



# Digital Health

Learnings from investing in digital health innovations for reproductive, maternal, newborn, child and adolescent health



Grand Challenges Canada®  
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**This learning brief provides an overview of Grand Challenges Canada’s key learnings in scaling, sustaining, and measuring the impact of digital health innovations. Featuring organizations that are at the forefront of creating and testing new, versatile digital health approaches, this brief also includes reflections on the role of digital health tools in addressing compounding factors that affect access to digital health resources in low- and middle-income countries, including gender inequalities and the digital divide. Finally, the emergence of COVID-19 as a global crisis offers an important opportunity to reflect on the role of digital health innovations in addressing health needs, especially for women and children.**

### **Key Takeaways of this Brief Include:**

#### **Successful Digital Health Innovations are Gender Responsive & Transformative**

- While mobile phones are widely available in low- and middle-income countries, access to this technology is often influenced by gender inequalities. Successful digital health innovations are designed to empower women and girls both online and offline, and account for the complex barriers women and girls face in fully accessing mobile technology.
- Gender equality and improved health for women and girls cannot be achieved without a more holistic societal approach. Digital health innovations offer unique opportunities for addressing harmful gender norms and engaging men in maternal and newborn health, so they are better able to support the health and wellbeing of their partners, and their children.

#### **Scaling & Measuring for Success is Highly Contextual**

- Successful scale and sustainability are influenced by factors such as demand for the intervention, establishment of public and private partnerships, ability to respond and adapt to unpredictability, and high-quality data to demonstrate that digital solutions provide measurable, long-term impact on improving health systems.
- Digital health innovations offer exciting and expansive possibilities for data collection and analysis. As this is a relatively new area of global health, funders investing in this space should adopt monitoring and evaluation requirements to what is contextually feasible based on the stage of maturity; and allow innovators to focus on measurements most useful in understanding progress, challenges, and successes.

#### **Digital Health Innovations Complement Health Systems & Strengthen Resiliency**

- Digital health innovations are not substitutes for strong health systems but rather complement and enhance components of health systems to empower end-users to make more informed decisions and improve health outcomes.
- Digital health technologies are versatile and dynamic, with the ability to readily adapt to change. The COVID-19 pandemic demonstrates that digital health solutions were the most equipped to adjust to the needs of the pandemic.

# Grand Challenges Canada: Investing in Impact

**Digital health solutions** can be a powerful tool to promote behaviour change, improve diagnostic accessibility, and increase equity and access to health services. While some digital tools are integral to service delivery, others have a more ancillary role: allowing other health programs and services to pivot in times of uncertainty and reach those without physical access. They are also well-suited to provide patient-centered health services that require fewer specialized health professionals, which is especially appealing in resource-constrained contexts. With the ongoing **COVID-19 pandemic**, the versatility of digital health solutions is particularly salient. They have enabled continuity of health services throughout the pandemic and have shown promise as a transformative force in addressing broader health system gaps.

Grand Challenges Canada invests in innovations that save and improve the lives of people facing the most pressing challenges in Canada and low and middle-income countries. With targeted support through the Transition To Scale program, Grand Challenges Canada provides grant and non-grant financing along with technical assistance to catalyze early-stage innovators on their path to achieving sustainable impact at scale. To date, Grand Challenges Canada has supported over 20 digital health innovators in reproductive, maternal, newborn, child and adolescent health (RMNCAH) globally with Transition To Scale investments ranging between \$150,000 and \$1 million CAD. The focus in RMNCAH supports innovators in driving change towards the Sustainable Development Goals, particularly Goal 3: to ensure the healthy lives and promotion of wellbeing for all and Goal 5: to achieve gender equality and empower all women and girls.

The term digital health is rooted in eHealth, which is defined as “the use of information and communications technology in support of health and health-related fields”. Mobile health (mHealth) is a subset of eHealth defined as “the use of mobile wireless technologies for public health”. More recently, the umbrella term digital health was introduced as a term encompassing both eHealth and mHealth, as well as emerging areas, such as the use of advanced computing in ‘big data’, genomics, and artificial intelligence (1).

