The COVID-19 Global South AI and Data Innovation Program:
Leveraging AI and data science to improve responses to COVID and future pandemics in Low and Middle-Income countries

- This document is a Call for Research Proposals for funding support from the International Development Research Centre (IDRC) and the Swedish International Development Cooperation Agency (Sida).
- The purpose of this call is to support multi-disciplinary research to deepen understanding of how to develop and scale responsible, evidence-based and proven Artificial Intelligence and data science approaches that support COVID-19 response and recovery in low and middle-income countries.

Deadline: June 28, 2020
Click here to submit an application

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1. About this Call

The COVID-19 Global South AI and Data Innovation Program supported by IDRC and Sida aims to support multi-disciplinary research to deepen our understanding of how to develop and scale responsible (inclusive, rights-based, ethical and sustainable), evidence-based Artificial Intelligence (AI) and data science approaches that support response and recovery COVID-19 in Low and Middle Income countries (LMICs). Specifically, the program will aim to support research that is linked to government responses in the following areas: Forecasting transmissions and reducing spread through policy and public health interventions; Mobilizing AI and data science to understand and support gender-inclusive COVID action; Optimizing public health system responses for patient diagnosis, care and management; Building trust and combatting mis- and dis-information around COVID-19; Strengthening data systems and information sharing about COVID-19; Supporting transparent and responsible AI, data and digital rights governance around COVID-19 and pandemic responses.

Objectives

- Support multi-disciplinary research on how to develop and scale responsible and evidence-based AI and data science approaches that support COVID-19 response and recovery in developing countries, and to ensure that those responses are gender responsive and are culturally appropriate, community specific and based on local needs and contexts;
- Inform policies, both organizationally and nationally, that support and build trust in AI and data science responses to epidemics and that mitigate potential harms;
- Strengthen the capacity of health systems in developing countries to respond to epidemics through the use of AI and data science techniques.

About the International Development Research Centre

The International Development Research Centre (IDRC), a Canadian Crown corporation, funds research in developing countries to create lasting change on a large scale. IDRC supports local organisations in the Global South to generate the evidence that is relevant in their context. We provide financial resources, advice, and training to researchers in developing countries to help them find solutions to local problems, and encourage knowledge sharing with policymakers, researchers, and communities.

About the Swedish International Development Cooperation Agency

The Swedish International Development Cooperation Agency (Sida) is Sweden's government agency for development cooperation. We strive to reduce world poverty by allocating resources and knowledge with the goal of making a difference for people in Africa, Asia, Europe and South America. To achieve this, we collaborate with actors from civil society and universities, as well as the public and private sector. Sida's activities are funded through Swedish tax revenue.

2. Context: AI and data science as part of a coordinated response to the COVID-19 crisis

A sharp increase in the number of novel coronavirus (COVID-19) infections across low and middle-income countries has raised fears of a full-blown crisis across the developing world, generating concerns that many people could die if the pandemic overwhelms already weakened healthcare systems. With COVID-19 cases now reported in nearly every country in the world, states are balancing measures to respond to and contain the contagious disease, while also addressing the emerging social and economic challenges resulting from restrictive but essential public health measures.

The COVID-19 crisis is being called a "data-driven pandemic" – that is, massive amounts of information and data are being released and shared at a scale that has never been seen before. Across the world, AI and data science research is showing promise for early COVID detection, timely communications with the public, new diagnostic tools; and informed policy and public health responses that can be automated, implemented and scaled affordably. AI and data science methodologies are particularly well suited to pattern recognition, forecasting, and automation. Dashboards can help to relay risk and hotspots to policy makers, help support at-home self-testing and advice, as well as supporting care practitioners with medical diagnosis and patient triage. AI and data science research should call into consideration the needs of women and other vulnerable groups, or may risk exacerbating existing inequalities. A more detailed analysis of the potential of AI and data science for a COVID response is available in Annex A.

Multi-disciplinary AI and data science research may also support new approaches to deal with related challenges emerging from the COVID-19 pandemic, the so-called "shadow pandemics". This includes addressing the "infodemic" - the increase in COVID-19 related mis-information - and the documented increase in gender-based violence attributed in part to social distancing. Research using AI and data science techniques may also help to gather better evidence on the differential impacts of the crisis on women and other vulnerable groups that can be used for policy and action.

In LMICs, AI and data science research should take into consideration local contexts, systems and challenges, including lessons learned and capacities built from past pandemics like SARS-COV-1, Ebola and Zika. One ongoing challenge is a lack of timely, quality data from governments on populations and health systems. If responsibly managed, alternate sources of data such as mobile phone carrier data, satellite data, remote sensors, e-health records, and social media, may be able to address data gaps. In the longer term, strengthening the quality of data available for AI and machine learning and the capacity of health systems to act on it must also be a priority to detect and address contagious diseases much earlier.

Despite the positive potential of AI and data innovations, it is important to understand the potential ethical, legal, and socio-economic ramifications that could emerge from mis-use in emergency contexts, especially to safeguard rights and ensure inclusive approaches to response and recovery. For example, while citizens might be more willing to forgo their civil liberties in the short term to address the COVID challenge, most low and middle-income countries lack strong privacy legislations and data protection laws. As a result, AI enabled health surveillance could permanently curtail privacy rights and enable authoritarian practices. AI's challenges related to gender, racial or social bias are well documented (see Annex A). In addition, vulnerable groups such as refugees and irregular migrants may also face curtailments to their collective rights and additional marginalization if AI forecasting and scenario mapping aren't implemented carefully. Research on governance, oversight and the implementation of AI and data science in health systems is, therefore, vital to maintain public trust in its use over the medium to long-term.

