



Planetary Health Report Card (Pharmacy):

*University of California,
San Francisco*



2022-23 Contributing Team:

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Summary of Findings

Overall	B-
<u>Curriculum</u>	B
<p>The University of California, San Francisco (UCSF) School of Pharmacy (SOP) curriculum addresses several aspects of planetary health, however the depth of coverage is limited to three core lectures and a few elective lectures. Some topics are only briefly mentioned and limited to a single slide or two. Others are discussed in greater depth. Current curricular content focuses on relevant, real life examples for students to learn and practice applying their knowledge. We recommend: improvement in this domain could be achieved through integration of planetary health across the UCSF SOP curriculum. This could be done by incorporating at least one planetary health topic per block. Additionally, faculty education on the impacts of climate on health could allow for more explicit connections between disease states and climate change during relevant lectures. We recommend the continued use of patient cases and other active learning methods to help students identify opportunities for planetary health mitigation and adaptation.</p>	
<u>Planetary Health Research</u>	B-
<p>UCSF SOP researchers study a diverse range of fields, however few specifically focus on the impacts of climate on health. One UCSF SOP researcher has conducted studies evaluating the effect of instructional sessions about planetary health on student outcomes. Some researchers within the SOP focus on health disparities, but not specifically those caused by climate change or other environmental conditions. There are researchers within UCSF but outside of the SOP who do conduct research on the impacts of climate on health. We recommend: having researchers with a targeted focus on planetary health and pharmacy sustainability would be beneficial for many reasons. For example, researchers could teach students about their findings and invite them to collaborate on their research. They may also strengthen the connection between the San Francisco community and UCSF SOP to uplift the voices of those who are most deeply affected by environmental conditions.</p>	
<u>Community Outreach and Advocacy</u>	F+
<p>UCSF SOP has not formally partnered with organizations that promote planetary health or sustainable practice. UCSF SOP is also not part of any national or international organization with this focus. UCSF as an institution does have two centers, the EaRTH center and Center for Climate, Health and Equity, that address these topics. Partnering with organizations would demonstrate dedication towards sustainable healthcare practice and education. This may also lead to opportunities for student participation in a variety of organizational experiences, such as educational programs.</p>	
<u>Support for Student-Led Initiatives</u>	C-
<p>The UCSF EaRTH Center, Center for Climate, Health and Equity, and Office of Sustainability provide support for student-led initiatives. UCSF also provides free access to outdoor programs for students. We recommend: UCSF SOP may consider strengthening relationships with the UCSF EaRTH Center, Center for Climate, Health, and Equity, and Office of Sustainability. One way to achieve this is through pre-existing student organizations, such as the Alliance for Pharmacy Sustainability or the Human Health and Climate Change Club.</p>	
<u>Campus Sustainability</u>	A-
<p>UCSF is committed to reducing their carbon footprint and transforming into a sustainable institution. Additionally, UCSF has sought to include sustainable practices throughout the institution, from the labs to the professional schools. UCSF has set a goal to become carbon neutral by 2025 and has voted to divest from all companies on the Carbon Underground 200 List</p>	

Statement of Purpose

Planetary health is human health.

The Planetary Health Alliance describes planetary health as, “a solutions-oriented, transdisciplinary field and social movement focused on analysing and addressing the impacts of human disruptions to Earth’s natural systems on human health and all life on Earth”[1]. This definition is intentionally broad, intended to encompass the multitude of ways that the environment can affect health, including water scarcity, changing food systems, urbanisation, biodiversity shifts, natural disasters, climate change, changing land use and land cover, global pollution, and changing biogeochemical flows. The health of humanity is dependent on our environment and our environment is changing rapidly and in disastrous ways. Although the World Health Organization has called climate change “the single biggest health threat facing humanity”[2] many pharmacy schools’ institutional priorities do not reflect the urgency of this danger to human health. Fossil-fuelled electricity and gas and medical or pharmaceutical products used in healthcare account for around 8% of the total global greenhouse gas footprint of healthcare[3] with pharmaceutical waste also providing a dangerous contaminant to our water systems [4]. Metered dose inhalers contribute 500g CO₂eq per dose [5], whilst air pollution causes 7 million deaths per year worldwide and exacerbates chronic respiratory disease [6]. Pharmacy therefore has a direct and detrimental impact on planetary health and this contradiction in patient care must be addressed and actioned.

As future health professionals, we must be prepared to address the impacts of human-caused environmental changes on our patients’ health. This preparation is in the hands of the institutions providing our pharmacy training. It is imperative that we empower those who are educating pharmacy students about the health impacts of climate change and other anthropogenic environmental changes, generating research to better understand health impacts and solutions, supporting related student initiatives, embracing sustainable practices as much as possible, and engaging with surrounding communities that are most affected by environmental threats, and hold those who are not accountable. Because climate change and environmental threats disproportionately affect vulnerable populations [7] (for example, communities of colour, older adults sensitive to health threats, and individuals in low-resource settings), these issues are inherently ones of equity and justice.

With the purpose of increasing planetary health awareness and providing recommendations and opportunities for improvement among pharmacy schools, we have created a Planetary Health Report Card that pharmacy students internationally can use to grade and compare their institutions on an annual basis. This pharmacy-student-driven initiative aims to compare pharmacy schools nationally and internationally on the basis of discrete metrics in five main category areas: 1) planetary health curriculum, 2) planetary health research, 3) university support for student planetary health initiatives, 4) community outreach centred on environmental health impacts, and 5) pharmacy school campus sustainability.