## Grand Challenges Canada seeks to invest in digital health innovations that offer:

### A bold idea:

- Use digital technology to enhance engagement with users, patients, and/or healthcare providers in a unique manner
- Monitor a user’s engagement journey to enable appropriate, timely, responses from service providers
- Use digital technology to increase access to personal health decision-making for all, by considering gender equity and existing systemic barriers to access

### Potential for big impact:

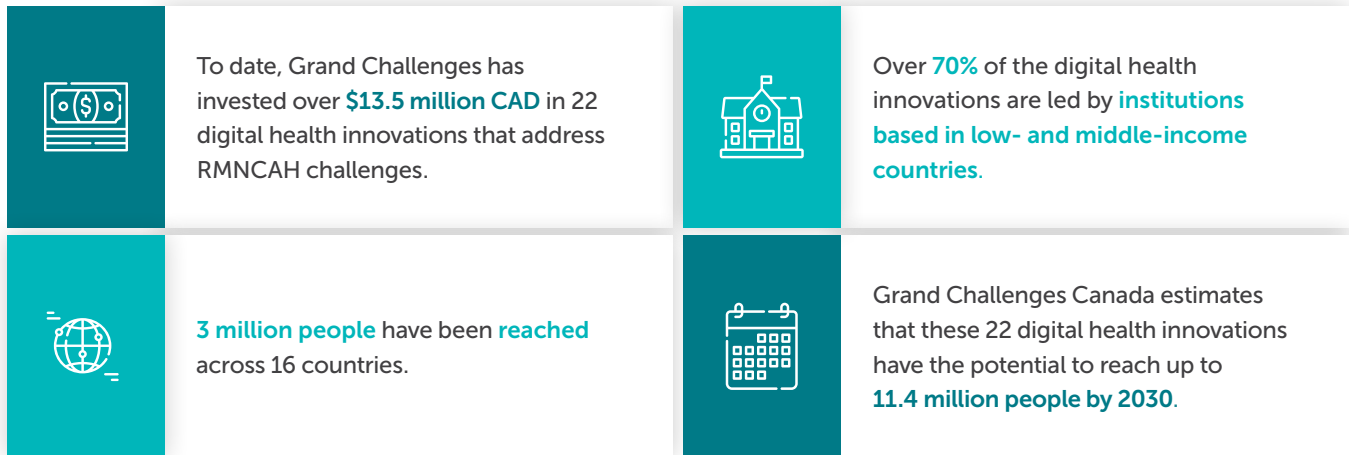
- Accessible to underserved users, including those reliant on non-smartphones and 2G networks
- Potential to reach people at scale, especially women and children
- Validated proof-of-concept results that demonstrate improved health outcomes or health-seeking behaviours

### A path to scale & sustainability:

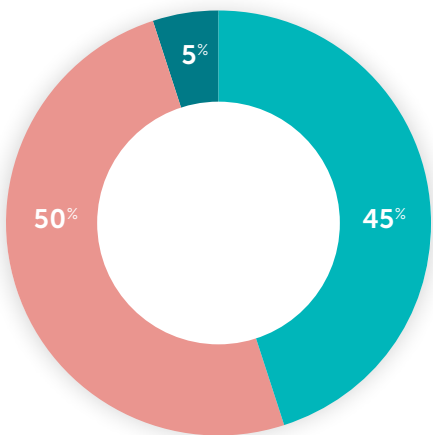
- Demonstrated willingness to pay by either the end-users, healthcare facilities, or governments
- Strong partnerships with major implementing partners and secured government support
- Alignment with national strategies and harmonization with national digital health efforts
- Cost-effective relative to the current standard of care
- Driven by user-friendly design that is interoperable with other data systems

# By the Numbers

## KEY RESULTS-TO-DATE

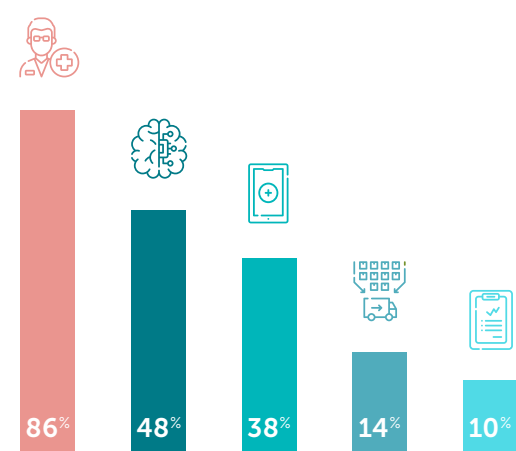


## SECTOR



- Primary Health Care
- Medical Products and Technologies
- Sexual and Reproductive Health and Rights

