

ORIGINAL CONTRIBUTION

The Climate Change Conversation: Understanding Nationwide Medical Education Efforts

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Despite increasing awareness of the public and global health ramifications of climate change, there is a lack of curricula discussing climate change within medical education. Where greater societal awareness and improved scientific understanding have begun to grab the attention of members of the medical education community, there is the precedent, the desire, and the need to incorporate climate-health topics into medical education. We hosted semi-structured interviews (n=9) with faculty members at different institutions across the country who have been involved with climate change education. We pursued a qualitative approach to begin an inter-institutional conversation and better understand what support our colleagues and peers need to expand climate-health education, and we identified a set of key barriers to implementation: Obtaining Institutional Resources, Formalizing Initiative Leadership, and Empowering Faculty Involvement. We also began to appreciate the creative strategies that programs across the country have employed to tackle these challenges. Working with interested students to manage workload, advocating for funded faculty positions, and integrating curricular materials in multiple formats are just a few of the approaches that have helped climate-health initiatives to achieve longevity and penetration in the curriculum. A better identification of the challenges and drivers for success in curricular efforts can provide a roadmap to more efficient implementation of climate-health topics within medical education.

INTRODUCTION

Climate change is a global health crisis. The World Health Organization (WHO) cites climate change as the “single biggest health threat facing humanity,” predicted to cause 250,000 deaths annually from 2030 to 2050 as well as widespread suffering in the form of adverse chron-

ic health impacts and critical economic burden [1,2].

By compounding adverse societal and environmental health effects, such as extreme weather events and food insecurity, climate change represents a risk factor for individual health [1]. Changing heat patterns affect common chronic conditions such as asthma [3], diabetes [4], and mental health disorders [5]; poor air quality ad-

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Abbreviations: WHO, World Health Organization; CCH, climate-health; LCME, Liaison Committee on Medical Education; NIH, National Institutes of Health; PHRC, Planetary Health Report Card; GCCHE, Global Consortium on Climate and Health Education.

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versely affects childhood lung development and further exacerbates childhood illness [6]; and climate change is altering the geographies of concern for vector-borne diseases such as Lyme disease and Zika virus [7], amongst others [8]. Across the climate's multifaceted impact on health, vulnerable populations and lower income communities—particularly those already impacted by health disparities, such as Black populations in the United States—are disproportionately affected [9,10].

Despite increasing awareness of the public and global health ramifications of climate change, the WHO's Global Strategy Statement on climate change cites “Knowledge gaps continue to prevent efficient implementation of health-protective strategies, and more evidence-based and efficient communication is needed” [11]. The 2022 *Lancet* Countdown on health and climate change states “Urgent action is therefore needed to strengthen health-system resilience and to prevent a rapidly escalating loss of lives and to prevent suffering in a changing climate” [12]. In response, organizations such as the American Medical Association (AMA) and the National Academy of Sciences, Engineering, and Medicine have put out calls for physicians and medical students to develop a knowledge of climate change's clinical relevance and basic science [13,14]. And increasingly, resources are being devoted to advancing our understanding of risks and solutions, such as the June 2022 funding opportunity from the National Institutes of Health (NIH) to develop a “Community of Practice” to further the NIH Climate Change and Health Initiative (CCH) push for longitudinal research [15].

A call to action for the medical community to develop a deeper understanding of an ecological or social phenomenon is not without precedent [16-18]. The Liaison Committee on Medical Education's (LCME) requirements for medical school accreditation mandate that schools engage with social issues:

The faculty of a medical school ensure that the medical curriculum includes instruction in the diagnosis, prevention, appropriate reporting, and treatment of the medical consequences of common societal problems [19].

