



# HHS Public Access

Author manuscript

*J Environ Health*. Author manuscript; available in PMC 2024 July 22.

Published in final edited form as:

*J Environ Health*. 2024 January ; 86(6): 8–13.

## Rebuilding Caribbean Environmental Health Post-Crisis Programs: A Preliminary Study for Virtual Mentorship

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### Abstract

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After the hurricanes in 2017 in the U.S. Caribbean, it was essential to rebuild, strengthen, and sustain essential environmental health (EH) services and systems. The National Environmental Health Association, in partnership with the Centers for Disease Control and Prevention, developed an online mentorship program for newly hired and existing EH staff and health department leadership in Caribbean health departments. Participants were provided with both practical and didactic learning and were allowed to evaluate the program. Both mentors and mentees were highly satisfied with the knowledge and skills acquired, and mentees expressed it was relevant to their daily work. Based on the findings, we recommend both an online and a hybrid mentorship program for leadership- and inspector-level workforces in EH and potentially in other fields.

### Keywords

environmental health; mentorship program; Caribbean; emergency preparedness; emergency response and recovery

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### Introduction

In 2017, two Category 5 hurricanes struck the U.S. Virgin Islands (USVI) and Puerto Rico. Hurricanes Irma and Maria devastated these U.S. territories, leaving many island residents without power, running water, or access to necessary resources. These hurricanes also devastated the governmental environmental health (EH) infrastructure. Vital EH services (e.g., retail food inspections) were halted due to a lack of capacity within the health departments as priorities shifted to response and recovery. Many people migrated from the islands to seek safety or employment. This migration resulted in the USVI Department of Health and the Puerto Rico Department of Health having depleted resources and fewer trained staff members to conduct EH inspections.

Ironically, the 2017 hurricanes created conditions where a sufficiently resourced and skilled EH workforce would have greatly benefited the health, safety, and economic security of the affected communities. Therefore, if health department EH programs had been maintained, then a sufficient and skilled workforce of EH professionals would have been available in the most affected areas.

According to the Office for Coastal Management within the National Oceanic and Atmospheric Administration (2023), “Of 258 U.S. weather disasters since 1980, hurricanes have caused the most damage: \$945.9 billion total, with an average cost of almost \$21.5 billion per event. They are also responsible for the largest number of deaths: 6,593 between 1980 and 2020.” Climate change has a demonstrated impact on the frequency and intensity of hazardous events for coastal and island communities. Since 1979, the frequency of Category 3, 4, and 5 tropical cyclones has increased by 5% per decade (Kossin et al., 2020). With hurricanes projected to increase in severity and frequency, a trained and prepared workforce will be essential for hurricane recovery efforts and to ensure preparedness for response to future emergencies (Ross, 2023).

Puerto Rico and the USVI faced challenges before the 2017 hurricanes, a reality that underscores the need for EH preparedness and recovery plans. These challenges included

environmental hazards such as water and air quality, wastewater management, structural risks, vectorborne diseases, chronic illness, and healthcare access. EH plays a crucial role in safeguarding the health and safety of affected communities. Furthermore, EH professionals are vital in aiding in the recovery from public health threats to address drinking water quality, wastewater management, healthy homes, food safety, and vectors—all of which are impacted by hurricanes. Maintaining a skilled workforce through extensive training is crucial in these areas of expertise (Brooks et al., 2019; Chandra et al., 2021).

After the hurricanes, the National Environmental Health Association (NEHA) received funding through a Centers for Disease Control and Prevention (CDC) cooperative agreement to support USVI and Puerto Rico in rebuilding and strengthening their EH program capacity. The goal was to rebuild and strengthen EH services and systems after the hurricanes. The project aimed to train and provide hands-on experience to EH staff through mentorship, which builds a foundation of knowledge, skills, and field experience for these professionals to conduct inspections, assess hazards, and enhance their skills. The mentorship program supported existing and newly hired EH staff in gaining or expanding technical and management skills.

