

Supplement S1: Authors' autobiographies

This Supplement provides autobiographical accounts of authors' motivation for being eco-ethical leaders in climate, sustainable health care, and/or planetary health education, including acknowledgment of peers, mentors, guides, and role models.

Michelle McLean, currently Professor of Medical Education who has been overseeing the integration of planetary health across the medical curriculum at Bond University (Australia, situated on the lands of the Kombumerri People). I have always had a passion for the natural environment and everything that lives in it. It does not take much to convince me to spend time outdoors, hiking, snorkeling, or rehabilitating the land. Although I was set on being a marine biologist, this did not transpire, but I did graduate with an ecology major. Circumstances led me to medical education, where I have worked since 1987 in three countries (South Africa, United Arab Emirates, and Australia). My first few years in Australia were notable because of the repeated flooding, bushfires, and rising temperatures. I became acutely aware of how the planet's ecosystems were being degraded and the high rate of animal extinction, particularly in Australia. Climate change was on the agenda and I found a like-minded Australian colleague and so began a mission to ensure that climate change (at that stage) was included in all Australian medical curricula. It began with recommendations for cosmetic changes to the Australian Medical Council's Accreditation Standards by adding the terms 'environmental' and 'sustainability' where we could until the call for submissions for revision of the Standards. This call came in late 2021, to which we collectively and individually responded. Importantly, I collaborated with a First Nations colleague to ensure a submission recommending that Traditional Knowledges around resilience, connection to Country, and resource stewardship are included.

Over the last few years, I have been collaborating with international colleagues across different disciplines, mainly through the Association for Medical Education (AMEE). This association led to serving as an editor for a special issue of *Medical Teacher* on sustainable health care and planetary health education, an eco-ethical leadership article, and the AMEE Consensus Statement on Planetary Health and Education for Sustainable Healthcare in Health Professions Education. What has struck me over the last few years is how active medical students are in this space, which has led to this submission that includes as co-authors some of the students and recent graduates who have taken up the challenge to become the eco-ethical leaders the world needs to advocate for a sustainable and just future. I am in awe of their ongoing commitment and achievements in this space.

Georgia Behrens, is a recently graduated doctor who after living and working on the lands of the Eora Nation in Sydney, Australia, is currently an MSc Public Health candidate at the London School of Hygiene. Throughout my medical degree, I dealt with my (occasionally overwhelming) climate anxiety by doing as much as I could to raise awareness and inspire action on the link between climate

change and human health. I led a national climate change and health project for the Australian Medical Students' Association, and the national student committee of Doctors for the Environment Australia, published on planetary health and education for sustainable healthcare, contributed to policy briefs for the *MJA-Lancet* Countdown on Health and Climate Change in Australia. I also represented the International Federation of Medical Students' Associations at two United Nations Climate Conferences. I currently balance my clinical work with roles in planetary health advocacy and academia and aspire to work as a public health physician shaping Australia's healthcare system to become more sustainable, equitable, and climate resilient. I have been supported on my planetary health journey by incredible mentors. Professor Lynne Madden, Associate Professor Ying Zhang, and Dr Alice McGushin who are formidable, generous, inspiring women championing human and planetary health in all that they do.