The LCME also requires content related to “Structural Competence, Cultural Competence, and Health Inequities” as well as “Medical Ethics” [19]. In recent years, these requirements, combined with demand from faculty and students, have led to education initiatives across interdisciplinary issues, such as racism and bias, women's health, LGBTQ health, and human rights [20-22]. A similar demand exists for climate-related initiatives to join these important cross-cutting topics; a 2021 study of medical students across 12 institutions found

that 84% believed that climate-related health should be included in core curriculum [23]. However, only 13% of respondents felt that their institution was adequately covering related topics [23]. Greater societal awareness and the improved scientific understanding of climate change and its health-related sequelae have begun to grab the attention of members of the medical education community; there is the precedent, the desire, and the need to take the next step in incorporating climate-health into medical education.

Existing literature has identified institutions that have implemented climate-health curriculum in various formats [24,25]. Stanford University School of Medicine, for instance, implemented a climate-health elective, exploring intersectional topics across women's health, psychiatry, disaster medicine, and sustainability in medicine [13]. The Icahn School of Medicine at Mount Sinai has developed the Climate Change Curriculum Infusion Project (CCCIP), which sought to integrate climate-health slides into preclinical courses such as “Medical Microbiology” and “Brain and Behavior” [26]. The Georgetown University School of Medicine provides educational modules, and the University of California San Francisco School of Medicine combines elective and core coursework in their climate implementation by including climate-health lectures in the core curriculum as well as an optional inquiry immersion course [13]. These are just a few of many examples of formats via which institutions have integrated climate change-related materials.

Even so, a 2020 survey from the International Federation of Medical Students Associations (IFMSA) found that only around 15% of medical schools worldwide teach climate change and in 12% of these institutions, students are leading the climate-health-related educational endeavors [27]. In a 2017 study of member institutions of the Global Consortium on Climate and Health Education (GCCHE), only 63% of the 53 respondent institutions offered climate education, and 71% cited challenges in implementing curricula despite support from faculty, students, and administration [28]. Amongst the institutions that have engaged in such efforts, a subset has been assessed by The Planetary Health Report Card (PHRC), a student-driven initiative founded in 2019 [20]. The PHRC uses a systematic approach to assess international medical education efforts toward curricular inclusion of climate change, as well as institution-wide sustainability efforts and research. For the 2021-2022 PHRC assessment, out of the 33 participating US institutions, only one institution, Emory University, Atlanta, GA, received an “A,” and the modal average of the remaining institutions was a “C” [29]. Participation in the PHRC and the GCCHE are already selective for community interest and engagement in the problem of climate-health; why are *these* institutions struggling to implement climate-health

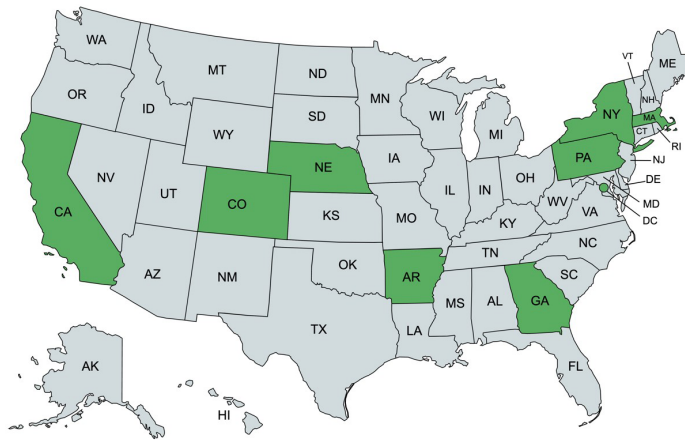


Figure 1. Interviewee Institution Map. Image generated with mapchart.net [53].

curriculum?

Past literature has investigated the varying formats in which climate-health curriculum has been implemented and have conducted surveys of students and faculty members [13,23,28]. However, there have been few examples of studies that have conducted open-ended interviews of faculty members involved in these efforts; face-to-face conversations with faculty members may illuminate nuance within the conversation of curriculum development and implementation of climate change-related health curriculum [30].

The health impacts of climate change are multifaceted, and medical education initiatives have been sparse, with efforts incredibly diverse in format and content. To better understand the process of bringing climate-health to medical education, we conducted semi-structured interviews with faculty members at institutions across the country involved with climate change education at their respective medical schools.

