Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

PROTECTED WHEN COMPLETED

Appl. #

Application Details

Funding Opportunity:

Operating Grant: Canadian 2019 Novel Coronavirus (COVID-19) Rapid Research Funding Opportunity (2020-02-18)

Applicant:

Surname	Given Names	Participant Type
EARN	David	

Institution	Faculty	Department
McMaster University		

Telephone	Fax	E-mail
905-525-9140 (27245)		earn@math.mcmaster.ca

Title:

Routes of communication: understanding the information flows that shape public and official reaction to COVID-19

Primary location where research to be conducted: McMaster University

Faculty:

Department:

Institution which will administer project funds (Institution Paid):

McMaster University

Budget:

Total Requested Amount: $244000

Certification Requirements

☐ Human subjects ☐ Human stem cells ☐ Animals ☐ Biohazards
☐ Environmental Impact ☐ Containment Level

☐ Clinical Trial

☐ Contains a randomized trial

☐ In order to carry out the proposed research in this application, an exemption from Health Canada under Section 56 of the Controlled Drugs and Substances Act is required. I agree to obtain an exemption from Health Canada to use the controlled substance for research purposes, as needed.

Other Project Information

For statistical purposes, does this application propose research involving Indigenous peoples?	☐ Yes ☑ No
Is sex as a biological variable taken into account in the research design, methods, analysis and interpretation, and/or dissemination of findings?	☑ Yes ☐ No
Is gender as a socio-cultural factor taken into account in the research design, methods, analysis and interpretation, and/or dissemination of findings?	☑ Yes ☐ No

Please describe how sex and/or gender considerations will be integrated into your research proposal or explain why sex and/or gender are not applicable to your research proposal:

Gender, sex and ethnicity will be coded in our analysis. The results provides information on how they are represented in media. We will apply the result for a better understanding of social and cultural differences (if found) and to reduce negativity.

Other Applicants

Surname	Given Names
Janjua	Naveed
Role	**Participant Type**
Knowledge User	
Institution	**Department** / **Faculty**
British Columbia Centre for Disease Control	

Surname	Given Names
Michel	Pascal
Role	**Participant Type**
Knowledge User	
Institution	**Department** / **Faculty**
Public Health / Government of Canada	

Surname	Given Names
Dushoff	Jonathan
Role	**Participant Type**
Principal Applicant	
Institution	**Department** / **Faculty**
McMaster University	Biology / Faculty of Science

Surname	Given Names
Bolker	Ben
Role	**Participant Type**
Co-Applicant	
Institution	**Department** / **Faculty**
McMaster University	

Surname	Given Names
Carenini	Giuseppe
Role	**Participant Type**
Co-Applicant	
Institution	**Department** / **Faculty**
University of British Columbia	

Surname	Given Names
Li	Michael
Role	**Participant Type**
Co-Applicant	
Institution	**Department** / **Faculty**
McMaster University	

Other Applicants

Surname Loeb		**Given Names** Mark
Role Co-Applicant		**Participant Type**
Institution McMaster University	**Department**	**Faculty**

Surname shi		**Given Names** chyun
Role Co-Applicant		**Participant Type**
Institution McMaster University	**Department**	**Faculty**

Surname Yeh		**Given Names** Jung Hui
Role Co-Applicant		**Participant Type**
Institution Shin Hsin University, Taiwan	**Department**	**Faculty**

Surname Chng		**Given Names** Nai Rui
Role Collaborator		**Participant Type**
Institution University of Glasgow	**Department**	**Faculty**

Surname Jiang		**Given Names** Xingpeng
Role Collaborator		**Participant Type**
Institution 086-27-8744 6102	**Department**	**Faculty** Central China Normal University

Descriptors *

Coronavirus, dynamical modeling, statistical modeling, textual analysis, social media, data synthesis

Areas of Research *

Primary
SOCIETAL & CULTURAL DIMENSIONS OF HEALTH

Secondary
HEALTH RESEARCH

Classification Codes *

Primary
HEALTH PROMOTION

Secondary
HEALTH POLICY

Themes *

1. Not applicable/Specified
2. Social/Cultural/Environmental/Population Health

Suggested Institutes *

1. Population and Public Health
2. Health Services and Policy Research

Operating Grant: Canadian 2019 Novel Coronavirus (COVID-19) Rapid Research Funding Opportunity/Subv. de fonctionnement: PF canadienne pour une intervention de recherche rapide contre la maladie à coronavirus 2019 (COVID-19) Application/Demande 2020-02-18

Summary of Research Proposal/Résumé de la proposition de recherche

The proposed research will investigate how information flows between scientists, public-health workers and the general public via various routes, particularly mass media and social media. We will analyze these flows by combining textual; AI-assisted data mining; time-series analysis; and dynamical modeling.

We are an inter-disciplinary team and will work to both strengthen understanding of community impacts and provide evidence to inform public-health responses. Our research is directly responsive to many of the research area bullet points, and particularly to the first three “Social and policy countermeasures” points.

The project will be organized around three Research Questions:

- How does information (and misinformation) travel between scientists, public-health workers, mass media and social media?
- How does communication affect public behaviour and the course of the outbreak?
- How can scientists and policy-makers evaluate and improve the effectiveness of their communication?

Methods

We will systematically collect data from scientific publications; public-health websites; and traditional and social media. We will combine social-science, data-mining and machine-learning techniques to identify themes and frames, and to track the flows of good information and misinformation.

We will then use techniques from statistical analysis, dynamical modeling and social science to investigate how information affects public behaviour, and study what factors allow communication to be effective.

Finally, we will work with our public-health partners and others in public health to track misinformation and build effective messages in real time.

We will also produce data streams, and analysis and tracking tools, which we will share publicly.

Applicants

Our scientific team is accomplished and multidisciplinary. The two principal applicants have a long history of influential research on disease outbreaks. Our team includes computer scientists, social scientists, quantitative scientists a leading epidemiologist (Dr. Loeb) and a leading statistician (Dr. Bolker). We are well connected to public health through the PAs and particularly through our BCCDC co-applicants. We also have support from PHAC and KFL&A Public Health. Finally, we are well positioned to understand the early outbreak, since our team is well connected to the emergence region, with members based in China and Taiwan, and with connections to Singapore.

Response

Our team is ready to respond rapidly, and in fact has already started doing so. Dr. Jang has begun to collect twitter data, and Dr. Li has been working on curating data as well as transcribing epidemic reports released by National Health Commission of China about the epidemic. Dr. Shi will begin gathering google trends and media data as soon as this proposal is submitted.

Lay Title and Lay Abstract

Lay Title:
Communication flow during COVID-19 outbreak

Lay Abstract:
In response to the new COVID-19 outbreak, the proposed research will investigate how information flows between scientists, public-health workers and the general public via various routes, particularly mass media and social media.

The project will be organized around three Research Questions:

• How does information (and misinformation) travel between scientists, public-health workers, mass media and social media?

• How does communication affect public behaviour and the course of the outbreak?

• How can scientists and policy-makers evaluate and improve the effectiveness of their communication?

We will analyze these flows by combining textual; AI-assisted data mining; time-series analysis; and dynamical modeling.

We are an inter-disciplinary team and will work to both strengthen understanding of community impacts and provide evidence to inform public-health responses. Our research is directly responsive to many of the research area bullet points, and particularly to the first three “Social and policy countermeasures” points.

Our scientific team is accomplished and multidisciplinary. The two principal applicants have a long history of influential research on disease outbreaks. Our team includes computer scientists, social scientists, quantitative scientists, a epidemiologist and statisticians. We are well connected to public health through the PAs and particularly through our BCCDC co-applicants. We also have support from PHAC and KFL&A Public Health. Finally, we are well positioned to understand the early outbreak, since our team is well connected to the emergence region, with members based in China and Taiwan, and with connections to Singapore.

Our team is ready to respond rapidly, and in fact has already started doing so. We have begun to collect twitter data, and working on curating data as well as transcribing epidemic reports released by National Health Commission of China about the epidemic.

Routes of communication: understanding the information flows that shape public and official reaction to COVID-19

1 Project overview

Information related to health risks and healthy behaviour is typically generated by scientists and distilled into recommendations by public-health agencies. From there it is transmitted to the public, often via mass media. Misinformation, generated by careless or irresponsible scientists, pseudo-scientists, or marketers can follow a similar route. In the age of the internet, these routes remain important, but the public also has easy direct access to information from public-health agencies, and to many scientific papers, including unvetted preprints. The public also has an expanded ability to interpret, transmit, and amplify messages through social media. More recently still, scientists and agencies have become active on social media as well.

