UNIVERSITY OF MANITOBA

15-1

CANADA FOUNDATION FOR INNOVATION
Innovation Fund

Notice of Intent

1. Completed NOIs must be submitted by the Associate Dean (Research)/Research Liaison Officer of the "Lead" Unit to the Office of Research Services to: Birtukan.Gebretsadik@umanitoba.ca by May 15, 2018.

Proposed name of project: The SHIELDS project: *Stress and Health Innovations to Enable Long-term Dual-generation Success*	**Estimated Total Project Costs:** $880,000

Designated Project Leader/Faculty/Dept: Leslie Roos / Faculty of Arts / Psychology **CV:** X

List Principal Users/Faculty/Dept:

1. Ryan Giuliano / Faculty or Arts / Psychology CV: X
2. Melanie Soderstrom / Faculty of Arts / Psychology CV: X
3. Meghan Azad / Faculty of Health Sciences / Pediatrics and Child Health CV: X
4. Mariette Chartier / Faculty of Health Sciences / Community Health Sciences CV: X
5. Tracie Afifi / Faculty of Health Sciences / Community Health Sciences CV: X
6. James Bolton / Faculty of Health Sciences / Psychiatry CV: X

'Lead' Unit ADR/RLO: Associate Dean for Research, Faculty of Arts

Name: Robert Hoppa

Briefly describe (max 1 page, 12 pt. font size, 2 cm margins):

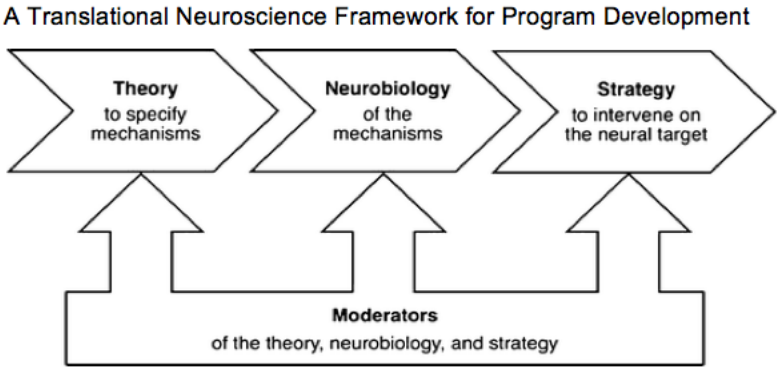
- The proposed research and how it is world-class, innovative and demonstrates clear benefits to Canada.
- The infrastructure and how it will enhance the University's existing research capacity.
- The excellence of the team, including expertise and existing collaborations necessary to conduct the proposed research.
- Plans to secure matching funds and the potential funding sources for the operation and maintenance of the infrastructure.

SHIELDS: Project Summary

Chronic exposure to early life stressors (ELS), such as poverty, maltreatment, and parent mental illness, alters the regulatory function of multiple biological systems implicated in physical and mental health. These effects are compounded by developmental profiles shifted towards impulsive tendencies (e.g., aggression, substance use, promiscuity) as a means of coping with ongoing stress. Moreover, inequities are intergenerationally perpetuated; ELS-exposed parents often have challenges providing the safe and responsive caregiving key to scaffolding cognitive skills children need to reach their potential. Although evidence-based interventions exist to address young children's emerging psychopathology, critical gaps exist in scientists' ability to predict *why, how,* and *for whom* programs work. Further, the most at-risk families remain underserved by extant protocols, with limited understanding of how intergenerational stress becomes embedded in biology and behavior.

The proposed CFI funds will provide innovative biobehavioral assessment infrastructure in a well-established clinical training facility to advance the SHIELDS (*Stress and Health Interventions to Enable Long-term Dual-generation Success*) project. This will facilitate comprehensive assessments of stress-sensitive biological systems implicated in health and achievement (neural; cardiac; immune; endocrine; microbiome) in a multi-use family lab. Therapeutic classrooms and telehealth conferencing will enable intervention development and dissemination. Collaborative users across psychology, education, pediatrics, and community health sciences will use facilities to conduct multiple lines of work that enable the University of Manitoba in becoming a global leader in understanding and disrupting the intergenerational transmission of stress-linked health and achievement inequity.

Building on translational neuroscience principles, The SHIELDS project will use rigorous experimental measures of family processes and stress regulation to advance intergenerational risk transmission theories. Precise knowledge about biobehavioral mechanisms underlying vulnerabilities will be used to improve early intervention program efficacy through targeted strategies that support caregiver and child function.



