

## Final Technical Report

Grand Challenges Canada

MaRS Centre, WEST Tower, 101 College Street, Suite1720, Toronto, Ontario, Canada M5G 1M1

T 416.583.5821 F 416.978.6826 E info@grandchallenges.ca



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## Final Technical Report

The Development Innovation Fund in Health

Grant No. 106061-001

Prepared by:

- **Peter Singer**, Chief Executive Officer
- **David Brook**, Chief Strategy Officer
- **Karlee Silver**, Vice-President, Programs
- **Jocelyn Mackie**, Vice-President, Operations

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## Executive Summary

In Budget 2008 the federal government announced the creation of the Development Innovation Fund in Health (DIF-H). A consortium was created to deliver on this commitment with Grand Challenges Canada (GCC) as the implementation partner (with about 98% of funding flowing to GCC), Canada's International Development Research Centre (IDRC) providing accountability to the government of Canada and the Canadian Institutes of Health Research (CIHR) administering or certifying peer review processes. This consortium structure was itself an experiment to explore the potential to use an outside-of-government delivery vehicle to foster development innovation while still maintaining strong accountability to Parliament through the consortium.

DIF-H was unusual in that it was intended to support the implementation of an outside-of-government delivery vehicle for government policy in development innovation. As such, its three primary objectives were quite broad:

1. Identify and prioritize profound health and health-related challenges facing the developing world;
2. Mobilize Canadian and international, including developing world, scientific, social and business communities to address these health and health-related challenges through a competitive selection process or other appropriate selection process and the direct or indirect funding of, or investment in, projects; and
3. Facilitate affordable implementation and commercialization, in developing regions of the world, of solutions that emerge.

GCC delivered on these objectives through three targeted challenges: Saving Lives at Birth, Saving Brains, and Global Mental Health. Assessments of the impact of these targeted challenges by GCC's Scientific Advisory Board found that:

*(The Saving Brains program) couldn't build a better/more distinctive brand for Canada. It is entrepreneurial, and builds on a strong evidence base.*

*Has the Saving Lives at Birth program been successful? I would say categorically 'yes'. I would say that it has been very successful.*

*The global mental health program provides huge value for money ... GCC has been a key player in helping to leverage other investments.*

GCC also implemented two open innovation platforms: Stars in Global Health and Transition to Scale (TTS). The TTS platform, in particular, featured a unique Investment Committee process that combines elements of a more traditional peer review process with elements from venture capital/private investment due diligence. The Scientific Advisory Board found that:

*The stars program has been catalytic in supporting young innovators in low- and middle-income countries particularly in Africa ... The coolest part of GCC is Stars – 500+ grants and funded a whole bunch of early-stage concepts that wouldn't have seen the light of day without GCC.*

*(The Transition to Scale Program) is a good thing and unique to GCC in which it has a nice capability for leadership.*

In addition, GCC was the anchor investor in the Global Health Investment Fund, a \$108 million social impact investment fund and developed and hosts the Every Woman Every Child Innovation Marketplace.

One of the more powerful aspects of the GCC model has been the ability to drive significant interest and engagement in innovators across Canada and throughout the developing world.

*GCC has **supported over 700 innovations in over 80 countries** roughly 2/3 of which are led by innovators in low- and middle-income countries and 1/3 by Canadian innovators.*

A Summative Evaluation conducted in 2015 found that GCC has had significant real-world impact in only five (5) years. GCC's internal analysis supported by comments from our Scientific Advisory Board suggests that this success is due, at least in part, to our focus on Integrated Innovation—combining social, business and scientific/technological innovation to maximize the potential for sustainability and scale.

*Innovations funded by GCC through the DIF-H are estimated to **improve between 15 and 42 million lives by 2030**, with over 1.3M lives improved to-date.*

*Innovation funded by GCC through the DIF-H are estimated to **save between 520,000 and 1.6 million lives by 2030**, with over 11,200 lives saved to-date*

*GCC's programs have produced **more than 360 peer-reviewed publications to-date**, and that number is likely to increase as innovators continue to work on projects and innovations that emerged from their DIF-H related work.*

*GCC-supported innovations have **influenced 85 policies** by engaging with government officials, decision-makers and other local stakeholders.*

In its first two years of implementing the DIF-H, GCC identified a critical gap in enabling validated solutions to effectively and sustainably go to scale. To address this gap, GCC developed a robust Transition to Scale program with a unique investment committee process and a focus on post-deal execution. An important element of this program has been the use of non-grant investments to support social enterprises and other private sector implementers.

*GCC has invested **\$83M into 107 TTS projects** that are implementing in 34 countries. This investment has **leveraged over \$107M** in additional funding.*

*Of these 107 projects, **75 are still continuing on the path to scale** after the GCC funding ended.*

One of the significant learnings for GCC over the course of implementing the DIF-H was about the importance of measuring and tracking the actual outcomes of investments in innovation and projecting the potential impact of innovations at scale by 2030. GCC recognized that since the outcomes of innovation are in the future, it is not enough simply to measure current outcomes but it is also critical to develop impact models to estimate potential future outcomes. GCC worked closely with a global development consultancy *Results for Development Institute* and with the *IDIA Working Group* to develop and test a robust methodology for modeling and projecting future outcomes. This methodology will be an important legacy of GCC's work in implementing the DIF-H.

Another important learning was in the area of non-grant financing. While Financial Innovations are newer and can be perceived as being higher risk, requiring more testing and refinement, the use of appropriate financial tools, such as loans, and equity investments (which are part of Conditionally Repayable Contributions) is standard practice in many sectors and has a long track record of leveraging in private capital and catalyzing partnerships to support innovation.

A third lesson learned through the implementation of the DIF-H was that organizations that effectively catalyze innovators and innovations must have three core attributes:

1. Most importantly, strong **oversight and accountability including an independent Board of Directors** with experience across sectors informed by expert scientific and innovation advice,
2. **Flexibility** to react to new opportunities and to learn quickly and course correct along with the ability to **manage and mitigate risk**, which is an integral part of meaningful innovation (a key function of an independent board is to oversee the risk taking and management of risk and to set the right risk appetite), and
3. Sufficient and predictable **operational support** (as evaluated by an independent board) to drive long-term value for money. This is particularly true for the Transition to Scale platform, where we have learned that success is often driven more by post-deal execution and support, and active management than pre-deal negotiations and due diligence.

Finally, at the conclusion of the DIF-H GCC has two observations on the use of an outside-of-government organization to foster innovation:

1. **The use of an outside-of-government organization to drive development innovation was a success.** The actual and potential outcomes achieved by the innovations that were supported and the value for money to achieve these outcomes are the primary indicators of success.
2. **The success of this model in development innovation raises the question of whether it could also be successful in driving innovation in other federal departments or agencies.**

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In Budget 2008 the federal government announced the creation of the Development Innovation Fund. A consortium was created to deliver on this Government of Canada priority with Grand Challenges Canada (GCC), the Canadian Institutes of Health Research (CIHR) and the International Development Research Centre (IDRC). As laid out in a Memorandum of Understanding<sup>1</sup> signed in August 2009, the roles of the three consortium members were:

**IDRC** – providing accountability to parliament and coordinating monitoring and evaluation of the Development Innovation Fund

**CIHR** – administering or certifying peer review processes

**GCC** – operating as the primary vehicle for the delivery of the Development Innovation Fund

This consortium structure was itself an experiment to explore the potential to use an outside-of-government delivery vehicle to foster development innovation while still maintaining strong accountability to Parliament. In the implementation of this model, about 98% of funding flowed through GCC and GCC delivered all program elements of the DIF-H.

Lessons learned from GCC's work on outcomes-focused innovation may be of interest more broadly within the federal system given the current interest in mission-oriented innovation. These lessons learned are summarized in the GCC Annual Letter 2016<sup>2</sup> and in a document entitled *Points to Consider in Developing Grand Challenges Initiatives* which is available upon request from GCC.

## Objectives

The Development Innovation Fund in Health (DIF-H) is unusual in that it was intended to support the implementation of an outside-of-government delivery vehicle for government policy in development innovation. As such, the three primary objectives that were established in the Amended Funding Agreement<sup>3</sup> between Canada's International Development Research Centre (IDRC) and Grand Challenges Canada (GCC) are quite broad:

1. *Identify and prioritize profound health and health-related challenges facing the developing world;*
2. *Mobilize Canadian and international, including developing world, scientific, social and business communities to address these health and health-related challenges through a competitive selection process or other appropriate selection process and the direct or indirect funding of, or investment in, projects; and*

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<sup>1</sup> Memorandum of Understanding Concerning the Developing Innovation Fund for Health between the International Development Research Centre, the Canadian Institutes of Health Research and Grand Challenges Canada, 2009

<sup>2</sup> <http://www.grandchallenges.ca/who-we-are/annual-letter/>

<sup>3</sup> Amended Funding Agreement between Canada's International Development Research Centre and Grand Challenges Canada, 2010

3. *Facilitate affordable implementation and commercialization, in developing regions of the world, of solutions that emerge.*

These objectives remained essential unchanged over the course of the DIF-H.

Since 2010, GCC has identified and prioritized global health challenges including both **targeted challenges** that focus on specific thematic areas and **innovation system challenges** that focus on the processes by which development innovation is sourced, supported and scaled. Specifically:

- GCC identified three **Targeted Challenges** (Saving Lives at Birth, Saving Brains, and Global Mental Health) based on consultations with Canadian and international experts, and our Scientific Advisory Board, against a set of criteria (see **Annex 1**). GCC built specific programs to address each of these challenges.
- GCC partnered with others on the identification and launch of two other **Targeted Challenges**: Point-of-Care Diagnostics with the Bill & Melinda Gates Foundation, and Hypertension with the Canadian Institutes of Health Research (CIHR) under the Global Alliance for Chronic Diseases.
- GCC designed the **Stars in Global Health** platform to create a pipeline of promising health innovations that could transition to scale and sustainability.
- GCC designed a **Transition to Scale platform** to catalyze the scale and sustainability of promising innovations through Integrated Innovation (the coordinated application of technological / scientific innovation with social and business innovations). GCC developed a unique Investment Committee process that combines elements of a more traditional peer review process with elements from venture capital/private investment due diligence.

These programs and platforms were the primary vehicle through which GCC mobilized Canadian and international innovators. Through the DIF-H, GCC has funded over 700 innovations in more than 80 countries globally. More detail on these programs can be found in the Development Outcomes section of this report.

Lastly, GCC's efforts on affordable implementation and commercialization have centered on our Transition to Scale platform (also described in more detail in the Development Outcomes section). In addition, GCC was also the anchor investor in the Global Health Investment Fund, a \$108 million **social impact investment fund** designed to provide financing to advance the development of drugs, vaccines, diagnostics and other interventions against diseases that disproportionately burden low- and middle-income countries. Finally, GCC developed and hosts the Every Woman Every Child Innovation Marketplace, which is designed to systematize the transition from pilot to scale of innovations in women's, children's and adolescent health.

## Progress towards Milestones

There were very few specific milestones articulated in the DIF-H Funding Agreement because GCC would develop and implement its programs after its launch and evolve over time. Rather, the agreement stipulated that a *Learning, Monitoring and Evaluation Framework* would be developed and finalized by June 30, 2011 that would become part of the Funding Agreement. This framework was then used as the basis for a **Formative Evaluation** of the Development Innovation Fund in Health (completed in 2012) and a **Summative Evaluation**<sup>4</sup> (completed in 2015).