3. Scope and focus of this call

The purpose of this call is to support research to leverage Artificial Intelligence (AI) and data science that improves responses to COVID and future pandemics in low and middle-income countries. The multi-disciplinary research funded through the call should aim to:

- Deepen understanding of how to develop and scale responsible, evidence-based and proven AI and data science approaches that support COVID-19 response and recovery in developing countries;
- Inform policies and implementation, both organizationally and nationally, that support and build trust in AI and data science responses to epidemics, and mitigate potential social and economic harms;
- Strengthen research capacity and the capacity of health systems in developing countries to respond to epidemics through the use of AI and data science techniques.

Research should be immediately applicable and useful to governments and other knowledge users in responding to the pandemic, and all research should be gender responsive and inclusive in design, questions, and planned outcomes and impacts. Proposed projects should aim to build on previous research and learning, to support novel approaches, or to respond to current knowledge and practice gaps in response efforts. The projects should be designed for scale, as the likelihood that research and innovation will have impact - at broader scale - is increased when strategies for scaling are incorporated from the outset.

Out of scope: Research that is theoretical or that does not have a practical application. In addition, vaccine and drug discovery and trials, protein mapping and other molecular science are out of scope.

3.1 Thematic areas

Research proposals must address at least one of the following thematic outcome areas. As the fund is designed for rapid research support, the six thematic outcome areas are intended to be broad enough for research to respond to identified priorities in various contexts and are not meant to be prescriptive in nature. Proposals should ultimately respond to the priorities, capacities, needs, and contexts of the countries of planned impact**. All proposals will be required to include gender responsive considerations and research questions, and to provide responsible (ethical, inclusive, rights-based and sustainable) approaches to implementation, governance and oversight, though these are also distinct thematic outcome areas for research.**

Forecasting transmissions and reducing spread through policy and public health interventions: AI and data science models can help predict the location, timing and the size of outbreaks, allowing governments to allocate resources more effectively, to conduct scenario and signal analysis, and to determine policy approaches. Epidemiological tools like contact tracing can help to limit the scope and spread of outbreaks. However, the impact of these approaches are poorly understood. It is important to ensure oversight, check assumptions in modelling; and ensure the veracity, reliability, and accountability of these tools in order address bias and other potential harms.

Questions to consider include: What are effective approaches to rapidly adapt existing epidemiological techniques, AI and data science approaches to forecast COVID transmission and reduce the spread of COVID in low and middle-income countries? What existing and novel techniques for contact tracing, forecasting and scenario planning and approaches may be effective, and how can they be tested, researched and scaled? What approaches are needed to ensure uptake and action on these models by decision-makers and the public? What approaches are needed to ensure these methodologies and applications are gender-sensitive, consider the socio-economic and political contexts, and address needs equitably and responsibly?

Optimizing public health system responses for patient diagnosis, care and management: Research shows that AI, automation and data science can support overburdened health systems and health workers when responsibly deployed. Automated systems can contribute to better logistics and resource allocation such as PPEs, help health officials triage patient and plan who to test, and estimate the number of patients in a location and coordinate needed beds, equipment and treatment options based on availabilities. Solutions can be used to communicate timely information to the public, support self-diagnosis, and communicate initial recommended treatment options, and even support psychosocial care.

Questions to consider include: How can AI and data science be deployed to help optimize health system management and responsiveness for crisis care, patient triage and resource deployment? How can AI and automation influence clinical practice and patient care in COVID contexts? How can AI and data science research support dissemination of public health information, self-diagnosis and self-care? How can health system optimization be more gender-equitable and take differential gender needs into consideration?

Mobilizing AI and data science to understand and support gender inclusive COVID action: Providing baseline disaggregated data about COVID-19 infection and mortality rates is a necessary start to a more complex and vital issue. There are a number of research gaps in the gender and inclusion implications of pandemic response. More research is needed to better understand how public health responses implicate diverse and vulnerable populations on the basis of gender, socio-economic status, ethnicity, education, age, (dis)ability, education and more (and vice versa). There is a need to understand how diversity in leadership shifts decisions, resources, and allocations (especially as AI models forecast using complex assumptions). There is a need to explore approaches to co-design or pilot tools that can support the social, sexual and reproductive health, and psychosocial needs of vulnerable women, including front-line health care workers, and people of other identities in the crisis.

Questions to consider include: How can AI and data science, understand the differential impacts of the public health crisis on people of different genders and other identities? What AI and data science approaches and techniques can be leveraged to help meet the health, social, physical, and psychosocial needs of women and other vulnerable groups such as LGBTQ+ communities, migrants, ethnic minorities and indigenous communities during emergency responses? What existing or novel approaches could data science and AI tools undertake to support psychosocial care for people in crisis during a time of social distancing, for example, women and other groups experiencing increased instances of GBV, and for front-line health care workers?

Building trust and combatting mis- and dis-information around COVID-19: The COVID-19 “infodemic” has resulted in the widespread dissemination censorship, false medical advice, hoaxes, fake products and fake information about the virus and responses. There is a need to explore approaches to improve trust in public health measures and policy decisions.

Questions to consider include: What is the scope of the problem and the kinds of censorship, misinformation and disinformation being spread in developing country contexts and their results? How is AI and data science being leveraged to amplify or counter misinformation related to COVID-19 in developing country contexts? How can data and AI research help to disseminate reliable public health information and build trust?

Strengthening data systems and information sharing about COVID-19: A key challenge in optimizing public health responses and implementing AI and data science innovations in response to the COVID-19 crisis are weak systems to collect quality, timely, disaggregated data related to the crisis. Historical underfunding, and a lack of interoperability, standards and sharing of data between different levels (local, regional, national, and internationally) can make it challenging to track cases, understand health system capacity, and support

modelling efforts. Beyond health system and government administrative data, other data sources such as social media data, mobile phone data, satellite data, and citizen-generated data can help address gaps, often in near-real time, but pose other challenges.

