Minigrants to Local Health Departments: An Opportunity to Promote Climate Change Preparedness

Elena Grossman, MPH; Michelle Hathaway, MPH; Kathleen F. Bush, PhD; Matthew Cahillane, MPH; Dorette Q. English, MA; Tisha Holmes, PhD; Colleen E. Moran, MPH, MS; Christopher K. Uejio, PhD; Emily A. York, MPH; Samuel Dorevitch, MD, MPH

ABSTRACT

Context: Human health is threatened by climate change. While the public health workforce is concerned about climate change, local health department (LHD) administrators have reported insufficient knowledge and resources to address climate change. Minigrants from state to LHDs have been used to promote a variety of local public health initiatives.

Objective: To describe the minigrant approach used by state health departments implementing the Centers for Disease Control and Prevention's (CDC's) Building Resilience Against Climate Effects (BRACE) framework, to highlight successes of this approach in promoting climate change preparedness at LHDs, and to describe challenges encountered.

Design: Cross-sectional survey and discussion.

Intervention: State-level recipients of CDC funding issued minigrants to local public health entities to promote climate change preparedness, adaptation, and resilience.

Main Outcome Measures: The amount of funding, number of LHDs funded per state, goals, selection process, evaluation process, outcomes, successes, and challenges of the minigrant programs.

Results: Six state-level recipients of CDC funding for BRACE framework implementation awarded minigrants ranging from $7700 to $28 500 per year to 44 unique local jurisdictions. Common goals of the minigrants included capacity building, forging partnerships with entities outside of health departments, incorporating climate change information into existing programs, and developing adaptation plans. Recipients of minigrants reported increases in knowledge, engagement with diverse stakeholders, and the incorporation of climate change content into existing programs. Challenges included addressing climate change in regions where the topic is politically sensitive, as well as the uncertainty about the long-term sustainability of local projects beyond the term of minigrant support.

Conclusions: Minigrants can increase local public health capacity to address climate change. Jurisdictions that wish to utilize minigrant mechanisms to promote climate change adaptation and preparedness at the local level may benefit from the experience of the 6 states and 44 local health programs described.

KEY WORDS: climate change, emergency preparedness, local health department, minigrant, public health

The Fourth US National Climate Assessment concluded that globally and in the United States, temperature is increasing, sea level is rising, extreme weather events are increasing in frequency, and that "it is *extremely likely* that human influence has been the dominant cause of the observed warming since the mid-20th century."[1] National[2] and

Author Affiliations: *Division of Environmental and Occupational Health Sciences, School of Public Health, University of Illinois at Chicago, Illinois, Chicago (Mss Grossman and Hathaway and Dr Dorevitch); Division of Public Health Services, New Hampshire Department of Health & Human Services, Concord, New Hampshire (Dr Bush and Mr Cahillane); Office of Health Equity, California Department of Public Health, Richmond, California (Ms English); Departments of Urban & Regional Planning (Dr Holmes) and Geography (Dr Uejio), Florida State University, Tallahassee, Florida; Wisconsin Department of Health Services, Madison, Wisconsin (Ms Moran); and Oregon Health Authority, Portland, Oregon (Ms York).*

Mss Grossman and Hathaway contributed equally as cofirst authors.

The authors were funded by the Centers for Disease Control and Prevention (CDC UE1 EH001045) Climate-Ready States and Cities Initiative grant to implement the Building Resilience Against Climate Effects framework.

The contents are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the Department of Health and Human Services, or their respective agencies.

Since 2012, Samuel Dorevitch, MD, MPH, has directed "Building Resilience Against Climate Effects in Illinois" ("BRACE-Illinois"). That public health practice project is funded by the Centers for Disease Control and Prevention to prepare the Illinois Department of Public Health and local health departments for the health effects of climate change. The other authors declare no conflicts of interest.