Hannah Chase, currently a Foundation Year 1 doctor at Oxford University Hospital Trust, UK, and Partnerships Co-chair of the Planetary Health Report Card (PHRC). Prior to medical school, I worked as an equine veterinarian for three years. The changing climate felt very real in my life with increasing extreme weather and changing disease patterns evident in my short period of training and career. After 18 months in my medical degree, there had been no mention of the health impacts of climate change and I approached Dr Richard Harrington, the course associate director, to see if it had been considered. With his encouragement, a few months later, a student-staff collaborative committee was organizing faculty workshops at Oxford to include sustainable healthcare on the curriculum agenda. In 2021, Dr SanYuMay Tun accepted a post to lead Education for Sustainable Healthcare. Dr Tun has been inspirational as a personal mentor as well as instrumental with her expertise at Oxford. Before facilitating our workshops at Oxford, she invited me to co-author the AMEE Consensus Statement (Shaw et al. 2021), with a focus on the faculty development section. This was an honor and a steep learning curve in terms of my knowledge in the field. Concurrently, I reached out to Karly Hampshire regarding the PHRC, which had recently published the results of its pilot year in North America, suggesting an expansion of the initiative to the UK. I took on the role of the UK lead and within a few months, I was invited to become a PHRC co-director with Karly, whom I feel privileged to call a colleague and is an ongoing inspiration. The urgency and severity of the climate crisis, the need for quality education as the crucial starting point for anyone to be able to make informed choices, the reality that current healthcare practices are harming patients, and the passionate people (too many to name) with whom I have worked and continue to work keep me motivated. I graduate this summer but will definitely be pursuing further work in sustainability in health care education concurrently with my junior doctor role.

Note: Hannah received the Association for the Study of Medical Education's New Leaders Award for her work PHRC work in October 2022.

Omnia El Omrani, currently a second-year Plastic, Reconstructive and Aesthetic Surgery Resident in Egypt with a passion for planetary health education and advocacy. I am also a Commissioner at the *Lancet*-Chatham House Commission on Post-COVID Population Health, a member of the first-ever Youth Sounding Board of the European Commission Department for International Partnerships, an associate at Women Leaders for Planetary Health and the SDG 3 Focal Point for the Global Youth Coalition for Road Safety. As a young medical doctor working in one of the largest public hospitals in Egypt, I witness patients suffering from lung diseases like asthma and bronchitis, and cardiovascular diseases on a daily basis, which have become the new normal due to poor air quality. I have also seen an increase in heat stroke and occupational injuries in the emergency room due to rising temperatures. Yet, I never learned about climate change or air pollution during my medical studies, and, according to a study I undertook with an exceptional group of IFMSA members, 85% of medical students from 2817 universities in 112 countries also did not learn about climate change. This leaves the majority of the health workforce unprepared for the climate crisis and its accelerating impacts on health. I was lucky to be involved with IFMSA for six years with diverse positions such as the Public Health Regional Assistant for the Eastern-Mediterranean Region, Public Health Development Assistant and finally, the Liaison Officer for Public Health Issues to represent the voice of more than 1.3 million medical students from 140 countries for two consecutive years. I led IFMSA's external work in the areas of planetary health, climate change and non-communicable diseases by collaborating with the UNFCCC, World Health Organization NCDs/GCM, and Climate Change Unit. I attended 18 high-level intergovernmental conferences including the past three UN Climate Change Conferences (COPs) and World Health Assemblies. At COP25 in Madrid, I led the IFMSA delegation, conducting a survey to explore participants' views on the importance of health in climate change negotiations and outcomes and their understanding of and attitudes towards sustainable food systems, based on a similar survey done in COP16. We found a statistically significant increase in participants' understanding of health in the climate agenda. I additionally led 17 panels of students, formulating a range of evidence-based policy documents and modules for the medical curriculum and have been an author on 14 research papers in a range of journals, including the *Lancet Planetary Health*, *Medical Teacher* and *Health and Human Rights*. I also worked with the WHO and a group of medical student representatives in a scoping review of original research on climate change and human health (from 2010 to 2020) to identify research gaps and gender-disaggregated data which was presented at COP26 in Glasgow. I contributed to the WHO Air Pollution Department Clinical Case Scenarios for a Training of Trainers (ToT) Manual for physicians on air pollution and asthma-related diseases. As a certified trainer, I have facilitated over 94 hours of capacity-building workshops and sessions in 15 countries that mainly aimed to empower medical students with the competences to build capacities and advocate for planetary health and climate change. Recently, I joined the Climate in Obstetrics, Anesthesia and Surgery Team (COAST), generating primary data and examining the intersection between climate change and surgery, obstetrics, and anesthesia.

Note: Omnia was the first COP Youth Envoy at the November 2022 COP27 in Egypt...

