PAN AMERICAN JOURNAL OF PUBLIC HEALTH

Original research

Pan American climate resilient health systems: a training course for health professionals

Cecilia Sorensen[1], Carolos Barboza[2], Peter Berry[3], Daniel Buss[4], Haley Campbell[1], Kristie Hadley[1], Nicola Hamacher[1], Danielly Magalhaes[1], Gilma Mantilla[1], Anwar Mendez[4], Karen Polson-Edwards[4], Anna Stewart-Ibarra[5], and IreneTorres[5]

Suggested citation. Sorensen C, Barboza C, Berry P, Buss D, Campbell H, Hadley K, et al. Pan American climate resilient health systems: a training course for health professionals. Rev Panam Salud Publica. 2024;48:e83. https://doi.org/10.26633/RPSP.2024.83

ABSTRACT

Objectives. To describe the development, implementation, and results of a training course designed to equip health professionals from the Pan American Health Organization region with the knowledge and tools needed to adapt health systems to current climate realities.

Methods. The *Pan American climate resilient health systems* course was a 9-week live-virtual course in March–April 2023, which was delivered through Zoom and offered in English, Spanish, and French. All lectures were delivered by local and regional climate and health experts. The curricular foundation of this initiative was the Global Consortium on Climate and Health Education core competencies for health professionals. Participants completed pre- and post-course surveys.

Results. A total of 1212 participants attended at least one of the nine sessions and 489 (from 66 countries) attended at least six sessions. Of these, 291 participants completed both the pre- and post-course surveys which were used in the analysis. Longitudinal survey results suggested an improvement in participants' climate and health communication, an increased frequency of incorporating climate knowledge in professional practice, and improved confidence in engaging in climate initiatives. At the same time, many participants expressed a need for additional training.

Conclusions. The results indicate that live-virtual courses have the potential to empower health professionals to contribute to climate resilience efforts by: increasing their communication skills; changing their professional practice; increasing their ability to lead climate and health activities; and preparing them to assess vulnerability and adaptation in health systems, measure and monitor environmental sustainability, and apply a health equity lens.

Keywords Capacity building; environmental health education; climate change; health system resilience; Americas.

Health systems are on the frontline of climate change, and are bearing the costs of increasing climate-related disease burdens and the consequences of more frequent extreme weather events (1–5). In addition to being affected by the changing climate, health systems themselves unintentionally contribute to adverse climate and environmental impacts (6). The Intergovernmental Panel on Climate Change (IPCC) states that "With proactive, timely and effective adaptation, many risks for human health and well-being could be reduced and some potentially avoided (very high confidence)" (7). Therefore, rapidly scaling up climate change adaptation and mitigation measures in health systems, through structural and operational transformations, is

[1] Global Consortium on Climate and Health Education, Department of Environmental Health Sciences, Mailman School of Public Health, Columbia University, New York, NY, United States of America. Cecilia Sorensen, ✉ cjs2282@cumc.columbia.edu

[2] Environmental Health and Climate Change, Ministry of Public Health, Montevideo, Uruguay.

[3] Faculty of Environment, University of Waterloo, Waterloo, Ontario, Canada.

[4] Unit on Climate Change and Environmental Determinants of Health, Pan American Health Organization, Washington, DC, United States of America.

[5] Inter-American Institute for Global Change Research, Montevideo, Uruguay.

crucial for reducing current and future effects on human health (8). This includes ensuring that the workforce has the knowledge and capacity to recognize climate-related health outcomes and actively engage in climate and health adaptation and mitigation efforts (9).

The recently approved Climate Change and Health Resolution (WHA A77.7) at the 77th World Health Assembly recognized this gap and urged the Director-General of the World Health Organization (WHO) to support Member States, upon their request, in the development of national strategies for sustainable and climate-resilient health systems (10). This support includes capacity-building of health professionals and providing training to health professionals on the interdependence of climate change and health. WHO's *Operational framework for building climate resilient and low carbon health systems* also promotes the need for a "climate-smart workforce" (11). Without proper training, health professionals may contribute to maladaptation, increasing risks to individuals, communities, and health systems. Yet, with a few exceptions, climate change education is generally absent in health professional training, leaving health professionals without the necessary knowledge and skills to identify, prepare for, and respond to current and future climate-related threats effectively (12). According to the *2021 WHO climate and health country survey*, 54% of the 46 countries identified insufficient capacity of human resources as a primary barrier to the implementation of national health and climate plans, while 46% cited inadequate access to tools, methods, and technologies (13).