## TYPES OF DIGITAL HEALTH INNOVATIONS



- Provision of health care and services
- Patient knowledge/behaviour
- eHealth records
- Supply chain management
- Mobile diagnostics

Note: Types of digital health innovations span more than 1 category



# The Gender Digital Divide

The **gender digital divide** refers to gender biases built into technology products, the technology sector, and digital skills education (2). Bridging the gender digital divide across different contexts includes:

- **Access** — Increasing access to the internet, smartphones, and other digital technologies
- **Training** — Ensuring training for women and girls on skills needed to use digital tools
- **Women's leadership** — Boosting the number of women in technology leadership positions, including in academia and entrepreneurship



## GRAND CHALLENGES CANADA SEEKS TO ADDRESS THE GENDER DIGITAL DIVIDE BY:

- **Providing advisory support on integrating gender equality** that builds innovator capacity to conduct gender analysis, apply inclusive design principles, and strengthen gender equality outcomes.
- Around **one-third** of digital health innovations increase access to **sexual and reproductive health and rights services**.
- **38% of digital health innovations are led by women**. Grand Challenges Canada continues to work on reaching gender parity for funding innovations led by women.
- **Over 80% of interventions** are contributing to **gender equality outcomes**. This includes formalizing human resources policies to create more equitable employment and leadership opportunities for women, collaborating with local women-led groups, engaging men and boys to help challenge gender inequities including gender-based violence, and addressing women's decision-making power in their sexual and reproductive health.

## Innovator: [Praekelt.org](https://praekelt.org)

Pregnant women need timely information to make decisions regarding their health and to access essential services. Led by South Africa's National Department of Health, Praekelt.org developed **MomConnect**, a cellphone-based platform that delivers health advice to expecting and new parents via bi-weekly text messages, tailored to the pregnancy or parenting stage they are at ("stage-based messaging"). The platform is free and accessible on the WhatsApp platform, a commonly used messaging app. MomConnect is available in all 11 of South Africa's official languages.

Through a comprehensive gender equality analysis, Praekelt.org found that fathers in South Africa often felt excluded from maternal health conversations. To empower all caregivers, Praekelt.org will soon be making the platform more inclusive to fathers and other caregivers. This has included adapting marketing, messaging, and program design to engage fathers and promote their involvement in childcare.

# Access Equity

Digital health solutions expand access to essential health information and services for many. However, they are often inherently exclusive, requiring a baseline level of access to mobile and internet technologies. Innovators funded by Grand Challenges Canada seek to expand access for hard-to-reach or vulnerable users that:

- Have limited access to electricity and network services
- Have low digital literacy skills
- Speak minority languages
- Have disabilities such as sight and hearing impairments
- Address migrant populations in new settings

To build capacity for reaching the most vulnerable populations, Grand Challenges Canada supports a number of innovators that have adapted their smartphone platforms for use in low connectivity contexts. Sample adaptations include:

- Alternative ways to use application-based mobile platforms (e.g., Facebook Messenger) for accessibility at internet cafes or remote sites
- SMS functionalities with no data required
- Capabilities for offline and paper-based usage
- Availability in multiple languages, including minority languages



## Innovator: University of British Columbia & Walimu

In Uganda, children under-five hospitalized for severe infections and sepsis have a very high post-discharge mortality rate, as more children die after discharge than during hospitalization. The **Smart Discharges** program consists of a facility scan to assess current discharge practices, training modules for health workers to improve the discharge process, counselling materials for caregivers, and a follow-up program for the most vulnerable children.





Integral to the approach is a series of validated risk algorithms, derived through epidemiological analysis of over 10,000 children with sepsis, that identify those at highest risk of post-discharge mortality. These children are flagged for follow-up, thereby enabling a more precise approach to the provision of care. The Smart Discharges approach recognizes that technological solutions must already be embedded into existing health systems to enable adoption. As such, the algorithms are open and flexible to facilitate the paper-based administration of the algorithm for use in rural hospitals with limited internet access so they can be incorporated into existing electronic health record systems or accessed using a mobile app. This approach is now being scaled regionally across Uganda, in collaboration with the Uganda Ministry of Health.

