

Lessons from Hurricane Sandy: a Community Response in Brooklyn, New York

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ABSTRACT *The frequency and intensity of extreme weather events have increased in recent decades; one example is Hurricane Sandy. If the frequency and severity continue or increase, adaptation and mitigation efforts are needed to protect vulnerable populations and improve daily life under changed weather conditions. This field report examines the devastation due to Hurricane Sandy experienced in Red Hook, Brooklyn, New York, a neighborhood consisting of geographically isolated low-lying commercial and residential units, with a concentration of low-income housing, and disproportionate rates of poverty and poor health outcomes largely experienced by Black and Latino residents. Multiple sources of data were reviewed, including street canvasses, governmental reports, community flyers, and meeting transcripts, as well as firsthand observations by a local nonprofit Red Hook Initiative (RHI) and community members, and social media accounts of the effects of Sandy and the response to daily needs. These data are considered within existing theory, evidence, and practice on protecting public health during extreme weather events. Firsthand observations show that a community-based organization in Red Hook, RHI, was at the center of the response to disaster relief, despite the lack of staff training in response to events such as Hurricane Sandy. Review of these data underscores that adaptation and response to climate change and likely resultant extreme weather is a dynamic process requiring an official coordinated governmental response along with on-the-ground volunteer community responders.*

KEYWORDS *Climate change, Vulnerable populations, Community engagement*

INTRODUCTION

In the New York metropolitan area, Hurricane Sandy (Sandy) resulted in 97 deaths; produced major power outages, some lasting weeks; and created billions of dollars in structural damage.¹ Sandy was a reminder that coastal cities are especially vulnerable to major storms and rising sea levels. Many major cities, including parts of New York City (NYC), are in hazard-prone areas, either near the coast or in flood plains. Governments are responsible for identifying vulnerabilities of such at-risk urban areas and for applying adaptive measures to increase the resiliency of these communities in order to reduce the damaging effects of weather-related disasters.^{2,3}

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Red Hook, Brooklyn, was vulnerable to Sandy since it lies on a peninsula and is isolated from the remainder of Brooklyn by the Brooklyn–Queens Expressway (BQE).⁴ It is a densely populated area (pop. 11,069 in 0.82 square miles) with some of the largest public housing complexes in NYC. The community has a 45 % poverty rate and high levels of asthma and diabetes.^{5,6} When Hurricane Sandy landed on October 29, 2013, the major disaster plans anticipated aftereffects such as electrical fires, flooding, and displacement of populations residing in evacuation zones. However, these plans, as critics had suspected, did not address extensive and long-lasting power outages and subsequent lack of key services. Without electricity, heat, or running water for 2 to 3 weeks, garbage collection, or local health clinical services, the residents experienced an inability to cook, did not have access to clean drinking water or have proper sanitation within their homes, as well as experienced increased exposure to the elements and limited access to routine medical care.

The focus of this paper is not to critically analyze adaptation strategies but to highlight the community response to Sandy in one community and to provide potential public health lessons to better inform future adaptation, mitigation, and response plans, especially for coastal cities with diverse urban populations, including vulnerable populations.

BACKGROUND

Given the predicted continuing rise in global temperature, evaluation of the effects of climate change should focus on public health needs of vulnerable populations. Vulnerability assessments, public health researchers agree, are a key part of planning to enhance adaptation and response to extreme weather events; they also agree that identifying vulnerable subpopulations remains a key issue in plan development.^{7–13} Such vulnerable populations include the elderly, who are more physiologically susceptible, and the poor, who have fewer resources to prepare for and cope with extreme weather events.¹⁴ Indeed, some suggested vulnerability assessment strategies use a local-level approach (that is, a bottom-up, rather than top-down, planning system), which in turn informs adaptation strategies and may build resilience at multiple community levels through early anticipation and response to problems.^{15–18} A key feature in the field of vulnerability assessment is “how the adaptive capacity of individuals, households and communities is shaped and constrained by social, political, and economic processes at higher levels.”¹⁶ This interaction between local and “higher” levels is thought to be important in developing realistic adaptation plans that serve multifaceted needs. Vulnerability assessments provide the evidence and build the political will necessary to design, fund, and implement adaptive measures that reduce the costs of interventions and responses,^{19–21} protect vulnerable populations, and save lives during extreme weather events.²² Red Hook is prone to flooding, was in a mandatory evacuation zone, and was severely affected by Sandy.^{23,24} It provides an apt case study of response to a weather disaster.

