

Surveying Local Health Departments and County Emergency Management Offices on Cooling Centers as a Heat Adaptation Resource in New York State

Seema G. Nayak¹ · Shao Lin² · Scott C. Sheridan³ · Yi Lu² · Nathan Graber¹ · Michael Primeau⁴ · Claudine Jones Rafferty¹ · Syni-An Hwang¹

Published online: 11 August 2016
© Springer Science+Business Media New York 2016

Abstract Local agencies in New York State (NYS) set up cooling centers to provide relief from summer-time heat especially for people with limited access to air-conditioning. We aimed to determine cooling center locations in NYS, and explore county agencies' involvement in organizing and promoting utilization of cooling centers. We conducted a survey among county health and emergency preparedness offices in NYS (excluding NYC) and explored official county websites. We identified 377 cooling centers, mostly in metropolitan areas of NYS. Although 47 % of counties listed locations online, only 29 % reported locations via survey. Radio (90 %) and internet (84 %) were popular for information dissemination. Air-conditioning was available at all indoor cooling center facilities. Cooling centers in 13 % of the counties were accessible by either public transportation or shuttles arranged by the facility. About 38 % counties do not consider cooling centers important in their region or promote informal cooling centers. More than a third of New

York counties had neither cooling centers nor plans to establish a cooling center as extreme heat was not perceived as a threat in their region.

Keywords Cooling centers · Extreme heat · Cooling sites · County agencies · Heat adaptation resources

Introduction

In the past decade, deaths associated with extreme heat were greater than those associated with any other single weather-related cause, with majority of deaths occurring from prolonged exposure to outdoor extreme heat or lack of access to air-conditioning indoors [1, 2]. Many negative health impacts of extreme heat can be reduced or even prevented by avoiding being outdoors for extended periods, or staying indoors in cooler places, during extreme heat days [3–8]. However, for many this is difficult, either because of a lack of access or ability to afford air conditioning at work or home, or due to long exposures to outdoor heat during occupational or recreational activities. Several studies have shown that a more achievable option of spending at least two hours a day in an air-conditioned place during extreme heat events can greatly prevent or reduce negative health impacts [3–7]. Following this recommendation, many organizations and local government agencies implement mitigation efforts like providing the public with cooling centers in their communities where they can seek relief during extreme heat events. Cooling centers are usually located in community settings such as libraries, senior or community centers, fairgrounds, and recreation parks, but can also be housed within privately owned facilities including local shopping malls, grocery stores and sports stadiums.

✉ Seema G. Nayak
seema.nayak@health.ny.gov

¹ Center for Environmental Health, New York State Department of Health, Empire State Plaza, Corning Tower Room 1203, Albany, NY 12237, USA

² Department of Environmental Health Sciences, School of Public Health, University at Albany, SUNY, 1 University Place, Rensselaer, NY 12144, USA

³ Department of Geography, Kent State University, McGilvrey Hall 443, Kent, OH 44242, USA

⁴ Office of Health Emergency Preparedness, New York State Department of Health, 800 North Pearl St (Suite 322), Menands, NY 12204, USA

While the presence of cooling centers has become more common in recent years, there is no information available on how involved county agencies are in organizing these centers in New York State (NYS). In addition, upon contacting several state-level health and emergency preparedness agencies, it was determined that, other than for New York City (NYC), a database of cooling centers for NYS did not exist. Knowledge of this valuable heat adaptation resource can inform county leaders in planning and implementing mitigation efforts in NYS. Therefore, the main objectives of this study were to: (1) survey county health and emergency preparedness officials on their involvement in setting up cooling centers and their perception of these facilities as resources of heat adaptation; and (2) determine cooling center locations and create a centralized database available to the public. Findings from this study can help local and state public health and emergency preparedness leaders create or supplement regional response plans to extreme heat conditions.

Study Design and Methods

We, the NYS Department of Health (NYS DOH), determined cooling center locations across NYS (other than NYC) from two main sources: (1) a survey among local health departments and county emergency management offices; and (2) online resources including official NYS county websites and press releases, and American Red Cross websites.

