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# PUBLIC HEALTH RESEARCH

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## Climate Change and Health Beliefs, Knowledge, and Educational Needs among Disaster Providers

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### ABSTRACT

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<b>Introduction</b>	Climate change has been called the greatest public health threat of our time. Increasing morbidity and mortality is expected to continue as climate-associated disasters become more prevalent. Disaster health professionals are on the front lines of addressing these health sequelae, making the need to assess their knowledge of climate change and health and their perceived need for a policy response critically important. The purpose of this study is to examine the knowledge, opinions, and educational needs of disaster health providers surrounding climate change and health.
<b>Methods</b>	A web-based questionnaire assessing disaster health professionals' attitudes and knowledge on the health effects of climate change and associated policy recommendations was administered to a sample of disaster health professionals.
<b>Results</b>	Among the study's 150 participants, 95% responded affirmatively that climate change exists and is largely caused by humans. Two-thirds (67%) indicated climate change affects their patient's health and 93% indicated climate change will continue to affect patients in the future. Respondents also believed climate change will impact vulnerable populations such as children under four years old (75%), the elderly (72%) and those living in poverty (71%). Three-quarters (76%) indicated educating patients about climate change and its association with health outcomes should be integrated into health professions education.
<b>Conclusions</b>	Disaster health professionals need access to education on climate-change related health impacts, materials for patients and relevant policy information. This research provides evidence from front-line disaster and emergency health professionals that can inform policy on climate change and health.
<b>Keywords</b>	Climate change - Health policy - Health education - Disaster health professionals.

### INTRODUCTION

Climate change has been called the greatest public health threat of our time.<sup>1</sup> According to the World Health Organization (WHO), climate change has resulted in over 150,000 deaths annually over the past 30 years due to warming and precipitation trends<sup>2,3</sup> and is expected to cause approximately 250,000 additional deaths annually between 2030 and 2050.<sup>4</sup> Health effects of climate change are largely attributed to several broad categories, including fatalities related to weather and climate-associated disasters, increased heat stress, decreased air quality, altered disease patterns of some climate-sensitive infections, and food/water insecurity.<sup>5-8</sup>

Disasters are increasing in number and intensity, making the severity of the 2017 hurricanes in the United States a warning of possible future disasters. Disaster health professionals are on the frontlines of the effects of climate change. Through working in disasters-affected settings, in disaster education and in setting disaster policy, they can play a vital role in understanding and communicating the risk climate change poses to human health.<sup>14</sup> Previous studies have assessed attitudes on climate change and health among varied health professionals, including pulmonary and critical care providers and African-American physicians<sup>9-11</sup> in order to guide the development of health profession education around climate and health. These current approaches to addressing education on climate change among the health professions<sup>15</sup> can also apply to disaster health providers. However, an initial step to establishing a policy agenda among disaster health providers is to assess their knowledge of climate change and health, and their perceived need for a policy response. Therefore, the purpose of this study was to examine the knowledge, opinions and educational needs of disaster health providers surrounding climate change and health.

### METHODS

This descriptive study used a web-based survey. The study design and survey instrument were adopted with permission from a similar study conducted among members of the American Thoracic Society.<sup>9,10</sup> Questions were modified to better fit the population surveyed, which consisted of disaster health care responders. Specifically, the language in several questions was modified from “medical” to “professional” or from “physician” to “disaster and emergency health professionals”. See Appendix for survey instrument. Ethical approval was obtained from the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board (HUM00126779).

Data was collected via an online survey in Qualtrics administered to members and attendees (n=877) of the 2017 World Association for Disaster

and Emergency Medicine (WADEM) conference in Toronto, Canada. Two tablets with pre-loaded surveys were made available at the conference, with the permission of conference organizers. Small incentives (a first aid kit or an emergency blanket) were given to participants. Following the conference, an announcement to participate in the survey was made in a post-conference e-mail. A link was posted to the WADEM website, which was made available for approximately one month post-conference.