SETTING

The New York City Housing Authority (NYCHA) buildings, Red Hook East and Red Hook West (known as the Red Hook Houses), were completed in 1955 and provided much needed low-income housing in the area with a total of 2,878 apartments, some as high as 14 floors.²⁵ The Red Hook Houses are the second largest public housing complexes in New York State and among the largest in the

country.²⁶ Beyond the public housing residents, Red Hook includes a range of stakeholders including small business owners, churches, primary schools, public and private home residents and retail giants new to the area (e.g., IKEA and Fairway Market).²⁷

Despite many community strengths, Red Hook has numerous vulnerabilities. Red Hook has a higher percentage of people living in poverty, lower percentage of adults with a high school diploma or higher, and a higher concentration of residents under 18 years of age compared to NYC as a whole (see Table 1).⁵ In Red Hook, 85 % of residents are Black or Latino; data indicate they are more likely to be exposed to social risk factors, increased barriers to health care, and compounded stressors than non-White residents.^{28,29} In 2009, a health assessment survey for the residents of the Red Hook Houses was conducted to explore how sharing the 11231 zip code with an adjacent affluent neighborhood might mask health disparities.⁶ Their findings highlight the following health disparities: 18 % of Red Hook Houses respondents had been diagnosed with diabetes versus 6 % in the 11231 zip code and 9 % in all of New York City. Twenty-six percent of respondents had been diagnosed with asthma compared to 8 % in the 11231 zip code and 5 % in all of New York City. While 89 % of Red Hook Houses respondents had health insurance, nearly 80 % of those uninsured earned less than \$20,000.⁶ Specifically, 49 % of respondents who did not have health insurance earned less than \$10,000 while 29 % earned between \$10,000 and \$20,000.⁶

EXISTING ADAPTATION AND MITIGATION PLANS FOR NYC

Studies projecting risks posed to NYC by climate change state that sea level rise, coastal storms, and extreme heat events will continue to affect the city.^{30–32} While there are many vulnerability assessments and adaptation plans for NYC in the academic literature that seek to identify vulnerable geographical areas and populations,^{33–35} there are few official government assessments for adaptation to climate change in NYC. For example, the New York City Hazard Mitigation Plan,

TABLE 1 Demographics of NYC and Red Hook, Brooklyn

	NYC ^a	Red Hook, Brooklyn ^b
Total population	8,244,910	11,069
Under 18 years (%)	22 %	31 %
Female (%)	53 %	56 %
Race/ethnicity		
Black (%)	26 %	38 %
Hispanic or Latino origin (%)	29 %	47 %
White, not Hispanic (%)	33 %	13 %
Education		
High school degree or equivalent (% , 25 years and older)	25 %	14 %
Bachelor's degree (% , 25 years and older)	20 %	10 %
Income		
Median household income	\$51,270	\$40,026
Persons below poverty level (%)	19 %	45 %

^a2010 US Census

^b2009 American Community Survey for census tracts 0085, 0057, 0059. Source: US Census: American Community Survey⁵

produced by the NYC Office of Emergency Management (NYCOEM), and PlaNYC from the Office of the Mayor are official assessments incorporating human health aspects into adaptation and mitigation planning.^{26,36} The Federal Emergency Management Agency (FEMA) provides training for community emergency response teams (CERT) to assist in disaster recovery by linking community members and local governments.³⁷ However, to successfully implement a CERT, coordination between FEMA, local emergency management officials, and on-the-ground community groups is needed. Unfortunately, neither of the NYC plans lists the involvement of CERTs in their adaptation and mitigation efforts.