METHODS

We used a qualitative approach with live, virtual interviews [31]. We contacted faculty leaders across medical schools in the US and conducted 30–60-minute semi-structured interviews with key players in the climate-health space at climate-health curriculum-adopter institutions to better understand implementation and penetration of their initiatives.

Utilizing the PHRC and Google and PubMed searches through previous publications documenting climate-health curricular initiatives, we identified faculty members who have taught or implemented climate change-related materials at their US-based medical school. We reached out to 31 faculty members across 14 institutions and received responses from 17 (55%) of the

potential interviewees, representing seven institutions (Figure 1). Out of the 17 responses that we received, two respondents declined to participate, and five recommended that we connect with another member of their institution. We were able to complete interviews with nine remaining faculty members, whose work experiences covered nine total institutions (Table 1).

During the semi-structured interviews, we utilized an adapted version of a questionnaire developed by students and faculty at the Emory University School of Medicine to guide our discussions (Appendix A), which took place virtually via videoconference [32]. During the interviews, one to two additional viewers worked together to manually take notes, which were assigned a numerical code and stripped of person-specific identifiers.

After conducting the interviews, we analyzed them thematically [33,34]. We familiarized ourselves with the interview notes and identified ideas within each interview. We inductively generated codes based on the interview notes, from which we identified themes [33]. We then reviewed and edited the themes, such that we were able to categorize the codes into three large thematic categories [35]. The initial coding was spot-checked by a second coder, who chose three of the interviews at random to separately read and redundantly code. The two coders reviewed the interviews they both analyzed and found that the coding was largely consistent with only vernacular differences. This redundant coding contributed to the iteration through a thematic analysis to designate the final themes discussed. We received exemption from our institutional review board for the protection of human subjects for this project.

RESULTS

We recognized three categories of climate-health

Table 1. Interviewee Demographics

	# of Interviewees
Interviewee Degree	
MD	5
PhD	2
MD, MPH	1
MD, MPA	1
Medical/Research Specialty	
Internal Medicine/Hospitalist	2
Pediatrics	3
Molecular Biology	1
Pulmonary, Critical Care	1
Emergency Medicine	1
Water, Climate, Health	1
Funding Received for Climate Position	
Position Funded	4
Position Unfunded	5

curricular implementation challenges reported by interviewees (Table 2 and detailed below). We also identified some strategies employed to tackle these challenges, described below, alongside the results in each category.

Obtaining Institutional Resources

Longitudinal curriculum changes must be approved by administration to ensure that the institution maintains proper documentation for accreditation. One interviewee emphasized that for any curricular implementation to gain traction, they “need buy-in from the medical education department,” and every interviewee agreed that support from administration is essential to curriculum implementation. Integrating climate-health curriculum into medical education necessitates allocation of resources, such as time and potentially funding. If institutional administration does not perceive the utility of climate-health topics within a packed curriculum, then it is more difficult to obtain the resources for successful implementation.

One interviewee notes that climate-health topic utility is doubted in the context of teaching topics that “we can’t fix” and exploring ideas that can be “so depressing” without a clear course of curative action. Interviewees note that the sentiment that faculty need to “teach [students] how to get [things] done” and focus on the “training of doing” contributes to the misperception of climate-health as an unproductive topic area in medical education. This perceived lack of usefulness of climate-health curriculum can have circular impacts on implementation efforts; students are less likely to engage in elective materials and push for increased climate-health integration if they do

not believe the subject to be worthwhile in their curriculum and careers, and in turn, less pressure is exerted on administration for resources if the student body is not uniformly engaged.

Another barrier to obtaining institutional resources for climate-health curriculum is the reality of a densely packed curriculum. One interviewee reports that at their institution, reception of climate-health proposals has gone along the lines of: “Oh yeah, this is important, but where to fit this in.” This challenge, which came up in every interview, often resulted in efforts to identify areas of the curriculum where climate change-related information could be integrated with “minimal disruption.” Beyond the challenges of time and utility in fighting for resources, one interviewee commented that in their majority Republican state, there was a fear that the “culture war may rear its ugly head.” This interviewee stressed the importance of obtaining institutional support such that one can move forward “without fear of retaliation.” This interviewee noted that their institution is careful with its support of topics that can be considered political, such as climate change, for fear of retaliatory funding changes.

