


Student knowledge and perceptions of climate change and environmental sustainability at the Faculty of Health Sciences, University of Cape Town, South Africa

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Background. Climate change and polluting healthcare systems are significant threats to public health. Education about planetary health and environmentally sustainable healthcare is needed to equip health professionals to meet these challenges.

Objectives. To assess the knowledge, perceptions and understanding of climate change and environmental sustainability among undergraduate health sciences students at the Faculty of Health Sciences (FHS), University of Cape Town (UCT).

Methods. Two student-led focus groups helped to design a cross-sectional survey of all undergraduate health sciences students. The survey findings were analysed quantitatively and thematically.

Results. The 264 respondents included 211 medical and 53 health and rehabilitation students. Two-thirds of respondents (64.4%) claimed awareness but little understanding of climate change, which was understood mainly as changes in weather and climate patterns (40%) as a result of human activities (96.6%). Most (72%) were aware of the concept of environmental sustainability, but with little understanding. Students' main sources of information about climate change were the internet (84.1%) and social media (77.3%). Two-thirds believed that climate change will highly impact their patients' health and quality of life. Most (58.3%) thought that health professionals can help to prevent climate change by educating patients and promoting sustainable lifestyles. Nearly half (47.3%) thought it important to teach climate change and environmental sustainability in the curriculum.

Conclusion. Climate change and environmental sustainability have been poorly incorporated into current FHS, UCT curricula. Students acknowledged that these concepts are important and should be taught. The FHS should integrate planetary health and environmental sustainability into its curricula, in line with global efforts.

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Climate change has emerged as a major amplifier of environmental risks to the health of our planet and people via multiple pathways.^[1,2] The worldwide increase in extreme weather events (e.g. floods, storms, heatwaves, droughts) contributes significantly towards the global burden of disease, especially in low- and middle-income countries (LMICs),^[3,4] and among vulnerable populations, such as children and the elderly. Health professionals play a pivotal role in diagnosing, treating and protecting the public's health from direct and indirect climate-health impacts. Healthcare systems are significant polluters of the environment and contributors to climate change;^[5] hence, they also have an important role to play in more environmentally sustainable healthcare. The foundation for health professional preparedness to address the negative impacts of climate change comprises comprehensive education about planetary health and sustainable healthcare. There is growing international consensus on the importance of academic institutions educating about sustainable healthcare and planetary health to help meet the 2030 Sustainable Development Goals (SDGs). Three of the SDGs, i.e. SDG 4 (quality education), SDG 12 (responsible production and consumption) and SDG 13 (climate action), include targets and indicators for mainstreaming education for sustainable development in national education policies, curricula, teacher education and student assessment.^[6]

Internationally, education for sustainable healthcare (ESH) aims to develop knowledge, skills and attitudes regarding the interdependence of human health and planetary ecosystems.^[7-9] Yet, many medical schools and health sciences faculties, especially in LMICs, have overcrowded curricula, which makes it difficult to integrate ESH topics into the curriculum.^[10,11] Efforts to integrate ESH into health sciences curricula^[12-15] should also involve students, to increase their support for educational changes.^[16] The inclusion of environmental health topics may promote student understanding of how the changing environment impacts the pathophysiology of disease^[17] and of their role in protecting health from climate change and its associated environmental risks. It is therefore important to assess the knowledge, perceptions and understanding of current health sciences students regarding climate change and environmental sustainability. University students in African countries and the Philippines have been found to have poor awareness and knowledge about climate change and its effects on health,^[18,19] which may also be true of health sciences students in South Africa (SA).^[20] This study, therefore, aimed to survey the knowledge, perceptions and understanding of climate change and environmental sustainability of undergraduate health sciences students at the Faculty of Health Sciences (FHS), University of Cape Town (UCT). This is the basis for preparing

UCT students to actively contribute to SA delivering on the SDGs related to quality education (SDG 4) and climate action (SDG 13) by 2030.