Critics of PlaNYC claim there has been limited and disorganized community engagement to inform this particular official response plan.^{38–41} While PlaNYC mentioned a continued engagement of vulnerable populations, there are no methodological agenda stated in the plan for this outreach and engagement. PlaNYC's main focus is sustainability by improving mitigation efforts to combat the negative effects of climate change by reducing greenhouse gases (e.g., through transportation alternatives, increased green spaces). The NYC Hazard Mitigation plan provides only a broad spatial and secondary data analysis to identify vulnerable populations without actively engaging communities.^{6,23,36} Both plans fail to incorporate community-level adaptation capabilities for dealing with climate change at the local level; nor is health data indicative of the health vulnerability of individual NYC communities addressed in the aforementioned adaptation plans.

DATA SOURCES

This field report describes on-the-ground response efforts in Red Hook, primarily from the perspective of several board members and staff from Red Hook Initiative (RHI), a nonprofit organization whose mission focuses on creating social change through youth development and leadership. RHI served as an information and service anchor in the aftermath of Sandy. Data sources for this report include two separate firsthand accounts from a RHI staff person and a board member who were on the ground during the event and well known in the community before Sandy. In addition, to triangulate data, the following were reviewed: minutes from four community meetings before utilities were restored in Red Hook, personal texts which provided a timeline of events, and finally, social media including the Twitter feeds and Facebook posts of the Red Hook Initiative and a New York City Council member.

HURRICANE SANDY EVENTS AND PUBLIC HEALTH IMPLICATIONS IN RED HOOK

Despite a mandatory evacuation order for Red Hook, many residents did not leave since Hurricane Irene's minimal impact, the year prior, provided a false sense of security. Additionally, residents conveyed they feared, "they may not be allowed back in once they were evacuated."⁴² Despite posted mandatory evacuation flyers on all building floors, with instructions to residents when they should evacuate and by what means, with transportation to shelters provided, many preferred to stay in their apartments and homes. This sentiment was similar to that of residents of public housing in New Orleans during Hurricane Katrina.⁴³

The timeline shown in Fig. 1 presents an overview of the events in Red Hook in the weeks after Hurricane Sandy. As there were multiple players on the ground

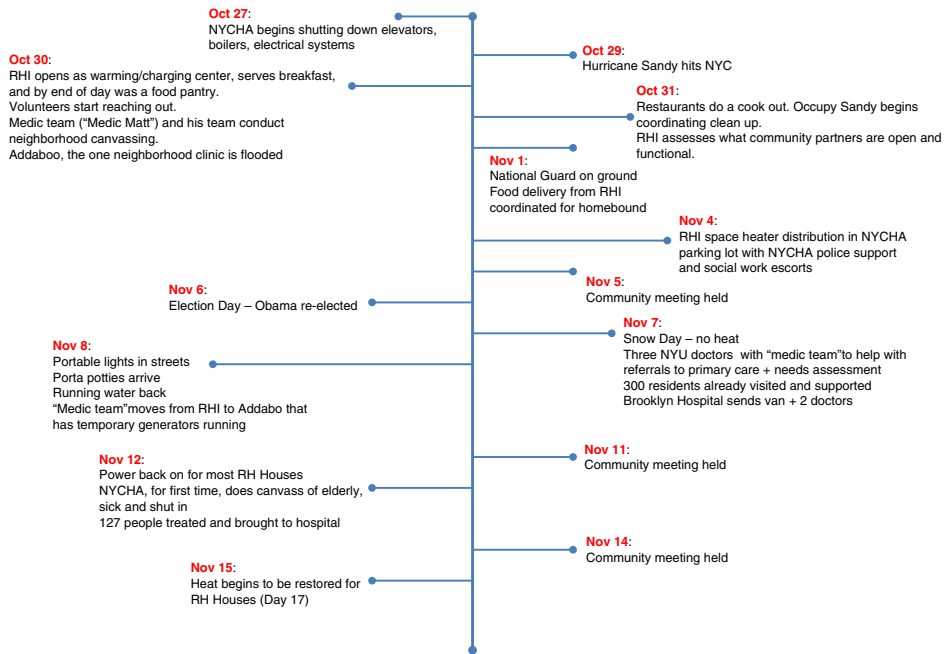


FIGURE 1. Timeline of events in Red Hook, New York, during and after Hurricane Sandy.