Definitions & Other Considerations

Definitions:

- **Planetary Health:** is described by the *Planetary Health Alliance* as “a solutions-oriented, transdisciplinary field and social movement focused on analysing and addressing the impacts of human disruptions to Earth’s natural systems on human health and all life on Earth” [1]. For example, topics such as climate change, declining biodiversity, shortages of arable land and freshwater, and pollution would all fall under the realm of planetary health. Both planetary health and traditional ‘environmental health’ examine the relationship between human health and the external environment, including extreme temperatures, chemicals, vector-borne diseases, etc. Planetary health explicitly concerns itself with the potential health harms associated with human-caused perturbations of natural systems. Therefore, the human health focus of planetary health makes the field well-adapted for the context of pharmacy school education. Throughout this report card, we use the term planetary health to refer to this broad swath of topics, but resources do not need to explicitly include the term “planetary health” to satisfy the metric.
- **Education for Sustainable Healthcare (ESH):** is defined as “the *process of equipping current and future health professionals with the knowledge, values, confidence and capacity to provide environmentally sustainable services through health professions education. We define a health professional as a person who has gained a professional qualification for work in the health system, whether in healthcare delivery, public health or a management or supporting role and education as ‘the system comprising structures, curricula, faculty and activities contributing to a learning process’* [8]. Planetary Health Education is an integral part of this education rather than an end in itself. This is because knowledge about planetary health is required to fully understand the necessity of sustainable healthcare. It is also part of the broader knowledge needed to fully protect and promote health.
- **Pharmacy School vs. Institution:** When “pharmacy school” is specified in the report card, this only refers to the curriculum and resources offered by the school of pharmacy and does not include offerings from other parts of the university (for example, undergraduate departments [USA], other related departments e.g. Public Health, Population Health departments). In contrast, when “institution” is specified in the report card, we are referring to the university more broadly. Any resource reasonably accessible by pharmacy students, no matter where in the institution the resource comes from or if it is specifically targeted for pharmacy students, can meet this metric.
- **Community organisations:** For most institutions, there are existing groups that are not directly affiliated with the university and exist as a product of what the community the institution exists in cares about or needs. These specific community organisations

relevant to this report include those that are focused around some aspect of climate and health preservation. These community organisations can include but are not limited to local mutual aid initiatives, underserved-resource distribution groups, clean-up and nature conservation groups, community gardeners, and other environmental-related organisations. If your institution does not have access to local volunteerships with community groups, please report any community organisations your institution or school has collaborated with.

Planetary Health Curriculum

Section Overview: This section evaluates the integration of planetary health topics into the pharmacy school curriculum. Today's pharmacy students will be on the frontlines of tackling the health effects of climate and other environmental changes. Therefore, it is critical that pharmacy students understand planetary health issues and principles.

1. Does your pharmacy school curriculum address the impacts of extreme weather events on individual health and/or on healthcare systems?	
3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.
<p><i>Score explanation: UCSF provides several opportunities for students to learn about and discuss the impacts of extreme weather events on individual health. There is a lecture during the Respiratory Science & Therapeutics course (PharmIS 112) entitled “Spare the Air”, which discusses the impact of wildfires on airway diseases such as asthma. During the Neuroscience and Therapeutics Course (PharmIS 117), there is an inquiry session entitled “Effects of Climate Change Events on Mental Health”, which invites students to explore the effects of extreme weather events such as heat, floods, wildfires, and droughts, on mental health. These course offerings identify vulnerable populations that are more likely to be impacted by such events and counseling techniques for supporting patients in these circumstances. There is also an optional mini-course offered through the 123A Inquiry Immersion 1 entitled “Climate and Health” that explores the health impacts of extreme weather events.</i></p>	

2. Does your pharmacy school curriculum address the environmental impact of medicines in terms of their pollution, ecological impact and contamination of water systems?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.

Score explanation: A lecture during the Respiratory Science & Therapeutics course (PharmIS 112) entitled "Spare the Air" discusses the direct impacts of medications on the environment due to typical use and inappropriate disposal. For example, the effects of propellants from inhaler use on greenhouse gas emissions leading to worsening air quality. This includes the comparison of different inhaler carbon footprints and how students could determine patients eligible for a more environmentally friendly inhaler. This lecture also discusses how oral medications are introduced into the environment and their impacts (e.g. feminization of fish).

3. Does your pharmacy school curriculum address the health effects of pharmaceutical industry- and manufacturing-related environmental toxins?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.

Score explanation: The elective mini-course “Reproductive Health and the Environment” (123A Inquiry Immersion 1 Course) discusses the chemical usage and waste from pharmaceutical industry and manufacturing. This course specifically discusses PBDEs, policies from the EPA, and counseling points for patients to limit exposure. The mini-course “Climate and Health”, also included in 123A Inquiry Immersion 1 Course, elaborates on the impacts of drug development on the environment, using the synthesis of Tamiflu as an example to illustrate Green Chemistry Principles.

4. Does your pharmacy school curriculum address the carbon footprint of healthcare systems?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.