We developed and conducted a survey among local health departments (LHDs) and county emergency management offices (EMOs) in 57 NYS counties (excluding 5 NYC counties) with the goal of obtaining locations of cooling centers as well as determining county officials' involvement in setting them up during periods of extreme heat. The survey also obtained information on: (1) whether county offices provided the public with information on cooling centers; (2) how and when information was provided; (3) if additional services like transportation, food/snacks, water, first aid, medical services were available; and (4) if educational materials on 'protection from heat' or 'vulnerability to heat' were provided. We distributed the questionnaires electronically during the summer and early fall of 2013 to LHDs via an e-mail listserv and to EMOs through the NYS Office of Emergency Management State Watch Center (SWC). Agencies received three reminders: 1, 2 and 4 weeks after the initial survey. At the end of the 4 week period, we presented our results to the NYS DOH Regional Environmental Health Directors (REHDs), who encouraged counties in their jurisdiction to respond, thereby greatly improving the response rate. In addition, the NYS Relations Disaster Liaison Officer

contacted all NYS American Red Cross (ARC) chapters to obtain locations of cooling centers previously set up by ARC.

To supplement the survey, during the summer of 2012–2013, we conducted searches on official websites of 57 NYS counties for cooling centers. Search tool-bars on primary homepages and relevant subsidiary webpages (e.g., 'Emergency Management', 'Emergency Preparedness' or 'Environmental Health') were used with keywords like 'cooling center', 'cooling site', 'heat alert', 'heat warnings', and 'heat advisory'. Based on the finding that not all counties had information on their websites, we sought official county office press releases issued during the summer.

LHD survey responses were recorded and analyzed using Microsoft Access 2013 and SAS Version 9.4. Cooling center locations were geocoded and mapped using MapMarker Ver22 and MapInfo© Version 12.5. Rural–urban commuting area (RUCA) codes developed by the U.S. Department of Agriculture (USDA) were used to determine the distribution of cooling centers by urbanicity of census tracts in NYS. A cooling center application was created on the NYS DOH web page [9] and was shared through multiple NYS DOH social media venues. The NYS DOH shared the link with REHDs, LHDs, EMOs, regional National Weather Service (NWS) offices to maximize dissemination in NYS.

Since this survey was conducted among agencies and did not collect confidential information or involve human participants, IRB approval was deemed unnecessary for this study.

Results

The NYS DOH identified 377 cooling center locations across NYS via multiple sources including the survey, online resources and ARC Chapters (Fig. 1).

Survey

We received 62 responses from LHDs (36) and EMOs (26) covering 56 counties. Nine of the 56 counties responded within 24 h of receiving the survey and 23 responded within the first week. By the end of the 4 week survey period, 42 counties had responded; with the assistance of the REHDs, the NYS DOH was able to obtain responses from 14 additional counties (98 % response rate).

All counties that reported having cooling centers also provided their physical locations. Twenty-one counties responded that they have cooling centers and/or provide cool down information to the public; information on 193 cooling center locations were obtained from all agencies