during a rapidly changing situation, this timeline serves as one of many possible illustrations of key events that occurred. The only health clinic in the neighborhood was flooded; clinic staff, nurses, and doctors were evacuated. A local resident, a medical student, assembled a lay and professional team of medics to canvass the neighborhood using a basic medical intake form he created. The team targeted senior citizens and other homebound individuals, particularly those who were running out of vital medications or were on life-assisting devices in public housing.⁴⁴ In the first week, the team saw an estimated 250 to 300 patients. Nearly 2 weeks after the storm, the clinic reopened largely due to volunteer groups' ability to obtain generators and recruit volunteers for rapid cleanup efforts.

Running water, electricity, and heat were restored at different periods in Red Hook. After 11 days, running water was restored, during which time, residents had to leave their homes for food and drinking water and could not flush their toilets. Electricity was not fully restored to most of the Red Hook Houses until 3 weeks after Sandy landed, including the period when NYCHA preemptively shut down electricity before Sandy made landfall to prevent additional damage and the possibility of fires when the storm arrived.⁴⁵ Some residents experienced intermittent electrical outages through the remainder of the year. Volunteers and RHI staff canvassed the Red Hook Houses to tabulate where utilities were restored. Occasionally, this information conflicted with the official NYC estimation broadcasted by local news media. The lack of communication about utilities and progress to restore them was frustrating to residents, some of whom voiced their despair at community meetings with public officials.

There was no heat for Red Hook Houses residents for 17 days, between October 30 and November 15, during which time the city faced average temperatures in the mid-40s (degrees Fahrenheit)⁴⁶ and a winter Nor'easter a week after Sandy. Exposure to cold temperatures for long periods of time can lead to hypothermia

and can increase the risk of a heart attack and pneumonia. For a community with high asthma rates and other underlying medical conditions, this was a potential risk factor for upper respiratory infections (URIs). Water damage can aid mold growth and in turn exacerbate respiratory ailments such as asthma, chronic obstructive pulmonary disorder, bronchitis, and other respiratory infections, the rates of which increased among people affected by flooding due to Hurricane Katrina.⁴⁷⁻⁴⁹ One example of a URI, potentially among many, was the story of a young person who contracted pneumonia after a few weeks of engaging in relief work and living in the Red Hook Houses. In addition to health concerns from disease and sanitation issues, there were security concerns due to the darkness that covered the neighborhood for weeks. Although there was no reported or documented crime of community members within the area, there was a feeling of unease.

COMMUNITY PARTICIPATION AND NEED FOR COORDINATED RESPONSE

One benefit of geographic isolation is the opportunity for community stakeholders to establish and maintain strong social networks and have a profound understanding of the inner workings of the community. High social capital within the neighborhood that might not be replicable in other vulnerable communities contributed to Red Hook's resiliency in the weeks after Hurricane Sandy landed. Individual groups including volunteers from outside of Red Hook, residents, and local community-based organizations (CBOs) had important resources they were able to bring to bear on the problems that emerged. Their efforts were coordinated to provide hot meals, resource and information distribution, and limited access to electricity. To address the lack of refrigeration and gas to cook meals, RHI and other volunteers coordinated efforts to deliver food, medicine, and ice for medication to the homebound. This service began as early as the day after the storm and continued over a 3-week period. Activist groups used online registry tools (e.g., typically used for wedding registry) to collect donations for NYC and then triage them to high-need areas. RHI also utilized social media to communicate beyond Red Hook when food, supplies, and volunteers were needed for specific tasks. This approach translated into 300 contributors per day for 3 weeks. It was not until government officials arrived that public health needs were addressed. The government provided porter potties, generated powered floodlights for public safety, and coordinated street sanitation pickup and transportation to and from shower facilities. This case study demonstrated how Red Hook, an urban environment without running water, heat, and electricity, was exposed to potential for disease transmission (e.g., diarrheal disease) and exacerbation of underlying medical conditions (e.g., upper respiratory infections).⁵⁰⁻⁵²

LIMITATIONS

The primary limitation of this report is that it is written from the perspective of individuals closely affiliated with a single CBO in Red Hook, RHI. The authors recommend that a full case study be undertaken to provide a more inclusive lens of the Red Hook experience. Another suggestion is to undertake a comparative case study to allow researchers to examine how other geographically vulnerable neighborhoods fared during this period to learn about the strengths and weaknesses

of the existing adaptation and mitigation plans. Despite these limitations, we provide recommendations based on the experiences described above.