The Theory of Change that was developed for the Development Innovation Fund in Health was as follows (emphasis added):

*IF the **best minds** in the developing world and in Canada are focused together on innovation to **develop solutions** to significant global Grand Challenges,*

*THEN, over a ten- to fifteen-year timeframe, practical solutions to these Grand Challenges in terms of **new knowledge, products and services** will be found*

*AND, since these solutions will include relevant scientific, social and business innovations needed to bring the solution to scale, they can be **widely and effectively implemented** where they are needed the most.*

*AS A RESULT, the **health outcomes** of many in the developing world will be **significantly improved**.*

This Theory of Change was expanded into a flow diagram included as **Annex 1**. Without duplicating the analysis in the Summative Evaluation it is interesting to highlight key learnings from each of the four elements of the Theory of Change:

- **Focus the best minds:** One of the more powerful aspects of the GCC model has been the ability to drive significant interest and engagement in innovators across Canada and throughout the developing world. As noted earlier in this report, through DIF-H funding GCC has supported over 700 innovations roughly 2/3 of which are led by innovators in low- and middle-income countries and 1/3 by Canadian innovators.
- **New knowledge, product and services found:** The Theory of Change recognized that there would be a significant challenge in terms of the timeline to impact in that technological innovations can take ten to fifteen years to successfully go to scale. Despite this challenge, the Summative Evaluation found that GCC has had significant real-world impact in only five (5) years. GCC's internal analysis supported by comments from our Scientific Advisory Board

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<sup>4</sup> [http://www.grandchallenges.ca/wp-content/uploads/2016/03/DIF-H\\_SummativeEvaluation\\_web\\_10-20-15.pdf](http://www.grandchallenges.ca/wp-content/uploads/2016/03/DIF-H_SummativeEvaluation_web_10-20-15.pdf)

suggests that this success is due, at least in part, to our focus on Integrated Innovation.

- **Solutions are widely and effectively implemented:** In its first two years of implementing the DIF-H, GCC identified a critical gap in enabling validated solutions to effectively and sustainably go to scale. To address this gap, GCC developed a robust Transition to Scale program with a unique investment committee process and a focus on post-deal execution. An important element of this program has been the use of non-grant investments to support social enterprises and other private sector implementers.
- **Health outcomes will be significantly improved:** One of the significant learnings for GCC over the course of implementing the DIF-H was about the importance of measuring and tracking the actual outcomes of investments in innovation and projecting the potential impact of innovations at scale by 2030. GCC recognized that since the outcomes of innovation are in the future, it is not enough simply to measure current outcomes but it is also critical to develop impact models to estimate potential future outcomes. GCC worked closely with a global development consultancy *Results for Development Institute* and with the *IDIA Working Group* to develop and test a robust methodology for modeling and projecting future outcomes. This methodology will be an important legacy of GCC's work in implementing the DIF-H.

Progress against the Theory of Change was assessed in the aforementioned Formative and Summative Evaluations. It is worth highlighting some of the key findings of the Summative Evaluation in this report:

- *DIF-H addresses demonstrable needs for Canada, as well as the international community, and in so doing provides a significant contribution to several SDGs (2, 3, 6, 9, and 17).*
- *There is a continuing need for financing to support innovations while resolving barriers to global health and safety, and promoting development and equity in low- and middle-income countries (LMICs).*
- *Innovation is recognized as a relevant and cost-effective way to address health challenges in LMICs. DIF-H has increased the opportunities for Canadian researchers and innovators to engage with LMIC innovators and research institutions.*
- *This work, supported by DIF-H, has contributed to positioning Canada at the forefront of international efforts to rethink development modalities.*

Overall, the Summative Evaluation found that:

*Ultimate outcomes have been achieved ... intermediate outcomes have been achieved ... immediate outcomes have been achieved ... as current investments mature, further beneficial outcomes are expected. These are significant accomplishments for a research and innovation program that has only been operational for five years.*

GCC's overall progress and our progress in each of our program areas is also assessed on an annual basis by our Scientific Advisory Board. During the 2016 portfolio review process, Scientific Advisory Board members were asked for their assessment both of the key outcomes from the past year and of the achievements as a whole over the course of implementing the Development Innovation Fund in Health.

### Assessment of the Scientific Advisory Board: Overall Impact

The SAB executive committee offered the following observations on GCC's performance as a whole:

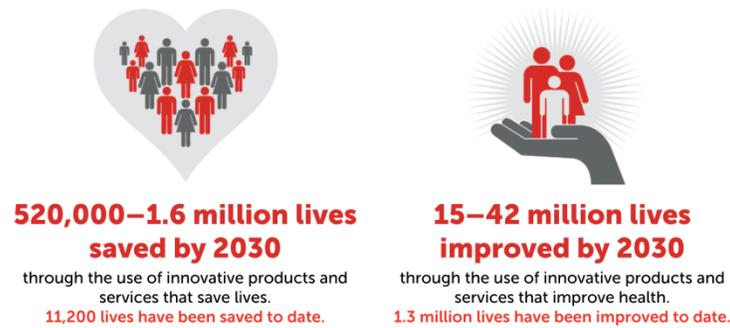
- Grand Challenges Canada is a “**lynchpin**” that enables so many other organizations, institutions and innovators to maximize their impact;
- Grand Challenges Canada is a “**catalyst**” that engages and bridges between the public, private and not-for-profit sectors in ways that would not otherwise be possible;
- Grand Challenges Canada is a “**pathbreaker**” that demonstrates the potential impact of transformative innovations that attracts further investment and lead to incredible long-term impact;
- Grand Challenges Canada has accomplished what others can't because it has been **flexible and strategic**, and has used these to tackle critical barriers for global health; and
- The reported outcomes in terms of actual and potential lives saved and improved are a valid albeit an understated articulation of Grand Challenges Canada's impact to date given the **catalytic role** of its funding and the resulting **cascading impact** that cannot all be captured in the performance measurement approach.

As the delivery partner for the Development Innovation Fund in Health, GCC has implemented a comprehensive Results-based Management and Accountability Framework (RMAF) and associated processes to track our outputs and outcomes. In addition, GCC worked with Results for Development (R4D) to tackle the challenge of projecting the potential future impact (i.e., when innovations have their true impact) of innovations that were sourced and supported through the DIF. **Figure 1** provides a summary of the projected and actual outcomes from innovations funded through the DIF-H. Note that the projected outcomes to 2030 are modeled using a validated methodology outlined in a white paper entitled *How We Assess the Potential Impact of the Innovations We Support*<sup>5</sup>, which is available upon request. The projections cited in this report are based on models resulting from this methodology that have been

<sup>5</sup> *How we assess the potential impact of the innovations we support*, Prepared for Grand Challenges Canada by Results for Development Institute, Updated March 2017

reviewed by the GCC knowledge management and program teams, and validated by external experts.

**Figure 1: Outcomes from the DIF-H by 2030**



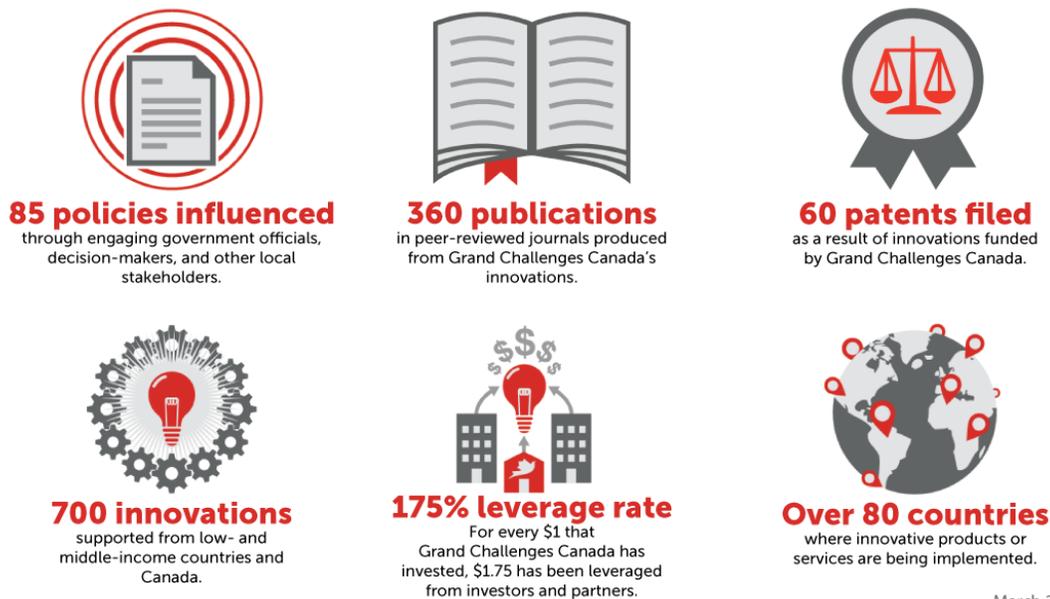
As GCC developed increasingly sophisticated processes to track outcomes, it became clear that there was significant variation within the broader category of ‘lives improved.’ **Figure 2** provides an overview of some of the more significant areas in which our innovators have improved the lives of the poorest of the poor in low- and lower-middle income countries.

**Figure 2: Overview of Contributors to Lives Improved by the DIF-H by 2030**



In addition, DIF-H produced a number of significant Outputs that are summarized in **Figure 3**.

Figure 3: Outputs from the DIF-H



Further, the number of publications is likely to increase as innovators continue to work on projects and innovations that emerged from their DIF-H related work. Examples of articles that have been published in high impact journals include:

- Burke, T, Ahn, R, Nelson BD, et al. **A postpartum haemorrhage package with condom uterine balloon tamponade: a prospective multi-centre case series in Kenya, Sierra Leone, Senegal, and Nepal.** BJOG. 2016; 123:1532.
- Charpak, N, Tessier, R, Ruiz, JG, et al. **Twenty-year follow-up of Kangaroo Mother Care versus traditional care.** Pediatrics. 2017; 139:e20162063.
- Chibanda, D, Weiss, HA, Verhey, R. **Effect of a primary care-based psychological intervention on symptoms of common mental disorders in Zimbabwe: a randomized clinical trial.** JAMA. 2016; 316:2618.
- Nakimuli-Mpungu, E, Wamala, K, Okello, J, et al. **Group support psychotherapy for depression treatment in people with HIV/AIDS in northern Uganda: a single-centre randomized controlled trial.** Lancet HIV. 2015; 2:e190.
- Pernica JM, Steenhoff, AP, Welch H, et al. **Correlation of clinical outcomes with multiplex molecular testing of stool from children admitted to hospital with gastroenteritis in Botswana.** J Pediatric Infect Dis Soc. 2016; 5:312.
- Rhein J, Morawski, BM, Hullsiek KH, et al. **Efficacy of adjunctive sertraline for the treatment of HIV-associated cryptococcal meningitis: an open-label dose-ranging study.** Lancet Infect Dis. 2016; 16:809.

The following section highlights progress against the three DIF-H objectives and lessons learned for each of GCC's programs funded through the DIF-H.

