Challenge-based module 1: Sustainable health care

Introduction

The healthcare sector plays a critical role in managing and improving public health, but it also has a significant environmental impact. As of recent estimates, the healthcare sector is responsible for roughly 4.4% of global greenhouse gas (GHG) emissions [(health care climate footprint report](#), 2019). These emissions contribute to global warming and climate change, posing risks not only to the environment but also to public health. To effectively address and mitigate these impacts, it's important to understand where emissions come from and how they are managed within healthcare facilities.

Greenhouse gas emissions are divided into three distinct categories, known as Scopes. These categories help in understanding and managing emissions from various sources within a sector or organization.

Scope 1: Direct Emissions: Emissions directly connected to the operation of healthcare facilities from sources that are directly owned or controlled by the healthcare facility (i.e. emissions from patient transport in vehicles owned by the facility, anesthetic gases, combustion of fossil fuels on site).

Scope 2: Indirect Emissions from Purchased Energy: Emissions stemming from the energy supply needed to run the healthcare facility (i.e. energy needed for electricity to operate medical equipment and HVAC systems). The emissions occur at the power plants that produce the electricity or energy.

Scope 3: Indirect Emissions from the Supply Chain: Emissions that occur in the supply chain of the healthcare facility, including emissions from the production, transport and disposal of medical supplies.

Step-by-step assignment instructions for students

Prepare a Powerpoint presentation aimed at the healthcare facility board members to inform them about the biggest sources of emissions and possible mitigation efforts to reduce these emissions. To inform this presentation, identify the biggest sources of greenhouse gas emissions at your healthcare facility.

1. **Review Pre-Read Materials & Discussion (10 minutes)**

Start by discussing any questions regarding the pre-read materials on greenhouse gas emissions and their scopes. Ensure you understand how emissions are categorized and measured.

2. **Identify the five biggest emission sources (20 minutes)**

Identify sources of information about your facility's GHG emissions. Look for a department dedicated to sustainability or information about sustainability in the annual corporate report. Alternatively, if this is unavailable try to find information from similar institutions that published reports on this information. Look for scientific publications.

Determine the five biggest sources of emissions in your facility. Categorize these sources into Scope 1, Scope 2, and Scope 3.

Include this information with figures and citation of sources on your slides.

3. Develop Mitigation Strategies (20 minutes)

Based on your findings, develop 3-5 recommendations for reducing the chosen facility's GHG emissions. Use the "reduce, reuse, recycle" approach.

- Reduce: Suggestions for minimizing emissions, such as energy efficiency improvements or process changes.

- Reuse: Ideas for reusing resources or products to minimize waste.

- Recycle: Recommendations for recycling materials or waste management improvements.

Consider the feasibility of your recommendations and highlight the added benefits, such as cost savings, improved efficiency and/or patient safety, or enhanced sustainability. Identify potential concerns related to the implementation of your recommendations and propose solutions.

4. Finalize PowerPoint Presentation (10 minutes)

Prepare up to 6 slides (excluding the title slide) summarizing your findings of the biggest emission sources and recommendations for mitigation. Make sure to address potential co-benefits and concerns around your proposed solutions.

Ensure slides are not text-heavy and use visuals like charts, graphs, and images where appropriate. Follow your institution's standard slide format.

5. Presentation to the Board Members (20 minutes)

Present your findings and recommendations. The presentation should be max. 15 minutes long followed by a Q&A session.

Start a discussion about:

- The most significant sources of emissions identified.

- The feasibility and impact of the proposed recommendations.

- How different strategies could be implemented in real-world settings.

Mandatory pre-reading materials:

Waste from one surgery

Health care's response to climate change: a carbon footprint assessment of the NHS in England

Optional pre-read materials:

Health Care's Climate Footprint

UK Health Alliance on Climate Change – Green Surgery

Challenge-based module 2: Healthy and Sustainable Diets: From a lose-lose diet to a win-win diet

Introduction

Food and nutrition play a crucial role in maintaining and promoting health. However, the current Western diets are unhealthy and a major contributor to premature morbidity and death. The food sector as a whole (including the food production, processing, distribution, retailing, consumption and waste management) emits a staggering 27% of global GHG emissions. Changing our dietary patterns and moving towards a sustainable food production has co-benefits for people and the planet.