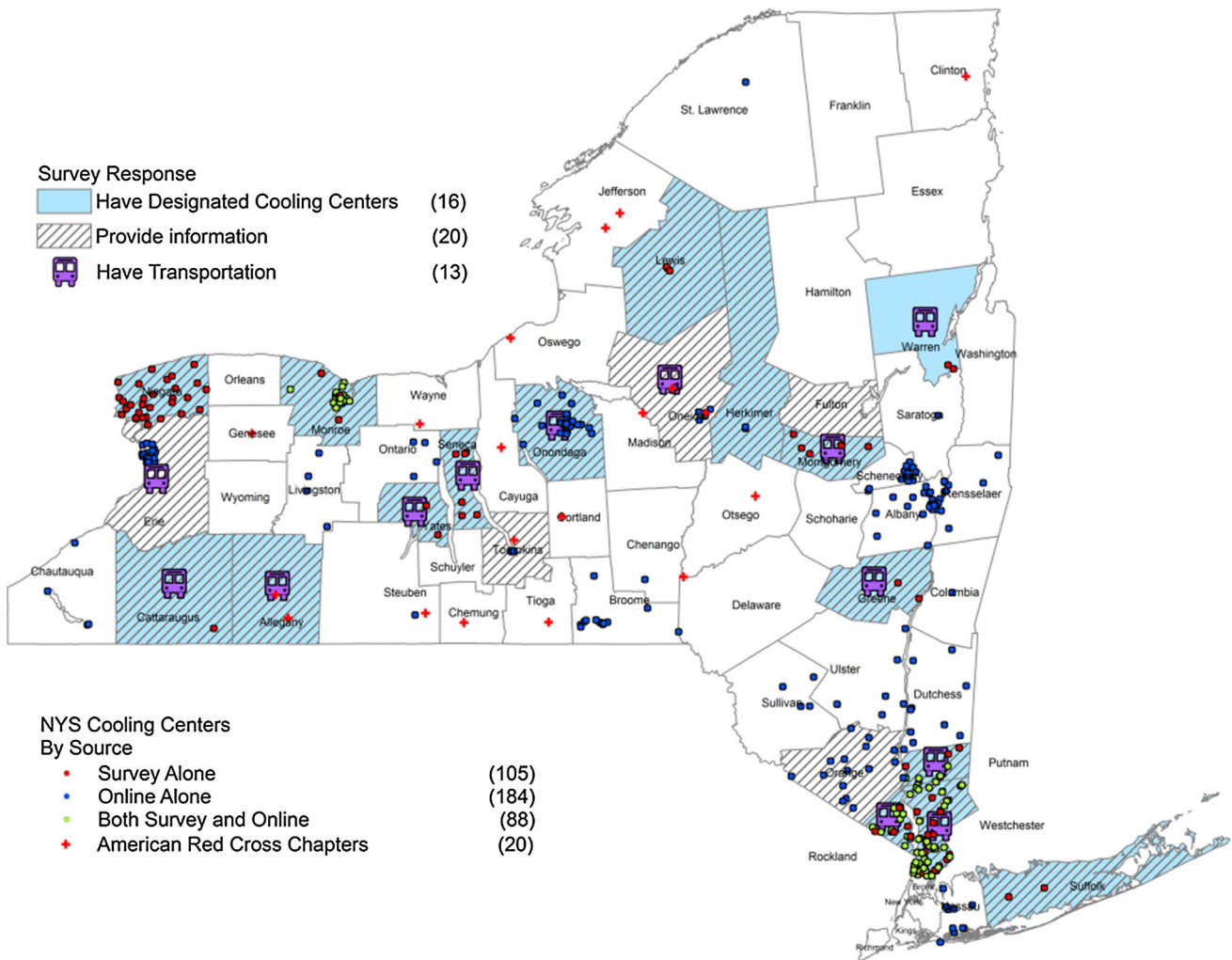


Fig. 1 Distribution of reported New York state cooling centers (2012–2013) and survey responses

with 65 % of the locations obtained from EMO responses (Fig. 1). Nearly all (15 of 16) counties that reported having cooling centers provided location information to the public, and an additional five counties without cooling centers provide information on informal cool down locations.

Table 1 displays responses to the survey, with less than a third of the counties reporting having cooling centers and about 36 % providing information on cool down locations. The majority of counties (about 90 %), provided information to the public when heat advisories were issued for the region. Among the various media and methods that agencies use to disseminate cooling center information to the public, radio (90 %) was the most frequently used platform, followed by internet media (official county website, social media like Facebook and Twitter, and town-wide emails). The use of other platforms, such as newspapers, were reported by about 68 % of the agencies, with television being the least frequently used mass media platform. Other methods of local dissemination included

calling seniors and home care agencies, and getting the word out via churches in the community.

Responses on services provided, showed that air-conditioning and cold water were provided at almost all facilities. Although some cool down locations were set up outdoors, all indoor facilities provided air-conditioning. Via county websites and/or hand-outs at the centers, about 65 % the agencies either provided educational materials on vulnerability to heat and/or how to protect oneself from extreme heat and/or, respectively. Some also provided food or snacks (38 %) and/or medical services (31 %), mostly first aid, at the center. Regarding provision of transportation and availability of public transport, the majority of agencies reported that cooling centers were accessible via public transportation, but about 13 % of the agencies also provided additional transportation to and from the cooling centers especially for their senior population (Fig. 1).