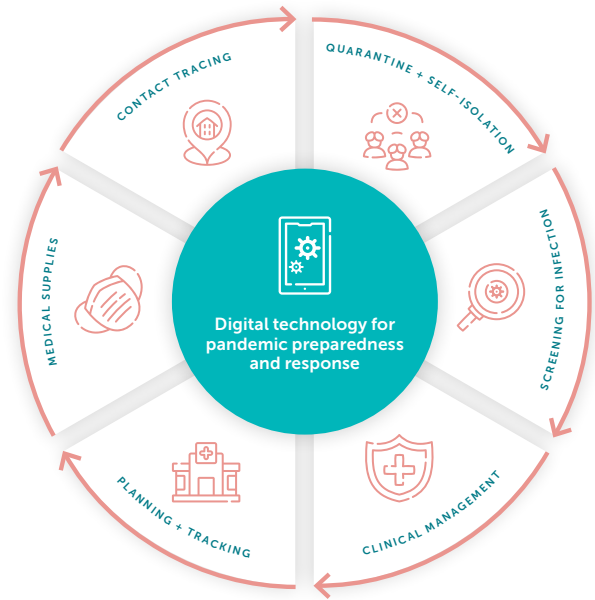
In the context of COVID-19, digital health solutions are well equipped to meet public health information needs. Effective strategies for pandemic response rely on successfully integrating digital technology into policy and service provision. Countries that have maintained low COVID-19 mortality rates have digital health strategies that include rigorous tracking, screening for infection, contact tracing, quarantine, and clinical management (3).

The 2020 Grand Challenges Annual Meeting facilitated collaboration among scientists, researchers, funders, and policymakers to discover, develop, and deploy solutions needed to control the COVID-19 virus and prepare for future global health emergencies. The seminal gathering focused on the importance of innovating and creating digital systems that are not only responsive to the needs of today but also consider the opportunities of tomorrow. Additionally, the meeting explored how digital health interventions should acknowledge evolving global demographics and a rise in internet connectivity to improve the quality of service provision and access to health information.

In response to the spread of COVID-19, Grand Challenges Canada has provided funding to digital health innovators offering vital resources, ideas, and solutions in resource-constrained settings. Grand Challenges Canada is also supporting innovators who have pivoted, incorporating digital tools to adapt otherwise offline activities to the new realities of the pandemic.

**Examples of activities facilitated by digital tools include:**

	<b>Telemedicine platforms for remote triaging, risk assessment, and referrals for last-mile populations</b>
	<b>Using artificial intelligence-powered chatbots to provide education, monitor case surveillance, and facilitate treatment</b>
	<b>Dissemination of accurate, timely COVID-19 information</b>
	<b>Provision of mobile and SMS-based mental health support</b>



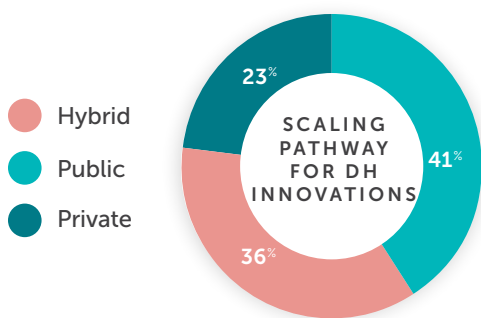
**Innovator: WelTel Inc.**

WelTel is a digital health service that uses text messages to connect remote HIV outpatients with the healthcare system. The remote service provides virtual care and monitoring, and encourages treatment adherence and support for holistic patient self-management. The platform has been augmented to support the COVID-19 response in Kenya and Rwanda, where public health agencies are using it to monitor and support COVID-19 cases and contacts in home quarantine.

Patients can send text messages to WelTel, and receive responses and reminders according to the patients' needs. WelTel uses natural language processing and predictive algorithms to tailor these responses and collects real-time data to facilitate public health management. In response to the COVID-19 pandemic, WelTel has adapted its platform to focus on pregnant women, young children, and other vulnerable populations requiring enhanced monitoring by healthcare providers, while simultaneously avoiding COVID-19 exposure at healthcare centres.

# Scaling Digital Health Innovations

A scaling pathway is the route pursued to maximize the reach of an innovation amongst target populations to achieve widespread sustainable impact. Grand Challenges Canada funding at Transition to Scale seeks to support early-stage innovators on their pathway from proof-of-concept to achieving scalable impact. In the digital health portfolio, 41% of innovations are scaling through the public sector, 23% are scaling via the private sector, and 36% are using a hybrid approach.



