CANADIAN SCIENCE POLICY CENTRE

Featured Editorial Series
Volume 1, Issue 3
June 2020

Response to COVID-19 Pandemic and its Impacts

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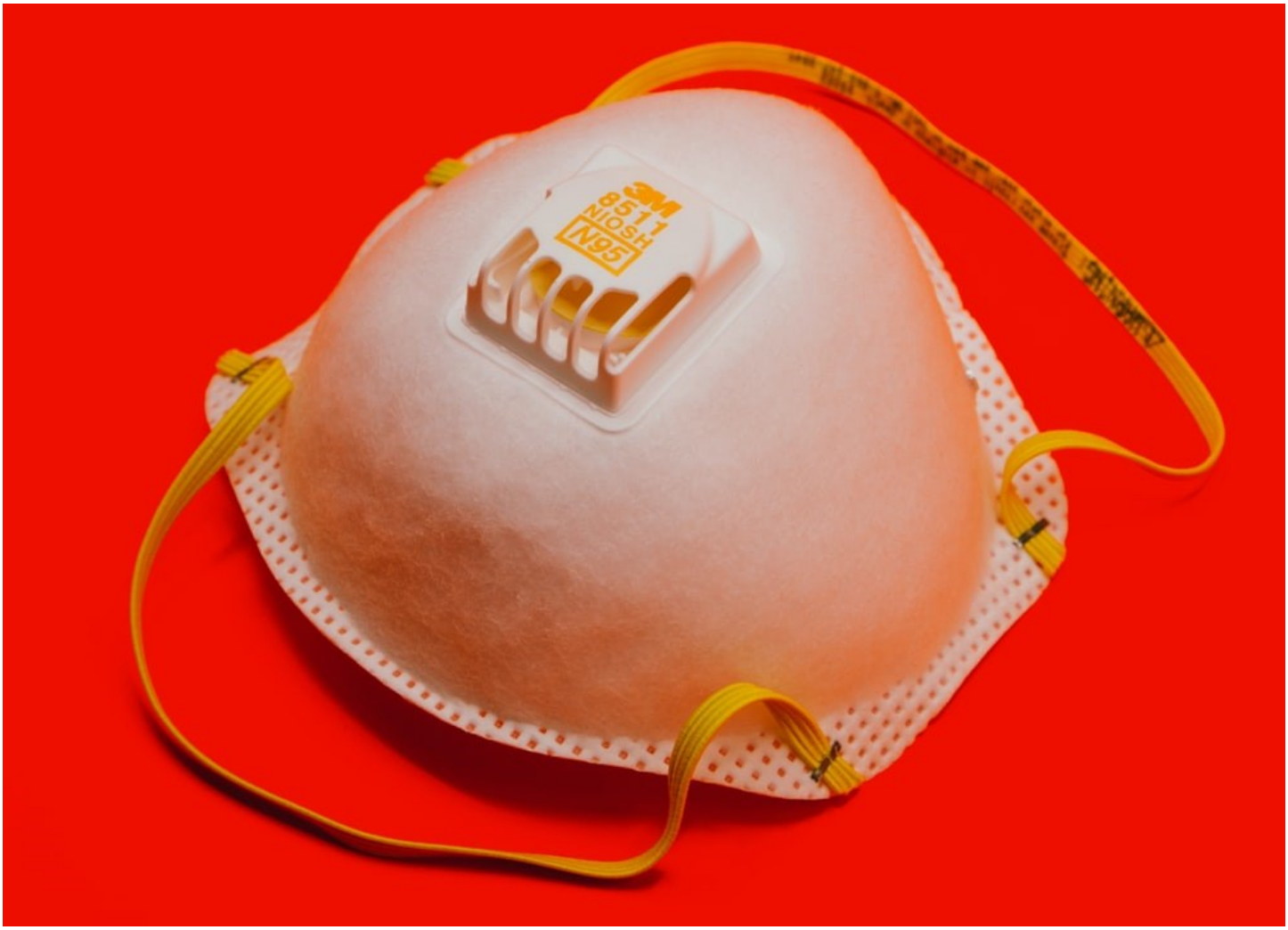

We know we have a problem, but what exactly is it? – A call for data collection on the Canadian food system in response to COVID-19

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The global pandemic has a disastrous effect on all aspects of our society – and our food system is no exception. On the surface, the food supply seems to be more-or-less stable, but it has caused considerable distress to many of us during this lockdown period.

We are left to wonder whether what we see reflects some fundamental feature of our food system that needs work. And, if so, what should we do about it?

In the supermarket, everything seems normal and some products even become cheaper in the fruits and vegetables section. But the Canadian potato industry recently declared a major crisis due to the shut down of dining establishments. Is this just because our entire industry is dependent on people eating French fries at restaurants?

Rationing measures apply for meat products in some stores, but farmers are now sharing heart-wrenching stories about having to euthanize their animals at the farm due to loss in demand. Is this at root caused by reduced capacity in highly concentrated slaughtering facilities – which are now hotbeds of coronavirus? The working conditions of these facilities are now under scrutiny. Is meat consumption now an act of both animal and human cruelty? Should we all stop eating meat?

In major supermarket chains, flour and yeast are hard to find. Robin Hood even had to change their packaging to meet the surge in demand. Is it just because all Canadians are now stress baking at home?

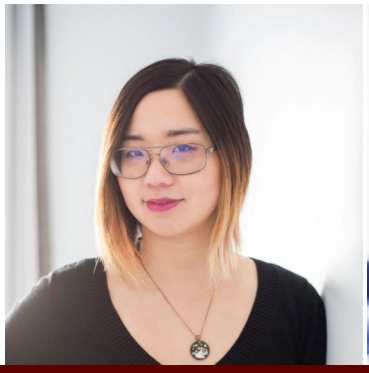
The shelves for pasta and related products stay barren. Is it only because Canadians are stocking up shelf-staple food? Walk to another aisle and all is well in the canned beans, vegetable, and seafood section. How do we explain this?

These days, more and more people talk about the importance of "supporting local" – including farmers and small food businesses. People talk about shortening the food chain as the way of our future. Is it really just "scale of production" and "globalization" that got us to where we are right now?

Some people think we need to break our dependence on purchased food. Interest in vegetable gardening is at an all time high as news media, such as the Global and Mail, are encouraging people to plant "victory gardens" to combat COVID-19. Will this help the country stay food secure? Could this be a remedy for our remote and vulnerable populations?

Even a simple question like "How are Canadians doing and responding?" elicit mixed responses. Some claim that they are eating better during this quarantine because not being able to dine out forces them to be more creative at home. On the other hand, others are deeply concerned about people who rely on school lunches and soup kitchens for daily nutrition.

It is very easy to say, "We have a problem". However, we know very little about what the problem is, let alone the extent and the significance of the problem.



What we are seeing these days are anecdotal observations and opinions, each carries some truth but does not represent the whole story. Personal beliefs, prior experience, and linear thinking very much dominate existing discussions on our country's food system.

Evidence-based policy making is all the rage in the pandemic response, but we continue to make decisions based on impressions anchored in fanciful stories. In the absence of real-time data, experts and policy scholars are making all sorts of recommendations, from asking people to just be patient and let things stabilize to urging people to buy local or go 100% self-sufficient. Look deeper and one will notice that none of these recommendations has any real basis in evidence.

With COVID-19, we now know how incomplete, low quality data can really hurt the nation's health. This too will affect how decisions are made within our food system. By now, it is apparent that what regular consumers are seeing is not what other stakeholders are experiencing. The knowledge gap makes it very difficult for the government to navigate the system – let alone pinpointing the issues that warrant intervention.

Statistics Canada is actively gathering data to illustrate COVID-19's impact on the economy and the society. The pandemic has triggered many Canadians to take actions that contribute to a greater good. Unprecedented time has created an unprecedented opportunity to collect useful data on how the nation's food system is functioning under stress.

It is time to move beyond the "we have a problem and here is this one solution to solve it" tactic and get working to really understand what is driving what we are seeing. We have the means but so far have not organized to use them. Recent digitalization within the agri-food sector has already fulfilled some of our data requirements as we are now generating accurate price and inventory turnover data. More is needed.

To this end, we strongly urge Statistics Canada to roll out a nation-wide survey to examine Canadian's food consumption behavior and how it changes in face of a pandemic. We also urge policy research institutes across the country to actively share information and put together data resources for future research and policy making. Coordination between private and public sectors within the food chain could provide vital evidence that will help reveal the deep roots of what we see at the store and give us a better chance to address the causes rather than simply respond to the symptoms.

Driving Canada's Economic Recovery Post-Covid-19 Through The Oil and Gas Sector

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The oil and gas sector could play a key role in Canada's economic recovery post the Covid-19 pandemic. However, the rebound of oil markets, innovation and government involvement will be crucial in achieving this objective.

The oil and gas sector contributes significantly to Canada's economy and well-being of Canadians. The energy sector accounted for 10% of GDP, $130B in exports, and over $70B in investments in 2018 (1). The sector also employs hundreds of thousands of workers in skilled and unskilled jobs. Over 95 percent of Canada's oil and gas exports go to the U.S., contributing to North American energy security. The availability of energy and other resources in Canada has contributed to the attainment of a high standard of living of Canadians, and has helped Canada develop a strong competitive economy, and deal with the disadvantages of a small open economy.

Covid-19 brought the world's economies to almost a screeching halt. Covid-19 resulted in unprecedented threats and challenges not only to health but to economies around the world, including Canada and the U.S., Canada's largest trading partner. Many businesses have shuttered, schools remain closed, job losses have increased and are in the millions, GDP has slowed, travel has become minimal, and working from home has increased substantially. For Canada, unemployment increased to 13 percent in April, and GDP dropped by 2.6 percent in the first quarter of 2020 (2, 3).

The significant drop in worldwide economic activity was felt in the oil markets quickly and dramatically. Oil demand fell by 29 million barrels per day or about 30 percent, down to the levels experienced in 1995 (4). Oil prices also plunged despite efforts by OPEC to shore up prices and at one point, prices went into negative territory due to lack of storage capacity to accommodate the glut in supply, as has never been seen before for an industry that is highly cyclical (5). The price for West Texas Intermediate (WTI) has




Recently recovered to U.S.$34/bbl but well below the U.S. $57/bbl in 2019. The U.S. Energy Information Administration (EIA) sees prices further improving to $43/bbl in 2021 (6).

The Canadian oil and gas sector requires relatively high prices to be profitable. The drop in oil prices dealt a significant blow to the industry that was already suffering in the last year. Canada's oil and gas sector, which is highly capital intensive, operates in a market-oriented environment and is a price taker. Prior to Covid-19, the sector was already experiencing regulatory uncertainty, reductions in investment, and environmental pressures, including reducing greenhouse gas emissions, lack of transportation capacity, and pipeline construction hurdles.

The Canadian economy and other economies around the world are beginning to open up with great caution. There is significant uncertainty as to when things will return to normal. A lot of hope is resting on a successful vaccine. Threats also exist of a second and third wave of the virus before a vaccine is found. Even if a vaccine is found, the view is that economies will not rebound overnight. Further, it is expected that working and schooling from home, and less travelling will become more prevalent. A slow recovery will likely result in only gradual growth in energy demand and oil price. Improvements in world oil demand and higher oil prices are crucial for Canada, given that it is a high-cost producer.

The oil and gas sector is highly innovative, investing significantly in research and development, and the adoption of leading-edge technologies. The pressures to innovate will become more crucial to lower costs in a competitively low-price market-oriented environment. Innovation will be important for addressing environmental issues including reducing greenhouse gas emissions, which will remain a public policy issue for the foreseeable future, notwithstanding that there has been a reduction in emissions due to Covid-19.

The government introduced various programs in the hundreds of billions of dollars, including the Canada Emergency Response Benefit (CERB), and Canada Emergency Wage Subsidy (CEWS) to help Canadians who do not have a paycheck, and businesses to retain their workers. The government has also introduced the Business Credit Availability Program to help businesses access credit (7). The Bank of Canada has also lowered its prime lending rate. The government has introduced programs to help specific sectors such as the oil and gas sector, which will benefit from $1.7B for cleaning up of orphan and inactive wells, and $750 million for a new Emissions Reduction Fund (7, 8). The government has also recently announced the new Industry Strategy Council to address the impact of Covid-19 on specific sectors (9). Government spending, due to Covid-19, could cause Canada's budget deficit to rise to $250B by 2021(10).

The oil and gas sector has historically provided a sustained contribution to the Canadian economy. The sector will be well placed as an engine of growth to help rebuild the economy, create jobs and drive economic prosperity. The sector also has projects ready to go (11). In this period of rebuilding and reviving the Canadian economy, it would be a good time to look at how the energy sector can create greater value for its resources and move up the value chain such as further developing petrochemicals; and also developing leading-edge sustainable energy technologies that can be used in the sector as well as marketed worldwide . It is opportune time to also examine the involvement in the sector through various forms of investments, direct incentives for innovation, and collaboration, which reflect synergies with other areas of the economy while, at the same time, maintaining a market-oriented policy focus in the sector.