## Mentorship Program Description

The mentorship program incorporated training and hands-on experience for inspectors and leadership in the EH workforce in the USVI and Puerto Rico. Mentees gained knowledge and skills in EH topics, while the leadership cohort focused on programmatic skills. Initially in person, the program pivoted to virtual due to travel restrictions in 2020 during the COVID-19 pandemic. The virtual format was essential for these isolated communities, and NEHA collaborated with CDC, the USVI Division of Environmental Health, and the Puerto Rico Department of Health to ensure relevant content. The program used a learning management system (LMS) and launched in March 2021.

## Methods

### Participant Characteristics

A total of 21 mentees participated in the virtual program: 9 from USVI and 12 from Puerto Rico. Among the USVI participants, 6 were at the inspector level and 3 were at the leadership level. Among the Puerto Rico participants, 6 were at the inspector level and 6 were at the leadership level. Of the participating mentees, 33% held a degree in EH, while 11% had a certificate in EH. Some mentioned on-the-job experience and taking Food and Drug Administration and Food Code courses. The majority (61%) had 10 years of experience in EH, while 33% had 3 years of experience.

### People-Centered Approach to Mentorship

A structured approach was implemented and comprised two main components: didactic group training and practical mentorship. The 12-week program used expert instructional designers in the EH training field. Before the mentorship program launch, NEHA conducted several in-person trainings on EH and provided inspection kits to the jurisdictions. These activities were foundational to the capacity-building efforts of the USVI and Puerto Rico.

The didactic group training included six EH webinars and two quality improvement check-ins. The webinars were either 1- or 2-hr long and provided information and data on the chosen webinar topics (Table 1). This component provided a foundation of knowledge for mentees to then be able to conduct EH work.

The practical component included the use of the NEHA LMS platform based on the needs of each program. The LMS housed all webinars, recordings, assignments, group message boards, private message boards, resources, and materials. Participants could communicate with their mentors and with other mentees, read and comment on materials and assignments, and rewatch webinars. The practical component of this mentorship program was intended to apply knowledge learned in the training webinars to enhance practical skills in place of a hands-on shadowing experience.

NEHA leveraged its vast network of subject matter experts to aid in the design of the program and to serve as mentors. Program staff secured four mentors with a wide range of expertise in all areas of EH. Two levels of mentors were secured: 1) retired EH leaders and 2) EH specialists who routinely conduct inspections. Retired leaders mentored the leadership-level cohort and current EH specialists mentored the inspector-level cohort.

Mentors provided one-on-one mentoring to mentees through assignments, resources, and check-ins twice a month. Mentors also supported cohort engagement within the LMS, each conducting at least one training webinar for the entire cohort.

Of the 21 mentees, four groups were formed, each assigned to one mentor. All groups included a mix of both USVI and Puerto Rico participants. Three groups included personnel at the inspector level, with one group for leadership-level mentees. The leadership cohort was separate due to the varying level of mentorship needed and the discussion topics. In the practical component of the program, mentors in the leadership cohort focused more heavily on enhancing leadership skills. Group 1 (leadership) had nine mentees, Group 2 (inspectors) had five mentees, Group 3 (inspectors) had three mentees, and Group 4 (inspectors) had four mentees.

Inspectors had private web conferencing or phone meetings twice a month with their mentors, whereas leadership mentees met once per month. These meetings covered topics such as continuing training, addressing challenges, sharing successes, and discussing needed resources. Mentees were encouraged to participate in all training components and a certificate of completion was awarded to all participants. Optional participation included webinars, quality improvement sessions, one-on-one mentoring, group mentoring, and cohort engagement via the LMS.

### **Data-Driven Program Assessment and Evaluation**

Participant data drove the mentorship program's education component. A needs assessment was developed and disseminated to better understand mentee knowledge, confidence, skills, prior training, and interests related to the EH field. The resulting information enabled program staff to design the mentorship experience to meet mentee needs and interests.