During disease outbreaks of international concern, like 2003 SARS, 2009 H1N1, 2014 Ebola, or the current COVID-19 outbreak, this process is both compressed and amplified. The stakes also become higher, because public behaviour directly affects the spread of infectious disease: people who avoid large gatherings may slow disease spread, while people who flee infected areas may accelerate it, for example. Excessive fear of disease spread can have severe economic effects, and may also lead to bias and discrimination against groups seen as linked to the disease, or simply identified as "others".

The proposed research will study how information flows between forums – including scientific publications; governmental policies and agency recommendations; and mass and social media – and investigate how it affects public perceptions and behaviours. Our inter-disciplinary group will analyze these flows by combining textual analysis; AI-assisted data mining; time-series analysis; and dynamical modeling. We will study how good information competes with misinformation, and look for factors correlated with successful spread of good information. We will gather information on communication and surrogates for behaviour from a wide range of sources. Sources about communication will include agency websites; preprint servers and publicly available scientific journals; major newspaper websites; and social-media platforms. Surrogates for public perceptions and behaviour will include data from open social-media platforms twitter and Weibo (the most-popular twitter-style platform in China); Google Trends; publicly available box-office information for movies and major sporting leagues; publicly available travel information; and information from our textual analysis about cancellations and shortages (for example of face masks or pharmaceutical or pseudo-pharmaceutical products).

The project will be organized around three Research Questions (RQs), all based on the Social and policy countermeasures research area from the funding opportunity:

RQ1 How does information (and misinformation) travel between scientists, public-health workers, mass media and social media? (*based on funding opportunity research sub-area*: "cultural dimensions of the epidemic")

RQ2 How does communication affect public behaviour and the course of the outbreak? (*research sub-area*: "feasibility and effectiveness of public health response")

RQ3 How can scientists and policy-makers evaluate and improve the effectiveness of their communication? (*research sub-area*: "strategies to combat misinformation")

2 Background

Public-health communication is a balancing act. Officials are often caught between the need to be heard, and the danger of causing panic. This problem is particularly acute in the case of an infectious disease outbreak, since the presence of a novel pathogen increases both the importance of being heard and the danger that the public will over-react.

In the case of COVID-19, scientists are still scrambling to understand the pathogen's biology; public-health workers are scrambling to decide on the best recommendations and policy decisions given current knowledge at any given time; and the mass media is scrambling to understand the situation and decide how best to communicate with the public.

There are other complicating factors. An outbreak of global concern represents an opportunity for mainstream and peripheral media, and for social-media actors to increase their "clicks" and "likes" and therefore prestige and/or profitability. These motivations work against the balancing act, and instead favor over-simplification and sensationalization.

That traditional media can strongly influence public perceptions, creating fear by overestimating risk during the SARS outbreak [1] and the influenza pandemic [2], or feeding into bias – e.g., anti-Chinese bias during both the SARS crisis [3] and the current outbreak. Media is also the tool public health authorities rely on to promote their concerns and recommendations during outbreaks. Understanding media effects on disease spread (e.g., under what circumstances media attention increases self-protection) can help enhance epidemic forecasting and preventive measures to slow the disease spread [4].

While traditional news media (including their online presence) remains influential, social media plays an increasingly important role in shaping how we communicate and understand information [5]. Social media can play a positive role spreading good information, [6–8], but may also spread misinformation and feed bias [9, 10]. Since the initial reports, a cluster of acute severe respiratory disease (COVID-19) and the potential for global spread, there has been widespread discussion and dissemination of information through social media [11–13].

3 Methods and feasibility

3.1 Data

Science We will develop systematic search and screening strategies to extract relevant peer-reviewed publications from Google Scholar and PubMed. To account for the strong influence of preprints early in the epidemic [14], we will also include preliminary scientific findings posted on medRxiv through 31 March 2020. We will index these papers and track their appearances in mass media and social media; we will also track which of the preprints are published after peer review.

Public health recommendations We will collect and analyze reports, guidelines and recommendations available from the World Health Organization and from the central disease control agency of each of our focal countries (Canada, China, England, Singapore, Taiwan, and the USA). It is worth noting that all of these agencies have launched special COVID-19 web pages.

Mass media We will use the NexisUni search engine (via McMaster University) and OriProbe Information Services to collect articles relevant to the outbreak, going back to the outbreak start in December 2019, and continuing throughout the grant period. We will focus on the top English- and Mandarin-language newspapers (taking both circulation and online access into account) from our focal countries, including the top Mandarin-language newspapers in both Canada and the USA.

Social media We will collect data from Twitter and Weibo by purchasing API access and writing special-purpose scripts, using data going back to November 2019 – before the epidemic started – to give a baseline for comparison.

Public response Twitter (and Weibo) data will give us information not only on information flows, but also on public interest, attitudes and topics being discussed on the social media. We will also probe public interest and concern using publicly available data from Google Trends, which tabulates frequency of searches (by search times and topics) in various regions across the world [15, 16]. We will also use publicly available economic data – e.g., travel, movie box office reports – as proxies for public reaction to outbreak fears.

3.2 Analysis

Textual analysis To investigate how information/misinformation travels and how communication affects public responses, we will use state-of-the-art machine learning and natural language processing (NLP) techniques. We have two directions. First, we plan to develop codebooks to manually annotate random samples of articles/messages from scientific papers, government recommendations, mass media and social media. Codebooks will contain both themes and frames relevant to our analysis. For example, correct or incorrect information (misinformation or not?) will be annotated. Then, using the annotated data as training and test data, we will develop supervised machine learning algorithms that can code large quantities of material. Second, to study public responses, we will leverage NLP techniques such as aspect-based sentiment analysis and topic modeling. Using collaborative iteration between programmers, human coders and subject-matter experts, we will build AI algorithms that can usefully process large volumes of text into summaries that experts can interpret. The findings would be shared with public-health practitioners to assist with counter-messaging strategies.

Time-series analysis We will use cross-correlation analyses to look for indicators that information is moving from one communication forum to another; that events (like disease spread or public behavior) are affecting communication; or that communication is affecting events. Cross-correlation analysis is complicated and prone to false-positive results. Importantly, therefore, we will be able to use the cross-correlation analysis to generate hypotheses that can be checked by more detailed textual analysis. For example, if we hypothesize that tweets about fatalities are being driven at a certain time and place by mass media, or by government policies, we can sample from those tweets and examine them for detailed information or citations; if we hypothesize that a trend in self-isolation is driven by social media, we can search for mass media stories that interview people about their motivation. The ability to compare large-scale trends with detailed texts should amplify our pattern to detect and confirm patterns.

Dynamical modeling Dynamical modeling provides the link between individual events and emergent phenomena. We will make a range of simple dynamical models to further probe our time-series results. These models will ask what underlying *mechanistic* rules and connections might explain the connections we observe. Such models will allow us both to explore hypotheses about what sort of local connections can lead to observed large-scale patterns, and to make and evaluate predictions about future flows of information, how these flows might affect behaviour, and to explore hypotheses about how changes in behaviour may loop back to affect disease transmission or economic interactions.

Synthesis Effective health communication, including dissemination of good information and countering misinformation, is key to outbreak management [17] and consistent recommendation [17, 18]. We will use techniques from content analysis [19, 20] to combine results from our textual and time series analyses above to formulate hypotheses about what factors lead to effective communication. In particular, we will identify cases where good information did or did not out-compete bad information. When information from public-health agencies spreads effectively we will also evaluate our behavioural proxies to ask when it led to a calibrated reaction from the public (as opposed to over- or under-reaction). We will make use of previous studies to evaluate [21–24] and develop [17, 25, 26] strategies for effective health communication.

3.3 Applications

Real-time identification and response We will combine our analysis results to identify examples of misinformation spreading well; good information spreading poorly; and public over- and under-reaction. We will work directly with team members at BCCDC, knowledge users at PHAC and their associates to develop and evaluate messaging strategies. We will also share information about spreading misinformation with public-health workers and the public, through twitter, blog posts and a dedicated web site.

Academic outreach We will share our methods and results through peer-reviewed papers and academic conferences.