## Public Sector Scaling

Innovators scaling through the public sector must build strong, long-term relationships with government systems at multiple levels. In collaborative partnerships with public partners, innovators develop solutions that address existing health gaps.

**Touch Foundation** and **Vodafone Foundation's m-mama program** is an integrated emergency transport and referral system, which is accessible using simple mobile devices. The m-mama program provides women and newborns in hard-to-reach communities in Tanzania with transportation services for obstetric and post-natal emergencies. The program's goal from the outset was to increase ownership and secure buy-in and financial commitment from local and national government stakeholders. The Shinyanga Regional Government instituted a team of legal, procurement, and clinical heads that are engaged in all aspects of the innovation – from program design and site selection, to payment for community drivers and monitoring and evaluation activities. Enabling factors that led to government commitment included: (i) Strong evidence showing significant reductions in maternal mortality in the region m-mama was piloted – garnering regional and national government interest and financial commitment from the outset; (ii) Strong evidence of cost-effectiveness demonstrating that the innovation could be scaled and sustained in new regions; and (iii) A phased financing approach where the program's operating and payment costs are gradually integrated into annual governmental budgets, with increased budget allocation each fiscal

year. This scaling model presents an opportunity for Grand Challenges Canada to advance learning on strategies of engaging governments to take on the ownership of digitally-enabled services.

## Private Sector Scaling

Scaling via the private sector typically entails developing and delivering a commercial product and/or service that delivers value and benefits to target populations (i.e., it is desirable, affordable, accessible) to allow for financial returns to be generated.

**AskNivi** is a Kenya-based digital health start-up that has designed the first digital contraceptive screening and referral service in East Africa. Through an interactive and automated chatbot available over WhatsApp and Facebook Messenger, AskNivi users can learn about various topics in the SRH space, and get connected to health products and services through the chatbot's screening and referral engine that is based on WHO standards for recommending SRH services. AskNivi reaches its users – women and adolescent girls – through social media and branded materials distributed by local partner organizations. The platform is easy to register and use and free for end-users. AskNivi generates revenue from clients, which includes clinics, government, non-government organizations, and industry stakeholders in two ways: (i) As a business intelligence product, allowing clients to generate and gain insights on consumer preferences, needs, and behaviours; and (ii) As a marketplace product, where clients list their products and services on the AskNivi marketplace to be discovered when a user is referred a product or service.

## Hybrid Scaling

Hybrid scaling harnesses the power of both public and private sector approaches, which ultimately leverages the resources, expertise, and support of a diverse group of stakeholders.

**Vitalk Health (formerly TNH Health)** is a virtual health assistant providing users with in-app consultation services related to pregnancy, mental health, and chronic diseases. Vitalk offers users engaging content, advice, and health information that is also accessible through secure, cross-channel communication via iOS/Android apps, WhatsApp, email, and SMS. Vitalk employs a hybrid scaling model that targets both public and private sector clients. Public sector clients include municipal health systems, for which the innovation helps to reduce stress on public clinics and hospitals by enabling more efficient utilization of maternal health services. Vitalk has also been able to attract increased demand for their services from private sector clients, like employers and health insurance companies, which was facilitated by expanding product offerings, leading to rapid company growth. Both public and private clients cover the cost of Vitalk Health's maternal messaging and monitoring service at an affordable rate, allowing end-users to benefit from the service at no cost. At an affordable price point, every local health system in Brazil can afford to monitor pregnancy outcomes at the individual, community, and population levels.



# Keys to Scalability and Sustainable Impact

Across the digital health portfolio, several factors consistently play a role in shaping an innovation’s ability to scale. Grand Challenges Canada assesses these factors when determining which digital health innovations to fund and how to best support innovators to strengthen these areas during the funding period.

## CONTEXT-RELEVANT SOLUTIONS

Digital health technologies are most effective when they address specific, needs-based contextual challenges, such as addressing declining vaccination rates interfering with disease eradication efforts, promoting mental health, or providing accurate information in the wake of the COVID-19 pandemic.