The needs assessment helped identify training topics, preferred communication methods, learning styles, and informed the curriculum developed by NEHA.

Mentors then created presentations and provided resources based on the curriculum. Evaluations were implemented during and after the mentorship program to ensure a high-quality experience. Two quality improvement check-ins provided real-time feedback. Mentees and mentors completed logs to track progress and challenges. Program adjustments were made based on collected information, including a Spanish language post-webinar discussion for mentees who spoke Spanish.

Program improvements were implemented as needed. The goal was to ensure a high-quality mentorship experience. As such, evaluations were conducted during and after the program to monitor progress and inform adjustments. Weekly mentee logs were shared with mentors, and mentor logs were shared with program staff. Program changes were implemented based on collected data. Weekly logs and real-time feedback provided opportunities for improvement. Quality improvement check-ins allowed for real-time adjustments to enhance the program. Further, a post-program survey was administered to both mentees and mentors, and interviews with select mentees were conducted. Overall, data and feedback were used to optimize the mentorship experience for participants.

## Results

Based on mentor logs submitted twice a month, mentors spent an average of 7 hr/week preparing activities, assignments, and webinars for the program. Mentors spent approximately 4 hr/week communicating with their mentees via various channels. Most mentors did not meet with each mentee weekly but indicated that weekly time with mentees was ideal.

A total of 13 mentees submitted at least one weekly log during the mentorship, with 5 mentees completing one log for each week. On average, mentees spent 3.5 hr/week on activities, webinars, and reading resources and reported spending slightly less than 1 hr/week in communication with their mentor.

Overall, mentors were satisfied with the program and rated their experience as a mentor as very good (75%) or good (25%). Mentors felt the program length was appropriate, although one mentor expressed that the program could have been longer to dive deeper into the topics and to create stronger relationships with mentees.

Likewise, mentors perceived the program to have a good balance between instruction and one-on-one opportunities; one mentor expressed that there could have been more structured instruction. Figure 1 shows mentor agreement with the various goals and components of the virtual mentorship.

A total of 10 mentees completed the post-program survey. In all, 80% of respondents rated the mentorship program as excellent, and 20% rated it as very good. Of the mentees, 90% found the mentorship program to be an extremely valuable experience.

Overall, mentees were satisfied with their mentor and the learning opportunities offered in this program. They reported that they found their mentor knowledgeable and prepared, and the webinars increased their knowledge. Mentees felt supported in their learning and had opportunities to practice new skills. They also found the topics relevant and felt more prepared for their job. Most mentees (80%) felt that the time spent with their mentor was the appropriate amount of time and that the 12-week program was the right duration for a virtual mentorship; however, 20% reported that they felt the program was not long enough. Furthermore, 90% of mentees felt the mentorship program balanced instruction and one-on-one opportunities well.

Mentees highly rated webinar topics, one-on-one opportunities with their mentor, and assigned activities. They were also satisfied with participation expectations but rated the message board and weekly activity logs lower. To assess the knowledge and skills acquired from the mentorship program, mentees were asked to indicate their confidence in key EH areas before and after the program (Figure 2). Mentee confidence in key areas increased by an average of 40% after the mentorship program. The most significant improvements were in interpersonal skills, professional written communication skills, and human relations.

## Discussion

The successes of the mentorship program far outweigh the challenges. Similar themes were captured from the surveys and interviews from mentor and mentee perspectives. This program demonstrated that NEHA program staff could pivot from an in-person to a virtual experience and still provide a high-quality, interactive, and personalized experience. The mentors and mentees were highly satisfied with the knowledge and skills acquired, and mentees expressed that the program was relevant to their daily work.

Language barriers, however, were a common theme throughout the feedback process. We recommend and encourage the inclusion of multilingual program facilitators for virtual and in-person mentorship programs to address any language and trust barriers.

