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Assessing the Congregate Disaster Shelter: Using Shelter Facility Assessment Data for Evaluating Potential Hazards to Occupants During Disasters

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Abstract

Disaster shelter assessments are environmental health assessments conducted during disaster situations to evaluate the living environment of shelters for hygiene, sanitation, and safety conditions. We conducted a secondary data analysis of shelter assessment records available (n = 108) on ice storms, floods, and tornado events from 1 state jurisdiction. Descriptive statistics were used to analyze results of environmental health deficiencies found in the facilities. The greater numbers of environmental health deficiencies were associated with sanitation (26%), facility physical issues (19%), and food areas (17%). Most deficiencies were reported following ice storms, tornadoes, and flood events. This report describes the first analysis of environmental health deficiencies found in disaster shelters across a spectrum of disaster events. Although the number of records analyzed for this project was small and results may not be generalizable, this new insight into the living environment in shelter facilities offers the first analysis of deficiencies of the shelter operation and living environment that have great potential to affect the safety and health of shelter occupants.

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Keywords

disaster assessments methods; disaster shelters; environmental health; preventive services; public health; risk assessments

Disasters are complex events and measured in the way they affect people.[1] When emergency management agencies implement population preventive measures, such as evacuations, people are often temporarily displaced or permanently forced out of their homes. These displaced or newly homeless often will seek refuge and protection in disaster shelters operated by organizations such as the American Red Cross and other National Volunteer Organizations Active in Disasters or NVOADs.[2] Disaster congregate shelters come in various sizes and types (medical, last resort, etc) and range from small facilities designated to house a few dozen individuals to large mega-facilities capable of holding several thousands of victims.[3] Because disaster shelters are congregate settings that bring disaster survivors and shelter workers in close quarters in an austere environment, there is often increased concern about the potential for disease transmission, injury, or health hazards in these facilities due to environmental conditions.[4,5] Following disasters, there is often a presumption that outbreaks of disease may follow, and several outbreaks of communicable diseases and conditions have been documented in shelter facilities during past disasters.[6–12]

Disaster survivors and those providing volunteer care for them in shelter facilities may be vulnerable or predisposed to illness or injury due to their health status and limitations.[13] For example, many disaster survivors will arrive with their own mental health–related, medical, mobility-impaired, and functional needs (eg, physical, sensory, cognitive, or intellectual disabilities) that could increase their risk for illness or injury.[14] Shelter workers can be at risk because they are often older, retired members of the community with their own health issues. In addition, many shelter workers, including medical staff who will be expected to perform basic public health preventive functions, may lack knowledge or training in public health areas.[15–18]

Evaluating this living environment for potential risks to disaster shelter occupants and workers is a public health priority. However, the prevalence of certain environmental health factors such as hygiene, sanitation, and safety issues under disaster conditions has not been fully assessed. Public health agencies play key roles in supporting disaster shelter agencies in monitoring and protecting the health of disaster shelter occupants.[19–21] Hygiene, sanitation, and other safety issues can be ascertained using environmental health shelter assessment tools that are already available.[22] Using environmental health data for risk assessment and risk management is not new. Two well-known examples of programs that use environmental health assessment data for risk determination and prevention are the Food and Drug Administration Food Code and the inspection system of the Vessel Sanitation Program, Centers for Disease Control and Prevention (CDC).[23–25]

In 2008, the CDC released an environmental health assessment tool for disaster shelters created with the assistance of local, state, federal, academic, and non-governmental organization officials (see Supplemental Digital Content Appendices A and B, available at: http://links.lww.com/JPHMP/A235 and http://links.lww.com/JPHMP/A236).[26] The shelter

tool captures 90 information elements grouped into 14 domains and subdomains. The domains and number of subdomains are as follows: assessing agency data (5); facility type and census data (22); facility (10); food (14); drinking water and ice (4); health and medical (3); sanitation (8); solid waste (6) child care (7); sleeping area (5); companion animals or pets (4), other considerations (2). There is also an open text area for noting critical or immediate needs. Since the form was released, some states or territories may have adopted the CDC tool, created modified versions, or used their own jurisdictional tools to assess disaster shelters. According to the CDC project officer (M. Kalis, CDC, oral communication, 2014) for the CDC-sponsored Environmental Health Training in Emergency Response (EHTER) course, more than 2000 public health professionals have been trained in shelter assessments using this form.

