

# A Curricular Framework Linking Climate and Health Learning Objectives for Resident Education to ACGME Core Competencies, Suggested Learning Formats, Assessment Strategies, and Specific Curricular Content

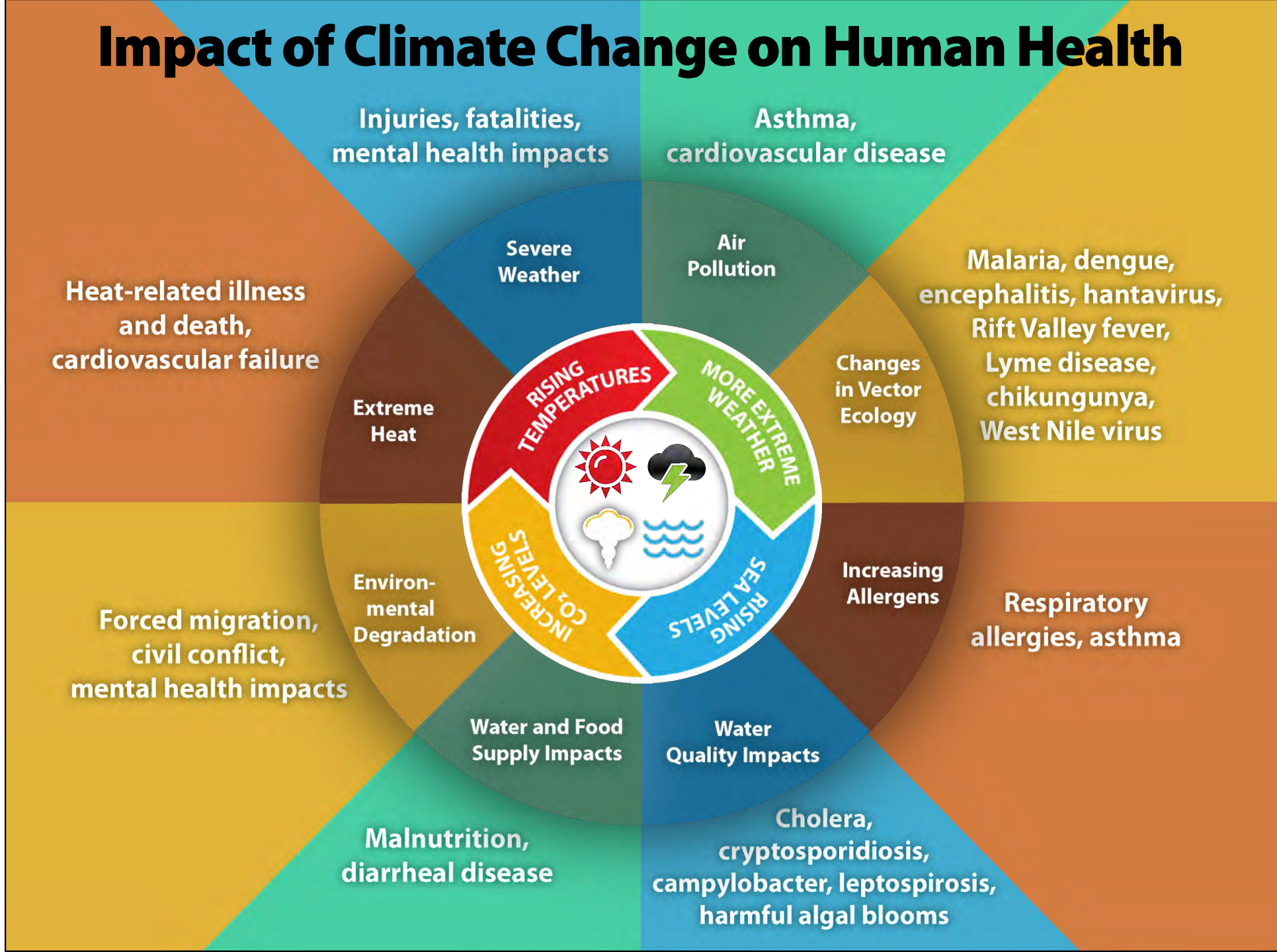
**Table 1. Sample learning objectives for climate change and health.**