## Development Outcomes

At the close of the DIF-H, it is useful to assess its success in meeting the three objectives outlined above.

### IDENTIFY AND PRIORITIZE PROFOUND HEALTH AND HEALTH-RELATED CHALLENGES FACING THE DEVELOPING WORLD

Very early on in the delivery of the DIF-H, GCC took a conscious strategy of balancing funds between targeted challenges and a platform for open innovation—Stars in global health. For its targeted challenges, GCC used a structured process to identify Grand Challenges based on eight criteria (please see **Annex 2**). This process is described in more detail in a white paper entitled *The Grand Challenges Approach*<sup>6</sup>. In implementing this approach GCC learned some important lessons about identifying and shaping grand challenges. For example,

- GCC launched but chose not to renew a program in Point-of-Care Diagnostics with the Bill & Melinda Gates Foundation. Although this was a successful program it put too much focus on technological solutions and not enough on problem definition and integrated innovation.
- GCC, through Dr. Abdallah Daar, also played a leadership role in identifying the **Grand Challenges in Chronic Non-Communicable Disease** which led, in turn, to the creation of the Global Alliance for Chronic Disease and to a partnership with CIHR to support a set of projects on hypertension. These projects had a very long timeline and few levers for control, which limited the ability for GCC to enable their success.

Building on the findings of the Summative Evaluation, we would suggest that this process was successful: the themes that GCC identified for the three Targeted Challenges are still seen to be globally relevant and important. More recently, Minister Morneau drew attention to the importance of the Global Mental Health program at the 2016 Spring World Bank / WHO *Out of the Shadows* meeting during which he emphasized Canada's ongoing commitment to this priority:

*Our support of the Grand Challenges Canada global mental health portfolio is something that we are proud of. It's an organization that has given real prominence to this issue and has delivered some really important initiatives around the world ... We are going to remain committed as a country to the global mental health agenda.*

As a result of the DIF-H, Canada, through GCC, has developed an expertise in defining Grand Challenges. GCC is currently working with an international steering committee to identify a set of Humanitarian Grand Challenges. This expertise can be applied to other elements of the development agenda, and, to other sectors (e.g., climate, energy, indigenous, etc.).

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<sup>6</sup> Available from GCC on request and on [grandchallenges.ca](http://grandchallenges.ca)

## **MOBILIZE CANADIAN AND INTERNATIONAL RESEARCHERS TO ADDRESS THESE CHALLENGES**

The primary vehicle to mobilize Canadian and international researchers to address the challenges that were identified are GCC's three Targeted Challenges: Saving Lives at Birth, Saving Brains and Global Mental Health and our open innovation platform, the Stars in Global Health program. The following section provides a summary of key outcomes, lessons learned and examples of impact for each of these programs.

### ***Saving Lives at Birth***



Currently, more than 40% of maternal and newborn deaths and stillbirths occur on the day of birth and newborn mortality rates account for 44% of all under five child deaths. Further, virtually all of the 303,000 maternal deaths, 2.7 million newborn deaths, and 2.6 million stillbirths that occur each year, happen in low- and middle-income countries. Given this staggering challenge, a strong and focused effort to enhance maternal and newborn health will be crucial to achieving the Sustainable Development Goals.

### **Assessment of the Scientific Advisory Board: Saving Lives at Birth**

The SAB offered the following observations on the Saving Lives at Birth portfolio:

#### *Findings*

- An important accomplishment of the Saving Lives at Birth program is that it has helped to focus attention and build a pipeline of innovations to address the critical period for maternal and newborn survival that had previously been neglected.
- There is a rich and exciting pipeline of innovations in this program that are just beginning to transition to scale. The pipeline has huge potential for impact.

#### *Recommendation to Improve Value for Money*

- Ensure a strong focus on transitioning innovations to scale so the full value of the rich innovation pipeline is realized.

The Saving Lives at Birth Partnership bring together USAID, NORAD, the Bill & Melinda Gates Foundation, Grand Challenges Canada (funded by the Government of Canada), the UK's DFID, and KOICA on this Grand Challenge for Development.

The Saving Lives at Birth (SL@B) program seeks to overcome these challenges by supporting the development and transition-to-scale of ground-breaking innovations in low and middle-income countries (LMICs) that accelerate substantial and sustainable progress against maternal and newborn deaths and in the prevention of stillbirth. The Saving Lives at Birth program filled a gap in maternal and newborn health innovation by creating a highly competitive platform through which to source innovations of scientific excellence.

The Saving Lives at Birth program has invested \$84.3M CAN to support 106 innovations in 21 countries leveraging an additional \$70M CAN. This pipeline of innovations is illustrated in **Figure 4**.

**Figure 4: The Saving Lives at Birth Pipeline of Innovations**



Many of the innovations supported are early in their development. The 14 of 18 innovations transitioning to scale from this program that we have modeled to-date have the potential to save 48,900-159,000 women and newborns by 2030. Given the early stage of the innovations, continuous support from the Saving Lives at Birth program has been important to drive progress along the path to impact.

One of the key lessons learned from this project was that an investment through the Saving Lives at Birth program, along with the reputation of the programs partners, can provide enhanced visibility and improve an innovator's ability to raise additional funds and find partners at scale.

A second lesson learned is that multinational corporations can be valuable partners to help promising, early-stage innovations to realize sustainable impact at scale. For example, in 2016, Laerdal Global Health licensed the NIFTY Cup. Developed by Seattle Children's Hospital and PATH, the NIFTY Cup is designed for babies to drink breastmilk who otherwise find it hard to breastfeed. The selection of the NIFTY Cup as a Round 5 innovation was a factor in Laerdal's decision to license the Cup.

## EXAMPLES: Saving Lives at Birth



**Inhaled Oxytocin:** A heat-stable, inhaled dry powder oxytocin formulation is set to disrupt this lifesaving drug's availability and accessibility.

- **Years in the Saving Lives at Birth portfolio:** 7 years through three seed/validation awards
- **Original investment:** Stability and efficacy studies in a sheep model
- **Current Status:** Clinical trials amongst the target population have been initiated. Expected drug registration is 2019.
- **Expected impact:** Should distribution begin in 2020, it is estimated that inhaled oxytocin will save 27,000 lives by 2030.



**Pratt Pouch:** A polyethylene pouch offers a unique way for mothers to provide pre-measured, single doses of the HIV prophylaxis nevirapine to their babies.

- **Years in the Saving Lives at Birth portfolio:** 7 years through two seed awards and one Transition To Scale award
- **Original investment:** Feasibility and acceptability of the pouch amongst pharmacists and mothers
- **Current Status:** Elizabeth Glaser Pediatric AIDS Foundation is introducing pouches during antenatal care, delivery, and postnatal care services in Uganda
- **Expected impact:** 40,000 newborn lives improved over the next three years

In summary, the Saving Lives at Birth program has created an exciting package of innovations with the strong potential for sustained impact. Although a few social innovations in this program are already scaling and demonstrating impact, many innovations are technological in nature and will not realize their full impact for 10 to 15 years. As such, the true outcomes of this program will not be realized until the promising innovations have had the opportunity to go to scale. Going forward it will be critical to ensure that the necessary funding is in place to ensure that the most promising innovations transition to scale and, once they do so, that there are purchasers, likely governments in LMICs, to enable them to be deployed widely to maximize their benefits.

*"My first encounter with the AIR (Augmented Infant Resuscitator) team was at the 2014 DevelopmentXChange. It was one of three innovations that caught my eye. Seeing a strong business case for the AIR device, conversations with the team quickly led to a mutual interest in collaboration."*

*Venture Manager, Philips*

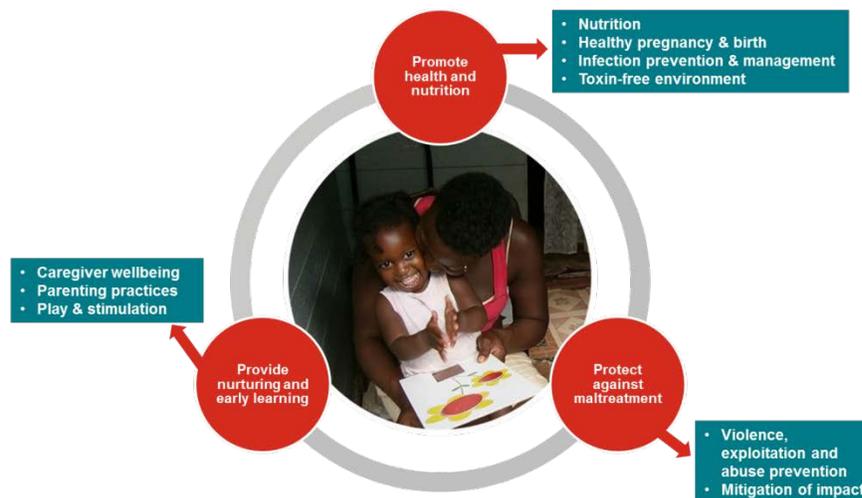


## Saving Brains



One in three children (200 million globally) fail to reach their full physical, cognitive, psychological and/or socioemotional potential due to poverty, poor health and nutrition, insufficient care and stimulation, and other risk factors to early childhood development. The Saving Brains program is focused on holistic solutions (see **Figure 5**) to develop and scale up products, services and policies that protect and nurture early brain development in an equitable and sustainable manner.

**Figure 5: Areas of Focus for the Saving Brains program**



Through the DIF-H, GCC provided \$16.8M CAD to 13 projects funded through the focus phase which sought to better define the long-term impact of known early life interventions, and the return on investment in potential interventions with respect to human capital. GCC also provided \$18M CAD to 35 proof of concept and 7 TTS projects funded through the solutions phase which seeks innovative products, services, policies and implementation models to nurture and protect early brain development. These projects were implemented in 26 countries and leveraged an additional \$11.6M CAD in funding. Through these projects:

- **31,765 children** have experienced improved development;
- **37,273 children** are receiving innovations designed to improve child development; and
- **35,867 caregivers** are delivering innovations designed to improve early childhood development

### Assessment of the Scientific Advisory Board: Saving Brains

The SAB offered the following observations on the Saving Brains portfolio:

#### *Findings*

- Grand Challenges Canada has lots to be proud of with Saving Brains. The Government of Canada should spread the word to other bilateral donors to leverage Canada's leadership in any way that they can.
- This program couldn't be building a better or more distinctive brand for Canada. It is entrepreneurial and is building on strong base.
- A very big part of the impact comes from the fact that Saving Brains has brought new voices into this discussion and new researchers from low- and middle-income countries.

#### *Recommendations to Improve Value for Money*

- Continue to support learning communities that are focused on (a) scaling and (b) evidence-rich ideas (e.g., Kangaroo Mother Care), which could include other efforts around the word to scale beyond those funded by GCC.
- Engage specific countries in the learning community to help build understanding and demand for early child development innovations.

Saving Brains leadership has raised attention globally by taking a bold holistic approach to early child development that:

- Created a new, global partnership; and
- Has made a strong and influential contribution to the global movement from "survival" alone to "survive to thrive" and aligns with the new Global Strategy: Survive. Thrive. Transform.