In 2013, Florida International University (FIU) conducted a 2-phase project titled State and Territorial Use of Shelter Assessments Survey (STUSA). During STUSA phase 1, levels of knowledge, familiarity, and preparedness with these assessment methods were assessed in US state and territorial jurisdictions. The FIU researchers reported that of the 56 jurisdictions targeted, 55 responded to the survey (98% response rate), and of those, most reported knowledge of shelter assessments (91%) and were using or considering using these assessments (76%) in disasters.[27] Despite knowing about these assessment methods and tools, little is known about the actual results of these disaster assessments or which areas of the shelter operation showed the greatest numbers of deficiencies. In 2014, the FIU researchers analyzed information available on environmental health assessments conducted in disaster shelter facilities. Our aims were to analyze these assessments records and describe the number and types of deficiencies most commonly found according to the domains of the CDC environmental health assessment tool for disaster shelters. This report summarizes the results of the analysis of this information.

Methods

Selected state and territorial jurisdictions that reported using shelter assessments during the 2013 STUSA (n = 42) were contacted by e-mail and asked about their interest to share data available from environmental health shelter assessments conducted in previous disasters. In response, we received a total of 239 shelter forms completed from 4 different states for various types of disasters: extreme weather, flood, ice storm, tornado, and wildfires that occurred during 2008–2014. However, during cleanup and preparation for the data analysis, we found high levels of inconsistency across the domains of the various forms received. This occurred because some jurisdictions had used a customized version or their own tool; as a result, we were unable to match these form domains to the CDC tool domains. Therefore, we decided to use the largest data set from a single state jurisdiction that had been using a shelter assessment tool similar to the CDC shelter assessment tool.[26] This jurisdiction, which has a population in the range of 4 to 5 million, provided 216 shelter assessment forms. Our inclusion and exclusionary criteria applied to these records were using only the initial assessment conducted at a facility, allowing only 1 record per facility during a particular disaster event, and excluding records with incomplete entries. Individual deficiencies documented were each matched to 1 of the 9 domains of the CDC shelter assessment tool.[26] Study data were collected and managed using REDCap electronic data

capture tools hosted at FIU.[28] We used descriptive statistics to describe our findings across the various domains using IBM SPSS (version 21).[29]

Results

Of the initial 216 shelter assessments forms available from a single jurisdiction, 108 (50%) met our criteria for analysis. These forms assessed shelters during emergency or disaster events occurring during 2008–2014. Table 1 describes the specific disaster events during which these shelters were assessed and the number of shelter assessments conducted by specific disaster or emergency event. These events included extreme cold weather storms or ice storms (32%), floods (31%), and tornadoes (31%). Table 1 also describes the types of facilities that were assessed during the events. Among the most common facilities used as shelters were places of worship (26%), schools (22%), and large facilities such as convention centers (8%). Other facilities, including military armories and hangars, made up the remaining 35%.

Of the environmental health deficiencies found within each domain during shelter assessments, we found that most deficiencies were in the areas of sanitation, status or damage to the facility, and in food service areas (Table 2). A list of those deficiencies that matched the CDC shelter tool is included in Supplemental Digital Content Appendix C (available at: http://links.lww.com/JPHMP/A237). Across types of disaster events, the most common domain of environmental health deficiency was sanitation, followed by facility and food service issues. The events that generated the most environmental health issues were ice storms (n = 58), followed by tornadoes (n = 18). The only domain in which we noted no deficiencies was waste management.

Discussion

This preliminary analysis described the types of facilities that are commonly used as shelters and results of environmental health issues found in those facilities from a single public health jurisdiction. Nevertheless, our results identified common areas and deficiencies that may pose potential risks to the health of occupants in shelters. However, because we analyzed only shelter assessments from 1 jurisdiction, results cannot be compared or generalized. Moreover, we have no knowledge of the method by which these assessments were conducted or by whom, the assessor's level of training, or the particular set of training or shelter standards that were used for evaluating the facility.