CONCLUSION AND RECOMMENDATIONS

We document the community response to unfolding challenges, coordination of local efforts, and emerging liaison with government entities and then argued for future vulnerability assessments that encourage input from local communities on planning and response. This case study revealed that the current process for getting city-, state-, and federal-level help in responding to emergency weather situations highlighted a lack of coordinated government response and that the immediate response relied on individuals and CBOs. A tenet of public health is to first, do no harm. While having local CBOs, churches, other community groups, and volunteers collaborate as first responders was encouraging, this highlighted a lack of coordinated disaster planning and response. Collaborations between government and on-the-ground volunteer responders, including CBO staff and other volunteers, should be formalized in adaptation and mitigation plans.

We argue that future plans need to include meaningful community input to develop a bottom-up and realistic approach to planning for the next natural disaster. While RHI, a social service agency with no disaster response training, was able to assemble a response and relief effort akin to a CERT program, there should be an officially trained front-line team organized by government officials capable of responding to emergency situations. Preparedness efforts should include engaging organizations from vulnerable communities prior to extreme weather events, to recruit and train individuals who can serve on these teams in an official capacity. Government agencies have the resources and organizational infrastructure to quickly and efficiently respond to public health needs of affected communities, while local organizations and communities can provide networks and community knowledge to identify vulnerable populations and direct recovery implementation. One key example of this type of collaboration during Sandy recovery efforts came from FEMA reaching out to CBOs for direction on where to deliver 4,000 blankets.

Is it possible that measures in the form of generators or additional power and water alternatives taken near low-lying areas prior to the storm could improve recovery and relieve the stress placed on this and other geographically vulnerable communities? Are there particular measures and resources that can be made available in public housing to protect low-income residents? These are questions that should be posed to community members, utility companies, and most importantly, to government officials. Similarly, understanding that the only clinic in Red Hook was vital to the community's routine medical care is another issue that needs to be addressed prior to a disaster. An alternative to primary care and chronic illness maintenance is critical so as not to drain key emergency services during immediate recovery. Mandatory evacuation as a policy needs to be reanalyzed as well. For example, will transportation be provided? Will special needs populations have sufficient care at shelters? How long can a shelter maintain a displaced population? What is needed to encourage relocation and reintegration? Communities that are required to evacuate and use shelters should have their needs heard and addressed to facilitate and support evacuation efforts. Vulnerability assessment theory and practice literature postulate that improving bottom-up approaches to adaptation can help in building resilience in vulnerable populations and reducing the negative effects from extreme weather events caused by climate change.^{15,16,53} As presented

in this paper, the community members that make up Red Hook had comprehensive knowledge about its strengths and weaknesses during an extreme weather event. Future adaptation efforts should stem from this foundation.

Finally, contingency plans must be in place, especially in large housing developments like the Red Hook Houses, and accessible to the community to quickly and efficiently address critical infrastructure issues. Transporting portable facilities 9 days after Sandy landed is far too long to leave any urban population without access to proper sanitation. Closure of the only clinic in Red Hook highlights a need for clinics to have emergency preparedness plans. These plans could include: staff assignments, generators on site to support community recovery for routine nonemergency medical needs, and identifying alternate locations if clinics are in low-lying areas. With some effort, response to extreme weather events will resemble other rapid responses from emergency services, such as EMTs and the fire department the public have come to rely on.

The authors of this article are hopeful that the government will provide a safety net for those who are most vulnerable by investing in plans to improve response efforts to extreme weather events—plans that actively engage the community, respond to needs with appropriate resources, and collaborate with and draw from the knowledge base that exists within the various low-lying neighborhoods throughout the country.

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