

# Postdoctoral Fellow, OMNI-RÉUNIS Research Projects

8 positions

## POSITION SUMMARY

OMNI-RÉUNIS is seeking to fill several post-doctoral fellowship positions across Canada to build capacity in modelling of infectious diseases with a one-health lens. Successful candidates will work at the interface of mathematics/statistics, epidemiology, and public health to design and analyze mathematical/statistical models through an infection spectrum from early detection to mitigation. They will work with interdisciplinary committees of scientists and public health experts to produce simulation data and inform public health policy. Postdoctoral fellows will communicate their results through high-impact publications, conference presentations, and knowledge transfer events such as public seminars and other outreach activities.

## ABOUT OMNI-RÉUNIS

The One Health Modelling Network for Emerging Infections (OMNI)/Réseau une seule santé sur la modélisation des infections (RÉUNIS), OMNI-RÉUNIS for short, is a newly established network born out of the COVID-19 pandemic. The network is led by three Co-Directors, Dr. Huaiping Zhu, York University, Dr. Hélène Carabin, Université de Montréal and Dr. Mark Lewis, University of Alberta, experts in research, mathematical modelling and biology, and veterinary science. The Canadian Centre for Disease Modelling at York University is proud to host OMNI-RÉUNIS.

Our mission is to build a modelling network that will enhance Canada's early detection, warning, and response to emerging infectious diseases by systematically incorporating a multi-species, multi-system One Health approach into our thinking, modelling research and training capacity while also recognizing the unique impact emerging infectious diseases has on Indigenous peoples and their communities.

OMNI-RÉUNIS's vision is to ensure that our enhanced modelling capacity and interdisciplinary research collaborations fostered by our network will lead to rigorous science-informed policy decision-making across global and national academic and public spaces during and after the COVID-19 pandemic. We will achieve this through One Health-enhanced infectious disease modelling expertise, capacity building of highly qualified personnel (HQP), and effective Knowledge Transfer (KT) strategies.

Funded by the Natural Sciences and Engineering Research Council of Canada (NSERC) and the Public Health Agency of Canada (PHAC), OMNI-RÉUNIS is part of the broader Emerging Infectious Diseases Modelling (EIDM) initiative. Our network plays a unique role in the EIDM consortium as the lead in systematically incorporating One Health in our endeavours by using multidisciplinary knowledge about the connections between environmental, animal, and human Health to refine the disease modelling used to identify pathogens early.

Our research projects focus on five themes: Data Management, Risk for Emergence and Spillovers, Early Warning Systems of Emerging Infectious Diseases, Intervention and Control, and Indigenous Peoples Health and Wellbeing.

Our English and French acronyms of the network, OMNI and RÉUNIS, symbolize universality and the bringing together of people and ideas. This is precisely what we have done, having amassed a robust network of interdisciplinary experts committed to a One Health approach to stopping emerging infectious diseases (EIDs) at all levels.

OMNI-RÉUNIS is geographically broad with 100+ network members and Co-Applicants from 10 provinces from coast to coast from 23 academic institutions and collaborators from 28+ national and international organizations. Their expertise ranges from public health, infectious diseases, epidemiology, human health, animal health and wildlife, and indigenous and climate-related health outcomes.

## FUNDED RESEARCH PROJECTS

\*For project details, please visit our website [www.omni-reunis.ca](http://www.omni-reunis.ca)