Globally, a considerable gap exists in knowledge among health professionals on the interactions between climate and health. A 2018 review found that, while most health professionals understood that climate change was happening and affecting health, many felt they lacked sufficient knowledge on the topic (14). In a survey of 877 health providers working in disasters at the 2017 conference of the World Association for Disaster and Emergency Medicine, only 22% felt very knowledgeable about the association between climate and health, while 41% were somewhat knowledgeable (15). The situation is likely worse in low- and middle-income countries where colonial practices based on western knowledge and lacking contextual relevance in some health care education, combined with a lack of climate literacy among institutions and policy-makers hinder the promotion of climate education and necessary adaptations (16). This leaves health care providers poorly prepared and underscores the need for training to support national climate action plans and address health disparities. Additionally, despite a strong commitment to education and advocacy, health professionals face personal, professional, and societal barriers—especially time constraints—that hinder their efforts. Resources such as continuing education, communication training, and policy guidance can help overcome such obstacles (17).

Efficient, time-sensitive training tailored to local priorities is crucial for enhancing health professionals' knowledge and practice. Since the health effects of climate change depend on a number of factors, including geographical location, severity of hazards, exposure levels, population vulnerabilities, and effectiveness of the health care system (18), training programs must be customized to address region-specific challenges. Localized training by community experts empowers health professionals to respond to specific health risks and incorporate culturally relevant practices and local/indigenous knowledge, thus increasing the applicability and usability of the training. This increases the likelihood that the training can be effectively used to implement solutions that align with existing community resources and expertise. Regional customization of training can also support the development of targeted strategies for climate change adaptation and mitigation (e.g., through climate change and health vulnerability and adaptation assessments), ultimately contributing to increased resilience and better health outcomes for the community.

This manuscript details the development, use, and evaluation of a regional 14-hour live-virtual course entitled *Pan American climate resilient health systems*, organized by the Global Consortium on Climate and Health Education (GCCHE), Health Canada, the Inter-American Institute for Global Change Research, and the Pan American Health Organization (PAHO). The course aimed to equip participants with the knowledge and tools to build climate resilience within health systems, including how to: (i) apply best practices to assess health system vulnerabilities and adaptation options; (ii) measure and monitor climate resilience; and (iii) promote environmental sustainability of health systems, integrating health equity, and undertaking broad stakeholder engagement. A longitudinal survey was conducted to evaluate whether the course increased health professionals' capacity to address climate and health threats.

METHODS

Program structure

This course was offered in March–April 2023 and spanned 5 weeks, with bi-weekly, 90-minute, live-virtual sessions on Zoom, with live interpretation in English, Spanish, and French. All lectures were delivered by local and regional climate and health experts and had accompanying online reading and learning resources. Participants had the opportunity to engage in a question-and-answer format through the chat function, with key questions relayed to and answered live by regional experts. Additional resources, such as multilingual presentation slides and suggested readings (e.g., guidelines, reports, and papers), were provided to participants before each session. Sessions were recorded and made freely available afterwards.

Session attendance was tracked using Zoom and participants who attended at least six sessions and passed a final exam with a minimum score of 80% received a certificate of participation. The course was offered free of charge.

Program content

The curricular foundation of this initiative was the GCCHE core competencies for health professionals, which are reviewed every 18 months by our interprofessional and international coordinating committee and thoroughly evaluated by our entire Consortium (12). The course curriculum (additional information on curriculum details is available through the corresponding author) was developed in collaboration with experts from the GCCHE, Health Canada, the Inter-American Institute for Global Change Research, and PAHO. Input from various ministries of health and environment, as well as from civil society climate and health practice communities in the Americas, was sought and incorporated into the course

planning. The course was divided into nine sessions (Table 1) with each session presenting foundational theory followed by exploration of regional case studies.

Audience

The course was designed to nurture interdisciplinary collaboration among diverse health-related professionals, including health system planners, hospital administrators, clinical health care business continuity officers, emergency planners, sustainability officers, public health officials, and health practitioners, as well as researchers and students. While certain groups were targeted, no limitations were placed on who could register for the course.

Recruitment and enrollment

The recruitment and enrollment outreach efforts used channels, including email campaigns and social media posts by participating organizations. A pre-course survey was included in the course registration. On the last day of the course, all registrants who attended at least one session were sent an email inviting them to participate in a post-course survey. Demographic information of each participant who enrolled in the study was obtained from the registration information. Only those who attended one class (verified through Zoom attendance) were counted as registered. The study protocol was approved by Columbia University's Institutional Review Board (AAAR4912).

Survey description

Longitudinal survey. The longitudinal survey was a structured survey to assess the effectiveness of this training course in affecting professional behavior related to climate and health communication, application of climate and health knowledge skills, and engagement or action to address climate and health risks. Response data were collected in Qualtrics (Silver Lake, Seattle, WA, U.S.A.), where participants were identified by their email. Responses were anonymized before being analyzed.

With regard to communication, survey participants were assessed before and after the course on the degree to which they communicated with patients, community members, and colleagues about the risks of climate change to health. Multiple choice options were given, namely: frequently, sometimes, rarely, and never.

With regard to application, survey participants were assessed before and after the course about the degree to which they incorporated climate change and health knowledge and skills in their professional work environment. Response options included: strongly agree, agree, neutral, disagree, and strongly disagree.

