



Predictive modeling and forecasting of the transmission of COVID-19 in Africa using Artificial Intelligence

Project Number
109559-001

Lead Author
Jude Dzevela Kong

Name of the Research Institution
York University, Canada

Period covered
November 01, 2020-May 30, 2023

Table of contents

<i>Section 1: Project information</i>	3
<i>Section 2: Narrative report</i>	3
2.1. Objectives	3
2.2. Approach and workplan	7
2.3. Research findings	7
2.4. Gender and diversity	68
2.5. COVID-19 context	74
2.6 Key achievements	75
2.7 Preliminary lessons learned	82
<i>Section 3: Project management considerations</i>	85
3.1. Management of sub-grants	85
3.2. Key challenges encountered	88
3.3. Milestones	89
3.4. Adjustments to budget or timelines	89
<i>Section 4: Research outputs</i>	90
4.1 Publications and papers	90
4.2 Policy, advocacy and public engagement	130
4.3 Non-academic outreach products	159
4.4 Media coverage and citations in public events	161
<i>Section 5: Outcomes and impacts and lessons</i>	172
5.1. AI for COVID-19 Policy and Decision-Making	172
5.2. User-Centric Data Innovation and AI for COVID-19	205
5.3. Cross-cutting objectives	219
5.4 Positioning for sustainability	220

Please note the following guidance:

- Based on past IDRC experience, reports of about 10-12 pages tend to provide an appropriate level of detail and be most useful to grantees and the Centre.
- Additional information, such as outputs, documents related to events and workshops, etc. may be included as annexes in separate files. Don't hesitate to share with us draft working papers, briefs or articles prepared as part of this project, whether they can be shared externally or otherwise.
- Some questions of section 5 might not apply to your project. This is explained by the nature of the initiative structured around two pillars – COVID-19 policy and decision making, and data and AI innovations for COVID-19.
- We recognize that every question may not be relevant at every stage of the project lifecycle. If you choose to leave a question blank, please indicate a reason. Also note that bullet point answers are fine.
- If helpful, you can refer to the [original call for proposals for the selection of AI4COVID projects](#) and the [initiative's website](#) to guide you in the reporting and outputs and outcomes.
- Please consult with your IDRC Program Officer if you have any questions.

Section 1: Project information

Project title	Predictive modeling and forecasting of the transmission of COVID- 19 in Africa using Artificial Intelligence
IDRC project number	109559-001
Report type (first progress report, interim progress report, final technical report, etc.)	final technical report
Period covered by the report	November 01, 2020-May 30, 2023
Report author(s)	Jude Dzevela Kong (PI)
Name of lead research institution	York University
Start date of project	October 01, 2020
Project budget (in \$ CAD)	1,249,030

Section 2: Narrative report

2.1. Objectives

Is the project on track to meet the original objectives? If not, why not? Have any objectives changed or evolved during the reporting period? If so, describe how and why. Please note that major changes must be discussed and agreed with IDRC.

Yes, the project met and exceeded its original objectives. Some of our objectives evolved and went beyond the initial plan. This was due to what was happening within communities throughout the outbreak. We co-created the models with governments, community leaders, and other policy makers. As the needs of the government and communities changed throughout the pandemic, we kept on updating or adjusting our objectives to meet the needs of the people. This was still in line with the initial objectives, but went beyond it.

The overall objective of our project was to harness the power of gender responsive, responsible artificial intelligence and big data to provide locally relevant COVID-19 information in real-time to specific urban and peri-urban communities in 9- African countries: Botswana, Eswatini, Cameroon, Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe. This information was to be used to inform and implement public health policy and communication.

The Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) has successfully delivered locally nuanced analyses to monitor COVID-19, predict resurgences, identify and analyze emergent hotspots and outbreaks, identify individuals at higher risk of infection, stratify patients, identify gendered vulnerability, and develop strategic, highly targeted and staged delivery plans of vaccines to priority areas. We are also doing ongoing monitoring to enhance testing and development to ensure that public health interventions are equitable and effective. Our models are the official models used by governments in their interactions with both local and national policymakers (see attached file for a detailed summary of our achievements). We draw on the government and community related networks of our team leaders in Botswana, Eswatini, Cameroon, Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe. Many of our team leaders also lead their national COVID-19 advisory committee or modelling task force (e.g Professor Bruce Mellado is the Head of the Gauteng Province Premier's COVID-19 Advisory Committee and head of Southern Africa COVID-19 Modelling Taskforce; Professor Wilfred Ndifon is one of the leaders of Rwanda COVID-19 Modelling Taskforce ; Professor Ngwa Gideon is the head of the South West province, Cameroon Modelling Taskforce ; Professor Jude Dzevela Kong, the lead PI is a member of the Africa CDC Modelling Taskforce). The experience of our team leaders, their community partners, their detailed understanding of national and local context and constraints and opportunities, have each been core to the success-to-date of the ACADIC Consortium. Below are some of the items we have successfully delivered and continue to deliver

1. Monitoring and forecasting the growth and spread of COVID-19 at the local, state, and national levels
2. Evaluating efforts to mitigate and control the spread
3. Identifying trends in the disease infections, hospitalizations, and deaths
4. Guiding purchase and allocation of health care resources
5. Guiding the collection of data (ensuring that data disaggregated by race, gender, sexuality, class, geographic location and Indigeneity)
6. Assessing the impact of different vaccine distribution strategies
7. Providing situational intelligence: on populations at risk, stage of outbreak, projected burden of illness, school/business/work closure and re-opening etc.
8. Nowcasting labor market flow
9. Supporting race, gender, sexuality, class, geographic location and Indigeneity, inclusive COVID-19 actions.
10. Developing methodologies and technologies to describe contact mixing and transmission networks to quantify impacts of contact shifting and individual mobility
11. Supporting transparent and responsible AI, data, and digital rights governance around COVID-19 and pandemic responses
12. Strengthening data systems and information sharing about COVID-19
13. Building trust and combatting mis- and dis-information around COVID-19
14. Optimizing public health system responses for patient diagnosis, care, and management

15. Establishing sustainable collaborations among model developers, policy makers, community leaders etc
16. Preparing the next generation of leaders in infectious disease modelling approaches in these countries
17. Working closely with public health agencies and other stakeholders to build trust and knowledge of artificial intelligence models among key decision makers
18. Developing stand-alone and predictive public health decision support tools.
19. Creating a collaborative network that can respond rapidly to support decision makers in each country to address infectious diseases or other disasters and emergency situations in general.

Though the project has come to an end, we have continued to meet every other week, to share best practices and learn from each other. We have successfully created a support platform that has kept researchers active, even without funding.

Our future initiatives stemming from this project are divided into three parts: research, capacity building and data pipeline construction. In addition to informing COVID-19 policies, below are some of the key signature projects that we are embarking on at the moment:

1. Research

1.1: University of the Witwatersrand

—**AI-powered early detection system for communicable respiratory diseases based on integrated data sets**

- a. Development of a cost-effective AI-powered IoT system for air-pollutants.
- b. Integration data from air pollutants, epidemiology, clinical, atmospheric and satellite data for the development of AI-powered early detection algorithms for pandemic preparedness and mitigation of infectious diseases

Link: <https://www.sacaqm.org/contact>

—**Digital ecosystem to fight GBVF**: development of AI-enhanced visualization tools (dashboard) to collate data from all sources available: first prototype available: <https://www.gbvf-dashboard.org/>

—**The application of remotely sensed data to develop a malaria warning system**

The main objectives of this study to extract relevant features of our study area from satellite images retrieved from open-source satellite products such as Landsat by NASA (National Aeronautics and Space Administration), MODIS by NASA, and Sentinel by ESA (European space agency). Using the satellite data and climatic data we will design and implement a temporal graph neural network (GNN) to predict future malaria incidences.

1.2 University of Ibadan:

Genomic Surveillance: Artificial Intelligence (AI) in Detection of Diagnostic and Drug resistance in Infectious Diseases

Objective: develop AI-based model to identify and flag drug, and diagnostic resistant genotype sequences from a diverse disease genetic background for disease prevention and management.

It proposes to train, operationalize and deploy a model that is capable of detecting multiple tropical pathogenic infections with confirmatory diagnostic predictions placed on a decision tree based on genomic data profiling.

1.3 University of Buea

Integration of Home Health Care and Artificial Intelligence in the Prevention and Management of Emerging and Reemerging Diseases

Objectives:

1. To integrate home healthcare with Artificial Intelligence and Big Data Analytics for the early identification and management of Emerging and Re-emerging Infectious Diseases
2. To provide mobile and web-based AI solutions to help strengthen Cameroon's public health system to improve prevention, preparedness, and response to emerging and re-emerging infectious disease outbreaks
3. To develop artificial intelligence model to predict spread of infectious disease outbreak by combining health system routine data and environment data
4. To generate data and analyse machine learning, and deep learning approaches applied to study zoonotic diseases, to understand predictive models, to help researchers identify the risk factors, and develop mitigation strategies.

1.4 CSIR and University of Pretoria

Informing public health response using AI modelling tools for wastewater surveillance of emerging viral diseases in South Africa

Objective: Prediction of disease location and severity using wastewater collection, taking into account feeder areas for wastewater plants as well as covariate data

1.5 AIMS Rwanda

Health and Interventions Monitoring with Artificial Intelligence

Objective:

- a) Build a one of its kind pharmacovigilance framework comprising healthcare providers, patients, and other relevant stakeholders which will result in a large and continuously update database of diseases symptoms, medical interventions and outcomes.
- b) Use AI techniques to mine the pharmacovigilance database to systematically monitor how diseases and medical interventions affect people, and thereby generate novel insights to inform the improved diagnosis and treatment of diseases.
- c) Directly contribute to achieving the United Nation's sustainable development goal #3.
- d) Create various opportunities for researchers and entrepreneurs to create innovative data analytics tools in the health sector.
- e) Detect early warning signals for new disease epidemics to enable a better public health management.

2. Capacity Building

This is divided into three parts: i) Africa-Canada AI and Data Innovation Workshops for Undergrad and High School students, ii) Africa-Canada AI and Data Innovation Workshops for Policy Makers and Civil Society Organizations; iii) Africa-Canada AI and Data Innovation Faculty Enrichment program.

2.1 Africa-Canada AI and Data Innovation Workshops for Undergrad and High School students

1. To familiarize students with AI-Algorithm and Data Science and their applications in helping governments and communities address issues

2. The program provides students with the opportunity to lead AI and Data Innovation chapters and immerse themselves in the quantitative skills highly needed in the job market.
3. We have had preliminary meetings with the Canadian High Commissioner to South Africa and MTN to partner with MTN for this.

2.2 Africa-Canada AI and Data Innovation Workshops for Policy Makers and Civil Society Organizations

1. **Target Audience:** Health Service staff in each of the country where our hub is located: Diseases surveillance unit, Civil society organizations diseases surveillance unit
2. **Aim:** to provide training on AI and Data Science modelling to national and regional staff of health services and civil society organizations for health emergency preparedness and response in South Africa for Public Health Emergency preparedness and response and strengthened management of endemic diseases

2.3 Africa-Canada AI and Data Innovation Faculty Enrichment program

1. Lean AI and Data Innovation with ACADIC by designing and executing their own project; improve written and oral science communication skills
 2. **Target Audience:** Africa Faculty (teaching in African Universities) who are passionate about data science and AI
 3. **Size:** 3-5 participants per year
 4. **Duration** 18 Weeks in person at (initial cohort will be placed at Wits/York University). Once they are trained, they will in turn act as hosts.
3. **Data Pipeline Construction:** An online searchable repository comprehensively compiling resources containing locally relevant data. This is already in progress. We have built several dashboards that will be added to the repository: <https://academic.org/malaria-in-africa/> etc

2.2. Approach and workplan

Are the research approach, methodology used and key activities being implemented as planned? If not, describe any changes and adaptations and explain why you made any changes.

We augmented our research approach, methodology used and key activities in certain situations to meet up with the request from governments, community leaders, etc. The changes helped us to achieve much more than we proposed. When we started we were using a participatory, decolonial, gender sensitive, intersectional, and rights-based approach, but have expanded this to a participatory, decolonial, gender transformative, intersectional, and rights-based approach (thanks to GAL program that we went through).

2.3. Research findings

Describe any findings based on your research thus far. How have they been useful or innovative? Highlight the significance of these findings in relation to expanding the existing knowledge base and/or policy development in relation to effective government responses and pilot new approaches to response and recovery to the COVID-19 pandemic, or to medium term research that contributes to strengthening pandemic preparedness (for example through precision public health metrics).

By drawing on the connections our team leaders in Botswana, Eswatini, Cameroon, Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe have with the governments of these countries; the fact that they are heads of COVID-19 advisory committee or modelling task force; their set of experiences; their community

partners; local context; constraints; and possibilities of each country' team etc., we have successfully delivered locally-nuanced analyses to monitor COVID-19, predict resurgences, identify and analyze emergent hotspots and outbreaks, identify individuals at higher risk of infection, stratify patients, identify gendered vulnerability, and developed strategic, highly targeted and staged delivery plans of vaccines to priority areas.

We are also doing ongoing monitoring to enhance testing and development to ensure public health interventions are equitable and effective. Our models are the official models used by governments in their interactions with both local and national policy-makers. A publication with a summary of some our findings, framework and recommendations can be found on the link below: <https://www.mdpi.com/2227-9032/11/4/457>.

Below is a video summary of our achievements can be found here: <https://youtu.be/kplM7hMy5y0>.

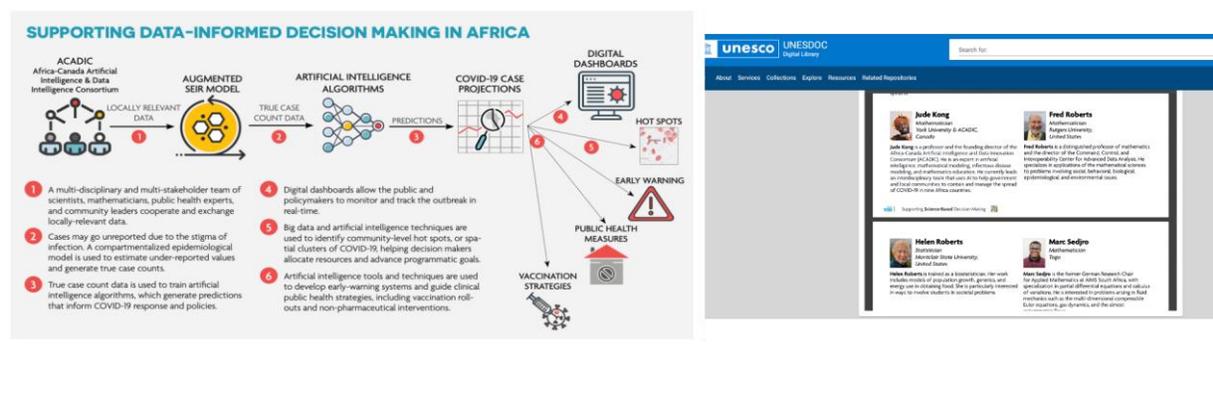
Below we have outlined some of our achievements.

1. **UNESCO:** Because of the impact of our models in helping government and communities to contain COVID-19, we were contacted to write a Policy Brief on how to leverage AI and Big Data techniques to inform disease outbreak policies (based on ACADIC AI4COVID project) for UNESCO. Title: Supporting Data-informed Decision-Making in Africa. This has been distributed wide across all UNESCO member States.

English version: <https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en> (pages 8-9)

French Version:

https://unesdoc.unesco.org/ark:/48223/pf0000384607?fbclid=IwAR2pzbjT3Nt1zI_TNb1xHK5ogliVKqwpC5q5SByCkU38BLvxNX25_hi73ZI

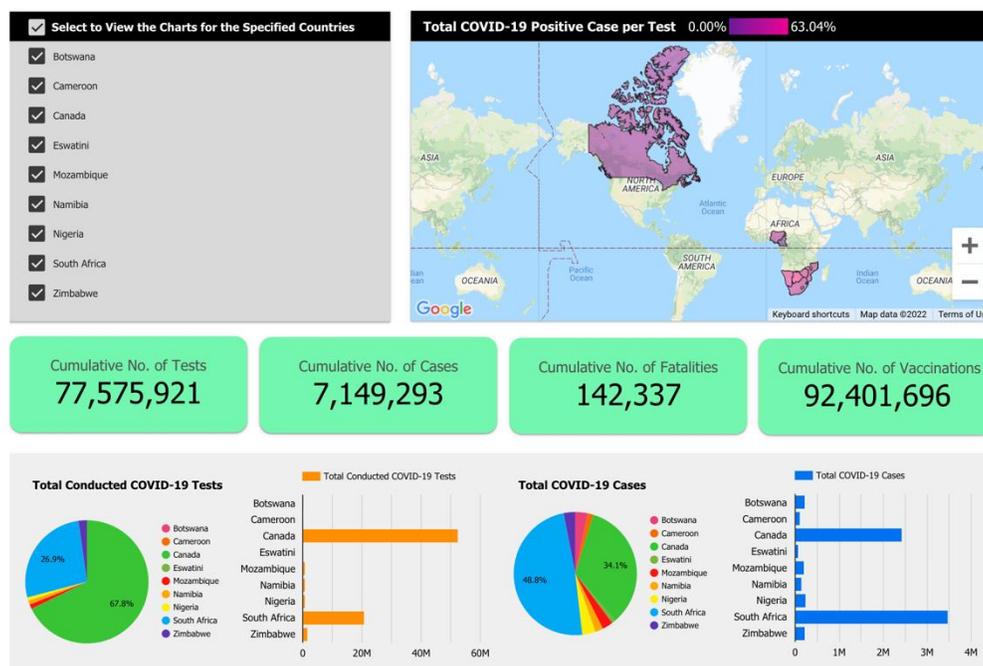


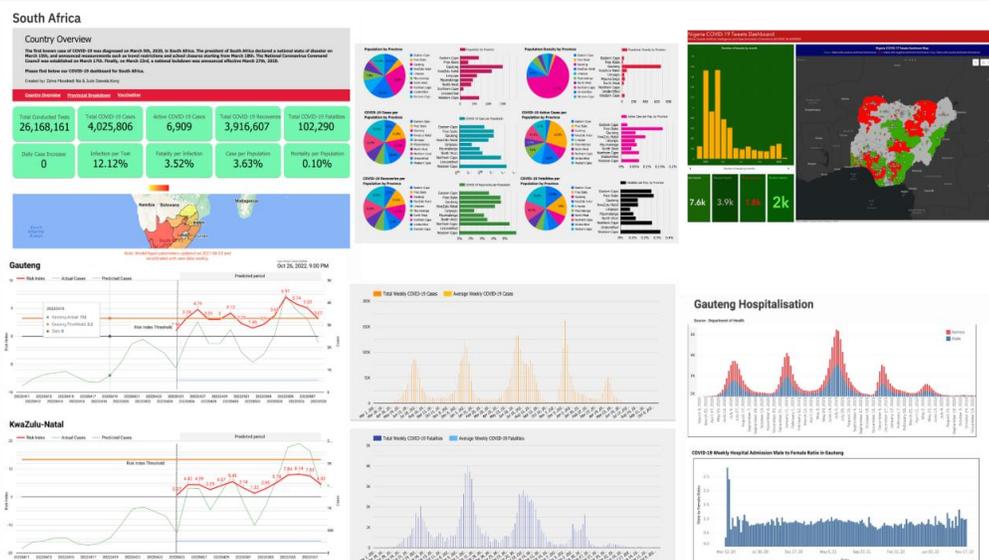
2. We have developed COVID-19 monitoring dashboards that visualize locally relevant information to the public and policy makers: <https://acadic.org/>

We delivered AI-powered analytics dashboards to communities and governments across Africa: These tools are unique in that they do not only provide real-time visualization but also detailed modelling and predictions down to the smallest administrative unit in each region. Experts and high-level policy-makers use these tools to visualize the situation on the ground and enact policies accordingly. These dashboards are the official dashboards used by policy makers in Botswana, Eswatini, Cameroon, Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe. The website for South Africa is viewed by more than one million people daily and those for the other countries is viewed by more than 50 thousand people daily. Below is a link to the Dashboards

- South Africa: <http://www.covid19sa.org/>
- Botswana: <https://tinyurl.com/4e83hubd>
- Eswatini: <https://tinyurl.com/2p9eyeff>
- Mozambique: <https://tinyurl.com/3wrxwvr7>
- Cameroon: <https://tinyurl.com/ynd878fz>
- Nigeria: <https://tinyurl.com/ytmxuzmp>

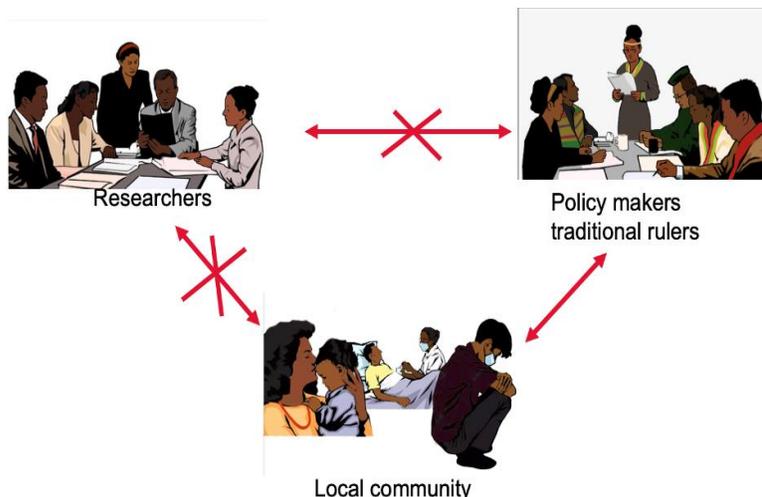
A disease outbreak response requires timely exchange of information between policy makers and the public. People are usually keen to see how the dynamics is evolving in their communities where their families live, or places they plan to travel. This dictate the need for an urgent dashboard during an outbreak. To this end we integrated the power of Artificial Intelligence, predictive modelling and simulations, to develop COVID-19 monitoring dashboards that visualize information locally relevant to the public and policy makers.





3. **Social disparities and vulnerabilities** (<https://tinyurl.com/mwndvvhb4>; <https://doi.org/10.3390/vaccines10020194>): In terms of “explainable, trustworthy, responsible AI and BDA for social good” (<https://doi.org/10.3390/healthcare11040457>), ACADIC is also making efforts to expand our understanding of social disparities and vulnerabilities, which are of crucial importance in data gathering/collection, model design and implementation, and outcome interpretation (<https://doi.org/10.3390/vaccines10020194>; <https://doi.org/10.3389/fpubh.2021.751197>). A set of sources—such as detailed, locally informed geospatial maps—will be employed as inputs to our future models.

4. **Obtaining locally relevant data in Africa to train AI algorithms.** Obtaining locally relevant data in Africa to train AI-based algorithms is essential to inform public health policies in an evidence- and data-driven fashion. However, in Africa, this is rather challenging. During an outbreak, community leaders are usually aware of what is happening in the local community, and modelers have the tools to solve the problem but most often these people do not talk to each other. ACADIC team includes community leaders (e.g. chiefs, fons etc), and policy makers. The collaboration among ACADIC multidisciplinary and multi-stakeholder team of scientists, mathematicians, public health experts, and community leaders has been helpful in securing locally relevant data. In ACADIC the community leaders articulate the problem in their communities, and the modelers inform the collection of data for the problem. The community is involved at every step of the process and the models are tailor-built to solve real-life problems affecting the community. We plan with, learn from, and act with communities and build capacity in communities. This Interdisciplinary approach grounded in an intersectional feminist and decolonial framework has been one of the keys to getting locally relevant data and designing locally relevant models.



5. Estimation of epidemiological parameters and under-estimation (under-ascertainment & and/or under-reporting) rate from the early transmission of COVID-19 across communities
 (<https://doi.org/10.21203/rs.3.rs-1708820/v1>)

Country-reported case counts suggested a slow spread of SARS-CoV-2 in Africa's initial phase of the COVID-19 pandemic. However, due to inadequate public awareness, unestablished monitoring practices, limited testing, ineffective diagnosis, stigmas attached to being infected with SARS-CoV-2, self-medication, and the use of complementary/alternative medicine that are common among Africans for social, economic, and psychological reasons, there might exist extensive under-estimation of the true case count, either in terms of under-ascertainment (when not all the cases seek healthcare) and/or under-reporting or under-notification (when a failure to adequately report and notify cases occurs), especially at the beginning of the novel epidemic. We developed a mechanistic model to track the early epidemics in all communities. Data on the reported cumulative number of cases and daily confirmed cases were used to train the model for the time period with no or little massive interventions yet in each community. The figures below show the epidemiological parameters and under-estimation rate for the entire Africa, but this was done for each local community as well. Our estimates provided policymakers with a clear picture of the nature of COVID-dynamics across communities (true case count, basic reproduction number, relative infectivity of the severe infectious, mild infectious and asymptomatic). The estimated low reporting rates suggest an improved surveillance system is needed in communities across Africa.

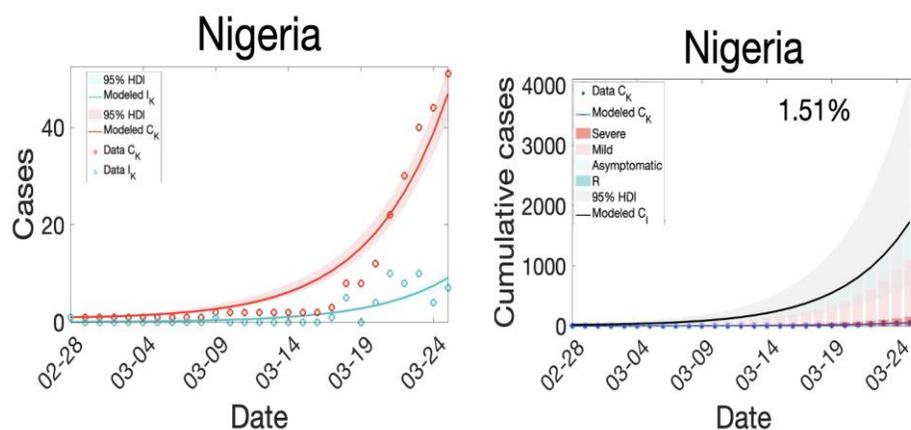


Figure: Estimated mean true cumulative cases (black line) with modeled and data of reported cumulative cases (blue line and blue star) in each country for the initial time period with no major mitigation at national level. Colored bars show the percentage of severe (darker red), mild (lighter red), asymptomatic (lighter green) and already recovered cases before the reporting started (darker green). Grey shaded areas show 95% high density intervals (HDI).

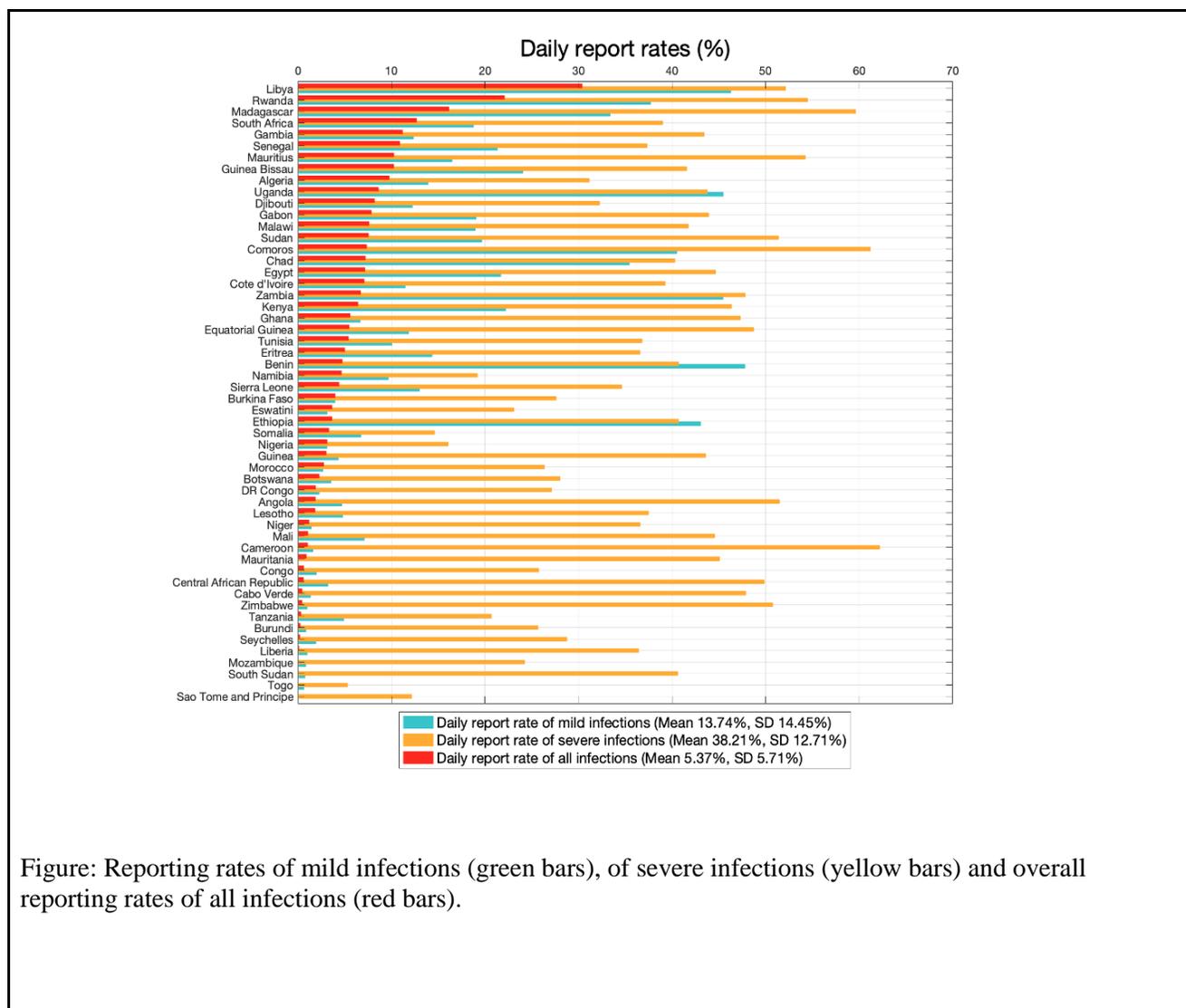


Figure: Reporting rates of mild infections (green bars), of severe infections (yellow bars) and overall reporting rates of all infections (red bars).

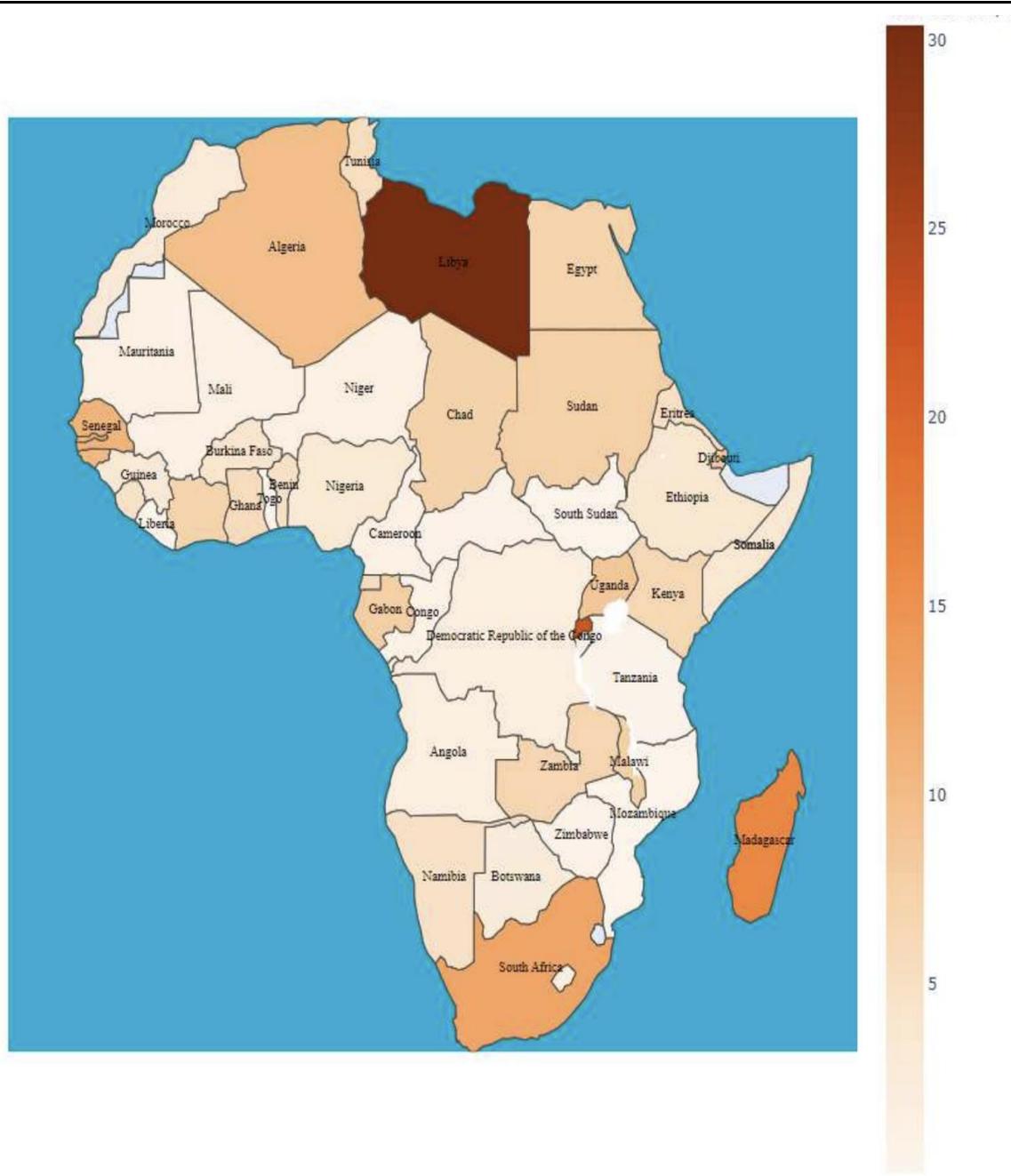
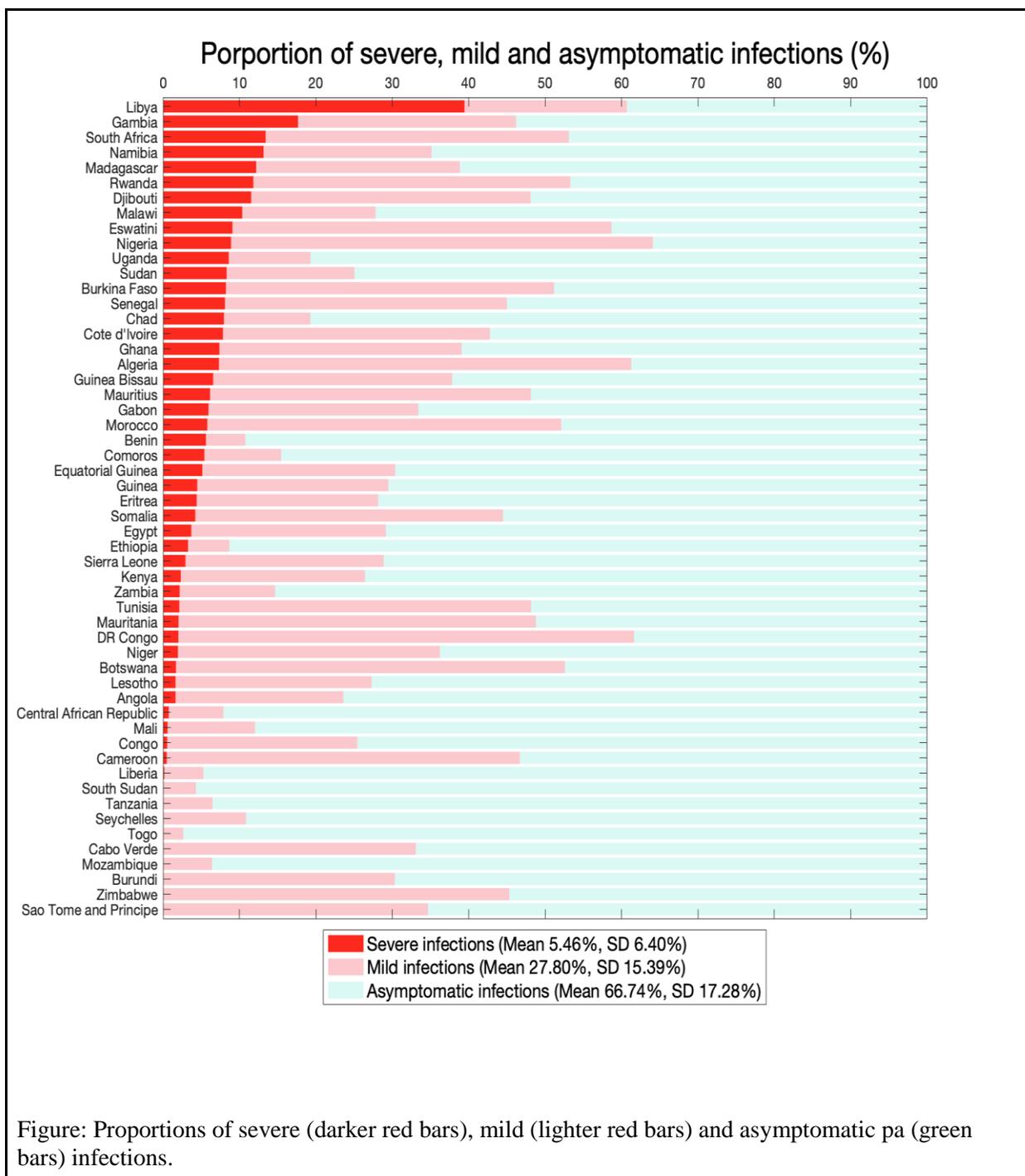
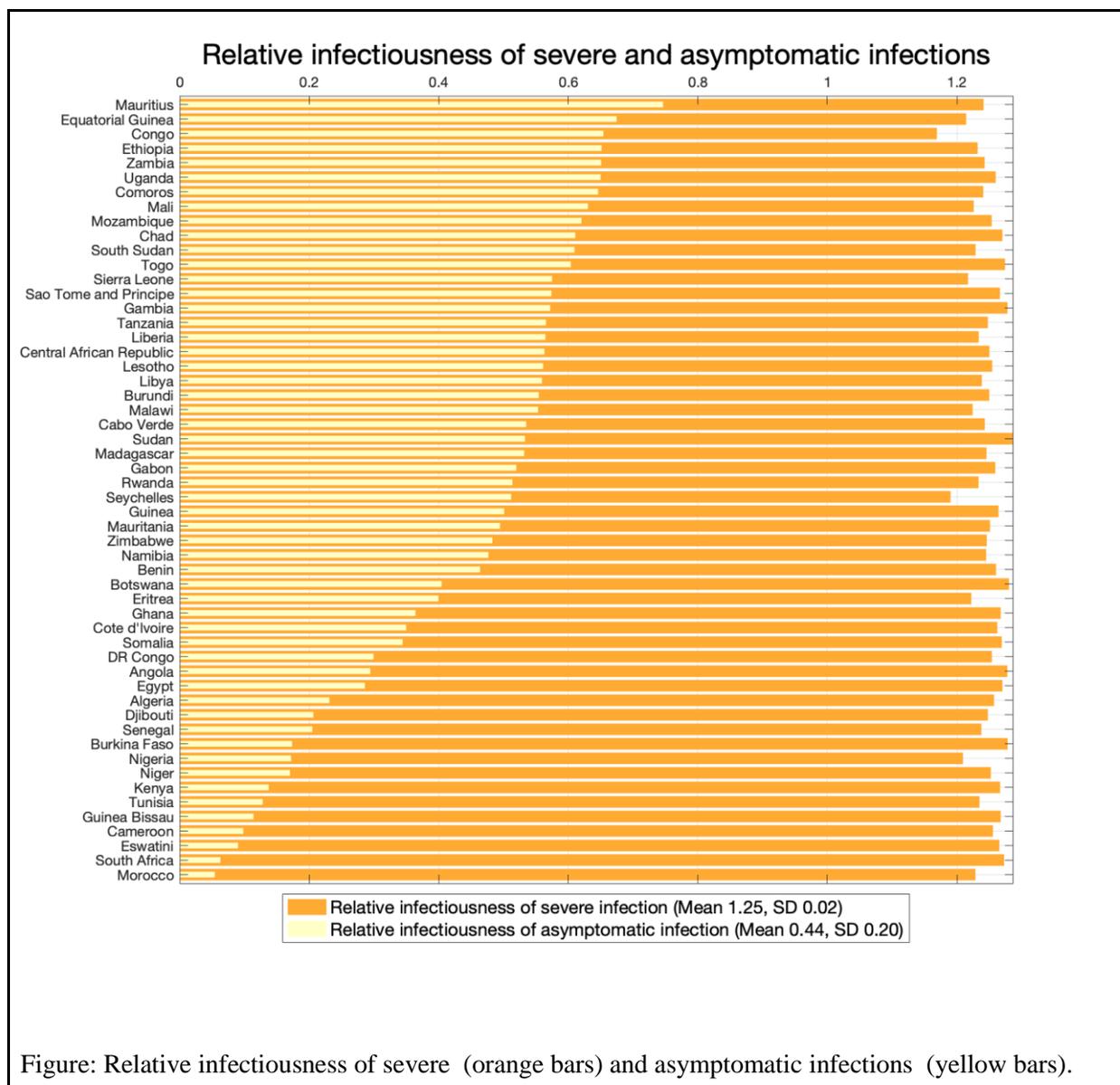
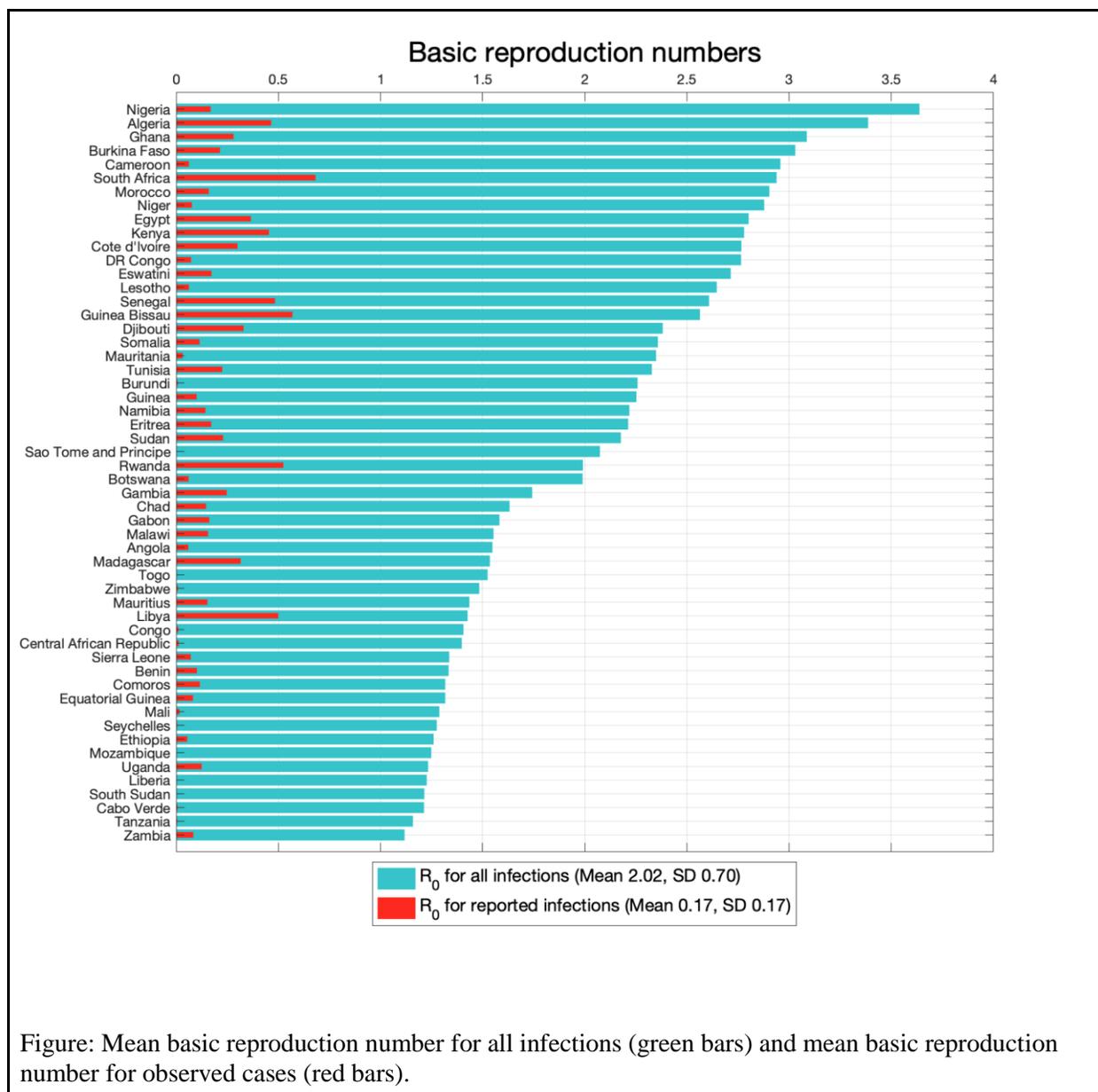


Figure: Estimated overall COVID-19 case reporting rate





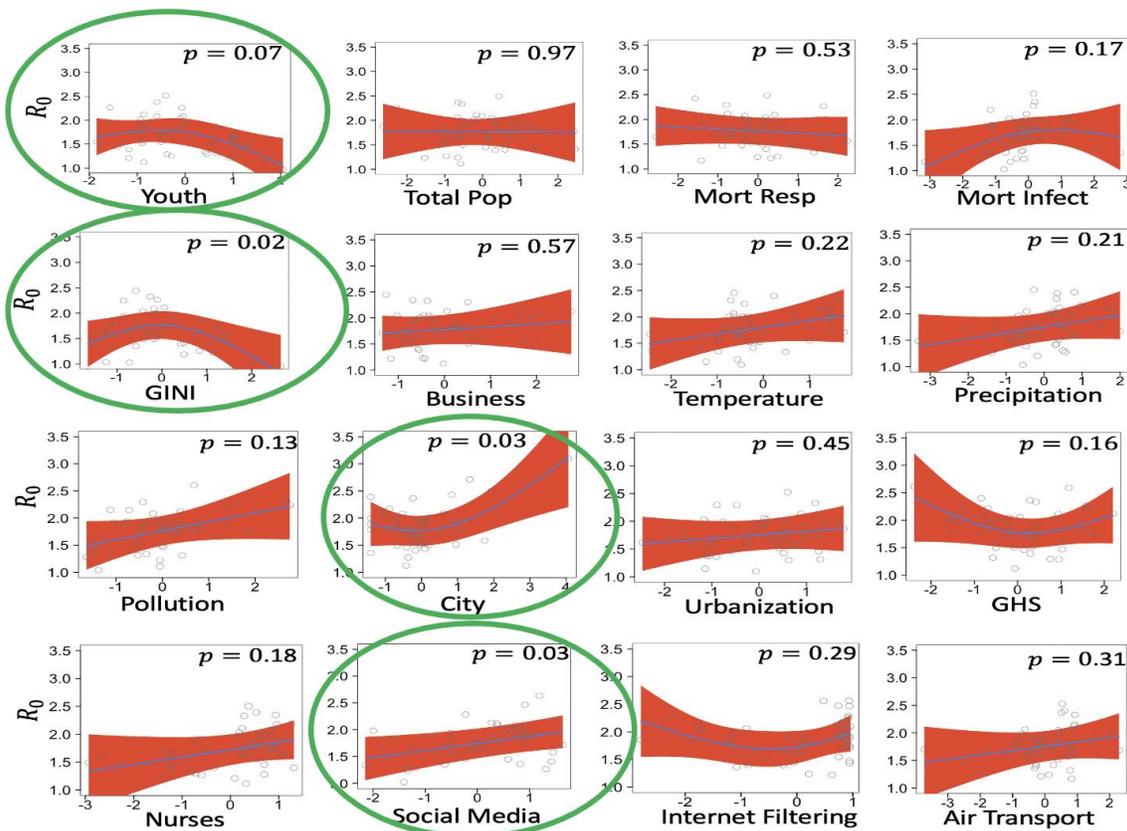


6. Social, economic, and environmental factors that predispose a community greater intrinsic vulnerability to COVID-19

We assess whether the initial spread of COVID-19 is different across communities in a country and what local demographic, social, and environmental factors other than interventions characterize initial vulnerability to the virus.

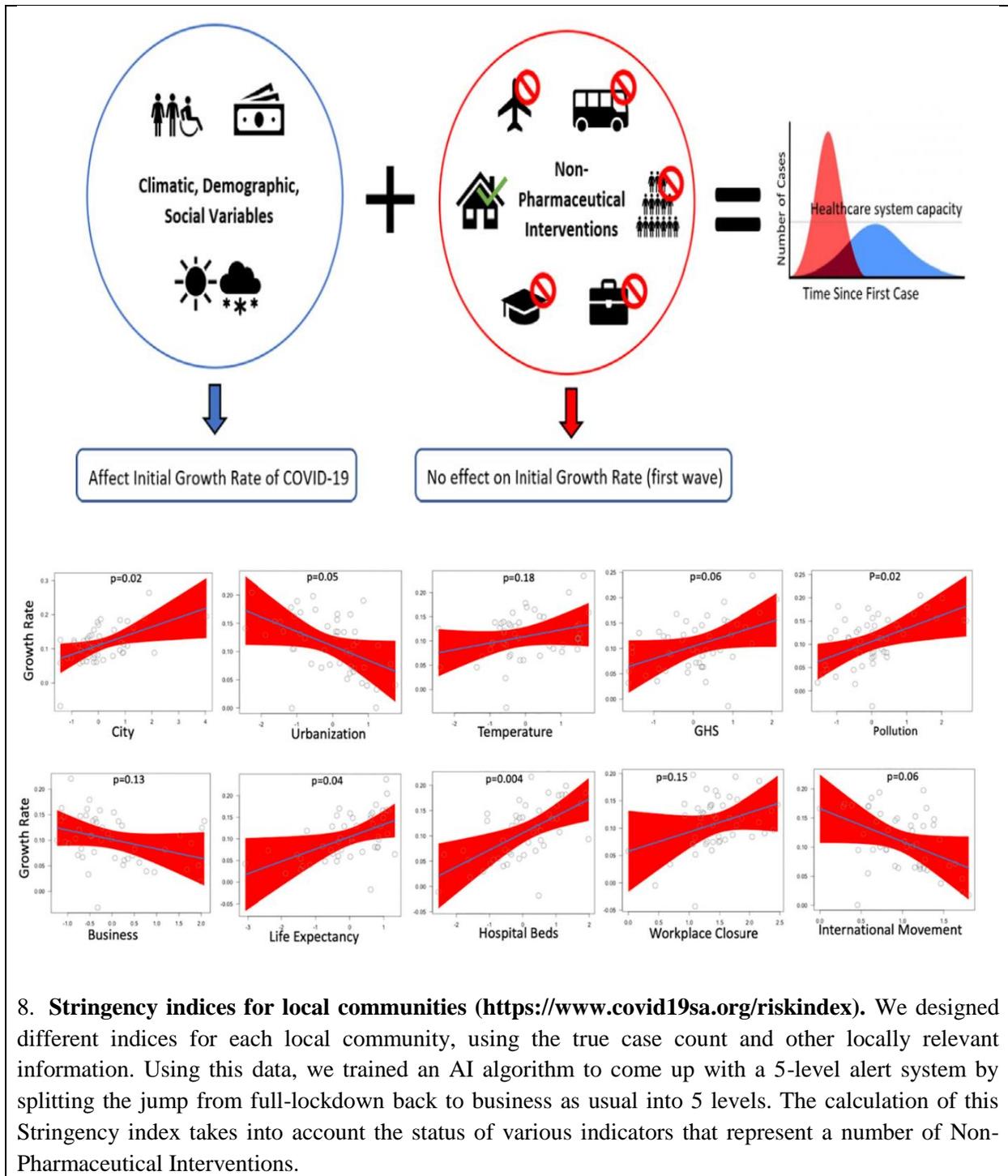
We found that it was different. We identified four factors—population between 20–34 years old (youth), population residing in urban agglomerates over 1 million (city), social media use to organize offline action (social media), and GINI income inequality—as having strong relationships (see link below for global analysis, but this was done for communities in each of the countries: <https://doi.org/10.1371/journal.pone.0252373>). Our research shows that communities and countries

have different characteristics that predispose them to greater intrinsic vulnerability to COVID-19. Studies that aim to measure the effectiveness of interventions across locations should account for these baseline differences in social and demographic characteristics.



7. The impact of non-pharmaceutical interventions on the initial growth rate of COVID-19 across communities.

Once policies were put in across communities, we investigated the impact of such policies. These variables were combined with pre-existing community characteristics (demographic, social, and climatic factors). We found out that once policies were put in place on average the following variables now had an effect on the spreading rate of COVID-19. Population in urban agglomerations of more than 1 million, PM2.5 air pollution mean annual exposure, life expectancy, hospital beds available, urban population, Global Health Security detection index and restrictions on international movement had the most significant effects on the initial growth of COVID-19. (see link below for global analysis, but this was done for communities in each of the countries: <https://doi.org/10.1016/j.scitotenv.2020.144325>)



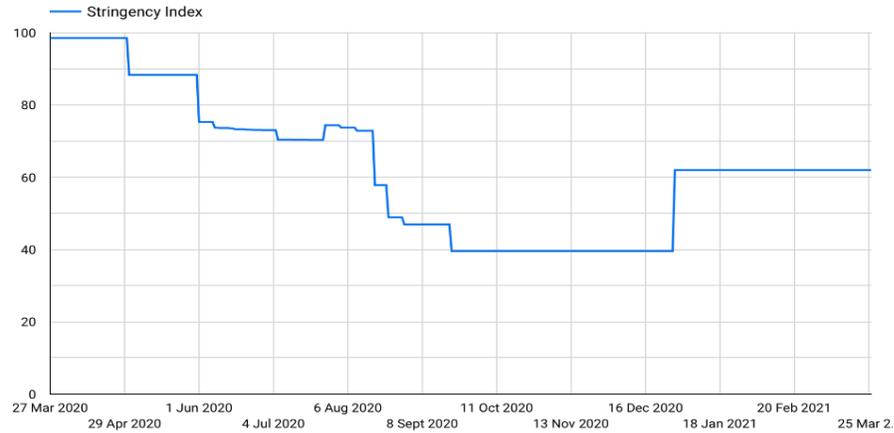
Time Series Graph of South African Stringency Index for a Specific Municipality

Select Municipality:

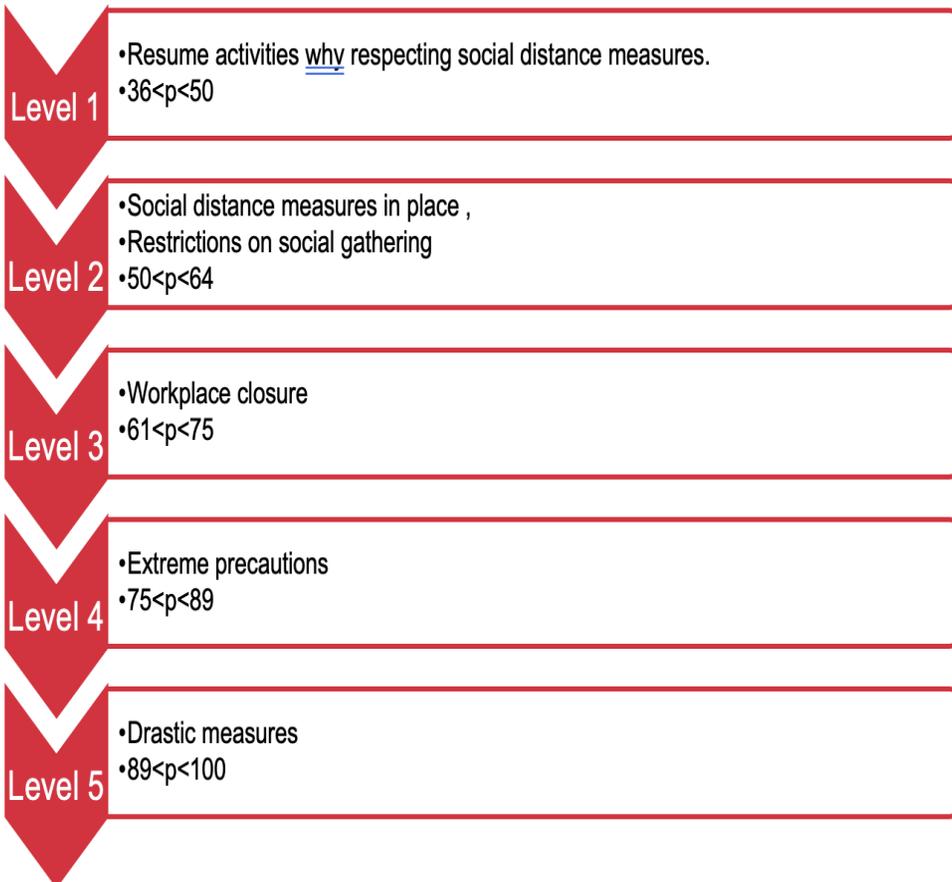
Municipality ▼

Currently, all SA municipalities are following the same Stringency graph that can be seen below. If regulation changes and different municipalities have different alert levels, this will be incorporated to show the differences

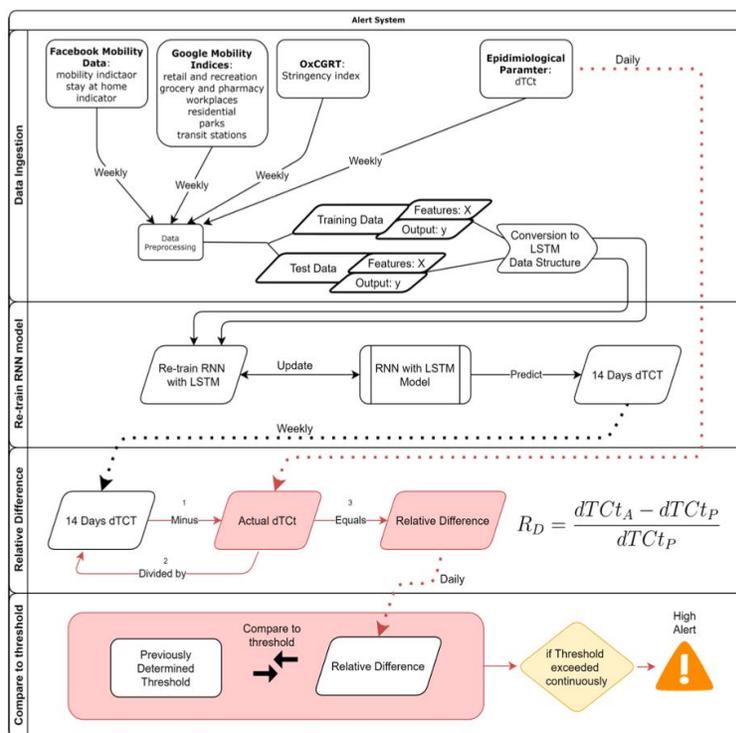
Time Series Graph of South African Stringency Index



Please note: Future changes are based on announcements made by government and are subject to change. The date of future changes in alert level have not yet been announced.



