



ANNUAL IMPACT REPORT FOR HEALTH INNOVATION 2017-18

This report is a comprehensive summary of the outcomes and early impacts in 2017-18 resulting from research and innovation investments by Alberta Innovates' Health Innovation. The information is collected annually for the purposes of accountability and learning.

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ACKNOWLEDGEMENTS

The outcomes and early impacts demonstrated by Alberta Innovates through our health research and innovation investments reflect the achievements being made by our researchers and members of their research groups, trainees, partners, and many more. We gratefully acknowledge the effort of our research community and partners in compiling and submitting their achievements for this report.

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EXECUTIVE SUMMARY

Alberta Innovates is committed to evolving Alberta's research and innovation system to be more responsive to the needs of Albertans and more focused on impacts. This includes supporting research and innovation activities that focus on the priorities of Albertans, as well as working with our partners to cultivate a more seamless innovation system with a clear path from discovery to impact.



Alberta Innovates has a long history of collaborating with other funders to advance impact assessment in the health sector. This includes serving as a leader in the development and use of shared impact assessment tools and frameworks. Each year since 2014/15, Alberta Innovates has published an annual impact report to:

- Demonstrate to Albertans how investments in research and innovation are contributing to their health and wellbeing, as well as to economic diversification in the province;
- Share the impact-related evidence that helps inform our decision-making with the broader innovation ecosystem; and
- Assist the research community in responding to the need to more fully and accurately report on the achievements they make through publicly funded research activities.

The 2017/18 Impact Report highlights the multitude of ways in which Alberta Innovates is making a difference for Albertans through our strategic investments in health. Yet because this report does not capture the full spectrum of Alberta Innovates' investments in the health sector and beyond, it reflects only a portion of the value that we are delivering to Albertans. As Alberta Innovates continues to integrate evidence capture and reporting activities across its newly consolidated agencies (i.e., BioSolutions, Energy and Environment Solutions, Health Solutions and Technology Futures), we look forward to the future of research impact assessment in the province.

HEALTH RESEARCH AND INNOVATION (R&I) IMPACT HIGHLIGHTS (2017-18)

\$

Catalyzing Health R&I
FROM DISCOVERY TO IMPACT*

\$79.7 MILLION IN ANNUAL INVESTMENTS

563
ACTIVE R&I PROJECT AND PEOPLE INVESTMENTS

Collaborating to accelerate health R&I

Moving **research into practice** in partnership with Alberta Health Services

65 Industry partners



21 Real-world health solutions tested in Alberta's Health System



78% of supported projects involve end-user partnership & engagement

Making Health R&I easier to do in Alberta

Streamlining access to data, analytic expertise, ethics review, and the patient voice



50+ linked health databases and analytic support accessible through a single window

85% of data requests completed in 2 days



1,600+ research projects enabled

1,130 clients served

133 patients/families registered to support research

Enhancing health and wellbeing

Proportion of investments advancing Alberta's R&I targets**

38%

Improve quality of care



10% Accelerate health and wellness innovation

7% Skills development / people investments

5% Improve the robustness of health data

36% Reduce the burden of disease

Growing our economy



2,374

knowledge-based workers supported

\$1



\$2.71



follow-on funding secured by award holders

\$1



\$3.21



leveraged by Alberta Innovates through partnerships

*This scorecard reflects self-reported impact data submitted by 55% of active award holders.

**Investments mapped by primary outcome to the R&I targets in the Alberta Research and Innovation Framework

INTRODUCTION

Alberta Innovates invests in R&I activities to improve the health and well-being of Albertans and create health-related social, environmental and economic benefits.

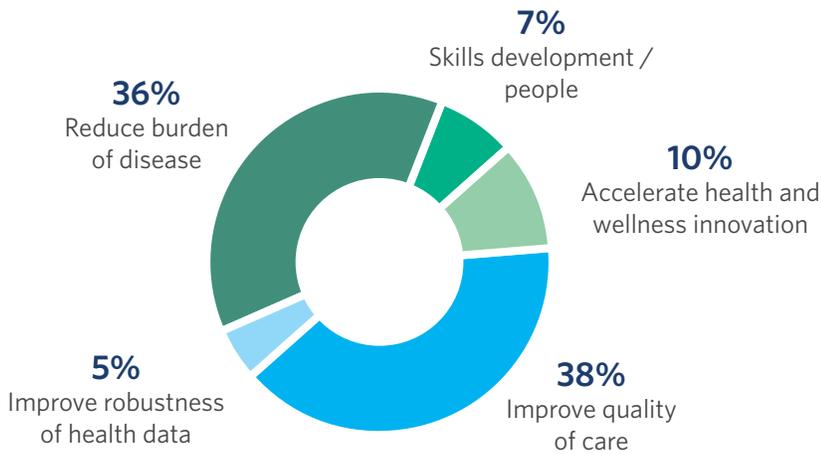


AI's key health sector investments are:

- Supporting R&I projects that improve health outcomes through the development of new treatments, technologies, and models of care;
- Accelerating the translation of new discoveries into care by partnering with key entities in the innovation pipeline, from medical device makers to small and medium-sized enterprises (SMEs);
- Linking health systems with SMEs to facilitate the co-design of solutions that address real-world health problems;
- Supporting the development of highly-skilled people through training and early career development programming;
- Coordinating and integrating Alberta's R&I system through the establishment of provincial platforms and collaborative partnerships that:
 - » Increase the prevalence and quality of patient-oriented research;
 - » Facilitate high quality, integrated and efficient clinical research;
 - » Provide a streamlined, effective, collaborative and integrated model for ethics review of human health research; and
 - » Put secondary health and health-related data to work.

Based on the committed value of active awards and grants in 2017/18, Health Innovation’s portfolio of investments align to Alberta’s R&I targets as follows:

FIGURE 1
Proportion of investments advancing Alberta’s R&I targets



The support that AI provides through its Health Innovation portfolio (herein referred to as “Health Innovation”) enhances the science knowledge base in Alberta. More specifically, AI’s investments are used to train, attract and maintain leading researchers in Alberta, and advance high quality R&I projects that address the needs of the population. This report provides an overview of the achievements made through the support and services of Health Innovation in 2017-18.

Measuring Achievements

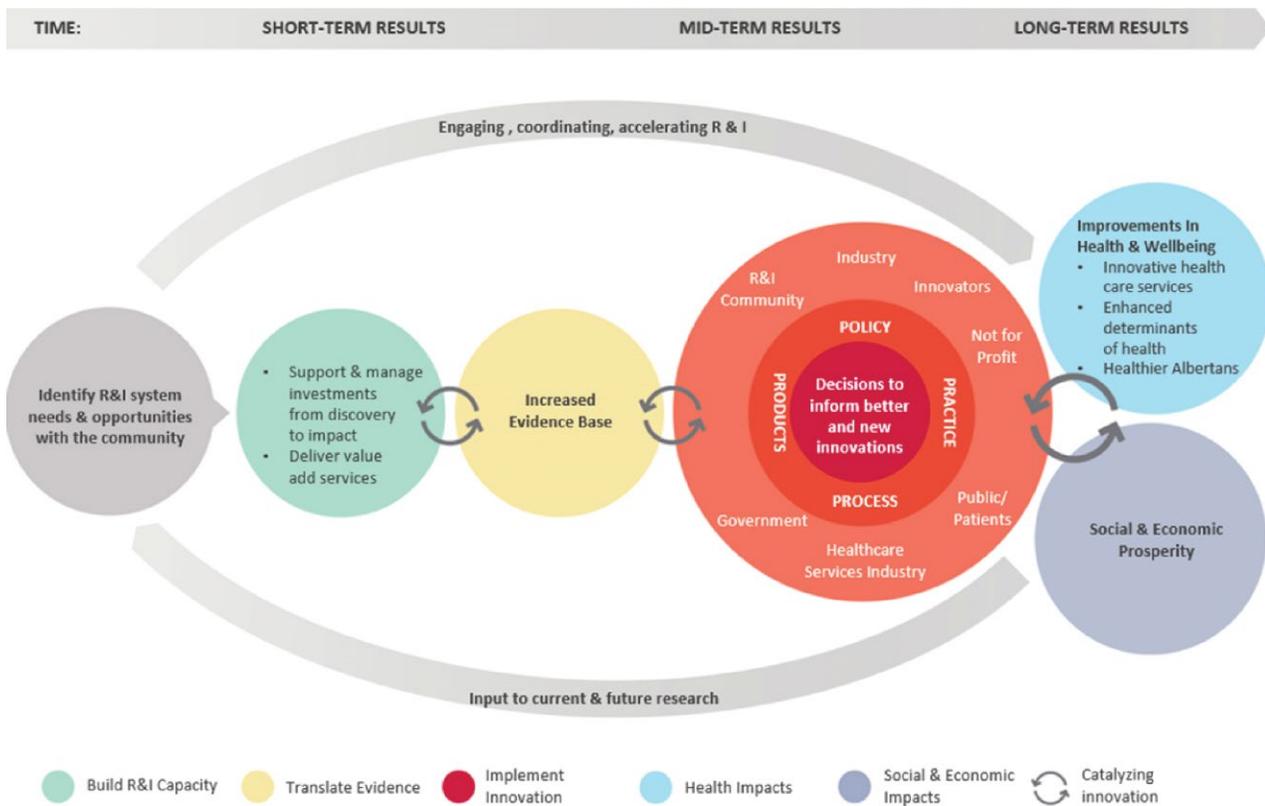
The outcomes (and more distal impacts) of AI’s support and services are not always immediately apparent. This is because a sufficient period of time must pass between when research is initiated, when new knowledge is generated, and when specific applications (e.g., new products, policies, or practices) are developed. Additional time lags are often experienced before widescale adoption/diffusion is achieved.

Given these time lags, impact pathways represent an effective way to illustrate the people, processes, and tools through which research and innovation are translated into outcomes and impacts. By monitoring progress along these pathways, AI and its stakeholders are better able to trace incremental progress and deliver the right supports and services at the right time to optimize the R&I ecosystem.

The figure below illustrates the impact pathways developed for Health Innovation. It highlights the importance of building R&I capacity in Alberta to increase the health-related knowledge and evidence base. More importantly, it shows that innovation is necessary to move advancements in knowledge into real-world changes that improve our health, well-being and economic and social prosperity.

AI uses a series of indicators to monitor the progress being achieved through its investments in projects (i.e., awards and grants provided to researchers) and people (i.e., studentships and fellowships awarded to trainees). An online reporting system called Researchfish® is used to ensure routine and systematic data collection on these indicators across the majority of AI's health-related grant investments. The majority of this data is self-reported by award holders. Data on the progress being achieved by other initiatives in Health Innovation, such as provincial platforms and partnerships and collaborations, is collected from the leads of those initiatives as well as through administrative systems. Please see Appendix A for more information about the methodologies used for this report.

FIGURE 2
Impact Pathways for Health Innovation



Health Innovation Strategies

Health Innovation's standing mission is to catalyze the development, growth and sustainability of an impact-focused health innovation ecosystem and economy in Alberta. In 2017-18, Health Innovation used three strategies for achieving impact. These include strategic investments, provincial platforms, and partnerships and collaborations.

Strategic Investments

Strategic investments represent a key mechanism through which Health Innovation helps highly-skilled people engage in collaborative, interdisciplinary research and innovation activities. In 2017/18, these investments generated benefits such as:

- The implementation of a new surgical pathway for Alberta patients that reduces the length of stay in hospital by 2.5 days, thereby resulting in a greater patient experience and an average savings of \$4,500 per patient.
- The implementation of a new provincial rectal cancer intake pathway designed to improve patient outcomes.
- The adoption of new recreational water testing innovations and management policies by Alberta Health, now being implemented by the Provincial Laboratory.

Provincial Platforms

Health Innovation also invests in several provincial platforms to assist researchers and innovators in overcoming support and service challenges, towards the goal of increasing the success of research and accelerating the application of new knowledge.