With regard to engagement, survey participants were asked before and after the course how confident they felt that they could engage with a climate and health initiative within their community, institution, or professional area of practice. Response options included: very confident, somewhat confident, not very confident, definitely not confident.

Post-survey questionnaire. The post-course questionnaire included further questions asking participants to reflect on the effectiveness of the course, how the course may change their practice, their ability to lead adaptation and mitigation initiatives in their communities, self-evaluation of skills and knowledge gained during the course, how confident participants felt using these skills and knowledge in the future, and areas for course improvement.

TABLE 1. Curricular outline of the *Pan American climate resilient health systems course*

Session	Topic
1	Introduction – health care systems in a changing climate
2	Assessing risks to human health and health systems from climate change
3	Focusing on health facilities: assessing risks and opportunities for adaptation and resilience building
4	Considering the health adaptation process: key actors, activities, and partnerships
5	Integrating health equity into efforts to address climate change: identifying uniquely vulnerable populations for adaptation and greenhouse gas mitigation
6	Estimating the costs of the effects of climate change on health and health systems
7	Identifying opportunities and guidance for lowering the carbon footprint of health systems
8	Measuring, monitoring, and evaluating progress in developing the climate resilience and environmental sustainability of health systems
9	Effectively communicating climate change risks to stakeholders and the public

Source: Prepared by authors.

Analysis

The course evaluation assessed how the course influenced participants' behaviors that were conducive to improving climate resilience in the health sector. The analysis included only participants who attended at least six live sessions, completed all the registration questions, and submitted the end-of-course survey. All data from registration, course participation, and pre- and post-surveys were organized and analyzed using RStudio. For each longitudinal survey question, responses were modified into numbers, creating a Likert scale, from 1 (definitely not confident or never) to 4 (very confident or frequently). The scale was used to calculate a mean pre- and post-course survey score. The number of respondents for each possible answer and a total number of respondents were used to calculate the percentage responses to each question in the pre- and post-surveys. After making these calculations, the pre-course survey percentages and participant numbers were subtracted from post-course survey percentages and participant numbers for each question. These data were then assessed for statistical significance using Wilcoxon signed rank tests. All other questions were analyzed using total responses and corresponding percentages.

RESULTS

Demographics and participation

The course had 2 487 people registering, of whom 1 212 attended at least one session and 489 (from 66 countries)

completed the course, meaning they attended at least six sessions. Of those who completed the course, 291 participants from 54 countries completed both the pre- and post-course surveys and these respondents were used in the analysis.

Most participants were from the government/public sector (43.6%), followed by academia (28.9%), nongovernmental and nonprofit organizations (16.8%), and the private sector (10.7%). A large proportion of participants were professionals in public health (29.9%), environmental health (13.4%), and related fields (Table 2). This trend persisted when segmented into government, nongovernmental organizations, and academia categories. In the private sector, the largest representation came from environmental engineers (19.3%), followed by physicians and public health experts (16.1% combined). English was the preferred language (64.6%), followed by Spanish (31.6%) and French (2.7%).

TABLE 2. Occupation of course participants included in the analysis

Profession	n (%) (*n*=291)
Public health professional	87 (29.9)
Environmental health professional	39 (13.4)
Other	33 (11.3)
Nurse	23 (7.9)
Environmental engineer	20 (6.9)
Physician	20 (6.9)
Educator	10 (3.4)
Health care administrator	10 (3.4)
Natural/physical scientist	10 (3.4)
Public policy professional	7 (2.4)
Economics/finance professional	5 (1.7)
Pharmacist	4 (1.4)
Engineer	3 (1.0)
Physical/occupational/speech therapist	3 (1.0)
Veterinarian	3 (1.0)
Information technology professional	2 (0.7)
Social worker	2 (0.7)
Urban planner/Architect	2 (0.7)
Advanced practice provider	1 (0.3)
Clinical social worker	1 (0.3)
Communications/marketing professional	1 (0.3)
Dentist	1 (0.3)
Emergency responder	1 (0.3)
Journalist/Media professional	1 (0.3)
Lawyer	1 (0.3)
Mental health professional	1 (0.3)

Source: Prepared by authors from the results.

Longitudinal survey

Communication. Compared with the beginning of the course, no significant changes were seen in participants' reported communication on the health effects of climate change with colleagues, patients, or community members after taking the course. Pre- and post-course, 86.6% of participants reported communicating about the topic either sometimes or frequently.

Application. Compared with the beginning of the course, no significant changes were seen in participants' reported incorporation of climate and health knowledge and skills into their professional practice. Pre-course, 82.1% of participants reported frequently or sometimes incorporating climate and health considerations into their professional practice, which increased to 85.3% on post-evaluation.