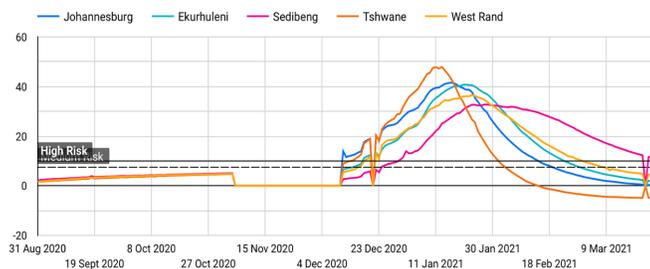
9. Early Warning systems for COVID-19 Waves (<https://doi.org/10.3390/ijerph18147376>). During the COVID-19, ACADIC has been able to predict all the waves in each community in countries across Africa. We created an early warning system for other waves of COVID-19 using a recurrent neural network with long short-term memory. The system is working effectively. This was covered by multiple national and international media including German DW TV(<https://www.dw.com/en/covid-artificial-intelligence-in-the-pandemic/a-58171146>).



The figure below shows the third wave predictions in South Africa by ACADIC.

Graph showing the 3rd wave risk index for 5 Districts in Gauteng

From the 05 November 2020 to 10 December 2020, there was no data available. These explains the gap in the graph.



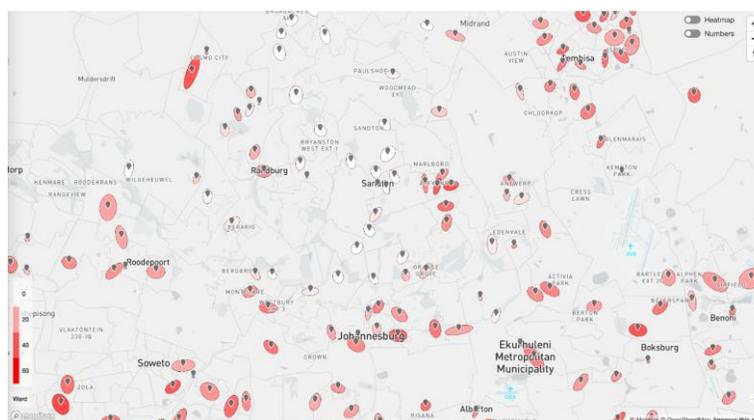
10. Using AI and Big Data techniques to identify COVID-19 Hotspots (<https://doi.org/10.1186/s12911-023-02098-3>):

The importance of hotspots also known as spatial clusters in infectious disease epidemiology cannot be over emphasized. Identifying local hotspots for an epidemic helps to inform resource allocation and programmatic goals. Over the past decade there has been increasing interest in spatial clusters for infectious diseases. This includes calls to target spatial clusters in an outbreak. For example, recommendations to focus on hotspots have been part of strategic plans for Ebola, malaria, COVID-19 and other emerging pandemic threats. In the ongoing COVID-19, ACADIC, visualizes hotspots in each local community across Africa and this has been helpful to policy-makers at different levels and the population.

1. Firstly the geo-coded case data is processed, for each community
2. The data is clustered using Gaussian Mixture Models, grouping cases by their locations, at a selected granularity. Once the cases are clustered, the parameters of disease growth function is calculated for each Cluster to reflect the area-specific virus progression.

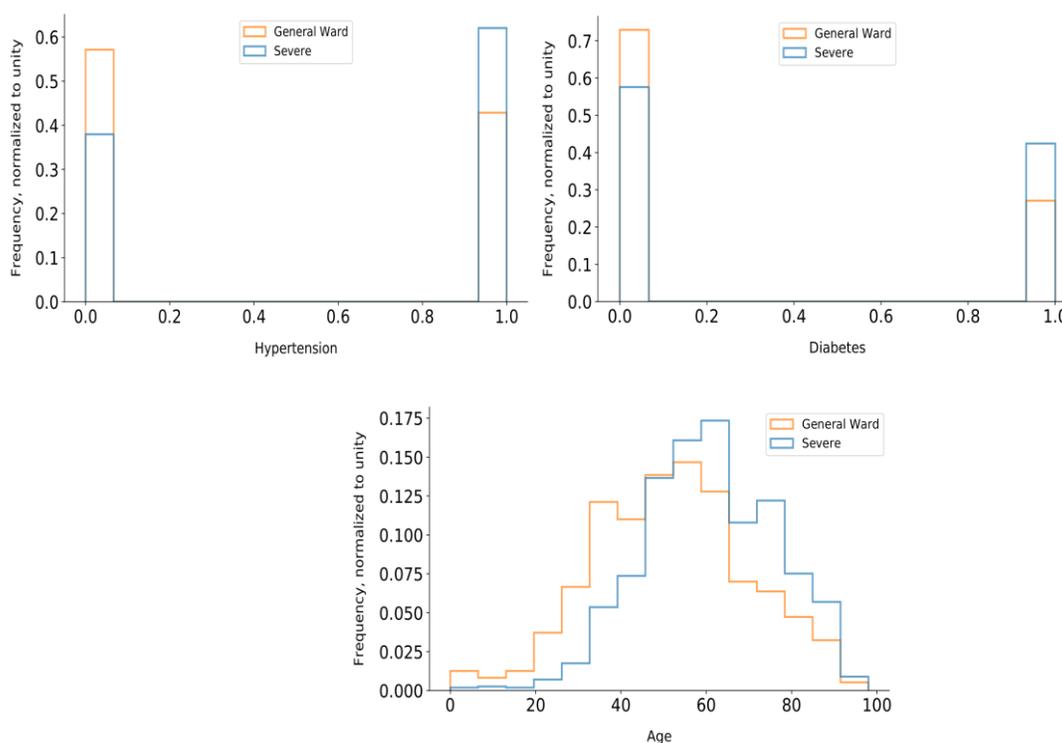


An analysis of the cluster dynamics is then used to calibrate/define criterion for clusters to be considered hotspots: the extent to which the cluster is active and a measurement of risk associated with it.



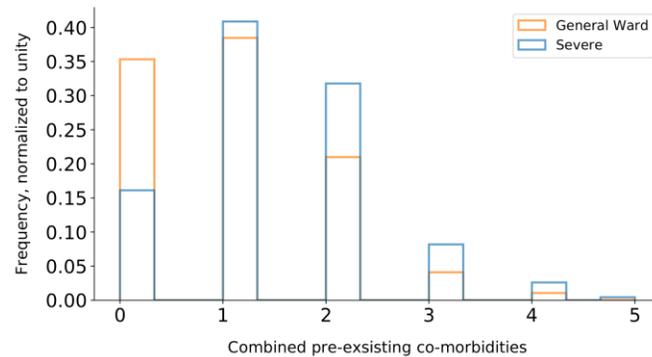
11. Leveraging AI and Big Data techniques to optimize clinical public health and vaccination roll-out strategies (<https://doi.org/10.3390/ijerph18157890>). Once vaccines became available in Africa, ACADIC leveraged AI and Big Data techniques to develop strategic, highly targeted and staged delivery plans of vaccines to prioritize vulnerable, at-risk populations and hotspots areas. Deploying and administering effective and safe vaccines against a novel disease to large populations at a fast pace is a nontrivial task. Due to the logistical challenges that exist in Africa, an assessment of different vaccination scenarios and roll-out strategies, that take into account national and local realities, is of paramount importance for public health policy and decision making, in order to maximize and track staged progress towards the achievement of herd immunity. Our roll-out strategy has been adopted by the governments in all the 9 countries.

Considering South Africa (as an example) we found that two comorbidities: hypertension and diabetes enhanced the severity of COVID-19. This finding is important especially when you are analysing the behaviour of an emerging virus. This finding was established using the hospitalisation data collected from both private and government hospitals. The data was separated into two classes, severe class which is associated with patients with severe symptoms from contacting the virus and were hospitalized in ICU, HC and Isolation wards. The other class is the general ward which is associated with patients who were hospitalized in the general ward and had mild symptoms or none from contacting the virus. From the two graphs below (Hypertension & Diabetes), a number of patients had both of these comorbidities. It was also found that the severity of the virus increased with the presence of both. In the severe class we see that most of the population were the elderly (aged ≥ 60 years) and over 60% of them had these major COVID-19 comorbidities.

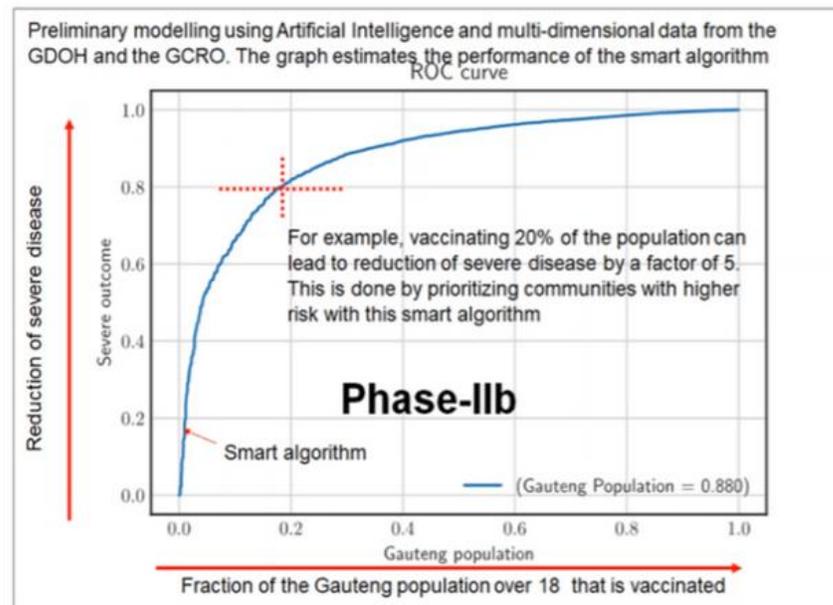


- Although a number of comorbidities were involved in this project, only two out of 11 comorbidities were found to enhance COVID-19. From the graph below, when summing the number of comorbidities a patient has, over 35% of patients admitted in general ward did not have any comorbidities whereas for severe ward only 15% did not have any comorbidities. This confirms that the two comorbidities that influence the

severity of the virus are indeed hypertension and diabetes. This was also major and crucial in identifying the target group that needed vaccination



- The model used in this project uses 14 input features to train, with age, gender, ethnicity and 11 comorbidities. A deep neural network was prepared to classify people into two categories and the DNN's performance can be measured with the Roc curve graph shown below. Vaccinating 20% of the population would reduce the severity suffered from the virus by over 80%. Identifying the right population we need was a critical in reaching herd immunity to the virus when vaccination is available



12. Management of hospital beds and ventilators in the Gauteng province, South Africa, during the COVID-19 pandemic (<https://doi.org/10.1371/journal.pgph.0001113>): ACADIC leverage models to inform the distribution of healthcare resources (hospital beds and ventilators) and management strategies.

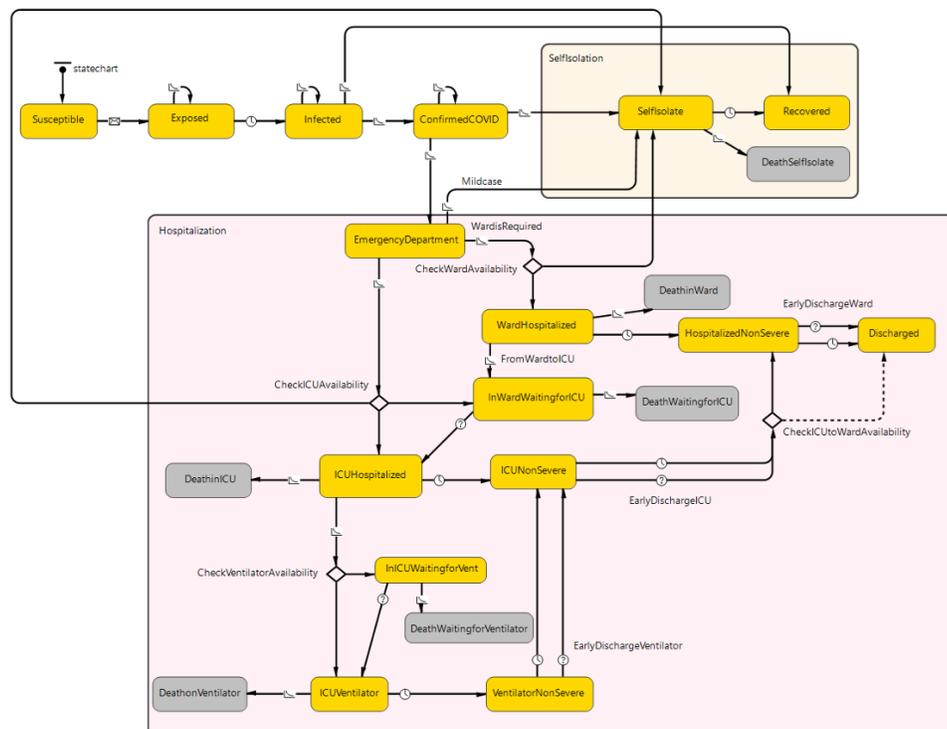
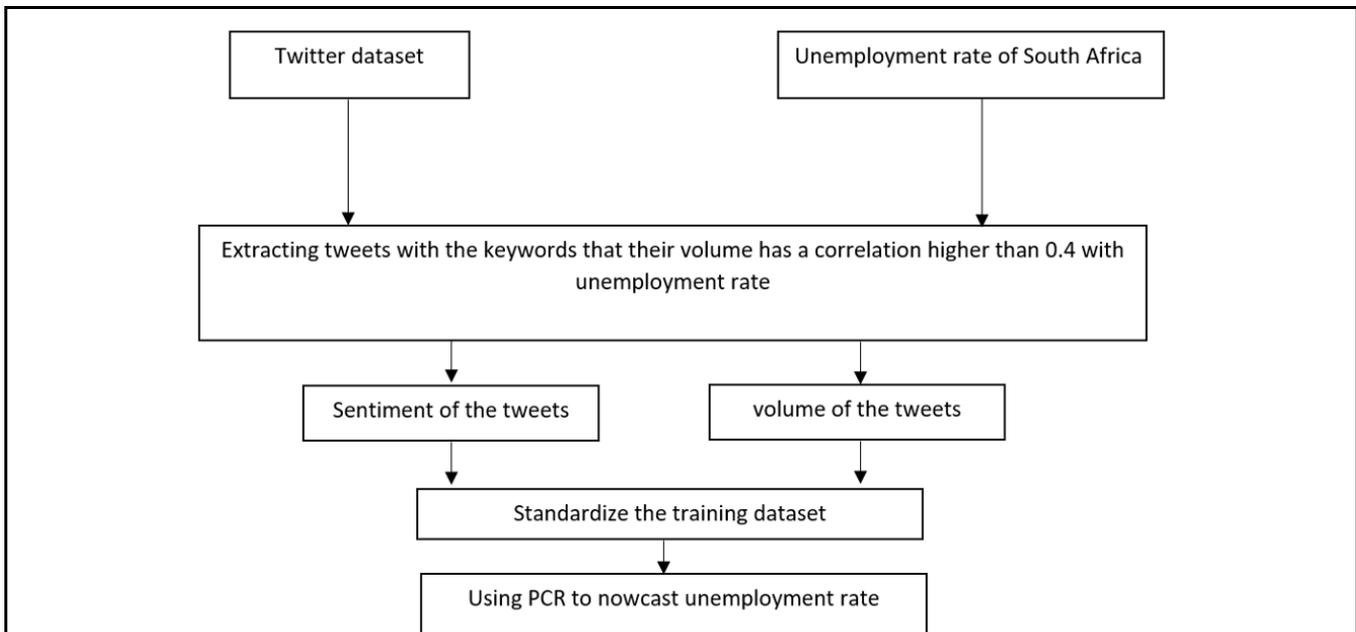
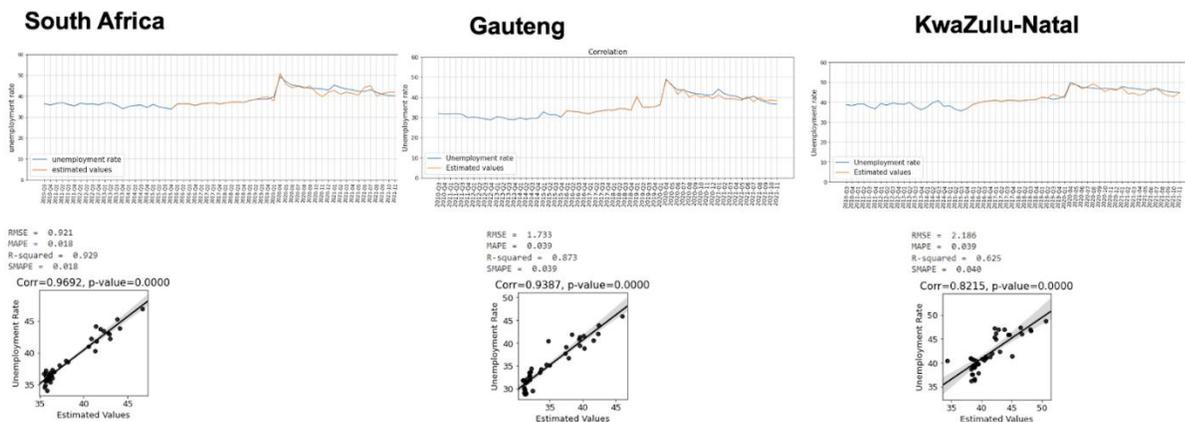


Figure: Flow diagram of the disease dynamics and the in-hospital flow of COVID-19 patient in our agent based model.

13. Providing a near term forecasts (nowcasting) of labour market flows in Africa during the pandemic (<https://doi.org/10.3389/fpubh.2022.952363>): As COVID-19 was going on, the government in South Africa, wanted to estimate unemployment in the country. The unemployment rate is an important economic indicator that is input into decision making by policy makers. Measuring unemployment rate using the traditional approach: Is expensive and time-consuming; Requires a lot of man-power and administrative personnel; Faces many difficulties and obstacles (e.g. low public cooperation, dealing with migration/homelessness/nomadism, privacy concerns); Mostly done on seasonal and annual basis; The results are ready to report several months later. An alternative approach is to leverage AI to use social media to nowcast unemployment rate, because Its cheaper and faster; Only requires several lines of code; Could easily measure on monthly basis; The result is available in real-time. To this end, ACADIC immediately employ artificial intelligence to provide a framework that can be used to provide more timely information about the unemployment rate in countries across Africa.



Using Principal Component Regression, unemployment rate was nowcasted with an outstanding accuracy.



14. Non-conventional data streams: ACADIC has been utilizing “non-conventional data streams”, such as Facebook, Google Searches, and Twitter (doi:10.2196/45108; DOI: 10.1109/TCSS.2023.3236368; <https://doi.org/10.1038/s41598-021-04731-5>; <https://doi.org/10.1371/journal.pone.0272208>; <https://doi.org/10.21203/rs.3.rs-2454619/v1>; https://link.springer.com/chapter/10.1007/978-3-031-35501-1_20; <https://doi.org/10.3389/fpubh.2022.987376>; arXiv:2205.06801), to better understand the “dynamics in sentiments toward community-based infectious diseases- related discussions” and to provide “city-level information to health policy in planning and decision-making regarding vaccine hesitancy” (<https://doi.org/10.3389/fpubh.2022.987376>), early warning systems (<https://doi.org/10.3390/ijerph18147376>), hotspots (<https://doi.org/10.1186/s12911-023-02098-3>) and adopted macroeconomic responses to COVID-19 pandemic (<https://doi.org/10.1371/journal.pone.0272208>).

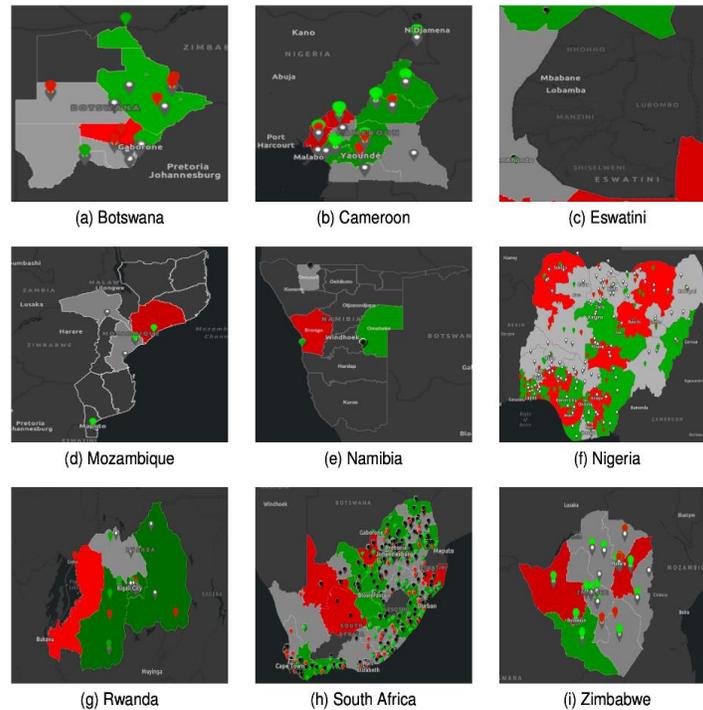
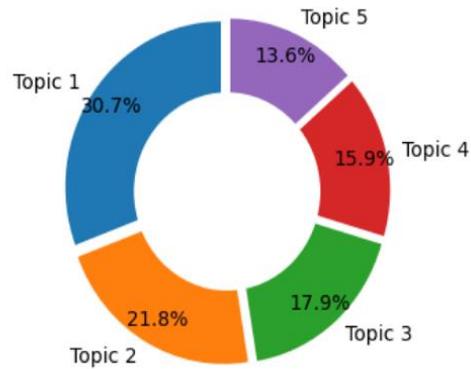


Figure: Vaccine Hesitancy Hotspots in Africa: An Insight from Geotagged Twitter Posts

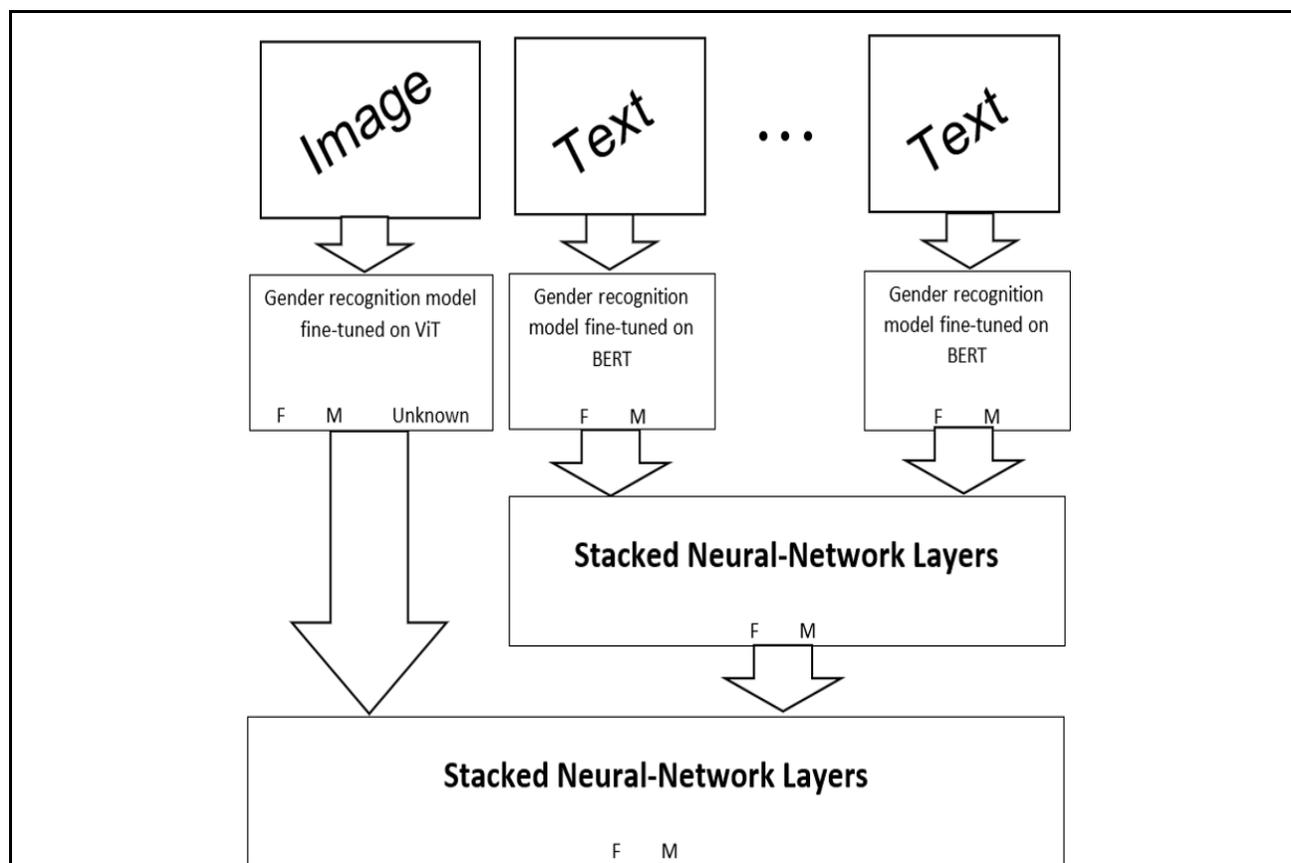
The top five vaccine related topics across South Africa vaccine hesitancy hotspots were:

- Topic 1** : Inefficient mass vaccination roll out schemes in terms of availability and service delivery (30.7%),
- Topic 2** : Defiance in response to international travel restrictions that target the non-vaccinated or partially-vaccinated population (21.8%),
- Topic 3** : Safety concerns about severe side-effects from the vaccine (17.9%),
- Topic 4** : Inescapability from illness/ death (15.9%)
- Topic 5** : concerns of ineffectiveness of vaccines in preventing the spread of the virus (13.6%).



15. Gender transformative research: Gender is a major variable impacting COVID-19, as well as other diseases and disease outbreaks, in terms of risk of developing communicable diseases, disease severity, response to treatment, adverse reactions to medications, and magnified social vulnerability (<https://doi.org/10.3389/fpubh.2021.751197>).

For this reason, it is being actively incorporated and fully embedded by ACADIC across all AI-based models, performing what is known as “Gendered Health Analysis”. ACADIC has come up with a novel model for predicting twitter user's gender from their images and tweets (<https://arxiv.org/pdf/2205.06801.pdf>). First we fine-tuned on Vision Transformers (ViT) to identify gender using profile images. Next we fine-tuned a model on BERT to identify gender. The image and text-classification model are combined using a feed-forward stacked neural network layer.



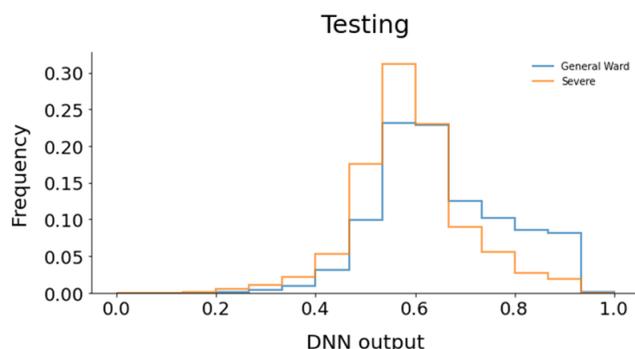
We went through Gender Action Learning program (led by Gender at works) and it helped transform our approach towards research. We have embedded Gender, Equity, Inclusion and Decolonization (GEID) priorities into our project's questions, objectives, methods, interpretation of results, governance, and implementation plan. We meet every two weeks and share our gender, initiatives', observations, challenges and successes. "Sharing regularly" has been the best teacher that has gotten so many of our team members from being gender neutral to not only performing gender sensitive or responsive research but gender transformative research (proud to say this).

We document and evaluate our GEID initiatives' challenges and successes in our publications and the dissemination of the project's work for both academic and general audiences -- thus specifically demonstrating the connections between GEID and transformational change. All members of our team have taken GEID and Unconscious Bias training found here: <https://www.chairs-chaires.gc.ca/program-programme/equity-equite/bias/module-eng.aspx>; <https://www.cihr-irsc-igh-isfh.ca/?lang=en>. We seek diversity across disciplines, jurisdictions, and those groups requiring equity-oriented remediation. We have taken a whole-of-society approach to network composition, consultation, and implementation that is intersectional, intergenerational, and gender- and trans-gender-inclusive. This includes seeking out diverse scholars and practitioners, and also incorporating community expertise and lived experiences through active participation of informal and marginalized groups in decision-making processes and project development.

16. Analysis of Clinical and demographic characteristics of male and female COVID-19 patients

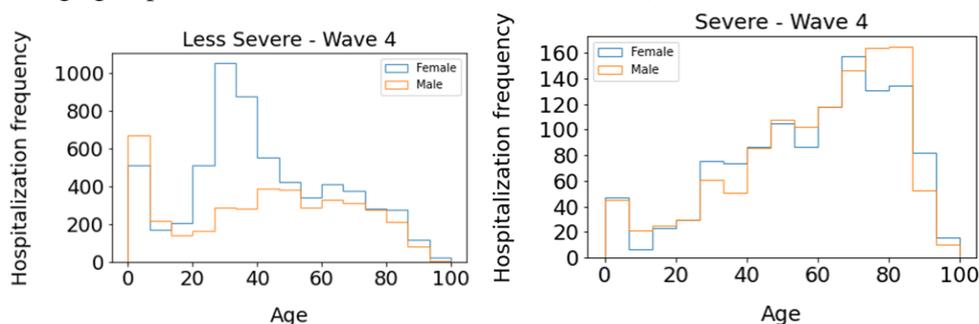
We leverage AI to provide a detailed analysis of the clinical and demographic characteristics of male and female COVID-19 patients admitted in hospitals across communities. This helped us determine the

COVID-19 hospitalization rates, disease severity, and mortality difference between males and females. It also helped us identify hidden clinical and demographic variables that account for any observed gender differences in COVID-19 hospitalization and outcomes. A weak supervision learning algorithm was used to perform binary classification. The training of a DNN was performed on 14 dimensions of patient characteristics (Demographic variables, presence of comorbidity, care received upon admission and setting of care), to separate the two classes of data sets: a) severe disease class (a proxy measure of higher severity, which included those who died during admission or were admitted into an intensive care (ICU) or high care unit (HCU)), and b) less severe disease class.



For Gauteng province in South Africa (for example) a sum of 147,141 patients were admitted to hospital for COVID-19 in Gauteng province between 7 March 2020 and 25 March 2022. The number of Covid-19 hospitalisations was highest in wave 3 for both males and females, and higher in females than males across all 4 waves. Whereas the lowest number of COVID-19 hospitalizations occurred during the first wave.

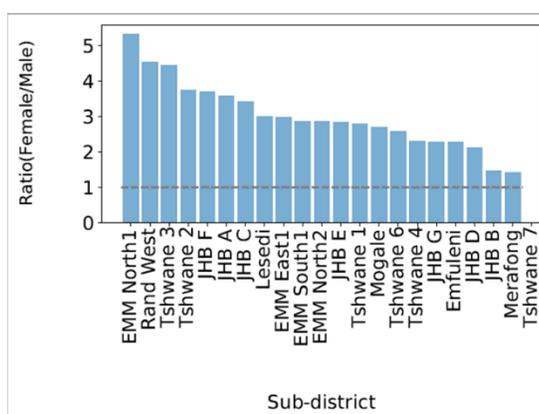
The observed difference in COVID-19 hospitalization frequency between men and women was highest for wave 4 in the 20 - 40-year age group with a ratio of 1:3 for COVID-19 hospitalisation between men and women. Within the severe disease class, similar hospitalization frequencies were observed for all ages across the four waves, except for those aged between 50 and 80 years, where a higher frequency was observed. Similarly, less severe disease showed similar frequencies between male and females, with the exception of the 20–40-year age group, where females had three times more hospital admissions.



Results from the analysis of co-morbidity uncovered gender differences for hypertension, diabetes, and HIV frequencies across all age groups. Like hypertension, females with diabetes experienced higher frequencies of severe disease in comparison to males for the fourth wave, where there are no noticeable differences in the less severe cases of disease. Results from the t-test analysis show there were statistically significant differences in hypertension frequencies between the sexes in the first three waves, however showed no significance in the fourth wave. Diabetes showed no significance across all four waves. Lastly HIV showed statistically significant differences between the sexes across all four waves of the pandemic.

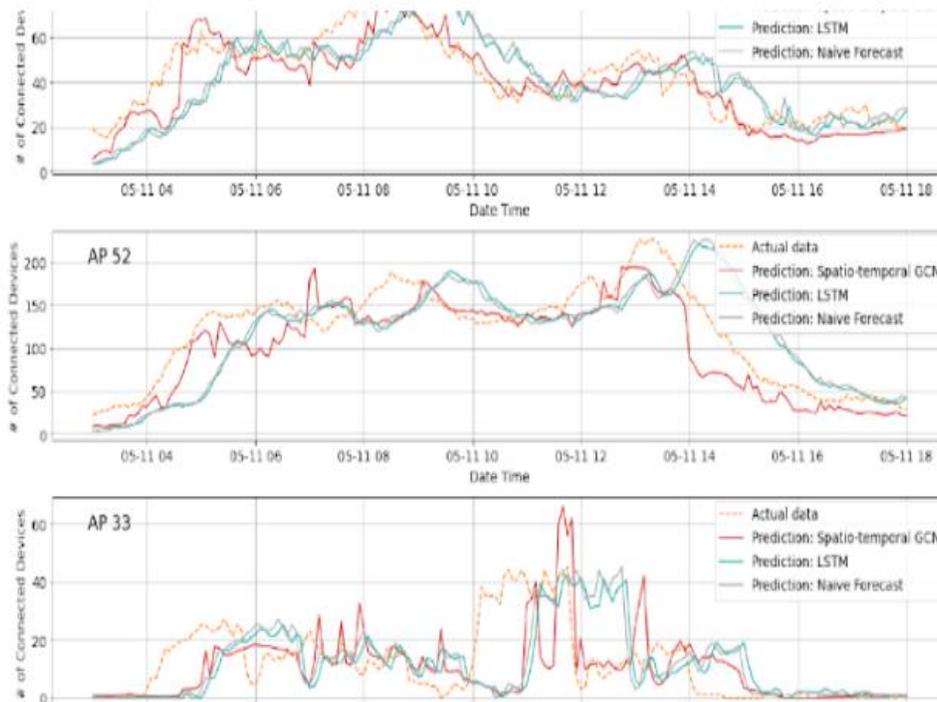
Our study shows that overall women accounted for 53.5% of hospitalisations, among those who had one or more comorbidity women accounted for 63%. The observed gender difference in hospitalization was greater in the fourth wave in comparison to the first three waves, a period when the omicron variant became more prevalent. Results from the t-test show the observed differences were significant. The difference in hospitalization between men and women observed in the fourth wave conveyed that despite females in the 20-to-40-year age group showing higher numbers of hospitalization, these occurred mostly in the general ward of various health facilities within the province, indicating less severe cases of disease in women.

Evidently, the fourth wave has demonstrated a larger increase in the gender imbalance across all sub-districts within the Gauteng province, with three districts having no data for this time period as seen in. Differences in hospitalization frequency remained balanced on average between males and females, therefore the data reported in the graph below speaks to the fourth wave where gender differences were observed across the sub-districts.



17. Monitoring and forecasting for social distancing with Wi-Fi data.

Our research delivered a social distancing monitoring tool to universities across South Africa. The system provides real-time alert signals to the university's security service and other relevant stakeholders. Our AI-powered solution measures the number of mobile devices near each Wi-Fi router in real time and predict the number of mobile devices in a few minutes with higher accuracy.



18. Leveraging AI to assist in the production of face shields and facemasks via 3D printing technology

Our AI research facilitated the production of face shields and facemasks via 3D printing technology. We employ AI in PPE design optimization; rapid prototyping; automated quality control; customization leading to the production of 250 personal protective equipment that were distributed to 3 health facilities in Nigeria. Figures 1 to 4 shows a brief overview of the PPE production process and donation to the National Hospital Abuja.

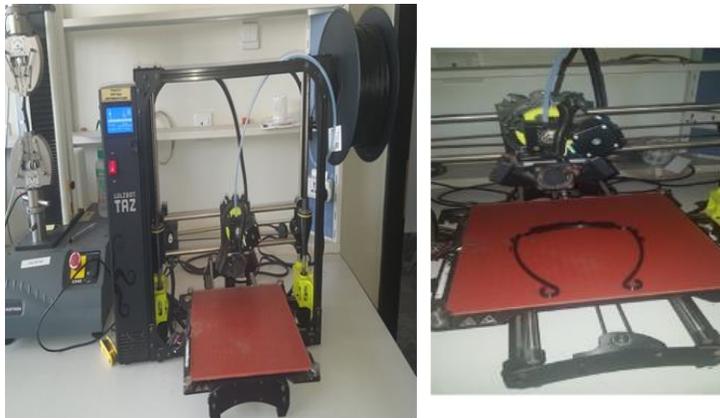


Fig. 1: Lulzbot Taz 6 3D printer at AUST and printed faceshield bracket on printing bed.



Fig. 2: Assembled Face Shields and Face Masks.



Fig. 3: Assembly Process of Faceshields and Face Masks by AUST students and faculty.



Fig. 4: Presentation of Face Shields to National Hospital Abuja.

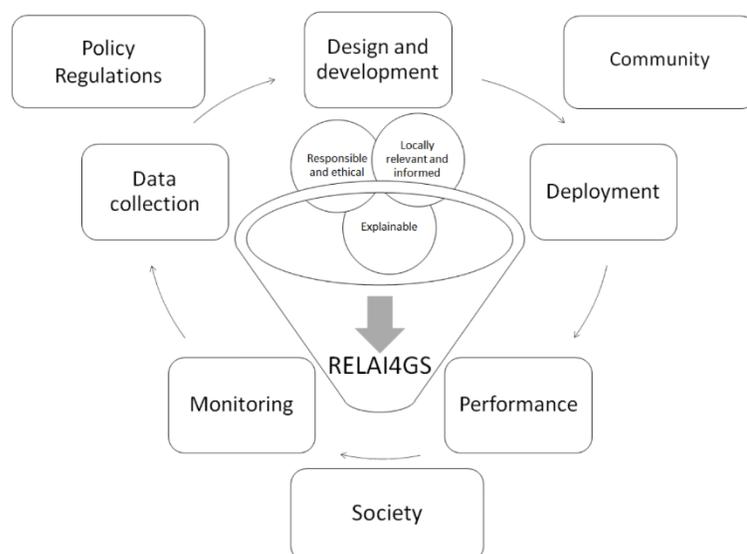
19. Knowledge Transfer: Subsequently, the ACADIC consortium has been transferring this pilot study to other African settings and contexts in terms of knowledge gained, lessons learned, and developed modeling techniques. This has required accounting for country-specific differences in socio-demographic, epidemiological, and clinical variables, including rates of comorbidities. As such, ACADIC has been re-weighting the models initially developed for South Africa. ACADIC has already carried this out with Botswana, and it is doing this for other African countries, in terms of

validating and further correcting/adapting procedures in order to ensure that the assumptions of the model are aligned with the specific features of the selected country.

20. Address dis- and mis-information about COVID-19 prevention, treatment and vaccines: Since the outbreak of COVID-19, rumours about COVID-19 have been doing rounds on social media in Africa. These include: i) "this or that" tradition medicine can cure COVID-19 or prevent one from having it ii) "afoko" (a locally made alcohol with an unknown alcoholic content) can prevent you from having COVID iii) "this or that pastor" cures COVID-19 iv) SARS-CoV-2 does not affect Africans, iv) chloroquine cures COVID-19, iv) spraying alcohol and chlorine all over your body will prevent you from having COVID v) SARS-CoV-2 cannot survive in Africa's warm climate vi) steaming your face with and inhale neem tree leaves prevent you from having COVID-19 vii) vitamin C tablets prevent COVID-19 viii) having had malaria makes one immune, ix) pepper soup with lime or lemon flushes out the virus x) drinking black tea first thing in the morning prevents you from having COVID-19. To support local stakeholders in addressing this infodemic, ACADIC employed artificial intelligence and big data to identify the hot-spots of infodemic. In addition, ACADIC helped support communication strategies with local stakeholders that addresses the root courses of this infodemic.



21. **Our Framework** (<https://doi.org/10.3390/healthcare11040457>) : The Figure and Table below depict the framework that ACADIC adopted. We term this framework “Responsible, Explainable, and Local Artificial Intelligence for Clinical Public and Global Health in the Global South” (REL-AI4GS). The diagram coherently shows the “how”, the “what”, and the “who” of our proposed framework. The inner shell (“how”) contains the set of ethical and legal rules and codes that should be designed in such a way that they are responsible (incorporating policy and regulations), locally relevant for communities, and explainable to society at large. Moreover, they should be applied and embedded all along the processes of AI solutions in the Global South. The medium shell (“what”) describes the processes that should be implemented in an iterative fashion (step 1: locally relevant data collection, step 2: design and development of locally meaningful algorithms, step 3: deployment of locally relevant data, step 4: execution and performance of locally meaningful algorithms, and step 5: monitoring of the outcomes of the locally meaningful algorithms and identification (and removal) of potential biases). The outer shell (“who”) contains all the relevant stakeholders and actors that should be involved (Figure).



Component	Definition
Responsible	Accountable, auditable, compliant, ethical, respectful, safe, secure
Explainable	Equitable, fair, impactful, interpretable, meaningful, reliable, reproducible, transparent, trustworthy, unbiased
Local	Autonomous, caring, connecting, decolonized, human- and community-centered, inclusive, intentional, intersectional, just, participatory, practical, protecting, process-based, sustainable

22. Media Coverage. Our work has been covered on all main TV, Radio and newspapers of these countries and other international medias hundreds of times. A selection of some of the media coverage can be found below:

Title	Date	Link
Artificial intelligence and COVID-19	08/30/2021	https://www.dw.com/en/covid-artificial-intelligence-in-the-pandemic/a-58171146
Huge spotlight on prime time news: Find out what ACADIC project is all about from Prof. Ngwa	07/07/2022	https://www.youtube.com/watch?v=4xN8JrBN5XA

Our team leader in Cameroon addressing dis- and miss-information about COVID-19 & COVID-19 vaccines,	07/07/2022	https://www.youtube.com/watch?v=Sm_J5WX_di8
ACADIC using Artificial Intelligence and Big Data to inform COVID-19 policies in Africa	07/07/2022	https://www.youtube.com/watch?v=4H6iiPRmtW0
University of Buea Among Africa's COVID Modeling and Reporting Centers	07/07/2022	https://www.youtube.com/watch?v=5AM9h0y5ptI
Misinformation on social media linked to higher spread of COVID-19 in new study	06/11/2021	https://toronto.ctvnews.ca/misinformation-on-social-media-linked-to-higher-spread-of-covid-19-in-new-study-1.5466846
Dealing with the pandemic by drinking and swearing? Boffins say you're not alone	06/11/2021	https://www.theregister.com/2021/06/11/pandemic_drinking_and_swearing_outbreak/
Social media use one of	06/09/2021	https://phys.org/news/2021-06-social-media-factors-higher-covid-.html

four factors related to higher COVID-19 spread rates early on		
How artificial intelligence and big data are fighting COVID-19 in Africa	08/22/2021	https://yfile.news.yorku.ca/2021/08/22/how-artificial-intelligence-and-big-data-are-fighting-covid-19-in-africa/?http://yfile.news.yorku.ca/?utm_source=YFile_Email&utm_medium=Email&utm_content=Current-News&utm_campaign=yfile
透過不同角度，加深對身邊人、事、物的了解。每集內容分為兩部份：第一節介紹有關文化、傳媒、電影等資訊，亦會邀請新聞人物接受個人專訪；第二節邀請專家及相關人物討論最熱門的新聞話題。		https://www.fairchildtv.com/newsarchive_detail.php?n=28
AI can help with COVID Inequalities		https://www.ctvnews.ca/video?clipId=2401509
Gauteng Command Council gives an update on Covid-19 in the province	2021/06/24	https://www.youtube.com/watch?v=8iPw6gQrx8k
Prof Bruce Mellado	2021/06/24	https://www.youtube.com/watch?v=neIjCJTr0ro

gives insight into the impact of the third wave on Gauteng		
Gauteng Premier David Makhura on province's response to COVID-19 - YouTube	2021/06/05	https://www.youtube.com/watch?v=IkL-PFTneX4
Professor Bruce Mellado gives an update on COVID-19 behaviour in Gauteng amid the third wave - YouTube	2021/06/15	https://www.youtube.com/watch?v=ongMjF7k1MM
AI techniques used to identify hotspots - YouTube	2020/12/22	https://www.youtube.com/watch?v=af9m7HIUivM Page 1 of 2 #DStv403 AI techniques used to identify hotspots
[Hazardous things in your area] Focus on Ruimsig	2021/02/13	http://702.co.za/podcasts/415/the-john-perlman-show/485505/hazardous-things-in-your-area-focus-on-ruimsig
南非研究：Omicron可突破部分免疫再感染率較Delta高	2021/12/03	https://www.cna.com.tw/news/firstnews/202112030068.aspx
'First signs' of fourth	2021/11/24	https://www.jacarandafm.com/news/news/first-signs-fourth-covid-19-wave-gauteng-expert/

Covid-19 wave in Gauteng - expert		
Lower-to-mid income nations have more joblessness post-pandemic	2022/08/26	https://theguardian.com/lower-to-mid-income-nations-have-more-joblessness-post-pandemic/
‘Up to 1-million at risk of Covid-19 in SA in 40 days’	2020/03/23	https://www.businesslive.co.za/bd/national/2020-03-23-up-to-1-million-at-risk-of-covid-19-in-sa-in-40-days/
Gauteng is ready to relax lockdown” – Gauteng Provincial Command Council	2020/08/13	https://vaalweekblad.com/70550/gauteng-is-ready-to-relax-lockdown-gauteng-provincial-command-council/
【南非觀察】新冠確診數直線上升，南非第四波疫情恐即將來襲 多源焦點	2021/11/27	https://dyfocus.com/news-world/324f0c.html
«El problema de Ómicron es la rapidez con la que	2021/12/01	https://theworldnews.net/es-news/el-problema-de-omicron-es-la-rapidez-con-la-que-afecta-a-los-no-vacunados

afecta a los no vacunados»		
Omicron si diffonde ad un ritmo mai visto prima»	2021/12/03	https://www.cdt.ch/mondo/omicron-si-diffonde-ad-un-ritmo-mai-visto-prima-HN4935229
News - South China Morning Post « » Omicron spreading quicker than all other Covid-19 variants in South African 'epicentre'	2021/12/02	https://player.fm/series/news-south-china-morning-post/omicron-spreading-quicker-than-all-other-covid-19-variants-in-south-african-epicentre
10 years since Higgs Boson was found - SAfm Sunrise - Omny.fm	2022/07/08	https://omny.fm/shows/safm-sunrise-1/10-years-since-higgs-boson-was-found
Wits researchers launch most comprehensive COVID-19 dashboard in South Africa	23 March 2020	http://www.wits.ac.za/news/latest-news/general-news/2020/2020-03...aunch-most-comprehensive-covid-19-dashboard-in-south-africa.html
Twitter shows lower-to-middle income countries have higher unemployment post pandemic	24 August 2022	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0272208

AI algorithm system predicts low risk of third wave in SA	2021/04/13	https://www.iol.co.za/news/south-africa/western-cape/ai-algorithm...low-risk-of-third-wave-in-sa-8f73b1d4-0dac-46e6-82da-818a4687b9ba
AI algorithm system predicts low risk of third wave in South Africa	2021/04/13	https://eminetra.co.za/ai-algorithm-system-predicts-low-risk-of-third-wave-in-south-africa/237543/
AI helps to identify new COVID-19 hotspots in Gauteng	2020/12/24	https://medicalxpress.com/news/2020-12-ai-covid-hotspots-gauteng.html
AI-based algorithm shows SA has low risk of Covid-19 third wave - for now	2021/04/13	https://www.capetalk.co.za/articles/413677/south-africa-has-low-risk-of-covid-19-third-wave-infections-for-now
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://medicalxpress.com/news/2021-04-ai-powered-algorithm-south-africa.html
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://floridanewstimes.com/ai-powered-algorithm-released-to-detect-the-third-wave-in-south-africa/215517/
Algoritmo impulsado por IA lanzado para detectar la tercera ola en Sudáfrica	2022/09/02	https://www.biblia.work/articulos-salud/algoritmo-impulsado-por-ia-lanzado-para-detectar-la-tercera-ola-en-sudafrica/

Analysis on President Cyril Ramaphosa's address	2021/06/27	https://www.youtube.com/watch?v=6-HDoA1VZPs
As Covid-19 cases surge, SA expands vaccine programme	2021/06/25	https://www.biznews.com/briefs/2021/06/25/covid-19-sa-vaccine-expansion
As Latest COVID-19 Wave Recedes, Public Health Leaders Brace For The Next One	02/02/2021	https://adf-magazine.com/2021/11/as-latest-covid-19-wave-recedes-public-health-leaders-brace-for-the-next-one/
Bad news for Gauteng province. Corona Virus infections are rising rapidly.	2021/06/15	https://za.opera.news/za/en/health/64c718e2298361f9ccec82cd8ed69f23
Bad news- COVID 4th wave expected to hit SA,	2021/10/20	https://za.opera.news/za/en/health/0d6e6152a94f11b2fe7dbb42d9e8c6c4
Bad news- COVID 4th wave may hit SA early	2021/10/20	https://za.opera.news/za/en/health/amp/62749b3438fcfc5afb15a8b4a94a00fa
Behavioural changes will reduce the spread - Brakpan Herald	2021/06/29	https://brakpanherald.co.za/251384/behavioural-changes-will-reduce-the-spread/

Biến thể Omicron gây nguy cơ tái nhiễm cao gấp 3 lần các chủng trước	12/03/2021	http://keonhacai.com/bien-the-omicron-gay-nguy-co-tai-nhiem-cao-gap-3-lan-cac-chung-truoc/
BIUST Covid-19 Data Analysis for Botswana Goes Live	9 April 2020	http://www.thetswanatimes.co.bw/index.php/arts-lifestyle/theatre/92-home/793-biust-covid-19-data-analysis-for-botswana-goes-live
Buenas noticias si ha recibido la vacuna Johnson & Johnson Covid-19	2021/09/11	https://notiulti.com/buenas-noticias-si-ha-recibido-la-vacuna-johnson-johnson-covid-19/
Burial homes under strain as deaths surge in Gauteng	9 July 2021	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://blackmediadaily.com/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/amp/
Burial homes under strain as deaths surge in South African hub	2021/07/09	https://www.moneyweb.co.za/news/south-africa/burial-homes-under-strain-as-deaths-surge-in-south-african-hub/

Call for calm amid new Covid19 strain	2022/12/06	https://www.youtube.com/watch?v=nOEeND8Gkss
Cases of Gauteng Omicron are increasing at a rate never seen before	2021/12/02	https://remonews.com/southafrica/cases-of-gauteng-omicron-are-increasing-at-a-rate-never-seen-before/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/19/2022	https://lowvelder.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/20/2022	https://mpumalanganews.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Confirmed Covid-19 infections may be tip of the iceberg in Gauteng	06/24/2021	https://www.sowetanlive.co.za/news/south-africa/2021-06-24-confirmed-covid-19-infections-may-be-tip-of-the-iceberg-in-gauteng/
Containing COVID-19 with digital technology, AI	02/07/2020	https://guardian.ng/features/health/containing-covid-19-with-digital-technology-ai/
Coronavirus 'tipping point' – South Africa's lockdown is all we have to prevent	03/24/2020	https://businesstech.co.za/news/government/384291/coronavirus-tipp...-south-africas-lockdown-is-all-we-have-to-prevent-more-infections/

more infections		
Coronavirus cases rise to five-hundred and fifty-four in SA	03/24/2020	https://www.politicalanalysis.co.za/coronavirus-cases-rise-to-five-hundred-and-fifty-four-in-sa/
COVID 4th wave may hit Gauteng as early as November, says provincial command council	10/18/2021	https://news365.co.za/provincial-command-council/
COVID 4th wave may strike as early as November	10/19/2021	https://za.opera.news/za/en/health/b1311fd972f5956288c8e514a6b0906a
Covid -19 fourth wave is announced lock down might take place	11/26/2021	https://za.opera.news/za/en/health/fe3617c019000d0f2007c256cdd44b58
Covid and Vaccine update	06/09/2021	https://omny.fm/shows/living-redefined/covid-and-vaccine-update?in_playlist=living-redefined!podcast#sharing
Covid-19 cases expected to rise in Gauteng Province	01/05/2021	http://www.soshanguvepulse.co.za/2021/01/covid-19-cases-expected-to-rise-in-gauteng-province/
Covid-19 cases expected to soar in Gauteng province	01/04/2021	https://gautengnewspaper.co.za/2021/01/04/covid-19-cases-expected-to-soar-in-gauteng-province/

Covid-19 fourth wave expected to hit Gauteng between November and January	10/20/2021	https://kemptonexpress.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Covid-19 fourth wave expected to hit Gauteng between November and January	10/23/2021	https://northernnatalnews.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Professor Bruce Mellado on the the Omicron variant	11/27/2021	https://rvwab.com/videos/watch/ouBrejIFQJs
COVID-19 storm in Gauteng has slowed down.	13/08/2020	https://fullview.co.za/top-stories/item/4322-covid-19-storm-in-gauteng-has-slowed-down
Covid-19 surge in January a real concern for Gauteng	01/02/2021	https://www.jacarandafm.com/news/news/covid-19-surge-january-real-concern-gauteng/
Covid-19 tăng theo 'cấp số nhân' ở tâm dịch Omicron	12/03/2021	http://antt.vn/covid-19-tang-theo-cap-so-nhan-o-tam-dich-omicron-329890.htm
Data modelling calls for stricter restrictions as number of infections	03/06/2020	https://omny.fm/shows/the-breakfast-show-702/data-modelling-calls-for-stricter-restrictions-as

spike		
Gauteng ramps up vaccination drive	09/27/2021	https://myplay.deod.tv/en/specials/trending-content/mzansi-magic/107119/gauteng-ramps-up-vaccination-drive
Funeral homes under pressure as deaths rise in central South Africa	12/02/2021	https://www.bloomberglia.com.ar/2021/12/02/eeuu-requerira-a-viaj...t-negativo-de-covid-19-dentro-de-24-horas-anteriores-a-su-partida/
El número de casos de Covid-19 aumenta constantemente, la gente sigue muriendo	10/07/2022	https://mxn.news/el-numero-de-casos-de-covid-19-aumenta-constantemente-la-gente-sigue-muriendo/
En Afrique du Sud, en utilisant l'IA, des chercheurs prédisent un faible risque de 3e vague de Covid-19	13/04/2021	https://www.agenceecofin.com/intelligence-artificielle/1304-87139-...-des-chercheurs-predisent-un-faible-risque-de-3e-vague-de-covid-19
If more people don't vaccinate, mandatory vaccinations could be the only option - David Makhura	12/02/2021	https://www.engineeringnews.co.za/article/if-more-people-dont-vaccinate-mandatoryvaccinations-could-be-the-only-option---david-makhura-2021-12-02
Wits researchers launch comprehensive Covid-19 dashboard	03/24/2020	https://www.engineeringnews.co.za/print-version/wits-researchers-launch-comprehensive-covid-19-dashboard-for-south-africa-2020-03-24

for South Africa		
Wits, York University to develop AI Covid-19 project	03/12/2020	https://www.engineeringnews.co.za/print-version/wits-york-university-to-develop-ai-covid-19-project-2020-12-03
Expert warns of second Covid-19 surge in Gauteng	01/11/2021	https://kemptonexpress.co.za/lmn/1145301/expert-warns-of-second-covid-19-surge-in-gauteng/
Experts say Gauteng has yet to see the worst, peak a week out	06/27/2021	http://hitechnewsdaily.com/2021/06/experts-say-gauteng-has-yet-to-see-the-worst-third-wave-peak-a-week-out/
Fourth wave could hit Gauteng as early as next month	10/20/2021	https://www.iol.co.za/the-star/news/fourth-wave-could-hit-gauteng-as-early-as-next-month-49db8cbe-44cc-4a8c-8d8b-3f766dede8e6
Fourth wave of Covid infections 'fast approaching', expert warns	08/26/2021	https://www.jacarandafm.com/news/news/fourth-wave-covid-infections-fast-approaching-expert-warns/
Funeral homes under pressure as deaths rise in central South Africa	07/09/2021	https://ondequando.com/2021/07/09/funeral-homes-under-pressure-as-deaths-rise-in-central-south-africa/
Gauteng accounts for more of the daily Covid-19 cases	11/23/2021	https://omny.fm/shows/power-breakfast/gauteng-accounts-for-more-of-the-daily-covid-19-ca
Gauteng Covid-19	07/07/2020	https://m.engineeringnews.co.za/article/gauteng-covid-19-visualisation-platform-enables-monitoring-prediction-2020-07-07/rep_id:4433

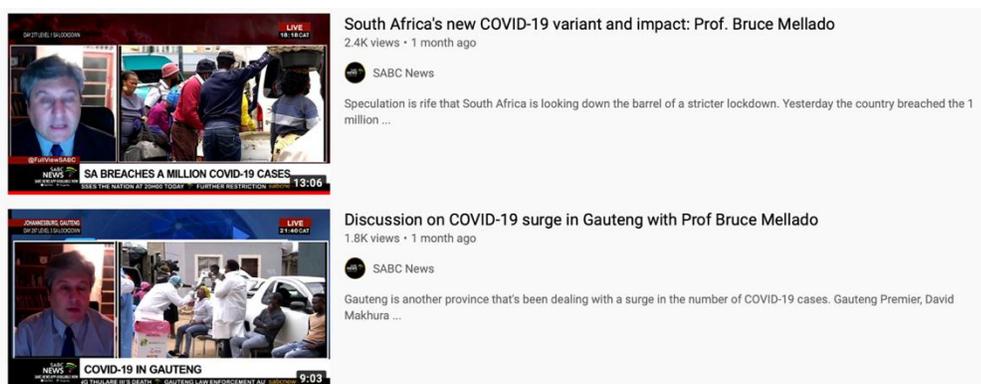
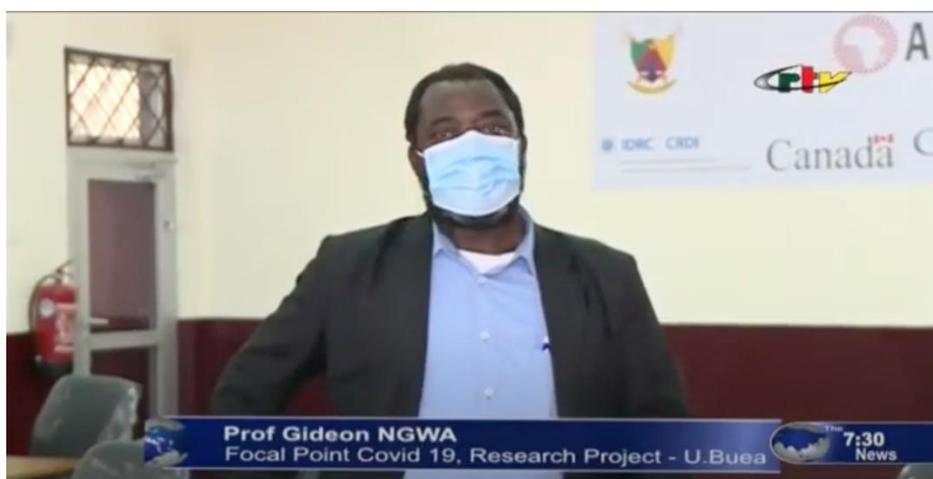
visualisation platform enables monitoring, prediction		
Gauteng is ready for the Covid-19 vaccine, says Makhura	01/30/2021	https://www.iol.co.za/saturday-star/news/gauteng-is-ready-for-th...id-19-vaccine-says-makhura-c5457219-2bb2-472d-8161-7ddd37799466
Gauteng Provincial Command Council warning fourth wave could hit earlier than expected	10/21/2021	https://www.youtube.com/watch?v=FM6Gd1yqnZs&t=103s
Gauteng records 78% COVID-19 recovery rate	08/13/2020	https://www.sabcnews.com/sabcnews/gauteng-records-78-covid-19-recovery-rate/
Good news about Covid-19 third wave in Gauteng	07/08/2021	https://mybroadband.co.za/news/trending/405263-good-news-about-covid-19-third-wave-in-gauteng.html
J&J vaccine reduces COVID infections by half among health workers, according to a new study.	08/09/2021	https://fullview.co.za/top-stories/item/12814-j-j-vaccine-reduces-covid-infections-by-half-among-health-workers-according-to-a-new-study
Is Gauteng in the fourth wave of Covid-19	12/03/2021	https://www.nouvelles-du-monde.com/les-cas-de-gauteng-omicron-aug...t-la-province-accelere-le-deploiement-du-vaccin-dans-les-ecoles/
York explores	03/06/2023	https://yfile.news.yorku.ca/2023/05/03/york-explores-research-partnerships-with-south-africa/

research partnerships with South Africa		
York University News and the office of the provost spotlighted me as a leader within SDG 17: Partnerships for the Goals through the use of AI to improve health in the global south	03/07/2023	https://tinyurl.com/tcmdwpsk
Joining forces to work with Black communities to build equitable, resilient governance strategies & increase Black communities' preparedness for future diseases and climate disasters.	06/12/2022	https://tinyurl.com/5n8r65rw
Leveraging responsible AI solutions to help gov't & communities prepare and respond to	10/30/2022	https://www.ctvnews.ca/video?clipId=2552980&jwsource=fb&fbclid=IwAR2YtC8QUon5cvcFbwleIPdWZ7K3k5pJ8QisqLZELwXQIaB-d8w_B5xOeII

disease outbreaks		
Leveraging Natural Language Processing to inform policies. Twitter shows lower-to-middle income countries have higher unemployment post-pandemic.	08/25/2022	https://tinyurl.com/7mwph8cm
Leveraging Natural Language Processing to inform policies. High unemployment rates in lower, mid income countries after Covid	08/25/2022	https://tinyurl.com/2vnvypvx
Employing artificial intelligence to address inequalities and systematic vulnerabilities in our communities .	13/03/2022 .	https://www.ctvnews.ca/video?clipId=2401509
How artificial intelligence and big data	08/22/2021	https://tinyurl.com/3zbf6ht9

are fighting
COVID-19
in Africa.





