

Snow Storms and Vulnerable Populations: Local Public Health Activities in Response to the 2014-2015 Severe Winter Weather

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ABSTRACT

The Northeastern United States experienced some of its coldest and snowiest conditions ever recorded during the winter of 2014-2015. The snowfall and extreme temperatures created significant challenges for local health departments attempting to continue critical services and respond to storm-related needs of the community. This report from the field aims to describe the impact of the severe weather on local health departments' operations, to examine the disruption to public health services, and to document public health support provided to vulnerable populations during the 2014-2015 winter season. Our findings show that the severe weather exposed major challenges in continuity of public health operations across health departments of various sizes and highlighted some key issues as well as effective strategies, such as collaborations with community-based organizations, to identify and address the needs of the most vulnerable during the winter storms. (*Disaster Med Public Health Preparedness*. 2019;13:647-649)

Key Words: public health, severe weather, vulnerable populations

The Northeastern United States experienced some of its coldest and snowiest conditions ever recorded during the winter of 2014-2015.¹ The National Weather Service announced that Boston, with a seasonal snowfall total of 108 inches, experienced its snowiest winter since 1872.¹ The snowfall and extreme temperatures created significant challenges for local health departments attempting to continue critical services and respond to storm-related needs of their communities. Between January and March 2015, heavy snowstorms caused a disruption in transportation and in the continuation of utility services. Severe winter events, similarly to other extreme weather events, present a set of challenges that can lead to a need for mass care operations and sheltering.² This report from the field aims to document the impact of the severe weather on local health departments operations, examine the disruption to public health operations, and document public health support provided to vulnerable populations, while deriving lessons learned for future public health preparedness efforts.

METHODS

In March 2015, we gathered data from a convenience sample of 123 local health departments' officials in Massachusetts by the use of an online survey. Survey questions were designed to gather information about the impact of the severe weather season on health departments' operations, document collaborations with community-based organizations, and the ability to communicate and serve a range of vulnerable groups. The

survey was deemed exempt by the Institutional Review Board at the Harvard T.H. Chan School of Public Health. The quantitative data analysis was performed using the statistical package STATA version 13 (Stata-Corp, College Station, TX), and qualitative coding and content analysis were done by the use of Microsoft Excel.

RESULTS

Sample Characteristics

The 123 survey respondents included public health directors (58%), health agents (19%), nurses (7%), administrative staff (7%), board of health members (4%), and other positions (ie, health educators, preparedness coordinators [5%]). Eighty-eight (72%) of the respondents were public officials from communities that recorded a 2014-2015 seasonal snowfall total of more than 80 inches. The characteristics of the communities served by the health departments included in the survey are shown in Table 1.

Disruption of Public Health Operations

During the storms, public health officials experienced constant challenges while performing their duties; the majority (62%) expressed difficulties about continuing the coordination of daily public health operations, due, in part, to staffing issues. All public transportation was significantly hampered across all areas. Consequently, numerous municipal administrative offices, including city or town halls, closed with 77% of respondents reporting commuting issues. Overall, 80% of survey respondents reported the closure of

TABLE 1

Characteristics of Respondents		
	Number	% n = 123
Size of population served (number of residents)		
Small (<8,000)	30	24.4
Medium (8,000-32,000)	62	50.4
Large (≥32,000)	31	25.2
Type of community		
Urban	29	23.6
Suburban	82	66.7
Rural	12	9.7
Snowfall		
High (≥80 inches)	88	71.5
Low (<80 inches)	35	28.5

their health departments at some point during the winter. Health departments' closures ranged from a minimum of 1 day to a maximum of 7 days, with a mean closure period of 2 days. In addition, 26% of participants experienced challenges finding child-care because day-care centers were not open due to personnel shortages and hazardous road conditions.

Public Health Successes and Challenges

Health departments were involved in preparedness and response activities; the most frequently reported activities included public outreach and messaging (28%), waste management (24%), and property structural monitoring (22%) due to heavy snow and ice accumulation. When asked about successful public health activities, respondents were satisfied with interdepartmental collaborations (35%), public outreach efforts (19%), and communication (13%). Challenges included waste disposal problems (46%) and sheltering operational issues (12%).

Communication

Traditional methods of communication, such as television (25%), newspapers (17%), and radio (9%), were used by public health officials for storm-related messaging. Over 59% of health departments used various Internet-based channels and texting to disseminate winter weather warnings, with the most popular mechanisms being posting information on a website (47%), using Facebook (20%) and Twitter accounts (11%), and text messaging (7%).

Identifying and Assisting Vulnerable Populations

A *vulnerable population* may be defined as any group that experiences difficulty in obtaining, understanding, or responding to information due to its condition.³ Vulnerable populations may require special assistance before, during, and after a disaster.³ An open-ended question asked respondents to describe how their health department had assisted vulnerable populations in their communities during the storms. One respondent explained, "Our staff made sure our meals-on-wheels [program] continued." Another stated,

"We reached out to frail and fragile residents in advance of the storm...and assisted with plan development in some cases, [including] negotiated beds in long-term care facilities." Other respondents reported that their health department supported homebound residents and provided home visits to individuals with access and functional needs. A participant described efforts to "connect residents with shoveling resources, extra meals for the home bound, and extra food at [our] food pantry." One success story involved a Buddy program in which Medical Reserve Corps volunteers conducted daily well-being telephone and personal checks to local vulnerable populations.