Software and data To the extent possible, all of the software developed for this project will be based on open platforms (primarily python and R). All software will be shared publicly via version-control repositories. In particular, the tools we develop to assist textual analysis have the potential to find a wide audience, but we will also share software for applied time-series analysis and dynamical modeling.

3.4 Research Setting & Personnel

The research will principally take place at McMaster University. Data mining will be centered at the BCCDC and Wuhan. We will also interact with public-health officials in Ottawa and Kingston, and social-science experts in Glasgow and Taiwan. Nominated principal applicant Dr. David J.D. **Earn** led the creation of the International Infectious Disease Data Archive and has expertise in gathering and curating infectious disease data, and in dynamical modelling, including modelling the influence of individual decision-making on epidemic dynamics. Principal applicant Dr. Jonathan **Dushoff** is an internationally recognized expert in infectious disease modelling, has extensive experience with statistical frameworks for fitting models to data, and has been involved in the Ebola challenge and other forecasting projects.

Our scientific team is accomplished and multidisciplinary, including computer scientists, social scientists, quantitative scientists and an epidemiologist. Dr. Chyun **Shi** is accomplished social-scientist with extensive experience in social and health behaviour and applied experience in both journalism and advertising. Dr. Nai Rui **Chng** is a political scientist with an interest in the development and evaluation of complex interventions in health, social and environmental policy domains. He is a versatile qualitative researcher who works in high, middle and low-income countries. Dr. Jung Hui **Yeh** is a Taiwan-based social scientist specializing in medical communication and cultural issues. Dr. Giuseppe **Carenini** and Dr. Hyeju **Jang** (to be hired as a post-doctorial researcher) are accomplished computer scientist with extensive experience in artifical intelligence

(AI) and computational linguistics. Dr. Xing Peng Jiang has extensive experience with data mining and machine learning. He also has personal experience with the Wuhan city lockdown, as a resident. Dr. Naveed Z. **Janjua** at the BCCDC, leads data and analytic services and was involved in the 2009 H1N1 pandemic response; during pandemic, lead or contributed to studies on immuno-epidemiology of pandemic H1N1, household transmission, modelling, effect of prior seasonal vaccine receipt on pandemic H1N1 infection risk and pandemic vaccine effectiveness. Dr. Benjamin **Bolker** is a highly accomplished ecological statistician with extensive experience in spatial-dynamical modeling, statistical modeling and statistical software. Dr. Michael **Li** has focused his research on epidemic forecasting and is experienced working with large databases. Dr. Mark **Loeb** M.D., M.Sc. is an infectious disease clinician and epidemiologist with broad experience in practical public health issues.

Our public health team includes experts who will help us ask questions, interpret the answers and will work to apply our work in the field: Dr. Pascal **Michel** Chief Science Officer at Public Health Agency of Canada. Dr. Kieran **Moore** CEO and Medical Officer of Health at Kingston, Frontenac, Lennox Addington (KFLA) Public Health, has spearheaded development of an Ontario-wide real-time hospital surveillance system.

Our team is ready to respond rapidly, and in fact has already started doing so. Co-applicant Jang has begun to collect twitter data, and co-applicant Li has been working on curating data about the epidemic. Co-applicant Shi has interim funding to begin working on gathering Google Trends and media data as soon as this proposal is submitted.

We are also already in touch with public-health response officials through BCCDC and KFL&A, and will reach out through our collaborators at PHAC as well to provide information directly of use.

4 Challenges and Mitigation Strategies

This proposal is ambitious and will meet with unexpected obstacles. Our main strategy is to actively foster open communication between members of this very diverse team. We are working on clear task definitions, so that everyone is able to move forward and also clear lines of communication so that we are able to advise and make use of each others' work.

China is at the center of the outbreak, but information from China is not always open. Chinese use of twitter and Google differs sharply from most of the rest of the world. Team member Jiang is based in Wuhan, and will help us navigate some of these difficulties. We will interpret Chinese data with care, and not put analysis of China at the center of our project. Importantly, we also have team members familiar with Singapore and Taiwan, more open societies that have also felt strong social effects from the outbreak.

The future of the coronavirus outbreak is unpredictable. We will tailor our geographic focus, search queries and filters, and possibly our research questions depending on where and how fast the virus spreads, and how attitudes towards it evolve.

KFL&A Public Health

Telephone: 613-549-1232×1121
Email: kieran.moore@kflaph.ca

18-February-2020

TO WHOM IT MAY CONCERN:

RE: CIHR Project Grant

I am the Medical Officer of Health for KFL&A Public Health and certified as a fellow of the Royal College of Physicians and Surgeons of Canada in Public Health and Preventative Medicine.

The Knowledge Management Division at KFL&A Public Health has extensive experience in surveillance systems for bioterrorism and outbreak detection, public health, pre-hospital care and multidisciplinary research projects. We have a significant interest in the evaluation of various data streams for the early detection of outbreaks as well as assessment of deprivation distribution in populations.

We operate Ontario's only real-time surveillance system which monitors over 150 acute care facilities. We receive secure data feeds for both emergency departments and admissions to hospitals, which includes basic non-identifiable demographic information as well as the reason for visit or admission. This data is analyzed in real time with automated anomaly detection and alerting.

We welcome the opportunity to partner with McMaster to study "Routes of communication: understanding the information flows that shape public and official reaction to COVID-19." We will help researchers understand how messages are working and we expect to also benefit from practical real-time information about misinformation and message effectiveness.

This is practical, applicable work that will enable improved protection and health system responsiveness to any public health threat. We look forward to supporting this work.

Yours sincerely,

Kieran Michael Moore, MD, CCFP(EM), FCFP, MPH, MSc(DM), DTM&H, FRCP(C)
Medical Officer of Health
Program Director, Public Health and Preventative Medicine, Queen's University
Professor, Department of Emergency and Preventive Family Medicine, Queen's University

NAI RUI CHNG, PhD

MRC/CSO Social & Public Health Sciences Unit, University of Glasgow, 200 Renfield Street, G2 3AX. Tel: +44 141 353 7500 Email: nairui.chng@glasgow.ac.uk

CURRENT ROLES

Co-Investigator/Research Associate, (Institute of Health and Wellbeing, Social Scientists in Health)

- Co-leading on overall project (SPEEDIER); Leading on Process Evaluation

Research Associate, (MRC/CSO Social & Public Health Sciences Unit)

- Leading in Evaluability Assessment project on national guidance development and case study research

EDUCATION

2013	PhD. Political Science, Department of Government, London School of Economics. Thesis: Even flow: Water privatization and the mobilization of power in the Philippines.
2006	MRes. (Merit) Political Science, Department of Government, LSE.
2003	MSc. (Merit) Political Sociology, Department of Government, LSE.
2000	BA. (1st Class Hons. with Distinction) Politics, Department of Politics, University of York.

EXPERIENCE

2017-2018 Research Associate, EuroFIT.

- Led analysis of qualitative and quantitative data collected from a RCT.
- Project management of a work package on sustainability, replication and implementation of EuroFIT in England.

2016-2017 Research Associate, What Works Scotland.

- Led research project involving secondary data analysis, presented findings at national meetings, workshops and conferences, and am writing up findings for submission to peer-reviewed journals.

2014-2017 Research Associate (Qualitative Research Lead), Evaluation of the Links Worker Programme in 'Deep End' General Practices in Glasgow.

- Planned, coordinated and conducted all qualitative research activities (design of tools, data collection, and data analyses) in collaboration with project teams and external partners.
- Presented findings at project team meetings, internal/external academic, and practitioner national/international meetings, workshops, and conferences.
- Delivered reports on the studies for funders, and wrote up research findings for submission to peer-reviewed academic journals.

2012-2014 Affiliate Research Fellow in Human Rights, School of Social and Political Sciences, University of Glasgow.

2009-2010 Max Weber Post-Doctoral Fellow, Max Weber Programme, European University Institute.