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|--|--|
| Eco-health literacy                        | Outline the reliance of human health on local and global ecosystems; <sup>11,14,48</sup> Describe features of a healthy natural, social and built environment; <sup>14</sup> Identify populations where social and environmental determinants of health may interact to amplify risk; Incorporate knowledge of eco-health and planetary boundaries to justify priorities that promote both health and sustainability; Articulate an appreciation of the importance of sustainability to global health equity   |
| Clinical climate change preparedness       | Describe the mechanisms of direct, indirect, deferred and diffuse climate health risks; <sup>13,14,49</sup> Demonstrate competence in diagnosis and management of climate-sensitive and climate-induced illness; <sup>11,13,31</sup> Describe inter-sectoral collaboration to promote climate-change preparedness and emergency management; <sup>11,32</sup> Role-play consultations involving the prevention of climate-related illness and promotion of co-benefits of climate change mitigation; Identify resources for continuing professional education and evidence-based practice of climate-related illness <sup>11,49</sup> |
| Sustainable health systems                 | Define sustainability; <sup>14</sup> Explain how shifts in climate, natural resources, technology, economy and demography may affect the provision of healthcare in the future; <sup>14</sup> Apply systems thinking and multidisciplinary perspectives to develop strategies to promote health service sustainability; <sup>14</sup> Demonstrate a commitment to practice medicine sustainably and ethically <sup>49,50</sup>   |
| Professionalism and public health literacy | Apply principles of active citizenship and professionalism to discuss doctors' responsibility to engage in advocacy and policy; <sup>51</sup> Acknowledge the ethical tensions in climate change contribution and vulnerability; <sup>51</sup> Apply critical appraisal and science communication skills to describe climate health risks; Articulate a commitment to resolving local and global health inequities <sup>50</sup>   |

| Learning objectives   | ACGM1 competency* | Core or advanced objective* | Learning formats  | Assessment strategies  | Curricular points and notes   |
|---|-------------------|-----------------------------|---|--|---|
| <b>Knowledge of climate change and its effects on health</b>  |                   |                             |   |  |   |
| Describe the negative effect of extreme heat exposure on health.  | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> </ul>  | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> </ul>   | <p>Extreme heat is associated with increases in the following:</p> <ul style="list-style-type: none"> <li>Asthma exacerbations,</li> <li>Fluid and electrolyte disturbances,</li> <li>Heat-related nephropathy,</li> <li>Congenital anomalies,</li> <li>Infant mortality and poorer pregnancy and perinatal outcomes,</li> <li>Skin and soft tissue infections, and</li> <li>Suicide.</li> </ul>  |
| Discuss the links among air pollution (including wildfires), climate change, and their relationship to health.  | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> </ul>  | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> </ul>   | <ul style="list-style-type: none"> <li>Heat increases ground-level ozone.</li> <li>Wildfires increase particulate matter air pollution.</li> <li>Ozone exposure increases the severity of asthma and COPD exacerbations and decreases lung function in children.</li> <li>Particulate matter pollution worsens asthma and COPD, results in preterm and low-birth-weight infants, and impairs cognitive development.</li> </ul>  |
| Explain how climate change contributes to more allergic symptoms in patients.   | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> </ul>  | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> </ul>   | <ul style="list-style-type: none"> <li>Warm temperatures prolong pollen seasons.</li> <li>Higher concentrations of atmospheric carbon dioxide result in greater pollen production by allergenic plants (e.g., ragweed).</li> </ul>  |
| Describe how climate change alters the geographic distribution and incidence of vector-borne diseases and population morbidity.   | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> </ul>  | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> </ul>   | <p>Warming temperatures ...</p> <ul style="list-style-type: none"> <li>Promote the movement of disease-carrying mosquitos and ticks to new locations and</li> <li>May result in the use of more pesticides that can be associated with detrimental effects on neurodevelopment.</li> </ul>  |
| Discuss the climate events that increase risk of waterborne disease outbreaks and the common pathogens causing disease in these scenarios.                                      | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> </ul>  | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> </ul>   | <ul style="list-style-type: none"> <li>Warming and heavy precipitation are associated with increased outbreaks of <i>Campylobacter</i>, <i>Cryptosporidium</i>, <i>Escherichia coli</i>, <i>Giardia</i>, hepatitis A virus, nontyphoidal <i>Salmonella</i>, and <i>Shigella</i>.</li> </ul>   |
| Describe how extreme weather associated with climate change leads to increased risks of malnutrition and food insecurity.   | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> </ul>  | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> </ul>   | <p>Extreme weather events associated with climate change can result in the following:</p> <ul style="list-style-type: none"> <li>Reduced crop yields,</li> <li>Harm to livestock,</li> <li>Interference with food supply chains (e.g., from fires, floods, storms), and</li> <li>Disruption of livelihoods and income.</li> </ul>   |
| Connect climate-driven natural disasters, such as hurricanes, floods, heat waves, and wildfires, to the associated risks of injury, displacement, and mental health conditions. | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> <li>Clinical rotations</li> <li>Standardized patients</li> </ul> | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> <li>Oral presentation (rounds)</li> <li>Chart audits</li> <li>OSCE</li> </ul> | <ul style="list-style-type: none"> <li>Heavy rainfall flushes toxins and heavy metals into the water supply.</li> <li>Carbon monoxide poisonings increase with electrical outages due to the use of generators or alternate heat sources that are poorly ventilated.</li> <li>Natural disasters increase the risk of accidental and nonaccidental trauma, as well as mental health disorders.</li> <li>Displacement from homes and separation of families increase the risk of mental health conditions.</li> </ul> |
| List the common mental health conditions that occur after climate-associated natural disasters.   | MK                | Core                        | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> <li>Clinical rotations</li> </ul>                                | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> </ul>   | <p>Climate-associated natural disasters are associated with increases in the following:</p> <ul style="list-style-type: none"> <li>Depression,</li> <li>Anxiety,</li> <li>Posttraumatic stress disorder, and</li> <li>Suicide,</li> </ul>   |



