



PHAC Science Strategy 2024–25 to 2029–30

Advancing health, well-being,
and equity through science



Public Health
Agency of Canada

Agence de la santé
publique du Canada

Canada 

To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.

—Public Health Agency of Canada

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Land acknowledgment

We respectfully acknowledge that the lands on which we developed this Strategy are the traditional territories of First Nations, Inuit, and Métis nations and communities. Specifically, this document was developed in the following cities:

- › In Ottawa, also known as Adawe, on the traditional and unceded territory of the Algonquin People, members of the Anishinabek Nation Self-Government Agreement
- › In Toronto, also known as Tkaronto, the traditional territory of many nations including the Mississaugas of the Credit, the Anishnabeg, the Chippewa, the Haudenosaunee, and the Wendat peoples and is now home to many diverse urban First Nations, Inuit, and Métis Peoples. Toronto is within the lands protected by the Dish With One Spoon Wampum Belt Covenant, an agreement between the Haudenosaunee and Anishinaabe and allied nations to peacefully share and care for the resources around the Great Lakes
- › In Hamilton, the traditional territories of the Erie, Neutral, Huron-Wendat, Haudenosaunee and Mississaugas. This land is also covered by the Dish With One Spoon Wampum Belt Covenant

We also affirm that the inherent rights of First Nations, Inuit, and Métis peoples are embedded in their territories and whose historical relationships with the land continue to this day. We commit to honouring the treaties and agreements that lay the foundations for our interactions and to advancing Indigenous rights as guided by the:

- › Truth and Reconciliation Commission of Canada's Calls to Action
- › Missing and Murdered Indigenous Women, Girls and 2SLGBTQQIA+ People's Final Report and Calls for Justice
- › United Nations Declaration on the Rights of Indigenous Peoples.

We recognize that there is much more work ahead to address the harmful impacts of colonialism and racism that continue to generate inequities between Indigenous and non-Indigenous communities. We remain strongly committed to working collaboratively with Indigenous Peoples in Canada to:

- › address health inequities
- › decolonize science
- › contribute to the creation of culturally humble public health systems
- › support the self-determination of Indigenous communities

President's foreword

I am pleased to present the Public Health Agency of Canada (PHAC) Science Strategy for 2024–25 to 2029–30. The Strategy depicts a forward-looking science plan to advance health, well-being and equity for all people and communities in Canada.

In 2024, PHAC is celebrating its twentieth anniversary. Since its creation, science has shaped the Agency's work. The Agency's broad and deep scientific expertise, underpinned by scientific excellence and integrity, has contributed to responding to public health crises nationally and internationally, including developing the Ebola vaccine, responding to the drug toxicity crisis, and most recently the COVID-19 pandemic response. The key role of our science workforce was highlighted throughout the pandemic when timely and evidence-grounded advice was essential in guiding Canada's response to an unprecedented public health emergency.

In an increasingly complex world, where public health issues are borderless and require solutions across multiple disciplines, the practice of science at PHAC needs to be strategic, collaborative, innovative, open, and forward-thinking to ensure that Canada is fully prepared to address future public health threats.

PHAC's mission is to improve the health of all people and communities in Canada by addressing public health priorities through science, innovation, service delivery, and collaborative action. The Science Strategy will guide us in advancing this mission through our scientific activities by applying the lessons we have learned from the pandemic and putting science at the forefront of all we do. The Strategy is designed to support our commitment to an open and collaborative model for science to foster public trust, to further health equity, and to build PHAC's science capacity to better serve all people in Canada.

I thank all of you who have contributed to this Strategy. I am confident that this Strategy will lead the way to further enhance the health and safety of people living in Canada.

Heather Jeffrey
President



Chief Science Officer foreword

Science is at the core of PHAC's mission to improve the health of all people and communities in Canada. We harness scientific methods to analyze data, conduct research, and monitor population health trends, enabling us to identify and address public health threats—often averting crises before they happen or greatly minimizing their scope and impact.

I am inspired every day by the breadth of science and innovation occurring throughout the Agency, the talent of its science workforce, and the reach of our scientific collaborations. However, in speaking with people across the country to develop this strategy, it became clear that we have more work to do to make our science and its impact more visible. People in Canada expect their public health agency to provide relevant, trustworthy, and timely public health advice based on the best possible evidence—whether generated inside or outside of our walls. This requires a strong culture of science excellence that is inclusive, open, and collaborative.

Our society and science are in constant transformation, perpetually influencing one another. An increasing understanding of intersections between human, animal, and environmental health and how they influence public health issues stresses the importance of multidisciplinary science. Over time, a better understanding of the impact of the social and structural determinants of health have underscored the need for equity-driven science. Recognition that concepts of science and knowledge have been shaped by societies where racism, colonization, and discrimination exist has led to initiatives on anti-racism and decolonization in science.

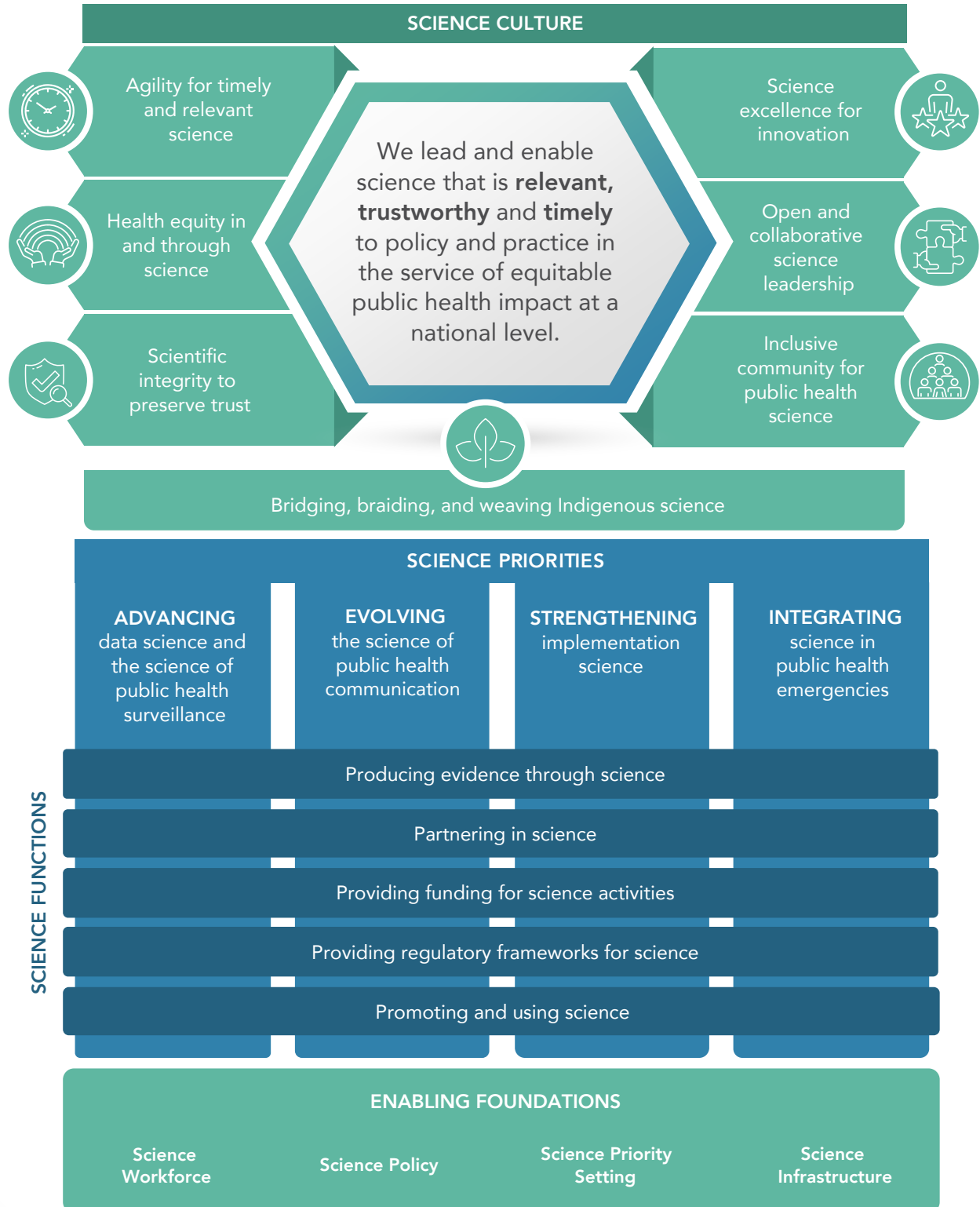
The Science Strategy articulates a broad and inclusive view of science at PHAC. One which encompasses multiple ways of knowing, values integrity, and fosters inclusion and collaboration. The Strategy represents a commitment to making our science activities more transparent and visible, ensuring that people in Canada benefit from the science we lead and enable on their behalf. It will support better coordination within the broader public health science ecosystem and help foster meaningful and productive collaborations to promote and protect the health of all people in Canada.