Engagement. No significant differences were seen after the course in participants' confidence to engage in initiatives to enhance health sector resilience to climate and health impacts in their community, institution, or practice. Before the training, most participants felt very confident (47.4%) or somewhat confident (40.9%) compared with after training, when 45.5% felt very confident and 49.5% felt somewhat confident.

End-of-course survey

The post-course survey assessed participants' self-evaluation of skills and knowledge acquired during the course and areas for potential course improvement. At the end of the course, 182 (62.5%) participants felt very prepared to have conversations (about climate change and health) with all contacts and 103 (35.4%) felt prepared in limited scenarios. Similarly, 105 (36.1%) participants reported that the knowledge and skills they had gained would change their professional practice to a large degree, while 160 (55.0%) reported that some aspects of their professional practice would change.

Participants were also asked about their ability to lead climate and health resilience activities. About a third of participants stated that they now felt prepared to lead climate and health resilience initiatives – 100 (34.4%) participants. A further 154 (52.9%) participants stated that they felt more prepared, but still needed further knowledge and experience to serve as a leader.

Most participants (91.9%) agreed or strongly agreed that the course adequately prepared them to apply methodologies and frameworks for assessing vulnerability and adaptation in health systems (Figure 1). Similarly, most participants (86.5%) agreed or strongly agreed that the course adequately prepared them to apply approaches for measuring and monitoring the environmental sustainability of health systems and identify opportunities for green health systems (Figure 1). Additionally, 88.3% agreed or strongly agreed that the course adequately prepared them to apply a health equity lens when addressing health system decarbonization and building climate resilience (Figure 1).

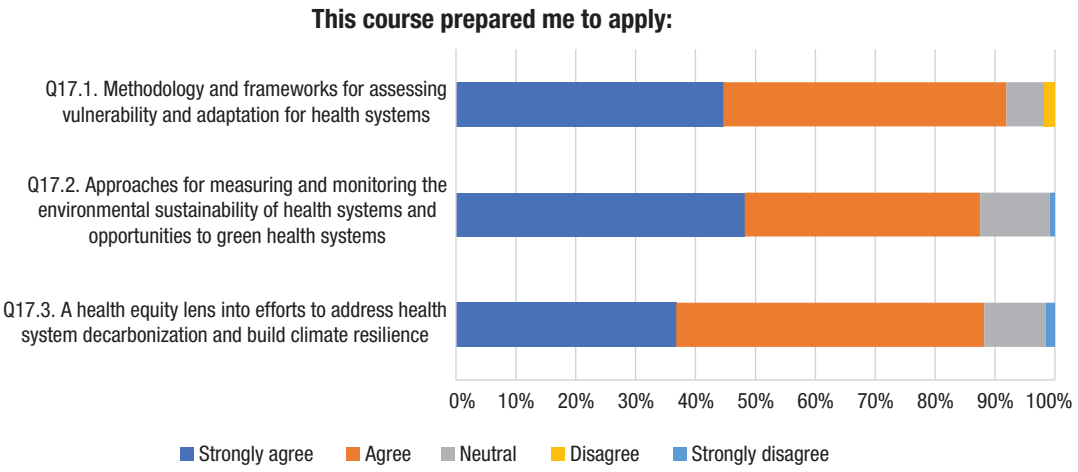
In the post-course survey, variation was found between participant groups about the most valuable course topics. The most highly rated topics included communication, risk assessment and measuring, and monitoring and evaluating climate-resilient health systems. Similarly, variation was seen between participant groups about topic areas in which additional education would be needed (Table 3).

Most participants expressed interest in joining a regional climate and health community of practice (74.6%) and in receiving training tailored to their respective country or region (75.9%).

DISCUSSION

Health systems are on the front lines of the climate emergency. However, a lack of education and training are barriers to health professional engagement in adapting health systems to the

FIGURE 1. Post-course survey responses on course effectiveness in achieving stated goals (*n*=112)



current climate and environmental realities and taking meaningful action to mitigate the root causes of climate change stemming from health system activities (17, 19). The *Pan American climate resilient health systems* course was successful in equipping participants from 66 countries and more than 25 health professions with the knowledge and skills needed to build climate-resilient health systems. The course prepared participants to apply methodologies for assessment of health system vulnerability, environmental sustainability measurement, and the integration a health equity lens in climate resilience efforts. It also increased participants' knowledge of climate and health concepts, and boosted their confidence and ability to implement climate and health initiatives, and lead and communicate on these issues, as shown by the post-course survey results. Given the urgent challenges posed by climate change, courses such as this one, designed by trusted regional stakeholders using evidence-based guidelines (20) and distributed on a free, multilingual platform, can rapidly disseminate knowledge and build capacity to protect patients, communities, and health systems. This approach has proven effective as shown by a study that evaluated three large online courses on climate and health (21). These courses attracted a diverse global audience, including many participants from low-income countries, and demonstrated the potential for capacity-building and acting as an enabler for equitable access to good quality education worldwide (21).