References available in online version at https://sciencepolicy.ca/response-covid-19

Politics, Science, COVID-19: Where Does It All Intersect?

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The current COVID-19 crisis underscores the need for effective communication and advocacy efforts by the scientific community. The devastating spread of the SARS-CoV-2 virus was followed by an unprecedented social distancing campaign. As a result, Google's report of Canada showed a decrease in mobility trends in public places such as transit stations (-67 %), retail & recreation (-63 %), and grocery & pharmacy (-45 %) by April 5th [1]. This campaign seems to be working: the number of new COVID-19 cases is on a downward trend since its peak at 1,554 cases on April 2nd [2]. While the pandemic is far from over, the preliminary success of the social distancing campaign demonstrates how science, together with politics, can lead to social good.

Public (Dis)Trust in Science

The past relationship between science and the public has been complicated. There are portions of the public that reject scientific evidence, resulting in grave consequences, such as the measles outbreak in 2019 fueled by the anti-vaccine movement. Public distrust of scientific evidence shapes politics: despite the scientific consensus on climate change, the public debate remained around its dismissal. As a result, elected policy-makers have been slow to answer to the urgent call for action. Recently in the U.S., many citizens held protests against government-mandated lockdowns despite the large number of COVID-19 cases [3]. The public calling for scientifically-ill-advised decisions may prove to be deadly.
Interestingly, while hesitant to accept the scientific evidence, the public nevertheless has confidence in science itself. While many believe scientists to be biased and elitist, nine out of ten Canadians trust them and wish to learn more about science [4].
However, science is failing to fulfill the public's desire for knowledge. For an ordinary individual without a subscription or an institutional affiliation, many journals remain inaccessible. Moreover, the difficult scientific language comprehensible is only to selected experts in the field. Lastly, with the vast literature that contradicts itself many times during its development, science does not easily grant a sense of grounded consensus to a truth. In obtaining the scientifically-sound truth, one requires 1) easy access to the scientific literature, 2) the knowledge to process the complex information, 3) rigorous research skills and vast efforts to gather consensus from numerous scientific results. This is a tall order for ordinary individuals, and scientific truth remains largely inaccessible. The gap between the desire and the inaccessibility of knowledge is inadequately fulfilled by the mass media. The uninformed public, disconnected from the present sea of scientific evidence, is easily manipulated by misinformation leading to devastating political consequences.

Science's Place in Society

On April 2nd, Canadian Institutes of Health Research (CIHR) canceled the Spring 2020 grant competition as a result of the COVID-19 pandemic [6]. The result was an uproar from academics on Twitter, with many fearing the potential obstruction of groundbreaking research. Many criticized the lack of transparency and sufficient consultation with researchers in the

decision-making process, protesting that it reflects Canada's lack of focus on scientific research. This announcement comes as the Government of Canada invests $54 million to support 96 COVID-19 research projects [7]. During a critical time for science, the government's contradictory decisions undermine Canada's commitment to foundational scientific research.

In a recent article published by Nature, the continuity of future funding in Canada is called into question [8]. According to Jim Woodgett, Koffler Director of Research at the Lunenfeld- Tanenbaum Research Institute in Toronto, CIHR was the only grant agency that cancelled a competition in progress. Many criticized the actions of CIHR, noting that the U.S. National Institutes for Health switched to an online platform within a week; CIHR's lack of ability questions its capacity to support remote IT solutions.
Perhaps Canada will follow France's investment of €5 billion in a research fund over the next 10 years to bolster science. President Macron said, "the COVID-19 crisis reminds us of the vital nature of scientific research and the need to invest massively for the long term", while Frédérique Vidal, Minister of Research and Innovation, stated that the investment is, "an unprecedented effort to support the scientific community and its essential work" [9].
Science influences politics, and politics influence science. Governments must invest in the advancement of scientific knowledge, build relationships with the scientific community, and reach an understanding of the role of science in every-day life. The scientific community must find ways to actively engage with the political environment. Media facilitates the flow of information to the public; scientists must use the media as a platform to explain crucial findings in simple terms and actively use scientific knowledge for political advocacy. Many should consider participating directly in politics themselves. While science is not partisan, it is easily corrupted in politics: its survival depends on the collaboration between the public, the scientists, and the governments from all stripes.

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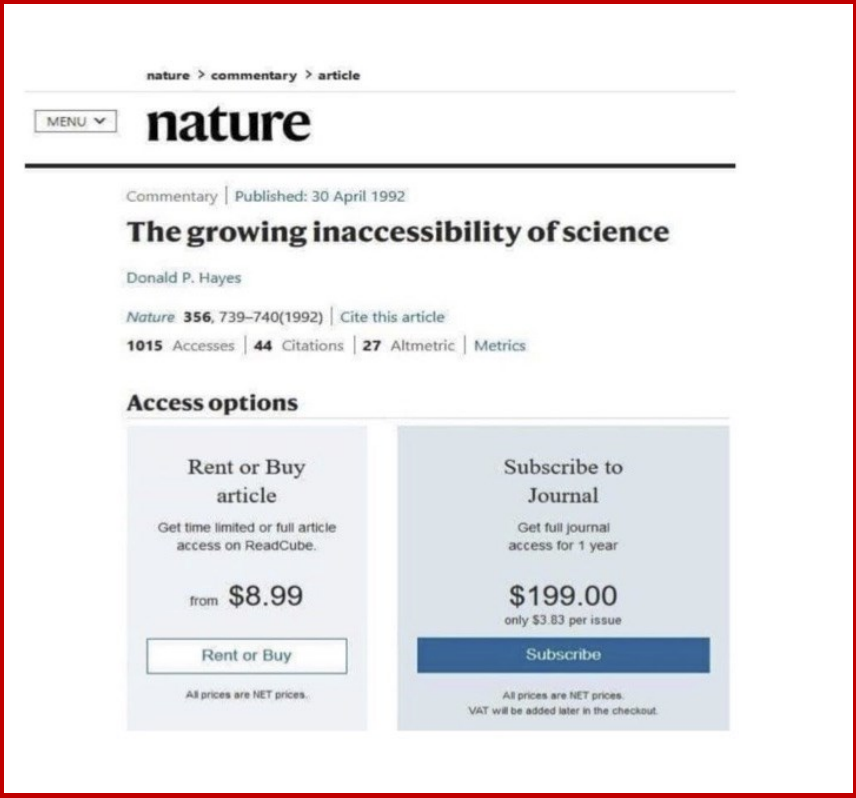
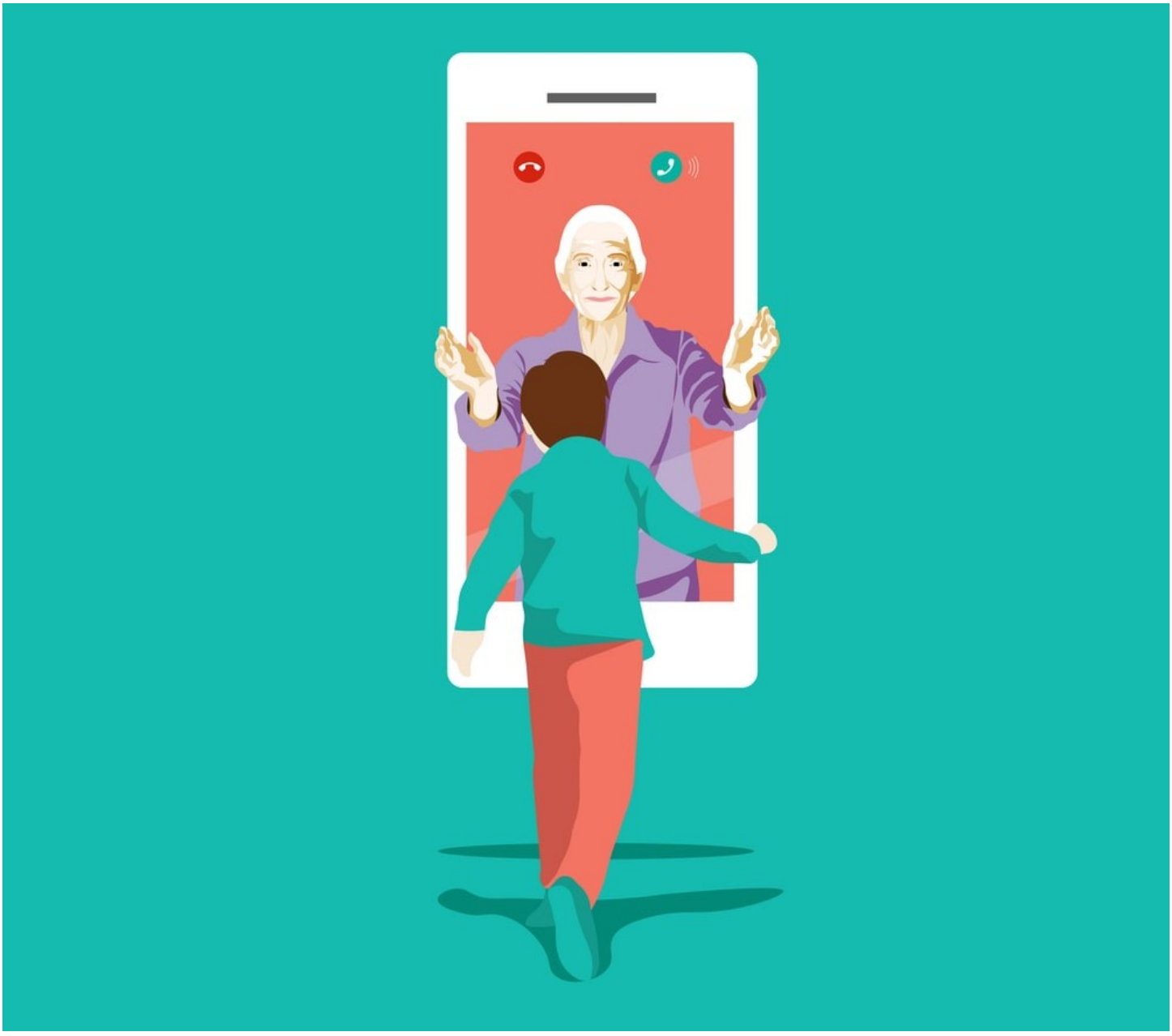


Written in 1992, "The growing inaccessibility of science" investigated how science became increasingly difficult for non-experts to understand [5]. Now a free article on Nature, it would have cost $8.99 USD to read about the inaccessibility of science. Ironic, isn't it?

Social Impacts



The pandemic will not invalidate business and management degrees, to the contrary…

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As the Covid-19 pandemic has spread across the globe, so has the numerous news headlines on its devastating effects on the global economy. While in March it was reported that the pandemic could cost the global economy $2.7 trillion [1], another headline in mid-May revised that figure to $8.8 trillion[2]. Similarly, much has been speculated in the media about the demise of globalization due to the pandemic. One of the consequences of such headlines, we have observed as professors within the larger business and management fields, is that our students are increasingly believing that their undergoing undergraduate and postgraduate studies will lead to irrelevant or invalid degrees in a post Covid-19 world.

Indeed, world flows of foreign direct investment (FDI) have dipped significantly[3] since the pandemic started and some protectionist measures have emerged in sectors like healthcare, medical supplies and agriculture. Governments have deployed these protectionist industrial policies to reduce dependence on imports and ensure sufficient domestic capacity in case of another outbreak or of a looming penury. These are now the newly strategic sectors of most world economies but also, we argue the exceptions for such interventionist and protectionist measures. Thus, while the Covid-19 pandemic has prompted some aspects of globalization to slow down, people, governments and businesses everywhere are using the very tools of globalization – those based on information technology and communication - to stay connected and informed. In fact, Covid-19 related R&D collaborations between countries, research organizations, and companies are being sustained through these very globalization tools[4].

One expected shift from this pandemic is some or considerable FDI flight from China[5]. These fleeing multinational enterprises and their investments will most likely be funneled to other countries and regions once the global economy begins its path to recovery. This implies a fresh wave of globalisation and investment that could benefit other developing economies in South and Southeast Asia, Central and Eastern Europe and possibly in Central and Latin America as well.
We have in common our research and teaching interests on the intersecting fields of innovation studies and economic/international development. Thus, we often find ourselves teaching our students that the world is made up of advanced countries, catching-up countries and falling behind countries. The successful potential "candidate countries" for this redirected FDI from China, we argue, will mostly be to catching-up countries and among other things largely determined by their institutional environments and national capabilities. Indeed, the pandemic has already triggered increased competition for attracting FDI by these candidate countries. UNCTAD reports that the crisis has boosted several countries to implement new administrative procedures to attract FDI including Myanmar, Serbia, Thailand, Lesotho, Guatemala, Cameroon, Iraq and Cuba[6].

