

Case Based Module: Planetary Health for Family Medicine Residents and Teachers - Applying a planetary health lens to clinical encounters

Authors: Samantha Green, KitShan Lee, and Katherine Yu

Reviewers: Laura Feldman, Laura Kroeker, Sarah Park, and Marlee Vinegar

Medical Writers: Gabrielle Bauer and Jackson Smylie

April 22nd, 2025

**This work was supported by the Educational Development Fund,
Temerty Faculty of Medicine and the DFCM**

Table of Contents

Learning Objectives.....	4
Test Yourself.....	4
INTRODUCTION.....	6
What is Planetary Health?.....	6
Relevance of Planetary Health to Medicine.....	6
PATIENT CASES.....	8
Case #1 – Avery S.....	8
Case #2 – John C.....	9
INFORMATION SECTION.....	10
Climate Change and Human Health.....	10
General Framework.....	10
Extreme Heat.....	10
Environmental Exposures.....	11
Diet.....	12
Indigenous Communities.....	13
Effect of Climate Change on Respiratory Health.....	14
Wildfires.....	14
Allergens.....	14
Air Pollution.....	14
Social Determinants.....	14
Effect of Climate Change on Mental Health.....	15
Acute and Delayed Effects.....	15
Heat.....	15
Climate Anxiety.....	16

Putting a Planetary Health Perspective into Practice.....	16
Healthcare Stewardship.....	16
Patient-Centred Care.....	18
Advocacy.....	18
Concluding Thoughts.....	19
CASE DISCUSSIONS.....	19
Case #1 – Avery S.....	19
Case #2 – John C.....	21
Retest yourself.....	22
REFERENCES.....	24

Learning Objectives

Upon completion of this module, participants will be able to:

- Understand the multidimensional relationship between planetary and human health
- Better educate patients on the co-benefits of sustainable lifestyles
- Support vulnerable patients with co-morbid conditions during extreme weather events
- Apply methods to reduce unnecessary healthcare utilization
- Advocate for the protection of planetary health at the micro, meso, and macro levels

Test yourself

[Note: this test also appears at the end of the module, so learners can retest themselves.

Answers appear in the post-test]

1. Environmental degradation is known to increase the incidence of:
 - a. Respiratory illnesses, such as asthma
 - b. Outbreaks of transmissible diseases in humans
 - c. Displacement due to flooding
 - d. All of the above
2. Environmental degradation intersects with Indigenous peoples' health and well-being:
 - a. More severely because of their geographic isolation
 - b. Less severely if they live in remote communities
 - c. More severely because of colonization
 - d. Less severely because of their communal orientation
3. Wildfires elevate the prevalence of what type of particle in the atmosphere?
 - a. Ozone
 - b. Pollen
 - c. Fine particulate matter
 - d. Viral particles
4. How is pollen season affected by climate change?
 - a. It begins later in the year
 - b. It lasts longer
 - c. It is shorter but more intense
 - d. It is not affected

5. Regarding the impact of climate on myocardial infarction (MI), which statement is false?
- Cold temperatures can increase vulnerability to MI
 - MI risk has a directly proportional relationship to temperature
 - Climate-associated MI risk may be mediated by type 2 diabetes
 - Changes in temperature within a single day can impact MI risk
6. Which factors increase a person's vulnerability to heat:
- Extremes of age
 - Use of bisoprolol
 - Living in high density apartment complex
 - All of the above
7. The Planetary Health Diet discourages consumption of:
- More than 200 g of whole grains per day
 - Tubers and starchy vegetables
 - Proteins sourced primarily from animals
 - Nuts and legumes
8. Climate change can affect mental health by increasing the risk of:
- Subclinical depression
 - Post-traumatic stress disorder
 - Suicide
 - All of the above
9. Approximately what percentage of healthcare investigations and treatments provide either minimal or potentially negative benefit to a patient?
- 1%
 - 10%
 - 40%
 - 60%
10. Which factor does *not* increase the risk of morbidity during extreme heat?
- Older age
 - Mental illness
 - Living in a rural area
 - Living alone

11. Higher levels of atmospheric ozone increase the likelihood of:
- a. Asthma attacks
 - b. Chronic fatigue
 - c. Gastroenteritis
 - d. Metabolic problems
12. A planetary-health mindset in clinical practice involves:
- a. More testing to ensure a correct diagnosis
 - b. Less diagnostic testing for normative human experiences
 - c. Avoiding discussions that are likely to induce stress (e.g. about serious illness)
 - d. Eliminating virtual appointments

INTRODUCTION

What is Planetary Health?

Planetary health, as defined by the Lancet Commission, is the health of human civilisations and the natural systems on which they depend.¹ This concept is especially pertinent now in the face of climate change, which introduces new challenges to human health. For the family physician, meaningful changes can be understood on multiple scales of impact, from micro to meso to macro.²

Planetary health is emerging as an interdisciplinary field of study that seeks to investigate both the effects of environmental change on human health and the social forces that drive these effects.¹ It is also a call to action: a planetary health lens encourages people to look for solutions for a more resilient future.

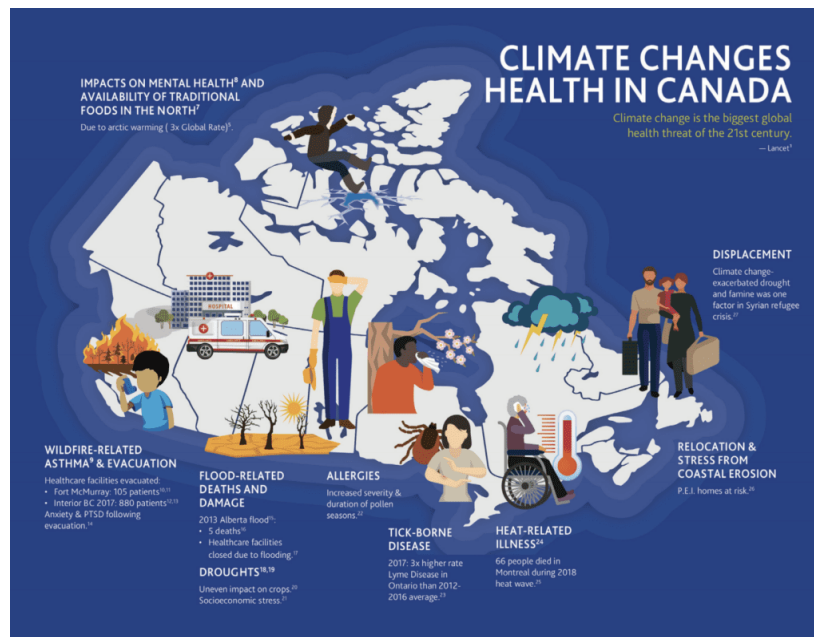
Relevance of Planetary Health to Family Medicine