Key focus areas for the provincial platforms in 2017/18 were: integrating and making health data available for secondary use (e.g., research); creating research and care that puts the 'patient-first'; and streamlining processes for ethics review and clinical research. These platforms and the diverse connections that underpin them optimize the ability of our health research and innovation system to identify and respond to Alberta's health needs.



Collaborations and Partnerships

AI works through partnerships and collaborations to accelerate the process of putting health solutions into practice, and in turn, serve the needs of Albertans. This includes brokering linkages that bring different organizations and people together to jointly overcome barriers within the life sciences innovation system. In addition to pooling expertise and leveraging resources, these linkages stimulate the exploration of cross-sector opportunities to expand and optimize the use of research findings and achieve health, social, environmental and economic impacts. These partnerships and collaborations also assist AI in attracting additional investments to Alberta to support innovation, foster new technologies and solutions and contribute to the creation of a thriving health sector.

To translate research into solutions, Alberta Innovates collaborates with partners in the health system, publicly-funded post-secondary institutions, small and medium-sized enterprises (SMEs), multinational enterprises (MNEs), government and others. These collaborations and partnerships also assist in targeting solutions to meet the identified needs of the health system and to create an environment for innovation that will make a difference in the lives of Albertans.^a

^a Note that this report does not include all of Alberta Innovates' industry partnerships and collaborations. Within Health Innovation, some recently implemented industry partnerships and collaborations were excluded as it is too early to report on their progress, outcomes and impacts.

PROGRESS TO IMPACTS

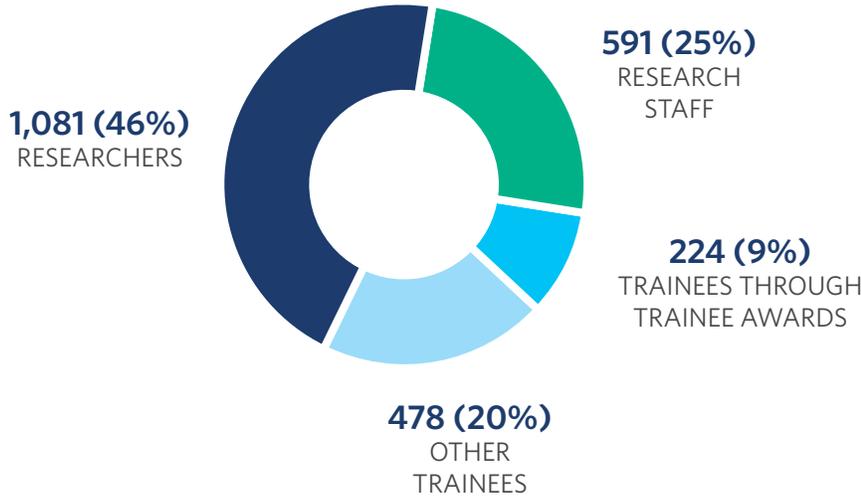
In 2017-18, the progress and achievements of 311 award holders were monitored through Researchfish^b and are reported in aggregate herein. This report also includes insight into other investments made by Health Innovation during that time and monitored using other mechanisms (see Appendix A).

Building Research and Innovation Capacity

Strategic Investments

Our strategic investments contributed to Alberta’s strong science knowledge base by supporting human capacity within the province’s R&I ecosystem. This support assists individuals or groups in developing higher skill levels and enhancing their abilities to meet continued and emerging health needs within and outside of Alberta.¹ In 2017-18, grants and awards provided through Health Innovation directly or indirectly supported 2374 researchers, research staff and trainees (Figure 3).

FIGURE 3
Building Human Research Capacity

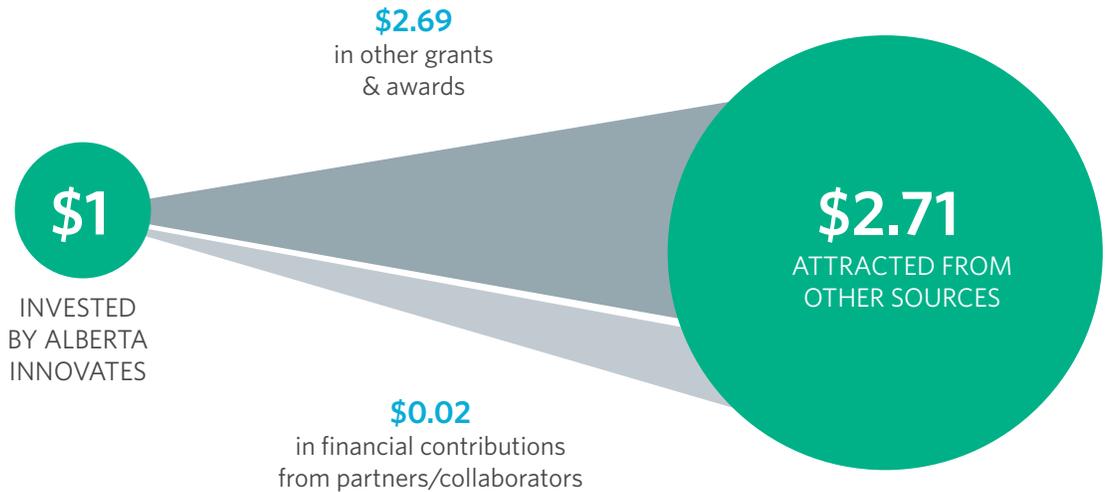


^b This represents 55% of the grants and awards managed by Health Innovation in 2017-18. Those excluded from reporting in Researchfish[®] included some legacy grants and awards, as well as funding such as travel and conference grants, transitional funding, etc.

The high calibre of researchers and trainees supported by AI is broadly recognized. This is exemplified by the additional investments that they attract and by the awards and recognitions they receive. Together, researchers and trainees (collectively referred to as “investigators” herein) supported by Health Innovation attracted \$106.2 million in additional funding from other sources in 2017-18. Approximately \$105.3 million of this was obtained by award holders through successful follow-on grant and award applications with other funding agencies. Another \$866,454 was received in financial contributions from collaborators/partners.^c This equates to an additional \$2.71 in financial support for every \$1 invested through AI during that period (Figure 4).^d

Overall, researchers attracted nearly 24 times more in additional funding than trainees and the average value of additional funding per researcher was 60 times higher than that of trainees (Table 1). Genome Canada, which pledged or provided \$38.2 million through four individual grants and awards, was the largest single contributor of additional funding to investigators (Table 2).

FIGURE 4
Growing AI’s Investments



^c Approximately 10% of collaborations/partnerships reported included direct financial contributions from partners. However, this proportion and the value of direct contributions is likely underreported as contractual confidentiality agreements limit reporting related to 33 (4.2%) collaborations/partnerships.

^d It is important to note that a smaller number of award holders were tracked in 2017/18 (311), relative to 2016/17 (363). Additionally, Researchfish® changed the way it collects information on additional funding in 2017/18. Both of these changes contributed to an apparent drop from the \$3.47 in leveraged funding per \$1 spent by Alberta Innovates in 2016/17.

TABLE 1
Additional Funding Acquired by Investigators

	TYPE OF INVESTIGATOR		
	Researchers	Trainees	Overall
No. of grants and awards funded by Health Innovation	87	224	311
# (%) with additional funding	50 (57%)	78 (35%)	128 (41%)
Additional funding (in \$1000s)	\$101,028	\$4,310	\$105,339
Average funding per AI-funded investigator (in \$1000s)	\$1,161	\$19	\$339
Additional funding per \$1 invested by AI (Health Innovation)	\$2.45	\$0.26	\$1.87

* Excludes direct financial contributions from collaborators

TABLE 2
Top Sources of Additional Funding

	Additional Funding Pledged to or Received by Investigators (in millions)	Number of Grants or Awards
Genome Canada	\$38.2	4
NoNo Inc.	\$15.4	1
Canadian Institutes of Health Research	\$13.9	56
Canada Foundation for Innovation	\$9.8	3
Centre for Infections Services	\$4.7	1
Alberta Economic Development and Trade	\$4.3	2
Social Sciences and Humanities Research Council	\$2.8	5
Alberta Health Services	\$2.0	8
Juvenile Diabetes Research Foundation	\$1.3	1
National Institutes of Health	\$1.4	3
Other	\$10.3	277
Total	\$104.9	361

* Excludes direct financial contributions from collaborators

**Some award holders received follow-on funding from multiple sources, resulting in their grant being included more than once in the above table.

IMPACT EXEMPLAR

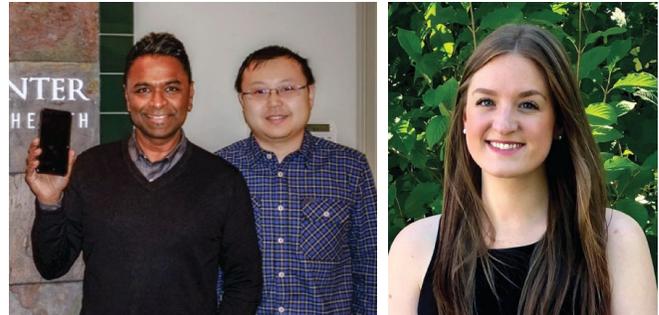
BUILDING THE CAPACITY AND RESILIENCE TO MAKE A DIFFERENCE

Pursuing a career in research involves uncertainty and risk - from the infinite number of research questions one may explore to the challenges new graduates face in marketing their skills and experience to prospective employers. With the support of Alberta Innovates and partners, trainees in the province are getting more experience in identifying and solving problems that matter most to patients, practitioners, and businesses.

The trainee that helps Albertan companies gain a competitive edge

Much like researchers, companies face continual pressure to bring new and useful ideas to life. Yang Liu is a serial Mitacs fellow (co-funded by Alberta Innovates) who has made a post-graduate career out of helping local companies bootstrap the development of data-driven innovations. His latest project involves helping the Chokka Center for Integrative Health (Chokka) digitize and test the usability and efficacy of a novel screening tool for psychiatric conditions. Prior to connecting with Yang, Chokka had a paper-based version of the screening tool in place. Yang drew on his expertise in behavioural science and computer-based laboratory experiments to build a proof-of-concept app version of the tool and collect enough data to help Chokka assess the efficacy and potential of online screening. The results for usability and office workflows were particularly promising, resulting in the green-light for contracting a software developer to start building out Chokka's cloud services. Yang is now managing that process while helping the company make the most of its data for predictive modeling and computational psychiatry.

In reflecting on his career in research, Yang describes it as risk taking that may change the world. He looks forward to a career in consulting where he can help companies engage more successfully with data-driven innovation.