SELECTED PUBLICATIONS

Refereed Journal Articles

2019 Mercer, S. W., Fitzpatrick, B., Grant, L., **Chng, NR.**, McConnachie, A., Bakhshi, A., James-Rae, G., O'Donnell, C. A. and Wyke, S. (2019) Effectiveness of community-links practitioners in areas of high socioeconomic deprivation. *Annals of Family Medicine* 17(6). pp. 518-525. (doi: 10.1370/afm.2429)

2019 Wentworth, D., Hampson, K., Thumbi, S. M., Mwatondo, A., Wambura, G. and **Chng, NR.** (2019) A social justice perspective on access to human rabies vaccines. *Vaccine* 37(1). pp. A3-A5. (doi:10.1016/j.vaccine.2019.01.065)

2019 Hanlon, P., Gray, C. M., **Chng, NR.** and Mercer, S. W. (2019) Does Self-Determination Theory help explain the impact of social prescribing? A qualitative analysis of patients' experiences of the Glasgow 'Deep-End' Community Links Worker intervention. *Chronic Illness* (doi: 10.1177/1742395319845427)

2018 Skivington, K., Smith, M., **Chng, NR**., Mackenzie, M., Wyke, S., and Mercer, S. W. "Delivering a Primary Care based social prescribing initiative: a qualitative study." *British Journal of General Practice* 68(672), e487-e494. (doi: 10.3399/bjgp18X696617)

2017 Mercer, S. W., Fitzpatrick, B., Grant, L., **Chng, NR**., O'Donnell, C., Mackenzie, M., McConnachie, A., Bakhshi, A., and Wyke, S. "The Glasgow 'Deep End' Links Worker Study Protocol: a quasi-experimental evaluation of a social prescribing intervention for patients with complex needs in areas of high socioeconomic deprivation." *Journal of Comorbidity* 7(1). pp. 1-10. (doi: 10.15256/joc.2017.7.102)

2012 **Chng, NR**. "Regulatory Mobilization and Service Delivery at the Edge of the Regulatory State." *Regulation & Governance* 6(3). pp. 344-361. (doi:10.1111/j.1748-5991.2012.01137.x)

2008 **Chng, NR**. "Privatisation and Citizenship: Local Politics of Water in the Philippines." *Development* 51(1). pp. 42-48. (doi:10.1057/palgrave.development.1100444)

Book Chapters

2015 **Chng, NR**. and Munro, N. "Zhong Ou gongzhong canyu huanjing zhili de youxiaoxing duibi" (The Comparative Effectiveness of Participation in Environmental Governance in China and Europe). In Yu, W. (ed.), Zhong Wai huanjing gonggong zhili bijiao yanjiu (Comparative Research on Public Environmental Governance in China and Abroad). Beijing: China Environment Press, 49-71.

2015 Munro, N. and **Chng, NR**. "Pinggu Zhongguo gongzhong canyu huanjing zhili youxiaoxing de di yi bu" (First Steps Towards Evaluating the Effectiveness of Participation in Environmental Governance in China). In Yu, W. (ed.), Zhong Wai huanjing gonggong zhili bijiao yanjiu (Comparative Research on Public Environmental Governance in China and Abroad). Beijing: China Environment Press, 72-94.

2013 **Chng, NR**. "Regulatory Mobilization and Service Delivery at the Edge of the Regulatory State." In Navroz K. Dubash and Bronwen Morgan (eds.), *The Rise of the Regulatory State of the South: Infrastructure and Development in Emerging Economies*. Oxford: Oxford University Press.

Reports

2017	Wyke, S., Mercer, S., Chng, NR, Fitzpatrick, B., Mackenzie, M., McConnachie, A., O'Donnell, C., and Skivington K., "Evaluation of the Links Worker Programme in 'Deep End' general practices in Glasgow"
2014	Munro, N. and Chng, NR. "First steps towards evaluating the effectiveness of participation in environmental governance in China" and "The comparative effectiveness of participation in environmental governance in Europe and China", EU-China Environmental Governance Programme.
2009	Chng, NR. "Philippines: Civil society organisation involvement in urban water sector reform", London: WaterAid.
2005	Chng, NR. "Low Income Consumers, Water & Sewerage Charges in the South West", Office of Linda Gilroy MP.

RECENT GRANTS & AWARDS

Sept 2018-2021	UK Medical Research Council "Surveillance integrating Phylogenetics and Epidemiology for Elimination of Disease: Evaluation of Rabies Control in the Philippines" (SPEEDIER) (Co-I/PDRA)	£460,000
Oct 2017-Mar 2018	University of Glasgow/Scottish Funding Council GCRF Small Grants Fund "Social Accountability for Sustainable Domestic Water in Dar es Salaam" (Co-I)	£49,992
Apr-Aug 2017	University of Glasgow, Academic Returners and Research Support Fund	£10,000
Oct 2016	University of Glasgow, International Partnership Development Fund	£944
2013	Regulation & Governance Journal prize for the best article published	£300

TEACHING

2015-current	**Dissertation Supervisor**, MSc Global Health Programme, Institute of Health and Wellbeing, University of Glasgow

Public Health Agency of Canada | Agence de la santé publique du Canada

Ottawa, February 18, 2020

Canadian Institutes of Health Research
Institute of Infection and Immunity

To whom it may concern,

Re: Letter of Support for application to the CIHR priority announcement on the COVID-19 Rapid Research Funding opportunity

On behalf of the Public Health Agency of Canada, it is my pleasure to provide this letter in support of a research proposal by Drs. Earn, Dushoff and Shi, from McMaster University, to the CIHR Rapid Research Funding opportunity on the novel coronavirus (COVID-19).

This research project aims to contribute to a better understanding of risk / outbreak communication and public reactions to the COVID-19 outbreak.

It is my understanding that this project will address three key areas of focus for this opportunity by studying social and policy countermeasures research, such as: cultural dimensions of the epidemic (i.e. individuals' and communities' understanding and reactions to the disease); the public health response, and; strategies to combat misinformation, stigma, and fear.

The multidisciplinary research team assembled by Dr. Earn brings credible expertise in computational and statistical approaches to public health and population dynamics in epidemics, pathogen evolution, mathematical epidemiology and social sciences.

In summary, the Public Health Agency of Canada recognises the relevance, the timeliness and the value of the proposed research to help Canada in responding to infectious disease threats in the context of the current COVID-19 epidemic and in the future.

Yours sincerely,

Pascal Michel.

Dr. Pascal Michel, DMV, MPVM, PhD
Chief Science Officer
Public Health Agency of Canada
Pascal.Michel@canada.ca

Canada

Giuseppe Carenini

Professor, University of British Columbia, Computer Science

B.Sc. University of Milan; Ph.D., University of Pittsburgh

Associate Professor	*01/07/2010 -- 30/06/2018*
Full Professor	*01/07/2018 -- present*

Research Interests:

Dr. Carenini has broad interdisciplinary interests. His work on Natural Language Processing (NLP) and Information Visualization to support decision making has been published in over 130 peer-reviewed papers. Dr. Carenini has pioneered abstractive, multimedia summarization of evaluative text, neural summarization of long documents, and neural topic segmentation. He has also pioneered research in summarizing and visualizing human conversations (e.g., email and blogs) as well as visualizing topic models and the output of multi-tasking deep-learning NLP models. His work on Information Visualization has also focused on visualizing preferences, evaluations and opinions. Dr. Carenini has contributed to establish the novel and promising research area of adaptive Information Visualization, as well as to develop state-of-the-art discourse parsers, currently trained with distant supervision.

Awards & Distinctions 2015-present

Yahoo Faculty Research Award in 2016

Program Co-Chair for IUI 2015

Program Co-Chair for SigDial 2016

Co-Director Master in Data Science (2017-)

Selected Publications 2015-present (h-index 42):

1. *Enamul Hoque, Giuseppe Carenini:* Interactive topic hierarchy revision for exploring a collection of online conversations. Information Visualization 18(3) 2019.
2. *Patrick Huber, Giuseppe Carenini:* Predicting Discourse Structure using Distant Supervision from Sentiment. EMNLP/IJCNLP (1) 2019.
3. *Vaden Masrani, Gabriel Murray, Thalia Shoshana Field, Giuseppe Carenini:* Domain Adaptation for Detecting Mild Cognitive Impairment. Canadian Conference on AI 2017.
4. *Sébastien Lallé, Cristina Conati, Giuseppe Carenini:* Predicting Confusion in Information Visualization from Eye Tracking and Interaction Data. IJCAI 2016.
5. *Shafiq R. Joty, Giuseppe Carenini, Raymond T. Ng:* CODRA: A Novel Discriminative Framework for Rhetorical Analysis. Computational Linguistics 41(3), 2015.

Contributions to Teaching and Graduate Supervision 2015-present:

Contributed to the design of the courses for the UBC Master of Data Science.