Research Themes	Project Titles and summary	Location	Open positions
Theme 1: Data Management	<p><b>PDF Posting #1:</b></p> <p><b><i>‘Systematic review and repository of available models’</i></b>            Conduct a systematic review of modelling approaches and parameter values in published and grey literature. Review mathematical and statistical models applicable to the monitoring of IDs (e.g., human/animal/environmental pathogen surveillance, human behavioral, animal management systems, and syndromic surveillance). Also review prevention/control-focused mathematical and statistical models applied to evaluating interventions for preventing circulation of ID in animals, humans and the environment (pre-pandemic or during response). Support research theme objectives by reviewing transmission-based mathematical and statistical models applicable to transmission of IDs among animals, humans and the environment.</p> <p><b>The work will be co-supervised by:</b> J. Arino (University of Manitoba) and B. Nasri and H. Carabin (Université de Montréal)</p> <p><b>Start date:</b> immediately  <b>Term:</b> One year (renewable in 2022 contingent on satisfactory progress)  <b>Contract Type:</b> Full-time</p>	University of Manitoba	1
	<p><b>PDF Posting #2:</b></p> <p><b><i>‘Credibility of various sources of data for use in models’</i></b>            The development of reliable models requires eliciting, calibrating, and adjusting for bias in event probabilities that could impact decisions for early warning systems (EWS). This shall be addressed via probabilistic models of uncertainty, specifically, Bayesian networks with probabilistic inference mechanisms. Data credibility can be included in these models and assessed by calculating risk and biases using various measures of uncertainty.</p> <p><b>The work will be co-supervised by:</b> B. Nasri and H. Carabin (Université de Montréal), and J. Arino (University of Manitoba)</p> <p><b>Start date:</b> immediately  <b>Term:</b> One year (renewable in 2022 contingent on satisfactory progress)  <b>Contract Type:</b> Full-time</p>	Université de Montréal	1
Theme 2: Risk for	<p><b>PDF Posting #3</b> (University of Prince Edward Island):  <b>PDF Posting #4</b> (University of Guelph):</p>	University of Prince	1



Emergence & Spillover	<p><b>‘Interventions / Antimicrobial Resistance (AMR)’</b></p> <p>The development and use of participatory modelling to engage traditional and non-traditional stakeholders will contribute to the generation of new knowledge to identify drivers of emergence and spillover and characterize contexts in which interventions may be more or less successful. Building on existing work in AMR, we will use established participatory and fuzzy modelling approaches to characterize the complex pathways of emergence to complement more traditional modelling approaches.</p> <p><b>The work will be co-supervised by:</b> J. Sanchez (University of Prince Edward Island) and J. Parmley (University of Guelph)</p> <p><b>Start date:</b> February 2022</p> <p><b>Term:</b> 7 months (February-August 2022. Renewable for one year in 2022 contingent on satisfactory progress)</p> <p><b>Contract Type:</b> Full-time</p>	Edward Island	
		University of Guelph	1
Theme 3: Early Warning Systems of Infectious Diseases	<p><b>PDF Posting #5:</b></p> <p><b>‘Determining a characteristic structure within multiple early warning signals via machine learning and statistical approaches’</b></p> <p>We will use statistical analysis and machine learning to determine a characteristic structure within multiple early warning signals driven by a disease outbreak. More specifically, we will develop machine-learning models to detect the structural signatures in the coordinated surveillance data of EWS1 and to accurately identify the presence of an outbreak. We will then use statistical analyses and machine learning techniques to detect early warnings from objective EWS2. Bayesian networks will be applied to identify key features and reveal the statistical dependencies between the features.</p> <p><b>The work will be co-supervised by:</b> M. Lewis and H. Wang (University of Alberta)</p> <p><b>Start date:</b> immediately</p> <p><b>Term:</b> One year (renewable in 2022 contingent on satisfactory progress)</p> <p><b>Contract Type:</b> Full-time</p>	University of Alberta	1
	<p><b>PDF Posting #6:</b></p> <p><b>‘Network Modeling Approach for Predicting the International and Domestic Spread of Emerging Infectious Disease’</b></p> <p>We aim to develop methods that a) evaluate the risk of case importation into major Canadian cities through international travel; b) detect and give early warnings to domestic spread for cities with imported cases; and c) evaluate the risk of case spread from these to other regions in Canada through domestic travel.</p> <p><b>The work will be supervised by:</b> J. Ma (University of Victoria)</p> <p><b>Start date:</b> immediately</p> <p><b>Term:</b> One year (renewable in 2022 contingent on satisfactory progress)</p> <p><b>Contract Type:</b> Full-time</p>	University of Victoria	1