Questions to consider include: What approaches and standards help to responsibly share and manage data from a variety of sources for use to support rapid responses to COVID-19? How to strengthen sharing and opening of relevant data, with privacy, security and other rights by design? What sharing arrangements, such as data trusts and collaboratives, can be used to responsibly share potentially sensitive data from governments, academia, the private sector, and citizen-generated data for COVID response? How to responsibly manage alternate data sources for pandemic response? What approaches can address data gaps around vulnerable populations in responsible ways?

Supporting transparent and responsible AI, data and digital rights governance around COVID-19 and pandemic responses: It is important to ensure responsible (rights-based, ethical, inclusive and sustainable) approaches to AI and data governance in Pandemic situations. As responses are normalized, it is important to mitigate potential harms of implementation of AI systems due to explainability challenges, privacy concerns, and cybersecurity vulnerabilities. It is also important to better understand the ethical, legal and socio-economic implications of government responses (particularly in the use of AI and data science) as emergency provisions allow for exceptional measures. For example, surveillance is playing a significant part in many COVID-19 responses, and there is a need to ensure that exceptional measures are time and purpose bound so they don't become normalized.

Questions to consider include: What governance or oversight mechanisms are needed for responsible (ethical, inclusive, rights-based and sustainable) oversight and safeguarding in the COVID context? What approaches are needed to accompany research, innovation and policy measures that take into account rights, governance and oversight, explainability, privacy, consent, algorithmic bias, technical accuracy, security, transparency, scalability, future usage, data collection, identification and pseudo-anonymization techniques (among others)? What are the implications of current COVID-19 policy responses and approaches on AI, data and digital rights governance? In countries that may not have strong legal frameworks on data protection and privacy, what design approaches support the implementation of appropriate safeguards, restrictions, ethics and modalities for public oversight for COVID response?

4. Available funds

- IDRC and Sida will contribute up to CAD $10 million towards this COVID-19 Global South AI and Data Innovation Program, and project funds will be disbursed and administered by IDRC on behalf of the partnership;
- Projects should be between CAD $500,000 (for individual applicants) up to CAD $1,250,000 (for larger research consortia) for two years (2020-2022);
- The number of supported projects will depend on the number, quality, review and ranking of eligible proposals by the review process.

5. Eligibility criteria

Research consortia and individual organizations may apply. For the purposes of this call, research consortia are multi-disciplinary research collaborations and networks made up of multiple organizations. Preference in selection will be given to research consortia who demonstrate an ability to work across different disciplines and

directly with governments (these consortia may include partners in the Global North). Individual organizations must be from Low- and Middle-Income countries.

- Eligible applicants are legal entities, such as accredited universities, non-governmental organizations, think tanks, or government-funded research organizations. Primary applicants must be a financially stable legal entity that can receive funds in a timely manner, and not be subject to lengthy approvals or country clearance. Private sector organizations may apply, although commercial applications and innovations are not eligible for funding.
- Consortia should identify a primary applicant institution who will receive and administer the funds as IDRC will not contract directly with additional organizations. Consortia partners, in addition to those organizations listed above, may also include governments, multi-national organizations, and private sector organizations. The involvement and role(s) of consortia partners must be clearly articulated in the proposal and budget. Regardless of the institutional lead, please note that more than 50% of organizations in a research consortium should be from low- and middle-income countries.
- All organizations will need to demonstrate how they can conduct research design, planning and execution in accordance to local laws and public health guidelines, including social distancing.

Primary applicants must agree to IDRC's General Terms and Conditions in order to apply. They must also agree to abide by IDRC's Corporate Principles on Research Ethics, Open Access Policy and Open Data Statement of Principles to proceed. Research funded though this call must also adhere to all applicable regulations and procedures, including research ethics approvals, in the countries where the research will take place. IDRC reserves the right to amend its template terms and conditions to reflect the programmatic requirements applicable to this fund.

IDRC requires that research involving human subjects be carried out in accordance with the highest ethical standards possible. When relevant, grantees will need to obtain approval from an official institutional or national research ethics body; the process for this needs to be specified in the proposal. Where obtaining national ethics approval is not possible the application needs to propose mechanisms for setting up an ethics review committee for the project, and grantees are expected to submit the ethics and security protocols to IDRC.

6. Evaluation process and selection criteria

Proposals will be reviewed for eligibility, then assessed by an external review committee comprised of multidisciplinary technical experts who will provide a quantitative scoring, and qualitative feedback. IDRC may choose to retain proposals that are not selected for future consideration if additional funding becomes available or if other funders express interest.

Successful applicants will receive notice by July 25, 2020 at the latest**.** Successful applicants will be notified by an IDRC Program Officer, who will communicate the further process, and issues to be addressed (technical amendments and recommendations, time-lines, milestones, budget, etc.) in the proposal and the Grant Agreement. Technical selection does not guarantee funding.

Applicants with approved technical proposals will be required to sign a Grant Agreement with IDRC that details the terms and conditions for the grant. Further details on Grant Agreements are described in section .

IDRC will consider the following criteria in the evaluation of all proposed projects:

In addition to the above quantitative scoring rubric (below), the review of the proposals will consider the balance and distribution of disciplinary perspectives and research approaches, local sustainability, thematic and contextual relevance, and geographic distribution. IDRC reserves the right to reject proposals based on relevant policy or legal considerations. IDRC reserves the right to require the applicant's organization to partner with another institution as a condition of receiving the grant.

