# PATHWAYS

HOW DO WE FUTURE-PROOF OUR HEALTH
IN A CHANGING CLIMATE?

From wildfires to extreme heat, the effects of climate change are all around us.

Researchers at UBC are working to create a healthier, more equitable future for all.

With gratitude, we acknowledge that the University of British Columbia Faculty of Medicine and its distributed programs, which include four university academic campuses, are located on traditional, ancestral and unceded territories of Indigenous peoples around the province.

We respectfully acknowledge that the UBC Vancouver-Point Grey academic campus is located on the traditional, ancestral, unceded territory of the  $x^w m \theta \theta k^w \theta \phi m$  (Musqueam), and UBC operations in Vancouver more generally are also on the territories of the Skwxwú7mesh (Squamish) and sølilwəta?† (Tsleil-Waututh).

We respectfully acknowledge that the UBC Okanagan academic campus is situated on the traditional, ancestral, unceded territory of the Syilx Okanagan Nation.

We respectfully acknowledge that the University of Northern BC Prince George campus is situated on the unceded traditional territory of the Lheidli T'enneh First Nation, part of the Dakelh (Carrier) peoples' territory.

We acknowledge and respect the ləkwəŋən peoples on whose traditional territory the University of Victoria is located and the Songhees, Esquimalt and  $\underline{W}$ SÁNEĆ peoples whose historical relationships with the land continue to this day.

#### **Contents**

#### DEAN'S MESSAGE

Transforming health in a changing climate
By Dr. Dermot Kelleher, Dean, Faculty of Medicine,
Vice-President, Health, UBC

#### **HOW DO WE FUTURE-PROOF OUR HEALTH IN A CHANGING CLIMATE?**

2

| Helping people live healthier lives,                 |    | Shrinking healthcare's carbon footprint                                     | 36     |
|------------------------------------------------------|----|-----------------------------------------------------------------------------|--------|
| from childhood to old age                            | 6  | Toward greener, healthier hospital menus                                    | 38     |
| Feature: The science of exposure                     | 8  | From planetary health to the Planetary                                      |        |
| Unlocking the benefits of greenspace                 | 14 | Healthcare Lab                                                              | 40     |
| Healthy aging in a changing climate                  | 16 | Highlights                                                                  | 42     |
| Highlights  Making healthcare accessible and         | 19 | Training future-ready healthcare professionals                              | 44     |
| inclusive for everyone                               | 20 | Making medical practices greener                                            | 46     |
| Better respiratory health for Indigenous communities | 22 | Putting accessibility and climate change at the center of medical education | 48     |
| A diet for healthier lungs and a healthier planet    | 24 | Highlights                                                                  | 51     |
| Highlights                                           | 26 |                                                                             |        |
| Preparing for the worst —                            |    | OPINION                                                                     | 52     |
| so the worst doesn't happen                          | 28 | Why infectious diseases are spreading —                                     |        |
| Safeguarding rural healthcare —                      |    | and what we can do about it                                                 |        |
| with the help of drones                              | 30 | By Dr. Jennifer Gardy, Bill & Melinda Gates Found                           | dation |
| From climate worry to climate action                 | 32 |                                                                             |        |
| Highlights                                           | 34 |                                                                             |        |

## Transforming health in a changing climate

The climate crisis will test our readiness on all fronts. We must act now to future-proof our health and our healthcare systems — countless lives depend on it.

Fresh air, clean water, vibrant ecosystems — our health depends on the health of the planet. It's a relationship we instinctively understand from the time we are very young because it's so powerful and so essential to who we are. It shapes us throughout our lives, as we grow, develop and age.

Climate change threatens this relationship in many different ways. With rising global temperatures, we are seeing more frequent and intense wildfires, flooding, drought, heat domes and other climatesensitive hazards. They present new threats to our physical and mental health and wellbeing, and make existing challenges worse.

In the late fall of 2022, Dr. Theresa Tam, Canada's Chief Public Health Officer, released her report on Mobilizing Public Health Action on Climate Change in Canada, which notes that climate change "is arguably the largest looming threat to the health of our communities and our planet."

She goes on to say, "We need to put health at the center of climate action and focus on efforts that will lead to significant and near-immediate health and environmental benefits. By advocating for healthy environments, we can reduce chronic diseases, premature deaths and hospital admissions, promote positive mental well-being and reduce air pollution." Already in 2023, we are seeing the increasing importance of these words.

So the question is, how do we future-proof our health and healthcare systems so we can adapt, thrive

and make the world a better place, today and for generations to come?

Here at UBC's Faculty of Medicine, we are tackling this urgent question head on.

Through action-oriented research and education, we are uncovering the complex and evolving impacts of climate change on health, from our individual genes to entire populations. And we are focused on translating our research findings into treatments, tools and programs to help us live longer and healthier lives from birth to old age; to make healthcare systems more accessible, equitable and responsive when we do get sick; and to minimize the disruption caused by emergency climate events.

We are also charting a course toward zero-emission health care. With our health partners, UBC researchers are finding innovative solutions to reduce laboratory waste, make hospital food more sustainable, minimize

Only by protecting the health of the people who are most affected by climate change today can we transform health for everyone tomorrow.



Dr. Dermot Kelleher

unnecessary patient testing and treatment, reduce emissions from patient commuting and from the medical supply chain, and more.

All of this work demands new skills, new knowledge and new perspectives in health. The Faculty of Medicine is training the next generation of researchers, clinicians and health professionals — within and across a wide range of disciplines and in collaboration with our partners in healthcare — to tackle the health impacts of climate change as they evolve and change over time.

Ultimately, climate action in health begins with our most vulnerable populations, here in British Columbia (B.C.), across Canada and around the world. Only by protecting the health of the people who are most affected today can we transform health for everyone tomorrow.

In this special issue of Pathways, you'll see this vision at work in everything we do, whether it's uncovering the benefits of urban green space on childhood development; testing drone-based

health supply delivery in Rwanda and in northern B.C.; or making respiratory health services more accessible and culturally safe for Indigenous communities.

Right now, we find ourselves on the cusp of change. With global temperatures projected to rise for the foreseeable future, the work of UBC researchers has never been more urgent. Countless lives depend on the action we take together — as researchers, educators, learners, staff, community members and citizens of the world.

The future of health starts with us.

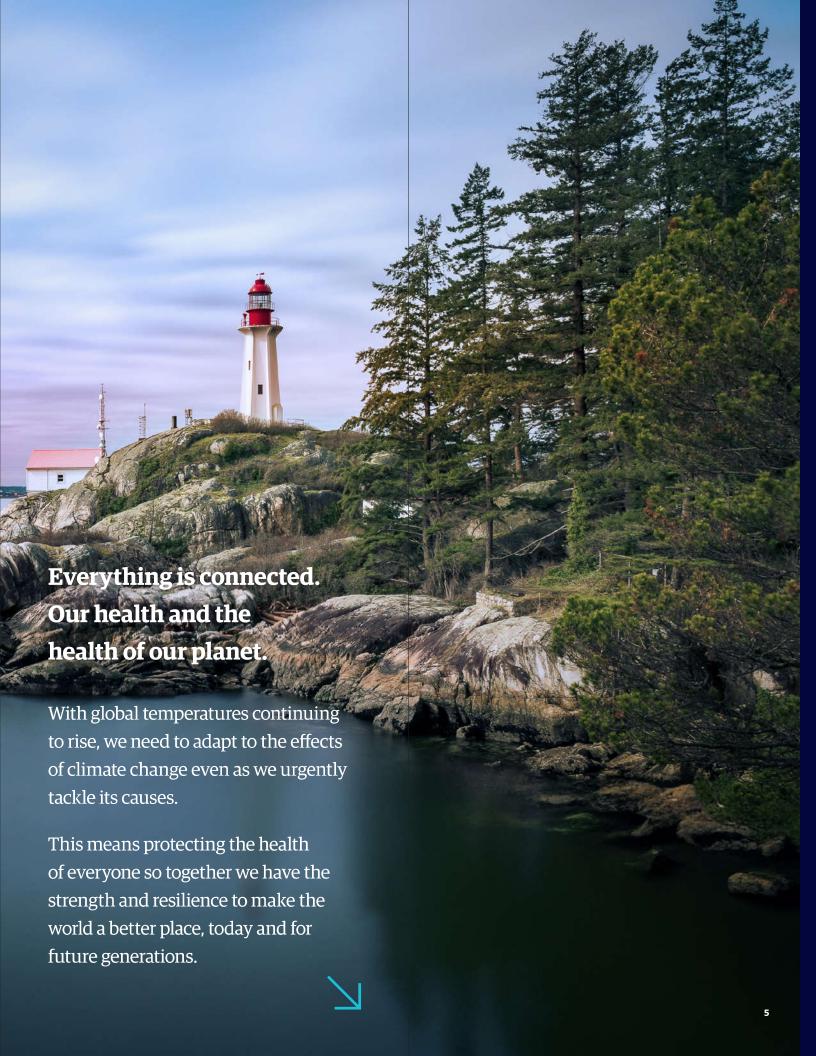
Yours sincerely,

#### Dr. Dermot Kelleher

MB, MD, FRCP, FRCPI, FMedSci, FCAHS, FRCPC, AGAF

Dean, Faculty of Medicine Vice-President, Health The University of British Columbia

# HOW DO WE FUTURE-PROOF OUR HEALTH IN A CHANGING CLIMATE?



# HOW DO FUTURE OUR HEAL INACHA CLIMATE

To succeed, we need healthcare systems that are adaptable, equitable, and environmentally sustainable — planetary healthcare systems.