The portfolio has provided important evidence on the factors that influence and help to stimulate child development. In addition, the Saving Brains funding has produced a growing pipeline of potentially scalable models. The results of the Saving Brains program have been instrumental in shaping the understanding of early childhood development by:

*Canada is the largest donor to early child development programs. For every dollar committed by donors reporting to the OECD, seven cents were from Saving Brains.*

Saving Brains Portfolio Evaluation  
Report (November 2016)

1. **Defining the Problem:** Determining through the direct measurement of cognitive and/or social emotional development that one third of children in low- and middle-income countries fail to reach developmental milestones. The #1 risk for child stunting in these countries is poor growth before birth<sup>7</sup>.
2. **Understanding the Impact:** Saving Brains studies determined that poor child growth costs low- and middle-income countries \$177B US in lost wages and 69 million years of educational attainment for children born each year. Each dollar invested in eliminating poor child growth would yield a three dollar direct economic return<sup>8</sup>.
3. **Offering a Path forward:** The follow-up studies of early life interventions in LMICs helped to define the impact on human capital formation, including:
  - a. A study in Indonesia identified **maternal micronutrients**, early life nurturing, happy moms and educated parents as essential ingredients for smarter and more productive children<sup>9</sup>.
  - b. Babies **exclusively breastfed** to six months of age are half as likely to have later conduct disorders<sup>10</sup>.
  - c. Enriched **play and parenting** to 2 years of age leads to brighter 4-year-olds. A coaching intervention for parenting in Pakistan was effectively combined with delivery of health services through community workers resulting in children with higher IQ, better pre-academic skills and executive functioning, and more pro-social behavior. These gains in brain development did not translate into higher school enrollment<sup>11</sup>.
  - d. **Kangaroo Mother Care** for preterm babies has significant, long-lasting social and behavioral protective effects – including improvements in brain size, wages, and family cohesion – 20 years after the intervention<sup>12</sup>.

Overall, the Saving Brains portfolio offers a number of lessons learned about:

1. **What Works:**
  - a. Those showing signs of cognitive and growth delays may have the most to gain. e.g., ECD interventions for children with malnutrition (Bangladesh), developmental delay (Peru) lead to greater improvements in development (~1SD) than best practice interventions<sup>13</sup>
  - b. Interventions that create more nurturing and positive caregiving at home. Strengthening the relationship between caregiver and child can support healthy development throughout a child's life. E.g., Impact at 20yrs from

<sup>7</sup> Reference: <http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002034>

<sup>8</sup> Reference: <http://ajcn.nutrition.org/content/early/2016/06/29/ajcn.115.123968.abstract>

<sup>9</sup> Reference: [http://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(16\)30354-0/fulltext](http://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30354-0/fulltext)

<sup>10</sup> Reference: <http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002044>

<sup>11</sup> Reference: [http://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(16\)30100-0/fulltext](http://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30100-0/fulltext)

<sup>12</sup> Reference: [http://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(16\)30100-0/fulltext](http://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30100-0/fulltext)

<sup>13</sup> Forthcoming

KMC in newborn period was created by the changing parental nurturing and their aspirations for their child<sup>14</sup>

## 2. Innovative approaches to delivery and implementation are critical to delivering interventions with impact

- a. Analysis comparing SB portfolio and published literature shows SB solutions are testing new implementation and delivery strategies.
- b. Many of these innovations are feasible and effective at changing outcomes for children, even at proof of concept stages in low-resource settings.
- c. Motivation, training and supervision of service providers who support caregivers is critical.
- d. Future analysis that links impact data to the implementation metrics will help to understand the minimal delivery requirements to achieve positive gains for children.

### EXAMPLE: Saving Brains

#### KMC Training Program as a strategy to scale-up KMC diffusion and implementation

Kangaroo Foundation (Cameroon, Mali)

##### Problem

Kangaroo mother care (KMC) saves lives and improves developmental outcomes especially for preterm babies, but scaling of quality KMC has been limited in areas that need it most.

##### Innovation

Train-the-trainer model supported by an e-learning platform to scale KMC from Centers of Excellence to surrounding hospitals.

##### Results to date

One Center of Excellence in each Mali and Cameroon were successfully trained on KMC delivery; they then trained 9 regional centers. So far, 2,365 low birth weight and premature infants have received comprehensive and quality KMC and 163 newborn lives have been saved.

##### Potential for Transformation

Could help achieve global KMC coverage targets. In Cameroon, a development impact bond is stimulating national scaling of quality KMC. The approach has the potential to reach 74,300 newborns and save 8,300 lives by 2030.



Photo credit: Kangaroo Foundation

***“We firmly believe that this is a powerful, efficient, scientifically based health care intervention that can be used in all settings, from those with very restricted to unrestricted access to health care”***  
***-Nathalie Charpak (Director, Kangaroo Foundation)***

<sup>14</sup> Reference: <https://pediatrics.aappublications.org/content/early/2016/12/08/peds.2016-2063>

- 3. The deliberate focus on measurement has been valuable to understand the impact of innovations and is a beacon for the field of child development.**
- a. Saving Brains established a set of core outcome metrics that all Saving Brains projects needed to measure. This has provided a common language and comparable data sets across the Saving Brains portfolio.
  - b. Child development metrics are most valuable when complemented with rigorous assessment of a child's context, including home environment, maternal wellbeing, parent-child interaction.
  - c. Over-reliance on screening tools, lack of locally-validated tools, and poor comparability of data are still limitations to the field that Saving Brains can continue to challenge. For example, Saving Brains seeded the development of a population-level ECD assessment for 0-3years that would allow tracking of the SDG indicator 4.2.1: Proportion of children under 5 years who are developmentally on track. This is currently being validated by WHO and Harvard in 14 countries.

### **Global Mental Health**

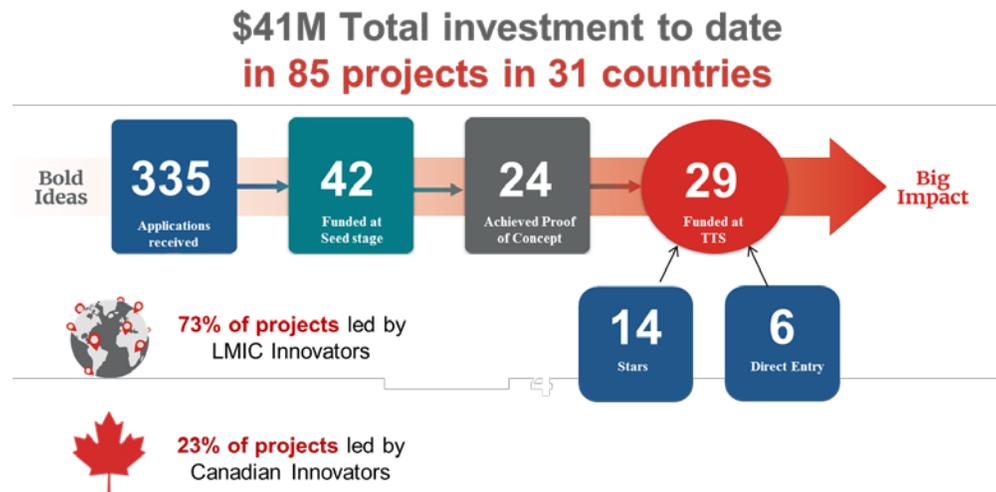
Mental disorders contribute to **14% of the global burden of disease worldwide**. 75% of this burden occurs in low- and middle-income countries where **scarce resources** and a **shortage of trained professionals** mean individuals living with mental disorders have limited access to evidence-based treatments. Even in contexts where treatment is available, **widespread stigmatization** faced by those living with mental illness means that they are often unwilling or unable to access this care.



To this end, GCC's mental health program focuses on funding innovations that can improve treatments and expand access to care across a range of priority areas, such as: community based care, developing treatments for use by non-specialists, improving children's access to care, and improving the supply of medication. The goal is to **flip the gap**: currently only 10% of people with mental health conditions have access to treatment and care, we want to reverse this so that 90% have access to high-quality, evidence-based treatment and care.

Through the DIF-H, GCC invested \$41M in 85 projects in 31 countries, as illustrated in **figure 6**.

Figure 6: The Global Mental Health Innovation Pipeline



These projects have enabled 159,000 individuals to access and use treatment with 20,000 individuals who have symptomatic improvement. By 2030 this impact will

### Assessment of the Scientific Advisory Board: Global Mental Health

The SAB offered the following observations on the Global Mental Health portfolio:

#### Findings

- The impact of this program goes far beyond the number of individual lives improved to date. The transformational potential of scaling up of these innovations is the most exciting and promising aspect of this program.
- The program has made a critical contribution to knowledge generation and exchange in global mental health, especially in low- and middle-income countries. This contribution should be widely emphasized.
- The program has played a critical role in building leadership capacity in global mental health, especially by engaging social entrepreneurs and supporting low- and middle-income country innovators
- Lack of future support for this program would result in lost opportunities for scaling promising innovations and for invigorating the field through strategic partnerships with other funders and peer organizations.

#### Recommendations to Improve Value for Money

- Work with grantees (individuals and institutions) to document where they started, what they have achieved and key future opportunities in order to enhance their longer-term sustainability.
- Strengthen the evaluation capacity of innovators.

increase to 1.1M to 3.2M individuals who will access and use treatment with 297,000 to 844,000 who will have symptomatic improvement. In addition, the projects supported by the portfolio have influenced 17 policies including changes to essential medicines lists, health worker training curricula and others. Through this program, GCC has invested in 18 projects in emergency settings that target highly vulnerable populations.

Investment in the Mental Health Innovation Network (\$3.6M) and annual community meetings has increased the capacity of innovators to evaluate impact, communicate results and leverage resources for mental health.

Canada is recognized globally as a leader in global mental health innovation:

*Canada's contributions at the international level also set an example for other countries to contribute to global mental health*

**Patricio Marquez, World Bank**

One of the key learnings from this program is that the public sector remains the primary path to scale and sustainability for mental health solutions. The program found that governments want and are willing to invest in evidence-based mental health innovations, for example:

- Makueni County, Kenya invested **\$650,000 CAD into scaling mental health** through their primary care system by African Mental Health Foundation.
- Ministry of Labour, Invalids and Social Affairs (MOLISA), Vietnam committed **\$1M CAD for a randomized controlled trial** of family mental health intervention led by Simon Fraser University.

**Beneficiary Experience: *Champion mother volunteer, FaNS for Kids, Pakistan***

*'...through my training, which was so simple and interesting, I came to know a lot about developmental disorders and simple solutions to the problems my child faced in his everyday life...Sharing our problems in our network meetings, I saw I was not alone and this lessened my pain and increased my resolve'*



Another important lesson is the power of technology to help reach more people at a reduced cost. On average, projects using technology screened twice the number of people as those using paper based methods only. Training through a technological platform was also demonstrated to yield equally good results as training through specialists. Finally, the use of audio-visual training and supervision tools can help expand the human resource base by empowering persons with low levels of formal education to provide mental health services.

A third lesson was that task shifting remains critical for overcoming the human resource shortage in mental health; but requires appropriate supervision, incentives and motivation. Projects that train specialists and either non-specialists/lay health workers seem more likely to exceed treatment targets than projects that trained a single cadre. Incentives, however, must be tailored to suit the cadre of worker. (e.g., primary school teachers are more likely to embrace additional training as an opportunity for career advancement than secondary school teachers). Incorporating peer mental health users in service delivery can help overcome challenges with workforce motivation and retention.