Survey data was exported from Qualtrics into STATA (version 15.1, College Station, TX), where univariate and bivariate statistics were calculated. Open-ended questions were edited for grammar, spelling and to abbreviate the length of the statements without altering the meaning.

### RESULTS

#### Demographics

A total of 150 individuals completed the survey, representing a response rate of 17%. The sample was equally distributed between male (48%) and female (52%) respondents. Less than half of the sample (44%) was comprised of individuals aged 40 or younger; the remaining 56 percent of respondents were 41 and over. Respondents were more likely to live outside of the United States (69%) than in the United States (31%). One-third of respondents (33%) held a medical degree and one-quarter (26%) were registered nurses. The professions of the remaining participants varied, including physician assistant, nurse practitioner, paramedic and emergency medical technician. Nearly half of respondents (46%) had been in their current practice area for more than 10 years. The most common work settings were hospitals (32%), academic/research (28%), and governmental (12%). One-third of respondents (33%) identified their practice/type of work as emergency medicine, with another 12% indicating their type of work as public health and 11% identifying their primary type of work as scientific research.

#### Beliefs

##### Existence of Climate Change and Cause

Nearly all respondents (95%) indicated that climate change is happening, and more than two-thirds indicated climate change over the past 150 years is entirely (8%) or mostly (63%) due to human activity. Only 4% indicated climate change has been caused entirely by natural changes in the environment and less than 1% indicated that climate change is not happening.

##### Impact of climate change on healthcare

Most respondents indicated climate change is relevant to direct patient care, with 39% classifying the relevance of this relationship as “a great deal” and 43% classifying it as “a moderate amount”.

Additionally, 26% of respondents reported climate change is impacting their patients' health "a great deal" and 41% indicated that climate change is impacting the health of their patients "a moderate amount". The majority of respondents (93%) agreed that climate change will continue to affect the health of their patients in the next 10-20 years. A significant relationship was seen between type of provider (MD, RN and other) and the belief that climate change is currently affecting health of patients, and is relevant to direct patient care (Table 2).

Addressing climate change

Three-quarters of respondents (77%) indicated the actions they take in their personal and/or professional life can contribute to effective action on climate change. Respondents also noted that disaster health professionals can play an active role in addressing climate and health issues. They agreed/strongly agreed that disaster health professionals have a responsibility to bring the effects of climate change to the attention of both the greater public (82%) and their patients (73%). They also agreed/strongly agreed that disaster health professionals should play a significant advocacy role in relation to climate change and health (85%) and should have a leadership role in encouraging offices, clinics, and hospitals to be as environmentally sustainable as possible (83%). A majority (81%) agreed/strongly agreed with the statement "my professional societies should have a

significant advocacy role in relation to climate change and health".

Knowledge

Participants noted that climate change affects the health of their patients through health conditions such as injuries due to severe storms, floods, droughts and fires (86%), air pollution related increases in severity of illness (84%), heat-related effects (81%), vector-borne infection (76%), increased care for allergic sensitization and symptoms of exposure to plants or mould (71%), and diarrhoea from food/waterborne illnesses (69%) (Table 1). Respondents indicated several groups that would disproportionately experience negative health effects from climate change. The groups include children aged 4 and under (75%), those 60 and older (72%), people with chronic diseases (75%) and the poor/working poor (71%). Via qualitative anecdotal responses, disaster health professionals in the sample also drew links between climate change and many of these public health threats (Table 3). However, only 22% indicated they were very knowledgeable about the association between climate change and health outcomes and 41% indicated they were somewhat knowledgeable about this association. Only 5% reported no knowledge of this association. No significant associations were seen between demographic factors and knowledge about climate change and health (Table 2).