The UBC Faculty of Medicine is helping to future-proof healthcare systems — and our health — through research, innovation, education and partnerships.

Here's how.



What is Planetary Healthcare?

**UBC'S DR. ANDREA MACNEILL EXPLAINS** 



Helping people live healthier lives, from childhood to old age.

UBC researchers are breaking new ground in the fields of preventative medicine and environmental health.

They're helping people to stay healthy as they live, grow, and age in a changing climate.



# Helping per live health from child to old age.

Better health means fewer doctor visits, shorter hospital stays, and lower demand for long-term care.

It means resilient communities that are better able to adapt to the effects of climate change and thrive.

And it means more healthcare resources for the most vulnerable patients.







A few summers ago, during British Columbia's worst-ever wildfire season, Dr. Sarah Henderson began to receive worried messages from the families and friends of people with dementia.

"They were telling us, 'My dad has Alzheimer's, and he seems more confused than usual,'" she recalls. "The stories were coming from all over. At first, we weren't sure what to make of them."

A professor at the UBC School of Population and Public Health (SPPH) and Scientific Director of Environmental Health at the B.C. Centre for Disease Control (BCCDC), Dr. Henderson is a leading expert on the health effects of air pollution, extreme heat and other climate-sensitive hazards in the province.

But this was something new. Could wildfire smoke affect cognitive function?

She reached out to Dr. Chris Carlsten, the director of UBC's Air Pollution Exposure Laboratory (APEL) and a close colleague, for his opinion. Dr. Carlsten agreed it was possible, and not just in people with dementia.

"The thing about air pollution — whether it's wildfire smoke or ozone pollution emitted by vehicles and factories — is that it affects basically every organ system in the body," he explains.

As global temperatures rise, and climate hazards intensify, so does their toll on our physical and mental health. We experience more severe respiratory illnesses, worse cardiovascular disease, and increased anxiety and distress from the uncertainty that comes with disruption — as well as other issues we're only just beginning to understand. These effects are further compounded by where we live, how much money we make, whether we belong to a marginalized community and other factors.

"The fact is, we can't separate our health from the social and physical spaces we inhabit," says UBC's Dr. Michael Brauer, a leading global expert on environmental health and frequent collaborator with Drs. Henderson and Carlsten.



UBC researchers are on a mission to understand how biological, social, and environmental factors interact to make us more susceptible to climate change.

Their findings could hold the key to better health for everyone — starting with our most at-risk communities. "Climate change forces us to confront existing health inequities and think very hard and very creatively about how we can build a healthier and more equitable future for everyone."

Dr. Michael Brauer

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"The fact is, we can't separate our health from the social and physical spaces we inhabit," says UBC's Dr. Michael Brauer, a leading global expert on environmental health and frequent collaborator with Drs. Henderson and Carlsten.

"That's what makes climate change such a multifaceted threat — one that requires far-reaching, even radical solutions."

Together, Faculty of Medicine researchers are investigating how everything from our genes, to the design of our cities, to the geography of extreme weather events can interact to make us more vulnerable to the effects of climate change. Working in close collaboration with B.C. health authorities and colleagues around the world, they are translating this work into new tools and strategies to help protect our health, today and in the future.

It's within this larger program of action-oriented research that Drs. Henderson and Carlsten set out to solve the puzzle of air pollution and brain health.

#### From DNA to demographics

Working with researchers from the University of Victoria, Dr. Carlsten designed a study that would map the neurological effects of air pollution.

The team exposed 25 healthy adults to diesel exhaust for brief intervals in APEL's state-of-the-art exposure booth, measuring brain activity before and after with functional magnetic resonance imaging (fMRI).

They discovered that even brief exposure — equivalent to a commuter sitting in busy traffic for a couple of hours on a high-pollution day — causes a temporary dip in the brain's default mode network, the circuit of interconnected brain regions which plays an important role in memory and thinking.

"This research, the first of its kind in the world, provides fresh evidence supporting a connection between air pollution and cognitive function," Dr. Carlsten says. "The next step is to determine whether the mechanism is similar to what we see happening in the respiratory and cardiovascular systems,

whereby exposure triggers an unhealthy inflammatory response at the cellular level."

The study, published this winter, joins a growing and influential body of UBC research into the physiological effects of air pollution. In just the past few years, Dr. Carlsten and APEL scientists have demonstrated a definitive link between traffic pollution and chronic obstructive pulmonary disease (COPD); revealed how genetics make some people more susceptible to exposure-related health complications; and catalogued the epigenetic changes that air pollution can trigger in the human genome.

Clinical studies like these help to inform Dr. Henderson's work. In her joint UBC and BCCDC roles, she takes a broader approach to the problem of climate hazards and their impact on health.

"I'm a generalist in the sense that my research is oriented toward public health and how climate change affects whole communities and populations. When I need in-depth insights into the individual and physiological impacts, I turn to people like Chris," she says.

"Income, age, gender, education, social marginalization and pre-existing medical conditions — all of these things influence our risk for adverse health effects from climate change."

Dr. Sarah Henderson



Inspired by their conversation, Dr. Henderson embarked on a population-level investigation of wildfire smoke and brain function. She and her team analyzed the performance scores of 10,000 anonymous adult users of a popular brain-training app. All the participants lived in areas where there was recent wildfire activity.

The team found that poorer air quality correlated with lower scores — a proxy measure of cognitive function — in the short- and long-term, depending on the length of exposure.

Significantly, young adults and people over 70 showed the most pronounced effects. These demographic indicators are important, because the impacts of climate change are distributed unevenly within and across populations. Understanding who is most vulnerable, and why, is an essential part of Dr. Henderson's work.

In two other studies, on extreme heat, she found that poverty, social isolation, and health conditions such as schizophrenia increase British Columbians' risk of serious health complications and death during periods of high temperatures. "Income, age, gender, education, social marginalization and pre-existing medical conditions — all of these things influence our risk for adverse health effects from climate hazards," she says.

As it turns out, so does our immediate physical environment.

#### **Practical interventions**

For people who live in cities, the presence in their neighbourhoods of busy roads, multi-story buildings, parks, community centres and good quality housing all affect their climate risk — and their ability to adapt.

"You can have two neighbourhoods side by side, one with heat-efficient housing, ample greenspace and shared public spaces, the other without. During a heat dome, like the one we saw here in 2021, the people in the second neighbourhood will, on average, fare worse," says Dr. Brauer, a professor in the School of Population and Public Health.

"The difference can be life or death."

Working in partnership with regional health authorities, Dr. Brauer created the Climate Vulnerability Index, a powerful data visualization tool that allows researchers and policymakers to map the interaction between biological, social, and environmental factors and understand how they put certain neighbourhoods and communities at higher risk than others.

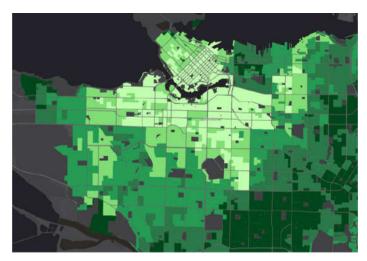
As researchers better understand these interactions, potential solutions begin to emerge.

"If we know, for example, that older adults are among the most physically susceptible to extreme heat, and poverty and social isolation further increase their risk, then we can begin to look at specific ways of reducing their exposure and mitigating the impact," Dr. Henderson says.



"The same would be true for air pollution and brain health — or any climate hazard."

Much of the research happening at the Faculty of Medicine focuses on practical interventions that can be implemented at the household, neighbourhood and community levels — and tailored to the circumstances of people who are most vulnerable. This includes strengthening social support networks, testing the protective benefits of anti-inflammatory and anti-oxidative foods, designing more effective emergency alert systems and developing strategies for healthier aging in a changing climate.



The Climate Vulnerability Index allows researchers and policymakers to understand how biological, social, and environmental factors interact to make certain neighbourhoods and communities more vulnerable to the effects of ozone pollution and other climate hazards.

The research is also highly collaborative. Dr. Brauer is working with UBC's School of Architecture and the Department of Mechanical Engineering to rethink the way we design indoor spaces, making them easier to cool and better at filtering outside air pollution.

Dr. Carlsten, who also directs the Legacy for Airway Health at Vancouver Coastal Health Research Institute, and Forestry professor Dr. Lorien Nesbitt recently launched the Climate Change Health Effects, Adaptation and Resilience Network (HEAL). The HEAL research cluster brings together scientists from Medicine, Forestry and other disciplines to study the compounding health effects of extreme weather events and develop adaptation strategies for individuals and communities.