Collaboration to Assist Vulnerable Populations

To better serve vulnerable populations, collaboration between public health and community organizations is critical in building community preparedness and resilience.³⁻⁵ The majority (70%) of respondents engaged with local organizations to help identify vulnerable groups. Councils on Aging were cited as the most common partner (95%), followed by emergency management (76%), faith-based organizations (33%), home care agencies (30%), and hospitals (20%). Public data resources were used by 21% of respondents to assist in locating vulnerable populations.

DISCUSSION

While not all regions of the United States experience the large-scale impact of prolonged severe winter weather, other types of natural and manmade disasters occur across the nation, and lessons learned from this emergency can be applied to other circumstances. In our brief literature review of disaster preparedness as applied to snow emergencies, we found only 1 study on hospital worker preparedness,⁶ 1 study on emergency ambulance preparedness,⁷ and 1 study of social media warnings for winter storm preparedness.⁸

As shown by our findings, the severe weather experienced by local health departments in Massachusetts during the 2014-2015 winter season exposed major challenges in continuity of public health operations and highlighted some key public health issues. Transportation system issues presented significant barriers for staff attempting to report to work to ensure continuity of public health operations, including staffing absences stemming from school and day-care closures. Public health officials were overwhelmed with public works-related issues: post-storm waste management and the monitoring of both residential and commercial roof collapse.

However, the most significant implication of this study highlights the importance of identifying and addressing the needs of vulnerable populations. When planning for emergencies, it is critical to understand the needs of all community residents, including vulnerable populations, so resources can be prioritized and allocated over the course of the emergency situation.^{3,9}

The needs of vulnerable populations may place increased demands on local health departments and emergency management personnel. Vulnerable populations often face increased isolation during emergency situations and may present unique challenges to public health in terms of planning and implementing effective communication and support. It is crucial to identify and understand the most effective way to identify and reach these groups.^{4,9} In this survey, the level of public health communication and support by respondents varied greatly across different types of vulnerable populations.

Of note, the fact that the great majority (75%) of respondents pointed to emergency management agencies as leading the reach to vulnerable populations implies that more training and tools are needed to empower local health departments in being proactive in this role. The need to locate these populations prior to an emergency is critical. Public health is a crucial player in serving the most vulnerable segments of the population, and roles and responsibilities on this issue between public health and emergency management agencies should be clarified and coordinated in a consistent manner.

Limitations

Data were derived from a convenience sample of health departments who volunteered to respond to the survey. The use of a convenience sample may not reflect the totality of health departments that experienced the severe weather situation. An accurate measure of snow inches by town or city is not available because snowfalls are typically reported by county in Massachusetts. Therefore, we do not know to what extent the 123 health departments that we surveyed represent the totality of health departments affected by the storm and how severely they were affected by the snowfalls. Last, because Massachusetts has a history of experiencing and responding to severe winter weather events, the response activities of their local health departments to severe snowfall may not represent how other local health departments across the United States could respond to similar situations.

CONCLUSIONS

Despite its limitations, our study findings suggest that pre-incident operations collaboration with local organizations serving vulnerable populations, information dissemination capabilities beyond traditional media, clarity of roles and integration with emergency management, and the continuity of public health operations planning should be prioritized in planning response activities for future severe winter weather conditions. Further training for public health professionals focusing on winter-specific issues, such as waste management and roof collapse monitoring due to ice and snow, would enable public health departments to respond to a broader range of residents' concerns and mitigate the often

devastating effects of prolonged winter storms. Collaboration between public health and community agencies could be fostered by educating the public health workforce regarding the need for pre-incident relationships to support communication with hard-to-reach vulnerable populations in the aftermath of any type of emergency.

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REFERENCES

1. National Weather Service. Weather prediction service significant event reviews. Published February 5–6, 2016. http://www.wpc.ncep.noaa.gov/winter_storm_summaries/event_reviews.shtml. Accessed June 7, 2016.
2. Hunter M, Hunter J, Yang J, et al. Public health system response to extreme weather events. *J Public Health Manage Pract.* 2016;22(1): E1–E10.
3. Benson WF, Aldrich N. Centers for Disease Control disaster planning goal: protect vulnerable older adults. January 25, 2006. https://www.cdc.gov/aging/pdf/disaster_planning_goal.pdf. Accessed June 14, 2018.
4. Iowa Public Health Preparedness Program. Iowa Department of Public Health. Emergency planning for people with disability. January 25, 2006. http://www.idph.state.ia.us/bh/common/pdf/disability_health/emergency_planning.pdf. Accessed June 14, 2018.
5. Shoaf K, Kelley M, O'Keefe K, et al. Enhancing emergency preparedness and response systems: correlates of collaboration between local health departments and school districts. *Public Health Rep.* 2014;129(Suppl 4):107–113.
6. Merin O, Goldberg S, Peyser A, et al. Lessons from preparedness of hospitals to snowstorms. *Harefuah.* 2015;154(11):688–691.
7. Caliskan C, Algan A, Kocak H, et al. Preparations for severe winter conditions by emergency health personnel in Turkey. *Disaster Med Public Health Prep.* 2014;8(2):170–173.
8. Bobban-White J, Shulman J, Bielecke A. Snow tweets: emergency information dissemination in a US county during 2014 winter storms. *PLoS Curr.* 2014. doi:10.1371/currents.dis.100a212f4973b612e2c896e4cdc91a36.
9. Eisenman D, Cordasco K, Asch S, et al. Disaster planning and risk communication with vulnerable communities: lessons from Hurricane Katrina. *Am J Public Health.* 2007;97(Suppl 1):S109–S115.