# Impact of Climate Change on Human Health



Centers for Disease Control and Prevention. (2022, April 25). *Climate effects on health*. Centers for Disease Control and Prevention. <https://www.cdc.gov/climateandhealth/effects/default.htm>

**Climate change-related adaptations for clinical practice<sup>d</sup>**

|  |           |      |   |  |   |
|--|-----------|------|---|--|---|
| Recognize climate-related illnesses, illness exacerbations, and exposures.   | MK, PC    | Core | <ul style="list-style-type: none"> <li>Lecture</li> <li>Small group</li> <li>Clinical rotations</li> <li>Standardized patients</li> </ul>   | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral presentations (rounds)</li> <li>OSCE</li> <li>Clinical evaluations</li> <li>Chart audits</li> </ul>                    | <p>Climate change may be related to the following:</p> <ul style="list-style-type: none"> <li>Heat exhaustion,</li> <li>Heat stroke,</li> <li>Syncope,</li> <li>Heat-related nephropathy,</li> <li>Electrolyte imbalances,</li> <li>Asthma/COPD exacerbations,</li> <li>Pollution and wildfire smoke exposure,</li> <li>Seasonal allergies,</li> <li>Gastroenteritis (viral, bacterial),</li> <li>Malnutrition,</li> <li>Micronutrient deficiency,</li> <li>Poor glycemic control in diabetics, and</li> <li>Heart failure exacerbations.</li> </ul>  |
| Develop appropriate management plans for patients with climate-related illnesses.  | MK, PC    | Core | <ul style="list-style-type: none"> <li>Small group</li> <li>Clinical rotations</li> <li>Standardized patients</li> </ul>                    | <ul style="list-style-type: none"> <li>Oral presentations (rounds)</li> <li>OSCE</li> <li>Clinical evaluations</li> <li>Chart audits</li> </ul>                                  | <ul style="list-style-type: none"> <li>See the list of conditions listed immediately above for climate-related illnesses.</li> <li>Plans should address managing any acute or chronic problems, identifying and acquiring any resources needed, and providing anticipatory guidance.</li> </ul>   |
| Counsel patients on the risks and appropriate use of medications when patients and/or medications are exposed to extreme heat. | MK, PC, C | Core | <ul style="list-style-type: none"> <li>Small group</li> <li>Clinical rotations</li> <li>Role play</li> <li>Standardized patients</li> </ul> | <ul style="list-style-type: none"> <li>MCQs</li> <li>Oral questions</li> <li>Direct observation</li> <li>Standardized patient checklist</li> <li>Clinical evaluations</li> </ul> | <ul style="list-style-type: none"> <li>Extreme heat may alter some of the pharmacologic properties of medications (e.g., insulin, levothyroxine, epinephrine).</li> <li>Patients need proper storage for their medications.</li> <li>Some medications increase the risk of heat-related illnesses (e.g., beta-blockers, diuretics, antidepressants, antihistamines).</li> <li>Aerosolized or pressurized canisters (e.g., albuterol inhalers) may burst at temperatures &gt; 120°F.</li> </ul>  |
| Identify individual-specific risk factors for climate-related illnesses.   | MK, PC    | Core | <ul style="list-style-type: none"> <li>Small group</li> <li>Clinical rotations</li> <li>Standardized patients</li> </ul>                    | <ul style="list-style-type: none"> <li>Standardized patient checklist</li> <li>Oral presentations (rounds)</li> <li>Clinical evaluations</li> <li>Chart audits</li> </ul>        | <p>Individual factors that put patients at greater risk for climate-related illnesses include the following:</p> <ul style="list-style-type: none"> <li>Young or older age,</li> <li>Pregnancy,</li> <li>Sports participation or outdoor occupation,</li> <li>Exertion,</li> <li>Chronic medical conditions,</li> <li>Linguistic isolation,</li> <li>Structural inequities in the built environment and structural racism,</li> <li>Lack of family resources (poverty; homelessness; lack of reliable, safe transportation; lack of adequate air-conditioning, heating, and ventilation),</li> <li>Lack of community resources (lack of shelters, no warning systems for severe weather or air quality), and</li> <li>Family displacement and/or separation from family members.</li> </ul> |