Our team leaders are regularly invited by governments to participate in the press conferences given to the population to raise awareness of where we are in the pandemic and what measures need to be emphasized at any given time.

23. Conference/workshops/webinar series/presentations.

A. **Presentations to Government:** We have given over 400 presentations to different work streams in the government. Most of these presentations are given during closed doors sessions and cannot be shared here. Below are links to sample reports that the team share with policy makers.

1. https://www.dropbox.com/s/bea9yo8fw3b3gph/COVID19_PCCC_301121.ppt?dl=0
2. https://www.dropbox.com/s/xneylee8glctdha/COVID19_PCCC_110122.ppt?dl=0
3. https://www.dropbox.com/s/kwsihpur40kno2r/COVID19_PCCC_141221.ppt?dl=0
4. https://www.dropbox.com/s/vmc1hrzjelbmvdh/COVID19_PCCC_161121.ppt?dl=0
5. https://www.dropbox.com/s/57rbzuk5g7gy3pf/COVID19_PCCC_091121.ppt?dl=0
6. https://www.dropbox.com/s/rd7viz2lsqgmvs0/COVID19_PCCC_280921.ppt?dl=0
7. https://www.dropbox.com/s/0x8afnnd2e4g2v/COVID19_PCCC_210921.ppt?dl=0

8. https://www.dropbox.com/s/hkmvdmhqw86z0hp/COVID19_PCCC_140921.ppt?dl=0
9. https://www.dropbox.com/s/yyamlx5tjlb4580/COVID19_PCCC_070921.ppt?dl=0
10. https://www.dropbox.com/s/i4qankdst16675x/COVID19_PCCC_310821.ppt?dl=0
11. https://www.dropbox.com/s/qsfeu3kr03bgjnm/COVID19_PCCC_240824.ppt?dl=0
12. https://www.dropbox.com/s/fxovb7iqplnqs7o/COVID19_PCCC_170821.ppt?dl=0
13. https://www.dropbox.com/s/x71rhxcn5fief2y/COVID19_PCCC_100821.ppt?dl=0
14. https://www.dropbox.com/s/y4mnhuurh0dikwq/COVID19_PCCC_030821.ppt?dl=0
15. https://www.dropbox.com/s/y4h77degmhouqp8/COVID19_PCCC_270721.ppt?dl=0

B. Presentations at conferences/seminars

We have also given over 400 presentations in national and international conferences/seminars in last two years..

Below is a sample of some of the conferences and workshops we have presented in:

1. keynote: gave a talk to the Public Health Association of BC Summer Institute on: "the impact of responsible local and explainable AI on communities (<https://phabc.org/phsi-2023-registration/?civiwp=CiviCRM&q=civicrm%2Fevent%2Finfo&reset=1&id=52>).
2. Attended IndabaX Cameroon 2023 conference and gave a talk on "Leveraging Responsible, Explainable, & Local AI for Population Health & Health Systems (<https://deeplearningindaba.com/2023/indabax/cameroon/>).
3. Attended DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN #SDGs and gave a talk on AI-based frameworks and algorithms for achieving SDG3 and SDG5 in the Global South (<http://dimacs.rutgers.edu/events/details?eID=2394>).
4. Invited Speaker: We gave a talk at the Next Einstein Forum Webinar series on leveraging responsible artificial intelligence methods for population health and health systems. April 18, 2023.
5. Invited Speaker: We gave a presentation to South African University leaders (during their visit to York University) on the work that we have been doing in South Africa: mobilizing AI to build equitable, resilient governance strategies & increase societal preparedness for future global pandemics and climate disasters. April 24, 2023.
6. Invited Speaker: We were invited to talk about how we can leverage AI to assist the Governor of Kajiado, Kenya (during his visit to York University) in his agenda for the Maasai people of Kenya (vulnerable community): in particular SDG 2 ("Zero hunger"); SDG 3 ("Good Health and Well-being"), SDG4 ("Quality Education"), SDG5 ("gender equality"), SDG 6("Clean Water and Sanitation"), SDG11 ("Sustainable cities and communities"). March 23, 2023.
7. Invited Speaker: We attended and gave a talk on Leveraging Responsible AI for Population Health & Health Systems in Nigeria at the Nigeria Computer Society, Artificial Intelligence & Robotics Conference: <https://lnkd.in/g4HwZGti>. March 21-23, 2023.

8. Invited Speaker: We attended the American Mathematical Society Southeastern Sectional Meeting at Georgia Institute of Technology, Atlanta Georgia and gave a talk on Mpox dynamic model: incorporating adaptive behavioural changes, different control strategies in the MSM community & under-reporting. March 18-20, 2023.
9. Invited Speaker: We gave a guest talk on Leveraging Responsible AI for Population Health & Health Systems at Queens University. March 07, 2023.
10. Invited Speaker: We gave a presentation at Michael Garron Hospital on Canadian Black Scientists and the Key to Leveraging Responsible Data Science Methods for Population Health & Health Systems.
11. Invited Speaker: We gave a guest lecture at the Dalla Lana School of Public Health on Leveraging Responsible, Explainable, and Local Data Science Methods for Population Health & Health Systems. Feb. 07, 2023.
12. Keynote Speaker: We organized a workshop at the Fields Institute on Early Warning Systems (EWS) for Emerging and Re-emerging Diseases and gave a talk on EWS for re-emerging diseases. <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Attended in person. Jan. 23-25, 2023.
13. Invited Speaker: We attended the Joint Mathematics Meetings in Boston and gave a talk entitled: "adaptive changes in sexual behaviour in the high-risk population in response to mpox can control the outbreak: insights from an epidemic model. Attended in person. Jan. 04-07, 2023.
14. Panellist : We organized and took part in a panel discussion on "Towards an Inclusive Data Governance Policy for the use of AI in Africa" at the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. Attended in person. Dec. 10, 2022.
15. Invited panellist : We were invited to two-panel conversations at the Bill & Melinda Gates Foundation in Seattle: 1) Ethics and Efficacy of modelling and machine learning, 2) The politics of data. December 09, 2022. <https://members.dataforpolicy.org/2022-conference/seattle-programme/>
16. Invited Speaker: We gave a talk at the Canadian Mathematical Society winter meeting on "Adaptive changes in sexual behavior in the high-risk population in response monkeypox can control the outbreak: insights from an epidemic model". Attended in person. December 04, 2022.
14. Keynote Speaker: We gave a keynote presentation at the New York University Abu Dhabi Global Perspectives in Science Lecture Series. Title of my talk: Leveraging AI for Clinical Public and Global health Needs: Implications for Policies and Lessons Learned from the ACADIC project. Attended in person. Nov 28, 2022.
17. Invited Speaker: We gave a presentation at the China-Canada Symposium On Modelling, Prevention and Control of Zoonoses. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in the Global South". Attended virtually-zoom. Nov 15, 2022.
18. Keynote Speaker: We gave a presentation at the Ghanian Mathematical Biology and Medicine Workshop. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in Africa". Attended virtually-zoom. Nov 08, 2022.
19. Invited Speaker: We gave a presentation at the University of Massachusetts Mathematical Biology Seminar series. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in the Global South". Attended virtually-zoom. October 31, 2022.
20. Keynote Speaker: We gave a keynote speaker at the Science Atlantic Conference 2022, that held at Mount Allison University, Sackville, NB . Attended in person. Oct. 21-15, 2022. the MfPH next generation. Title of my talk: "Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage". Attended virtually-zoom. August 17, 2022.
22. Invited Speaker: During the deputy Minister of Higher Education, Science and Innovation (South Africa), the Hon. Buti Manamela visit to York University, we presented our initiatives in South Africa: Leveraging Artificial Intelligence and Big Data for clinical public health in South Africa. September 14, 2022.

23. Invited Speaker: We gave a presentation at the MfPH next generation. Title of my talk: “Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage”. Attended virtually-zoom. August 17, 2022.
24. Keynote Speaker: We were invited as a keynote speaker at the Queen’s University, Workshop on Mathematical Ecology (<https://mast.queensu.ca/math-ecology/>). Attended in person. Title of talk: ‘Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage. August 10-11, 2022.
25. Invited Speaker: We gave a presentation at the Applied and Industrial Mathematics Society Annual Meeting 2022 in UBC-Okanagan. Title: “Estimation of epidemiological parameters and ascertainment rate from early transmission of COVID-19 Across Africa”. Attended in person. June 15, 2022
26. Keynote Speaker: keynote speaker at the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30, 2022
27. Invited Speaker. We gave a presentation in the Mathematics Department, University of Alberta entitled: “comparing public sentiments toward COVID-19 vaccines across Canadian cities: analysis of comments on Reddit”. Attended virtually-zoom. February 14, 2022
28. We Moderated a panel conversation on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. Attended virtually-zoom. Feb 03, 2022.
29. Keynote Speaker: keynote talk on the impact of social economics and environmental factors on the dynamics of COVID-19 at the Artificial Intelligence for Pandemics Centered, University of Queensland, Australia. Attended virtually-zoom. January 19, 2022.
30. Invited Speaker. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Talk title The impact of social, economic, environmental factors and public health measures on the dynamics of COVID-19. Attended virtually-zoom. September 16, 2021.
31. Panelist. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Attended virtually-zoom. September 17, 2021.
32. Panelist. Artificial Intelligence Virtual Stakeholders Forums: A Rights-Respecting Artificial Intelligence Policy for Nigeria. Attended virtually-zoom. October 20, 2021.
33. Invited Speaker. Mathematics for Public Health Colloquium <http://www.fields.utoronto.ca/activities/21-22/public-health-colloquium>. Talk title: Early Warning Tools for Emerging Infectious Diseases Outbreak. Attended virtually-zoom. October 12, 2021.
34. Plenary Speaker. Ghana Science Association 2021 Conference <https://www.ghanascience.org.gh>. Theme: Mitigating COVID-19 Pandemic. Talk title: The power of Collaboration, Artificial Intelligence & Big Data in the Fight Against COVID-19 in Africa. Attended virtually-zoom. October 07, 2021.
35. Invited Speaker Black Heroes of Mathematics 2021 conference <https://www.lms.ac.uk/events/black-heroes-mathematics>. Talk title: Harnessing Artificial Intelligence and Big Data Techniques to Monitor Manage and Forecast an Epidemic: the Case of COVID-19. Attended virtually-zoom. October 05, 2021.
36. Panelist. Black Heroes of Mathematics 2021 conference <https://www.lms.ac.uk/events/black-heroes-mathematics>. Panel conversation on increasing the number of Blacks in research and STEM programs. Attended virtually-zoom. September 13, 2021.
37. Invited Speaker Data for policy 2021 conference: lessons for policy-data interactions after COVID-19 <https://dataforpolicy.org>. Attended virtually-zoom. September 13, 2021.

38. Panelist. Data for policy 2021 Conference: lessons for policy-data interactions after COVID- 19 [https:// dataforpolicy. org](https://dataforpolicy.org) . Attended virtually-zoom. September 14, 2021. Data for Policy is a premier global forum for interdisciplinary and cross-sector discussions around the impact and potentials of the digital revolution in the government sector. I equally gave a presentation in this conference. Attended virtually-zoom. September 14, 2021.

39. Invited Speaker. University of British Columbia Mathematical Biology Lecture series. The impact of social, economic, environmental factors and public health measures on the dynamics of COVID-19. Attended virtually-zoom. June 02, 2021.

40. Panelist. Panelist at a Symposium on Building Momentum for Transformative Disaster Risk Governance. Attended virtually-zoom. February 12, 2021.

41. Invited Speaker. Dahdaleh Institute for Global Health Research. Presentation on our IDRC project on predictive modeling and forecasting the transmission of COVID-19 in Africa using Artificial Intelligence. Attended virtually-zoom. January 27, 2021.

42. Invited Speaker. University of Alberta Mathematical Biology Lecture series. The impact of social, demographic and climatic variable on the growth rate of COVID-19 across countries. Attended virtually-zoom. November 16, 2020.

C. Events that we have organized

We have also organized over 100 workshops, conferences and webinars in last two years
Below is a sample of some of the workshops, conferences and webinars that we organized:

1. Consortium of Universities for Global Health 2023 conference: I organized a workshop on “Fairness in Machine Intelligence for Global Health” at the consortium of Universities for Global Health 2023 conference. [https:// www. cugh2023. org/ satellitesession13](https://www.cugh2023.org/satellitesession13) . April 03, 2023.
2. AI for Global Challenges and Lessons learned: organized Global South AI4PEP Network bi-weekly lecture series. Theme: AI for Global Challenges and Lessons learned <https://www.yorku.ca/cifal/ai4pep/>. Feb, 20-May 29, 2023 .
3. 2023 MfPH Early Warning Systems Workshop: organized a workshop at the Fields Institute on Early Warning Systems for Emerging and Re-emerging Diseases from January 23-25: <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Jan. 23-25, 2023 .
4. Data for Policy Conference 2022: organized and took part in a panel discussion on ”Towards an Inclusive Data Governance Policy for the use of AI in Africa” in the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. link: <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. December, 10, 2022 .
5. United Nation General Assembly 77 (UNGA77) Science Summit interactive panel session : During the UNGA77 we co-organize a panel session on artificial Intelligence Research in Health: Tackling Global Challenges as One (other co-organize are: I-DAIR , the United Nations University Institute in Macau (UNU Macau), Indraprastha Institute of Information Technology Delhi (IIIT-Delhi), Universidade Federal do Rio Grande do Sul (UFRGS), the Africa-Canada AI and & Data Innovation Consortium (ACADIC), the University of the Witwatersrand, and the City University of New York (CUNY). September, 22, 2022 .
6. Mini-Symposium: Big Data and AI for Public Health. I co-organized a mini symposium at the Canadian Industrial and Applied Mathematics 2022 Meeting on Big Data and AI for Public Health. June 15, 2022.
7. Collaborative workshop on big data analysis of covid-19. In partnership with the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30-31, 2022 .

8. Conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. In collaboration with CIFAL York, and representing ACADIC, we organize a conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence at York University, Canada. Feb 03, 2022

9. Canadian Applied and Industrial Mathematics Meeting 2021: Organized a mini- symposium at the Canadian Applied and Industrial Mathematics 2021 Meeting on Modelling Infectious Disease. June 21, 2021.

10. Society for Mathematical Biology Meeting 2021: Organized a mini-symposium at the Society for Mathematical Biology Meeting 2021: on Modelling Infectious Disease. June 15, 2021.

11. Disaster Risk Governance Webinar: Organized a webinar series on AI for Disaster Resilience and Sustainable Development. April 30, 2021

D. Regional Webinar series

Each country runs a weekly webinar series where they invite researchers from around the world to come and share their research work with them. We meet bi-weekly for updates from each country and this has been going on since we started working on the project.

24. Providing insight information on Omicron to Federal Government of Canada and the Ontario COVID-19 Science Advisory Table:

When the omicron variant became a global public health issue, Canada's deputy Minister of health and the Ontario COVID-19 Science Advisory Table (led by Dr. Peter Juni) reached out to us (Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC)), and intensively consulted with ACADIC's AI4COVID Program team at the University of the Witwatersrand (led by Prof. Bruce Mellado) to estimate the disease burden of the omicron variant from our South African data.

Within this period we met separately with the provincial government and Ontario COVID-19 Science Advisory Table every day for at least two weeks. We shared all the data from South Africa with them and equally had working meetings to discuss what was happening. We provided the Canadian government with first-hand knowledge about Omicron.

Our collaboration with the federal government and Ontario COVID-19 Science Advisory Table emphasis the importance of supporting international development work. Our work greatly informed Omicron policies in Canada as the government of Gauteng (represented by Bruce) provided first-hand knowledge/experience and expertise about the dynamics of the variant. Before it became a major concern in the country, we already knew everything about it from the government of Gauteng. This is the best surveillance intelligence we can have.

Below are some of the intelligence we provided to the federal government and the Ontario Science Advisory Table. We were giving these presentations to them every day followed by a working meeting.

1. https://www.dropbox.com/s/7aww7hwhp8dexdp/ACADIC_Canada_Health_291121.ppt?dl=0
2. https://www.dropbox.com/s/iq2p3w20wld0rj3/ACADIC_Science_Table_301121.ppt?dl=0
3. https://www.dropbox.com/s/wns8k3gadypmv6c/ACADIC_Status_4thwave_041221.ppt?dl=0
4. https://www.dropbox.com/s/p7qryumycaw9pox/ACADIC_Status_4thwave_071221.ppt?dl=0
5. https://www.dropbox.com/s/sdhffqy11bd2lua/ACADIC_Status_4thwave_121221.ppt?dl=0
6. https://www.dropbox.com/s/5mtvr49mr25th0m/ACADIC_IDRC_010222.ppt?dl=0

25. Publications. The consortium has published several peer-reviewed articles as well have several article currently being reviewed. Below is a list of some of our publications where our findings and impact can be found.

A. Refereed Journal Publications:

1. Nia, Z. M., Bragazzi, N. L., Wu, J., & Kong, J. D. (2023). A Twitter Dataset for Monkeypox, May 2022. *Data in Brief*, 109118.
2. Movahedi Nia, Z., Bragazzi, N., Asgary, A., Orbinski, J., Wu, J., & Kong, J. (2023). Mpox Panic, Infodemic, and Stigmatization of the Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer or Questioning, Intersex, Asexual Community: Geospatial Analysis, Topic Modeling, and Sentiment Analysis of a Large, Multilingual Social Media Database. *Journal of Medical Internet Research*, 25, e45108.
3. Puce, L., Okwen, P., Yuh, M. N., Akah, G., Pambe Miong, R. H., Kong, J., & Bragazzi, N. L. (2023). Well-being and quality of life in people with disabilities practicing sports, athletes with disabilities, and para-athletes: Insights from a critical review of the literature. *Frontiers in Psychology*, 14, 242.
4. Kong, J. D., Akpudo, U. E., Effoduh, J. O., & Bragazzi, N. L. (2023, February). Leveraging Responsible, Explainable, and Local Artificial Intelligence Solutions for Clinical Public Health in the Global South. In *Healthcare* (Vol. 11, No. 4, p. 457). MDPI.
5. Puce, L., Okwen, P., Yuh, M. N., Akah, G., Pambe Miong, R. H., Kong, J., & Bragazzi, N. L. (2023). Well-being and quality of life in people with disabilities practicing sports, athletes with disabilities, and para-athletes: Insights from a critical review of the literature. *Frontiers in Psychology*, 14, 242.
6. Bragazzi, N. L., Han, Q., Iyaniwura, S. A., Omame, A., Shausan, A., Wang, X., ... & Kong, J. D. (2023). Adaptive changes in sexual behavior in the high-risk population in response to human monkeypox transmission in Canada can help control the outbreak: insights from a two-group, two-route epidemic model. *Journal of Medical Virology*.
7. Kaur M, Bragazzi NL, Heffernan J, Tsasis P, Wu J, Kong JD. COVID-19 in Ontario Long-term Care Facilities Project, a manually curated and validated database. *Front Public Health*. 2023 Feb 10;11:1133419. doi: 10.3389/fpubh.2023.1133419. PMID: 36844842; PMCID: PMC9950626.
8. Bragazzi NL, Kong JD, Mahroum N, Tsigalou C, Khamisy-Farah R, Converti M, Wu J. Epidemiological trends and clinical features of the ongoing monkeypox epidemic: A preliminary pooled data analysis and literature review. *Journal of medical virology*. 2023 Jan;95(1):e27931.
9. Bragazzi NL, Kong JD, Wu J. Is monkeypox a new, emerging sexually transmitted disease? A rapid review of the literature. *Journal of Medical Virology*. 2023 Jan;95(1):e28145.
10. Ogbuokiri B, Ahmadi A, Nia ZM, Mellado B, Wu J, Orbinski J, Asgary A, Kong J. Vaccine hesitancy hotspots in africa: An insight from geotagged twitter posts. *IEEE Transactions on Computational Social Systems*. 2023 Jan 19.
11. Iyaniwura SA, Musa R, Kong JD. A generalized distributed delay model of COVID-19: An endemic model with immunity waning. *Mathematical Biosciences and Engineering*. 2023;20(3):5379- 412.
12. Lieberman B, Kong JD, Gusinow R, Asgary A, Bragazzi NL, Choma J, Dahbi SE, Hayashi K, Kar D, Kawonga M, Mbada M. Big data-and artificial intelligence-based hot-spot analysis of COVID-19: Gauteng, South Africa, as a case study. *BMC Medical Informatics and Decision Making*. 2023 Dec;23(1):1-5.
13. Ahmed, H., Cargill, T., Bragazzi, N. L., & Kong, J. Dataset of Non-pharmaceutical inter- ventions and community support measures across Canadian universities and colleges during COVID-19 in 2020. *Frontiers in Public Health*, 4512.
14. Alavinejad*, M., Mellado, B., Asgary, A., Mbada, M., Mathaha, T., Lieberman*, B., ... & Kong, J. D. (2022). Management of hospital beds and ventilators in the Gauteng province, South Africa, during the COVID-19 pandemic. *PLOS Global Public Health*, 2(11), e0001113.

15. Ogbuokiri*, B., Ahmadi, A., Bragazzi*, N. L., Nia, Z. M., Mellado, B., Wu, J., ... & Kong, J. (2022). Public sentiments toward COVID-19 vaccines in South African cities: An analysis of Twitter posts. *Frontiers in Public Health*, 10.
16. Fabris-Rotelli, Inger, Jennifer P. Holloway, Zaid Kimmie, Sally Archibald, Pravesh Debba, Raeesa Manjoo-Docrat, Alize Le Roux, Nontembeko Dudeni-Tlhone, Charl Janse Van Rensburg, and Renate Thiede. "A spatial SEIR model for COVID-19 in South Africa." (2022).
17. Potgieter, A., Fabris-Rotelli, I.N., Kimmie, Z., Dudeni-Tlhone, N., Holloway, J.P., Janse van Rensburg, C., Thiede, R.N., Debba, P., Manjoo-Docrat, R., Abdelatif, N. and Khuluse-Makhanya, S., 2021. Modelling representative population mobility for COVID-19 spatial transmission in South Africa. *Frontiers in big Data*, 4, p.718351.
18. Manda, S.O., Darikwa, T., Nkwenika, T. and Bergquist, R., 2021. A spatial analysis of COVID-19 in African countries: evaluating the effects of socio-economic vulnerabilities and neighbouring. *International Journal of Environmental Research and Public Health*, 18(20), p.10783.
19. Nia*, Z. M., Ahmadi, A., Bragazzi*, N. L., Woldegerima, W. A., Mellado, B., Wu, J., ... & Kong, J. D. (2022). A cross-country analysis of macroeconomic responses to COVID-19 pandemic using Twitter sentiments. *PloS one*, 17(8), e0272208.
20. Ilu, Saratu Yusuf, Prasad Rajesh, and Hassan Mohammed. "Prediction of COVID-19 using long short-term memory by integrating principal component analysis and clustering techniques." *Informatics in Medicine Unlocked* 31 (2022): 100990
21. Ilu, Saratu Yusuf, and Rajesh Prasad. "Improved autoregressive integrated moving average model for COVID-19 prediction by using statistical significance and clustering techniques." *Heliyon* 9, no. 2 (2023).
22. Ilu, S.Y. and Prasad, R., 2023. Improved autoregressive integrated moving average model for COVID-19 prediction by using statistical significance and clustering techniques. *Heliyon*, 9(2).
23. Stevenson, F.D., Mellado, B., Choma, J., Lieberman, B., Corrêa, F., Dahbi, S.E., Hayashi, K., Monnakgotla, K., Naude, J., Ruan, X. and Maslo, C., 2020. Risk Adjusted Non-Pharmaceutical Interventions for the Management of COVID-19 in South Africa.
24. Lazarus, J.V., Romero, D., Kopka, C.J., Karim, S.A., Abu-Raddad, L.J., Almeida, G., Baptista-Leite, R., Barocas, J.A., Barreto, M.L., Bar-Yam, Y. and Bassat, Q., 2022. A multinational Delphi consensus to end the COVID-19 public health threat. *Nature*, 611(7935), pp.332-345.
25. Tan YR, Agrawal A, Matsoso MP, Katz R, Davis SL, Winkler AS, Huber A, Joshi A, El-Mohandes A, Mellado B, Mubaira CA. A call for citizen science in pandemic preparedness and response: beyond data collection. *BMJ Global Health*. 2022 Jun 1;7(6):e009389.
26. Dai, H., Younis, A., Kong, J., Puce, L., Jabbour, G., & Bragazzi*, N. L. (2022). Big Data in Cardiology: State-of-Art and Future Prospects. Towards a new cardiology: more predictive, personalized, participatory, digital, smarter, and bigger. *Frontiers in Cardiovascular Medicine*, 606. Chicago
27. Wang, X., Han*, Q., & Kong, J. D. (2022). Studying the mixed transmission in a community with age heterogeneity: COVID-19 as a case study. *Infectious Disease Modelling*.
28. Kong J, Mellado B, Wu J (2022). Harnessing the power of data: Artificial Intelligence -based pandemic support. UNESCO: <https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en>.
31. Bragazzi* NL, Bridgewood C, Watad A, Damiani G, Kong JD, McGonagle D. Harnessing Big Data, Smart and Digital Technologies and Artificial Intelligence for Preventing, Early Intercepting, Managing, and Treating Psoriatic Arthritis: Insights From a Systematic Review of the Literature. *Front. Immunol.* 13: 847312. doi: 10.3389/fimmu. 2022 Mar 10.
32. Tao* S, Bragazzi* NL, Wu J, Mellado B, Kong JD. Harnessing Artificial Intelligence to assess the impact of nonpharmaceutical interventions on the second wave of the Coronavirus Disease 2019 pandemic across the world. *Scientific reports*. 2022 Jan 18;12(1):1-9.
33. Kazemi* M, Bragazzi* NL, Kong JD. Assessing Inequities in COVID-19 Vaccine Roll-Out Strategy Programs: A Cross-Country Study Using a Machine Learning Approach. *Vaccines*. 2022 Feb;10(2):194.

34. Iyaniwura* SA, Rabiou M, David* JF, Kong JD. The basic reproduction number of COVID-19 across Africa. *Plos one*. 2022 Feb 25;17(2):e0264455.
35. Habees* AA, Aldabbas E, Bragazzi NL, Kong JD. Bacteria–bacteriophage cycles facilitate Cholera outbreak cycles: an indirect Susceptible-Infected-Recovered-Bacteria-Phage (iSIRBP) model-based mathematical study. *Journal of Biological Dynamics*. 2022 Dec 31;16(1):29-43.
36. Guelmami N, Tannoubi A, Chalghaf N, Saidane M, Kong J, Puce L, Fairouz A, Bragazzi* NL, Alroobaea R. Latent Profile Analysis to Survey Positive Mental Health and Well-Being: A Pilot Investigation Insight Tunisian Facebook Users. *Front. Psychiatry*. 2022 Apr 7;13:824134.
37. Chen R, Safiri S, Behzadifar M, Kong JD, Zguira MS, Bragazzi* NL, Zhong W, Zhang W. Health Effects of Metabolic Risks in the United States From 1990 to 2019. *Frontiers in public health*. 2022;10.
38. Yan* C, Law* M, Nguyen* S, Cheung* J, Kong J. Comparing Public Sentiment Toward COVID-19 Vaccines Across Canadian Cities: Analysis of Comments on Reddit. *Journal of medical Internet research*. 2021 Sep 24;23(9):e32685.
- 39.. Cheong* Q, Au-Yeung* M, Quon* S, Concepcion* K, Kong JD. Predictive Modeling of Vaccination Uptake in US Counties: A Machine Learning–Based Approach. *Journal of medical Internet research*. 2021 Nov 25;23(11):e33231.
40. Bragazzi* NL, Kolahi A, Nejadghaderi SA, Lochner P, Brigo F, Naldi A, Lanteri P, Garbarino S, Sullman MJM, Dai H, Wu , Kong JD, Jahrami H, Sohrabi M, & Safiri S. Global, regional, and national burden of Guillain–Barré syndrome and its underlying causes from 1990 to 2019. *Journal of neuroinflammation*. 2021 Dec;18(1):1-1.
41. Kong JD, Tekwa EW, Gignoux-Wolfsohn SA. Social, economic, and environmental factors influencing the basic reproduction number of COVID-19 across countries. *PLoS one*. 2021 Jun 9;16(6):e0252373.
42. Duhon* J, Bragazzi* N, Kong JD. The impact of non-pharmaceutical interventions, demographic, social, and climatic factors on the initial growth rate of COVID-19: A cross-country study. *Science of The Total Environment*. 2021 Mar 15;760:144325.
43. Dai H, Younis A, Kong JD, Bragazzi* NL, Wu J. Trends and Regional Variation in Prevalence of Cardiovascular Risk Factors and Association With Socioeconomic Status in Canada, 2005- 2016. *JAMA network open*. 2021 Aug 2;4(8):e2121443-.
44. Bouba* Y, Kagning* Tsinda E, Mbogning* Fonkou MD, Mmbando* GS, Bragazzi* NL, Kong JD. The determinants of the low COVID-19 transmission and mortality rates in Africa: A cross-country analysis. Maxime Descartes and Mmbando, Gideon Sadikiel and Bragazzi, Nicola Luigi and Kong, Jude Dzevela, The determinants of the low COVID-19 transmission and mortality rates in Africa: A cross-country analysis. *Frontiers in Public Health*. (2021)
45. Mahroum N, Damiani G, Watad A, Amital H, Bragazzi* NL, Farah R, Wu JH, Kong JD, Bridgewood C, McGonagle D, Khamisy-Farah R. Higher rates of COVID-19 but less severe infections reported for patients on Dupilumab: a Big Data analysis of the World Health Organization VigiBase. *European Review for Medical and Pharmacological Sciences*. 2021 Sep 1;25(18):5865-70.
46. Guelmami N, Khalifa MB, Chalghaf N, Kong JD, Amayra T, Wu J, Azaiez F, Bragazzi* NL. Development of the 12-Item Social Media Disinformation Scale and its Association With Social Media Addiction and Mental Health Related to COVID-19 in Tunisia: Survey-Based Pilot Case Study. *JMIR Formative Research*. 2021 Jun 9;5(6):e27280.
47. Guelmami N, Ben Khalifa M, Chalghaf N, Kong JD, Amayra T, Wu J, Azaiez F, Bragazzi* NL. Preliminary development of the social media disinformation scale (SMDS-12) and its association with social media addiction and mental health: COVID-19 as a pilot case study. *JMIR Formative Research*. 2021 May 3.
48. Khamisy-Farah R, Damiani G, Kong JD, Wu JH, Bragazzi*NL. Safety profile of Dupilumab during pregnancy: a data mining and disproportionality analysis of over 37,000 reports from the WHO individual case safety reporting database (VigiBase™). *Eur Rev Med Pharmacol Sci*. 2021 Sep 1;25(17):5448-51.

- 49.. R. Khamisy-Farah, G. Damiani, J.D. Kong, J.-H. Wu, N.L. Bragazzi* Safety profile of Dupilumab during pregnancy: a data mining and disproportionality analysis of over 37,000 reports from the WHO individual case safety reporting database (VigiBase™) *Eur Rev Med Pharmacol Sci.* (2021); 25(17): pages 5448-5451
50. Stevenson* F, Hayasi* K, Bragazzi* NL, Kong JD, Asgary A, Lieberman* B, Ruan X, Mathaha T, Dahbi SE, Choma N, Kawonga M. Development of an Early Alert System for an Additional Wave of COVID-19 Cases using a Recurrent Neural Network with Long Short-Term Memory. *Int. J. Environ. Res. Public Health.* (2021).
51. Botelho*, C., Kong, J. D., Lucien, M. A., Shuai, Z., & Wang, H. (2021). A mathematical model for Vibrio-phage interactions. *Mathematical Biosciences and Engineering*, 18(3).
52. Mellado B, Wu J, Kong JD, Bragazzi* NL, Asgary A, Kawonga M, Choma N, Hayasi K, Lieberman B, Mathaha T, Mbada M. Leveraging Artificial Intelligence and Big Data to optimize COVID-19 clinical public health and vaccination roll-out strategies in Africa. *Int. J. Environ. Res. Public Health.* (2021).
53. Mahroum N, Watad A, Bridgewood C, Mansour M, Nasr A, Hussein A, Khamisy-Farah A, Farah R, Gendelman O, Lidar M, Shoenfeld Y, Amital H, Kong JD, Wu J, Bragazzi* NL, & McGonagle D. Systematic Review and Meta-Analysis of Tocilizumab Therapy Versus Standard of Care in over 15,000 COVID-19 Pneumonia Patients during the First Eight Months of the Pandemic. *International Journal of Environmental Research and Public Health.* 2021 Jan;18(17):9149.
54. Khamisy-Farah R, Gilbey P, Furstenu LB, Sott MK, Farah R, Viviani M, Bisogni M, Kong JD, Ciliberti R, Bragazzi* NL. Big Data for Biomedical Education with a Focus on the COVID- 19 Era: An Integrative Review of the Literature. *International Journal of Environmental Research and Public Health.* 2021 Jan;18(17):8989.
55. Mbogning* Fonkou MD, Bragazzi* NL, Tsinda* EK, Bouba* Y, Mmbando* GS, Kong JD. Covid-19 pandemic related research in africa: Bibliometric analysis of scholarly output, collaborations and scientific leadership. *International journal of environmental research and public health.* 2021 Jan;18(14):7273.
56. Zhong W, Bragazzi* NL, Kong JD, Safiri S, Behzadifar M, Liu J, Liu X, Wang W. Bur- den of Respiratory Infection and Tuberculosis Among US States from 1990 to 2019. *Clinical Epidemiology.* 2021;13:503.
57. Bragazzi* NL, Beamish D, Kong JD, Wu J. Illicit Drug Use in Canada and Implications for Suicidal Behaviors, and Household Food Insecurity: Findings from a Large, Nationally Representative Survey. *International Journal of Environmental Research and Public Health.* 2021 Jan;18(12):6425.
58. Khamisy-Farah R, Furstenu LB, Kong JD, Wu J, Bragazzi* NL. Gynecology meets big data in the disruptive innovation medical era: State-of-art and future prospects. *International Journal of Environmental Research and Public Health.* 2021 Jan;18(10):5058.
59. Kong JD, Tchuendom* RF, Adeleye* SA, David* JF, Admasu FS, Bakare EA, Siewe N. SARS-CoV-2 and self-medication in Cameroon: a mathematical model. *Journal of Biological Dynamics.* 2021 Jan 1;15(1):137-50.
60. Wang D, Adedokun OA, Millogo O, Madzorera I, Hemler EC, Workneh F, et al. The Continued Impacts of the COVID-19 Pandemic on Education and Mental Health Among Sub-Saharan African Adolescents. *Journal of Adolescent Health.* 2023 Apr 1;72(4):535–43.
61. Nia ZM, Asgary A, Bragazzi N, Mellado B, Orbinski J, Wu J, Kong J. Nowcasting unemployment rate during the COVID-19 pandemic using Twitter data: The case of South Africa. *Frontiers in Public Health.* 2022 Dec 2;10:952363.

62. Kong JD, Fevrier K, Effoduh JO, Bragazzi NL. Artificial Intelligence, Law, and Vulnerabilities. In AI and Society 2023 Jan 8 (pp. 179-196). Chapman and Hall/CRC.

B. Refereed Policy Briefs:

1. Kong J, Mellado B, Wu J (2022). Harnessing the power of data: Artificial Intelligence -based pandemic support. UNESCO: <https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en>.

Refereed book publication:

2. Kong, J. D., Fevrier, K., Effoduh*, J. O., & Bragazzi*, N. L. (2022). Artificial Intelligence, Law, and Vulnerabilities. In AI and Society (pp. 179-196). Chapman and Hall/CRC.

C. Links to preprints of manuscript in press or currently being reviewed:

1. Jude Kong, Hong Qin, Wandi Ding, Ramneek Ahluwalia, Christo El Morr, Zeynep Engin, Jake Okechukwu Effoduh, Rebecca Hwa, Serena Jingchuan Guo, Laleh Seyyed-Kalantari, Sylvia Kiwuwa Muyingo, Candace Makeda Moore, Ravi Parikh, Reva Schwartz, Dongxiao Zhu, Xiaoqian Wang, Yiye Zhang, owards Trustworthy Artificial Intelligence for Equitable Global Health.

2. Jude Kong, Jake Okechukwu Effoduh and Ugochukwu Ejike Akpudo, Towards an Inclusive Data Governance Policy for the Use of Artificial Intelligence in Africa.

3. Meghan Malaatjie, Mahnaz Alavinejad, Benjamin Lieberman, Nicola Luigi Bragazzi, Jude Dzevela Kong, Mary Kawonga, Mduduzi Mbada, Thuso Mathaha, and Bruce Mellado. Transition to endemicity with the Omicron variant in Gauteng, South Africa: insights from an agent based modeling study

4. Meghan Malaatjie, Thuso Mathaha, Mary Kawonga, Bruce Mellado and Jude Kong. The use of machine learning to identify gender differential outcomes in a South African multi-center COVID-19 cohort

5. Kaur M, Cargill T, Hui K, Vu M, Bragazzi NL, Kong JD Leveraging social media data to inform healthcare supply-chain decisions with COVID-19 as a case study: A sentiment analysis and topic modelling approach JMIR Preprints. 2023:46087

6. Sekkak, I., NASRI, B. R., RE MILLARD, B. N., KONG, J. D., & EL FATINI, M. O. H. A. M. E. D. (2023). A Stochastic Analysis of a SEIR Epidemic Model With Short and Long-term Prophylaxis. (Submitted to SIAM Journal on Applied Mathematics).

7. Ismail A, Madzorera I, Apraku EA, Tinkasimile A, Dasmane D, Zabre P, et al. The COVID-19 pandemic and its prolonged impacts on food prices, food consumption and diet quality in sub-Saharan Africa [Internet]. medRxiv; 2022 [cited 2023 Jul 8]. p. 2022.12.12.22283393. Available from:

<https://www.medrxiv.org/content/10.1101/2022.12.12.22283393v1>

8. Wang D, Chukwu A, Mwanyika-Sando M, Abubakari SW, Assefa N, Madzorera I, et al. Levels and determinants of COVID-19 vaccine hesitancy among sub-Saharan African adolescents [Internet]. medRxiv; 2022 [cited 2023 Jul 8]. p. 2022.05.18.22275274. Available from:

<https://www.medrxiv.org/content/10.1101/2022.05.18.22275274v1>

9. Bragazzi*, N. L., Kong, J. D., & Wu, J. (2023). Integrated epidemiological, clinical, and molecular evidence points to an earlier origin of the current monkeypox outbreak and a complex route of exposure. Available at SSRN. (Submitted to Journal of medical virology).

10. Bragazzi*, N. L., Kong, J. D., & Wu, J. (2023). A tale of two (and more) stories: smallpox- monkeypox viruses (HIV, and other sexually transmitted diseases) interaction dynamics. Re- searchGate Project: 2022 Monkeypox Epidemic. (Submitted to Journal of medical virol- ogy).

11. Thiede R, Abdelatif N, Fabris-Rotelli I, Manjoo-Docrat R, Holloway J, van Rensburg CJ, et al. Spatial variation in the basic reproduction number of COVID-19: A systematic review [Internet]. arXiv; 2020 [cited 2023 Jul 8]. Available from: <http://arxiv.org/abs/2012.06301>

12. Bragazzi*, N. L., Kong, J. D., & Wu, J. (2023). Monkeypox and laboratory medicine: more data are urgently needed. ResearchGate Preprint. (Submitted to Journal of medical vi- rology).

13. Avusuglo*, W., Han*, Q., Woldegerima, W. A., Bragazzi, N. L., Ahmadi, A., Asgary, A., ... & Kong, J. D. (2023). COVID-19 and malaria co-infection: do stigmatization and self-medication matter? A mathematical modelling study for Nigeria. A mathematical modelling study for Nigeria (April 21, 2022). (Submitted to Scientific Reports).
14. Nia*, Z. M., Ahmadi, A., Mellado, B., Wu, J., Orbinski, J., Agary, A., & Kong, J. D. (2023). Twitter-Based Gender Recognition Using Transformers. arXiv preprint arXiv:2205.06801. (Submitted to Pattern Recognition Letters).
15. Han*, Q., Bragazzi*, N. L., Asgary, A., Orbinski, J., Wu, J., & Kong, J. D. (2023). Estimation of epidemiological parameters and ascertainment rate from early transmission of COVID-19 across Africa. Available at SSRN 4131409 (Submitted to Scientific Reports).
16. Sekkak I, Kong JD, El Fatini M. Containing and Managing an Emerging Disease Outbreak: A Stochastic Modelling Approach. Available at SSRN. 2023 Feb 17. (Submitted to SIAM Journal on Applied Mathematics).
17. Ogbuokiri* W, Bragazzi* NL, Asgary A, Orbinski J, Wu J, Kong JD. The Role of Behavioral Compliance to Non-Pharmaceutical and Pharmaceutical Interventions in the Fight Against COVID-19: Insights From a Behavior-Disease Economic Epidemic Model Coupled With Optimal Control Theory. Available at SSRN 3922118. (Submitted to Journal of Mathematical Biology).
18. Nia* ZM, Asgary A, Bragazzi N, Melado B, Orbinski J, Wu J, Kong JD Tracing Unemployment Rate of South Africa during the COVID-19 Pandemic Using Twitter Data JMIR Preprints. 26/09/2021:33843 (In press in Frontiers in Public Health)
- Service assignments and other contributions
19. Naderi PT, Asgary A, Kong J, Wu J, Taghiyareh F. COVID-19 Vaccine Hesitancy and Information Diffusion: An Agent-based Modeling Approach. arXiv preprint arXiv:2109.01182. (Submitted to Scientific Reports).
20. Guelmami N, Chalghaf N, Wu J, Kong JD, Mellado B, Jahrami H, Ben Khalifa M, Amayra T, Azaiez F, Bragazzi* NL. Social Media COVID-19 Information and Vaccine Decision: A Latent Class Analysis. Available at SSRN 3841301. (Submitted to BMC Medical Informatics and Decision Making).
21. David* JF, Iyaniwura* SA, Yuan* P, Tan* Y, Kong JD, Zhu H. Modeling the potential impact of indirect transmission on COVID-19 epidemic. medRxiv. (Submitted to Bulletin of Mathematical Biology)
22. Degoot, Abdoelnaser M., Eva Lilian, and Wilfred Ndifon. A Simple Mathematical Model for Assessing Impact of NPI Measures Against COVID-19 in Rwanda (draft paper).
23. Degoot, Abdoelnaser M., and Wilfred Ndifon. Stochastics of DNA Quantification. arXiv preprint arXiv:2301.02149 (2023).
24. Degoot, Abdoelnaser M., Neil Turok, and Wilfred Ndifon. Group Testing via Hypercube Slicing Matrices. Pre-print (2022).

26. Building Capacity: Through our collaboration, we have built capacities for the use of artificial intelligence in public health in the various countries. Our highly qualified personnel meet weekly to learn from each other in addition to the meetings with their individual team leaders. Through the unique training that we are giving them, they have gained essential and transferable skills, including the capacity to develop research questions, design and analyze artificial intelligence models, manage data, mentor junior scientists, and conduct complex cutting edge public health data analyses on large datasets using artificial intelligence and big data techniques. This has resulted to a critical mass of next generation world-class researchers and practitioners that will ensure these countries can mobilize the required expertise for modeling assisted rapid responses to existing and emerging public health issues. Each country can now boast of at least 5 experts in using artificial intelligence to address public health issues.

27. Because of the impact of our work and our strategy, we have been spotlight as Canadian Innovation Research Leaders. A link where we are spotlighted among Canadian Innovation Research Leaders: <https://researchinfosource.com/pdf/CIL2021.pdf>

researchinfosource.com March 3, 2021

INSIDE

<p>3 Canada's Top 50 Research Universities</p> <p>6 Leaders' Corner</p> <p>10 Focus on Canada's Recovery: Research is Key</p> <p>11 Researchers' Corner</p>	<p>12 Canada's Innovation Achievements</p> <p>16 Canada's Top 40 Research Hospitals</p> <p>18 Canada's Top 50 Research Colleges</p> <p>22 Canada's Top 100 Corporate R&D Spenders</p>
---	---

CANADIS TOP 100 CORPORATE R&D SPENDERS CANADIS TOP 50 RESEARCH UNIVERSITIES CANADIS TOP 40 RESEARCH HOSPITALS CANADIS TOP 50 RESEARCH COLLEGES

RESEARCH 20 YEARS LEADERSHIP FOCUS ON CANADA'S RECOVERY RESEARCH IS KEY

CANADA'S INNOVATION LEADERS 2021

20/20 Innovation Vision: Looking back and moving forward

Canada's decades-long effort to up its lacklustre innovation game has shown

councils together and then not completing the actions recommended by them," said Naylor. "Canada has been teetering on the brink of an outstanding transformation

as one might think, according to Dr. Peter Nicholson, an innovation expert who has held senior posts in government, business, science, and academia. Necessity, as the

among OECD nations – a situation that has persisted for most of the last 20 years. CME's goal is for Canada to attract at least 2% of global capital which companies could use to invest in innovation. "We call it the 2% challenge," said Darby. "If Canada could double its investment in technology and investment to become more efficient, to improve the resiliency of our supply chains, to become more greenhouse gas-efficient

which continues to be the single biggest market for Canadian exports. "US President Joe Biden has shown any particular affinity for NAFTA or continental free trade. Right now it's all about the US," he noted. "I need a better understanding that we mix things together, that we're integrat because we haven't really been on radar screens in the U.S."

28. **AI-enhanced Air quality monitoring device** :We developed an air quality monitoring device that we designed to collect aerosols and study health-related challenges: <https://www.sacaqm.org/partners>. The system combines power-optimized air quality sensors with a low-cost Internet-of-Things (IoT) network architecture and Artificial Intelligence predictive capabilities (AI).

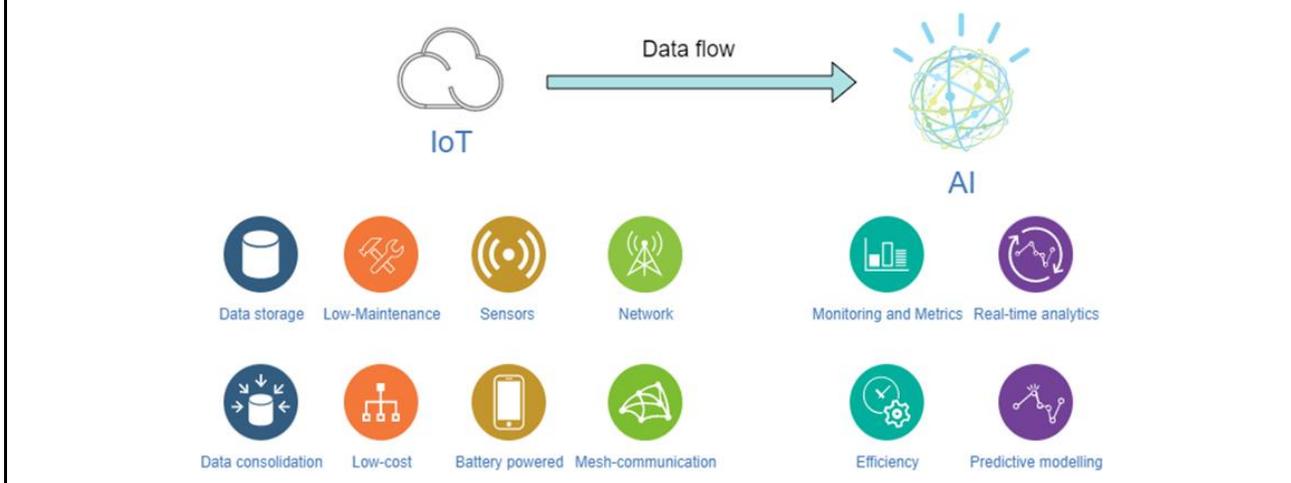
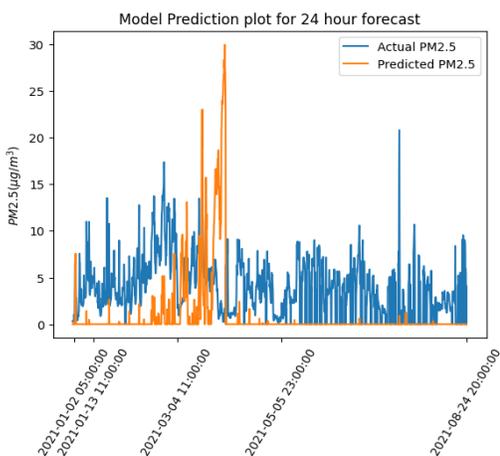
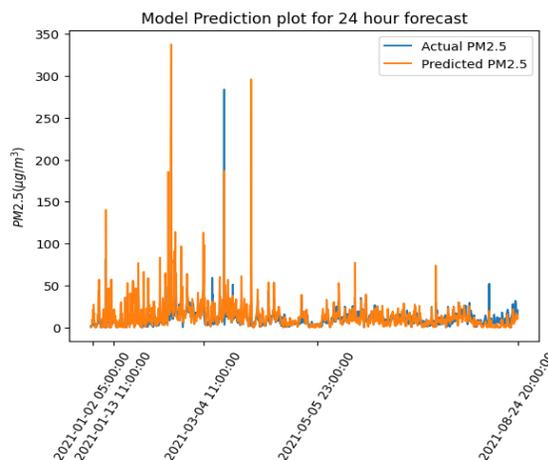


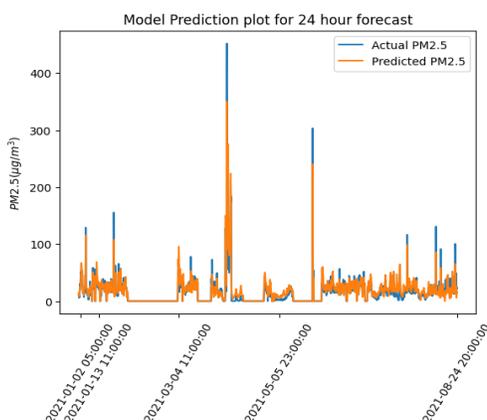
Figure: A high-level view of the AI_r Air Quality Monitoring Systems key attributes.



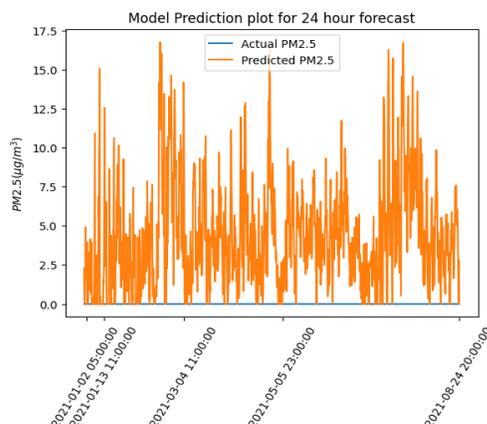
1. Dikolong station



2. Mokopane station



3. Capricorn station



4. Thabazimbi station

2.4. Gender and diversity

Describe your experience integrating gender and diversity considerations in the project's activities. Have you adjusted or changed plans since the original proposal? What are some emerging learnings? A glossary of gender-related terms is provided in Annex 1 to help you prepare your response. You can also refer to the resource materials on the [AI4COVID research page](#).