I would like to express my profound gratitude to all the public health actors, science partners, and members of the public in Canada whose insights and contributions have informed the development of this Strategy. My deepest thanks also goes to employees at PHAC who championed and advanced this work. The Agency looks forward to working with all its stakeholders and partners to implement this Strategy.

Dr. Sarah Viehbeck
Chief Science Officer



Science Strategy at a glance



About the Public Health Agency of Canada

The Public Health Agency of Canada (PHAC, the Agency) was established in 2004, drawing on lessons learned from the 2003 Severe Acute Respiratory Syndrome (SARS) outbreak, to identify and lower public health risks and to anticipate and respond effectively to public health threats.¹ As part of the federal [Health Portfolio](#), which works together to maintain and improve the health of people in Canada, the Agency focuses on health at a population-level.

The Agency's core mandate is set through legislation, with the [Public Health Agency of Canada Act](#) outlining the breadth of its areas of focus: health protection and promotion, population health assessment, health surveillance, disease and injury prevention, and public health emergency preparedness and response. A strong science base is essential in enabling effective action across these areas, with the legislation underscoring that the public health advice provided by the Canada's Chief Public Health Officer must be developed on a scientific basis.



Vision

Health, well-being and equity for all people and communities in Canada.



Mission

Improve the health of all people and communities in Canada by addressing public health priorities through science, innovation, service delivery and collaborative action.



Core values

Agility, health equity, integrity, science excellence and a culture of innovation, collaborative leadership, and a culture of community.



Delivering on our vision and mission drives our focus—protecting against threats to public health, preventing and reducing diseases and injury, and promoting health, well-being and equity.



To advance its mandate, PHAC fosters collaboration and promotes cooperation among governments at all levels, Indigenous partners and communities, research communities, professional associations, commercial entities, community-based organizations, and international organizations. Such a collaborative approach is essential to advance public health priorities for people and communities in Canada.

The COVID-19 pandemic has transformed the way we think about public health and the way public health institutions serve people who live in Canada. Like its counterparts around the world, PHAC is continuously adapting to new realities to effectively serve our nation's diverse populations.

PHAC is committed to addressing the root causes of health inequities, reducing stigma and discrimination, and improving the physical and mental health and well-being of all people in Canada. Health equity is not just a goal, it is a guiding principle of public health.² We acknowledge that much work lies ahead to redress the harmful impacts of racism, ableism, sexism, ageism, and other forms of discrimination as well as the ongoing harms of colonialism. This is especially important for fostering reconciliation and bridging the existing gaps between Indigenous and non-Indigenous communities.

Science at PHAC

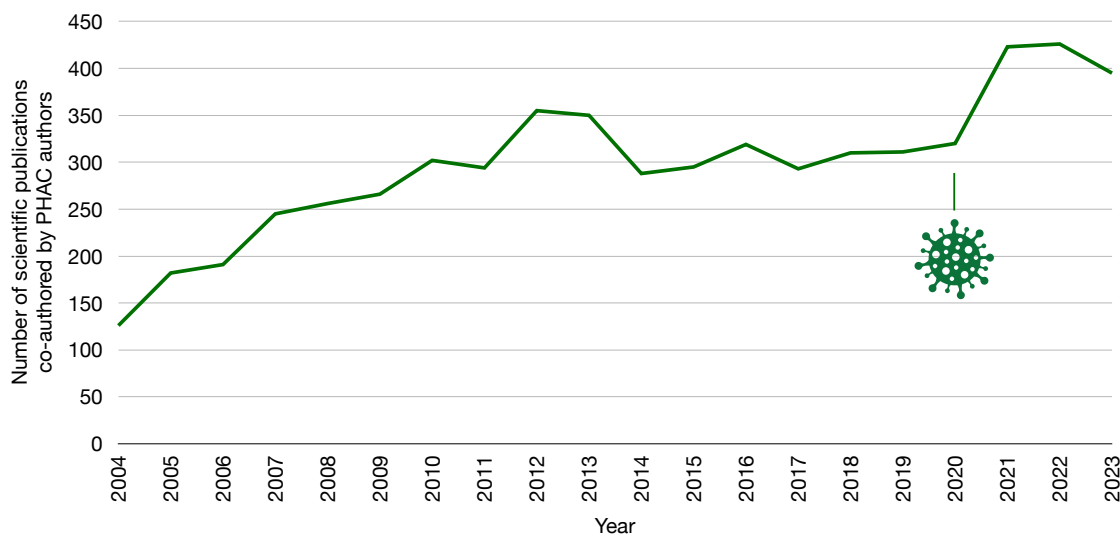
PHAC's mission is explicit on the important role science plays in improving the health of all people and communities in Canada. Through science, a systematic and iterative process of inquiry and investigation, we seek to understand the natural and social world. This occurs through the collection and analysis of empirical evidence, the formulation of testable hypotheses, and the development of theoretical frameworks.³ Science encompasses various epistemological approaches, including but not limited to Western and traditional, Indigenous, Afrocentric or other cultural knowledge systems, recognizing that different cultures and communities may have unique ways of understanding and interpreting the world.^{4,5}



Translating science into decisions is essential to evidence-informed public health action. The Agency uses a diverse array of knowledge mobilization activities to support the reciprocal and complementary flow of scientific knowledge between scientists and knowledge users, including policymakers, health care professionals, community organizations, and the public.⁶ These activities ensure that science is contextually applied in solutions to public health challenges. Science performance measurement and scientific evaluation are also used to continually assess the impact of our public health research and knowledge mobilization activities.

Through rigorous scientific activities, informed and contextualized through community engagement, we can understand public health threats and how they differ across and between populations, anticipate challenges, identify opportunities for equity-based solutions, and respond effectively with tailored and relevant interventions. This work is often unseen as the Agency puts together early signals and acts in advance of emerging health threats to avert crises or minimize their impacts on people in Canada. The scientific evidence we produce and use helps us, and our partners, make informed public health decisions that impact the lives of millions.

As a science-based organization, the Agency plays a leading role in public health science in Canada investing over \$400 million per year on average in science activities* between 2021–22 and 2024–25.⁷ This includes not only our scientific research activities, but efforts to detect and understand health threats, investments in applied public health research, and science communication activities.



* Between 2018–19 and 2019–20, PHAC invested an average of nearly \$290 million per year. No data was published in 2020–21.

About PHAC's laboratory science

The Agency's laboratories are known around the world for their scientific excellence. PHAC is home to Canada's only Containment Level 4 laboratory for human health, which allows for the research on dangerous pathogens, such as Lassa fever, Marburg virus disease, and Crimean Congo haemorrhagic fever. The scientists working in these laboratories generate scientific knowledge including the development of medical countermeasures and safe and effective vaccines. These contributions keep people in Canada safe and support Canada's role in addressing global health challenges. Moreover, they provide national laboratory leadership in emergency preparedness and response, laboratory-based surveillance, and innovative approaches to reference testing and diagnostics.