Score explanation: The “Spare the Air” lecture in the Respiratory Science & Therapeutics course (PharmIS 112) discusses the SABINA CARBON study, reported carbon emissions associated with asthma care, including short acting beta-2 agonist (SABA) usage. This study concluded that well controlled asthma, and thus a decreased reliance on SABA inhalers, leads to a decreased carbon footprint. Practice cases provide students the opportunity to determine whether patients would be able to use more environmentally friendly inhaler devices such as dry powdered inhalers (DPIs). There is also discussion about the US healthcare system’s greenhouse gas emissions, with a focus on emissions from the pharmaceutical lifecycle.

5. Does your pharmacy school curriculum address the impact of climate change on the changing patterns of infectious diseases and increased antimicrobial resistance?

3	These topics are explored in depth by the core curriculum.
2	These topics are briefly covered in the core curriculum.
1	These topics are covered in elective coursework.
0	These topics are not covered.

Score explanation: During the Infectious Disease Science and Therapeutics Course (PharmIS 119), the seminar “Global Health and Climate Change” explores the correlation between climate change, extreme weather, and infectious disease incidence and spread. One researcher presents on the relationship between climate change, food insecurity and HIV. The topics discussed are dependent on the availability of guest speakers. Therefore, learning objectives can vary slightly each year, but this also presents an opportunity to explore new topics.

The effect of climate change on infectious disease spread is also discussed within the elective mini-course “Parasitic Disease” in 123A Inquiry Immersion 1 Course. This course briefly reviews how environmental changes affect disease outbreaks.

6. Does your pharmacy school curriculum address the respiratory health effects of climate change and air pollution?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.

0	This topic is not covered.
<p><i>Score explanation: This topic is discussed in the Respiratory Science & Therapeutics course (PharmIS 112). A lecture entitled “Spare the Air” discusses the correlation between poor air quality due to climate events and airway disease exacerbations. For example, wildfires produce environmental particulates that can lead to asthma exacerbations. This topic is further explored in the “Social Determinants of Telehealth” lecture, which addresses the effect of air pollution on asthma in a social and community healthcare context. Students also participate in two “Tobacco Modules” which explain the health effects of secondhand smoke, such as lung cancer, SIDs, and infections.</i></p>	

7. Does your pharmacy school curriculum address the cardiovascular health effects of climate change, including increased heat?	
3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.
<p><i>Score explanation: This topic was briefly mentioned in the “Spare the Air” lecture as part of the Respiratory Science & Therapeutics course (PharmIS 112). The association between extreme heat and various health outcomes such as heat stroke and mental health outcomes are explored. The speaker also mentions how increased use of medications used to treat some of these mental health conditions (e.g. antidepressants, antipsychotics) can exacerbate heat stroke. In a discussion of vulnerable populations susceptible to climate health impacts, there is an example shared about those with certain comorbidities having more serious health outcomes during a heat wave.</i></p> <p><i>This topic could be discussed more in depth during the cardiovascular block.</i></p>	

8. Does your pharmacy school curriculum address the relationship between climate change and allergies?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.

Score explanation: This topic is mentioned in several lectures in the Respiratory Science & Therapeutics course (PharmIS 112). The “Spare the Air” lecture discusses the relationship between climate change and aeroallergens leading to the negative health impacts. For example, how rising carbon dioxide levels and temperatures alter precipitation levels, leading to an increase in airborne allergens and thus increase in asthma and allergies. This lecture as well as the “Social Determinants of Telehealth” lecture explore how certain populations are more likely to be exposed to these factors leading to increased rates of allergies. The “Hypersensitivity” lecture mentions how increased exposures to such allergens leads to increased rates in allergies as well.

9. Does your pharmacy school curriculum address the mental health and neuropsychological effects of environmental degradation and climate change?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.

Score explanation: The inquiry session “Effects on Climate Change Events on Mental Health” in the Neuroscience and Therapeutics Course (PharmIS 117) discusses examples of climate change events associated with poor mental health outcomes, protective and exacerbating factors, vulnerable populations more likely to experience mental health effects, and policy solutions aimed at mitigating environmental disparities. Students explore these concepts via vignettes with discussion questions, including the opportunity to practice counseling on coping mechanisms for patients in these situations.

10. Does your pharmacy school curriculum address the unequal regional health impacts of climate change nationally and globally, including the impact of social inequality?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic was not covered.

Score explanation: Three courses include discussions on this topic: Respiratory Science & Therapeutics course (PharmIS 112) (“Spare the Air”), Neuroscience and Therapeutics Course (PharmIS 117) (“Effects of Climate Change Events on Mental Health”), and Infectious Disease Science and Therapeutics Course (PharmIS 119) (“Global Health, Climate Change and Pharmaceutical Supply Chain”). These sessions explore how climate change is a social determinant of health and the role of a pharmacist in addressing these disparities. Examples include the interactions of the health effects of climate change and poverty/racial discrimination, underlying health disparities, and opportunities for policies. The framework from the US Global Change Research Program (USGCRP) is used to explore how populations experiencing increased exposure, sensitivity, and/or adaptive capacity are particularly vulnerable to the effects of climate on health.

Students who select the elective “Climate and Health” mini-course learn more about this topic in detail by discussing ways that social injustice and racism can be exacerbated by

climate change as well as how it may be mitigated by climate action. Students look for solutions to reduce climate impact, improve resilience of communities and systems and identify synergies between policies that promote environmental sustainability.