Yang Liu (right) with host at Chokka Center for Integrative Health Brooke Russell

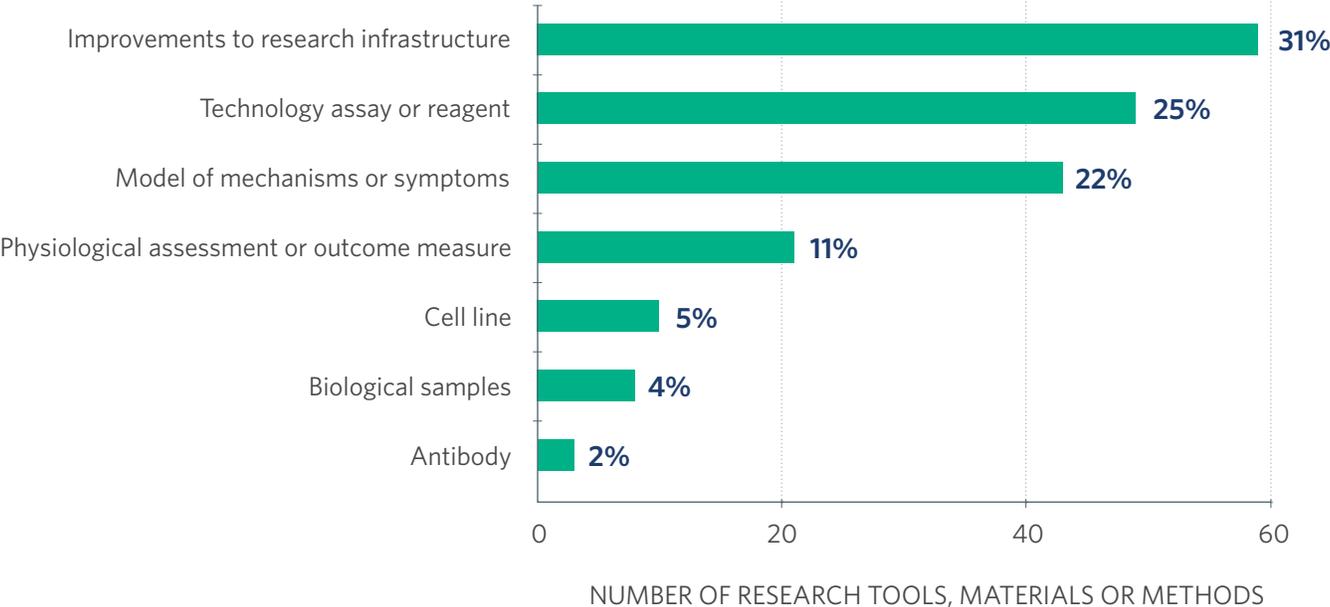
Realizing the many potentials of patient-oriented research

Engaging patients as partners in research can pay off socially, scientifically, and professionally. Brooke Russell, a recent SPOR Graduate Studentship awardee (master's level), has managed to craft a competitive research trajectory by focusing on the concerns and experiences of pediatric oncology patients. Recently named a Rising Researcher by the Canadian Child Health Clinician Scientist Program, Brooke leveraged her SPOR studentship to become proficient in tools and best-practices for patient-oriented research. This assisted her in strengthening relationships with important community stakeholders, such as the long-term survivor clinic at the Alberta Children's Hospital and Kids Cancer Care. With a professional network that now spans the globe and the ability to align research priorities with the needs of vulnerable populations, Brooke is making a difference for patients while also increasing her relevance and competitiveness as a researcher. She has secured three additional scholarships from the University of Calgary based on her research productivity, a fellowship in the Training in Research and Clinical Trials in Integrative Oncology (TRACTION) program, and Doctoral Awards for her PhD studies from Alberta Innovates and the Canadian Institutes of Health Research.

AI-funded investigators collectively received 264 awards and recognitions. Seventy-five percent of these involved receiving research prizes, poster or abstract prizes, or a personal invitation to be a keynote speaker, reflecting opportunities in which investigators could also share and advance the research supported by AI. Recognition of AI's investigators extended well beyond Alberta's borders with 33% and 30% of awards and recognitions being at the national or international level, respectively.

Novel research materials are sometimes created as a part of research in order to make new lines of enquiry possible. The grants and awards supported by Health Innovation generated 193 research tools and methods in 2017-18. Almost half of the research materials were models of mechanisms or symptoms and technology assays or reagents (Figure 5). Thirty-six percent of the research materials had been shared with others and this sharing most often occurred in the calendar year following the grant or award start year.

FIGURE 5
Types of Research Materials Created



Investigators may develop new databases, datasets or models during the course of their research that can make a significant difference to their research or that of others. Fifty-four investigators reported 124 such developments and these predominantly consisted of databases and models (Figure 6). The reach of AI's investments was indirectly enhanced through the sharing of 27% of the reported databases, datasets or models with other research groups.

FIGURE 6
Types of Research Databases and Models Developed

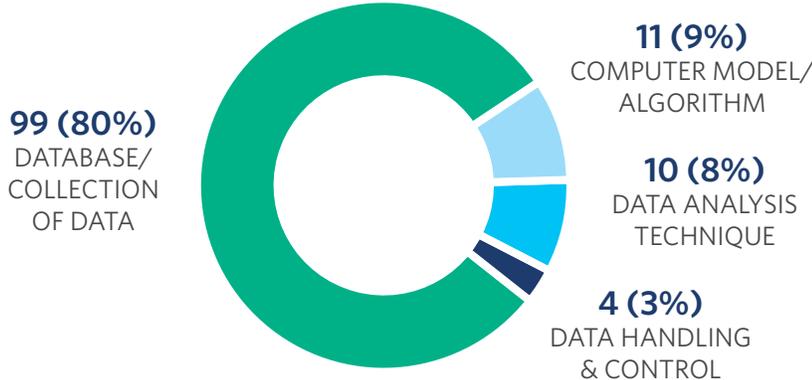


FIGURE 7
Provincial Platforms



Provincial Platforms

In addition to funding research, Alberta Innovates invests in provincial platforms – clusters of services and capacity building initiatives that are designed to address barriers and inefficiencies in Alberta’s R&I environment. These platforms are described in more detail below:

Alberta Strategy for Patient Oriented Research Support Unit (AbSPORU)

Patient-oriented research in Alberta and the Northwest Territories is being accelerated and its quality and quantity improved through the efforts of the Alberta SPOR SUPPORT Unit (AbSPORU).^e Launched in 2014 as a five-year \$48 million federal-provincial partnership between Alberta Innovates and CIHR, this platform connects researchers and trainees with a network of training, expert advice and research services with a patient perspective. This enables new discoveries to happen faster because investigators are gaining more timely access to data, critical expertise and services. It also helps ensure that more researchers are listening and responding to patient priorities. AbSPORU served 455 clients in 2017/18.

The AbSPORU Data Platform facilitated access to 50+ linked health databases along with analytic services for health research. In 2017/18, it completed 85% of data requests within two days, supporting expansion of the number and quality projects carried out in Alberta using administrative data holdings. High levels of service quality and responsiveness were maintained despite growing demand for data support services. Additionally, AbSPORU’s data platform was involved as a key contributor to the Pan-Canadian Real-world Health Data Network (PRHDN) and other national groups in harmonizing data elements for minimum datasets in each province to allow close to real time tracking of health outcomes and system performance.

Health Research Ethics Board of Alberta (HREBA)

The Health Research Ethics Board of Alberta (HREBA) is a research ethics board (REB) governed by Alberta Innovates. It provides ethical reviews and ongoing ethical oversight of cancer and community-based research involving humans, personal information and biological samples. HREBA served 675 clients in 2017/18, enabling over 1600 projects. HREBA is composed of a cross-disciplinary team including doctors, members of the scientific community, non-scientific members with specific expertise, including ethicists, lawyers, privacy experts and community members from across the province. The board’s role is to safeguard the rights and welfare of individuals who volunteer to participate in research by ensuring ethical principles have been considered and applied prior to the research being initiated.

^e Information about AbSPOU is available at <https://albertainnovates.ca/our-health-innovation-focus/the-alberta-spor-support-unit/>

Key achievements for 2017/2018 include:

- Approval of 431 new research applications and 3,217 post-approval activities;
- Steady decrease in average days to approval. In 2018, the time from submission of an application to approval was 56 days. This means that research studies can start sooner.

As part of the Alberta Health Research Ethics Harmonization Initiative, the Ethics Unit at Alberta Innovates has been collaborating with its provincial stakeholders (e.g., University of Alberta, University of Calgary, Alberta Health Services, Covenant Health and the Northern Alberta Clinical Trials and Research Centre) to allow for the appropriate sharing of information in support of institutional oversight and the streamlining of operational/administrative research approval processes. This allows for various processes to be conducted concurrently while using the same information rather than consecutively, thereby increasing efficiencies and reducing lag times. Alberta Innovates has supported this by allowing view access to the IRISS online ethics application system and will continue to collaborate with its stakeholders to enhance processes that lead to improvements within Alberta's health research system.

A pRoject Ethics Community Consensus Initiative (ARECCI)

Established in 2008, **A pRoject Ethics Community Consensus Initiative (ARECCI)** is an Alberta Innovates platform that provides support to project leads in assessing and addressing risks in non-research projects through the delivery of decision-support tools, training opportunities and an ethics consultation service.^f At the heart of ARECCI is the recognition that not all projects requiring ethics review need to be reviewed by a REB despite having an ethical risk that can be as great as those of research projects due to the involvement of people, their information, or its sensitive nature.² By diverting non-research projects from REBs, ARECCI is helping to reduce the use of REBs' resources in screening out and redirecting ethics applications for these projects while facilitating shorter project start times. Since its inception, nearly 20,000 individuals within and outside of the health ecosystem have accessed ARECCI's online decision support tools. Since April 2014, ARECCI has conducted 70 ARECCI Project Ethics courses with 922 participants (1993 participants since 2009). It has also completed approximately 150 Second Opinion Reviews and delivered 27 presentations to 869 attendees. To remain relevant and meet demand, the Project Ethics course is now offered by distance and all curricular material is now electronic.

^f Information about ARECCI is available at: <https://albertainnovates.ca/our-health-innovation-focus/a-project-ethics-community-consensus-initiative/arecci-ethics-guideline-and-screening-tools/>

Alberta Clinical Research Consortium (ACRC)

Managed by Alberta Innovates since its start in 2011, the Alberta Clinical Research Consortium (ACRC) is tackling barriers and building solutions to increase the efficiency of conducting clinical research and clinical trials in the province.⁸ This is being achieved through the efforts of the member organizations of ACRC – Alberta Innovates, AHS, the College of Physicians and Surgeons of Alberta, Covenant Health, and the Universities of Alberta and Calgary – to collaboratively streamline processes and enhance the capacity and quality of clinical health research. Key achievements to date include:

- **Establishing shared terminology, tools, and metrics:** The Glossary and Common Terminology (Version 3.0) was released in May 2017. It includes over 1000 provincially agreed upon clinical health research terms, as well as an Alberta agreed upon definition of Clinical Health Research. Through a series of six priority setting workshops, ACRC members and partner organization also identified five metrics for clinical health research that can be monitored through a provincial dashboard. The data will be collected and aggregated across partner organizations. Finally, 28 tools and templates have been developed that are uniformly recognized by ACRC partner organizations for use in clinical health research. Supporting guidance documents have also been developed to assist new researchers in achieving best practice and regulatory compliance on their projects.
- **Demystifying the clinical research process:** the Alberta Clinical Research Roadmap Version 2.0 was released at <http://acrc.albertainnovates.ca>. The Roadmap can walk a researcher through all stages of a clinical health research project, or just help with a particular step.
- **Improving integration and experiences:** the EDGE research management system was piloted within Alberta Health Services, Research Administration to help streamline processes. This system is expected to improve AHS's capacity to host Alberta's clinical health research studies and integrate activity with Connect Care for an improved patient care experience.
- **Raising awareness and capacity:** from producing a quarterly industry mailout that now reaches over 1000 recipients to co-developing training recommendations and opportunities, the ACRC better connects stakeholders with information and skills development opportunities that will help optimize engagement in clinical health research.

