



Public Health  
Agency of Canada

Agence de la santé  
publique du Canada

Canada

# Artificial Intelligence and Public Health in Canada

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PROTECTING AND EMPOWERING CANADIANS  
TO IMPROVE THEIR HEALTH

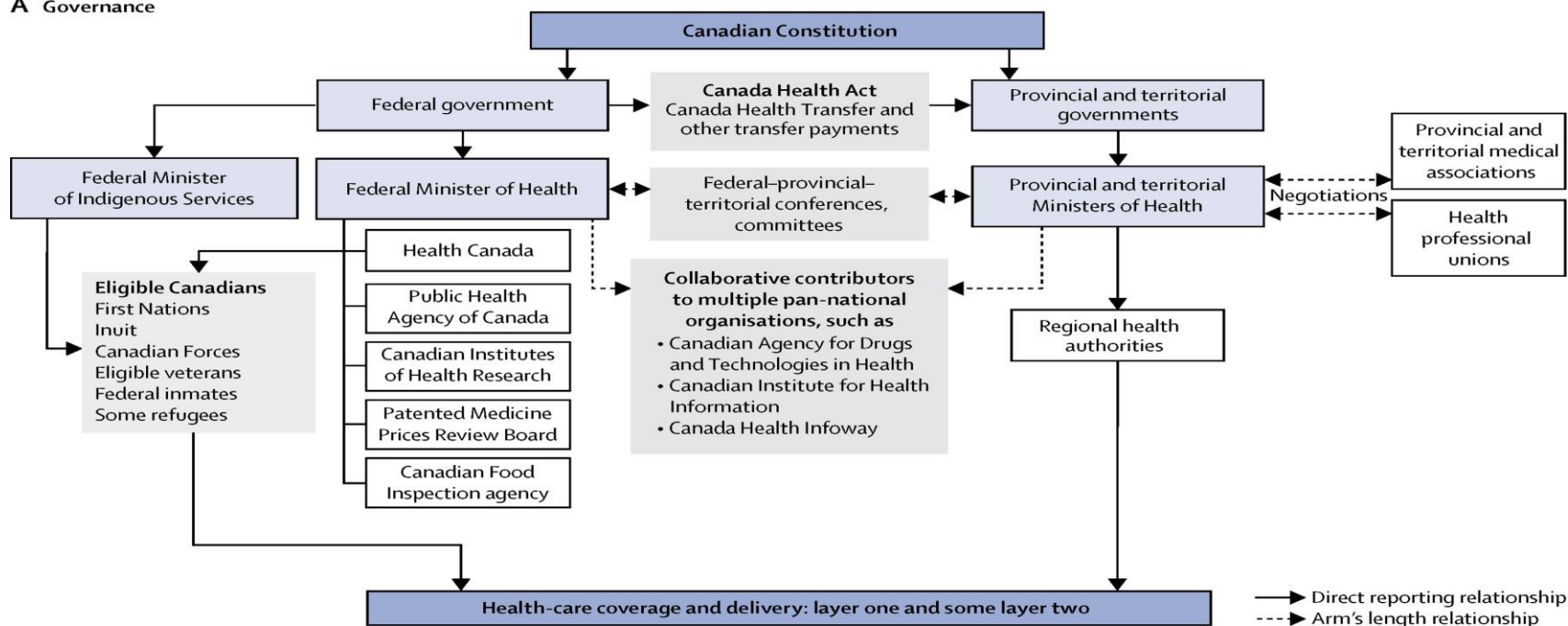


# Overview of the Canadian health system



- Organization determined by the Canadian Constitution
  - Roles at Federal, Provincial and Territorial levels
- Provinces and Territories have most of the responsibility for delivering health and social services
  - Public health
- Collection of 13 provincial and territorial health plans

## A Governance



## B Coverage

	Services	Funding	Administration	Delivery
<b>Layer one</b> Public services (Medicare): all public funding	Hospitals Physicians Diagnostics	Public taxation	Universal single-payer systems Private self-regulating professions	Private professional for-profit and not-for-profit facilities, and public arm's length facilities
<b>Layer two</b> Mixed services: combination of public and private funding	Prescription drugs Home care Long-term care Mental health care	Public taxation Private insurance Out-of-pocket payments	Public coverage is targeted Public regulation of private services	Private professional for-profit and not-for-profit facilities, and public arm's length facilities
<b>Layer three</b> Private services: almost all private funding	Dental care Vision care Complementary medicine Outpatient physiotherapy	Primarily private insurance, out-of-pocket payments, with some public taxation	Private ownership Private professions Limited public regulation	Private professional for-profit facilities