Review criteria	**Percentage of score**
Quality of the proposal and methodology Proposals should demonstrate: • A good knowledge of the field and subject matter and strong justification for the proposed approach, methodology and techniques (15%); • Articulate how the proposed approaches and interventions are appropriate and relevant to research users, and (5%); • Outline a multidisciplinary approach to the research (5%). • Proposals should indicate how the proposed research questions or outcomes sought are relevant to the themes of this call (5%). In the case of novel research methodologies, proposals must demonstrate how they will validate and test the quality of the techniques and insights before scaling.	25 %
Potential for informing real-time policy and / or potential for impact *Potential for informing policy (10%):* Proposals should demonstrate: • how they will connect to national, sub-national and/or multi-national policy and public responses to COVID-19; • a clear plan for how they will ensure the engagement of policymakers and other key actors in their work and specific examples of the potential of the intervention(s) to support policy and public health responses; and • a dissemination plan for who will use and benefit from the research. *Potential for impact (10%):* Proposals should demonstrate: • clearly articulated outcomes for how the proposed research will address local contexts and meet needs for pandemic response; • how the research could contribute to research field building and/or capacity building; and • how the proposed research could support longer term capacity and systems for pandemic response.	20 %
Gender-responsive and inclusive: Proposals must an inclusive approach to research, demonstrate considerations of gender and other vulnerable groups in research design, questions, and outcomes, and should outline proposed strategies to reduce or mitigate bias.	10 %
Designed for scale: Proposals should demonstrate how their approaches and methodologies incorporate design for future scaling.	10 %
Responsible and ethical approach: evidence that structures and systems, including ethics boards, are in place to deal with ethical, legal, and socio-economic implications of proposed	10%

research, and that proposed approaches demonstrate strategies for oversight that are rights-based, ethical, inclusive and sustainable.	
Expertise of research teams and composition of research consortia The preference is for research teams to be led by an institution in the global south, for both research consortia and individual organizations. This is reflected in the scoring (5%) Research consortia are an asset for this call, and this is reflected in the scoring (5%) • Research consortia bring together organizations with, for example, public health capacity, AI and data science capacity, and digital rights and governance capacity to create new networks and support capacity and field building. • Research consortia are lead by an organization in the global south; • Research consortia are composed of a majority of partners from the global south (i.e. more than 50% of organizations are from the global south). All research teams demonstrate the necessary expertise and partners to (5%): • Conduct relevant, multi-disciplinary research; • To rapidly, openly and responsible share findings, data; • Support capacity and field building around the availability of multidisciplinary research for COVID rapid response; • To support gender responsive research.	15 %

Clear and appropriate project management plan
• The project management plan should identify:
  ○ All partners and a brief description of how they operate or will operate with regard to governance and communication;
  ○ Contributions (e.g. In-kind resources, staff time, and/or funds) and support for the program of work provided by the institution(s) and other organization(s);
  ○ Clear communications strategy to extend the impact of the research and results;
  ○ A quality monitoring and evaluation framework for the research;
  ○ Identification of strategies for adapting to potentially rapidly changing contexts, including addressing mobility and other restrictions related to COVID research.
	10 %

7. How to Apply and Timelines

- All applications must be submitted through the online application system by Sunday, June 28, 2020 at 11:59pm ETD. Proposals received after the submission deadline will not be considered.
  - The research proposal and questions are outlined in the platform;
  - As part of the application, you **are required** to upload CVs **of the leads of the applying organization and of the partner organizations** to the SurveyMonkey Apply system;

- Acknowledgements of receipt will be sent to all applicants whose application was received before the closing date and time.

- Applications can be submitted in either English or French. Spanish-language proposals will be considered in specific circumstances; please email us at covidresponse@idrc.ca if you would like to propose this.

- Successful applicants will be notified by July 25, 2020 at the latest. IDRC will work closely successful applicants to discuss revisions to the technical proposal and finalize budgets in order to rapidly disburse funds.

- As part of the application, applicants must complete IDRC's Proposal Budget as part of their submission, as appropriate to the nature of the Call. Budgets may be flexible due to the uncertainty of the crisis, but should include detailed notes indicating where this is the case. For research consortia, budgets for each collaborating institution, where applicable, are required, as well as a consolidated budget. Please add information on any matched funding, or additional leveraged resources, that are relevant to this proposal under the "Donor contributions" and "Local contributions" tabs. Applications must be submitted in the applicant's working currency (the currency in which the books of accounts are maintained). However, as a Canadian Crown Corporation, IDRC restricts all of its contractual obligations for grants and contributions to the approved Canadian dollar amount.

8. Finalizing the Proposal, Required Budget and other Documentation

After the review, evaluation and selection of proposals, IDRC will follow up with successful applicants regarding technical and administrative considerations. Please note that the technical selection of a proposal does not guarantee that it will be funded.

a. *Proposal finalization* - Prior to finalizing a Grant Agreement, IDRC reserves the right to request any revisions to the submitted proposal and budget. A revised proposal or budget with the necessary revisions must be returned in a timely manner to IDRC, which will be communicated at the time of selection.

b. *Administrative Finalization* - Administrative considerations must also be satisfactory – the following documentation is required:

   Proposed budget:
   - The amount of an IDRC grant is based on the forecasted costs of the project at the exchange rate between the working currency of the project and the Canadian dollar **at the time the project is approved**.
   - Budget notes are an essential part of IDRC's due diligence and form an integral part of the approval process. The rationale and support for arriving at each budget figure allows IDRC to understand the activities to be undertaken, their impact on project costs, and the reasonability of the cost estimates.
   - Without budget details – appropriate to the nature of this Call – that clearly support the cost estimates, the grant approval process and any subsequent financial reporting and payment cycles may be delayed. Delays in funding can impact project outcomes.
   - Please note that when the law limits banking transactions by Canadian financial institutions in a particular country, IDRC will not undertake any form of programming in that country that results directly or indirectly in Canadian funds flowing to it.

- Please see Section D: Proposed Budget and Timeline for more information on budget categories and allowable expenses.