Exploitation of the planet's natural resources, while yielding substantial short-term benefits to humans, has led to environmental degradation characterized by a changing climate and loss of biodiversity.¹

The rising temperatures, extreme weather, and compromised air quality associated with climate change has direct impacts on several dimensions of human health (Figure 1) that are often managed in primary care, including aggravation of cardiovascular and respiratory illnesses, allergies, and mental health.³ Increased points of contact between humans and potential animal

reservoirs of disease have facilitated the outbreaks of infectious diseases such as malaria, Zika, and HIV/AIDs.¹ As noted in the inaugural issue of *The Lancet Planetary Health*, the reduction in biodiversity resulting from human activity may enable these animal reservoirs to persist.¹

Figure 1: Examples of impacts of Climate Change on Health and Health Systems in Canada³



From: The Lancet Countdown on Health and Climate Change, with permission to reprint

Planetary health and medicine have a bidirectional relationship: climate change affects human health, and healthcare produces greenhouse gas emissions that drive climate change.⁴ In Canada, healthcare is responsible for more than 4.5% of all greenhouse gas (GHG) emissions, equivalent to those of the aviation industry.⁵ Incidents of illness related to climate change have increased dramatically in recent years.⁶

Practical changes to our existing healthcare delivery model can improve both human health and the health of our planet.⁷ These steps can be taken at every level, from individual medical practice to technological and health system innovations to changes in government policy.

Note: while it is important for the healthcare system to reduce greenhouse gas emissions, an approach to sustainable healthcare will not be covered in this module.

PATIENT CASES

Case #1 – Avery S.

You are a primary care physician taking care of a 53-year-old woman, Avery, with shortness of breath on exertion. Avery has a longstanding history of smoking and a possible childhood history of asthma, and has always been prescribed inhalers whenever she is sick. In fact, she mentions that she still uses her blue puffer off and on, but she is finding that it is no longer helping with her shortness of breath. She also has well-managed schizophrenia and receives injections every 2 weeks.

It is July and your community has been under a heat warning for the last week. Due to the heat, it has been harder for Avery to come in for physician visits, and one week, your registered nurse (RN) informs you that she did not come in.

As you provide home visits and are concerned about Avery, you and your RN head over to her place after your clinic day. On arrival, Avery doesn't answer her phone or intercom, but you are fortunate to be able to gain access through the front door by a friendly neighbour. Avery answers the door and you note how warm and smoky it is in her apartment. She is short of breath and hasn't combed her hair, but recognizes you and your RN and agrees to receive her injection. You auscultate her lungs and she has scattered wheezes, but her oxygen saturation, temperature and heart rate are within normal. She has used her blue inhaler, but is not sure if it is empty and wants you to renew it. Avery admits that her mental health “isn't good” and has been unable to leave her apartment. She declines any further testing and just wants her inhaler. She agrees for you to return in 2 weeks for her injection. You set up a date to return, but you are concerned about how Avery's mental and physical health will be in her warm apartment.

Avery is supported by the Ontario Disability Support Program (ODSP). You wonder if there are other ways you can support Avery's health during a heat wave. You recall seeing a handout distributed on one of your many emails about applying for funding for cooling devices, and think you should offer this to Avery. You also inquire about access to a cool room in the building.

Questions

[Note: these questions will be discussed following the information section]

How does climate change affect Avery specifically?

How would you discuss these risk factors with her?

How might micro, meso, and macro levels of advocacy improve Avery's health?

How would you address Avery's inhaler use?

Case #2 – John. C

You are a primary care physician working in a busy inner-city family practice. One of your patients, John, a 68-year-old Métis man, was recently discharged from hospital after suffering from heat stroke at the beginning of July. John also has Type 2 diabetes, and hypertension. He is currently unhoused and living primarily in a tent, which he moves from park to park, occasionally gaining access to shelters for 1-2 days at a time. He has been prescribed metformin 1g BID and ramipril 5mg daily, but has difficulty taking it regularly. There has been a heat wave for the past 4 days, with more unseasonably high temperatures expected for the rest of the month. You see John for follow-up after his admission to review his discharge and next steps.

Questions

When meeting with John, how would you discuss climate change and his health?

How might John's housing situation affect your treatment plan?

What other questions would you ask John?

What guidance would you offer to John?