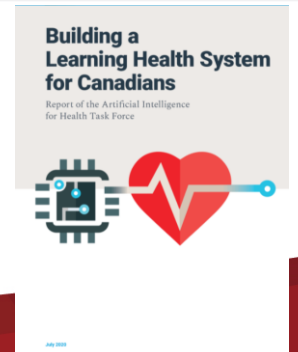
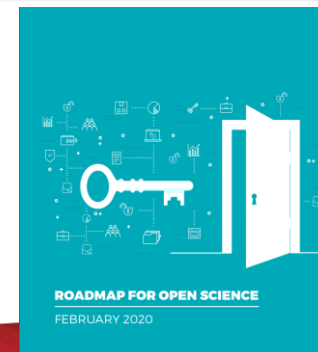
# Government of Canada's Enablers

- Directive on Open Government
- Data Strategy Roadmap for the Federal Public Service
- Open Science Roadmap
- Canada-US Innovation Partnership
- Digital Charter
- Directive on Automated Decision Making
- Global Partnership on Artificial Intelligence
- Government of Canada's Advisory Council on Artificial Intelligence
- Innovation Superclusters Initiative
- G7 & G20 Support
- AI Source List
- Algorithmic Impact Assessment
- Pan-Canadian Artificial Intelligence Strategy
- AI4H: Report of the AI for Health Task Force