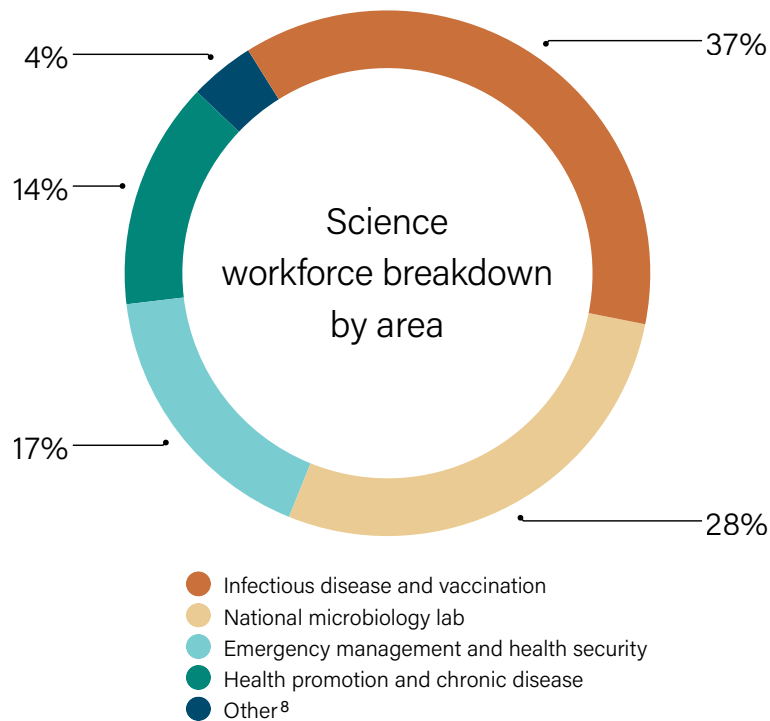
Read more: [Lab 101: What does it take to house the world's deadliest diseases?](#)

A strong science workforce is a core enabler of the Agency's science functions and supports the Chief Public Health Officer in ensuring the Minister of Health receives trusted public health advice developed on a scientific basis. The Agency's highly skilled professionals span a breadth of disciplines which contribute to public health, from microbiology and laboratory science, to modelling and epidemiology, to economic/policy research and behavioural/social sciences. They work alongside many others who enable our science work and culture, including regulatory inspectors and engineers, science policy experts, and science managers.

About PHAC's regulatory science

PHAC's regulatory role supports safe and secure laboratory science across the country related to human pathogens and toxins, biosafety, and biosecurity.

Human pathogens and toxins pose a small but significant risk to human health and safety, either through accidental or deliberate release. Accidental release can result from inadequate controls on activities such as possession, use, transfer, or disposal. A deliberate release could be possible if there are inadequate security measures in place. To address these concerns, PHAC established a national safety and security program to protect the health and safety of the public against risks posed by human pathogens and toxins.

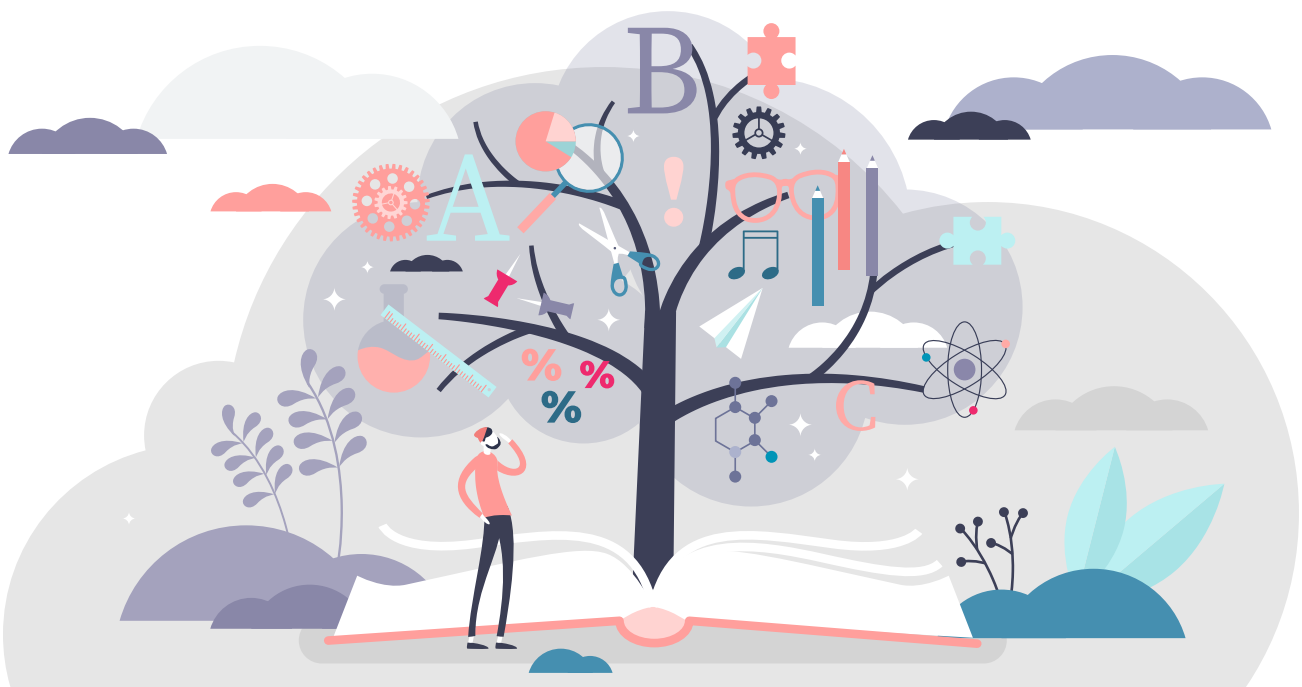


On December 1, 2015, the [Human Pathogens and Toxins Act \(HPTA\)](#) came into full force. This Act is one of the key pillars of a safety and security program for human pathogens and toxins along with the [Human Pathogens and Toxins Regulations](#), the [Canadian Biosafety Standard](#), as well as supporting activities, such as an expert advisory committee, training programs, compliance audits and outreach to promote capacity building amongst regulated parties. This program applies to everyone conducting specified activities with human pathogens and toxins whether imported or domestically acquired, including: production, possession, handling, use, storage, access to, transfer, disposal, release, abandonment, import or export.

As the federal authority and regulator of facilities working with human pathogens and toxins under the Act and Regulations, PHAC is responsible for licensing new and newly renovated facilities, providing ongoing oversight in the form of inspections for all regulated facilities, and issuance of HPTA security clearances for staff working in certain higher-risk facilities. In this way, the Agency plays a critical role in protecting Canadians against risks posed by pathogens and toxins.

PHAC Science Strategy

Science and societies have perpetually influenced each other. For example, new scientific disciplines resulting from technology (e.g., genomics, epigenetics, gene editing, artificial intelligence, and big data) have emerged to offer important transformational opportunities to our societies. Acknowledgement of Canada's history of systemic racism, colonization, and discrimination⁹ has brought with it efforts to advance anti-racism and decolonization in science. The COVID-19 pandemic underscored the need for robust science and risk communications, open science approaches, and science advice mechanisms.



Considering these and other societal, technological, and public health transformations, the way we approach science in public health must change as well. We need coordinated and collaborative scientific efforts to guide public health decision-making and generate new solutions to public health challenges. This is the essence of PHAC's Science Strategy.

The Science Strategy describes horizontal priorities to guide the Agency's scientific work. It offers an opportunity to build lessons learned from COVID-19 into our science planning^{10,11,12} and to advance the forward-looking vision for Canada's public health system provided by the Chief Public Health Officer in her 2021 report, *Vision to Transform Canada's Public Health System*. The principles for a world-class public health system outlined in the report are also foundational to a world-class public health science system: equity-driven, trustworthy, participatory, evidence-informed and effective, and population health approach.¹³

The Science Strategy has a global outlook, aligns with the federal science agendas, and supports pan-Canadian science priorities. It will guide PHAC in:

- › Planning and prioritizing its science activities effectively and aligning its science assets with cross-cutting priorities
- › Communicating transparently about the role of science in its decision-making and public health guidance
- › Building its science workforce and science advice mechanisms; and
- › Collaborating strategically and sustainably in areas when the Agency can add scientific value

To inform the Strategy, we connected with public health and science stakeholders from across the country to understand what people in Canada expect from their national public health agency. We heard about the science contributions that PHAC is uniquely positioned to make or are unlikely to be made by others. This included specialized laboratory work, applied public health research, and science to policy and practice activities. Many stakeholders highlighted the unique national role for PHAC science, which is often leveraged to inform federal, provincial, territorial, and Indigenous public health policy and practice. International engagements helped to articulate the key science functions for national public health organizations and the foundational supports needed for a strong science culture. Details from these consultations have been compiled in a What We Heard report.