11. Does your pharmacy school curriculum address the relationship between climate change and social determinants of health (e.g., reduced nutritional value of food)?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.

Score explanation: In the Respiratory Science & Therapeutics course (PharmIS 112) and Neuroscience and Therapeutics Course (PharmIS 117), a lecture entitled “Spare the Air” and a lecture entitled “Effects of Climate Change Events on Mental Health” explore this topic. These lectures discuss how different social determinants of health such as poverty, education, social norms, occupation and underlying health disparities affect patients and exacerbate the effects of climate on health. For example, the “Spare the Air” lecture highlights how those with underlying health disparities experience more severe health impacts from climate change. The inquiry session further explores this topic by discussing how certain populations are affected by climate change and natural disasters due to their living environments.

12. Does your pharmacy school curriculum address the environmental and health co-benefits of a plant-based diet?

3	This topic is explored in depth by the core curriculum.
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2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic was not covered.

Score explanation: The Gastrointestinal Science and Therapeutics Course (PharmIS 114) discusses the importance of plant-based diets. The seminar “Human Microbiome: Clinical and Therapeutic Implications” explains how our microbiome is a reflection of our environmental exposures and its implications for disease states. The lectures “Negotiating Weight Loss Surgery” and “Obesity and Bariatric Surgery” further explore how certain diets affect health, specifically mentioning how obesity can be caused by changes in our food and built environments, and how many weight loss dietary supplements contain combinations of plant products. The lectures “Vitamin and Mineral Function” and “Dietary Supplements” discusses the source of these vital nutrients and explains how the medicinal properties are directly related to factors such as the plant parts used, climate, soil conditions and others. Furthermore, the curriculum discusses the importance of plant nutrients in diets and implications when a deficiency occurs. In addition, the effects of climate and the environment on the medicinal properties of supplements and vitamins from plants is discussed.

However, the curriculum does not draw an explicit connection between the positive benefits of plant-based diets on the environment and climate.

13. Does your pharmacy school curriculum cover these components of sustainable clinical practice? (1 point each)

1	Waste production within the healthcare system and strategies for reducing waste in clinical activities such as single use plastic and packaging.
1	Patient counseling on safe disposal of medications. For example, what can be disposed of and how to locate recycling schemes, in addition to certain drugs or drug classes that are most important to dispose of properly (e.g. hormonal contraceptives, drugs that are excreted unchanged/active metabolites).

1	The impact of extreme heat, on patients on medications which can interfere with thermoregulation
1	The impact of anaesthetic gases on the healthcare carbon footprint.
1	The environmental impact of pharmaceuticals and over-prescribing as a cause of climate health harm. Alternatively, teaching on de-prescribing where clinically appropriate and its environmental and health co-benefits would fulfil this metric.
1	The health and environmental co-benefits of non-pharmaceutical management of conditions where appropriate such as exercise or yoga classes for type 2 diabetes; social group activities such as gardening for mental health conditions; active transport such as bicycle schemes for obesity. This is commonly known as social prescribing in the UK.
1	The impact and benefits of benign by design pharmaceuticals through exploring medicinal chemistry concepts and/or discussing implications of excretion of active metabolites/unchanged drug products on ecological systems

Score explanation: These topics are covered in both “Spare the Air” lecture in the Respiratory Science & Therapeutics course (PharmIS 112) and the elective mini-course “Climate and Health” in 123A Inquiry Immersion 1.

The “Spare the Air” lecture reviews patient counseling points on safe medication disposal options, the impact of extreme heat on health, greenhouse gas emissions from anaesthetic gases, de-prescription as a solution to the impacts of medications on the environment, and green chemistry principles.

In the elective mini-course “Climate and Health”, negative health outcomes associated with increasing temperatures are reviewed. Additionally, this course discusses the environmental impacts of oral medications, inhalers, and anaesthetic gases (e.g. indirect and direct greenhouse gas emissions of desflurane, isoflurane and sevoflurane)

14. Does your pharmacy school curriculum discuss the environmental implications of various dosage forms, medication delivery devices, and/or excipients?

3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.

Score explanation: The “Spare the Air” lecture in Respiratory Science & Therapeutics course (PharmIS 112 discusses the effects of different inhaler delivery devices on the environment. Students complete an exercise to consider the carbon footprint of MDI propellants and criteria for substituting a DPI for an MDI. A discussion of the SABINA CARBON study, which reviewed carbon emissions associated with asthma care, further reinforces this concept.

In the Gastrointestinal Science and Therapeutics Course (PharmIS 114), there is a lecture entitled “Dietary Supplements,” where students learn how the environment and climate can impact the clinical properties of plant-based medicines.

Other dosage forms and medication delivery devices are not discussed with regard to their impact on the environment.

15. In training for patient communication, does your pharmacy school’s curriculum introduce strategies for having conversations with patients about the health effects of climate change?