TABLE 3. Reported topics of highest relevance and topics in need of additional education, by sector

Sector	Most relevant topics (>70% response)	Topics in greatest need of additional education (>70% response)
Government and public	B, H, I	H, I
Private	B, H, I	F, G, H
Academia	B, H, I	B, H, I
Nongovernmental organizations	B, I	G, H, I

Topic: (A) Health care systems in a changing climate; (B) Assessing risks to human health and health systems from climate change; (C) Focusing on health facilities: assessing risks and opportunities for adaptation and resilience building; (D) Considering the health adaptation process: key actors, activities, and partnerships; (E) Integrating health equity into efforts to address climate change; (F) Estimating the costs of the effects of climate change on health and health systems; (G) Identifying opportunities and guidance for lowering the carbon footprint of health systems; (H) Measuring, monitoring, and evaluating climate resilient health systems; (I) Effectively communicating climate change risks to health to stakeholders and the public.
Source: Prepared by authors from the results

To our knowledge, this is the first multilingual, live course explicitly designed to prepare health professionals for building climate-resilient health systems; thus, it is difficult to make direct comparisons with other studies. Institutions including Harvard University (22), Imperial College London (23), Yale University (24), and the WHO Academy (25) offer publicly accessible climate and health-related courses online. However, some of these programs often charge fees, thus limiting access to health professionals from low-income countries (24). They also generally have long durations, which requires considerable time commitment from already overburdened health professionals (23, 24), or they are self-paced which can lead to low participant retention (22, 23, 25). Furthermore, all these courses are typically only available in English and are not tailored to the specific characteristics and challenges of different regions, except for the Yale course that has some specific regional modules. Our findings generally concur with results of similar region-based climate and health education and capacity-building courses designed and organized by GCCHE (20). Notably, the 2022 *Caribbean climate and health responder* course showed statistically significant longitudinal changes in participants' intentions to communicate, apply, and engage in climate and health discussions and activities after participating in a 10-session live-virtual course (20). In our regional course, longitudinal changes were not statistically significant. This could be because at baseline, participants reported high levels of climate and health communication and engagement before the course began, as well as because the survey did not have sufficient power to reach significance. The high baseline preparedness may be the result of participants being self-selected professionals already sensitized to the importance of climate and health.

Only a minority of participants strongly agreed that they were fully confident to lead climate and health initiatives after the course; many reported needing additional training in measuring, monitoring, and evaluating climate-resilient health systems, and other topics (Table 3). More tailored courses and complementary capacity-building are needed to address these gaps. Many important knowledge gaps and uncertainties still exist about the measurement of health system resilience, adaptation indicators, data availability, communication, and the robust projection of health effects associated with climate change (26–28). Climate-resilience in health sectors is

an emerging science, and so the limited knowledge currently available creates challenges for capacity-building efforts. As the scientific understanding of the effects of climate on health and the broader field matures, continuous assessment of the most relevant topics for health professionals and the best methods to convey this information will be crucial.

In addition to specific knowledge gaps, other barriers for health professionals to feel fully prepared to lead climate efforts in the health sector should be considered, although not all will be successfully addressed through training. These barriers include a lack of national and local governance structures to enable effective action and financial support (29). If health professionals do not have agency to act within their workplaces or communities, then additional knowledge alone will not be enough to promote leadership or action. Other beneficial skills include leadership, management, communication, and community organization (30). Additionally, courses that are sector-specific, skill-specific, or geographically specific will likely be important.

Strengths

This study introduces an innovative educational approach that can be replicated to substantially improve the preparedness of health professionals to address the effects of climate change on health and support planning and action. The educational opportunity aligns closely with recent frameworks and guidelines, such as the WHO *Operational framework for building climate resilient and low carbon health systems* (11) and the *Communicating on climate change and health: toolkit for health professionals* (31). The live and interactive format of the toolkit allows participants to pose questions, seek clarification, engage in practical discussions, and build professional networks. This dynamic approach enriches the learning experience by promoting engagement and deepening participants' understanding of the subject matter.

The method of our course facilitated its broad outreach to health professionals from 66 countries and more than 25 health professions. Originally developed for participants across all the Americas, the course's global participation underscores the scarcity of training opportunities and the growing interest of health professionals in addressing climate challenges. Simultaneous interpretation in English, Spanish, and French improved accessibility and inclusivity. Multilingual video recordings of each session enabled participants with varying schedules and internet access to engage in the training. Finally, the strong positive response from participants around future engagement, including interest in hosting similar courses regionally or joining a community of practice, demonstrates an untapped opportunity to engage further and utilize health expertise to address the climate crisis, which echoes findings from previous trainings organized by GCCHE (20, 32, 33).

Limitations

The study's limitations include the participation in the survey was likely biased towards English-speaking participants since the pre-course registration was only available in English. While the survey responses provide valuable insights, reliance on self-assessed outcomes instead of on objective knowledge measures or clear pre- and post-training benchmarks may obscure the true effect of this course. The lack of a significant change in the longitudinal survey results may be due to high pre-training competence, as well as a bias towards those who were self-motivated to complete the survey; however, this finding also raises questions about the need for improvements in course content and/or delivery.