While on the other hand, we also fear that some falling behind countries in sub-Saharan Africa, in Central and Latin America and South Asia may become even more marginalized in the aftermath of the Covid-19 pandemic.

It is amid these new, challenging and some albeit alarming trends that business and management graduates and professionals will use their specialized knowledge to contribute to the recovery of the global economy. Businesses and countries, alike, are having to repurpose their models to deal with the new global economic, health and safety realities. Apart from having to navigate forces such as protectionism, business executives will need to leverage their knowledge on rationalizing cross-border activities, adapting and changing business models and supply chains on short notice in view of changing demands (for example Tesla producing ventilators with car parts) in order to maintain and sustain profitability.

While changing business models to produce products that are similar or simpler to their core activities may not entail much chaos, those businesses that are compelled to radically change their business models will face much more chaos. At HEC Montreal, for example, in addition to our trilingual degree programs (English, French and Spanish) we offer international business courses which when realigned with these new realities, will better prepare students for the demands of cross-border businesses during and post the Covid-19 pandemic. The courses will provide students with the knowledge on rationalizing global supply chains as they become more diversified, adapting their international business models, evaluating internationalization strategies, evaluating entry modes and country competitiveness under crisis and dealing with the emerging realities of a Covid-19 world. They also provide students with the knowledge on the ways in which countries and firms will build capacity and knowledge from within and innovate to deal with "this new normal".

The Master's course, "Multinational Enterprises, Industrialization and Development" designed by Dr. Jahan Peerally, for example, now addresses how the candidate countries mentioned above, and even countries that have so far been left behind or fallen behind can capitalize on this new normal to leverage and upgrade their capabilities in order to attract the FDI that is leaving China. Multinational enterprises will choose host countries with better institutions because their home country regulators and global investors will expect certain standards when it comes to environmental, social and governance factors.

The courses on "Innovation Process and Management" and "Globalization of Innovation" taught at Saint Mary's University at the Master's on Technology Entrepreneurship and Innovation were designed by Dr. Claudia De Fuentes. She now focuses more on equipping students with the knowledge and skills required to observe and identify problems and societal needs, and contribute with the creation of innovative solutions to respond to the pandemic's effects on societies and the global economy. These courses also address the need to source knowledge not only from local settings, but additionally to identify potential sources of knowledge in a global context.

In terms of the knowledge and skills that our future leaders will require, these will focus on developing an aptitude linked to observation and networking of facts and ideas, so that they can identify potential threats and challenges. Courses will need to be realigned to stress this teaching objective. Moreover, as employment markets contract and larger enterprises downsize, graduates and professionals will more than ever need to rely on a combination of their flexibility, experiences, aspirations, entrepreneurial flairs and acquired academic knowledge, to react fast and launch start-ups and other solutions that attend to the nascent social and economic needs and challenges in the post-pandemic years. Both theory and history have shown that we will need collaboration and engagement to respond quickly to these new emerging challenges. Is it not within an academic setting that students learn about collaboration and engagement?

Our societies will also need leaders that are more inclusive in nature. The current pandemic has shown that Covid-19 is spreading more rapidly in neighbourhoods and cities where inequality is more prevalent. What does that teach us - the teachers? That in a complex and interconnected world, academics and scholars need to pedagogically provide students and future empowered employees, leaders, business

owners, and policymakers with the skills and capacity to generate change, but a change that is inclusive.

These trends will put a lot of pressure from within countries and businesses alike, and both with rely on talent with international business, innovation and entrepreneurial expertise and knowledge in seeing the larger cross-border picture and links between economic and innovation systems. This talent will be needed in the public, private and third sectors of the world economies. Companies, policymakers and capacity and capability building local and international institutions will need to strike a new balance with a broader range of stakeholders, and pay more attention to workers, the local community and the environment. More than ever, practice needs to inform policy and vice versa. Advanced countries' governments, whether it is the Canadian government, or the various EU governments, will not only need to re-evaluate and recalibrate their own policies to survive, but they will also need to re-evaluate their foreign policies, especially their international development and aid policies for years to come to address the exacerbated challenges of falling behind countries. The latter is also true for international institutions axed on capacity and capability building and inclusive development. These mandates require a workforce across the developed and developing world that is well versed in all aspects of business and economic organization at all levels. The pandemic, we predict, will not invalidate business and management degrees, to the contrary, it will require their strengthening and stronger collaboration with other disciplines to seek solutions to complex social problems and grand challenges.

References available in online version at https://sciencepolicy.ca/response-covid-19

COVID19 – Let's Not Forget the Humans

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As Canadian expats in Austria, one of the things that has particularly struck my family and I is the orderliness with which the country is dealing with the pandemic. As quarantine policies were put into place, we saw panic toilet paper hoarding in other countries, but here in Austria people were (amazingly) compliant and seemed to obey instructions and timelines provided by the authorities. We never worried about our basic needs. Grocery stores were always well stocked, public transit was always there and on time - and masks were readily available when required as a physical barrier to protect others.

Expert opinions, governments, and publics are making it clear that there is no one-size-fits-all solution to this pandemic. What works in Austria might not work for South Korea; and likely not even in other parts of Europe. Consider the Canadian landscape. There is huge variation in sociopolitical and cultural dynamics between and within provinces and territories. What works for some parts of Canada (virtual homeschooling, grocery shopping) is impossible for others (Canada's North). Cultural norms (multigenerational living, child/elder care) vary across the vast landscape. The "At Home on the Land" initiative - aimed at the particular needs of Indigenous communities is an example of a culturally-grounded way to address the pandemic. Finding solutions isn't always as intuitive as we might like.

Humans tend to look for the easiest way out – we want simple solutions to complex problems. We don't seem to want to think about the problems, we want them to magically disappear. And thinking "outside of the box" isn't always appreciated. Hand washing, clean water and the advent of antibiotics have made enormous leaps in our ability to tackle public health outbreaks – significant results. Where the bubonic plague is estimated to have killed 30-60% of Europe's population in the Middle Ages, modern outbreaks are now quickly identified and contained (were you even aware of the 2017 outbreak of the bubonic plague in Madagascar?). Understanding transmission routes has significantly impacted public health outcomes. The identification of tainted water as a vector for cholera transmission by John Snow led to the advent of modern epidemiology. But, as we find solutions to larger challenges, those that remain are more complex with increasing numbers of variables making solutions harder to come by.

There is some global agreement: lots of testing, quick results/containment, use of masks/physical barriers for community protection, social distancing, data collection. However, certain measures work better in some jurisdictions than others. What policies and practices are working and why are they working in these contexts? What is applicable in different contexts?

Our current global situation has reminded me of a presentation I saw on the 2014 Ebola outbreak

(Professor Melissa Leach, IDS), and how important it is to remember the human factor in crises. She discussed how the key elements that made the Ebola pandemic so persistent - despite the best efforts of global public health engagement - was due to a failure to understand how historic context, trust, cultural dynamics played into the spread of the virus. Those providing interventions did not appreciate how historic context (i.e. post-colonialism, slavery, medical testing scandals) and mistrust in the intentions of Western interventions factored into the willingness of the local population to accept the solutions provided. Awareness of social structures, influencers and leaders, and co-creation were also important to developing solutions that would be adopted by affected communities.

Evidence is more than the numbers of tests, infections, and

deaths. It is understanding the social context of communities, society writ large, and how they interact within and between. It's about understanding historical context and how it feeds into local culture, social interactions, and trust relationships. It's about community dynamics, power struggles, and the struggle for some to meet basic survival needs. It's about the timing of decision-making, political landscapes, and different ways of leading. As with many of our global challenges, it's a complex and multifaceted systems problem – in which the human factor is a huge driver.

As we strive for solutions to this global crisis – bring on innovation, research, and science funding. We will need these – but please, also bring along those who study the complexity that is humanity: epidemiologists, anthropologists, economists, ethicists, political scientists, sociologists, futurists, etc. In an era where evidence is being questioned, fake news is rampant and anti-science sentiments are strong, it is crucial that we remember that one piece to engaging with this and the world's other wicked problems is our relationships with our communities - the ones we are trying to protect. Public trust, built on understanding of the importance of human dynamics is key to broad acceptance and uptake. Solutions need to be palatable to society, or they won't be adopted.

As we focus on the virus, let's not forget the humans.

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Connecting during COVID: How museums are rethinking engagement in a time of physical distancing

On Friday, March 13, 2020, amidst an intense swirl of COVID-19 news, Ingenium employees received word that they should take their working files and laptops home, and prepare to work remotely. That night, our three museums — the Canada Agriculture and Food Museum, the Canada Aviation and Space Museum, and the Canada Science and Technology Museum — shuttered their doors to the public. The following Monday, we began to take stock of our new reality. What would these developments mean for Ingenium and its museums for the foreseeable future?

As science museums, our overarching role is to act as a bridge between science and society. Grounding ourselves in physical spaces, our institutions offer a safe and inclusive place for people of all backgrounds to identify with science, better understand its impacts, and make sense of the world around them.

The strength of museums lies in our in-person engagement. At Ingenium, we offer interactive exhibitions, programming, and outreach to provide informal learning opportunities. Suddenly, in a world changed by COVID-19, our physical spaces are now off limits. Like many other institutions, Ingenium quickly recognized that the Internet is now the main venue for engaging with our communities. So how are we adapting our approach to connecting with our audiences, and how is this driving the evolution of our role as a bridge between science and society?

Recognizing the major social challenges we are collectively facing has helped us identify three main strategic directions:

- Helping our audiences understand the science behind public health policy;
- Supporting parents/guardians and teachers in the delivery of virtual science learning; and
- Fostering a strong sense of community across Canada.

Demystifying the science behind policy

Globally, museums have the responsibility and privilege of being accessible and trusted sources of information across a broad spectrum of audiences. As a result, Ingenium — and the greater informal science learning community — are well positioned to help our audiences navigate difficult topics.

In this time of crisis, the role of museums as a conduit to information is more relevant than ever. Our audiences are inundated with public health information, some of it from official sources, some highly politicized, some completely false and damaging. It can be difficult for anyone to identify reliable and fact-based information online. In the midst of the information jungle, Ingenium has made it a priority to serve our audiences by distilling complex public health concepts — and their implications — into easy-to-understand information, presented in an engaging and empathetic format.

Science at home

Parents, guardians, and teachers accustomed to a structured weekday school schedule, plus visiting museums and science centres for entertainment or

education, must now engage their children in full-time learning at home. Ingenium's museums are stepping firmly into the role of educational support by providing topical and fun at-home resources.

Museums have a wealth of programming content meant for in-person interactions. In response to the crisis, Ingenium — in collaboration with other institutions — is digitizing and reformatting these experiences into products such as videos, articles, and how-to guides, allowing us to deliver our resources to our community through websites and social media.

As museums, we need to make educational opportunities accessible to all people living in Canada, regardless of their background and abilities. In the current global context, this goal has not changed; if anything, it has become more crucial. Now, we're challenged to consider how we can best implement an inclusive digital strategy — to reach those without Internet connection, linguistic minorities, people with disabilities, and people in precarious economic situations. The strategies and relationships developed during this adaptation have the potential to have a lasting impact on the inclusion of these communities.

Community building and support

A museum is more than a place to learn; it is a place of belonging. Within the walls of our museums, people find community and friendship. In the wake of COVID-19, with strong physical distancing measures in place, there is an even greater and immediate need for human connection. As a result, Ingenium's approach to social media has expanded its focus, becoming a tool for nurturing positivity and bringing people together. Our online content also aims to empathize, to share our humanity — our joys and our frustrations — and find togetherness despite our physical distance. It's not easy to adapt our public offerings in the context of such large-scale social change. By communicating our own challenges and solutions, we become a role model for others trying to cope.

The element of community building is also occurring within our industry. Museums, science centres, and other informal learning organizations are looking to each other for support, bringing about immense creativity and collaboration. Through new networks, our sector is sharing challenges, ideas, and approaches with the common goal of fostering belonging and inclusiveness for our audiences and peers.

Responding to evolving needs

The global pandemic of COVID-19 highlights the critical and important role museums and cultural industries play in our society. Our goals have not changed; in fact, stepping up to them has become even more crucial. What has changed is our context and delivery.

In our shift from a primarily physical space to a primarily digital one, our initial response was to provide the necessary resources quickly. Going forward, we must work closely with our audiences to ensure our strategies are responding to their evolving needs. This means close collaboration with advisory and advocacy groups, community services, and the public is critical. In this way, COVID-19 has provided an opportunity to realize our mission in novel ways.

It's also important to recognize our own changing needs. As museum employees, we are also living through this pandemic. There are limits on our time, our tools, and our mental capacity while managing stresses, families, and various needs. While we may be limited as individuals, we have found empathy and support in our communities.

When the doors open again, the tools and connections we have built will continue to inspire new ways of engaging with our audiences, partners, colleagues and peers. But for the moment, this is a world of trial and error, where experimentation may not have the desired results. However, this should not deter us; failure is a wonderful driver for innovation.