Responses to questions on perception of cooling centers and planning for these facilities as resources for heat

Table 1 New York State county offices responses to 2013 cooling center survey

Survey question	Counties (%)
<i>Have designated cooling centers</i>	29
<i>Provide information on cooling centers</i>	36
<i>When cooling center information is provided</i>	
When there is a heat advisory	90
Throughout summer	11
<i>Methods of providing cooling center information</i>	
Radio	90
Internet (county website/social media/messaging via email)	84
Newspaper	68
Television	58
Other	16
<i>In-facility services at cooling center</i>	
Air conditioning (indoor cooling centers)	100
Cold drinking water	81
Provide information on protection against heat	63
Provide information on protection on vulnerable populations	50
Food/snacks	38
First aid or medical services	31
<i>Transportation to and from cooling centers</i>	
Have public transportation	76
Provide transportation	13
<i>County perception and plans for cooling centers</i>	
Promote informal cooling centers	63
Think cooling centers are important	63
Plan to have cooling centers in future	25

adaptation showed that among the counties without survey-reported cooling centers, over 63 % responded that they promote local resources as informal cool down places during hot weather and they considered cooling centers to be an important resource of heat adaptation. On the other hand, about 35 % said they do not currently have plans for cooling centers in their county and do not intend to plan for them in the future. The lack of need (Table 2) and low

attendance in the past were the most common reasons why a county did not think cooling centers were an important component of local government's response or why they did not have plans for cooling centers. Reasons cited for the absence of need included: sparse populations, cooler regional temperatures, and the availability of natural cool down resources in the community. Some counties could not

Table 2 Reasons why county does not have cooling centers or promote the use of informal cooling centers (N = 22)

	%
<i>Do not need cooling centers</i>	77
Extreme heat and heat related illness/death not an issue	31
Low attendance in the past	36
Rural area: sparse population	1
Have sufficient public areas (natural resources)	9
<i>Will set up cooling centers as needed</i>	36
<i>Depend on another agency to set it up</i>	46
Municipalities	23
Other county agency	14
American Red Cross/fire department	9
<i>Limited resources/funding</i>	14
<i>Prefer to provide cool down and heat protection information on county website</i>	9

set up cooling centers on their own because of limited resources in terms of facilities, funds and staff.

Online Resources

Two-hundred and seventy-two cooling center locations were obtained from official county websites and press releases, 88 of which were also reported in the survey. Of 57 NYS county websites visited, 47 % had cooling centers' address and hours of operation available (Fig. 1). Every county website listing cooling center locations also provided heat-protection information, including recommendations to avoid long exposure to heat, wear loose fitting clothes, stay hydrated, and use air-conditioned public facilities in their community. About 50 % of websites provided advice on proper use of indoor fans, avoiding alcohol, and reducing excessive physical activity. Approximately 10 % of the websites had additional information on protecting children, the elderly and pets. This information was either provided directly on the website or via a link to CDC's heat stress website [10]. In addition to their own websites, about 25 % of these counties also provided this information via multiple sources including media articles, news and radio stations.

Cooling Center Distribution

Figure 2 displays the locations of all cooling centers identified across NYS (excluding NYC) overlaying the rural–urban commuting area (RUCA) codes. About 87 % of cooling centers are located in metropolitan urban, high and low commuting areas and concentrated in larger cities. Only about three percent of cooling centers were located in rural areas, and the rest located in micropolitan and small town areas.

ARC chapters in NYS were mostly located in rural and small town areas where no cooling centers existed. While the ARC offices themselves do not always serve as cooling centers, they have the ability to set them up in the surrounding communities.

Discussion

We identified 377 cooling centers across NYS in this study, with most cooling centers located in metropolitan areas. While several counties make cooling centers available during the summer, according to our survey, almost a third do not view extreme heat as a threat for their counties and therefore do not think heat adaptation resources in the community are necessary. This could be because of the mild to moderate temperatures with the climate usually observed in these parts of NYS. Of 193 cooling centers

identified from the survey, about 25 percent were also retrieved from county websites (Fig. 1). The overlap seen in these six counties, suggests effective communication between survey respondents at the county agencies and local agencies involved with setting up cooling centers.

Our study had a high survey response rate (98 % among NYS counties excluding NYC) with responses indicating that county EMOs were more likely to be involved than LHDs in setting up cooling centers as part of their emergency preparedness efforts. The response rate was high in this study because of effective inter-agency communication between State offices, LHDs and EMOs as well as with other organizations including municipalities and fire departments. Regional Environmental Health Directors also played a key role in improving response rate among counties within their regions by contacting agencies directly to follow-up on their survey responses.