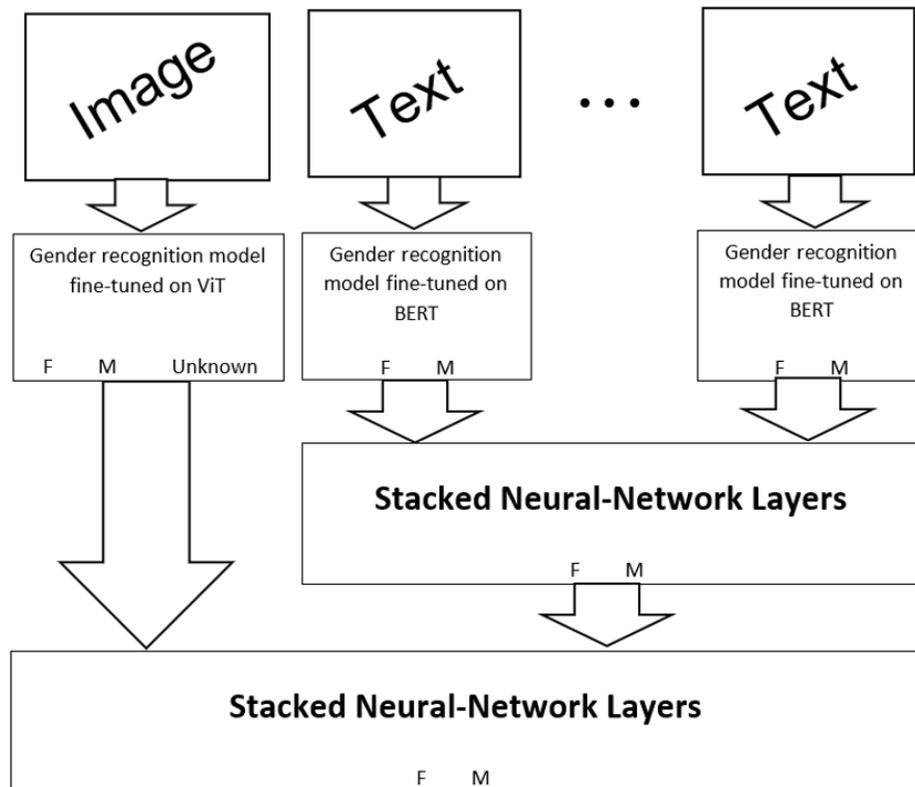
With help from our colleagues from Gender at Works, we adjusted our plans and embedded gender and diversity priorities into our project's goals, methods, governance, and implementation plan (much more than we did in our proposal). We went through the Gender Action Learning program (led by Gender at Work), which helped transform our research approach. We quickly learned that gender has profound implications for health over the life course and affects a person's experiences of emergencies and crises, their exposure to disease and use of healthcare resources. Gender disparities dramatically and disproportionately impact women and girls. These heightened vulnerabilities include differential exposures, pathogen vulnerability, and health and societal consequences. From a gender-based lens, sex-based biological and gendered socio-cultural norms and structural inequalities have proven to be factors that differentiate women's experiences of disease outbreaks. We observed that due to women's primary responsibility in paid and unpaid care work, the burden of care disproportionately fell on women in the home and in health care services while men's higher rates of smoking were a co-morbidity factor for vulnerability to COVID-19. We acknowledge that the history of colonialism and gendered oppression has enduring effects. It disproportionately impacts the health and quality of life of formerly colonized people and vulnerable groups, such as women, gender non-conforming people, people with disabilities, rural communities, and low-income households.

Our theoretical framework was modified to now have a Gender, Equity, Inclusion, and Decolonization lens (GEID). We have learned that intersecting and compounded forms of injustices and inequalities necessitate a feminist intersectional lens, decolonial methods, and the integration of diversity in research, and public policy processes. For us, decolonization is not a metaphor, but a political endeavor towards crucial transformation to equitable health. As part of our decolonial framework, we plan with, learn from, and act with communities and build capacity in communities. We embedded Gender, Equity, Inclusion and Decolonization (GEID) priorities into our project's questions, objectives, methods, interpretation of results, governance, and implementation plan. We meet every two weeks and share our gender, initiatives', observations, challenges and successes. "Sharing regularly" has been the best teacher that has gotten so many of our team members from being gender neutral to not only performing gender sensitive or responsive research but gender transformative research (proud to say this). We document and evaluate our GEID initiatives' challenges and successes in our publications and the dissemination of the project's work for both academic and general audiences -- thus specifically demonstrating the connections between GEID and transformational change. All members of our team have taken GEID and Unconscious Bias training found here: <https://www.chairs-chaires.gc.ca/program-programme/equity-equite/bias/module-eng.aspx>; <https://www.cihr-irsc-igh-isfh.ca/?lang=en>. We have organized webinar series that are aimed at discussing how our project is addressing equity diversity and inclusion, both within the team and in all aspects of our work, so that team members can raise any issues they have noticed, and we can act on them. Community partner organizations, students, and all colleagues involved have been included in these discussions. We have been inviting facilitators and speakers, as appropriate We seek diversity across disciplines, jurisdictions, and those groups requiring equity-oriented remediation. We have taken a whole-of-society approach to network composition, consultation, and implementation that is intersectional, intergenerational, and gender- and trans-gender-inclusive. This includes seeking out diverse scholars and practitioners, and also incorporating community expertise and lived experiences through active participation of informal and marginalized groups in decision-making processes and project development.

Our core team in the network and country-specific applied research teams co-learned, co-created and took actions on GEID 'change projects'. The GAL process provided the needed feminist and GEID resources and built critically reflective and co-learning relationships through virtual workshops and one in-person workshop (held in Kenya). These workshops use participatory feminist appreciative inquiry methods to support capacity building, critical consciousness and accelerate action on the GEID change projects. The GAL process deepened and advanced each country and the whole networks' gender responsive and inclusion AI-driven health research and policy and program influencing.

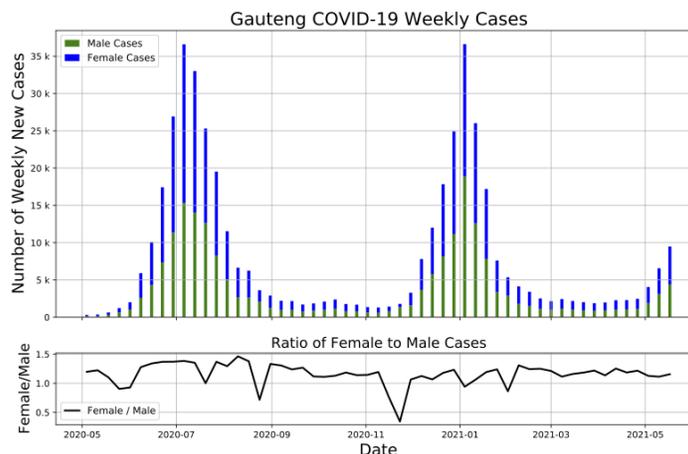
Despite succeeding in influencing policy makers to ensure that data is disaggregated by race, gender, sexuality, class, geographic location and Indigeneity to better understand how COVID-19 is disproportionately affecting vulnerable people, we have not been able to convince them to include other forms of gender. Thus, we have not been able to successfully integrate gender considerations into our project activities as much as we would have loved to since gender is binary in our data set. The following are examples of some of our gender transformative research.

A. ACADIC has come up with a novel model for predicting twitter user's gender from their images and tweets (<https://arxiv.org/pdf/2205.06801.pdf>)



B. COVID-19 Modeling and Projections

- As the pandemic progressed, data driven analysis of gender dynamics were developed to inform modeling efforts and understand the gender specific virus dynamics in South Africa.

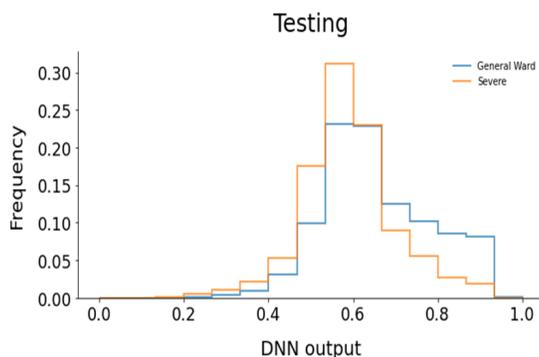


C. Leveraging AI and Big Data techniques for a gender-transformative clinical public health and vaccination roll-out strategies(<https://doi.org/10.3390/ijerph18157890>).

- Gender and ethnicity are amongst the 14 input features used to train our AI model for this purpose.

D. Analysis of Clinical and demographic characteristics of male and female COVID-19 patients

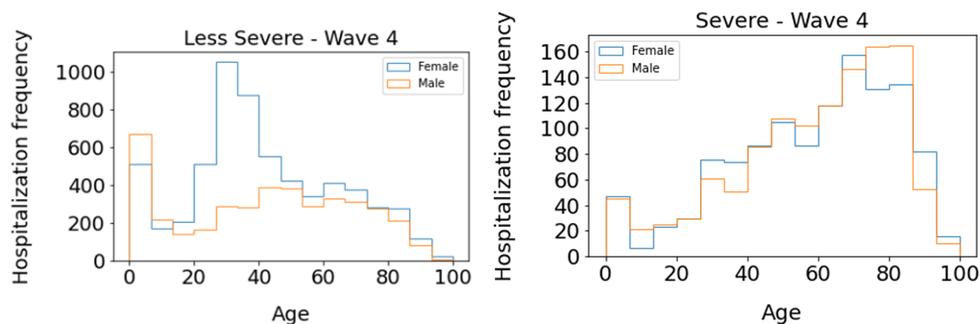
We leverage AI to provide a detailed analysis of the clinical and demographic characteristics of male and female COVID-19 patients admitted in hospitals across communities. This helped us determine the COVID-19 hospitalization rates, disease severity, and mortality difference between males and females. It also helped us identify hidden clinical and demographic variables that account for any observed gender differences in COVID-19 hospitalization and outcomes. A weak supervision learning algorithm was used to perform binary classification. The training of a DNN was performed on 14 dimensions of patient characteristics (Demographic variables, presence of comorbidity, care received upon admission and setting of care), to separate the two classes of data sets: a) severe disease class (a proxy measure of higher severity, which included those who died during admission or were admitted into an intensive care (ICU) or high care unit (HCU)), and b) less severe disease class.



For Gauteng province in South Africa (for example) a sum of 147,141 patients were admitted to hospital for COVID-19 in Gauteng province between 7 March 2020 and 25 March 2022. The number of Covid-19

hospitalisations was highest in wave 3 for both males and females, and higher in females than males across all 4 waves. Whereas the lowest number of COVID-19 hospitalizations occurred during the first wave.

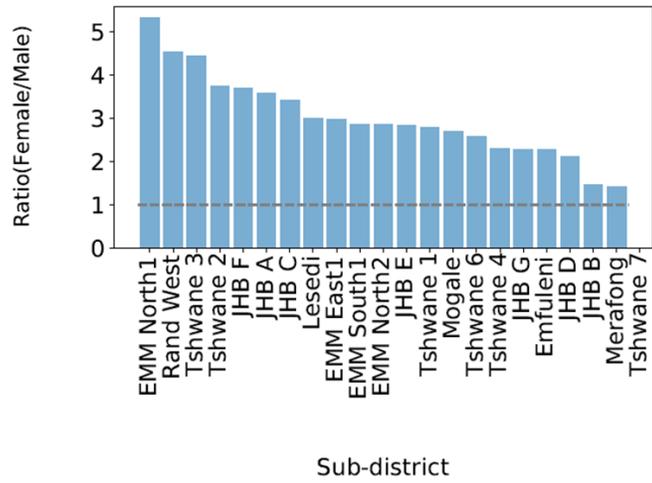
The observed difference in COVID-19 hospitalization frequency between men and women was highest for wave 4 in the 20 - 40-year age group with a ratio of 1:3 for COVID-19 hospitalisation between men and women. Within the severe disease class, similar hospitalization frequencies were observed for all ages across the four waves, except for those aged between 50 and 80 years, where a higher frequency was observed. Similarly, less severe disease showed similar frequencies between male and females, with the exception of the 20–40-year age group, where females had three times more hospital admissions.



Results from the analysis of co-morbidity uncovered gender differences for hypertension, diabetes, and HIV frequencies across all age groups. Like hypertension, females with diabetes experienced higher frequencies of severe disease in comparison to males for the fourth wave, where there are no noticeable differences in the less severe cases of disease. Results from the t-test analysis show there were statistically significant differences in hypertension frequencies between the sexes in the first three waves, however showed no significance in the fourth wave. Diabetes showed no significance across all four waves. Lastly HIV showed statistically significant differences between the sexes across all four waves of the pandemic.

Our study shows that overall women accounted for 53.5% of hospitalisations, among those who had one or more comorbidity women accounted for 63%. The observed gender difference in hospitalization was greater in the fourth wave in comparison to the first three waves, a period when the omicron variant became more prevalent. Results from the t-test show the observed differences were significant. The difference in hospitalization between men and women observed in the fourth wave conveyed that despite females in the 20-to-40-year age group showing higher numbers of hospitalization, these occurred mostly in the general ward of various health facilities within the province, indicating less severe cases of disease in women.

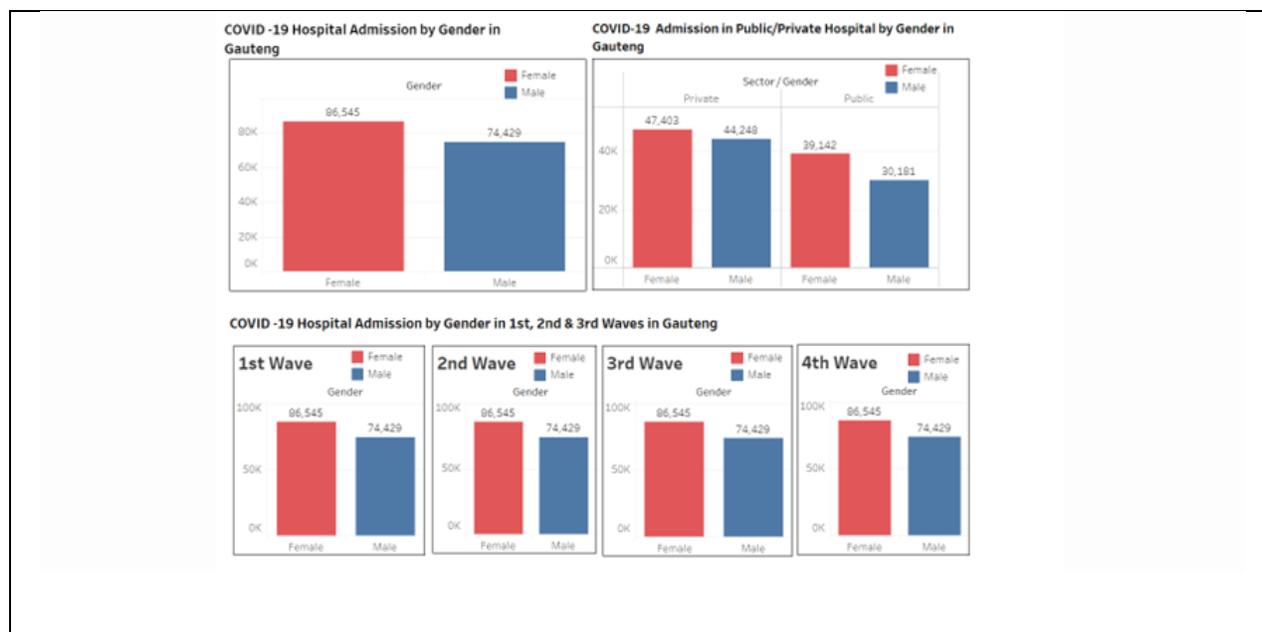
Evidently, the fourth wave has demonstrated a larger increase in the gender imbalance across all sub-districts within the Gauteng province, with three districts having no data for this time period as seen in. Differences in hospitalization frequency remained balanced on average between males and females, therefore the data reported in the graph below speaks to the fourth wave where gender differences were observed across the sub-districts.



F. Gender responsive COVID-19 Dashboard (<https://academic.org/covid-19-dashboards/>; <https://www.covid19sa.org>)

Our dashboards visualize disaggregated data provided by the departments of health in the various countries. We visualize hospital admission by gender, age, hospital admission ward, hospital discharge status, hospital admission during waves, and chronic condition in the patient at hospital admission.





2.5. COVID-19 context

How is the COVID-19 pandemic having an impact (positive, negative, or both) on research and engagement plans? What are emerging challenges and opportunities, as well as policy windows that the latest developments in the pandemic have created?

Impact: The ongoing COVID-19 pandemic has exerted a subtle, complex impact on research and engagement plans. On the one hand, it has distorted and even amplified existing inequalities and disparities in terms of the amount of scholarly output, share of global knowledge, and patterns of collaborations, due to the chronic lack of infrastructures, facilities and resources that plagues Africa. On the other hand, COVID-19 provided new opportunities for research collaborations, which contributed to generating novel international partners for academic exchanges, and research collaborations (<https://doi.org/10.3390/ijerph18147273>). Furthermore, COVID-19 enabled the identification of research fields in which African scholars can strengthen their scientific leadership.

Challenges: The COVID-19 pandemic has exacerbated global socio-economic inequities, revealing how crises affect people differently according to their gender, skin colour, geographic location, Indigeneity, and other factors, in troubling patterns which do not bode well for resilience to future crises. Human interrelatedness and our ecological dependence have never been clearer. Integrating governance at widening levels, and mitigating the limited economic options of marginalized communities, are two examples of systemic challenges which require attention for human futurity – but in many cases, even the data required to document and understand these challenges is not available.

As comprehensive measures are taken to curb the spread of the virus, it is imperative to investigate how these measures, made with the right data, could increase community resilience for future global pandemics. For stronger and more resilient governance strategies that increase societal preparedness to face future global challenges (e.g., pandemics) equitably, there is a need to address the data gaps revealed by the COVID-19 pandemic. International collaborations between researchers, policy makers, community leaders etc (as in ACADIC) that permits partners to ‘leapfrog’ novel ideas across countries and circumstances is highly needed for global resilience. Strategies to help reduce inequalities and vulnerabilities of health going forward includes 1) participatory work with vulnerable communities and populations to identify their needs, priorities, and areas of expertise; 2) novel data gathering techniques including citizen science and simple, anonymous digital platforms for data reporting; 3) novel data-sharing and dissemination to policy makers, researchers and

marginalized groups, for incorporation in informal-sector and community-based initiatives; and 4) prioritization and respect for local knowledge, diverse ways of knowing, and community solidarity in risk management.

2.6 Key achievements

Briefly present what you think are the 2 or 3 biggest achievements or results that happened this last year. Explain why you think these are the most important results or achievements and their contributions to the field of AI4D.

***Reference number in this section refers to the Peer-reviewed publications references listed in the Section: Research findings

1. COVID-19 Modeling and Projections with Responsible AI

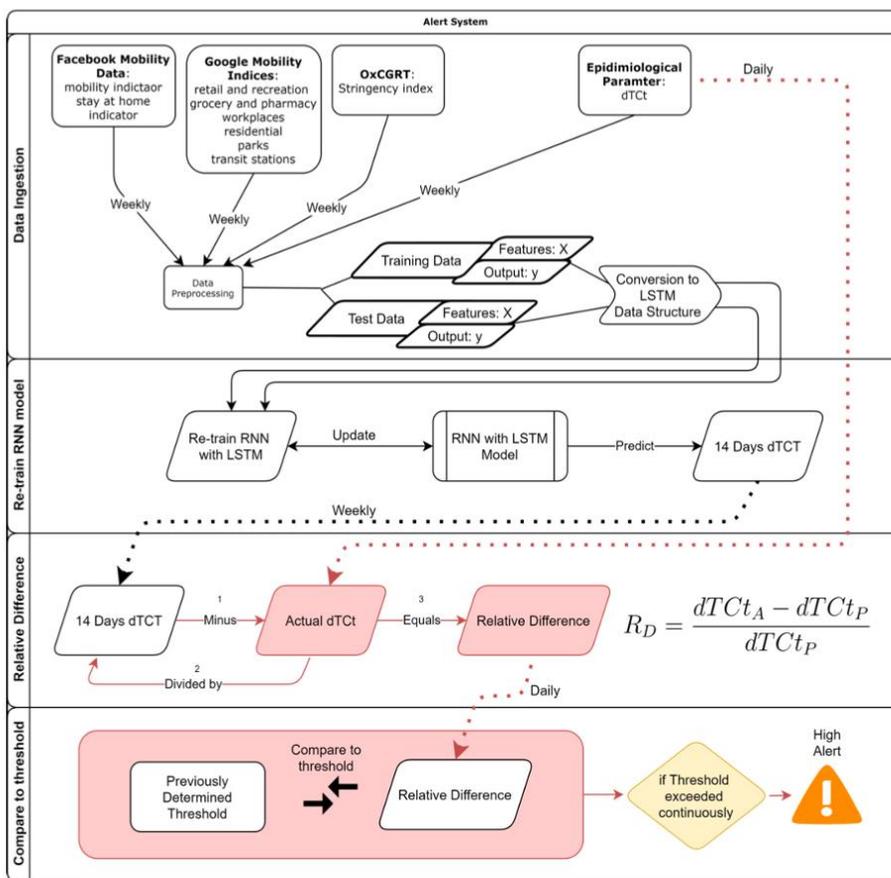
Last year, we continue to assist policy- and decision-makers with the fight against COVID-19, including (i) monitoring and forecasting the growth and spread of COVID-19 at the local, state, and national levels [1-60; <https://academic.org/>, <http://www.covid19sa.org/>], (ii) evaluating efforts to mitigate and control the spread [11, 12,14, 20-23, 32, 33,41, 42, 44 , 59, 62], (iii) identifying trends in the disease infections, hospitalizations, and deaths (<https://academic.org/>, <http://www.covid19sa.org/>), (iv) guiding purchase and allocation of health care resources [14], (v) guiding the collection of data (ensuring that data were disaggregated by race, gender, sexuality, class, geographic location, and Indigeneity) (<https://academic.org/>, <http://www.covid19sa.org/>), (vi) guiding the implementation of vaccine roll-out and the development of effective, data-driven, evidence-informed immunization strategies, taking into account that available supply of vaccines in Africa was limited [10, 12, 15, 23 , 32, 33, 52]; (vii) providing situational intelligence: on populations at risk, stage of the outbreak, the projected burden of illness, school/business/work closure and re-opening, etc. [11, 12,14, 20-23, 32, 33,41, 42, 44 , 59, 62], (viii) nowcasting labor market flow [61], (ix) supporting race, gender, sexuality, class, geographic location, and Indigeneity, inclusive COVID-19 actions [Kong et al. preprint; 33,62; <https://academic.org/>, <http://www.covid19sa.org/>], (x) developing methodologies and technologies to describe contact mixing and transmission networks to quantify impacts of contact shifting and individual mobility [12,50], (xi) supporting transparent and responsible AI, data, and digital rights governance around COVID-19 and pandemic responses [4], (xii) strengthening data systems and information sharing about COVID-19 [Kong et al. preprint], (xiii) building trust and combatting mis- and dis-information around COVID-19 [15], (xiv) optimizing public health system responses for patient diagnosis, care, and management [11, 12,14, 20-23, 32, 33,41, 42, 44 , 59, 62](xv) establishing sustainable collaborations among model developers, policymakers, community leaders, etc. [4] , (xvi) preparing the next generation of leaders in infectious disease AI-and BDA-based modeling approaches in these countries [4], (xvii) working closely with public health agencies and other stakeholders to build trust and knowledge of AI-based models among key decision-makers [4], (xviii) developing stand-alone and predictive clinical public health decision support tools [4], and, (xix) creating a collaborative network that can respond rapidly to support decision-makers in each country to address infectious diseases or other disasters and emergency situations in general [4].

ACADIC continued last year to use AI- and BDA-based modeling to prioritize strategies in the COVID-19 vaccine roll-out, using Deep Neural Network (DNN) algorithms [52]. In addition, ACADIC has been utilizing “non-conventional data streams”, such as Google searches, Wiki trends, Facebook, Reddit, LinkedIn, Twitter [1,10,15, 19, 61], to better understand the “dynamics in sentiments toward community-based infectious diseases- related discussions” and to provide “city-level information to health policy in planning and decision-making regarding vaccine hesitancy” [15] and adopted macroeconomic responses to COVID-19 pandemic [61]. Subsequently, the ACADIC consortium has been transferring this pilot study to other African settings and contexts in terms of knowledge gained, lessons learned, and developed modeling techniques.

This has required accounting for country-specific differences in socio-demographic, epidemiological, and clinical variables, including rates of comorbidities. As such, ACADIC has been re-weighting the models initially developed for South Africa. Last year ACADIC carried this out with eight other African countries, in terms of validating and further correcting/adapting procedures in order to ensure that the assumptions of the model are aligned with the specific features of the selected country. Moreover, in terms of “explainable, trustworthy, responsible AI and BDA for social good”, ACADIC is also making efforts to expand our understanding of social disparities and vulnerabilities, which are of crucial importance in data gathering/collection, model design and implementation, and outcome interpretation [62]. A set of sources—such as detailed, locally informed geospatial maps—will be employed as inputs to our future models. Further, gender is a major variable impacting COVID-19, as well as other diseases and disease outbreaks, in terms of risk of developing communicable diseases, disease severity, response to treatment, adverse reactions to medications, and magnified social vulnerability. For this reason, it is being actively incorporated and fully embedded by ACADIC across all AI- and BDA-based models, performing what is known as “Gendered Health Analysis” (GHA). ACADIC is also devising models that can assist clinical public and global health policy- and decision-makers develop optimal COVID-19 testing policies and mass vaccination strategies as well as help in identifying some coronavirus variants of concern (VOCs) that may evade immunity conferred by vaccines and previous infections.

Though already mentioned above, I will like to spotlight the Early Warning System (EWS) for re-emerging COVID-19 outbreaks that we designed last year. This is because we have expanded this and have designed an early warning system for major re-emerging diseases in Africa. We are at the moment working on expanding it to warn of an emerging outbreak ahead of time. This will be a major breakthrough.

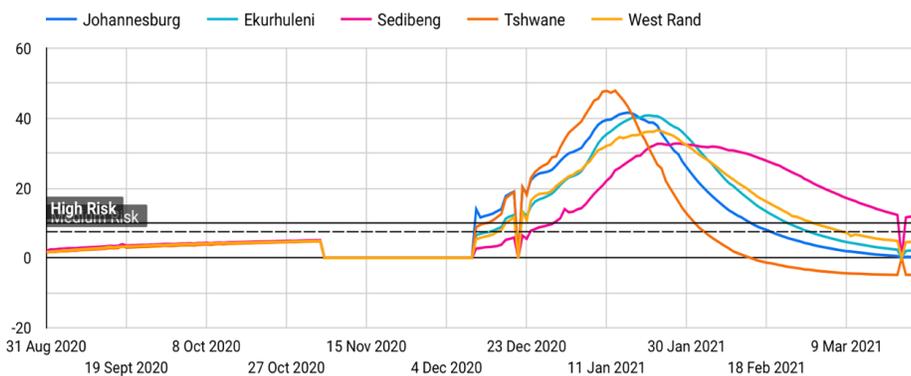
*****Early Warning systems for COVID-19 Waves** (<https://doi.org/10.3390/ijerph18147376>). We designed an early warning system for future waves of COVID-19 using a recurrent neural network with long short-term memory. The system is working effectively and has been utilised by the Gauteng provincial government in South Africa. This was covered by multiple national and international media including German DW TV(<https://www.dw.com/en/covid-artificial-intelligence-in-the-pandemic/a-58171146>)



The figure below shows the third wave predictions in South Africa by ACADIC.

Graph showing the 3rd wave risk index for 5 Districts in Gauteng

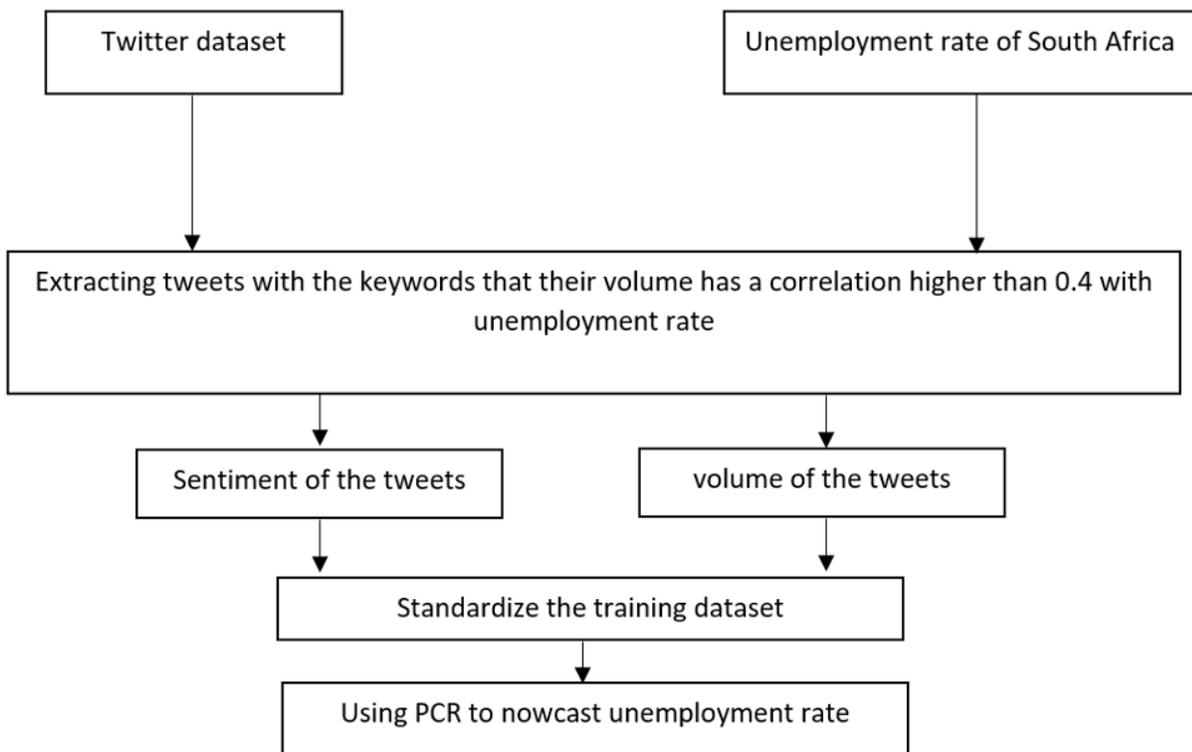
From the 05 November 2020 to 10 December 2020, there was no data available. These explains the gap in the graph.



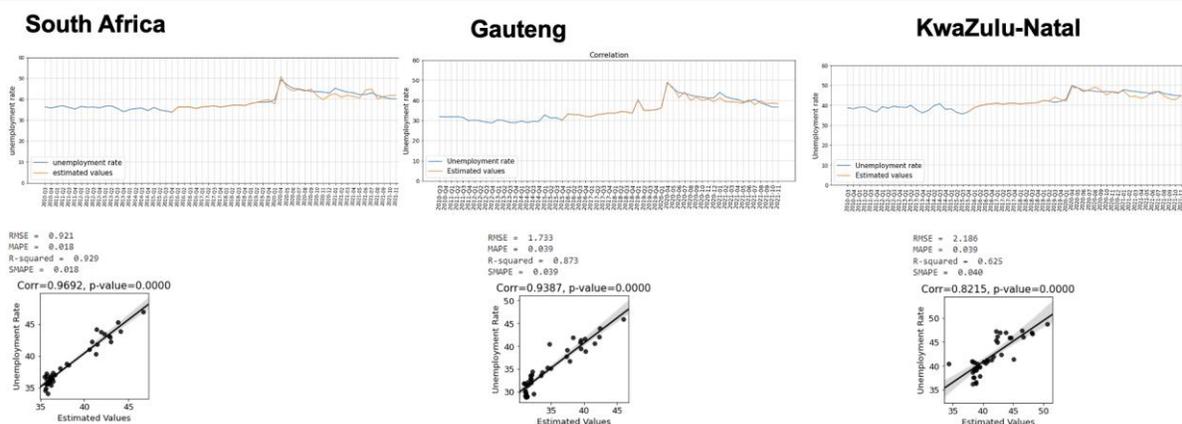
***Providing a near term forecasts (nowcasting) of labour market flows in Africa during the pandemic (<https://doi.org/10.3389/fpubh.2022.952363>):

I am equally highlighting the framework we have been using to nowcast unemployment in South Africa because of how helpful it has been to the Government of Gauteng.

As COVID-19 was going on, the government of Gauteng wanted to have an idea of the level of unemployment in the province. Unemployment rate is an important economic indicator that is input into decision making by policy makers. Measuring unemployment rate using the traditional approach: Is expensive and time-consuming; Requires a lot of man-power and administrative personnel; Faces many difficulties and obstacles (e.g. low public cooperation, dealing with migration/homelessness/nomadism, privacy concerns); Mostly done on seasonal and annual basis; The results are ready to report several months later. An alternative approach is to leverage AI to use social media data to nowcast the unemployment rate, because its cheaper and faster; Only requires several lines of code; Could easily be measured on a monthly basis; The result is available in real-time. To this end, ACADIC immediately employs artificial intelligence to provide a framework that can be used to provide more timely information about the unemployment rate in countries across Africa.



Using AI, unemployment rate was nowcasted with an outstanding accuracy.



***Dashboards

Throughout last year, our dashboards continue to be the first go to destination by the public and government for COVID-19 related information. Thus worth spotlighting as a great achievement for last year as well.

Last year, we improved our AI-powered analytics dashboards. These tools are unique in that they do not only provide real-time visualization but also detailed modelling and predictions down to the smallest administrative unit in each region. Experts and high-level policy-makers use these tools to visualize the situation on the ground and

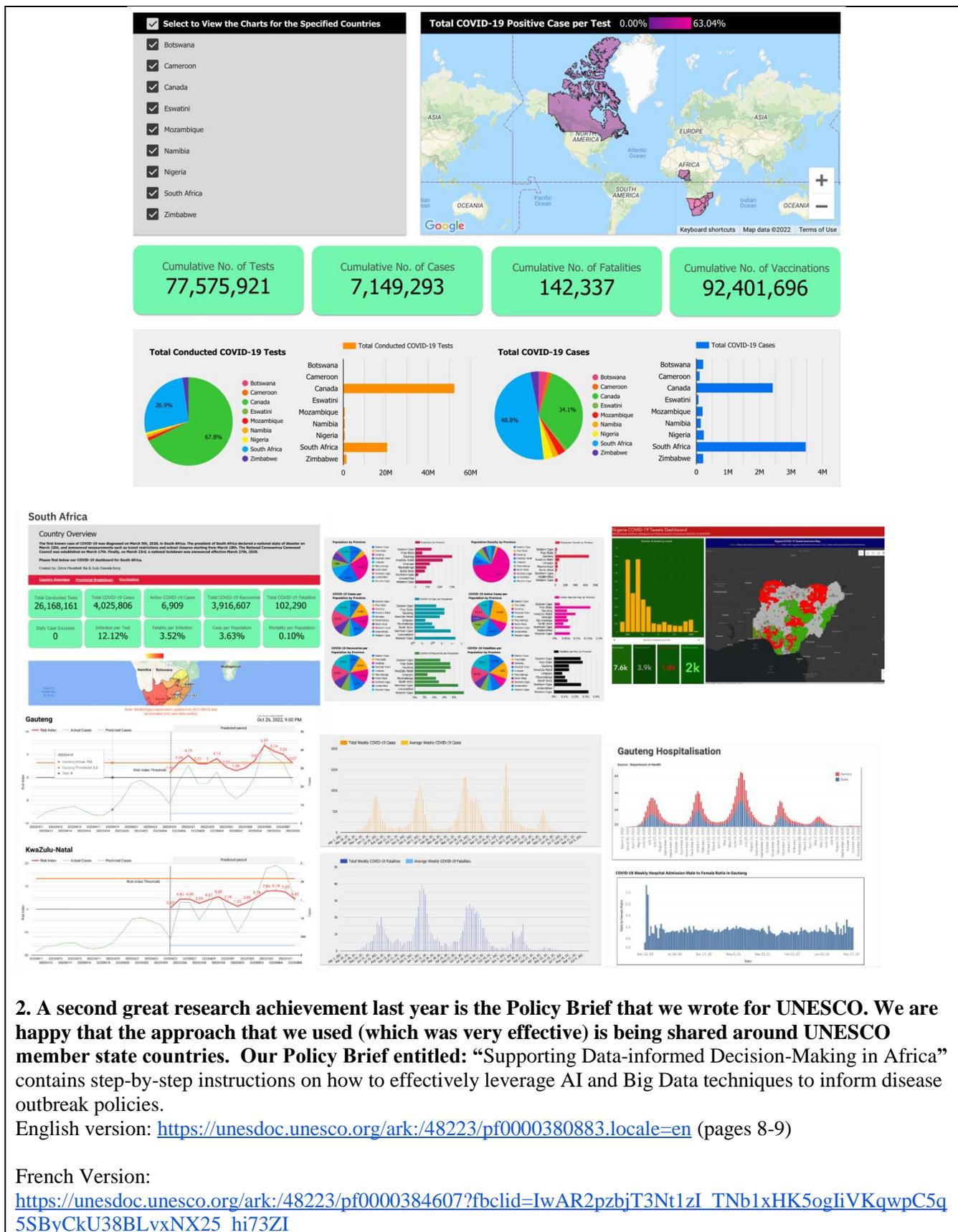
enact policies accordingly. These dashboards are the official dashboards used by policy makers in Botswana, Eswatini, Cameroon,

Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe. The website for South Africa is viewed by more than one million people daily and those for the other countries is viewed by more than 50 thousand people daily. Below is a link to the Dashboards

- <https://academic.org/covid-19-dashboards/>
- South Africa: <http://www.covid19sa.org/>
- Botswana: <https://tinyurl.com/4e83hubd>
- Eswatini: <https://tinyurl.com/2p9eyeff>
- Mozambique: <https://tinyurl.com/3wrxwvr7>
- Cameroon: <https://tinyurl.com/ynd878fz>
- Nigeria: <https://tinyurl.com/ytmxuzmp>

A disease outbreak response requires timely exchange of information between policy makers and the public.

People are usually keen to see how the dynamics is evolving in their communities where their families live, or places they plan to travel. This dictate the need for an urgent dashboard during an outbreak. To this end we integrated the power of Artificial Intelligence, predictive modelling and simulations, to develop COVID-19 monitoring dashboards that visualize information locally relevant to the public and policy makers.

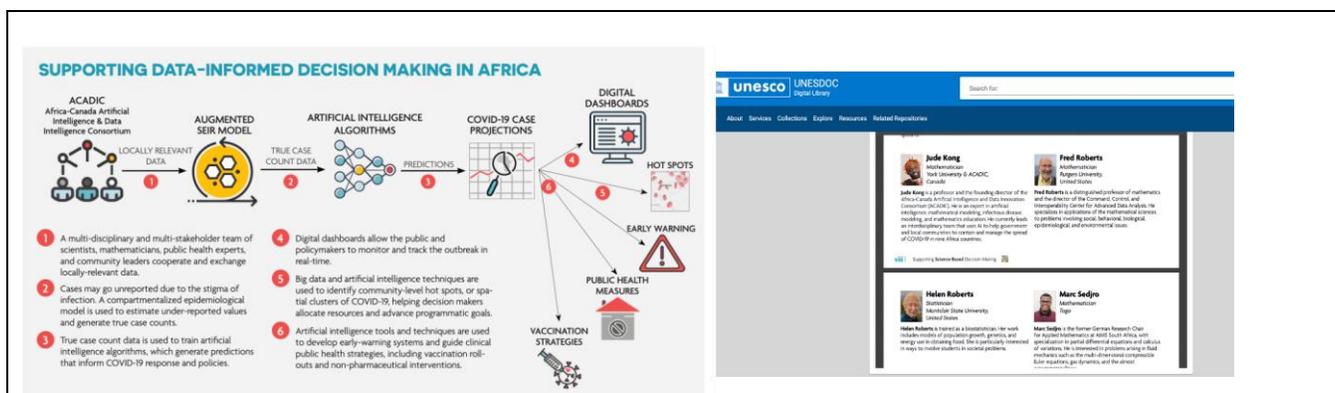


2. A second great research achievement last year is the Policy Brief that we wrote for UNESCO. We are happy that the approach that we used (which was very effective) is being shared around UNESCO member state countries. Our Policy Brief entitled: “Supporting Data-informed Decision-Making in Africa” contains step-by-step instructions on how to effectively leverage AI and Big Data techniques to inform disease outbreak policies.

English version: <https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en> (pages 8-9)

French Version:

<https://unesdoc.unesco.org/ark:/48223/pf0000384607?fbclid=IwAR2pzbjT3Nt1zI TNb1xHK5ogliVKqwpC5q 5SByCkU38BLvxNX25 hi73ZI>



3. Another achievement last year was providing insight information on Omicron to Federal Government of Canada and the Ontario COVID-19 Science Advisory Table:

When the omicron variant became a global public health issue, Canada's deputy Minister of health and the Ontario COVID-19 Science Advisory Table (led by Dr. Peter Juni) reached out to us (Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC)), and intensively consulted with ACADIC's AI4COVID Program team at the University of the Witwatersrand (led by Prof. Bruce Mellado) to estimate the disease burden of the omicron variant from our South African data.

Within this period we met separately with the provincial government and Ontario COVID-19 Science Advisory Table every day for at least two weeks. We shared all the data from South Africa with them and equally had working meetings to discuss what was happening. We provided the Canadian government with first-hand knowledge about Omicron.

Our collaboration with the federal government and Ontario COVID-19 Science Advisory Table emphasize the importance of supporting international development work. Our work greatly informed Omicron policies in Canada as the government of Gauteng (represented by Bruce) provided first-hand knowledge/experience and expertise about the dynamics of the variant. Before it became a major concern in the country, we already knew everything about it from the government of Gauteng. This is the best surveillance intelligence we can have.

Below are some of the intelligence we provided to the federal government and the Ontario Science Advisory Table. We were giving these presentations to them every day followed by a working meeting.

1. https://www.dropbox.com/s/7aww7hwhp8dexdp/ACADIC_Canada_Health_291121.ppt?dl=0
2. https://www.dropbox.com/s/iq2p3w20wld0rj3/ACADIC_Science_Table_301121.ppt?dl=0
3. https://www.dropbox.com/s/wns8k3gadypmv6c/ACADIC_Status_4thwave_041221.ppt?dl=0
4. https://www.dropbox.com/s/p7qryumycaw9pox/ACADIC_Status_4thwave_071221.ppt?dl=0
5. https://www.dropbox.com/s/sdhffqy11bd2lua/ACADIC_Status_4thwave_121221.ppt?dl=0
6. https://www.dropbox.com/s/5mtvr49mr25th0m/ACADIC_IDRC_010222.ppt?dl=0

4. To add one additional achievement; last year, we designed an air quality monitoring device that is currently being deployed across South Africa and in the Oil Sands tailing in Alberta. We are super impressed with this device. Detailed information about this AI-, IoT-enhanced device can be found here:
<https://www.sacaqm.org/partners>.

We are using the measurements from the device to study it's impact on human health.

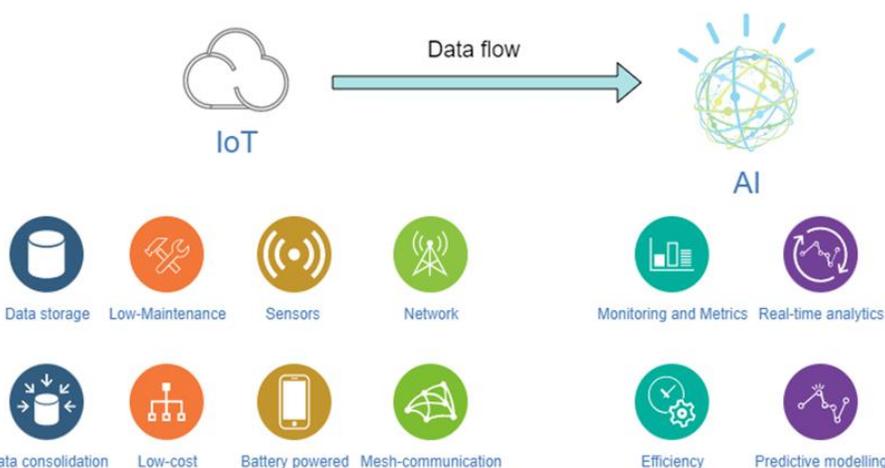


Figure: A high-level view of the AI_r Air Quality Monitoring Systems key attributes.



2.7 Preliminary lessons learned

If relevant, please share any learning about executing your project that may inform future activities related to your project. Include any lessons that can be relevant to other activities or the AI4COVID initiative as a whole.

Through the ACADIC project in Africa, we have learned various lessons that will inform the execution of future programs and initiatives in the field of clinical public health and AI in Africa. These lessons point to:

Lesson no 1: A Need for Partnerships with Community-Led Organizations (CLOs) and Community Healthcare Workers

Partnering with CLOs and community healthcare workers helped us to acquire some of the data from communities and populations that do not visit the healthcare system. In our partnership with community health workers, we had

them visit households in certain communities to collect data for us. Some of the CLOs that we partnered with already have networks set up in some of these communities and this made it very easy for us to acquire some of the “hard to get” data. For a meaningful change in the health of people in communities, it is important for solutions to be developed and scaled from the bottom up, as modeling and data collection must be community-focused, owned, and -co-led .

Lesson no 2: A Need for Buy-In from the Decision- and Policymakers

In most of the countries in Africa, without “buy-in” from the government, it is difficult to influence policies or implement research results. For policy-driven research in Africa, this is essential. Buy-in from the decision- and policymakers gave us access to data and the ability to influence the collection of data. Thanks to the fact that we had a seat at the table where decisions were made, we were able to influence data gathering in most of the countries and had it disaggregated/stratified by ethnicity, gender, sexuality, socio-economic class, geographic location, and Indigeneity to better understand how COVID-19 is disproportionately affecting socially vulnerable people. It enabled us to influence government communication strategies to address misinformation about the prevention and treatment of COVID-19.

Lesson no 3: A Need for a Diverse Blend of Research and Implementation Experts

It is essential to put together a team with different expertise. The diverse expertise in our team enabled us to merge new data sources from science, technology, social, and cultural systems, in relation to opportunities and risks, centering local needs and knowledge while learning from all partners’ experiences. Being engaged with communities gave us the ability to adjust swiftly to changing circumstances.

Lesson no 4: A Need for a Network to Create and Promote Mutual Support across the Network

For impactful research work in Africa, it is important to create a network and have each team uniquely assemble its own strategy for meeting the program’s objectives and provide an opportunity for teams to learn from each other and an opportunity for knowledge transfer between the teams. In addition, the teams should be encouraged to draw on their own set of experiences, community partners, local context, constraints, and possibilities. By sharing their processes and results, the groups will draw out larger-scale comparisons, synergies, and conclusions in relation to the overall goal(s). It is important to provide an opportunity for them to ‘learn by doing and ‘in the community.’ Research that leads to meaningful change is new in most LMICs in Africa given the history of colonialism and being “forced by circumstances” to rely on the formal colonial masters up to date for most of the innovations. Thus, it is necessary to hold each other’s hands and provide mutual support. The moment researchers become frustrated with research in most countries, if there is no one to provide them with the necessary support to keep going, they will give up. Learning from each other through weekly meetings, workshops, webinars, town hall meetings, etc., is very essential. We learned from other groups within the ACADIC consortium by having weekly meetings and regular workshops. The transnational partnership’s value-added for all partners in ACADIC is grounded in our sharing across contexts and specific situations regarding effective digital data generation, management, dissemination, and ways to address equity priorities for risk minimization by amplifying the voices and agency of marginalized and highly impacted communities.

Lesson no 5: A Need for Novel Data-Gathering Techniques, Including Citizen Science/Participatory Science and Simple, Anonymous Digital Platforms for Data Reporting.

It is imperative to harness data from all available sources including unconventional sources to make up for the gaps that exist in data. We have used unconventional datasets that include, household visits by community health workers, voice scripts, chatbots, Twitter, Google searches, community-level Reddit, WhatsApp, Facebook, etc., to inform health needs about COVID-19. In addition, there is a need for novel data-sharing and dissemination to marginalized groups, not just governmental agencies, for incorporation into informal-sector and community-based initiatives.

Lesson no 6: A Need for AI and Big Data Governance and Legislation for Africa

We developed a framework that takes into account regulatory and ethical aspects (policies, regulations), as well as community and societal needs. We extensively searched the literature (either scholarly/peer-reviewed) and we identified 35 adjectives that were mapped to three dimensions (dimension R: responsible, dimension E: explainable, and dimension L: local). The processes of (i) data collection, (ii) design and development, (iii) deployment, (iv) performance and (v) monitoring are implemented iteratively and progressively refined until each potential gap is filled in. A set of iniquity/disparity metrics is adopted to track risks of biases and vulnerabilities, that need to be addressed.

Lesson no 7: A Need for Strengthening AI- and BDA-Related Funding in Africa

Science granting councils and local funding agencies in Africa suffer from several, interrelated shortcomings and challenges, including a lack of adequate capacity, coordination, and implementation of research funding policies. Local policy frameworks and enabling structures should be developed and/or strengthened to better support the local communities of scholars and researchers. Moreover, public-private sector partnerships should be incentivized.

Lesson no 8: A Need for Strengthening AI- and BDA-Based Modeling Capacity in Africa

AI- and BDA-based modeling has attracted increasing interest from policy and decision- makers across countries in Africa, including Africa. AI- and BDA-based modeling can, indeed, help them shape their local, regional, and national Strategic Plans in an in- formed, evidence-based, and data-driven fashion, tracking their progress and monitoring their effectiveness.

However, there still exists a significant knowledge power imbalance between a few countries leading in AI- and BDA-based modeling and the rest of the world. As such, the AI modeling ecosystem and the research and development (R&D) landscape across the countries in Africa should be strengthened, in terms of adequate qualified personnel of researchers and innovators, as well as infrastructure and algorithms/tools.

Lesson no 9: AI and Big Data techniques are useful tools for diseases outbreak

Lesson no 10: Pandemic is faster than Science

Lesson no 11: Long term prediction of infections is impossible due to “irrational” human and political behaviour

Lesson no 12: Hospitalizations, ICU occupancies and outcome are predictable

Lesson no 13: A need for Gender disaggregated data

Section 3: Project management considerations

Please share information and flag any concerns the project team may be facing and for which it may need IDRC support. Please only complete relevant sections.

3.1. Management of sub-grants

If applicable, list sub-grantees that you oversee as part of your project. Discuss the governance and coordination arrangements you put in place to support sub-grantees, enhance collaboration and produce high quality work.

Our sub-grantees include:

- 1) The Council for Scientific and Industrial Research (CSIR) - South Africa
- 3) University of the Witwatersrand - South Africa
- 4) African Institute of Mathematical Science (AIMS) - Rwanda
- 5) University of Ibandan Research Foundation - Nigeria
- 6) University of Buea – Cameroon

Governance

We have an Executive Board that helps foster collaborations and effective utilization of resources and efforts to achieve the objectives of the project. The structure includes (Figure 1):

- **Africa-Canada COVID-19 AI & Data Consortium (ACADIC) Executive Committee (EC).** ACADIC Executive Committee provides guidance on the strategic direction of the project. The EC support good governance and help create an environment that reinforces and motivates interinstitutional, international and regional collaborations to foster effective implementation of the objectives of the project. The EC steers and guide the implementation of plans and delivery of the project. ACADIC Executive Committee is led by the PI of the project, Jude Kong, and includes the ACADIC co-presidents: Jianhong Wu and Bruce Mellado, lead investigators from each of the Consortium partners; senior African leaders with experiences in academia and government including Ayoade M. J. Oduola, Enow-Orock George Enownchong and Charles Chidume and co-applicants with vast knowledge on Global health such as James Orbinski.

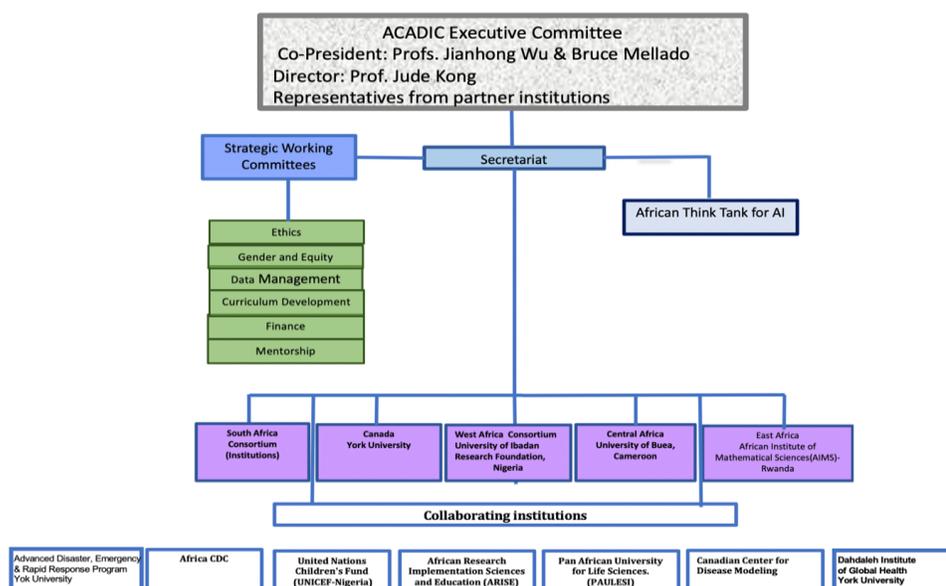
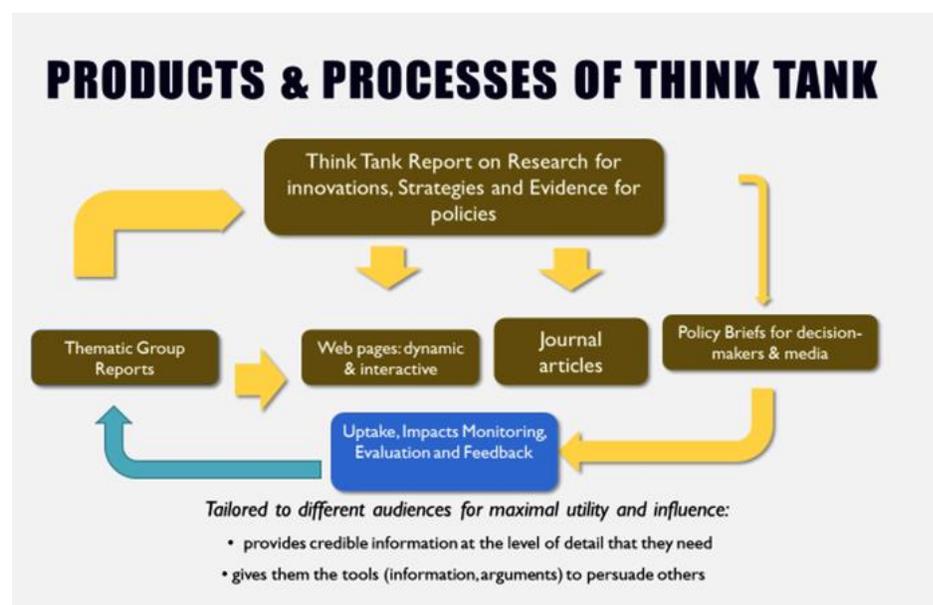


Figure 1: Organizational structure of ACADIC

- **The Strategic Working Committee (SWC).** We have SWC that focus on developing frameworks to make implementation of the activities of the consortium relevant and consistent with principles of participating institutions and national guidelines. The SWC is responsible for collating and harmonizing institutional frameworks for Ethic (ERB), Data Management and Access, Finance, Mentorship and Public Good. One of the SWC goals is to prepare the framework for future replication and expansion of the consortium with other institutions in Africa and assist the Consortium to operationalize the vision of the Executive committee. The SWC provides support, advice and assistance on program plans, research and training, provides opportunities for mentoring and leadership training, and linkages with other networks. It is led by Prof. Ali Asgary and includes all lead investigators from each of the Consortium partners.
- **Partner Institutions.** Activities in each partner institution are led by a Team Lead with a strong individual track record in undertaking interdisciplinary research in Africa. We factor the levels of AI activities at the Institutions into our capacity building strategy and support. The Team Lead works with teams of research staff to undertake and supervise joint interdisciplinary consortium projects. They are also involved in joint training and promotional activities of the consortium. Each team is guided by administrative support to develop good research governance structures within the broader institution.
- **ACADIC Secretariat.** The Secretariat serves as the administrative platform for implementation of the EC objectives and vision of the ACADIC, working closely with the SWC and carrying out the day-to-day running of the EC program. The secretariat is located at York University. The secretariat is headed by the hosting Lead Team assisted by a part time administrative assistant. The administrative assistant is in charge of the logistics and organization of meetings, scientific meetings, students and mentor assignments, training activities including workshops, courses, Journal Clubs and seminars.
- **Engagement with Decision Makers through the Think Tank.** The added value of the new knowledge and innovations generated by the consortium research resides in its ability to inform effective policy options based on careful assessment, review of information, data and input by stakeholders for validation. The research generates data useful for innovations and competencies for predictive modelling. The success of the outcomes requires careful consideration of data, to ensure efficiency in utilization of resources and innovations. These data and information generated from the projects require critical review, assessment and inputs from stakeholders to have impacts on policies and health outcomes in Africa. We have an African Think Tank Working Group on AI and predictive modelling for public health as the ‘driving engine’ for

Translating Research to Innovations, Strategies and Evidence for policy options in Africa. The Think Tank serves as a collaborative platform for the review of novel ideas, data, interventions and potential policy options for consideration by governments. The Think Tank operates on an impartial ethos – with an underpinning asset-based, solution-focused, and sustainable (leapfrogging) approach for enhancing impacts on health outcomes in Africa. The Think Tank provides platforms for national and international experts to critically assess challenges, opportunities and facilitate discussions on pathways to drive implementation of consortium outcomes. It identifies issues and challenges to contributions of research to public health, provides oversight for independent, objective analysis of complex problems and challenges that can be addressed to enhance commitments of the policy makers and efforts of public health leaders in Africa.