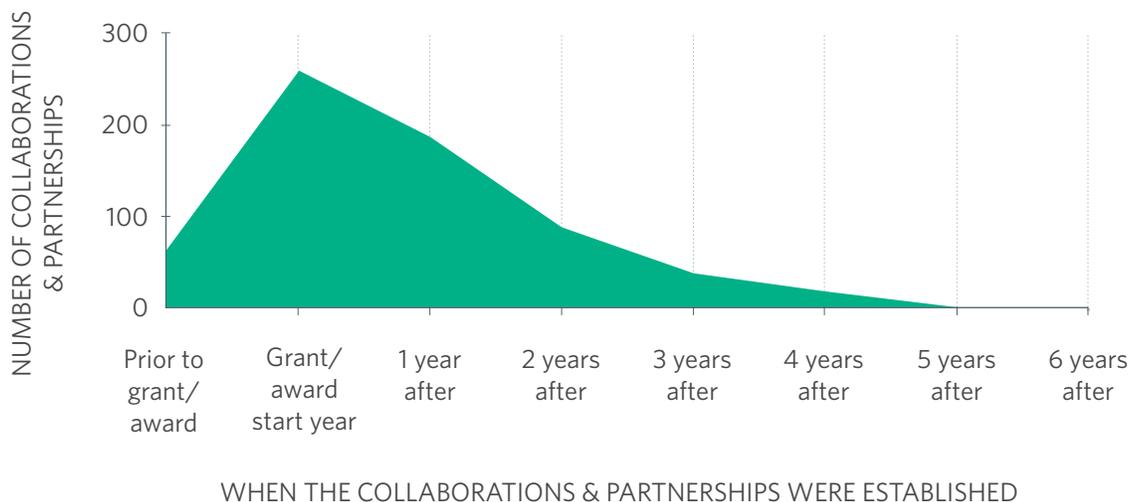
⁸ Information about ACRC is available at: <https://albertainnovates.ca/our-health-innovation-focus/alberta-clinical-research-consortium/>

Translating Evidence

Researchers contribute to science, knowledge and better understanding when their findings and insights are shared with others. This sharing demonstrates progress along the pathways to impact but does not in itself constitute an outcome or impact. Rather, outcomes begin to occur after knowledge moves beyond the researchers in a way that guides the decisions and actions of innovators (e.g., policy and decision makers, practitioners, industry, service providers, other researchers, patients and the public). Three mechanisms through which research knowledge is shared are collaborations and partnerships, publications and engagement activities.

Collaborations and partnerships are often used to bridge the gap between research and innovation (i.e., the application of that research to create meaningful changes in policies, practices, processes and products). These mechanisms provide opportunities to improve the relevance of research in relation to innovator and end-user needs and, in turn, can lead to accelerated and/or amplified adoption of research findings in the 'real-world'. Collaborations and partnerships also assist in building capacity, creating a shared understanding through the exchange of information and advancing or accelerating research through the sharing of resources. Overall, 640 active collaborations and partnerships were reported by 151 (49%) grant and award holders. This represents an average of 4.2 collaborations or partnerships amongst those grants and awards. Fifty percent of these collaborations and partnerships were established either prior to or during the start year of AI's support, a finding that suggests that collaborators and partners had an opportunity to inform the research in its earliest stages (Figure 8).

FIGURE 8
Timing of Collaborations and Partnerships
Relative to Grant and Award Start Year



Collaborations and partnerships often involve multiple organizations. As a result, there were 854 individual collaborators and partners – average of 1.3 collaborators and partners for each reported collaboration and partnership – from 25 countries (Figure 9). By and large, these collaborators and partners were located in Canada (83%) and, more specifically, Alberta (61% overall and 74% of those located in Canada) (Figure 10). The majority of collaborators and partners were in the academic or university sector, while 8% were with private sector organizations (Figure 11).

FIGURE 9
Collaborators and Partners Around the World

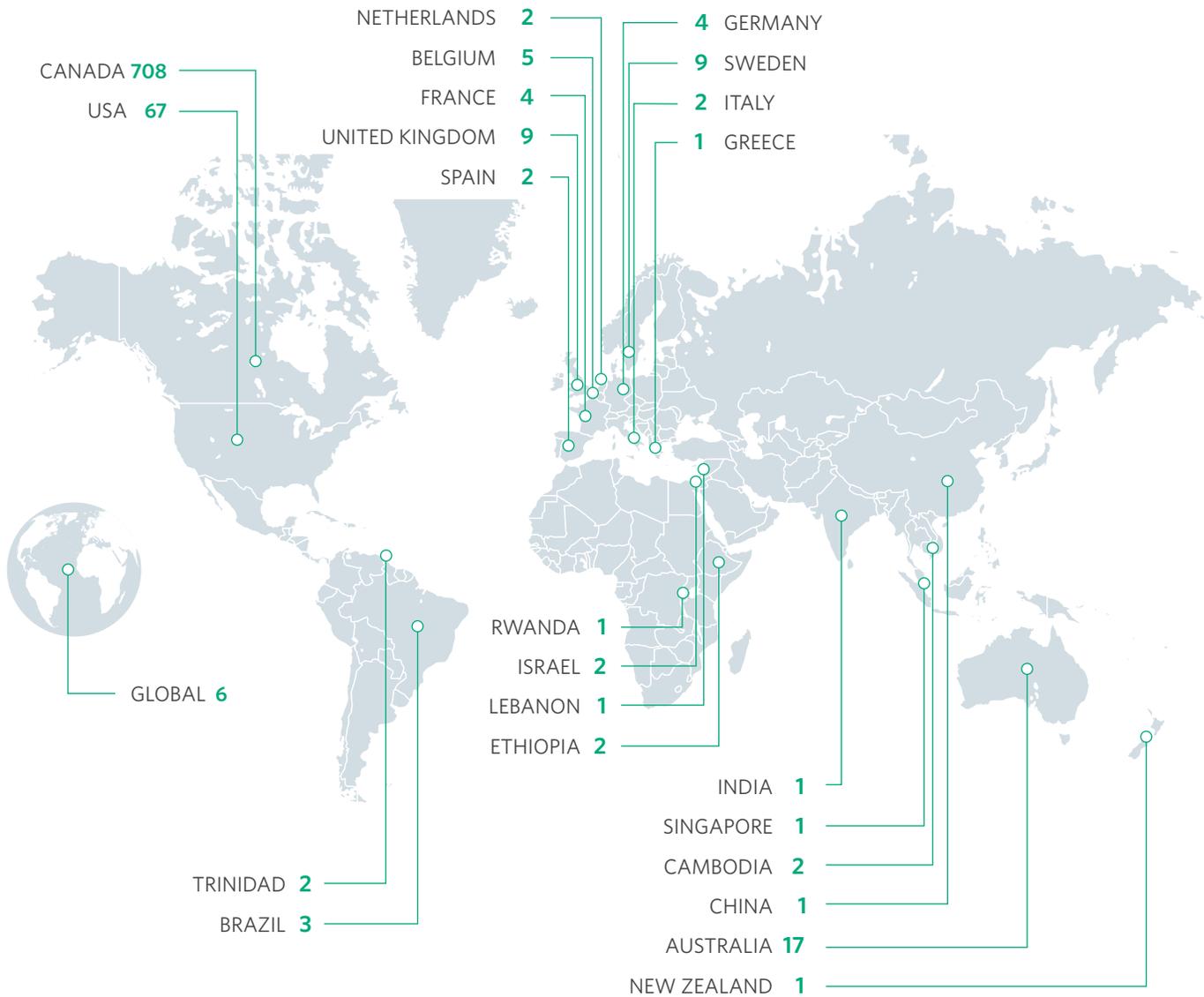
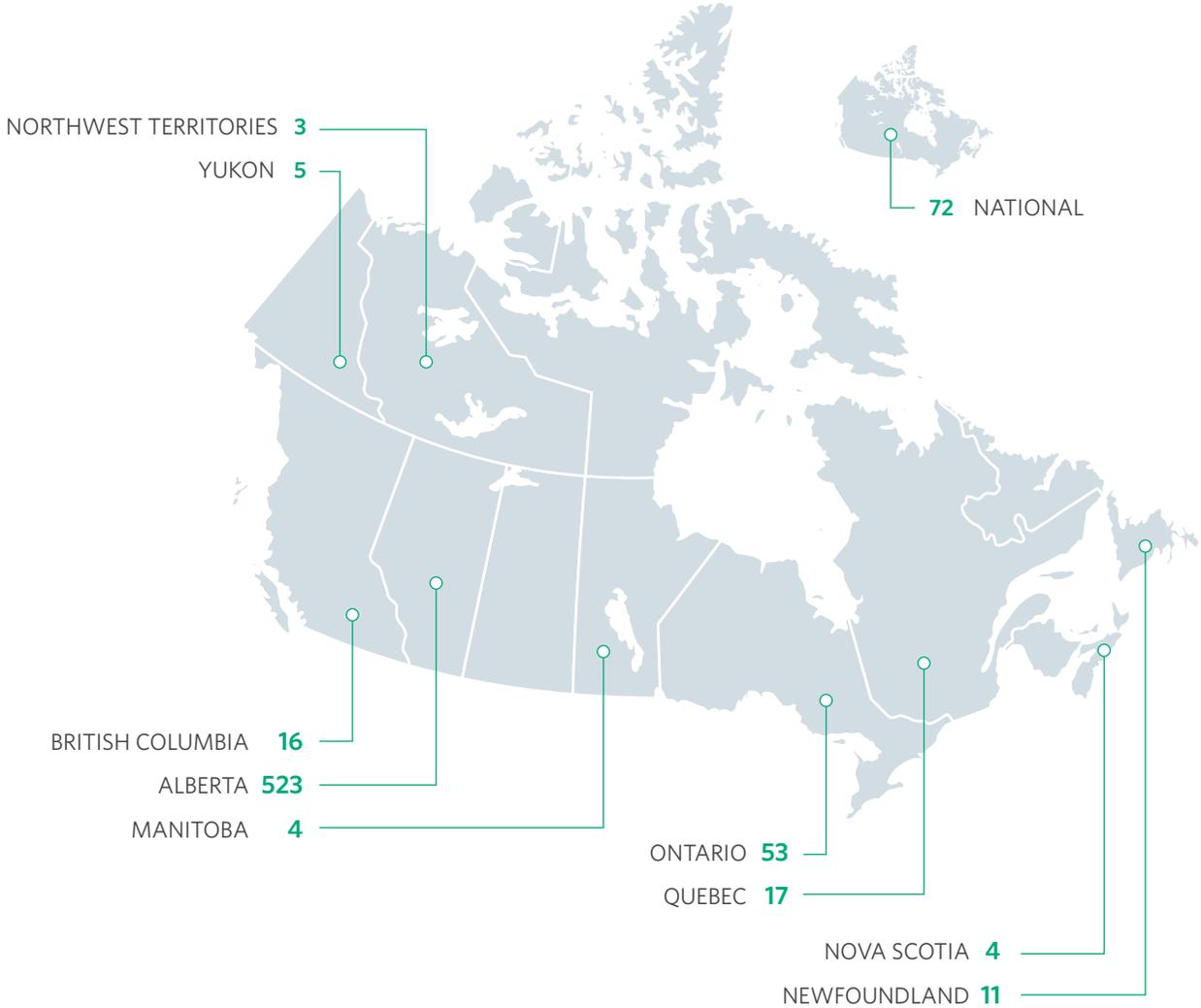


FIGURE 10
Collaborators and Partners in Canada



IMPACT EXEMPLAR

ARCHITECTING SAFER AND MORE SUSTAINABLE WATER SYSTEMS

There are many reasons to rethink municipal water services – from the staggering inefficiencies of the current system to the dangerous microorganisms that thrive within it. Dr. Nicholas Ashbolt, an Alberta Innovates (AI) Translational Health Chair in waterborne disease, is at the forefront of efforts to help municipalities harness next generation ideas and infrastructure to achieve safer and more sustainable water systems.