I am inspired by Mary Robinson, the first woman to be President of Ireland and the former UN High Commissioner for Human Rights and Chair of the Elders, who has been an exemplary leader for gender equity and climate justice. She provided young people, including myself, the opportunity to share our perspectives in a series of intergenerational blogs on climate change in which each blog was championed with a foreword by a global leader, including Grace Michel and Ban Ki-moon. There is also Dr. Nicole De Paula, the Founder and Executive Director of Women Leaders for Planetary Health, a social enterprise that builds the capacity of women from the Global South to address the interaction between health and the environment with gender-just solutions. Finally, I believe that as a young doctor, my duty is not only to my patients but also to my community and the planet on which all life depends.

Finola Hackett, is currently a Rural Family Physician, practicing as a generalist locum in Alberta and Yukon, Canada. I completed medical school at the University of Alberta in 2019 and a Family Medicine residency in 2021 through the University of Calgary Lethbridge program. As a medical student, I was Chair of CFMS HEART from 2017 to 2019 and led the establishment of the HEART national student network and planetary health curriculum competencies for Canadian undergraduate medical education. I have co-authored the 2020, 2021, and 2022 *Lancet* Countdown Canada Policy Briefs on Climate Change and Health. My initial motivation in this area was due to my background Bachelor studies in Environment and Political Science at McGill University, which led to an internship at the World Health Organization Public Health and Environment Department in Geneva, as well as at JUCCCE, a sustainability non-profit organization in Shanghai. After entering medical school, I noticed a gap in the curriculum in terms of the environmental determinants of health and the impacts of climate change and other environmental changes on health. I became involved with HEART to change this, which set out a national framework for including these topics in medical education and applying planetary health to clinical practice. I continue to stay involved in this area as a busy attending family physician, largely because of the inspiration of the colleagues with whom I have worked (including many medical students) who share this passion for practicing medicine in a holistic way that accounts for planetary health equity and climate justice.

Karly Hampshire, currently a fourth-year medical student at the University of California, San Francisco (UCSF) School of Medicine. As an undergraduate, I studied anthropology. In September 2018, as the destructive Camp Fire raged through Paradise, California, causing record-breaking low air quality, I was struck by how our pulmonology classroom lectures felt disconnected from the realities of the outside world. Seeing reports referring to climate change as the largest threat to health in the 21st century, I was aware of how unprepared health professionals were to prevent, diagnose, and manage climate change-related diseases. I increasingly recognized climate change as the great

exacerbator, threatening to worsen so many social issues, from displacement to food insecurity to homelessness to racism. In 2019, several UCSF classmates and I founded the Planetary Health Report Card (PHRC), a student-driven, metric-based initiative to inspire planetary health in medical schools. The report card has now been leveraged as an institutional advocacy tool by students and faculty at more than 80 medical schools in eight countries and pilots have been published for nursing and pharmacy schools. Last year, I took a break from medical school to focus on climate and health full-time, working as a fellow with the newly established UC Center for Climate, Health, and Equity, helping to develop the Climate Resources for Health Education Initiative spearheaded by the GCCHE, engaging with research projects at the intersection of climate and health, serving as curriculum co-chair at Medical Students for a Sustainable Future, and launching the Interview without Harm Initiative, advocating for increasing the sustainability of medical training interviews. I have been fortunate to work with passionate students (Hannah Chase and the rest of the PHRC leadership team, Natasha Sood and Sarah Hsu and the rest of the MS4SF leadership team, and Nuzhat Islam and other UCSF student leaders), and faculty mentors (Katherine Gundling, Arianne Teherani, Sheri Weiser, Teddie Potter, Nicholas Iverson, Heather Whelan, among others) in this space, who bring inspiration, fierce competence, joy, and laughter to what can be disheartening work.