The Think Tank is led by n 11 experts and coordinated by two Co-Chairpersons selected from the Consortium Institutions and an Implementation agency at the University of Witwatersrand. The Think Tank is mandated to co-opt expert teams to gather relevant information, create a database of the information, produce a succinct summary of a comprehensive and systematic review of the research findings, analyse existing evidence and evaluate its relevance in the context of:



- challenges to public health in Africa;
- new and significant scientific advances and opportunities from research by the consortium and best practices from OECD countries to address the challenges;
- critical research gaps, capacity and needs to strengthen efforts in African countries;
- summary and guidance on priority areas with relevant information for innovations, strategies

and evidence from predictive modelling to guide policy options for public health.

The Think Tank reviews the reports of the co-opted experts and provide guidance and oversight in finalising the reports. Each final analysis is expected to provide:

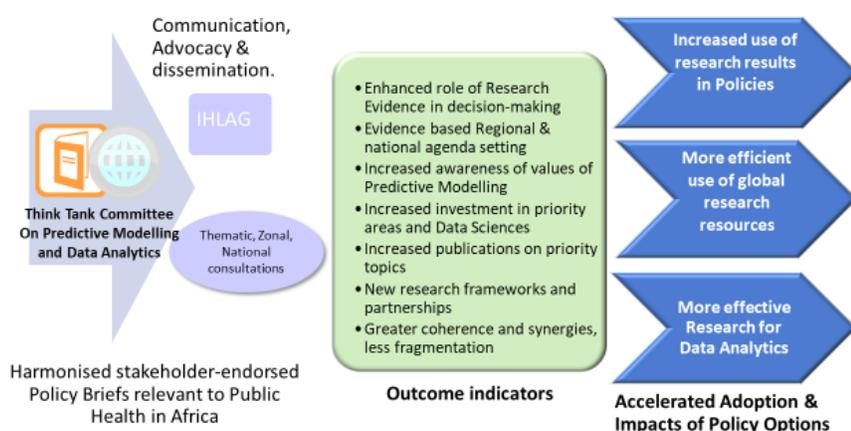
- succinct summaries of research findings useful in addressing the challenges in public health;
- road map on community education, strategies and policy imperatives to overcome the challenges;
- framework to strengthen implementation of proven practices and innovations.

Each report is reviewed by independent external experts and debated through stakeholders' consultations before publication. The outputs (reports, policy briefs, summaries) of the Think Tank are so far being used to guide discussions with policy makers to foster evidence-based consensus on strategies, innovations and policies imperatives for public health in Africa.

The engagement with policy makers focuses on:

- convening an annual Stakeholders Forum for National and Regional Public Health Leaders and decision makers, rotated among participating institutions and countries, in partnerships with an international public health implementation agency;
- organising workshops for development of frameworks on production of policy briefs in each participating country;
- commissioning expert reviews;
- using the platform to mentor, train postgraduate scholars, public health leaders and postdoctoral fellows.

Think Tank for Policy Options for AI, Data Analytics and Public Health in Africa



3.2. Key challenges encountered

Have any administrative or financial challenges been faced in the reporting period? What were your adaptation strategies? You may also wish to include changes in political/policy space, unexpected delays, staff turnover, etc. Please describe how you have responded to these challenges and identify any specific support you require from IDRC.

No.

Adaptation: We sent advance payment to sub-grantees that do not have money to pay for the execution of the project and submit receipts for reimbursement after. These sub-grantees had to commit to providing a report prior to requesting for another advance payment. This has been working pretty well.

For sub-grantees that have the money to spend and request for reimbursement after, we have them spent the money and then request for reimbursement.

3.3. Milestones

Have any timelines of project milestones shifted from the initial workplan? If yes, please describe which milestone timelines have shifted, and propose a revised timeline.

No

3.4. Adjustments to budget or timelines

Are there any changes to the budget or the timeline that need to be made considering what has happened and/or adjusted plans? Please note that major changes must be discussed and agreed with IDRC.

Yes, we extended the project.

Section 4: Research outputs

Please complete the tables in this section, leaving any that are not relevant at this time blank and indicating a reason for doing so. Please make sure that you upload all research outputs to the [IDRC Connect site](#). You can also attach a final copy of all outputs to this report, send by email or include the hyperlink as appropriate.

4.1 Publications and papers

List research outputs that are publicly available as direct results of research supported by your project. Examples include peer-reviewed publications, working papers, articles, book chapters and reports.

Title	Author (s) and institution(s)	Author (s)' gender	Venue (journal name, book, series, etc.)	Date submitted/ accepted/ published	Open access?	Peer-reviewed?	Uploaded to IDRC Connect?	Link (if available online)
<i>Harnessing the power of data: Artificial Intelligence - based pandemic support</i>	Kong J, Mellado B, Wu J		UNESCO- Policy Brief					https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en
<i>Artificial</i>	Kong, J. D.,		<i>In AI and Society (pp.</i>					https://www.taylorfrancis.com/chapters/edit/

<i>al Intelligence, Law, and Vulnerabilities</i>	<i>Fevrier, K., Effoduh, J. O., & Bragazzi, N. L.</i>		<i>179-196). Chapman and Hall/CRC</i>					<i>10.1201/9781003261247-13/artificial-intelligence-law-vulnerabilities-jude-dzevela-kong-kesha-fevrier-jake-okechukwu-effoduh-nicola-luigi-bragazzi</i>
<i>Leveraging Responsible, Explainable, and Local Artificial Intelligence Solutions for Clinical Public Health in the Global South.</i>	<i>Kong JD, Akpudo UE, Effoduh JO, Bragazzi NL.</i>		<i>Healthcare</i>					https://doi.org/10.3390/healthcare11040457
<i>Twitter dataset for</i>	<i>Nia ZM, Bragazzi NL, Wu J, Kong</i>		<i>Data in Brief</i>					https://doi.org/10.1016/j.dib.2023.109118

<i>Monkey pox</i>	<i>JD</i>							
<i>Impact assessment of self-medication on COVID-19 prevalence in Gauteng, South Africa, using an age-structured disease transmission modelling framework.</i>	<i>Avusuglo WS, Han Q, Woldegerima WA, Bragazzi N, Asgary A, Ahmadi A, Orbinski J, Wu J, Mellado B, Kong JD</i>							https://doi.org/10.21203/rs.3.rs-2828156/v1
<i>Mpox Panic, Infodemic,</i>	<i>Movahedia Z, Bragazzi N, Asgary A,</i>		<i>Journal of Medical Internet Research</i>					doi:10.2196/45108

<p><i>and Stigmatization of the Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer or Questioning, Intersex, Asexual Community: Geospatial Analysis, Topic Modeling, and Sentiment Analysis of a Large, Multilingual</i></p>	<p><i>Orbinski J, Wu J, Kong J.</i></p>								
--	---	--	--	--	--	--	--	--	--

<i>Social Media Database.</i>								
<i>Adaptive changes in sexual behavior in the high-risk population in response to human monkey pox transmission in Canada can help control the outbreak: insights from a two-</i>	<i>Bragazzi NL, Han Q, Iyaniwura SA, Omame A, Shausan A, Wang X, Woldegerima WA, Wu J, Kong JD.</i>		<i>Journal of Medical Virology</i>					https://doi.org/10.1002/jmv.28575

<p><i>group, two-route epidemic model.</i></p>								
<p><i>COVID-19 in Ontario Long-term Care Facilities Project, a manually curated and validated database.</i></p>	<p><i>Kaur M, Bragazzi NL, Heffernan J, Tsasis P, Wu J, Kong JD</i></p>		<p><i>Frontiers in Public Health</i></p>					<p>https://doi.org/10.3389/fpubh.2023.113341 <u>2</u></p>
<p><i>Well-being and quality of life in people</i></p>	<p><i>Puce L, Okwen PM, Yuh MN, Akah Ndum Okwen G, Pambe Miong RH,</i></p>		<p><i>Frontiers in Psychology.</i></p>					<p>https://doi.org/10.3389/fpsyg.2023.1071656</p>

<p><i>with disabilities practicing sports, athletes with disabilities, and para-athletes : Insights from a critical review of the literature.</i></p>	<p><i>Kong JD, Bragazzi NL.</i></p>							
<p><i>Big data- and artificial intelligence-based hot-spot analysis</i></p>	<p><i>Lieberman B, Kong JD, Gusinow R, Asgary A, Bragazzi NL, Choma J, Dahbi SE, Hayashi K, Kar D, Kawonga M, Mbada M.</i></p>		<p><i>BMC Medical Informatics and Decision Making.</i></p>					<p>https://doi.org/10.1186/s12911-023-02098-3</p>

<p><i>s of COVID-19: Gauteng, South Africa, as a case study. BMC Medical Informatics and Decision Making</i></p>								
<p><i>Vaccine hesitancy hotspots in Africa: An insight from geotagged Twitter</i></p>	<p><i>Ogbuokiri B, Ahmadi A, Nia ZM, Mellado B, Wu J, Orbinski J, Asgary A, Kong J</i></p>		<p><i>IEEE Transactions on Computational Social Systems</i></p>					<p>10.1109/TCSS.2023.3236368</p>

<i>posts</i>								
<i>The Impact of Omicron Variant in Vaccine Uptake in South Africa</i>	<i>Ogbuokiri B, Ahmadi A, Tripathi N, Movahedi Z, Melado B, Wu J, Asgary A, Orbinski J, Kong J</i>							https://doi.org/10.21203/rs.3.rs-2454619/v1
<i>A generalized distributed delay model of COVID-19: An endemic model with immunity waning</i>	<i>Iyaniwura SA, Musa R, Kong JD</i>		<i>Mathematical Biosciences and Engineering</i>					10.3934/mbe.2023249

.								
<i>Is monkey pox a new, emerging sexually transmitted disease? A rapid review of the literature.</i>	<i>Bragazzi NL, Kong JD, Wu J.</i>		<i>Journal of Medical Virology.</i>					https://doi.org/10.1002/jmv.28145
<i>Epidemiological trends and clinical features of the ongoing monkey pox epidemic</i>	<i>Bragazzi NL, Kong JD, Mahroum N, Tsigalou C, Khamisy-Farah R, Converti M, Wu J</i>		<i>Journal of Medical Virology.</i>					https://doi.org/10.1002/jmv.27931

<p><i>c: A preliminary pooled data analysis and literature review.</i></p>								
<p><i>Bacteria-bacteriophage cycles facilitate Cholera outbreak cycles: an indirect Susceptible-Infected-Recovered-Bacteria-</i></p>	<p><i>Habees AA, Aldabbas E, Bragazzi NL, Kong JD</i></p>		<p><i>Journal of Biological Dynamics.</i></p>					<p>https://doi.org/10.1080/17513758.2021.2017032</p>

<p><i>Phage (iSIRB P) model-based mathematical study. Journal of Biological Dynamics</i></p>								
<p><i>Can Post-vaccination Sentiment Affect the Acceptance of Booster Jab?</i></p>	<p>Ogbuokiri B, Ahmadi A, Mellado B, Wu J, Orbinski J, Asgary A, Kong J.</p>		<p><i>Cham: Springer Nature Switzerland.</i></p>					<p>https://link.springer.com/chapter/10.1007/978-3-031-35501-1_20</p>
<p><i>Nowcasting unemployment rate</i></p>	<p>Nia ZM, Asgary A, Bragazzi N, Mellado B, Orbinski J,</p>		<p><i>Frontiers in Public Health</i></p>					<p>https://doi.org/10.3389/fpubh.2022.952363</p>

<p>during the COVID-19 pandemic using Twitter data: The case of South Africa.</p>	<p>Wu J, Kong J.</p>							
<p>Dataset of non-pharmaceutical interventions and community support measures across Canadian universities and colleges</p>	<p>Ahmed H, Cargill T, Bragazzi NL, Kong JD.</p>		<p>Frontiers in public health.</p>					<p>https://doi.org/10.3389/fpubh.2022.1066654</p>

during COVID-19 in 2020.								
<i>A tale of two stories: COVID-19 and disability. A critical scoping review of the literature on the effects of the pandemic among athletes with disabilities and para-athletes .</i>	<i>Puce L, Trabelsi K, Ammar A, Jabbour G, Marinelli L, Mori L, Kong JD, Tsigalou C, Cotellessa F, Schenone C, Samanipour MH.</i>		<i>Frontiers in physiology.</i>					https://doi.org/10.3389/fphys.2022.967661
<i>Manag</i>	<i>Alavinejad</i>		<i>PLOS global</i>					https://doi.org/10.1371/journal.pgph.00011

<p>ement of hospital beds and ventilators in the Gauteng province, South Africa, during the COVID-19 pandemic.</p>	<p>M, Mellado B, Asgary A, Mbada M, Mathaha T, Lieberman B, Stevenson F, Tripathi N, Swain AK, Orbinski J, Wu J.</p>		<p>public health</p>					<p>13</p>
<p>Planetary sleep medicine: Studying sleep at the individual, population, and</p>	<p>Bragazzi NL, Garbarino S, Puce L, Trompetto C, Marinelli L, Currà A, Jahrami H, Trabelsi K, Mellado B, Asgary A, Wu J.</p>		<p>Frontiers in Public Health</p>					<p>https://doi.org/10.3389/fpubh.2022.1005100</p>

<i>planetary level.</i>								
<i>Knowing the unknown: The underestimation of monkey pox cases. Insights and implications from an integrative review of the literature</i>	<i>Bragazzi NL, Woldegerima WA, Iyaniwura SA, Han Q, Wang X, Shausan A, Badu K, Okwen P, Prescod C, Westin M, Omame A.</i>		<i>Frontiers in Microbiology</i>					https://doi.org/10.3389/fmicb.2022.1011049
<i>Integrated epidemiological, clinical</i>	<i>Bragazzi NL, Kong JD, Wu J</i>							http://dx.doi.org/10.2139/ssrn.4207333

<p><i>, and molecular evidence points to an earlier origin of the current monkey pox outbreak and a complex route of exposure.</i></p>							
<p><i>A cross-country analysis of macroeconomic responses to COVID-19 pandemic</i></p>	<p><i>Nia ZM, Ahmadi A, Bragazzi NL, Woldegerima WA, Mellado B, Wu J, Orbinski J, Asgary A, Kong JD</i></p>		<p><i>Plos one.</i></p>				<p>https://doi.org/10.1371/journal.pone.0272208</p>

ic using Twitter sentiments.								
<i>Public sentiments toward COVID-19 vaccines in South African cities: An analysis of Twitter posts.</i>	Ogbuokiri B, Ahmadi A, Bragazzi NL, Movahedi Nia Z, Mellado B, Wu J, Orbinski J, Asgary A, Kong J.		<i>Frontiers in Public Health</i>					https://doi.org/10.3389/fpubh.2022.987376
<i>Studying the mixed transmission in a community with age heterog</i>	Wang X, Han Q, Kong JD.		<i>Infectious Disease Modelling</i>					https://doi.org/10.1016/j.idm.2022.05.006

<p><i>eneity: COVID -19 as a case study</i></p>								
<p><i>Estimat ion of epidemi ologica l parame ters and ascerta inment rate from early transmi ssion of COVID -19 across Africa.</i></p>	<p><i>Han Q, Bragazzi NL, Asgary A, Orbinski J, Wu J, Kong JD.</i></p>							<p>https://doi.org/10.21203/rs.3.rs-1708820/v1</p>
<p><i>Twitter -Based Gender Recogn ition Using Transfo</i></p>	<p><i>Nia ZM, Ahmadi A, Mellado B, Wu J, Orbinski J, Agary A,</i></p>							<p>https://doi.org/10.48550/arXiv.2205.06801</p>

rmers.	Kong JD.						
Covid-19 and malaria co-infection: do stigmatization and self-medication matter? a mathematical modelling study for nigeria. A mathematical modelling study for Nigeria	Avusuglo W, Han Q, Woldegerima WA, Bragazzi NL, Ahmadi A, Asgary A, Wu J, Orbinski J, Kong JD.						http://dx.doi.org/10.2139/ssrn.4090040
The	Iyaniwura		Plos one.				https://doi.org/10.1371/journal.pone.02644

<p><i>basic reproduction number of COVID-19 across Africa.</i></p>	<p><i>SA, Rabiun M, David JF, Kong JD</i></p>							<p>55</p>
<p><i>Assessing inequities in COVID-19 vaccine roll-out strategies: a cross-country study using a machine learning approach.</i></p>	<p><i>Kazemi M, Bragazzi NL, Kong JD</i></p>		<p><i>Vaccines</i></p>					<p>https://doi.org/10.3390/vaccines10020194</p>

<p><i>Harnessing Artificial Intelligence to assess the impact of nonpharmaceutical interventions on the second wave of the Corona virus Disease 2019 pandemic across the world.</i></p>	<p><i>Tao S, Bragazzi NL, Wu J, Mellado B, Kong JD.</i></p>		<p><i>Scientific Reports</i></p>					<p>https://doi.org/10.1038/s41598-021-04731-5</p>
<p><i>Monkeypox and laboratory</i></p>	<p><i>Bragazzi NL, Kong JD, Wu J.</i></p>							<p>https://www.researchgate.net/profile/Nicola-Bragazzi/publication/361411982_Monkeypox_and_laboratory_medicine_more_data_a</p>

<p><i>ory medicin e: more data are urgenty needed.</i></p>							<p>re urgently needed/links/62af8b0123f3283e3af56df2/Monkeypox-and-laboratory-medicine-more-data-are-urgently-needed.pdf</p>
<p><i>A tale of two (and more) stories: smallpo x- monkey pox viruses (HIV, and other sexuall y transmi tted diseas es) interact ion dynami cs</i></p>	<p><i>Bragazzi NL, Kong JD, Wu J.</i></p>						<p>https://www.researchgate.net/profile/Nicola-Bragazzi/publication/361396667_A_tale_of_two_and_more_stories_smallpox_monkeypox_viruses_HIV_and_other_sexually_transmitted_diseases_interaction_dynamics/links/62adf06540d84c1401b4edfb/A-tale-of-two-and-more-stories-smallpox-monkeypox-viruses-HIV-and-other-sexually-transmitted-diseases-interaction-dynamics.pdf</p>

<p><i>Predictive modeling of vaccination uptake in US counties: A machine learning-based approach</i></p>	<p><i>Cheong Q, Au-Yeung M, Quon S, Concepcion K, Kong JD.</i></p>		<p><i>Journal of medical Internet research</i></p>					<p>10.2196/33231</p>
<p><i>The determinants of the low COVID-19 transmission and mortality rates in Africa: a</i></p>	<p><i>Bouba Y, Tsinda EK, Fonkou MD, Mbando GS, Bragazzi NL, Kong JD.</i></p>		<p><i>Frontiers in public health.</i></p>					<p>https://doi.org/10.3389/fpubh.2021.751197</p>

<i>cross-country analysis.</i>								
<i>Comparing public sentiment toward COVID-19 vaccines across Canadian cities: analysis of comments on Reddit</i>	<i>Yan C, Law M, Nguyen S, Cheung J, Kong J.</i>		<i>Journal of medical Internet research.</i>					10.2196/32685
<i>The Role of Behavioral Compliance to Non-</i>	<i>Avusuglo W, Bragazzi NL, Asgary A, Orbinski J, Wu J, Kong JD.</i>							http://dx.doi.org/10.2139/ssrn.3922118

<i>Pharmaceutical and Pharmaceutical Interventions in the Fight Against COVID-19: Insights From a Behavioral-Disease Economic Epidemic Model Coupled With Optimal Control Theory</i>								
<i>Assessing the impact</i>	<i>Iyaniwura SA, Rabiun M, David</i>							https://doi.org/10.1101/2021.08.16.21262135

<i>of adherence to non-pharmaceutical interventions and indirect transmission on the dynamics of covid-19: a mathematical modelling study.</i>	<i>JF, Kong JD</i>						
<i>Leveraging artificial intelligence and big data to optimize</i>	<i>Mellado B, Wu J, Kong JD, Bragazzi NL, Asgary A, Kawonga M, Choma N, Hayasi K, Lieberman B, Mathaha T, Mbada M.</i>						https://doi.org/10.3390/ijerph18157890

<p><i>COVID-19 clinical public health and vaccination roll-out strategies in Africa</i></p>								
<p><i>Development of an early alert system for an additional wave of covid-19 cases using a recurrent neural network with long</i></p>	<p><i>Stevenson F, Hayasi K, Bragazzi NL, Kong JD, Asgary A, Lieberman B, Ruan X, Mathaha T, Dahbi SE, Choma J, Kawonga M.</i></p>		<p><i>International Journal of Environmental Research and Public Health</i></p>					<p>https://doi.org/10.3390/ijerph18147376</p>

<p><i>short-term memory.</i></p>								
<p><i>COVID-19 pandemic related research in Africa: bibliometric analysis of scholarly output, collaborations and scientific leadership</i></p>	<p><i>Mbogning Fonkou MD, Bragazzi NL, Tsinda EK, Bouba Y, Mmbando GS, Kong JD.</i></p>		<p><i>International journal of environmental research and public health.</i></p>					<p>https://doi.org/10.3390/ijerph18147273</p>
<p><i>Development of the 12-item Social</i></p>	<p><i>Guelmami N, Ben Khalifa M, Chalghaf N, Kong JD,</i></p>		<p><i>JMIR formative research</i></p>					<p>10.2196/27280</p>

<p><i>Media Disinformation Scale and its association with social media addiction and mental health related to COVID-19 in Tunisia : Survey-based pilot case study.</i></p>	<p><i>Amayra T, Wu J, Azaiez F, Bragazzi NL.</i></p>						
<p><i>Social, economic, and environmental factors influen</i></p>	<p><i>Kong JD, Tekwa EW, Gignoux-Wolfsohn SA</i></p>		<p><i>PloS one</i></p>				<p>https://doi.org/10.1371/journal.pone.0252373</p>

<p>cing the basic reprod uction number of COVID -19 across countri es.</p>								
<p>Social Media COVID -19 Inform ation and Vaccin e Decisio n: A Latent Class Analysi s</p>	<p>Guelmami N, Chalghaf N, Wu J, Kong JD, Mellado B, Jahrami H, Ben Khalifa M, Amayra T, Azaiez F, Bragazzi NL.</p>							<p>http://dx.doi.org/10.2139/ssrn.3841301</p>
<p>The impact of non- pharma</p>	<p>Duhon J, Bragazzi N, Kong JD</p>		<p>Science of The Total Environment</p>					<p>https://doi.org/10.1016/j.scitotenv.2020.144325</p>

<p><i>ceutical interventions, demographic, social, and climatic factors on the initial growth rate of COVID-19: A cross-country study.</i></p>							
<p><i>Modeling the potential impact of indirect transmission on covid-19 epidemi</i></p>	<p><i>David J, Iyaniwura SA, Yuan P, Tan Y, Kong J, Zhu H.</i></p>						<p>https://doi.org/10.1101/2021.01.28.20181040</p>

c								
<i>SARS-CoV-2 and self-medication in Cameroon: a mathematical model</i>	Kong JD, Tchuendom RF, Adeleye SA, David JF, Admasu FS, Bakare EA, Siewe N.		<i>Journal of Biological Dynamics.</i>					https://doi.org/10.1080/17513758.2021.1883130
<i>Risk Adjusted Non-Pharmaceutical Interventions for the Management of COVID-19 in South Africa</i>	Choma J, Correa F, Dahbi SE, Hayasi K, Lieberman B, Maslo C, Mellado B, Monnagotla K, Naudé J, Ruan X, Stevenson F.							https://doi.org/10.1101/2020.07.15.20149559
<i>A multina</i>	Lazarus, J.V.,		<i>Nature</i>					https://doi.org/10.1038/s41586-022-05398-2

<i>tional Delphi consensus to end the COVID-19 public health threat</i>	Romero, D., Kopka, C.J., Mellado, B							
<i>A call for citizen science in pandemic preparedness and response: beyond data collection</i>	Yi-Roe Tan, Bruce Mellado, et al.		<i>BMJ Global Health</i>					http://dx.doi.org/10.1136/bmjgh-2022-009389
<i>A spatial SEIR model for COVID-19 in</i>	<i>Fabris-Rotelli I, Holloway JP, Kimmie Z, Archibald S, Debba P, Manjoo-</i>		<i>Journal of Data Science, Statistics and Visualisation</i>					<i>10.20944/preprints202106.0262.v1</i>

<p><i>South Africa.</i></p>	<p><i>Docrat R, Le Roux A, Dudeni-Tlhone N, Van Rensburg CJ, Thiede R.</i></p>							
<p><i>Modelling representative population mobility for COVID-19 spatial transmission in South Africa</i></p>	<p><i>Potgieter A, Fabris-Rotelli IN, Kimmie Z, Dudeni-Tlhone N, Holloway JP, Janse van Rensburg C, Thiede RN, Debba P, Manjoo-Docrat R, Abdelatif N, Khuluse-Makhanya S</i></p>		<p><i>Frontiers in big Data.</i></p>					<p>https://doi.org/10.3389/fdata.2021.718351</p>
<p><i>A Spatial Analysis of COVID-19 in</i></p>	<p><i>Manda SO, Darikwa T, Nkwenika T, Bergquist R</i></p>		<p><i>International Journal of Environmental Research and Public Health</i></p>					<p>https://doi.org/10.3390/ijerph182010783</p>

<p><i>African Countries: Evaluating the Effects of Socio-Economic Vulnerabilities and Neighbouring</i></p>								
<p><i>Stochastics of DNA Quantification</i></p>	<p><i>Degoot AM, Ndifon W</i></p>							<p>https://doi.org/10.48550/arXiv.2301.02149</p>
<p><i>Prediction of COVID-19 using long short-term memory by</i></p>	<p><i>Ilu SY, Rajesh P, Mohammed H.</i></p>		<p><i>Informatics in Medicine Unlocked</i></p>					<p>https://doi.org/10.1016/j.imu.2022.100990</p>

<p><i>integrating principal component analysis and clustering techniques.</i></p>								
<p><i>Improved autoregressive integrated moving average model for COVID-19 prediction by using statistical significance</i></p>	<p><i>Ilu SY, Prasad R.</i></p>		<p><i>Heliyon</i></p>					<p><i>https://doi.org/10.1016/j.heliyon.2023.e13483</i></p>

<p><i>and clustering techniques.</i></p>								
<p><i>Towards Trustworthy Artificial Intelligence for Equitable Global Health</i></p>	<p><i>Jude Kong, Hong Qin, Wandi Ding, Ramneek Ahluwalia, Christo El Morr, Zeynep Engin, Jake Okechukwu Effoduh, Rebecca Hwa, Serena Jingchuan Guo, Laleh Seyyed-Kalantari, Sylvia Kiwuwa Muyingo, Candace Makeda Moore, Ravi Parikh, Reva Schwartz, Dongxiao</i></p>							

	Zhu, Xiaoqian Wang, Yiye Zhang							
<i>Towards an Inclusive Data Governance Policy for the Use of Artificial Intelligence in Africa.</i>	ude Kong, Jake Okechukwu Effoduh and Ugochukwu Ejike Akpudo							
<i>Transition to endemicity with the Omicron variant in Gauteng, South</i>	Meghan Malaatjie, Mahnaz Alavinejad, Benjamin Lieberman, Nicola Luigi Bragazzi, Jude Dzevela Kong, Mary Kawonga, Mduduzi							

<p><i>Africa: insights from an agent based modeling study</i></p>	<p><i>Mbada, Thuso Mathaha, and Bruce Mellado</i></p>							
<p><i>The use of machine learning to identify gender differential outcomes in a South African multi-center COVID-19 cohort</i></p>	<p><i>Meghan Malaatjie, Thuso Mathaha, Mary Kawonga, Bruce Mellado and Jude Kong.</i></p>							



4.2 Policy, advocacy and public engagement

List policy and public opportunities that you engaged with. Engagement includes (i) high-level discussions or formal meetings; (ii) informal interaction (potentially one-on-one) with important high-level stakeholders; and (iii) events with multiple stakeholders from research, policy, practice, media/intermediaries and communities regarding AI research and uptake. Examples of engagement events include conferences, workshops, or webinars, or one-on-one meetings (in person or virtual).

Conference/workshops/webinar series/presentations.

A. **Presentations to Government:** We have given over 400 presentations to different work streams in the government. Most of these presentations are given during closed doors sessions and cannot be shared here. Below are links to sample reports that the team share with policy makers.

1. https://www.dropbox.com/s/bea9yo8fw3b3gph/COVID19_PCCC_301121.ppt?dl=0
2. https://www.dropbox.com/s/xneylee8glctdha/COVID19_PCCC_110122.ppt?dl=0
3. https://www.dropbox.com/s/kwsihpur40kno2r/COVID19_PCCC_141221.ppt?dl=0
4. https://www.dropbox.com/s/vmc1hrzjelbmvdh/COVID19_PCCC_161121.ppt?dl=0
5. https://www.dropbox.com/s/57rbzuk5g7gy3pf/COVID19_PCCC_091121.ppt?dl=0
6. https://www.dropbox.com/s/rd7viz2lsqgmvs0/COVID19_PCCC_280921.ppt?dl=0
7. https://www.dropbox.com/s/0x8afnnd2e4g2v/COVID19_PCCC_210921.ppt?dl=0
8. https://www.dropbox.com/s/hkmvdmhqw86z0hp/COVID19_PCCC_140921.ppt?dl=0
9. https://www.dropbox.com/s/yyamlx5tjlb4580/COVID19_PCCC_070921.ppt?dl=0
10. https://www.dropbox.com/s/i4qankdst16675x/COVID19_PCCC_310821.ppt?dl=0
11. https://www.dropbox.com/s/qsfeu3kr03bgjnm/COVID19_PCCC_240824.ppt?dl=0
12. https://www.dropbox.com/s/fxovb7iqplnqs7o/COVID19_PCCC_170821.ppt?dl=0
13. https://www.dropbox.com/s/x71rhxcn5fief2y/COVID19_PCCC_100821.ppt?dl=0
14. https://www.dropbox.com/s/y4mnhuurh0dikwq/COVID19_PCCC_030821.ppt?dl=0
15. https://www.dropbox.com/s/y4h77degmhouqp8/COVID19_PCCC_270721.ppt?dl=0



B. Presentations at conferences/seminars

We have also given over 400 presentations in national and international conferences/seminars in last two years. Below is a sample of some of the conferences and workshops we have presented in:

1. keynote: gave a talk to the Public Health Association of BC Summer Institute on: "the impact of responsible local and explainable AI on communities (<https://phabc.org/phsi-2023-registration/?civiwp=CiviCRM&q=civicrm%2Fevent%2Finfo&reset=1&id=52>).

2. Attended IndabaX Cameroon 2023 conference and gave a talk on "Leveraging Responsible, Explainable, & Local AI for Population Health & Health Systems (<https://deeplearningindaba.com/2023/indabax/cameroon/>).

3. Attended DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN #SDGs and gave a talk on AI-based frameworks and algorithms for achieving SDG3 and SDG5 in the Global South (<http://dimacs.rutgers.edu/events/details?eID=2394>).

4. Invited Speaker: We gave a talk at the Next Einstein Forum Webinar series on leveraging responsible artificial intelligence methods for population health and health systems. April 18, 2023.

5. Invited Speaker: We gave a presentation to South African University leaders (during their visit to York University) on the work that we have been doing in South Africa: mobilizing AI to build equitable, resilient governance strategies & increase societal preparedness for future global pandemics and climate disasters. April 24, 2023.

6. Invited Speaker: We were invited to talk about how we can leverage AI to assist the Governor of Kajiado, Kenya (during his visit to York University) in his agenda for the Maasai

people of Kenya (vulnerable community): in particular SDG 2 ("Zero hunger"); SDG 3 ("Good Health and Well-being"), SDG4 ("Quality Education"), SDG5 ("gender equality"), SDG 6("Clean Water and Sanitation"), SDG11 ("Sustainable cities and communities"). March 23, 2023.

7. Invited Speaker: We attended and gave a talk on Leveraging Responsible AI for Population Health & Health Systems in Nigeria at the Nigeria Computer Society, Artificial Intelligence & Robotics Conference: <https://lnkd.in/g4HwZGti>. March 21-23, 2023.

8. Invited Speaker: We attended the American Mathematical Society Southeastern Sectional Meeting at Georgia Institute of Technology, Atlanta Georgia and gave a talk on Mpox dynamic model: incorporating adaptive behavioural changes, different control strategies in the MSM community & under-reporting. March 18-20, 2023.

9. Invited Speaker: We gave a guest talk on Leveraging Responsible AI for Population Health & Health Systems at Queens University. March 07, 2023.

10. Invited Speaker: We gave a presentation at Michael Garron Hospital on Canadian Black Scientists and the Key to Leveraging Responsible Data Science Methods for Population Health & Health Systems.

11. Invited Speaker: We gave a guest lecture at the Dalla Lana School of Public Health on Leveraging Responsible, Explainable, and Local Data Science Methods for Population Health & Health Systems. Feb. 07, 2023.

12. Keynote Speaker: We organized a workshop at the Fields Institute on Early Warning Systems (EWS) for Emerging and Re-emerging Diseases and gave a talk on EWS for re-emerging diseases. <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Attended in person. Jan. 23-25, 2023.



13. Invited Speaker: We attended the Joint Mathematics Meetings in Boston and gave a talk entitled: "adaptive changes in sexual behaviour in the high-risk population in response to mpox can control the outbreak: insights from an epidemic model. Attended in person. Jan. 04-07, 2023.
14. Panellist : We organized and took part in a panel discussion on "Towards an Inclusive Data Governance Policy for the use of AI in Africa" at the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. <https://members.dataforpolicy.org/2022-conference/seattle-programme/> . Attended in person. Dec. 10, 2022.
15. Invited panellist : We were invited to two-panel conversations at the Bill & Melinda Gates Foundation in Seattle: 1) Ethics and Efficacy of modelling and machine learning, 2) The politics of data. December 09, 2022. <https://members.dataforpolicy.org/2022-conference/seattle-programme/>
16. Invited Speaker: We gave a talk at the Canadian Mathematical Society winter meeting on "Adaptive changes in sexual behavior in the high-risk population in response monkeypox can control the outbreak: insights from an epidemic model". Attended in person. December 04, 2022.
14. Keynote Speaker: We gave a keynote presentation at the New York University Abu Dhabi Global Perspectives in Science Lecture Series. Title of my talk: Leveraging AI for Clinical Public and Global health Needs: Implications for Policies and Lessons Learned from the ACADIC project. Attended in person. Nov 28, 2022.
17. Invited Speaker: We gave a presentation at the China-Canada Symposium On Modelling, Prevention and Control of Zoonoses. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in the Global Sout". Attended virtually-zoom. Nov 15, 2022.
18. Keynote Speaker: We gave a presentation at the Ghanaian Mathematical Biology and Medicine Workshop. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in Africa". Attended virtually-zoom. Nov 08, 2022.
19. Invited Speaker: We gave a presentation at the University of Massachusetts Mathematical Biology Seminar series. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in the Global South". Attended virtually-zoom. October 31, 2022.
20. Keynote Speaker: We gave a keynote speaker at the Science Atlantic Conference 2022, that held at Mount Alison University, Sackville, NB . Attended in person. Oct. 21-15, 2022. the MfPH next generation. Title of my talk: "Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage". Attended virtually-zoom. August 17, 2022.
22. Invited Speaker: During the deputy Minister of Higher Education, Science and Innovation (South Africa), the Hon. Buti Manamela visit to York University, we presented our initiatives in South Africa: Leveraging Artificial Intelligence and Big Data for clinical public health in South Africa. September 14, 2022.
23. Invited Speaker: We gave a presentation at the MfPH next generation. Title of my talk: "Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage". Attended virtually-zoom. August 17, 2022.
24. Keynote Speaker: We were invited as a keynote speaker at the Queen's University, Workshop on Mathematical Ecology (<https://mast.queensu.ca/math-ecology/>). Attended in person. Title of talk: 'Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dy- namics worldwide in the early stage. August 10-11, 2022.
25. Invited Speaker: We gave a presentation at the Applied and Industrial Mathematics Society Annual Meeting 2022 in UBC-Okanagan. Title: "Estimation of epidemiological parameters and ascertainment rate from early transmission of COVID-19 Across Africa". Attended in person. June 15 , 2022
26. Keynote Speaker: keynote speaker at the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Con- sortium (ACADIC)and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30 , 2022



27. Invited Speaker. We gave a presentation in the Mathematics Department, University of Alberta entitled: “comparing public sentiments toward COVID-19 vaccines across Canadian cities: analysis of comments on Reddit”. Attended virtually-zoom. February 14 , 2022
28. We Moderated apanel conversation on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. Attended virtually-zoom. Feb 03, 2022.
29. Keynote Speaker: keynote talk on the impact of social economics and environmental factors on the dynamics of COVID-19 at the Artificial Intelligence for Pandemics Centered, University of Queensland, Australia. Attended virtually-zoom. January 19 , 2022.

30. Invited Speaker. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Talk titleThe impact of so- cial, economic, environmental factors and public health measures on the dynamics of COVID- 19.Attended virtually-zoom. September 16, 2021.
31. Panelist. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Attended virtually-zoom. September 17, 2021.

32. Panelist. Artificial Intelligence Virtual Stakeholders Forums: A Rights-Respecting Artificial Intelligence Policy for Nigeria. Attended virtually-zoom. October 20, 2021.
33. Invited Speaker. Mathematics for Public Health Colloquium [http:// www. fields. utoronto. ca/ activities/ 21-22/ public-health-colloquium](http://www.fields.utoronto.ca/activities/21-22/public-health-colloquium) . Talk title: Early Warning Tools for Emerging Infectious Diseases Outbreak. Attended virtually-zoom. October 12, 2021.
34. Plenary Speaker. Ghana Science Association 2021 Conference [https:// www. ghanascience. org. gh](https://www.ghanascience.org.gh) . Theme: Mitigating COVID-19 Pandemic. Talk title: The power of Collaboration, Artificial Intelligence & Big Data in the Fight Against COVID-19 in Africa.Attended virtually-zoom. October 07, 2021.
35. Invited Speaker Black Heroes of Mathematics 2021 conference [https:// www. lms. ac. uk/ events/ black-heroes-mathematics](https://www.lms.ac.uk/events/black-heroes-mathematics) . Talk title: Harnessing Artificial Intelligence and Big Data Techniques to Monitor Manage and Forecast an Epidemic: the Case of COVID-19. Attended virtually-zoom. October 05, 2021.
36. Panelist. Black Heroes of Mathematics 2021 conference [https:// www. lms. ac. uk/ events/ black-heroes-mathematics](https://www.lms.ac.uk/events/black-heroes-mathematics). Panel conversation on increasing the number of Blacks in re- search and STEMM programs . Attended virtually-zoom. September 13, 2021.
37. Invited Speaker Data for policy 2021 conference: lessons for policy-data interactions after COVID-19 [https:// dataforpolicy. org](https://dataforpolicy.org) . Attended virtually-zoom. September 13, 2021.
38. Panelist. Data for policy 2021Conference: lessons for policy-data interactions after COVID- 19 [https:// dataforpolicy. org](https://dataforpolicy.org) . Attended virtually-zoom. September 14, 2021. Data for Policy is a premier global forum for interdisciplinary and cross-sector discussions around the impact and potentials of the digital revolution in the government sector. I equally gave a presentation in this conference. Attended virtually-zoom. September 14, 2021.
39. Invited Speaker. University of British Columbia Mathematical Biology Lecture series. The impact of social, economic, environmental factors and public health measures on the dynamics of COVID-19. Attended virtually-zoom. June 02, 2021.
40. Panelist. Panelist at a Symposium on Building Momentum for Transformative Disaster Risk Governance. Attended virtually-zoom. February 12, 2021.
41. Invited Speaker. Dahdaleh Institute for Global Health Research. Presentation on our IDRC project on predictive modeling and forecasting the transmission of COVID-19 in Africa using Artificial Intelligence. Attended virtually-zoom. January 27, 2021.
42. Invited Speaker. University of Alberta Mathematical Biology Lecture series. The impact of social, demographic and climatic variable on the growth rate of COVID-19 across countries. Attended virtually-zoom. November 16, 2020.



C. Events that we have organized

We have also organized over 100 workshops, conferences and webinars in last two years. Below is a sample of some of the workshops, conferences and webinars that we organized:

1. Consortium of Universities for Global Health 2023 conference: I organized a workshop on “Fairness in Machine Intelligence for Global Health” at the consortium of Universities for Global Health 2023 conference. <https://www.cugh2023.org/satellitesession13> . April 03, 2023.
2. AI for Global Challenges and Lessons learned: organized Global South AI4PEP Network bi-weekly lecture series. Theme: AI for Global Challenges and Lessons learned <https://www.yorku.ca/cifal/ai4pep/>. Feb, 20-May 29, 2023 .
3. 2023 MfPH Early Warning Systems Workshop: organized a workshop at the Fields Institute on Early Warning Systems for Emerging and Re-emerging Diseases from January 23-25: <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Jan. 23-25, 2023 .
4. Data for Policy Conference 2022: organized and took part in a panel discussion on “Towards an Inclusive Data Governance Policy for the use of AI in Africa” in the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. link: <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. December, 10, 2022 .
5. United Nation General Assembly 77 (UNGA77) Science Summit interactive panel session : During the UNGA77 we co-organize a panel session on artificial Intelligence Research in Health: Tackling Global Challenges as One (other co-organize are: I-DAIR , the United Nations University Institute in Macau (UNU Macau), Indraprastha Institute of Information Technology Delhi (IIIT-Delhi), Universidade Federal do Rio Grande do Sul (UFRGS), the Africa-Canada AI and & Data Innovation Consortium (ACADIC), the University of the Witwatersrand, and the City University of New York (CUNY). September, 22, 2022 .
6. Mini-Symposium: Big Data and AI for Public Health. I co-organized a mini symposium at the Canadian Industrial and Applied Mathematics 2022 Meeting on Big Data and AI for Public Health. June 15, 2022.
7. Collaborative workshop on big data analysis of covid-19. In partnership with the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30-31, 2022 .
8. Conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. In collaboration with CIFAL York, and representing ACADIC, we organize a conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence at York University, Canada. Feb 03, 2022
9. Canadian Applied and Industrial Mathematics Meeting 2021: Organized a mini-symposium at the Canadian Applied and Industrial Mathematics 2021 Meeting on Modelling Infectious Disease. June 21, 2021.
10. Society for Mathematical Biology Meeting 2021: Organized a mini-symposium at the Society for Mathematical Biology Meeting 2021: on Modelling Infectious Disease. June 15, 2021.
11. Disaster Risk Governance Webinar: Organized a webinar series on AI for Disaster Resilience and Sustainable Development. April 30, 2021



D. Regional Webinar series

Each country runs a weekly webinar series where they invite researchers from around the world to come and share their research work with them. We meet bi-weekly for updates from each country and this has been going on since we started working on the project.

Type of engagement (conference, meetings etc.)	Role in engagement (Presenter, meeting invitee etc.)	Presentation or discussion topic	Date & Location	Key stakeholder, title, affiliation (if relevant)	Details (website if relevant)	Follow up action/change as a result of the engagement
Presentations to Government	See detailed information above	See detailed information above	see detailed information above	See detailed information above	See detailed information above	See detailed information above
Conference	keynote Speaker	Gave a talk to the Public Health Association of BC Summer Institute on: "the impact of responsible local and explainable AI on communities	June 22, 2023	Public Health Association of BC Summer Institute	https://phabc.org/phsi-2023-registration/?civiwp=CiviCRM&q=civicrm%2Fevent%2Finfo&reset=1&iid=52	
Conference	Keynote Speaker	Attended IndabaX Cameroon 2023 conference and gave a talk on "Leveraging Responsible, Explainable, & Local AI for Population	June 19-21		https://deeplearningindaba.com/2023/indabax/cameroon/	

		Health & Health Systems				
Conference	Invited Speaker	We gave a talk at the Next Einstein Forum Webinar series on leveraging responsible artificial intelligence methods for population health and health systems.	April 18, 2023.			
Workshop	Invited Speaker	Attended DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN #SDGs and gave a talk on AI-based frameworks and algorithms for achieving SDG3 and SDG5 in the Global South	May 15, 2023 - May 16, 2023		http://dimacs.rutgers.edu/events/details?eID=2394	
Meeting	Invited Speaker	We gave a presentation to South African University leaders (during	April 24, 2023.			

		<p>their visit to York University) on the work that we have been doing in South Africa: mobilizing AI to build equitable, resilient governance strategies & increase societal preparedness for future global pandemics and climate disasters.</p>				
Meeting	Invited Speaker	<p>We were invited to talk about how we can leverage AI to assist the Governor of Kajiado , Kenya (during his visit to York University)in his agenda for the Maasai</p> <p>people of Kenya (vulnerable community): in particular SDG 2</p>	<p>March 23, 2023.</p>			

		(“Zero hunger”); SDG 3 (“Good Health and Well-being”), SDG4 (“Quality Education”), SDG5 (“gender equality”), SDG 6(“Clean Water and Sanitation”), SDG11 (“Sustainable cities and communities”).				
Conference	Invited Speaker	We attended and gave a talk on Leveraging Responsible AI for Population Health& Health Systems in Nigeria at the Nigeria Computer Society, Artificial Intelligence & Robotics Conference	March 21-23, 2023.		https://lnkd.in/g4HwZGti	
Meeting	Invited Speaker	We attended the American Mathematical Society	March 18-20, 2023			

		Southeastern Sectional Meeting at Georgia Institute of Technology, Atlanta Georgia and gave a talk on Mpox dynamic model: incorporating adaptive behavioural changes, different control strategies in the MSM community & under-reporting.				
Seminar	Keynote	We gave a guest talk on Leveraging Responsible AI for Population Health & Health Systems at Queens University	March 07, 2023.			
Webinar	Keynote	We gave a presentation at Michael Garron Hospital on Canadian Black Scientists and the Key to	FEBRUARY 28, 2023		https://www.tehn.ca/about-us/newsroom/mgh-inclusion-alliance-	

		Leveraging Responsible Data Science Methods for Population Health & Health Systems.			hosts-2023-speaker-event-series-black-history-month	
Seminar	Invited Speaker	We gave a guest lecture at the Dalla Lana School of Public Health on Leveraging Responsible, Explainable, and Local Data Science Methods for Population Health & Health Systems	Feb. 07, 2023.			
Workshop	Keynote	We organized a workshop at the Fields Institute on Early Warning Systems (EWS) for Emerging and Re-emerging Diseases and gave a talk on EWS for re-emerging	Jan. 23-25, 2023		http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop	

		diseases				
Meeting	Invited Speaker	We attended the Joint Mathematics Meetings in Boston and gave a talk entitled: "adaptive changes in sexual behaviour in the high-risk population in response to mpox can control the outbreak: insights from an epidemic model"	Jan. 04-07, 2023.			
Conference	Invited Speaker	We organized and took part in a panel discussion on "Towards an Inclusive Data Governance Policy for the use of AI in Africa" at the Data for Policy Conference at the Evans School of Public Policy and	Dec. 10, 2022.		https://members.dataforpolicy.org/2022-conference/seattle-programme/	

		Governance, University of Washington				
Meeting	Invited Speaker	We were invited to two-panel conversations at the Bill & Melinda Gates Foundation in Seattle: 1) Ethics and Efficacy of modelling and machine learning, 2) The politics of data.	December 09, 2022		https://members.dataforpolicy.org/2022-conference/seattle-programme/	
Meeting	Invited Speaker	We gave a talk at the Canadian Mathematical Society winter meeting on "Adaptive changes in sexual behavior in the high-risk population in response monkeypox can control the outbreak: insights from an epidemic model"	December 04, 2022.			
Seminar	Keynote	We gave a keynote presentation at	Nov 28, 2022.			

		the New York University Abu Dhabi Global Perspectives in Science Lecture Series. Title: Leveraging AI for Clinical Public and Global health Needs: Implications for Policies and Lessons Learned from the ACADIC project.				
Symposium	Invited Speaker	We gave a presentation at the China-Canada Symposium On Modelling, Prevention and Control of Zoonoses. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”.	Nov 15, 2022.			

Conference	Keynote	We gave a presentation at the Ghanaian Mathematical Biology and Medicine Workshop. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in Africa”	Nov 08, 2022			
Seminar Series	Invited Speaker	We gave a presentation at the University of Massachusetts Mathematical Biology Seminar series. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”	October 31, 2022.			
Conference	Keynote	We gave a keynote speaker at the Science Atlantic Conference 2022, that held	August 17, 2022.			

		at Mount Alison University, Sackville, NB . Attended in person. Oct. 21-15, 2022. the MfPH next generation. Title: “Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage’.				
Meeting	Invited Speaker	During the deputy Minister of Higher Education, Science and Innovation (South Africa), the Hon. Buti Manamela visit to York University, we presented our initiatives in South Africa: Leveraging	September 14, 2022.			

		Artificial Intelligence and Big Data for clinical public health in South Africa.				
Webinar	Invited Speaker	We gave a presentation at the MfPH next generation. Title of my talk: “Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage”.	August 17, 2022			
Workshop	Keynote	We were invited as a keynote speaker at the Queen’s University, Workshop on Mathematical Ecology Title: ‘Estimation of COVID-19 ascertainment rates across Africa and	August 10-11, 2022.		https://mast.queensu.ca/math-ecology/	

		drivers of transmission dynamics worldwide in the early stage				
Meeting	Invited Speaker	We gave a presentation at the Applied and Industrial Mathematics Society Annual Meeting 2022 in UBC-Okanagan. Title: “Estimation of epidemiological parameters and ascertainment rate from early transmission of COVID-19 Across Africa”.	June 15 , 2022			
Workshop	Invited Speaker	keynote speaker at the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium	May 30 , 2022			

		(ACADIC)and the University of Pretoria collaborative workshop on big data analysis of covid-19				
Seminar	Invited Speaker	We gave a presentation in the Mathematics Department, University of Alberta entitled: “comparing public sentiments toward COVID-19 vaccines across Canadian cities: analysis of comments on Reddit”	February 14 , 2022			
Webinar	Invited Speaker	Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence	Feb 03, 2022.			
Seminar	Keynote	keynote talk on the impact of social economics and	January 19 , 2022.			

		environmental factors on the dynamics of COVID-19 at the Artificial Intelligence for Pandemics Centered, University of Queensland, Australia				
Symposium	Invited Speaker	Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Talk titleThe impact of so- cial, economic, environmental factors and public health measures on the dynamics of COVID- 19	September 16, 2021			
Symposium	Invited Speaker	Canadian Centre for Disease Modelling 2021 China-Canada	September 17, 2021			

		Symposium on Modelling, Prevention and Control of Infectious Diseases.				
Meeting	Invited Speaker	Artificial Intelligence Virtual Stakeholders Forums: A Rights-Respecting Artificial Intelligence Policy for Nigeria.	October 20, 2021.			
Colloquium	Invited Speaker	Mathematics for Public Health Colloquium. Talk title: Early Warning Tools for Emerging Infectious Diseases Outbreak.	October 12, 2021		http://www.fields.utoronto.ca/activities/21-22/public-health-colloquium	
Conference	Keynote Speaker	Ghana Science Association 2021 Conference Theme: Mitigating COVID-19 Pandemic. Talk title: The power	October 07, 2021		https://www.ghanascience.org.gh	

		of Collaboration, Artificial Intelligence & Big Data in the Fight Against COVID-19				
Conference	Invited Speaker	Invited Speaker Black Heroes of Mathematics 2021 conference . Talk title: Harnessing Artificial Intelligence and Big Data Techniques to Monitor Manage and Forecast an Epidemic: the Case of COVID-19.	October 05, 2021		https://www.lms.ac.uk/events/black-heroes-mathematics	
Conference	Invited Speaker	Invited anelist. Black Heroes of Mathematics 2021 conference Panel conversation on increasing the number of Blacks in re-search and STEMM programs.	September 13, 2021.		https://www.lms.ac.uk/events/black-heroes-mathematics .	

Conference	Invited Speaker	Data for policy 2021 conference. Title of talk: lessons for policy-data interactions after COVID-19	September 13, 2021		https://dataforpolicy.org	
Lecture Series	Invited Speaker	Invited Speaker. University of British Columbia Mathematical Biology Lecture series. The impact of social, economic, environmental factors and public health measures on the dynamics of COVID-19.	June 02, 2021.			
Symposium	Invited Speaker	Symposium on Building Momentum for Transformative Disaster Risk Governance in Africa	February 12, 2021			
Seminar	Invited Speaker	Dahdaleh Institute for Global Health Research. Presentation on	January 27, 2021.			

		our IDRC project on predictive modeling and forecasting the transmission of COVID-19 in Africa using Artificial Intelligence.				
Lecture series	Invited Speaker	The impact of social, demographic and climatic variable on the growth rate of COVID-19 across countries.	November 16, 2020			
Conference	Session Organizer and Speaker	Consortium of Universities for Global Health 2023 conference: We organized a workshop on “Fairness in Machine Intelligence for Global Health” at the consortium of Universities for Global Health	April 03, 2023.		https://www.cugh2023.org/satellitesession13	

		2023 conference.				
Lecture Series	Organizer	bi-weekly lecture series on AI for Global Challenges and Lessons learned	Feb, 20-May 29, 2023			
Workshop	Organizer	organized a workshop at the Fields Institute on Early Warning Systems for Emerging and Re-emerging Diseases	January 23-25:		http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop	
Conference	Session Organizer	Data for Policy Conference 2022: organized and took part in a panel discussion on "Towards an Inclusive Data Governance Policy for the use of AI in Africa" in the Data for Policy Conference at the Evans School of Public Policy and Governance, University of	December, 10, 2022		https://members.dataforpolicy.org/2022-conference/sattle-programme/	

		Washington.				
Conference	Co-organizer	<p>United Nation General Assembly 77 (UNGA77) Science Summit interactive panel session : During the UNGA77 we co-organize a panel session on artificial Intelligence Research in Health: Tackling Global Challenges as One (other co-organize are: I-DAIR , the United Nations University Institute in Macau (UNU Macau), Indraprastha Institute of Information Technology Delhi (IIIT-Delhi), Universidade Federal do Rio</p>	September , 22, 2022			

		Grande do Sul (UFRGS), the Africa-Canada AI and & Data Innovation Consortium (ACADIC)				
Mini-Symposium	Organizer	organized a mini symposium at the Canadian Industrial and Applied Mathematics 2022 Meeting on Big Data and AI for Public Health	June 15, 2022			
workshop	Organizer	In partnership with the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and the University of Pretoria organized a collaborative	May 30-31, 2022			

		workshop on big data analysis of covid-19				
Conference	organizer	In collaboration with CIFAL York, and representing ACADIC, we organize a conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence at York University, Canada.	Feb 03, 2022			
mini- symposium	Organizer	Organized a mini-symposium at the Canadian Applied and Industrial Mathematics 2021 Meeting on Modelling Infectious Disease.	June 21, 2021.			
Mini-symposium	Organizer	Organized a mini-symposium at the Society for	June 15, 2021			

		Mathematical Biology Meeting 2021: on Modelling Infectious Disease.				
Webinar Series	Organizer	Organized a webinar series on AI for Disaster Resilience and Sustainable Development.	April 30, 2021			
Conference	Presenter, COVID-19 gender studies	Presentation	30 May - 31 May 2022	The Spatial Epidemiological group (SEPIMOD)	https://www.up.ac.za/media/shared/115/ZP_Files/collaborative-workshop-on-big-data-analysis-of-covid-19.zp219983.pdf	
Conference	Presenter, A NLP approach to Probe COVID-19 Vaccine Hesitancy from Tweets in South Africa	Presentation	30 May-31 May 2022	ACADIC Collaborative Workshop on Big Data Analysis of COVID-19		
Meeting	Invited Speaker	An Intelligent Monitoring and Prediction System for	9 September 2022			

		Smart Cities				
--	--	--------------	--	--	--	--

4.3 Non-academic outreach products

List knowledge outputs that are focused on knowledge translation and public awareness. These include stories developed, policy and knowledge briefs, brochures, blogs, op-eds and other non-academic products.

Type (policy brief, blog, op-eds, brochure, etc.)	Name/ title of publication	Date	Reach (global, regional, national, local)	Focus of tools	Link (if available online)
Policy Brief	Harnessing the power of data: Artificial Intelligence - based pandemic support		Global	Policy	https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en
Blog	AI4COVID Research				https://youtu.be/kplM7hMy5y0



	Overview: ACADIC, Africa.				
Blog	Reflections from ACADIC, Africa				https://youtu.be/kw3HrOafRW0
Blog	AI4COVID:AC ADIC Chief Counsel Barrister Jake Okechukwu Effoduh Talks About AI Ethics in Healthcare		Global	AI Ethics	https://youtu.be/HBCnibs9bic

4.4 Media coverage and citations in public events

Please provide details of any media coverage (radio, television, print media, etc.) of your research activities or outputs. This can also include references which cite or otherwise reference your work, including speeches, public statements, policy documents and regional and global forums where your work is featured or discussed.