An example of a successful innovation that was validated and is transitioning to scale through this program is the Friendship Bench, described below.

### EXAMPLE: Global Mental Health

#### The Friendship Bench

University of Zimbabwe, Seed + TTS, \$1,899,000 CAD

##### Problem

Prevalence of common mental disorders such as depression and anxiety is above 25%, yet there are only 10 psychiatrists and 15 psychologists in Zimbabwe.

##### Innovation

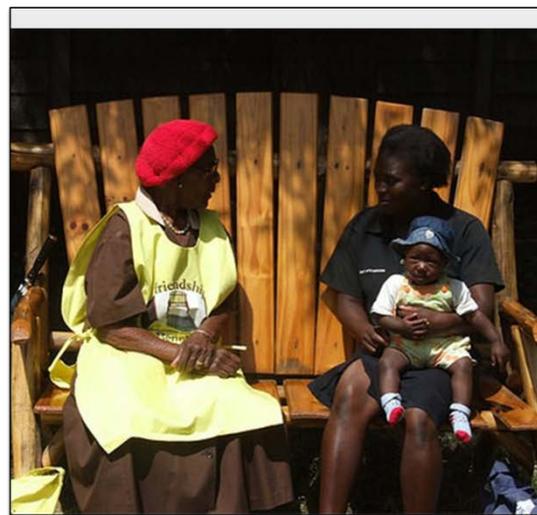
Friendship Bench is a brief cognitive behavioral therapy intervention delivered by community “grandmothers” on simple wooden seats located in the grounds of health clinics

##### Results to Date

- Beneficiaries treated via the Friendship Bench are 3x less likely to experience depression, 4 x less likely to have symptoms of anxiety, and 5 x less likely to have suicidal ideation than those who received treatment as usual
- 27,500 to date people treated at 72 clinics in Zimbabwe since September 2016

##### Potential for Transformation

Model shows that mental health can be part of Universal Health Coverage and sustained with minimal additional investment. Expansion to additional cities in Zimbabwe offers potential to reach 309,000 persons by 2030, of whom 139,000 would experience improvements in mental health symptoms and functioning.



*Imagine a world where everyone has access to mental health care*

### Stars in Global Health

Health and well-being for all is essential to sustainable development -- highlighted in the Sustainable Development Goals (SDGs). Innovation, in turn, is crucial for achievement of the Sustainable Development Goals. Promising innovations are often limited in their ability to achieve scale and sustainability which greatly diminishes their ability to help achieve the SDGs.

Grand Challenges Canada launched the Stars in Global Health program with the objective to solve complex global health challenges by supporting **bold ideas with the potential for big impact**. Investing small amounts of funding (approx. \$100,000 each) into a large number of diverse projects is a robust de-risking strategy. Data gained during Stars in Global Health funding drives evidence-based decisions on which to transition to scale. Overall, we found that the proportion of Stars in Global Health innovations that attract funding to go to scale is moderately higher than in comparable Venture Capital models.

### Assessment of the Scientific Advisory Board: Stars in Global Health

The SAB offered the following observations on the Stars in Global Health portfolio:

#### *Findings*

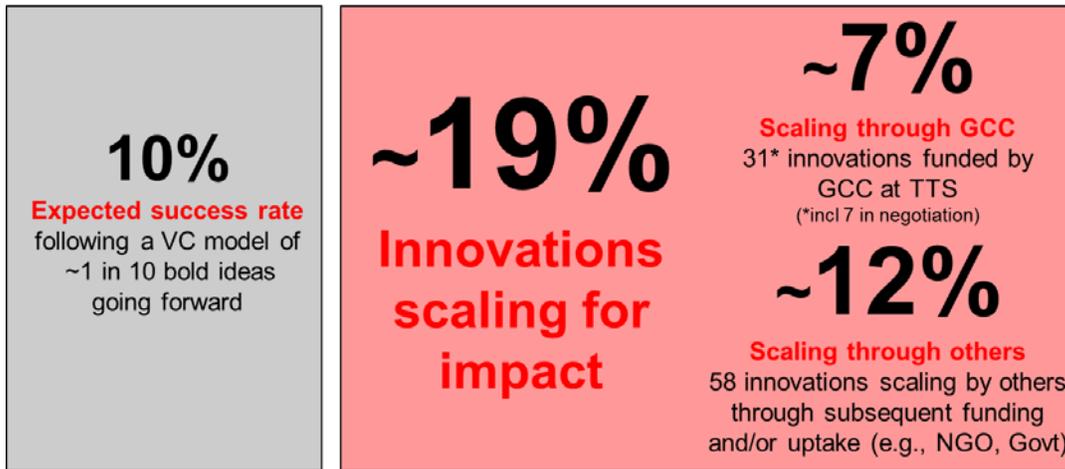
- The Stars in Global Health program has catalyzed innovators, particularly young innovators, in low- and middle-income countries in a way that is both unique and transformative.
- This open platform for innovation is important in that it encourages and enables out-of-the-box thinking.
- In some ways the Stars program is the coolest part of GCC with over 500 innovations and concepts that wouldn't otherwise have seen the light of day.
- Integrated innovation is a unique niche and comparative advantage for GCC.

#### *Recommendations to Improve Value for Money*

- Stay focused on the top innovators and innovations to ensure that they go to scale [through the TTS platform].
- Continue to and, indeed, expand efforts to work with other organizations (e.g., Grand Challenges Africa) to enable proven innovations sourced and supported through the Stars in Global Health platform to transition to scale.

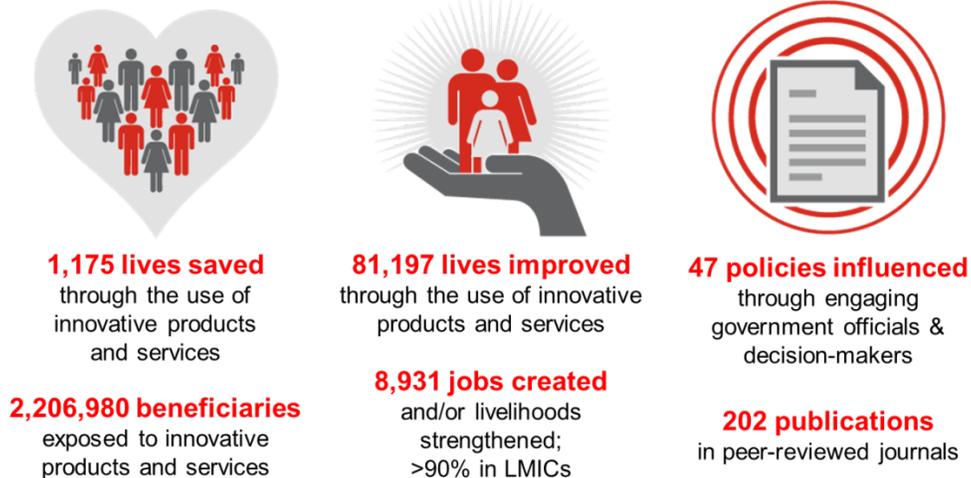
Through the DIF, GCC supported 471 innovations with \$52.1M CAD over seven rounds that were implemented in 81 low- and middle-income countries (LMICs). This funding leveraged an additional \$68.5M. 60% of the projects funded through project are led by innovators in LMICs with the remaining 40% led by Canadian innovators working with partners in LMICs.

Overall, we found that 19% of Stars in Global Health innovations attract transition to scale investment, which exceeds the 10% expected in a venture capital model. 7% of these received TTS funding from GCC and 12% received subsequent funding or uptake by other parties, including NGO and local governments. The TTS innovations sourced through Stars in Global Health are projected to contribute the majority of GCC's projected impact by 2030: 520K-1.6M lives saved and 915M-42M lives improved.



Despite the outcomes of innovation expected in the future (not in the first 12-18 months of development), the Stars in Global Health program has generated significant early results, as illustrated in **Figure 7**.

**Figure 7: Outcomes and Outputs of the Stars in Global Health program**



Over the course of the seven rounds of the Stars in Global Health program a number of additional lessons learned emerged:

- Approach of sourcing widely and scaling selectively is resulting in high potential impact innovations being transitioned to scale;
- Excellence of the bold idea going into seed funding is necessary but not sufficient to predict likelihood of attracting transition to scale funding;
- Global reach provides strong diplomatic and brand value for Canada; and

- The program set out to support bold ideas and ended up enabling innovators and generating new knowledge as well.

Successful innovations are still emerging from the Stars in Global Health program; please see the examples on the following page. One of the more powerful aspects of the Stars model has been its ability to energize young innovators, especially women innovators like **Etheldrera Nakimuli-Mpungu** in LMICs:



**Etheldrera Nakimuli-Mpungu** initially trained as a physician and wanted to be a doctor that made a difference in peoples' lives. She identified an opportunity to address the enormous – and untreated – mental health burden in people living with HIV/AIDS in Kampala, Uganda. She received a Stars in Global Health award in 2012 to test her group psychotherapy for people living with HIV, the results of which were published in *Lancet HIV* in May 2015. In 2016, she was awarded an Elsevier Foundation Award for Women in Science, a Presidential Medal for her contribution to Uganda's development, and support from UK mental health NGO, MQ (the first to a researcher in a developing country).

The Stars in Global Health program has been described as having a 'catalytic impact' for innovation more broadly in LMICs. The broad engagement also provides an important base for, and ongoing institutional alignment with, grand challenges platforms in LMICs, in particular, Grand Challenges Africa. These platforms have benefited greatly from the existing pipeline of innovations and the transfer of knowledge and best practices.

### EXAMPLES: Stars in Global Health

- A solar-powered oxygenator** (University Health Network) uses solar energy to concentrate oxygen to treat hypoxemic children in settings without electricity. An RCT demonstrated non-inferiority of solar-powered oxygen delivery, compared to the conventional method
- A low-cost ultrasound for pneumonia detection** (Universidad Peruana Cayetano Heredia, Peru) uses an algorithm to analyze data from a conventional ultrasound to produce easy-to-interpret results. The algorithm can detect pneumonia with sensitivity of 91% and specificity of 100%, and the system can be adapted to smartphones for point of care diagnosis
- An innovative approach using coconut coir fibres for rearing **nematodes to control malaria vector populations** (Université d'Abomey-Calavi). Treatment of 210,000 m<sup>2</sup> of mosquito breeding sites in a pilot area in Benin achieved a 96.8% reduction of adult malaria mosquito populations
- Iron-fortified dal** (University of Saskatchewan) was designed to combat iron deficiency. In Bangladesh, the iron-fortified lentils were shown to improve iron bioavailability and were acceptable to consumers



### ***Other Programs***

In addition to the ongoing programs described above there were two additional programs that were undertaken as part of the DIF-H that were successfully concluded: **Point-of-Care Diagnostics** and **Hypertension**.

In 2014–2015, Grand Challenges Canada wrapped up its participation in the Point-of-Care Diagnostics program. Through this program, Grand Challenges Canada and the Bill & Melinda Gates Foundation invested over \$55M to develop a panDx strategy aimed at revolutionizing the diagnostics industry for the developing world, by setting “plug-and-play” standards for component elements that would enable innovators to develop urgently-needed tests capable of running on a universal platform. Grand Challenges Canada provided \$12.4M in funding to 12 innovations (one of which was terminated early).