Sarah Hsu, currently an Internal Medicine-Primary Care Resident at the University of California San Francisco (UCSF), 2021 Switzer Fellow. My father, the son of Taiwanese farmers, grew almost everything we needed to eat in the drought-heavy suburbs of Los Angeles. As a young child, I learned about composting and regenerative farming and tagged along as he would check in on elderly Asian immigrants in our neighborhood, using produce as a tool to deliver much-needed sustenance and social interaction. My father taught me that understanding the intersection between our environment and community was central in our quest for mental and physical well-being. I brought this belief with me to medical school and hoped to explore this intersection in clinical practice.

As I trained in Rhode Island, the fastest warming state in the continental US, I found immense difficulty in understanding how to utilize clinical tools to mitigate and prevent climate-related health risks or receiving guidance in how to decarbonize our healthcare system. Hoping to change this, I co-founded Alpert Medical School's Environmental Coalition and designed the first medical school elective on "Climate Change and Health" in 2019. Seeing the need for a coordinated national effort of medical students advocating for climate and health justice, I joined forces with medical students across the US to found Medical Students for a Sustainable Future (MS4SF).

Connecting with this network has also brought the gift of incredible physician mentors who continually guide, teach, and support my work. Dr Amy Collins with the Physician Network of Healthcare without Harm was my first mentor in this space, introducing me to my research mentor, Dr Jonathan Slutzman. Together, we published the first audit and carbon footprint of an Emergency

Department in 2020. Dr Gaurab Basu introduced me to the power of storytelling, and, with his mentorship, I have been an avid proponent of using op-eds as a way to engage health professionals in climate and health equity work. From Dr Lisa Patel, I am continually learning the art of work-life balance as a physician climate activist as well as podcasting. Thanks to her guidance, Natasha Sood and I launched the new podcast "Code Green: The Climate Smart Health Professional", to provide an easily accessible medium for health professionals to learn about climate and health. Finally, a huge thanks to Dr Aparna Bole, who has so graciously opened up opportunities for me to use my voice on larger platforms such as the American Academy of Pediatrics.

Nuzhat Islam, currently a first-year resident at the University of California, San Diego's internal medicine program, an alumna of the University of California, San Francisco (UCSF) School of Medicine, and a co-founder and former design chair for the Planetary Health Report Card (PHRC). I have always been interested in climate change, but I came to more clearly understand climate change's impact on people during medical school. My understanding shifted during the northern California wildfires of 2018, which led to the loss of many lives, homes, and livelihoods. Although San Francisco was at a distance from the fires, we could not go outside without the use of N95 masks due to the poor air quality. Incidentally, my classmates and I were in our pulmonary unit at the time and noticed that there was no mention of the health impacts of wildfires in our pulmonary teaching sessions, although we were surrounded by the effects. Thus, some of my classmates and I began wondering about the gaps in our medical education regarding the topics of climate change and planetary health. We co-founded the Planetary Health Report Card (PHRC), a needs assessment tool used to evaluate medical schools' integration of planetary health into the training environment and inspire institutional change. Since then, the initiative has expanded globally, has been leveraged to create tangible change at medical schools, and has provided a community for medical students looking to become engaged within this space. I continued on as a member of the PHRC leadership team as design chair for the initiative. I was also engaged at UCSF as a student leader in the Human Health and Climate Change student organization through educational and advocacy projects. Additionally, I served as student advocate in the UC Climate Change Resilience and Adaptation Planning Project, working to address climate challenges (e.g., heat waves, etc.) facing San Francisco communities and to plan for UCSF's role in navigating these challenges through an approach centered on justice, equity, diversity, and inclusion. Engaging in this space has provided me the opportunity to meet, learn from, and grow with a community of inspiring people. It has been an honor to work with such wonderful mentors (Katherine Gundling, Thomas Newman, Robert Gould, Arianne Teherani, Annemarie Charlesworth, and many others) and colleagues (Karly Hampshire, Hannah Chase, and the rest of the PHRC leadership team and community, Colin Baylen, Bennett Kissel, and other student leaders at UCSF, and Natasha Sood and MS4SF team members). As I continue my training in

residency, I look forward to identifying new avenues for pursuing education and advocacy within this space.