3	Yes, there are clear and detailed strategies introduced for having conversations with patients about climate change in the core curriculum.
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2	Yes, having conversations with patients about climate change is briefly mentioned in the core curriculum.
1	Yes, there are some examples of having conversations with patients about climate change in elective coursework.
0	No, there are not strategies or examples for having conversations with patients about climate change
<p><i>Score explanation: Counseling strategies for patients affected by climate change are taught in both the inquiry course “Effects of Climate Change Events on Mental Health” (Neuroscience and Therapeutics Course (PharmIS 117)) and in the elective mini-course “Reproductive Health and the Environment” (123A Inquiry Immersion 1). Students practice providing guidance on coping with climate events and limiting exposure to pollutants/toxins.</i></p>	

16. Does your pharmacy school curriculum guide students to consider the environmental impact of medications as a factor in addition to safety, efficacy, cost, and pill burden when comparing equivalent therapies?	
3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.
<p><i>Score explanation: The “Spare the Air” lecture in Respiratory Science & Therapeutics course (PharmIS 112) discusses this topic. The lecturer compares two anticoagulants with regards to drug persistence, bioaccumulation, and toxicity levels based on a Swedish-based environmental classification system:</i></p>	

<https://janusinfo.se/beslutsstod/lakemedelochmiljo/pharmaceuticalsandenvironment.4.7b57ecc216251fae47487d9a.html> . This example illustrates how environmental consequences of medications could be used to guide medication choice, in addition to other traditional factors, such as safety, efficacy, etc.

17. Is your pharmacy school currently in the process of implementing or improving Education for Sustainable Healthcare (ESH)/planetary health education?

4 Yes, the school is currently in the process of making major improvements to ESH/planetary health education.

2 Yes, the school is currently in the process of making minor improvements to ESH/planetary health education.

0 No, there are no improvements to planetary health education in progress.

Score explanation: One professor, Dr. Katherine Gruenberg, has increased ESH/planetary health education in the School of Pharmacy by providing 1 lecture, designing a required small group discussion, and coordinating a research talk all within the core curriculum on sustainable healthcare and pharmacy practice. These sessions are entitled “Spare the Air” in Respiratory Science & Therapeutics course (PharmIS 112), “Effects of Climate Change Events on Mental Health” in Neuroscience and Therapeutics Course (PharmIS 117), and “Global Health and Climate Change” in the Infectious Disease Science and Therapeutics Course (PharmIS 119). Dr. Gruenberg is also a lecturer for the “Climate and Health Inquiry” mini-course elective. Although there are not sustainability lectures in every block, we hope this report card can be used to stimulate further uptake across the curriculum.

18. Does your pharmacy school have a member of faculty to incorporate planetary health and sustainable healthcare as a theme throughout the curriculum ?

4	Yes, there is/are a member(s) of faculty whose role is directly responsible for the incorporation of planetary health and sustainable healthcare as a theme throughout the curriculum
2	Yes, there is/are member(s) of faculty who are incorporating planetary health and sustainable healthcare as a theme throughout the curriculum as well as doing their principle role
0	There are no members of faculty who are incorporating planetary health and sustainable healthcare as a theme throughout the curriculum

Score explanation: As previously mentioned, Dr. Gruenberg has been the professor leading the incorporation of sustainable healthcare practice into the core curriculum and leads such lectures. There is also a faculty dedicated to incorporating topics related to health equity across the curriculum, which could be a potential future venue for this topic throughout the curriculum.

19. Does your pharmacy school curriculum offer clinical practice experiences (for example, IPPE/APPE rotations in the U.S. or placement opportunities in the UK) that allow for the exploration of planetary health topics?

3	There are multiple clinical practice experiences/placements that allow for direct exposure to planetary health topics.
2	There is one available clinical practice experience/placement that allows for direct exposure to planetary health topics.
1	There are available clinical practice experiences/placements that allow for indirect exposure to planetary health topics.

0	No, there are no such clinical practice experiences/placements available through the pharmacy school.
<i>Score explanation: There are no such options.</i>	

20. Does your pharmacy school curriculum acknowledge a disparity in the effects of climate change? Specifically, does your curriculum address groups more vulnerable to environmental impacts, such as BIPOC, immigrant groups, low income populations, children, elderly, persons with disabilities, persons with pre-existing or chronic medical conditions?	
3	This topic is explored in depth by the core curriculum.
2	This topic is briefly covered in the core curriculum.
1	This topic is covered in elective coursework.
0	This topic is not covered.
<i>Score explanation: This topic is discussed in the core curriculum during the Respiratory Science & Therapeutics course (PharmIS 112). For example, the “Spare the Air” lecture explores the disproportionate impacts of climate on health based on social determinants of health. There is another session in this course entitled the “Social Determinants of Telehealth” lecture that also describes these topics. These lectures have students identify not only issues that may arise, but also look for possible solutions, either through counseling, action, or policy.</i>	

Section Total (44 out of 66)	67%
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Planetary Health Research

Section Overview: *This section evaluates the quality and quantity of planetary health research at the school and with the broader institution. Interactions between health and the environment are complex and multifactorial. While climate change has been extensively studied from an environmental science perspective, planetary health is an emerging field. Pharmacy schools should support research in areas such as the health effects of climate change, adaptive measures and pharmacy's environmental impact.*

1. Are there researchers engaged in planetary health research and healthcare sustainability research at your pharmacy school?	
3	Yes, there are faculty members at the School of Pharmacy who have a primary research focus in planetary health or healthcare sustainability.
2	Yes, there are individual faculty members at the School of Pharmacy who are conducting research related to planetary health or healthcare sustainability, but it is not their primary research focus.
1	There are planetary health and/or healthcare sustainability researchers at the institution, but none associated with the pharmacy school.
0	No, there are no planetary health and/or healthcare sustainability researchers at the institution or pharmacy school at this time.
<p><i>Score explanation: The UCSF Environmental Research and Translation for Health (EaRTH) Center engages in research about how pollutants contribute to disease, intervention/prevention, and support for vulnerable populations. The UCSF Center for Climate, Health, and Equity includes research as one of its key pillars. Within the School of Pharmacy, Dr. Katherine Gruenberg has investigated the effects of environmental sustainability education on student learning, though it is not her primary research focus.</i></p>	

2. Has your institution recently provided extra curricular talks or learning opportunities on topics related to planetary health?