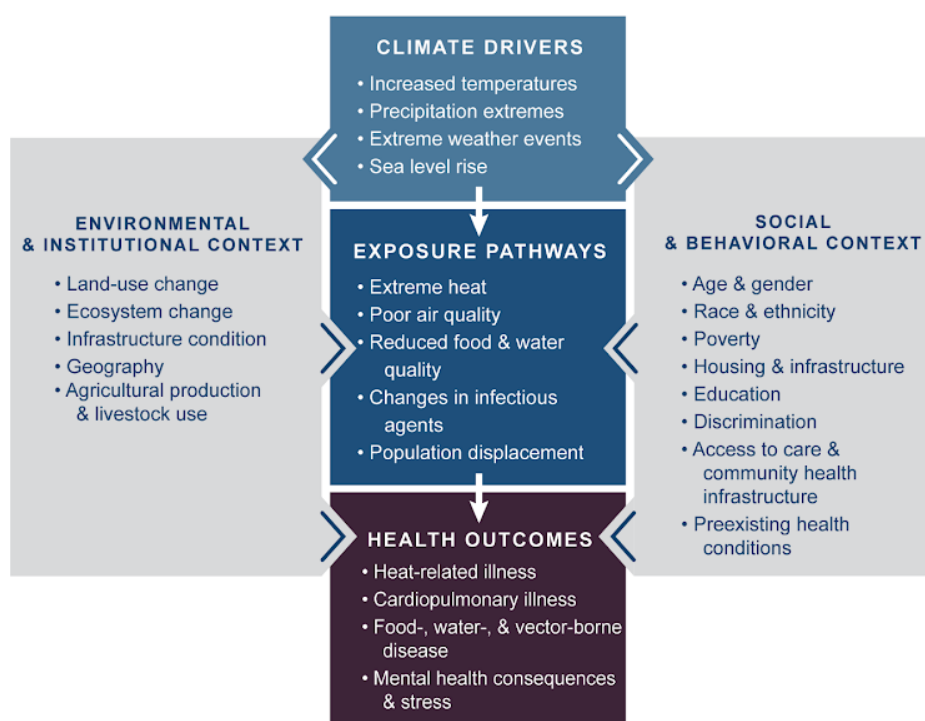
INFORMATION SECTION

Climate Change and Human Health

1 – General Framework

Climate does not impact health in a vacuum. As illustrated in Figure 2, the exposures driven by climate change intersect with environmental factors such as geographic location and land use as well as social and structural determinants of health such as housing status and racism.⁸ Taken together, these factors may amplify or mitigate the effects of climate on health.⁸

Figure 2: Parameters that interact with climate to impact health outcomes⁸



2 – Extreme Heat

Populations without access to cooling are especially vulnerable to the effects of extreme heat. While air conditioning is not considered a vital service in Ontario,⁹ there are programs in place through Ontario Works and the Ontario Disability Support Program that can help patients secure funding for an air conditioning unit.¹⁰ Medical practitioners can help support these patients through a letter of support or a prescription for a cooling device.¹⁰ A similar program exists in British Columbia for low income residents.¹¹ They can also advocate for a maximum temperature by-law in their communities.¹²

Circumstances that put a patient at a higher risk for negative outcomes during extreme heat events can be divided into the categories of increased exposure, increased vulnerability, lack of access to resources, and medication use (Table 1).¹³

Table 1: Factors affecting individual risk during extreme heat events¹³	
Increased Exposure	• Working outdoors (especially physically intense labour, or work that requires heavy personal protective equipment) • Athletes or military personnel in competitive environments • Individuals experiencing homelessness • Urban areas with little tree coverage
Increased Vulnerability	• Mental illness (less awareness of symptom onset) • Older age • Obesity • Medication use (especially cardiovascular medications or those that can cause dehydration)
Lack of Access to Resources	• Cognitive impairment • Language barrier (preventing proper education) • Social isolation
Medication use	• Psychiatric - anti psychotics/neuroleptics, anti depressants, lithium • Cardiac - Calcium channel blockers, ACE-inhibitors, Beta blockers, Diuretics, nitrate vasodilators • Anti Alzheimer's and Anti-Parkinson's - Cholinesterase inhibitors, benztropine, levodopa, cogentin • Other - anti histamines, anti epileptics, many more

Adapted from: Green S et al. Can Fam Physician 2024;9:546-550 .

It can be a challenge to determine who is at greatest risk and how to identify heat-related illness.¹⁴ The National Collaborating Centre for Environmental Health (NCCEH), a Canadian organization, has created a [checklist](#) to help rapidly assess vulnerability.¹⁴

3 – Environmental Exposures

In addition to causing climate change, burning fossil fuels is the source of about 85% of air pollution globally. Air pollution is responsible for one in five deaths worldwide and one in seven premature deaths in Canada.¹⁵ Air pollution affects all systems in the body and can increase the risk of heart and lung disease, dementia, some cancers, skin diseases, adverse pregnancy outcomes, and adverse childhood developmental outcomes.¹⁶ Extreme heat also increases ground level ozone levels, which is detrimental to respiratory and cardiovascular health. Especially harmful are fine particulate matter (smaller than 2.5 microns or about one thirtieth the width of a human hair), which the International Agency for Research on Cancer has categorized as a Group 1 carcinogen.¹⁶

Fine particulate matter in the air is also causally implicated in cardiovascular disease morbidity and mortality, and exacerbates the effect of extreme heat exposure. A study in Italy found that the effect of heat on mortality is tripled under conditions of high concentration of fine particulate matter (compared with conditions of low concentration of fine particulate matter).¹⁷

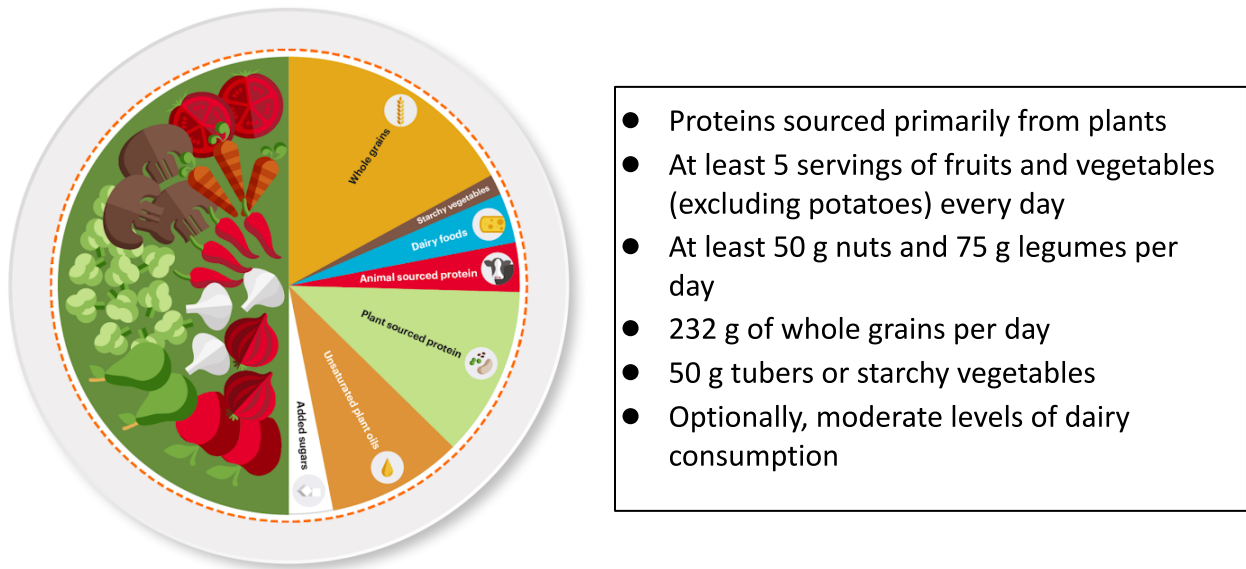
Wildfires, another environmental exposure exacerbated by climate change, are becoming more common every year in Canada. This added exposure poses risks to the respiratory system, cardiovascular system, and metabolic health.¹⁸ While long term effects are largely unknown, studies have demonstrated a reduction in overall respiratory health and an increased risk of dementia.¹⁹