Mentoring & Supervision 2015-Present		
PhD Current: 3	MSc Current: 2	Ugrad Advisees: 5
PhD Graduated: 2	MSc Graduated:10	Postdocs: 3

Other Activities and Leadership Roles 2015-present:

Since 2017, Dr. Carenini is the Co-Director of the UBC Master in Data Science (MDS). Dr. Carenini was the area chair for NAACL'12 and EMNLP'19 in ``Summarization and Generation", and for ACL'19 in "Discourse"; the Program Co-Chair for the IUI conference 2015, and the Program Co-Chair for SigDial2016. Dr. Carenini has also extensively collaborated with industrial partners, including Microsoft and IBM. Giuseppe was awarded a Yahoo Faculty Research Award in 2016.

Research or Equivalent Grants 2015-present:

(indicate under COMP whether grants were obtained competitively (C) or non-competitively (NC))

Granting Agency	Subject	COMP	$ Per Year	Year	Principal Investigator	Co-Investigator(s)
Michael Smith Fundation + matching from WelTel	Smart Text Analytic Tools (STAT) - ConVisScope	C	150,000 150,000	20-21 21-22	R. Lester	G. Carenini
VVHRI Innovation and Translational Research Awards Research Module	Clinical data ANd NAtuRal language processing for earlY detection of dementia (CANARY)	C	37,500	19-21	T. Field	G. Carenini C. Conati
UBC Language Sciences Initiative	Detecting Dementia: Literature Review and Annotation	C	2,000	18-19	G. Carenini	H. Jang
Huawei DSI initiative	Leveraging more accurate and flexible discourse structures in question-answering and summarization	C	100,000 100,000 100,000 (100%)	19-20 20-21	G. Carenini	
Nanyang Technological University, Singapore	Multilingual Processing with Generative Adversarial Autoencoders	C	SGD 100,000 ($ 96,000)	18-19	S. Joty	G. Carenini (visiting professor)
Empowered startups	Integration of Natural Language and Information Visualization	C	$14,000	18-19	G. Carenini	
UBC Data Science Institute	Using Text Analysis for Chronic Disease Management	C	$40,000 (50%)	17-18	G. Carenini	K. Ho
NSERC Discovery	Improving, Extending and Leveraging Discourse Parsing	C	$26,000 $26,000 $26,000 $26,000 $26,000 (100%)	17-18 18-19 19-20 20-21 21-22	G. Carenini	

NSERC Engage	A Modular Web-based Interface for Group Decision-making	C	$24,960 100%	2017	G. Carenini	
VGH & UBC Hospital Foundation	Using Natural Language Processing Algorithms for Early Detection of Cerebral Small Vessel Disease: A Pilot Study	C	40,000 25,000 25,000 (33%)	2018-19 2017-18 2016-17	G. Carenini	T. Field G. Murray
Canadian Foundation for Innovation Cyber-infrastructure	MERIDIAN: Marine Environmental Research Infrastructure for Data Integration and Application Network,	C	$70,000 $70,000 $70,000 (50%)	16-17 17-18 18-19		G. Carenini R. Ng
Yahoo Labs Faculty Research and Engagement Program	Effective and Scalable Email Summarization	C	$40,000 (100%)	2015-16	G. Carenini	
MITACS Accelerate	Towards Interactive and Adaptive Visualizations for Preferential Choices and Public Engagement	C	$15,000 (50%)	2015	G.Carenini C. Conati	

Invited Presentations (non-conference) i.e., universities and labs 2015-present:

- Research Themes in NLP and InfoVis: University of Toulouse, July 11, 2019
- Multi-document Summarization: from state of the art to open questions. Invited talk in the 1-week long Dagstuhl Seminar on Multi-document Consolidation, Wadern, Germany, Apr. 29 - May, 2nd , 2019
- Exploring a Rich Design Space for Text Summarization
    - McGill University, CS dept., Montreal, Quebec, Canada, May 30th, 2016
    - Northeastern University, CS dept., Boston, Massachusetts, USA, May 31st, 2016
    - University of Pennsylvania, CS dept., Philadelphia, Pennsylvania, USA, June 1st, 2016
    - University of Alberta, CS dept., Edmonton, Alberta, Canada, June 3rd, 2016
    - Splunk Research Seminar in ML/NLP, Vancouver, BC, August 25th , 2016
    - Bar Ilan University, CS dept., Tel Aviv, Israel, March 18th, 2018
    - Universita' Bocconi, Bocconi Institute for Data Science and Analytics, Milan, Italy, May 18th, 2018
    - Nanyang Technological University, CS dept., Singapore, May 30th, 2018
    - I2R Research Institute, Singapore, June 1st, 2018
    - Alibaba Research Lab, Singapore, November 20th, 2018
    - Universita di Salerno, July 24th, 2019
- Modeling and Visualization of Topics in on-line Asynchronous Conversations
    - University Of Trento, Department of Information Engineering and Computer Science, Trento, Italy, July 21st, 2015

Applicant profile

Please refer to the instructions below in order to complete the profile. NOTE: The profile may not exceed three pages but there are no section restrictions, therefore each applicant can choose what to emphasize.

Name: Xingpeng Jiang

Title/role:
Professor/

Affiliation/community:
School of Computer, Central China Normal University, Wuhan, Hubei Province, China

Areas of expertise/knowledge and/or education:
Research experience in data mining and visualization for large-scale multi-omics data in biology, as well as developing artificial intelligence methods in bioinformatics applications.

A. Personal Statement

I (Xingpeng Jiang) received the Ph.D. degree from the National Laboratory of Pattern Recognition at the Institute of Automation of the Chinese Academy of Sciences in 2009. I'm a Professor at School of Computer, Central China Normal University, Wuhan, China since 2015. He is lived in Wuhan right now and undergo the spread event of the COVID-19.

My current research interests include machine learning and visualization methods in large-scale multi-omics data including genomes, metagenomes and biomedical texts et al.. I was a PostDoc at Department of Biology, McMaster University for two and half years. During these period, I worked with Jonathan Dushoff and Chyun-fung Shi for exploring the effect of social media on the H1N1 transmission using dimension reduction and visualization technology. My working experience in the PI's lab also make the collaboration spontaneously.

After that, I continued my PostDoc training at College of Computing & Informatics of Drexel University, where he focused on the developing of novel machine learning and statistical methods for the analyzing and visualization of microbiome data. These training have provide solid background for helping to accomplish data analysis of this project.

B. Positions and Honours

1. **Professor**, Central China Normal University, Wuhan, China, 2015-present
2. "**Chutian Young Scholar**" Talent Program in Hubei Province, China, 2015-2019 (250,000 RMB)

3. **co-PI,** Pattern extraction and analysis from high-throughput microbiome data, key program of National Science Funding of China (61532008), 2016-2020 (2900,000 RMB)

4. **PI**, Computational prediction of high-order microbial interaction from multi-omics data, general program of National Science Funding of China, 2019-2022 (600,000 RMB)

5. **Program Committee Membe**r of *IEEE International Conference on Bioinformatics and Biomedicine* since 2013

6. **Committee Member** *of the Bioinformatics Committee of the Chinese Computer Society, since 2017*

7. **Standing Committee Member** *of Gene Detection Technology Branch of the Chinese Pharmaceutical Biotechnology Association, since 2018*

8. **Vice President** *of the Hubei Province Bioinformatics Society, China, since 2018*

9. **Editor board** of *International Journal of Data Mining and Bioinformatics, since 2014*.

10. **Editor board** of *Journal of Artificial Intelligence for Medical Sciences, since 2019*

11. **Editor board** of *Advances in Biomarker Sciences and Technology, since 2019*

C. Contributions to Knowledge Creation, Knowledge Sharing, and/or Knowledge Translation

Briefly describe your most significant contributions to knowledge creation and/or knowledge sharing/translation. (Maximum of 5)

(1)Data Visualization and Dimension Reduction for Microbiome Data

Working with Jonathan Dushoff, a new NMF model selection method is proposed to select the dimension of decomposed matrix with higher accuracy (Journal of mathematical biology, 2012). The extension of this method is used to deal with the dimensionality reduction of large-scale marine metagenomic data (results published in PLoS ONE, 2012) and soil microbiome data (FEMS microbiology ecology, 2013). Based on these studies, I have also proposed several multi-view NMF for integrating different data resources (IEEE transactions on Computational Biology and Bioinformatics, 2017).I have also developed novel visualization methods by introducing graph regularization to the extension of a famous visualization method t-sne which improved the model performance (BMC medical genomics, 2014; BMC Bioinformatics, 2019). These studies contribute novel approaches for efficiently analyzing microbiome data.