Correspondence: *Samuel Dorevitch, MD, MPH, Division of Environmental and Occupational Health Sciences, School of Public Health, University of Illinois at Chicago, 2121 W Taylor St, Chicago, IL 60612 (sdorevit@uic.edu).*

DOI: 10.1097/PHH.0000000000000826

international[3] assessments have concluded that the continued warming of the climate is expected to increase the frequency of heat stress illness, injuries and illnesses attributable to flooding, increases in respiratory symptoms due to poor air quality, and changes in patterns of vector-borne diseases. Other health consequences will be location specific and driven by events such as wildfires, coastal erosion, and sea-level rise (coastal areas), melting of permafrost (arctic regions), drought (southwest), and tropical storms (coastal states and territories).

The important role that local government entities play in planning for disasters was emphasized by the US Federal Emergency Management Agency.[4] The National Disaster Recovery Framework developed by the US Department of Homeland Security notes that "…local, regional/metropolitan, state, tribal, territorial, insular area, and Federal governments have primary responsibility for the recovery of their communities and play the lead role in planning for and managing all aspects of community recovery."[5] Local health departments (LHDs) perform essential functions that are relevant to climate change preparedness, including the development of preparedness plans for extreme heat and floods, the planning for continued provision of health services following disasters, and the education of policy makers about the impacts of climate change on health.[6]

Despite the critical role that LHDs might play in preparing for the health impacts of climate change, LHD officials have reported that institutional deficiencies in knowledge, skills, staff, and money significantly limit their ability to address climate change. A majority of LHD directors in 2008[7] and 2012[8] agreed with the following statement: "In the next 20 years, it is likely that my jurisdiction will experience one or more serious public health problems as a result of climate change." However, in the 2008 and 2012 surveys, less than 25% of respondents thought that their health department had "ample expertise to assess the potential health impacts associated with climate change" locally. A similar gap between concern about the health impacts of climate change on the one hand, and the knowledge and resources needed to respond to them on the other hand, has been noted by US public health nursing administrators.[9] This combination of a high perception of risk and a low level of readiness has also been demonstrated in surveys and/or interviews of LHD leaders in California[10] and New York State.[11] In those studies, LHD managers reported that to be better prepared, they would need additional staff, training, information about health impacts of climate change, vulnerability to climate change, and climate-relevant health surveillance databases. Furthermore, funding would be needed to support local preparedness activities and partnerships. Respondents from LHDs in New York were significantly less likely to report having sufficient information on climate and health preparedness than respondents from the state health department in New York,[11] emphasizing the need for the education of staff at LHDs about climate change and its impacts on health.

To reduce the burden of climate-sensitive illness and injury, the US Centers for Disease Control and Prevention (CDC) developed the Building Resilience Against Climate Effects (BRACE) framework. The framework has 5 steps: (1) forecasting climate impacts and identifying vulnerabilities; (2) projecting the future burden of diseases attributable to climate change; (3) assessing public health interventions to reduce that disease burden; (4) implementing a climate and health adaptation plan; and (5) evaluating the impact of the plan and improving the quality of the preceding steps.[12] Sixteen states and 2 cities have received CDC funding to utilize the BRACE framework through the Climate-Ready States and Cities Initiative. However, it is LHDs that respond first to floods, hurricanes, heat waves, vector-borne diseases, and other climate-sensitive health threats. Furthermore, LHDs are well positioned to educate communities about the connections between weather, climate, and health problems. Nevertheless, LHDs outside of major cities have not been funded through this mechanism.

State health departments or other federally funded entities in the United States have provided "minigrants"—financial support, typically $2000 to $15 000—to LHDs or nonprofits in order to promote a variety of local initiatives, as summarized recently by Porter and colleagues.[13] These have included programs that focus on cancer prevention,[14-16] healthy eating and physical activity,[14,17] public health preparedness,[18] and community health.[16]

Although not specifically directed by CDC's Climate-Ready States and Cities Initiative, several state health departments funded to implement the BRACE framework (herein referred to as "CDC grantees") independently decided to direct funding to local health entities. Federal funds managed by the CDC grantees were allocated to the respective LHD with approval by CDC project officers and fiscal reviewers.

The purpose of this report is to describe an approach promoting preparedness for health impacts of climate change by LHDs. That approach—minigrants from federally funded state health departments—its goals, implementation methods, variations among states, challenges, successes, and lessons learned are described. This information may be useful to local and state health departments that wish to prepare for the health threats posed by climate change.