Methods

A cross-sectional survey was conducted using Google Forms over 3 weeks in June 2019 of all 2 102 registered undergraduate FHS, UCT students: 1 351 medical and 751 health and rehabilitation sciences (HRS) students (227 physiotherapy, 246 occupational therapy, 159 speech and language pathology and 119 audiology students). All were invited to participate via an email from the FHS student office. Twenty vouchers for a local café were randomly awarded to incentivise participation. Five female and 5 male students (medical and physiotherapy) were purposively selected to represent academic year of study, discipline and gender. They were invited via FHS student-run WhatsApp groups to take part in two focus group discussions (FGDs) for prior development of the online survey. The FGDs were facilitated, recorded and scribed, with consent, by 2 of the authors (ZR and QAP), who were third-year medical students. An FGD guide was developed, which covered students' understanding of climate change and environmental sustainability; how these concepts relate to healthcare professional education and their previous learning on climate change and sustainability; and student reflections on their prior education.

The survey included 27 questions related to student demographics (gender, age, race/ethnicity, year of study, degree of study); knowledge and understanding of climate change; perceptions of environmental sustainability; and perceptions of ESH in the curriculum. Four of the FGD participants completed a pretest of the draft survey, which resulted in some questions being deleted, added or slightly revised to enhance their face validity and reliability. The final survey was then shared with all participants via email.

Responses from the survey were exported to Microsoft Excel version 18.2210.1203.0 (Microsoft Corp., USA) for analysis, using descriptive statistics and Pearson's χ^2 tests for statistically significant differences ($p < 0.05$) between predefined subgroups of gender, and year and degree of study. Thematic analysis of the open-ended survey questions was performed using Microsoft Excel for frequencies of responses regarding the perceived impacts of climate change, and NVivo 12 for responses regarding both the phenomenon of climate change and the perceived causes of climate change (other than those presented in the checklist of options).

Ethics approval was obtained from the FHS Human Research Ethics Committee (ref. no. HREC 326/2019), and research access to students by the Department of Student Affairs (DSA).

Results

Of the 2 102 students invited to participate, 264 completed the survey (12.6% response rate); 80% of them were medical students ($n=211$; 15.6% response) and 20% HRS students ($n=53$; 7.1% response). The medical students ranged from 20% ($n=42$) in their first year to 10% ($n=22$) in their sixth year, and the HRS respondents from 13% ($n=7$) in their first year to 21% ($n=11$) in their fourth and final year of study (Table 1).

Knowledge and understanding of climate change

Two-thirds of all respondents (64.4%; $n=170$) reported that they were aware, with limited understanding, of climate change. A further 31% ($n=82$) claimed in-depth understanding and knowledge of climate change, and 4% ($n=11$) said they were aware but with no understanding. Of the

medical students, those in years 5 and 6 (10.4%; $n=22$) had the most understanding, and those in year 3 (26.1%; $n=55$) and year 4 (16.1%; $n=34$) the least. There were no significant differences in understanding by year of study ($p=0.48$), or between medical and HRS students ($p=0.15$). Climate change was understood mainly as changes in weather and climate patterns (40%; $n=105$). These changes were perceived by many to be due to global heating caused by human activities such as fossil fuel combustion that emit greenhouse gases and pollution, and have detrimental impacts on the environment and all life forms (Table 2).

Perceived causes of climate change, selected without restriction from a list of options, were industrialisation (97%; $n=256$), human activities (96.6%; $n=255$), increase in fossil fuel usage (96.2%; $n=254$), deforestation (95.8%; $n=235$), urbanisation (91.7%; $n=242$), increasing human population (87.9%; $n=232$) and other causes (14.8%; $n=39$), such as unsustainable agriculture and animal farming (5.3%; $n=14$) and pollution (1.9%; $n=5$).

For sources of knowledge and perceptions about climate change, the internet ranked the highest (84.1%; $n=222$), followed by social media (77.3%; $n=204$), television (58.3%; $n=154$), peers (43.9%; $n=116$), community/society living in the vicinity of the students (41.3%; $n=109$), family (34.1%; $n=90$), radio (23.9%; $n=63$) and magazines (20.8%; $n=55$). About a third of respondents cited the university curriculum (31.4%; $n=83$) and scientific journals (31.4%; $n=83$).