Step-by-step assignment instructions for students

You work as a general practitioner at a health center in a low-income neighborhood of a metropolitan city. The area is a food desert, meaning affordable, healthy, and fresh food options are scarce. Many of your patients have a high average body mass index (around 33 kg/m²), indicating obesity, and suffer from lifestyle-related diseases like hypertension, diabetes, insulin resistance, and metabolic dysfunction-associated steatohepatitis (MASH). When you start investigating you notice that the diets of your patients primarily consist of ready-to-eat packaged foods, sugary drinks, processed meats, and red meat (consumed more than five times a week). There is a common belief that daily meat intake is necessary in a healthy diet. Most patients do not consider the environmental impact of their diets.

As a healthcare professional, you aim to improve your patients' dietary habits and bring awareness to the connection between food choices, health, and climate change, working collaboratively with a dietitian in your practice. The focus will be on helping patients shift from a "lose-lose diet" to a "win-win diet."

Prepare a presentation of up to 5 slides addressing the following points:

1. Explain the differences between "lose-lose" and "win-win" diets and their impact on health and the environment using 2 example meals.

2. Compare the carbon footprint of meals representing both diets.

3. Identify actions for reducing the environmental impact of specific foods.

4. Address barriers and solutions for adopting a "win-win" diet in a low-income, food desert setting that is accessible and affordable for your patients.

1. Explain "Lose-Lose" vs. "Win-Win" Diets and create two example meals (30 minutes)

Create slides that describe 5 key differences between a "lose-lose diet" (e.g., Western dietary pattern) and a "win-win diet" (e.g., Mediterranean, New Nordic, plant-based diets). For each difference, explain its impact on both health and the environment.

Present two dinners, one representing a "lose-lose" meal and one representing a "win-win" meal. This can be a breakfast, lunch or dinner meal representing an actual meal from your own country.

2. Visualize the Environmental Impact (15 minutes)

Create a graphic comparing the carbon footprint of the "lose-lose" meal vs. the "win-win" meal. Use data from OurWorldinData to illustrate the impact of different food products.

Use a figure template to illustrate the difference in carbon emissions between both meals.

3. Practical Actions to Reduce Carbon Footprint with Barriers and Potential Solutions (20 minutes)

Identify the 2 foods in the "lose-lose" dinner with the highest carbon footprint. Suggest alternatives from the "win-win" diet to replace them with lower carbon footprint options. Present the environmental and potential health impact of the products. Discuss 2-3 main barriers to switching from a "lose-lose" diet to a "win-win" diet in the context of your low-income patients, and propose 2-3 practical solutions.

4. Present PowerPoint (15 minutes)

Each group has 5 minutes to present with 1-2 minutes for 1 or 2 questions. Ensure clarity, conciseness, and persuasive communication, targeting healthcare providers with practical, actionable solutions. Cite any research or figures used (e.g., dietary guidelines, carbon footprint data).

5. Conclusion and Reflection (10 minutes)

After all presentations, participate in a discussion on the challenges of promoting sustainable diets in food deserts, and how healthcare professionals can play a role in encouraging healthier, environmentally friendly eating habits.

Mandatory pre-reading materials

Food, Planet and Health – EAT Lancet Commission (specifically the introduction, pages 4 to 8, Figure 2, session Target 1 – healthy diets)

Food in the Anthropocene

For calculating carbon footprint of foods, use https://assets.plateupfortheplanet.org/carbon-calculator/

Take a look at our world in data on food systems: https://ourworldindata.org/environmental-impacts-of-food

Challenge-based module 3: Air pollution and health advocacy

Introduction

Air pollution is one of the most significant environmental threats to human health, contributing to millions of premature deaths each year. It impacts the climate, exacerbates respiratory and cardiovascular diseases, and disproportionately affects vulnerable populations. Your task in this assignment is to explore the relationship between air pollution and public health, identify key sources of air pollution in your community or region, and propose actionable strategies to reduce these emissions and their health impacts.