Methods

Project managers and principal investigators of the 18 recipients of CDC grants to implement the BRACE framework[12] were contacted by e-mail to identify those that had provided minigrants. Those that had provided minigrants were asked to enter information into 2 data collection instruments about the minigrant programs that they had funded. One was a spreadsheet with fields for data entry regarding (1) minigrant program goals, (2) funding amounts, (3) general design of the grants, and (4) process for selecting LHDs for funding. The other was a questionnaire that inquired about (A) successes, (B) challenges, and (C) recommendation for future minigrant programs. Given the small number of states and the small number of questions, responses were categorized manually (ie, without qualitative research software) to identify common responses as well as unique responses. States used different terms to refer to minigrant recipients, including "county health departments (CHDs)," "local health departments (LHDs)," "regional public health networks (RPHNs)," "local health jurisdictions (LHJs)," or "local or tribal public health agencies (LPHAs)." We refer collectively to the local recipients of minigrants as LHDs, recognizing that not all states use that term.

Human subject compliance statement: This work was a public health practice program evaluation and did not involve human research subjects. For that reason, institutional review board approval was not sought.

Results

Seven CDC grantees reported having minigrant programs; of those, 6 were able to contribute information about their programs; elements of the 6 minigrant programs are summarized in Table 1. Procedures for notifying potential minigrant recipients about funding opportunities were similar: all distributed (or posted) electronically a request for proposals (RFP) and defined review criteria for selecting proposals for funding. Some of the states issued minigrants to LHDs that had already engaged in activities related to climate change, whereas others prioritized LHDs with no climate-related experience. CDC grantees funded 3 to 7 LHDs per year, and the amount of funding ranged from $7700 to $28 500 per LHD per year. In some states, LHDs received funding for 1 year, whereas in others, funding was renewed for 2 to 3 consecutive years. Two CDC grantees differentiated between planning grants and implementation grants.

Increasing local knowledge and increasing capacity to respond to the health consequences of climate change were stated goals of minigrant programs of 5 of the 6 CDC grantees. Several states specified that minigrant recipients should develop adaptation plans, whereas others promoted the more general concept of improving community resilience to extreme weather. A minority of states specified that the needs of vulnerable populations should be addressed and/or that LHDs partner with organizations in at-risk communities. One state specified that evidence-based public health interventions be implemented. Another specified that minigrant recipients should implement initial steps of the BRACE framework and, in partnership with the state BRACE project, codevelop county-level "Climate and Health Profile Reports" and "Vulnerability Assessments." All minigrant recipients convened stakeholder groups to identify priority issues and receive input on key decisions.

The 6 state-level CDC grantees provided technical assistance, training, and guidance to minigrant recipients. Technical assistance often involved guidance about accessing and summarizing weather, health, and social vulnerability data. Frequent communications between the LHDs and the state BRACE project personnel were an element of all minigrant programs. All state programs evaluated their minigrant initiatives. Most state programs used pre- and postsurvey questionnaires or interviews (or both) to evaluate changes in knowledge and abilities. Two states utilized third parties to assess perceptions of minigrant recipients about their programs, as well as opportunities to improve processes, goals, and activities of this funding mechanism. All 6 state-level CDC grantees reviewed quarterly and/or final reports from minigrant recipients. One state program applied the CDC evaluation framework to minigrant assessments. Feedback from Oregon minigrant recipients is available online.[19]

Successes

Four areas of success were noted by the CDC-funded state programs: (1) increased knowledge about climate change and health on the part of LHD personnel; (2) stakeholder engagement in activities related to climate change; (3) the inclusion of information about climate change into health communications for existing or new public health programs; and (4) efforts to identify people and places at increased risk (vulnerability) to the adverse health consequences of climate change. In addition, one state identified as a success the development of mentoring relationships between the staff of LHDs funded in the first year of the minigrant program and the staff of LHDs that received minigrant funding in later years. Another state identified as a success the development of regional estimates of health impacts from extreme weather events.