Many projects are global in scope. Through the Healthy Cities initiative, UBC researchers are tackling urban health inequality in the context of climate change with partners around the world. Meanwhile, Dr. Brauer's Global Burden of Disease-Major Air Pollution Sources Project is the most comprehensive study of its kind, ever, on global air pollution and disease — and publicly available as an interactive tool for researchers and public health officials.

"Just as we're identifying places in B.C. where people are most at risk, we're identifying those places around the world and making the argument that governments need to strategically prioritize those populations, too," he says.

#### Building a healthier and more equitable future – for everyone

With global temperatures projected to rise for the foreseeable future, the work of UBC researchers has never been more urgent. Or more forward-looking.

Dr. Henderson is teaming up with scientists from the Faculty of Medicine's Edwin S.H. Leong Centre for Healthy Aging to study how wildfire smoke exposure during pregnancy rewrites infants' biological markers of aging.

"We want to understand how wildfire smoke changes the way we age, beginning even before we're born, what this could mean for our long-term health, and what the implications could be for future health policy," she explains.

Dr. Carlsten, meanwhile, sees the potential for genomics to make public health interventions more effective: "If we have robust data which show that a certain percentage of the population is genetically more susceptible to air pollution, then we can use that data to drive public health measures."

"Through our research,
we're making the argument
that governments need
to strategically prioritize
at-risk populations here
at home and around the
world."

#### Dr. Michael Brauer

Given the enormity of the challenge and the limitations of health resources in Canada and around the world, innovative solutions like these are needed.

But, as Dr. Brauer points out, we will only succeed if our efforts begin with the most vulnerable people. In this, he sees an opportunity.

"The silver lining, if there is one, is that climate change forces us to confront existing health inequities and think very hard and very creatively about how we can build a healthier and more equitable future for everyone."





#### Unlocking the benefits of greenspace

Air pollution puts children at increased risk for neurodevelopmental issues. UBC researchers reveal the protective effects of urban greenspaces.

Air pollution's impact on childhood development is an emerging area of concern for researchers and policymakers. Recent studies suggest that exposure to airborne pollutants puts children at greater risk of developing attention deficit hyperactivity disorder (ADHD) and other neurodevelopmental issues.

UBC's Dr. Matilda van den Bosch believes more greenspaces could be the solution.

"Parks, playgrounds, and urban forests aren't just beautiful and fun. Our research shows that they can have a protective effect," says Dr. van den Bosch, an adjunct professor in the School of Population and Public Health and the Faculty of Forestry.

She and her team investigated the relationship between greenspace, pollution and ADHD risk among

"When children are exposed to greenspaces early in life, they enjoy greater cognitive health, partly because these spaces may reduce air pollution, which can impair brain development."

Dr. Matilda van den Bosch

a cohort of children in Metro Vancouver. They found that ADHD risk nearly doubled among children who lived in areas with low levels of greenspace and high levels of air pollution, whereas an abundance of greenspace reduced the risk. In a separate study, the team found that autism risk also increases where natural spaces are sparse.

"When children are exposed to greenspaces early in life, they enjoy greater cognitive health, partly because these spaces may reduce air pollution, which can impair brain development," says Dr. van den Bosch.

Both studies have important implications for urban planning and health policy.

Because lower-income neighbourhoods typically have fewer greenspaces, children living in those communities could be more vulnerable to the effects of air pollution.

Rising global temperatures have the potential to make the problem worse. Built-up urban areas trap heat more readily than natural spaces, and heat intensifies the harmful effects of pollution. This, in turn, could further exacerbate health inequality in urban areas.

"We should move quickly towards building healthier, more equitable cities as the climate changes," says Dr. van den Bosch.

"And more greenspaces should be a top priority for everyone, beginning with the most vulnerable communities."

#### Healthy aging in a changing climate

Dr. Michael Kobor and Dr. Kim Schmidt on how the environment affects the way we age, and what we can do to protect our health.

As humans, we are deeply connected to our environment. It's a connection that becomes more evident as we grow older, with our natural surroundings playing a vital role in shaping our overall health and longevity. Climate change threatens this delicate balance, exposing us to environmental stressors that can have a significant impact on our ability to age healthily.

Scientists at the Faculty of Medicine's Edwin S.H. Leong Centre for Healthy Aging are studying these impacts and finding ways to help people age well in a changing climate. To learn more about their work, we spoke with Dr. Michael Kobor (MK), the Edwin S.H. Leong UBC Chair in Healthy Aging — a UBC President's Excellence Chair — and Dr. Kim Schmidt (KS), the program's research director.

#### Can you describe how the natural environment and aging are connected?

MK: Aging is a complex, lifelong process. It's determined not only by our genes, but also by the physical and social environments in which we live our lives. Our natural environment is an important part of this. It influences the air we breathe, the food we eat, our physical activity, and the stresses we endure physically and mentally. All of these factors come together to shape our risk of chronic disease and have a real impact on both our healthspan and lifespan. Healthy aging is inextricably linked to the health of our planet.

#### What impact does climate change have on how we age?

KS: We're already seeing the consequences of climate change on aging. There are very clear and immediate impacts from the extreme weather events that are becoming more frequent with climate change. Consider the unprecedented heat dome that British Columbia experienced in summer 2021, which was the deadliest weather event in Canada to date. We saw an immediate impact on quality of life and mortality, and this fell hardest on some of the most vulnerable members of society, including older adults and people living in inadequate housing.

But there are also hidden impacts. Cumulative, year-after-year exposure to things like climate stress, wildfire smoke and extreme heat get under the skin

to create lasting biological changes. These exposures literally alter the composition and location of chemical groups that bind to DNA in our cells. They affect how our genes are expressed, turning them off and on, and can increase our risk of disease and other health complications as we age.



Dr. Kim Schmidt



Dr. Michael Kobor says aging is a complex process determined by our genes and our physical and social environments.

#### How do these hidden impacts shape our long-term health and aging?

**MK:** There's ample evidence linking the impacts of climate change — and wildfire smoke in particular — to increased prevalence of diseases like cancer, asthma, respiratory illness, and cardiovascular diseases. Overall, my prediction would be that the physical and mental stress associated with climate change and exposure to environmental extremes would lead to accelerated aging on a population level.

**KS:** These hidden impacts can start from a young age, even before we're born. Knowing this, we're collaborating with Dr. Sarah Henderson and the B.C. Centre for Disease Control to study how wildfire smoke exposure during pregnancy impacts an infant's biological markers of aging. No one has done this before. It will shed light on how climate change impacts aging right from the beginning of our lives and the consequences prenatal exposure has across the lifespan.

"Cumulative, year-afteryear exposure to things like climate stress, wildfire smoke and extreme heat get under the skin to create lasting biological changes."

Dr. Kim Schmidt

#### What can we do to protect ourselves?

MK: Ultimately, the goal should be to limit climate change. But in addition to this, we need to think about how we can build resilience and future-proof our communities against climate change in a way that promotes healthy aging. Things like ensuring people have access to green space, adequate housing, clean drinking water, healthy food, and clean air. This includes effective public health strategies that help people to reduce harmful environmental exposures and provide real-time, helpful information during emergencies.

On an individual level, many of the activities that we typically associate with healthy aging will help buffer against the impacts of changing climate. Activities like eating healthy foods, getting regular exercise, keeping mentally active, and many more.

Social connectivity is important too. Being connected to family, friends and your community can shield us from climate stress and anxiety. And in times of emergency, like an extended heat wave, social

connection provides a support network that ensures we're checking in and caring for our most vulnerable.

#### What role can the Edwin S.H. Leong Centre for Healthy Aging play?

**KS:** We've brought together an incredible interdisciplinary team of researchers who are tackling aging from every angle, including the biological, social, cultural and environmental factors. Climate change doesn't know academic boundaries, so it's important that our response is holistic, interdisciplinary and collaborative.

One example of this: we're collaborating with the School of Health and Exercise Sciences at UBC Okanagan, and we recently provided a research award to UBC student Kathryn Cosby for a study examining environmental barriers to physical activity in older adults, including the role of extreme weather events in B.C.'s interior. The goal is to help older adults stay active and age in place within the context of climate change.

"We need to think about how we can build resilience and future-proof our communities against climate change in a way that promotes healthy aging."

Dr. Michael Kobor

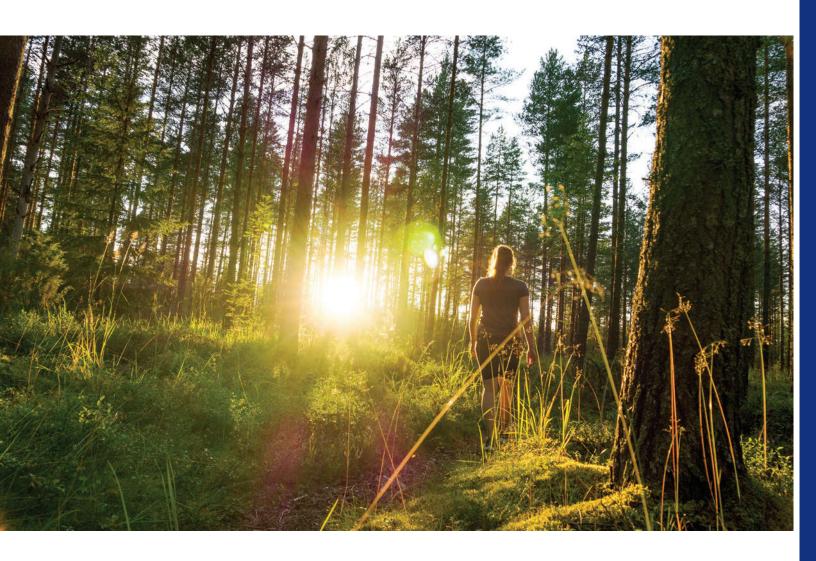
### Highlights

#### Genomics for more effective public health policy

Dr. Chris Carlsten and researchers from the Air Pollution Exposure Laboratory have identified genetic variants that make some people more susceptible to air pollution-related health complications. Their findings have the potential to transform the way we treat and prevent respiratory illnesses at the population level.