Ingenium
Canada's Museums of Science and Innovation
Musées des sciences et de l'innovation du Canada

Dr. **Tamara Franz-Odendaal**

Full Professor, Mount Saint Vincent University

NSERC Chair for Women in Science and Engineering (Atlantic Region)

How COVID-19 measures are impacting women in academia

There has been some media attention on how COVID-19 is impacting working parents. This editorial focuses on the impact on women, particularly the impacts on academic female faculty. As a Full Professor at Mount Saint Vincent University, I run a medium sized research laboratory, comprised of six trainees, and an outreach program. I am not currently teaching, unlike many of my colleagues. I am a mother. I also hold the NSERC Chair for Women in Science and Engineering (Atlantic region) and many female academics who are struggling at this time have reached out to me. Social distancing is not the only challenge for us. Most of us are dealing with multiple unprecedented responsibilities, which are having a cumulative and significant effect on our careers and our mental health and wellness.

Women are most often the primary caregivers at home. They are the people who children run to when they need help or don't feel well. Women are also taking on the brunt of home schooling. Female academics are doing all this while also trying to teach their courses online (often for the first time) and trying to maintain some semblance of research productivity. Both of these mean supporting and engaging with our students. Single mothers face additional challenges as there is no second person to share their childcare and homeschooling responsibilities - yet they are still expected to teach online and to do research like all other faculty.

Teaching, research and service are how academic workloads are described and all three are required to be fulfilled. Some married women have reported that their non-academic partners have been told to report to work, leaving them to manage all these responsibilities themselves. Employers should be asking employees if they have child-care support at home before calling them back to the workplace and should not assume that their wives are available. Families that have lost loved ones during the last few months are additionally impacted. Women that are pregnant have concerns about their pre- and post-natal healthcare and, about how their deliveries will be handled during the pandemic. Individuals who are immigrants or permanent residents in Canada are far away from their extended families; watching from the sidelines as their native countries battle with COVID-19. While both men and women face some of these challenges, the majority of women are facing multiple such challenges all at the same time – a young family, teaching online, trying to do research, dealing with loss of a family member – the impacts of this on one's mental health and wellness are huge. Not to mention, if you or any of your children have medical or mental health issues of their own or require specialized care or are disabled. The challenges keep coming.

The need to maintain research productivity is important for an academic because it directly affects one's ability to obtain promotion and job security. Individuals who are doing the above mentioned roles (home-schooling, child care etc) while also conducting the required academic work (online teaching, committee work), are unable to attend or present at the virtual seminars and conferences that have sprung up and which are essential for maintaining one's connections within the research community. Finding the time to read or write research articles or grant applications is impossible with young children at home who are requiring your attention. Therefore, it is not surprising that the research productivity of female faculty is and continues to be significantly

impacted by the COVID-19 measures that are in place across the country. Indeed data has emerged that the number of manuscripts submitted by female authors has declined compared to those by male colleagues since the start of the pandemic.

Researchers who depend on trainees to conduct research in a science laboratory are impacted differently than researchers in other disciplines. We have no alternative options to be able to continue to do our research. We simply cannot collect new data, and many types of laboratory analysis rely on continuous production of data from new experiments. We do not have a supply of existing data to analyze. Furthermore, like many other science researchers, I have trainees dependent on me for funding to support their living expenses.

Not engaging in research impacts one's future ability to secure research grants; these grants support scientific discoveries and train future scientists. Some granting agencies have provided extensions to research grants (sometimes with funding), which alleviates the pressure to maintain a "normal" research productivity during this time, however this does not ease the burden on trainees. While financial support to trainees is expected to come, we are eight weeks into the pandemic and the impacts are getting more significant with each passing week. A lower research productivity directly influences one's ability to obtain tenure (permanence) and promotion within academia since research is one of the major criteria that is evaluated by Tenure and Promotion Committees. While some universities have granted faculty the ability to delay their tenure and promotion, the individuals who may want to take this option are likely to be mostly women. Anyone taking this option will then be a year behind their colleagues in terms of securing permanent employment and/or promotion. With promotion comes an increase in salary. An alternative solution would be to encourage individuals to apply for promotion on their current track and then ask the Tenure and Promotion Committees to take into consideration how the pandemic has affected the candidate. Candidates should be allowed to explain this impact in their files as every individual's situation will be different.

I hope that employers will start to recognize that the impacts of COVID-19 are different for women than for men and that they should work with individual employees to find the best solution that works for their households without making assumptions about their current situation.

References available in online version at https://sciencepolicy.ca/response-covid-19

Fighting Misinformation in the Face of COVID-19

Anton Holland
President and CEO of NIVA Inc

It was pretty clear from the outset of the COVID-19 crisis that one of the main victims of the situation would be clarity. Credible, consistent, and understandable information—the kind needed to guide the actions of citizens in the fight against the coronavirus.

The situation is constantly changing—information about how different populations are being affected, what we know about how the coronavirus behaves, the ways in which it affects different people, what we need to do to keep people safe as they go about their daily business—and this means that messages from experts are continually being revised too. What makes things even more complicated is that all of this information, both good and bad, is coming at us from all angles and inundating our ability to process it, like a tsunami.

The World Health Organization coined the term "infodemic" to describe the situation, where an excessive amount of information concerning a problem like the coronavirus is flooding all forms of media, such that communicating a solution is made more difficult. It's like trying to drink from a firehose instead of a water fountain. One wrong move, and who knows what you'll be choking on.

The science changes all the time. That's what science does and that's how we find solutions to problems. At no time is there a static list of facts that allow us to communicate immutable guidance on how we should act. As the science evolves, the guidance evolves right along with it. The problem is, there's a wide swath of the public who may want to trust scientists, but they just don't understand how science works. To be honest, it's no wonder the average person is confused.

I should wear a mask because it may help people around me. I shouldn't wear a mask because it may increase my own risk of infection.

Only people probably infected with the virus should be tested because supplies are limited. Everyone should get tested if we're going to keep the spread in check.

If you've had a mild case of the disease, you'll probably be immune once you recover since that's how viruses work. We don't really know for sure how immunity is conferred to people who have had the coronavirus...

Many people have a difficult time dealing with uncertainty and the way it's presented. Many more don't know how probabilities work. Still others are generally receptive to science-based messages, but are confused because the processes behind scientific investigation are a mystery to them. They've heard that science is about finding out the truth, but if the science keeps changing, does that mean our foundations for truth are malleable too?

If new information from trusted authorities isn't put out at a rate and at a volume that keeps up with the evolving nature of the problem, a dangerous and constantly growing void is established. A void that's filled by misinformation, conspiracy theories, myths, and outright lies.

Day in and day out, scientists, public health officials, and other trusted authorities are talking about the coronavirus, and just about everyone in the news media is talking or writing about it too. Plenty of good, trustworthy information does exist—the facts, to the best of everyone's knowledge, are out there.

Most people want to believe factual information from reliable sources, material that will help to keep them

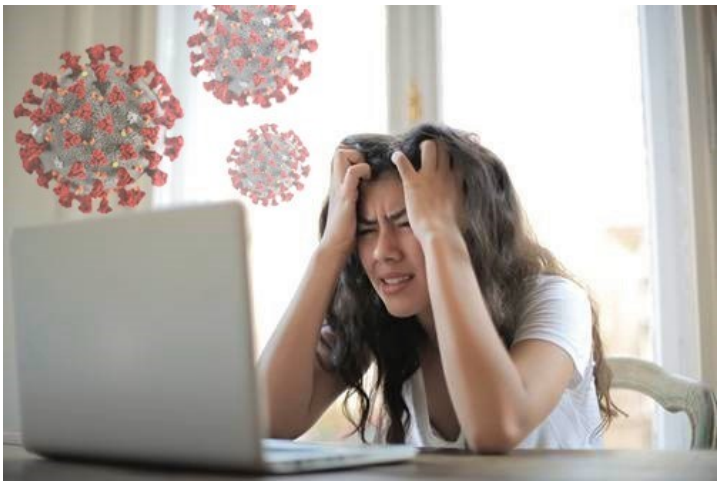
healthy and safe. But if they encounter that void—the gap that exists between the facts put out by scientists and public officials and the flood of misinformation they are exposed to on social media (and often echoed by those around them), then the door is open for that misinformation to take hold.

There's a certain type of person that buys into conspiracy theories. People who are often angry, less trusting, and who see connections where none exist. And a lot of them are effective at building narratives that use just enough real information to make their wild stories seem believable at first blush to other people who are less mindful of critical thinking. People who are genuinely trying to fill that information void because they're scared and don't know what to do. It gets them thinking: "this could happen, right?" And just like the coronavirus, a conspiracy theory becomes an infection that is hard to get rid of.

A recent study by Carleton University's School of Journalism and Communication found that 57% of Canadians say they are confident that they can "easily distinguish conspiracy theories and misinformation from factual information about COVID-19." However, a quarter of the study's survey respondents believe a widely discredited conspiracy theory that the coronavirus that causes COVID-19 was engineered as a bioweapon in a Chinese lab and released into the general population. A quarter of Canadians also believe the hyped and unproven claim promoted by U.S. President Donald Trump that drugs such as hydroxychloroquine are effective in treating COVID-19 patients.

But what's really concerning is that among those who believe the bioweapon theory, half are also in the camp that says they have no problem recognizing conspiracy theories. It underscores just how insidious the spread of misinformation and conspiracy theories really is.

Trying to change the mind of a hardcore conspiracy theorist is largely a wasted effort. But there's a lot to be gained by engaging the people they are trying to infect. Most people want to do the right thing and believe real facts—they just need to be nudged in the right direction. With the right messaging, the general public can be steered towards information that benefits themselves and the rest of us.



Use some empathy to understand their position. That way you'll build much needed trust. Provide them with facts from independent sources, those that can be verified and are not just based on what one person said to another. Try to get people to use their critical thinking skills whenever they encounter this information. If a person is just sharing misinformation because someone they know sent it to them, or because it sounds believable, those people can just as easily be encouraged to share content that is actually helpful.

But the situation can't truly be rectified unless public health organizations take a much more direct approach to putting out the right information, at the right time, in ways that ensure the broadest possible audience can understand it. Taking tips from the marketing world isn't a bad thing either—it might just provide the means to get this done. Public health organizations need to coordinate their messaging, and broadcast it repeatedly, at a high volume, with every tool at their disposal. Drown out the noise. Get ahead of the problem, rather than just reacting to it. One of those important marketing tips? *If you don't write your own narrative, someone else will.*

Much of the discussion about misinformation is done from a distance, with many of us commenting on what a terrible state of affairs it has created. But each and every one of us reading these editorials has a responsibility to ensure that bad information is stopped in its tracks.

One of the most popular hashtags of the COVID-19 era is #AllInThisTogether. That doesn't just hold for flattening the curve—it's essential for halting the spread of misinformation too.

Coronavirus shining a spotlight on homo sapiens

Noushin Nabavi, PhD
Mitacs Canadian Science Policy Fellow

I am a scientist who has learned to not speak when tried and tested evidence of my carefully measured experiments and observations are not available. This pandemic lockdown, however, has fascinated, frightened, and bewilderingly amused me into the following thoughts. You could call them rants, meditations, or just insights received from the serendipitous universe. I thought instead of having to convince, debate, discuss, or converse with friends and family, I can reflect on the broadening horizons while we race to win against the virus as one race.

The global coronavirus crisis, even though very unfortunate in its manifestations, has united communities worldwide in our post-modern era like no other event in our lives. It has reminded me, personally, that humankind's capacity to innovate and adapt is remarkably astounding, and perhaps unlimited. It has also gently brought me back to the cradle and a forgotten childhood innocence, nudging thoughts that geopolitical demarcations are increasingly meaningless. That race, power, money, gender, religion, status, and color of skin cannot put a limit on the vast resilience and adaptive abilities of Homo sapiens. A reminder to go inside when I can't go outside, to witness and acknowledge the vast horsepower of our collective thoughts and actions. The invisible mighty virus has shown me that I had grown quite comfortable with my status quo. I greet this gentle invitation to witness my limits, or lack thereof. I welcome this push out of my comfort zone as a call to think, speak, act, and, perhaps, love out-loud. Time is ripe, bleak, and painful, while space is filled with seeds of realizations.

I write to share and hope that the opportunities that this grand pause is affording us don't go wasted when our busy lives resume after COVID19. We ultimately empower a sustainable change in our very being, one that goes in the woven fabrics of our societies and DNA of our thoughts. Albert Einstein said: "In the midst of every crisis lies great opportunity", and Brad Evans confirms: "A lot of the big major changes in the history of the human condition have come in response to pandemics." Allan Chalmers further affirms: "Crises refine life. In them, you discover what you are." Oblique glitters of transformation and revolution have already occurred, twinkling very weakly in our psyche. I hope it doesn't get forsaken into the ashes of our short-term memories and modern amnesia. I hope the virus infects and inoculates a new consciousness outside of the rat races we have created and brings us to the humanity we had forgotten. As the available medical resources like personal protective equipment, disinfectants, biologics, diagnostics, and therapeutics get consumed rapidly, more solidarity forms between frontline workers, companies, communities, and the nations. An invisible thread of supply and demand chain forms from passion and

compassion without the atrocities of monetary concepts that had crippled us into mere ego and existence. From rapid mobilization and centralized actions to the direction of efforts and capacities towards supporting the management of the pandemic to social distancing and diagnosis apps, science and technology have been at their peak in guiding us towards our journey of eradicating COVID19 worldwide.