**Table 1** Impact of Climate Change on Patient Health

	Yes (%)	No (%)	Don't Know (%)
Injuries due to severe storms, floods, droughts, fires (n=147)	86%	7%	6%
Air pollution-related increases in severity of illness (n=148)	84%	9%	7%
Heat-related effects (n=148)	81%	7%	11%
Vector-borne infection (n=148)	76%	13%	11%
Increased care for allergic sensitization and symptoms of exposure to plants or mold (n=147)	71%	10%	19%
Diarrhoea from food/waterborne illnesses (n=148)	69%	18%	14%

**Table 2** Association between demographic factors and knowledge/beliefs about climate change and health

	How knowledgeable do you feel about the association between health outcomes and climate change?		How much, if at all, do you think that climate change is relevant to direct patient care?		How much, if at all do you think that climate change is currently affecting the health of your patients?	
	x <sup>2</sup>	p-value	x <sup>2</sup>	p-value	x <sup>2</sup>	p-value
Gender (Male, Female)	3.03	0.39	8.55	0.07	5.07	0.41
Type of provider (MD, RN, Other)	12.19	0.20	24.54	0.04 <sup>a</sup>	23.10	0.08 <sup>c</sup>
Age (<=39, >40)	3.06	0.38	0.35	0.99	6.57	0.25
Location (USA, Other)	0.50	0.92	4.39	0.36	1.12	0.95
Length of time practicing (<=5, 5-10, >15)	18.27	0.11	16.36	0.43	22.20	0.33

<sup>a</sup>: p<.05

<sup>b</sup>: p<.01

<sup>c</sup>: p<.10

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**Table 3** Brief responses to the question “Please describe if you have a relevant anecdote about a patient who has experienced one of these outcomes”.

Injuries due to severe storms, floods, droughts, fires	<ul style="list-style-type: none"> <li>I worked in Manhattan during Hurricane Sandy in 2012. Patients who could not get to their dialysis centres due to power outages and other logistical problems were directly affected. Some people died.</li> </ul>
Air pollution-related increases in severity of illness	<ul style="list-style-type: none"> <li>Many patients managed for asthma and upper respiratory tract infections during dry, dusty season in Nigeria.</li> <li>Our city is in a dip between hills. We often develop an inversion layer over the city that causes respiratory difficulties for our asthmatics and COPD patients.</li> </ul>
Heat-related effects	<ul style="list-style-type: none"> <li>With temperatures soaring above 115F, the elderly report with heat stroke from home.</li> <li>Mosquito borne diseases travelling further down Australia due to warming weather.</li> </ul>
Vector-borne infection	<ul style="list-style-type: none"> <li>We are now experiencing a Lyme disease epidemic as a result of climate change.</li> </ul>
Increased care for allergic sensitization and symptoms of exposure to plants or mold	<ul style="list-style-type: none"> <li>Worsened lung symptoms due to pollution and earlier spring pollen.</li> </ul>

### Educational Needs and Barriers

Nearly all respondents (91%) indicated that continuing education on climate change and health would be helpful to them and 76% agreed that teaching about the environment and its association with health impacts should be integrated into general health professions education (Table 4). A majority (79%) of respondents indicated it would be helpful if their professional associations had

policy statements on climate change and health. Additionally, 83% agreed or strongly agreed that patient education materials on climate change and health would be helpful. Reported trusted sources of information included information from the media (66%), data in research journals (56%), international policy documents (52%), and news from their professional associations (34%).

**Table 4** Responses to “How much do you agree with the following statements?”

Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Don't Know
The primary hospital or clinic that I am associated with is well prepared for climate-related events. (n=150)	5%	30%	17%	22%	16%	9%
My primary place of work does an effective job minimizing its use of fossil fuels. (n=148)	4%	21%	26%	24%	13%	11%
Teaching about the environment and its association with health impacts should be integrated into health professions education. (n=147)	37%	39%	13%	6%	3%	2%
Disaster health professionals should have a significant advocacy role in relation to climate change and health. (n=148)	43%	42%	8%	3%	2%	1%
My professional associations should have a significant advocacy role in relation to climate change and health. (n=148)	32%	49%	9%	3%	5%	1%
I feel that actions that I take in my personal and/or professional life can contribute to effective action on climate change. (n=146)	33%	45%	14%	4%	2%	1%
Disaster health professionals have a responsibility to bring the health effects of climate change to the attention of their patients. (n=147)	30%	43%	19%	5%	2%	2%
Disaster health professionals have a responsibility to bring the health effects of climate change to the attention of the public. (n=148)	36%	45%	10%	6%	1%	1%