#### A prescription for better mental health

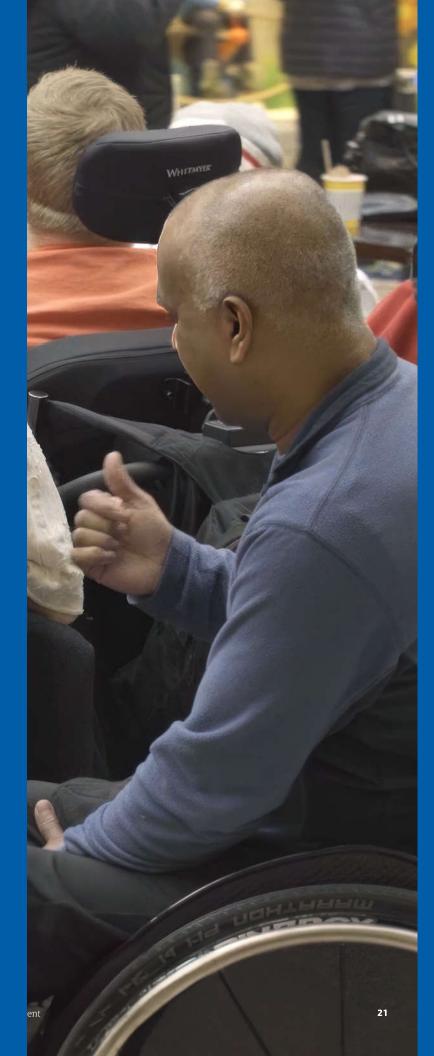
Research shows that spending time in nature benefits our mental and physical health. Dr. Melissa Lem's award-winning initiative, created in partnership with the B.C. Parks Foundation, enables healthcare providers to 'prescribe' time in nature to their patients — in the form of activity plans and free passes to national parks and other outdoor spaces.



Making healthcare accessible and inclusive for everyone.

Climate change affects
people's access to healthcare
in many different ways.
It drives higher demand
for services and disrupts
delivery.

It also increases the physical and social barriers that prevent vulnerable populations from receiving the care they need.



# Making he accessible inclusive for everyone.

The Faculty of Medicine is helping to close existing healthcare gaps and prevent future ones — through policy research, novel virtual healthcare technology, by training healthcare professionals in their home communities, and more.



# Better respiratory health for Indigenous communities



Indigenous peoples in B.C. experience higher rates of asthma, COPD, and other respiratory diseases. A team of UBC-VCH researchers is on mission to understand why — before climate change makes the problem worse.

Indigenous peoples in British Columbia experience higher rates of respiratory illness than any other group, and are three times more likely to be hospitalized as a result.

Dr. Brittany Bingham, a UBC assistant professor of social medicine and the director of Indigenous Health Research at Vancouver Coastal Health (VCH), is determined to understand why.

"We think this is due in part to gaps in health services, care and prevention — including access to culturally safe care," she says. "Our concern is that many Indigenous people with respiratory diseases lack access to potentially lifesaving treatments and supports. But the problem is that there isn't a lot of good research on this."

Climate change is making the problem even more urgent. Environmental hazards such as wildfire smoke and traffic pollution are linked to higher incidences of diseases like asthma and chronic obstructive pulmonary disease (COPD) — and worse health outcomes.

As a member of the shíshálh First Nation and the leader of a joint UBC-VCH research project focused on the issue, Dr. Bingham is well-versed in the health impacts of respiratory diseases on Indigenous communities in B.C. — and she is well-positioned to make a difference.

"We're the first Indigenous research team embedded in a healthcare system in the province that is doing community-based research with the express goal of identifying gaps and improving services," she explains.

Taking a two-eyed seeing approach — one that brings together Indigenous and Western perspectives and ways of knowing, with an emphasis here on the former — the project team is working with affected communities in the VCH region to identify existing healthcare gaps and highlight priorities for further research and action.

To do this, the team is conducting in-person and virtual talking circles with community members. Dr. Elder

Roberta Price, of the Coast Salish Snuneymuxw and Cowichan Nations, and Musqueam Elder Doris Fox lead the circles, creating a culturally safe space for participants to share and reflect on the experience of living with a respiratory disease and engaging with the healthcare system as an Indigenous patient.

"To really grasp the problem, we need to understand people's lived experiences. That means working closely with elders and community members at every stage," Dr. Bingham says.

"To grasp the problem, we need to understand people's lived experiences. That means working closely with elders and community members."

#### Dr. Brittany Bingham

The research project is unique in that it explores the experiences of Indigenous people with respiratory disease who live in urban and rural settings. The study results will allow researchers and policymakers to glean valuable insights on the needs of both populations, and how they might differ. This, in turn, will inform future research and action.

"It's important to recognize that there's not one sole Indigenous voice, but unique experiences and perspectives within and between communities," Dr. Bingham says.

"Our goal is to develop recommendations from these diverse voices that will be relevant to communities across the VCH region — and ultimately lead to better respiratory health and healthcare for Indigenous peoples across B.C."

# A diet for healthier lungs and a healthier planet

UBC researchers are testing a secret weapon in the fight against air pollution: food!

Each year, respiratory illnesses are among the leading causes of hospitalization and premature death in Canada and across the globe. And those numbers are growing as temperatures rise and air pollution levels shift.



Dr. Emily Brigham

"Exposure to air pollution can trigger inflammation and oxidative stress in the body, with negative short- and long-term effects on the lungs, heart, and other organs," says Dr. Emily Brigham, a UBC assistant professor of respirology and research scientist at the Vancouver Coastal Health Research Institute.

While Dr. Brigham counsels patients on ways to reduce their

own exposure, she and others are also looking for ways to reduce risk in those who cannot.

"Unfortunately, the people least able to avoid the air pollution are often the ones impacted the most," she says.

Creative and scalable solutions are urgently needed. Dr. Brigham and her team are investigating an intervention that holds promise as both a treatment and as preventative medicine: anti-inflammatory and antioxidant foods.

"We know from our and others' research that foods rich in certain nutrients may reduce inflammation, and improve and protect people's respiratory health," she explains.

For example, kale, spinach, tomatoes and many other vegetables have high levels of antioxidants like lutein, which help the body to regulate the oxidative stress caused by air pollution. They also have high levels of fibre, which can stimulate the production of potent inflammation-fighting molecules by the bacteria that live in the gut. Fatty fish like salmon, meanwhile, are packed with omega-3 fatty acids that help to regulate inflammation.

Diets with more of these beneficial nutrients — and less of the pro-inflammatory nutrients found in fast foods and processed foods — could help the body to combat the negative effects of air pollution.

Dr. Brigham and her team are working with a registered dietician and a healthy food delivery service to measure the possible benefits. Their study, currently under review, will deliver specially selected meals and groceries to study participants and track how they respond to air pollution exposure.

The diet could be particularly beneficial to communities that are disproportionately affected by air pollution and respiratory illness. And with an emphasis on plant-based foods and fish, such diets



The UBC Farm features cultivated annual crop fields, perennial hedgerows and orchards, pasture, Indigenous-led gardens, and forest stands. Photo: Martin Dee

are also better for the environment than those with more resource-intensive ingredients like red meat.

"These foods are good for us and the planet," Dr. Brigham says. "But to really make an impact, they need to be convenient, affordable and take cultural preferences into account."

A diet rich in anti-inflammatory and antioxidant foods could be beneficial to communities disproportionately affected by air pollution and respiratory illness. The team is keeping all of this in mind as they consult with partners and communities — including patients — on how they might translate any positive study findings into accessible, real-life interventions. That means also taking into account the environmental impact of local, national, and global production and supply chains.

It's a lot to consider, but given the importance of nutrition in every aspect of health, Dr. Brigham believes it's worth the investment.

"There's no way to separate the planet's health from our own health. We need to protect people from the harms of air pollution, starting with those in highest need, while also working to limit, prevent and most ideally reverse harmful air pollution trends in the context of climate change."

### Highlights

#### The Pathways to Equitable Healthy Cities initiative

The design of our cities influences our health — and the health impacts of climate change. Dr. Michael Brauer leads a multidisciplinary team of Vancouver researchers that is finding innovative ways to reduce health inequality through urban planning, design, and policy to create healthier communities for everyone.