It is important to emphasize that these programs are not successful without several supportive factors. Based on NEHA's extensive experience implementing these types of programs, necessary factors include:

- buy-in from interested parties such as partners, funders, and employers;
- clear communication about the importance of the program;
- relevance of program materials; and
- a trusting relationship among mentees, mentors, and program facilitators.

### Mentorship Program Strengths

First, the relationship between mentors and mentees was the main success and is essential to establish. As one mentee stated, "You need to understand the person to make an impact. It is important to establish communication and respectful interactions."

Mentors were knowledgeable, listened, and provided expert guidance and expertise. One mentee explained that the best part of the program was “getting to meet the mentors and working one-on-one with my mentor. It was an eye-opening experience to see the scope of the EH field and learn from professionals with vast experience on the topics discussed.”

Second, mentors and mentees noted that the EH topics and content areas covered were relevant and of interest to the mentees. Overall, feedback showed that mentees found the webinars informative, well-organized, and delivered smoothly.

Lastly, many mentees mentioned that they found the peer-to-peer learning beneficial. They also stated that comprehending the procedures and processes in different geographic areas and locales and meeting new EH colleagues were all beneficial.

The virtual aspect of the mentorship program was beneficial due to the ease and flexibility of participation from anywhere, the ability to connect with mentees from different locales, and the content being readily accessible at any time. Mentors and mentees emphasized the importance of their relationship as the main success factor in the program, with mentees valuing understanding, communication, and respectful interactions. Mentors provided expert guidance and mentees appreciated learning from experienced professionals in the field.

### **Recommendations**

Most of the suggested program improvements are straightforward. To enhance the webinars, it would be beneficial to provide more in-depth and advanced coverage of topics and use real-world scenarios for better learning and practical application of skills to address field-related issues. While the mentees expressed satisfaction with the LMS, there were some recommendations to improve its functionality and ease of use and to provide additional training on its features.

One challenge that was identified was the lack of engagement from some mentees, who felt that the experience would have been more enriching if everyone had been more actively involved. Drawing from our expertise in developing and implementing mentorship and leadership programs, we recommend including more activities to stimulate conversations, increase mentee comfort levels, and raise mentor awareness about how to be responsive to each individual as well as to group dynamics. Other recommendations included reducing the frequency of emails, creating a chat group for better communication, incorporating more group activities, and addressing language barriers by providing more content in Spanish.

Based on the findings and feedback received, we highly recommend considering an online mentorship program for leadership- and inspector-level workforces in EH and other fields, especially when faced with in-person challenges in the future. The benefits of a virtual program are even more evident as our workforce becomes busier. Virtual options allow for increased scheduling flexibility and provide valuable professional development opportunities that might otherwise be unavailable.

Additionally, we want to highlight the value of in-person interactions in hybrid training formats. For example, some mentors and mentees in the virtual mentorship program

had prior in-person training and meetings as part of another program, which we believe contributed to the success of this virtual program.

We also recommend a hybrid approach combining in-person opportunities with virtual experiences. This approach would fulfill the expressed desire from mentees for more hands-on field experience. The NEHA Annual Educational Conference (AEC) & Exhibition would be an ideal venue for the in-person component of this hybrid approach, providing a nexus point for NEHA, CDC, mentors, and mentees to come together in a conducive learning environment that encourages networking, support, and recognition. The AEC is a prime setting that reinforces collaboration and prepares participants for future successes, next steps, and opportunities. Other organizations and health departments interested in a mentorship program could consider a similar hybrid approach. We recommend implementing these improvements to enhance the mentorship program and create a more effective and engaging learning experience for all participants.

## Conclusion

We acknowledge that there will be continuous challenges with leadership, training, and mentorship due to the changing needs of the work environment. The mentorship program case study from this program could serve as a model for other organizations and governmental departments, especially local and small governments. The program is low cost because it does not require travel, has a workflow that could easily be replicated, and can be integrated with other departments and organizations to increase cross-collaboration and interdisciplinary work.