Theme 4: Intervention & Control	<p><b>PDF Posting #7:</b></p> <p><b><i>‘Mathematical modelling of human response behaviour, opinion dynamics, and social influence during pandemics’</i></b></p> <p>COVID-19 showed that understanding human response to intervention is essential in mitigating disease spread and forming policy. We are particularly interested in understanding how opinion influence affects vaccine and NPI hesitancy. Applicants should have some familiarity with mathematical modelling, particularly using differential equations and other dynamical systems. They should be comfortable simulating, analyzing, and interpreting models and their results. The successful applicant will regularly present their work to a group of researchers interested in mitigation of infectious diseases at various stages of progression.</p> <p><b>The work will be co-supervised by:</b> I. Moyles (York University) and R. Tyson (University of British Columbia)</p> <p><b>Start date:</b> January 2022</p> <p><b>Term:</b> One year (renewable in 2023 contingent on satisfactory progress)</p> <p><b>Contract Type:</b> Full-time</p>	York University	1
	<p><b>PDF Posting #8:</b></p> <p><b><i>‘Vaccination and antimicrobials, from the individual to the population: Real-time modelling and data analysis to project therapeutic intervention’</i></b></p> <p>Vaccination and antimicrobials, from the individual to the population: Real-time modelling and data analysis to project therapeutic intervention”. Vaccination is a critical piece of the pharmaceutical arsenal in the fight against (re-)emerging infectious diseases. The COVID-19 pandemic has shown that deploying a treatment and vaccination campaign in the middle of a crisis poses specific complications, particularly when the efficacy and protection of different interventions against the pathogen’s evolutionary landscape may not fully understood. Rapid and accurate forecasting of drug and vaccine dosing needs are paramount to successful public health planning. Here, we will develop within-host mathematical models of pathogen evolution and pharmaceutical interventions to support real-time, population-level public health decision-making.</p> <p><b>The work will be co-supervised by:</b> J. Arino, K.-L. Liao, S. Portet (University of Manitoba) and M. Craig (Université de Montréal)</p> <p><b>Start date:</b> January 2022</p> <p><b>Term:</b> one year and is renewable for one year, contingent on satisfactory progress</p> <p><b>Contract Type:</b> Full-time</p> <p><b>Additional application requirements:</b></p> <ul style="list-style-type: none"> <li>• CV including date of the thesis defense, and summary of the Ph.D. thesis, previous and current academic positions</li> <li>• A complete list of publications (with highlighting up to three most significant papers and explaining your individual contribution to each of them with 3-4 sentences)</li> </ul>	University of Manitoba	1

#### QUALIFICATIONS & SKILLS

- PhD in applied mathematics, statistics, computer science, data science or a related field (essential)

- Demonstrated mathematical modelling, statistics, or data analysis capacities using data-driven quantitative analyses, differential equations, stochastic modelling, and/or mixed-effects modelling (essential)
- Experience in epidemiology or One Health (desired)
- Good oral and written communication skills

#### **TO APPLY**

To ensure full consideration, please submit application materials at your earliest opportunity. Review of the applications will start immediately and will continue until the position is filled. You are asked to apply and submit the pdf files to <https://www.mathjobs.org/jobs/list/19028> to apply:

1. Current CV
2. A statement that describes how your research interests are relevant to the OMNI-RÉUNIS network (clearly state which PDF posting(s) you are applying to)
3. Three references letters

If you have any questions, please contact Natasha Ketter, Program Manager of OMNI-RÉUNIS at [nketter@yorku.ca](mailto:nketter@yorku.ca).

*OMNI-RÉUNIS is hosted by York University and is committed to the university's Equity, Diversity, and Inclusion Action Plan. OMNI-RÉUNIS welcomes applications from all qualified individuals, including individuals within the University's employment equity categories of women, persons with disabilities, members of visible minorities and aboriginal persons, individuals of diverse gender and sexual orientation and all groups protected by the Human Rights Code. OMNI-RÉUNIS is committed to employment equity and diversity and a positive and supportive environment. OMNI-RÉUNIS offers accommodation for applicants with disabilities in its recruitment processes. If you are contacted by OMNI-RÉUNIS regarding a job opportunity or testing, please advise if you require accommodation.*