## STRONG PARTNERSHIPS

There must be a focus on brokering smart partnerships that mobilize private capital and domestic public resources to access the appropriate channels to grow beyond the initial context, as well as to foster a network for collaboration. Having access to business development expertise to inform strategic planning and facilitate key partnerships is crucial to scale.

## WIDESPREAD ACCESSIBILITY

The breadth of an innovation’s reach allows messaging to permeate more broadly and influence health outcomes at both the community and population level. Online and mobile platforms increase access to accurate health information, resources and services, and also foster communication to facilitate a space for online communities to thrive.



THE AGA KHAN UNIVERSITY

### Innovator: Aga Khan University

Pakistan and Afghanistan began facing declining immunization rates in 2011 due to misinformation, mistrust, fear-based propaganda, and a lack of vaccine awareness in rural areas. Led by Aga Khan University, **Hayat** – an electronic maternal, newborn, and child health android mobile app and web portal, aims to address these challenges and improve health outcomes for women and children in remote districts of Afghanistan and Pakistan.

The app allows health care providers to track and manage patients while they are out in communities and increases transparency with respect to vaccine coverage. This data management tool has encouraged accountability for routine immunization efforts between healthcare providers, as well as with parents, significantly improving vaccine coverage rates. The platform has also improved antenatal care for mothers and children by tracking the number of healthcare worker visits per patient. Promoting transparency through app usage contributes to the overall strengthening of health systems in both countries.

# Keys to Scalability and Sustainable Impact

## RESILIENCY & ADAPTABILITY

The COVID-19 pandemic has highlighted the need for systems to be built with agile approaches to respond to unpredictability and adapt accordingly. For digital technologies, this includes having resilience with respect to changes in access to hardware or connectivity for users, but also includes having the “surge capacity” to respond to increased demand, and to pivot platforms to mitigate unexpected risks.

## HIGH-QUALITY DATA

Access to accurate and reliable data, including national datasets, are required to demonstrate an impact on the health challenge and convey insights to improve operational efficiencies. This is particularly salient for public sector-oriented innovations where high-quality data can help illustrate an evidence-based need and establish a product-market fit to guide governments in the decision-making process.

## TECHNICAL SUPPORT

Beyond infusions of capital, early-stage innovators working towards scale and sustainability typically benefit from technical support in one or several areas, such as:

- Navigating public and private sector partnerships, including government engagement
- Business model refinement and evaluation
- Growth and sustainability strategies
- Planning for geographic and technology expansion

Grand Challenges Canada’s Venture Advisor Program provides innovators with guidance and support to help scale their innovations. Digital health innovators requiring additional assistance have access to one-on-one coaching and cohort-based webinars.



## Innovator: Triggerise

Triggerise implements a digital platform that improves sexual and reproductive health outcomes for young women using a reward-based system combining information with behaviour change. The platform helps create awareness of local services, incentivizes demand for these services, connects users to service providers, and rewards active users with discounts for products. Triggerise is also able to generate behavioural insights to track and project areas of need and nudge behaviours accordingly. This includes reminding women to refill oral contraceptive prescriptions or to attend antenatal consultations. Trained social health activists called “Tiko Pros” deliver the program, and users can earn virtual rewards called “Tiko Miles” on the platform, which can be used to buy products locally.

To address the unique needs of the pandemic, Triggerise developed a mobile-based COVID-19 screening tool for community-based surveillance and real-time monitoring of cases. Community health workers then refer symptomatic people to nearby testing facilities and shares screening data with local government authorities. Thus far, they have screened thousands of people in Ethiopia and India. This in-app module has already generated interest from other governments to integrate the program within existing networks of community health workers.

# Lessons Learned on Impact Measurement

Digital health technologies provide tangible solutions to tackle health system challenges, offering the potential to enhance the coverage and quality of healthcare services. Generating evidence of impact helps to make the case for governments and partners to invest in long-term, sustainable adoption of digital health solutions. The following learnings on impact measurement for digital health innovations help to shape context-specific, appropriate approaches to generating evidence of impact.

## Adapt M&E approaches based on platform objectives:

Digital health technologies are well-positioned to collect a wide variety of data, enabling innovators to build monitoring and evaluation tools to track user engagement. Measuring the health impact of service delivery platforms vs. knowledge and behaviour change platforms requires different approaches, and different platform use cases present unique measurement challenges. Funders that invest in innovation can adapt monitoring requirements to what is (a) feasible for innovators, and (b) most relevant to understand the progress and success of the particular innovation.