|  |          |                |  |   |   |
|--|----------|----------------|--|---|---|
| Create patient-tailored heat action plans, asthma/chronic lung disease action plans, disaster preparedness plans, and/or other appropriate guidance with consideration of local climate risks. | PC       | Core, advanced | <ul style="list-style-type: none"> <li>• Small group</li> <li>• Clinical rotations</li> <li>• Standardized patients</li> </ul>   | <ul style="list-style-type: none"> <li>• Review of drafted plans</li> <li>• Oral presentation (rounds)</li> <li>• OSCE</li> <li>• Chart audits</li> </ul>                     | <ul style="list-style-type: none"> <li>• Heat plans should include communicating risks; limiting outside activities; dressing properly; increasing intake of fluids; providing advice on keeping home interiors heated, cooled, and ventilated properly; and storing heat-sensitive medications.</li> <li>• Asthma/chronic lung disease action plans should incorporate air quality alerts for sensitive groups, warnings to staying indoors when air quality is poor, and wearing masks when outside, if appropriate for the patient and deemed medically needed.</li> <li>• Disaster preparedness plans should be tailored based on climate risk, health status of family members, food and water supplies, medication supplies, need of a generator (for loss of power), location of shelters, etc.</li> </ul> |
| Effectively communicate health risks that result from climate change to stakeholders (e.g., patients, family members, community stakeholders, politicians).                                    | MK, C, P | Core, advanced | <ul style="list-style-type: none"> <li>• Clinical rotations</li> <li>• Role play</li> <li>• Speaking at a community or legislative event</li> <li>• Written communication</li> </ul> | <ul style="list-style-type: none"> <li>• Direct observation of role play</li> <li>• Direct observation of communication</li> <li>• Review of written communication</li> </ul> | <ul style="list-style-type: none"> <li>• Risks are detailed in this article.</li> </ul>   |
| Advise patients and families on the health benefits of climate mitigation activities, including active transportation and plant-rich diets.  | MK, C, P | Core           | <ul style="list-style-type: none"> <li>• Clinical rotations</li> <li>• Role play</li> <li>• Standardized patients</li> </ul>   | <ul style="list-style-type: none"> <li>• Clinical evaluations</li> <li>• Direct observation</li> <li>• Standardized patient checklist</li> </ul>                              | <ul style="list-style-type: none"> <li>• Eating more plant-based foods results in a reduction in greenhouse gases (animal agriculture is responsible for significant greenhouse gas production), reduced risk of chronic illnesses, and, potentially, financial savings.</li> <li>• Decreasing food waste decreases carbon footprint.</li> <li>• Active transportation (walking, cycling) reduces automotive emissions and improves fitness.</li> </ul>   |
| Discuss ethical issues related to climate change and its effects on health.  | MK, C, P | Core, advanced | <ul style="list-style-type: none"> <li>• Lecture</li> <li>• Small-group discussions</li> <li>• Pro/con debates</li> </ul>  | <ul style="list-style-type: none"> <li>• Direct observation of small-group discussion</li> <li>• Direct observation of debates</li> </ul>                                     | <ul style="list-style-type: none"> <li>• The effects of climate change inequitably affect children, the elderly, and marginalized populations.</li> <li>• Future generations have the right to a healthy environment.</li> </ul>  |