Survey responses indicated that radio and internet were the most common methods of communicating information to the public and that television was the least favored platform by counties to promote locations of cooling centers. In contrast, a study surveying NYC residents [11] noted that the public mostly received heat and protection information from television, indicating that NYS county officials should consider television as a good resource for information dissemination. In our study, county officials did not report using television as a major platform, but it is possible that local networks obtained information from resources used by county agencies and rebroadcast it to the public. But a vulnerable population, for example, the homeless, may not have access to television, radio or the internet [12] during heat waves so extra outreach efforts to alert them must be made.

Counties provided cooling center information generally between the months of May and September but they used their own definitions of trigger events for this provision. For example, some counties provided information throughout summer, and some on an “as needed” basis, which usually meant they followed NWS alerts and advisories issued in that the region. NWS heat advisories in NYS are issued when the HI is expected to exceed 105°–110 °F (depending on local climate) for at least two consecutive days [13]. However, except for NYC, these high temperatures rarely occur in rest of NYS. In addition, studies have shown that heat can affect health at much lower temperatures [14–17] and can vary regionally. Therefore, it may be more beneficial for counties to have cooling centers available when at lower temperatures than those that trigger current NWS heat warnings.

By definition, a cooling center is an air-conditioned facility where people can find relief from extreme heat. Although all reported indoor cooling centers in this study had air-conditioning, these were not the only cool down