4 Yes, the pharmacy school has hosted at least one opportunity for extra learning on topics related to planetary health in the past year.

3 Yes, the **institution** has hosted at least one opportunity for extra learning on topics related to planetary health in the past year.

2 Yes, the institution has provided at least one opportunity for extra learning on topics related to planetary health in the past three years.

1 The institution has not hosted anything directly, but they have provided financial support for a local planetary health event.

0 No, the institution has not hosted anything on topics related to planetary health in the past three years.

Score explanation: The UCSF SOP has two student organizations, The Alliance for Pharmacy Sustainability and Project Safe Medication Disposal, that have hosted speakers discussing sustainable healthcare practices. In addition, UCSF Center for Climate, Health, and Equity and EaRTH Center have previously held webinars on these topics.

3. Is there a process by which communities disproportionately impacted by climate change and environmental injustice give input or make decisions about the research agenda at your pharmacy school?

3 Yes, there is a process in which community members impacted by climate and environmental injustice have decision-making power in the climate + environmental research agenda.

2	Yes, there is a process in which community members impacted by climate and environmental injustice advise the climate + environmental research agenda.
1	No, but there are current efforts to establish a process for community members to advise or make decisions on the research agenda.
0	There is no process, and no efforts to create such a process.
<i>Score explanation: There is no current process available.</i>	

Section Total (6 out of 10)	60%
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Community Outreach and Advocacy

Section Overview: *This section evaluates pharmacy school engagement in community outreach and advocacy efforts associated with planetary health. Researching and teaching planetary health is necessary but not sufficient. It is critical that institutions also directly engage with communities most affected by environmental health harms. Although climate change is a problem largely created by those with power and resources, its impacts fall disproportionately on under-resourced populations and communities of colour. Institutions should partner with local communities affected by climate change and pollution to share information about environmental health threats, advocate together for change, and provide opportunities for students to be a part of this work.*

1. Does your pharmacy school partner with community organisations to promote planetary and environmental health?	
3	Yes, the pharmacy school partners with multiple community organisations to promote planetary and environmental health to share opportunities for student involvement.
2	Yes, the pharmacy school partners with one community organisation to promote planetary and environmental health to share opportunities for student involvement.
1	The institution partners with community organisations, but the pharmacy school is not part of that partnership.
0	No, there is no such meaningful community partnership.
<p><i>Score explanation: The UCSF EaRTH Center partners with multiple community organizations, such as Western States Pediatric Environmental Health Specialty, San Francisco Bay Physicians for Social Responsibility, Bayview Hunters Point Community Advocates, and others. UCSF Health also partners with Practice Greenhealth, an organization focused on providing environmentally friendly solutions to health systems.</i></p>	

2. Does your pharmacy school have coverage of issues related to planetary health and/or sustainable healthcare in their update communications?

2 Yes, all students regularly receive communication updates dedicated to planetary health and/or sustainable healthcare.

1 Yes, planetary health and/or sustainable healthcare topics are sometimes included in communication updates.

0 **Students do not regularly receive communications about planetary health or sustainable healthcare.**

Score explanation: Though these communications are regularly available on the University level, communications from the School of Pharmacy on this topic are rare.

3. Is your pharmacy school a member of a national or international planetary health or ESH organisation?

1 Yes, the school is a member of a national or international planetary health or ESH organisation

0 **No, the school is not a member of such an organisation**

Score explanation: There is no affiliation.

Section Total (1 out of 6)

17%

Support for Student-Led Planetary Health Initiatives

Section Overview: This section evaluates institutional support for student-led planetary health initiatives, such as funding, fellowships, programming, and student groups. Planetary health is a young field and, as young people facing a future deeply shaped by climate change, students are often some of the first at an institution to engage with it. Institutions should provide support for students to engage in sustainability quality improvement (QI) initiatives, discover mentors in their area of interest, and receive funding for planetary health projects.

1. Does your institution offer opportunities for pharmacy students to do research related to planetary health and/or sustainable healthcare?	
2	The institution has a specific research program or fellowship for students interested in doing planetary health/sustainable healthcare research.
1	There are research opportunities for students to perform research related to planetary health/sustainable healthcare but these require student initiative to seek these out and carry them out in their spare time.
0	There are no opportunities for students to engage in planetary health/sustainable healthcare research.
<p><i>Score explanation: Pharmacy students are required to complete a research project during their enrollment. Though projects specific to planetary health or sustainable healthcare are not currently offered, some groups allow students to propose a research topic. UCSF also offers a fellowship program (The UCSF Carbon Neutrality Initiative Fellowship), which provides funding for students to lead projects on carbon neutrality. Three UCSF School of Pharmacy students have participated in the UCSF Carbon Neutrality Initiative Fellowship.</i></p>	

2. Does the pharmacy school provide access for students to specific information related to planetary health and/or sustainable healthcare activities and mentors within the school? For example, a web page detailing projects achieved, current initiatives underway at the pharmacy school and/or contact information for potential mentors.

