INSTITUTE FOR PANDEMICS

INTERDISCIPLINARY SYMPOSIUM PROGRAM

April 18, 2024
8:00 a.m. – 6:00 p.m.
Hart House, University of Toronto

UNIVERSITY OF TORONTO | Institute for Pandemics

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WELCOME MESSAGE FROM THE DIRECTOR

Welcome to the Institute for Pandemics 2024 Interdisciplinary Symposium!

The Institute for Pandemics was established amid the COVID-19 pandemic to address the complex, multifaceted challenges of global public health crises. As an Institutional Strategic Initiative of the University of Toronto, our goals are to power interdisciplinary research, equip future health leaders, and strengthen our pandemic responses, policies, and public health systems ready for upcoming challenges. Over 160 faculty members are joining this effort and teaming up to initiate interdisciplinary research projects that are public health, epidemiology and policy-focused. Our trainees are receiving cross-discipline training to broaden their skills, and knowledge mobilization programs are reaching out to a wider audience.

The COVID-19 pandemic has led to millions of deaths and worldwide catastrophe; the broader and longer-term impacts on population health, society and human capital loss are beginning to unfold. It is time for us to synthesize what we have learnt and reimagine response and preparedness for future public health emergencies.

In this symposium, we will hear from our keynote speaker (Prof. Ashish Jha) on 'data, innovation, and partnership in preparing for the next health crisis'; our Recovery theme will explore the 'relationship between pandemic response and urban recovery in Canada' (Prof. Karen Chapple and panelists); Readiness theme will share insights from mathematical models that 'reconstruct patterns of disease spread in past and future pandemics' (Prof. David Earn and panelists); and Resilience theme will discuss 'approaches to community engagement and equity initiatives to foster public trust' (Dr. Mrigank Shail and panelists). Our students and trainees will showcase their ongoing research work. I am hopeful this symposium will provide valuable opportunities for reflection, discussion, interaction, and collaboration among participants from diverse backgrounds and sectors. I look forward to witnessing the dynamic discussions and knowledge sharing that will take place at our 2024 Interdisciplinary Symposium.

NELSON LEE

Director

ABOUT THE INSTITUTE FOR PANDEMICS

OVERVIEW

IfP is a University of Toronto (U of T) Institutional Strategic Initiative (ISI), with a membership of 160+ researchers across all three U of T campuses. Last year, IfP distributed over $600k in research grants and studentship awards and held numerous events to promote the research from the Institute.

OUR VISION

To be a global leader in helping the world respond to pandemics, overcome infectious disease crises, and prepare for future threats so that everyone, regardless of background or experience, can thrive.

OUR MISSION

To power transdisciplinary research, train future health leaders in pandemic readiness, resilience, and recovery, and strengthen pandemic responses, policies, and systems in an equitable way that advance national and global health.

One of the world's first academic centres dedicated exclusively to preventing, preparing for, fighting, and recovering from pandemics.

RESEARCH THEMES

Readiness
To prevent and track evolving pandemics

Resilience
To improve public health policies and interventions

Recovery
To reduce health disparities in pandemics and to build back stronger and more fairly

Equity
Leading the research thrust on a multitude of EDI related issues in pandemics and public health crises

MEMBERSHIP

LEADERSHIP

Adalsteinn Brown
DLSPH,
Dean

Nelson Lee
IfP, Director
DLSPH, Professor

Tedd Konya
IfP,
Associate Director

Sara Allin
Theme Lead, DLSPH
Associate Professor

David Fisman
Theme Lead,
DLSPH, Professor

Geoff Anderson
Theme Lead,
DLSPH, Professor

STEERING COMMITTEE

Arij Al Chawaf
Institutional
Strategic Initiatives

Zubin Austin
Leslie Dan Faculty
of Pharmacy

Brian Baigrie
Faculty of
Arts & Science

Shauna Brail
U of T
Mississauga

Scott Gray-Owen
Temerty Faculty
of Medicine

Rosemary Hannam
Rotman School
of Management

Fahad Razak
Temerty Faculty of
Medicine

Jeff Siegel
Faculty of Applied
Science & Engineering

Simone Vigod
Temerty Faculty
of Medicine

Our Members at a Glance

Membership includes 160+ faculty and postdoctoral fellows across all three U of T campuses. Our members are based within 11 U of T divisions and we are financially supported by the following faculties:

Dalla Lana
School of Public Health

Rotman

Temerty Medicine

ARTS & SCIENCE
UNIVERSITY OF TORONTO

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

UNIVERSITY OF
TORONTO
MISSISSAUGA

UNIVERSITY OF TORONTO
LESLIE DAN FACULTY OF PHARMACY

ADVISORY COMMITTEE

COMMITTEE

Amy Coupal
CEO
The Ontario Caregiver
Association

Eileen DeVilla
Medical Officer of Health
Toronto Public Health

Randy Huffman
Chief Food Safety &
Sustainability Officer
Maple Leaf Foods

Jessica Hopkins
Chief Health Protection &
Emergency Preparedness Officer.
Public Health Ontario

Claudia Krywiak
CEO
Ontario Centre of Innovation

Jeff Latimer
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Stephanie Lockert
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Ontario Health

Roselle Martino
VP Public Policy
Toronto Region Board of Trade

Camille Orridge
Wellesley Institute
Health Quality Ontario

Brian Schwartz
Dept Family & Community Medicine
Former Vice President,
Public Health Ontario

Sabina Vohra-Miller
Co-founder, IfP
Vohra-Miller Foundation

Christoper Yip
Dean
Faculty of Applied Science &
Engineering, U of T

POSTDOCTORAL FELLOWS

POSTDOCS

Renzo Jose Carlos Calderon Anyosa
IHPME, DLSPH

Tegan Mosugu
DLSPH

Stefanie Tan
IHPME, DLSPH

John Sina Moin
Former Postdoc
DLSPH

Javad Moradpour Taleshi
Former Postdoc
Leslie Dan Faculty of
Pharmacy

Fanor Balderrama Santander
Former Postdoc
IHPME, DLSPH

Iffath Unissa Syed
Former Postdoc
IHPME, DLSPH

INTERDISCIPLINARY SYMPOSIUM AGENDA

Breakfast & Registration   **8:00 a.m. – 9:00 a.m.**

Welcome & Announcements   **9:00 a.m. – 9:15 a.m.**

Nelson Lee, Director, Institute for Pandemics

Keynote Lecture
Dean Ashish Jha
Brown University School of Public Health   **9:15 a.m. – 10:30 a.m.**

Lessons from COVID-19: Data, innovation, and partnership in preparing for the next health crisis

Coffee Break   **10:30 a.m. – 10:45 a.m.**

Session 1 – Recovery Theme
Closed by Covid-19? Exploring the Relationship between Government Pandemic Response and Downtown Recovery in Canada   **10:45 a.m. – 12:00 p.m.**

<u>Speaker</u>: Karen Chapple
<u>Chair/Moderator</u>: Shauna Brail
<u>Panelists</u>: Renzo Calderon Anyosa & Dr. Eileen de Villa

Lunch Break   **12:00 p.m. – 1:00 p.m.**

Poster Session   **1:00 p.m. – 1:45 p.m.**
Room 1034

INTERDISCIPLINARY SYMPOSIUM AGENDA

Session 2 – Readiness Theme
Learning from Models of Pandemics of the Past and the Future

1:45 p.m. – 3:00 p.m.

Speaker: David Earn
Chair/Moderator: David Fisman
Panelists: Jude Kong, Alison Simmons, & Ashleigh Tuite

Coffee Break   **3:00 p.m. – 3:15 p.m.**

Session 3 – Resilience Theme
Learning from Approaches to Community Engagement and Equity Initiatives to Foster Trust in Health Systems

3:15 p.m. – 4:30 p.m.

Speaker: Dr. Mrigank Shail
Chair: Sara Allin
Moderator: Stefanie Tan
Panelists: Ishtiaque Ahmed, Nadia Caidi, & Ameil Joseph

Poster Awards   **4:30 p.m. – 4:45 p.m.**

Closing Remarks

Cocktail Reception   **4:45 p.m. – 6:00 p.m.**

SYMPOSIUM INFORMATION

The Institute for Pandemics (IfP) is pleased to present our 2024 Interdisciplinary Symposium, on April 18th at the historic Great Hall of Hart House on the St. George campus of the University of Toronto.

This year's theme is "Reimagining Response & Preparedness for Future Public Health Emergencies." Members of the Institute, the university, government, private sector, and community members come together for presentations and discussions around IfP's themes of pandemic readiness, resilience, recovery, and equity.

For Wifi access, please follow the steps below.
1. Text (SMS) pandemics to 1-833-338-7626 to get your username and password.
2. Install the eduroam app on your device(s) by Scanning the QR code to the right. Download and open the app.
3. When prompted, enter the username and password you received in the text message.