Most thought that health is impacted by climate change due to natural disasters or extreme weather events (94.7%; $n=250$), air quality-related illnesses (92.4%; $n=44$), water-borne diseases (91.7%; $n=250$), malnutrition (81.4%; $n=215$), vector-borne diseases (76.9%; $n=203$), mental illnesses (65.5%; $n=173$) and heat-related illnesses (28.0%; $n=74$). Two-thirds (64.0%; $n=168$) thought that climate change will have a high impact on the health, quality of life or environment of their future patients, due to factors such as the quality of the air, food and water (Table 3). Those who thought that the impacts will be of medium severity (25%; $n=66$), also believed that climate change is still reversible or less extreme in SA than elsewhere, or that climate-health impacts are not apparent. Others who thought that the impacts will be low (11%; $n=30$), believed that their generation would not be affected, that social factors in SA are more important determinants of health than climate change, or they were unaware of any climate-health impacts.

More than half (58.3%; $n=154$) believed that health professionals can mitigate climate change by, for example, educating their patients about sustainable lifestyles, about the general and health-related impacts of climate change, about how to reduce their personal 'carbon footprint' and about reducing and recycling waste. Perceptions of how health professionals can mitigate climate change in the clinical setting included public awareness regarding the effects of climate change (20.5%; $n=54$) and advocating for the use of sustainable energy and healthcare resources (18.9%; $n=50$).

Understanding of environmental sustainability

With regard to environmental sustainability, 72% ($n=191$) said they were aware but with little understanding, 25% ($n=65$) claimed to have an in-depth understanding and knowledge, and 3% ($n=8$) were not familiar with the concept. A sustainable lifestyle was perceived to be 'eco-friendly' (37.9%) and about preserving resources for future generations (17.8%), reducing one's carbon footprint (12.9%), reducing the usage of natural resources (11.4%) and benefiting the environment (10.6%). Over half (56.8%) wished

Table 1. Student respondents by discipline and year of study, *n (N=264)**

Health sciences discipline	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total, <i>n</i> (%)
Audiology	0	0	8	1	-	-	9 (3.4)
Occupational therapy	2	4	6	3	-	-	15 (5.7)
Physiotherapy	2	5	2	5	-	-	14 (5.3)
Speech and language pathology	3	3	7	2	-	-	15 (5.7)
Students							
HRS	7	12	23	11	-	-	53 (20.1)
HRS, %	13	23	43	21	-	-	100
Medical	42	41	49	33	24	22	211 (79.9)
Medical, %	20	19	23	16	11	10	100
Respondents	49	53	72	44	24	22	264
Respondents, %	19	20	27	17	9	8	100

HRS = health and rehabilitation sciences.
*Except where otherwise indicated.

Table 2. Students' understanding of the phenomenon of climate change (N=264)

Thematic summary of responses	<i>n</i> (%)
Changing weather and climate patterns	105 (40)
Detrimental impacts on the environment and all life forms	52 (20)
Increasing greenhouse gases/fossil fuels/pollution/'carbon footprint'	50 (19)
Increasing global temperatures	46 (17)
Planetary impacts due to human activities	43 (16)
Rising sea levels/droughts/floods/melting ice	20 (8)
Destruction of the ozone layer	17 (6)

Table 3. Perceptions of climate change impacts on future patients (N=264)

Perceived impact of climate change	Medical students, <i>n</i> (%)	HRS students, <i>n</i> (%)	Total, %
High	135 (64)	33 (62.3)	64
Medium	55 (26.1)	11 (20.8)	25
Low	21 (10)	9 (17)	11
Total	211	53	

HRS = health and rehabilitation sciences.

to have a sustainable lifestyle, of whom significantly more were female than male (43.2% v.13.6%; $p=0.003$). Only 11% ($n=29$) perceived that they already had a sustainable lifestyle, while 16% ($n=41$) perceived such a lifestyle to be very expensive.