Our science culture

How we do our work is shaped by our science culture. The Agency's six core values guide our science work, inform the behaviour of our science workforce, and influence how we make decisions. These values complement those outlined in the [Values and Ethics Code for the Public Sector](#).

At the heart of our scientific endeavours and our work as a department in the Government of Canada is our commitment to promote and enable **science in service of the public**. This includes prioritizing and mobilizing the right science when people and communities in Canada need it most, including during emergencies. The public health landscape changes rapidly. From infectious disease outbreaks to the health impacts of climate change to social policies affecting health and human rights, public health decision makers require timely science evidence to make decisions.



Agility: We aim to be an agile public health agency that’s prepared to respond to any emerging public health threat in a timely manner. It’s not enough to be able to adapt to change: we must instead be designed to adapt.

Integrity: We uphold the value of integrity by prioritizing research security, upholding ethical standards, respecting democratic principles, and responsibly stewarding public investments in our department. Transparency and accountability are foundational pillars that underpin effective governance, democracy, and trusted communication.

Health equity: We strive to ensure everyone can reach their full health potential. This includes working to remove barriers to access to social determinants of health, such as: race, gender, ethnicity, sexual orientation, and socioeconomic status.

Scientific excellence and a culture of innovation: We’ll achieve our mandate through a continued commitment to science excellence and innovation. One of our top priorities is to ensure that public health guidance, programs and policies are grounded in data.

Collaborative Leadership: We build relationships with partners to combine our strengths and resources, helping us to solve shared challenges. Although we assume a federal leadership role, we have an equally important role to play as a convener to foster a comprehensive and integrated approach.

Culture of Community: We strive to foster a workplace culture where kindness, empathy, support, and well-being are prioritized and ingrained in our practices. This contributes to a safe and healthy work environment that promotes collaboration, openness and transparency.

The Agency has put in place means to ensure that its science workforce has the **agility** to respond to public health issues in a relevant and timely way. This includes, for example, nimble research prioritization processes, modernizing its surveillance assets, and systems to integrate lessons learned from both acute (COVID-19, H5N1) and chronic (HIV, Tuberculosis, systemic racism, gender-based and family violence, substance use harms) public health crises. Balancing forward-looking investments in discovery-driven science, while supporting applied public health research, is also critical to ensure we are equipped with the science we need at the right time.

PHAC is committed to incorporating **health equity** considerations within its science activities. We value Sex and Gender Based Analysis Plus and health equity integration, inclusion of people with disabilities and anti-ableism in science, developing and making science available in both of Canada's official languages and implementing the Agency's *Official Languages Action Plan*, reconciliation, anti-racism and decolonization in science, and Indigenous ways of knowing. Embracing equity in our science can help ensure that the outcomes of our science will have equitable impacts. PHAC recognizes that taking meaningful action against racism in science and racial biases experienced by racialized communities is crucial for achieving science excellence. To support a culture of anti-racism in science, apply an anti-racism lens to PHAC science activities, and diversify PHAC's scientific workforce, we will continue to implement PHAC's *Anti-Racism in Science Action Plan* which seeks to eliminate the misuse or misinterpretation of scientific research and data that promotes or justifies racial hierarchies, stereotypes, and discriminatory practices. These issues stem from a cascade of racial inequities rooted in Eurocentric scientific methods which affect the equitable distribution of resources, opportunities, and privileges along racial lines. The plan outlines a path to create a more inclusive environment, nurture a diverse scientific workforce, and ensure equitable treatment of diverse scientists, scientific expertise and scientific methodologies and knowledge systems within the Agency.

At the Agency, we are dedicated to the **security and integrity of our scientific endeavours**. By adhering to ethical principles and standards, we continuously strive to earn and build public trust in our science-based public health advice. Our research, science, and related activities are conducted in compliance with our [Scientific Integrity Policy](#) and our [Research Ethics Board policies and guidelines](#). We support the democratization of knowledge (making it widely available, understandable, and useful to non-specialists) by removing barriers and enabling access to information whenever possible. PHAC will continue to implement its [Open Science Action Plan](#) which aims to make its scientific and research publications "open by design and default" while respecting **privacy, research security, and ethical considerations**, as well as appropriate intellectual property protection and disclosure. To this end, we share our scientific outputs in the [Federal Open Science Repository of Canada](#) and publish two open access, fully bilingual peer-reviewed journals—the [Canada Communicable Disease Report](#) and the [Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice](#). As a member of the [Federal Science Libraries Network](#), the Agency supports the Government of Canada's priorities in research, innovation and open science by collaborating in the development and delivery of innovative infrastructure, systems, tools, resources and services for federal science-based departments and agencies.

Related to our commitment to open science, we will endeavour to make our science activities more visible and **transparent** to the public and our public health science partners. This includes communicating about our scientific activities more consistently to foster trust and make our scientific **operations** more transparent to promote better collaboration using mechanisms such as peer reviewed publication, the [Science of Health Blog](#), the [Data Blog](#), the [Healthy Canadians podcast](#), and support for conferences like the [Canadian Public Health Association](#), [Journées Annuelles de Santé Publique](#) and [Canadian Science Policy Centre](#) conferences.

PHAC recognizes the drivers of **scientific excellence**, including intellectual curiosity and honesty, constructive skepticism and debate, meticulousness, transparency in methods and results, avoidance of bias, humility in the discovery and use of science evidence, and the limitations of scientific inquiry.¹⁴ Excellent science must also be inclusive and meaningfully integrate diverse perspectives, disciplines, and methods to maximize impact and benefits to society.¹⁵ We recognize science excellence is critical for building and maintaining public trust and fostering innovation.

At PHAC, we are committed to an **open and collaborative model for science**. We encourage and facilitate scientific collaborations between our science workforce and those working in governments of all orders; Indigenous communities; communities and public health settings; academia; and industry¹⁶ to share knowledge, exchange ideas, and develop innovative solutions to public health challenges. We also are eager knowledge users. We recognize that complex public health issues and the drivers underpinning them require multidisciplinary approaches including citizen-led science and participatory methods that involve communities and civil society. With humility, we commit to learning from First Nations, Inuit, and Métis Peoples how to better bridge, braid and weave Indigenous knowledges to ensure a more holistic view of science and knowledge.

Strengthening knowledge mobilization in Canada through the National Collaborating Centres for Public Health

The National Collaborating Centres for Public Health (NCCs) promote the use of scientific research, diverse knowledges, and acquired experience to strengthen public health practices, programs, and policies in Canada. Located across the country, each of the six centres focuses on a specific area: environmental health, Indigenous health, infectious diseases, methods and tools, healthy public policy, and determinants of health.

The NCCs synthesize and share high quality evidence and knowledge, foster collaboration among diverse networks, and support public health professionals, policymakers and decision makers in using evidence-informed knowledge to improve health outcomes for Canadians. They produce tailored knowledge products, including guidance documents, reviews, and case studies that are contextualized to their settings. Responding to emerging issues with evidence, skills, and network development, the NCCs support Canada's public health workforce to meet the challenges of today and of tomorrow.

Indigenous science and ways of knowing

PHAC works closely with Indigenous governments and communities to ensure we uphold Indigenous rights through our reconciliation approach. This includes work to meet foundational Government of Canada commitments under the United Nations Declaration on the Rights of Indigenous Peoples Act, the National Inquiry into Missing and Murdered Indigenous Women and Girls, and the Truth and Reconciliation Commission. It also includes how we work as a department to ensure dialogue with First Nations, Inuit, and Métis partners to advance self-determination, co-development of priorities, and creation of culturally humble public health science systems.