To get to the venue, please use the map below.
The Great Hall, Hart House, 7 Hart House Cir, Toronto, ON M5S 3H3
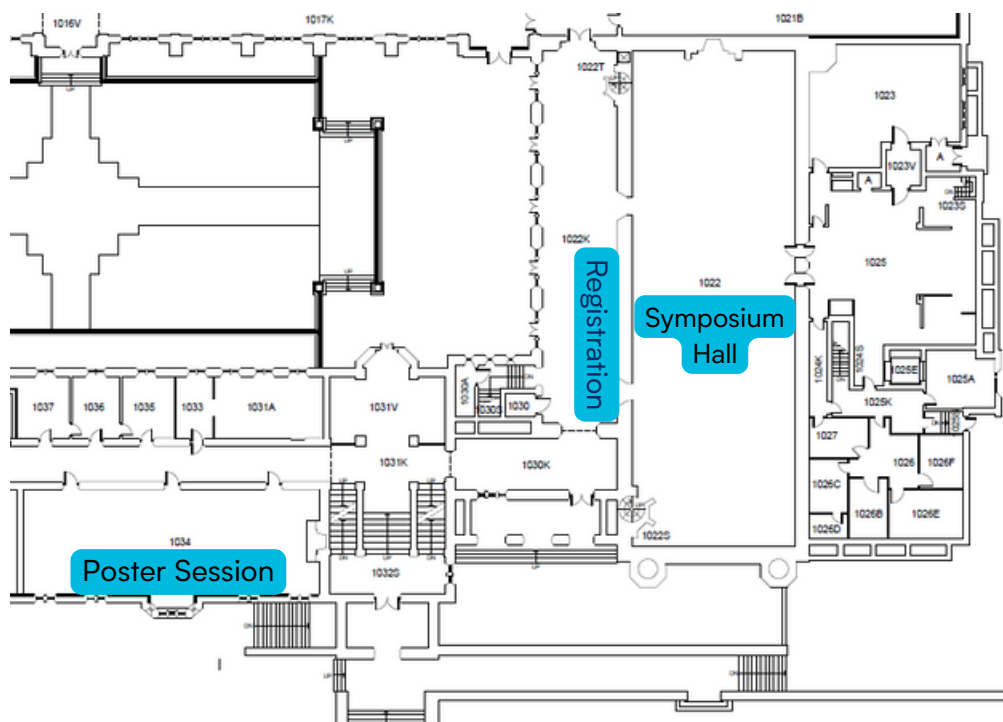
Queen's Park Crescent West

Registration

Symposium Hall

Poster Session

Entrance from Hart House Circle

KEYNOTE SPEAKER

DR. ASHISH JHA

Dean
Brown University School of Public Health

Dr. Ashish Jha is a globally renowned public health leader currently serving as the Dean of the Brown University School of Public Health.

A respected physician, Dr. Jha is acclaimed for his expertise in addressing major health issues. Appointed by President Biden as White House COVID-19 Response Coordinator in March 2022, Dr. Jha led initiatives that enhanced treatment and vaccine accessibility, improved testing, and strengthened national stockpiles. His pragmatic approach to public health has garnered bipartisan praise for translating complex scientific challenges into actionable improvements. With over 300 publications in esteemed medical journals and a leadership role in pandemic preparedness, Dr. Jha's impact extends globally. Prior to his current role, he held prominent positions at Harvard University, including K.T. Li Professor of Global Health and Director of the Harvard Global Health Institute.

Lessons from COVID-19: Data, innovation, and partnership in preparing for the next health crisis

Dr. Ashish Jha will highlight the global health challenges of pandemics and biosecurity -- and how key lessons from the COVID-19 pandemic can help public health leaders to meet and respond to these challenges. He will emphasize the shortcomings and achievements of the pandemic - how innovation reshaped the public health response, why partnerships were critical, and how we might use these lessons to be better prepared. As we enter a new era of health risks, Dr. Jha will point to key research and policy efforts essential for enhancing preparedness. These efforts will ensure that as we face new health threats, the world stands ready to respond more flexibly -- and more effectively.

SESSION SPEAKER

Closed by Covid-19?
Exploring the relationship between government pandemic response and downtown recovery in Canada

As downtowns throughout North America have struggled to recover from the pandemic, many are eager to blame government directives that mandated distancing, closures, and quarantining. Yet, research from the Downtown Recovery project has shown that the structure of the downtown economy is far more important in shaping the ability of downtowns to come back. In this talk, we examine recovery patterns across downtowns in light of long–term patterns in hybrid and remote work. Our conclusions have implications for how governments might best restrict activity in the next pandemic.

KAREN CHAPPLE

Director of the School of Cities, Professor
Department of Geography and Planning
University of Toronto

Karen Chapple, Ph.D., is Director of the School of Cities and Professor in the Department of Geography and Planning at the University of Toronto.

Chapple studies inequalities in the planning, development, and governance of cities and regions throughout the Americas. Her recent publications include "Pandemic polycentricity? Mobility and migration patterns across New York over the course of the Covid–19 pandemic" in the Cambridge Journal of Regions, Economy and Society and "Can we save the downtown? Examining Pandemic Recovery and Polycentricity Trajectories across 62 North American Cities" in Cities. In Summer 2022, Chapple launched www.downtownrecovery.com to track pandemic recovery patterns in North American downtowns. Chapple is a Professor Emerita of City and Regional Planning at the University of California, Berkeley, where she served as department chair. A recipient of multiple awards, including the 2023 Regional Studies Association's Sir Peter Hall Award for Lifetime Contribution to the Field, Chapple holds a B.A. in Urban Studies from Columbia University, an M.S.C.R.P from the Pratt Institute, and a Ph.D. from UC Berkeley.

SESSION SPEAKER

Learning from Models of Pandemics of the Past and the Future

Historical records allow us to reconstruct patterns of disease spread in the past, in some cases going back hundreds of years. The questions we can address depend on the available data, which has varied enormously over time. I will present data, going back as far as 1348, which we have acquired and studied at McMaster in the last few years. I will discuss insights obtained from mathematical modelling inspired by these data, and opportunities we have to improve our understanding of plague, influenza, COVID-19, and other diseases that have caused -- or have the potential to cause -- pandemics.

DAVID EARN

Faculty of Science Research Chair, Professor
Mathematical Epidemiology
McMaster University

David Earn is a Professor of Mathematics and the Faculty of Science Research Chair in Mathematical Epidemiology at McMaster University.

His primary research interests are in infectious disease dynamics, from the time of the Black Death to the present. He was an undergraduate in mathematics at the University of Toronto, and received his PhD in theoretical astrophysics from the University of Cambridge, where he was a Commonwealth Scholar and held an Isaac Newton Studentship. As a postdoctoral fellow in Cambridge and Princeton, he shifted focus to biological problems, especially the epidemiology of infectious diseases.

He is a recipient of a CIHR New Investigator Award, an Ontario Premier's Research Excellence Award, the Canadian Applied and Industrial Mathematics Society Research Award, and is a Fellow of the Canadian Academy of Health Sciences. He is a member of the executive committee of the M. G. DeGroote Institute for Infectious Disease Research at McMaster, and co-leads the Canadian Network for Modelling Infectious Diseases (CANMOD, https://canmod.net/).

SESSION SPEAKER

Learning from Approaches to Community Engagement and Equity Initiatives to Foster Trust in Health Systems

Community engagement and equity initiatives are integral to public health efforts, particularly during infectious disease outbreaks. Dr. Shail's talk will showcase the collaborative efforts between the World Health Organization (WHO) and LGBTQ+ communities and leaders during the MPOX and COVID-19 outbreaks, highlighting strategies to foster trust in health systems and the importance of tailored approaches to engagement and equity. During the MPOX outbreak, WHO actively collaborated with LGBTQ+ community leaders and organizations to develop culturally sensitive messaging, inclusive healthcare services, and targeted outreach initiatives. By involving LGBTQ+ leaders in decision-making processes, WHO promoted community ownership and trust, enhancing the effectiveness of outbreak response efforts. Similarly, amid the COVID-19 pandemic, WHO prioritized engagement with post-COVID [Long-COVID] condition communities to address intersecting health disparities and systemic inequities. Leveraging digital platforms, social media and virtual forums, WHO facilitated dialogue and exchange between health authorities and advocates, ensuring community engagement and equity endeavours to promote trust in health systems.

MRIGANK SHAIL, MD

Strategic Communications Consultant
Department of Communications
World Health Organization

Dr. Mrigank Shail is an accomplished medical researcher, writer, and strategic content creator with a passion for global public health and strategic communications.