Bank Information:

- Please Complete the Tax and Banking Information Form – Canadian Supplier or Supplier Outside of Canada

Institution:

- Institutional Profile Questionnaire (only required if this is first application for the lead institution in receiving IDRC funding)

Corporate Documents:

- In order for IDRC to enter into an agreement with your organization, IDRC must be satisfied that your organization has independent legal status (or 'legal personality') and is capable of contracting in its own right and name.
- In the event that you have no prior grants with IDRC and to help us make this determination, please provide a copy of the legal documentation by which your organization was founded or created in the location in which it is based. Such legal documentation obviously varies depending on the location and the type of organization. By way of illustration to assist you in providing the necessary documentation to us, however, such legal documentation may include:

  For private institutions
  - letters patent,
  - articles of incorporation,
  - articles of association,
  - certificates of incorporation,
  - certificates of registration, or
  - récipissé issued by government authorities for private sector/non-governmental organizations; or

  For public institutions
  - legislation (acts of a legislature)

  creating public sector or governmental/quasi-governmental bodies.

  The documentation provided to IDRC should clearly indicate the name of the institution and should be provided to IDRC in English, French or Spanish. If the original documentation is not available in one of these languages, a certified translation into one of these languages should be provided together with a copy of the original document.

  A certified translation means the translation is completed by someone who is an external translator (not part of your organization) and who certifies that the translation is accurate to the best of their knowledge

Government Approval

- Letter of approval from government authority (if required)

c. *Country clearance requirements* - IDRC has conducted general agreements for scientific and technical cooperation with a number of governments. These agreements establish the framework for IDRC cooperation with that country by defining the rights and obligations of both IDRC and the government. As such, the applicant institution may be required to obtain country approval in accordance with these agreements prior to receiving funding from IDRC. This requirement applies only for selected applications. IDRC reserves the right to not pursue the funding of a selected project if the country approval is not

secured within six months after IDRC officially announces approval of the project, as this would jeopardize the timely completion of the initiative.

Any selected proponents shall be required to sign IDRC's standard Grant Agreement, as amended by IDRC from time to time. Furthermore, IDRC reserves the right to cancel the process at any time without prior notice and/or at its discretion to grant all or none of the awards under this process. The grant agreement will provide a schedule for submitting interim and final technical and financial reports.

9. Conflict of interest

In submitting an application, the applicant must avoid any real, apparent or potential conflict of interest and will declare to IDRC any such conflict of interest. If any real, apparent, or potential conflict of interest cannot be resolved to IDRC's satisfaction, IDRC will have the right to immediately reject the applicant from consideration.

10. Use, Disclosure and Retention of Information

By way of submitting an application under this Call for competitive grants, the applicant consents to the disclosure of the documents submitted by the applicant to the reviewers involved in the selection process, both within IDRC and externally. The applicant further consents to the disclosure of the name of the applicant, the name of the lead researcher and the name of the proposed project, in any announcement of selected proposals.

All personal information collected by IDRC about grant, scholarship and fellowship applicants is used to review applications, to administer and monitor awards, and to promote and support international development research in Canada and in the regions where IDRC operates. Consistent with these purposes, applicants should expect that information collected by IDRC may come to be used and disclosed in IDRC supported activities.

As a Canadian Crown corporation, IDRC is subject to Canada's *Access to Information Act*. Consequently, any submissions in response to this Call for Research Proposals will be held by IDRC in a manner consistent with the *Access to Information Act*, including IDRC's obligations to disclose documents requested by members of the public.

By way of submitting an application under this call, the applicants consent to the disclosure of the documents submitted by the applicant to the reviewers within IDRC and externally who are involved in the assessment and selection processes of proposals. If selected for funding, the applicants further consent to the disclosure of their name and the title of the proposed project in any announcement of selected projects. Unsuccessful proposals will be destroyed within 180 days after the close of the application period.

Annex A. Background: AI and data innovations as part of a coordinated COVID-19 crisis response

With COVID-19 cases now reported in nearly every country in the world, states are now balancing measures to respond to and contain the contagious disease, while also addressing the emerging social and economic challenges resulting from restrictive but essential public health measures.[1] Developing countries stand to be disproportionately impacted by the COVID-19 health crisis, as these societies may be more vulnerable to higher infection rates, especially in major urban centres and slums, and greater death rates due to weaker health systems. Many developing countries have less fiscal capacity to invest in interventions to flatten the curve and keep daily cases at a manageable level for health care systems.

The COVID-19 crisis is being called a "data-driven pandemic[2]"– that is, massive amounts of information and data are being released and shared at a scale that has never been seen before, augmented by digital technologies and new means of analyzing data such as with AI. Past epidemics such as SARS-COV-1, H1N1, Zika, and the Ebola crisis demonstrated the need for timely, reliable, and open data.[3] During the COVID crisis, new research is demonstrating how AI is supporting early detection, timely communications with the public, new diagnostic tools, and informed policy and public health responses that can be automated, implemented and scaled affordably.

Supporting pandemic-responsive public health systems in the global south with AI and Data

Governments and other stakeholders around the world have been experimenting with the implementation of Artificial Intelligence[4] and data science[5] as a complementary approach to traditional response mechanisms.

Forecasting transmissions and reducing spread through policy and public health interventions

AI and data science innovations have supported several areas of epidemiological research, including forecasting the duration of the epidemic, modelling the number of new confirmed cases given different public policy choices, and modelling the rate of asymptomatic cases. In some circumstances, models can help predict the location, timing and the size of outbreaks, allowing governments to allocate resources more effectively – although this can be challenging even in contexts with a lot of data. In addition to supporting the nuancing of traditional methods, the crisis is also driving the creation of novel methods as well.