(2)Inferring Bacterial Interaction Networks from Literature Based on Deep Learning

I have proposed a bacterial named entity recognition (IEEE BIBM 2018,BMC Systems Biology 2018) and relationship extraction framework (APBC 2019, IEEE BIBM 2019) based on deep learning and conditional random field (CRF). The results of the proposed method can effectively identify bacterial entities and interactions from about half million PubMed literature contains bacteria. The framework can be used to quickly and

accurately dig out these interactions from biomedical texts. The extracted bacterial interactions is helpful for the understanding the relationship between micro-ecological systems and human health.

(3)Microbial Biomarker Identification by Deep Forest and Graph Embedding

We propose an ensemble feature learning method based on Deep Forest (Methods, 2019) and conduct experimental analysis on microbiome data. Compared with deep neural networks, Deep Forest can learn the layered structure adaptively according to the complexity of the data. Without affecting the prediction accuracy, the training speed of the model is faster and the efficiency is higher. Moreover, the feature selection method based on the deep forest has more intuitive interpretability and better robustness. Considering the complexity of real data and the dependence between variables, we also proposes a deep learning method based on graph embedding (Frontier in Genetics, 2019). These methods could be used to microbial biomarker identification from large-scale microbioem data.

D. Other Relevant Information (Optional)

If applicable, please include any other relevant information to support your role/ contribution to the proposed research application.

Applicant profile

Please refer to the instructions below in order to complete the profile. NOTE: The profile may not exceed three pages but there are no section restrictions, therefore each applicant can choose what to emphasize.

Name: Jung Hui Yeh

Title/role: Associate Professor

Affiliation/community: Shih Hsin University

Areas of expertise/knowledge and/or education:

Ph.D. in Human Communication, Spring 1999
University of Oklahoma, Norman OK

Expertise & Interests: Health communication, intercultural communication, interpersonal communication, ethnographic methods, qualitative research, conversation analysis,

A. Personal Statement

My research areas mostly focused on interpersonal relationships and communication patterns in the Chinese society and intercultural setting. I have spent time investigating how people in the Chinese cultures (e.g., China, HK & Taiwan) differently perceive their relations with others, and how their value orientations affect communication behaviors (e.g., being argumentative). The concept of "culture" I explored was not simply constrained on races, nations or static boundary, but also refers to dynamic and fluid contexts that shared same rules and pace. Taken the perspective of sharing codes and rules within contexts, I create possibilities for my intercultural adventures.

The first adventure is to step into medical contexts. I have been a regular instructor for several branches of a teaching hospital in (New) Taipei City since 2008, specifying in doctor-patient communication and relationships. It is a novel journey while medical staff differently perceive time, reality, relations and communication from that of my training in social science. Feedbacks, experiences and frustrations shared by medical staff enrich the depth and feasibility of my curriculum in hospitals. Collaborated with research findings and experiences, I possess both medical experts and layperson lenses to manage communication and relational difficulties.

The second journey of being intercultural is to bridge communication with big data. Living under the stream of social media, I am pushing forward to embrace technology

and various formats of data. I am a co-principal investigator of a Lab in Communication Innovation & Data Intelligence (CIDI) at Shih Hsin University, Taiwan. CIDI seeks to integrate visual, digital or text data from health education, information science, nutrition etc. In CIDI, I start to accept that a paradigm shift, as I learned in graduate school decades ago, is actually happening in rea time. Hugh quantity of information and data is spreading everywhere. To make information and data meaningful and useful, we need a team

B. Positions & Honors

Associate Professor (2004-present)	Shih Hsin University, Taipei Taiwan
Assistant Professor (1999-2004)	Shih Hsin University, Taipei Taiwan
Co-principal Investigator (2016-present)	Lab in Communication Innovation & Data Intelligence
Instructors (2008-present)	Wan Fang Municipal Hospital, Taipei Taiwan
	Taipei Medical University- Shuang Ho Hospital, New Taipei City, Taiwan;
Guest speaker (2020)	Pojen General Hospital, Taipei Taiwan
Keynote speaker (2019)	En Chu Kong Hospital, Sanxia Taiwan

C. Contributions to Knowledge Creation, Knowledge Sharing, and/or Knowledge Translation

Several articles published in English and Chinese may show my interests in health and cross-cultural issues: doctor-patient relations, flu outbreaks, persuasive messages in the blood donation campaign. These works mostly applied ethnographic methods (e.g., interviews, participant observation and text analysis) and text mining to discuss issues behind phenomenon.

Yeh, Jung Hui Becky (2018). When People Become Patients: Fluctuations of Trust from the Cancer Patients' Perspective. Chinese Journal of Communication, 11, 365-384. (SSCI)

Yuan, Ming-Shu, Yeh, J.H. (2018). Extending and applying scientific information to blood related knowledge. Chapter collected in Essays of Science Communication 9. [In Chinese].

Yeh, J.H., Huang, W.C. (2017). Comments and responses to Flu news: In the Facebook. Chapter collected in Essays of Science Communication 8. [In Chinese].

Yeh, B. J. H., & Lien, G. S. (2011). Reducing Patient Uncertainty by Addressing Patient/ Physician Relationships from the Patient's Perspective in Taiwan. Communication & Society, 17, 61–86.

Yeh, J. H. (2010). Relations Matter: Redefining Communication Competence: From a Chinese Perspective. Chinese Journal of Communication, 3, 64-75. (SSCI)

D. Other Relevant Information (Optional)

If applicable, please include any other relevant information to support your role/ contribution to the proposed research application.

Applicant profile

Please refer to the instructions below in order to complete the profile. NOTE: The profile may not exceed three pages but there are no section restrictions, therefore each applicant can choose what to emphasize.

Chyun Shi

Research Associate

McMaster University

Health Communication, Health Behaviour

A. Personal Statement

My research focus is on health behaviour and communication in analyzing secondary data. My current research mainly investigate health behaviour in various demographic settings. I implement social and cultural perspective in analyzing research results, especially with gender and culture perspective, for example, in intimate partner violence, HIV and male circumcision.

My training background was in cultural communication and media study. I supervised graduate students thesis and taught course in Advertising and Media, Cultural Studies and Communication (at graduate level) and was mentors to graduate students. When working at the advertising industry, I was involved in planning of strategies and media planning for clients such as Coca-Cola and Burger King.

B. Positions and Honours

Postdoc fellow, Biology dept, McMaster University, ON. 2010-present
Postdoc fellow, Math and Statistics dept, McMaster University, ON. 2008-2009
Volunteer Consultant, Project of Reach-Out to Chinese Community, National Association of Mental Illness, NJ. 2004-2005
Adjunct professor, Department of Communication Studies, The College of New Jersey, 2002-2004.
Associate Professor, Advertising and Communications departments, Fu-Jen University, Taiwan, 1995-2001.
Reporter, The Independent Evening, Taiwan,1990-92
Account Executive, MaCANN International, Taiwan 1985-1988

C. Contributions to Knowledge Creation, Knowledge Sharing, and/or Knowledge Translation

My research interest in public health in gender and culture has transferred into publications.

My training background in communication and media and the current research focus will enable me to apply social and culture perspective in analyzing the COIVD-19 outbreak in various countries. My work experiences in advertising industry before entering academic field will also help me to compare health strategies and risk management.

C. **RESEARCH INTERESTS**

health communication and health literacy, social and cultural studies, gender study

D SELECTED PULBICATION

Traditional Male Circumcision is Associated with Sexual Risk Behaviors in Sub-Saharan Countries Prioritized for Male Circumcision. Shi C, Li M, Dushoff J. AIDS Behav. 2020 Mar;24(3):951-959. doi: 10.1007/s10461-019-02473-0.

Evidence that promotion of male circumcision did not lead to sexual risk compensation in prioritized Sub-Saharan countries. Shi CF, Li M, Dushoff J. PLoS One. 2017 Apr 25;12(4):e0175928.

The effect of sexually transmitted co-infections on HIV viral load amongst individuals on antiretroviral therapy: a systematic review and meta-analysis.
Champredon D, Bellan SE, Delva W, Hunt S, Shi CF, Smieja M, Dushoff J.
BMC Infect Dis. 2015 Jun 30;15:249.

Intimate partner violence is associated with HIV infection in women in Kenya: a cross-sectional analysis.
Shi CF, Kouyoumdjian FG, Dushoff J.
BMC Public Health. 2013 May 28;13:512.