Dr. Shail earned his Medical Doctorate (MD) with Honours from Xavier University School of Medicine. He has pursued Continued Medical Education courses at institutions such as Harvard University and the Yale Institute for Global Health. Dr. Shail has acquired valuable experience in a range of medical fields, including neurosurgery, addiction and mental health, strategic health communications, and medical content development. Currently, he serves as a Strategic Communications Consultant at the World Health Organization (WHO) in the Department of Communications headquartered in Geneva. Dr. Shail's research interests focus on exploring data-driven strategies to develop effective social media communication campaigns, establish an expert online presence, and promote health messages to target audiences. As a teacher, he helps students navigate credible web and social media information, identify and combat misinformation and disinformation using various trends and metrics, and create and amplify customized digital content. Dr. Shail emphasizes the importance of data analysis, visualization, and social media metrics in achieving these goals and works towards equipping his students with the necessary tools to become reliable sources of credible information for their followers. Through collaboration with WHO teams, he promotes health messages and creates positive social impact.

Syed Ishtiaque Ahmed
Department of
Computer Science

Syed Ishtiaque Ahmed is an Assistant Professor of Computer Science at the University of Toronto and the Director of the 'Third Space" research group. He is also a graduate faculty member of the School of Environment, a Faculty Fellow at the Schwartz Reisman Institute for Technology and Society, and a Senior Fellow at Massey College. Ishtiaque's research focuses on the design challenges around strengthening the 'voices' of marginalized communities worldwide. He conducted ethnography and built technologies with many underprivileged communities in Bangladesh, India, Pakistan, Iran, Iraq, Turkey, China, Canada, and the US. Ishtiaque received his Ph.D. and Master's from Cornell University in the USA and his Bachelor's from BUET in Bangladesh. He received the International Fulbright Science and Technology Fellowship, Fulbright Centennial Fellowship, and Schwartz Reisman Institute Fellowship, among others. His research has been funded by all three branches of Canadian tri-council research (NSERC, CIHR, SSHRC), NSF, NIH, Google, Microsoft, Facebook, Intel, Samsung, the World Bank, UNICEF, and UNDP, among others.

Sara Allin
IfP Resilience Theme Lead,
Institute for Health Policy,
Management & Evaluation

Professor Allin is Assistant Professor at the Institute of Health Policy, Management and Evaluation (IHPME) at the University of Toronto, and Director of Operations of the North American Observatory on Health Systems and Policies. Prof. Allin conducts research that aims to improve health system performance, and comparative studies across provinces/territories and internationally in health care and public health. She founded the North American COVID-19 Monitor to systematically document the public health, health system and economic policies introduced in response to the COVID-19 pandemic in Canada, its provinces and territories, and the United States and Mexico.

Shauna Brail
IfP Recovery Theme Co-Lead,
University of Toronto
Mississauga

Professor Brail is an Associate Professor and Director of the Institute for Management & Innovation, University of Toronto Mississauga and holds a cross-appointment at the Munk School of Global Affairs and Public Policy, University of Toronto. As an economic geographer and urban planner, her research focuses on the transformation of cities as a result of economic, social, and cultural change. Professor Brail's research encompasses studies of broad urban economic challenges associated with 21st century cities — including the impacts of COVID-19 on cities; the relationship between cities and the digital platform economy, with a particular emphasis on mobility; and shifts in urban governance, policy and planning in connection to innovation and technological change.

MODERATORS AND PANELISTS

Nadia Caidi is a Professor at the Faculty of Information, University of Toronto. Her research focuses on global migration through an information science lens, and interrogates how the multiple and overlapping local and transnational information environments of individuals and communities are negotiated, and how they come to embody new kinds of knowledge and engagement models. Recent funded research (Public Health Agency of Canada) examines the characteristics and diffusion of misinformation in selected digital spaces that newcomers use (with partner, Refugee613). Dr. Caidi was the 2011 President of the Canadian Association for Information Science (CAIS) and the 2016 President of the International Association for Information Science & Technology (ASIS&T).

Nadia Caidi
Faculty of Information

Dr. Renzo Calderon is a postdoctoral fellow at the Institute for Pandemics at the University of Toronto under the co-supervision of Drs. Geoff Anderson at the Institute of Health Policy, Management and Evaluation (IHPME), Shauna Brail at the University of Toronto Mississauga, and Simone Vigod at the Temerty Faculty of Medicine. He completed his Ph.D. in Epidemiology at McGill University and achieved an MD and MSc in Biomedical Informatics in Global Health from Cayetano Heredia University in Lima, Peru.

During his doctoral journey, Dr. Calderon centered his research on the application of quasi-experimental methodologies for policy assessment. His primary focus encompassed policies addressing gender-based violence and the ramifications of measures taken during the COVID-19 pandemic. He also participated in interdisciplinary global health programs, emphasizing social and clinical epidemiology, alongside the amalgamation of various data sources for policy evaluation purposes.

Renzo Jose Carlos Calderon Anyosa
IfP Postdoctoral Fellow

Dr. Eileen de Villa serves as Toronto's Medical Officer of Health, leading Toronto Public Health, Canada's largest local public health unit since 2017. Dr. de Villa earned her Doctor of Medicine and Master of Heath Science in Health Promotion from the University of Toronto, and a Master of Business Administration from York University's Schulich School of Business. Additionally, she is an Adjunct Professor at the Dalla Lana School of Public Health at the University of Toronto.

In her capacity as Medical Officer of Health, Dr. de Villa has been at the forefront of public health initiatives in Toronto. She provided guidance and leadership to Canada's most multi-cultural city, serving a population of 3 million people through the most significant public health crisis in the past century. This included overseeing the implementation of the largest vaccination campaign in history during the global COVID-19 pandemic. Dr. de Villa's efforts extended beyond equipping Toronto residents with the necessary tools and information to protect themselves and their communities; she played a pivotal role in the Province of Ontario's response and recovery efforts and contributing to broader regional strategies.

Eileen de Villa
Medical Officer of Health for the City of Toronto,
IfP Advisory Table Member

MODERATORS AND PANELISTS

David Fisman
IfP Readiness Theme Lead,
Dalla Lana School of Public
Health

Professor Fisman is a physician and epidemiologist who studies the epidemiology of infectious diseases, particularly pneumonia. His interests include laboratory datasets as epidemiological resources, mathematical modeling and simulation, infectious disease and environment/climate change, and decision/cost effectiveness analysis. Professor Fisman's work on COVID-19 has been focused on understanding sources of variability in severity and outcomes, and in mathematical modeling to identify control strategies and optimal uses of drugs and vaccines. He has created seminal models of COVID-19 spread in Ontario that have informed policy decisions.

Ameil Joseph
McMaster University

Ameil Joseph is an Associate Professor in the School of Social Work at McMaster University. Ameil currently holds a Professorship in Equity, Identity, and Transformation from the Faculty of Social Sciences at McMaster University and is the Academic Director of Community-Engaged Research & Relationships with the Office of Community Engagement, also at McMaster University. He draws on perspectives of critical forensic mental health, mad studies, postcolonial theory, critical race theory, and critical disability studies to analyze the historical production of ideas about difference, normalcy, sexuality, eugenics, race, ability and mental "illness" as they cohere, diverge, interdepend, and perform within policy, law and practice. Ameil has presented and advocated across Canada, in the US, Asia, and in Europe on issues related to racism, critical mental health and social justice. Ameil has over a decade of experience in the mental health field in areas of assertive community treatment, community-based early intervention, supportive housing, crisis respite, and governance settings.

Jude Kong
Dalla Lana School of
Public Health

Dr. Kong is a professor in the Dalla Lana School of Public Health and Mathematics Department (cross-appointed), University of Toronto, where he serves as the director of the Artificial Intelligence and Mathematical Modeling lab (AIMM lab). Additionally, he is the Director of the Africa-Canada Artificial Intelligence and Data Innovation Consortium and the Global South Artificial Intelligence for Pandemic and Epidemic Preparedness and Response Network. He is also the Regional Node Liaison to the steering committee of the Canadian Black Scientist Network.

He obtained his Ph.D. in Mathematics with a certificate in AI from the University of Alberta, his MSc in Engineering Mathematics from the University of Hamburg, Germany, and the University of L'Aquila, Italy. His B.Sc. in Computer Science and Mathematics was acquired at the University of Buea, Cameroon, and his B.Ed. in Mathematics was earned at University of Yaounde I, Cameroon. Dr. Kong is an expert in AI, data science, mathematical modeling, and mathematics education. His principal research program focuses on designing and deploying AI, data science, and mathematical methodologies and technologies to build equitable, resilient governance strategies and increase societal preparedness for future global pandemics and climate disasters. During the COVID-19 pandemic, Dr. Kong led a team of 52+ researchers across nine African countries, using AI to help contain and manage the virus. In 2022, he founded the AI4PEP network, overseeing 160+ researchers from 16 countries.

MODERATORS AND PANELISTS

Alison Simmons is a PhD Candidate in the Division of Epidemiology at the University of Toronto and an Infectious Disease Modeller at the Public Health Agency of Canada. She is interested in applying economic, epidemiological, and mathematical methods to inform public health interventions to prevent the transmission and consequences of communicable diseases.