4 - Diet

Food systems have major impacts on human health and environmental sustainability,²⁰ and therefore, dietary modification is an opportunity to co-benefit planetary and individual health. The current Canadian food guide prioritizes plant-rich foods and de-emphasizes red meat and dairy products due to the significant impact of animal based foods on the planet.²¹ This advice aligns with the Planetary Health Diet (PHD) (Figure 3), developed by leading global nutrition and environmental experts alongside the EAT-Lancet Commission.²⁰

Climate change can impact food systems due to elevated temperatures. For example, increased ice melt can affect access to traditional food sources for Indigenous communities, and compound the detrimental effects of colonization.^{22,23} Another example is through the disruption of supply chains due to increase in vector borne diseases, such as Avian Flu.²⁴ The infection of poultry results in mass culling, therefore leading to shortages of eggs in the United States.

Figure 3: Basic principles of PHD²⁰



Adapted from: EAT-Lancet Commission brief for healthcare professionals

5 – Indigenous Communities

Planetary health has long been a core tenet of many Indigenous cultures. Human-centric hierarchies are often absent in Indigenous languages and cultures, which hold a deep respect for all human and non-human entities.²⁵ The land on which a community lives, encompassing elements on the ground, in the air, and in the water, assumes a high level of importance.²⁶ Stewardship of this land is rooted in notions of reciprocity and responsibility and the perception of biospheric values as human values.²⁵

Climate change has had a disproportionate effect on Indigenous communities. The Indigenous perspective, which gives primacy to local conditions, has often been cast aside.²⁵ While the past decade has seen an increasing recognition of the importance of the Indigenous perspective in mitigating and adapting to climate change, the recognition has been largely symbolic to date.²⁵ There are opportunities to apply Indigenous perspectives to both healthcare practice and policy.

In Canada, Indigenous peoples experience trauma and poor health caused by displacement and colonization.^{25,27} As such, promoting resilience to climate change for Indigenous communities in Canada requires understanding the context of colonization, as well as each community's geographic and cultural context.²⁷

Effect of Climate Change on Respiratory Health

6 – Wildfires

The higher incidence of wildfires associated with climate change increases the proportion of fine particles in the atmosphere. When breathed, these particles diffuse to the walls of the airways and get deposited in the alveolar region of the lungs, escalating the risk of developing respiratory illness.²⁶ Informing patients of the link between climate change and respiratory health can be a part of routine discussions with patients. Individuals with conditions like asthma, chronic obstructive pulmonary disease (COPD), and allergies should be made aware of how shifts in air quality can aggravate their symptoms.²⁹

7 – Allergens

Higher temperatures and increased levels of carbon dioxide in the atmosphere lead to earlier and longer pollen seasons, along with higher pollen potency.³ Increased storms, precipitation, heat, and humidity can all promote mold growth, which is a known trigger for asthma and allergies.³ If flooded areas and the objects in them are not dried quickly, mold can spread and become difficult to eradicate.³

8 – Air Pollution

Extreme heat, an effect of climate change, can increase the level of many airborne pollutants that have negative impacts on respiratory health, including ground-level ozone (a key component of smog).³ High levels of ozone exposure can trigger asthma attacks and aggravate allergy symptoms.³ Nitrogen dioxide, which is emitted from cars, also has negative impacts on people with asthma.³⁰ Air pollution has also been associated with development and worsening symptoms of COPD.³¹ An Air Quality Health Index (AQHI) of 5 or above is considered unhealthy for people with asthma, but symptoms can worsen even when AQHI levels are moderate.³⁰ Clinicians can help patients understand such air quality indices and pollen projections and adjust their medications and day-to-day activities in response to these indices.³²

9 – Social Determinants

Social determinants of health (SDOH) can have a major impact on the prevention, treatment, and progression of respiratory conditions.³³ A 2022 study found that 74% of frequently admitted COPD patients (>2 admissions per year) had unmet SDOH, primarily food and housing insecurity and lack of transportation.³⁴ Unhealthy housing conditions that expose residents to toxins, such as mold or dust, are among the most important determinants of asthma health disparities.³³

Effect of Climate Change on Mental Health

10 – Acute and Delayed Effects

Exposure to extreme weather events increases the risk of mental health problems, especially in individuals with pre-existing mental health conditions.³⁵ As many as 25 to 50 percent of people exposed to a natural disaster experience mental health effects.³⁶ After Hurricane Katrina, 49.1% of those who remained in New Orleans developed an anxiety or mood disorder, which also occurred in 26.4% of those who relocated — both rates significantly higher than the national average.³⁷ People with mental health disorders are at increased risk of climate-related illness. In the 2021 BC heat dome event, people with schizophrenia had a 3-fold mortality rate.³⁸ Psychiatric medication use, as highlighted in Table 1, increases the risks of heat illness due reduced perception of heat¹⁹.

Climate change may have both acute and gradual effects on mental health, along with indirect impacts (Table 1).³⁶ Without intervention, individuals who experience an extreme weather event may experience post-traumatic stress disorder (PTSD) and an increase in suicidality.³⁹ Mental trauma may also result from more chronic changes to the environment; for example, suicides in farmworker populations tend to increase during periods of prolonged drought, which are becoming more common due to climate change.⁴⁰

Table 1: Three levels of impact of climate on mental wellness ³⁶	
Acute	● Stress, anxiety, depression ● Post-traumatic stress disorder
Gradual	● Chronic stress from such impacts as physical health deterioration, job loss or displacement
Indirect	● Loss of connection to community and environment ● Diminished sense of self

Adapted from: McNeill A et al. Lancet Planet Health 2021;5.