Relevant Strategies Address the Challenge of Obtaining Institutional Resources

In every interview, student interest was cited as a major driving force behind the development of successful climate-health initiatives. One interviewee described their interactions with students as having developed “organically,” and the importance of student engagement was echoed by others. Student interest groups and extra-curricular organizations relating to climate change often approached faculty independently, or else contributed enthusiastically to the consumption and production of elective curricular materials.

In approaching the battle for institutional resources, one interviewee commented that in order to prove that climate-health material is relevant and useful, faculty leaders need to “make sure there’s a foundation in *our* community otherwise it feels lofty and out of touch.” For example, at rural medical schools, climate-health may feel intrinsically tied to wilderness and austere medicine and the management of diseases and disaster-related sequelae that climate change brings to the region. One interviewee notes that in their more rurally-located institution, where there is a tradition of conservation and wilderness land use, the idea of an environmentally conscious curriculum “resonates with people that grow up there.” At more urban institutions, climate-health may feel more grounded in air quality and asthma in public housing, or the effect of extreme weather conditions on unhoused populations.

To tackle the problem of a packed curriculum, one interviewee mentioned that there is a “discrepancy” be-

Table 2. Key Themes Identified Through Thematic Coding

Coded Assigned to Theme ¹	Themes	Solutions Pertaining to Theme
Funding, Time in Curriculum, Perceived Lack of Utility, Lack of Prominence, Medical Student Interest, Identifiable Student Engagement Trends, Precedent, Assessment	Obtaining Institutional Resources	1) Choosing CCH topics that are relevant to the medical school's surrounding community 2) Engaging with medical student advocacy groups 3) Framing CCH content in the context of LCME requirements
Key Person Risk, Siloing, Motivator: Personal Interest, Funding	Formalizing Initiative Leadership	1) Approaching an institutional committee with potential sources of research funding 2) Pushing for formalization of a CCH position title 3) Advocating for any amount of funding 4) Onboarding medical students and team members for administrative support
Culture: Faculty Responsive, Faculty Bandwidth, Faculty Empowerment, Motivator: Personal Interest	Empowering Faculty Involvement	1) Utilizing guest speakers rather than existing faculty 2) Helping to prepare lecture materials for faculty members to lessen the labor involved in developing new lecture content 3) Compiling research materials for faculty 4) Reminding faculty that they are not expected to be an expert in the climate field

CCH, climate-health; ¹See Appendix B for the comprehensive list of themes identified throughout interview coding.

tween “what matters and what’s taught.” This interviewee used the example of the Krebs Cycle, which students are required to memorize for the USMLE Step One exam, but which is rarely relevant in quotidian clinical practice. The Krebs Cycle, this interviewee asserted, is taught because of licensing requirements and accreditation requirements. Given the LCME requirements for “Structural Competence, Cultural Competence, and Health Inequities” and “Medical Ethics,” from an institutional perspective, climate-health topics could become just as important as any other subject matter. This interviewee suggested that framing climate-health curriculum within the context of LCME requirements can better enable climate-health proponents to stake a claim on curriculum time.

Formalizing Initiative Leadership

Another set of challenges the climate-health leaders we interviewed have faced include finding the bandwidth to engage in curriculum development on top of existing clinical and educational responsibilities and managing the pitfalls of key person risk and siloing of efforts. In the discussion of obtaining institutional resources, we understand that time in the medical education curriculum for new content is extremely limited; faculty bandwidth represents another nuance to the challenge of finite time, but here interviewees discussed their own time management, balancing clinical, research, and existing educational responsibilities with their climate leadership roles. Several interviewees commented on the relative independence of different initiatives nationally and within their respective

institutions; this siloing effect is exacerbated by inconsistent communication amongst interested players, and lack of a greater medical education community to unite faculty interested in improving climate-health curricular endeavors.