Alison's doctoral research focuses on preventing COVID-19 and invasive pneumococcal disease. Her research is supported by a Researcher Mobility Award from the Emerging and Pandemics Infections Consortium and a Connaught International Scholarship for Doctoral Students. She holds a Master of Public Health from the Brown University School of Public Health and an undergraduate degree in Biology from Bates College. Prior to beginning her PhD, she led substance use surveillance at the Allegheny County Health Department in Pittsburgh, Pennsylvania.

Alison E. Simmons
PhD Candidate, Dalla Lana
School of Public Health

Stefanie Tan is a Postdoctoral Fellow affiliated with the North American Observatory for Health Systems and Policy and the Institute for Pandemics in the Institute of Health Policy, Management and Evaluation, Dalla Lana School of Public Health, University of Toronto. She specialises in health financing, outcomes-based contracts and comparative health policy. Previous to this, she was an independent research consultant based in Toronto, Canada and a Research Fellow in the Policy Innovation Research Unit at the London School of Hygiene and Tropical Medicine for a decade. Her research has focused on Social Impact Bonds, a novel variant of pay for performance funding using outcomes-based contracting, and incentives for innovation in the biopharma sector to combat antimicrobial resistance (AMR). She has also worked in the WHO's Department of Health Financing Policy and in the non-profit sector overseeing community development and health promotion projects.

Stefanie Tan
IfP Postdoctoral Fellow

Ashleigh Tuite is an infectious disease epidemiologist whose research focuses on the use of mathematical modeling and other quantitative methods to improve decision-making for emerging, re-emerging, and endemic communicable diseases. She is particularly interested in the use of mathematical models to synthesize and communicate complex information and uncertainty. She is Manager of Health Economics and Modelling at the National Advisory Committee on Immunization Secretariat at the Public Health Agency of Canada and an Assistant Professor with the Dalla Lana School of Public Health.

Ashleigh Tuite
Public Health
Agency of Canada

POSTER ABSTRACTS

Yasmin Aboelzahab, PhD Student
Supervisor: Dr. Lisa Dolovich,

Virtual Care in Community Pharmacy Services: A Scoping Review and Resulting Recommendations for Practice and Policy
Aboelzahab YH; McCracken A; McLean M; Tricco AC; Pinto AD; Dolovich L.

Background: The rapid and increased integration of virtual care has been essential to ensure the continuity of patient care during the COVID-19 pandemic. Community pharmacists have increased their use of virtual care to provide remote services. However, the use of virtual care has not been comprehensively reviewed. Purpose: To conduct a scoping review aimed at mapping the literature and exploring research gaps in the use and value of virtual care in community pharmacy services.

Methods: The proposed scoping review will be conducted in accordance with JBI methodology. A comprehensive search strategy will be employed to locate studies in Ovid MEDLINE, Ovid Embase ,CINAHL, Scopus, and gray literature sources. Two levels of screening will be conducted, and data extraction will use a pre-specified form. Community pharmacists and patients will be the target subjects. A descriptive summary, PRISMA-scoping review flow diagram, infographic, and digital digest will be used to present the findings to end-users.

Results: Findings from this review will explore: 1) how virtual care has been used in community pharmacy settings; 2) the types of virtual care platforms that have been used for the delivery of community pharmacy services and their associated barriers and facilitators; 3) strategies for integration of virtual care into community practice and associated patient outcomes (e.g., medication adherence, quality of life) that have been studied; 4) the current evidence on the utilization of virtual care to enhance patient outcomes, particularly in the context of mental health; 5) the current approaches employed to educate pharmacy students on the delivery of virtual care

Conclusion: This scoping review will identify and summarize what is reported in the literature about the provision of virtual care by community pharmacies. This will aid in informing future service design by understanding why interventions work, for whom, in what setting, and under what circumstances. Moreover, the findings from this review can significantly help enhance pandemic readiness and resilience by identifying opportunities to improve access to healthcare services and maintain continuity of care through virtual care in community pharmacy services.

Juliette Blais-Savoie, MSc Candidate
Supervisor: Samira Mubareka, Nicole Mideo, Sunnybrook Research Institute

Launching a novel 'torpedo' sampling method for avian influenza virus surveillance in wetlands
Blais-Savoie, J; McGuire Sherritt, A; Schryer, R; Hasan, T; Chien, E; Yim, W; Yip, L; Mubareka, S; Nituch, L; McBean, E; Jardine, C

Background: Avian influenza viruses (AIVs) can significantly impact free-ranging wildlife and agricultural animal health. AIVs have also caused numerous pandemics historically, and they are of continuing concern for future pandemic emergence. There is currently a gap in the environmental surveillance for AIVs in Canada. The ongoing highly pathogenic avian influenza (HPAI) H5Nx clade 2.3.4.4b virus panzootic and the reassortment of clade 2.3.4.4b H5N1 with endemic North American AIV strains elevates the importance of AIV surveillance in Canada. Current methods used for sampling AIVs include sampling live or dead animals, which is limited by time, resources, and accessibility. Our study aimed to test the efficacy of a novel environmental surveillance method for AIV in bodies of water using a novel device termed the torpedo. This device is loaded with sorbent materials allowing for water sampling on immersion and towing.

Methods: Sampling was conducted at six Ontario wetlands from 17 August to 20 September 2023. Oral and cloacal swab samples from free-ranging waterfowl were collected in parallel with wetland water samples using the torpedo. Samples were tested by qPCR with a universal influenza A matrix gene target and an H5 gene target. Samples that were matrix gene-positive and H5-negative underwent whole-genome sequencing using Opti whole-genome influenza primers for amplification and the Illumina MiniSeq platform for sequencing.

Results: Two hundred swab samples and 72 torpedo sorbent material samples placed in 28 torpedoes were collected. AIV was detected in 32 swab samples and 16 sorbent materials from 5 torpedoes. Mean ct values for all samples ranged from 27.18 to 35.96 in waterfowl samples and from 36.57 to 38.92 in torpedo samples. H5 was detected in 1 waterfowl sample with a ct of 31.72 and no torpedo samples. We observed that sites with a higher prevalence of AIV in waterfowl samples also had a larger proportion of AIV-positive torpedo samples. Whole genome viral sequences were obtained from both swab and torpedo samples, and 7 unique subtypes were detected. One site had several detections of subtype H6N2 in both waterfowl and torpedo samples. The average depth of sequencing coverage was 91.55 for torpedo samples and 544.08 for waterfowl samples.

Conclusion: We concluded that the torpedo environmental sampling method is capable of detecting AIV in water in a field setting. This novel tool could allow for more affordable and accessible passive sampling in bodies of water which, if used strategically along with direct animal sampling efforts, could greatly increase our knowledge of circulating AIVs in Canada and in other regions where this method is implemented.

Aisling Brody, HBSc candidate, Year 4. Immunology Specialist and History and Philosophy of Science Minor.
Supervisor: Brian Baigrie,

Challenges in the Measurement of Public Trust in Public Health: A Rapid Review of Post-Pandemic Literature
Brody, DA; Konyar, J; Fountain, S; Perillat, L; Baigrie, B

Background: There is a growing consensus among academics and commentators that public trust is at a low ebb across a range of public health issues, from the contribution of human activity to climate change, or the safety of vaccines, to the effectiveness and equity of public health interventions during the COVID-19 pandemic. Public trust, which is a form of social trust is cultured indirectly, usually through education and social discourse, but also through the historical legacy of trust/mistrust due to past interactions with social entities. The objective of this project is to develop a thorough understanding of the concept of public trust to help focus attention on the salient issues around trust, facilitate the validity of its measurement, and provide a roadmap for the identification of steps that are needed to rebuild trust in public health. Our first step in this undertaking is to conduct a rapid review to investigate how public trust has, in the period coming out of the pandemic, been conceptualized and measured in medical and social science literature. Studies selected for the rapid review were analyzed according to the following research question: how does the definition of ?trust? (or lack thereof) influence measurements of public trust?

Methods: Our search strategy included four databases: Google Scholar, PubMed, PsycINFO and IBSS, to represent the variety of medical and social science literature databases. Keywords were chosen to identify articles that focused on the conceptualization and measurement of trust with regards to public health measures and entities. The keyword thesaurus function was used for PsycINFO and PubMed. All relevant peer-reviewed articles, written in English and published between May 5th, 2023 (when the COVID-19 pandemic was declared over by the WHO) to November 30th, 2023, were included in the initial screening. Further screening restricted the search to empirical studies with the following two requirements: (1) a primary research question related to trust and (2) a clear definition of trust stated in the manuscript.

Results: Out of 436 articles selected after the initial screening phase, 39 met the two criteria stated above. The articles selected cover a range of different populations across all five continents. The analysis revealed four common methodological issues: (1) studies often lack a clear, comprehensive and measurable definition of public trust, (2) studies fail to differentiate among the different kinds of trust relationships that exist, (3) studies tend to use proxies to measure public trust in public health such as individuals? self-reported levels of trust, compliance to directives or adherence to directives, (4) sampling strategies tend to exclude certain segments of the public.