Key takeaways from this program included the importance of having a clear Canadian niche (there were no distinctly ‘Canadian’ elements to this program) and of maximizing impact (in the end GCC felt that our funding was not sufficiently catalytic in a field rich with investment to merit continuation of the program). In the end, it was felt that continued investment in this program was not likely to deliver significant and differentiated value going forward.

GCC also co-funded a set of projects on hypertension that were sourced through the Global Alliance for Chronic Diseases platform with CIHR as part of the implementation of the DIF-H. We learned through this program that the value of the consortium partnerships was best achieved at the organizational level and that the structure of the hypertension program resulted in limited ability for Grand Challenges Canada to use the oversight and support tools that allow Grand Challenges Canada to add value to funded projects.

### **FACILITATE AFFORDABLE IMPLEMENTATION AND COMMERCIALIZATION, IN DEVELOPING REGIONS OF THE WORLD, OF SOLUTIONS THAT EMERGE.**

This section provides an overview of the outcomes, impact and lessons learned from GCC’s efforts to facilitate the affordable implementation and commercialization of global health solutions. In particular, it focuses on:

- The Transition to Scale (TTS) Program
- The Global Health Investment Fund (GHIF)
- The Every Woman Every Child (EWEC) Innovation Marketplace
- The Kangaroo Mother Care (KMC) Development Innovation Bond

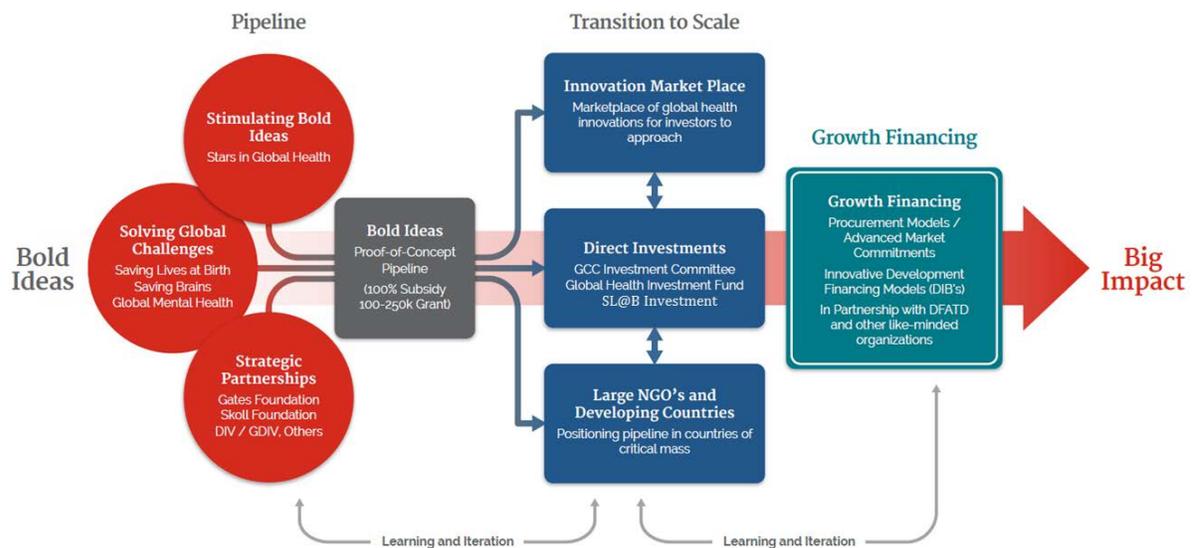
#### ***Transition to Scale (TTS) Program***

Innovation is needed to reach the Sustainable Development Goals yet relatively few seed innovations successfully and sustainably go to scale, what is sometimes called “pilotitis”. At the same time, the Addis Agenda recognizes that even in an ideal world

public funding alone will be insufficient to meet these goals and highlights the importance of leveraging funding from both the private sector and low- and middle-income country governments.

To address this challenge, GCC launched its Transition to Scale (TTS) program to apply the concept of Integrated Innovation to the assessment of potential transition to scale investments and entrain expertise that could optimize innovations for sustainable, significant health impacts at scale. To this end, GCC has created a high performance (and still improving) platform that aims to scale seed innovations in a sustainable manner, with a focus on outcomes which is summarized in **Figure 8**.

**Figure 8: The GCC Transition To Scale Process**



To date, GCC has invested \$102M into 107 TTS projects that are implementing in 34 countries. This investment has leveraged over \$107M in additional funding. Of these 107 projects, 75 are still continuing on the path to scale after the GCC funding ended. The TTS investment criteria and processes add value at each stage of the investment process as outlined in **Figure 9**.

**Figure 9: Transition To Scale Criteria and Processes**



The majority of actual lives improved, and all of the potential lives saved and improved achieved by GCC are through the TTS portfolio. We estimate that the innovations in the TTS pipeline will **save between 520,000 and 1,600,000** and **improve between 15M and 42M lives by 2030**.

### Assessment of the Scientific Advisory Board: Transition To Scale

The SAB offered the following observations on the Transition To Scale program:

#### Findings

- Applying integrated innovation to address the challenge of scale is a valuable contribution of the TTS platform.
- The TTS innovations are, for the most part, at an earlier stage of development than originally anticipated, but these earlier-stage investments are critical and an area of comparative advantage for GCC.
- Clustering investments into multiple innovations from the same sector / on the same theme is helpful in that it can foster cross-learning and amplify comparative advantages of certain approaches.

#### Recommendations to Improve Value for Money

- Ensure and exercise the flexibility to make multiple rounds of investments of varying sizes to enable sustainability and scale.
- Benchmark GCC against other similar programs in development innovation to better illustrate the impact of the TTS program.
- Report progress against anticipated outcomes to improve the ability to tell if on track.

**VisionSpring** is an example of a successful innovation in the TTS pipeline.

## EXAMPLE: Transition To Scale

### Problem

Over 700 million people need eyeglasses but lack access to affordable options, creating further disadvantages among hardest-to-reach communities. Uncorrected vision costs global economy \$202 billion annually.

### Innovation

Empowering entrepreneurs to sell & distribute affordable eyeglasses to address the two most common types of vision impairment: presbyopia (via reading glasses) and refractive error (via prescription glasses)

### Results

- Corrected eyesight of over **1 million people** in India and Bangladesh with ready-made reading glasses (of which about ½ attributable to GCC funding) leading to potentially increased productivity, income earning potential and overall quality of life
- Seeded a new market for reading glasses, with ~ 90% of customers purchasing their first ever pair of eye glasses

### Potential Transformation

VisionSpring is building an ecosystem by bringing together corporations, NGOs and foundations to close the vision services gap. **Potential to improve the lives of up to 1.6M people living with vision impairment by 2030.**



Some of the key lessons learned that have emerged from the TTS program include:

- **The TTS program fills a pioneering gap.** GCC is often the lead investor into innovations at early stages of development with three quarters of our funding in TTS deployed at either the validation or early TTS stages. Through these investments GCC catalyzes the formation of social enterprises to scale innovations that are often developed in academic or research settings.

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- **GCC adds value in both private and public scaling pathways:**

#### Private

- Building discipline and governance
- Facilitating organic revenues
- Enabling follow-on financing

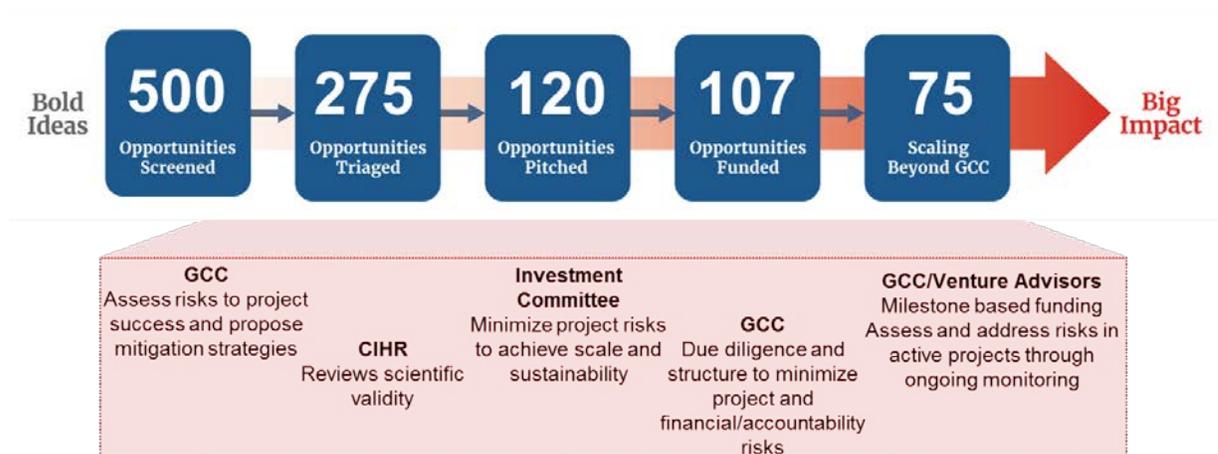
#### Public

- Supporting further government support
- Facilitating government uptake
- Enabling policy change

- **Restrictions on funding phases** and investment ceilings limit the effectiveness of the TTS process. It is important to be able to tailor funding approaches and amounts to the realities of each individual deal. To illustrate what occurred without restrictions: the average investment across the 107 TTS projects funded to date is ~\$900,000 with a wide range between the smallest (~\$100,000) and largest (~\$2,500,000) investments. Eight innovations received follow-on funding.

- **Non-grant financing** can be an effective tool both to enable innovators and to support future investments and the operations of the platform. GCC has invested 33% of its TTS funding through non-grant finance.
- **It is important to assess and mitigate risk at each stage of the investment process** so as to enable “smart” risk taking as outlined in **Figure 10**.

**Figure 10: Managing Risk at Transition to Scale**



- **Gender is important**, it is formally considered throughout the investment cycle to improve not only the condition of women and girls but also their position. GCC’s gender processes are outlined in **Figure 11**.

**Figure 11: GCC’s Gender Processes**



### **Global Health Investment Fund**

The Global Health Investment Fund is a \$108 million impact investment fund. Through a pioneering group of investors – including a \$10 million anchor investment from Grand Challenges Canada (funded by the Government of Canada) – the Global Health Investment Fund is helping to advance promising interventions to fight public health challenges in low-income countries, such as malaria, tuberculosis, HIV/AIDS, and maternal and infant mortality. The fund was created to overcome a critical market failure: the lack of availability of investment capital to take promising global health innovations to scale in low-income countries.

The target investments for this fund are innovations that may struggle to meet traditional risk/return standards for purely commercial investment, but that offer potentially transformative global health outcomes. To-date, the fund has made investments in seven (7) companies as follows:

- **Genedrive** – Allows earlier and faster diagnosis of TB
- **EuBiologics** – Increases the supply of much-needed cholera vaccines
- **Moxidectin** – Accelerates the elimination of river blindness
- **BD/DiabetOmics** – Early diagnosis of GDM & PE, triaging pregnant women for high levels of care
- **Atomo** – Improves error rates on tests for HIV, malaria and dengue
- **Access Bio** – Secures the supply of high quality RDTs
- **PATH (Tribendimidine)** – Increases the supply for MDA campaigns and cures additional hookworm cases

### **Every Woman Every Child (EWEC) Innovation Marketplace**

Another innovative platform to support the commercialization of innovations that was developed and hosted by GCC with funding through the DIF-H is the EWEC Innovation Marketplace. The EWEC Innovation Marketplace is a strategic alliance of development innovation organizations that was launched by the UN Secretary General in September 2015 as part of the *Global Strategy for Women’s, Children’s and Adolescent’s Health*.