11 – Heat

An Australian study suggests a correlation between heat waves and increased rates of admissions for mental disorders.⁴¹ Such heat waves have been associated with mood disorders,

anxiety disorders, and dementia.⁴² An association between increased temperature and suicide rates has also been observed.⁴³

12 – Climate Anxiety

The degree of climate-related distress a person experiences is often related to the direct impact of climate change on their microenvironment.⁴⁴ Even in countries minimally affected by devastation due to climate change, there are numerous personal and clinical accounts of subclinical depressive emotions, anxiety, and guilt associated with the climate crisis and global environmental damage.⁴⁵

Climate anxiety, also known as eco-anxiety, is characterized by severe and debilitating worry about the climate and potential environmental changes. This anxiety can result in a loss of appetite, loss of sleep, and panic attacks.⁴⁵ Clinicians can help normalize these reasonable emotional responses to an unprecedented and distressing planetary crisis.

Putting a planetary health framework into practice

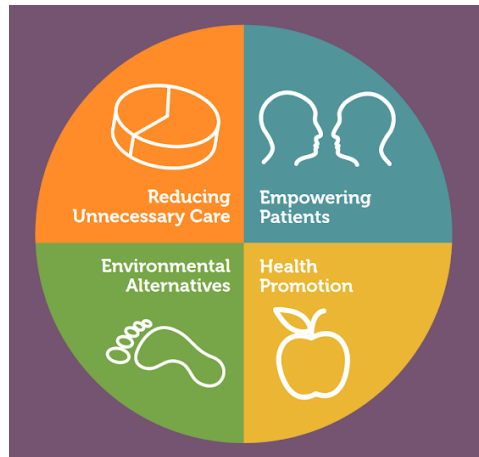
“The practice of planetary healthcare includes the idea that healthier populations use less healthcare and that lessens our environmental footprint. So, planetary healthcare means focusing upstream on prevention, ensuring universal access to primary care, and shifting patients into what we called a ‘low-tech, high-touch community environment’ and keeping them out of the more resource-intense acute care environment.”⁵

Dr. Andrea MacNeill
Director, Planetary Healthcare Lab
University of British Columbia

13 – Healthcare Stewardship

Traditionally, environmental action has focused on reducing the consumption of energy to power buildings and vehicles, but such measures account for only about 20% of the greenhouse gas emissions in healthcare; the remaining 80% comes from the waste in the healthcare supply chain, including excessive materials required for medications, diagnostic investigations, and treatments.⁴⁶ Adopting a planetary healthcare perspective in clinical practice entails reducing waste, and also finding lower-impact alternatives and empowering patients to make lifestyle choices that reduce the need for medical interventions (Figure 4).⁴⁷

Figure 4: Principles of sustainable healthcare⁴⁷



*From: Planetary Health for Primary Care
East Kootenay Division of Family Practice and CASCADES Canada*

A major way to offset the climate burden of healthcare delivery is to reduce excessive medical interventions and promote preventive care. Up to 30% of investigations and treatments ordered in healthcare provide minimal or no benefit to the patient, with an additional 10% causing potential harm.⁴⁶ These treatments also come at a large environmental cost, given the energy and resources required for them.⁴⁶

A planetary health mindset also prioritizes reducing resource waste. For example, using online communication and telemedicine tools can reduce patient travel requirements.⁴⁸ Clinicians can also prioritize reusable medical supplies over disposable, and reduce unnecessary glove use.

Many lifestyle changes that support individual health, such as smoking cessation and active transportation, also benefit the environment.⁴⁹ While the feasibility of these lifestyle changes may partly depend on government initiatives such as protection of urban green spaces,⁵⁰ primary care physicians can operate at the individual level to promote such changes. Encouraging patients to view these changes as a “win-win” (benefiting both individual and planetary health) may increase their motivation.

Respiratory health

Patients are often prescribed inhalers without a definitive diagnosis. By current estimates, a 100-dose metered-dose inhaler (MDI) emits as much greenhouse gas as a gas-powered car driven for up to 170 km.⁵¹ It is important to not initiate medications for asthma patients who

have not had confirmation of reversible airflow limitation with a suitable pulmonary function test (PFT) such as spirometry.⁵² If an inhaler is needed, a dry-powder inhaler (DPI) has several advantages over an MDI inhaler, including lack of propellant, greater portability, no need for a spacer, and a dose counter displaying the number of remaining doses.⁵³

Also important is the proper disposal of inhalers, accompanied by patient education on how to properly recycle them when empty. Patients should be advised to read the handling instructions on the label of the inhaler and to contact their local pharmacy to inquire about recycling programs.⁵⁴

Mental health

While treatment for mental health issues is paramount in some cases, many people present to primary care with mild variations of the normal human condition that have self-limited symptoms and respond well to conservative treatments. Pressure from advertising leads an increasing number of people who go through such experiences to believe they have a diagnosis – and thus require treatment.⁵⁵ The role of the primary care provider is to apply appropriate diagnostic criteria and clinical skills to distinguish between the two,⁵⁵ and not overmedicalize or overmedicate patients going through normal life experiences.

14 – Patient-Centred Care

Shifting the current healthcare culture towards greater resource stewardship requires a patient-centred approach to care.³⁵ Not only can patient-centred care improve outcomes, but it can reduce unwanted care and excessive reliance on healthcare services.⁵⁶ A patient-centred approach entails⁵⁶:

- Inquiring about and respecting patient preferences
- Using shared decision-making strategies and tools
- Supporting self-management
- Tailoring guidance to individual risks
- Honest communication

15 – Advocacy

A planetary health mindset includes advocacy, both at the individual and the community level. The World Organization of Family Doctors (WONCA) declaration has noted the opportunity for healthcare professionals to advocate for structural changes that promote better health, both in their practices and via their professional associations.⁵⁷ For example, while encouraging a

patient to walk or cycle more as part of their daily routines, a primary care physician could also advocate for city planning activities that enable and encourage these activities.⁵⁷ Advocacy is a CANMEDS roles outlined for family medicine.⁵⁸

16 – Concluding Thoughts

The prevailing biomedical lens fails to fully integrate socioeconomic determinants of health and misses opportunities to engage communities in healthcare efforts.⁵⁷ A planetary health perspective on health and health interventions, which encompasses individuals, communities, and populations, represents an opportunity to expand the scope of primary care consultations and management. The dual benefits of personal health improvement and planetary health stewardship could encourage patients to change their behaviours, even in an imperfect environment.⁵⁷

The World Organization of Family Doctors (WONCA) has called for primary care physicians to integrate planetary health principles into their practices.⁵⁷ As frontline healthcare professionals, primary care physicians are ideally positioned to integrate traditional principles of primary care with the broader vision required by planetary healthcare.