**Implications of climate change for health care delivery\***

|  |            |                |   |   |  |
|--|------------|----------------|---|---|--|
| Access state or community resources for environmental health.  | PBLI, SBP  | Core           | <ul style="list-style-type: none"> <li>• Experiential learning</li> <li>• Clinical rotations</li> </ul>   | <ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Oral presentation (rounds)</li> <li>• Chart audits</li> </ul>  | Physicians should be aware of the following: <ul style="list-style-type: none"> <li>• Air quality measurements or air quality alerts,</li> <li>• Daily pollen counts,</li> <li>• Locations of toxic substance repositories in the community, and</li> <li>• Local boil water advisories.</li> </ul>  |
| Demonstrate effective use of resources such as ProMED, HealthMap, and the CDC website to evaluate nationally relevant vector-borne disease emergence.  | PBLI, SBP  | Advanced       | <ul style="list-style-type: none"> <li>• Experiential learning</li> <li>• Clinical rotations</li> </ul>   | <ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Oral presentation (rounds)</li> </ul>  | <ul style="list-style-type: none"> <li>• Adapt place-based differential diagnoses and management plans based on patient history and patterns of disease emergence.</li> <li>• Discuss the role of physicians in contributing to and responding to early-warning systems in the context of emerging infections and outbreak control.</li> </ul>   |
| Review the hospital's or practice's disaster plans and discuss strategies to maintain patient care at a facility compromised by systems failures, such as power outages or electronic medical record disruption. | SBP        | Core, advanced | <ul style="list-style-type: none"> <li>• Small- or large-group review of plans</li> <li>• Preparatory exercise for disaster training</li> </ul> | <ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Module MCQs</li> </ul>   | <ul style="list-style-type: none"> <li>• Know how to access the hospital's or practice's disaster preparedness plan and review or practice this plan.</li> <li>• Demonstrate competence in following medical record downtime procedures and workflows (e.g., writing paper prescriptions).</li> <li>• Know, review, and practice roles and responsibilities during different types of disaster scenarios.</li> </ul> |
| Communicate patient status and needs to EMS personnel and a receiving facility to transfer care of patients in the instance of a unit or facility evacuation.  | C, PC, SBP | Core           | <ul style="list-style-type: none"> <li>• Role play evacuation handover</li> <li>• Standardized patients</li> <li>• Simulation</li> </ul>        | <ul style="list-style-type: none"> <li>• Direct observation of evacuation handover with feedback</li> <li>• Standardized patient checklist</li> <li>• Simulation checklist</li> </ul> | <ul style="list-style-type: none"> <li>• Trainees should have access to, and they should practice using, a standardized template with information that needs to be provided to patients, EMS, and families in the event of patient transfer or evacuation.</li> </ul>  |