TABLE 1
Minigrant Project Funding and Selection Criteria, by State

	No. of Counties Funded; Population of Counties Funded (Amount of Annual Funding per LHD)	Selection Process and Priorities
California	Cohort 1: 3 Cohort 2: 6 Cohort 3: 8 Cohort 4: 2 Population range: 14 000-3.3 million (cohorts 1 and 2: $9400; cohorts 3 and 4: $9990)	One LHD per Climate Impact Region was invited to apply, based on geographic, social, demographic, and economic factors. Applicants indicated readiness to collaboratively develop assessment and planning tools, which would be made available to all counties upon completion. LHDs were to pilot the BRACE framework to increase climate change planning, readiness, and resilience.
Florida	Cohort 1: 3 Cohort 2: 4 Population range: 77 500-1.3 million ($10 000/y)	Competitive RFP process. Projects were selected on the basis of (1) potential for development of evidence-based adaptation interventions; and (2) potential to further implement the BRACE framework. Open to LHDs and community organizations.
Illinois	Year 1: 3 Year 2: 3 Year 3: 5 Population range: 37 900-121 400 ($7700 to $13 500/y)	Competitive RFP process. Intended to geographically represent Illinois and focused on LHDs that serve a population of <250 000 and are at the early stages of climate change adaptation.
New Hampshire	Year 1: 2 RPHNs Year 2: 4 RPHNs Year 3: 4 RPHNs Population range: 60 400-404 300 ($20 000/y)	Competitive RFP process, but limited to RPHNs already funded to implement emergency preparedness plans. Selection based on: (1) ability to assess weather and climate hazards relevant to region and population; (2) potential to implement the BRACE framework and develop evidence-based interventions.
Oregon	5 LHJs Population range: 21 000-776 700 (Assessment and Planning: $15 000/y for 2 y; Implementation: $28 500 for 1 y)	Initial "Planning and Assessment Grant" was a competitive RFP process, intended to geographically represent Oregon's LHJs. Implementation grants were available only to LHJs with existing climate adaptation plans.
Wisconsin	7 pilot projects that cover 11 counties Population range: 7 300-118 000 (cohort 1: $12 500/y; cohort 2: $10 500/y)	Competitive RFP process. Applicants scored on the basis of (1) familiarity with climate and extreme weather planning, experience, and readiness to engage local stakeholders; (2) support and involvement of internal and external stakeholders; and (3) ability to develop and test climate adaptation strategies, community engagement methods, and integrate these into local emergency planning mechanisms.

Abbreviations: BRACE, Building Resilience Against Climate Effects; LHDs, local health departments; LHJs, local health jurisdictions; RFP, request for proposals; RPHNs, regional public health networks.

Increased knowledge

LHD personnel who participated in minigrant activities reported increased knowledge and the development of skills related to climate change adaptation planning, vulnerability assessment, and development of partnerships (Table 2). Several minigrant recipients reported that staff of partnering organizations (recreation, aging, other) also gained knowledge in these areas.

Stakeholder engagement

Minigrant recipients engaged with a variety of local agencies and community organizations. Entities with which minigrant recipients partnered most frequently were (in descending order) emergency management/first responders/public health preparedness organizations; faith-based groups/community advocacy organization; county and city government officials; and medical providers/hospitals/health care systems/long-term care facilities. Less commonly, stakeholder groups included organizations that addressed urban planning/zoning, aging, natural resources, education, agriculture, mental health, and homelessness. Through these partnerships, LHDs informed local organizations about the connection between climate change and public health, and they expanded existing collaborative programs.

TABLE 2
Knowledge Gained and Skills Developed by Staff at LHDs That Received Minigrants

Knowledge Gained	Skills Developed
Awareness of challenges faced by vulnerable populations in preparing for and responding to climate-sensitive disasters	Development of an inventory of local and regional initiatives that address climate change adaptation, mitigation, and resilience initiatives
The concept of climate change adaptation planning	Holding educational sessions about local community and cross-sector partnerships that address climate change
Knowledge about climate-sensitive illnesses	Tailoring templates for climate and health adaptation and partnerships to local concerns
Increased awareness of opportunities for LHDs to address health impacts of climate change	Application of resources to identify vulnerable groups and micro-communities
Knowledge about ways that other LHDs address climate change (Lyme disease and heat stress illness prevention)	Identification of vulnerable critical infrastructure
	Refinement of emergency planning processes to address needs of vulnerable populations
	Working with stakeholders to jointly develop climate change adaptation plans
	Communicating local climate change risks and public health strategies and interventions to local decision makers

Abbreviation: LHDs, local health departments.