A Canadian resource for day-to-day planetary-health-aware clinical practice

For a wealth of practical details on simple ways to practice through a planetary health lens, consult the Planetary Health for Primary Care resource, developed with oversight from CASCADES Canada (a Government of Canada initiative). Organized around the four principles in Figure 4, the resource provides real-world examples, practice tips, and links to other resources. The downloadable resource is available at:

<https://cascadescanada.ca/resources/sustainable-primary-care-toolkit/>

CASE DISCUSSIONS

Case #1 – Avery S.

How does climate change affect Avery specifically?

As someone with schizophrenia, Avery is at a higher risk during an extreme heat event (Info section 2). Her mental illness also raises her risk of developing PTSD in response to extreme weather events (Info section 10). Poor air quality as a result of wildfires and fossil fuel air

pollution already exacerbate Avery's breathing issues (Info section 6). With rising temperatures, the effects will become more severe (Info section 3).

How would you discuss these risk factors with her?

It would be helpful to talk with Avery about strategies for staying cool during extreme heat and for coping with the mental health impacts of extreme weather events. Education about the Air Quality Health Index could help her choose times to stay indoors (Info section 6). She can be counselled on the benefits of an indoor air purifier, such as a HEPA filter. She should also be advised about the benefit of quitting smoking for her respiratory health.

It is important to approach Avery's treatment with a patient-centred mentality (Info section 15). While there are many tools and programs available to Avery, discussions of a healthcare plan should seek to identify which strategies will actually work for her. This will help avoid unnecessary healthcare interventions that could have detrimental impacts on Avery's physical and mental health or on the environment.

How might micro, meso and macro levels of advocacy affect and improve Avery's health?

On the micro level, Avery could be assisted in applying for funding for an air conditioning unit, if such funding exists in her region (Info section 2). At the meso level, advocacy for funds to support home visits could improve Avery's access to care, as patients in her circumstances often have trouble accessing clinics and hospitals, in part due to environmental factors such as heat waves or periods of heightened air pollution (Info section 2). At the macro level, Avery could benefit from a maximum-temperature by-law and from policies that offer more resources for individuals living with disabilities.

How would you address Avery's inhaler use?

Spirometry should be conducted (Info section 14) once Avery is stable. Further testing for asthma or COPD would help determine whether the inhalers prescribed to Avery are necessary and helpful. Avery's inhaler could also be checked to ensure it is not empty, as MDIs do not come with a dose counter. Her inhaler technique should be assessed and a spacer for her inhaler recommended. She could also be offered a dry powder inhaler (DPI) as an alternative to an MDI inhaler, as DPIs come with a dose counter, are easier to use, and have a lower impact on emissions (Info section 14). It would also be helpful to ask Avery if she is aware of proper inhaler disposal procedure.

Case #2 – John C.

When meeting with John, how would you discuss climate change and his health?

John should be counselled that he is at a higher risk of adverse health impacts during extreme heat events due to his age, medical conditions and housing status (Info section 2). He can also be advised that extreme heat can exacerbate the adverse health effects of poor air quality (Info section 3). While he may not have a way to monitor the AQHI, he could be encouraged to take more precautions during periods of noticeably poor air quality or extreme heat.

How might John's housing situation affect your treatment plan?

John can be counselled on the warning signs of heat stroke and on how to prevent heat-related illness. He can be provided with a list of public cooling centres in his community. If he is not already connected with an Indigenous community organization, he can be encouraged to do so.

What additional questions might you pose to John?

John could be asked about his access to air-conditioned spaces during hotter months (Info section 2), which could help inform a strategy for self-protection during extreme heat events. It would also be worth investigating if he has any other risk factors for vulnerability to heat-related events, including substance use, mobility issues, and mental illness (Info section 2). A conversation with John about the impact of colonization could help both patient and practitioner understand his relationship to the land on which he resides (Info section 5).

What guidance would you offer to John?

John could be informed about the shelter and cooling-centre options available in his region, including resources for Indigenous populations. It would be crucial to connect John to medical care, including mobile clinics and shelter-based care, so that his physical and mental health can be monitored on an ongoing basis. You can advise John that his blood pressure medication, ramipril, heightens his risk for heat related illness.

It is important to approach John's healthcare treatment with an understanding of the collective identity and history shared by many Indigenous peoples (info section 5), as his current and historical relationship to the land may impact his experience of the effects of climate change.

Retest yourself

2. Environmental degradation is known to increase the incidence of:
 - a. Respiratory illnesses, such as asthma
 - b. Outbreaks of transmissible diseases in humans
 - c. Displacement due to flooding
 - d. All of the above
3. Environmental degradation intersects with Indigenous peoples' health and well-being:
 - a. More severely because of their geographic isolation
 - b. Less severely if they live in remote communities
 - c. More severely because of colonization
 - d. Less severely because of their communal orientation
4. Wildfires elevate the prevalence of what type of particle in the atmosphere?
 - a. Ozone
 - b. Pollen
 - c. Fine particulate matter
 - d. Viral particles
5. How is pollen season affected by climate change?
 - a. It begins later in the year
 - b. It lasts longer
 - c. It is shorter but more intense
 - d. It is not affected
6. Regarding the impact of climate on myocardial infarction (MI), which statement is false?
 - a. Cold temperatures can increase vulnerability to MI
 - b. MI risk has a proportional relationship to temperature
 - c. Climate-associated MI risk may be mediated by type 2 diabetes
 - d. Changes in temperature within a single day can impact MI risk
7. Which factors increase a person's vulnerability to heat:
 - a. Extremes of age
 - b. Use of bisoprolol
 - c. Living in high density apartment complex
 - d. All of the above