Modelling the population-level effects of male circumcision as an HIV-preventive measure: a gendered perspective. Dushoff J, Patoc A, Shi CF.
PLoS One. 2011;6(12)

Mapping out gender power: A Bourdieuian approach. Feminist Media Studies, 1(1): 54-61.(2001).

DISSERTATION

Representation of gender in mass media in the light of Bourdieu's capital: News coverage of female candidates in political campaign in Taiwan. 1995.

GRANTS

2000-2001: Taiwan's National Science Council. Wine consumption culture in Taiwan: A

view of media, culture and class. (NSC 89-2412-H-030-014)

1999-2000: Taiwan's National Science Council. National identity in the news coverage of Taiwan national leaders visiting aboard from 1982-1999. (NSC892412H030007)

1998-1999: Taiwan's National Science Council. Public memory and the 228 Incident in Taiwan. (NSC882412H030003)

References

[1] T. R. Berry, J. Wharf-Higgins, and P. J. Naylor. SARS wars: an examination of the quantity and construction of health information in the news media. *Health Commun*, 21:35–44, 2007.

[2] J. M. Tchuenche, N. Dube, C. P. Bhunu, R. J. Smith, and C. T. Bauch. The impact of media coverage on the transmission dynamics of human influenza. *BMC Public Health*, 11 Suppl 1:S5, 2011 Feb 25.

[3] Y. Huang and C. C. M. Leung. Western-Led Press Coverage of Mainland China and Vietnam during the SARS Crisis: Reassessing the Concept of 'Media Representation of theOther'. *Asian Journal of Communication*, 15:2005, 2005.

[4] L. Kim, S. M. Fast, and N. Markuzon. Incorporating media data into a model of infectious disease transmission. *PLoS One*, 14:e0197646, 2019.

[5] J. Liu, L. Siegel, L. A. Gibson, Y. Kim, S. Binns, S. Emery, and R. C. Hornik. Toward an Aggregate, Implicit, and Dynamic Model of Norm Formation: Capturing Large-Scale Media Representations of Dynamic Descriptive Norms Through Automated and Crowdsourced Content Analysis. *J Commun*, 69:563–588, 2019 Dec.

[6] C. H. Basch and G. C. Hillyer. Skin cancer on Instagram: implications for adolescents and young adults. *Int J Adolesc Med Health*, 2020 Feb 7.

[7] M. Sun, L. Yang, W. Chen, H. Luo, K. Zheng, Y. Zhang, T. Lian, Y. Yang, and J. Ni. Current status of official WeChat accounts for public health education. *J Public Health (Oxf)*, 2020 Jan 23.

[8] N. Ahmed, S. C. Quinn, G. R. Hancock, V. S. Freimuth, and A. Jamison. Social media use and influenza vaccine uptake among White and African American adults. *Vaccine*, 36:7556–7561, 2018 Nov 26.

[9] W. Y. S. Chou, A. Oh, and W. M. P. Klein. Addressing Health-Related Misinformation on Social Media. *JAMA*, 320:2417–2418, 2018 Dec 18.

[10] M. McKee, M. C. I. van Schalkwyk, and D. Stuckler. The second information revolution: digitalization brings opportunities and concerns for public health. *Eur J Public Health*, 29:3–6, 2019 Oct 1.

[11] W. Ahmed, P. A. Bath, L. Sbaffi, and G. Demartini. Novel insights into views towards H1N1 during the 2009 Pandemic: a thematic analysis of Twitter data. *Health Info Libr J*, 36:60–72, 2019 Mar.

[12] C. Chew and G. Eysenbach. Pandemics in the age of Twitter: content analysis of Tweets during the 2009 H1N1 outbreak. *PLoS One*, 5:e14118, 2010 Nov 29.

[13] L. Tang, B. Bie, S. E. Park, and D. Zhi. Social media and outbreaks of emerging infectious diseases: A systematic review of literature. *Am J Infect Control*, 46:962–972, 2018 Sep.

[14] Majumder MS and Mandl KD. Early in the Epidemic: Impact of Preprints on Global Discourse of 2019-nCOV Transmissibility. *SSRN preprint*, Abstract ID, 2020.

[15] J. Bousquet, I. Agache, J. M. Anto, K. C. Bergmann, C. Bachert, I. Annesi-Maesano, P. J. Bousquet, G. D'Amato, P. Demoly, G. De Vries, E. Eller, W. J. Fokkens, J. Fonseca, T. Haahtela, P. W. Hellings, J. Just, T. Keil, L. Klimek, P. Kuna, K. C. Lodrup Carlsen, R. Mosges, R. Murray, K. Nekam, G. Onorato, N. G. Papadopoulos, B. Samolinski, P. Schmid-Grendelmeier, M. Thibaudon, P. Tomazic, M. Triggiani, A. Valiulis, E. Valovirta, M. Van Eerd, M. Wickman, T. Zuberbier, and A. Sheikh. Google Trends terms reporting rhinitis and related topics differ in European countries. *Allergy*, 72:1261–1266, 2017 Aug.

[16] N. Mahroum, N. L. Bragazzi, F. Brigo, R. Waknin, K. Sharif, H. Mahagna, H. Amital, and A. Watad. Capturing public interest toward new tools for controlling human immunodeficiency virus (HIV) infection exploiting data from Google Trends. *Health Informatics J*, 25:1383–1397, 2019 Dec.

[17] J. Song, T. M. Song, D. C. Seo, D. L. Jin, and J. S. Kim. Social Big Data Analysis of Information Spread and Perceived Infection Risk During the 2015 Middle East Respiratory Syndrome Outbreak in South Korea. *Cyberpsychol Behav Soc Netw*, 20:22–29, 2017 Jan.

[18] A. W. Ohlrogge and L. S. Suggs. Flu vaccination communication in Europe: What does the government communicate and how? *Vaccine*, 36:6512–6519, 2018 Oct 22.

[19] D. Finfgeld-Connett. Use of content analysis to conduct knowledge-building and theory-generating qualitative systematic reviews. *Qualitative Research*, 14:2013, 2013.

[20] P. Mayring. Qualitative Content Analysis: Theoretical Background and Procedures. *Advances in Mathematics Education*, 2014.

[21] H. Ding. Transnational quarantine rhetorics: public mobilization in SARS and in H1N1 flu. *J Med Humanit*, 35:191–210, 2014 Jun.

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[26] F. Shen, V. C. Sheer, and R. Li. Impact of Narratives on Persuasion in Health Communication: A Meta-Analysis. *Journal of Advertising*, 44:2015, 2015.

Applicant profile

Name: **Pascal Michel (CIHR NIP: 41286)**

Title/role: **Knowledge user (end of grant)**

Affiliation/community: **Public Health / Government of Canada**

Areas of expertise/knowledge and/or education: **Public health / public policy / strategies / epidemiology**

A. Personal Statement

Dr. Pascal Michel is the Chief Science Officer of the Public Health Agency of Canada. In this role, he is mainly responsible for overseeing and leading excellence and innovation in Agency science as well as to provide corporate leadership on science-policy issues.

In case of public health emergencies, the Chief Science Officer is leading insight and advice on strategies, collaborations and investments in response to the event.

The Chief Science Officer is well positioned to understand high-level inter-relationships between various programs and priorities. Epidemics, emergencies and disasters often bring pressures on various organizations to produce timely information to guide decisions making. In the population, information about epidemics may also elicit reactions of fear, stigmatization and polarization of opinions – in these situations, the flow of technical and risk based information is key to the success of the response. This is an area of high interest to the Public Health Agency of Canada and for Canada overall.

Prior to his current responsibilities, Dr. Michel held various cross-appointments with the academia and developed a publications record as author and editor of many scientific communications along with strong collaborations across Canada and internationally. In that regard, he cofounded a multi-sectoral research centre on zoonotic diseases and decision sciences, and built long lasting relationships at the United Nations in relation to the role of space technologies to improve global health outcomes.