As discussed, administrative “buy-in” is critical to implementing climate-health curriculum and achieving such buy-in is dependent on initiative leadership. Every curricular initiative from our series of interviews was championed to administration by an existing faculty member who was independently passionate about climate-health education. Some of the interviewees studied environmental science as undergraduates, or pursued research related to climate policy. One interviewee was inspired to learn more by what they saw on the news, and another was moved to study medicine *because* of their interest in the intersection of climate and health. These personal reasons led many of the interviewees to pursue quasi-extracurricular work in advocating for their climate-health initiative.

For some schools that have implemented climate-health materials, prioritization of these topics has involved the institution approving an elective or infusing selected slides into pre-existing core curricular lectures. And with these efforts, only a handful of the interviewees noted that there was any funding allocated to climate-health efforts. Without institutional funding to compensate for the work of curricular implementation, even the most passionate individuals find this difficult to manage. One interviewee spoke to the issues of funding

and leadership directly, exclaiming “I wish I had time to lead a charge.”

Further, for those faculty members who were able to successfully implement climate-health materials, many confessed that were they to leave their position or take on other responsibilities, the programming would likely cease. One faculty member whose elective course was reported on within the PHRC explained that the elective failed to take place once they were assigned to a different role within the institution. This “key person risk” amongst leadership of curricular initiatives without allocated funding poses a threat to the sustainability of successful climate-health efforts.

Relevant Strategies Address the Challenge of Formalizing Initiative Leadership

Approaching the challenge of formalizing climate-health initiative leadership, one interviewee mentioned that institutions that receive funding for a research or educational topic, from the NIH, the government, or other grants, are more likely to teach it. Approaching an institutional committee with potential sources of research funding may help encourage the establishment of a formal position in the pursuit of academic prominence.

One interviewee worked on climate-health projects for several years and then secured institutional funding and a formal title associated with the role. While only covering a portion of the interviewee’s time, the interviewee noted its important “symbolic” role in validating this work. Any amount of funding ensures that institutional administration has “skin in the game,” and officially designating a position associated with climate-health implementation “gives it a place and gives it a home.” This interviewee noted that they have utilized funding to provide small stipends to involved faculty and onboard students and trainees to manage administrative tasks. Another interviewee reported that their climate-health position is funded at 7.5% full-time equivalent (FTE). Pushing for formalization of a climate-health position and advocating for any amount of funding are strong strategies to establish longitudinal initiative leadership.

For interviewees without official funding for climate-health initiatives, many utilized existing curriculum development channels and prepared a development plan. One interviewee has been able to establish institutional memory for leadership of their initiative by onboarding first-year medical students, who have been able to help carry some of the burden relating to curriculum development, meetings, and administrative tasks.

Empowering Faculty Involvement

Beyond the challenge of finding and funding leadership for climate-health efforts, in all of the initiatives

discussed, there was a need for teachers. For the curricular approaches that integrate climate-health content into existing lectures, the initiative needs the faculty who give those lectures to participate.

One interviewee mentioned that most of their medical school’s faculty know “climate [change] is a thing,” but are not well-versed in applying the principles of climate science to materials they are already teaching, or feel uncomfortable attempting to do so without personal expertise. This interviewee gave the example of microbiology lectures that “talked about dengue and malaria as if climate change hasn’t happened.” This interviewee posited that for students to understand the importance of climate-health, faculty need to teach it, and for faculty to understand the utility of climate change within the curriculum, they need to be better informed. As one interviewee put it, it is challenging for faculty to feel empowered to teach climate-health materials given that the average “climate report urges readers to read the last 13 reports.”

If there is a lack of faculty empowerment to teach climate-health curriculum from a personal lack of education or awareness of its relevance, this sentiment can trickle down and affect the perception of the material from the student perspective as well, despite what many of the interviewees noted as a large proportion of students being informed about climate change.