A third of students (35.6%; $n=94$) described sustainability opportunities at UCT, such as water saving and waste recycling on campus. Most (58.3%; $n=154$) were unaware of student-run initiatives on environmental sustainability at UCT; 108 mentioned the Green Campus Initiative (GCI), a student society on the main campus, but less active at the FHS. Students suggested many ways in which the FHS campus and its clinical training hospitals and health centres could operate more sustainably, such as having more recycling bins, more online academic content and assessments, more plant-based food options, less electricity usage and more teaching about sustainable lifestyles.

Climate change and environmental sustainability in FHS, UCT curricula

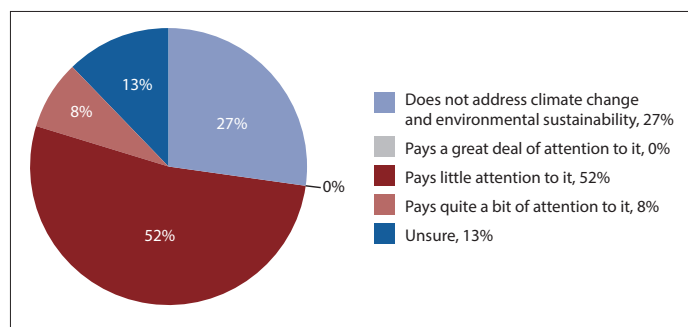
Two-thirds of students (62.5%; $n=165$) recalled few or no lectures on environmental sustainability. On a scale of 1 - 5, fewer than half (47.3%; $n=125$) thought it extremely important to teach climate change and environmental sustainability, with no significant difference between medical and HRS students ($p=0.42$). Half (51.5%; $n=136$) thought that the current health sciences curricula pay little attention to climate change and environmental sustainability, significantly more among medical than HRS students (54.5% v. 39.6%; $p=0.05$). A quarter (26.5%; $n=70$) said that the curriculum does not address these topics at all, and 13% ($n=35$) were unsure (Figs 1).

Preferred methods for teaching ESH topics included facilitated group discussions (36.0%; $n=96$), peer-to-peer discussions (32.2%; $n=85$), online interactive resources (31.1%; $n=82$), case studies (32.1%; $n=84$) and electives (29.5%; $n=78$). Two-fifths (41%; $n=108$) were neutral about lectures as an effective mode, and writing of assignments were least preferred (43.6%; $n=115$). A third of students (34.1%; $n=90$) preferred to be formatively assessed on these topics, and 29% ($n=77$) did not want these topics to be assessed at all. The most common topics suggested for future curricula were the impacts of climate change on health (including health promotion (22.3%; $n=59$)), living a sustainable lifestyle (15.2%; $n=40$), mitigation of climate change effects (12.5%; $n=33$) and reducing one's carbon footprint (11.0%; $n=29$).

Discussion

Knowledge and understanding of climate change

Most students claimed to be aware of climate change, but with little understanding of the phenomenon, which is consistent with a similar finding among rural SA university students in 2018.^[20] The internet and social media were the most common sources of information, despite their doubtful credibility and bias. These sources can, however, enhance student awareness of climate change and sustainable development through increasing publicity, both good and bad, of climate change.^[19] Ultimately though, students' understanding and ability to apply this information in a clinical setting depend on both university curricula and reputable science-based media.^[20] Nevertheless, scientific journals and the curriculum were among the least cited sources of climate change information in this



Figs 1. Student perceptions of climate change and environmental sustainability regarding curricula at the Faculty of Health Sciences, University of Cape Town (N=264).

study. Participants may have thought that ‘curriculum’ referred to their schooling rather than FHS curricula, meaning that this finding may even be overestimated. This outcome was expected because the current medical curriculum addresses climate change and health only briefly in the second and fourth years.