### Service delivery

Service delivery platforms where health services are directly delivered to end-users are often able to track the direct health outcomes of each user. As a result, these platforms enable innovators to concretely measure improved health outcomes that are directly attributed to the uptake of health services and treatments (e.g., antenatal care clinic visits, safe deliveries, receipt of childhood vaccinations, and medication adherence). For example, Aga Khan University's Hayat platform, which provides routine immunization coverage against preventable life-threatening diseases like polio, measles, and tuberculosis, uses an android application and web portal to strengthen immunization tracking. The comprehensive reports produced by such platforms allow for efficient monitoring of individual health improvement outcomes.



### Knowledge acquisition & behaviour change

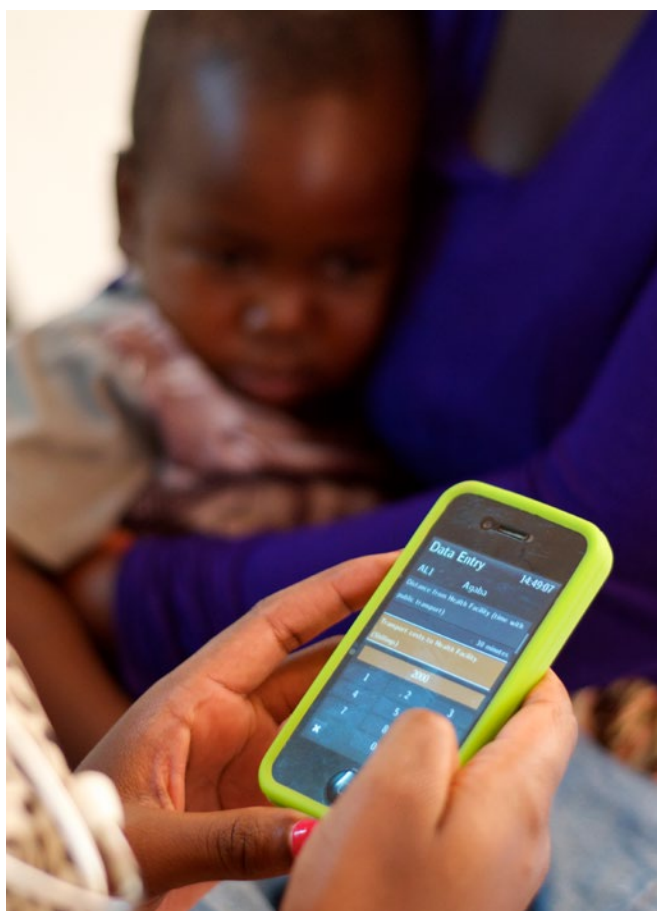
Knowledge and behaviour change platforms are not always able to directly measure health impact, as their engagement with end-users starts and ends with providing information rather than delivering health services directly. These platforms, however, can measure knowledge and behaviour change among end-users, which are important precursors for improved health impact. In some cases, partnerships with the government and service providers in the health system can enable data collection on health outcomes that link to knowledge and behaviour change. Knowledge acquisition platforms in Grand Challenges Canada's digital health portfolio are primarily related to addressing sexual and reproductive health issues. For example, platforms like Triggerise, that link to buying services or products, can track aggregate numbers of women attending antenatal care or contraceptive counselling sessions. Without applying a rigorous study design, drawing a clear line from knowledge acquisition to tangible changes in behaviour and improved health outcomes can be a difficult task for these types of interventions. However, digital health innovations are well-equipped to monitor the frequency and depth of user engagement. Therefore, proxy measures such as quizzes and surveys; and integrating other sources of primary data are alternative ways to evaluate changes in knowledge that can provide insight into individual health outcomes.

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# Lessons Learned on Impact Measurement

## Allow time for robust evidence generation

Most innovations in Grand Challenges Canada’s digital health portfolio are at an early stage and will only start to show health outcomes in coming years. At earlier stages, innovators focus on tracking usage of the innovation by end-users and healthcare providers and evaluating the resulting changes in health outcomes. Adjusting the timeframe and expectations for impact measurement of digital health innovators to meet what is contextually realistic is a crucial way for donors to support robust evidence generation.