As part of the journey, we aim to transform how we, as an Agency, think about science—recognizing that truth must come before reconciliation. Often what we consider “science” in Canada is Western science, with roots in Western or European ways of knowing and being, and history. Scientists and the scientific community are rooted in a society where racism exists. Histories of imperialism, colonialism, racism, and sexism have influenced concepts of science and knowledge, contributing to the perpetuation of multi-layered and intersecting forms of racism, discrimination, and stigma.^{17,18} Acknowledging these truths is critical in moving toward a space where a more inclusive, decolonized science can inform program and policy at the Agency and where Indigenous knowledges and other worldviews can meaningfully guide public health policies for all. PHAC is committed to fostering respectful collaboration between these knowledge systems, recognizing that each brings complementary strengths and insights.

Distinct from Western science traditions, Indigenous peoples have knowledge systems with methodologies and ways of knowing that have been shared across generations.¹⁹ While there is no single, monolithic definition of Indigenous knowledge, which is contextual, dynamic, place-based, and encompasses the complex worldviews of Indigenous Peoples, it is often generated through observation, experience and dialogue, reflection, and collaboration.^{20,21} Many Indigenous methods emphasize relationships, such as those between humans, animals and nature or between disciplines²² and the importance of contextual knowledges across communities and lands.

First Nations, Inuit, and Métis have called for a more unified approach across government to address their interconnected and distinctive priorities and minimize engagement fatigue, including in the areas of public health science, surveillance, and data. The Government of Canada is moving towards a cluster approach to minimize duplication, government silos, and improve effectiveness while co-developing solutions with Indigenous partners.²³

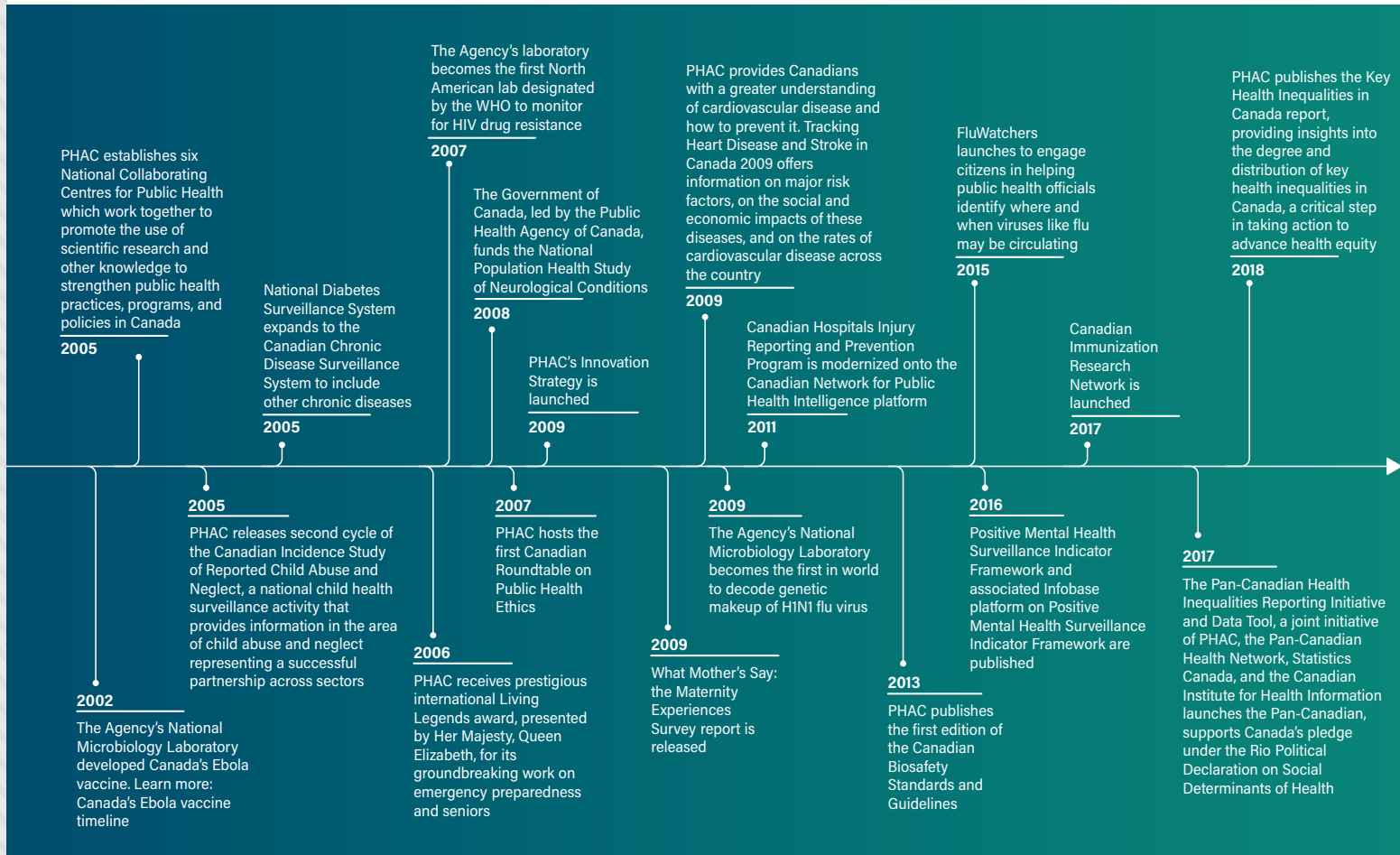
The Agency has joined 14 federal organizations as a member of the Government of Canada’s Indigenous—Science, Technology, Engineering and Mathematics (I-STEM) Cluster which works collaboratively to:

- › Foster long-term and reciprocal relationships with Indigenous partners
- › Work within the federal STEM space to educate and train public servants
- › Attract, nurture, and retain Indigenous talent in STEM fields

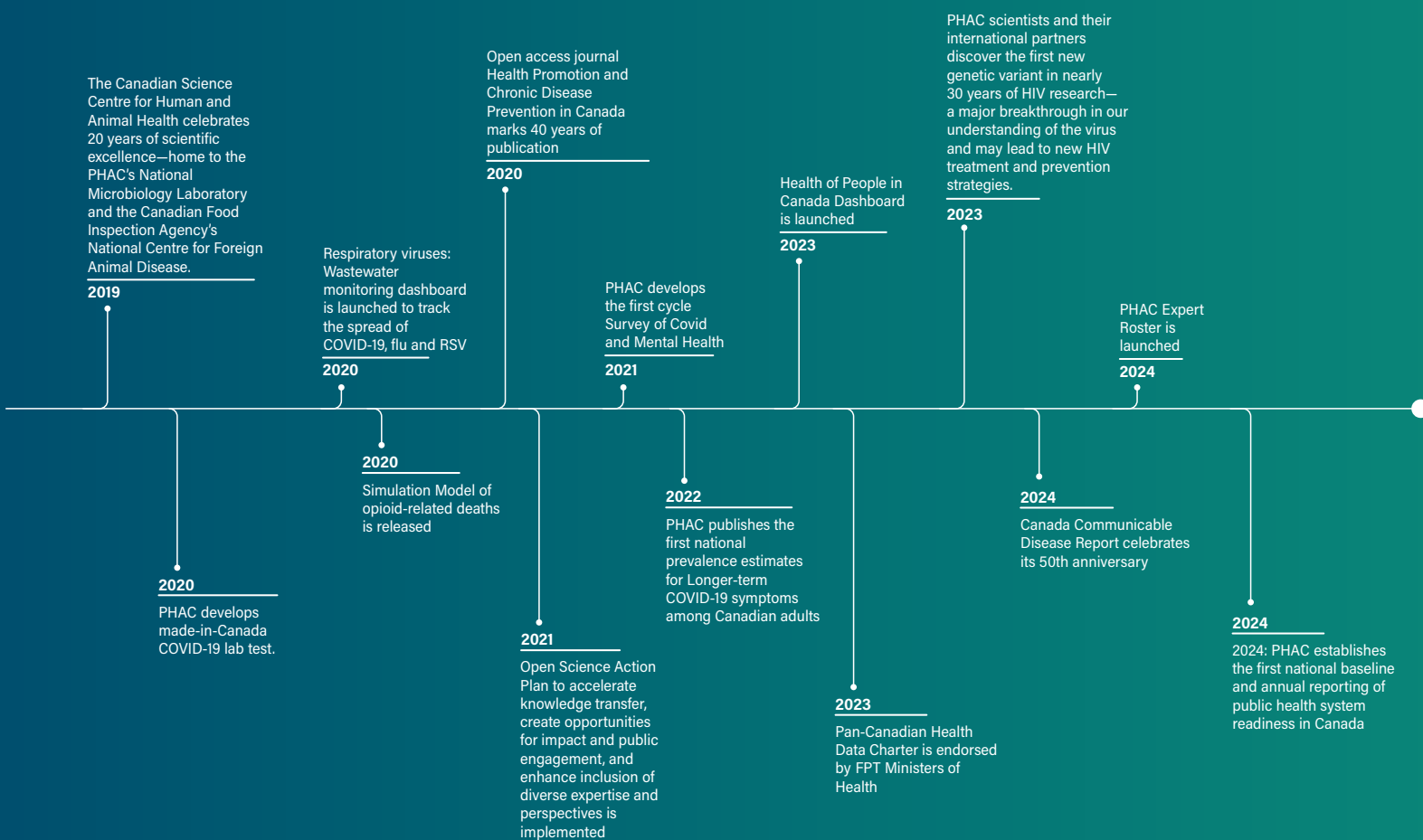
In its science endeavours, PHAC will adopt I-STEM’s foundational focus on relationships, training, and talent which provide a platform for bridging Western and Indigenous knowledge systems.²⁴ Moving forward, PHAC aims to foster long-term relationships with First Nations, Inuit and Métis communities, ensuring that Indigenous knowledge is not siloed but is woven into the broader scientific and public health landscape.