B. Positions and Honours

Education and professional affiliations

- Doctoral degree in veterinary medicine (University of Montreal, 1987)
- Masters in Preventive Veterinary Medicine (University of California at Davies, USA, 1992)
- Ph.D. in epidemiology (University of Guelph, 1997)
- Licence in veterinary medicine in the province of Quebec, Canada (1987–current)
- Various academic affiliations Laval, Montreal, Guelph, McGill, and Sherbrooke universities (1997-2017)

Key functions in the federal public service

- 1997-2000: Veterinary epidemiologist, Health of Animals Laboratory, Agriculture Canada
- 2000-2010: Chief, St-Hyacinthe section and lead of the Population and the Environment program, Laboratory for Foodborne Zoonoses (LFZ) , Health Canada and Public Health Agency of Canada (PHAC)
- 2010-2012: Director, Populations and the Environment Division, LFZ, PHAC
- 2012-2014: Director, Public Health Risk Science Division, LFZ, PHAC
- 2014-2015: Senior science advisor to the ADM, Infectious Disease and Prevention Branch, PHAC
- 2015- Current: Chief Science Officer, PHAC

Recent awards: Queen Elizabeth II Diamond Jubilee Medal (2012); Public Health Agency Policy and Program Merit Award - Lyme disease Action Plan (2014)

C. Contributions to Knowledge Creation, Knowledge Sharing, and/or Knowledge Translation

P Michel has published more than 125 peer-reviewed publications in the area of food safety, zoonoses and epidemiological methods and supervised 17 graduate students. In 2005, P Michel was featured in the television series "*Les Éclaireurs*" looking at the professional and personal lives of several Francophone Canadian scientists. This series profiles 13 researchers whose work and discoveries help shape our lives.

D. Other Relevant Information

Innovative partnership initiatives

P Michel is the cofounder in 2000, of a multi-sectorial research centre focusing on the epidemiology of zoonoses (*Groupe de Recherche en Épidémiologie des Zoonoses et Santé Publique*, GREZOSP, University of Montreal). In this context, he has designed, developed, negotiated and implemented a set of partnership agreements linking the various universities with provincial public health and federal organizations. This has provided structure to establish formal linkages with the Public Health Agency of Canada, the Canadian Food Inspection Agency, and various provincial public health organizations with special engagement of the Provincial agriculture Ministry (MAPAQ) and the Quebec Institute of Public Health (INSPQ).

Since 2007, P Michel has led the work of the United Nations body, mandated to compile observations and promote international cooperation on leveraging space sciences to improve public health in developing and developed countries. Over this time, P Michel has worked with high ranked state representatives, drafted and delivered various official statements on this subject, tabled official technical reports and recommendations, organised international workshops and participated to various UN missions and international policy discussions. From this leadership, Canada has positioned an ongoing point on the agenda of the UN committee on the Peaceful Use of Outer Space on global health and contributed to enhance linkages between

the World Health Organisation and the UN-Office of Outer Space Affaire. In order to deliver on this mandate, P Michel established a formal agreement with the Canadian Space Agency to ensure common vision which also set the foundation to operational collaborations with PHAC on its response and research capacity using geomatics. This experience has provided tangible high level experience in international policy discussions, science diplomacy, the functioning of various United Nations bodies and has created bilateral opportunities with new collaborators around the world.

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Appl. #

Application for Funding – Budget

Funding Opportunity

Operating Grant: Canadian 2019 Novel Coronavirus (COVID-19) Rapid Research Funding Opportunity 2020-02-18

Applicant

Last Name	First Name	Institution
EARN	David	McMaster University

Financial Assistance Required **Year** 1

Research Staff (excluding trainees)	**No.**	**Salary**	**Benefits**	**CIHR**	**Other Funding Sources**		**Total**
					Cash*	**In-Kind***	
Research Assistants	0.0	$0	$0	$0	$0	$0	$0
Technicians	0.0	$0	$0	$0	$0	$0	$0
Other personnel (as specified in Employment History)	0.0	$0	$0	$0	$0	$0	$0

Research Trainees	**No.**	**Stipend**	**Benefits**	**CIHR**	**Other Funding Sources**		**Total**
					Cash*	**In-Kind***	
Postdoctoral Fellows (post PHD, MD, etc.)	3.0	$167,500	$38,500	$206,000	$0	$0	$206,000
Graduate Students	0.0	$0	$0	$0	$0	$0	$0
Summer Students	2.0	$5,000	$0	$5,000	$0	$0	$5,000

Materials, Supplies and Services	**CIHR**	**Other Funding Sources**		**Total**
		Cash*	**In-Kind***	
Animals	$0	$0	$0	$0
Expendables	$0	$0	$0	$0
Services	$6,000	$0	$0	$6,000
Other (as specified in the Details of Financial Assistance Requested)	$7,000	$0	$0	$7,000

	CIHR	**Other Funding Sources**		**Total**
		Cash*	**In-Kind***	
Travel	$8,000	$0	$0	$8,000
Total Operating	$232,000	$0	$0	$232,000
Total Equipment	$12,000	$0	$0	$12,000
Total Request	$244,000	$0	$0	$244,000

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Appl. #

Application for Funding – Budget

Funding Opportunity

Operating Grant: Canadian 2019 Novel Coronavirus (COVID-19) Rapid Research Funding Opportunity 2020-02-18

Applicant

Last Name	First Name	Institution
EARN	David	McMaster University

Financial Assistance Required **Year** 2

Research Staff (excluding trainees)	**No.**	**Salary**	**Benefits**	**CIHR**	**Other Funding Sources**		**Total**
					Cash*	**In-Kind***	
Research Assistants	0.0	$0	$0	$0	$0	$0	$0
Technicians	0.0	$0	$0	$0	$0	$0	$0
Other personnel (as specified in Employment History)	0.0	$0	$0	$0	$0	$0	$0

Research Trainees	**No.**	**Stipend**	**Benefits**	**CIHR**	**Other Funding Sources**		**Total**
					Cash*	**In-Kind***	
Postdoctoral Fellows (post PHD, MD, etc.)	3.0	$172,520	$39,655	$212,175	$0	$0	$212,175
Graduate Students	0.0	$0	$0	$0	$0	$0	$0
Summer Students	2.0	$3,000	$0	$3,000	$0	$0	$3,000

Materials, Supplies and Services	**CIHR**	**Other Funding Sources**		**Total**
		Cash*	**In-Kind***	
Animals	$0	$0	$0	$0
Expendables	$0	$0	$0	$0
Services	$6,000	$0	$0	$6,000
Other (as specified in the Details of Financial Assistance Requested)	$7,000	$0	$0	$7,000

	CIHR	**Other Funding Sources**		**Total**
		Cash*	**In-Kind***	
Travel	$23,000	$0	$0	$23,000
Total Operating	$251,175	$0	$0	$251,175
Total Equipment	$0	$0	$0	$0
Total Request	$251,175	$0	$0	$251,175

Human Resources

Surname	Given Names	Role	Hours / week
EARN	David	Nominated Principal Applicant	4
Janjua	Naveed	Knowledge User	2
Michel	Pascal	Knowledge User	2
Dushoff	Jonathan	Principal Applicant	4
Bolker	Ben	Co-Applicant	2
Carenini	Giuseppe	Co-Applicant	2
Li	Michael	Co-Applicant	4
Loeb	Mark	Co-Applicant	2
shi	chyun	Co-Applicant	40
Yeh	Jung Hui	Co-Applicant	4
Chng	Nai Rui	Collaborator	2
Jiang	Xingpeng	Collaborator	5

Research Staff $154,788

Independent Research Associate Chyun Shi will co-ordinate the human coding, qualitative analysis and the overall analysis plan. She has experience in social-science research, Taiwanese culture, advertising and journalism. [Accidentally tallied under trainees on the researchnet budget, sorry!]

Trainees $271,393

Post-doctorial fellow Jang is an experienced coder who will take the lead in the machine-learning part of the project.

We have also budgeted for a PDF with statistical and dynamical modeling skills. We have already begun this search; in the meantime Li will be able to dedicate part of his time to get the project started.

We have also budgeted $8K for part-time research assistance to help with validating codebooks and cross-coding texts.

Non-Consumables $18 000

We budgeting $6K per year to pay for data from Twitter and Weibo, via API, and from publishers via NexisUni

We budgeted $12K for the first year for computing resources. This should cover both the project back-end and computers for the Ontario-based postdocs.

Knowledge Translation $47 000

To enhance our ability to share information, we have budgeted for 4 open-access publications over 2 years at ~$3500 per article and two scientific meetings for up to three team members each to participate at ~$5000/per meeting.

Two team members will attend the annual CIHR meetings at a cost of ~$3000/per meeting.

We have budgeted $15000 to organize a group meeting after one year for researchers and knowledge users involved in the grant.