Media Coverage. Our work has been covered on all main TV, Radio and newspapers of these countries and other international media hundreds of times. A selection of news bits can be found [here](#). A selection of some of the media coverage can be found below:

Title	Date	Link
Artificial intelligence and COVID-19	08/30/2021	https://www.dw.com/en/covid-artificial-intelligence-in-the-pandemic/a-58171146
Huge spotlight on prime time news: Find out what ACADIC project is all about from Prof. Ngwa	07/07/2022	https://www.youtube.com/watch?v=4xN8JrBN5XA
Our team leader in Cameroon addressing dis- and miss-information about COVID-19 & COVID-19 vaccines,	07/07/2022	https://www.youtube.com/watch?v=Sm_J5WX_di8
ACADIC using Artificial Intelligence and Big Data to inform COVID-19 policies in Africa	07/07/2022	https://www.youtube.com/watch?v=4H6iiPRmtW0
University of Buea Among Africa's COVID Modeling and Reporting Centers	07/07/2022	https://www.youtube.com/watch?v=5AM9h0y5ptI
Misinformation on social media linked to higher spread of COVID-19 in new study	06/11/2021	https://toronto.ctvnews.ca/misinformation-on-social-media-linked-to-higher-spread-of-covid-19-in-new-study-1.5466846
Dealing with the pandemic by drinking and swearing? Boffins say you're not alone	06/11/2021	https://www.theregister.com/2021/06/11/pandemic_drinking_and_swearing_outbreak/
Social media use one of four factors related to higher COVID-19 spread rates early on	06/09/2021	https://phys.org/news/2021-06-social-media-factors-higher-covid-.html

How artificial intelligence and big data are fighting COVID-19 in Africa	08/22/2021	https://yfile.news.yorku.ca/2021/08/22/how-artificial-intelligence-and-big-data-are-fighting-covid-19-in-africa/?http://yfile.news.yorku.ca/?utm_source=YFile_Email&utm_medium=Email&utm_content=Current-News&utm_campaign=yfile
透過不同角度，加深對身邊人、事、物的了解。每集內容分為兩部份：第一節介紹有關文化、傳媒、電影等資訊，亦會邀請新聞人物接受個人專訪；第二節邀請專家及相關人物討論最熱門的新聞話題。		https://www.fairchildtv.com/newsarchive_detail.php?n=28
AI can help with COVID Inequalities		https://www.ctvnews.ca/video?clipId=2401509
Gauteng Command Council gives an update on Covid-19 in the province	2021/06/24	https://www.youtube.com/watch?v=8iPw6gQrx8k
Prof Bruce Mellado gives insight into the impact of the third wave on Gauteng	2021/06/24	https://www.youtube.com/watch?v=neIjCJTr0ro
Gauteng Premier David Makhura on province's response to COVID-19 - YouTube	2021/06/05	https://www.youtube.com/watch?v=IkL-PFTneX4
Professor Bruce Mellado gives an update on COVID-19 behaviour in Gauteng amid the third wave - YouTube	2021/06/15	https://www.youtube.com/watch?v=ongMjF7k1MM
AI techniques used to identify hotspots - YouTube	2020/12/22	https://www.youtube.com/watch?v=af9m7HIUivM Page 1 of 2 #DStv403 AI techniques used to identify hotspots
[Hazardous things in your area] Focus on Ruimsig	2021/02/13	http://702.co.za/podcasts/415/the-john-perlman-show/485505/hazardous-things-in-your-area-focus-on-ruimsig
南非研究：Omicron可突破部分免疫再感染率較Delta高	2021/12/03	https://www.cna.com.tw/news/firstnews/202112030068.aspx
'First signs' of fourth Covid-19 wave	2021/11/24	https://www.jacarandafm.com/new

in Gauteng - expert		s/news/first-signs-fourth-covid-19-wave-gauteng-expert/
Lower-to-mid income nations have more joblessness post-pandemic	2022/08/26	https://theguardian.com/low-to-mid-income-nations-have-more-joblessness-post-pandemic/
‘Up to 1-million at risk of Covid-19 in SA in 40 days’	2020/03/23	https://www.businesslive.co.za/bd/national/2020-03-23-up-to-1-million-at-risk-of-covid-19-in-sa-in-40-days/
Gauteng is ready to relax lockdown” – Gauteng Provincial Command Council	2020/08/13	https://vaalweekblad.com/70550/gauteng-is-ready-to-relax-lockdown-gauteng-provincial-command-council/
【南非觀察】新冠確診數直線上升，南非第四波疫情恐即將來襲_多源焦點	2021/11/27	https://dyfocus.com/news-world/324f0c.html
«El problema de Ómicron es la rapidez con la que afecta a los no vacunados»	2021/12/01	https://theworldnews.net/es-news/el-problema-de-omicron-es-la-rapidez-con-la-que-afecta-a-los-no-vacunados
Omicron si diffonde ad un ritmo mai visto prima»	2021/12/03	https://www.cdt.ch/mondo/omicron-si-diffonde-ad-un-ritmo-mai-visto-prima-HN4935229
News - South China Morning Post « » Omicron spreading quicker than all other Covid-19 variants in South African ‘epicentre’	2021/12/02	https://player.fm/series/news-south-china-morning-post/omicron-spreading-quicker-than-all-other-covid-19-variants-in-south-african-epicentre
10 years since Higgs Boson was found - SAfm Sunrise - Omny.fm	2022/07/08	https://omny.fm/shows/safm-sunrise-1/10-years-since-higgs-boson-was-found
Wits researchers launch most comprehensive COVID-19 dashboard in South Africa	23 March 2020	http://www.wits.ac.za/news/latest-news/general-news/2020/2020-03...aunch-most-comprehensive-covid-19-dashboard-in-south-africa.html

Twitter shows lower-to-middle income countries have higher unemployment post pandemic	24 August 2022	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0272208
AI algorithm system predicts low risk of third wave in SA	2021/04/13	https://www.iol.co.za/news/south-africa/western-cape/ai-algorithm...low-risk-of-third-wave-in-sa-8f73bd4-0dac-46e6-82da-818a4687b9ba
AI algorithm system predicts low risk of third wave in South Africa	2021/04/13	https://eminetra.co.za/ai-algorithm-system-predicts-low-risk-of-third-wave-in-south-africa/237543/
AI helps to identify new COVID-19 hotspots in Gauteng	2020/12/24	https://medicalxpress.com/news/2020-12-ai-covid-hotspots-gauteng.html
AI-based algorithm shows SA has low risk of Covid-19 third wave - for now	2021/04/13	https://www.capetalk.co.za/articles/413677/south-africa-has-low-risk-of-covid-19-third-wave-infections-for-now
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://medicalxpress.com/news/2021-04-ai-powered-algorithm-south-africa.html
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://floridanewstimes.com/ai-powered-algorithm-released-to-detect-the-third-wave-in-south-africa/215517/
Algoritmo impulsado por IA lanzado para detectar la tercera ola en Sudáfrica	2022/09/02	https://www.biblia.work/articulos-salud/algoritmo-impulsado-por-ia-lanzado-para-detectar-la-tercera-ola-en-sudafrica/
Analysis on President Cyril Ramaphosa's address	2021/06/27	https://www.youtube.com/watch?v=6-HDoA1VZPs
As Covid-19 cases surge, SA expands vaccine programme	2021/06/25	https://www.biznews.com/briefs/2021/06/25/covid-19-sa-vaccine-expansion
As Latest COVID-19 Wave Recedes, Public Health Leaders Brace For The Next One	02/02/2021	https://adf-magazine.com/2021/11/as-latest-covid-19-wave-recedes-public-health-leaders-brace-for-the-next-

		one/
Bad news for Gauteng province. Corona Virus infections are rising rapidly.	2021/06/15	https://za.opera.news/za/en/health/64c718e2298361f9ccec82cd8ed69f23
Bad news-COVID 4th wave expected to hit SA,	2021/10/20	https://za.opera.news/za/en/health/0d6e6152a94f11b2fe7dbb42d9e8c6c4
Bad news-COVID 4th wave may hit SA early	2021/10/20	https://za.opera.news/za/en/health/amp/62749b3438fc5afb15a8b4a94a00fa
Behavioural changes will reduce the spread - Brakpan Herald	2021/06/29	https://brakpanherald.co.za/251384/behavioural-changes-will-reduce-the-spread/
Biến thể Omicron gây nguy cơ tái nhiễm cao gấp 3 lần các chủng trước	12/03/2021	http://keonhacai.com/bien-the-omicron-gay-nguy-co-tai-nhiem-cao-gap-3-lan-cac-chung-truoc/
BIUST Covid-19 Data Analysis for Botswana Goes Live	9 April 2020	http://www.thetswanatimes.co.bw/index.php/arts-lifestyle/theatre/92-home/793-biust-covid-19-data-analysis-for-botswana-goes-live
Buenas noticias si ha recibido la vacuna Johnson & Johnson Covid-19	2021/09/11	https://notiulti.com/buenas-noticias-si-ha-recibido-la-vacuna-johnson-johnson-covid-19/
Burial homes under strain as deaths surge in Gauteng	9 July 2021	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://blackmediadaily.com/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/amp/
Burial homes under strain as deaths surge in South African hub	2021/07/09	https://www.moneyweb.co.za/news/south-africa/burial-homes-under-strain-as-deaths-surge-in-south-african-hub/

Call for calm amid new Covid019 strain	2022/12/06	https://www.youtube.com/watch?v=nOEeND8Gkss
Cases of Gauteng Omicron are increasing at a rate never seen before	2021/12/02	https://remonews.com/southafrica/cases-of-gauteng-omicron-are-increasing-at-a-rate-never-seen-before/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/19/2022	https://lowvelder.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/20/2022	https://mpumalanganews.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Confirmed Covid-19 infections may be tip of the iceberg in Gauteng	06/24/2021	https://www.sowetanlive.co.za/news/south-africa/2021-06-24-confirmed-covid-19-infections-may-be-tip-of-the-iceberg-in-gauteng/
Containing COVID-19 with digital technology, AI	02/07/2020	https://guardian.ng/features/health/containing-covid-19-with-digital-technology-ai/
Coronavirus ‘tipping point’ – South Africa’s lockdown is all we have to prevent more infections	03/24/2020	https://businesstech.co.za/news/government/384291/coronavirus-tipp...-south-africas-lockdown-is-all-we-have-to-prevent-more-infections/
Coronavirus cases rise to five-hundred and fifty-four in SA	03/24/2020	https://www.politicalanalysis.co.za/coronavirus-cases-rise-to-five-hundred-and-fifty-four-in-sa/
COVID 4th wave may hit Gauteng as early as November, says provincial command council	10/18/2021	https://news365.co.za/provincial-command-council/
COVID 4th wave may strike as early as November	10/19/2021	https://za.opera.news/za/en/health/b1311fd972f5956288c8e514a6b0906a
Covid -19 fourth wave is announced lock down might take place	11/26/2021	https://za.opera.news/za/en/health/f3617c019000d0f2007c256cdd44b

		58
Covid and Vaccine update	06/09/2021	https://omny.fm/shows/living-redefined/covid-and-vaccine-update?in_playlist=living-redefined!podcast#sharing
Covid-19 cases expected to rise in Gauteng Province	01/05/2021	http://www.soshanguvepulse.co.za/2021/01/covid-19-cases-expected-to-rise-in-gauteng-province/
Covid-19 cases expected to soar in Gauteng province	01/04/2021	https://gautengnewspaper.co.za/2021/01/04/covid-19-cases-expected-to-soar-in-gauteng-province/
Covid-19 fourth wave expected to hit Gauteng between November and January	10/20/2021	https://kemptonexpress.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Covid-19 fourth wave expected to hit Gauteng between November and January	10/23/2021	https://northernnatalnews.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Professor Bruce Mellado on the the Omicron variant	11/27/2021	https://rvwab.com/videos/watch/ouBrejIFQJs
COVID-19 storm in Gauteng has slowed down.	13/08/2020	https://fullview.co.za/top-stories/item/4322-covid-19-storm-in-gauteng-has-slowed-down
Covid-19 surge in January a real concern for Gauteng	01/02/2021	https://www.jacarandafm.com/news/news/covid-19-surge-january-real-concern-gauteng/
Covid-19 tăng theo 'cấp số nhân' ở tâm dịch Omicron	12/03/2021	http://ant.vn/covid-19-tang-theo-cap-so-nhan-o-tam-dich-omicron-329890.htm
Data modelling calls for stricter restrictions as number of infections spike	03/06/2020	https://omny.fm/shows/the-breakfast-show-702/data-modelling-calls-for-stricter-restrictions-as
Gauteng ramps up vaccination drive	09/27/2021	https://myplay.deod.tv/en/specials/rendering-content/mzanzi-magic/107119/gauteng-ramps-up-vaccination-drive

Funeral homes under pressure as deaths rise in central South Africa	12/02/2021	https://www.bloomberglia.com.ar/2021/12/02/eeuu-requerira-a-viaj...t-negativo-de-covid-19-dentro-de-24-horas-anteriores-a-su-partida/
El número de casos de Covid-19 aumenta constantemente, la gente sigue muriendo	10/07/2022	https://mxn.news/el-numero-de-casos-de-covid-19-aumenta-constantemente-la-gente-sigue-muriendo/
En Afrique du Sud, en utilisant l'IA, des chercheurs prédisent un faible risque de 3e vague de Covid-19	13/04/2021	https://www.agenceecofin.com/intelligence-artificielle/1304-87139...-des-chercheurs-predisent-un-faible-risque-de-3e-vague-de-covid-19
If more people don't vaccinate, mandatory vaccinations could be the only option - David Makhura	12/02/2021	https://www.engineeringnews.co.za/article/if-more-people-dont-vaccinate-mandatory-vaccinations-could-be-the-only-option---david-makhura-2021-12-02
Wits researchers launch comprehensive Covid-19 dashboard for South Africa	03/24/2020	https://www.engineeringnews.co.za/print-version/wits-researchers-launch-comprehensive-covid-19-dashboard-for-south-africa-2020-03-24
Wits, York University to develop AI Covid-19 project	03/12/2020	https://www.engineeringnews.co.za/print-version/wits-york-university-to-develop-ai-covid-19-project-2020-12-03
Expert warns of second Covid-19 surge in Gauteng	01/11/2021	https://kemptonexpress.co.za/lnn/145301/expert-warns-of-second-covid-19-surge-in-gauteng/
Experts say Gauteng has yet to see the worst, peak a week out	06/27/2021	http://hitechnewsdaily.com/2021/06/experts-say-gauteng-has-yet-to-see-the-worst-third-wave-peak-a-week-out/
Fourth wave could hit Gauteng as early as next month	10/20/2021	https://www.iol.co.za/the-star/news/fourth-wave-could-hit-gauteng-as-early-as-next-month-49db8cbe-44cc-4a8c-8d8b-3f766dede8e6

Fourth wave of Covid infections ‘fast approaching’, expert warns	08/26/2021	https://www.jacarandafm.com/news/news/fourth-wave-covid-infections-fast-approaching-expert-warns/
Funeral homes under pressure as deaths rise in central South Africa	07/09/2021	https://ondequando.com/2021/07/09/funeral-homes-under-pressure-as-deaths-rise-in-central-south-africa/
Gauteng accounts for more of the daily Covid-19 cases	11/23/2021	https://omny.fm/shows/power-breakfast/gauteng-accounts-for-more-of-the-daily-covid-19-ca
Gauteng Covid-19 visualisation platform enables monitoring, prediction	07/07/2020	https://m.engineeringnews.co.za/article/gauteng-covid-19-visualisation-platform-enables-monitoring-prediction-2020-07-07/rep_id:4433
Gauteng is ready for the Covid-19 vaccine, says Makhura	01/30/2021	https://www.iol.co.za/saturday-star/news/gauteng-is-ready-for-th...id-19-vaccine-says-makhura-c5457219-2bb2-472d-8161-7ddd37799466
Gauteng Provincial Command Council warning fourth wave could hit earlier than expected	10/21/2021	https://www.youtube.com/watch?v=FM6Gd1yqnZs&t=103s
Gauteng records 78% COVID-19 recovery rate	08/13/2020	https://www.sabcnews.com/sabcnews/gauteng-records-78-covid-19-recovery-rate/
Good news about Covid-19 third wave in Gauteng	07/08/2021	https://mybroadband.co.za/news/trailing/405263-good-news-about-covid-19-third-wave-in-gauteng.html
J&J vaccine reduces COVID infections by half among health workers, according to a new study.	08/09/2021	https://fullview.co.za/top-stories/item/12814-j-j-vaccine-reduces-covid-infections-by-half-among-health-workers-according-to-a-new-study
Is Gauteng in the fourth wave of Covid-19	12/03/2021	https://www.nouvelles-du-monde.com/les-cas-de-gauteng-omicron-aug...t-la-province-accelere-le-deploiement-du-vaccin-

		dans-les-ecoles/
York explores research partnerships with South Africa	03/06/2023	https://yfile.news.yorku.ca/2023/05/03/york-explores-research-partnerships-with-south-africa/
York University News and the office of the provost spotlighted me as a leader within SDG 17: Partnerships for the Goals through the use of AI to improve health in the global south	03/07/2023	https://tinyurl.com/tcmdwpsk
Joining forces to work with Black communities to build equitable, resilient governance strategies & increase Black communities' preparedness for future diseases and climate disasters.	06/12/2022	https://tinyurl.com/5n8r65rw
Leveraging responsible AI solutions to help gov't & communities prepare and respond to disease outbreaks	10/30/2022	https://www.ctvnews.ca/video?clipId=2552980&jwsourc= fb& fbclid=IwAR2YtC8QUon5cvcFbwleIPdWZ7K3k5pJ8QisqLZELwXQIaB-d8w_B5xOeII
Leveraging Natural Language Processing to inform policies. Twitter shows lower-to-middle income countries have higher unemployment post-pandemic.	08/25/2022	https://tinyurl.com/7mwph8cm
Leveraging Natural Language Processing to inform policies. High unemployment rates in lower, mid income countries after Covid	08/25/2022	https://tinyurl.com/2vnvypvx
Employing artificial intelligence to address inequalities and systematic vulnerabilities in our communities.	13/ 03/2022.	https://www.ctvnews.ca/video?clipId=2401509
How artificial intelligence and big data are fighting COVID-19 in Africa.	08/ 22/ 2021	https://tinyurl.com/3zbf6ht9



Type (radio, speech, interview, etc.)	Title	Name of publication, network, etc.	Date	Reach (global, regional, national, local)	Focus of article or broadcast	Link
<i>See Table above</i>	<i>See table above</i>	<i>See Table above</i>		<i>See Table above</i>	<i>See Table above</i>	<i>See Table above</i>

Section 5: Outcomes and impacts and lessons

In this section you have the opportunity to share examples of how your work is contributing to broader and longer-term positive change. Please describe how these changes are being monitored and assessed. Wherever possible, provide the source of information (including links) that demonstrate the impact. If there is an anticipated impact but you are facing challenges in achieving it, we invite you to highlight the outcome and the strategies you are taking or took to overcome that challenge.

Note: We do not expect projects to contribute to outcomes and impacts in the first year of the initiative. In this case, we invite you to speak about current plans and strategies to generate impacts.

5.1. AI for COVID-19 Policy and Decision-Making

Has this project been referenced, cited or influenced sub-national, national or international policies, regulations, legislations or responses to epidemics? If yes, please explain:

Yes.

1. The modeling and projections have been presented directly to the governments and thus directly informed sub-national and national policies.

Below are links to sample reports that the team shared with policy makers.

1. https://www.dropbox.com/s/bea9yo8fw3b3gph/COVID19_PCCC_301121.ppt?dl=0
2. https://www.dropbox.com/s/xneylee8glctdha/COVID19_PCCC_110122.ppt?dl=0
3. https://www.dropbox.com/s/kwsihpur40kno2r/COVID19_PCCC_141221.ppt?dl=0
4. https://www.dropbox.com/s/vmc1hrzjelbmvdh/COVID19_PCCC_161121.ppt?dl=0
5. https://www.dropbox.com/s/57rbzuk5g7gy3pf/COVID19_PCCC_091121.ppt?dl=0
6. https://www.dropbox.com/s/rd7viz2lsqgmvs0/COVID19_PCCC_280921.ppt?dl=0
7. https://www.dropbox.com/s/0x8afnnd2e4g2v/COVID19_PCCC_210921.ppt?dl=0
8. https://www.dropbox.com/s/hkmvdmhqw86z0hp/COVID19_PCCC_140921.ppt?dl=0
9. https://www.dropbox.com/s/yyamlx5tjlb4580/COVID19_PCCC_070921.ppt?dl=0
10. https://www.dropbox.com/s/i4qankdst16675x/COVID19_PCCC_310821.ppt?dl=0
11. https://www.dropbox.com/s/qsfeu3kr03bgjnm/COVID19_PCCC_240824.ppt?dl=0
12. https://www.dropbox.com/s/fxovb7iqplnqs7o/COVID19_PCCC_170821.ppt?dl=0
13. https://www.dropbox.com/s/x71rhxcn5fief2y/COVID19_PCCC_100821.ppt?dl=0

14. https://www.dropbox.com/s/y4mnhuurh0dikwq/COVID19_PCCC_030821.ppt?dl=0

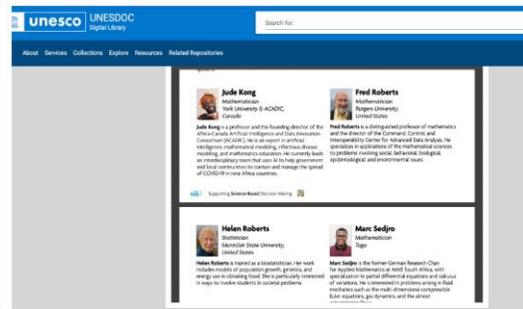
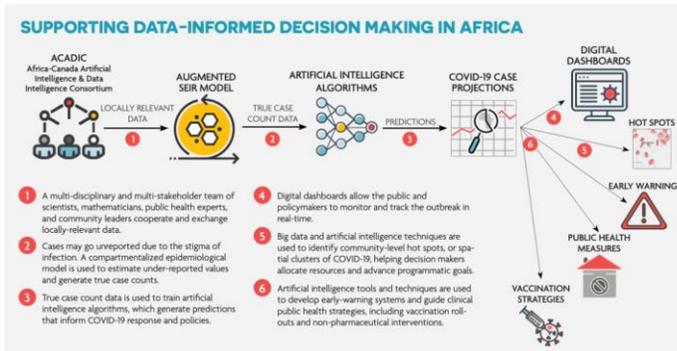
15. https://www.dropbox.com/s/y4h77degmhouqp8/COVID19_PCCC_270721.ppt?dl=0

2. **Discussion in the media about our work:** The work we are doing; helping government and communities to contain and manage COVID-19 has been covered on all main TV, Radio and newspapers of these countries and other international medias hundreds of times. Please see detailed information in Section 4.4: **Media coverage and citations in public events**

3. **Our Project has been cited in many policy documents including UNESCO Policy Brief:** English version: <https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en> (pages 8-9)

French Version:

https://unesdoc.unesco.org/ark:/48223/pf0000384607?fbclid=IwAR2pzbtT3Nt1zI_TNbl1xHK5ogliVKqwpC5q5SByCkU38BLvxNX25_hi73ZI



4. Our project influence the Federal Government of Canada and the Ontario COVID-19 Science Advisory Table policies towards omicron variant:

When the omicron variant became a global public health issue, Canada's deputy Minister of health and the Ontario COVID-19 Science Advisory Table (led by Dr. Peter Juni) reached out to us (Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC)), and intensively consulted with ACADIC's AI4COVID Program team at the University of the Witwatersrand (led by Prof. Bruce Mellado) to estimate the disease burden of the omicron variant from our South African data.

Within this period we met separately with the provincial government and Ontario COVID-19 Science Advisory Table every day for at least two weeks. We shared all the data from South Africa with them and equally had working meetings to discuss what was happening. We provided the Canadian government with first-hand knowledge about Omicron.

Our collaboration with the federal government and Ontario COVID-19 Science Advisory Table emphasizes the importance of supporting international development work. Our work greatly informed Omicron policies in Canada as the government of Gauteng (represented by Bruce) provided first-hand knowledge/experience and expertise about the dynamics of the variant. Before it became a major concern in the country, we already knew everything about it from the government of Gauteng. This is the best surveillance intelligence we can have.

Below are some of the intelligence we provided to the federal government and the Ontario Science Advisory Table. We were giving these presentations to them every day followed by a working meeting.

7. https://www.dropbox.com/s/7aww7hwhp8dexdp/ACADIC_Canada_Health_291121.ppt?dl=0
8. https://www.dropbox.com/s/iq2p3w20wld0rj3/ACADIC_Science_Table_301121.ppt?dl=0
9. https://www.dropbox.com/s/wns8k3gadyvmv6c/ACADIC_Status_4thwave_041221.ppt?dl=0
10. https://www.dropbox.com/s/p7qryumycaw9pox/ACADIC_Status_4thwave_071221.ppt?dl=0
11. https://www.dropbox.com/s/sdhffqy11bd2lua/ACADIC_Status_4thwave_121221.ppt?dl=0
12. https://www.dropbox.com/s/5mtvr49mr25th0m/ACADIC_IDRC_010222.ppt?dl=0

5. Invited to Canada-Africa Economic Cooperation Strategy (CA-ECS) Seminar & Reception to discuss how initiatives like ACADIC could be expanded. Those who attended the Seminar & Reception included i) Mr. Arif Virani MP, Parliamentary Secretary to the Minister of International of Trade, Export Promotion, Small Business and Economic Development, Canada; Ms. Thandiwe Fadane, Consul-General Republic of South Africa. Toronto. We were invited thanks to the impact of our work on communities.



6. **AESIS's 11th annual conference on Societal Impact of Science in Halifax:** We were invited to AESIS's 11th annual conference on Societal Impact of Science in Halifax because they found out about how impactful ACADIC project has been and invited us to elaborate more on it.





7. Hon. Michael S. Kerzner, the Solicitor General of Ontario, came to York University and specifically requested that we give a talk on the work that we have been doing in Africa: Helping government and communities to contain and manage COVID-19.



8. Hon. John Ntim Fordjour MP, Deputy Minister of Education and Member of Parliament, Ghana came to York University to explore the possibility of ACADIC working with the Ghanaian government on AI and health. The minister mentioned to us that they learned about ACADIC from other governments in Africa.



9. The deputy Minister of Higher Education, Science and Innovation (South Africa), The Hon. Buti Manamela, visited York University to discuss expanding and scaling ACADIC initiative in South

Africa: Leveraging Artificial Intelligence and Big Data for clinical public health in South Africa.







10. South Africa's Consul General in Toronto Ms. Thandiwe Fadane has visited York University twice to discuss our initiatives in South Africa.



11. South Africa University Presidents, Vice Chancellors and Deputy Vice Chancellors visited York University to explore expanding our initiatives in South Africa to include other Universities, especially historically disadvantaged Universities. They learned about our initiatives because of how impactful our projects are in South Africa.



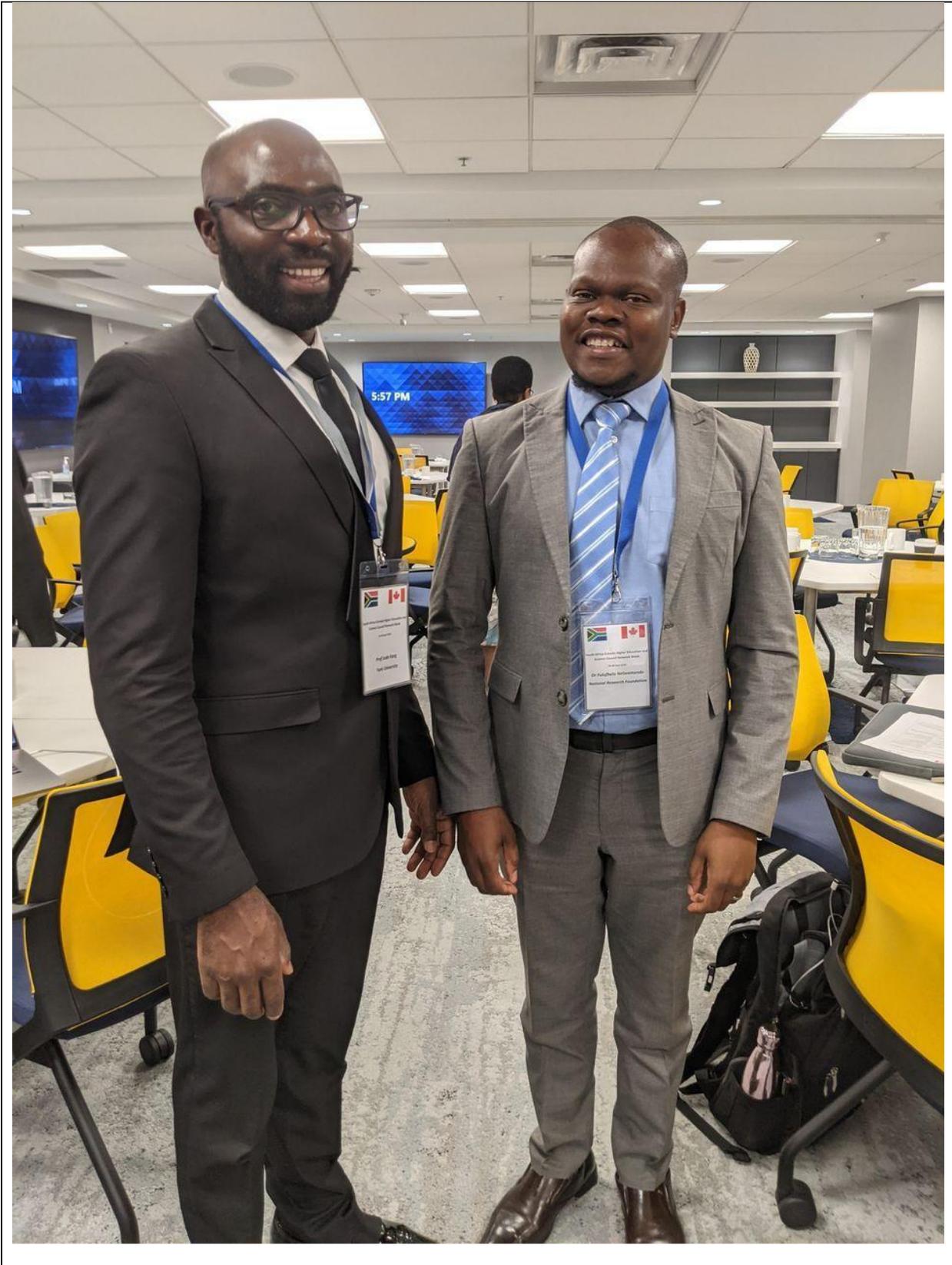






12. South Africa's National Research Foundation Meet with us to explore expanding and scaling our AI for health initiatives in South Africa.





13. The Governor of Kajiado, Kenya to York University visited York University, to explore the possibility of ACADIC working with him to achieve his agenda for the Maasai people of Kenya (vulnerable community): in particular SDG 2 ("Zero hunger"); SDG 3 ("Good Health and Well-being"), SDG4 ("Quality Education"), SDG5 ("gender equality"), SDG 6("Clean Water and Sanitation"), SDG11 ("Sustainable cities and communities"). He mentioned that he learned about ACADIC from other governments in Africa.



14. We were invited to the Gates Foundation in Seattle to discuss ACADIC projects and our approach.





15. The senior Medical Director, Moderna Canada Dr. Shehzad Iqbal exploring the potential for collaboration between Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and Moderna Canada



16. Canadian High commissioner to Cameroon, travelled a long distance (from Yaounde to Buea, Cameroon) and spent 2 business days with authorities in the South West Region of Cameroon discussing ACADIC project and it's impact on communities. Other High Commissioners abroad have equally discussed the impact of our projects with policy makers in the various countries where they are located.

The UB-Canada IDRC project

- The project, "*Predictive Modelling and Forecasting of the Transmission of COVID-19 in Africa using Artificial Intelligence*", has received funding from the Canadian International Development and Research Centre (IDRC).
- The Project is one of nine projects selected for funding through the Global South AI4COVID Response Program, focused on low and middle-income countries. (<https://www.idrc.ca/en/news/using-ai-and-data-against-pandemic-new-projects-global-south>).
- The core of the project will be coordinated from York University in Canada under the leadership of Dr Jude Dzevela Kong, Researcher at York University, as Principal Investigator.
- Subgrants go to research centres in Cameroon, South Africa, AIMS, Nigeria, Botswana, Rwanda, Namibia, and shall involve a cross section of scientists that together constitute the consortium.

©2020 University of the District of Columbia
August 13, 2020









17. Our team members won several research awards.

18. We have also organize 23 stakeholder forums on a Pan-Nigerian strategy and policies for AI. This was in partnership with Stakeholders in Nigeria.

19. Because of the impact of our work and our strategy, we have been spotlight as Canadian Innovation Research Leaders. A link where we are spotlighted among Canadian Innovation Research Leaders: <https://researchinfosource.com/pdf/CIL2021.pdf>

researchinfosource.com March 3, 2021

INSIDE	3	Canada's Top 50 Research Universities	12	Canada's Innovation Achievements
	6	Leaders' Corner	16	Canada's Top 40 Research Hospitals
	10	Focus on Canada's Recovery: Research is Key	18	Canada's Top 50 Research Colleges
	11	Researchers' Corner	22	Canada's Top 100 Corporate R&D Spenders

CANADA'S INNOVATION LEADERS 2021

CANADA'S TOP 100 CORPORATE R&D SPENDERS
CANADA'S TOP 50 RESEARCH UNIVERSITIES
CANADA'S TOP 40 RESEARCH HOSPITALS
CANADA'S TOP 50 RESEARCH COLLEGES

20/20 Innovation Vision: Looking back and moving forward

Canada's decades-long effort to up its lacklustre innovation game has shown

councils together and then not completing the actions recommended by them," said Naylor. "Canada has been teetering on the brink of an outstanding transformation

as one might think, according to Dr. Peter Nicholson, an innovation expert who has held senior posts in government, business, science, and academia. Necessity, as the

among OECD nations – a situation that has persisted for most of the last 20 years. CME's goal is for Canada to attract at least 2% of global capital which companies could use to invest in innovation.

"We call it the 2% challenge," said Durby. "If Canada could double its investment in technology and investment to become more efficient, to improve the resiliency of our supply chains, to become more greenhouse gas-efficient

which continues to be the single big market for Canadian exports.

"[US President Joe] Biden has shown any particular affinity: NAFTA or continental free trade. Right now it's all about the US," he noted. "I need a better understanding that we mix things together, that we're integrated because we haven't really been on a radar screen in the U.S."

Does this project have stories of policy and decision makers actively engaged in discussing AI applications for COVID-19 response issues at policy or other events? If yes, please provide names, dates and contexts:

A. Yes. Our team leaders discuss with policy makers about AI applications every week. Below is a link to sample reports that the team share with policy makers.

1. https://www.dropbox.com/s/bea9yo8fw3b3gph/COVID19_PCCC_301121.ppt?dl=0
2. https://www.dropbox.com/s/xneylee8glctdha/COVID19_PCCC_110122.ppt?dl=0
3. https://www.dropbox.com/s/kwsihpur40kno2r/COVID19_PCCC_141221.ppt?dl=0
4. https://www.dropbox.com/s/vmc1hrzjelbmvdh/COVID19_PCCC_161121.ppt?dl=0
5. https://www.dropbox.com/s/57rbzuk5g7gy3pf/COVID19_PCCC_091121.ppt?dl=0
6. https://www.dropbox.com/s/rd7viz2lsqgmvs0/COVID19_PCCC_280921.ppt?dl=0
7. https://www.dropbox.com/s/0x8afnned2e4g2v/COVID19_PCCC_210921.ppt?dl=0
8. https://www.dropbox.com/s/hkmvdmhqw86z0hp/COVID19_PCCC_140921.ppt?dl=0
9. https://www.dropbox.com/s/yyamlx5tjlb4580/COVID19_PCCC_070921.ppt?dl=0
10. https://www.dropbox.com/s/i4qankdst16675x/COVID19_PCCC_310821.ppt?dl=0
11. https://www.dropbox.com/s/qsfeu3kr03bgjnm/COVID19_PCCC_240824.ppt?dl=0
12. https://www.dropbox.com/s/fxovb7iqplnqs7o/COVID19_PCCC_170821.ppt?dl=0
13. https://www.dropbox.com/s/x71rhxcn5fief2y/COVID19_PCCC_100821.ppt?dl=0
14. https://www.dropbox.com/s/y4mnhuurh0dikwq/COVID19_PCCC_030821.ppt?dl=0
15. https://www.dropbox.com/s/y4h77degmhouqp8/COVID19_PCCC_270721.ppt?dl=0

We have also organized 3 stakeholder forums on a Pan-Nigerian strategy and policies for AI. This was in partnership with Stakeholders in Nigeria.

The work we are doing; helping government and communities to manage and contain COVID-19 has been covered on all main TV, Radio and newspapers of these countries and other international medias hundreds of times. Please see detailed information in Section **4.4: Media coverage and citations in public events** on.

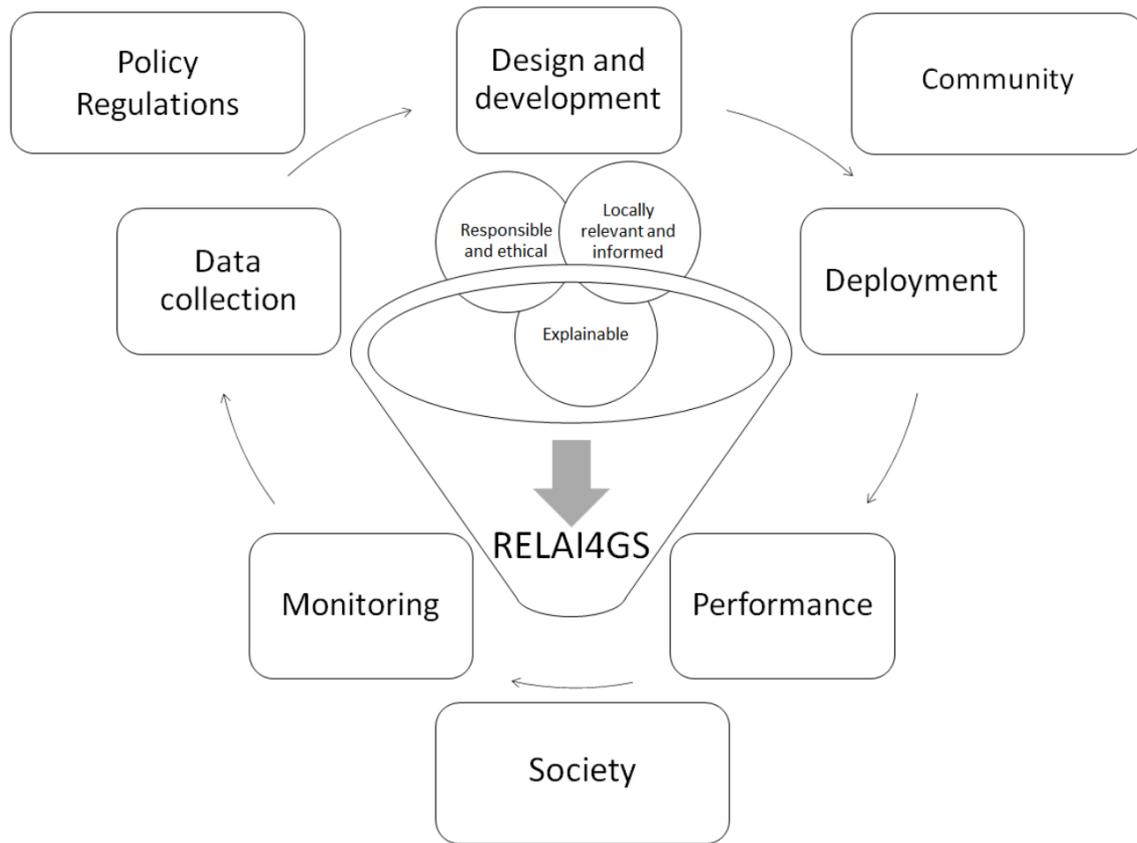


Has this project contributed to build accountability and trust in AI and data science responses to epidemics, including combatting mis- and dis-information around COVID-19? Has this project supported transparent and responsible AI, data, and digital rights governance around COVID-19 and pandemic response? If yes, please explain

1. Our Framework (<https://doi.org/10.3390/healthcare11040457>) :

ACADIC framework is termed “Responsible, Explainable, and Local Artificial Intelligence for Clinical Public and Global Health in the Global South” (REL-AI4GS). The diagram below coherently shows the “how”, the “what”, and the “who” of our proposed framework. The inner shell (“how”) contains the set of ethical and legal rules and codes that should be designed in such a way that they are responsible (incorporating policy and regulations), locally relevant for communities, and explainable to society at large. Moreover, they should be applied and embedded all along the processes of AI solutions in the Global South. The medium shell (“what”) describes the processes that should be implemented in an iterative fashion (step 1: locally relevant data collection, step 2: design and development of locally meaningful algorithms, step 3: deployment of locally relevant data, step 4: execution and performance of locally meaningful algorithms, and step 5: monitoring of the outcomes of the locally meaningful algorithms and identification (and removal) of potential biases). The outer shell (“who”) contains all the relevant stakeholders and actors that should be involved (Figure). This framework helped build accountability and trust in AI and data science responses to COVID in the countries where ACADIC is currently informing policies. We have published the framework and our strategy in the link below with the hope that other researchers will adopt. If adopted, we are confident that it will build accountability and trust in AI and data science responses to epidemics.
Link: <https://doi.org/10.3390/healthcare11040457>.

7.



Component	Definition
Responsible	Accountable, auditable, compliant, ethical, respectful, safe, secure
Explainable	Equitable, fair, impactful, interpretable, meaningful, reliable, reproducible, transparent, trustworthy, unbiased
Local	Autonomous, caring, connecting, decolonized, human- and community-centered, inclusive, intentional, intersectional, just, participatory, practical, protecting, process-based, sustainable

2. **Workshops and Conferences:** We have organized several workshops and conferences aimed at building accountability and trust in AI and data science responses to epidemic. We have equally given several talks that are aimed at building accountability and trust in AI and data science responses to epidemics. These include
- <https://youtu.be/HBCnibs9bic>
 - Consortium of Universities for Global Health 2023 conference: We organized a workshop on “Fairness in Machine Intelligence for Global Health” at the consortium of Universities for Global Health 2023 conference. <https://www.cugh2023.org/satellitesession13>. April 03, 2023.
 - AI for Global Challenges and Lessons learned: ACADIC bi-weekly lecture series
 - Data for Policy Conference 2022: organized and took part in a panel discussion on “Towards an Inclusive Data Governance Policy for the use of AI in Africa” in the Data for Policy

Conference at the Evans School of Public Policy and Governance, University of Washington.
link: <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. December, 10, 2022 .

- United Nation General Assembly 77 (UNGA77) Science Summit interactive panel session : During the UNGA77 we co-organize a panel session on artificial Intelligence Research in Health: Tackling Global Challenges as One (other co-organize are: I-DAIR , the United Nations University Institute in Macau (UNU Macau), Indraprastha Institute of Information Technology Delhi (IIIT-Delhi), Universidade Federal do Rio Grande do Sul (UFRGS), theAfrica-Canada AI and & Data Innovation Consortium (ACADIC), the University of the Witwatersrand, and the City University of New York (CUNY). September, 22, 2022
- Conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. In collaboration with CIFAL York, and representing ACADIC, we organize a conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence at York University, Canada. Feb 03, 2022
- Invited Speaker Data for policy 2021 conference: lessons for policy-data interactions after COVID-19
- Panelist. Artificial Intelligence Virtual Stakeholders Forums: A Rights-Respecting Artificial Intelligence Policy for Nigeria. Attended virtually-zoom. October 20, 2021.
- A panel conversation on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. Attended virtually-zoom. Feb 03, 2022.
- Gave a presentation at the University of Massachusetts Mathematical Biology Seminar series. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”. Attended virtually-zoom. October 31, 2022.
- We gave a presentation at the Ghanaian Mathematical Biology and Medicine Workshop. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in Africa”. Attended virtually-zoom. Nov 08, 2022.
- We gave a presentation at the China-Canada Symposium On Modelling, Prevention and Control of Zoonoses. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”. Attended virtually-zoom. Nov 15, 2022.
- We gave a keynote presentation at the New York University Abu Dhabi Global Perspectives in Science Lecture Series. Title of my talk: Leveraging AI for Clinical Public and Global health Needs: Implications for Policies and Lessons Learned from the ACADIC project. Attended in person. Nov 28, 2022.
- We were invited to two-panel conversations at the Bill & Melinda Gates Foundation in Seattle: 1) Ethics and Efficacy of modelling and machine learning, 2) The politics of data. December 09, 2022.
- We organized and took part in a panel discussion on “Towards an Inclusive Data Governance Policy for the use of AI in Africa” at the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington.
- We gave a guest lecture at the Dalla Lana School of Public Health on Leveraging Responsible, Explainable, and Local Data Science Methods for Population Health & Health Systems.
- We gave a presentation at Michael Garron Hospital on the Key to Leveraging Responsible Data Science Methods for Population Health & Health Systems.
- We gave a guest talk on Leveraging Responsible AI for Population Health & Health Systems at Queens University.
- We gave a talk on Leveraging Responsible AI for Population Health & Health Systems in Nigeria at the Nigeria Computer Society, Artificial Intelligence & Robotics Conference
- We gave a talk at the Next Einstein Forum Webinar series on leveraging responsible artificial intelligence methods for population health and health systems in Africa.

- Attended DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN #SDGs and gave a talk on AI-based frameworks and algorithms for achieving SDG3 and SDG5 in the Global South
 - Gave a talk to the Public Health Association of BC Summer Institute on: "the impact of responsible local and explainable AI on communities"
3. **Radio and TV Discussions:** Our team members are usually in the media discussing our framework. . Please see detailed information in Section **4.4: Media coverage and citations in public events** on. This is equally helping to build accountability and trust in AI and data science responses to epidemic
 4. **Publications:** We have written and published several papers to this effect. For detailed information please see Section **4.1: Publications and papers**

Has this project contributed to strengthening data systems and information sharing about COVID-19? IN particular, has it helped vulnerable communities? If yes, please explain:

Obtaining hard to get data. Partnering with CLOS and community healthcare workers helped us to acquire some of the data from communities and population that do not visit the health care system. In our partnership with community health workers, we had them visiting households in certain communities to collect data for us. Some of the CLOs that we partnered with already have networks set up in some of these communities and this made it very easy for us to acquire some of the “hard to get” data. For a meaningful change in the health of people in communities, it is important for solutions to be developed and scaled from the bottom up, as modeling and data collection must be community-focused, -owned, and -co-led.

It is imperative to harness data from all available sources including unconventional sources so as to make up for the data gaps that exist in data. We have used unconventional datasets that includes, household visits by community health workers, voice scripts, chatbots, twitter, google searches, community level reddit, whatsApp, facebook etc to inform our needs around COVID-19.

Obtaining locally relevant data to train AI algorithms (disaggregated by race, gender, sexuality, class, geographic location, and Indigeneity).

Obtaining locally relevant data in Africa to train AI-based algorithms is essential to inform public health policies in an evidence- and data-driven fashion. The collaboration among ACADIC multi-disciplinary and multi-stakeholder team of researchers, public health experts, and community leaders has been helpful in securing locally relevant data. In ACADIC the community leaders articulate the problem in their communities, and the modelers inform the collection of data for the problem. The community is involved at every step of the process and the models are tailor-built to solve real-life problems affecting the community. This has been one of the keys to our success in informing COVID-19 policies in Africa. Collecting disaggregated locally relevant data helped improved the accuracy our AI-based algorithms which is crucial in ensuring an effective allocation of resources such as public health information, testing centers, economic support, and healthcare services.

Cameroon data management. Once our Cameroon team started working with the ministry of public health, they identified gaps in the Covid-19 data that the regional authorities were collecting and key ethical considerations that were neglected. They have been able to work with the Data Managers to improve on data collection strategies and fill in gaps in Covid-19 related data that the different units of the region had collected. This involved providing indicators as well as means that enabled the data

managers for the 19 health districts of our region to communicate with each other on what to improve on the data. After this, we now have that the Regional database can boast of

- a. An up-to-date and harmonized district and regional COVID-19 line lists
- b. A harmonized line list for both PCR and RDT tests done in the Region
- c. A time series of COVID 19 interventions for the region

The cleaned data is in turn used for national policy development. Thanks to our work, the South West Region in Cameroon will soon have a set of ethical and practical guidelines for data collectors, users, and stakeholders to consider when applying AI/data science to humanitarian work.

Data sharing between Gauteng Province, South Africa and Ontario COVID-19 Science Advisory Table. When Omicron started, we had meeting with PHAC to discuss what we were observing, given that we had access to all the data. We equally started working with the Ontario COVID-19 Science Advisory Table, meeting regularly and sharing experience and ideas based on the data from both provinces.

Data sharing between our 9 Africa countries. Our executive committee members meet every other week to share experience and ideas based on what each team is observing in the data. In addition, our researchers meet every Wednesday to share techniques and methods on analyzing the data.

Reducing Barriers and Discrimination. We recognize and are committed to addressing structural and systemic barriers faced by women and visible minorities; our strategies to do this include the following.

Webinar series; we have organized webinar series that are aimed at discussing how our project is addressing equity diversity and inclusion, both within the team and in all aspects of our work, so that team members can raise any issues they have noticed, and we can take action on them. Community partner organizations, students, and all colleagues involved have been included in these discussions.

We have been inviting facilitators and speakers, as appropriate.

All members and team members have taken some sort of EDI and Unconscious Bias training.

We have been seeking diversity across disciplines, jurisdictions and those groups requiring equity- oriented remediation. This includes broad representation from public, private, and civil society communities. We take a whole-of-society approach to network composition, consultation and implementation that is intersectional, intergenerational and gender and trans-gender-inclusive. This includes seeking out diverse scholars and practitioners and incorporating community expertise and lived experiences through active participation of informal and marginalized groups in decision-making processes and project development.

To help implement our EDI priorities, we set up a Recruitment and EDI Task Force, with these initial responsibilities: maintain data and statistics on our project's community and academic partners, applicants, acceptances, and representation by EDI category and discipline/area of focus; periodically assess our project's decision-making and results from an EDI perspective; serve as an information-conduit for EDI information, updates and suggestions; be the initial focal point for any complaints, suggestions, or disputes, which are handled confidentially when requested using established equitable conflict-resolution processes, which the Task Force developed and established at the beginning of the project's life, linking to the processes of other related bodies at the partner universities.

Modelling EDI Prioritization. We have been documenting and evaluating our EDI initiatives' challenges and successes, including this aspect in our publications and the dissemination of the project's work for both academic and general audiences.

5.2. User-Centric Data Innovation and AI for COVID-19

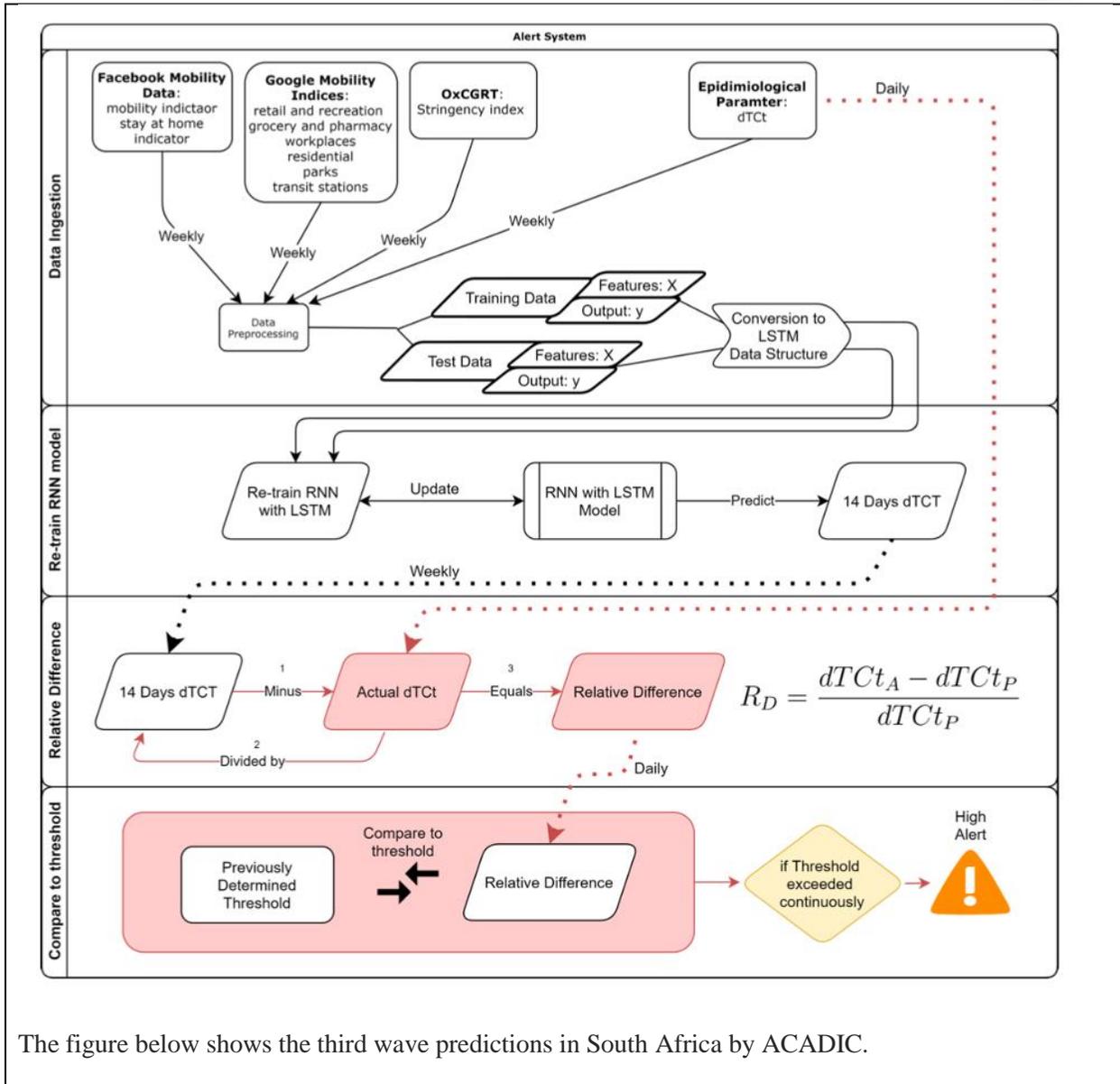
Provide the AI innovations (models, methods, etc.) developed, tested or scaled through your project. Describe their current stage and how they can contribute to an equitable and inclusive COVID-19 response and recovery in developing countries.

1. **An AI-solution for monitoring and forecasting social distancing using Wi-Fi data**

- The innovative aspect of this research is that the data of each router taken from the Wi-Fi network is considered as a network and the number of mobile devices connected to each network was counted and predicted.
- Graph Neural Network is used for the prediction and the entire network is built as a single model, in an effort to reduce computational complexity.
- The system works in facilities with many existing Wi-Fi networks installed. In this sense, it can also be easily deployed in many developing countries.

2. **Early Warning systems for COVID-19 Waves (<https://doi.org/10.3390/ijerph18147376>).**

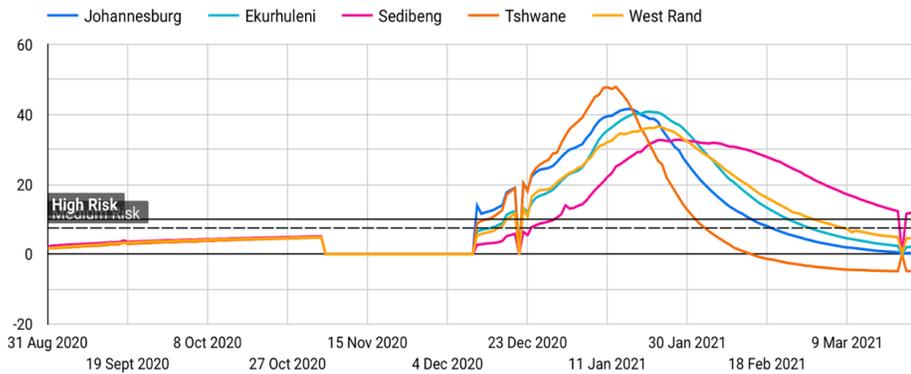
We designed an early warning system for future waves of COVID-19 using a recurrent neural network with long short-term memory. The system is working effectively and has been utilised by the Gauteng provincial government in South Africa. We have built on this work and developed an early warning framework for major re-emerging infectious diseases in Africa. We are now moving on to adapt the knowledge and come up with a framework for emerging infectious diseases. This will help the governments in Africa prepare for an outbreak before it happens.



The figure below shows the third wave predictions in South Africa by ACADIC.