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|--|---------------|----------|---|---|--|
| Identify the institutional and local public health contacts in case of a disaster in which the trainee needs help (e.g., program director, on-call hospital administrator, state health department). | SBP, P        | Core     | <ul style="list-style-type: none"> <li>Reinforcement at resident or fellow meetings or retreats</li> </ul>  | <ul style="list-style-type: none"> <li>Module MCQs</li> <li>Oral questions</li> </ul>   | <ul style="list-style-type: none"> <li>Trainees should know the institutional, government, and public health contacts that may coordinate responses to natural disasters and how to contact them if needed.</li> </ul>   |
| Effectively collaborate with hospital or public health officials on climate-related disaster preparedness and/or response.   | MK, C, SBP, P | Advanced | <ul style="list-style-type: none"> <li>Service on a hospital committee</li> <li>Public health elective</li> <li>Scholarly project work</li> </ul>   | <ul style="list-style-type: none"> <li>Participation on committee</li> <li>Scholarly project outcome</li> <li>Experiential learning (elective)</li> </ul>   | <p>Examples include the following:</p> <ul style="list-style-type: none"> <li>Serving as a trainee member of a hospital committee to prepare a climate-related disaster plan and ensure trainees are considered in these plans and</li> <li>Engaging with public health officials to learn about the generation of hospital disaster preparedness plans, especially during a research elective or summer experience.</li> </ul>  |
| Participate in the planning, practice, or evaluation of evacuation and transfer exercises as part of hospital disaster preparedness plans.   | MK, C, SBP, P | Core     | <ul style="list-style-type: none"> <li>Experiential learning (practice)</li> <li>Service as a committee member for disaster drill planning</li> </ul>   | <ul style="list-style-type: none"> <li>Participation in hospital drill</li> <li>Participation on committee</li> </ul>   | <p>Examples of resident involvement in disaster drills include the following:</p> <ul style="list-style-type: none"> <li>Reviewing patient lists to identify patients who are safe for discharge home,</li> <li>Prioritizing patients for transfer,</li> <li>Reviewing roles and responsibilities of team members and outlining a pathway for safe evacuation of a list of patients in the absence of power and electronic medical records, and</li> <li>Communicating updates to patients' family members.</li> </ul>   |
| Advocate and participate in activities that advance low- or no-carbon solutions in the provision of health care and the practice of medicine.  | MK, C, SBP, P | Advanced | <ul style="list-style-type: none"> <li>Advocacy rotation or elective</li> <li>Health care administration or business of medicine elective</li> <li>Committee member for health care sustainability</li> <li>Sustainability quality improvement project</li> </ul> | <ul style="list-style-type: none"> <li>Review of written advocacy communication</li> <li>Direct observation of oral advocacy communication</li> <li>Self-report of participation</li> <li>Review of quality improvement project outcomes</li> </ul> | <p>Examples of ways to promote cleaner air and reductions in greenhouse gases include the following:</p> <ul style="list-style-type: none"> <li>Writing a letter to the editor in support of carpooling and greater utilization of public transportation to decrease carbon footprint,</li> <li>Advocating institutional commitments to decreasing greenhouse gas emissions and participating in quality improvement projects on this topic (e.g., energy efficiency, waste reductions, power purchase agreements),</li> <li>Advocating sustainability initiatives that promote healthier, greener activities for employees (e.g., public transportation, bike paths), and</li> <li>Advocating plant-based menu choices in the cafeteria.</li> </ul> |

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; MCQs, multiple-choice questions; COPD, chronic obstructive pulmonary disease; OSCE, objective structured clinical examination; and EMS, emergency medical services.

<sup>†</sup>The 6 ACGME core competencies are, in the order they appear here, medical knowledge (MK), patient care (PC), interpersonal and communication skills (C), professionalism (P), practice-based learning and improvement (PBLI), and systems-based practice (SBP).

<sup>‡</sup>Some activities can be considered core knowledge at a fundamental level and are amenable to in-depth learning as an advanced knowledge or skill for interested trainees.