Communications about climate change

Minigrant recipients addressed climate change by developing or revising a variety of health communications materials (Table 3). These materials were distributed at LHDs, at county fairs, and through partnerships with various governmental and nongovernmental organizations in communities. Some of these communications centered on climate change, whereas others mentioned climate change in the context of routine communications about disease prevention; others addressed specific climate-sensitive diseases without mentioning climate change.

TABLE 3
Local Health Communications Related to Health Impacts of Climate Change

Lyme disease prevention brochure, with information about climate change as a factor in the changing geography of tick and disease distribution
Social media campaign about mental health needs of communities impacted by floods
Include information about climate change into existing priorities identified in community health assessments and Hazard Vulnerability Assessment
Heat stress illness prevention among the elderly: developed printed information and color-metric refrigerator magnet thermometers in collaboration with a local Meals-on-Wheels program, which distributed the materials along with meals.
Mention of climate change impacts on air quality in respiratory health communications
Drought preparedness
Public service radio announcements, Web sites, and printed materials about climate, as well as the development of a climate change education campaign and curriculum for the county's Special Supplemental Nutrition Program for Women, Infants, and Children[20]
Climate and health adaptation plans shared with county commissioners and presented in press releases

Vulnerability

Several minigrant recipients incorporated the concept of vulnerability to the health impacts of climate change into their activities. Among these was an analysis of the degree to which the county's current emergency management plans addressed vulnerable populations. This was done through workshops, focus groups, and geographic information system (GIS) analyses. This led to new partnerships between LHDs and local organizations that serve marginalized populations. Vulnerability maps were created, decision makers were informed, and emergency management plans were updated on how to better meet the needs of vulnerable populations. One LHD that received a minigrant used GIS to highlight the distribution of land parcels with well permits in 500- and 100-year floodplains. The maps allowed the LHD to focus the distribution of flood preparedness kits to high-risk locations. Another minigrant recipient published its own vulnerability assessment that focused on heat.[21] Some CDC grantees and minigrant recipients used CDC's online tool for mapping social vulnerability[22] to communicate with stakeholders about communities at increased risk. One state-level CDC grantee posted data on social vulnerability at the neighborhood level to help minigrant recipients identify at-risk populations, as well as the drivers of

vulnerability (housing, income, etc). Other minigrant recipients focused on identifying areas of interagency coordination, including estimating increased capacity needed by agencies to adequately address climate risks. The potential health co-benefits of various climate mitigation strategies were the focus on the project of another minigrantee.

Challenges

Several states reported that because of state and local budget constraints, some minigrant recipients suffered from a loss of staff (or staff hours), which limited the ability of those grantees to achieve their proposed objectives. Because minigrant projects were contingent on support from CDC to state-level grantees, uncertainty surrounding the future availability of federal funding made planning difficult for states and LHDs. It was unclear in some states whether the funding was a one-time demonstration project, seed funding to leverage support from other sources, or the beginning of multiyear support.

The 1- to 2-year duration of most minigrants did not allow many LHDs to demonstrate concrete impacts that could have helped them obtain financial support from local agencies or to fully embed some of their activities into existing secure programs. Likewise, some state programs did not initially determine whether it would be better to support a small number of programs for multiple years or to provide more limited funds to a larger number of LHDs. As a result, managing expectations of stakeholders for continued funding or the goals of short-term funding became challenging. Some state programs noted that it was a challenge for LHDs to openly discuss and gain support for climate and health adaptation and preparedness within their agencies, communities, and among public officials.