Conclusion: This rapid review identified several challenges around the conceptualization and measurement of public trust. The apparent uncertainty and vagueness around the concept of ?trust? in the medical and social science literature seem to complicate measurements of trust, which are already difficult to perform given the multidimensionality and malleability of the concept of trust. Moving forwards, these scholarly communities may want to dissect the concept of trust further and discuss more specific and accurate ways to measure the perceived erosion of trust in public health. This would represent an important stepping stone in identifying ways to rebuild public trust in public health.

Anne Fu, PhD Candidate
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Risk factors for COVID-19 in Canada: pollution, social-economical determinants of health, and migration
Fu, A; Shakeri, Z; Chow, CW

Background: As of March 2024, almost 5 million cases and 60,000 deaths have occurred in Canada due to COVID-19 (1). Several populational factors have been investigated related to COVID-19. Research suggests that pollution is associated with COVID-19 severity (2) and even short-term exposure was associated with more emergency department visits (3). Furthermore, Health Canada has found significant socioeconomic inequalities in COVID-19 death rates, particularly in those who reside in large cities, lower-income neighborhoods, visible minority groups, and recent immigrants to Canada (4,5). There remain gaps in our understanding of the risk factors for higher incidence and poorer prognosis of COVID-19 in Canada. Additional epidemiological knowledge would help to guide the development of future health initiatives and policies surrounding pandemic preparedness. The objective was to explore how the environment and health inequalities may influence COVID-19 incidence.

Methods: Data were obtained from the COVID-19 Canada Open Data portal, Toronto Open Data portal, McGill University, the University of Toronto, the Canadian Urban Environmental Health Research Consortium (CANUE), Statistics Canada, and Google COVID-19 Community Mobility Reports. Data visualization techniques were conducted using Tableau, RStudio, and Python.

Results: We observed a positive association between COVID-19 incidence and long-term exposure to reactive oxygen species in fine particulate matter (PM2.5) and a negative association with greenness, defined as the % of area covered in vegetation. A higher incidence of COVID-19 was observed in neighborhoods with greater unemployment, lower achieved education, or people of color residing in crowded housing. There also appears to be an overlap between immigration and pollution across Canada, with higher pollution and immigrant populations in Ontario, Quebec, British Columbia, and Alberta, indicating a potential interplay between a high population-density city infrastructure, socioeconomic disparity, and COVID-19 incidence.

Conclusion: Data visualization allowed for exploring the complex relationships between the pollution and health indicators of COVID-19. Our results suggest recent immigrants, especially those of lower income residing in major cities, may be more vulnerable than the general population to COVID-19 in Canada and may require additional resources in future pandemics.

Omid Jafarinezhad, PhD Candidate
Supervisor: Zahra Shakeri, Institute for Health Policy, Management & Evaluation

Pandemic Solutions at the Speed of Collaboration: Innovating with Federated Learning Through a Dynamic Web Platform
Jafarinezhad, O; Shakeri, Z

Background: The COVID-19 pandemic has underscored the critical importance of accurate predictive modeling in public health crises. Predictive models play a pivotal role in informing decision-making, resource allocation, and mitigation strategies. However, centralized approaches to model development encounter significant challenges, particularly concerning data privacy and access. Health institutions often possess vast amounts of sensitive patient data, making data sharing and centralized model training impractical or ethically problematic. Federated Learning (FL) has emerged as a promising approach for collaborative model training across decentralized data sources while maintaining data privacy. However, the implementation of FL often poses challenges, particularly for individual researchers or institutions, due to the resource-intensive nature of the process and the complexity of implementing privacy-preserving techniques like differential privacy and security considerations.

Methods: This project aims to develop a reusable software framework with a web user interface that reduces the implementation and deployment costs associated with distributed predictive models in the health domain. It handles intricate details related to privacy, communication networks, and operational deployment, allowing researchers to focus on domain applications, particularly on modeling parameters and features engineering. Additionally, the user interface design will prioritize seamless communication interactions among stakeholders to enhance the overall user experience.

Results: The outcomes of the project include a more efficient collaboration process for FL model development, reduced time and resources required for researchers to deploy predictive models, and broader adoption of FL technology in public health research. By prioritizing interoperability, and reusability, the framework will facilitate seamless integration with existing workflows, enabling researchers to leverage FL technology for pandemic response more effectively. As a practical demonstration, we utilized the FedAVG implementation for binary classification for heart disease prediction across four hospitals? datasets, achieving an accuracy of 80%.

Conclusion: The development of a system for collaborative FL model development represents a significant advancement in health informatics research. By enabling seamless collaboration and integration with existing systems, the project aims to accelerate the adoption of FL technology for pandemic-related research. By empowering researchers to collaborate and develop predictive models tailored to pandemic-related challenges, the project contributes to enhancing public health preparedness and response efforts. Collaboration among researchers from diverse backgrounds will be essential for addressing the complex and interconnected issues associated with pandemics, ultimately improving health outcomes and promoting equity in healthcare delivery.

David Jones, MPP candidate (Master of Public Policy)
Supervisor: Dr Sara Allin, Prof Stephan Heblich, Munk School of Global Affairs & Public Policy

A framework for nursing workforce resilience

Jones, DJE

Background: The Covid-19 pandemic has exacerbated healthcare workforce shortages, particularly for hospital nurses. This study analyses nursing shortages - both causes and effects - to identify any lessons for policymakers that can improve workforce resilience.

Methods: This study builds on a policy-facing logic model of the healthcare workforce, developed by Sonderegger et al. (2021). A systemic literature review was undertaken to consider the validity of this existing framework and to consider whether the model could (and/or should) be amended in the light of Covid-19 research. A literature search was undertaken within the PubMed database, covering existing systematic reviews, using the search term: ((nurse) OR (nursing)) AND ((shortage) OR (shortfall)) AND (hospital). The search generated 104 systematic reviews. 70 articles were excluded if they fulfilled any of the following conditions:

- Focused on healthcare services or products, rather than the workforce;
- Focused on the specification of workforce roles or teams, rather than workforce shortages;
- Focused on a single workforce policy without offering insights around workforce shortages;
- Utilised a specific low-middle income country (LMIC) geography.

Finally, the remaining 34 articles were reviewed in terms of causes, effects and mitigants of workforce shortages.

Results: The analysis is still being undertaken, so final results are not yet available. However, initial analysis indicates two likely results:

1. Sonderegger et al.'s (2021) model is overly supply-focused. In practice, healthcare system outcomes are not merely a function of workforce supply, but rather of workforce shortages. Therefore, a more comprehensive and practical healthcare framework would also incorporate workforce demand. Without this amendment, policymakers' attention may be skewed towards supply-side factors.

2. Sonderegger et al.'s unidirectional logic model can be enhanced by including a small number of important feedback loops, which have become increasingly influential since the onset of the Covid-19 pandemic. Specifically:

a) Even though higher staff supply (e.g. recruitment) can reduce workforce shortages, an increase in workforce shortages due to an external factor (e.g. Covid-19 infection) can have a negative feedback effect on supply, by increasing staff workload, burnout and reducing retention.

b) Even though higher staff supply can improve the quality and quantity of healthcare services, a deterioration of healthcare outcomes due to an external factor (e.g. Covid-19 causing higher elective waiting lists) can have a negative feedback effect on supply, principally because staff cannot deliver safe patient care and this reduces morale.

Conclusion: The study's analysis is still being undertaken, so firm conclusions are not yet available. However, based on the initial analysis above, the study has the potential to offer informative findings for policymakers. First, it can help policymakers to take a more sophisticated approach to workforce planning by focusing on workforce shortages, not solely workforce supply. Second, the potential negative feedback effects observed in the Covid-19 literature present a strong rationale for proactive workforce support (e.g. rapid mental health clinics, etc.). For example, proactive policy to improve workforce resilience may have upfront costs, but if this materially prevents (or limits) negative feedback loops, the positive impact on retention would deliver a net beneficial policy outcome.

Faraz Khoshbakhtian, PhD Candidate
Supervisor: Dionne M. Aleman, NA

Optimal design of vaccination policies: A case study for Newfoundland and Labrador
Validi, H; Ventresca, M; Aleman, D

Background: COVID-19 pandemic highlighted the critical importance of effective vaccination policies in mitigating the spread of infectious diseases. In this work, we introduce a data-driven optimization pipeline for formulating effective vaccination strategies and evaluate our framework on for Newfoundland and Labrador (NL) province, leveraging mixed integer programming (MIP) models based on the distance-based critical node detection problem (DCNDP). Our focus is on minimizing short-range connections within a contact network, which are crucial in the context of highly contagious diseases like COVID-19. The research is motivated by the urgent need for strategic vaccine allocation, especially when supplies are limited, to ensure the best possible outcomes in terms of public health and economic stability.

Methods: We introduce two novel compact MIP formulations for the 1-DCNDP and 2-DCNDP variants. We conducted a polyhedral study for the 1-DCNDP and introduced new aggregated inequalities for the 2-DCNDP to improve computational performance. Our models were applied to a simulated contact network of NL generated using the Medical Operations Research Lab?s Pandemic Outbreak Planner (morPOP), which incorporates census, workplace, school, and travel data to create realistic interaction networks. Additionally, we utilized decision trees to translate DCNDP solutions into actionable vaccine allocation policies, ensuring that the strategies are practical and easily communicated to policymakers and the public.