2	The pharmacy school provides specific information related to planetary health or sustainable healthcare that includes up-to-date information on relevant initiatives and contact information of potential mentors.
1	The pharmacy school provides some information on projects and mentors within planetary health and sustainable healthcare within the school, but it lacks key information.
0	There is no pharmacy school specific access to planetary health and/or sustainable healthcare projects or mentors.

Score explanation: UCSF SOP currently does not provide specific access to planetary health or sustainable healthcare projects or mentors.

3. Does your University have registered student groups dedicated to fostering a culture of planetary health engagement, scholarship, and advocacy on campus, supported by faculty advisors?

2	Yes, there is a student organisation with faculty support at my University dedicated to planetary health or sustainability in healthcare.
1	Yes, there is a student organisation at my University dedicated to planetary health or sustainability in healthcare but it lacks faculty support.
0	No, there is not a student organisation at my institution dedicated to planetary health or sustainability in healthcare.

Score explanation: The UCSF Human Health and Climate Change Club is an interdisciplinary student organization that aims to bring awareness about climate change and global health challenges. Within the UCSF School of Pharmacy, the Alliance for Pharmacy Sustainability provides outreach and education on sustainable pharmacy practices.

4. In the past year, has the institution had one or more extra-curricular planetary health programs or initiatives in the following categories? (1 point each)

1	Projects where students are able to gain experience in organic agriculture and sustainable food systems, such as gardens, farms, community supported agriculture (CSA), fishery programs, or urban agriculture projects.
1	Panels, speaker series, or similar events related to planetary health that have students as an intended audience.
1	Events in which students learn directly from members of a local environmental justice community about the climate and environmental challenges they face, and how health professionals can partner with their community to address these exposures and impacts.
1	Cultural arts events, installations or performances related to planetary health that have students as an intended audience.
1	Local volunteer opportunities related to building community resilience to anthropogenic environmental impacts.
1	Wilderness or outdoors programs (e.g., that organise hiking, backpacking, kayaking, or other outings for students)

*Score explanation: **Panels, speaker series, or similar events related to planetary health:** The UCSF Center for Climate, Health and Equity has hosted a series of webinars with*

climate and health leaders on planetary health topics. The EaRTH center has also provided lectures and forums relating to these topics.

Wilderness or outdoor programs: *UCSF offers outdoor programs for students and staff which include activities such as day hikes, camping, and kayaking,*

Section Total (5 out of 12)

42%

Campus Sustainability

Section Overview: This section evaluates the support and engagement in sustainability initiatives by the pharmacy school and/or institution. The healthcare industry is a major contributor to greenhouse gas emissions as well as pollution that harms local, regional, and global ecosystems. While healthcare is, by nature, a resource-intensive endeavour, the healthcare sector is well poised to lead the world to a more sustainable future. This will involve scrutinising every aspect of how our systems operate, from where we source our energy, to how we build our infrastructure, to what companies we invest in. Our pharmacy schools and institutions must set the standard for sustainable practices, and show other sectors what is possible when it comes to minimising environmental impact.

1. Does your University have an Office of Sustainability?	
3	Yes, there is an Office of Sustainability with multiple full-time staff dedicated to campus sustainability. If the Office of Sustainability serves the entire campus, there is at least one designated staff member for sustainability at the pharmacy school.
2	There is an Office of Sustainability with one or more full-time staff dedicated to campus sustainability, but no specific staff member in charge of pharmacy.
1	There are no salaried sustainability staff, but there is a sustainability task force or committee
0	There are no staff members or task force responsible for overseeing campus sustainability
<i>Score explanation: UCSF has an Office of Sustainability for the institution, but it lacks a specific staff member for the School of Pharmacy.</i>	

2. How ambitious is your pharmacy school/institution's plan to reduce its own carbon footprint?

4	The institution has a stated goal of carbon neutrality by 2030 or earlier and the pharmacy school has a well-defined and adequate plan in place to achieve this goal.
3	Yes, there is a stated carbon neutrality goal by at least 2040 and the school has a well-defined and adequate plan in place to achieve this goal.
2	Yes, there is a stated carbon neutrality goal by at least 2040, but the pharmacy school has not created a plan to reach that goal or the plan is inadequate.
1	There is a CO2 emission reduction goal, but it is not one of carbon neutrality.
0	There is no stated goal for reduction of CO2 emissions.

Score explanation: UCSF has an institutional goal to become carbon neutral by 2025. However, the School of Pharmacy does not have a well-defined plan.

3. Does your pharmacy school have an organics recycling program (compost) and a conventional recycling program (aluminium/paper/plastic/glass)?

2	Yes, the pharmacy school has both compost and recycling programs accessible to students and faculty.
1	The pharmacy school has either recycling or compost programs accessible to students and faculty, but not both.
0	There is no compost or recycling program at the pharmacy school.

Score explanation: Compost and recycling bins are placed around campus alongside standard trash bins and are easily accessible.