8. The Planetary Health Diet discourages consumption of:
- a. More than 200 g of whole grains per day
 - b. Tubers and starchy vegetables
 - c. Proteins sourced primarily from animals
 - d. Dairy products
9. Climate change can affect mental health by increasing the risk of:
- a. Subclinical depression
 - b. Post-traumatic stress disorder
 - c. Suicide
 - d. All of the above
10. Approximately what percentage of healthcare investigations and treatments provide either minimal or potentially negative benefit to a patient?
- a. 1%
 - b. 10%
 - c. 40%
 - d. 60%
11. Which factor does *not* increase the risk of a medical event during extreme heat?
- a. Older age
 - b. Mental health illness
 - c. Living in a rural area
 - d. Living alone
12. Higher levels of atmospheric ozone are most likely to increase the likelihood of:
- a. Asthma attacks
 - b. Chronic fatigue
 - c. Gastroenteritis
 - d. Metabolic problems
13. A planetary-health mindset in clinical practice involves:
- a. More testing to ensure a correct diagnosis
 - b. Less diagnostic testing for normative human experiences
 - c. Avoiding discussions that are likely to induce stress (e.g. about serious illness)
 - d. Eliminating virtual appointments

REFERENCES

1. Welcome to The Lancet Planetary Health. Lancet Planet Health 2017;1:E1. Accessed December 2, 2024 at: [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(17\)30013-X/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30013-X/fulltext)
2. Prescott SL, Logan AC, Albrecht G et al. The Canmore Declaration: Statement of Principles for Planetary Health. Challenges 2018;9:31.
3. The Lancet Countdown on Health and Climate Change. Policy brief for Canada. 2019 Nov. Accessed December 6, 2024 at: <https://policybase.cma.ca/viewer?file=%2Fmedia%2FPolicyPDF%2FPD20-06.pdf#page=1>
4. Planetary Health International and Global Health Office, University of Ottawa Faculty of Medicine. Accessed October 24, 2024 at <https://www.uottawa.ca/faculty-medicine/international-global-health-office/planetary-health>.
5. MacNeill A. From Planetary Health to Planetary Healthcare. Pathways Magazine. Accessed October 24, 2024 at <https://pathwaysmagazine.med.ubc.ca/from-planetary-health-to-planetary-healthcare/>.
6. Climate Change Crisis Goes Critical. Lancet Resp Med 2023;11:213.
7. Foster A, Cole J, Farlow A, Petrikova I. Planetary Health Ethics: Beyond First Principles. Challenges 2019;10:14.
8. The impacts of climate change on human health in the United States: a scientific assessment. US Global Change Research Program, 2016. Accessed October 28, 2024 at https://health2016.globalchange.gov/brochures/ClimateHealth2016_01_Introduction_factsheet.pdf
9. OHRC Statement on Human Rights, Extreme Heat Waves and Air Conditioning. Ontario Human Rights Commission, August 19, 2022. Accessed October 24, 2024, at https://www.ohrc.on.ca/en/news_centre/ohrc-statement-human-rights-extreme-heat-waves-and-air-conditioning.
10. OW/ODSP Discretionary Benefits: Cooling Devices. Health Providers Against Poverty. Accessed October 24, 2024, at <http://healthprovidersagainstopoverty.ca/>.
11. Free portable air conditioners. BC Hydro Power Smart. Accessed April 21, 2025. <https://www.bchydro.com/powersmart/residential/rebates-programs/savings-based-on-income/free-air-conditioner.html>.
12. CELA supports addition of maximum indoor temperature. CELA. Accessed April 21, 2025. <https://cela.ca/cela-supports-addition-of-maximum-indoor-temperature-to-national-building-code/>
13. Green S, Deering S, Ng D, Lee KS. Approach to heat-related illness. Can Fam Physician 2024;9:546-550 .

14. National Collaborating Centre for Environmental Health. Health Checks during Extreme Heat Events [Guidance Document]. National Collaborating Centre for Environmental Health, 2022. Accessed October 28, 2024, at <https://ncceh.ca/resources/evidence-reviews/health-checks-during-extreme-heat-events>.
15. Perrotta K. Air pollution responsible for one in five deaths. Chase Canada; Accessed April 15, 2024 at: <https://chasecanada.org/2021/04/15/air-pollution-responsible-for-one-in-five-deaths/>
16. Bernicker E, Averbuch SD, Edge S, et al. Climate Change and Cancer Care: A Policy Statement From ASCO. *Oncology Practice* 2024;20:178-186.
17. Peters A, Schneider A. Cardiovascular Risks of Climate Change. *Nature Reviews Cardiology* 2021;18:1–2.
18. Policy Brief for Canada. The Lancet Countdown on Health and Climate Change, 2023. Accessed October 28, 2024, at <https://lancetcountdown.org/>.
19. Elser H, Frankland TB, Chen C, et al. Wildfire smoke exposure and incident dementia. *JAMA Neurol.* 2024 Nov 25:e244058.
20. EAT-Lancet Commission: The Planetary Health Diet. EAT Forum. Accessed October 24, 2024, at https://eatforum.org/content/uploads/2019/01/EAT_brief_healthcare-professionals.pdf.
21. Backgrounder: the science behind the new Canada Food Guide. Government of Canada. Accessed October 30 at <https://www.canada.ca/en/health-canada/news/2019/01/backgrounder-the-science-behind-the-new-food-guide-----.html>
22. Argumedo A et al. Support Indigenous Food System Biocultural Diversity. *The Lancet Planetary Health* 2020:4
23. Zavaleta-Cortijo C et al. Climate Change and COVID-19: Reinforcing Indigenous Food Systems. *The Lancet Planetary Health* 2020;4–e382.
24. Boodhoo, N and Sharif, S. COMMENTARY: Climate Change is helping the H5N1 Bird flu virus spread and evolve. UofG News. Accessed April 21, 2025. <https://news.uoguelph.ca/2024/06/commentary-climate-change-is-helping-the-h5n1-bird-flu-virus-spread-and-evolve/>
25. Redvers N, Celidwen Y, Schultz C, et al. The determinants of planetary health: an Indigenous consensus perspective. *Lancet Planet Health* 2022;6:E156-162.
26. Redvers J. “The land is a healer”: Perspectives on land-based healing from Indigenous practitioners in northern Canada. *Int J Indig Health* 2020;15:90-107.
27. Kirmayer LJ, Dandeneau S, Jessen Williamson K, et al. Rethinking resilience from Indigenous perspectives. *Can J Psychiatry* 2011; 56:84-91.