In terms of public health management, AI models also enable policymakers and health officials to conduct scenario analyses that will enhance their capacity to make effective data-driven decisions in current and future outbreaks. Models can integrate many complex factors such as compliance rates, economic vulnerabilities, and travel histories to generate possible paths for public health responses. The scenarios also support decision making to redirect and focus resources to ensure that highest priority health services are maintained (maternal

[1] Hale, Thomas and Samuel Webster (2020). Oxford COVID-19 Government Response Tracker. https://www.bsg.ox.ac.uk/research/research-projects/oxford-covid-19-government-response-tracker
[2] The data-driven pandemic: Information sharing with COVID-19 is 'unprecedented', CBC news, https://www.cbc.ca/news/canada/coronavirus-date-information-sharing-1.5500709
[3]COVID-19 Open Research Dataset (CORD-19) https://pages.semanticscholar.org/coronavirus-research
[4] Bullock, J., Alexandra, Luccioni, Pham, K. H., Sin, C., & Luengo-Oroz, M. (2020). Mapping the Landscape of Artificial Intelligence Applications against COVID-19. Retrieved March 30, 2020, from arXiv.org website: https://arxiv.org/abs/2003.11336
[5] Mobile phone data and COVID-19: Missing an opportunity? (2020) from arXiv.org website https://arxiv.org/abs/2003.12347

health, malaria control), in addition to the epidemic response. These models can also account for other economic and social factors, helping governments decide how to respond.

AI is well suited for health surveillance and signal detection. For example, one start-up used data from hundreds of thousands of sources, such as statements from official public health organizations, media, health reports, as well as demographics and airline information to predict the outbreak nine days before the World Health Organization alerted the world. Countries such as Brazil,[6] Pakistan[7] and India,[8] are already using data and AI techniques and predictive modelling to inform their responses. Researchers have also used similar techniques to map vectors of disease, such as Dengue Fever in Brazil and the spread of Zika in Latin America.

Contact tracing

Contact tracing – the process of monitoring the transmission of COVID-19 or other infectious pathogens through individual contacts – has become an area of great interest in COVID response. Contact tracing can help limit community transmission of diseases by ensuring that people who are at risk of being infected can self-isolate. It was deployed extensively during the Ebola crisis in West Africa. Mobile phone data and advanced algorithms can allow for contact tracing at a massive scale, and also in supporting the enforcement of isolation measures by coordinating logistics to provide people with food and ensuring they are adhering to isolation through GPS and geolocation – but potentially at the risk of privacy and other rights.

Singapore and South Korea both used contact tracing techniques to reduce and contain the number of cases. So far, they have avoided implementing significant social distancing measures and the resulting economic disruption that can ensue from those measures. Singapore developed the TraceTogether app, which leveraged police techniques and mobile phone data to support rigorous contact tracing, which is now being piloted in a number of other countries. In South Korea, positive cases were distributed publicly with extensive personal information such as age, gender, and a detailed log of movements,[9] derived from multiple data sources such as surveillance cameras, cellphone data and credit card transactions. These measures have been somewhat effective but controversial, particularly in contexts where the state has a propensity to use surveillance for other means than public health.[10] Privacy and security of personal data are key challenges with some contact tracing approaches. Large companies such as Apple and Google are now partnering to explore "opt-in" contact tracing.[11] While contact tracing is an important strategy in containing the spread of the disease, it must be applied in a way that respects ethics, privacy, and consent when scaled with digital technologies and AI. Germany offers an interesting potential approach for ensuring that the privacy of its citizens is optimized while also protecting broader public health.[12] The EU has also launched an open-source privacy preserving proximity tracing tool[13].

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[6] Data analysis and modeling of the evolution of COVID-19 in Brazil (2020) https://arxiv.org/abs/2003.12150

[7] COVID-19 Outbreak in Pakistan: Model-Driven Impact Analysis and Guidelines 2020 https://arxiv.org/abs/2004.00056

[8] Age-structured impact of social distancing on the COVID-19 epidemic in India, pre-print, https://arxiv.org/abs/2003.12055

[9] South Korea is reporting intimate details of COVID-19 cases: has it helped? https://www.nature.com/articles/d41586-020-00740-y

[10] See: The 'Big Brother' surveillance that may put you in quarantine… or keep you out. https://www.timesofisrael.com/the-big-brother-surveillance-that-may-put-you-in-quarantine-or-keep-you-out/

[11] Apple and Google partner on COVID-19 contact tracing technology, April 10, 2020 https://www.apple.com/ca/newsroom/2020/04/apple-and-google-partner-on-covid-19-contact-tracing-technology/

[12] See: In Germany, High Hopes For New COVID-19 Contact Tracing App That Protects Privacy https://www.npr.org/sections/coronavirus-live-updates/2020/04/02/825860406/in-germany-high-hopes-for-new-covid-19-contact-tracing-app-that-protects-privacy; How Germany is Gearing Up for Virus Traching App https://www.thelocal.de/20200410/interview-how-germany-is-gearing-up-for-virus-tracing-app

[13] Pan-European Privacy-Preserving Proximity Tracing (PEPP-PT) https://www.pepp-pt.org/

Optimizing health system responses for patient diagnosis, care and management

Digital, AI, and data solutions can help to support overburdened health systems and health workers when responsibly deployed. However, capacity and implementation challenges can delay and impede the adoption of technologies for rapid response[14].

Diagnosis and resource allocation

Automated systems can contribute to better logistics and resource allocation in overburdened health systems, helping health officials plan who to test, when and where. Data science tools can estimate the number of patients that might need critical care at a specific location and coordinate needed beds, equipment and treatment options based on availabilities. Tools can help to predict patient outcomes, assist practitioners to triage the most high-risk patients, and curb mortality rates.[15] Algorithms can also support faster diagnosis in many ways. Automated systems can facilitate rapid screening for COVID-19 or antibodies. As testing kits run low, local data from x-rays could support more novel approaches, such as being plugged into AI models to train a model to assist overburdened health officials in detecting COVID-19.[16]

Outreach to the public

Human behavior plays an important role in disease transmission, and algorithms and automation can help stretched public health departments with prevention efforts through automated public outreach. Regularly updated dashboards and maps can help people understand the scope of the problem, and unpack the measures and interventions being undertaken by authorities. AI tools like chatbots can help communicate reliable information to the public by supporting self-diagnosis and screening while recommending preliminary treatment options. HealthAlert, for example, uses the WhatsApp communications platform to send COVID-19 messages to South Africans based on their questions and National Department of Health guidelines. A natural language processing engine answers most queries automatically. This system relies on technology people are comfortable with; therefore, no training or behaviour change is needed for adoption.