The project leverages strengths in Manitoba across disciplines to achieve the following **Specific Aims**:

1. *Employ multisystem assessments and administrative-linked data to identify intergenerationally-linked biobehavioral phenotypes underlying risk and resilience in health and achievement.*
2. *Develop innovative dual-generation programs building on best-practice principles to address pathology linked to self-regulation impairments and caregiver-child relationship disruption.*
3. *Employ rapid-cycle evaluations to maximize knowledge, efficacy, and transitions to scale.*

It is hypothesized that (a) Family screenings will allow for the personalization of early intervention modules consistent with a precision medicine model; intergenerational adversity will predict greater child and caregiver needs. (b) Concurrently building self-regulation capacities in children and caregivers will improve outcomes beyond extant best-practices in at-risk groups. (c) Improvements in caregiver mental health, stress, and parenting capacities will mediate child responsiveness to interventions, resulting in long-term well-being and achievement as well as the disruption of inequity.

Programmatic Research Studies, **Across Collaborative Users**

- Identifying profiles of biobehavioral phenotypes linked to clusters of ELS experiences.
- Familial factors moderating ELS effects on child health, cognition, language, and school readiness.
- Caregiver and child biological systems underlying the intergenerational transmission of risk.

- Precursors and outcomes of ELS and biobehavioral risk, assessed with administrative-linked data.
- Employing translational neuroscience to advance family program strategies with rapid-cycle design.
- Personalize interventions based on familial biobehavioral phenotypes and clinical areas of need.
- Develop local and remote training strategies for biobehavioral assessment and service delivery.
- Evaluate health, achievement, and economic outcomes of programs with administrative-linked data.

Cross-Study Infrastructure (Full Budget, $880,000)

1. The SHIELDS family space
   1.1. Family-friendly laboratory connected to experimental testing rooms that minimize caregiver-child separations (Child proof room; Interactive toys, Video monitors; $20,000)
   1.2. Training classrooms for caregiver and child intervention protocols. (Video-based feedback and recording; Therapeutic classroom equipment for 20 children; $60,000).
   1.3. Video conferencing telehealth capacity: for training, supervision, and live observation with teams implementing programs. Consultation with advisory teams across institutes ($30,000)
   1.4. Renovations for aforementioned spaces (Wall removals for dyadic and individual biomarker assessment spaces; Sound proofing; Two-way mirrors with linked testing booths; $170,000).
2. Biomarker-specific data collection hardware and processing, using proprietary system software
   2.1. Immune, Endocrine, Gut microbiome (Blood spot, Salivary; Urine; Fecal $150,000)
   2.2. Brain function (Electroencephalogram, EEG; Eye Tracker systems $250,000)
   2.3. Cardiac Physiology (Electrocardiogram, ECG, Impedance Cardiogram, IC; $150,000)
3. Computing: Cross-system data synchrony hardware and software (video, EEG, eye-tracker, ECG, IC); Advanced statistical software for multi-level models and latent analysis; ($50,000)

Excellence of the Team: The team of *Principal Users* includes emerging and established leaders with both ongoing and new collaborations. Expertise includes: translational neuroscience, advanced statistics, rapid-cycle program development (Leslie E. Roos); developmental neuroscience and multi-biomarker experimental design (Ryan Giuliano); epidemiology of intergenerational risk and health outcomes (Tracie Afifi); social determinants of health and program evaluation in administrative-linked data (Mariette Chartier); biological mechanisms underlying origins of chronic disease (Meghan Azad); cognitive and linguistic development (Melanie Soderstrom). *Collaborating users* include experts in health psychology and trauma (Renée El-Gabalawy), psychology training and service utilization (Corey Mackenzie); program and policy evaluation for vulnerable families with administrative-linked data (Marni Brownell; Deepa Singal), mental health, indigenous partnership, and clinical trials (James Bolton, Jitender Sareen), literacy, neurocognitive development and school readiness (Richard Kruk; Amy Desroches, U Winnipeg); psychology of health inequity across the lifespan (Judith Chipperfield).

External Partners: Healthy Child Manitoba (Leanne Boyd, Director of Policy and Development), Seven Oaks School District (Brian O'Leary, Superintendent). *External Advisors* bring expertise in dual-generation clinical trials, program development, personalized medicine, and neurobiology (Brendan Andrade, Centre for Addiction and Mental Health; Philip Fisher, University of Oregon).

Note: We are working to identify interest with indigenous community leaders and scholars as potential stakeholders and collaborators, prior to full CFI proposal development and submission.

Plans to secure matching funds and potential funding sources for operation and maintenance
Provincial funds from Research Manitoba will match CFI at 40% ($352,000). Other sources will provide 20% of funds including: start-up funds held by Roos and Giuliano ($100,000); Harvard Centre on Developing Child Portfolio Projects, Canada Post Community Grants, and/or New Investigator funds ($76,000); Operation and maintenance will be supported by Infrastructure Operating Funds from the University of Manitoba ($80,000 / year). Tri-Council Grants will provide programmatic research funds based on the SHIELDS proposed studies. It is expected reducing inequities will result in cost-savings (to be assessed with economic analyses), which will facilitate ongoing government investment.