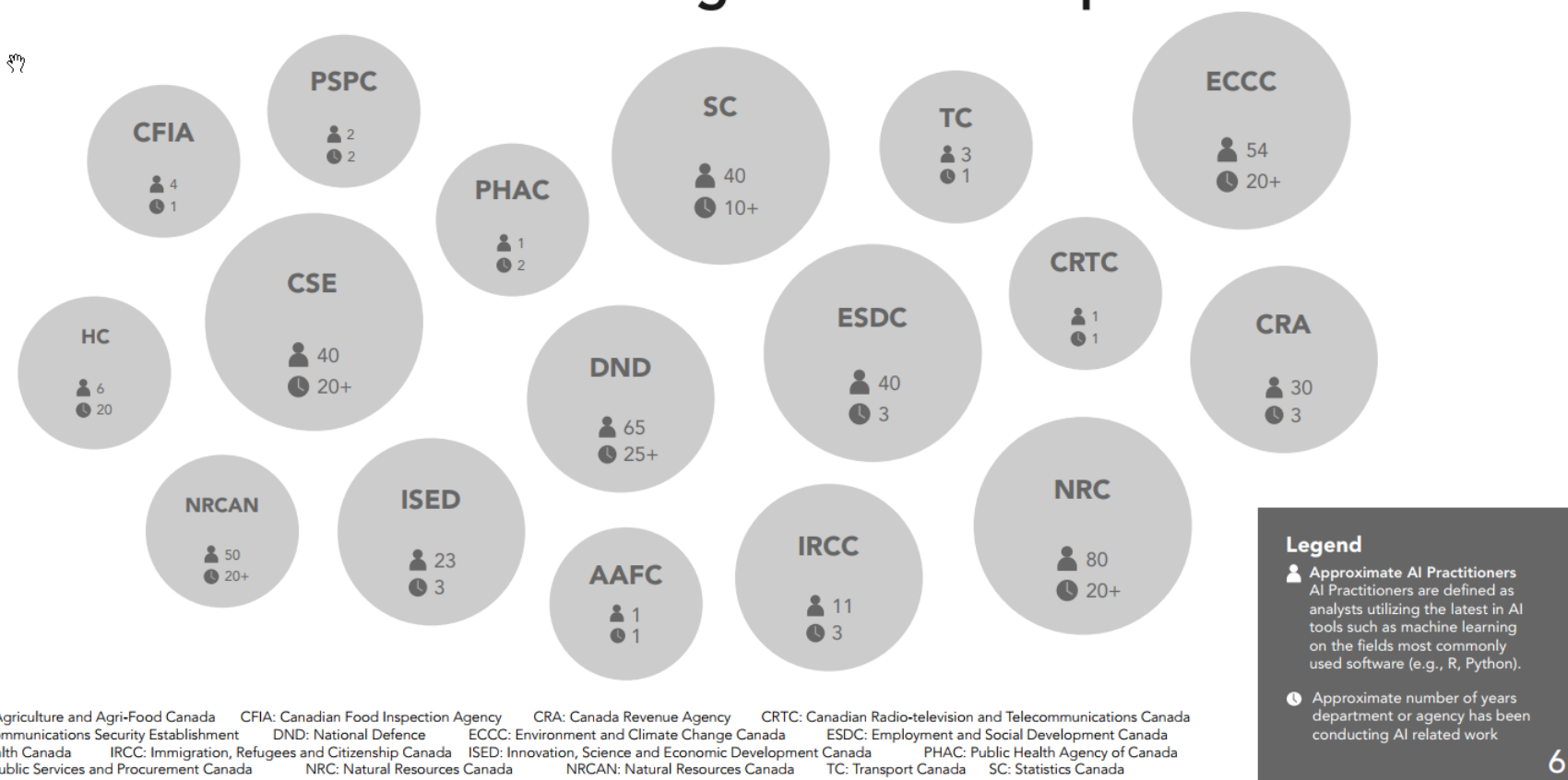
## DATA STRATEGY FRAMEWORK FOR THE FEDERAL PUBLIC SERVICE

A whole-of-government approach to creating, protecting, using, managing and sharing data as a strategic asset, enabling informed decisions that lead to better outcomes and services for Canadians



# Survey conducted in 2018/2019 across government

## Government of Canada Artificial Intelligence Landscape



AAFC: Agriculture and Agri-Food Canada    CFA: Canadian Food Inspection Agency    CRA: Canada Revenue Agency    CRTC: Canadian Radio-television and Telecommunications Canada  
CSE: Communications Security Establishment    DND: National Defence    ECCC: Environment and Climate Change Canada    ESDC: Employment and Social Development Canada  
HC: Health Canada    IRCC: Immigration, Refugees and Citizenship Canada    ISED: Innovation, Science and Economic Development Canada    PHAC: Public Health Agency of Canada  
PSPC: Public Services and Procurement Canada    NRC: Natural Resources Canada    NRCAN: Natural Resources Canada    TC: Transport Canada    SC: Statistics Canada



# How is it being used across Government of Canada?



## Public Health

Early warning analytic tool to detect potential public health threats worldwide



## Natural Resources

Early emergency warning and real-time extreme forest fire prediction and flood mapping



## Transport

Risk-based oversight of air cargo information



## Engagement

Categorization and analysis of massive volume of qualitative input

# AI and Public Health

- 2019 Environmental scan of AI-related activities

- Challenges:

- Training and access to required software
    - Infrastructure
    - Silos
    - Resources: IMIT, capacity, expertise
    - Data access

- Inventory of existing projects

- Machine learning
    - Natural language processing
    - Deep learning

- Science Narrative: Artificial Intelligence in Public Health

- Impact on population health
  - Applications in public health
  - Critical considerations

- Special issue in the [Canada Communicable Disease Report \(CCDR\)](https://www.canada.ca/ccdr)



# AI and Public Health

- CIFAR-CIHR Application of AI Approaches to Tackle Public Health Challenges ([January 19, 2018](#))
  - Partnerships with private sector
  - Access to data
  - Need for training
  - Using AI to improve upon existing methods to answer a question
  - Addressing a novel question or challenge using AI that could not be done using traditional methods
- Wellcome-CIHR-CIFAR Symposium: Ethical, Social and Political Challenges of Using AI in Health
- Community Dialogue on the Future of Canadian Public Health Systems
  - Public health data systems
  - Public health workforce planning
  - Infodemiology: public trust and communication



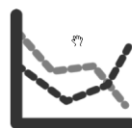
# AI and Public Health

- Best Brains Exchange: Building a strategy for artificial intelligence in public health: centering partnership, equity and interdisciplinarity
  - What characterizes the public health niche with the AI sphere?
  - Who should be our on-going partners to inform the strategy?
  - What are the key barriers/facilitators to implementing AI in public health?
  - What are the ethical considerations/guiding principles that we should prioritize, and how do they apply in the public health context?
  - What are the research/public health priorities?
  - What are the organizational needs?
- Pan-Canadian Health Data Strategy (pCHDS)
  - Improve health data collection, standardization, and use