*Dr. Nicholas
Ashbolt*

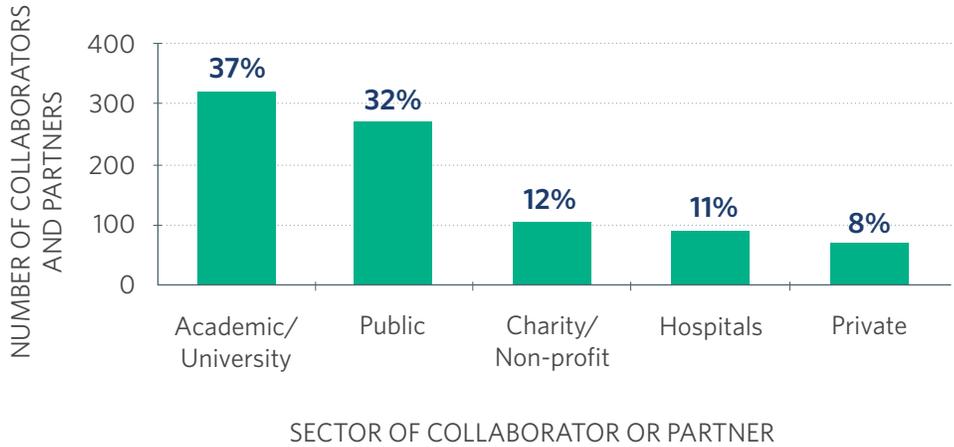
Decentralizing wastewater facilities is one of the ways in which Dr. Ashbolt hopes to reduce the carbon footprint associated with how we heat and treat water, which currently accounts for 19-21% of national energy production. To test the merits of decentralization, he's collaborating with a land developer and his colleagues in AI's Clean Energy group to establish a small, local wastewater facility in a new community slated to be built outside of St. Albert. While awaiting this development, the team is demonstrating how the wastewater system works on a smaller scale, using blackwater (wastewater from toilets) sourced from the town of Devon.

In addition to decentralizing wastewater treatment, Dr. Ashbolt is using new technologies to better control the pathogens in pipes, recover and reuse greywater (relatively-clean wastewater from household activities like bathing or doing the dishes), and transform blackwater into thermal energy and Struvite (a high-quality fertilizer).

With the recent launch of his Precise Plumbing Lab, Dr. Ashbolt is now able to pilot many of these interventions in a simulated domestic plumbing system.

Yet lab work and demonstration projects occupy only a portion of Dr. Ashbolt's time. In recognition of how important regulatory reform is to the realization of next-generation water systems, Dr. Ashbolt participated in three expert panels in 2017/18 to inform the development of guidelines and new water management plans. He has had success both at home and abroad in advancing policy through quantitative microbial risk assessment techniques. This includes collaborating with Alberta Health Services and the Provincial Laboratory to establish new procedures for monitoring and responding pathogens in the water systems of healthcare facilities.

FIGURE 11
Sectors of Collaborators and Partners



Publications are one key means of increasing the science and knowledge base. Successful publication also draws attention to the investigators, their institutions and their funding sources and therefore is commonly taken into consideration for funding decisions and academic recognition or promotion. In 2017-18, 228 (73%) investigators contributed 1179 publications to the scientific literature and 1040 (88%) of these were journal articles.

TABLE 3
Journal Publications

Journal Articles	Total Published	Average # of Articles Per Grant/Award Holder
Researchers	586	6.7
Trainees	454	2.0

Relevant and appropriate engagement activities – the means through which researchers meaningfully involve a broad range of stakeholders in the research activities³ – are another important way of progressing research along the impact pathway. These activities can occur at any time throughout the research process depending on the purpose of engagement (e.g., to assist with the design of the research, to communicate findings, or to gather feedback on findings). Overall, nearly 1461 engagement activities were completed in 2017-18. These activities, which were predominantly in the form of talks or presentations, were mainly conducted locally or regionally and were provided to professional practitioners (Figures 12 to 14). The most frequent known outcome of engagement activities was a change in views, opinions or beliefs as reported by the audience (Figure 15).

FIGURE 12
Types of Engagement Activities

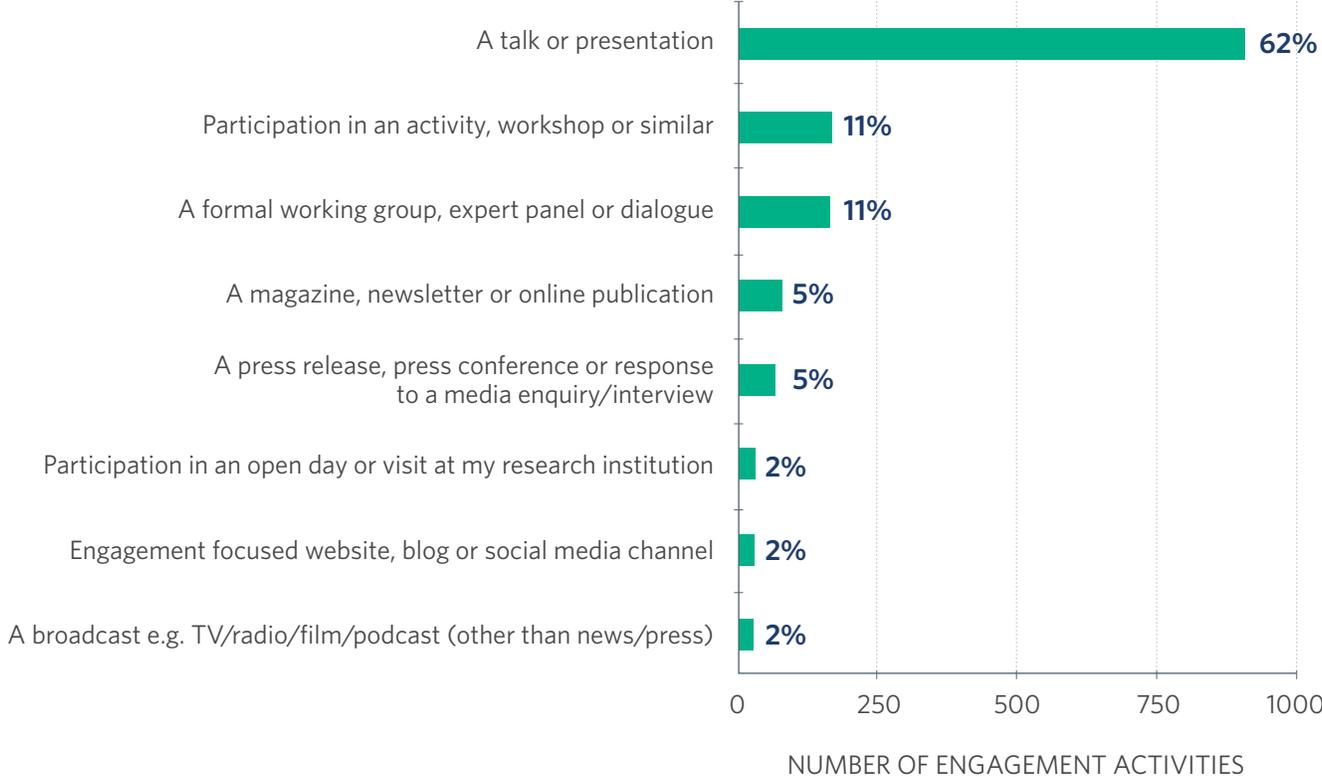


FIGURE 13
Geographic Reach of Engagement Activities

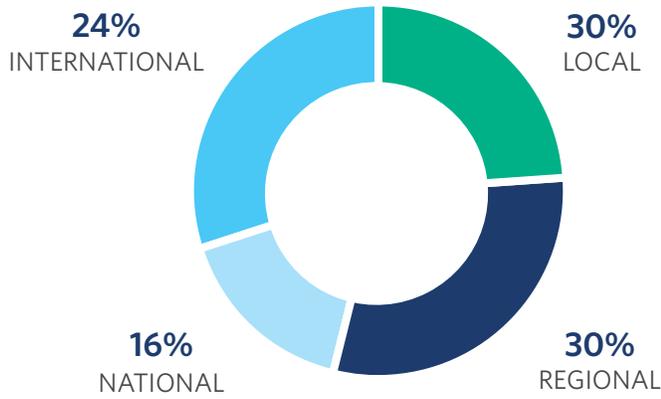


FIGURE 14
Primary Audiences for Engagement Activities

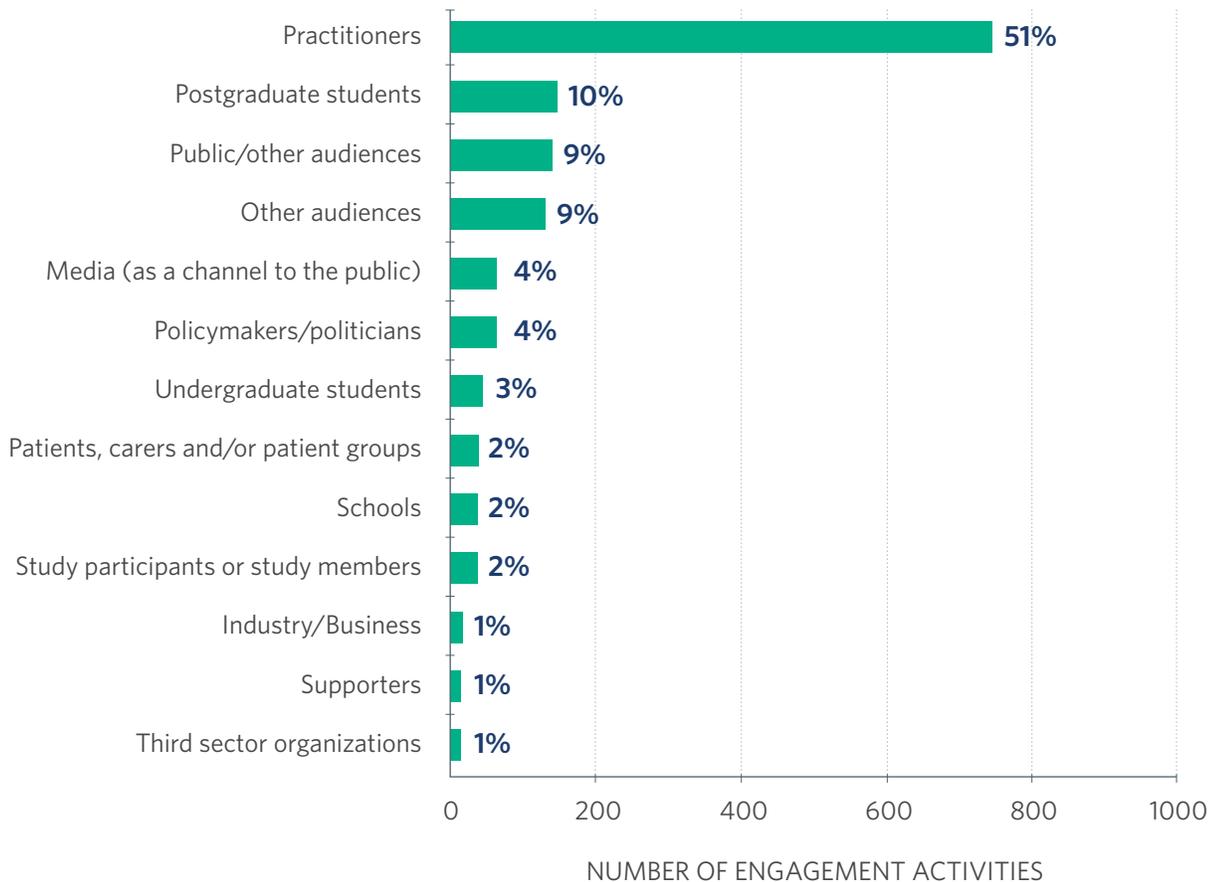
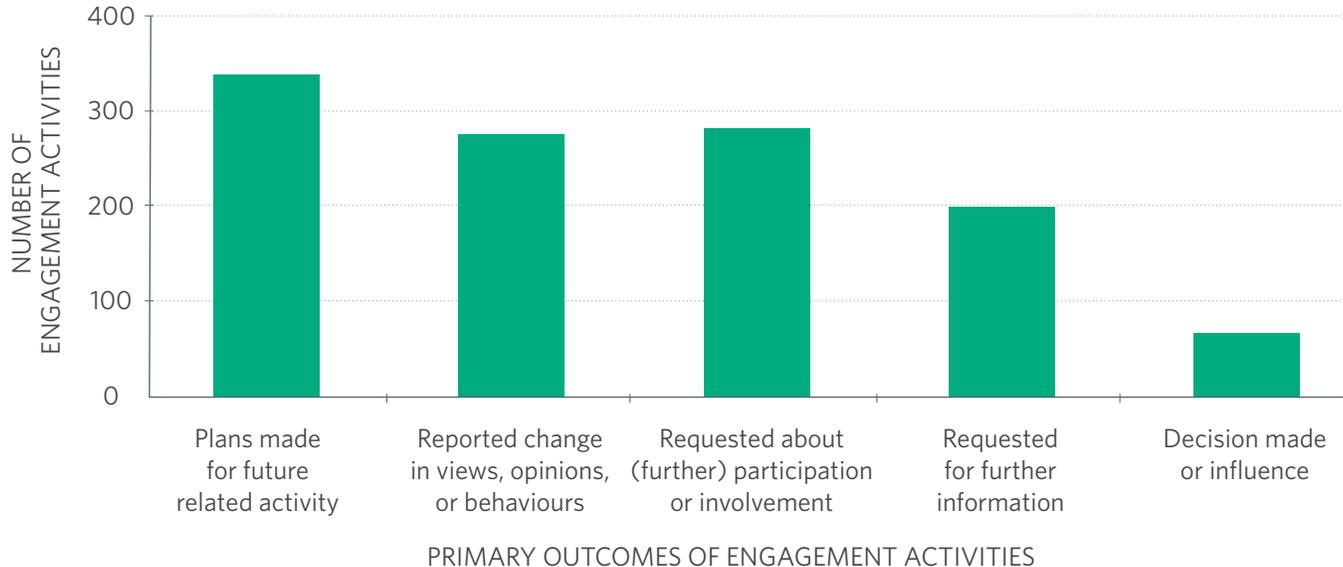