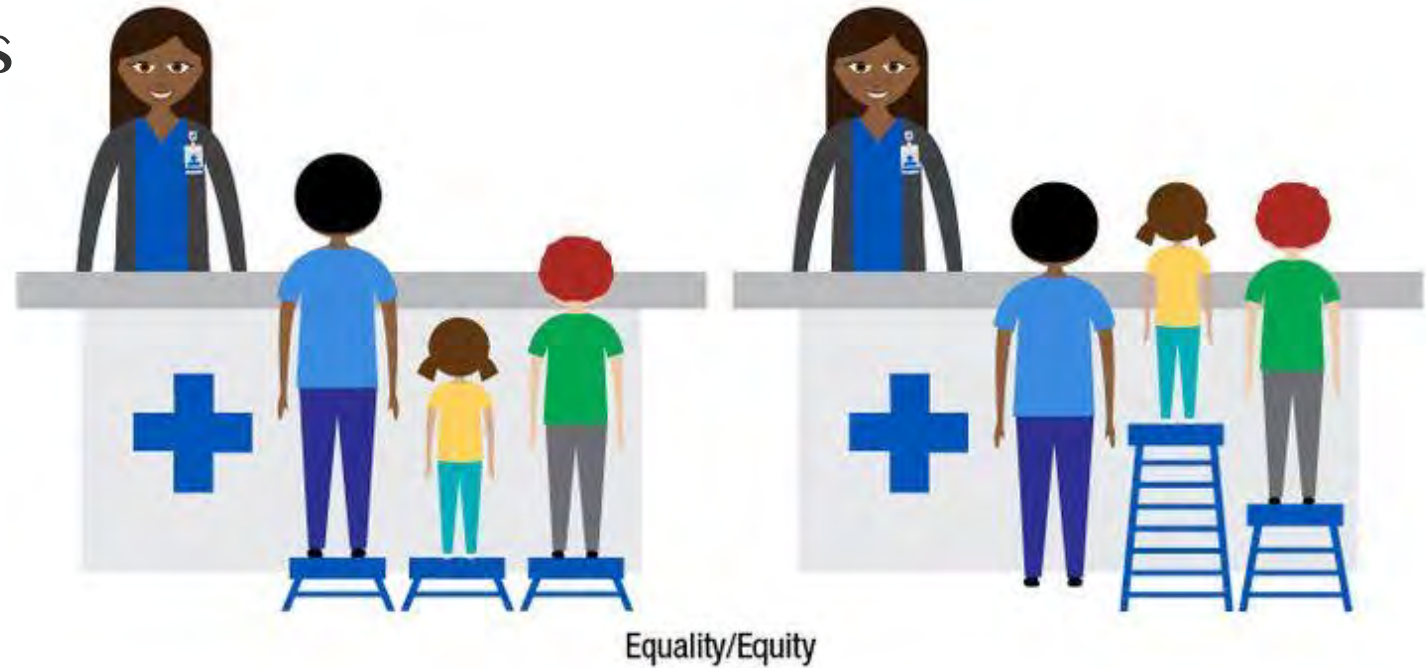
<sup>§</sup>Many learning objectives could be delivered in multiple formats and integrated into existing activities. Suggested formats are those that could be implemented to provide consistent delivery of material and experiences to all residents.

<sup>¶</sup>Adaptations for clinical practice entail the following: identifying and treating climate-related illnesses; obtaining and integrating patient- and location-specific climate risks into plans for disease prevention and treatment; and effectively communicating information to and collaborating with patients, families, and other health professionals.

<sup>||</sup>Implications for health care delivery entail the following: working within local and regional medical and public health systems on preparing for and responding to the health effects of climate changes and climate-related disasters and advocating changes at the patient, institution or practice, and policy levels to promote a healthier

# Health inequities

By identifies educational implications to consider in designing curricula to address the large burden of climate-associated conditions that occur in at-risk, vulnerable, disadvantaged, medically complex, or special populations can built foundational and specialized educational formats and trainings.