Results: Our results show that the DCNDP-based vaccination strategies, when combined with decision tree-based policy formulation, could effectively reduce disease transmission in NL. Our rollout outperforms the real-world baseline in terms of 1-hop and 2-hop connections as well as the basic reproduction number (R0). This highlights the potential of our approach in enhancing the effectiveness of vaccination policies for pandemic mitigation.

Conclusion: Our study demonstrates the effectiveness of DCNDP-based vaccination policies in NL. By combining optimization and decision trees, we develop practical strategies that outperform real-world approaches in controlling disease spread. This improvement highlights the potential of such methods in pandemic mitigation. Future research will explore incorporating equity in vaccine access into our framework to ensure fair and balanced distribution.

Sayyed Mohammad Pourya Momtaz Esfahani, MSc student
Supervisor: Zahra Shakeri, Institute for Health Policy, Management & Evaluation

Reimagining Hospital Preparedness: Bridging the Gap between Patient Experiences and Pandemic Preparedness with NLP and an Intelligent Hospital System
Momtaz Esfahani, SMP

Background: The COVID-19 pandemic exposed critical weaknesses in hospital preparedness for public health emergencies. While hospitals are lifelines during crises, the strain revealed the need for proactive measures to ensure their operational efficiency and resilience. Long-term recovery relies on a healthcare system's ability to adapt and improve. Here, patient experiences become crucial. Studies show positive experiences lead to better health outcomes [reference]. This research bridges the gap by leveraging NLP analysis of patient reviews. By identifying factors impacting patient satisfaction during COVID-19, like staff communication and cleanliness, the study aims to uncover vulnerabilities and inform the development of an intelligent hospital system. This system will utilize NLP for real-time feedback analysis and integrate interactive mechanisms for patient input. Additionally, a patient-centric chatbot will be developed to promote equity and provide personalized support, ultimately strengthening healthcare delivery during future crises. These findings highlight the need for innovative solutions to bridge the gap between patient experiences and optimal healthcare delivery during public health emergencies.

Methods: This research utilized a comprehensive dataset of 120,000 deidentified patient reviews from Ontario hospitals (2015-2023). Reviews were labeled and categorized into sentiments. Manual correction and NLP techniques were applied to preprocess the data. A Bio-Epidemiology-NER model extracted key entities like disorders and drugs. Analysis compared factors across COVID-19 and non-COVID periods. This research also involves developing a system for all Canadian hospitals to visualize reviews, ratings, and reasons interactively. A chatbot based on clinical LLMs will provide personalized recommendations for patients and clinicians, integrating real-time hospital information for optimized healthcare practices.

Results: The analysis of patient reviews highlighted significant shifts in sentiment distribution between the COVID-19 and non-COVID periods, with the former showing 66% positive and 29% negative reviews compared to 61% positive and 34% negative in the latter. Key entities like anxiety, pain, and infection were prominent in COVID reviews, while factors such as 'access/coordination of care,' 'physical comfort,' and 'nurse/nurse aide' consistently influenced dissatisfaction across both periods. Service Alert units faced higher negative feedback, Emergency units saw a decrease in negatives during COVID, and maternity units had more negative reviews in non-COVID years. Inpatient units showed minimal change. Additionally, a dashboard was developed for assessing Ontario hospitals' performance which aims to enhance transparency and informed decision-making within the healthcare system.

Conclusion: The analysis of patient reviews during COVID-19 and non-COVID periods emphasizes the evolving landscape of patient experiences in healthcare. Recommendations include enhanced anxiety management, improved access to care, sustained focus on physical comfort, staff training for better interactions, and tailored responses for specific units. Implementing these strategies can enhance patient satisfaction, prepare healthcare facilities for future crises, and foster a patient-centric approach to healthcare delivery. This research not only identifies crucial areas for improvement but also proposes a reimagined hospital system utilizing real-time patient feedback and personalized support through a chatbot. Implementing these combined strategies can enhance patient satisfaction, strengthen healthcare preparedness for future crises, and ultimately foster a more patient-centric healthcare delivery model.

Nivatha Moothathamby, PhD Candidate
Supervisor: Dr. Richard Volpe, OISE - Applied Psychology and Human Development

?Different Disasters, but Similar Aftermath?: ? Exploring the Impact of COVID-19 and Wildfires on Health & Well-Being?
Moothathamby, N. ; Hong, S.; & Volpe, R.

Background: We explore the need to examine the impact of COVID-19 and wildfires on individuals, specifically focusing on health and well-being among the global community. Our work is in a creative perspective approach, which incorporates the process of review articles and offer the authors? perspectives on the impact of COVID-19 and wildfires, specifically on health and well-being. Mainly, we explore to examine the impact of climate-related disasters, while understanding the development and alterations of a population?s mental and physical well-being and resiliency.

Methods: A review was conducted, through various search engines. Key terms and strings were established and used by the research team. These articles were based on COVID-19 and wildfires, specifically in relation to psycho-social and physical impacts and overall well-being.

Results: There is a large variety of circumstances, among wildfires and COVID-19, that contribute to fears and mental health challenges ? including the changes in routine, lack of socialization due to evacuations and restrictions, destruction of environments, threats of injury and death to self, family and/or friends. These challenges include anxiety, PTSD, depressive episodes, and survivor guilt. Similarly, these disasters contribute to exacerbated increases in physical health illnesses, such as asthma, hypertension, diabetes, chronic obstructive pulmonary disease, cardiopulmonary disease, and musculoskeletal symptoms.

The relationship between adaptations to the complexities of the environment throughout our lives can be seen here. Individuals show coping capacities in direct or indirect links between challenges and their environment. Wildfires and COVID-19 present constantly altering environments. To test a person?s adaptability to altering environments, four life elements are introduced in this discussion ? sociocultural, physical environment, interpersonal, and internal states. People build their resilience from adapting to the adversities faced within these elements, during wildfires and COVID-19. Each element ascribes to different values, which will be highlighted on the poster.

Conclusion: Regardless of the adversities faced in each life element, people find their community, inner voice, and resources to fight through wildfires and COVID-19. Physical resources, healthcare-based resources, shelters, food, water, clothing, and more are found and used by individuals during these intense situations. There are options of finding mental and physical resources, medical supplies, updates from media outlets, and tele-healthcare to aid with coping and working through illnesses of COVID-19, or those caused by wildfires (Emmanuel et al., 2020; Dangerfield, 2023). The COVID-19 pandemic has remodelled and rearranged the internal and external environments for children and youth. Globally, people face abrupt interruptions in their daily lives, including falling ill, losing homes and loved ones, collapsed physical and economic communities, and social isolations. However, people are learning strategies and gathering resources to help recoup from these disasters and build their resilience. While building resilience from adapting to the disasters, especially COVID-19 and wildfires, social relationships and connections during precarious stages of life also allow individuals to initiate a sense of community and cohesion. Which in turn works towards altruistic behaviours and provides a greater chance of people to practice protective climate and health practices.

Kuganya Nirmalarajah, PhD Candidate
Supervisor: Dr. Samira Mubareka and Dr. Venkata Duvvuri, Sunnybrook Health Sciences Centre and Public Health Ontario

Investigating associations between SARS-CoV-2 genomic signatures, clinical characteristics, and disease severity using supervised machine learning

Nirmalarajah K; Kotwa JD; Aftanas P; Zhong XZ; Barati S; Chien E; Crowl G; Faheem A; Farooqi L; Jamal AJ; Katz K; Khan S; Kozak R; Li AX; Maguire F; Mozafarihashjin M; Nasir JA; Shigayeva A; Yim W; Yip L; McArthur AG; McGeer AJ; Duvvuri VR; and Mubareka S

Background: Host risk factors associated with COVID-19 have been well studied. However, determinants of disease severity are multi-factorial and may include viral variants, hosts demographics and pre-existing conditions, complicating prediction outcome models for existing and future severe acute respiratory syndrome coronavirus (SARS-CoV-2) variants. Although millions of SARS-CoV-2 genomes have been shared publicly in global databases, linkages to clinical data are scarce. Combining patient demographic and clinical data with viral genomes is a powerful strategy for disease surveillance, particularly during times of crisis such as pandemics. Therefore, we aimed to establish a COVID-19 patient cohort with combined clinical-genomic data and investigate associations between SARS-CoV-2 mutational signatures and clinical phenotypes of disease.