#### **Sample Investment: The Global Health Investment Fund EuBiologics**

*EuBiologics is a privately-held Korean biopharmaceutical company that recently became the second WHO-prequalified manufacturer of an oral cholera vaccine suitable for use in resource-limited settings.*

*In the wake of Hurricane Matthew, which hit Haiti in October 2016, there was a significant increase in the number of reported cases of cholera. In an effort to limit the spread of the disease the Haitian Ministry of Health, WHO, UNICEF and other organization mobilized to procure and distribute the cholera vaccine. EuBiologics, a GHIF investee, was able to provide 1M doses of its oral cholera vaccine to help address this crisis. They expect to send a further 1.5M doses in the near future as part of an island-wide vaccination campaign.*

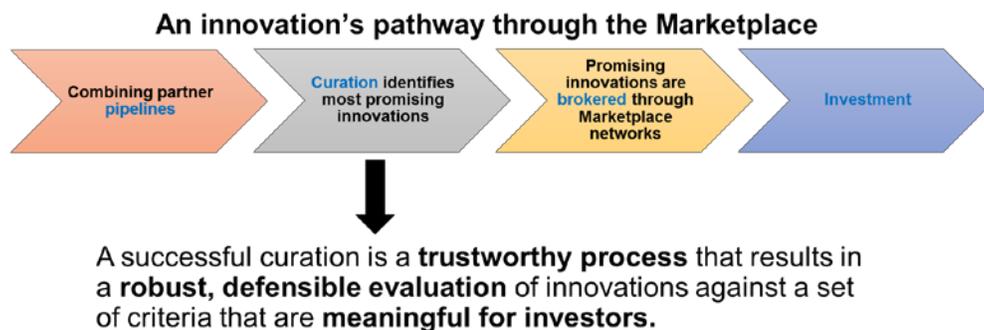
*EuBiologics successfully listed on the KOSDAQ exchange in January 2017. Both the tangible impact of the company’s cholera vaccine and its IPO are important milestones for the GHIF.*

The EWEC Innovation Marketplace goal is to transition to scale 20 women’s, children’s and adolescents’ health investments by 2020, and by 2030 to see at least 10 of these innovations widely available and having significant impact on women, children and adolescents..

The challenge that the EWEC Innovation Marketplace seeks to address is that while there are an increasing number of innovative healthcare concepts at the early pilot stage, a bottleneck exists at the “critical testing” and “transition to scale” stages. The Innovation Marketplace seeks to create a more efficient pathway from seed to scale, one that connects innovators to funding agencies, resolves the problem of inefficiencies among funders and taps into private capital in order to remove the prevailing barrier from idea to impact, as illustrated in **Figure 12**. To do so, it links a supply of innovations from development innovation organizations to demand from company and governments. It catalyzes investment in high quality innovations through curation and brokering<sup>15</sup>.

There were 105 innovations in the Innovation Marketplace as of October 2016. The Innovation Marketplace, which is hosted at GCC, has completed the curation of this initial set of innovations and is currently sourcing additional innovations from the anchor partners, other Grand Challenges network partners, and others. A Private Sector Engagement Strategy has been developed that will be implemented in 2017 and funding has been secured to support the operations of the marketplace over the next five years.

**Figure 12: The Innovation Pathway to Market**



***Kangaroo Mother Care Development Innovation Bond***

As part of the DIF-H, and through Saving Brains, GCC funded the transition to scale of Kangaroo Mother Care (KMC) in Cameroon (see box in **Saving Brains** section). In parallel, GCC was exploring the role of pay-on-results financing to catalyze scale and sustainability of innovations with a public sector scaling path. With the expertise of MaRS Centre for Impact Investing, we conducted a systematic analysis of the Saving

<sup>15</sup> Curation is comparative analysis of innovations from partner organizations; Brokering is the process of matching promising innovations to the right investor.

Brains and Global Mental Health portfolios and, based on a set of criteria (strength of evidence, measurability of outcomes, innovator capacity, etc), identified the KMC scale up as the only one suitable for a pay-on-results approach.

GCC is currently working with the MaRS Centre for Impact Investing and Social Finance UK to design a KMC Development Impact Bond (DIB) – an outcomes-based financial instrument – to fund the rollout of KMC on a larger scale in Cameroon. In a DIB, private investors pay in advance for an intervention to achieve agreed results, e.g. improved health outcomes for LBW infants using KMC. Outcomes funders (donors and/or governments) commit to making payments to investors only if the interventions succeed. Investors' financial returns are directly linked to independently verified outcomes.

The proposed KMC DIB would align with existing interventions designed to strengthen the healthcare system in Cameroon. GCC is working closely with the Ministry to ensure alignment with government health priorities. For example, it would aim to build on the Performance-Based Financing (PBF) program run by Cameroon's Ministry of Public Health with support from the World Bank.

GCC plans to launch a DIB in cooperation with partners in summer 2017, with outcomes payments of \$6-9 million CAD. \$4.5 million CAD have been committed to date from the Global Financing Facility via the Government of Cameroon, Micronutrient Initiative and Grand Challenges Canada. These outcomes funding commitments are being used to leverage private investment to pay for the upfront costs of the intervention. We are currently in final stages of negotiation for a single \$5 million investor.

## Methodology

There were a number of innovative methodological elements in the development and implementation of the DIF-H by GCC. We would like to highlight two elements in particular:

- First, the work that GCC as part of the International Development Innovation Alliance (IDIA) on **measuring impact**; and,
- Second, the use of **non-grant financing** to support innovators at transition to scale.

### MEASURING AND PROJECTING IMPACT

A key limitation in measuring the impact of innovation is that with innovation, impact occurs in the future. To address this challenge, GCC develops impact models to estimate the potential outcomes of the innovations it invests in – almost like budget forecasting and expense measurement in finance. Actual results from the innovations are reported to GCC, and the impact models are then validated against these results. A group of funders called the *International Development Innovation Alliance* (IDIA) are building a consensus around the best framework to measure the impact of development

innovation. Opinion is converging around the idea that impact on beneficiaries (lives saved and improved) is the most important outcome measure.

At the heart of the problem of how to measure the outcomes of innovation is a paradox: how to measure outcomes that occur in the future. Traditionally, innovation funders have attempted to measure impact by looking at inputs (such as whether processes are on schedule) or early outputs (such as papers published or patents obtained). Unfortunately, these measures do not provide much visibility on the actual impact of the innovation – particularly lives saved and lives improved. Changes in inputs or outputs do not necessarily assure that the desired outcomes will be achieved, and may provide little insight on the nature or magnitude of those eventual outcomes. Outcomes, thus, are critical.

Measuring impact is an essential part of GCC's mission. As part of the implementation of the DIF-H GCC invested significantly in how to measure actual and project future outcomes. Decision makers can use the methods that GCC has developed to help them:

- Get answers to questions about how much impact an innovation might have – answers that can be useful for (i) deciding whether or not to fund it (and/or others), (ii) tracking its progress; (iii) evaluating what has already been accomplished and will be soon; and (iv) sharing results with wider audiences
- Identify key drivers of an innovation's impacts, and the "leverage points" where timely intervention in post-deal execution can enhance the chances for success and/or the impacts
- Compare innovations with each other and discern which outperform the rest
- Identify which innovations yield the most impacts per dollar invested
- Adapt our approach for other applications, not just for innovations responding to challenges or in international development.
- Perhaps most significantly for public policy, evaluate how much impact an entire program of innovation investments is having (for instance, our portfolio at GCC)

An in-depth discussion of our modeling methodology can be found in a document entitled *How We Assess the Potential Impact of the Innovations We Support* which is available upon request from GCC.

## **NON-GRANT FINANCING**

One area that became increasingly important for GCC over the course of implementing the DIF-H was the use of non-grant financing. At the request of Global Affairs Canada, GCC developed a submission for the International Assistance Review that highlighted our lessons learned and recommendations in this regard. The remainder of this section highlights the most important elements of this submission.

For GCC, **Financing Innovation** means using the full range of existing and proven financial tools including Conditionally Repayable Contributions (CRCs) to maximize the development impact of investments in innovation. One set of tools in this regard are

grants or non-repayable contributions that have been the traditional tool of choice for Global Affairs Canada. There are a range of additional proven financial tools, however, that have been used for decades to support innovation across a range of sectors including repayable grants, debt with or without interest, convertible debt, equity and others. Through the DIF-H, GCC learned that innovation platforms need to have leeway to innovate in how they finance projects to maximize the impact of different innovations in different contexts, but must also monitor effectiveness and be guided by the resulting evidence.

In contrast to the proven financial tools that can finance innovation, GCC also explored **Financial Innovations** by developing and testing new approaches/tools to more efficiently and/or effectively finance development and maximize development impacts. Examples of financial innovations include the use of Development Impact Bonds or the leveraging of a government's balance sheet to provide a first loss provision to encourage additional investment in a promising area<sup>16</sup>.

GCC has been working on both of these elements over the past five years, in conjunction with the federal government through the **Social Finance Task Force**—made up of Global Affairs Canada (GAC), Finance Canada (FC), Employment and Social Development Canada (ESDC), Canada's International Development Research Centre (IDRC), the Canadian Institutes of Health Research (CIHR) and GCC. This taskforce has worked together to share knowledge and best practices around the use social finance, particularly, in development innovation.

The primary lesson learned from this work for GCC has been that while Financial Innovations are newer and can be perceived as being higher risk, requiring more testing and refinement, the use of appropriate financial tools, such as loans, and equity investments (which are part of CRCs) is standard practice in many sectors and has a long track record of leveraging in private capital and catalyzing partnerships to support innovation more sustainably. GCC concluded its submission to the IAR on non-grant financing with the following recommendations:

- Be given the necessary Terms and Conditions to provide its innovation platforms with the authority to make use of the most appropriate and effective financial tools to finance development innovation, including Conditionally Repayable Contributions (CRCs), in order to maximize sustainable development impact.
- Support the implementation of a revision to the Income Tax Act to enable non-profits (or, at a minimum, Government of Canada funded development innovation platforms like GCC) to earn an uncapped return on investments tied to the organization's charitable or public benefit mission.
- Support financial innovations and include them in their definition of innovation

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<sup>16</sup> Other financial innovations include credit guarantees, the stacking of lower cost capital, alternative or structured exits and others

## Project Outputs

There have been a broad range of outcomes and outputs from the DIF-H over the past six years. These are summarized on the Grand Challenges Canada website which includes an interactive map of GCC's innovators and innovations<sup>17</sup> and earlier in this paper in the section entitled **Progress Towards Milestones**. GCC also has detailed project-level data that is has tracked and maintained.