FIGURE 15
Primary Outcomes of Engagement Activities



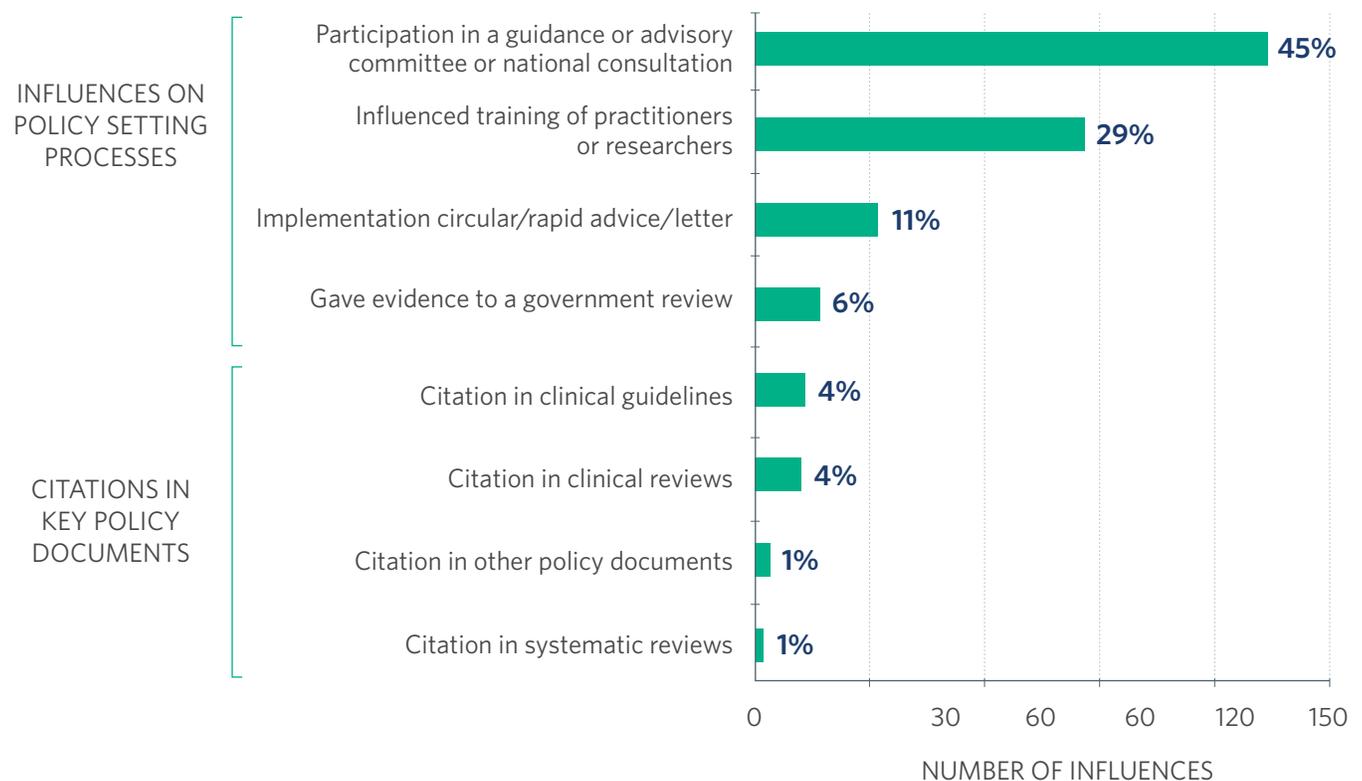
Engagement activities with industry partners and end-users were further explored among researchers receiving support from Health Innovation (excluding trainee awards). Seventy-four percent of these grants and awards reported 218 engagements with these audiences. These engagement activities were most often done for the purpose of knowledge exchange or translation (Figure 19).

Enabling Decisions: Implementing Innovations

In the context of health, the intended purpose of enabling decisions is for health-related knowledge to be adopted and used by organizations or individuals to affect or create health or health-related impacts. To do so, knowledge must first be translated into various innovations that include new or revised policies, practices, products (including services) or processes. These in turn serve as the pathways to improvements in health and well-being.

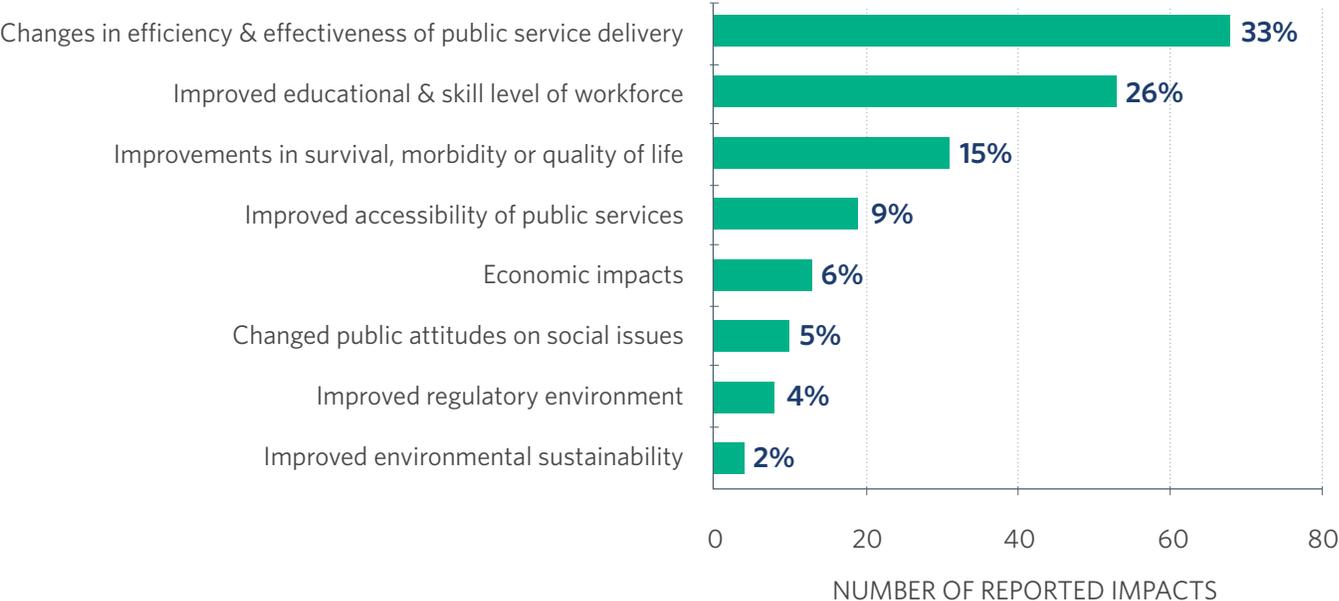
In 2017-18, 60 (19%) grant and award holders reported 300 influences on policy, practice, patients and the public. These grants and awards had an average of 5 influences (SD 4.6). Policy settings processes (90%) accounted for the vast majority of influences and these primarily consisted of participation in a guidance or advisory committee (45% overall) (Figure 16).

FIGURE 16
Types of Influences on Policy, Practice, Patients and the Public



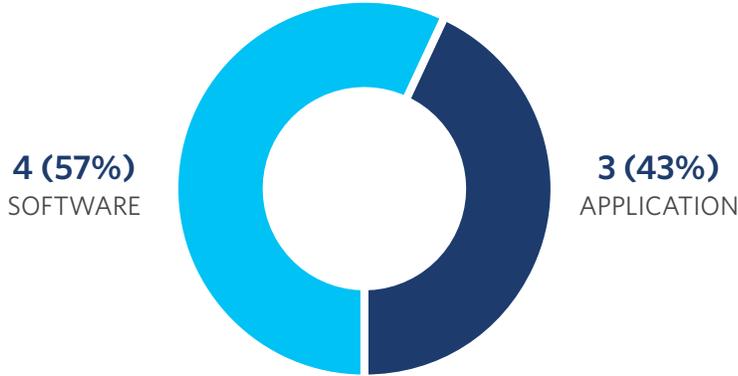
The investigators knew of 135 impacts from the above influences. As illustrated in Figure 17, the most frequent outcomes were changes in the efficiency and effectiveness of public service delivery and improvements in the educational and skill level of the workforce.

FIGURE 17
Outcomes of Influences on Policy, Practice, Patients and the Public



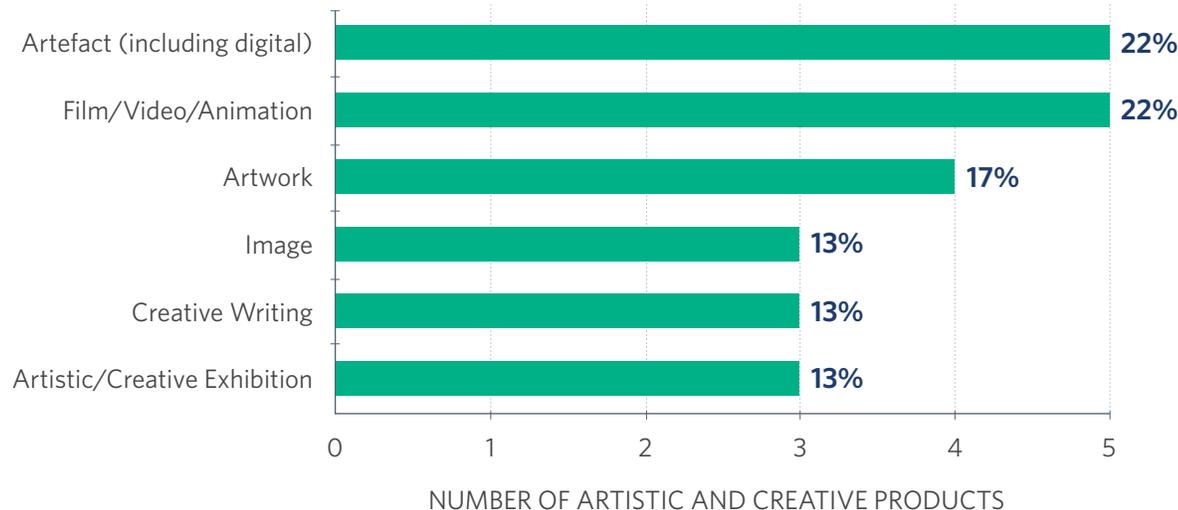
The development of software and technical products represent another way in which research is advanced and/or translated into new products or services. In 2017/18, seven software and technical products were developed through seven grants (Figure 18). Almost half (43%) of these products were made available online as a webtool.