Despite the fact that our sample was relatively small, the process of aggregating shelter data across jurisdictions identified serious challenges that exist when trying to analyze disaster shelter assessment data across several jurisdictions. The amount of variability and lack of standardization of assessment tools across jurisdictions impeded a more comprehensive or multijurisdictional comparative analysis of these key areas of the shelter operation. The standardization of these assessment methods and tools may allow for faster access to critical information for monitoring facilities, decision making, and allocating disaster shelter resources.

Regardless of which deficiencies were most common, focusing the assessments in all domains of the shelter operation is important from a public health prevention standpoint. This may be important to evaluate the benefits of shelter information and establish whether assessment activities have any effect in protecting people or whether there is a need to changing protective and preventive practices in shelter assessments to focus on areas that pose the highest risk to occupants.

Conclusion

Environmental health professionals play an important role in safeguarding the health of all individuals, especially in disaster settings where their health may be at risk if optimum levels of hygiene and sanitation are not maintained. Although this study was based on the experience of a single data set of shelter assessment records, we expect that the analysis of additional shelter assessments data will provide further evidence of the need to evaluate shelters and shelter operations for sound environmental health practices during disasters. For this to occur, efforts must be made to standardize these shelter assessment methods. In addition, results from such assessments may help public health agencies, disaster managers, and shelter operators understand the value of using these assessments to evaluate the living environment of occupants of disaster shelters. Amassing a sufficient knowledge base will put us in better position to raise support for standardizing shelter assessment tools and methods to be used in disaster settings.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Implications for Policy & Practice

Implications for policy and practice in public health preparedness programs span across various phases of the disaster management cycle.[22] For example, during the preparedness phase, jurisdictions would have to establish fully trained shelter assessment teams, operational procedures, and agreements with disaster shelter operators for access to their facilities.[30] The ideal public health incident command or management structure may have to include a branch or teams under which those environmental health assessment activities would take place.

In addition, programs must request access and become familiar with national shelter systems operated by the Red Cross and FEMA to use the information available there for shelter assessment operations. However, a list of shelter facilities will be incomplete without including facilities established by nonaffiliated shelter operators, spontaneous or ad hoc facilities (including disaster worker base camps) not monitored by those systems. Finally, in order for the assessment teams to get the full support and access to the facilities, they must avoid creating a perception that shelter assessments are inspections with the only objective of punishing the shelter operators. Rather, this activity must be one that stresses collaboration and teamwork between all the agencies involved to resolve issues, rather than finger-pointing or threats of legal actions.

TABLE 1

Number and Percent of Disaster Events and Types of Shelter Facilities Assessed During Disaster Events, State and Territorial Utilization of Shelter Assessments Survey, 2013

Variables	n	%
Type of disaster		
Extreme weather	8	7.4
Flood	33	30.6
Ice storm	34	31.5
Tornado	33	30.6
Total	108	100
Type of facility		
School	24	22.2
Church	28	26
Convention/arena/expo center	9	8.3
Other	38	35.2
Missing	9	8.3
Total	108	100

TABLE 2

Number of Deficiencies Found by Domain[a] and Types of Disaster Events, State and Territorial Use of Shelter Assessments Survey, 2013

Domain	Extreme Weather	Flood	Ice Storm	Tornado	All Events	%
Sanitation	2	5	15	3	25	26.0
Facility	1	2	12	3	18	18.75
Food service	3	1	6	6	16	16.67
Sleeping area	0	1	9	3	13	13.54
Health and medical	0	2	8	1	11	11.46
Drinking water	1	2	4	0	7	7.29
Children's area	0	0	3	1	4	4.17
Waste/water/sewage	0	0	0	1	1	1.04
Companion animals	0	0	1	0	1	1.04
Solid waste	0	0	0	0	0	0.00
Total	7	13	58	18	96	100.0

[a]Centers for Disease Control and Prevention, Environmental Health Assessment Form for Shelters.

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