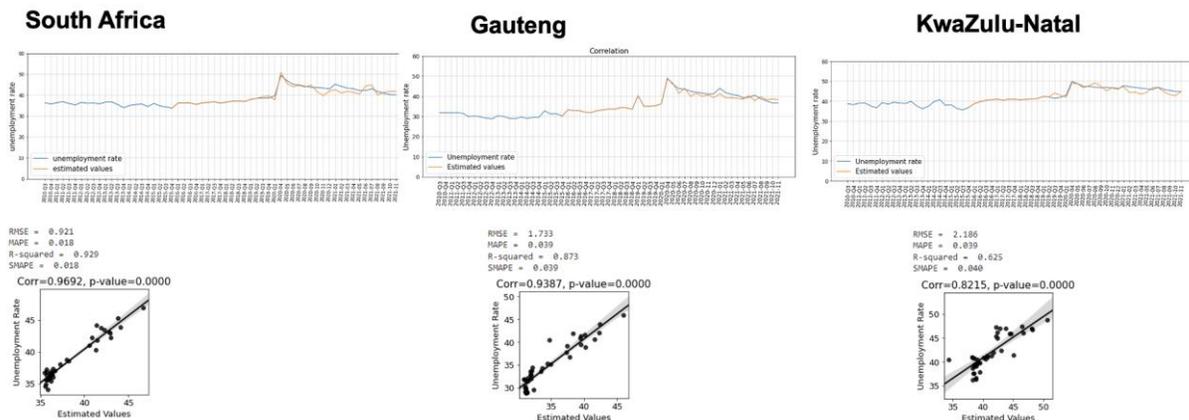
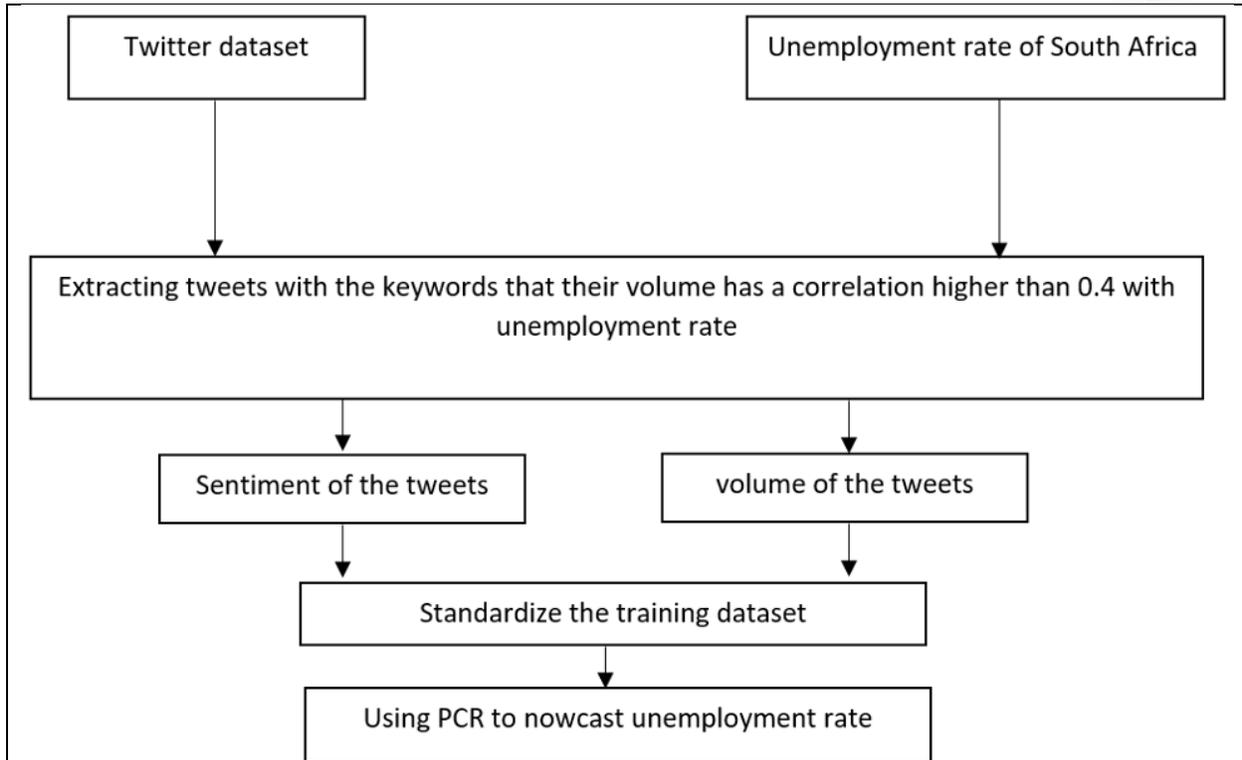
Graph showing the 3rd wave risk index for 5 Districts in Gauteng

From the 05 November 2020 to 10 December 2020, there was no data available. These explains the gap in the graph.



3. AI-powered framework to nowcast unemployment:

We have designed an AI-powered framework to nowcast unemployment rate. Unemployment rate is an important economic indicator that is input into decision making by policy makers. Measuring unemployment rate using the traditional approach: Is expensive and time-consuming; Requires a lot of man-power and administrative personnel; Faces many difficulties and obstacles (e.g. low public cooperation, dealing with migration/homelessness/nomadism, privacy concerns); Mostly done on seasonal and annual basis; The results are ready to report several months later. An alternative approach is to leverage AI to use social media data to nowcast the unemployment rate, because its cheaper and faster; Only requires several lines of code; Could easily be measured on monthly basis; The result is available in real-time. ACADIC employed AI and come up with a framework that can be used to provide more timely information about the unemployment rate in countries across Africa.



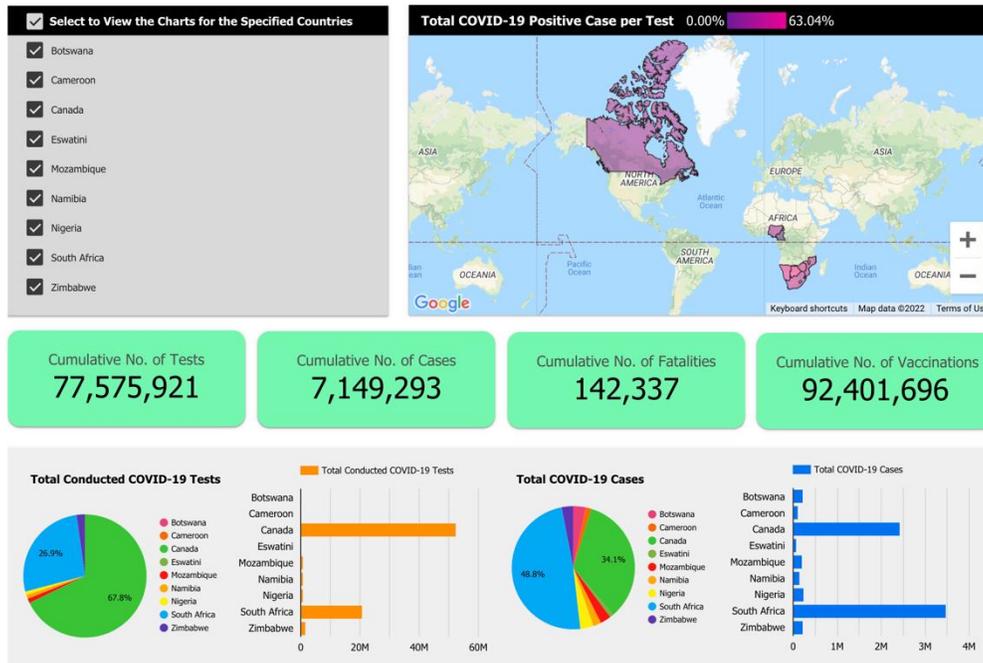
4. Dashboards

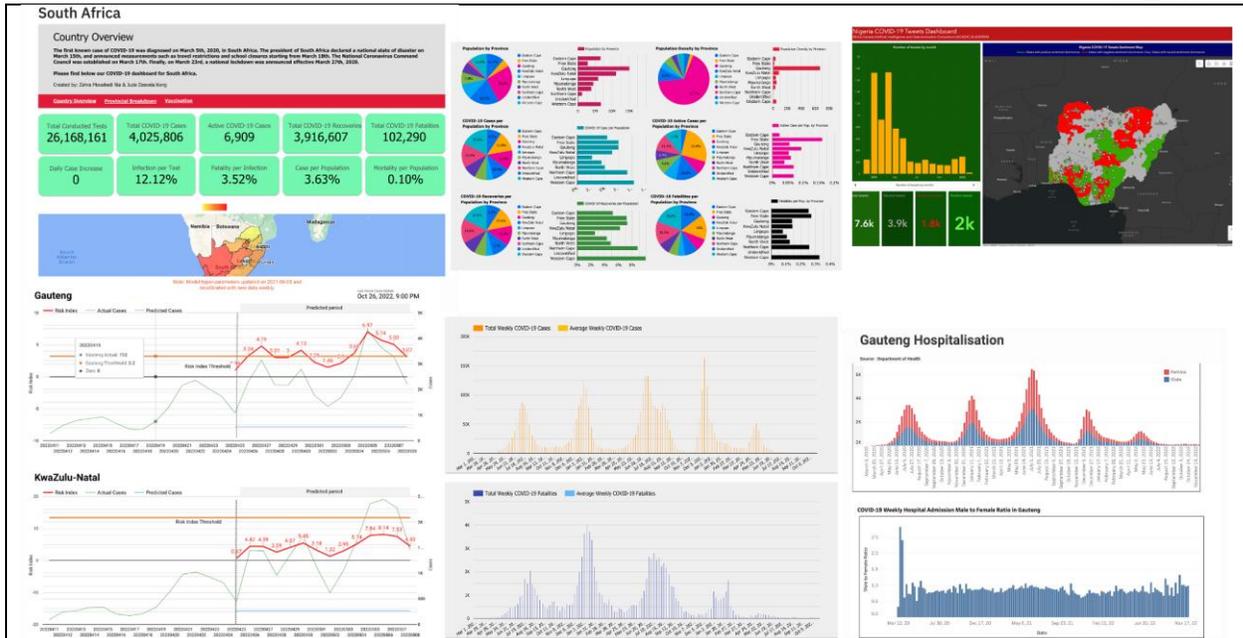
We designed dashboards that do not only provide real-time visualization but also detailed modelling and predictions down to the smallest administrative unit in each region. Experts and high-level policy-makers use these tools to visualize the situation on the ground and enact policies accordingly. These dashboards are the official dashboards used by policy makers in Botswana, Eswatini, Cameroon, Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe. The website for South Africa is viewed by more than one million people daily and those for the other countries is viewed by more 50 thousand people daily. We are now building dashboards for major diseases in Africa. The final goal is to come up with an AI-

powered searchable repository comprehensively compiling resources containing locally relevant data.

Below are links to some of our dashboards

- <https://academic.org/malaria-in-cameroon/>
- <https://academic.org/malaria-in-ghana/>
- <https://academic.org/mpox-in-africa/>
- <https://academic.org/malaria-in-burundi/>
- <https://academic.org/rotavirus-in-africa/>
- <https://academic.org/dengue-fever-in-africa/>
- <https://academic.org/covid-19-dashboards/>
- <https://academic.org/covid-19-sentiment-dashboard/>
- <https://academic.org/early-warning-framework-for-monkeypox-outbreak/>
- <https://academic.org/monkeypox-stigmatization/>
- South Africa: <http://www.covid19sa.org/>
- Botswana: <https://tinyurl.com/4e83hubd>
- Eswatini: <https://tinyurl.com/2p9eyeff>
- Mozambique: <https://tinyurl.com/3wrxwvr7>
- Cameroon: <https://tinyurl.com/ynd878fz>
- Nigeria: <https://tinyurl.com/ytmxuzmp>



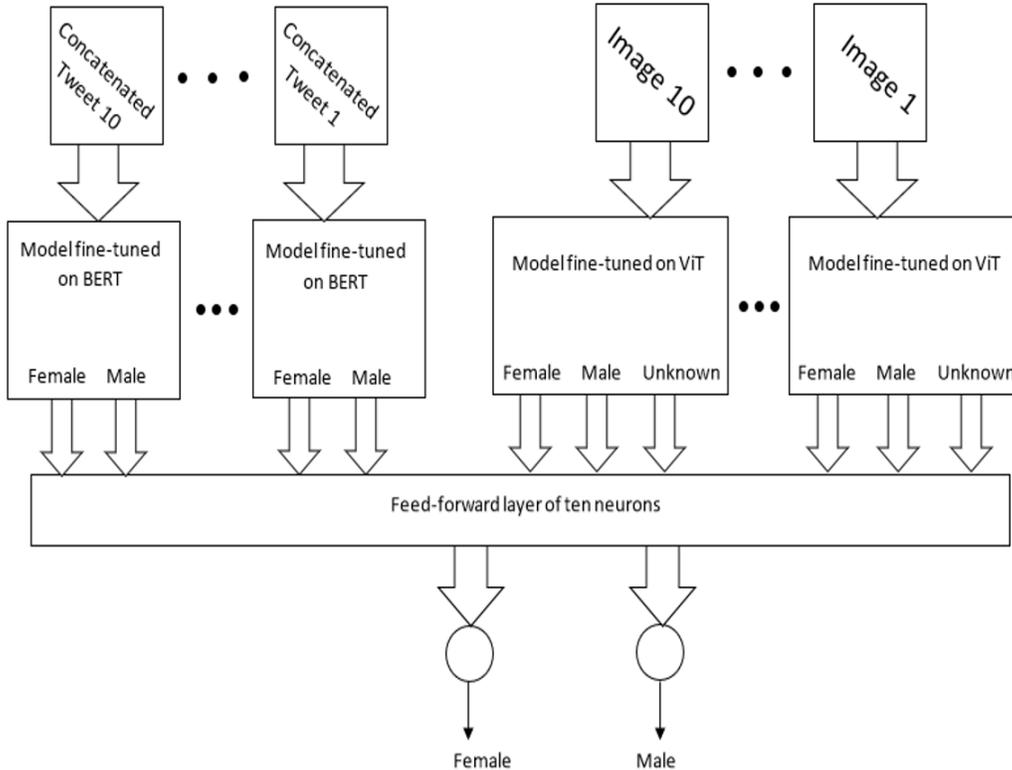


4. Air Quality Monitoring Device. We have designed and produced an AI-, IoT-enhanced air quality monitoring device that is currently being used in South Africa and Alberta, Canada: <https://www.sacaqm.org/partners>. We are using the measurements from the device to study it's impact on human health.



5. Framework to predict twitter users' gender from posted pictures and tweets. Social media contains useful information about people and the society that could help advance research in many different areas (e.g. by applying opinion mining, emotion/sentiment analysis, and statistical analysis) such as business and finance, health, socio-economic inequality and gender vulnerability. User demographics provide rich information that could help study the subject further. However, user demographics such as gender are considered private and are not freely

available. ACADIC has come up with an AI-powered framework to predict the user's gender from their images and tweets.



Has this project contributed to more efficient and accurate forecasting of transmissions and reducing spread through policy and public health interventions (e.g. vaccine rollouts)? If yes, please explain:

***Reference number in this section refers to the Peer-reviewed publications references listed in the Section: Research findings

Yes. ACADIC project has contributed to a more efficient and accurate forecasting of COVID-19. ACADIC has been assisting policy- and decision-makers with the fight against COVID-19, including (i) monitoring and forecasting the growth and spread of COVID-19 at the local, state, and national levels [1-60; <https://academic.org/>, <http://www.covid19sa.org/>], (ii) evaluating efforts to mitigate and control the spread [11, 12,14, 20-23, 32, 33,41, 42, 44 , 59, 62], (iii) identifying trends in the disease infections, hospitalizations, and deaths (<https://academic.org/>, <http://www.covid19sa.org/>), (iv) guiding purchase and allocation of health care resources [14], (v) guiding the collection of data (ensuring that data were disaggregated by race, gender, sexuality, class, geographic location, and Indigeneity) (<https://academic.org/>, <http://www.covid19sa.org/>), (vi) guiding the implementation of vaccine roll-out and the development of effective, data-driven, evidence-informed immunization strategies, taking into

account that available supply of vaccines in Africa was limited [10, 12, 15, 23, 32, 33, 52]; (vii) providing situational intelligence: on populations at risk, stage of the outbreak, the projected burden of illness, school/business/work closure and re-opening, etc. [11, 12,14, 20-23, 32, 33,41, 42, 44, 59, 62], (viii) nowcasting labor market flow [61], (ix) supporting race, gender, sexuality, class, geographic location, and Indigeneity, inclusive COVID-19 actions [Kong et al. preprint; 33,62; <https://academic.org/>, <http://www.covid19sa.org/>], (x) developing methodologies and technologies to describe contact mixing and transmission networks to quantify impacts of contact shifting and individual mobility [12,50], (xi) supporting transparent and responsible AI, data, and digital rights governance around COVID-19 and pandemic responses [4], (xii) strengthening data systems and information sharing about COVID-19 [Kong et al. preprint], (xiii) building trust and combatting mis- and dis-information around COVID-19 [15], (xiv) optimizing public health system responses for patient diagnosis, care, and management [11, 12,14, 20-23, 32, 33,41, 42, 44, 59, 62](xv) establishing sustainable collaborations among model developers, policymakers, community leaders, etc. [4], (xvi) preparing the next generation of leaders in infectious disease AI-and BDA-based modeling approaches in these countries [4], (xvii) working closely with public health agencies and other stakeholders to build trust and knowledge of AI-based models among key decision-makers [4], (xviii) developing stand-alone and predictive clinical public health decision support tools [4], and, (xix) creating a collaborative network that can respond rapidly to support decision-makers in each country to address infectious diseases or other disasters and emergency situations in general [4].

ACADIC has been using AI- and BDA-based modeling to prioritize strategies in the COVID-19 vaccine roll-out, using Deep Neural Network (DNN) algorithms [52]. In addition, ACADIC has been utilizing “non-conventional data streams”, such as Google searches, Wiki trends, Facebook, Reddit, LinkedIn, Twitter [1,10,15, 19, 61], to better understand the “dynamics in sentiments toward community-based infectious diseases- related discussions” and to provide “city-level information to health policy in planning and decision-making regarding vaccine hesitancy” [15] and adopted macroeconomic responses to COVID-19 pandemic [61]. Subsequently, the ACADIC consortium has been transferring this pilot study to other African settings and contexts in terms of knowledge gained, lessons learned, and developed modeling techniques.

This has required accounting for country-specific differences in socio-demographic, epidemiological, and clinical variables, including rates of comorbidities. As such, ACADIC has been re-weighting the models initially developed for South Africa. Last year ACADIC carried this out with eight other African countries, in terms of validating and further correcting/adapting procedures in order to ensure that the assumptions of the model are aligned with the specific features of the selected country. Moreover, in terms of “explainable, trustworthy, responsible AI and BDA for social good”, ACADIC is also making efforts to expand our understanding of social disparities and vulnerabilities, which are of crucial importance in data gathering/collection, model design and implementation, and outcome interpretation [62]. A set of sources—such as detailed, locally informed geospatial maps—will be employed as inputs to our future models. Further, gender is a major variable impacting COVID-19, as well as other diseases and disease outbreaks, in terms of risk of developing communicable diseases, disease severity, response to treatment, adverse reactions to medications, and magnified social vulnerability. For this reason, it is being actively incorporated and fully embedded by ACADIC across all AI- and BDA-based models, performing what is known as “Gendered Health Analysis” (GHA). ACADIC is also devising models that can assist clinical public and global health policy- and decision-makers develop optimal COVID-19 testing policies and mass vaccination strategies as well as help in

identifying some coronavirus variants of concern (VOCs) that may evade immunity conferred by vaccines and previous infections.

More in details,

1. We have developed COVID-19 monitoring dashboards that visualize locally relevant information to the public and policy makers: <http://acadic.org/>

These dashboards are the official dashboards used by policy makers in Botswana, Eswatini, Cameroon, Mozambique, Namibia, Nigeria, Rwanda, South Africa and Zimbabwe. The website for South Africa is viewed by more than one million people daily and those for the other countries is viewed by more 50 thousand people daily. Below are links to some of our dashboards

- <https://acadic.org/malaria-in-cameroon/>
- <https://acadic.org/malaria-in-ghana/>
- <https://acadic.org/mpox-in-africa/>
- <https://acadic.org/malaria-in-burundi/>
- <https://acadic.org/rotavirus-in-africa/>
- <https://acadic.org/dengue-fever-in-africa/>
- <https://acadic.org/covid-19-dashboards/>
- <https://acadic.org/covid-19-sentiment-dashboard/>
- <https://acadic.org/early-warning-framework-for-monkeypox-outbreak/>
- <https://acadic.org/monkeypox-stigmatization/>
- South Africa: <http://www.covid19sa.org/>
- Botswana: <https://tinyurl.com/4e83hubd>
- Eswatini: <https://tinyurl.com/2p9eyeff>
- Mozambique: <https://tinyurl.com/3wrxwvr7>
- Cameroon: <https://tinyurl.com/ynd878fz>
- Nigeria: <https://tinyurl.com/ytmxuzmp>

A disease outbreak response requires timely exchange of information between policy makers and the public. People are usually keen to see how the dynamics is evolving in their communities where their families live, or places they plan to travel. This dictate the need for an urgent dashboard during an outbreak. To this end we integrated the power of Artificial Intelligence, predictive modelling and simulations, to develop COVID-19 monitoring dashboards that visualize information locally relevant to the public and policy makers

2. Obtaining locally relevant data in Africa to train AI algorithms. Obtaining locally relevant data in Africa to train AI-based algorithms is essential to inform public health policies in an evidence- and data-driven fashion. However, in Africa, this is rather challenging. During an outbreak, community leaders are usually aware of what is happening in the local community, and modelers have the tools to solve the problem but most often these people do not talk to each other. ACADIC team includes community leaders (e.g. chiefs, fons etc), and policy makers. The collaboration among ACADIC multi-disciplinary and multi-stakeholder team of

scientists, mathematicians, public health experts, and community leaders has been helpful in securing locally relevant data. In ACADIC the community leaders articulate the problem in their communities, and the modelers inform the collection of data for the problem. The community is involved at every step of the process and the models are tailor-built to solve real-life problems affecting the community. This has been one of the keys to our success in informing COVID-19 policies in Africa

- 3. Providing governments with a precise portrait of the epidemic at the local, state, and national levels-using a hybrid of Mechanistic and AI models.** In Africa, there are stigmas attached to being infected with SARS-CoV-2. Moreover, self-medication and the use of complementary/alternative medicine are common among Africans for social, economic, and psychological reasons. Governments in these countries are generally faced with a number of challenges, including limited resources and poor infrastructure and patient's health literacy. For COVID-19, this is fueled by the rapid spread of rumours in favour of these modalities on social media. Hence, irrespective of how ACADIC/public health authorities are with the communities, there is bound to be so much under-reported data in most communities. Thus, to have a clear picture of the nature of an epidemic (true case count, basic reproduction number, relative infectivity of the severe infectious, mild infectious and asymptomatic), after securing relevant data, ACADIC modelers design AI based algorithm to estimate under reported values.
- 4. Using AI and Big Data to Inform decisions about non-pharmaceutical Interventions during COVID-19.** Now with the capability to generate true case count, we next design different indices for each local community, using the true case count and other locally relevant information. Using this data, we trained an AI algorithm to come up with a 5-level alert system by splitting the jump from full-lockdown back to business as usual into 5 levels. In order to quantify the effects of the alert system, a Stringency Index was carefully created for each Alert Level. The calculation of this Stringency index takes into account the status of various indicators that represent a number of Non-Pharmaceutical Interventions.
- 5. Using AI and Big Data techniques to provide predictions of future COVID-19 peaks and of their intensities.** During the COVID-19, ACADIC has been able to predict all the waves in each community in countries across Africa. The figure below shows the third wave predictions in South Africa by ACADIC.
- 6. Using AI and Big Data techniques to identify COVID-19 Hotspots:** The importance of hotspots also known as spatial clusters in infectious disease epidemiology cannot be over emphasized. Identifying local hotspots for an epidemic help to inform resource allocation and programmatic goals. Over the past decade there has been increasing interest in spatial clusters for infectious diseases. This includes calls to target spatial clusters in an outbreak. For example, recommendations to focus on hotspots has been part of strategic plans for Ebola, malaria, COVID-19 and other emerging pandemic threats. In the on going COVID-19, ACADIC, visualizes hotspots in each local community across Africa and this have been helpful to policy-makers at different levels and the population
- 7. Leveraging AI and Big Data techniques to optimize clinical public health and vaccination roll-out strategies.** Once vaccine became available in Africa, ACADIC leveraged AI and Big Data techniques to develop strategic, highly targeted and staged delivery plans of vaccines to

prioritize vulnerable, at risk population and hotspots areas. Deploying and administering effective and safe vaccines against a novel disease to large populations at a fast pace is a nontrivial task. Due to the logistical challenges that exist in Africa, an assessment of different vaccination scenarios and roll-out strategies, that take into account national and local realities, is of paramount importance for public health policy and decision making, in order to maximize and track staged progress towards the achievement of herd immunity. Our roll-out strategy has been adopted by the governments in all the 9 countries.

8. Providing a near term forecasts (nowcasting) of labour market flows in Africa during the pandemic: The unemployment rate is an important economic indicator that is input into decision making by policy makers. In Africa, they are usually released infrequently with substantial delay. The speed of economic decline during the onset of COVID-19 made policy makers confused as to what to do to get timely information about the labour market. To this end, ACADIC immediately employ artificial intelligence to provide a framework that can be used to provide more timely information about the unemployment rate in countries across Africa. In the upcoming year, there will also be uncertainty about the timing and extent of any improvement in labour market outcomes that will also highlight the value of the framework that ACADIC came up with.

9. Address dis- and mis-information about COVID-19 prevention, treatment and vaccines: Since the outbreak of COVID-19, rumours about COVID-19 have been doing rounds on social media in Africa. These include: i) "this or that" tradition medicine can cure COVID-19 or prevent one from having it ii) "afoko" (a locally made alcohol with an unknown alcoholic content) can prevent you from having COVID iii) "this or that pastor" cures COVID-19 iv) SARS-CoV-2 does not affect Africans, iv) chloroquine cures COVID-19, iv) spraying alcohol and chlorine all over your body will prevent you from having COVID v) SARS-CoV-2 cannot survive in Africa's warm climate vi) steaming your face with and inhale neem tree leaves prevent you from having COVID-19 vii) vitamin C tablets prevent COVID-19 viii) having had malaria makes one immune, ix) pepper soup with lime or lemon flushes out the virus x) drinking black tea first thing in the morning prevents you from having COVID-19. To support local stakeholders in addressing this infodemic, ACADIC employed artificial intelligence and big data to identify the hot-spots of infodemic. In addition, ACADIC helped support communication strategies with local stakeholders that addresses the root courses of this infodemic.

Has this project contributed to optimising public health system responses for patient diagnosis, care, and management? If yes, please explain:

Yes. Our work helped guide the purchase and allocation of health care resources in all the countries. We equally helped optimize vaccination roll-out strategies. The modelling and projections of hospital bed occupancy enabled public health systems to understand better the extent of strain each wave

pandemic wave would have on the hospital resources. This enabled policy and non-pharmaceutical interventions to be implemented to reduce hospital burdens as well as resources to be distributed effectively.

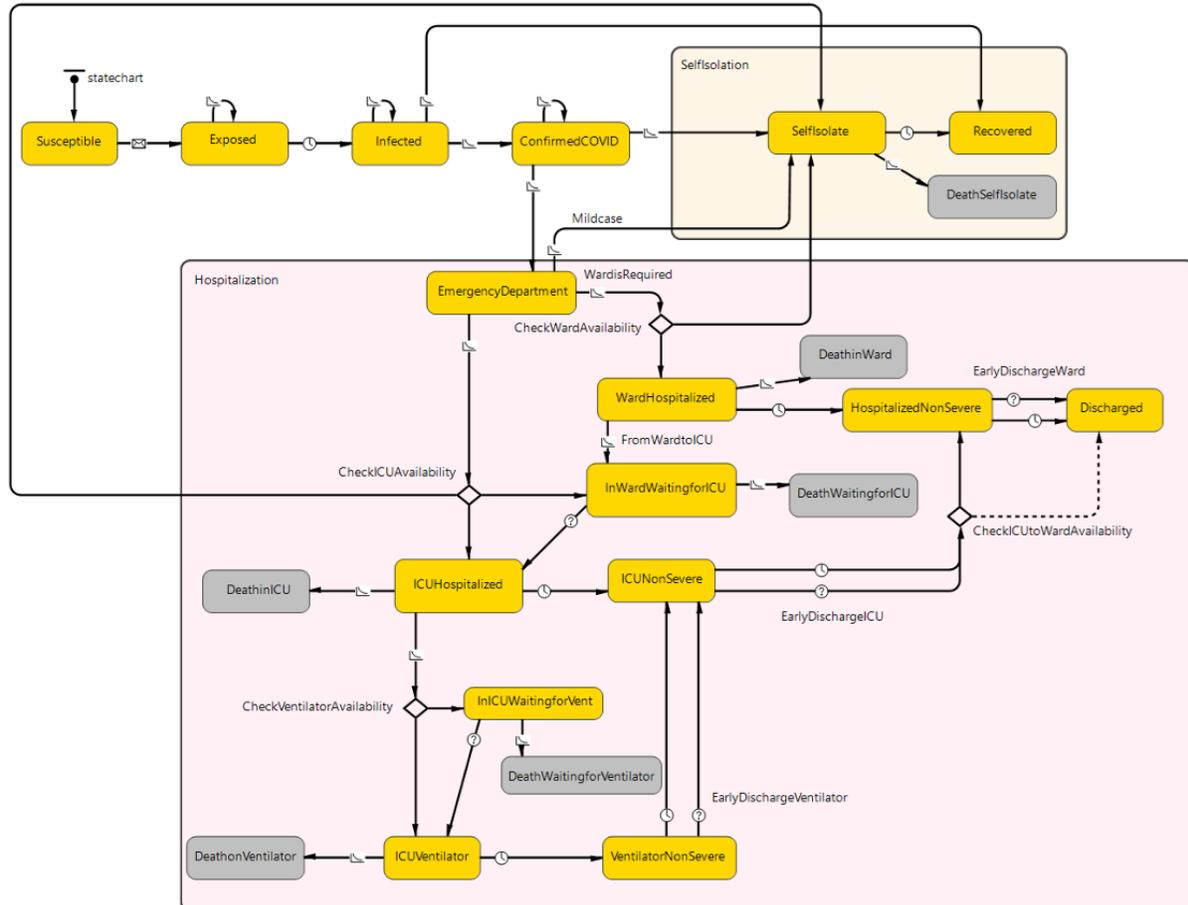


Figure: Framework for the management of hospital beds and ventilators during the COVID-19 pandemic

Has this project contributed to a deepened understanding of the social impacts (positive and negative) of AI innovations in developing countries? Has it generated lessons learned and best practices in how to design and scale responsible AI innovations that are gender responsive and culturally appropriate, community specific, and based on local needs and contexts? How are these learnings applied or used?

Yes; because of our work, the public and policy makers in the countries where we worked now have high hopes and trust in AI.

We have organized several stakeholder forums in most of the 9 countries that brings together a diverse blend of research and implementation experts from across disciplines and sectors, community health practitioners and program managers, policy and decision makers from across levels of government, community members and other key stakeholders to explore and discuss evidence that will guide a

country specific strategy for the application of artificial intelligence in public health practice, programming and decision- making. The objectives of these stakeholder meetings that we have been having from country to country are to

- 1) Scope the public health niche within the sphere of artificial intelligence (AI) and technological innovation, and the unique opportunities for impact in the context of the country;
- 2) Outline initial ideas on priority activities and early opportunities to include in a future country specific strategy for AI and public health;
- 3) Articulate foreseen concerns, barriers and unintended consequences arising at the intersection of technological innovation, public health practices, and social values (building on the COVID-19 response and previous experiences and evidence); and
- 4) Identify key stakeholders and experts across sectors that should be engaged in developing a country specific strategy for AI in public health.

We have equally given several presentations and organized several workshops to deepened understanding of the social impacts (positive and negative) of AI innovations. These include:

- <https://youtu.be/HBCnibs9bic>
- Consortium of Universities for Global Health 2023 conference: We organized a workshop on “Fairness in Machine Intelligence for Global Health” at the consortium of Universities for Global Health 2023 conference. <https://www.cugh2023.org/satellitesession13>. April 03, 2023.
- AI for Global Challenges and Lessons learned: ACADIC bi-weekly lecture series
- Data for Policy Conference 2022: organized and took part in a panel discussion on “Towards an Inclusive Data Governance Policy for the use of AI in Africa” in the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. link: <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. December, 10, 2022 .
- United Nation General Assembly 77 (UNGA77) Science Summit interactive panel session : During the UNGA77 we co-organize a panel session on artificial Intelligence Research in Health: Tackling Global Challenges as One (other co-organize are: I-DAIR , the United Nations University Institute in Macau (UNU Macau), Indraprastha Institute of Information Technology Delhi (IIIT-Delhi), Universidade Federal do Rio Grande do Sul (UFRGS), the Africa-Canada AI and & Data Innovation Consortium (ACADIC), the University of the Witwatersrand, and the City University of New York (CUNY). September, 22, 2022
- Conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. In collaboration with CIFAL York, and representing ACADIC, we organize a conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence at York University, Canada. Feb 03, 2022
- Invited Speaker Data for policy 2021 conference: lessons for policy-data interactions after COVID-19
- Panelist. Artificial Intelligence Virtual Stakeholders Forums: A Rights-Respecting Artificial Intelligence Policy for Nigeria. Attended virtually-zoom. October 20, 2021.
- A panel conversation on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. Attended virtually-zoom. Feb 03, 2022.
- Gave a presentation at the University of Massachusetts Mathematical Biology Seminar series. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”. Attended virtually-zoom. October 31, 2022.

- We gave a presentation at the Ghanaian Mathematical Biology and Medicine Workshop. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in Africa”. Attended virtually-zoom. Nov 08, 2022.
 - We gave a presentation at the China-Canada Symposium On Modelling, Prevention and Control of Zoonoses. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”. Attended virtually-zoom. Nov 15, 2022.
 - We gave a keynote presentation at the New York University Abu Dhabi Global Perspectives in Science Lecture Series. Title of my talk: Leveraging AI for Clinical Public and Global health Needs: Implications for Policies and Lessons Learned from the ACADIC project. Attended in person. Nov 28, 2022.
 - We were invited to two-panel conversations at the Bill & Melinda Gates Foundation in Seattle: 1) Ethics and Efficacy of modelling and machine learning, 2) The politics of data. December 09, 2022.
 - We organized and took part in a panel discussion on “Towards an Inclusive Data Governance Policy for the use of AI in Africa” at the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington.
 - We gave a guest lecture at the Dalla Lana School of Public Health on Leveraging Responsible, Explainable, and Local Data Science Methods for Population Health & Health Systems.
 - We gave a presentation at Michael Garron Hospital on the Key to Leveraging Responsible Data Science Methods for Population Health & Health Systems.
 - We gave a guest talk on Leveraging Responsible AI for Population Health & Health Systems at Queens University.
 - We gave a talk on Leveraging Responsible AI for Population Health & Health Systems in Nigeria at the Nigeria Computer Society, Artificial Intelligence & Robotics Conference
 - We gave a talk at the Next Einstein Forum Webinar series on leveraging responsible artificial intelligence methods for population health and health systems in Africa.
 - Attended DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN #SDGs and gave a talk on AI-based frameworks and algorithms for achieving SDG3 and SDG5 in the Global South
 - Gave a talk to the Public Health Association of BC Summer Institute on: "the impact of responsible local and explainable AI on communities"
5. **Radio and TV Discussions:** Our team members are usually in the media discussing the impact of AI on society. Please see detailed information in Section **4.4: Media coverage and citations in public events** on. This is equally helping to build accountability and trust in AI and data science responses to epidemic
6. **Publications:** We have written and published several papers on the impact of AI on the society. For detailed information please see Section **4.1: Publications and papers**

Provide the number of private sector actors (start-ups, consultancies, private companies) involved in the development, testing or scaling up of AI innovations. Specify their name and how they are involved.

- **IBM South Africa:** Provided website infrastructure to visualise the hot-spot clustering on a map for easy engagement by policy makers and citizens.

5.3. Cross-cutting objectives

Capacity strengthening

Describe and indicate the number of learning activities that your organisation put in place to strengthen capacities of staff, partners and beneficiaries as part of this project. These include internal and external activities, such as workshops, trainings, coaching services, etc. Where possible, specify the number of participants and the female-male ratio.

Team supervision: All highly qualified personnel (HPQ) are hired at designated institutions, but work with experts and members from our multidisciplinary network from several institutions, gaining interdisciplinary training experiences, including in the diverse array of cross-cultural, outcomes-based, and technical expertise characteristic of our diverse network.

ACADIC bi-weekly Meeting: We have bi-weekly meetings for the researchers to review the progress of projects and learn from each other. We equally have separate bi-weekly meetings to discuss how we are integrating gender and sex into our research questions and methodology and our gender related findings and implications.

ACADIC Knowledge Institute: We organize four-day annual events that brings together all the staff and HPQ in the Network and Executive committee members, the project's partners and end-users.

Day 1: had lectures and discussions by project method experts. Required by all ACADIC trainees, the course provided instruction and training in state-of-the-art AI modeling and knowledge approaches.

Day 2 : involved presentations by all trainees, videotaped and reviewed with ACADIC Network members, to augment communication training. The final two days of the ACADIC Annual Meeting was dedicated to reviewing and examining benchmark models. This meeting provided valuable opportunities for informal discussions between trainees, collaborators and partners, facilitating Knowledge translation, planning of future projects and transition to employment.

ACADIC Summer School: We organized two online summer schools that brought together trainees and other selected participants with interdisciplinary backgrounds to provide trainees and their potential future collaborators with a common language and platform within which different groups can communicate and collaborate effectively. The school's scientific program consists of introductory lectures; case studies and public lectures based on ACADIC projects; and HPQ presentations.

Workshop/Conferences: We organized at least 2 conferences every semester (4 semesters a year). During our workshops and conferences, trainees give short research talks and poster presentations and participate in interdisciplinary small group discussions. Trainees are also given opportunities to participate in interactive sessions on Science Communication, Project Management, Teamwork, Entrepreneurship and Innovation.

Has this project supported emerging researchers and early career academics to be trained and build their leadership skills? Have some benefitted from new knowledge and skills acquired through this project to advance in their careers? If yes, please explain.

Yes, our project has been training emerging researchers and early career academics. All highly qualified personnels (HPQ) are hired at designated institutions, but work with experts and members from our multidisciplinary network from several institutions, gaining interdisciplinary training experiences, including in the diverse array of cross-cultural, outcomes-based, and technical expertise characteristic of our diverse network.

ACADIC recognizes the importance of providing training opportunities and experience in online fora. To gain experience in these technologies twice a semester (for 4 semesters a year) HPQ: (i) participate in blended programs across the network, using in-person training programs and electronic communication tools embedded in digital learning platforms; (ii) participate in regular online research discussions with their geographically dispersed supervisory committee and collaborators; and (iii) attend technology-focused training workshops.

During our workshops and conferences, trainees give short research talks and poster presentations and participate in interdisciplinary small group discussions. Trainees are also given opportunities to participate in interactive sessions on Science Communication, Project Management, Teamwork, Entrepreneurship and Innovation.

Every week, our HPQ meet to work and learn from each other.

An effective personal training program must provide leadership opportunities, our HPQ are provided with experience in mentorship and training of undergraduate students, graduate students and research assistance and other HPQ. We also give them the opportunities to participate in organization components of our network activities (i.e., conference, workshops, summer schools, etc.). We have a Trainee Committee that coordinate and monitor trainee satisfaction, collect ideas for new training initiatives and is the voice of the trainees in the network.

We recognize the importance of effective communication skills in knowledge translation (i.e., government decision-makers, policy-makers, community outreach) and in collaborative discussions across disciplines. Training and experience in communication in various interdisciplinary fora involved active participation in research discussion with team members and co-supervisors, giving talks at ACADIC workshops that involve a diverse array of backgrounds, participating in interdisciplinary team projects in Summer School and Health-a-thon programs, and encouragement to participate in our communication workshops.

Some of our trainees have gotten jobs in universities as University Professors as well as in IBM South Africa, thanks to the training we have given to them.

5.4 Positioning for sustainability

Has this project helped your organisation (or consortium partners) to be recognized as a leader in the AI and data science or public health fields? If yes, please explain.

Yes;

1. We have received several official requests from government officials, researchers and other policy makers from other African countries to join our Consortium.

2. We have been invited to several stakeholders forums on the adoption and use of artificial intelligence with different stakeholders across Africa (including from countries that are not members of our consortium)
3. We were invited to write a policy for **UNESCO** on Harnessing the power of data: Artificial Intelligence -based pandemic support:
<https://unesdoc.unesco.org/ark:/48223/pf0000380883.locale=en>
4. Our research approach have been recognize as being very innovative. E.g we were recognized among Canada's Innovation Leaders 2021:<https://researchinfosource.com/pdf/CIL2021.pdf>
5. Our team members constantly get invited to provide opinions on national tv on employing artificial intelligence and Big data to manage and contain epidemics.

A selection of News bits can be found [here](#) and below

Title	Date	Link
Artificial intelligence and COVID-19	08/30/2021	https://www.dw.com/en/covid-artificial-intelligence-in-the-pandemic/a-58171146
Huge spotlight on prime time news: Find out what ACADIC project is all about from Prof. Ngwa	07/07/2022	https://www.youtube.com/watch?v=4xN8JrBN5XA
Our team leader in Cameroon addressing dis- and miss-information about COVID-19 & COVID-19 vaccines,	07/07/2022	https://www.youtube.com/watch?v=Sm_J5WX_di8
ACADIC using Artificial Intelligence and Big Data to inform COVID-19 policies in Africa	07/07/2022	https://www.youtube.com/watch?v=4H6iiPRmtW0
University of Buea Among Africa's COVID Modeling and Reporting Centers	07/07/2022	https://www.youtube.com/watch?v=5AM9h0y5ptI
Misinformation on social media linked to higher spread of COVID-19 in new study	06/11/2021	https://toronto.ctvnews.ca/misinformation-on-social-media-linked-to-higher-spread-of-covid-19-in-new-study-1.5466846
Dealing with the pandemic by drinking and swearing? Boffins say you're not alone	06/11/2021	https://www.theregister.com/2021/06/11/pandemic_drinking_and_swearing_outbreak/
Social media use one of four factors related to higher COVID-19 spread rates early on	06/09/2021	https://phys.org/news/2021-06-social-media-factors-higher-covid-19-spread-rates-early-on.html

		.html
How artificial intelligence and big data are fighting COVID-19 in Africa	08/22/2021	https://yfile.news.yorku.ca/2021/08/22/how-artificial-intelligence-and-big-data-are-fighting-covid-19-in-africa/?http://yfile.news.yorku.ca/?utm_source=YFile_Email&utm_medium=Email&utm_content=Current-News&utm_campaign=yfile
透過不同角度，加深對身邊人、事、物的了解。每集內容分為兩部份：第一節介紹有關文化、傳媒、電影等資訊，亦會邀請新聞人物接受個人專訪；第二節邀請專家及相關人物討論最熱門的新聞話題。		https://www.fairchildtv.com/newsarchive_detail.php?n=28
AI can help with COVID Inequalities		https://www.ctvnews.ca/video?clipId=2401509
Gauteng Command Council gives an update on Covid-19 in the province	2021/06/24	https://www.youtube.com/watch?v=8iPw6gQrx8k
Prof Bruce Mellado gives insight into the impact of the third wave on Gauteng	2021/06/24	https://www.youtube.com/watch?v=neIjCJTro0
Gauteng Premier David Makhura on province's response to COVID-19 - YouTube	2021/06/05	https://www.youtube.com/watch?v=IkL-PFTneX4
Professor Bruce Mellado gives an update on COVID-19 behaviour in Gauteng amid the third wave - YouTube	2021/06/15	https://www.youtube.com/watch?v=ongMjF7k1MM
AI techniques used to identify hotspots - YouTube	2020/12/22	https://www.youtube.com/watch?v=af9m7HIUivM Page 1 of 2 #DStv403 AI techniques used to identify hotspots
[Hazardous things in your area] Focus on Ruimsig	2021/02/13	http://702.co.za/podcasts/415/the-john-perlman-show/485505/hazardous-things-in-your-area-focus-on-ruimsig
南非研究：Omicron可突破部分免疫再感染率較Delta高	2021/12/03	https://www.cna.com.tw/news/firstnews/202112030068.aspx

'First signs' of fourth Covid-19 wave in Gauteng - expert	2021/11/24	https://www.jacarandafm.com/news/news/first-signs-fourth-covid-19-wave-gauteng-expert/
Lower-to-mid income nations have more joblessness post-pandemic	2022/08/26	https://theguardian.com/world/2022-08-26-lower-to-mid-income-nations-have-more-joblessness-post-pandemic/
'Up to 1-million at risk of Covid-19 in SA in 40 days'	2020/03/23	https://www.businesslive.co.za/bd/national/2020-03-23-up-to-1-million-at-risk-of-covid-19-in-sa-in-40-days/
Gauteng is ready to relax lockdown” – Gauteng Provincial Command Council	2020/08/13	https://vaalweekblad.com/70550/gauteng-is-ready-to-relax-lockdown-gauteng-provincial-command-council/
【南非觀察】新冠確診數直線上升，南非第四波疫情恐即將來襲_多源焦點	2021/11/27	https://dyfocus.com/news-world/324f0c.html
«El problema de Ómicron es la rapidez con la que afecta a los no vacunados»	2021/12/01	https://theworldnews.net/es-news/el-problema-de-omicron-es-la-rapidez-con-la-que-afecta-a-los-no-vacunados
Omicron si diffonde ad un ritmo mai visto prima»	2021/12/03	https://www.cdt.ch/mondo/omicron-si-diffonde-ad-un-ritmo-mai-visto-prima-HN4935229
News - South China Morning Post « » Omicron spreading quicker than all other Covid-19 variants in South African 'epicentre'	2021/12/02	https://player.fm/series/news-south-china-morning-post/omicron-spreading-quicker-than-all-other-covid-19-variants-in-south-african-epicentre
10 years since Higgs Boson was found - SAfm Sunrise - Omny.fm	2022/07/08	https://omny.fm/shows/safm-sunrise-1/10-years-since-higgs-boson-was-found
Wits researchers launch most comprehensive COVID-19 dashboard in South Africa	23 March 2020	http://www.wits.ac.za/news/latest-news/general-news/2020/2020-03...aunch-most-comprehensive-covid-19-dashboard-in-south

		africa.html
Twitter shows lower-to-middle income countries have higher unemployment post pandemic	24 August 2022	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0272208
AI algorithm system predicts low risk of third wave in SA	2021/04/13	https://www.iol.co.za/news/south-africa/western-cape/ai-algorithm...low-risk-of-third-wave-in-sa-8f73b1d4-0dac-46e6-82da-818a4687b9ba
AI algorithm system predicts low risk of third wave in South Africa	2021/04/13	https://eminetra.co.za/ai-algorithm-system-predicts-low-risk-of-third-wave-in-south-africa/237543/
AI helps to identify new COVID-19 hotspots in Gauteng	2020/12/24	https://medicalxpress.com/news/2020-12-ai-covid-hotspots-gauteng.html
AI-based algorithm shows SA has low risk of Covid-19 third wave - for now	2021/04/13	https://www.capetalk.co.za/articles/413677/south-africa-has-low-risk-of-covid-19-third-wave-infections-for-now
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://medicalxpress.com/news/2021-04-ai-powered-algorithm-south-africa.html
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://floridanewstimes.com/ai-powered-algorithm-released-to-detect-the-third-wave-in-south-africa/215517/
Algoritmo impulsado por IA lanzado para detectar la tercera ola en Sudáfrica	2022/09/02	https://www.biblia.work/articulos-salud/algoritmo-impulsado-por-ia-lanzado-para-detectar-la-tercera-ola-en-sudafrica/
Analysis on President Cyril Ramaphosa's address	2021/06/27	https://www.youtube.com/watch?v=6-HDoA1VZPs
As Covid-19 cases surge, SA expands vaccine programme	2021/06/25	https://www.biznews.com/briefs/2021/06/25/covid-19-sa-vaccine-expansion
As Latest COVID-19 Wave Recedes, Public Health Leaders Brace For The	02/02/2021	https://adf-magazine.com/2021/11/as-latest-

Next One		covid-19-wave-recedes-public-health-leaders-brace-for-the-next-one/
Bad news for Gauteng province. Corona Virus infections are rising rapidly.	2021/06/15	https://za.opera.news/za/en/health/64c718e2298361f9ccec82cd8ed69f23
Bad news-COVID 4th wave expected to hit SA,	2021/10/20	https://za.opera.news/za/en/health/0d6e6152a94f11b2fe7dbb42d9e8c6c4
Bad news-COVID 4th wave may hit SA early	2021/10/20	https://za.opera.news/za/en/health/amp/62749b3438fcfc5afb15a8b4a94a00fa
Behavioural changes will reduce the spread - Brakpan Herald	2021/06/29	https://brakpanherald.co.za/251384/behavioural-changes-will-reduce-the-spread/
Biến thể Omicron gây nguy cơ tái nhiễm cao gấp 3 lần các chủng trước	12/03/2021	http://keonhacai.com/bien-the-omicron-gay-nguy-co-tai-nhiem-cao-gap-3-lan-cac-chung-truoc/
BIUST Covid-19 Data Analysis for Botswana Goes Live	9 April 2020	http://www.thetswanatimes.co.bw/index.php/arts-lifestyle/theatre/92-home/793-biust-covid-19-data-analysis-for-botswana-goes-live
Buenas noticias si ha recibido la vacuna Johnson & Johnson Covid-19	2021/09/11	https://notiulti.com/buenas-noticias-si-ha-recibido-la-vacuna-johnson-johnson-covid-19/
Burial homes under strain as deaths surge in Gauteng	9 July 2021	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://blackmediadaily.com/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/amp/
Burial homes under strain as deaths surge in South African hub	2021/07/09	https://www.moneyweb.co.za/news/south-africa/burial-homes-under-strain-as-deaths-surge-in-south-

		african-hub/
Call for calm amid new Covid019 strain	2022/12/06	https://www.youtube.com/watch?v=nOEeND8Gkss
Cases of Gauteng Omicron are increasing at a rate never seen before	2021/12/02	https://remonews.com/southafrica/cases-of-gauteng-omicron-are-increasing-at-a-rate-never-seen-before/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/19/2022	https://lowvelder.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/20/2022	https://mpumalanganews.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Confirmed Covid-19 infections may be tip of the iceberg in Gauteng	06/24/2021	https://www.sowetanlive.co.za/news/south-africa/2021-06-24-confirmed-covid-19-infections-may-be-tip-of-the-iceberg-in-gauteng/
Containing COVID-19 with digital technology, AI	02/07/2020	https://guardian.ng/features/health/containing-covid-19-with-digital-technology-ai/
Coronavirus ‘tipping point’ – South Africa’s lockdown is all we have to prevent more infections	03/24/2020	https://businesstech.co.za/news/government/384291/coronavirus-tipp...-south-africas-lockdown-is-all-we-have-to-prevent-more-infections/
Coronavirus cases rise to five-hundred and fifty-four in SA	03/24/2020	https://www.politicalanalysis.co.za/coronavirus-cases-rise-to-five-hundred-and-fifty-four-in-sa/
COVID 4th wave may hit Gauteng as early as November, says provincial command council	10/18/2021	https://news365.co.za/provincial-command-council/
COVID 4th wave may strike as early as November	10/19/2021	https://za.opera.news/za/en/health/b1311fd972f5956288c8e514a6b0906a

Covid -19 fourth wave is announced lock down might take place	11/26/2021	https://za.opera.news/za/en/health/e3617c019000d0f2007c256cdd44b58
Covid and Vaccine update	06/09/2021	https://omny.fm/shows/living-redefined/covid-and-vaccine-update?in_playlist=living-redefined!podcast#sharing
Covid-19 cases expected to rise in Gauteng Province	01/05/2021	http://www.soshanguvepulse.co.za/2021/01/covid-19-cases-expected-to-rise-in-gauteng-province/
Covid-19 cases expected to soar in Gauteng province	01/04/2021	https://gautengnewspaper.co.za/2021/01/04/covid-19-cases-expected-to-soar-in-gauteng-province/
Covid-19 fourth wave expected to hit Gauteng between November and January	10/20/2021	https://kemp-tonexpress.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Covid-19 fourth wave expected to hit Gauteng between November and January	10/23/2021	https://northernnatalnews.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Professor Bruce Mellado on the the Omicron variant	11/27/2021	https://rvwab.com/videos/watch/ouBrejIFQJs
COVID-19 storm in Gauteng has slowed down.	13/08/2020	https://fullview.co.za/top-stories/item/4322-covid-19-storm-in-gauteng-has-slowed-down
Covid-19 surge in January a real concern for Gauteng	01/02/2021	https://www.jacarandafm.com/news/news/covid-19-surge-january-real-concern-gauteng/
Covid-19 tăng theo 'cấp số nhân' ở tâm dịch Omicron	12/03/2021	http://antt.vn/covid-19-tang-theo-cap-so-nhan-o-tam-dich-omicron-329890.htm
Data modelling calls for stricter restrictions as number of infections spike	03/06/2020	https://omny.fm/shows/the-breakfast-show-702/data-modelling-calls-for-stricter-restrictions-as
Gauteng ramps up vaccination drive	09/27/2021	https://myplay.deod.tv/en/specials/rendering-content/mzansi-

		magic/107119/gauteng-ramps-up-vaccination-drive
Funeral homes under pressure as deaths rise in central South Africa	12/02/2021	https://www.bloomberglia.com.ar/2021/12/02/eeuu-requerira-a-viaj...t-negativo-de-covid-19-dentro-de-24-horas-anteriores-a-su-partida/
El número de casos de Covid-19 aumenta constantemente, la gente sigue muriendo	10/07/2022	https://mxn.news/el-numero-de-casos-de-covid-19-aumenta-constantemente-la-gente-sigue-muriendo/
En Afrique du Sud, en utilisant l'IA, des chercheurs prédisent un faible risque de 3e vague de Covid-19	13/04/2021	https://www.agenceecofin.com/intelligence-artificielle/1304-87139...-des-chercheurs-predisent-un-faible-risque-de-3e-vague-de-covid-19
If more people don't vaccinate, mandatory vaccinations could be the only option - David Makhura	12/02/2021	https://www.engineeringnews.co.za/article/if-more-people-dont-vaccinate-mandatoryvaccinations-could-be-the-only-option---david-makhura-2021-12-02
Wits researchers launch comprehensive Covid-19 dashboard for South Africa	03/24/2020	https://www.engineeringnews.co.za/print-version/wits-researchers-launch-comprehensive-covid-19-dashboard-for-south-africa-2020-03-24
Wits, York University to develop AI Covid-19 project	03/12/2020	https://www.engineeringnews.co.za/print-version/wits-york-university-to-develop-ai-covid-19-project-2020-12-03
Expert warns of second Covid-19 surge in Gauteng	01/11/2021	https://kemptonexpress.co.za/lnn/145301/expert-warns-of-second-covid-19-surge-in-gauteng/
Experts say Gauteng has yet to see the worst, peak a week out	06/27/2021	http://hitechnewsdaily.com/2021/06/experts-say-gauteng-has-yet-to-see-the-worst-third-wave-peak-a-week-out/
Fourth wave could hit Gauteng as early as next month	10/20/2021	https://www.iol.co.za/the-star/news/fourth-wave-could-hit-

		gauteng-as-early-as-next-month-49db8cbe-44cc-4a8c-8d8b-3f766dede8e6
Fourth wave of Covid infections ‘fast approaching’, expert warns	08/26/2021	https://www.jacarandafm.com/news/news/fourth-wave-covid-infections-fast-approaching-expert-warns/
Funeral homes under pressure as deaths rise in central South Africa	07/09/2021	https://ondequando.com/2021/07/09/funeral-homes-under-pressure-as-deaths-rise-in-central-south-africa/
Gauteng accounts for more of the daily Covid-19 cases	11/23/2021	https://omny.fm/shows/power-breakfast/gauteng-accounts-for-more-of-the-daily-covid-19-ca
Gauteng Covid-19 visualisation platform enables monitoring, prediction	07/07/2020	https://m.engineeringnews.co.za/article/gauteng-covid-19-visualisation-platform-enables-monitoring-prediction-2020-07-07/rep_id:4433
Gauteng is ready for the Covid-19 vaccine, says Makhura	01/30/2021	https://www.iol.co.za/saturday-star/news/gauteng-is-ready-for-th...id-19-vaccine-says-makhura-c5457219-2bb2-472d-8161-7ddd37799466
Gauteng Provincial Command Council warning fourth wave could hit earlier than expected	10/21/2021	https://www.youtube.com/watch?v=FM6Gd1yqnZs&t=103s
Gauteng records 78% COVID-19 recovery rate	08/13/2020	https://www.sabcnews.com/sabcnews/gauteng-records-78-covid-19-recovery-rate/
Good news about Covid-19 third wave in Gauteng	07/08/2021	https://mybroadband.co.za/news/trailing/405263-good-news-about-covid-19-third-wave-in-gauteng.html
J&J vaccine reduces COVID infections by half among health workers, according to a new study.	08/09/2021	https://fullview.co.za/top-stories/item/12814-j-j-vaccine-reduces-covid-infections-by-half-among-health-workers-according-to-a-new-study

Is Gauteng in the fourth wave of Covid-19	12/03/2021	https://www.nouvelles-du-monde.com/les-cas-de-gauteng-omicron-aug...t-la-province-accelere-le-deploiement-du-vaccin-dans-les-ecoles/
York explores research partnerships with South Africa	03/06/2023	https://yfile.news.yorku.ca/2023/05/03/york-explores-research-partnerships-with-south-africa/
York University News and the office of the provost spotlighted me as a leader within SDG 17: Partnerships for the Goals through the use of AI to improve health in the global south	03/07/2023	https://tinyurl.com/tcmdwpsk
Joining forces to work with Black communities to build equitable, resilient governance strategies & increase Black communities' preparedness for future diseases and climate disasters.	06/12/2022	https://tinyurl.com/5n8r65rw
Leveraging responsible AI solutions to help gov't & communities prepare and respond to disease outbreaks	10/30/2022	https://www.ctvnews.ca/video?clipId=2552980&jwsourc=fb&fbclid=IwAR2YtC8QUon5cvcFbwleIPdWZ7K3k5pJ8QisqLZELwXQIaB-d8w_B5xOeII
Leveraging Natural Language Processing to inform policies. Twitter shows lower-to-middle income countries have higher unemployment post-pandemic.	08/25/2022	https://tinyurl.com/7mwph8cm
Leveraging Natural Language Processing to inform policies. High unemployment rates in lower, mid income countries after Covid	08/25/2022	https://tinyurl.com/2vnvypvx
Employing artificial intelligence to address inequalities and systematic vulnerabilities in our communities.	13/ 03/2022.	https://www.ctvnews.ca/video?clipId=2401509

How artificial intelligence and big data are fighting COVID-19 in Africa.