FIGURE 18
Software and Technical Products



Artistic and creative products have been used effectively by investigators to share knowledge and make it more accessible to targeted stakeholder groups such as patients, the public and practitioners. Twenty-three artistic and creative products were produced in 2017-18 by 11 grants and awards. The most frequent forms of these products were artwork, (digital) artefacts and film, video or animation (Figure 19). All of the artistic and creative products were realized after the start year of the award, with 70% occurring in the first or second calendar year after the award start year.

FIGURE 19
Artistic and Creative Products



IMPACT EXEMPLAR

HARNESSING THE METABOLISM OF MICROBES TO PERSONALIZE MEDICINE AND SAVE LIVES

Although most patients get well in hospital, one in 25 will fall ill with a new infection caused by pathogens — especially bacteria — lurking on stethoscopes, bed linens, and other unexpected surfaces. Sadly, 8,000 Canadians die each year as a result of hospital-acquired infections.

“This problem is actually getting worse because bacteria are becoming increasingly resistant to antibiotics,” explains Dr. Ian Lewis, a medical researcher and an Alberta Innovates (AI) Translational Health Chair in metabolomics. “There’s actually a global health crisis now where we need to find new ways to detect and control microbes and opportunistic pathogens.”

Dr. Lewis believes part of the solution lies in faster detection of infections, particularly those caused by the most dangerous pathogens. “If you go to [the] hospital right now [with an infection] and they take a blood sample, your chances of dying are related to how long it takes you to get diagnosed,” he says. Right now, diagnostic techniques can take days to produce results, allowing patients to become sicker as they wait to receive the correct treatment. Dr. Lewis is developing practical tools to diagnose infections in a fraction of the time using metabolomics, a new scientific field he helped pioneer.

Over the past year, Dr. Lewis’ lab has forged a partnership with Calgary Laboratory Services and Compute Canada’s Calgary operations to generate a large repository of clinical data that can be merged with microbiology data to facilitate biomarker discovery efforts. Additionally, the group implemented new machine learning techniques to identify significant clinical predictors of patient outcomes using clinical records. This resulted in the creation of an app with risk assessment guidelines to help doctors identify the sickest patients and get them the recommended intervention, such as a specific variety of antibiotic.



Dr. Ian Lewis

Dr. Lewis predicts that his unique brand of personalized medicine has the potential to save about 50,000 lives around the world each year. Of course, the technology has to reach the marketplace first. “There’s a lot of work that goes on between discovering a technology and getting into practice,” he says. Right now, Dr. Lewis’ research team is working with partners in government and industry on commercialization, which he predicts will take about three more years. “It wouldn’t be possible without the investments from AI,” says Dr. Lewis. “They’re an essential member of the team making this happen.”

Health Innovation's Partnerships and Collaborations

Alberta Innovates recognizes innovation as a key driver to reverse the trend of rising healthcare costs in Alberta year after year. The aim is to improve patient outcomes through the facilitation of state-of-the-art healthcare innovation. Alberta companies, with the support of Alberta Innovates, have an opportunity to play a role in shaping how the health industry evolves. To this end, Alberta Innovates invests in several innovation initiatives to establish or enhance the required activities and capabilities for innovation success as built through partnerships and collaborations. By collaborating with partners in the health system, post-secondary institutions, small and medium sized enterprises (SMEs), multinational enterprises (MNEs), government and others, Alberta Innovates helps translate research into solutions. It assists in targeting those solutions to meet the identified needs of the health system and creating an environment for innovation that will make a difference in the lives of Albertans. It is by driving research into innovation that these differences in the form of health, economic and social impacts will be accelerated and increased.

Translating Research into Solutions

Several of Alberta Innovates' innovation initiatives involve partnerships that focus on translating research into solutions that have a strong potential for commercialization and healthcare transformation. These solutions include innovative products, tools, therapies and services. Examples include:

- The **Alberta/Pfizer Translational Research Fund** is a partnership with Alberta Innovates, Pfizer Canada, Western Economic Diversification Canada and the Government of Alberta. In alignment to priorities of both Pfizer and the province, this initiative supports commercially promising health and medical research conducted in Alberta's academic and research institutions in order to bring concepts or ideas to market more quickly. The initiative also provides an important opportunity for innovators to benefit from the technical, business, and commercialization expertise offered through Pfizer Canada. Since its inception in 2012, this initiative has assisted in progressing technology from preclinical models to phase I and phase II clinical trials, as well as contributed to the development of novel diagnostic tools and software, a drug delivery device, four prototypes, and the therapeutic potential of novel compounds in the treatment of disease. Eight intellectual property and licensing agreements were realized, including two issued patents and one technology was adopted into national research studies and implemented in several research hospitals. Additionally, more than 160 highly skilled personnel were directly or indirectly supported through this fund, including the direct support of 28 full-time equivalents.

- The **Alberta/Novartis Translational Research Fund** was formed in 2014 through a partnership between Alberta Innovates, Novartis Pharmaceuticals Canada Inc. and the Government of Alberta. This opportunity supports translational R&I projects that focus on multiple sclerosis with the aim to translate novel innovations, evaluation methods and/or care pathways into practice. Four grants were awarded in 2016. Early progress and outcomes include: the securing of nearly \$1 million in additional funding; the production of two new tools and methods, the establishment of five collaborations and partnerships; and the development of one software application and one therapeutic intervention.^h

Targeting Solutions to Meet Health System Needs

New technologies and innovative care models offer the potential to improve patient health and reduce healthcare costs in the long term. However, they often also require high upfront costs and are complex to introduce into the system. Recognizing these challenges, Alberta Innovates has established a number of initiatives to support the health system in undertaking innovation activities in partnership with industry to help drive health innovation that is responsive to health system needs.

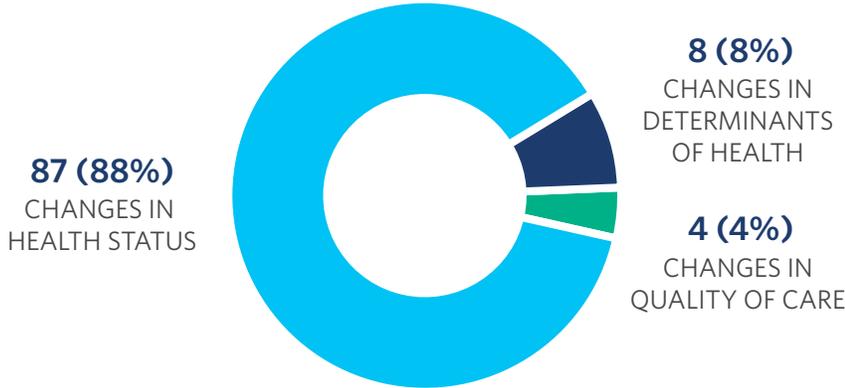
- **Accelerating Innovations into Care (AICE)** provides funding support to accelerate the testing and adoption of new technology solutions within the Alberta health system that have been developed by small-medium sized enterprise (SME) innovators. AICE assists Alberta's health system in making evidence-based decisions by testing and validating the impacts of new technologies, particularly on disease pathways or workflows, with the intent of informing adoption and improving the health system and overall health of Albertans. At the same time, SMEs gain critical market evidence that will help them enter health care markets globally. Since its implementation in Fall 2015, several potential collaborations have been explored and some have received funding.
- **CIHR eHealth Innovation Partnership Program (CIHR eHIPP)** is a partnered funding opportunity with CIHR that is intended to identify patient-oriented eHealth solutions that will improve health outcomes, patient experience, and lower the cost of care along the continuum for seniors with complex care needs in their homes. In Fall 2016, funding was provided to two projects to collaborate with SMEs to provide digital solutions to help remotely monitor blood pressure in high risk patients in their homes and provide better diabetes care in isolated First Nation communities. These projects reported 29 engagement activities and generated three journal articles in 2017/18. The media and professional practitioners were identified as the primary audience of the majority of engagement activities, 34% and 31% respectively.

^h The progress and outcomes of the Alberta/Novartis Translational Research Fund are collected through Researchfish® and therefore have been reported in aggregate with other grants and awards throughout this report.

Health and Wellness Impacts

It is often cited that it takes an average of 17 years to translate research discoveries from the lab to the marketplace, or from the bench to the bedside.^{4,5} However, early evidence of contributions to health and health-related impacts within the period of funding are often available and currently serve as leading indicators of translational potential. Over a third of AI-funded researchers are typically able identify impacts of their work during the grant period. In 2017/18, 36% of researchers (i.e., excluding trainee awards) identified 99 known outcomes in relation to health status, the determinants of health and/or quality of care (Figure 20).

FIGURE 20
Improving the Health of Albertans and Others



In addition to improved health outcomes, 25 medical products, interventions and clinical trials were reported by 20 (23%) of researchers and 5 (2%) of trainees. Nearly one-third of these were therapeutic interventions (Figure 21) that were focused on drugs, cellular and gene therapy, medical devices, psychological/behavioral and complementary medicine. The stage of development of these medical products, interventions and clinical trials were broad, ranging from initial development in the laboratory to wide-scale adoption in the health system (Figure 22). This diversity reflects the complexity of health research and innovation, with different stages of discovery and testing being necessary to ensure safety, effectiveness and efficiency prior to potential adoption in the health system. Of note is that with the passage of time, more impacts related to adoption are now being realized relative to earlier impact reports.

FIGURE 21

Progressing to Health Impacts through Medical Products, Interventions and Clinical Trials