Relevant Strategies Address the Challenge of Empowering Faculty Involvement

Various interviewees cited ways in which they managed faculty involvement in climate-health efforts. One interviewee, whose institution developed a climate-health elective, opted to mitigate the burden on existing faculty by tapping into a network of climate experts to bring in guest speakers rather than ask existing faculty to teach climate related materials, so as not to “put them in that position.”

Outside of inviting guest lecturers, several interviewees helped to prepare lecture materials for faculty members to lessen the labor involved in developing new lecture content. Other efforts to empower faculty to teach climate-health topics involved compiling research materials in the space to better enable faculty to educate themselves on how climate-health topics interact with their respective specialties.

Additionally, one interviewee noted that it is important to remember that the purpose of medical school is to teach a student how to practice medicine, not how to “become a climate scientist,” so it can be helpful to remind faculty that they by no means need to be an expert in the climate field to discuss how it affects their specialty of medicine.

DISCUSSION

Identifying which elements of curriculum change require special attention is useful in maximizing the chance of successful change implementation [36]. Our series of interviews illuminated several barriers to implementing climate change-related health materials into medical education: obtaining institutional resources, formalizing initiative leadership, and empowering faculty involvement. These challenges are largely consistent with the challenges identified throughout the decade-plus trend toward curricular redesign in medical education in the US [37]. Understanding these key challenges will enable better support of faculty and institutions interested in incorporating climate change-related health curriculum.

Existing scholarship surveying medical educators has identified some contributors to the success of climate education initiatives, such as student and faculty interest [28], as well as helped to capture post-implementation student reactions [32] and the phenomenon of implementation fall-off over time [30]. In taking a qualitative approach to understanding drivers for climate-health initiative success, we begin to better appreciate the nuanced and creative strategies that programs across the country have employed to take advantage of student and faculty interest and tackle challenges. Performing a needs assessment and selecting educational strategies are critical; our conversations contribute to a better understanding of medical education needs as they pertain to climate-health, as well as educational/implementation strategies that have helped climate-health initiatives to succeed [38]. These include working with interested students, developing funded faculty positions, and creatively integrating curricular materials. The strategies for success that we identified do not represent comprehensive solutions to the challenges our interviewees shared, nor do they represent the only tactics that our interviewees utilized to achieve their curricular aims; however, the levers of success that we discussed were repeatedly echoed and may be helpfully used as a starting point for brainstorming and further discussion for teams seeking to expand climate-health education.

An obvious limitation of this study is the small sample size. We spoke with only nine faculty members, who represented perspectives from only nine institutions. Further, within the institutions represented by these conversations, there was a geographic majority of institutions on the East Coast. This limitation touches upon one of the most discussed codes we identified within the greater discussion of formal climate-health initiative leadership, that of siloing. Because there is no central organization to which climate-health educators in medical schools belong, it was a challenge to identify faculty members involved in climate education, even at institutions that were

single out in existing literature as leaders in the field of climate education. Additionally, as interviewees were selected based on online mention, publications, and peer recommendation, the selection process for interviewees may have biased interviews toward faculty that were more able to overcome barriers due to factors such as institution-specific resources, as well as pre-established institutional openness to climate change and/or new curricular topics. Any small-scale series of interviews comparing efforts at medical schools with unique cultures, financial resources, and educational priorities will fail to account for every contributing factor that may enable the success of an initiative. Thus, this set of interviews may have more limited applicability to certain institutions.

To address the lack of centralized communication within the climate-health community, it is helpful to engage existing medical education frameworks and climate-health organizations to uplift new initiatives. Improved utilization of faculty development resources and more inter-institutional communication have been shown to improve faculty confidence, expertise, and satisfaction in teaching different topics [39]. According to LCME requirements, each medical school must have “an institutional body (ie, a faculty committee) that oversees the medical education program as a whole and has responsibility for the overall design, management, integration, evaluation, and enhancement of a coherent and coordinated medical curriculum” [19]. A faculty member or interested subset of students can engage this faculty committee as a touchstone to begin centralizing their respective climate-health curriculum development initiative. There are several papers that propose curricular models and key competencies that can be utilized to integrate climate-health into the LCME framework [13,24,40,41]. Further, given that the LCME requirement describes the teaching of “common societal problems,” but does not specify specific issues of priority, this may be an area for future lobbying, such that a list of problems, including climate change, might be referenced specifically.