This virtual mentorship program model provides the opportunity to meet and work with individuals outside of participant workplaces and fields of work. To understand the effectiveness of this program model, we recommend conducting a larger cohort with participants from multiple fields of work. In this way, information could be collected to determine how other governmental entities, nonprofits, and the private sector could benefit from online and hybrid mentorship, training, and leadership programs. We also recommend including program sustainability and resource-sharing plans in developing a virtual or hybrid program, if applicable.

The transfer of knowledge, skills, and abilities from one generation to the next through an organized mentorship program can accelerate the performance of the new and emerging leader workforce in EH. For an established organization, this virtual mentoring program requires a small amount of new investment into online learning platforms (i.e., an LMS), subject matter experts, and staff.

Our experience with this virtual mentoring program demonstrates that a modest investment in such an effort is effective in workforce capacity building in complex, dynamic, post-hurricane recovery conditions in isolated island communities. Given the findings and success of this effort, we recommend that a national mentoring framework to support rural, frontier, and territorial governmental EH be established to leverage the intellectual capital of senior-level and recently retired individuals. The resulting mentoring program will enhance the



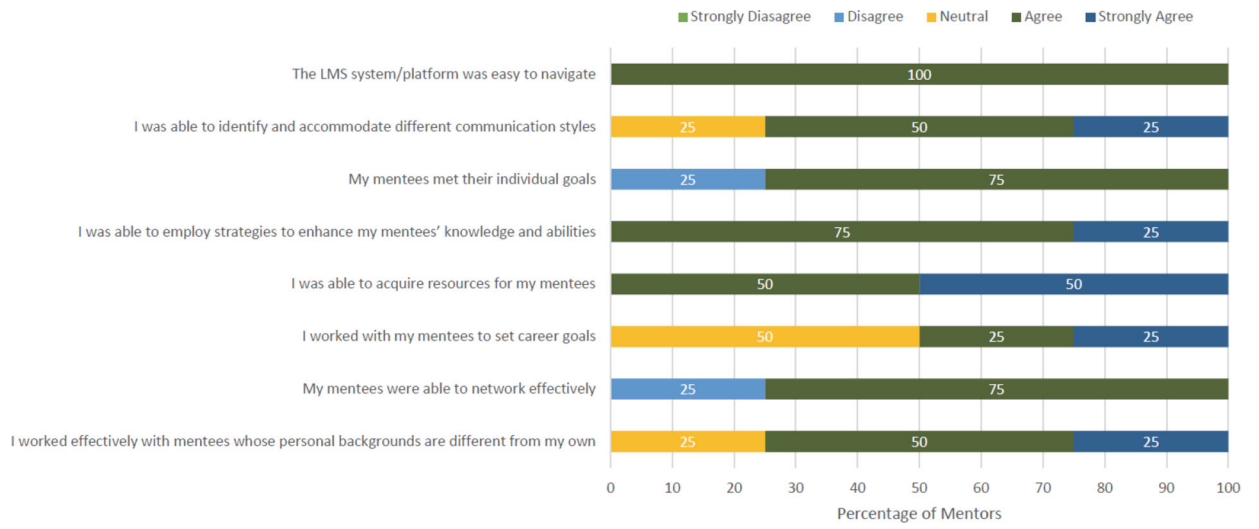
skills of the new EH workforce. This strategy can serve as a model for establishing a future pipeline for a strong EH workforce.