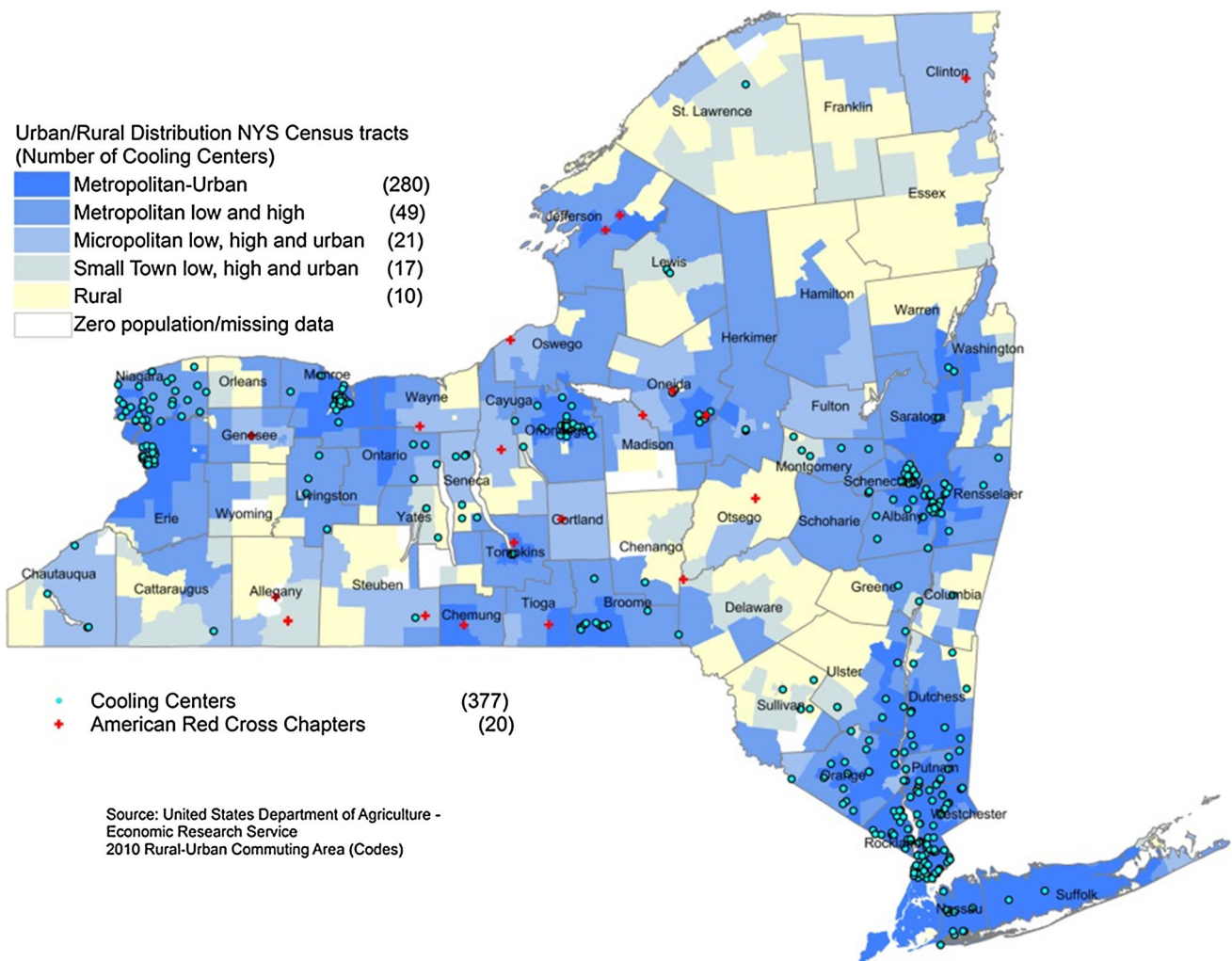


Fig. 2 Cooling center distribution by urbanicity of area overlaying rural–urban commuting area (RUCA) codes across New York state

places open to the public. Some municipalities had outdoor cooling sites like spray parks and state or local parks with micro-climates that would be cooler than adjacent urban areas. Feedback from some counties indicated that outdoor cooling sites were used more frequently than indoor cooling centers, as people would prefer to spend summer time outdoors in the northeast region. In a study conducted in Detroit [18], it was observed that average maximum outdoor temperatures may sometimes be 13.8 °C (24.8 °F) lower than indoor temperatures in homes without air-conditioning. With this in consideration, counties should also promote the use of outdoor cooling sites as a better alternative to staying indoors without air-conditioning. Counties experiencing low attendance at indoor cooling centers may also see better attendance at outdoor cool down sites.

On occasion, cooling centers are also known to provide food, drink, transportation, and medical services. Based on survey responses we observed that while 80 % of cooling centers provided cold drinking water, only 31 % of the

centers reported the provision of food/snacks to their visitors. Although some cooling centers reported higher attendance at cooling centers when food is available or activities planned for attendees/dependents, many centers wanted to avoid wasting food from low attendance. Accessibility [11] can also influence attendance, but not many facilities provide additional transportation unless they cater to a specific population like seniors, since cooling centers are usually housed in locations like public libraries and senior centers that are accessible via public transportation. Providing free air-conditioned buses can also be helpful to cool down as well as encourage those who cannot afford the cost of public transportation [19]. Also, similar to the Detroit study [20], while most cooling centers in NYS appear to be accessible by some form of public transportation, it is likely that only a small proportion of them are in walking or biking distance. A survey in Toronto [8] indicated that about one-third of people without air-conditioning cited transportation difficulties as a

barrier to accessing cooling centers. Similarly, in NYC [11], long distances to cooling centers and the lack of transport were barriers to leaving home to find a place to cool down. Therefore, in places where transportation is unavailable, officials should determine the proportion of population living within walking distance of a center and ensure there are sufficient facilities.

From our study, we observed that more than a third of the counties did not view extreme heat to be a threat in their region, or think that cooling centers were an important resource for adaptation to heat and therefore did not see the need for setting up cooling centers. However, an agency's risk communication and mitigation efforts can be influenced strongly by their own perception of the imminent threat by the weather hazard. Information provided by public health and emergency preparedness officials can help individuals, entire communities and other stakeholders make informed decisions to protect themselves [21]. County agencies in NYS may not perceive extreme heat as a threat because many parts of NYS do not experience excessive heat for very long periods. But for this very reason, homes in that region may not be equipped with air-conditioning, so when a heat event does occur, the effects of heat on health could be severe as people are neither acclimatized to extreme heat nor do they have resources at home to adapt to hot weather. One study [22] comparing 44 different cities in the US, observed that residents in areas with consistent hot weather showed more biological and behavioral adaptation in comparison to populations in areas with greater temperature variability. This emphasizes why cooling centers should be available and accessible to the NYS public even if the region does not usually experience extreme heat events and why risk and health protection communication to the public is important.