# Capacity building

- Community of Practice
- Canadian Institute for Health Research
  - Health System Impact Fellowship – [AI and Public Health Stream](#)
    - Data science, computer science, AI computational methods

- Canada School of Public Service



**Data:** skills and tools required to conduct analytics, develop and test hypotheses, visualize and share reproducible results



**Design:** skills related to techniques and tools used in user experience research and service design in a digital age



**Artificial intelligence and machine learning:** practical experience in developing and using algorithms to learn from and make predictions or decisions based on data

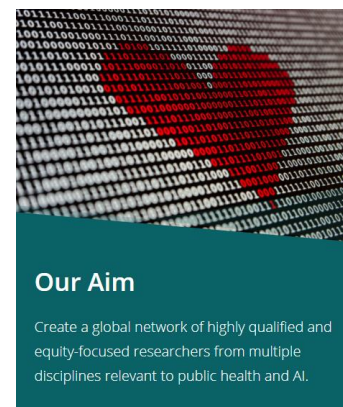


**DevOps:** application & Web development and coding; includes bootcamp in developing web and mobile applications



**Disruption:** understanding technology and how it's impacting and could impact Canada

- Artificial Intelligence for Public Health ([AI4PH](#))
  - Emphasis on trainees and researchers in public health domains (law, policy, epidemiology, health promotion, ethics). July 13-14 & July 20-21, 2021



## Current work on AI in public health

- Earth observation data for vector-borne disease risk mapping: tool for surveillance and assessment of public health risk
- Public health geomatics unit R&D, service and infrastructure development
  - Develop innovative approaches and services and to optimize the use of geomatics, tele-epidemiology, epidemiology and risk modeling applied to public health in relation to infectious diseases
- Develop a framework for prioritization of foodborne pathogen illness clusters for successful public health intervention using machine learning-based analysis of integrated surveillance and outbreak population genomic datasets.
- Mapping the risk of exposure to COVID-19 using neural network and mobility data

## Current work on AI in public health

- Incorporating advanced data analytics into a health intelligence surveillance system
  - Detect emerging threats
  - ID populations vulnerable to emerging threats
  - Predict the health impact and spread of emerging threats
  - Advance visualization tools that communicate the above
- Detecting Substance-Related Harms signals in media and social media
- Creation of a Canada Immunization Guide Q&A chatbot for health care providers
- Machine learning (ML) approach for risk prediction of dementia mortality
- Data trust for health data – identifying the needs

# Overarching themes - thoughts



Need to ensure that everyone that is impacted, benefits and uses AI is involved in this process. Many areas need to be addressed and come together to make this possible. Ensuring that the right principles are followed: ethics, equity, transparent, etc.



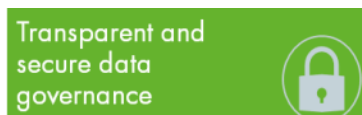
Technologies should be applied to address a public health question, rather than trying to fit the public health issues to the technology.



Key need that must be addressed to be successful. However, one must be open to broadening collaborations – expertise may not need to reside internally, look outside for further collaborations. Identification of what are the skills and competencies needed. How do we partner with academic institutions to assist in developing the skills at the undergraduate or graduate levels?



Public health can benefit not only from data collected through surveillance systems and outbreak investigations, but can learn from numerous other data sources. Need to ensure that current data is standardised.



Trust, clear roles and responsibilities, limitations to use, data dictionaries and meta data, data collection descriptors.



Opens new doors to data sources, partnerships, collaborations previously not present. Who have we not engaged with?



Communities/citizens need to be engaged. COVID-19 has shown the need for timely dissemination of data, analyses, and the need to engage at different levels to build trust.



What are we evaluating? Tools, results, outputs? Need to include evaluation of how the information is used.

# Questions

- Lots of activities to date, but a lot more to come in the next year
  - How and/or where do we go from here?
- Are there any key questions that we should ask in developing a strategy?
- What are your key priorities related to AI and public health?



Thank you!