Discussion

We described what we believe to be the first implementation of public health programs for climate change adaptation and preparedness by local public health entities supported by federally funded state programs (eg, minigrants). While local climate adaptation planning has taken place in a variety of US locations, these efforts are commonly in large cities in coastal areas and focus on infrastructure rather than human health.[23-25] Initiatives developed and implemented by minigrant recipients described here were generally their first efforts to address climate change. Minigrant recipients reported increased knowledge and abilities to address climate change by LHD personnel. The minigrants also allowed local nonprofits to address climate change, in some cases for the first time.

The health impacts of extreme weather events are location-dependent and risk varies across populations on the basis of factors such as age, the prevalence of underlying health problems,[26] housing quality, income, English fluency, and access to transportation.[22] The BRACE framework's focus on "people and places at risk" promotes preparedness for locations and communities at elevated risk for adverse health impacts of climate change. Compared with state-level agencies, local agencies are more familiar with their community's needs and assets, vulnerable populations, and are likely to be involved in local disaster response. Yet, a system for supporting climate change planning by LHDs has not been previously described. Across the United States, many state and county health departments are subject to budget cuts, making it increasingly difficult to fund climate change preparedness.[27] Substantial resources are often expended in response to extreme weather events; some of those funds might be better invested in adaptation and building resilience among communities at increased risk.

Communicating about climate change was noted by CDC grantees to be a challenge for minigrant recipients. This may be due, in part, to the fact that climate change has not been taught in schools of public health until recently. Although CDC grantees provided webinars, in-person trainings, and many online resources on the topic, LHD personnel—given the many demands on their time—could not easily develop the knowledge, skills, and confidence needed for effective climate change communications. Until communications challenges are addressed, the ability of LHD staff to work effectively with communities and partners will be limited.

As summarized recently by Porter and colleagues,[13] minigrants have been used to achieve a variety of public health goals. Because the technical expertise of the federal, state, and/or regional agencies is often available to minigrant recipients at no additional cost, this mechanism is relatively inexpensive. CDC grantees were not specifically directed by CDC to support LHDs, yet 7 of those grantees decided to pursue this approach to increase climate change adaptation and preparedness. While some state CDC grantees informally discussed minigrant programs with one another, each developed its program independently.

Our observations are subject to several limitations. These include the fact that each CDC-funded state program that issued minigrants did so before the development of a common plan to synthesize information across minigrant programs. As a result, the prospective collection of data about the programs was

TABLE 4
Feedback From LHDs and CDC Grantees About the Minigrant Programs

Program guidance and RFP development
Design of the minigrant should be done in partnership with local, regional, and state entities. Local partners provide community knowledge and have established trust with high-risk individuals and organizations that work with those individuals.
Include regional planning commissions in discussions with key stakeholders and in the development of viable action plans.
Include public health preparedness and disaster management agencies.
State agencies can provide a variety of technical skills and knowledge.
Include in guidance documents for minigrant recipients requests for lessons learned, successes, and challenges.
Budgets and expectations for sustaining activities beyond the duration of the minigrant.
If a goal is to leverage minigrant dollars in the pursuit of other external funding opportunities, include that information in the RFPs, along with suggestions about using project funds and activities to generate additional support.
Consider a multiyear timeline. Year 1 should focus on local assessments and the writing of well-documented plan of action. Year 2 should focus on implementation and evaluation of the results.
Support for minigrant recipients
Structure trainings and providing technical assistance to LHDs so that they can access and effectively communicate climate information.
Provide resources that describe in clear terms links between health problems, weather, and climate.
Provide climate and health communication tools that have preferably been evaluated for effectiveness. Develop educational tools and health messages geared for (1) community leaders, advisory boards, and county commissioners; and (2) the general public. These might help advance efforts to obtain local funding for climate and health work. Because few LHDs have a communications specialist, this technical support is needed from state or other agencies.
Lessons learned: Management of minigrant initiatives by state programs
Stagger minigrants to individual LHDs so that year 2 for county A is year 1 for county B. In year 2, county A staff would mentor county B staff.
Ensure realistic expectations about the scope of work. Because climate change adaptation is an emerging public health field, the burden on a grantee's internal resources may be greater than that for a minigrant program in an established public health field.
States should budget 1-2 h per week per grantee to assist identifying local climate hazards, health impacts, local vulnerabilities, and evidence-based interventions.
Compile and share information about methods, materials, and impacts of prior climate and health minigrant recipients

Abbreviations: LHD, local health department; RFP, request for proposals.