Step-by-step assignment instructions for students

Prepare a social media campaign aimed at a group of community leaders or policymakers, with the goal of informing them about the most significant sources of air pollution and recommending measures to mitigate these emissions to improve public health and address climate change.

1. **Explore the Health Impacts of Air Pollution and Reflect on Pre-read Materials (10 minutes)**

Discuss the readings provided, which examine the link between air pollution and public health, with a focus on how pollution also contributes to climate change. Reflect on how these materials might apply to your local or regional context. Consider the vulnerable populations most affected by air pollution.

2. **Investigate Air Pollution Sources in Your Community (20 minutes)**

Identify where air pollution in your area comes from, based on available data and identify the 3-5 biggest contributors to air pollution in your community.

Use government reports, data from environmental agencies (e.g., the World Health Organization (WHO), Environmental Protection Agency (EPA)), or local health and environmental authorities to investigate air quality. If direct data is unavailable, find reliable alternative sources, such as research articles or case studies from comparable regions.

3. Develop a Social Media Awareness Campaign (30 minutes)

Create an impactful social media post to raise awareness about air pollution and its effects on public health, encouraging action from community members and policymakers.

Design a social media post that includes a compelling graphic, or a series of posts summarizing your findings. You may use generative AI tools, such as ChatGPT, to help brainstorm ideas, refine your messaging, or generate graphics and content for the campaign. Critically upraise AI generated outputs and adapt if necessary.

Ensure the post includes:

- A **brief overview** of the issue, focusing on the local context and emphasizing the impacts on health and the environment.
- 1-2 of the **top source(s) of air pollution** specific to your area, with clear data presented through infographics or bullet points.

- 1-3 **actionable recommendations** to reduce these emissions, focusing on strategies aligned with sustainable practices.
- The **benefits** of implementing these strategies, such as improved public health, lower healthcare costs, and increased resilience to climate change.
- The potential **challenges** in implementing your recommendations, such as cost or policy barriers, and how they could be overcome. These don't need to be included in your social media post.

4. Present Your Social Media Campaign (20 minutes)

Share your campaign with the class, simulating a real-world advocacy scenario where you're pitching to community leaders or policymakers.

Present your social media post in 3-5 minutes, explaining the thought process behind your campaign and how you tailored it to engage the community or decision-makers. Discuss the feasibility of your recommendations, including their potential impact on public health and how they align with climate action goals.

6. Conclusion and Reflection (10 minutes)

Participate in a closing discussion on how healthcare professionals, community leaders, and environmental advocates can work together to promote cleaner air and healthier environments for all.

Mandatory pre-reading materials:

American Lung Association, "Environmental Justice and Air Pollution"

The Lancet, "Air Pollution and Health Inequity"

American Lung Association, State of the Air, People at Risk

Challenge-based module 4: Adapting to climate change induced flooding to reduce health impacts

Introduction

One of the major effects of climate change is the increasing frequency and severity of **flooding** events. In July 2021, heavy rains caused catastrophic flooding in countries like Germany, Belgium, and the Netherlands. Rivers overflowed, devastating communities. The floods caused more than 200 deaths, thousands were displaced, and public health systems were struck by an increase in waterborne diseases, contaminated drinking water, and mental health crises. These floods revealed the urgent need for **climate-resilient health systems**, sustainable infrastructure, and **nature-based solutions**—like restoring natural wetlands to help absorb excess water.

For more information on this flooding event, you can refer to:

> **BBC News**: https://www.bbc.com/news/world-europe-57858829

Step-by step assignment instructions for students

Flooding events like those seen in 2021 are predicted to become more frequent and severe. You are stepping into the roles of public health experts, and as such have been asked by a **parliamentary commission** to provide recommendations on how to address the health impacts of flooding and prevent future crises by 2050.

