



**Genome**Canada

AUGUST 4, 2023

# **Genomics Rising to the Challenge**

**Pre-Budget Submission to the  
House of Commons Standing  
Committee on Finance**



## Recommendations

**Recommendation 1:** Support the *One Million Genomes Initiative (1MG)* as a declaration of Canada's commitment to developing and delivering large-scale genomic datasets that support cross-sectoral life sciences innovation for national impact and security. Now is the time for made-in-Canada national genomics data assets and sovereignty in order to build a resilient biodata-driven industrial base and economy around our own supply.

**Recommendation 2:** Building from the Bouchard report, modernize and strengthen Canada's R and D ecosystem for greater national impact through changes in governance, strategy, delivery and renewed investment in research talent.



## Introduction

Genome Canada is an independent, federally funded not-for-profit organization and the national leader for Canada's genomics ecosystem at home and abroad. Working in partnership, and across sectors, we support the prosperity and well-being of communities across the country by:

- coordinating large-scale national [genomics research and innovation initiatives](#) to generate solutions to Canada's biggest challenges;
- supporting a pan-Canadian [network of Genome Centres](#) that drive regional economic development and strong industry connections; and
- promoting the equitable and responsible [adoption, implementation and commercialization of genomics](#).
- [See our 2022-23 Annual Report](#) for a roundup of our national impact.

Genome Canada received \$136.7M over 2 years via Budget 2021 which announced a new *Pan-Canadian Genomics Strategy* (PCGS). The PCGS (anticipated this fall) is intended to drive Canada's global competitiveness, with a focus on targeted measures to improve cross-economy genomics applications and downstream commercialization. We also await our results from the [Strategic Science Fund competition](#) that would see long-term investment in Canada's mobilization of the genomics research and innovation community around national challenges.

A key takeaway from the March 2023 [PCGS What We Heard consultation report](#) was *the need for made-in-Canada large-scale genomics data generation and coordination to drive economic and health benefits for Canadians. **Building on the PCGS, future investment in national genomics data assets across sectors must be a priority in order to achieve broader economic and security outcomes for Canada.***

## Canada's One Million Genomes Initiative

Twenty years ago, [sequencing the first human genome](#) launched a new era in health and life sciences. This early promise has grown into a [biological revolution](#) driven by decreases in cost and time for sequencing, the ability to manage and analyze massive amounts of data and the development of tools like CRISPR and mRNA technology.

Data is at the core of this bio-revolution, the key driver for innovation in life sciences—especially the large datasets that allow us to tease out complex, multigenic traits important for impact in health, agriculture and the environment. Large-scale data enables better diagnostics, new treatments, more secure food supplies and cleaner environments.

Genomics data grows economies, saves lives and augments climate actions.

Several countries have launched ambitious national genomic data initiatives to generate and analyze large-scale datasets for domestic health outcomes. These include the [UK's 100,000 Genome Project](#), the [US's All of Us Research Program](#) and the [EU's 1+ Million Genomes Initiative](#). While Canada could benefit from the innovation from such initiatives, *it is essential as a matter of national economic and health security that we develop our own national genomics data assets and capabilities.*

A large-scale coordinated *Canadian* dataset will reflect national priorities. It will help ensure we are future-proofed for emerging health challenges in rapidly growing and aging

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COVID19 exposed Canada's health data challenges and motivated innovative solutions like the Canadian COVID19 Genomics Network ([CanCOGeN](#)). A pan-Canadian public-private consortium, CanCOGeN brought together a federated, fragmented system into a coherent whole and delivered successfully against its objectives. It used marginal federal dollars to [connect existing activities, expand new ones, build capacity, consolidate data access and coordinate efforts nationally](#).

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communities and a changing climate. It will be foundational to Canada's *Biomanufacturing and Life Sciences Strategy 2.0*, intended to invest in new medical countermeasures for post-COVID health emergency readiness and security. It will support biomedical and precision health innovation by companies based in Canada; bolster Canadian health care systems and research initiatives; incentivize the attraction, training and retention of Canadian bio-talent; and represent Canada's diverse populations to address health inequities.

And beyond health applications, it will seize huge national opportunities for genomics innovation in agriculture, natural resources, and the environment. With our economic strengths and our natural endowments, building and coordinating *home-grown* data assets in these strategic sectors will create a major leg up for Canada and help ensure agricultural and environmental security.

*In today's volatile world, now is the time for made-in-Canada genomics data capabilities and sovereignty, building a resilient biodata-driven industrial base and economy around our own supply.*

**Recommendation 1: Support the One Million Genomes Initiative (1MG) as a declaration of Canada's commitment to developing and delivering large-scale genomic datasets that support cross-**

**sectoral life sciences innovation for national economic impact and security.** It would comprise:

- **500,000 human genomes** representative of the people of Canada
- **250,000 genomes** to provide baseline information about Canada's environment – terrestrial ecosystems, lakes, rivers and oceans, and microbial communities
- **250,000 genomes** to create national datasets for innovation in agriculture, fisheries, and natural resources
- **A network of initiatives and partners** to coordinate and build large-scale datasets and infrastructure accessible to Canadian industry, health care systems, researchers and policymakers
- **Data portals via an open innovation ecosystem** to foster Canadian innovation, fueled by collaborative initiatives under the Pan-Canadian AI Strategy.
- **Common, national approaches** for consent, metadata management, data governance, ethics and security, as well as a gateway for international partnerships

We will reach the *One Million Genomes* target by building on existing health research and cohorts such as [CanPath](#), [Pan-Canadian Human Genome Library](#), [Canadian Longitudinal Study on Aging](#), [CHILD cohort study](#) and launching new, targeted initiatives to address gaps. We will build on data assets being developed by Genome Canada's [Climate Smart Agriculture and Food Systems Challenge](#) and similar initiatives by the National Research Council (NRC) and Agriculture and Agrifood Canada.