08/ 22/ 2021

<https://tinyurl.com/3zbf6ht9>

6. Our team members are also constantly being invited on national tv for their opinions on harnessing artificial intelligence and big data techniques to address inequalities and systematic vulnerabilities in our communities as well as obtain unconventional data.



7) Our members have won several awards as a result of the work on this project. All our regional directors got promoted and won at least an award. As an example, the following award were provided to our PI:

- York University's 2023 President's Emerging Research Leadership Award. 2023
- York University 2023 Research Leader Award. 2023
- York University 2022 Faculty of Science Early Career Researcher Award. 2022
- Nominated for the 2022 Postdoctoral Supervisor of the Year Award. 2022
- Recognized for enumerating positive change by inspiring Black students to aspire. <https://magazine.yorku.ca/issues/fall-2022/enumerating-positive-change/2022>
- Recognized as a York University Community Changemaker. <https://www.yorku.ca/positivechange/2022/02/18/jude-kong-faculty/>
- Recognized as Canadian Innovation Research Leader. <https://researchinfosource.com/pdf/CIL2021.pdf> 2021
- Recognized as a Black Hero of Operational Research.(Received a certificate)<https://www.theorsociety.com/publications/magazines/inside-or/2021-october/the-black-heroes-of-oper> 2021
- 2020 York University Research Leader Award. (Received a present) <https://www.yorku.ca/research/wp-content/uploads/sites/39/2021/05/YorkVPRI-ResearchAwardWinnersProgram-for-po>

pdf

8) We are constantly being invited to give keynote presentations on our work at different workshops and conferences. As leaders in this area, we equally organized several workshops/conferences

Presentations to Government: We have given over 400 presentations to different work streams in the government. Most of these presentations are given during closed doors sessions and cannot be shared here. Below are links to sample reports that the team share with policy makers.

1. https://www.dropbox.com/s/bea9yo8fw3b3gph/COVID19_PCCC_301121.ppt?dl=0
2. https://www.dropbox.com/s/xneylee8glctdha/COVID19_PCCC_110122.ppt?dl=0
3. https://www.dropbox.com/s/kwsihpur40kno2r/COVID19_PCCC_141221.ppt?dl=0
4. https://www.dropbox.com/s/vmc1hrzjelbmvdh/COVID19_PCCC_161121.ppt?dl=0
5. https://www.dropbox.com/s/57rbzuk5g7gy3pf/COVID19_PCCC_091121.ppt?dl=0
6. https://www.dropbox.com/s/rd7viz2lsqgmvs0/COVID19_PCCC_280921.ppt?dl=0
7. https://www.dropbox.com/s/0x8afnned2e4g2v/COVID19_PCCC_210921.ppt?dl=0
8. https://www.dropbox.com/s/hkmvdmhqw86z0hp/COVID19_PCCC_140921.ppt?dl=0
9. https://www.dropbox.com/s/yyamlx5tjlb4580/COVID19_PCCC_070921.ppt?dl=0
10. https://www.dropbox.com/s/i4qankdst16675x/COVID19_PCCC_310821.ppt?dl=0
11. https://www.dropbox.com/s/qsfeu3kr03bgjnm/COVID19_PCCC_240824.ppt?dl=0
12. https://www.dropbox.com/s/fxovb7iqplnqs7o/COVID19_PCCC_170821.ppt?dl=0
13. https://www.dropbox.com/s/x71rhxcn5fief2y/COVID19_PCCC_100821.ppt?dl=0
14. https://www.dropbox.com/s/y4mnhuurh0dikwq/COVID19_PCCC_030821.ppt?dl=0
15. https://www.dropbox.com/s/y4h77degmhouqp8/COVID19_PCCC_270721.ppt?dl=0

Presentations at conferences/seminars

We have also given over 400 presentations in national and international conferences/seminars in last two years..

Below is a sample of some of the conferences and workshops we have presented in:

1. keynote: gave a talk to the Public Health Association of BC Summer Institute on: "the impact of responsible local and explainable AI on communities (<https://phabc.org/phsi-2023-registration/?civiwp=CiviCRM&q=civicrm%2Fevent%2Finfo&reset=1&id=52>).
2. Attended IndabaX Cameroon 2023 conference and gave a talk on "Leveraging Responsible, Explainable, & Local AI for Population Health & Health Systems (<https://deeplearningindaba.com/2023/indabax/cameroon/>).

3. Attended DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN #SDGs and gave a talk on AI-based frameworks and algorithms for achieving SDG3 and SDG5 in the Global South (<http://dimacs.rutgers.edu/events/details?eID=2394>).

4. Invited Speaker: We gave a talk at the Next Einstein Forum Webinar series on leveraging responsible artificial intelligence methods for population health and health systems. April 18, 2023.

5. Invited Speaker: We gave a presentation to South African University leaders (during their visit to York University) on the work that we have been doing in South Africa: mobilizing AI to build equitable, resilient governance strategies & increase societal preparedness for future global pandemics and climate disasters. April 24, 2023.

6. Invited Speaker: We were invited to talk about how we can leverage AI to assist the Governor of Kajiado , Kenya (during his visit to York University)in his agenda for the Maasai

people of Kenya (vulnerable community): in particular SDG 2 ("Zero hunger"); SDG 3 ("Good Health and Well-being"), SDG4 ("Quality Education"), SDG5 ("gender equality"), SDG 6("Clean Water and Sanitation"), SDG11 ("Sustainable cities and communities"). March 23, 2023.

7. Invited Speaker: We attended and gave a talk on Leveraging Responsible AI for Population Health& Health Systems in Nigeria at the Nigeria Computer Society, Artificial Intelligence & Robotics Conference: <https://lnkd.in/g4HwZGti>. March 21-23, 2023.

8. Invited Speaker: We attended the American Mathematical Society Southeastern Sectional Meeting at Georgia Institute of Technology, Atlanta Georgia and gave a talk on Mpox dynamic model: incorporating adaptive behavioural changes, different control strategies in the MSM community & under-reporting. March 18-20, 2023.

9. Invited Speaker: We gave a guest talk on Leveraging ResponsibleAI for Population Health& Health Systems at Queens University. March 07, 2023.

10. Invited Speaker:We gave a presentation at Michael Garron Hospital on Canadian Black Scientists and the Key to Leveraging Responsible Data Science Methods for Population Health & Health Systems.

11. Invited Speaker: We gave a guest lecture at the Dalla Lana School of Public Health on Leveraging Responsible, Explainable, and Local Data Science Methods for Population Health & Health Systems. Feb. 07, 2023.

12. Keynote Speaker: We organized a workshop at the Fields Institute on Early Warning Sys- tems (EWS) for Emerging and Re-emerging Diseases and gave a talk on EWS for re-emerging diseases. <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Attended in person. Jan. 23-25, 2023.

13. Invited Speaker: We attended the Joint Mathematics Meetings in Boston and gave a talk entitled: "adaptive changes in sexual behaviour in the high-risk population in response to mpox can control the outbreak: insights from an epidemic model. Attended in person. Jan. 04-07, 2023.

14. Panellist : We organized and took part in a panel discussion on "Towards an Inclusive Data Governance Policy for the use of AI in Africa" at the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. Attended in person. Dec. 10, 2022.

15. Invited panellist : We were invited to two-panel conversations at the Bill & Melinda Gates Foundation in Seattle: 1) Ethics and Efficacy of modelling and machine learning, 2) The pol- itics of data. December 09, 2022. <https://members.dataforpolicy.org/2022-conference/seattle-programme/>

16. Invited Speaker: We gave a talk at the Canadian Mathematical Society winter meeting on "Adaptive changes in sexual behavior in the high-risk population in response monkeypox can control the outbreak: insights from an epidemic model". Attended in person. December 04, 2022.

14. Keynote Speaker: We gave a keynote presentation at the New York University Abu Dhabi Global Perspectives in Science Lecture Series. Title of my talk: Leveraging AI for Clini- cal Public and Global

health Needs: Implications for Policies and Lessons Learned from the ACADIC project. Attended in person. Nov 28, 2022.

17. Invited Speaker: We gave a presentation at the China-Canada Symposium On Modelling, Prevention and Control of Zoonoses. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”. Attended virtually-zoom. Nov 15, 2022.

18. Keynote Speaker: We gave a presentation at the Ghanaian Mathematical Biology and Medicine Workshop. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in Africa”. Attended virtually-zoom. Nov 08, 2022.

19. Invited Speaker: We gave a presentation at the University of Massachusetts Mathematical Biology Seminar series. Title of my talk: “Leveraging Artificial Intelligence for Clinical Public Health in the Global South”. Attended virtually-zoom. October 31, 2022.

20. Keynote Speaker: We gave a keynote speaker at the Science Atlantic Conference 2022, that held at Mount Alison University, Sackville, NB . Attended in person. Oct. 21-15, 2022. the MfPH next generation. Title of my talk: “Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage’. Attended virtually-zoom. August 17, 2022.

22. Invited Speaker: During the deputy Minister of Higher Education, Science and Innovation (South Africa), the Hon. Buti Manamela visit to York University, we presented our initiatives in South Africa: Leveraging Artificial Intelligence and Big Data for clinical public health in South Africa. September 14, 2022.

23. Invited Speaker: We gave a presentation at the MfPH next generation. Title of my talk: “Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage’. Attended virtually-zoom. August 17, 2022.

24. Keynote Speaker: We were invited as a keynote speaker at the Queen’s University, Workshop on Math- ematical Ecology (<https://mast.queensu.ca/math-ecology/>). Attended in person. Title of talk: ‘Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dy- namics worldwide in the early stage. August 10-11, 2022.

25. Invited Speaker: We gave a presentation at the Applied and Industrial Mathematics Society Annual Meeting 2022 in UBC-Okanagan. Title: “Estimation of epidemiological parameters and ascertainment rate from early transmission of COVID-19 Across Africa”. Attended in person. June 15 , 2022

26. Keynote Speaker: keynote speaker at the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Con- sortium (ACADIC)and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30 , 2022

27. Invited Speaker. We gave a presentation in the Mathematics Department, University of Alberta entitled: “comparing public sentiments toward COVID-19 vaccines across Canadian cities: analysis of comments on Reddit”. Attended virtually-zoom. February 14 , 2022

28. We Moderated apanel conversation on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. Attended virtually-zoom. Feb 03, 2022.

29. Keynote Speaker: keynote talk on the impact of social economics and environmental factors on the dynamics of COVID-19 at the Artificial Intelligence for Pandemics Centered, University of Queensland, Australia. Attended virtually-zoom. January 19 , 2022.

30. Invited Speaker. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Talk titleThe impact of so- cial, economic,

environmental factors and public health measures on the dynamics of COVID- 19. Attended virtually-zoom. September 16, 2021.

31. Panelist. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Attended virtually-zoom. September 17, 2021.

32. Panelist. Artificial Intelligence Virtual Stakeholders Forums: A Rights-Respecting Artificial Intelligence Policy for Nigeria. Attended virtually-zoom. October 20, 2021.

33. Invited Speaker. Mathematics for Public Health Colloquium [http:// www. fields. utoronto. ca/ activities/ 21-22/ public-health-colloquium](http://www.fields.utoronto.ca/activities/21-22/public-health-colloquium) . Talk title: Early Warning Tools for Emerging Infectious Diseases Outbreak. Attended virtually-zoom. October 12, 2021.

34. Plenary Speaker. Ghana Science Association 2021 Conference [https:// www. ghanascience. org. gh](https://www.ghanascience.org.gh) . Theme: Mitigating COVID-19 Pandemic. Talk title: The power of Collaboration, Artificial Intelligence & Big Data in the Fight Against COVID-19 in Africa. Attended virtually-zoom. October 07, 2021.

35. Invited Speaker Black Heroes of Mathematics 2021 conference [https:// www. lms. ac. uk/ events/ black-heroes-mathematics](https://www.lms.ac.uk/events/black-heroes-mathematics) . Talk title: Harnessing Artificial Intelligence and Big Data Techniques to Monitor Manage and Forecast an Epidemic: the Case of COVID-19. Attended virtually-zoom. October 05, 2021.

36. Panelist. Black Heroes of Mathematics 2021 conference [https:// www. lms. ac. uk/ events/ black-heroes-mathematics](https://www.lms.ac.uk/events/black-heroes-mathematics). Panel conversation on increasing the number of Blacks in re- search and STEMM programs . Attended virtually-zoom. September 13, 2021.

37. Invited Speaker Data for policy 2021 conference: lessons for policy-data interactions after COVID-19 [https:// dataforpolicy. org](https://dataforpolicy.org) . Attended virtually-zoom. September 13, 2021.

38. Panelist. Data for policy 2021 Conference: lessons for policy-data interactions after COVID- 19 [https:// dataforpolicy. org](https://dataforpolicy.org) . Attended virtually-zoom. September 14, 2021. Data for Policy is a premier global forum for interdisciplinary and cross-sector discussions around the impact and potentials of the digital revolution in the government sector. I equally gave a presentation in this conference. Attended virtually-zoom. September 14, 2021.

39. Invited Speaker. University of British Columbia Mathematical Biology Lecture series. The impact of social, economic, environmental factors and public health measures on the dynamics of COVID-19. Attended virtually-zoom. June 02, 2021.

40. Panelist. Panelist at a Symposium on Building Momentum for Transformative Disaster Risk Governance. Attended virtually-zoom. February 12, 2021.

41. Invited Speaker. Dahdaleh Institute for Global Health Research. Presentation on our IDRC project on predictive modeling and forecasting the transmission of COVID-19 in Africa using Artificial Intelligence. Attended virtually-zoom. January 27, 2021.

42. Invited Speaker. University of Alberta Mathematical Biology Lecture series. The impact of social, demographic and climatic variable on the growth rate of COVID-19 across countries. Attended virtually-zoom. November 16, 2020.

Events that we have organized

We have also organized over 100 workshops, conferences and webinars in last two years
Below is a sample of some of the workshops, conferences and webinars that we organized:

1. Consortium of Universities for Global Health 2023 conference: I organized a workshop on “Fairness in Machine Intelligence for Global Health” at the consortium of Universities for Global Health 2023 conference. [https:// www. cugh2023. org/ satellitesession13](https://www.cugh2023.org/satellitesession13) . April 03, 2023.

2. AI for Global Challenges and Lessons learned: organized Global South AI4PEP Network bi-weekly lecture series. Theme: AI for Global Challenges and Lessons learned <https://www.yorku.ca/cifal/ai4pep/>. Feb, 20-May 29, 2023 .
3. 2023 MfPH Early Warning Systems Workshop: organized a workshop at the Fields Institute on Early Warning Systems for Emerging and Re-emerging Diseases from January 23-25: <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Jan. 23-25, 2023 .
4. Data for Policy Conference 2022: organized and took part in a panel discussion on "Towards an Inclusive Data Governance Policy for the use of AI in Africa" in the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. link: <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. December, 10, 2022 .
5. United Nation General Assembly 77 (UNGA77) Science Summit interactive panel session : During the UNGA77 we co-organize a panel session on artificial Intelligence Research in Health: Tackling Global Challenges as One (other co-organize are: I-DAIR , the United Nations University Institute in Macau (UNU Macau), Indraprastha Institute of Information Technology Delhi (IIIT-Delhi), Universidade Federal do Rio Grande do Sul (UFRGS), the Africa-Canada AI and & Data Innovation Consortium (ACADIC), the University of the Witwatersrand, and the City University of New York (CUNY). September, 22, 2022 .
6. Mini-Symposium: Big Data and AI for Public Health. I co-organized a mini symposium at the Canadian Industrial and Applied Mathematics 2022 Meeting on Big Data and AI for Public Health. June 15, 2022.
7. Collaborative workshop on big data analysis of covid-19. In partnership with the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30-31, 2022 .
8. Conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. In collaboration with CIFAL York, and representing ACADIC, we organize a conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence at York University, Canada. Feb 03, 2022
9. Canadian Applied and Industrial Mathematics Meeting 2021: Organized a mini- symposium at the Canadian Applied and Industrial Mathematics 2021 Meeting on Modelling Infectious Disease. June 21, 2021.
10. Society for Mathematical Biology Meeting 2021: Organized a mini-symposium at the Society for Mathematical Biology Meeting 2021: on Modelling Infectious Disease. June 15, 2021.
11. Disaster Risk Governance Webinar: Organized a webinar series on AI for Disaster Resilience and Sustainable Development. April 30, 2021

Regional Webinar series

Each country runs a weekly webinar series where they invite researchers from around the world to come and share their research work with them. We meet bi-weekly for updates from each country and this has been going on since we started working on the project.

Has this project helped team members or affiliated researchers to be recognized as thought-leaders and called upon for their inputs? If yes, please provide names, dates and contexts.

Yes; Our team leaders are constantly being invited for national, and international interviews on harnessing AI and Big Data techniques to manage and contain epidemics. They are equally constantly being invited as keynote speakers in national and international conferences. They have all been nominated to lead the national or regional modelling task force in their countries e.g Professor Bruce Mellado is the Head of the Gauteng Province Premier's COVID-19 Advisory Committee and head of Southern Africa COVID-19 Modelling Taskforce; Professor Wilfred Ndifon is one of the leaders of Rwanda COVID-19 Modelling Taskforce ; Professor Ngwa Gideon is the head of the South West province, Cameroon Modelling Taskforce ; Professor Jude Dzevela Kong, the lead PI is a member of the Africa CDC Modelling Taskforce. They have received awards for their work in employing artificial intelligence to manage and contain COVID-19.

Below we highlight a few examples.

1. A selection of News bits from our members can be found [here](#) and below

Title	Date	Link
Artificial intelligence and COVID-19	08/30/2021	https://www.dw.com/en/covid-artificial-intelligence-in-the-pandemic/a-58171146
Huge spotlight on prime time news: Find out what ACADIC project is all about from Prof. Ngwa	07/07/2022	https://www.youtube.com/watch?v=4xN8JrBN5XA
Our team leader in Cameroon addressing dis- and miss-information about COVID-19 & COVID-19 vaccines,	07/07/2022	https://www.youtube.com/watch?v=Sm_J5WX_di8
ACADIC using Artificial Intelligence and Big Data to inform COVID-19 policies in Africa	07/07/2022	https://www.youtube.com/watch?v=4H6iiPRmtW0
University of Buea Among Africa's COVID Modeling and Reporting Centers	07/07/2022	https://www.youtube.com/watch?v=5AM9h0y5ptI
Misinformation on social media linked to higher spread of COVID-19 in new study	06/11/2021	https://toronto.ctvnews.ca/misinformation-on-social-media-linked-to-higher-spread-of-covid-19-in-new-study-1.5466846
Dealing with the pandemic by drinking and swearing? Boffins say you're not alone	06/11/2021	https://www.theregister.com/2021/06/11/pandemic_drinking_and_swearing_outbreak/
Social media use one of four factors related to	06/09/2021	https://phys.org/news/2021-06-

higher COVID-19 spread rates early on		social-media-factors-higher-covid-.html
How artificial intelligence and big data are fighting COVID-19 in Africa	08/22/2021	https://yfile.news.yorku.ca/2021/08/22/how-artificial-intelligence-and-big-data-are-fighting-covid-19-in-africa/?http://yfile.news.yorku.ca/?utm_source=YFile_Email&utm_medium=Email&utm_content=Current-News&utm_campaign=yfile
透過不同角度，加深對身邊人、事、物的了解。每集內容分為兩部份：第一節介紹有關文化、傳媒、電影等資訊，亦會邀請新聞人物接受個人專訪；第二節邀請專家及相關人物討論最熱門的新聞話題。		https://www.fairchildtv.com/newsarchive_detail.php?n=28
AI can help with COVID Inequalities		https://www.ctvnews.ca/video?clipId=2401509
Gauteng Command Council gives an update on Covid-19 in the province	2021/06/24	https://www.youtube.com/watch?v=8iPw6gQrx8k
Prof Bruce Mellado gives insight into the impact of the third wave on Gauteng	2021/06/24	https://www.youtube.com/watch?v=neIjCJTr0ro
Gauteng Premier David Makhura on province's response to COVID-19 - YouTube	2021/06/05	https://www.youtube.com/watch?v=lkL-PFTneX4
Professor Bruce Mellado gives an update on COVID-19 behaviour in Gauteng amid the third wave - YouTube	2021/06/15	https://www.youtube.com/watch?v=ongMjF7k1MM
AI techniques used to identify hotspots - YouTube	2020/12/22	https://www.youtube.com/watch?v=af9m7HIUivM Page 1 of 2 #DStv403 AI techniques used to identify hotspots
[Hazardous things in your area] Focus on Ruimsig	2021/02/13	http://702.co.za/podcasts/415/the-john-perlman-show/485505/hazardous-things-in-your-area-focus-on-ruimsig
南非研究：Omicron可突破部分免疫再感染率較Delta高	2021/12/03	https://www.cna.com.tw/news/firstnews/202112030068.aspx

'First signs' of fourth Covid-19 wave in Gauteng - expert	2021/11/24	https://www.jacarandafm.com/news/news/first-signs-fourth-covid-19-wave-gauteng-expert/
Lower-to-mid income nations have more joblessness post-pandemic	2022/08/26	https://theguardian.com/lifeandstyle/2022/aug/26/low-to-mid-income-nations-have-more-joblessness-post-pandemic/
'Up to 1-million at risk of Covid-19 in SA in 40 days'	2020/03/23	https://www.businesslive.co.za/bd/national/2020-03-23-up-to-1-million-at-risk-of-covid-19-in-sa-in-40-days/
Gauteng is ready to relax lockdown” – Gauteng Provincial Command Council	2020/08/13	https://vaalweekblad.com/70550/gauteng-is-ready-to-relax-lockdown-gauteng-provincial-command-council/
【南非觀察】新冠確診數直線上升，南非第四波疫情恐即將來襲_多源焦點	2021/11/27	https://dyfocus.com/news-world/324f0c.html
«El problema de Ómicron es la rapidez con la que afecta a los no vacunados»	2021/12/01	https://theworldnews.net/es-news/el-problema-de-omicron-es-la-rapidez-con-la-que-afecta-a-los-no-vacunados
Omicron si diffonde ad un ritmo mai visto prima»	2021/12/03	https://www.cdt.ch/mondo/omicron-si-diffonde-ad-un-ritmo-mai-visto-prima-HN4935229
News - South China Morning Post « » Omicron spreading quicker than all other Covid-19 variants in South African 'epicentre'	2021/12/02	https://player.fm/series/news-south-china-morning-post/omicron-spreading-quicker-than-all-other-covid-19-variants-in-south-african-epicentre
10 years since Higgs Boson was found - SAfm Sunrise - Omny.fm	2022/07/08	https://omny.fm/shows/safm-sunrise-1/10-years-since-higgs-boson-was-found
Wits researchers launch most comprehensive COVID-19 dashboard in	23 March 2020	http://www.wits.ac.za/news/latest-news/general-news/2020/2020-

South Africa		03...aunch-most-comprehensive-covid-19-dashboard-in-south-africa.html
Twitter shows lower-to-middle income countries have higher unemployment post pandemic	24 August 2022	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0272208
AI algorithm system predicts low risk of third wave in SA	2021/04/13	https://www.iol.co.za/news/south-africa/western-cape/ai-algorithm...low-risk-of-third-wave-in-sa-8f73b1d4-0dac-46e6-82da-818a4687b9ba
AI algorithm system predicts low risk of third wave in South Africa	2021/04/13	https://eminetra.co.za/ai-algorithm-system-predicts-low-risk-of-third-wave-in-south-africa/237543/
AI helps to identify new COVID-19 hotspots in Gauteng	2020/12/24	https://medicalxpress.com/news/2020-12-ai-covid-hotspots-gauteng.html
AI-based algorithm shows SA has low risk of Covid-19 third wave - for now	2021/04/13	https://www.capetalk.co.za/articles/413677/south-africa-has-low-risk-of-covid-19-third-wave-infections-for-now
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://medicalxpress.com/news/2021-04-ai-powered-algorithm-south-africa.html
AI-powered algorithm released to detect the third wave in South Africa	2021/04/12	https://floridanewstimes.com/ai-powered-algorithm-released-to-detect-the-third-wave-in-south-africa/215517/
Algoritmo impulsado por IA lanzado para detectar la tercera ola en Sudáfrica	2022/09/02	https://www.biblia.work/articulos-salud/algoritmo-impulsado-por-ia-lanzado-para-detectar-la-tercera-ola-en-sudafrica/
Analysis on President Cyril Ramaphosa's address	2021/06/27	https://www.youtube.com/watch?v=6-HDoA1VZPs
As Covid-19 cases surge, SA expands vaccine programme	2021/06/25	https://www.biznews.com/briefs/2021/06/25/covid-19-sa-vaccine-expansion

As Latest COVID-19 Wave Recedes, Public Health Leaders Brace For The Next One	02/02/2021	https://adf-magazine.com/2021/11/as-latest-covid-19-wave-recedes-public-health-leaders-brace-for-the-next-one/
Bad news for Gauteng province. Corona Virus infections are rising rapidly.	2021/06/15	https://za.opera.news/za/en/health/64c718e2298361f9ccec82cd8ed69f23
Bad news-COVID 4th wave expected to hit SA,	2021/10/20	https://za.opera.news/za/en/health/0d6e6152a94f11b2fe7dbb42d9e8c6c4
Bad news-COVID 4th wave may hit SA early	2021/10/20	https://za.opera.news/za/en/health/amp/62749b3438fcfc5afb15a8b4a94a00fa
Behavioural changes will reduce the spread - Brakpan Herald	2021/06/29	https://brakpanherald.co.za/251384/behavioural-changes-will-reduce-the-spread/
Biến thể Omicron gây nguy cơ tái nhiễm cao gấp 3 lần các chủng trước	12/03/2021	http://keonhacai.com/bien-the-omicron-gay-nguy-co-tai-nhiem-cao-gap-3-lan-cac-chung-truoc/
BIUST Covid-19 Data Analysis for Botswana Goes Live	9 April 2020	http://www.thetswanatimes.co.bw/index.php/arts-lifestyle/theatre/92-home/793-biust-covid-19-data-analysis-for-botswana-goes-live
Buenas noticias si ha recibido la vacuna Johnson & Johnson Covid-19	2021/09/11	https://notiulti.com/buenas-noticias-si-ha-recibido-la-vacuna-johnson-johnson-covid-19/
Burial homes under strain as deaths surge in Gauteng	9 July 2021	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://blackmediadaily.com/burial-homes-under-strain-as-deaths-surge-in-gauteng/
Burial homes under strain as deaths surge in Gauteng	2021/07/09	https://businesstech.co.za/news/trending/504705/burial-homes-under-strain-as-deaths-surge-in-gauteng/amp/
Burial homes under strain as deaths	2021/07/09	https://www.moneyweb.co.za/new

surge in South African hub		s/south-africa/burial-homes-under-strain-as-deaths-surge-in-south-african-hub/
Call for calm amid new Covid019 strain	2022/12/06	https://www.youtube.com/watch?v=nOEeND8Gkss
Cases of Gauteng Omicron are increasing at a rate never seen before	2021/12/02	https://remonews.com/southafrica/cases-of-gauteng-omicron-are-increasing-at-a-rate-never-seen-before/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/19/2022	https://lowvelder.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Coming weeks vital to determine start of fifth Covid-19 wave in Gauteng	04/20/2022	https://mpumalanganews.co.za/lnn/1168606/coming-weeks-vital-to-determine-start-of-fifth-covid-19-wave-in-gauteng/
Confirmed Covid-19 infections may be tip of the iceberg in Gauteng	06/24/2021	https://www.sowetanlive.co.za/news/south-africa/2021-06-24-confirmed-covid-19-infections-may-be-tip-of-the-iceberg-in-gauteng/
Containing COVID-19 with digital technology, AI	02/07/2020	https://guardian.ng/features/health/containing-covid-19-with-digital-technology-ai/
Coronavirus ‘tipping point’ – South Africa’s lockdown is all we have to prevent more infections	03/24/2020	https://businesstech.co.za/news/government/384291/coronavirus-tipp...-south-africas-lockdown-is-all-we-have-to-prevent-more-infections/
Coronavirus cases rise to five-hundred and fifty-four in SA	03/24/2020	https://www.politicalanalysis.co.za/coronavirus-cases-rise-to-five-hundred-and-fifty-four-in-sa/
COVID 4th wave may hit Gauteng as early as November, says provincial command council	10/18/2021	https://news365.co.za/provincial-command-council/
COVID 4th wave may strike as early as November	10/19/2021	https://za.opera.news/za/en/health/b1311fd972f5956288c8e514a6b09

		06a
Covid -19 fourth wave is announced lock down might take place	11/26/2021	https://za.opera.news/za/en/health/e3617c019000d0f2007c256cdd44b58
Covid and Vaccine update	06/09/2021	https://omny.fm/shows/living-redefined/covid-and-vaccine-update?in_playlist=living-redefined!podcast#sharing
Covid-19 cases expected to rise in Gauteng Province	01/05/2021	http://www.soshanguvepulse.co.za/2021/01/covid-19-cases-expected-to-rise-in-gauteng-province/
Covid-19 cases expected to soar in Gauteng province	01/04/2021	https://gautengnewspaper.co.za/2021/01/04/covid-19-cases-expected-to-soar-in-gauteng-province/
Covid-19 fourth wave expected to hit Gauteng between November and January	10/20/2021	https://kemptonexpress.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Covid-19 fourth wave expected to hit Gauteng between November and January	10/23/2021	https://northernnatalnews.co.za/own-your-life/covid-19-fourth-wave-expected-to-hit-gauteng-between-november-and-january/
Professor Bruce Mellado on the the Omicron variant	11/27/2021	https://rvwab.com/videos/watch/ouBrejIFQJs
COVID-19 storm in Gauteng has slowed down.	13/08/2020	https://fullview.co.za/top-stories/item/4322-covid-19-storm-in-gauteng-has-slowed-down
Covid-19 surge in January a real concern for Gauteng	01/02/2021	https://www.jacarandafm.com/news/news/covid-19-surge-january-real-concern-gauteng/
Covid-19 tăng theo 'cấp số nhân' ở tâm dịch Omicron	12/03/2021	http://antt.vn/covid-19-tang-theo-cap-so-nhan-o-tam-dich-omicron-329890.htm
Data modelling calls for stricter restrictions as number of infections spike	03/06/2020	https://omny.fm/shows/the-breakfast-show-702/data-modelling-calls-for-stricter-restrictions-as

Gauteng ramps up vaccination drive	09/27/2021	https://myplay.deod.tv/en/specials/rendering-content/mzanzi-magic/107119/gauteng-ramps-up-vaccination-drive
Funeral homes under pressure as deaths rise in central South Africa	12/02/2021	https://www.bloomberglia.com.ar/2021/12/02/eeuu-requerira-a-viaj...t-negativo-de-covid-19-dentro-de-24-horas-anteriores-a-su-partida/
El número de casos de Covid-19 aumenta constantemente, la gente sigue muriendo	10/07/2022	https://mxn.news/el-numero-de-casos-de-covid-19-aumenta-constantemente-la-gente-sigue-muriendo/
En Afrique du Sud, en utilisant l'IA, des chercheurs prédisent un faible risque de 3e vague de Covid-19	13/04/2021	https://www.agenceecofin.com/intelligence-artificielle/1304-87139...-des-chercheurs-predisent-un-faible-risque-de-3e-vague-de-covid-19
If more people don't vaccinate, mandatory vaccinations could be the only option - David Makhura	12/02/2021	https://www.engineeringnews.co.za/article/if-more-people-dont-vaccinate-mandatoryvaccinations-could-be-the-only-option---david-makhura-2021-12-02
Wits researchers launch comprehensive Covid-19 dashboard for South Africa	03/24/2020	https://www.engineeringnews.co.za/print-version/wits-researchers-launch-comprehensive-covid-19-dashboard-for-south-africa-2020-03-24
Wits, York University to develop AI Covid-19 project	03/12/2020	https://www.engineeringnews.co.za/print-version/wits-york-university-to-develop-ai-covid-19-project-2020-12-03
Expert warns of second Covid-19 surge in Gauteng	01/11/2021	https://kemptonexpress.co.za/Inn/145301/expert-warns-of-second-covid-19-surge-in-gauteng/
Experts say Gauteng has yet to see the worst, peak a week out	06/27/2021	http://hitechnewsdaily.com/2021/06/experts-say-gauteng-has-yet-to-see-the-worst-third-wave-peak-a-week-out/

Fourth wave could hit Gauteng as early as next month	10/20/2021	https://www.iol.co.za/the-star/news/fourth-wave-could-hit-gauteng-as-early-as-next-month-49db8cbe-44cc-4a8c-8d8b-3f766dede8e6
Fourth wave of Covid infections ‘fast approaching’, expert warns	08/26/2021	https://www.jacarandafm.com/news/news/fourth-wave-covid-infections-fast-approaching-expert-warns/
Funeral homes under pressure as deaths rise in central South Africa	07/09/2021	https://ondequando.com/2021/07/09/funeral-homes-under-pressure-as-deaths-rise-in-central-south-africa/
Gauteng accounts for more of the daily Covid-19 cases	11/23/2021	https://omny.fm/shows/power-breakfast/gauteng-accounts-for-more-of-the-daily-covid-19-ca
Gauteng Covid-19 visualisation platform enables monitoring, prediction	07/07/2020	https://m.engineeringnews.co.za/article/gauteng-covid-19-visualisation-platform-enables-monitoring-prediction-2020-07-07/rep_id:4433
Gauteng is ready for the Covid-19 vaccine, says Makhura	01/30/2021	https://www.iol.co.za/saturday-star/news/gauteng-is-ready-for-th...id-19-vaccine-says-makhura-c5457219-2bb2-472d-8161-7ddd37799466
Gauteng Provincial Command Council warning fourth wave could hit earlier than expected	10/21/2021	https://www.youtube.com/watch?v=FM6Gd1yqnZs&t=103s
Gauteng records 78% COVID-19 recovery rate	08/13/2020	https://www.sabcnews.com/sabcnews/gauteng-records-78-covid-19-recovery-rate/
Good news about Covid-19 third wave in Gauteng	07/08/2021	https://mybroadband.co.za/news/trailing/405263-good-news-about-covid-19-third-wave-in-gauteng.html
J&J vaccine reduces COVID infections by half among health workers, according to a new study.	08/09/2021	https://fullview.co.za/top-stories/item/12814-j-j-vaccine-reduces-covid-infections-by-half-among-health-workers-according-

		to-a-new-study
Is Gauteng in the fourth wave of Covid-19	12/03/2021	https://www.nouvelles-du-monde.com/les-cas-de-gauteng-omicron-aug...t-la-province-accelere-le-deploiement-du-vaccin-dans-les-ecoles/
York explores research partnerships with South Africa	03/06/2023	https://yfile.news.yorku.ca/2023/05/03/york-explores-research-partnerships-with-south-africa/
York University News and the office of the provost spotlighted me as a leader within SDG 17: Partnerships for the Goals through the use of AI to improve health in the global south	03/07/2023	https://tinyurl.com/tcmdwpsk
Joining forces to work with Black communities to build equitable, resilient governance strategies & increase Black communities' preparedness for future diseases and climate disasters.	06/12/2022	https://tinyurl.com/5n8r65rw
Leveraging responsible AI solutions to help gov't & communities prepare and respond to disease outbreaks	10/30/2022	https://www.ctvnews.ca/video?clipId=2552980&jwsouce=fb&fbclid=IwAR2YtC8QUon5cvcFbwleIPdWZ7K3k5pJ8QisqLZELwXQIaB-d8w_B5xOeII
Leveraging Natural Language Processing to inform policies. Twitter shows lower-to-middle income countries have higher unemployment post-pandemic.	08/25/2022	https://tinyurl.com/7mwph8cm
Leveraging Natural Language Processing to inform policies. High unemployment rates in lower, mid income countries after Covid	08/25/2022	https://tinyurl.com/2vnvypvx
Employing artificial intelligence to address inequalities and systematic vulnerabilities in our communities.	13/ 03/2022.	https://www.ctvnews.ca/video?clipId=2401509

How artificial intelligence and big data are fighting COVID-19 in Africa.	08/ 22/ 2021	https://tinyurl.com/3zbf6ht9
---	--------------	---

2) As an example, the following award were provided to our PI:

- York University’s 2023 President’s Emerging Research Leadership Award. 2023
- York University 2023 Research Leader Award. 2023
- York University 2022 Faculty of Science Early Career Researcher Award. 2022
- Nominated for the 2022 Postdoctoral Supervisor of the Year Award. 2022
- Recognized for enumerating positive change by inspiring Black students to aspire. <https://magazine.yorku.ca/issues/fall-2022/enumerating-positive-change/2022>
- Recognized as a York University Community Changemaker. <https://www.yorku.ca/positivechange/2022/02/18/jude-kong-faculty/>
- Recognized as Canadian Innovation Research Leader. <https://researchinfosource.com/pdf/CIL2021.pdf> 2021
- Recognized as a Black Hero of Operational Research.(Received a certificate)<https://www.theorsociety.com/publications/magazines/inside-or/2021-october/the-black-heroes-of-oper> 2021
- 2020 York University Research Leader Award. (Received a present) <https://www.yorku.ca/research/wp-content/uploads/sites/39/2021/05/YorkVPRI-ResearchAwardWinnersProgram-for-po>

pdf

3) We are constantly being invited to give keynote presentations on our work at different workshops and conferences. As leaders in this area, we equally organized several workshops/conferences

Presentations to Government: We have given over 400 presentations to different work streams in the government. Most of these presentations are given during closed doors sessions and cannot be shared here. Below are links to sample reports that the team share with policy makers.

1. https://www.dropbox.com/s/bea9yo8fw3b3gph/COVID19_PCCC_301121.ppt?dl=0
2. https://www.dropbox.com/s/xneylee8glctdha/COVID19_PCCC_110122.ppt?dl=0
3. https://www.dropbox.com/s/kwsihpur40kno2r/COVID19_PCCC_141221.ppt?dl=0
4. https://www.dropbox.com/s/vmc1hrzjelbmvdh/COVID19_PCCC_161121.ppt?dl=0
5. https://www.dropbox.com/s/57rbzuk5g7gy3pf/COVID19_PCCC_091121.ppt?dl=0
6. https://www.dropbox.com/s/rd7viz2lsqgmvs0/COVID19_PCCC_280921.ppt?dl=0
7. https://www.dropbox.com/s/0x8afnnd2e4g2v/COVID19_PCCC_210921.ppt?dl=0
8. https://www.dropbox.com/s/hkmvdmhqw86z0hp/COVID19_PCCC_140921.ppt?dl=0
9. https://www.dropbox.com/s/yyamlx5tjlb4580/COVID19_PCCC_070921.ppt?dl=0

10. https://www.dropbox.com/s/i4qankdst16675x/COVID19_PCCC_310821.ppt?dl=0
11. https://www.dropbox.com/s/qsfeu3kr03bgjnm/COVID19_PCCC_240824.ppt?dl=0
12. https://www.dropbox.com/s/fxovb7iqplnqs7o/COVID19_PCCC_170821.ppt?dl=0
13. https://www.dropbox.com/s/x71rhxcn5fief2y/COVID19_PCCC_100821.ppt?dl=0
14. https://www.dropbox.com/s/y4mnhuurh0dikwq/COVID19_PCCC_030821.ppt?dl=0
15. https://www.dropbox.com/s/y4h77degmhouqp8/COVID19_PCCC_270721.ppt?dl=0

Presentations at conferences/seminars

Our members have given over 400 presentations in national and international conferences/seminars in last two years..

Below is a sample of some of the conferences and workshops we have presented in:

1. keynote: gave a talk to the Public Health Association of BC Summer Institute on: "the impact of responsible local and explainable AI on communities (<https://phabc.org/phsi-2023-registration/?civiwp=CiviCRM&q=civicrm%2Fevent%2Finfo&reset=1&id=52>).
2. Attended IndabaX Cameroon 2023 conference and gave a talk on "Leveraging Responsible, Explainable, & Local AI for Population Health & Health Systems (<https://deeplearningindaba.com/2023/indabax/cameroon/>).
3. Attended DIMACS Workshop on Algorithm and Mechanism Design for Achieving the UN #SDGs and gave a talk on AI-based frameworks and algorithms for achieving SDG3 and SDG5 in the Global South (<http://dimacs.rutgers.edu/events/details?eID=2394>).
4. Invited Speaker: We gave a talk at the Next Einstein Forum Webinar series on leveraging responsible artificial intelligence methods for population health and health systems. April 18, 2023.
5. Invited Speaker: We gave a presentation to South African University leaders (during their visit to York University) on the work that we have been doing in South Africa: mobilizing AI to build equitable, resilient governance strategies & increase societal preparedness for future global pandemics and climate disasters. April 24, 2023.
6. Invited Speaker: We were invited to talk about how we can leverage AI to assist the Governor of Kajiado, Kenya (during his visit to York University) in his agenda for the Maasai people of Kenya (vulnerable community): in particular SDG 2 ("Zero hunger"); SDG 3 ("Good Health and Well-being"), SDG4 ("Quality Education"), SDG5 ("gender equality"), SDG 6("Clean Water and Sanitation"), SDG11 ("Sustainable cities and communities"). March 23, 2023.
7. Invited Speaker: We attended and gave a talk on Leveraging Responsible AI for Population Health & Health Systems in Nigeria at the Nigeria Computer Society, Artificial Intelligence & Robotics Conference: <https://lnkd.in/g4HwZGti>. March 21-23, 2023.
8. Invited Speaker: We attended the American Mathematical Society Southeastern Sectional Meeting at Georgia Institute of Technology, Atlanta Georgia and gave a talk on Mpox dynamic model: incorporating adaptive behavioural changes, different control strategies in the MSM community & under-reporting. March 18-20, 2023.
9. Invited Speaker: We gave a guest talk on Leveraging Responsible AI for Population Health & Health Systems at Queens University. March 07, 2023.
10. Invited Speaker: We gave a presentation at Michael Garron Hospital on Canadian Black Scientists and the Key to Leveraging Responsible Data Science Methods

for Population Health & Health Systems.

11. Invited Speaker: We gave a guest lecture at the Dalla Lana School of Public Health on Leveraging Responsible, Explainable, and Local Data Science Methods for Population Health & Health Systems. Feb. 07, 2023.

12. Keynote Speaker: We organized a workshop at the Fields Institute on Early Warning Systems (EWS) for Emerging and Re-emerging Diseases and gave a talk on EWS for re-emerging diseases. <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Attended in person. Jan. 23-25, 2023.

13. Invited Speaker: We attended the Joint Mathematics Meetings in Boston and gave a talk entitled: "adaptive changes in sexual behaviour in the high-risk population in response to mpox can control the outbreak: insights from an epidemic model. Attended in person. Jan. 04-07, 2023.

14. Panellist : We organized and took part in a panel discussion on "Towards an Inclusive Data Governance Policy for the use of AI in Africa" at the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. Attended in person. Dec. 10, 2022.

15. Invited panellist : We were invited to two-panel conversations at the Bill & Melinda Gates Foundation in Seattle: 1) Ethics and Efficacy of modelling and machine learning, 2) The politics of data. December 09, 2022. <https://members.dataforpolicy.org/2022-conference/seattle-programme/>

16. Invited Speaker: We gave a talk at the Canadian Mathematical Society winter meeting on "Adaptive changes in sexual behavior in the high-risk population in response monkeypox can control the outbreak: insights from an epidemic model". Attended in person. December 04, 2022.

14. Keynote Speaker: We gave a keynote presentation at the New York University Abu Dhabi Global Perspectives in Science Lecture Series. Title of my talk: Leveraging AI for Clinical Public and Global health Needs: Implications for Policies and Lessons Learned from the ACADIC project. Attended in person. Nov 28, 2022.

17. Invited Speaker: We gave a presentation at the China-Canada Symposium On Modelling, Prevention and Control of Zoonoses. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in the Global South". Attended virtually-zoom. Nov 15, 2022.

18. Keynote Speaker: We gave a presentation at the Ghanaian Mathematical Biology and Medicine Workshop. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in Africa". Attended virtually-zoom. Nov 08, 2022.

19. Invited Speaker: We gave a presentation at the University of Massachusetts Mathematical Biology Seminar series. Title of my talk: "Leveraging Artificial Intelligence for Clinical Public Health in the Global South". Attended virtually-zoom. October 31, 2022.

20. Keynote Speaker: We gave a keynote speaker at the Science Atlantic Conference 2022, that held at Mount Allison University, Sackville, NB . Attended in person. Oct. 21-15, 2022. the MfPH next generation. Title of my talk: "Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage". Attended virtually-zoom. August 17, 2022.

22. Invited Speaker: During the deputy Minister of Higher Education, Science and Innovation (South Africa), the Hon. Buti Manamela visit to York University, we presented our initiatives in South Africa: Leveraging Artificial Intelligence and Big Data for clinical public health in South Africa. September 14, 2022.

23. Invited Speaker: We gave a presentation at the MfPH next generation. Title of my talk: "Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage". Attended virtually-zoom. August 17, 2022.

24. Keynote Speaker: We were invited as a keynote speaker at the Queen's University, Workshop on Mathematical Ecology (<https://mast.queensu.ca/math-ecology/>). Attended in person. Title of talk: 'Estimation of COVID-19 ascertainment rates across Africa and drivers of transmission dynamics worldwide in the early stage. August 10-11, 2022.

25. Invited Speaker: We gave a presentation at the Applied and Industrial Mathematics Society Annual Meeting 2022 in UBC-Okanagan. Title: “Estimation of epidemiological parameters and ascertainment rate from early transmission of COVID-19 Across Africa”. Attended in person. June 15 , 2022
26. Keynote Speaker: keynote speaker at the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30 , 2022
27. Invited Speaker. We gave a presentation in the Mathematics Department, University of Alberta entitled: “comparing public sentiments toward COVID-19 vaccines across Canadian cities: analysis of comments on Reddit”. Attended virtually-zoom. February 14 , 2022
28. We Moderated a panel conversation on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. Attended virtually-zoom. Feb 03, 2022.
29. Keynote Speaker: keynote talk on the impact of social economics and environmental factors on the dynamics of COVID-19 at the Artificial Intelligence for Pandemics Centered, University of Queensland, Australia. Attended virtually-zoom. January 19 , 2022.
30. Invited Speaker. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Talk title The impact of social, economic, environmental factors and public health measures on the dynamics of COVID-19. Attended virtually-zoom. September 16, 2021.
31. Panelist. Canadian Centre for Disease Modelling 2021 China-Canada Symposium on Modelling, Prevention and Control of Infectious Diseases. Attended virtually-zoom. September 17, 2021.
32. Panelist. Artificial Intelligence Virtual Stakeholders Forums: A Rights-Respecting Artificial Intelligence Policy for Nigeria. Attended virtually-zoom. October 20, 2021.
33. Invited Speaker. Mathematics for Public Health Colloquium [http:// www. fields. utoronto. ca/ activities/ 21-22/ public-health-colloquium](http://www.fields.utoronto.ca/activities/21-22/public-health-colloquium) . Talk title: Early Warning Tools for Emerging Infectious Diseases Outbreak. Attended virtually-zoom. October 12, 2021.
34. Plenary Speaker. Ghana Science Association 2021 Conference [https:// www. ghanascience. org. gh](https://www.ghanascience.org.gh) . Theme: Mitigating COVID-19 Pandemic. Talk title: The power of Collaboration, Artificial Intelligence & Big Data in the Fight Against COVID-19 in Africa. Attended virtually-zoom. October 07, 2021.
35. Invited Speaker Black Heroes of Mathematics 2021 conference [https:// www. lms. ac. uk/ events/ black-heroes-mathematics](https://www.lms.ac.uk/events/black-heroes-mathematics) . Talk title: Harnessing Artificial Intelligence and Big Data Techniques to Monitor Manage and Forecast an Epidemic: the Case of COVID-19. Attended virtually-zoom. October 05, 2021.
36. Panelist. Black Heroes of Mathematics 2021 conference [https:// www. lms. ac. uk/ events/ black-heroes-mathematics](https://www.lms.ac.uk/events/black-heroes-mathematics). Panel conversation on increasing the number of Blacks in research and STEMM programs . Attended virtually-zoom. September 13, 2021.
37. Invited Speaker Data for policy 2021 conference: lessons for policy-data interactions after COVID-19 [https:// dataforpolicy. org](https://dataforpolicy.org) . Attended virtually-zoom. September 13, 2021.
38. Panelist. Data for policy 2021 Conference: lessons for policy-data interactions after COVID-19 [https:// dataforpolicy. org](https://dataforpolicy.org) . Attended virtually-zoom. September 14, 2021. Data for Policy is a premier global forum for interdisciplinary and cross-sector discussions around the impact and potentials of the digital revolution in the government sector. I equally gave a presentation in this conference. Attended virtually-zoom. September 14, 2021.
39. Invited Speaker. University of British Columbia Mathematical Biology Lecture series. The impact of social, economic, environmental factors and public health measures on the dynamics of COVID-19. Attended virtually-zoom. June 02, 2021.

40. Panelist. Panelist at a Symposium on Building Momentum for Transformative Disaster Risk Governance. Attended virtually-zoom. February 12, 2021.

41. Invited Speaker. Dahdaleh Institute for Global Health Research. Presentation on our IDRC project on predictive modeling and forecasting the transmission of COVID-19 in Africa using Artificial Intelligence. Attended virtually-zoom. January 27, 2021.

42. Invited Speaker. University of Alberta Mathematical Biology Lecture series. The impact of social, demographic and climatic variable on the growth rate of COVID-19 across countries. Attended virtually-zoom. November 16, 2020.

Events that we have organized

Our members have also organized in over 100 workshops, conferences and webinars in last two years Below is a sample of some of the workshops, conferences and webinars that we organized:

1. Consortium of Universities for Global Health 2023 conference: I organized a workshop on “Fairness in Machine Intelligence for Global Health” at the consortium of Universities for Global Health 2023 conference. <https://www.cugh2023.org/satellitesession13> . April 03, 2023.

2. AI for Global Challenges and Lessons learned: organized Global South AI4PEP Network bi-weekly lecture series. Theme: AI for Global Challenges and Lessons learned <https://www.yorku.ca/cifal/ai4pep/>. Feb, 20-May 29, 2023 .

3. 2023 MfPH Early Warning Systems Workshop: organized a workshop at the Fields Institute on Early Warning Systems for Emerging and Re-emerging Diseases from January 23-25: <http://www.fields.utoronto.ca/activities/22-23/early-warning-workshop>. Jan. 23-25, 2023 .

4. Data for Policy Conference 2022: organized and took part in a panel discussion on “Towards an Inclusive Data Governance Policy for the use of AI in Africa” in the Data for Policy Conference at the Evans School of Public Policy and Governance, University of Washington. link: <https://members.dataforpolicy.org/2022-conference/seattle-programme/>. December, 10, 2022 .

5. United Nation General Assembly 77 (UNGA77) Science Summit interactive panel session : During the UNGA77 we co-organize a panel session on artificial Intelligence Research in Health: Tackling Global Challenges as One (other co-organize are: I-DAIR , the United Nations University Institute in Macau (UNU Macau), Indraprastha Institute of Information Technology Delhi (IIIT-Delhi), Universidade Federal do Rio Grande do Sul (UFRGS), the Africa-Canada AI and & Data Innovation Consortium (ACADIC), the University of the Witwatersrand, and the City University of New York (CUNY). September, 22, 2022 .

6. Mini-Symposium: Big Data and AI for Public Health. I co-organized a mini symposium at the Canadian Industrial and Applied Mathematics 2022 Meeting on Big Data and AI for Public Health. June 15, 2022.

7. Collaborative workshop on big data analysis of covid-19. In partnership with the South African Council for Scientific and Industrial Research (CSIR), Africa-Canada Artificial Intelligence and Data Innovation Consortium (ACADIC) and the University of Pretoria I organized a collaborative workshop on big data analysis of covid-19. May 30-31, 2022 .

8. Conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence. In collaboration with CIFAL York, and representing ACADIC, we organize a conference on Discovering COVID-19 Inequalities and Systemic Vulnerabilities: the role of Artificial Intelligence at York University, Canada. Feb 03, 2022

9. Canadian Applied and Industrial Mathematics Meeting 2021: Organized a mini-symposium at the Canadian Applied and Industrial Mathematics 2021 Meeting on Modelling Infectious Disease. June 21, 2021.

10. Society for Mathematical Biology Meeting 2021: Organized a mini-symposium at the Society for Mathematical Biology Meeting 2021: on Modelling Infectious Disease. June 15, 2021.
11. Disaster Risk Governance Webinar: Organized a webinar series on AI for Disaster Resilience and Sustainable Development. April 30, 2021

Regional Webinar series

Each country runs a weekly webinar series where they invite researchers from around the world to come and share their research work with them. We meet bi-weekly for updates from each country and this has been going on since we started working on the project.



South Africa's new COVID-19 variant and impact: Prof. Bruce Mellado
2.4K views · 1 month ago

SABC News

Speculation is rife that South Africa is looking down the barrel of a stricter lockdown. Yesterday the country breached the 1 million ...



Discussion on COVID-19 surge in Gauteng with Prof Bruce Mellado
1.8K views · 1 month ago

SABC News

Gauteng is another province that's been dealing with a surge in the number of COVID-19 cases. Gauteng Premier, David Makhura ...



Describe any new or ongoing collaborative arrangements you have developed with other institutions or key stakeholders. This can include collaborations with other AI4COVID institutions, with multi-lateral institutions, etc. in part or in whole from advancing this project. Comment on the usefulness of these partnerships/collaborations in achieving the project’s objectives and how it can help the sustainability of activities post project completion.

1. we are having a conversation with Gender at Work (<https://genderatwork.org/>), (an international feminist knowledge organization with associates all over the Global South), to collaborate on our [Gender Action Learning](#) building on previous successes, as well as ensure the uptake of the gender responsive AI-based toolkits.
2. We are currently having a collaborative agreement with Mathematics for Public Health (MfPH), IndabaX, Next Einstein Forum, Canada, One Health Modelling Network for Emerging and reemerging infectious diseases (OMNI) and AI for Public Health (AI4PH), Canada. We meet regular to exchange ideas, experiences and modelling approaches. The peak of our collaborative work happened during omicron as we were meeting almost every other day. We are currently having conversations with the minister of public health in Ghana, Senegal, DRC, Ethiopia, as well as the Governor of Kajiado, Kenya for a potential partnership. We have also partnered

with PLAN international, Ave Marie (a civil society organization in Cameroon), Women in Alternative Action (a civil society organization based in Cameroon) to use their community health workers to complement our data. We are exploring potential collaborations with the AI4COVID team at

1. the Universidad de los Andes: to exchange ideas on harnessing data from social media to complement other data sources;
- 2) CIECTI team: to share ideas as we have been requested by policy makers in Cameroon, Nigeria and South Africa to leverage AI and design models that constantly get data from electronic health records as well as other data sources, update itself and visualize results on a dashboard. Since they have been working with electronic health record, we decided to have some meetings to learn from them..
3. African Population and Health Research Center (APHRC))- We have been meeting with the APHRC team to share experience with them on the gender vulnerabilities we are identifying in our data.

We will continue working with these teams

Annex 1. Gender terms¹

Gender: The socially constructed roles, behaviours, expressions, and identities of girls, women, boys, men, and gender-diverse persons. It is distinct from biological sex and outside of the gender binary. Gender is not a synonym for women and it is experienced differently across cultures. It is recognized that intersectionality impacts the experience of gender and inequality. Gender relations are constituted, like all other social relations, through the rules, norms, and practices by which resources are allocated, stakes and responsibilities are assigned, value is given, and power is mobilized.

Gender analysis: A way to examine the differences in women's and men's lives, including those which lead to social and economic inequity for women, and to apply this understanding to policy development and service delivery. Gender analysis concerns the underlying causes of these inequities, including intersectionality, with other factors such as age, class, or ethnicity, and it is used to achieve positive change for women. Gender analysis is a means of achieving equity, rather than equality, recognizing that different strategies may be necessary to achieve equitable outcomes for different groups.

Gender equality: Represents the goal of equal access, resources, opportunities, benefits and rights for women and men, and lesbian, gay, bisexual, transgender, transsexual, queer and two-spirit (LGBTQ2S+) persons.

Gender-transformative research: An approach to research that examines, analyzes, and builds an evidence base to inform long-term practical changes in structural power relations and norms, roles, and inequalities that define the differentiated experienced of men and women. Gender-transformative research should lead to sustained change through action such as partnerships, outreach, and interventions.

Intersectionality: A concept that shows how gender intersects with other aspects of identity, such as age, ethnicity/nationality, ability, education, class, religion, sexual orientation, geographic location, and any other relevant factors, to impact experiences, agency, access to and control of resources, power and knowledge.

Marginalized groups: Those who have been systematically or historically excluded from participation or influence in society and/or who frequently experience exclusion from exercising rights and freedom.

¹ The gender definitions are from IDRC's 2019 publication "Transforming gender relations – Insights from IDRC research" available at <https://idl-bnc-idrc.dspacedirect.org/handle/10625/57633>.



...