Implications for Policy & Practice

- Preparing for the health impacts of climate change at the local level is limited by low levels of training, staffing, and funding for such efforts.
- Minigrants from state health departments to LHDs can promote greater knowledge about climate science, climate change, the impacts of climate change on health, and approaches to preparing for climate change.
- With funding generally in the range of $7700 to $15 000 per year, LHDs can engage in communications, education, outreach, and partnerships designed to promote awareness of climate change and its impacts on health in their communities and to begin preparing for those impacts.
- Ripple effects of the minigrant support included knowledge about climate change gained by partnering community organizations.
- Public health entities that wish to pursue minigrant mechanisms should be clear from the onset about plans for sustaining the funding as well as guidance for leveraging the funding provided.
- State health departments should also provide training about communicating climate science to communities with a wide range of political perspectives.

not done uniformly. CDC grantees that issued minigrants may have differed from those that did not, potentially limiting the generalizability of our observations. It is not possible to know whether the time, funds, and effort that went into the minigrant programs might have been directed better to other efforts to reduce the future burden of climate-sensitive disease. Finally, it is possible that LHDs may have presented their experience in a positive way to the state program that was the source of their minigrant funding in order to be considered for future funding.

Recommendations

Minigrant initiatives can provide an opportunity for LHDs to prepare for local public health consequences of climate change. On the basis of the successes and challenges encountered by 6 CDC-funded state programs, recommendations have been summarized for public health entities that wish to promote climate change preparedness locally (Table 4). These include suggestions for guidance documents for minigrant recipients, clarity about funding and expectations, and nonfinancial support for minigrant recipients.

Conclusion

More than one-third of states funded by CDC to implement the BRACE framework provided minigrants to LHDs so that they may prepare for local climate-related health threats. The minigrant structure provided financial support, education, training, and guidance to better meet the public health challenges posed by climate change. Minigrant recipients and their community partners reported knowledge gains and skills developed related to climate change preparedness. This work can inform other states interested in using similar mechanisms.