The total cost of such an initiative would be \$150M annually (for sequencing, capacity building, coordination etc.) ramped up over 10 years. Existing investments by [Genome Canada](#), [CFI](#), [DRAC](#), [CIHR](#), [NRC](#), and others - along with provincial and regional initiatives - can be leveraged, generating significant impact and returns with incremental new federal investment.

## Modernizing Canada's R & D Ecosystem

Science and research are essential to a country's well-being: it contributes to healthy people, a healthy economy, and a healthy planet. A well-functioning research ecosystem provides the foundation for science-based industrial strategy and ensures sustained domestic capacity to respond to national policy challenges. As seen with the [US CHIPS and Science Act](#), significant [investments in UK research](#) and the ongoing acceleration of Chinese S&T capacity, a strong R & D system is an essential tool for global competitiveness, productivity and growth, and national security.

Canada's R&D system is fragmented, disconnected from broad policy goals, and not framed as a strategic asset for the country. The March 2023 report of the [Advisory Panel on the Research Support System](#) ("the Bouchard report") outlined these challenges and made bold calls for change.

**Recommendation 2: Modernize and strengthen Canada's R and D ecosystem for greater national impact through changes in governance, strategy, delivery and renewed investment in research talent.**

Suggestions to achieve this recommendation are outlined below.

## Governance

### Establish a made-in-Canada version of the White House OSTP

In order to achieve broader national economic and security outcomes, Canada would benefit from greater whole-of-government coordination around S&T matters, including alignment with key policy goals and clearer accountability. Through the [White House Office of Science, Technology and Policy](#) (OSTP), the US has made this a key feature of its S&T ecosystem - and it has made science a strategic driver for its economy, national security, and policy objectives. A Canadian version is needed with a cross-governmental coordinating function, aligning efforts by the granting councils, NRC, science-based departments, third-party national research organizations and the provinces. This would ensure existing funding is aligned with policy priorities and new investments are integrated within a national economic, environmental, health and security frame.

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Building on and coordinating Canada's population cohorts for better health outcomes for Canadians was a key recommendation from the [2022 report by CIHR and Genome Canada](#). One example is the *Canadian Partnership for Tomorrow's Health (CanPath)*, Canada's largest population-health research platform with data from over 330,000 Canadians. It comprises the partnership of seven regional cohorts that, together, span all ten provinces. CanPath aims to establish the first Canadian federated national biobank, combining health data from all provinces and territories, and creating a 'centralized' platform for scientific and biomedical discoveries and innovations that benefit Canadians today and in the future.

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## **Establish a Council of Advisors on S&T**

To support this function, the government could establish a Council of Advisors on S&T to provide advice to the Prime Minister and Cabinet and help inform and identify emerging priorities. Accountabilities could include annual reporting against policy-linked KPIs and global benchmarks, supporting policy alignment, outcome delivery and competitiveness.

## **Strategy**

### **Adopt an ecosystem approach to federal science and technology**

Fragmentation and misalignment are symptoms of a lack of clear strategic S &T direction. They encourage silos, with organizations and initiatives pursuing independent, unlinked goals and competing for resources. The federal government has made significant strides in establishing strategic direction in certain areas – the [Pan-Canadian AI Strategy](#), the [National Quantum Strategy](#), [Pan-Canadian Genomics Strategy](#) and the [Biomanufacturing and Life Sciences Strategy](#) are good examples. Clear strategy can contribute to greater coordination and impact through an explicit understanding of how key elements of a strong, healthy system fit together.

- **Foundational research:** There is an important place for investigator-led research initiatives through the granting councils' open competitions. Consistent and predictable funding to these agencies will ensure a broad base of research activity across disciplines to fuel strategic initiatives and graduate training.
- **Mission-driven research:** Canada must prioritize and make *strategic investments* in areas where we have a strong advantage or national opportunity/need. These should be clearly signaled to the research community to encourage alignment. The government should explore the use of [ARPA-style investments](#) that bring together academic and industry researchers on high-risk short-term initiatives, alongside arms-length dedicated research initiatives with specific strategic mandates and timelines.
- **Knowledge mobilization and translation:** National third-party organizations like Genome Canada and other initiatives that actively link academic/government research with industry are valuable ecosystem contributors by de-risking adoption by industry and supporting innovative research and innovators in finding markets. Knowledge translation ensures a nimble policy and regulation regime.

### **Define coordinating responsibilities for strategic delivery**

The previous changes will require implementation supports. Coordinating responsibility for strategic delivery could be placed with an agency with experience, accountable to the newly created OSTP. This agency could be mandated to deliver national and international research missions through new or existing mechanisms; horizontal coordination and accountability with CFI on strategic research infrastructure and operations; and connections to federal innovation funding programs to drive downstream impact and policy coherence.

### **Develop a training and skills strategy for science and technology**

As Canada navigates economic, climate and geopolitical disruption, it will be next-gen talent who will lead greater innovation, build a resilient economy and produce the insights to tackle big challenges. Talent is the guaranteed outcome of investments in research - a significant portion of basic research funding supports trainees. In the global race for S&T talent to drive growth and productivity, it is essential that we scale investment in student



work-integrated learning and research training and in equity and capacity-building supports for trainee diversification.

**Attract, develop and retain talent by reinvesting in Canada’s research ecosystem**

In concert with changes to modernize the ecosystem, significant increases to bring Canada in line with research investments with competitor countries is essential. Canada should expand core research funding through the granting agencies by 10% annually over the next five years and increase the value of graduate scholarships by 50% across all categories, double the number of awards and index to inflation.





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