As a scientist, I am encountering a surge in the diversity of researchers, scientists, and technologists who rush in to help and come together in virtual spaces to share ideas, discuss possibilities, and innovate for the betterment of the world. The international partnerships and collaborations being formed in unexpected online platforms are astonishing and heartwarming to witness.

From organized virtual software and hardware hackathons to virtual summits, scientists, technologists, and methodologists among others are using every known technological platform they have developed or someone else developed to innovate. These times are also a testament to the importance of supporting the knowledge economy sustainably so that research and technology developments lead us in the foreseen disasters that are becoming more frequent, according to experts.

This crisis has also carved a new cultural window for me to experience social and cultural rebirths brought about by the arts, and catch up on the songs and movies I had missed. Much of humanity's masterpieces in the form of music, concerts, operas, circuses, and movies are being distributed for anyone irrespective of race, age, gender, and socioeconomic status to experience free online. This virus has personally brought me out of my primal modes of survival and the dead-minded devotion to the pursuit of the material and conceptual and towards returning to the moment with family, friends, and the entire human race.

A non-living twist of RNA is teaching us how to live and romantically reminds us, even only if momentarily in this temporary standstill, to exist in harmony with the food, animals, plants, children, elderly, and any ecosystem around us. It kindly whispers in our ears John Lennon's song "Imagine all the people, Sharing all the world".

Re-opening Schools Brings Opportunities for Educational Reform

Lana Parker
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At one point in the COVID-19 crisis, UNESCO noted that nearly 9 in 10 elementary and secondary students were out of school. Now, while countries across the world grapple with the return to school, key questions have emerged that present both challenges and opportunities. The first and most central question, of course, is when and how can classrooms re-open safely. Yet another question is how to manage issues of physical proximity using e-learning as an alternative virtual setting for learning. Lastly, there is the emerging question of what curricular, instructional and assessment adaptations might be required in the new school year(s) ahead. Each of these questions present a chance to make reforms that consider equity, socialization, emotion, and meaningful engagement.

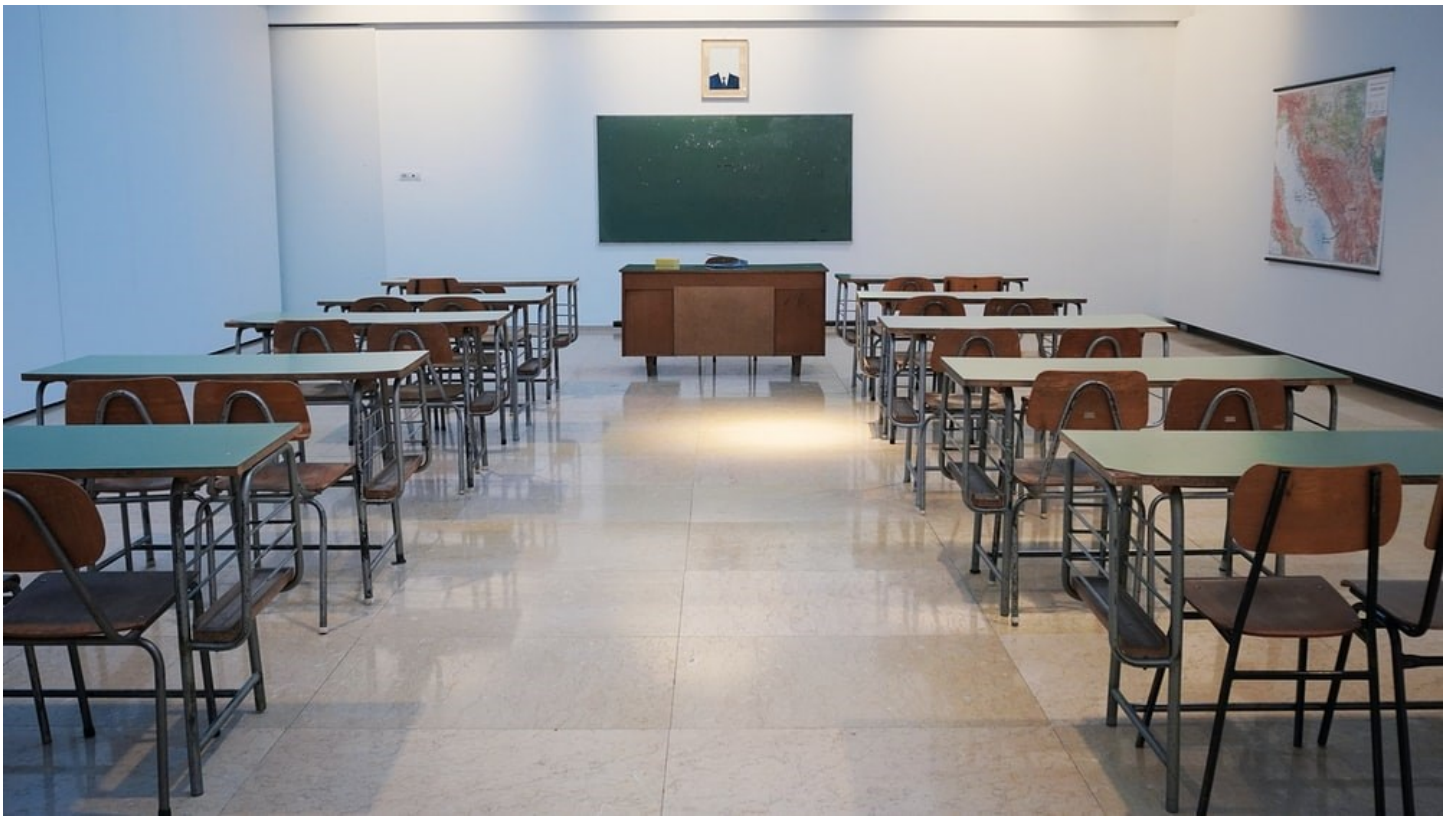
First, there is the most pressing question of when and how schools should re-open in order to minimize community transmission while permitting some semblance of return to normal routines. Some provinces—to date Québec and British Columbia—have opened schools but suggested that attendance is not compulsory. One issue with this approach is that it presents a false choice for many. Workers who have the privilege of working from home with limited or no impact on their income, many of whom are upper-middle class, have the choice whether to send their children in to schools and risk potential exposure for the children and the household. Other families, who are tenuously employed or in low wage work, might now be pressured by employers to send their children to school so that they can rejoin the workforce. It would be a better, and more equitable approach, to refrain from opening schools until the fall. Instead, use the time to meet with educators, administrators, and parents to determine what kinds of practices and policies need to be in place before all students are safely welcomed back.

A second prevalent question is how to make use of e-learning as a supplement to or substitute for in-person learning. In the initial and understandable rush to close schools, a great deal of learning migrated online. In the intervening weeks, some governments have advocated for a blend of synchronous and asynchronous learning for elementary and secondary students. Meanwhile, school boards have scrambled to provide the basic infrastructure for students to access virtual learning spaces from home. There is a great deal of literature exploring how to design and execute e-learning effectively, but a few factors need to be addressed before further policies are developed and implemented. First, because Wi-Fi access is not available equally to all students, and because devices like laptops and tablets are not accessible in all homes, provincial governments must work with providers and local school boards to address this most elemental requirement for participation. Second, in recognition that K-12 education differs from college and universities in that it largely engages minors, there needs to be some policy in place that protects student and teacher privacy, and that addresses the concerns that many teachers and parents have raised—especially in the context of synchronous learning. Third, teachers need to be engaged in some reciprocal learning to develop effective strategies for online environments. If e-learning is going to become

part of the short- and medium-term educational response to COVID-19, then educators should be supported through the transition by learning about how varied instruction and assessment techniques can be differentiated to meet the needs of students. Finally, there needs to be caution about how e-learning is taken up as a permanent fixture in K-12 schooling beyond the pandemic. Even before the school closures took place, Ontario moved toward mandatory e-learning in high school. The pandemic provides a perfect opportunity to put the brakes on the implementation of the "mandatory" element of that particular education policy, so that there is adequate time to attend to the aforementioned three factors (access, privacy, and educator support). In addition, educators and policymakers should be cautious about turning to e-learning as a cost-cutting measure for education in the long-term. Effective e-learning requires small classes, extensive infrastructure, and professional development; it is not a viable pathway for fiscal austerity.

The third question looks toward the fall and the start of the new school year. In Québec, as schools reopened, one social distancing accommodation has been to remove all art, drama, dance, music and gym classes. There has been a return to pencil-and-paper tasks as students sit isolated in rows. While this is once again understandable as a short-term measure, it raises some alarms about what is going to constitute a meaningful curriculum come the new year. The arts and physical education comprise key elements of student learning, as does the collaboration that takes place in more participatory environments. This is especially true as one considers the growth and development of the whole child: cognitive, social, and affective. Diversified and hands-on approaches are also of critical importance to students with different learning strengths and needs. For these reasons, it is crucial that even as schools strive to maintain social distancing in the fall and beyond, curriculum, instruction, and assessment do not thin into simple exercises of rote learning.

References available in online version at https://sciencepolicy.ca/response-covid-19



Impacts of COVID-19 on Graduate Students

Katharine Sedivy-Haley
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CSPC Volunteer

Graduate students occupy an in-between place in academia. They are at university to learn and obtain a degree, but most also contribute to the university's teaching, research, or both. In my time as a departmental representative for the UBC Graduate Student Society (GSS), and a member of the GSS's graduate student financial aid adjudication panel, I became familiar with the challenges that graduate students face as a result of their position in the academic structure. These challenges have been exacerbated by the COVID-19 crisis.

Graduate students are impacted by many of COVID-19's effects on the academic community. Remote work is stressful, especially for those with caregiving responsibilities. Thesis research is delayed, fieldwork and conferences cancelled. This hinders graduate students' ability to produce the expected body of research within their program timelines. In addition, grad students are often TAs or even instructors and have had to rapidly adapt to online classrooms . Graduate students who take courses face online learning challenges from the other side.

More distinctly, graduate students typically occupy a financially precarious position. COVID-19 has increased these pressures, reflecting the fragility of the system. Graduate funding is only guaranteed for a certain number of years, and even in ordinary circumstances the guaranteed funding period is often insufficient. At UBC, funding for PhD students is guaranteed for four years while the average length of a PhD is five years . In my experience reviewing financial aid applications with the UBC-GSS, the end of guaranteed funding was a recurring contributor to these students' financial distress. Students whose timelines are impacted by COVID-19 may therefore be feeling the effects not immediately, but in several years' time, if they are unable to complete their research before their guaranteed funding runs out.

Even for students who have not run out of guaranteed funding, income often decreases over time as scholarships run out. The Tri-Council Canada Graduate Scholarships cover only one year of a Master's degree, or three years of a PhD. Students who do not lose income still suffer from increased financial strain over the course of a program as cost of living increases. These factors can result in increased stress or food insecurity later in graduate programs.

Depending on university and graduate program policies, graduate students may not be able to earn extra income as TAs. A survey of graduate students at UBC indicated that 71% rely on external funding , including employment outside the university or from an employed spouse. If this income is lost as a result of COVID-19 graduate students may be forced to choose between paying summer and fall tuition, or rent. Financial stress is particularly impactful for international students, who pay higher tuition and have fewer opportunities for funding (e.g. scholarships).

Lack of funding, and other stressors, result in a high rate of mental health concerns among graduate students. They spend a great deal of time and energy attending to their research progress, and often have limited social support or self-care habits as a result. At any time, the trainee-supervisor relationship has a huge impact on graduate student wellbeing, and the responses of principal investigators during COVID-19 have varied widely. Some graduate students have

experienced pressure either from their PI or from their ticking program clock to work in the laboratory despite infection risk – a factor which requires careful consideration as restrictions on in-person research are lifted.

The transition to online doctoral defenses and graduations can be painful for PhD students. While in the wilderness of PhD research, it can be difficult to recognize and celebrate small wins – many doctoral students wait on the idea of a grand celebration once they come out the other side. This aspect of COVID-19 impacted me personally. I spent much of my Christmas holiday revising my thesis, and started the new year looking forward to having friends and out-of-province family attending my doctoral defense. Instead, on April 7th, I defended in front of a screen.

Graduate students at the ends of their programs are facing an uncertain future, with both financial and psychological implications. Highly trained graduates are now entering a challenging job market, or may have international postdoc positions delayed as a result of travel restrictions.