Science achievements

As a Government of Canada department, PHAC contributes to and integrates science in the service of the public and with the intention of making a tangible impact on people's lives and on public health. These are a few examples of the breadth of PHAC's scientific work over the years.



Science achievements (cont.)



Science priorities

We lead and enable science that is relevant, trustworthy, and timely to policy and practice in the service of equitable public health impact at the national level.

Over the next 5 years, we will focus our scientific contributions in four multidisciplinary priority areas which reflect the full scope of our mandate:

Advancing data science and the science of public health surveillance

Evolving the science of public health communication

Strengthening implementation science

Integrating science in public health emergencies

The priorities reflect what we heard from people in Canada through the consultation process and will require collaboration across scientific disciplines within and outside PHAC.

Advancing these cross-cutting science priorities will contribute to addressing major public health threats and the external factors influencing public health. This includes evolving public health threats (e.g., climate change, antimicrobial resistance); COVID-19 post-pandemic echo (e.g., health mis- and disinformation, mental health and wellness); inequities in the social determinants of health (e.g., racism, food insecurity); demographic changes (e.g., population aging, children’s health, population migration); and rapid evolution of technology (e.g., medical countermeasures, digitization). Through coordinated action across these Agency-wide science priorities, PHAC will advance its vision of health, well-being, and equity for all people in Canada.

We will advance each of these priorities through our core scientific functions:



Producing evidence through science including surveillance of population health, targeted research studies or risk assessments, and innovations in diagnostic and reference testing



Providing funding for science activities to Canadian researchers and community-based organisations including for research studies, data collection and analysis, and scientific impact evaluation of community-based programming



Partnering in science through research collaboration, knowledge mobilization activities, and infrastructure support. This includes defining national science priorities that are internationally grounded, fostering dialogue to enhance connections and build trust, and strengthening partnerships across jurisdictions, sectors, and with communities, First Nations, Inuit, Métis and Modern Treaty organizations



Promoting and using science through accessible communication and openly sharing scientific data, publications, and reports and by integrating science and scientists into decision-making processes



Providing regulatory frameworks for science through a modernized legislated role for human pathogens and toxins, biosafety, and biosecurity

Advancing data science and the science of public health surveillance

Overarching objective: Enhancing our ability to act on public health threats by innovating in surveillance methodologies and improving access to quality public health data.

Public health surveillance is a foundational element of effective public health practice. It refers to the ongoing collection, analysis, interpretation, and dissemination of health data for the purpose of planning, implementing, and evaluating interventions to protect and improve the health of populations.^{25,26}



Surveillance data are key to detecting health threats, preventing or controlling disease spread, and improving public health. These data can also be used for scientific research and are critical to decision-making by policy-makers, clinicians, health professionals, and for people and communities in Canada. Disaggregated data (e.g., race-based data) help us understand population health differences or inequities and so that public health strategies are effectively designed for the right population, at the right time. In turn, data on the effectiveness of these strategies helps to pinpoint research gaps for future improvement.

Data science, sitting at the intersection of statistics, computing, and domain expertise, is driving innovation in public health surveillance by introducing advanced methods and incorporating diverse data sources. By enhancing data quality, reducing biases, and ensuring ethical use of non-traditional data, data science has the potential to broaden and deepen the insights of public health surveillance.

However, we face barriers to collecting, sharing, and using public health data, which can interfere with timely health decision-making at personal, professional and system-wide levels. This can impair public health responses, worsen health outcomes, and contribute to health inequities. Data gaps include, for example, inconsistent collection of stratifying variables (factors used to define groups) across diseases and jurisdictions and challenges in linking data from various sources. Collected data must also reflect the diversity of the population so that innovative data science tools (e.g., artificial intelligence) are used ethically and do not reinforce biases and exacerbate inequities. These challenges can affect the quality of the data, and therefore, the analysis, findings, and public health decisions based on them.

At PHAC, the public health surveillance function is one of the biggest expressions of our science mandate. Scientific research and innovations in surveillance practices, data collection, risk assessment, mathematical modelling, and laboratory work are transforming how we approach public health. For example, PHAC scientists, along with their academic and provincial/territorial partners, are leading the way on [wastewater monitoring](#) based on its growing use during the COVID-19 pandemic. This knowledge has also helped scientists study the presence of other pathogens (e.g., influenza viruses, antimicrobial resistant organisms) or drugs (e.g., fentanyl) in wastewater. We work with municipalities to collect and ship wastewater samples to laboratories for analysis. Knowing the daily or weekly changes in the amount of infectious disease detected in wastewater can help manage:

- › outbreaks through public health action, such as vaccination and testing
- › health care resource allocation, such as hospital beds and staffing needs

| Learn more about [harnessing the power of wastewater testing to detect COVID-19 outbreaks](#)

Through its national role and science leadership functions, PHAC brings together public health partners across Canada to collectively strengthen surveillance practice and embrace data science in it. For example:

- › The Canadian Enteric Disease Reporting System (CEDARS) integrates more than 100 databases of food-based outbreaks into a single modern data system
- › The [Health of People in Canada Dashboard](#) is collection of public health indicators helps us understand areas where we are doing well and where we need to improve
- › The [Health Infobase](#) publishes data tools, infographics, charts and blogs about health data in Canada
- › *Public Health Surveillance Vision 2030* used a collaborative multi-stakeholder process to develop a forward-looking vision to strengthen public health surveillance across the country
- › Federal, provincial, and territorial health data partners continue to work towards a better-connected health system with standardized health data and digital tools, including collective action to advance the [Joint Federal, Provincial, and Territorial Action Plan on Health Data and Digital Health](#) and the [Pan-Canadian Health Data Charter](#)

For its part, to advance data science and the science of surveillance, the Agency will continue to work with partners to innovate in the science of surveillance and enable the production of quality, timely data that meets public health needs and supports health equity. In collaboration with public health partners, the Agency will continue to strengthen its data collection and dissemination mechanisms and procedures, apply [The First Nations Principles of ownership, control, access, and possession \(OCAP\)](#), develop a modern public health data sharing agreement with federal, provincial, territorial and Indigenous partners, modernize its data surveillance systems in accordance with Canada's upcoming *Public Health Surveillance Vision 2030*, and pursue frameworks to support equity in data science and science of public health surveillance.