## Problems and Challenges

Over any large-scale multi-year innovation process there will inevitably be problems and challenges, and not every innovative project supported will be executed well or succeed. Some of these have been discussed in some detail in our Annual Reports. In 2016, our Annual Letter<sup>18</sup> captured six of the more important Lessons Learned by GCC:

1. Focus Investment on a Grand Challenge
2. Energize the Next Generation of Innovators and Social Entrepreneurs
3. Source Widely and Scale Selectively
4. Emphasize Outcomes and Choose Smart Partners
5. Mobilize New Resources for Scale
6. Foster Reverse Innovation

Beyond these lessons learned we have also come to realize that organizations that effectively catalyze innovators and innovations must have three core attributes:

1. Most importantly, strong **oversight and accountability including an independent Board of Directors** with experience across sectors informed by expert scientific and innovation advice,
2. **Flexibility** to react to new opportunities and to learn quickly and course correct along with the ability to **manage and mitigate risk**, which is an integral part of meaningful innovation (a key function of an independent board is to oversee the risk taking and management of risk and to set the right risk appetite), and
3. Sufficient and predictable **operational support** (as evaluated by an independent board) to drive long-term value for money.

This section concludes with a brief discussion on the Consortium structure that was used to implement the DIF-H

### **BALANCING ACCOUNTABILITY WITH INDEPENDENCE**

It can be challenging for governments to manage the necessary level of risk and accept the inevitable failures that accompany innovation. Because of this reality, with the DIF-H

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<sup>17</sup> <http://www.grandchallenges.ca/who-we-are/discover-our-innovations-and-results/>

<sup>18</sup> <http://www.grandchallenges.ca/wp-content/uploads/2015/07/Annual-Letter-2016-EN.pdf>

the government chose to make use of innovation platforms<sup>19</sup> with independent governance outside of, but accountable to, the government to catalyze innovation.

To be successful and to effectively manage and mitigate risk, innovation platforms must have an independent Board of Directors that follows outstanding governance practices. The Summative Evaluation of the DIF-H found that:

*GCC's board and Chief Executive Officer have provided strong leadership to the organization, which guided DIF-H's implementation from the outset. Throughout the life of the program, GCC's board has been strong, and has been committed to all operational aspects of GCC.*

The Board should be supported by scientific and innovation advice from individuals with strong domain-specific knowledge and expertise. At GCC, for example, the Board is supported by an international Scientific Advisory Board and an Investment Committee. This strong governance function provides confidence that public funds will be invested in a responsible and accountable manner.

In implementing the DIF-H, the government chose to balance this independence through the use of a consortium structure with Canada's International Development Research Centre having overall accountability to the government of Canada. The Summative Evaluation of the DIF-H found that the consortium delivery structure had been effective and that all members of the consortium had delivered on their areas of accountability. That being said, over the course of the DIF-H it became apparent that there is an inherent and possibly irreconcilable tension when an inside of government organization funds an outside of government organization, particularly if they share mandates or areas of focus.

GCC would suggest that this tension was, primarily, a natural product of bringing together an inside of government and outside of government delivery vehicle to deliver on the DIF-H and the significant inherent tensions and potential conflicts of interest which, although managed with the highest integrity, could not entirely be mitigated.

Ultimately, a different funding vehicle was chosen by the Government of Canada to fund GCC's continuing programs. So while the delivery model was successful, the funding model was challenging for all parties, despite the best intentions on all sides. Going forward, it will be informative to compare the advantages and disadvantages of a more traditional funding relationship through Global Affairs Canada with the original consortium model.

### **Public Policy Priorities**

Similarly, when using an outside-of-government policy vehicle it is important to balance independence with the need to deliver on public policy objectives. On balance, we would argue that GCC was probably too independent at the outset in choosing the grand

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<sup>19</sup> There are many examples of other innovation platforms in Canada's domestic innovation portfolio like the *Canada Foundation for Innovation* and several in the development portfolio including *GCC* and *IDRC*

challenges to address (although management and, in particular, the Board of Directors were guided by the Government's publicly articulated priorities). Because of the restrictive nature of Contribution Agreements, however, this may now have shifted too far in the opposite direction.

## **FLEXIBILITY TO OPERATE**

Through the implementation of the DIF-H, GCC also learned that effective innovation platforms must combine this strong accountability and governance with the flexibility to learn quickly and pursue opportunities as they arise. An International Expert Panel Review of GCC found that:

*The Panel recognized that GCC's flexibility to operate will be an important driver of its continued efficiency and effectiveness.*

Although it can be tempting for the government to tightly manage its innovation platforms through highly prescriptive funding agreements, these agreements can actually undermine the strong independent governance of innovation platforms and can impair the ability of independent Boards of Directors to oversee the necessary risk taking and management of risk and to set the right risk appetite for the organization. One of the real strengths of the consortium approach and grant-based funding through the DIF-H was the degree of freedom it afforded to GCC to develop and implement its programs in a way that was effective and enabled continuous learning and improvement.

The intention going forward from the DIF-H was for GCC's future funding model to combine both a grant, through the renewed DIF-H, and contribution agreements. However, only the contribution agreement through Global Affairs Canada was implemented and the DIF-H has not been renewed. In the future, we hope that these contribution agreements can be supplemented with a complementary grant to support GCC's core operating costs and to provide the needed flexibility to operate.

## **SUFFICIENT OPERATIONAL SUPPORT**

Innovation is a long-term undertaking—it can take five to ten years, or longer, for the impact of a new innovation to be fully realized. GCC has found, and both the *Summative Evaluation of the Development Innovation Fund* and the *International Expert Panel Review of Grand Challenges Canada* agree, that both short-term funding and instability in operational support can undermine the value for money of innovation platforms for the government of Canada. The Summative Evaluation, in particular, states that:

*Further operational investment would increase efficiency to a greater extent and avoid the risk of underperformance. Although this represents a trade-off with cost minimization, investment in areas such as more comprehensive monitoring and additional specialist staff could improve results and reporting that will balance the allocative efficiency ratio of inputs to outcomes—in simpler terms, doing more with more*

Adequate support for operations – including investment decision making, strategy, monitoring, and knowledge and risk management functions of the operational platform – is necessary to ensure optimal value for money from the government of Canada's investment.

## Overall Assessment and Recommendations

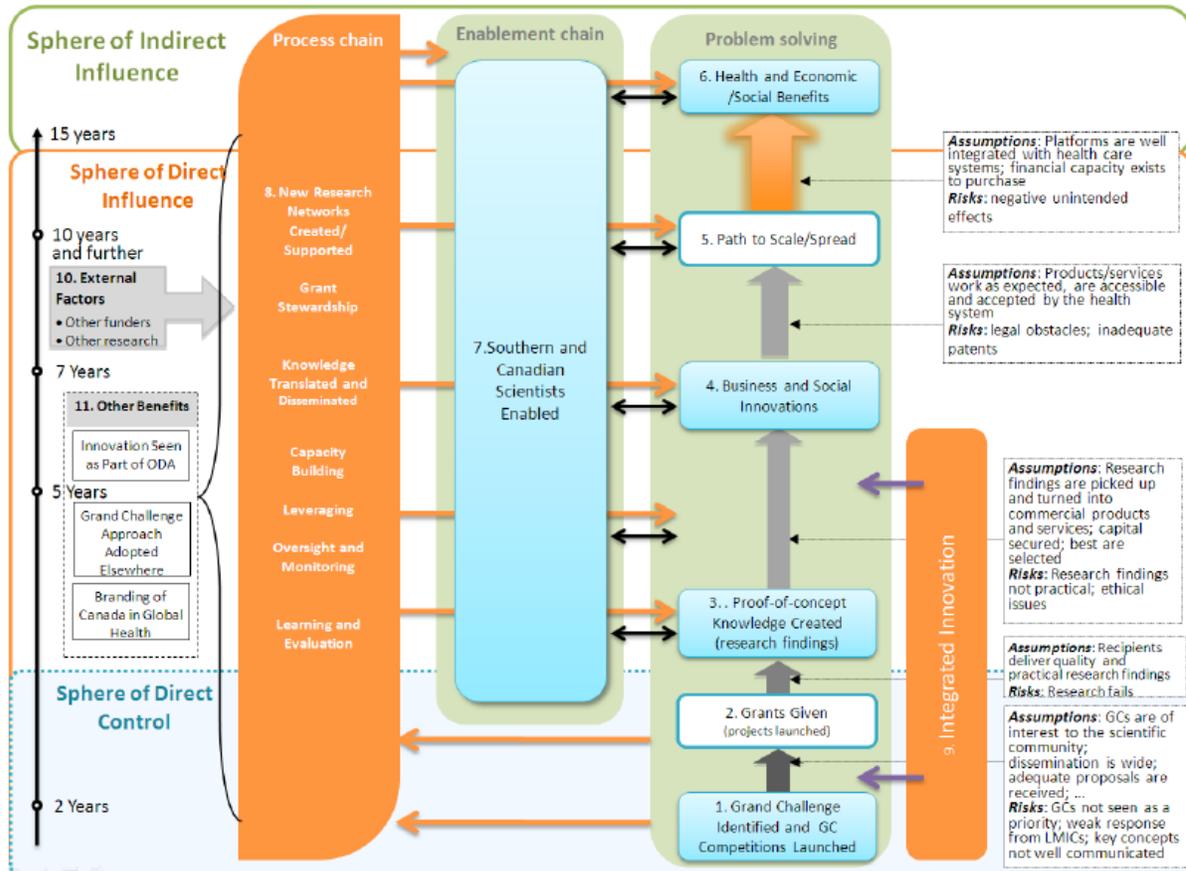
Over the past year, GCC has worked on capturing and communicating the key lessons learned from the implementation of the Development Innovation Fund in Health. As mentioned earlier in this report, these lessons are summarized in the GCC Annual Letter 2016<sup>20</sup> and in a document entitled *Points to Consider in Developing Grand Challenges Initiatives* which is available upon request. We feel that it might be helpful, however, at the conclusion of the DIF-H to provide two observations on its implementation:

1. **The use of an outside-of-government organization to drive development innovation was a success.** As indicated earlier, the Summative Evaluation of the DIF-H found that GCC's programs had achieved significant outcomes sooner than would normally be expected and that the DIF-H delivered value for money overall. The actual and potential outcomes achieved by the innovations that were supported and the value for money to achieve these outcomes are the primary indicators of success.
2. **The success of this model in development innovation raises the question of whether it could also be successful in driving innovation in other federal departments or agencies.** As GCC has wrapped up its activities under the DIF-H, there has been an ongoing effort to capture the lessons learned about the Grand Challenge process and to share these lessons more broadly. Our analysis suggests that such a methodology may be most impactful in 'greenfield' areas where existing investments in innovation are lacking and where there is a pent-up demand for solutions. Examples of the kinds of areas where such an approach could be impactful include Indigenous Grand Challenges and Humanitarian Grand Challenges.

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<sup>20</sup> <http://www.grandchallenges.ca/who-we-are/annual-letter/>

## Annex 1: The Development Innovation Fund in Health Theory of Change



## **Annex 2: Selection Criteria for Grand Challenges**

Grand Challenges Canada established a set of eight criteria which it uses in the identification of broad thematic areas for exploration and specific challenges within these themes:

1. Burden of disease
2. Tractability
3. Impact
4. Integrated innovation
5. Current funding landscape
6. Canadian expertise
7. Branding and niche
8. Potential topics