Recommendations for future courses

Based on our analysis, five major actions are recommended for future versions of this course and follow-up courses.

1. Increase training on "measuring, monitoring, and evaluating climate resilient health systems" as all the sectors indicated that this topic was a priority and that they needed deeper knowledge in this area.
2. Develop profession- and sector-specific follow-up short-courses/workshops to address the specific needs for deeper learning of the various sectors.
3. Develop future courses through a review of the communications needs of health professionals and practical application of information in health professional activities
4. As regards evaluation, consider incorporating objective assessments or pre- and post-course knowledge evaluations to obtain a more accurate understanding of the effectiveness of the training.
5. Change the baseline and follow-up questions to reflect the targeted audience of this non-introductory course to allow for more meaningful post-course analysis.

Conclusion

Climate change is a health emergency that will continue to have a substantial effect on health and health systems around the world. As the global community grapples with the escalating effects of climate change, the role of well prepared and knowledgeable health professionals becomes increasingly important. Capacity-building for health professionals is a fundamental step to adequately respond to the scale of the climate crisis. Live-virtual, evidence- and competency-based, and region-specific courses have the potential to shape behaviors, enhance communication, promote practice adaptation, and foster engagement in climate initiatives. Furthermore, such courses equip health professionals with the capability to play a leadership role in raising awareness among decision-makers within and outside of the health sector about the consequences of climate change and the necessity to safeguard both human health and the planet.

Authors contributions. CS, DM, KH, and NH analyzed the data and wrote the manuscript. All authors critically revised and approved the final version of the manuscript and are accountable for all aspects of the work.

Conflicts of interest. None declared.

Disclaimer. Authors hold sole responsibility for the views expressed in the manuscript, which may not necessarily reflect the opinion or policy of the *Revista Panamericana de Salud Pública/Pan American Journal of Public Health* or the Pan American Health Organization.