Disaster health professionals should have a leadership role in encouraging offices, clinics, hospitals to be as environmentally sustainable as possible. (n=147)	37%	46%	11%	3%	2%	1%
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**Barriers**

Respondents noted multiple barriers inhibiting them from taking leadership roles addressing the health effects of climate change. More than half of respondents (59%) were concerned about the current political climate; however, no significant associations were seen between political climate and type of provider ( $\chi^2=10.56$ ,  $p= 0.57$ ), location ( $\chi^2= 4.48$ ,  $p = 0.345$ ) or length of practice ( $\chi^2= 18.38$   $p= 0.302$ ). Nearly half also noted that they lack the knowledge regarding how to approach the issue with their patients (47%). One-quarter of respondents (26%) indicated they did not have time to address this issue, while 29% indicated they do not think their patients would be interested or knowledgeable enough about climate change to discuss this issue with them. Another 27% indicated that even if they addressed these issues with patients, they did not think it would make much difference in patients' overall health.

**DISCUSSION**

The purpose of this study was to describe the beliefs, knowledge, and educational needs of disaster health providers surrounding climate change and health.

**Beliefs**

Our results show that a diverse sample of disaster health professionals were attuned to the threat of climate change and its health implications. The vast majority of survey respondents believed that climate change is happening, with the majority of that change being driven by human activity.

Respondents also agreed that climate and health issues are directly relevant to direct patient care now and will continue to be in the foreseeable future, where significant associations were seen by provider type. Additionally, the findings reported here echo those from other studies of health care providers, including a sample of African American physicians,<sup>11</sup> members of the American Thoracic Society<sup>10</sup> and international members of the American Thoracic Society.<sup>9</sup>

Respondents believed they can contribute effectively both personally and professionally to addressing climate change. Action can be taken locally to educate patients and make clinics and practice more sustainable, as well as more broadly through advocacy efforts. The majority of respondents agreed that their professional associations play an important advocacy role. However, significant associations were not seen when examined by sociodemographic variables. Disaster health professionals are often also

members of other relevant disciplines such as public health and emergency care. They may be able to draw from the policy-relevant work these related associations have done. These findings add to a body of literature suggesting that health professionals from a variety of disciplines are encountering important climate change-related health concerns, and that they believe they can play an important role in mounting activity focused on climate change and health and environmental sustainability of medical workplaces.

**Knowledge**

Many respondents were able to identify the indirect health effects of climate change as they manifest in their patients, as well as the patient populations most vulnerable to these effects. However, less than a quarter of respondents felt themselves 'very knowledgeable' about the association of climate change and health. This deficiency could be interpreted not as a lack of awareness of the issue, but rather a lack of self-efficacy to effectively address it, warranting further investigation. For example, a disaster health professional may easily recognize how climate change is contributing to increased cases of vector borne illness, but may not feel empowered to effectively address such a complex and multi-faceted issue in a patient-care setting.

**Educational Needs & Barriers**

Disaster health professionals responding to this survey reported educational needs in two related but distinct areas: professional training and leadership, and patient communication. Respondents cited a need for leadership, guidance, and support from professional organizations. Many professional organizations have position statements on climate change and health,<sup>16-18</sup> though it is unclear if these are reaching members and providing guidance effectively. Efforts to communicate to members about the leadership taken by their own organizations may be needed.