The Canada Emergency Student Benefit will ease short-term financial insecurity, and some universities have announced accommodations for graduate students – for example, UBC introduced an emergency bursary. However, these accommodations came slower than measures such as pausing tenure clocks, possibly because graduate students face greater challenges in advocating for themselves than faculty do. As the crisis continues, universities and national policy makers should consider ongoing impacts on graduate students, and collaborate with student organizations, to ensure that a generation of incoming researchers does not find their financial futures, their careers, or their mental health flattened by this pandemic.

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COVID-19 and Mental Health

Shawna L Thompson
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As a result of the COVID-19 pandemic, there is a high likelihood that there will be a measurable increase in Canadians experiencing mental health and neurological problems. The causes for these brain disorders may be directly resulting from COVID-19 infection, like patients having strokes caused by the virus increasing coagulation to pathogenic levels [Beyrouti et al. 2020], or indirect, like people suffering with anxiety and depressive symptoms exacerbated by uncertainty and isolation [Domènech-Abella et al. 2019]. Research on past epidemics have shown that mothers infected with some viruses at specific times in their pregnancies are much more likely to give birth to a child who will later be diagnosed with autism spectrum disorder or schizophrenia [Patterson 2009]. This means that we might be dealing with consequences of this pandemic for decades, especially if Canadians continue to be infected in increasing numbers before a successful vaccine is available.

This problem highlights the need for proactive responses from the Canadian federal and provincial governments, Canadian scientists and researchers, and public health officials. It is more important than ever for us to glean information from the epidemics and pandemics of the past, as well as current mental health epidemics. There is a potential to mitigate or avoid some of the worst effects by supporting groups recent research has shown to be vulnerable, such as indigenous peoples, farmers, graduate students, and healthcare providers.

There are several Canadian institutions and policies in place that are well-poised to respond to the prospect of increased need for brain health initiatives in the upcoming months and years as we deal with this pandemic. First off, we can make sure that the policy and funding are in place for existing mental health supports, both outreach and public resources. The more and better access Canadians have now to mental health support, the less resources will be required for crises in the future.

On that note, we need to make sure vulnerable people have funding and access to financial resources necessary to ensure access to food, housing, and other essential needs. Stress is a precipitating factor for many mental health and neurological disorders, so supporting our citizens now will almost certainly cost taxpayers less than paying for healthcare later.

We can also invest now in research, science, engineering, public health, and epidemiology, among other fields. While some scientific domains are clearly important to stimulate in pandemics (including epidemiology, microbiology, immunology, and medicine), it is critical that we broaden our view now to make sure that key information from less obvious

domains is used as quickly and effectively as possible. For example, recent research from New York City suggests that acute stroke is a symptom of COVID-19 infection in some patients [Avula et al. 2020]. Stroke requires rapid emergency medical support, so if people who would usually not be at high risk for stroke now are due to COVID-19 infection, public awareness of this could save lives and lessen permanent symptoms in affected people. Funding for research like this is paramount to make sure that we are as prepared for future waves of infection as possible. It is also important to make sure that research on health issues that are secondary to infection, or in uninfected people, also gets funded by the Canadian granting agencies. Mental health research is even more important during this pandemic than it was before, so we need to make sure that neuroscience is funded and that researchers are able to access their laboratories and clinics in a safe way.

Knowledge translation initiatives are also fundamental to our response to COVID-19, and deserve policy and funding support as well. Canadians need to have access to good information about practices that they can do to maintain good mental health during times of high stress, and resources in the event they are experiencing mental illness. Knowing when to seek professional help, and from whom, can minimize the burden to our strained health care system, and prevent uninfected people from needing to visit an emergency room, where they are more likely to be exposed to COVID-19. We can also engage the public to participate in research as patients or healthy controls, and encourage them to read about and support Canadian science.

Overall, the best way that Canada can prepare for and respond to this pandemic is to act quickly and with foresight, so that we can invest now in the science and research that will protect us from facing much larger repercussions for generations to come.

References available in online version at https://sciencepolicy.ca/response-covid-19

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Step 1: Social Distancing; Step 2: Cognitive Decline?

"Why don't you visit?" This is a phrase we hear when we think of our grandparents, whose health and well-being require love and kindness from those around them - family, friends, and neighbours. In the era of social distancing and isolation, we are all at risk for anxiety, depression, long-term mental health conditions, and cognitive decline. Seniors, particularly those living in isolation, are especially at risk. A delicate pool of seniors, often missed in conversation, are those living with sensory disabilities. 1.5 million Canadians are blind or visually impaired (Canadian Survey on Disability, 2017). Approximately one-third of these individuals are over the age of 65. Furthermore, 30.9% of persons with sight loss in Canada also identify with concurrent hearing loss (Canadian Survey on Disability, 2017). Dual sensory loss of vision and hearing is strongly associated with depression in older adults and social distancing robs them of physical touch.

A study by Palmer and colleagues suggested that less social support, smaller social networks, and more negative social interactions have been linked to depression, poorer immune functioning, increased incidence of disease, and higher mortality in older adults. How does COVID-19 affect seniors with sensory loss? If the virus doesn't get to them, the lack of social support will. In this time of social distancing, the answer to "Why don't you visit?" may be simple. "We need to fight COVID-19." It shouldn't stop there. What we need to ask ourselves is, "What can we do to be kind to the grandparents of our society?"

Zoom or Skype is not a solution. Seniors who experienced sensory loss at a young age suffer from the world's reluctance to include the disabled in education and career development. Without opportunity for training and employment starting at a young age, these seniors are unable to afford monthly internet bills, let alone a computer. Calling a relative could mean calculating the cost of long-distance bills. For seniors who experienced sensory loss later in life, it takes great effort to learn the latest assistive technology to help them communicate with the world, often at a steep cost. The loss of drivers' licenses means loss of independence.

Social distancing creates more barriers for those that depend on a sighted guide for essential trips, such as shopping for groceries or picking up prescription drugs. Virtual healthcare delivery also may negatively impact this population, as many platforms and systems, forced to rapidly adjust to pandemic-driven circumstances, have not put accessibility front and centre. Worse, families may be faced with difficult choices: send a sick relative with sensory loss to the hospital unaccompanied, or keep them at home without proper care. Uncertainty brings out the worst or the best of us. We urge all policy makers, researchers, individuals and businesses to unite, draw on compassion and respond to this challenge with creative

solutions.

Research and evidence-based policy making in the healthcare, innovation and social services sectors need to respond to these emergent circumstances by placing a renewed emphasis on accessibility, particularly for groups on the margins, like seniors with sight and/or hearing loss. We further propose priority and subsidized delivery for seniors with disabilities ordering groceries online, and concessions for internet services and smart home devices, where voice user interface is more accessible than screens. Offering verbal guidance at a distance to blind or visually impaired seniors entering the bus or stores could come a long way. Boost accessibility of telemedicine to seniors with disabilities. Create an accessible advocacy platform for seniors to raise their voice. Increase training of staff at long-term care homes to interact with blind and visually impaired residents. Volunteer to be a Virtual Vision Mate to ease their anxiety. Businesses, caregivers, and policy-makers must come together to ensure all aspects of life remain open to seniors with sensory impairments, and that no one is left behind because of where they live or their socio-economic status.

In times of uncertainty, we have the power to choose how we react. Regardless of who we are and where we come from, kindness-giving is free and can be as valuable as supporting the health and well-being of our seniors with sensory loss. It's also a time to implement changes to better support a population that has just as much human rights as the rest of us.

Policy Development

Indigenous Peoples are not Canada's Charity Case

Among the faculty and staff at the Faculty of Native Studies (University of Alberta), there is no question that Pembina Hall – the historic building that houses our historic faculty – is haunted. The Northeast corridor where I typically work, is home to the energetic remains of ones lost during the last pandemic on this campus. The ghostly reminders of the 1918 Spanish Flu implore us to consider that the present coronavirus pandemic is not unprecedented. Indigenous worldviews that consider the spirited afterlives of previous pandemics offer valuable knowledge for science and health policy and for healing practices.

Historic epidemics – smallpox, measles, tuberculosis, influenza – have reshaped the biological and political terrains of territories. They were and are part and parcel of colonial settlement around the world. The health care system and public health policy field in this country have been created in mutual relation to a Canadian political project. Canada, including its sovereignty and institutions, have grown at the expense of Indigenous governance. Indigenous peoples know this. This is why, globally, in the course of this pandemic, Indigenous nations are asserting their right to self-determination through their planning and preparedness measures. These include, the development of culturally and linguistically relevant pandemic responses, assertions of regional sovereignty, and appeals to treaty rights to pandemic-related health care and resources. As Indigenous nations plan, prepare and act, there remain tensions between Canadian and Indigenous jurisdictions and their approaches to pandemic governance. It has been argued that the Covid-19 crisis is intensifying pre-existing colonial relationships whereas historic epidemics helped solidify colonial governance. For Indigenous peoples, risk associated with Covid-19 is high, but this risk extends beyond the potential for high morbidity and mortality rates. The risks faced by Indigenous nations also include ongoing threats to their self-determination and governance.

The current pandemic has emerged as the fields of science, politics, economy, law, and health continue to be defined by power imbalances in which Indigenous peoples are not often in control of the policies that affect them. As a result, pandemics and epidemics have always also been syndemic with the pathological spread of colonization. Syndemic theory, approached through a Native or Indigenous Studies lens, understands the imbalanced relationships between Indigenous, federal, and provincial governments, as being a sick system. No clearer is this pathology evident than on the Indigenous Services Canada: Coronavirus and Indigenous Communities webpage where instructions are featured prominently for hand washing in communities where there

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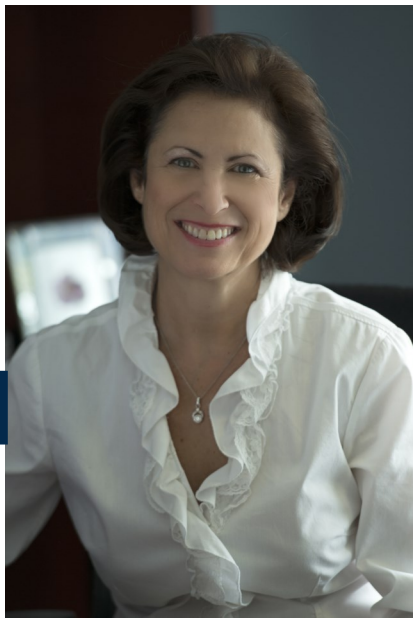
is no clean or running water. The fact that these instructions are necessary, is a visceral reminder of the structural inequities in Canada. To some degree, policy-makers are seeking to address structural factors that contribute to high disease and disease complication burdens on Indigenous peoples. The efficacy of such measures is still unknown.

In recent years, biomedical research and clinical practice aimed at addressing health disparities have offered hope for reconciliation. When political relationships between Indigenous peoples and Canada are defined by reconciliation, morality becomes a yardstick for measuring the strength of such relationships. However, the moral pursuit of reconciliation has done more to secure and strengthen Canada's own sovereignty and control of the nation, its citizens, institutions, and of the land than it has for transforming what remains a colonial political relationship. As a result, the governance of public health (including, the jurisdictional interactions between Indigenous and Canadian governments) is not simply a matter of morality, nor is it a humanitarian or charity project. Rather, Indigenous health governance, like that related to the current pandemic, is a matter of long standing political and legal relationships between nations. This is about power and power sharing. The ways that the current pandemic is being governed as a federal and provincial problem without deep coordination with Indigenous nations reinforces the colonial tug-of-war over governance that is constitutive of Canada's liberal democracy. This must change. Indigenous knowledges and worldviews that hold space for principles of shared governance; and that make decisions across multiple generations forward and back can help change the course of this pandemic.

References available in online version at https://sciencepolicy.ca/response-covid-19

PREDICTABILITY: The key for the way out of the pandemic for both business and science



Susan Stern
National Executive Director and CEO Weizmann Canada

In a 2016 EuroScientist journal article, the relationship between business and science is described as not always smooth. It goes on to say, "The difference in culture between the two fields often means that there is a lot of misunderstanding or a difference in expectations on either side."

In this pandemic however, one constant that we know is equally important to both business and science is predictability. **Predictability provides stability for the economy and enables positive human behaviour as a sustainable way out of this pandemic.** Uncertainty has the opposite effect.

Here at home, the Canadian Chamber of Commerce launched the Canadian Business Resilience Network, in partnership with the Government of Canada and various leading businesses and organizations, to help provide some of that predictability. The latest information, tools, and resources to guide day-by-day actions are presented with the hopes of helping businesses survive the COVID-19 pandemic.

At the same time, we are reminded daily that we must 'trust in science.'

Science gives us hope that this pandemic will be resolved. And the reality that science is for the benefit of all humanity has never been more apparent than right now.

As provinces and territories move forward with plans to reopen businesses, both business and science must come together to emerge sustainably from this pandemic.