Evolving the science of public health communication

Overarching objective: Enabling people in Canada to make informed decisions about their health based on trusted science-based public health communications

When it comes to public health science, groundbreaking studies are not enough on their own. For scientific insights to be useful, they must be translated in ways that are relevant and actionable for their intended audiences.

Science communication involves distilling technical information into messages that are accessible and meaningful for different audiences, including the public. From a public health perspective, the effective communication of science and evidence-based guidance is essential for people in Canada to make informed decisions about their health and the health of their communities. This requires people to trust



both the message and the messenger. During public health emergencies, obtaining and sharing the right information in the right way and at the right time can protect against illness, minimize unintended impacts, and save lives.^{27,28,29}

However, in Canada as in many other countries, public trust in government and public authorities declined over the course of the COVID-19 pandemic.³⁰ As the first pandemic of the digital era, an “infodemic” or overabundance of information, including false and misleading information, contributed to public confusion about what to believe and which sources to trust. Now and for the foreseeable future, public health information must compete for attention in an online environment where opinions are highly polarized and where mis- and disinformation is easily shared and amplified, including by AI-generated tools.

Another key lesson from the pandemic in Canada and other countries is the need to strengthen risk communications, including the communication of scientific uncertainty.^{31,32} With rapidly evolving evidence during COVID-19, authorities faced challenges in underscoring the iterative nature of science, in transparently sharing what was known and unknown, and in explaining differences in public health guidance between jurisdictions and over time. This may have added to confusion about public health messaging,^{33,34} allowing mis- and disinformation to take hold and further erode public trust.³⁵

Consequences include a rise in vaccine hesitancy,³⁶ with more frequent outbreaks of vaccine-preventable diseases that were thought to be all but eliminated in Canada such as measles, and an estimated 2,800 avoidable COVID-19 deaths due to misinformation about COVID-19 vaccines.³⁷

Moving forward, the Agency will take steps to strengthen and improve how it communicates public health science to protect and promote the health of people in Canada. This includes promoting trust in the institution through:

- › Operational transparency and openness with respect to sharing the data and science used to inform our work and the scientific basis for public health guidance development
- › Making information accessible, inclusive, and tailored to the needs of different audiences through deep community connections and understanding of the populations in Canada
- › Leveraging social and behavioural science to understand how to most effectively reach equity-deserving populations and supporting community-led engagement
- › Working with partners to promote science and health literacy, including debunking and prebunking, to boost resiliency to mis- and disinformation
- › Building Agency capacity in risk communication research and practice, including how to clearly communicate uncertainty—and what is known and not known in the face of health threats
- › Committing to reconciliation and cultural humility as the organization works to build trust with Indigenous partners

Strengthening implementation science

Overarching objective: Maximizing the impact of public health interventions by studying how they work and supporting the uptake and scale-up of evidence-based interventions in public health programs and policies.

For public health programs or interventions to be effective, they must be designed and tailored to the communities they serve, accounting for geographic, social, economic, and other structural and community contextual factors. Co-creating interventions and upstream prevention initiatives with communities helps identify public health challenges, builds knowledge, and ensures that interventions are culturally relevant, widely accepted, and address actual community needs. This collaborative approach enhances both the success and sustainability of public health efforts.



Understanding the contextual factors that contribute to the success of public health interventions is crucial and implementation science is key to this process. Implementation science examines methods to promote the adoption and integration of evidence-based practices, interventions, and policies into routine healthcare and public health settings to improve population health outcomes.³⁸ Its goal is to identify factors, processes, and methods that either help or hinder the successful uptake and integration of these interventions. By providing insights into what works, for whom, and in what context, implementation science can support the scaling up of effective interventions, to enhance overall health and well-being.

While implementation science has great potential to enhance public health interventions, achieving effective implementation is challenging. Research findings often do not translate well into practice, with only about half of medical and public health innovations being used in real-world settings.³⁹ Evidence of successful interventions in one context does not necessarily support its implementation in another context or on a wider scale. Factors such as varying or evolving contexts, lack of capacity—including insufficient trained personnel, inadequate funding and limited infrastructure—and top-down approaches that do not respond to community needs can hamper the implementation of evidence-based interventions.

PHAC can help strengthen implementation science through collaboration and co-creation of interventions and their evaluation with communities, adopting multidisciplinary approaches to the design and research of interventions, and collaborative knowledge mobilization, research prioritization, capacity building and research funding. PHAC prioritizes community capacity-building and bridging and community-based implementation science in its delivery of transfer payment programs as these are an integral tool to help us understand interventions are working, for whom, and under what circumstances. Through these programs, we also support research occurring in post secondary institutions. In 2023–24, this investment totalled \$83 million representing eighteen per cent of the Agency's overall grant and contributions. By collaborating with a broad range of partners, PHAC aims to develop innovative strategies to facilitate the uptake of evidence-based practices and the scaling-up of interventions. These strategies also support the translation of research into practice and policy, foster inclusive and locally relevant interventions through community engagement, and build capacity by addressing gaps in resources, skills and infrastructure.

By identifying and addressing the unique needs of communities in various contexts, PHAC can enhance the spread of effective public health interventions, ensure they are sustainable over time and equitable, and ultimately improve health outcomes on a broader scale. Additionally, PHAC can support the adaptation of interventions to local contexts by leveraging field experiences and strengthening national-to-local implementation channels. This can include active community engagement to ensure interventions are inclusive and address diverse needs.

Integrating science in public health emergencies

Overarching objective: Innovating in the integration of science in emergency preparedness, response, and recovery for better health outcomes for all people in Canada.

An emergency is “a serious event requiring immediate action to protect the health and safety of people, and limit damage to property and the environment”⁴⁰ These can be caused by many factors such as environmental, technological, geological, and microbiological hazards or human conflicts. Emergency preparedness and response is an essential public health function⁴¹ and science and research are essential components of this function.



Evidence generated through well-designed, effectively executed scientific activities and the incorporation of science advice in emergencies are integral to emergency management.^{42,43,44} Science infrastructure and processes must be supported in the inter-emergency period to ensure readiness during acute events when people and communities in Canada need it the most. This includes developing robust processes to identify research priorities for funders to help fill knowledge gaps; research on threats, mitigation requirements, and activities such as technical guidance; active intra/extramural research networks to facilitate collaboration during emergencies; plans for rapid research including ethics and funding mechanisms; and mature knowledge synthesis, mobilization and science advice systems.⁴⁵

Emergencies have immediate and long-term impacts on physical and mental health and well-being, though these impacts are not the same for all people in Canada. Social and structural determinants of health affect how people experience emergencies, with populations already experiencing inequities most often disproportionately impacted. For example, confined group living conditions, such as long-term care homes, correctional facilities or shelters, can pose difficulties in maintaining physical distancing, good hygiene, and sanitary standards, thereby promoting the spread of infectious disease in emergencies.⁴⁶ During the COVID-19 pandemic, we saw that early scientific literature was dominated by biomedical topics. As the pandemic went on, the literature shifted towards topics in the social and behavioural sciences, examining the differential impacts related to social and structural determinants of health.⁴⁷ Research priorities published in [Generating Knowledge for a Health Promotion Approach to Emergencies](#), a 2023 Chief Public Health Officer report companion resource, offer an opportunity to embed health promotion and equity lenses into emergency preparedness, response, and recovery.⁴⁸

Going forward, the Agency will continue to foster science networks to link partners across disciplines to strengthen a multidisciplinary and equity-focused approach to science in health emergencies such as establishing a pan-Canadian wastewater surveillance network. PHAC will continue convening public health partners during the inter-pandemic period—like through the Canadian Public Health Laboratory Network or the External Modelling Network for Infectious Diseases—so that we are nimbly able to act together during emergencies. The Agency will continue to invest in its core science infrastructures, such as its capacity in diagnostics and its public health surveillance systems, so they are ready when people in Canada need them most. This also includes supporting [regulatory infrastructure](#) to enable appropriate oversight of research facilities and maintaining expertise in risk assessment and modelling to anticipate risks and impacts and to plan public health emergency responses.