Students viewed their role in climate change primarily as educating patients, raising awareness and promoting sustainable lifestyles and behaviours, but application in the clinical setting is unlikely if their knowledge and understanding are deficient. Furthermore, their potential role as students in current climate change education was not well articulated.^[14]

Understanding of environmental sustainability

Respondents’ understanding of environmental sustainability was poor, with almost three-quarters aware of the concept, but with little understanding of it. Furthermore, fewer than half recognised that a sustainable lifestyle means conserving resources for future generations and being eco-friendly. The finding that female students were three times more likely than male students to prefer a sustainable lifestyle, may be explained by a psychological connection between sustainability and femininity.^[21] Students were much more aware of sustainable lifestyle activities than putting them into practice, which may be due to financial or practical constraints. Practising sustainability may not be exclusively to save the environment, but may also be due to reasons of convenience, affordability and social desirability.^[20]

There was high awareness and practice of saving water and re-using plastic bags and coffee tumblers, as the FHS provides such opportunities. There is a perceived need for more waste recycling, more plant-based food options, less paper usage and less electricity consumption on the FHS campus. There was low awareness of UCT student-run environmental initiatives among FHS students, probably because the FHS campus is distant from the central UCT campus, where these initiatives are mostly active, and also where more students are enrolled in environmental courses. Less awareness among FHS students of the relevance of the environment to their studies, and little active recruitment by GCI, may therefore account for low FHS participation in student-led sustainable campus initiatives.

Climate change and environmental sustainability in FHS, UCT curricula

It is evident from this study that current FHS curricula do not prepare UCT’s future health professionals to adequately address the public health impacts of climate change and the need for more environmentally sustainable healthcare. This was illustrated by two-thirds of participants

recalling few or no lectures on climate change and environmental sustainability, with more than half of the medical students and two-fifths of HRS students perceiving that little attention is given to these topics. Therefore, even though many students thought that health professionals should educate patients about climate change causes, impacts and mitigation, they do not receive adequate training to do so. As Kligler *et al.*^[11] show, without a curriculum focused on environmental health, students will not be prepared to provide relevant advice to their patients. Health professionals need support from their curricula to model environmentally sustainable behaviour by reducing their personal carbon footprint and minimising medical and general waste in clinical settings.^[20] Intentional exposure to environmentally sustainable healthcare at facilities subscribed to the global ‘green’ agenda would therefore provide good teaching and learning opportunities with regard to reducing the environmental impact of health services.^[22]

The study shows that there is much student interest in the FHS in education about planetary health and sustainable healthcare, using a variety of teaching and learning methods, such as facilitated group discussions, peer-to-peer teaching, online interactive educational resources, case studies and electives. Social media and technology can and should be used to help students connect local with global environmental issues, and to share their stories and initiatives appropriate to the literacy levels and needs of local communities.^[23]

Study limitations

Students were on vacation during most of the survey period, which resulted in a lower response rate than anticipated. Nonetheless, participants were representative of undergraduate FHS students across years of study and disciplines, albeit with different response rates. The response rate among HRS students was less than half of that of the medical students, probably because the latter were more easily contactable than HRS students by authors ZR and QAP. Awareness of sustainable lifestyle activities may be overestimated owing to a faulty online question format that prevented respondents from selecting the option of neither awareness nor practice of such activities.

Conclusion

The study findings support our hypothesis that too little curriculum space is allocated to planetary health, climate change and environmental sustainability topics in the FHS, even though students perceived that these topics are important and should be taught. It is therefore recommended that a variety of methods be used to teach and assess these topics. The FHS should also promote environmental sustainability in its operations and services, and FHS students should be more active in UCT’s sustainable campus initiatives.

There is growing global awareness of the need for including planetary health and environmental sustainability in health professional education. What is needed in SA is a standard requirement for these topics to be included in health professional coursework. This study adds to this requirement with a call for curriculum reform and exemplar environmental sustainability policy and practice in the FHS. A nationwide representative survey of health sciences faculty staff and students would add to knowledge of how best to implement these changes in the SA context.

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