Canada's Chief Public Health Officer, Dr. Theresa Tam, recently spoke about how modelling to restart the economy (while suppressing the epidemic), needs to achieve a reproduction number of less than one (i.e. less than one person being infected from each existing case).

While we're all eager to shift the momentum of this pandemic, it also means any plans to reopen the economy must maintain current measures including testing, social distancing, attention to high risk areas, and so forth.

Prof. Ron Milo and Prof. Uri Alon of the Weizmann Institute of Science are gaining international media attention (e.g. Financial Times & Newsweek) for their measured approaches to restart the economy. Most recently demonstrated in an op-ed in the New York Times, their modelling also aligns with Dr. Tam's direction of keeping infection rates per person to below one.

Importantly, their work reflects interests from both the business community and scientific community through input from economists and epidemiologists.

Their respective areas of research focus on what we know about the virus today, as well as what the ideal model to restart the economy looks like based on that data.

The virus by the numbers

Prof. Milo's lab is building on work from his postdoc at Harvard Medical School, where he created an online resource called BioNumbers.

Now, a corona-centered 'by the numbers' effort with text translated into 20 languages (http://book.bionumbers.org/) helps to answer questions

Cyclic strategy with two staggered groups allows more business days operation

cycle of 4 work days and 10 lockdown days for each group

	Mon.	Tue.	Wed.	Thr.	Fri.	Sat.	Sun.
week 1	work group A	work group A	work group A	work group A	lockdown	lockdown	lockdown
week 2	work group B	work group B	work group B	work group B	lockdown	lockdown	lockdown

openly for researchers worldwide, such as 'what is the effect of social distancing,' 'why was the initial quarantine period two weeks,' and 'how stable and infectious is the virus on surfaces.'

The formula to restart the economy

Prof. Uri Alon's 'cyclic work' formula is currently based on a 4-10 model, whereby individuals would work four days (with current social distancing measures in place) and would be in lockdown for a subsequent ten days.

Typically, recently infected individuals with COVID-19 are non-infectious for the first three days, making the 4-10 model an ideal mathematical formula to keep the risk of infecting others as low as possible.

Furthermore, groups could be staggered weekly to allow for more business days in operation.

As with any modelling, until it takes effect, we do not know its outcome. Mathematical modelling is forecasting based on what we know today.

Once implemented, workdays can be adjusted accordingly to reflect the actual scenario within a specific jurisdiction.

A similar model was adopted in Austria for their school system, which will see two groups learning five days every two weeks starting in mid-May.

At a time when we are constantly hearing 'this is an uncertain time,' let's create some predictability by having the business community and the scientific community come together.

After all, we are all in this together, and together **we can** map a sustainable way out.

References available in online version at https://sciencepolicy.ca/response-covid-19 *alongside the link to read more about the work of the 65+ labs at the Weizmann Institute of Science now working on the coronavirus.*

We suggest an intermittent work schedule

cycle of 4 work days and 10 lockdown days for each group

	Mon.	Tue.	Wed.	Thr.	Fri.	Sat.	Sun.
week 1	work	work	work	work	lockdown	lockdown	lockdown
week 2	lockdown	lockdown	lockdown	lockdown	lockdown	lockdown	lockdown

40% of work days - reduces time of exposure

To be tested for a month

Make Way—Science Policy has Arrived

Uzma Urooj
Advisor, Science Strategy, Canadian Institutes of Health Research (CIHR)

There is little doubt that we have found ourselves in the midst of an historical event –the likes of which humans have not experienced for at least a century. The last time the human race experienced a pandemic of global proportions was back in 1918, when the Spanish flu caused huge devastation in a population that was already reeling from the unimaginable devastation brought forth by World War 1. Millions of lives were lost with a death toll estimated between 50 to 100 million: several times more than the lives lost during World War 1 or World War 2 and at least 25 times more than previous flu pandemics known to humankind.

The Spanish flu left in its wake a substantial change in how healthcare was perceived, delivered and consumed. It was in the aftermath of the Spanish flu that the collective consciousness of the world realized the importance of protecting the health of the masses, or 'public health'. The elite could not remain protected if the masses were contagious. The emergence of socialized medicine, healthcare for all, was one by-product of the Spanish flu, initiated by Russia, then the Soviet Union, and subsequently adopted by many Western European countries. Employer-supported health care insurance schemes were another byproduct of the pandemic, adopted by countries like the United States.

The concept of preventative medicine also took root in the wake of the Spanish Flu. The powerful idea behind the concept is simple: What if measures are taken to prevent the onset of the disease before it becomes a pandemic? The push for prevention became the foundation for the field of epidemiology: the study of patterns, causes and effects in disease. The devastation brought by the Spanish flu highlighted the importance of tracking and measuring disease onsets and spread like never before. Departments of epidemiology popped up in most reputable academic institutions all across the globe. Several countries saw restructuring of health ministries and the establishment of public health departments within government machinery that relied heavily on the epidemiological studies to develop robust health care policies. National health surveys became a key method to systematically collect 'baseline' health datasets. The field of epidemiology highlighted that healthcare is not just about treating biological symptoms post disease onset, it is also about elevating social and occupational conditions to prevent illnesses. Talk about nipping in the bud!

If history is any indication, it would be reasonable to expect big changes coming our way post COVID-19 pandemic. Already, topics such as inequitable access to health care, health inequity within populations and across genders, coordination gaps between various levels of health care systems and lack of appropriate infrastructure for dealing with health crises at places like long-term care facilities are being heavily discussed and debated at various forums. There is also a greater recognition of mental health issues.

Simultaneously, serious reflections around how we

live our lives are also taking place – most of which define the very fabric of our society. Our economic system, transportation system, schooling systems, governance systems, rural and urban planning, and our relationships with climate and food all require a reexamination. No topic is left untouched, including those related to behavioral and social norms such as work-life balance, working from home, home schooling, domestic violence, and childcare.

These are complex and highly intertwined topics. That such topics are under discussion at all levels of the society indicate that how we perceive health care is about to take another overhaul!

If we are to learn from the devastation brought by COVID-19 and if we are serious about building resilience in our infrastructures to deal with future crises, governments will need to create effective policy interventions that reconcile the scientific evidence with evolving societal values, beliefs, and priorities. Dr. Theresa Tam, Chief Public Health Officer, has already indicated: "The new normal, when we get there, is one that is not the same as before. It's one that might see our society function in different ways." It is clear that things will not return to normal for normal, had serious inadequacies.

The new normal will require serious policy interventions informed by scientific evidence and balanced with societal values, norms, priorities to buy the willingness of the public to comply. This is where science policy can help because it is at the juncture of science and its application in society (as policies) where science policy resides.

The process has already begun. Currently, almost all of the virus spread control and health care provision strategies adopted by governments around the world are informed, one way or the other, by those at the juncture of science and government policy-making. From policy measures around physical distancing to advice around wearing masks in public settings, it is scientific evidence, grounded in the knowledge of societal beliefs and priorities, that has fueled unprecedented policy recommendations – some of which will have lasting consequences on the economy and societal norms. One reason is simply because there is no vaccine for the disease available as of yet, implying that there is no shortcut to solving the crisis. The only option, then, is to navigate through the complex scientific evidence and balance it with what the masses are willing to implement collectively.

How quickly a country has contained the crisis is directly correlated to how closely the governments have listened to the scientific advice and applied it to their society's norms, values, and priorities to come up with innovative policy interventions. The disease spread trends and evidence backs this idea. In this respect, science policy advisors have truly emerged as trusted allies in informing the government on policy solutions by balancing the dynamic relationships between complex science and the values, beliefs, and priorities of its citizenry.

As we move towards the reconstruction and recovery phase, even bolder policy interventions will be required almost certainly affecting the whole of the society. To support those bold policy interventions, established bodies and strong pools of science policy practitioners will be required at all levels of the government to contribute to the policy-making machinery. They will be essential in synthesizing the evidence from a multitude of scientific fields and in reconciling that knowledge with collective societal values, sensibilities, and priorities. The process will result in fruitful cooperation between scientists, policymakers, and the society, and will, inevitably, change the course of the society.

Intersectionality is an irreversible trend. Just as epidemiology became a recognized field of science after the Spanish flu, we will see science policy truly embedded in universities and government departments in the years to come.

It is time that science policy takes the driving seat. Make way.

References available in online version at https://sciencepolicy.ca/response-covid-19

When thousands of citizens innovate: how policy-makers can contribute

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The COVID-19 pandemic is a great challenge to our global society, exposing our limitations as well as new ways to generate adequate responses to global crises.
Communities and individuals have spontaneously organized to deal with this crisis. Thousands of skillful individuals have engaged in the development of mechanical ventilators and masks, SARS-CoV-2 test kits, mobile applications for contact tracking and for coordinating mutual help and care, to name just a few.

Since March, we recorded 63 groups focused on open source solutions for the coronavirus crisis, on Facebook alone. Open source enables faster innovation, as everyone can build on existing knowledge and information. In parallel, over 80 online hackathons were organized. Between April 24-26, 380 volunteers organized EUvsVirus, a hackathon initiated by the European Innovation Council to federate projects realized across Europe. 20,900 people registered for this event, which resulted in 2,150 projects submitted [1] At the same time, traditional organisations worldwide bridged with the crowd, proposing over 26 challenges and prices to crowdsource innovation [2].

This burst of crowd-based organized action propagated on top of existing networks of hackers and makers of all sorts, share a common culture of open collaboration. Governments around the world have started to pay attention to this phenomena, acknowledging its potential. Open source development and open science are well documented, but they have not yet been integrated into the mainstream. Some have coined the term "fourth sector" in referring to this wide-scale mobilization of individuals around a common purpose or issue.

Although the response of this movement has been very prolific, the results have not been up to the expectations that could be derived from this massive mobilisation. We need to better channel the potential expressed in this unique manifestation of will and this demonstration of skills, into practical, real, solutions. Is this a loss of opportunity? If so, what have been the shortcomings?

First, we can look at some issues within the movement: redundancy and poor horizontal coordination. For example, let's consider the vast number of open source ventilator projects that have been proposed. Many of them share multiple similarities and could have benefited from more collaboration and mutualization of resources. Moreover, we also observe poor trans-disciplinary coordination within these ventilator projects, many of which have suffered from lack of medical expertise.

Secondly, we can look at some issues between this movement and traditional sectors: recognition and legitimacy. Some open source development groups

have proposed very promising solutions, but they have not been considered by decision makers or by health institutions. Most projects have lacked direction and help from health organisations, many of which do not take these hacks seriously. Regulatory institutions need to learn how to work with these online groups in order to put in place appropriate processes for rapid scientific validation, accreditation and certification.

Third, we see cross-regional issues stemming from the digital divide. Although less industrialized countries can benefit a lot from less sophisticated but low cost open source solutions, they are not proportionally represented in these online communities. Technology re-contextualization and transfer to less industrialized countries is too slow, compared to the timescale of the pandemic.

This preliminary list of shortcomings is convincing enough to make us pause and think about policies that would allow our society to tap into the vast potential of the crowd, especially in similar situations of rapidly deteriorating conditions, when the public sector is overwhelmed and the private sector's capacity is greatly reduced.

The crowd must be recognized as a sector in itself, developing in parallel with the corporate, not-for-profit, and institutions sectors able to sense problems, mobilize resources, create, and validate solutions. The French Government is already moving in that direction with its Mission Société Numérique program [3] . Canadian policymakers can follow by elevating their viewpoint to consider the crowd not just as an extension, but as an origin, as a new locus of development and production that can be coordinated with the traditional sectors. It is already understood that intersectoral coordination can increase the speed of innovation, as in private-private partnerships. We can hypothesize that private-public-crowd partnerships can unlock a new potential.

The COVID-19 crisis has provided an environment for this new sector to raise above the ground and be noticed. Who hasn't heard about open source ventilators and 3D printed masks and face shields? But it is still in its early stages of development and suffers from lack of recognition and legitimacy, which is the biggest barrier in front of its potential. By eliminating this barrier we give ourselves another way to channel human creativity and resources into solving humanity's most wicked problems, such as peace, food security, climate change, and even democracy.

Therefore, we advise that the Canadian Government recognize this movement. This would lead to a second step of creating a normative system to regulate this new sector and to legitimize it [4]. From that basis, policies can be conceived to address the current issues of this movement and to accelerate its development. As this sector gets plugged into mainstream regulatory systems, its methods and its output will be trusted and its impact will be greatly amplified.

References available in online version at https://sciencepolicy.ca/response-covid-19

Crisis management through digital social innovation

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Tahmid Hasib Khan
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In the age of digital relationships, the #BacharLorai movement draws a connection between social innovation and disaster management in an online economy. As governments and billionaires run out of fuel, nudging a response from civic society could be the solution we are all looking for. The question: how do those looking to make a change, empower those in need?

If the last decade helped us turn human connections into sharing economies, this one started off asking for more. This year, a global call for collaboration using digital technology was put out to take a stand against COVID-19.