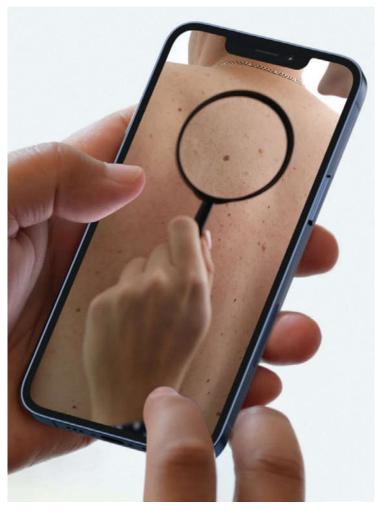
#### Building resilient and accessible health networks

UBC's Distributed Medical Education Program trains doctors and health professionals in rural, remote and urban communities across B.C. — building networks of health professionals in every corner of the province. This increases the reach and resiliency of the healthcare system while also helping to ensure equitable, high-quality care even during periods of climate disruption.



#### Virtual care for rural and remote communities

The brainchild of UBC's Dr. John Pawlovich, Dr. Ray Markham, and Dr. Kendall Ho, the peer-to-peer Real-Time Virtual Support (RTVS) pathways connect physicians and health professionals in rural, remote and First Nations communities with collegial support from emergency medicine to hematology to dermatology. This makes it easier for patients to receive timely and appropriate care without always needing to travel to a major urban centre — or worry that climate hazards will disrupt their treatment.



Preparing for the worst — so the worst doesn't happen.

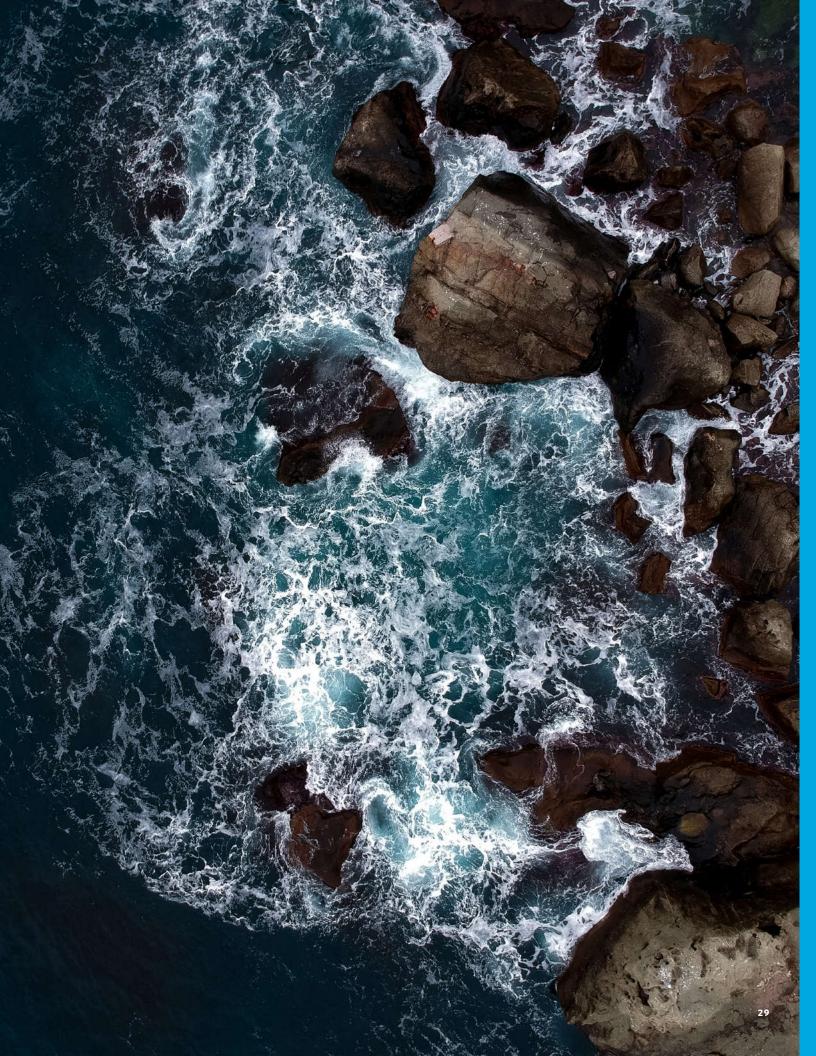
As temperatures rise, extreme weather events — wildfires, floods, mudslides, and drought — happen more often in B.C. and around the world. Climate change can also accelerate the frequency of viral pandemics.

The impact is immediate and long-lasting, with vulnerable people and communities worst affected.



# Preparing worst—s worst does happen.

Faculty of Medicine researchers are developing emergency preparedness tools and technologies to help strengthen healthcare systems and safeguard our health and wellbeing during and after periods of disruption.





From East Africa to northern British Columbia, UBC researchers are bringing lifesaving medical supplies to vulnerable communities, faster.

For people living in rural and remote areas, climate change threatens to make lifesaving medicines and supplies even more difficult to access.

It's a global problem, from northern British Columbia to East Africa — where UBC doctoral researcher Marie Paul Nisingizwe studies drone technology and its potential to bolster healthcare networks that are stretched thin and prone to disruption.



Marie Paul Nisingizwe

"Providing treatment and emergency care in areas with limited health facilities is challenging at the best of times. Without a ready supply of medicine and blood products, it's nearly impossible," Nisingizwe, a PhD candidate in the School of Population and Public Health, says.

"But with the help of drones, healthcare providers can reach these vulnerable communities with more supplies, sooner."

In 2016, Rwanda became the first African country to integrate the technology into its healthcare system, deploying drones to deliver blood products to rural and remote areas. In a country with few facilities to store blood supplies, this was both an important first step and a leap of faith: the real-world impact of drone technology on healthcare is largely unstudied because it is so new.

Nisingizwe's research, published in *The Lancet Global Health*, is among the first to measure actual outcomes. Working with colleagues in Rwanda and at the UBC Faculty of Medicine, she analyzed the outcomes of more than 12,000 drone-based healthcare deliveries over several years.

"Our research shows that, thanks to drones, many healthcare facilities in Rwanda now receive blood products in a fraction of the time — and with less waste."

#### Marie Paul Nisingizwe

Here in B.C., the Faculty of Medicine's Remote Communities Drone Transport Initiative tests drones in another real-world setting affected by climate change: Stellat'en First Nation and the Village of Fraser Lake, near Prince George.

"It's a similar story. Residents of rural, remote and Indigenous communities face much greater healthcare disparities than other people in B.C.," says Dr. John Pawlovich, the Rural Doctors' UBC Chair of Rural Health and Drone Initiative lead.

"When wildfires and pandemics happen, these communities are hardest hit and those disparities grow bigger."

The project, one of the first of its kind, flies drone deliveries along a short, simple route with the goal of understanding how the technology can be best used in what are often challenging conditions.

Both teams hope their findings will inspire the development of successful programs in other parts of Canada, Africa and around the world.

"We want to help shrink and close that inequity gap," Dr. Pawlovich says. **J** 

#### From climate worry to climate action

Climate anxiety is on the rise. UBC researchers are at the forefront of understanding this growing phenomenon — and developing strategies to help people cope.

Wildfires. Flooding. Extreme heat. These days, the impacts of climate change are being felt close to home, while at the same time dominating news headlines around the world. For many people, it's a source of considerable worry and stress.

We spoke with Dr. Steven Taylor, a UBC professor of psychiatry and clinical psychologist, about the steps people can take to cope with climate anxiety — and how they can use it as a motivating force for climate action.

#### What is climate anxiety?

Climate anxiety, or eco-anxiety, is a chronic state of distress some people feel about the effects of climate change. It's often accompanied by feelings of helplessness, loss, frustration and depression.

It's important to remember that some level of anxiety is normal, and even healthy. It's how we naturally respond when we feel threatened. So, when you consider a very real and urgent challenge like climate change, it's understandable that many people are feeling increasingly worried about the impact on themselves, their families and communities, and future generations. The problem arises when that anxiety reaches unhealthy and debilitating levels.

#### How does climate anxiety impact people?

We often see climate anxiety present itself in two ways. There's adaptive anxiety, which can be a motivating force that inspires people to take climate action.

On the other hand, there's maladaptive anxiety, which occurs when the level of anxiety becomes unhealthy

and starts interfering with a person's day-to-day life. For example, if you find yourself constantly thinking about climate change, having trouble sleeping, withdrawing from normal activities, or "doomscrolling" through climate news in your newsfeed.

#### Who are we seeing this impact the most?

Climate change impacts all of us, and so can climate anxiety. But we all have different exposures to climate risk. People living in an area with increasingly frequent extreme weather, like wildfires in the Okanagan, are more likely to experience climate anxiety because they come face-to-face with the impacts of climate change year after year.

This includes other populations disproportionately affected by climate change, such as Indigenous peoples, older adults, and people experiencing housing instability or food insecurity.

We're also seeing heightened rates of climate anxiety in young people. They have their whole future ahead of them and climate change has a big impact on their projected life course and aging, and plans for decades to come.