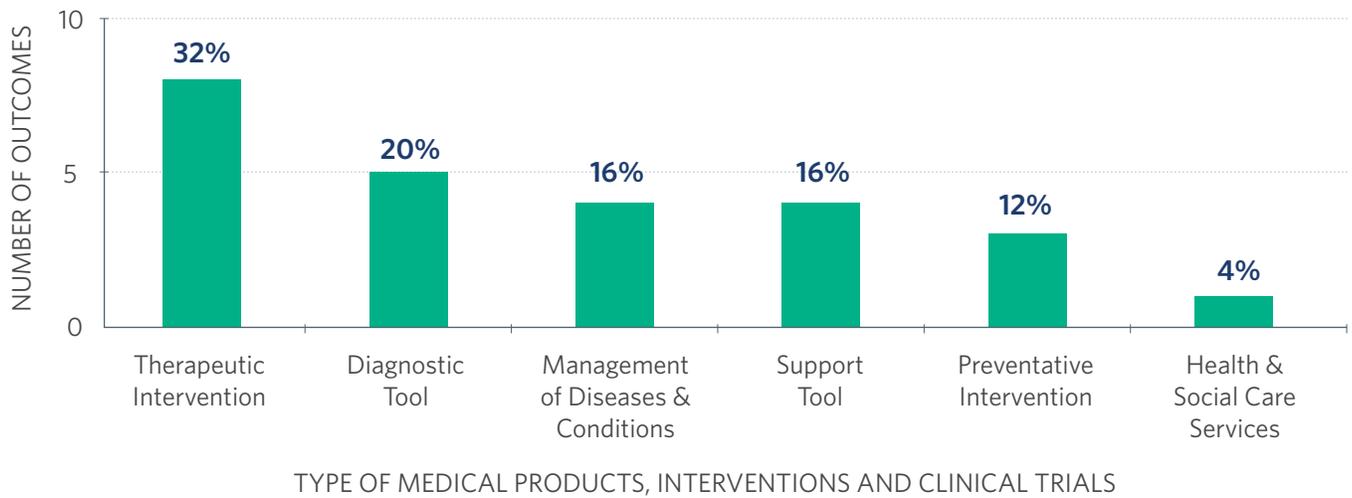
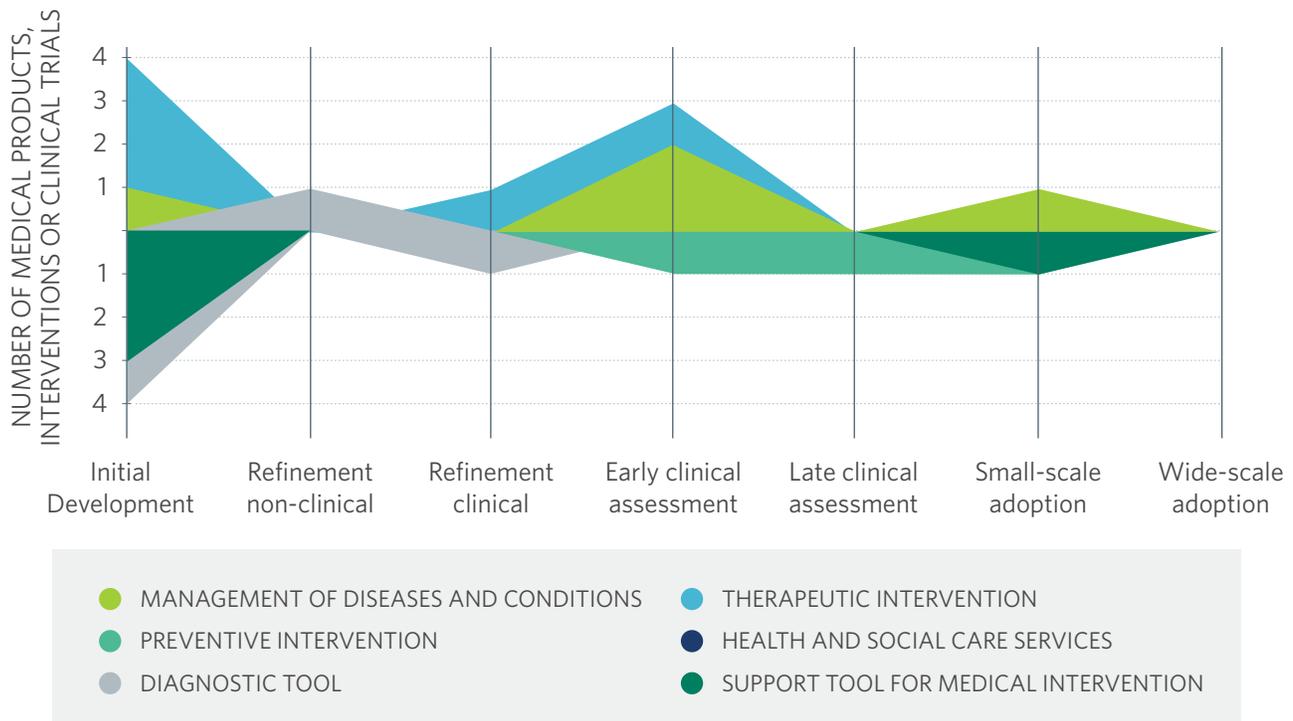


FIGURE 22

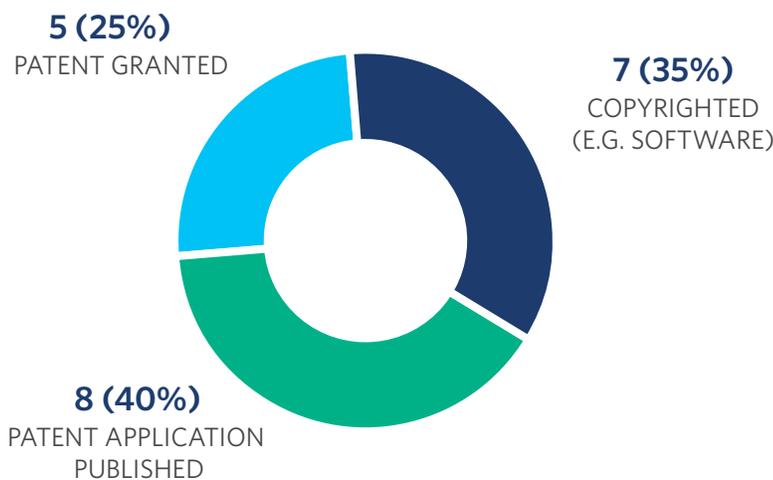
Development Stage of Medical Products, Interventions and Clinical Trials



Contributing to Social and Economic Prosperity

Commercialization activities reflect more immediate and measurable market acceptance of the products of academic research and innovation.⁶ It also provides an early indication of the work being done by researchers and innovators that may potentially contribute to economic and societal impact. 2017-18, 10 (3%) grants and awards reported 20 instances of intellectual property and licensing. Almost half of these consisted of patent applications being published (Figure 23).

FIGURE 23
Intellectual Property and Licensing



Research-based spin-outs are generally understood to be small, new technology-based firms whose intellectual capital originated in universities or other public research organisations.⁷ These firms, which are often perceived to be dynamic and capable of generating novel fields and markets, have the potential to contribute to innovation, growth, employment and revenues. Successful spin-outs can also assist the government in promoting regional development and creating supportive environments for entrepreneurs. In 2017-18, three spin-out companies were established. Two of these spin-outs had salaried people employed (in the range of 1-4 employees). These spin-outs were launched 3-4 years after the award start date.

SUMMARY

Alberta Innovates aims to be recognized nationally and internationally as a go-to organization for supporting and influencing the development of cutting-edge innovations and practices. Through supporting research and innovation, we hope to improve patient outcomes by facilitating state-of-the-art healthcare processes and systems, which currently makes up nearly half of the provincial government budget. Increased innovation is one of the paths for driving economic diversification and job growth while bending the cost curve.



This report demonstrates the progress that Alberta Innovates supported researchers are making in growing the health sector in Alberta and building a seamless innovation system from discovery to impact. It also describes numerous strategies that Alberta Innovates is delivering through partnerships and collaborations to ensure that Alberta's researchers and innovators are overcoming challenges and having a clearer path for innovation, one that concurrently provides patients with the best care for the best value.

These advancements reflect the efforts of our researchers and trainees as well as the collective efforts of many public and private organizations. It is through the building of human capacity and infrastructure, and the leveraging of expertise and resources that Alberta will be best able to address the health needs of Albertans, both now and in the future.

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APPENDIX A: DATA SOURCES AND TIMEFRAMES

Alberta Innovates' Annual Impact Report for Health Innovation: 2017-18 reflects information from multiple data sources. The primary source for impact-related data for our strategic investments is an electronic impact data collection system (Researchfish®). The information in this system includes numerous grants and awards, including those to trainees. As the grant and award process is dynamic, the grants and awards programs included in the Annual Impact Report may vary from year to year (i.e., new programs may be implemented by Alberta Innovates and others may be sunset) as may the specific projects funded within each program.

Due to the structure of data within Researchfish®, data reported for grants and awards includes achievements realized between January 1, 2017 and March 31, 2018 (i.e., 15 month period) as opposed to the actual fiscal year of April 1, 2017 to March 31, 2018. Additional information about the methodology, quality assurance processes, and analysis in relation to this data are available in the [AIHS Annual Impact Report: 2014-15](#).

Information related to the progress to and achievement of outcomes and impacts for investments such as provincial partnerships and partnerships and collaborations were gathered from Alberta Innovates' lead representative(s) for the initiative. It reflects information from various administrative and program management records. For these initiatives, the data was predominantly limited to progress to impact and the impacts achieved between April 1, 2017 and March 31, 2018. In a few cases, milestones that were necessary to achieve progress to impact are mentioned even if such milestones were reached prior to April 1, 2017.

Other data sources used for this report include the AI financial management system, and program management and tracking systems such as Edge, IRISS and ARECCI.

APPENDIX B: STRATEGIC INVESTMENTS

Funding Opportunity	Description	Number of Grants/Awards Active in 2017-18	Total Investments in 2017-18
Accelerating Innovation into CarE (AICE)	<p>Provides funding support to generate real-world evidence in a clinical setting for new technologies developed by SME innovators that have the potential to address priority needs of Alberta’s health system. The funding enables the health system to test and validate the impacts of new technologies, particularly on disease pathways or workflow, with the intent of informing adoption and improving the health system and overall health of Albertans.</p> <p><i>50% total project costs up to \$150,000 per project; maximum of 18 months</i></p>	5	\$405,222
Alberta/Eli Lilly Translational Research Fund Opportunity	<p>Collaboration between Eli Lilly, Alberta Innovates and Alberta Health to support targeted translational research and innovation projects that will impact the health of Albertans.</p> <p><i>\$1.5M total fund</i></p>	2	\$315,000
Alberta/Novartis Translational Research Fund Opportunity	<p>A partnership with Novartis Pharmaceuticals Canada Inc., this fund supports translational research and innovation projects with a strong potential to advance Multiple Sclerosis (MS) patient care and/or research over the short or medium term (three to five years). The Opportunity will support the development of research and innovation projects in the priority topic areas identified by Novartis and the province of Alberta: development and implementation of evidence-based care; delivery of patient care; advancement of MS research and innovation; and patient engagement.</p> <p><i>Up to a maximum of \$100,000 per year for up to 3 years</i></p>	4	\$1,190,555
Canadian Institutes of Health Research eHealth Innovation Partnership Program (CIHR eHIPP)	<p>Health Innovation Partnership Program (eHIPP), is a collaborative funding program designed to create a new generation of cost-effective patient- and population-centered health care solutions by supporting partnerships between Canadian technology companies and ‘innovation communities’ to co-develop and integrate innovative e-health solutions that deliver real-world health care value.</p> <p><i>Total Project values up to \$375,000 per year for four years from all partners (\$46,875 per year from AI)</i></p>	2 <i>(including 1 grant funded through the ACPLF)</i>	\$1,024,875

Funding Opportunity	Description	Number of Grants/Awards Active in 2017-18	Total Investments in 2017-18
CIHR Partnership – Chronic Disease	<i>Alberta Innovates matched funding of \$4.89 million for a period of support from January 1, 2016 to December 31, 2020.</i>	2	\$978,000
Collaborative Research & Innovation Opportunities (CRIO)	Funding for collaborative research in priority areas for Alberta that engage knowledge-/end-users for the purpose of producing new knowledge and translating that knowledge to improve health and the healthcare system.	18	\$20,105,468
Health Effects of the Alberta Wildfires	In development with the Canadian Institutes of Health Research and the Canadian Red Cross, this grant supports research that works to minimize the health impacts that the provincial wildfires and subsequent evacuations have had on Albertans. The research grant focuses on: pediatric resiliency related to mental health and addiction; adult resiliency related to mental health and addiction; and occupational health (e.g., workforce PTSD, exposure to air pollution/smoke affecting the respiratory system). <i>\$250,000 per year for a maximum of two years</i>	2	\$1,000,000
Partnership for Research & Innovation in the Health System (PRIHS)	A funding partnership with Alberta Health Services that supports the activities of the Strategic Clinical Networks focused on improving patient care and value for money in Alberta’s health system. <i>Up to \$250,000 per year for up to three years</i>	21 <i>(including 1 grant funded through the ACPLF)</i>	\$1,024,875
Translational Health Chairs	A partnership with Alberta’s Comprehensive Academic and Research Institutions to recruit translational health leadership in priority areas to improve health and the health system. <i>From \$250,000 to \$600,000 per year for 7 years</i>	9	\$6,435,714
Training and Early Career Development	A These grants and awards support the training of future leaders in the health research and innovation environment, so that they gain broad experience that will help them succeed in launching careers in academia, industry, government or elsewhere. This portfolio includes: <ul style="list-style-type: none"> ▪ Graduate Studentships and Postgraduate Fellowships ▪ MD-PhD Studentships ▪ Clinician Fellowships <i>These awards range in value from \$30,000 to \$70,000 per year with career development allowances of between \$2,000 and \$5,000 per year. Visit Health Innovation’s TECD webpage more details on each active program.</i>	224	\$14,841,754



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