In order to be more effective, support from professional associations and workplaces is needed. Achieving environmentally sustainable workplaces requires that, beyond individual clinicians, there is institutional commitment to sustainable healthcare practice and operations. Support may include dedicated training time and funds, convening of sustainability teams, or hiring a sustainability professional to spearhead efforts.

Although the impacts of climate and health are particularly important for the populations disaster health professionals serve, they often operate in austere environments. As a consequence

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of this, their own health and safety may be placed at risk. Tools to provide patient care are limited in these potentially resource-constrained settings, making prior knowledge and availability of tools and educational resources to better provide care even more important. Disaster health professionals also have competing demands on their time and effort. Tools such as continuing education to keep abreast of industry changes would help overcome some of the barriers they face when trying to develop skills to address climate change and health and contribute to sustainability efforts in low-resource, high-need care settings. Organizations that may provide further support from existing materials, resources, and educational modules are Healthcare Without Harm, (19) Practice Green health,<sup>20</sup> and Alliance of Nurses for Healthy Environments.<sup>21</sup>

The need for climate and health topics to be covered in healthcare professional training was also noted by respondents. The field of sustainability is growing rapidly both nationally and globally and relevance to health professional training is widely recognized.<sup>13,22-24</sup> Though widespread curricular uptake has yet to occur, learning modules are being developed. A locally relevant focus lends itself well to scenario- and case-based learning interventions that have been developed by nurses, environment professionals, and others.<sup>23,25,26</sup> These real-life, story-based, hands-on, and multimedia teaching and learning methods lend themselves well to learners of varying backgrounds and experiences. Adaptable, modular educational materials also allow for adaptability and tailoring in resource-constrained environments.

Respondents also reported a need for patient communication materials, as well as educational and professional development opportunities to build skills in patient communication related to climate and health challenges. Development of these resources needs to take into account significant barriers to patient communication about climate change including limited time, lack of patient interest and background knowledge, as well as differing beliefs stemming from a polarized political environment. Some respondents were doubtful that communicating with patients about climate change would have any impact on their overall health. Strategies for overcoming these barriers in patient communication may include avoiding polarizing language - perhaps omitting the use of phrases "climate change" and "global warming" entirely, instead using alternative terminology. Finding common ground and illustrating relevance to the patient is crucial. Focusing patient communication materials on locally relevant health concerns rather than the challenge of climate change as a whole may be effective.

Open-ended responses showed disaster health professionals described specific effects of climate change on health and offered anecdotes. This underlines the fact that although climate change is global, and can be perceived as an abstract concept, its health effects, disasters, and disruptions are local. Health impacts will vary across regions and locale; but solutions must respond to local effects. This fact is liberating when it comes to tackling educational needs. Disaster health professionals can help patients focus in on efforts for prevention, mitigation, adaptation, and treatment that are relevant to them. Climate's effects on health can also be viewed as a lens with which to view and frame existing patient care needs, thus allowing synergy, rather than an additional topic to master. Focusing on local, more tangible ramifications of climate change and health challenges may also allow the controversial terms to be avoided and ease political tensions.

## LIMITATION

The primary limitation to this study is the small sample size, which limits the reach of these findings, and the statistical power. Although the sample was diverse in many respects, caution should still be used in generalizing results to disaster health professionals in all contexts and settings and/or health professionals at large.

## CONCLUSION

Despite scientific evidence clearly documenting the impact of climate change on human health, policy responses and educational interventions are lacking<sup>9-11</sup> for health care providers.<sup>12,13</sup> Based on this study, disaster health professionals internationally are ready and willing to engage and assume leadership roles in issues of climate change and health, and they believe such leadership is consonant with their professional roles and obligations. However, they face barriers at several levels, including resource and time constraints, political tensions, and the challenges of effective patient communication. Despite strong beliefs about the relevance of climate change to health, few respondents reported high levels of knowledge about this association. The need for integration of climate and health material in disaster health professional training, continuing education, and patient communication was emphasized. This study supports the growing evidence for the health education community to develop tools and modules to support the needs of disaster health professionals.

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