#### What are some tips for people dealing with climate anxiety?

First, try to avoid extreme thinking that leads to panic, denial or avoidance. Instead, we want to shift our mindset toward constructive action.

Next, consider creating a personal climate action plan with steps you can take to reduce your environmental footprint. It's important to feel like you are doing



Dr. Steven Taylor says 'adaptive' anxiety can be a motivating force that inspires people to take climate action.

something to address climate change. It doesn't have to be anything heroic. Never underestimate the power of small things, especially at a collective level.

Third, get plugged into your community and connect with like-minded people. This could be through a climate action group on social media, community garden, recycling project, or neighbourhood cleanup. This has the dual benefit of achieving something constructive, while also providing social support and a sense of common purpose.

Lastly, the COVID-19 pandemic helped many of us identify personal coping strategies for managing stress in difficult times. Think about how you can apply those lessons in your life more broadly, whether it's making sure to get enough sleep and exercise, spending time in nature, maintaining a healthy diet, or managing your news exposure and dedicating time to unplug.

Of course, not everyone can easily take these steps. For people experiencing housing instability, food insecurity, or other challenges, coping strategies can be more complicated. There are resources in British Columbia to help with this, but as governments and populations adapt to climate change, we need to prioritize forward-looking solutions to protect everyone's mental health and physical wellbeing.

### Knowing climate anxiety disproportionately affects young people, any advice for parents?

Parents know their kids best. If you sense your child is overly stressed about climate issues, my advice is to talk with them, find out what their concerns are, and see if you can do anything to help. This may involve you and your child both getting involved in climate-related activities around the home or in the community. It could be a win-win situation: you better understand your child, and you both take constructive action to mitigate climate change.

#### Any final takeaways?

Remember, you're not facing this huge global problem all by yourself. This is a collective problem and it requires collective action. It can sometimes feel like our contributions to the climate crisis are small compared to the scale of the problem, but when you have millions of people making small, positive changes, that can translate into a big impact.

We're all facing these challenges together, so reach out to your friends, family and neighbours about how you're feeling. And if you feel like you need further support, I encourage you to speak with a health care professional, or with student counselling if you're a student.

### Highlights

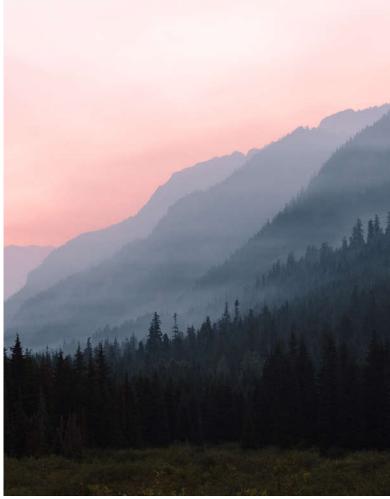
#### A million vaccine doses in a single test tube

Climate change has the potential to increase the frequency and severity of pandemics. Dr. Anna Blakney is developing self-amplifying RNA technology that is 100 times more efficient than the mRNA used in current vaccines, and equally safe. It has the potential to make population-level immunization faster, more equitable, and more cost-efficient.

#### Emergency preparedness for Indigenous and remote communities

In collaboration with the Carrier and Sekani communities, PhD candidate Justin Turner and Dr. Pat Camp are studying the health impact of recent wildfires on Indigenous communities in northern B.C. — with the goal of improving emergency health response practices.





#### Better care for children with complex medical needs

Climate disruption puts children who need regular and uninterrupted medical care at particular risk. In a rapid scoping review, Drs. Craig Mitton and Esther Lee show how careful planning and communication between healthcare providers and the families of children with special health care needs is needed to safeguard their care and treatment.

#### Effective public health messaging systems

When climate hazards happen, we all need timely, relevant advice and information to protect ourselves and our communities. Dr. Sarah Henderson is leading the design of emergency public health messaging systems for extreme heat and wildfire events in B.C.





## Shrinking healthcare's carbon footprint.

With the Planetary
Healthcare Lab leading the
way, Faculty of Medicine
researchers are charting a
path toward zero-emission
healthcare systems.

They are finding innovative ways to make hospital food more sustainable, minimize unnecessary patient testing and treatment, reduce emissions from the medical supply chain, and much more.



## Shrinking healthcare carbon for

The Faculty of Medicine is also working hard to shrink our own carbon footprint by adopting sustainable practices in our labs, classrooms, and offices.



## Toward greener, healthier hospital menus

UBC researchers are working to transform hospital food systems, serving up meals that are good for our bodies and the planet.

While walking hospital hallways as a general surgery resident, Dr. Annie Lalande started to notice a pattern: stacks of meal trays laden with unfinished food. It didn't necessarily come as a surprise. Hospital food's reputation is no secret. Often described as basic, bland and poorly prepared, it was no wonder patients were passing it up.



Dr. Annie Lalande

But Dr. Lalande started to see an opportunity — what if we could redefine hospital food, making it not only more appealing, but also more nutritious, cost-effective and sustainable?

"Patients were telling us how much food they weren't eating and how much that was impacting their recovery," says Dr. Lalande, who is completing a PhD at UBC's Institute for Resources, Environment and

Sustainability at the same time as her postgraduate medical education residency.

"It really got us thinking about how we could improve the overall patient experience, and patient outcomes, by rethinking something as simple as what's on the menu."

With support from Vancouver Coastal Health, Dr. Lalande and a multidisciplinary team of colleagues set out on a mission to study and improve the food served in local Vancouver hospitals. So far, her research has highlighted the critical link between patient wellbeing, hospital nutrition and planetary health.

"Poor food quality is often the primary driver of malnutrition in hospitals," said Dr. Lalande. "And when patients are undernourished, they are much more likely to experience complications and poorer health outcomes."

Hospital food systems also have a significant impact on the environment. Globally, the industrial food system is responsible for one-third of all greenhouse gas emissions and puts tremendous pressures on land, water sources and biodiversity.

Dr. Lalande says that up to 50 per cent of all hospital food served to patients in Canada goes uneaten.

"We're using a lot of resources to generate food that never gets used," said Lalande. "Land must be cleared, fertilizers must be applied, food must be processed, transported, packaged, prepared — but it's all wasted if patients don't eat it."

After collecting a trove of data on patients' experience with hospital food and what food was being wasted, Dr. Lalande and her team are designing a new hospital menu that features healthier and more sustainable options for patients.

"We need to align hospital menus with the latest evidence on healthy and sustainable diets," says Dr. Lalande. "This means making menus plant-rich,



Dr. Annie Lalande studies the impact of hospital food on patient and planetary health.

integrating more fresh, local, seasonal items, and relying less on animal protein and dairy. It also means moving away from processed foods and towards whole foods produced through environmentally-friendly farming practices."

But food is more than just fuel. Our relationship with food is deeply intertwined with personal preferences,

Hospitals need to offer a tastier, more diverse menu that gives patients more freedom to choose what, when and how much they eat.

along with cultural and social traditions. Dr. Lalande says that to make hospital food more appealing and accessible to patients, we need to offer a more diverse menu that gives patients more freedom to choose what, when and how much they eat. It also needs to taste good. All of this will help improve patient nutrition while minimizing food waste.

While this more customized and patient-centered approach to food service may seem like an expensive proposition, malnutrition in hospitals costs Canada's healthcare system an estimated \$2 billion annually in direct costs for longer hospital stays alone, so reform also makes financial sense.

"A healthier diet will help patients recover and live healthier lives while also benefiting the environment," says Dr. Lalande.

"It's a win-win solution."

## From planetary health to planetary healthcare

The UBC Planetary Healthcare Lab is charting a path toward net zero healthcare systems. Dr. Andrea MacNeill explains how.

In Canada, healthcare is responsible for more than four-and-a-half per cent of greenhouse gas emissions — equivalent to the aviation industry.

Formed in 2021, the Planetary Healthcare Lab brings together a highly interdisciplinary team of researchers and experts from UBC and Vancouver Coastal Health to tackle this problem. Together, they are examining the environmental effects of healthcare delivery and services and, through innovative solutions, charting a path toward net zero.

Launched in 2021 with start-up funds from the Faculty of Medicine's Strategic Investment Fund, the Planetary Healthcare Lab tackles everything from hospital food-related pollution and unnecessary patient testing and treatment through to emissions stemming from the medical supply chain.

Pathways spoke to Dr. Andrea MacNeill, director of the Planetary Healthcare Lab, about the concept of planetary health, the importance of planetary healthcare, and the team's progress so far.

#### What is planetary health?

Planetary health is the idea that human health is entirely dependent upon a healthy environment. So, in other words, our wellbeing is contingent upon clean air, clean water, clean soil and a stable climate. Climate change threatens these things, and without them we can't live or thrive.

## You coined the term "planetary healthcare" in a 2019 essay in *The Lancet*. Can you explain what that means?

When we take that idea of planetary health and the ecological determinants of health and we apply it to the health system, we arrive at what we've called planetary healthcare.

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.

It also means looking at the appropriateness of the care that we're delivering within that system and avoiding low-value care that just consumes resources and generates waste without contributing to patients' outcomes.