| Patient population  | Climate-related vulnerability   | Implications for the education of trainees   |
|---|---|--|
| Patients with chronic conditions, including those who ... <ul style="list-style-type: none"> <li>• Use medication daily</li> <li>• Have physical disabilities</li> <li>• Have mental health concerns</li> <li>• Depend on life-sustaining medical services or equipment (e.g., dialysis, home oxygen consumption, an insulin pump)</li> </ul> | Chronic illnesses increase the risk of poor outcomes due to disruptions in care and/or increased dependence on caregivers   | Education should include training in preparedness, particularly the development of emergency care plans for patients to use during climate-based or other disruptions to usual access to medications, services, electricity, and equipment. Education should prepare future physicians to advocate for these at-risk patients beyond the exam room and to encourage intentional consideration of individual, family, and community needs, as well as health systems resilience, in disaster preparedness and response plans. |
| Patients who are postsurgical, hospitalized, or acutely ill   | Acute illnesses require health services or follow-up care; thus, those with such illnesses have an increased risk of poor outcomes due to inaccessible care or disruptions in care  | Trainees should be educated on alternative follow-up care options that can be used in climate-driven natural disasters and during health systems disruptions or other emergencies (e.g., telehealth, phone calls to check on patients, home health nurses).  |
| People who are elderly  | Old age increases physiologic and social vulnerabilities to environmental exposures; older patients are more likely to be dependent on caregivers for the activities of daily living, to have reduced mobility, and to be socially isolated   | Trainees caring for the elderly should be instructed in assisting the patient (and family) in proactively identifying and activating backup plans, if needed, to check on the patient, ensure access to basic needs, and ensure continuation-of-care plans. Trainees should be taught and observed in giving anticipatory guidance to the elderly and their families regarding climate-related risks and mitigation of these risks.  |
| Neonates and infants  | The very young are physiologically vulnerable to environmental exposures; at risk for disruptions to optimal development; dependent on the health and well-being of their caregiver/s for their own; and require special consideration for all aspects of wellness, including feeding, stooling, and sleeping | Education of trainees should include learning how to give anticipatory guidance to parents of young children regarding climate and environmental exposures, preparing for emergencies and disruptions, and reducing children's risks and exposures.  |

|  |   |  |
|--|---|--|
| Pregnant women   | Pregnancy increases physiologic and social vulnerability to environmental exposures; the health of both the mother and the fetus are at risk  | Residency training should include education on climate risks and environmental exposures that jeopardize the health of the mother and/or fetus.  |
| Athletes, the military, and outdoor workers  | Outdoor activities increase the likelihood of exposure and, in turn, the risk of heat-related illness   | Residents require training on the contribution of exercise, personal protective equipment, and exposure variables to climate-related disease, as well as strategies for helping patients avoid or minimize the risk of exposure. Programs can educate residents on the role of physicians in advocating (and provide residents the opportunity to engage with) policy frameworks and society guidelines that protect these groups.   |
| People who are experiencing homelessness or who do not have stable housing   | People who do not have reliable shelter are socially vulnerable and have no guaranteed protection from the elements   | Homeless, poor, displaced, and linguistically isolated persons and families are all extremely vulnerable. Trainee education should include experiences with vulnerable patients to better understand their environmental determinants of health (including structural racism manifest in the environment), the specific challenges they face, and the community support systems and resources available to these groups. While learning how to provide anticipatory guidance for patients is important (e.g., in a heat wave seek out shade, drink more water, access a shelter), residency education should also include training in how to advocate shelter, food, mental health resources, medical care, medication, and support for these individuals. |
| Low-income families  | Historically neglected low-income communities, particularly low-income communities of color, face disproportionate exposure from a legacy of structurally racist policies and/or may have fewer resources to adapt to and avoid environmental exposures to safeguard health |  |
| Evacuees or others experiencing displacement   | Displaced persons are socially vulnerable and face challenges, such as family separation, lack of access to care, increased risk of exploitation, and mental health concerns, including increased risk of adverse childhood experiences                                     |  |
| Linguistically isolated individuals and families (those who do not speak the language/s of the general population) | Linguistically isolated families are less likely to have access to community resources, including emergency public service announcements  |  |

# Challenges of climate change curriculum integration.

- However, it is not possible to prescribe a single climate change curriculum that will have international applicability. (inequality). Climate change health impacts will be influenced by pre-existing health status and social conditions, as well as exposure, adaptive capacity and sensitivity to climate change.
- An added complexity is the uncertainty around regionally specific and disease specific climate change risks.<sup>13</sup> Although some risks exhibit clear international trends, such as an increase in frequency and intensity of heatwaves, other risks, such as the distribution of infectious disease, are less predictable. A climate change curriculum therefore needs to evolve with emerging evidence and local needs.



<https://journals.sagepub.com/doi/full/10.4081/jphr.2016.673>

<https://www.ingentaconnect.com/content/wk/acm/2021/00000097/00000002/art00014>

<https://journals.sagepub.com/doi/full/10.1177/2382120520957653>

<https://www.sciencedirect.com/science/article/pii/S2667278221000249>