Methods: A cohort of 2855 adult patients with laboratory confirmed SARS-CoV-2 from 11 participating healthcare institutions in the Greater Toronto Area (GTA) were recruited, from whom 1305 samples were available for whole genome sequencing. The Phylogenetic Assignment of Named Global Outbreak LINeages (PANGOLIN) tool was used to determine SARS-CoV-2 lineages assignments and Nextclade was used for mutation analyses. Python?s Scikit-learn library was used to build supervised machine learning models (ML) to identify associations between SARS-CoV-2 lineage-specific genome signatures, demographics, symptoms, pre-pre-existing comorbidities, and hospitalization. Amino acid sequences that span functionally relevant regions of the SARS-CoV-2 genome known to interact with the host immune system such as the spike protein, open reading frame (ORF) 3a and ORF8 were examined for associations with disease severity. ML model evaluation metrics accuracy, precision, recall, F1-score were assessed to select the optimal model. Feature importance was determined using the SHapley Additive exPlanations (SHAP).

Results: Complete clinical data and whole genome level information were obtained from 617 patients, of which 311 (50.4%) were hospitalized. Notably, inpatients were older with a median age of 67 years (IQR 54-81 years) compared to outpatients (median age 44 [IQR 31-56]). The best performing model based on the recall metric was 94.3% in the training set and 88.9% in the test set. Based on SHAP analyses, shortness of breath, age, and vascular disease were among the top clinical features associated with hospitalization. In models built on the amino acid sequence of the spike protein, pre-variants of concern (VOCs) variants were associated with hospitalization whereas omicron and gamma variants were associated with outpatient status.

Conclusion: Overall, clinical features had higher discriminatory power compared to genomic features. The results also reflect the importance of VOC based differences in regions of the spike protein such as the S1/S2 cleavage site and the N-terminal domain that are associated with disease severity. These findings highlight risk factors for severe COVID-19 at both clinical and genomic levels.

Adeteju Ogunbameru, PhD Candidate
Supervisor: Beate Sander, Institute for Health Policy, Management & Evaluation

Long-term equity-stratified healthcare resource use and cost associated with COVID-19 disease from the perspective of the Ontario Ministry of Health. A population-based cohort study.
Ogunbameru, A; Swayze, S; Liu, K; Mishra, S; Sander, B

Background: From Jan 2020 to March 20,2024, 1,609,170 Ontario residents were reported to be infected with SARS-CoV-2. Both COVID-19 disease and the implemented countermeasures caused an unprecedented human and economic strain on Ontario's health system. Early studies show that health system resource use and cost differ by individual-level characteristics such as health status and age. However, there is limited information on the resource use and costs attributable to COVID-19 by social factors, particularly among equity-deserving groups. We aim to provide a comprehensive population-based analysis of the healthcare resource use and cost attributable to COVID-19 disease, stratified by equity factors, from the health system payer (i.e., Ontario Ministry of Health) perspective.

Methods: We conducted an incidence-based, phase-of-care, propensity score-matched, retrospective costing study from the Ontario Ministry of Health perspective. All study data was sourced from person-level administrative data housed at ICES. Our study population were Ontario residents at risk of contracting COVID-19 disease from 2019 to 2022. Exposed individuals were residents who tested positive for SARS-CoV-2 between January 1, 2020 and December 31, 2020. The date of the first positive SARS-CoV-2 test was denoted as the index date. Unexposed individuals were residents with no positive SARS-CoV-2 test between January 1, 2020, and December 31, 2020, and who utilized the Ontario healthcare system between 2016 and 2018. We utilized a historical unexposed cohort to detect hidden biases in the attributable cost of COVID estimates due to the multiple surgery cancellations that occurred in Ontario hospitals in 2020. Study covariates included individual-level characteristics (e.g., age, sex, rurality) and area-level characteristics (e.g., neighbourhood income quintile, material deprivation quintile, the proportion of residents in the area who are immigrants, visible minors, and essential workers). Both exposed and unexposed individuals were matched 1:1 using a combination of hard (index date, sex, and age) and propensity-score matching. Study Outcomes included clinical outcomes (i.e., all-cause mortality, number of COVID-19 hospitalizations, intensive care unit admissions) and healthcare costs by phase of care in 2022 Canadian dollars. Using a combination of expert opinion and joinpoint regression analysis, care for COVID-19 disease was divided into four phases: pre-diagnosis (20 days before index), acute care (index date to 49 days after), post-acute care (day 50 to day 360 after index date) and pre-death (50 days before death date (for those who died)) phase. All statistical analyses were conducted using SAS 6.1 software.

Results: 168,489 exposed individuals met the study inclusion criteria, of which 164,366 (97.6%) were matched. Mean (SD) age was 40.62 (19.87) years, and 51% were female. Approximately 96% lived in urban areas, and 53% lived in average to high-income neighbourhoods (i.e., neighbourhood income quintiles 3 to 5). Within the 360-day follow-up period, 6.5% of individuals with COVID-19 disease were hospitalized, 1.3% were admitted to ICU, and 2.5% died (all-cause mortality). The mean (95% CI) 10-day per person costs attributable to COVID-19 disease for the pre-diagnosis, acute care, and post-acute care phases were $59.90 ($53.30, $66.40), $366.20 ($354.60, $377.90), and $38.80 ($34.80, $42.90), respectively. Hospitalization cost was the main driver of cost, accounting for 48% to 76% of mean attributable cost, depending on care phase. Costs were higher for males, individuals 70 years of age and older, and individuals living in the most marginalized neighbourhoods (i.e., neighbourhood income quintile 1 and material deprivation quintile 5). There was no directional trend of attributable costs for other equity variables, such as the percentage of adults in the area living in suitable housing, the percentage of adults in the area who are visible minorities, the percentage of adults in the area who are immigrants, and percentage of adults in the area who are essential workers.

Conclusion: Individuals with laboratory-confirmed COVID-19 disease have increased healthcare resource use from pre-diagnosis to post-acute care (i.e. 360 days post index date). Quantifying the health system cost of COVID-19 disease by population groups is important to inform resource allocation policies and pandemic preparedness planning.

Carmina Ravanera, Senior Research Associate
Supervisor: Sarah Kaplan and Beverley Essue, Institute for Health Policy, Management and Evaluation

Untangling Gender-Based Violence: Insights from Research and Practice
Essue, B; Kang, S; Kaplan, S; Lu, L; Ravanera, C

Background: Before COVID-19, violence against cis and trans women, Two-Spirit and gender-diverse people was already a crisis. Globally, the pandemic intensified this crisis through job loss, financial insecurity, and quarantining measures. The United Nations deemed this pandemic-fueled rise in violence as a ?shadow pandemic,? with marginalized communities, including low-income, Indigenous, racialized, and LGBT+ people, facing increased risks and worse outcomes from gender-based violence (GBV). This project addresses the IfP theme of pandemic recovery through the development of research collaborations themed on GBV and pandemic recovery to define and address the effects of this ?shadow pandemic.? The project aims to highlight the myriad impacts of gender-based violence (GBV) on communities facing marginalization, identify policy interventions to address GBV, including in future pandemics, and motivate an interdisciplinary research agenda for the future.

Methods: For this project, we convened researchers, community workers, and policymakers in a workshop to share their GBV research and insights across sectors, facilitate connections, and develop a research agenda; translated insights from the workshop to policymakers and the public; and are now in the process of forming the basis for new multi-disciplinary projects on GBV and pandemic recovery.

Results: The poster shares key and interconnected insights from the workshop:
- All types of GBV (e.g., physical, sexual, emotional, economic, and legal abuses; digital control) have persistent and damaging consequences (e.g., physical health, mental health, jobs, wages, mobility, ability to care for others, and more)
- The traumas caused by GBV accumulate quickly (e.g., brain trauma ? mental health issues ? inability to work ? economic stress ? mental stress) and spill over to affect children, families, communities, and economies
- GBV-related stress is amplified by precarious immigration status, poverty, and disability
- Gatekeeper biases?by police, judges, primary care and emergency doctors ?reduce survivors? ability to access help
- There are multiple ways of learning about GBV (e.g., personal stories, Indigenous knowledge, community-based research, and scholarly studies)
- We need better data to understand GBV, especially among Black, Indigenous, immigrant, non-binary, and trans people
- Funding to fight GBV must extend beyond services?more funding is needed for advocacy, research, and training
- Preventing GBV requires disruption of social, cultural, political, and economic norms and expectations

Conclusion: Our outcomes for the project were to lay the groundwork for a research network themed on GBV and pandemic recovery at University of Toronto (including community organizations), and to create educational resources for the public and researchers to understand more about GBV. The nuanced research- and community-informed insights from the workshop are now forming the basis for future multi-disciplinary work in this area to to better understand policy interventions to help mitigate GBV now and in the future, including in future pandemics.