Mobilizing AI and data science for COVID-19 action to support gender equality and inclusion

Recognizing how disease outbreaks affect women and men differently is "a fundamental step to understanding the primary and secondary effects of a health emergency on different individuals and communities, and for creating effective, equitable policies and interventions."[17] Gender – and how it plays out in differing roles, norms, and responsibilities - can result in differing vulnerabilities to infection, exposures to disease, and access to treatment in an epidemic or pandemic. In the case of social distancing measures, they can exacerbate domestic tensions and result in an increase in domestic abuse and other gender-based violence.[18] Ensuring equitable leadership in making public health decisions is fundamental, as is exploring ways to engage vulnerable groups in decision making – which is all the more challenging in social distancing settings. AI and data science innovations, in combination with other practices, can potentially support the needs of vulnerable groups in the short term and explore the differential impacts of the crisis on people of different genders in the longer term.

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[14] Shaw J, Rudzicz F, Jamieson T, Goldfarb A. Artificial Intelligence and the Implementation Challenge. J Med Internet Res. 2019;21(7):e13659. Published 2019 Jul 10. doi:10.2196/13659

[15] Yan et. Al. A machine learning-based model for survival prediction in patients with severe COVID-19 infection. (2020). Pre-print. https://doi.org/10.1101/2020.02.27.20028027

[16] Wan, Kang, Ma. Et al. A deep learning algorithm using CT images to screen for Corona Virus Disease (COVID-19), 2020, https://www.medrxiv.org/content/10.1101/2020.02.14.20023028v3.full.pdf

[17] Wenham, Clare et. al. COVID-19: the gendered impacts of the outbreak. (2020). https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30526-2/fulltext

[18] Jones SA, Gopalakrishnan S, Ameh CA, et. al.'Women and babies aredying but not of Ebola': the effect of the Ebola virus epidemic on the availability, uptake and outcomes of maternal and newborn health services in Sierra Leone. BMJGlobalHealth2016;1:e000065. doi:10.1136/bmjgh-2016-000065

One major gap in existing research is an understanding of differences in effects of the health emergencies on people of different genders and vulnerable communities such as refugees and migrants, LGBTQI+ communities, people with disabilities, and people with diseases. In particular, a lack of disaggregated data, and other gaps about gender and other identities, can lead to reliability issues in modelling strategies and timelines, potentially influencing decisions such as when to re-open schools, the kinds of stimulus packages and cash transfers that are delivered, access to treatment, and more. The risk is that without considering the needs of these groups, vulnerable communities may not be able to access support systems, may be more vulnerable to infection, and may not receive the same support as other groups. There is a need to ensure that research helps to better understand the real-time impacts of crisis responses on women and people of other identities, and also to ensure that responses are able to take into account "shadow pandemics" such as an increase in gender-based violence, a lack of access to sexual and reproductive health services, economic challenges and insecurities. Otherwise, COVID responses may exacerbate existing inequalities and biases.

Addressing challenges in implementing AI and Data Science for COVID-19 response

AI and data science can help with crisis response, and must take into consideration local contexts, systems[19] and challenges, including lessons learned and capacities built from past pandemics like SARS-COV-1, Ebola and Zika.[20]

Building trust and combatting mis- and dis-information around COVID-19

A key challenge facing health officials is in the accompanying "infodemic," the widespread dissemination of unfounded or false medical advice, hoaxes, fake products and fake information about the virus and responses. One challenge is the lack of context-specific information about policy responses, cases, and behaviours to be adopted. Within developing country contexts, experts had already captured the growing mistrust of people towards their governments, and unfortunately, many governments have responded to the COVID-19 crisis by weakening their transparency and accountability measures under emergency laws. The lack of information and trust can hamper public health efforts and create confusion and distrust. At its worst, it can stoke xenophobic sentiments and hate speech and actions, such as inciting violence against health care workers and marginalized communities in the Democratic Republic of Congo during the Ebola crisis.[21]

In the absence of timely, reliable reporting, there is evidence of significant amounts of mis- and dis-information[22] being disseminated about the origins of the disease, the numbers of infections, responses and treatment options.[23] Alternate (and false) treatment options are being distributed and shared virally, creating challenges in public health strategies that rely on public compliance and behaviours to address the pandemic.[24] In some contexts, there is a risk that rumours and conspiracy theories about the origins of the disease may also spur violence against particular communities and health care workers, as has happened in past epidemics and pandemics. Misinformation about the disease's severity and treatment options is fuelling cyber-crime activities,

[19] Wahl B, Cossy-Gantner A, Germann S, et al. Artificial intelligence (AI) and global health: how can AI contribute to health in resource-poor settings? BMJ Glob Health2018;3:e000798. doi:10.1136/bmjgh-2018-000798

[20] Erikson SL. Cell Phones ≠ Self and Other Problems with Big Data Detection and Containment during Epidemics. Med Anthropol Q. 2018;32(3):315–339. doi:10.1111/maq.12440

[21] During the Ebola crisis in Sierra Leone, amidst rumours that health care workers were transmitting the disease to the general population, there are reports that health care workers were attacked: https://www.intrahealth.org/vital/health-workers-pay-ultimate-price-fight-against-ebola

[22] Hate multiverse spreads malicious COVID-19 content online beyond individual platform control (2020) https://arxiv.org/abs/2004.00673

[23] Tasnim, Hossain, Mazumder. Impact of rumors or misinformation on coronavirus disease (COVID-19) in social media. (March 2020). Working paper. https://osf.io/preprints/socarxiv/uf3zn/

[24] WhatsApp is limiting message forwarding as coronavirus misinformation takes hold in Africa, Quartz Lagos, April 7 2020. https://qz.com/africa/1834095/coronavirus-whatsapp-clamps-down-on-message-forwarding/

and has also resulted in death: nearly 500 people died in Iran after drinking Methanol as a supposed treatment for COVID-19. AI detection tools can be used to identify harmful rumours and hate speech, which can help to address mis- and dis-information.