28. Chang JH, Lee YL, Chang TL et al. Climate Change, Air Quality, and Respiratory Health: A Focus on Particle Deposition in the Lungs. *Annals of Medicine* 2023;55: 55(2):2264881.
29. Covert H, Wahid FA, Wenzel S, Lichtveld SW. Climate Change Impacts on Respiratory Health: Exposure, Vulnerability, and Risk. *Physiological Reviews* 2023;103:2507-2522.
30. Air Pollution and Asthma. Asthma and Allergy Foundation of America. Accessed October 28, 2024 at <https://community.aafa.org/blog/air-pollution-and-asthma>.
31. Wendling D, Short J, Meng A, Edwards S. Climate Change and Respiratory Health: What Healthcare Providers Need to Know. *Chest* 2023;158:234–245.
32. Gibbons C, Beggs P. The Impact of Bushfire Smoke on Respiratory Health: What We Know and What We Don't. *Current Allergy and Asthma Reports* 2023;22:457–470.
33. Hood CM, Gennuso KP, Swain GR, Catlin BB. County Health Rankings: Relationships between determinant factors and health outcomes. *Am J Prevent Med* 2016;50:129–135.
34. Kearney L, Weiner R, Dahodwala M et al. A Mixed Methods Study to Inform and Evaluate a Longitudinal Nurse Practitioner/Community Health Worker Intervention to Address Social Determinants of Health and COPD Self-Management. *BMC Pulmonary Medicine* 2022;22:74.
35. Haines A, Ebi K. The Imperative for Climate Action to Protect Health. *New England Journal of Medicine* 2019;380:263–273.
36. McNeill A, McGain F, Sherman JD. Planetary health care: a framework for sustainable health systems. *Lancet Planet Health* 2021;5.
37. Galea S, Brewin CR, Gruber M et al. Exposure to Hurricane-Related Stressors and Mental Illness after Hurricane Katrina. *Archives of General Psychiatry* 64:1427–1434.
38. Green S, Rosenbaum D, Beder M. Heat resilience and severe & persistent mental illness. *Can J Psychiatry* 2023;69:239-241.
39. Nicholas PK, Breakey S, White BP et al. Mental Health Impacts of Climate Change: Perspectives for the ED Clinician. *J Emerg Nurs* 2020;46:590-599.
40. Hanigan IC, Kokic CN, Hutchison MF. Suicide and Drought in New South Wales, Australia, 1970-2007. *Proceedings of the National Academy of Sciences* 2012;109:13950–13955.
41. Nitschke M, Tucker G, Hansen AL et al. Impact of Two Recent Extreme Heat Episodes on Morbidity and Mortality in Adelaide, South Australia: A Case-Series Analysis. *Environmental Health* 2011;10:42.
42. Berry H, Bowen K, Kjellstrom T. Climate Change and Mental Health: A Causal Pathways Framework. *International Journal of Public Health* 2010;55:123–132.
43. Linkowski P, Martin F, De Maertelaer V. Effect of some climatic factors on violent and non-violent suicides in Belgium. *Journal of Affective Disorders* 1992;25:161–166.

44. Coyle KJ, VN Susteren L. The Psychological Effects of Global Warming on the United States: And Why the U.S. Mental Health Care System Is Not Adequately Prepared. National Wildlife Federation, 2012. Accessed October 28 at <https://nwf.org/>.
45. Ingle HE et al. Mental Health and Climate Change: Tackling Invisible Injustice. *The Lancet Planetary Health* 220;4–e130.
46. Sustainable Primary Care Toolkit. Cascades Canada, 2023. Accessed October 25, 2024 at <https://cascadescanada.ca/toolkits/>.
47. Planetary Healthcare. East Kootenay Division of Family Practice and CASCADES Canada (a Government of Canada initiative). Accessed October 24, 2024 at <https://cascadescanada.ca/resources/sustainable-primary-care-toolkit/>.
48. Wellbery CE. Climate Change Health Impacts: A Role for the Family Physician. *Am Fam Physician* 2019;100:602-603.
49. Perrotta K. Active Transportation Infrastructure: Improving health and health equity while fighting climate change. Canadian Health Association for Sustainability & Equity. May 27, 2024. Accessed October 24, 2024 at <https://chasecanada.ca/resources/>.
50. Kingsley, Marianne. Commentary – Climate Change, Health and Green Space Co-Benefits. *Health Promot Chronic Disease Prevent Can* 2019;39:131-135.
51. Inhaled coverage chart (Appendix). Publitas. Accessed December 12, 2024 at <https://view.publitas.com/5231e51e-4654-42c2-accd-b722e21f3093/inhaler-coverage-chart-references>
52. Jattan, Aaron. Prescribing Inhalers: An Interview with Dr. Kimberley Wintemute. *Choosing Wisely Canada*, November 2021. Accessed October 28, 2024 at <https://www.cfp.ca/content/cfp/67/11/e295.full.pdf>.
53. Advantages and disadvantages of MDI/DPI inhalers. Registered Nurses' Association of Ontario. Accessed December 10, 2024 at <https://bpgmobile.rnao.ca/node/1296>
54. How to Safely Dispose of Your Asthma and Allergy Medicines. Asthma and Allergy Foundation of America, October 5, 2022. Accessed October 28, 2024 at <https://community.aafa.org/blog/how-to-safely-dispose-of-your-asthma-and-allergy-medicines>.
55. Climate Changes Health: Mental wellness. American Public Health Association. Accessed October 29, 2024 at <https://www.apha.org/topics-and-issues/climate-health-and-equity/mental-wellness>.
56. Hale I, Green S, Davis M, Nowlan J. Planetary health lens for primary care. *Can Fam Physician* 2024;70:224–227.
57. Gonzalez-Holguera J, Gaille M, del Rio Carral M, et al. Translating Planetary Health Principles Into Sustainable Primary Care Services. *Front Public Health* 2022;10:931212.

58. Ince-Cushman D. Health Advocate. In: Shaw E, Oandasan I, Fowler N, eds. CanMEDS-FM 2017: A competency framework for family physicians across the continuum. Mississauga, ON: The College of Family Physicians of Canada; 2017.