4. Does your pharmacy school provide paperless teaching? e.g. lecture materials, exam papers, hand-outs

3	The whole course is delivered using online modalities of assignment, lecture, and examination delivery.
2	The majority of the course is delivered using online modalities with exception to few assignments where paper is still encouraged.
1	Some of the course is delivered using online modalities, but the majority of assignments and examinations are on paper.
0	None of the coursework is delivered using online modalities and paper printing is widespread.

Score explanation: Currently, UCSF SOP's entire curriculum is paperless, even with the transition from entirely virtual to hybrid class sessions.

5. Does your pharmacy school have programs and initiatives to assist with making lab spaces more environmentally sustainable?

2	Yes, the school has programs and initiatives to assist with making lab spaces more environmentally sustainable.
1	There are guidelines on how to make lab spaces more environmentally sustainable, but not programs or initiatives.

0	There are no efforts at the school to make lab spaces more sustainable.
<p><i>Score explanation: Programs and initiatives are not specific to the School of Pharmacy, but the Institution offers a dedicated webpage with resources for sustainable lab practices, such as ULT freezer rebates, lab waste practices, efficient energy policies, and water conservation programs. It also gives the option for labs to receive a sustainability certification.</i></p>	

6. Does your institution have a strategy or timeline for divestment from fossil fuels?	
4	The institution has fully divested from fossil fuels
3	Yes, the institution has solid divestment plans and a set timeline in which to divest by
2	The institution has committed to divestment but does not have a set strategy or timeline
1	The institution has mentioned divestment but doesn't have a strategy or timeline
0	No, there are no plans nor mention of divestment from fossil fuels
<p><i>Score explanation: On February 2019, a UCSF Memorial Vote on fossil fuel divestment passed, having the Regents completely divest from all companies on the Carbon Underground 200 List.</i></p>	

Section Total (15 out of 18)	83%
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Grading

Section Overview

This section focuses on the grading of the report card. The institution received a grade for each of the individual sections as well as an overall institutional grade. Section point totals were tallied, divided by the total points available for the section, and converted to a percentage. The overall institutional grade is a weighted average of the section grades, with curriculum receiving a higher weight owing to its larger number of metrics. Letter grades for each section and the institution overall were then assigned according to the table below.

Letter Grade*	Percentage
A	80% - 100%
B	60% - 79%
C	40% - 59%
D	20% - 39%
F	0% - 19%

Planetary Health Grades for University of California, San Francisco School of Pharmacy

The following table presents the individual section grades and overall institutional grade for the University of California, San Francisco on this pharmacy-school-specific Planetary Health Report Card.

Section	Raw Score	Letter Grade
Planetary Health Curriculum (59%)	$(44/66) \times 100 = 67\%$	B
Interdisciplinary Research (9%)	$(6/10) \times 100 = 60\%$	B-
Community Outreach and Advocacy (5%)	$(1/6) \times 100 = 17\%$	F+
Support for Student-led Planetary Health Initiatives (11%)	$(5/12) \times 100 = 42\%$	C-
Campus Sustainability (16%)	$(15/18) \times 100 = 83\%$	A-
Institutional Grade 39.53 5.4 0.85 4.62 13.28	$(A \times 0.59 + B \times 0.09 + C \times 0.05 + D \times 0.11 + E \times 0.16) = 64\%$	B-

References

1. PLANETARY HEALTH - Planetary Health Alliance [Internet]. Planetary Health Alliance. 2022 [cited 24 February 2022]. Available from: <https://www.planetaryhealthalliance.org/planetary-health>
2. Climate change and health [Internet]. Who.int. 2021 [cited 24 February 2022]. Available from: <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>
3. Lenzen M, Malik A, Li M, Fry J, Weisz H, Pichler PP, Chaves LS, Capon A, Pencheon D. The environmental footprint of health care: a global assessment. *The Lancet Planetary Health*. 2020 Jul 1;4(7):e271-9.
4. Patel M, Kumar R, Kishor K, Mlsna T, Pittman Jr CU, Mohan D. Pharmaceuticals of emerging concern in aquatic systems: chemistry, occurrence, effects, and removal methods. *Chemical reviews*. 2019 Mar 4;119(6):3510-673.
5. National Institute for Health and Care Excellence, NICE encourages use of greener asthma inhalers [Internet]. NICE. 2019 [cited 24 February 2022]. Available from: <https://www.nice.org.uk/news/article/nice-encourages-use-of-greener-asthma-inhalers#:~:text=Metered%20dose%20inhalers%20have%20estimated,compared%20to%2020g%20in%20DPIs>.
6. Urgent health challenges for the next decade. World Health Organization. 2020.[cited 24 February 2022]. Available from: <https://www.who.int/news-room/photo-story/photo-story-detail/urgent-health-challenges-for-the-next-decade>
7. Thomas K, Hardy RD, Lazrus H, Mendez M, Orlove B, Rivera-Collazo I, Roberts JT, Rockman M, Warner BP, Winthrop R. Explaining differential vulnerability to climate change: A social science review. *Wiley Interdisciplinary Reviews: Climate Change*. 2019 Mar;10(2):e565.
8. Shaw E, Walpole S, McLean M, Alvarez-Nieto C, Barna S, Bazin K, Behrens G, Chase H, Duane B, El Omrani O, Elf M. AMEE consensus statement: planetary health and education for sustainable healthcare. *Medical teacher*. 2021 Mar 4;43(3):272-86.