Though it is essential to track outcome level data, many digital health interventions intend to make other aspects of the health system operate more efficiently. For this reason, governments and donors are not only interested in health outcomes but are also keen to invest in digital solutions that support data-driven decision-making to guide strategic funding and resource allocation.

Strong evaluation is crucial to generate the evidence that governments need to make decisions on which technologies to integrate into the health systems to address health priorities (4). As innovations evolve through progressive stages of maturity, the monitoring and evaluation needs must also adapt. There should be concurrent evaluation activities planned to address the various stages of an intervention lifecycle from prototype to the pilot phase, demonstration, scale-up, and integration stage. Rigorous evaluation of digital health innovations over-time is necessary to attribute a range of outcomes to the intervention—from assessing how easily end-users engage with the system (usability) to the health impacts resulting from the innovation (efficacy/effectiveness). As innovations attempt to scale nationally at later stages of maturity, governments seek tools that are interoperable and capable of fitting squarely within the existing health system infrastructure. Evaluation approaches that include implementation science, such as process improvements, cost-effectiveness, and/or changes in policy and practices that are attributable to the innovation, can provide critical information to support governments in making evidence-based decisions (4).

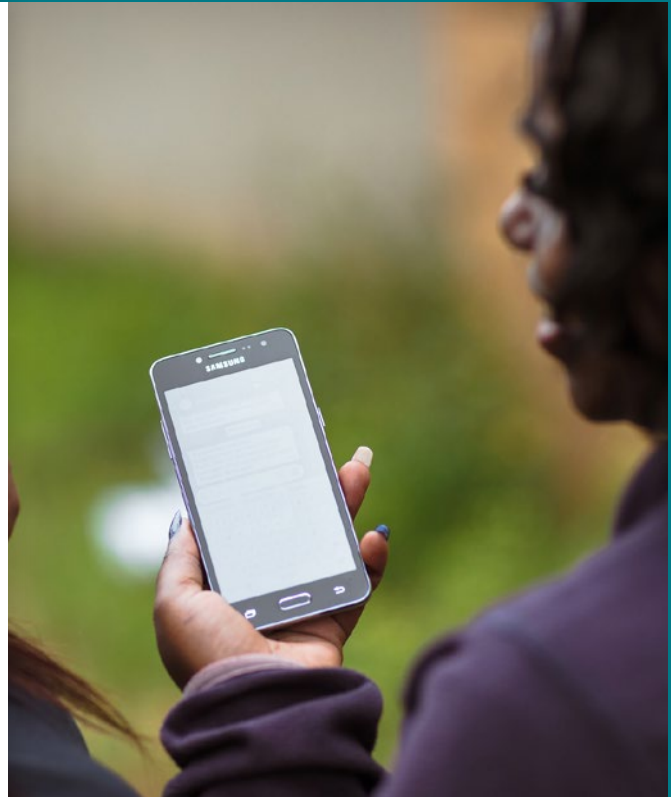


# Future Investments in Digital Health

Digital health innovations complement and support health systems, empower users to make better-informed decisions, and contribute to improved health outcomes, ultimately offering a significant avenue for global progress towards health equity. In 2019, Grand Challenges Canada signed onto the [Principles of Donor Alignment for Digital Health](#), which seeks to align global efforts in digital health to achieve the Sustainable Development Goals. Grand Challenges Canada is working to strengthen evidence of effective scaling paths to improve donor coordination and to harmonize solutions with national and international digital strategies. As part of building a diversified and context-appropriate portfolio, Grand Challenges Canada strives to align with the Principles, rather than creating bespoke solutions for each context.

COVID-19 continues to expose and heighten disparities in the global health system. With a limited number of trained professionals and overwhelmed public systems in many low resourced settings, there is a heightened need for accessible health supports. While digital solutions are not panaceas, they can **play an integral role in building resiliency by addressing persistent gaps in broader health systems**. Grand Challenges Canada will strategically focus on supporting digital technologies that: advance sexual and reproductive health and rights, facilitate mental healthcare, support primary healthcare services, and operate in humanitarian and conflict settings.

As new digital technologies emerge, Grand Challenges Canada will continue to evaluate the value of these developments to strengthen health systems and improve lives, while facilitating strategic partnerships and continue being a collaborative funder for innovators working towards accessible healthcare.



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2020

Grand Challenges Canada's programs are primarily undertaken with the financial support of the Government of Canada provided through Global Affairs Canada.



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