References

1. US Global Change Research Program; Wuebbles DJ, Fahey DW, Hibbard KA, Dokken DJ, Stewart BC, Maycock TK, eds. *Climate Science Special Report: Fourth National Climate Assessment*. Vol I. Washington, DC: US Global Change Research Program; 2017: 470.
2. US Global Change Research Program; Crimmins AJ, Balbus JL, Gamble CB, et al., eds. *Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. Washington, DC: US Global Change Research Program; 2016:312.
3. Smith KR, Woodward A, Campbell-Lendrum D, et al. Human health: impacts, adaptation, and co-benefits. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability, Part A: Global and Sectoral Aspects*. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. New York, NY: Cambridge University Press. 2014.
4. FEMA. Pre-disaster planning guide for local governments. FEMA Publication FD 008-03. https://www.fema.gov/media-library-data/1487096102974-e33c774e3170bebd5846ab8dc9b61504/PreDisasterRecoveryPlanningGuideforLocalGovernmentsFinal50820170203.pdf. Published 2017. Accessed November 27, 2017.
5. Department of Homeland Security. National Disaster Recovery Framework. 2nd ed. https://www.fema.gov/media-library-data/1466014998123-4bec8550930f774269e0c5968b120ba2/National_Disaster_Recovery_Framework2nd.pdf. Published 2016. Accessed November 27, 2017.
6. Frumkin H, Hess J, Luber G, Malilay J, McGeehin M. Climate change: the public health response. *Am J Public Health*. 2008;98(3):435-445.
7. Maibach EW, Chadwick A, McBride D, Chuk M, Ebi KL, Balbus J. Climate change and local public health in the United States: preparedness, programs and perceptions of local public health department directors. *PLoS One*. 2008;3(7):e2838.
8. Roser-Renouf C, Maibach EW, Li J. Adapting to the changing climate: an assessment of local health department preparations for climate change-related health threats, 2008-2012. *PLoS One*. 2016;11(3):e0151558.
9. Polivka BJ, Chaudry RV, Mac Crawford J. Public health nurses' knowledge and attitudes regarding climate change. *Environ Health Perspect*. 2012;120(3):321-325.
10. Bedsworth L. Preparing for climate change: a perspective from local public health officers in California. *Environ Health Perspect*. 2009;117(4):617-623.
11. Eidson M, Clancy KA, Birkhead GS. Public health climate change adaptation planning using stakeholder feedback. *J Public Health Manag Pract*. 2016;22(1):E11-E19.
12. Centers for Disease Control and Prevention. CDC's Building Resilience Against Climate Effects (BRACE) framework. http://www.cdc.gov/climateandhealth/BRACE.htm. Published 2015. Accessed November 27, 2017.
13. Porter CM, McCrackin PG, Naschold F. Minigrants for community health: a randomized controlled trial of their impact on family food gardening. *J Public Health Manag Pract*. 2016;22(4):379-386.
14. Arriola KRJ, Hermstad A, Flemming SSC, et al. Promoting policy and environmental change in faith-based organizations: description and findings from a mini-grants program. *Am J Health Promot*. 2017;31(3):192-199.
15. McCracken JL, Friedman DB, Brandt HM, et al. Findings from the Community Health Intervention Program in South Carolina: implications for reducing cancer-related health disparities. *J Cancer Educ*. 2013;28(3):412-419.
16. Smallwood SW, Freedman DA, Pitner RO, et al. Implementing a community empowerment center to build capacity for developing, implementing, and sustaining interventions to promote community health. *J Community Health*. 2015;40(6):1122-1129.
17. Jacob Arriola KR, Hermstad A, St Clair Flemming S, et al. Promoting policy and environmental change in faith-based organizations: outcome evaluation of a mini-grants program. *Health Promot Pract*. 2016;17(1):146-155.
18. Wiebel V, Welter C, Aglipay GS, Rothstein J. Maximizing resources with mini-grants: enhancing preparedness capabilities and capacity in public health organizations. *J Public Health Manag Pract*. 2014;20(suppl 5):S83-S88.
19. Oregon Health Authority. Local climate and health adaptation planning. http://www.oregon.gov/oha/ph/HealthyEnvironments/climatechange/Documents/Summary-of-Lessons-Learned.pdf. Accessed August 15, 2017.
20. San Luis Obispo County Health Department. OutsideIn SLO: we take health and climate change personally. NACCHO Model Practices Program. http://archived.naccho.org/topics/modelpractices/displaymp.cfm?id=1008. Published 2016. Accessed November 27, 2017.
21. Contra Costa Health Services. Climate change vulnerability in Contra Costa County: a focus on heat. https://cchealth.org/health-data/pdf/2015-climate-change.pdf. Published 2015. Accessed November 27, 2017.
22. Agency for Toxic Substances & Disease Registry. Social Vulnerability Index (SVI). https://svi.cdc.gov. Accessed November 27, 2017.
23. Southeast Florida Regional Climate Action Plan. Integrating the unified sea level rise projection into local plans. http://www.southeastfloridaclimatecompact.org/wp-content/uploads/2017/01/SLRGuidance-Doc.pdf. Published 2017. Accessed November 27, 2017.
24. City of Chicago. Chicago Climate Action Plan. http://www.chicagoclimateaction.org/filebin/pdf/finalreport/CCAPREPORTFINALv2.pdf. Published 2008. Accessed November 27, 2017.
25. City of Boston. Coastal resilience solutions for East Boston and Charlestown. https://www.boston.gov/sites/default/files/climatereadyeastbostoncharlestown finalreport web.pdf. Published 2017. Accessed November 27, 2017.
26. Semenza JC, Rubin CH, Falter KH, et al. Heat-related deaths during the July 1995 heat wave in Chicago. *New Engl J Med*. 1996; 335(2):84-90.
27. Ebi KL, Balbus J, Kinney PL, et al. U.S. funding is insufficient to address the human health impacts of and public health responses to climate variability and change. *Environ Health Perspect*. 2009; 117(6):857-862.