As people all over the world started co-creating solutions for a wide range of social needs at scales unimaginable before – we revisit the meaning of *Digital Social Innovation* (DSI) once again (1). While profit maximization creates the urgency for businesses to innovate (2), DSI encourages us to address social challenges in the digital economy - suggesting a new model for connecting information, data, and resources to people.

While authorities experimented with scientific measures to change health behaviour, members of the public involved others in a different way. Social nudges echoed from Italian balconies, French terraces, and Canadian patios encouraging more people to step up around the world. As these nudges started to transfer to Facebook, Instagram, and Twitter, the impact of encouraging others to come together became stronger. At a time when governments and billionaires started to run out of steam, citizens stepped up to initiate change.

As the overall structural machinery stumbles at the face of the pandemic, the cracks in our socio-economic foundations have been exposed. The countries at the highest risk, in particular, being those of the Global South. With a history of responding to similar crises, the pandemic has opened up new challenges for these economies. In these regions, there is a deep correlation between population density and the virulence of infectious agents. As seen with malaria, high population density regions were more prone to-multi-dimensional calamities at the onset of infectious diseases (3). Community mitigation measures

#বাঁচারলড়াই

#BacharLorai

www.bacharlorai.com

during the time represented a viable solution, as grassroots approaches like community clinics, became an appropriate strategy for crisis control (4). Thus, the Global South has increasingly sought ground-up approaches to human-centric problems like the Coronavirus.

Bangladesh continues to be a nation where sustainable innovation is a constant need in its battle for survival. The persistent threat of natural disasters, the existence of inefficient crisis management systems (5) and the challenges posed by sheltering the largest refugee camp in the world (6); calls for the wide-scale mobilization of non-state actors, grassroots organizations and social innovators in one of the fastest-growing digital economies (7) today.

Owing to its adaptation of the *Alma Ata Declaration on Primary Health Care (PHC)* in 1978, the healthcare infrastructure of the seventh most populous nation in the world promotes grassroots efforts towards planning, operation, and management of primary healthcare (8). Bangladesh's adaptation of the PHC enables a shared economic model that provides appropriate tools to respond to COVID-19.

Global digital social innovation can draw inspiration from similar interventions in Bangladesh. For instance, with the success of *BRAC* in enhancing rural healthcare or *Grameen Bank* in encouraging entrepreneurship or *Bkash* in promoting digital banking (7). These institutions have created a space for collaboration through the use of digital technology—increasing the ability to directly support vulnerable populations in rural Bangladesh. The question remains on how we connect people to the resources mentioned above.

A social movement can be built on these success stories by encouraging individuals to become social innovators. The philosophy of a movement can focus on giving everyone equal power and authority rather than a special seat at the table; creating more meaning for a person involved. Digital social innovation drives collaboration among innovators allowing them to hack bureaucracies and take swift action beyond borders when necessary. Canadian Bangladeshis have touched on this sentiment by involving their counterparts to co-create a movement of their own.

BacharLorai *(Batch-aar-Law-Rye)* means 'fighting for survival' in Bengali.

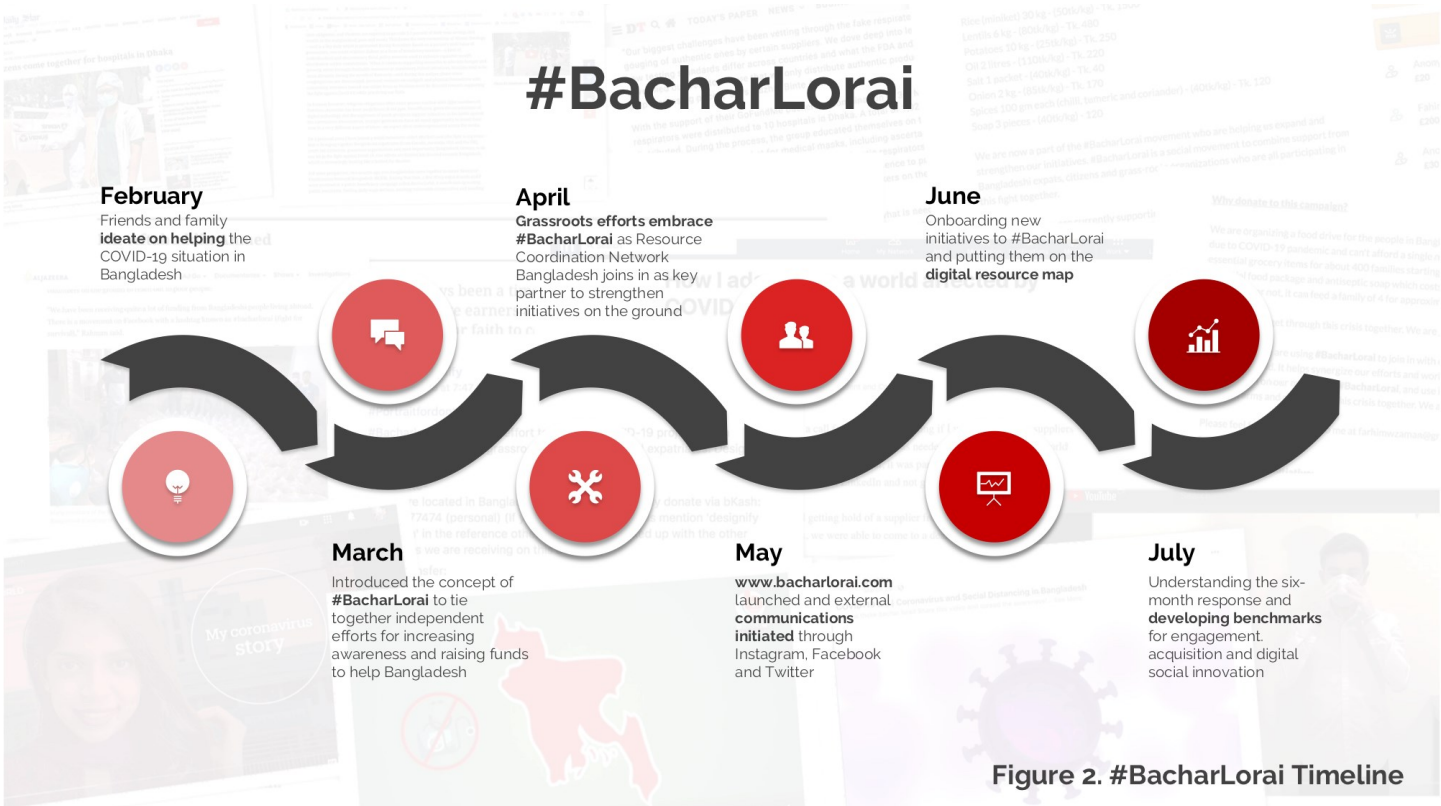

Figure 2. #BacharLorai Timeline

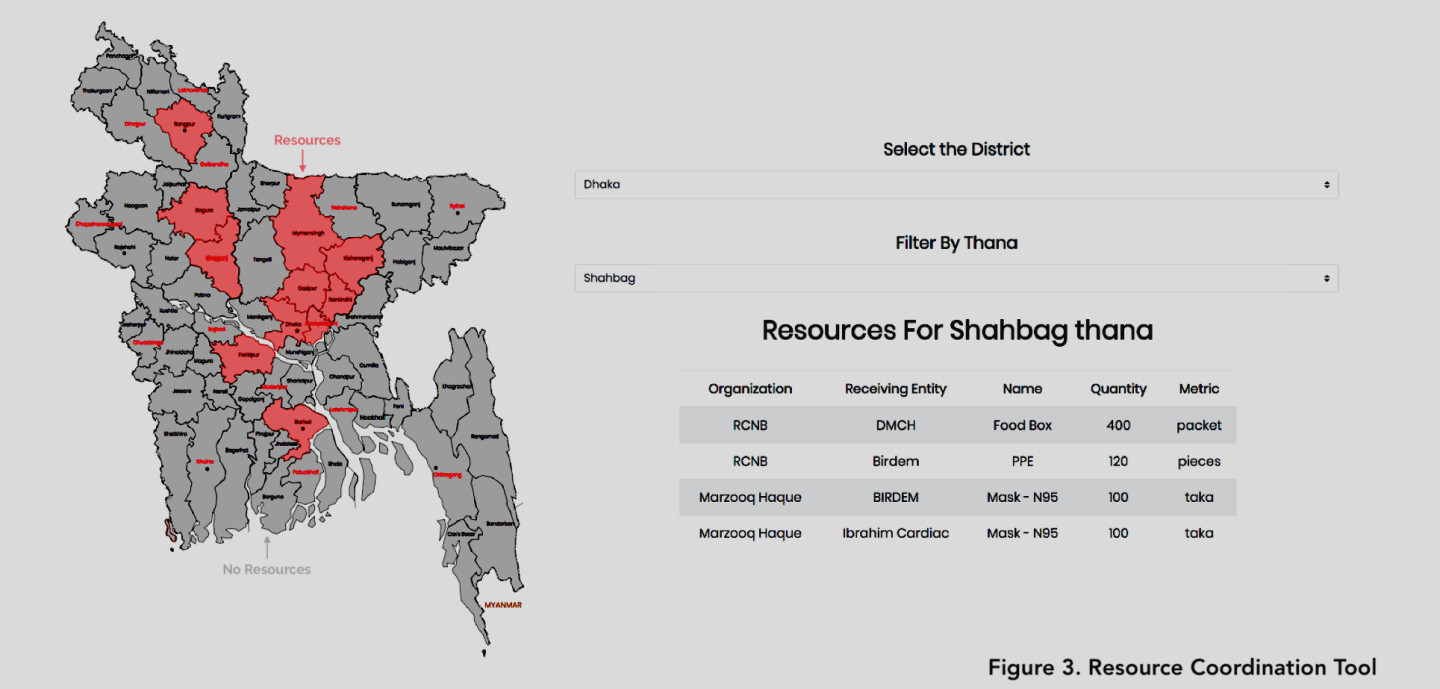

Figure 3. Resource Coordination Tool

The #BacharLorai movement connects expatriates, citizens, and grassroots organizations fighting COVID-19 through digital social innovation. It is a cross-disciplinary network to connect those who want to help, to those in need. The ecosystem enables people to start an initiative or collaborate on an existing one; this also includes launching or taking part in initiatives that create social impact as by-products of their economic activities. Such was the case when an artist connected with a charity through the movement to sell his art and support the economically displaced from the proceeds. Similar connections inspired more people to co-create solutions for challenges they couldn't address alone.

This growing network (Figure 2) has not been limited by socioeconomic class, age group, or proximity as seen previously in the Bangladeshi context. The global call for collaboration has allowed this to happen. From sons and mothers working together, to *rickshaw-pullers* and entrepreneurs teaching each other, #BacharLorai continues to facilitate avenues for awareness generation, aid dissemination, and supply chain creation. As the movement builds trust, bigger doors are opening, including opportunities to work with government agencies.

It's difficult to assess the impact of social innovation in a digital world as there are limits to quantifying positive change (1). #BacharLorai is trying to address this with a resource coordination tool co-created by members of the movement running their initiatives. Through a digital map (Figure 3) of Bangladesh, #BacharLorai aims to show when, where, and what resources are being allocated by its contributors. By doing so people can start measuring the impact of their initiatives while simultaneously creating a one-stop resource hub for others to do the same.

Synergies between technology, social media, and relief accelerate the movement in a digital economy. Flexible involvement through voluntary efforts creates an effective ecosystem. Prioritization of local technologies like Bkash, expedites monetary resources towards affected populations. Communication on Facebook and WhatsApp fast-tracks relationships beyond borders. Intersections between the avenues mentioned above create the scope for immediate impact.

By creating a network of individuals and communities that share the same values, social movements can build capacity to inspire, inform, and integrate crisis responses in this digital age. This makes #BacharLorai a small yet integral effort in the fight against COVID-19.

References available in online version at https://sciencepolicy.ca/response-covid-19

CSPC

Call for Editorials

Response to COVID-19 Pandemic and its Impacts

The Canadian Science Policy Center is looking for (600-800 word) opinion pieces on:

1. Policy Development

- Government funding packages deployed to help fight COVID-19
- Perspectives and context of policy decisions surrounding COVID-19
- How policy is developed during the pandemic
- Evidence-based decision making and the role of science advice in policy development
- Impact of policy developments and response by the public
- Federal, Provincial and Municipal coordination of policies during pandemics

2. Lessons Learned from Managing Global Health Challenges

- From managing previous outbreaks and pandemics (SARS, H1N1, Ebola, etc)
- Ongoing policy lessons from local and global initiatives on COVID-19

3. Scientific & Economic Impacts

- Open Science of COVID-19 Pandemic
- Research funding
- Industry & Innovation
- Evolution of workforce
- Public communication of science & crisis management

4. Social Impacts

- Climate change and environment
- Behavioural and societal
- Travel and globalism

If interested in writing an editorial, email editorial@sciencepolicy.ca

This issue is possible because of the CSPC 2020 Editorial Committee and their hard work:

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