Priyonto Saha, MSc Candidate
Supervisor: Dr. Zahra Shakeri, Dalla Lana School of Public Health

Characterizing Long COVID Causality through Collaborative Machine Learning for Fairness and Diversity
Saha, P; Shakeri, Z;

Background: A significant proportion of COVID-19 patients worldwide have reported a wide range of lingering effects which negatively impact their everyday living, referred to as the post-acute sequelae of SARS-CoV-2 (PASC) or more commonly as ?long COVID?. With over 200 different potential symptoms identified, the diverse and inconsistent nature of these symptoms presents a major challenge in pinning down an explicit definition of long COVID, especially at an international scale. This project demonstrates the need to include health data from diverse populations in addressing this global health crisis. Utilizing simulations based on real-world longitudinal electronic medical records (EMRs), we propose an innovative collaborative machine learning (ML) approach to characterize causal factors of long COVID with the aim of ensuring fairness and preserving privacy within an international health data network.

Methods: We conduct a comprehensive simulation study to investigate the efficacy of existing ML methods in estimating propensity scores using health data generated with various forms of multi-level clustering (i.e. multiple records of patients nested within different health systems). Our analysis encompasses a wide range of data complexities, including variations in sample sizes, within-cluster correlations, and sources of unmeasured confounding. These methods are evaluated in a collaborative learning framework, where no raw data is shared between clusters, to assess privacy, consistency, equity, and predictive performance. Additionally, working together with the Clinical Augmented Intelligence Group (CLAI) at Harvard Medical School, we assess how our models characterize causal relationships between COVID-19 and potential PASC symptoms within a real-world federated multi-site environment.

Results: Our findings reveal that current ML methodologies are inadequate for characterizing long COVID in diverse, heterogeneous datasets representative of real-world EMRs worldwide. A clear trade-off between privacy and fairness is apparent within the collaborative learning framework, demonstrating a need to carefully consider the nature of sensitive subclusters when choosing causal estimands and propensity score methods. With the proper adjustments, the differential privacy mechanisms inherent to collaborative learning presents opportunities to leverage larger, more diverse datasets and explore the generalizability of models which were previously limited to local populations. Future research in partnership with the CLAI Group will focus on designing collaborative learning models with precise tuning parameters to manage these trade-offs, allowing us to effectively characterize the key causal factors of PASC.

Conclusion: Long COVID is a global health emergency, yet current approaches lack a global perspective. Our simulation study demonstrates the need of diverse health data in long COVID research, highlighting the importance of inclusivity and fairness especially when considering sensitive subgroups. We propose an innovative privacy-preserving ML framework which facilitates collaborative model building in the research community, thereby leveraging diverse datasets previously unavailable. This project presents a great step forwards towards characterizing the causes of long COVID around the world, which is our overarching objective of our future research in collaboration with the CLAI Group.

Peter Sheffield, PhD Student
Supervisor: Dr. Rachelle Ashcroft

A Qualitative Examination of Barriers and Facilitators to Primary Health Care?s Involvement in Vaccination Efforts for COVID-19: Guidance for Future Pandemics
Sheffield, P; Ashcroft, R

Background: Interdisciplinary Primary Health Care (PHC) teams have been vital to successful historical immunization efforts. However, during the COVID-19 pandemic, vaccination distribution in Ontario targeted long-term care settings, and mass and mobile clinics, before explicitly involving PHC. Examining the barriers and facilitators for integrating COVID-19 vaccination into PHC settings in Ontario, during recovery from the acute phase of the pandemic, can inform how PHC can best contribute to future mass vaccination distributions and pandemic resilience.

Methods: A descriptive qualitative study design was used. Focus groups (n=8) of Ontarian PHC providers, staff, and administrators (n=39) were held (02/22-04/2022), including participants from all 6 Ontario health regions, and from a diversity of leadership, administrative, and clinical roles. Audio-recorded transcriptions were analyzed using thematic analysis.

Results: Facilitators of PHC?s involvement in COVID-19 vaccination included: i) deep patient knowledge (long-term and trusting relationships, ease at reaching priority populations, delivery of tailored patient-centred education), ii) team capacities (being vaccination experts, waste-mitigating specialists, and highly adaptable), and iii) intersectoral partnerships and collaborations (between primary care leadership, public health, hospitals, and municipalities). Barriers included: i) operational challenges (procurement, financial costs/human resources, inadequate booking system, inefficient electronic vaccination tracking) and ii) inadequate involvement in system-level planning/ recognition of PHC?s contributions.

Conclusion: PHC was an instrumental contributor to COVID-19 vaccination in Ontario. Most focus group participants viewed it as an optimal location for vaccination distribution in future pandemics. The inclusion of PHC stakeholders in system-level planning, decision-making, communications, and design of vaccination documentation/tracking, may expedite Ontario's recovery from future pandemics.

Rachel Tyli, PhD Candidate - Laboratory Medicine & Pathobiology
Supervisor: James Scott, Ontario Health

Validation of Respirator Fit For Ontario Paramedics
Tyli R; Bozek P; McGeer A; Scott JA; Kirkham, TL

Background: The COVID-19 pandemic demonstrated how the lack of reliable personal protective equipment could lead to disruption of critical healthcare services. Paramedics play a crucial role as the public?s first point of contact and rely on respirators as protection against infectious bioaeroeols. Healthcare workers, particularly paramedics, are amongst the most at-risk to infectious agents. Until changes to respirator fit technology and public policy is made, occupational diseases including new COVID-19 variants and emerging bioaerosols will remain an occupational risk for paramedics and allied health care workers. The study?s findings will provide insights on respiratory fit, inform future public policy at multiple levels, and support improvement of respiratory protection.   Most studies on respirator efficacy are epidemiological and involve counting infected cases to make causal inferences. However, this study uses an experimental approach to understand causes of poor respirator fit and identify problems so that respirator design and fit will improve against emerging infectious bioaerosols. Furthermore, this will be the first Canadian study of facial features related to respirator fit among non-military workers which holds significance because current respirator design is largely based on the facial features of Caucasian males, and therefore may not be suitable for Ontario?s diverse working population.

Methods: I am conducting an experimental study of 200 paramedics to investigate respirator fit during simulated work tasks (e.g., cardiopulmonary resuscitation-CPR, airway management and patient lifting, etc.), and for respirator fit factors. Investigation into fit factors will include facial and physiological measurements, simulated work tasks, with data partitioned based on sex and ethnicity. Additionally, I will develop a novel approach to predict respirator fit using facial measurements extracted from a 3D facial image.

Results: Finding that tasks or other variables lead to respirators failing on respirators that previously passed standard fit tests would support changes in respirator use among paramedics and/or changes to fit testing procedures. Such changes may reduce occupational respiratory disease in paramedics and will help inform respirator fit testing for paramedics and allied healthcare workers in preparation for future pandemics. The goal in developing 3D image-based fit tests is ultimately to utilize smartphone technologies to produce 3D facial images and to make fit test software readily available, so that all workers with smartphone access can be reliably fitted for respirators.
Thus far 77 paramedics have been sampled as participants and preliminary statistics include the following:
- 58% proportion of participants failed the N95 simulated work fit test.
- 51% of participants had fit factors decrease during normal breathing following the paramedic exercises- indicating that the exercise
- 35% reported filing a bioaerosol incident report to their employer
- 77% reported feeling the seal break when working in the field.

Conclusion: As the study is still ongoing, preliminary results will be presented at the symposium. General conclusions that can be drawn from the current data include the following:
For N95 respirators, there is a large range in fit factors when broken down by exercises
It is expected that lower fit factors occur during simulated tasks and thus far, the data supports this conclusion.

Mete Yuksel, PhD student, Ecology & Evolutionary Biology
Supervisor: Matthew Osmond, Nicole Mideo,

On the role of recombination in pathogen spillover and emergence
Yuksel, M; Osmond, M; Mideo, N

Background: Many pandemics are thought to have been enabled by pathogen recombination. Recombination occurs during co-infection of the same host to produce pathogen strains with new combinations of genes and proteins. From SARS-CoV-2 to the 2009 H1N1, recombination has played an important role in the spillover of pathogens from animal reservoirs (such as bats, birds, rodents, and swine) and their emergence (i.e., sustained transmission) in humans. To identify where future pandemics may come from, an important step is to determine in what reservoir taxa pathogens are recombining ? and how this recombination, together with ecological traits of the host, may influence emergence risk.

Methods: We develop mathematical models and use approximations from population genetics to study how traits of a host (e.g., mean lifetime) influence the rate at which pathogen genetic material is recombined, and the consequences of this recombination on the pathogen?s emergence in humans.

Results: We find support for the idea that pathogens of short lived, acutely infected hosts (e.g., rodents) should recombine frequently. However, even when recombination is extensive, we find that the risk of emergence is greatest when hosts lie on the other end of the life history continuum (e.g., bats). The reason for this is two-fold. (1) Emergence-favoring mutations are found at highest frequency when hosts are long-lived and chronically infected. (2) Although recombination alters associations between mutations, its effects on the risk of emergence is small relative to the other forces at play.

Conclusion: Using mathematical models, we determine how ecological traits of a host influence the pandemic potential of its pathogens. Our findings suggest that pathogens of short-lived and acutely infected hosts should frequently recombine, but that pathogens of hosts at the other life history extreme (long-lived, chronically infected) are most likely to trigger future epidemics and pandemics.

SPACE FOR NOTES