Natasha Sood, is a fourth-year medical student at Penn State College of Medicine. When I was six years old, I was exposed to Dr Jane Goodall's books for the first time. While as a six-year-old, I wasn't able to appreciate the depth of knowledge she contributed to the scientific community, I found myself fascinated by the pictures of her sitting in the Gombe Stream National Park in Tanzania observing the social and family interactions of wild chimpanzees. Through her photographs, I found that the chimpanzees interacted in much the same way that my sister and family did. Thus, Dr Goodall's work primed me on the concept of relationships with my family and my community, and now as a medical student, with my colleagues and patients. Her work also primed me for our relationship with our planet. As I progressed through school and graduate training, I have increasingly realized our dependence on nature to deliver effective health care.

Prior to medical school, I completed a Master of Public Health in Climate Change and Health at Columbia University to increase my knowledge of these issues. My training provided me a lens by which I view my role in medicine, as both a clinician and physician advocate. When starting medical school, I found that our organ system and health system science education did not address the impacts of climate change on health or health care delivery. In connecting with medical students across the country who felt similarly, we founded Medical Students for a Sustainable Future (MS4SF) to catalyze action on climate. In 2020 and 2021, I served as MS4SF Curriculum Chair and Executive Chair, respectively, helping to develop the Climate and Health Curriculum Reform Guide. To further my involvement in climate health education, I recently completed a year as a Global Consortium for Climate and Health Education (GCCHE) Medical Fellow. At GCCHE I created the Climate Resources for Health Education (CRHE) Initiative to provide health educators with a repository of climate health slides and cases for undergraduate and graduate health education with a supercharged team of students and faculty from GCCHE, Massachusetts General Hospital, Brigham Women's Hospital, Emory University School of Medicine, and University of California San Francisco.

MS4SF and GCCHE have afforded me the opportunity to work with and learn from colleagues and mentors around the country. I am motivated by the devotion and passion of my student colleagues, Sarah Hsu, Karly Hampshire, Harleen Marwah, Sarah Schear, Ellen Townley, and others. My mentors, Dr Cecilia Sorensen, Dr Guarub Basu, Dr Sarah Bronson, Dr Amy Collins, Dr Marcalee Alexander, Dr Lisa Patel, and *many* others. They are a constant source of inspiration, mentorship, support, and encouragement. I am grateful for the opportunity to continually learn from the expertise and experiences of those around me and look forward to a career of working with others to secure a healthy and just future for our patients.

Supplement S2. Student organizations and their involvement in climate, sustainable health care and/or planetary health education

International Federation of Medical Students' Associations (IFMSA): <https://ifmsa.org/>

The International Federation of Medical Students Associations (IFMSA), founded in 1951, is one of the world's oldest and largest student-run organizations. It represents, connects, and engages with an inspiring and engaging network of 1.3 million medical students from 140 national member organizations in 123 countries. For over 60 years, IFMSA has been run for and by medical students on a voluntary basis. On its website, IFMSA writes that it *"envision[s] a world in which all medical students unite for global health and are equipped with the resources, skills, and knowledge to take on health leadership roles locally and globally, so that we can shape the healthy and sustainable future we want. Numerous projects, campaigns, conferences and workshops are organized across member countries in the field of public health, sexual and reproductive health, medical education, and human rights and peace"*.

In addition to writing policies around global issues such as climate change, air pollution, food sustainability, and health equity, and developing training manuals such as the Climate and Health in collaboration with the World Health Organization, IFMSA also sends representatives to the Conference of Parties and COP26 was no exception. IFMSA is also a member of the WHO-Civil Society Working Group to Advance Action on Climate and Health and the Global Climate and Health Alliance. Additionally, IFMSA has a close relationship with the Association for Medical Education in Europe (AMEE), assisting with the annual conferences. AMEE offers student research grants in medical education.