There are also various organizational resources to empower greater faculty involvement [42]. One such resource is the GCCHE. The GCCHE, which was founded in 2017 and is based out of Columbia University, comprises over 240 member institutions, with each institution providing a representative to participate in periodic conference calls and webinars. The GCCHE provides members with curricular content, resources, and opportunities relating to climate change and health [43]. This organization connects faculty and student leaders with resources to mitigate the time and expertise burden of curriculum development [44]. Additionally, the Association of American Medical Colleges (AAMC) manages several affinity groups for faculty and medical educators [45,46]. Affinity groups such as the Group on Educational Affairs (GEA)

host meetings, conferences, and provide resources with the aim to “advance medical education and medical educators through faculty development, curriculum development, educational research, and assessment” [45]. There are also specialty specific groups, such as the American Academy of Pediatrics Council on Environmental Health and Climate Change (COEHCC) [47], which function as networks amongst faculty with a shared interest in learning more about climate-health and related initiatives. International communities, such as the Oxford Climate Society, also serve to connect people with similar goals and provide climate leaders and medical practitioners with helpful resources [48]. This paper does not contribute an exhaustive list of the organizations or new educational initiatives that are bringing climate-health topics to the fore, and to break down barriers of communication and integrate efforts, and it is prudent to investigate whether initiatives at an individual’s institution might already exist in any form.

From the student perspective, Medical Students for a Sustainable Future (MS4SF), founded in 2019, provides students with resources and materials to support “advocacy, curriculum reform, research, and climate-smart health care” at their respective institutions [49]. Students have been key in pushing the issue of climate change into medical education across the country, and individual students, student extracurricular organizations, and student interest groups are important resources for content creation and demand for change [50-52]. MS4SF provides pathways to approach faculty and administrators at a student’s institution and connects students with other climate-health efforts nationwide.

Our interview series contributes to a stronger understanding of some of the key challenges and strategies for success in teaching medical students about climate change-related health. Identifying patterns for success and common roadblocks can lead to more efficient utilization of existing resources and organizations dedicated to climate-health within medical education. These interviews represent only the very beginning of what should be a much larger inter-institutional conversation dedicated to climate change in medical education and the role of students and medical educators in spearheading this movement. Further studies might consider pursuing larger-scale interview series with more faculty members to encompass the experiences as more institutions, utilizing coding software in the thematic analysis of the interviews, and working with their review board to prioritize interview recording and transcription above manual note-taking.

As one interviewee succinctly put the issue of teaching medical students about climate change: “We can’t go over everything, but we should try.”

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Appendix A: Interview Guide

Topic	Questions
Introductory	<p>What is your medical/research/teaching specialty? What other roles at your institution do you hold?</p> <p>What is your teaching role at your institution?</p> <p>What is your role in teaching climate change curriculum to pre-clinical medical students?</p> <p>How did you come to teach climate change-related curriculum?</p> <p>What factors influenced your choice to incorporate/support content on climate change and health into your lecture, small group, or curriculum?</p> <p>Who would you identify as leading the climate change curricular initiatives at your institution?</p> <p>If you are not the lead faculty member, how would you describe your role? Is there communication between you and other faculty who teach climate change materials?</p>
Student Engagement	<p>Is there an official climate change-related curriculum? In what format is the climate change curriculum at your institution delivered to pre-clinical medical students?</p> <p>When in their education are students at your institution exposed to the climate change curriculum?</p> <p>Are all students equally drawn to this curriculum?</p> <p>a) <i>Planned Follow Up: Are there identifiable trends in which students/faculty are most engaged?</i></p> <p>b) <i>Planned Follow Up: Does this curriculum reach all students?</i></p> <p>Is there assessment/testing associated with this curriculum?</p>
Faculty Engagement	<p>How many faculty (approximately) are involved in climate change curricular implementation?</p> <p>Who is spearheading these programs (what departments, what specialties)?</p> <p>a) <i>Planned Follow-Up: Is there integration between</i></p>

