricane Sandy. *JAMA.* 2012;308(24):2569-2570.
5. Malilay J, Heumann M, Perrotta D, et al. The role of applied epidemiology methods in the disaster management cycle. *Am J Public Health.* 2014;104(11):2092-2102. <http://dx.doi.org/10.2105/AJPH.2014.302010>.
6. Zolla-Pazner S. Saving specimens after Sandy. *N Engl J Med.* 2013;368(21):e27. <http://dx.doi.org/10.1056/NEJMp1303024>.
7. Redlener I, Reilly MJ. Lessons from Sandy—preparing health systems for future disasters. *N Engl J Med.* 2012;367(24):2269-2271. <http://dx.doi.org/10.1056/NEJMp1213486>.
8. Jacobson J. A long, for some too slow, health care recovery after Sandy. *AJN Reports.* 2013;113:19-21.
9. Subaiya S, Moussavi C, Velasquez A, et al. A rapid needs assessment of the Rockaway Peninsula in New York City after Hurricane Sandy and the relationship of socioeconomic status to recovery. *Am J Public Health.* 2014;104(4):632-638. <http://dx.doi.org/10.2105/AJPH.2013.301668>.
10. Lane K, Charles-Guzman K, Wheeler K, et al. Health effects of coastal storms and flooding in urban areas: a review and vulnerability assessment. *J Environ Public Health.* 2013;2013:1-13. <http://dx.doi.org/10.1155/2013/913064>.
11. Casey-Lockyer M, Heick RJ, Mertzluft CE, et al. Deaths associated with Hurricane Sandy – October-November 2012. *MMWR Morb Mortal Wkly Rep.* 2013;62(20):393-397.
12. Currier M, King DS, Wofford MR, et al. A Katrina experience: lessons learned. *Am J Med.* 2006;119(11):986-992. <http://dx.doi.org/10.1016/j.amjmed.2006.08.021>.
13. Shipp Hilt A, Mack S, Eidson M, et al. New York State public health system response to Hurricane Sandy: an analysis of emergency reports [published online ahead of print December 2, 2015]. *Disaster Med Public Health Prep.* <http://dx.doi.org/10.1017/dmp.2015.142>.
14. Shipp Hilt A, Mack S, Eidson M, et al. New York State Public Health System Response to Hurricane Sandy: lessons from the field [published online ahead of print]. *Disaster Med Public Health Prep.* <http://dx.doi.org/10.1017/dmp.2016.69>.
15. Ye J, Leep C, Robin N, et al. Perception of workforce skills needed among public health professionals in local health departments: staff versus top executives. *J Public Health Manag Pract.* 2015;21(suppl 6):S151-S158. <http://dx.doi.org/10.1097/PHH.0000000000000299>.
16. New York State. ServNY—New York State's Volunteer Program. <https://apps.health.ny.gov/vms/appmanager/vms/public>. Accessed April 14, 2016.
17. Corbin J, Strauss A. Grounded theory research: procedures, canons, and evaluative criteria. *Qual Sociol.* 1990;13(1):3-21. <http://dx.doi.org/10.1007/BF00988593>.
18. Centers for Disease Control and Prevention, Office of Public Health Preparedness and Response. Public Health Preparedness Capabilities: National Standards for State and Local Planning. http://www.cdc.gov/php/capabilities/dslr_capabilities_july.pdf. Published March 2011. Accessed October 28, 2015.
19. Cutter SL, Barnes L, Berry M, et al. A place-based model for understanding community resilience to natural disasters. *Glob Environ Change.* 2008;18(4):598-606. <http://dx.doi.org/10.1016/j.gloenvcha.2008.07.013>.
20. Savoia E, Agboola F, Biddinger PD. Use of after action reports (AARs) to promote organizational and systems learning in emergency preparedness. *Int J Environ Res Public Health.* 2012;9(8):2949-2963. <http://dx.doi.org/10.3390/ijerph9082949>.
21. Ablah E, Konda KS, Konda K, et al. Emergency preparedness training and response among community health centers and local health departments: results from a multi-state survey. *J Community Health.* 2010;35(3):285-293. <http://dx.doi.org/10.1007/s10900-010-9236-7>.
22. Beck AJ, Boulton ML, Coronado F. Enumeration of the governmental public health workforce, 2014. *Am J Prev Med.* 2014;47(5S3):S306-S313.
23. National Association of County and City Health Officials. Local health department job losses and programs cuts: findings from the 2013 profile study. <http://www.naccho.org/topics/infrastructure/lhdbudget/upload/survey-findings-brief-8-13-13-3.pdf>. Published July 2013. Accessed April 14, 2016.