On uncurated social media platforms – and even in some news media – there is an abundance of inaccurate and even at times deliberately mis-leading information. Some bad actors are even spreading information that is criminal in nature. Indeed, past research has shown that misinformation is more likely to be disseminated than accurate information online.[25] Social media platforms have relied on human moderators as well as automated systems to detect false information and abusive content, but social distancing has meant the majority of moderation is now happening via automated systems that can be easily manipulated. While the WHO and social media platforms such as WhatsApp and YouTube are taking action to reduce the spread of misinformation, there is a need to understand the scope of the problem and the kinds of misinformation spreading in developing country contexts, and address it by building trust.

Strengthening data systems and information sharing about COVID-19

A key challenge in optimizing public health responses and implementing AI and data science innovations in response to the COVID-19 crisis are weak systems to collect quality, timely, disaggregated data related to the crisis that can be used to for decision making and to develop useful, meaningful solutions.[26] It can also pose a challenge for transparency and good governance within the crisis due to limited access to information. There is an opportunity to strengthen data sharing, to open data (while respecting privacy and personal information), and support better communication with the public and between actors in pandemic response.

Public sector health responses in developing countries have been challenged in their ability to drive the response due to a lack of data around health system capacities, resource availability, demographics, and other factors and drivers of transmission and vulnerability. Key data can be challenging to obtain, such as case data, GIS data, number of hospital beds, testing capacity, number of healthcare workers, population statistics, and even the number of people with conditions that increase vulnerability to COVID such as malaria, diabetes, tuberculosis, or HIV. Timely, reliable, high-quality data is fundamental to training many AI and data science innovations. Even when the data is available, in many cases, it hasn't been adequately labelled to be useful for algorithms, and this can be a time-consuming proposition.

There are a number of factors that have contributed to these data gaps – a lack of interoperability between information systems, under resourcing of data collection and management in public health information systems and in the government at large, a lack of open data policies, sharing and governance frameworks. These challenges are larger, more systematic ones than the scope of this call, but some of the lessons learned from past work can help to address immediate challenges around data challenges in the COVID crisis.

Alternate sources of data can help to address these gaps if responsibly managed, and include data from social media and internet applications, electronic health and mHealth records, traffic information, sensor and information networks, home disease diagnosis kits, and mobile network big data. There is also an opportunity to support better collaboration with private sector actors, where mobile big data, social media data and satellite feeds can offer proxy data sets to inform models for contact tracing or predict new outbreaks.

[25] Vosoughi, Roy, Aral. The spread of true and false news online (2018). Science, Vol. 359, Issue 6380, pp. 1146-1151. https://science.sciencemag.org/content/359/6380/1146

[26] Even the John Hopkins University coronavirus dashboard is facing challenges managing hundreds of sources, 'Every day is a new surprise.' Inside the effort to produce the world's most popular coronavirus tracker, Science, April 6. 2020 https://www.sciencemag.org/news/2020/04/every-day-new-surprise-inside-effort-produce-world-s-most-popular-coronavirus-tracker#

Finally, it is important to highlight the additional challenges that come from weak data systems, such as the lack of dis-aggregated data and other data that is essential to ensuring that systems are reliable and inclusive. Data that trains and calibrates systems can also amplify underlying biases and patterns in the data, sometimes leading to false conclusions and scenarios that could potentially amplify harm. In particular, gender data gaps, and gaps about other vulnerable groups can lead to challenges in modelling strategies and timelines, such as when to re-open schools, stimulus packages and cash transfers, and more. There are fairness techniques that can help address some of the bias challenges, but it remains an important challenge.

Supporting transparent and responsible AI, data and digital rights governance around COVID-19 and pandemic responses

Before the crisis, there was growing interesting in ethical, responsible and rights-based governance of data and AI systems to mitigate potential harms of these systems due to bias and explainability challenges, privacy and other digital rights challenges, and cybersecurity vulnerabilities. While many countries were in the process of drafting data protection laws and privacy measures, not many have yet codified these regulations and laws. The ethical, legal and socio-economic implications of applying AI and data science tools are amplified in disease outbreak preparedness and response. Crucially, there is a need to balance health-related benefits and harms between the population-at-large and at-risk populations, minimizing threats to privacy and autonomy, and ensuring just distribution of scarce resources. Broadly, these implications must be addressed by a number of stakeholders and actors through appropriate governance frameworks for managing innovations.

Responsible AI research must take into account rights, governance, transparency and accountability, privacy, security, future usage, socio-economic factors, data collection, identification and pseudo anonymization techniques. For example, if AI is used to identify an at-risk community during a disease outbreak, that community might face stigmatization, discrimination and perhaps even political marginalization. Although isolating that community might very well be in the interest of the broader population, there might also be legal or ethical barriers to doing so.

There is also the continued challenge that many systems using data science and AI are still contending with bias and other technical challenges, such as accuracy. It is vital to ensure there are strong governance agreements, oversight and transparency to identify, analyze, pre-empt and address the many challenges arising from the application of AI and data science in disease outbreak preparedness and response.

Building capacity for future pandemic detection and response

In the longer term, this Fund is seeking to strengthen the rapidly evolving field of Precision Public Health, which examines the application of new technologies and methods such as machine learning, artificial intelligence and data science to public health policy and practice. It is about implementing "the right intervention at the right time, every time to the right population."[27] Precision Public Health uses data to guide interventions that benefit populations more efficiently. It requires robust primary surveillance data, rapid application of sophisticated analytics to track the geographical distribution of disease, and the capacity to act on such information.

[27] Precision Public Health: What Is It? CDC, https://blogs.cdc.gov/genomics/2018/05/15/precision-public-health-2/