	<p><i>different departments, sustainability efforts, different education programs, etc. with respect to climate change?</i></p> <p>What the administrative/faculty culture looks like surrounding climate change. Are faculty interested?</p> <p>a) <i>Planned Follow Up: Is there ongoing research efforts related to climate change medical education?</i></p> <p>b) <i>Planned Follow Up: How do we encourage faculty and lecturers to involve climate change curricula?</i></p> <p>How does climate change curricular implementation relate to other social determinants of health curricula at your institution?</p>
Implementation	<p>What are the challenges to implementing a climate change curriculum that the faculty at your institution face?</p> <p>In your opinion, what made the approval and implementation of the climate change and environmental health preclinical curriculum possible?*</p> <p>How can we empower faculty to teach this content?</p> <p>How do we keep content up to date?</p> <p>a) <i>Who is managing updating content?</i></p> <p>b) <i>How do we approach sustainability and oversight over years of implementation?</i></p> <p>How important (if at all) do you think it is to educate medical students on the intersection between climate change and health in your field?</p> <p>How important (if at all) do you think it is to educate medical students on the intersection between climate change and health in other specialties?</p> <p>How integrated would you say efforts to incorporate varying climate-change related changes are in your institution?</p>

Appendix B: Comprehensive List of Codes

Codes	Definition
Motivator: Personal Interest	Includes faculty members who described how they forged a connection between climate change and healthcare as a result of a preexisting interest in climate impacts.
Motivator: News	Incorporates faculty members who saw research or effects of climate change on health in the news or in clinical practice.
Medical Student Interest.	Pushes from medical students for climate health incorporation.
Precedent	Awareness of pre-existing climate-related efforts.
Environment and Humanitarian Concerns	Existing discourse related to social determinants of health and social justice.
Success Made Possible By: Administration	Examples of institutional or administration-level support for endeavors.
Had Funding	Access to funding for curriculum development initiatives or awareness of funding for research related to climate change, etc.
Content Delivery: Pre-clinical Lecture	Content delivered during core coursework during the pre-clinical phase of medical education.
Content Deliver: Elective	Optional additional material developed in the form of an elective course, additional optional lectures, etc.; content made available to all or some students at any point during their medical education.
Content Delivery: Healthcare Delivery Course	Inclusion in a mandatory course focused on social aspects of healthcare delivery (i.e. “doctoring,” history taking, physical exam).
Content Delivery: Assessment	Testing or graded work related to the climate health curriculum.
Implementation Challenge: State politics	Challenges related to controversial nature of climate change in certain states.
Implementation Challenge: Faculty Bandwidth	Lack of additional time for faculty to pursue additional curriculum development, ongoing curricular education related to climate change.

Implementation Challenge: Faculty Empowerment	Availability of faculty development opportunities related to climate change.
No Funding	Lack of access to funding for curriculum development initiatives or awareness of funding for research related to climate change, etc.
Time in Curriculum	Lack of space in lectures or the academic calendar to add additional content.
Perceived Lack of Utility	Lack of administrative or faculty consideration of climate change as clinically relevant or necessary for student knowledge.
Implementation Challenge: COVID-19	Disruptions to climate health related efforts due to the COVID-19 pandemic.
Lack of Prominence	Unawareness of nation-wide efforts, funding, or calls to action related to climate and health.
Institutional Culture: Faculty Responsive	Generalized support from faculty at an institution.
Identifiable Student Engagement Trends	The identification of a subset of students more or less interested in climate health-related information.
Key-person Risk	The interviewee's perception that an initiative would fail without a single person continuing to push it.
Siloing	Examples of unawareness of others engaging in climate health implementation efforts and/or a lack of centralization of curricular efforts.