PHAC will continue to work with partners and community organizations to explore innovative approaches to health emergency prevention, preparedness, response, and recovery. This will include ways to integrate science into emergency management and related public health measures, to strengthen equity across the emergency management continuum, to advance the development and deployment of medical countermeasures, and to harness new technologies to improve emergency management. For example, the Agency, in collaboration with other multi-sectoral partners, has developed a One Health Approach to Risk Assessment Framework.

This work does not occur in isolation. PHAC will continue to work in lock step with federal partners to maintain a science readiness posture for health emergencies, including partners in Canada's Biomanufacturing and Life Sciences Strategy, the Canadian Institutes of Health Research Centre for Research on Pandemic Preparedness and Health Emergencies, and Health Emergency Readiness Canada. Together these collaborations and measures will support national and international strategies and agreements such as the [Emergency management strategy for Canada : toward a resilient 2030](#), the [Global Health Security Initiative](#), the [Sendai Framework for Disaster Risk Reduction 2015–2030](#) and the [Health Portfolio Emergency Response Plan](#).

Enabling foundations

The Agency's ability to lead and enable science that is relevant, trustworthy, and timely in the public's service is underpinned by enabling foundations. The following assets, tools and processes enable us to carry out our science functions, to support Canada's public health system, and to deliver on our science priorities.



Workforce: Our workforce is our greatest asset. Our scientific activities rely on a highly skilled, technical, and diverse workforce. As a caring environment is essential for both individual and organizational success, we are committed to offering our employees the best working environment possible. We will focus on attracting and retaining a diverse science workforce which builds on our long history of expertise in laboratory sciences and grows our capacity for science across other disciplines such as in the [PHAC Behavioural Science Office](#). We will also take measures to celebrate our workforce and their achievements and to provide pathways for their professional development and learning.



Science Infrastructure: Cutting-edge science infrastructure is essential for the delivery of public health services or interventions. PHAC has unique research and surveillance assets (e.g., Containment Level 4 laboratory, mathematical modelling capacity, data disaggregation capacity, national surveillance platforms), access to innovative technologies and procedures (e.g., wastewater, artificial intelligence, machine learning, natural language processing, data visualization, etc.) that support not only the Agency but also local, provincial, territorial, and Indigenous public health partners in doing their jobs. This also includes the systems and processes needed to enable agile, timely, and ethical science such as the Health Canada/PHAC research ethics board, Health Canada/PHAC health library, modern grants and contribution mechanisms, tools for collaboration, multi-sectoral research networks, science governance, and science advice systems.



Science Policy: A suite of science policies ground our work in science excellence and integrity—core elements of PHAC's ability to fulfil its mission to improve the health of all people and communities in Canada. The policies govern our scientific activities so that that the way we operate is aligned with our values and goals. Some of PHAC's science policies include: the *Scientific Integrity Policy*, the *Policy for Research Involving Humans*, the *Policy on Affiliations with Academic, Research, and Health Care Organizations*, the *Policy on the Dissemination of Research and Scientific Findings*, and the *Intellectual Property Policy*.



Science Priority Setting: A rigorous and systematic process to prioritize research activities to inform public health action ensures we are focusing, at the right time, on the scientific questions that matter most for people in Canada. This enables good stewardship of public investments in public health science.

The way forward

This Science Strategy represents a purposeful shift towards a more open and collaborative model for our scientific work and workforce. The Agency will continue to adapt to an ever-evolving landscape to lead and enable science that supports a resilient and proactive public health system.

We cannot work in isolation and do this alone. To advance our science priorities, we will look to create new and foster existing scientific partnerships and to make our scientific activities more visible and operationally transparent. These strategic collaborations will support PHAC's scientific work to remain credible, timely, relevant, and trustworthy into the future.

Moreover, the Agency will initiate a long-term dialogue with Indigenous Peoples about how to best meaningfully weave Indigenous knowledges with the Agency's current science activities. This will include critical reflection on the intersection between western science, Indigenous knowledges, and anti-racism in science to support decolonization of public health science. PHAC will also invite actionable recommendations, informed by Indigenous perspectives, on how to implement an anti-racism lens in its science practices and processes as it implements its Anti-Racism in Science Action Plan. We will seek to strengthen our focus on long-term, reciprocal relationships with Indigenous partners, working to educate and train our science workforce on culturally humble public health science practices, and attract, nurture and retain Indigenous talent in our science workforce.

We will measure the impact of both the Strategy and our science activities. While internal operational science plans will support implementation, science performance measures will help us determine if we are on track so we can course-correct if necessary. We commit to making these impacts, and the science behind them, more visible to people in Canada.

In the spirit of operational transparency, we will establish an External Advisory Committee on Science, which will provide expert advice on implementation and arm's length assessment of our science performance.

With this Science Strategy, we are embarking on a forward-looking journey to ensure the science PHAC leads and enables in the public's interest will make a difference in the areas where people in Canada told us that they need it most. Advancing this Strategy will not only strengthen the evidence base for public health interventions but also promote transparency and inclusivity in the scientific process. Through science, service delivery, innovation, and collaborative action, we can inform action on public health priorities to equitably improve the health of all people and communities in Canada.

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Dr. Sarah Viehbeck
Chief Science Officer

Glossary of terms

Term	Definition
Anti-racism in science	Anti-racism science is the continuous work of actively opposing racism by methodically identifying, assessing, preventing, reducing, and eliminating racial biases in the design, conduct, communication, management, review and use of research, science, and related activities.
Eurocentric perspectives	Views or approaches that are centered on European culture and experiences, often at the expense of other cultural viewpoints.
Equity	The principle of considering people’s unique experiences and differing situations and ensuring they have access to the resources and opportunities that are necessary for them to attain just outcomes.
Evidence	Factual knowledge gained through observation or experimentation in support of a conclusion.
Expert	An individual who possesses a significant depth of knowledge and skills in a specific domain or field, acquired through extensive research, experience, or practice. Experts are recognized for their ability to solve complex problems, make informed decisions, and provide authoritative advice within their area of specialization.
Implementation science	The study of methods to promote the adoption and integration of evidence-based practices, interventions, and policies into routine healthcare and public health settings. Its goal is to identify factors and processes that facilitate or hinder the successful implementation of these interventions, ultimately improving population health outcomes.
Indigenous knowledge	Indigenous knowledge is used to refer collectively to the knowledge systems that are based on the world views of Indigenous Peoples.

Term	Definition
Knowledge broker	An entity or person that facilitates the sharing of knowledge across sectors to support decision-making.
Knowledge mobilization	The reciprocal and complementary flow and uptake of research knowledge between researchers, knowledge brokers and knowledge users—both within and beyond academia—in such a way that may benefit users and create positive impacts within Canada and/or internationally, and, ultimately, has the potential to enhance the profile, reach and impact of science and research.
Research evidence	<p>Research evidence is generated through application of one or more systematic research methods. One such method is the scientific method, which aims to test scientific hypotheses.</p> <p>There is a wide range of research evidence that does not result from application of the scientific method. For example, opinion polls may generate estimates of the prevalence of certain attitudes or beliefs in a target population, but rarely are designed to test scientific hypotheses.⁴⁹</p>
Science	A systematic and iterative process of inquiry and investigation that seeks to understand the natural and social world through the collection and analysis of empirical evidence, the formulation of testable hypotheses, and the development of theoretical frameworks. It encompasses various epistemological approaches, including but not limited to positivism, constructivism, and traditional, including Indigenous, Afrocentric or other cultural knowledge systems, recognizing that different cultures and communities may have unique ways of understanding and interpreting the world.
Science advice	Value-added guidance deriving from scientific and technical knowledge, theories, data, findings and conclusions, to inform policy, regulatory and management decision making.

Term	Definition
Scientific integrity	The condition resulting from adherence to concepts of transparency, openness, high quality work, avoidance of conflict of interest and ensuring high standards of impartiality and research ethics.
Scientist	As a person who has expert knowledge of, and who is typically engaged in the conduct of, science. Government scientist refers to a scientist employed by the federal government.
Social determinants of health	The non-medical factors that influence health outcomes, including socioeconomic status, education, and environment.

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