## Acknowledgements:

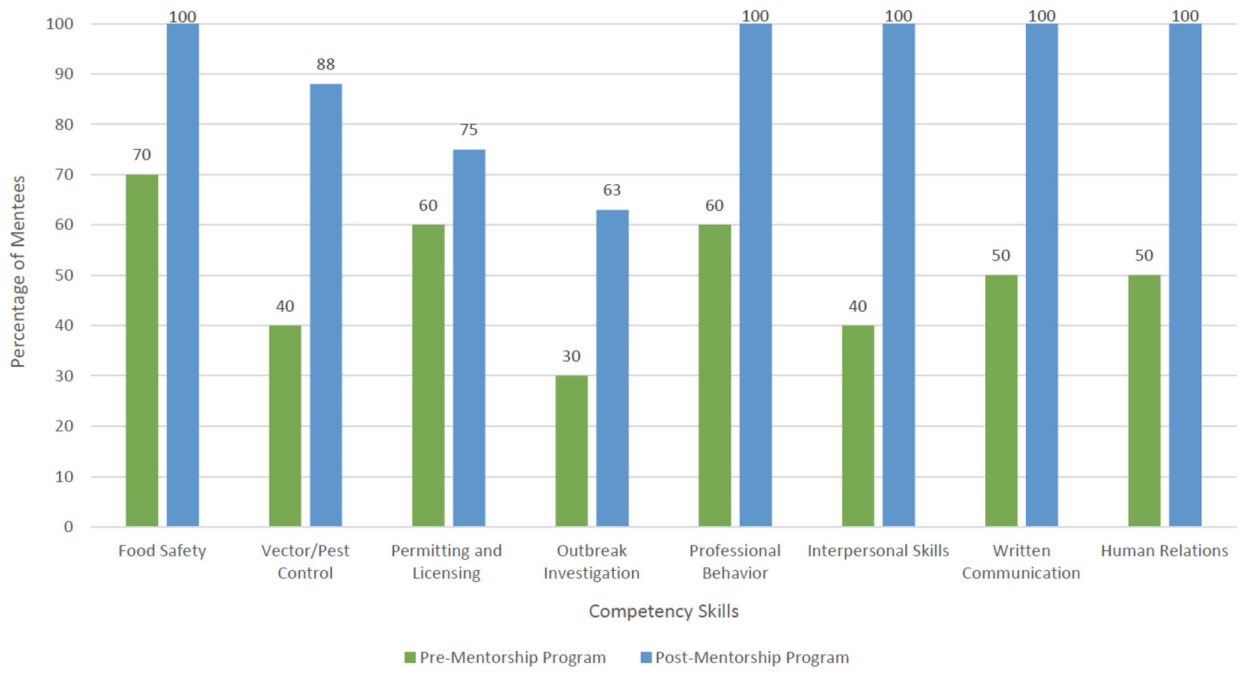
This article was made possible with support from CDC under Cooperative Agreement #NU1RO5000001. We thank participants from the USVI and Puerto Rico for their commitment and local knowledge. We also thank our technical advisors at the National Center for Environmental Health for their invaluable support throughout the project, as well as our trusted and committed mentors. This support greatly contributed to the successful implementation and evaluation of the project by NEHA.

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**Figure 1.**  
Mentor Agreement with Virtual Mentorship Responsibilities and Goals



**Figure 2.** Pre- and Post-Mentorship Program Confidence of Mentees in Competency Skills

**Table 1.**

## Webinar Topics

<b>Webinar Title</b>	<b>Description</b>	<b>Length of Time (hour)</b>
Outbreak Investigation	Approach/steps for investigation, including in a COVID-19 environment, and using social media as a tool in outbreak investigations	1
Food Safety	Handling, preparing, and storing food in a way to best reduce the risk of individuals becoming sick from foodborne illnesses	1
Permitting and Licensing Processes	Types of permits and licenses available and the process to apply, review, and grant permits and licenses	1
Vector/Pest Control	Methods to limit or eradicate mammals, birds, insects, or other arthropods that transmit disease pathogens	1
Interpersonal Skills, Professional Behavior, and Human Relations	Verbal and body language	2
Professional Written Communication	Professional reports, conference presentations, and formal communications	2

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