REFERENCES

1. George AM, Ansumana R, de Souza DK, Niyas VKM, Zumla A, Bockarie MJ. Climate change and the rising incidence of vector-borne diseases globally. Int J Infect Dis. 2024; 139:143–5. https://doi.org/10.1016/j.ijid.2023.12.004
2. Margolis HG. Heat waves and rising temperatures: human health impacts and the determinants of vulnerability. In: Pinkerton KE, Rom WN, editors. Climate change and global public health. Cham: Springer; 2021:123–61 [cited 2024 Jan 29]. Available from: https://link.springer.com/chapter/10.1007/978-3-030-54746-2_7
3. Saulnier DD, Brolin Ribacke K, Von Schreeb J. No calm after the storm: a systematic review of human health following flood and storm disasters. Prehosp Disaster Med. 2017;32(5):568–79. https://doi.org/10.1017/S1049023X17006574
4. Sorensen CJ, Salas RN, Rublee C, Hill K, Bartlett ES, Charlton P, et al. Clinical implications of climate change on US emergency medicine: challenges and opportunities. Ann Emerg Med. 2020;76(2):168–78. https://doi.org/10.1016/j.annemergmed.2020.03.010
5. World Health Organization. Operational framework for building climate resilient health systems. Geneva: WHO; 2015 [cited 2024 Jan 29]. Available from: https://iris.who.int/handle/10665/189951
6. Dzau VJ, Levine R, Barrett G, Witty A. Decarbonizing the U.S. health sector — a call to action. New Engl J Med. 2021;385(23):2117–9. https://doi.org/10.1056/NEJMp2115675
7. IPCC. Climate change 2022: impacts, adaptation, and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. H-O Pörtner, DC Roberts, M Tignor, ES Poloczanska, K Mintenbeck, A Alegría, et al., editors. Cambridge: Cambridge University Press; 2022. https://doi.org/10.1017/9781009325844
8. Palmeiro-Silva YK, Yglesias-González M, Blanco-Villafuerte L, Canal-Solis K, Neyra RC, Fernández-Guzmán D, et al. The Lancet Countdown South America: increasing health opportunities by identifying the gaps in health and climate change research. Lancet Reg Health Am. 2023:26:100605. https://doi.org/10.1016/j.lana.2023.100605
9. Jagals P, Ebi K. Core competencies for health workers to deal with climate and environmental change. Int J Environ Res Public Health. 2021;18(8):3849. https://doi.org/10.3390/ijerph1808384
10. World Health Organization. WHA A77/A/CONF./7: climate change and health. Geneva: WHO; 2024.
11. World Health Organization. Operational framework for building climate resilient and low carbon health systems. Geneva: WHO; 2023. https://iris.who.int/handle/10665/373837
12. Sorensenid C, Campbell H, Depoux A, Finkel M, Gilden R, Hadley K, et al. Core competencies to prepare health professionals to respond to the climate crisis. PLOS Clim. 2023;2(6):e0000230. https://doi.org/10.1371/journal.pclm.0000230
13. World Health Organization. 2021 WHO health and climate change global survey report. Geneva: WHO; 2021 [cited 2024 Jan 29]. Available from: https://iris.who.int/handle/10665/348068
14. Hathaway J, Maibach EW. Health implications of climate change: a review of the literature about the perception of the public and health professionals. Curr Environ Health Rep. 2018;5(1):197–204. https://doi.org/10.1007/s40572-018-0190-3
15. Bell SA, Czerwinski M, Horowitz J, Iwashyna TJ, Sarfaty M. Climate change and health beliefs, knowledge, and educational needs among disaster providers. Int J Public Health Res. 2019;9(2):1127–34.
16. Mazumder H, Hossain MM. Climate change education for healthcare professionals: crucial gaps in low-income and middle-income countries. Lancet Planet Health. 2024;8(4):e216. https://doi.org/10.1016/S2542-5196(24)00010-X
17. Kotcher J, Maibach E, Miller J, Campbell E, Alqodmani L, Maiero M, et al. Views of health professionals on climate change and health: a multinational survey study. Lancet Planet Health. 2021;5(5):e316. https://doi.org/10.1016/S2542-5196(21)00053-X
18. Crimmins A, Balbus J, Gamble JL, Beard CB, Bell JE, Dodgen D, et al., editors. Climate change impacts in the United States: The Third National Climate Assessment. Washington, D.C.; U.S. Global Change Research Program; 2016.
19. Shea B, Knowlton K, Shaman J. Assessment of climate-health curricula at international health professions schools. JAMA Netw Open. 2020;3(5):e206609. https://doi.org/10.1001/jamanetworkopen.2020.6609
20. Sorensen C, Hamacher N, Campbell H, Henry P, Peart K, De Freitas L, et al. Climate and health capacity building for health professionals in the Caribbean: a pilot course. Front Public Health. 202;11:1077306. https://doi.org/10.3389/fpubh.2023.1077306
21. Barteit S, Sié A, Yé M, Depoux A, Louis VR, Sauerborn R. Lessons learned on teaching a global audience with massive open online courses (MOOCs) on health impacts of climate change: a commentary. Global Health. 2019;15(1):1–5. https://doi.org/10.1186/s12992-019-0494-6
22. Harvard University. The health effects of climate change [internet]. 2024 [cited 2024 Jan 29]. Available from: https://pll.harvard.edu/course/health-effects-climate-change
23. Imperial College London. Global health challenges and governance specialization: climate change and health [internet]. 2024 [cited 2024 Jan 29]. Available from: https://www.coursera.org/specializations/global-health-challenges-governance
24. Yale School of Public Health. Climate change and health certificate [internet]. 2024 [cited 2024 Jan 29]. Available from: https://ysph.yale.edu/cchcert/
25. World Health Organization Academy. Alliance for Transformative Action on Climate and Health. Online training course: climate change and health [internet]. 2023 [cited 2024 Jan 29]. Available from: https://web-staging.lxp.academy.who.int/coursewares/course-v1:WHOA+0021_CCH_EN+2023
26. Jones L. Resilience isn't the same for all: comparing subjective and objective approaches to resilience measurement. WIREs Clim Change. 2019;10(1):e552. https://doi.org/10.1002/wcc.552
27. Uppalapati SS, Campbell E, Kotcher J, Maibach EW. Public and health professional engagement with climate change as a health issue: a review of the literature. SSRN. 2023 Jul 31. http://dx.doi.org/10.2139/ssrn.4536308
28. World Health Organization. Measuring the climate resilience of health systems. Geneva; WHO; 2022 [cited 2024 Jan 29]. Available from: https://iris.who.int/handle/10665/354542
29. Sheehan MC, Fox MA, Kaye C, Resnick B. Integrating health into local climate response: lessons from the U.S. CDC Climate-Ready States and Cities Initiative. Environ Health Perspect. 2017;125(9):094501. https://doi.org/10.1289/EHP1838
30. Basu G, Stojicic P, Goldman A, Shaffer J, McCormick D. Health professionals organizing for climate action: a novel community organizing fellowship. Acad Med. 2024;99(4):408–13. https://doi.org/10.1097/ACM.0000000000005637
31. World Health Organization. Communicating on climate change and health: toolkit for health professionals. Geneva: WHO; 2024 [cited 2024 Jan 29]. Available from: https://iris.who.int/handle/10665/376283
32. Hamilton W, Philippe C, Hospedales J, Dresser C, Colebrooke B, Hamacher N, et al. Building capacity of healthcare professionals and community members to address climate and health threats in The Bahamas: analysis of a green climate fund pilot workshop. Dialoguesn Health. 2023;3:100141 https://doi.org/10.1016/j.dialog.2023.100141
33. Wheat S, Katzman J, Herring D, Tomedi L, Sood N, Sorensen C. Climate-health tele-education as a force multiplier: a train-the-trainer ECHO course series. J Clim Change Health. 2023;14:100282. https://doi.org/10.1016/j.joclim.2023.100282

Manuscript received on 6 June 2024. Revised version accepted for publication on 3 July 2024.