Canadian Federation of Medical Students: Health and Environment Adaptive Task Force (HEART): <https://www.cfms.org/what-we-do/global-health/heart>

The Canadian Federation of Medical Students (CFMS) Health and Environment Adaptive Response Taskforce (HEART) was created in 2016. It is a national body of medical students advocating for education and action around planetary health and the impacts of climate change on health. HEART includes a core committee of students led by two co-chairs, as well as a broader network of local student representatives from each medical school.

HEART has undertaken comprehensive evaluations of the status of planetary health teaching in Canadian undergraduate medical education. These include surveys of all 17 medical schools with detailed reporting of strengths and areas for improvement. The most recent HEART report (August 2021) is available:

<https://www.cfms.org/files/HEART/CFMSHEARTNationalReportonPlanetaryHealthEducation2021.pdf>.

A recent graduate and colleagues involved with HEART have published a guide to integrating planetary health into Family Medicine training:

<https://www.cfpc.ca/CFPC/media/Resources/Education/GIFT-Planetary-Health-one-pager-ENG.pdf>

The HEART team has created the Climate Wise slides for easy integration into undergraduate medical teaching: <https://www.cwslides.com/>

Medical Students for a Sustainable Future (MS4SF): <https://ms4sf.org/>;

<https://ms4sf.org/founding-team/>

Founded in 2019, MS4SF is a growing community of over 550 medical students across 110 medical schools around the world who recognize climate change as an urgent threat to health and social justice. MS4SF students catalyze action now to prevent and address the health harms of climate change by engaging in committees such as advocacy, curriculum reform, research, and climate-smart healthcare. The exponential growth of this community reflects a deep understanding that climate change is a critical obstacle to the health of our patients and medical students are inspired to catalyze action now.

Planetary Health Report Card (PHRC): <https://phreportcard.org/>

2019: A student-led, metric-based initiative to evaluate and inspire planetary health engagement in health professional schools worldwide. Founded by University of California, San Francisco (UCSF) School of Medicine students Karly Hampshire, Nuzhat Islam, Bennett Kissel, and Colin Baylen with support from faculty mentor, Katherine Gundling, MD. It was revised and finalized with input from topic experts, Arianne Teherani, Sheri Weiser, Annemarie Charlesworth, Sarah Schear, Bob Gould, Patrice Sutton, Teddie Potter, Tom Newman, Natasha Sood, Sarah Hsu, SanYuMay Tun, Shanda Demorest, Amy Collins, Rhys Jones, Carlos Faerron, Sam Myers, Husein Moloo, Katharina Wabnitz, and Eva-Maria Schwiendorst-Stich. It was piloted at UCSF by founders and at Stanford Medical School by Stanford students, Anna Goshua and Jason Gomez. Below is a summary of achievements to date:

- *2019-2020:* Completed the first full cycle of the PHRC with 13 schools from the US and Canada (including pilot schools).
- *May-August 2020:* Recruited UK and Republic of Ireland medical schools and formed an international leadership team under guidance of initiative co-directors Karly Hampshire and Hannah Chase, who also served as the UK regional lead.
- *2020-2021:* Completed the second cycle of PHRC with 62 participating medical schools from US, Canada, UK, Malaysia, and Republic of Ireland.
- *2021-2022:* PHRC metrics translated into French, German and Japanese, to reflect further expansion to Canada, Germany, and Japan. Formation of a faculty advisory board with expert advisors from each of the four largest nations involved - Katherine Gundling (US), Hussein Moloo (Canada), SanYuMay Tun (UK), and Katharina Wabnitz (Germany). 74 participating medical schools from seven countries were included in the Earth Day summary report, with results of the medical school pilot in India published shortly thereafter. Metric adaptations for nursing and pharmacy programs also published.
- *2022-2023:* Fourth cycle of the PHRC underway, with the inclusion of medical schools from New Zealand, Australia, Indonesia, South Africa, Portugal, the Netherlands, Greece, Turkey, and Switzerland. Adaptations of the Report Card for physiotherapy and dentistry are in progress.