You will work in groups to:

1. **Identify the key public health challenges** posed by flooding (e.g., infectious diseases and mental health).

2. **Envision a sustainable, healthy future society** in 2050 where health systems and infrastructure are resilient to flooding.

3. **Develop actionable policy recommendations** for public and planetary health that ensures **resilient healthcare systems**

4. **Present your recommendations** to the parliamentary commission (the rest of the class).

1. Group Formation & Role Assignment (5 minutes)

- Form small groups of 4-5 students. Each group represents a team of public health experts.

- In your group, choose a note-taker and a presenter.

2. Background Review & Brainstorming (10 minutes)

Identify the key health risks associated with flooding and start imagining the future.

- Begin by discussing the public health impacts of the 2021 Western Europe floods:

    - How did flooding affect public health and healthcare systems? (Think about diseases, mental health, clean water, etc.)

    - What vulnerabilities in the health system did these floods reveal?

- Now think ahead to 2050, taking into account that with uncontrolled climate change extreme weather events and flooding will become more likely:
  - What health challenges will arise in flood-prone areas in 2050? Consider:
    - Healthcare infrastructure accessibility.
    - Outbreaks of infectious diseases
    - Displacement of vulnerable communities and mental health crises.

3. Visioning the Future (20 minutes)

Imagine a resilient and equitable society in 2050 that can withstand flooding events. Work together as a group to brainstorm innovative and practical solutions for the health risks of flooding events, especially focusing on healthcare resilience.

- Discuss with your group:
  - What does a climate and health-resilient society in 2050 look like?
- Try to identify innovative approaches for:
  - Adapting healthcare infrastructure and practice to deal with climate change induced flooding
  - Preventing and managing infectious diseases caused by flooding.
  - Preparing and protecting vulnerable communities from health impacts

As you brainstorm, consider the 2021 Western Europe floods as a key reference point, thinking about the public health challenges exposed during that event.

4. Drafting Policy Recommendations (15 minutes)

Use AI tools (e.g., ChatGPT or other generative AI platforms) to further refine your proposed policy recommendations in a statement to present to the parliamentary commission. Make sure to critically appraise AI generated texts and edit them if needed.

Draft a 1-page policy recommendation statement that includes:

1. **Health Challenges:** Describe the primary public health risks posed by flooding in 2050. Use the 2021 Western Europe Floods as a key example.

2. **Vision for 2050:** Present your group's vision for a healthy, sustainable society where the health system and infrastructure are resilient to climate-related flooding events.

3. **Policy Recommendations:** Provide 2-3 specific, actionable policy recommendations

4. **Implementation Strategies:** Explain how your solutions can be put into practice by 2050, addressing equity to ensure that vulnerable populations are protected.

5. Prepare and Finalize Your Oral Presentation (5 minutes)

Get ready to present your recommendations. Each group should choose a presenter to deliver the main points from their policy recommendations. This presentation does not have to be supported by a powerpoint presentation. Remember, you are public health experts. Your goal is to convince the commission that your solutions are necessary and realistic.

6. Present to the Parliamentary Commission (20 minutes)

Present and advocate for your group's policy recommendations.

- Each group will have 5 minutes to present their recommendations to the parliamentary commission (the rest of the class).

- After each presentation, the commission will have 1-2 minutes to ask questions or provide feedback.

7. Reflection & Class Discussion (15 minutes)

Reflect on the ideas presented and discuss key takeaways. After all presentations were held, discuss the following points:

- Which solutions were the most innovative or feasible?

- How well did the groups take into account the most vulnerable populations

Think about what you, as future health professionals, can do today to help make these ideas a reality.

Mandatory pre-reading material:

Watch the video by the Welcome Trust on the health impacts of flooding

WHO operational framework for building climate resilient health systems