The distribution of cooling centers appears to be concentrated in metropolitan areas of NYS with few in small towns and rural areas. Locations are mostly within large cities where the municipalities set up cooling centers for the community. It appears that the northern parts of the state, which have sparse populations, have very few cooling centers. The distribution of cooling centers seems reasonable in view of population density, although most rural areas in NYS have numerous natural cool down resources like trees and lakes, most homes may not have air-conditioning. Therefore, it would be prudent to set up cooling centers in publicly accessible facilities even in rural areas, so that people without access to air-conditioning at home can find them in their community. We will make regional recommendations to local government agencies once we complete the adequacy and accessibility assessment of cooling centers in NYS.

A limitation of this study is that we were only able to obtain reported cooling centers or locations available

online at the time of our search. It is possible that this database did not capture all cooling center locations as they can change on a daily basis depending on availability and capacity or the occurrence of an extreme heat event. In addition, people usually go to places in their community like pools, malls and recreation centers to cool down even though those places are not official cooling centers, so usage of these informal cooling locations are not included in this study. Therefore, although we have done our best to capture all the cooling centers, there will be some degree of under-reporting of cooling center locations in this study.

This study has greatly improved our knowledge on cooling center locations across NYS helping create a centralized database, which is now available on the NYS DOH website [9]. Through continued collaborative efforts between the NYS DOH, LHDs and county EMOs, the database is updated annually. This information is disseminated to the public in a timely manner via multiple platforms including county websites, NWS messaging and social media outlets. Since the initial survey in 2013 with 16 counties responding, we have seen significant improvement in responses with 36 counties responding with cooling center locations.

Conclusions

While many local government leaders in NYS are proactive about addressing the impact of extreme heat on health, some are yet to accept that cooling centers can be an important resource of heat adaptation for people, especially for those without access to air-conditioning. In 2013, less than a third of counties in NYS had designated cooling centers every summer, and those available are mostly located in metropolitan and urban areas of NYS. These counties provide information via different venues, but most commonly via internet and radio. Although younger populations obtain their information from the internet, the more vulnerable elderly population are more likely to rely on television, radio or newspapers, highlighting the importance of using multiple media outlets to reach all sectors of the community. Since most cooling centers were located in public buildings, additional transportation was often unavailable. Accessibility to the centers, effective communication to the public and between agencies are necessary to maximize attendance at cooling centers.

Acknowledgments We would like to thank the following agencies and individuals for their valuable assistance with the project: State of New York's Local Health Departments and Regional Environmental Health Offices; NY State and County Offices of Emergency Management; NYS Association of County Health Officials; NYS DOH Office of Health Emergency Preparedness; and NYS DOH Outreach and Education Group. Work on this project was supported in part by

grants from the National Environmental Public Health Tracking Program, Centers for Disease Control and Prevention (CDC), and the New York State Energy Research and Development Authority (NYSERDA).