And then the final element is looking at the care we're delivering — and optimizing its environmental performance.

By delivering low-carbon, sustainable care with low environmental impacts across all categories, we'll lessen our carbon footprint while at the same time improving people's health.



Dr. Andrea MacNeill established the Planetary Healthcare Lab in 2021.

#### Can you talk about the Planetary Healthcare Lab at UBC?

The UBC Planetary Healthcare Lab looks to reimagine health services to be better for both the patient and planetary health.

So, we are a novel and unique interdisciplinary collaborative that brings together experts and thought leaders from across a number of disciplines, including clinical specialties as well as health policy and economics, behavioral sciences, public health and environmental engineering to generate the data-driven best practices in sustainable healthcare — and then design appropriate behavioral and policy interventions.

#### What are some examples of Planetary Healthcare Lab projects?

Our work brings together faculty and learners from across the Faculty of Medicine, often in collaboration with researchers from the Faculty of Applied Science as well as other partners.

For example, we are investigating how to deliver the highest-quality, lowest-carbon care for end-stage kidney disease patients. The goal is to optimize their quality of life and clinical outcomes while simultaneously minimizing the environmental impacts of their care and their vulnerability to climate-related risks.

The Planetary Healthcare Lab has also conducted environmental impact assessments of different methods of warming patients before, during, and after surgery. We are now implementing the most successful of these strategies to help reduce surgery-related emissions while ensuring good patient outcomes.

Another project modelled carbon savings from virtual care, in terms of patient travel avoided. We are now working on more comprehensive, rigorous environmental impact assessments of virtual care options and their appropriate application.

Our researchers are doing really exciting, innovative work. We're the only academic entity of our kind, anywhere in the world.

### Highlights

#### More sustainable laboratories, classrooms and offices

In line with UBC's 20-year Sustainability Strategy, the Faculty of Medicine is taking action to reduce the environmental impact of labs, classrooms and offices through initiatives like medical glove and mask recycling, remote learning, and more.

#### Lower-emission radiology

Medical imaging technology — from simple X-rays to high-resolution MRI — is an essential but emission-intensive tool for medical professionals. Dr. Maura Brown is developing greener radiology protocols that will help radiologists reduce their carbon footprint without sacrificing diagnostic precision.

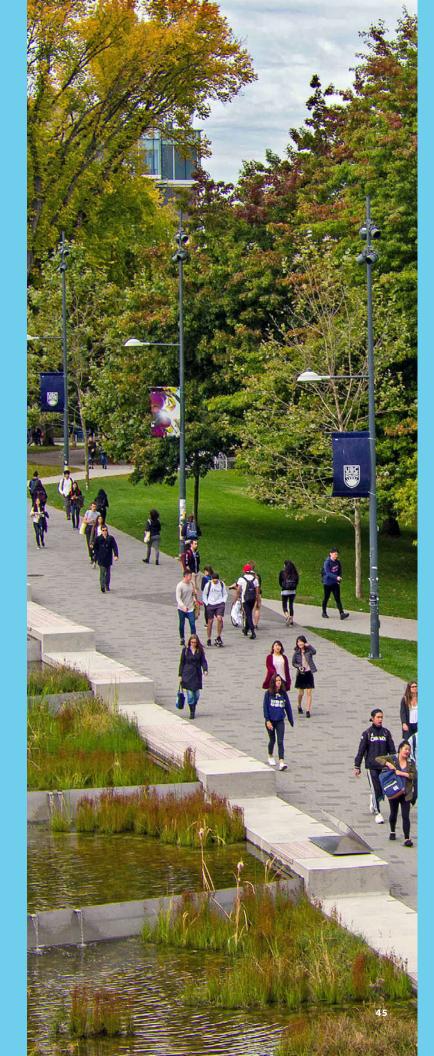






Training futureready healthcare professionals. The climate crisis demands new skills, new knowledge, and new perspectives in health.

The Faculty of Medicine is training the next generation of researchers, physicians, and health professionals to tackle the health impacts of climate change within and across a wide range of disciplines.



## Training fuready heal profession

To do this, we're developing new curriculum, degree programs, and professional development opportunities for students, residents, and practitioners at every stage of their training.



#### Making medical practices greener

A team of UBC family practice resident doctors have made it their mission to help physicians reduce their carbon footprint. Here's how.

From aging hospital buildings to biomedical waste to single-use products like gloves and gowns, the healthcare sector accounts for an estimated 4.6 per cent of Canada's total greenhouse gas emissions. And while the federal and provincial governments have made lower-emission healthcare a priority, a growing number of doctors are taking action to reduce their individual carbon footprint.

Here at UBC, a team of family medicine resident doctors (residents) in Kelowna has created a planetary health workshop to educate and inspire their peers to do just that.

We asked the team behind the workshop — which includes Drs. Mackenzie Moleski, Joanna Ritson, P.J. Retief and Alaina Terpstra — about the climate crisis, and the role physicians can play as difference-makers.

#### What is the goal of the workshop, and how did it come about?

It started as a Resident Scholar Project, which every family medicine resident completes in their second year at UBC. Building on guidelines created by the College of Family Physicians of Canada, we wanted to create a useful and engaging training module that would encourage family medicine residents to think, in practical terms, about the link between planetary and human health — and the ways they can become more sustainable physicians and agents of change.

#### What can doctors do to lead a greener practice?

There are simple, tangible changes we can make to our clinics and office spaces, like installing energy-efficient LED lights and low-flow toilets and taps, switching from paper to electronic files, and investing in reusable devices instead of single-use plastics.

Then there are other, less obvious but equally important ways doctors can make a difference. One way is being mindful of our prescribing patterns. For example, metered-dose asthma inhalers have high levels of hydrofluorocarbons that act like potent greenhouse gases when released into the atmosphere. Greener alternatives such as dry powder or soft mist inhalers can be just as effective — and have a smaller carbon footprint.

It's also important to understand how our practice contributes to transportation pollution. Patients will typically drive or take transit to see their doctors and then travel to and from hospitals and clinics for further testing, such as blood tests and x-rays.

By reducing unnecessary tests and offering virtual appointments when possible, we're not only reducing our practice's carbon footprint — we are also making the process more convenient and cost-effective for our patients.



Left to right: Drs. Mackenzie Moleski, Joanna Ritson, P.J. Retief and Alaina Terpstra

#### What about helping patients to adopt more sustainable lifestyles?

That's right, educating patients on the health benefits of sustainable living is also paramount. Research shows that Canadians are more likely to change their behaviour to benefit the planet if they know it may also benefit their health.

You would be surprised at how often doctors can bring this topic up during their patient visits — from discussing the co-benefits of a planetary-friendly diet for people living with diabetes; to encouraging people to cycle or walk to work to prevent disease and reduce emissions; to reminding patients to bring unused medication back to the pharmacy to reduce biomedical waste.

There are so many ways that family doctors can provide excellent care for their patients, while also extending that care to the environment.

#### Why is this workshop important?

Ultimately, our health can't be separated from the health of the environment. We see this right here in B.C. — for example, the physical and psychological impacts of wildfires — and we see this around the world.

Doctors are in a unique position not only to provide greener healthcare and advocate for it, but to help people adopt healthy, sustainable lifestyles.

Doctors are seen as trusted professionals in their community. They are in a unique position not only to provide greener healthcare and advocate for it, but to help people adopt healthy, sustainable lifestyles. We want to make sure doctors have the tools they need to tackle the impact of climate change on human and planetary health.

We designed the workshop in such a way that can be passed on from one cohort of residents to the next. Every year, each cohort can refine the workshop and teach it to their peers and colleagues. We also made the project flexible so it can be easily adapted and used in other residency programs or for practicing physicians.



## Putting accessibility and climate change at the center of medical education

Occupational science researchers and learners are working to address the challenges people with disabilities face in our changing climate.

For the 22 per cent of Canadians living with a disability, climate change amplifies the challenges many of them encounter on a daily basis, while introducing an array of new ones.

"People with disabilities are among the most vulnerable to climate change," says Dr. Ben Mortenson, department head of occupational science and occupational therapy at UBC. "They're far more likely to experience poverty, unstable housing, and a multitude of physical, social, economic and environmental barriers. This puts them on the front lines of the climate crisis, but for a long time, their needs have been overlooked."

The impact of climate change on people with disabilities is wide-ranging. Mobility challenges, for instance, can limit their ability to evacuate during a wildfire or flood, or access cooling centres during a heat wave. Sensory impairments, such as vision and hearing loss, can hinder their access to emergency alert information. And pre-existing health conditions, such as diabetes and respiratory diseases, can make people with disabilities even more vulnerable to the effects of extreme heat and poor air — exacerbated by the fact that they are less likely to have air conditioning in their homes.

Fortunately, Dr. Mortenson says, students and graduates from UBC's occupational therapy program are uniquely positioned to help.

UBC-trained occupational therapists are working with people in their homes and in their communities

across British Columbia to help them achieve greater independence and participate in the daily activities that are meaningful to them. This, in turn, can make them more resilient to the effects of climate change.

"Adaptation is at the core of what we do. The needs of people with disabilities are fluid and ever-evolving, so as our climate changes, occupational therapists can help people adapt and modify their lifestyles," says Dr. Mortenson.