Sistemas de salud panamericanos resilientes frente al clima: curso de capacitación para profesionales de la salud

RESUMEN

Objetivos. Describir la elaboración, la puesta en práctica y los resultados de un curso de capacitación diseñado para dotar a los profesionales de salud de la Región de la Organización Panamericana de la Salud de los conocimientos y las herramientas necesarios para adaptar los sistemas de salud a las realidades climáticas actuales.

Métodos. El *Curso Panamericano de Resiliencia al Clima para Sistemas de Salud* fue un curso virtual impartido a lo largo de nueve semanas, en marzo y abril del 2023. Se dictó en directo por medio de Zoom y se ofreció en español, francés e inglés. Todas las ponencias corrieron a cargo de expertos locales y regionales en clima y salud. El temario de esta iniciativa se basó en las competencias básicas para profesionales de la salud del Consorcio Global sobre Educación en Clima y Salud. Los participantes respondieron a cuestionarios antes y después del curso.

Resultados. Hubo un total de 1212 participantes que asistieron al menos a una de las nueve sesiones y 489 (de 66 países) que asistieron a un mínimo de seis. De ellos, 291 respondieron a los cuestionarios previos y posteriores al curso que se usaron para el análisis. Los resultados longitudinales del cuestionario indicaron una mejora en la comunicación de los participantes sobre el clima y la salud, una mayor frecuencia de incorporación de los conocimientos sobre el clima en la práctica profesional y una mayor confianza a la hora de participar en iniciativas relacionadas con el clima. Asimismo, muchos participantes expresaron la necesidad de una mayor capacitación.

Conclusiones. Los resultados indican que los cursos virtuales en directo brindan la posibilidad de facultar a los profesionales de la salud para que contribuyan a los esfuerzos de resiliencia frente al clima mediante: la mejora de sus competencias en materia de comunicación; la introducción de cambios en el ejercicio de su profesión; la mejora de su capacidad para dirigir actividades relacionadas con el clima y la salud; y la preparación para evaluar la vulnerabilidad y la adaptación de los sistemas de salud, medir y dar seguimiento a la sostenibilidad medioambiental y aplicar una perspectiva de equidad en la salud.

Palabras clave Creación de capacidad; educación en salud ambiental; cambio climático; resiliéncia de los sistemas de la salud; Américas.

Sistemas de saúde pan-americanos resilientes ao clima: curso de capacitação para profissionais de saúde

RESUMO

Objetivos. Descrever a elaboração, a implementação e os resultados de um curso de capacitação para fornecer aos profissionais de saúde na região da Organização Pan-Americana da Saúde os conhecimentos e as ferramentas necessários para adaptar os sistemas de saúde às realidades atuais do clima.

Métodos. O curso sobre sistemas de saúde pan-americanos resilientes ao clima, com nove semanas de duração, foi oferecido em formato on-line ao vivo (via Zoom). O curso foi realizado em inglês, espanhol e francês entre março e abril de 2023. As aulas foram ministradas por especialistas locais e regionais em clima e saúde. As competências básicas para profissionais de saúde do Consórcio Global de Educação em Clima e Saúde serviram de base curricular para esta iniciativa. Os participantes preencheram uma pré-avaliação e uma pós-avaliação do curso.

Resultados. Das pessoas que participaram do curso, 1212 assistiram a pelo menos uma das nove aulas, e 489 (em 66 países) assistiram a pelo menos seis aulas. Dessas, 291 fizeram a pré-avaliação e a pós-avaliação do curso, e os dados coletados foram usados na análise. Os resultados da pesquisa longitudinal indicam uma melhoria por parte dos participantes na comunicação sobre clima e saúde, maior frequência de incorporação dos conhecimentos sobre o clima na prática profissional e maior segurança dos profissionais para participar em iniciativas sobre clima. Muitos participantes também informaram que precisavam de mais capacitação.

Conclusões. Os resultados desta análise indicam que cursos on-line ao vivo podem ajudar a empoderar os profissionais de saúde para que possam contribuir para os esforços de resiliência ao clima de diversas formas: melhorando suas habilidades de comunicação; transformando sua prática profissional; melhorando sua habilidade de conduzir atividades relacionadas ao clima e à saúde; e preparando-os para avaliar a vulnerabilidade e a adaptação dos sistemas de saúde, aferir e monitorar a sustentabilidade ambiental e utilizar uma perspectiva de equidade em saúde.

Palavras-chave Fortalecimento institucional; educação em saúde ambiental; mudança climática; resiliência de sistemas de saúde; América.