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

References

- National Weather Service. (2015). Natural Hazard Statistics. 2013. January 9, 2015. <http://www.nws.noaa.gov/om/hazstats.shtml>.
- National Weather Service, National Oceanic and Atmospheric Administration. (2015). 2014 Heat Related Fatalities. 2015. January 9, 2015. <http://www.nws.noaa.gov/om/hazstats/heat14.pdf>.
- Anderson, B. G., & Bell, M. L. (2011). Heat waves in the United States: Mortality risk during heat waves and effect modification by heat wave characteristics in 43 US communities. *Environmental Health Perspectives*, 119(2), 210–218.
- Semenza, J. C., Rubin, C. H., Falter, K. H., Selanikio, J. D., Flanders, W. D., Howe, H. L., et al. (1996). Heat-related deaths during the July 1995 heat wave in Chicago. *New England Journal of Medicine*, 335(2), 84–90.
- Semenza, J. C., McCullough, J. E., Flanders, W. D., McGeehin, M. A., & Lumpkin, J. R. (1999). Excess hospital admissions during the July 1995 heat wave in Chicago. *American Journal of Preventive Medicine*, 16(4), 269–277.
- Kilbourne, E. M., Choi, K., Jones, T. S., & Thacker, S. B. (1982). Risk factors for heatstroke. A case-control study. *JAMA*, 247(24), 3332–3336.
- O'Neill, M. S., Zanobetti, A., & Schwartz, J. (2005). Disparities by race in heat-related mortality in four US cities: The role of air conditioning prevalence. *Journal of Urban Health*, 82(2), 191–197.
- Toronto Public Health. Protecting vulnerable people from health impacts of extreme heat, 2011. (2011). *Toronto Ontario Toronto Public Health* http://www1.toronto.ca/staticfiles/city_of_toronto/toronto_public_health/healthy_environment/heat_alert/files/pdf/backgroundfile-39469.pdf.
- New York State department of health. (2016). Cooling centers. 2016. June 14, 2016. <http://www.health.ny.gov/environmental/weather/cooling/>.
- Centers for disease control and prevention. extreme heat: A prevention guide to promote your personal health and safety. (2009). Atlanta, GA. 10-30-2012. http://www.bt.cdc.gov/diseases/extremeheat/heat_guide.asp.
- Lane, K., Wheeler, K., Charles-Guzman, K., Ahmed, M., Blum, M., Gregory, K., et al. (2014). Extreme heat awareness and protective behaviors in New York City. *J Urban Health*, 91(3), 403–414.
- Kalkstein, A. J., & Sheridan, S. C. (2007). The social impacts of the heat-health watch/warning system in Phoenix, Arizona: Assessing the perceived risk and response of the public. *International Journal of Biometeorology*, 52(1), 43–55.
- National oceanic and atmospheric administration, national weather service. NWS Heat Index. 2015. http://www.nws.noaa.gov/om/heat/heat_index.shtml.
- Lin, S., Hsu, W. H., Van Zutphen, A. R., Saha, S., Lubber, G., & Hwang, S. A. (2012). Excessive heat and respiratory hospitalizations in New York State: Estimating current and future public health burden related to climate change. *Environmental Health Perspectives*, 120(11), 1571–1577.
- Fletcher, B. A., Lin, S., Fitzgerald, E. F., & Hwang, S. A. (2012). Association of summer temperatures with hospital admissions for renal diseases in New York State: A case-crossover study. *American Journal of Epidemiology*, 175(9), 907–916.
- Van Zutphen, A. R., Lin, S., Fletcher, B. A., & Hwang, S. A. (2012). A population-based case-control study of extreme summer temperature and birth defects. *Environmental Health Perspectives*, 120(10), 1443–1449.
- Lin, S., Luo, M., Walker, R. J., Liu, X., Hwang, S. A., & Chinery, R. (2009). Extreme high temperatures and hospital admissions for respiratory and cardiovascular diseases. *Epidemiology*, 20(5), 738–746.
- White-Newsome, J. L., Sanchez, B. N., Jolliet, O., Zhang, Z., Parker, E. A., Dvonch, J. T., et al. (2012). Climate change and health: Indoor heat exposure in vulnerable populations. *Environmental Research*, 112, 20–27. doi:10.1016/j.envres.2011.10.008.
- Sampson, N. R., Gronlund, C. J., Buxton, M. A., Catalano, L., White-Newsome, J. L., Conlon, K. C., et al. (2013). Staying cool in a changing climate: Reaching vulnerable populations during heat events. *Global Environmental Change - Human and Policy Dimensions*, 23(2), 475–484.
- Kisner, C., Mulder, K., & Van Gessel B. (2015). Assessing heat vulnerability and access to cooling centers in Detroit, Michigan. University of Michigan Taubman College of Architecture & Urban Planning. 2012. Detroit, Michigan, USA, University of Michigan Taubman College of Architecture & Urban Planning. October 15, 2015. <http://graham.umich.edu/media/files/ClimateChateActionDetroit.pdf>.
- U.S. Department of health and human services (HHS), Centers for disease control and prevention. (2015). Crisis & emergency risk communication (cerc) by leaders for leaders. 2015. October 15, 2015.
- Chestnut, L. G., Brefflen, W. S., Smith, J. B., & Kalkstein, L. S. (1998). Analysis of differences in hot-weather-related mortality across 44 US metropolitan areas. *Environmental Science and Policy*, 1(1), 59–70.