These adaptation measures could include working with clients to help them stay safe and active during extreme weather events, and identifying home modifications that promote climate resiliency and good health, such as heat-mitigating techniques and

"People with disabilities are far more likely to experience poverty, unstable housing, and a multitude of social, economic and environmental barriers. This puts them on the front lines of the climate crisis."

Dr. Ben Mortenson

equipment. It means working with clients to plan for emergency scenarios, and helping people who are displaced from their communities or experience disruption get back to their regular routine.



Dr. Ben Mortenson

To equip the next generation of occupational therapists with the education and skills to help clients navigate climate change, Dr. Mortenson has initiated a new project that integrates climate change and sustainability practice into UBC's Master of Occupational Therapy program.

"By embedding sustainability and climate change content throughout the program, we want to empower our students

to become agents of change for a greener world, and in promoting climate resiliency with their clients," he says.

Dr. Mortenson is also leading the charge to make the occupational therapy profession more environmentally friendly through research.

In a recently presented study, Dr. Mortenson and his team examined the sustainability of home modification equipment that occupational therapists recommend for aging adults and people with disabilities. This includes grab bars, bathroom equipment, motion-activated lighting, ramps and lifts — important infrastructure that helps people perform daily tasks and age in place for longer, while reducing their need for caregiving services.

The study found that while many occupational therapists want to integrate environmental sustainability into their practice, current health systems don't prioritize the reuse and recycling of old equipment.

"People's needs change over time, and so do the home modifications they require. But too often that old equipment ends up in the landfill prematurely," Dr. Mortenson says.

Dr. Mortenson hopes to leverage the study's findings to establish programs and processes that will allow used equipment to re-enter the healthcare system. Better yet, he says funding for home modifications should prioritize future-proof solutions that adapt as people's needs change — saving money for both the healthcare system and clients in the long-term, while having a smaller environmental impact.

Those same funding systems also need to become more equitable and responsive to support the people who need it most.

#### "People's needs change over time... but too often that old equipment ends up in the landfill prematurely."

"A lot of funding programs are geared towards homeowners. This means that many people with a disability who rent must rely on landlords to make changes," says Dr. Mortenson. "We need to look at how we can get heat-mitigating equipment, like air conditioning, to people with disabilities and seniors who are most impacted by extreme weather events like B.C.'s 2021 heat dome."

For Dr. Mortenson, it comes back to the urgent need to elevate the voices of people with disabilities and highlight the many challenges they face in the context of climate change.

"People with disabilities must have a seat at the table in climate discussions so they can articulate their needs, fully participate in climate solutions, and secure climate justice for themselves."

### Highlights

#### New professional degree to tackle the global health impacts of climate change

The School of Population and Public Health is developing a new Master of Global Health professional degree program specifically focused on climate change and other systemic forces that impact health on a global scale. The goal of the program is to equip learners with the knowledge and skills to tackle the poor health outcomes and inequities created by these forces.

#### Planetary health for doctors-in-training

With support from UBC Sustainability, Dr. Adrian Yee is leading the development of new, planetary health-focused curricula for UBC's Doctor of Medicine (MD) program. The goal is to train learners in the latest knowledge and practices and empower them "to challenge the status quo and envision what it means to thrive as people on this planet."



L-R: Drs. Alison Wookey, Devon Mitchell, Maichael Thejoe

## Why infectious diseases are spreading – and what we can do about it

As global temperatures rise, malaria and other infectious diseases are on the move. **Dr. Jennifer Gardy**, a senior scientist with the Bill and Melinda Gates Foundation and UBC alumnus, explains why this poses a major threat to global health—and why we need to act now, together.

As a senior scientist with the Bill & Melinda Gates Foundation, I strongly believe that malaria eradication — zero malaria worldwide — is possible within a generation. I also know that it's not going to be an easy trajectory. One of the factors that complicates our work is climate change.

Rising global temperatures aren't just a challenge for those of us working to eradicate malaria. They're also one of the most disruptive threats the global health community has ever encountered. How we choose to respond today will have enormous consequences for the world our children and grandchildren will live in tomorrow.

The reality is that climate-related disruptions, from floods to cyclones to food insecurity, are intimately linked to global health. They directly influence everything from a population's vulnerability to disease through to disease ecology, epidemiology and transmission, and ultimately to our ability to effectively respond to infectious threats.

As I wrote this from my home office in Chicago, my city was experiencing the worst air quality in the world due to smoke from Quebec's wildfires, and people with respiratory conditions were being asked to stay indoors. That may be possible for a privileged few, but workers whose jobs keep them outdoors are risking their health in order to preserve their economic livelihoods.

Meanwhile, the World Meteorological Centre has declared July 2023 the hottest month on record, with

many places across the globe routinely exceeding temperatures of 40 degrees Celsius. In the immediate term, heat like this is profoundly dangerous for anyone going outside or working in poorly ventilated indoor environments; in the medium- and longer terms, rising temperatures are changing disease ecology in myriad ways.

Warming temperatures extend disease transmission seasons, meaning that viruses like dengue that were once seasonal can now spread throughout the winter months in certain geographies. Melting snowpacks and rising ocean temperatures have unleashed old strains of species such as anthrax and *Vibrio*, and have created the ideal conditions for harmful algal blooms to grow, rendering our coastal waters and our seafood supplies dangerous.

Droughts force insects and wild animals to gather around any available water source, putting them in close contact with human populations and seeding disease spillover events, from West Nile virus to hemorrhagic fevers like Ebola.

At the other end of the spectrum, floods result in wastewater overflow and increased direct and foodborne transmission of a range of diseases, from cholera to typhoid. And, as both of these types of climate emergencies impact our ability to grow crops, food insecurity and population displacement put large portions of our world's most vulnerable populations at even greater risk for communicable and non-communicable diseases alike.



## How we choose to respond today will have enormous consequences for the world our children and grandchildren will live in tomorrow.

In my own work on malaria, I see these threats seemingly converge into a perfect storm. Changes in temperature, humidity, and rainfall are altering the malaria map and bringing the mosquito vector back to places where the disease had previously been eliminated. In fact, the United States recently reported its first locally acquired malaria infections in decades.

In other parts of the world, the malaria transmission season is growing longer with prolonged rainy seasons. Higher rates of malaria infection place a heavier burden on health care — disrupting our ability to deliver basic health services, often where they are needed most. This, in turn, has a profound impact on our ability to prevent, test for, and treat malaria, creating an ever-tightening cycle of infection and poor health.

The reality we face as a global health community is that our planet's temperature will continue to rise for several decades, even if we were to completely eliminate greenhouse gas emissions today. Our children and our children's children will still be facing many of the climate-associated infectious disease threats outlined above — that is, unless we take collective action to mitigate these threats now.

What does this action look like? Luckily, for many diseases, we already know what works.

Malaria is preventable and treatable. Through intensive mosquito control efforts and use of other prevention tools, from bed nets to preventive treatments, many countries completely eliminated malaria from within their borders in the late 1990s.

Similarly, many other infectious threats can be effectively countered with vaccines, robust testing and treatment programs, and programs aimed at preventing spillovers of disease from animal into human populations.

As a global health community, we must double down on disease control efforts and work towards reducing the incidence of malaria and other climate-sensitive threats today so that we're better prepared for outbreaks and resurgences of disease in the future.

Disease control will require smarter, more strategic use of our current tools, and it will also require new ones. For example: innovative and efficient prevention tools like a single injection of monoclonal antibodies that can be delivered in challenging settings and offers a full season's worth of malaria protection, or self-replicating RNA vaccines that have the potential to be manufactured more quickly and in larger quantities than traditional vaccines.

To make these and other interventions sustainable, we need to build and strengthen our health systems at home and around the world, so they can withstand disruption from climate and other events. Most importantly, we need to ensure that the most vulnerable people have access to health services, so they can live longer, healthier lives.

Ultimately, keeping the global spread of infectious disease in check will be a multidisciplinary effort, engaging researchers, academia, governments, health authorities and professionals across domains from health to social sciences to engineering to

entomology. It will unfold at all levels — from global, national and regional policy decisions to hyper-local delivery of life-saving interventions. And none of it will be possible unless it's driven from the ground up, engaging local communities and understanding how their lived experiences can inform better disease control strategies.

At the Bill & Melinda Gates Foundation, we are committed to accelerating malaria eradication in the face of the climate crisis. This is a necessary but winnable battle in what we know will be a long-term war against climate change, and it's a battle that will take collaboration between organizations like the Foundation and the brightest minds from academia.

My own journey at UBC — as an undergraduate student curious about microbiology, then a postdoctoral fellow exploring the intersection of computational biology and immunology, and ultimately a faculty member developing innovative new approaches to public health epidemiology — shows just how much a community like UBC can shape the next generation of global health and climate science leaders.

UBC inspires its students to explore new areas and follow their interests, particularly through innovative and interdisciplinary programs. It nurtures talent and shows students how their work can have real-world impact. And it recruits world-class talent whose bright ideas will become the innovations that in the future will help us secure a healthy and resilient future for our world's population.

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