

The biomedical lab after COVID-19: cascading effects of the lockdown on lab-based research programs and graduate students in Canada

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Abstract

In the early months of 2020, the spread of the new coronavirus SARS-CoV-2 shook the world, which responded with various measures of quarantine, social distancing, and mass shutdowns. These measures have affected Canadian graduate students, especially those in lab-based science research programs who have been unable to access their workplaces. As a period of reopening may be approaching, and universities and research centers discuss ways to allow for work to resume cautiously, a discussion on the long-term impact of the pandemic on graduate students is necessary. Many students expressed significant concern regarding motivation with the shift to online courses; financial stress in terms of personal debt, bills, and tuition fees; as well as disrupted education and career plans. Uncertainty over the current economic situation and potential research material shortages lead to worry related to the quality and quantity of results and the impact these may have on funding. Luckily, universities, hospitals, governmental agencies, and employers have implemented a variety of programs and financial aid to help students in these trying times. Assuring the continuation of such measures is critical, and graduate students' drive to succeed will manifest in novel ways to tackle the challenges that the COVID-19 lockdown has imposed.

Key words: COVID-19, Canadian graduate students, lab-based research

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In early 2020, the spread of the new SARS-CoV-2 virus—and the COVID-19 disease it causes—set off a global pandemic, where governments around the world reacted by implementing social distancing and quarantining measures, as well as a mass shutdown of all services deemed nonessential. In Canada, hospitals, research institutes, and universities reduced ongoing research projects to a minimum and sent most of their students and staff home. The impact of such measures on graduate students throughout Canada, with an emphasis on those in lab-based research programs, has the potential of being monumental, and it may have an effect longer than just the confinement period. Here, we address the potential long-term effects of the COVID-19 pandemic on those graduate students, with a focus on students' mental health, finances, education, research results, and overall career. We argue that graduate students in the field of biomedical sciences could experience cascading detrimental effects that delve beyond extended timelines and acute research delay. This may be of particular importance to senior scientists and funding agencies to prepare them for the possibility of increased support towards trainees in their biomedical labs. This article aims to describe the concerns

of Canadian graduate students based on the authors' experiences as well as some of the latest available data.

With the imposed mandatory COVID-19 lockdowns, research-based graduate students found themselves scrambling to halt their research activities while attempting to preserve precious materials and samples (Chen 2020). Many found themselves homebound where funneling their tireless creativity and energy into early thesis writing, literature searches, free online seminars, and honing their literary skills became the norm. With skyrocketing stress levels related to uncertainty regarding the future and disrupted research timelines, many graduate students have come to face reality and accept delays in research timelines (Mervis 2020). To alleviate some of the stress imposed by shutdowns of biomedical labs in Canada, the Canadian Institutes of Health Research (CIHR) implemented policies to increase support for students and trainees who were already being funded by CIHR, while universities implemented guidelines on adaptation to the situation (CIHR 2020; University of Toronto 2020a). Although several articles discuss ways to find motivation at home, isolation poses its challenges, including students living with parents, alone, with a partner, or with young children (Gratton 2020). Motivation during and after confinement, especially related to online coursework, was a primary concern among Canadian postsecondary students (Academica Group 2020). A recent crowdsourcing survey by Statistics Canada of over 100 000 Canadian postsecondary students (Impact of the COVID-19 pandemic on postsecondary students (ICPPS)) highlighted significant concerns regarding finance, school, and grades as well as job prospects (Statistics Canada 2020a). Such concerns included using up savings and increasing student debt to pay tuition and other expenses, negative effects on grades and ability to return to school, as well as loss of current employment and job prospects. Many postsecondary students experienced work placement delays and cancellations, thereby increasing financial concern among these students (Statistics Canada 2020b). As the mental well-being of students takes a hit, several Canadian universities have responded by publishing online resources (videos and articles on learning remotely, financial aid, health, and well-being) and providing online services for their students (real-time chat and telephone consultations as well as tele-counselling) (McGill University 2020; University of British Columbia 2020; University of Ottawa 2020; University of Toronto 2020b). It is essential that when the gradual reopening of universities takes place, the mental health services provided to students remain in full force to accommodate a likely surge in anxious, stressed, and overwhelmed students.

Canadian graduate students have a very unique personal financial situation; in the case of graduate students doing lab-based science research, most are paid stipends below \$25 000 per year (NSERC 2020a; Tri-Agency Financial Administration 2020). Participants in the ICPPS survey expressed unease over drying up their savings (68%), increasing their student debt load (54%), as well as paying for their next study term (51%) and accommodation (50%) (Statistics Canada 2020a). Additionally, given that future research funding is dependent on good productivity, some graduate students may find themselves in a difficult position to continue doing their work as the research coffers deplete, highlighted by the worry over lack of research funding (39%) according to the ICPPS. Despite this, it is also possible to foresee funding agencies tackling this challenge by promising direct support to graduate students, as currently done by extending tri-council grants and implementation of relief programs such as the Canadian Emergency Student Benefit (CESB) (NSERC 2020b). Recently, the Natural Sciences and Engineering Research Council of Canada (NSERC), CIHR, and Social Sciences and Humanities Research Council have announced measures to increase funding to grant recipients to financially support students and trainees, especially those who may have been inadmissible for the CESB, citing "the supplement will be commensurate with the average level of support provided to trainees and research support personnel for each agency over a three-month period" (NSERC 2020c). Student debt and interest repayment has also been exempted for several months, depending on the province of the debt, and the federal government promises to enhance financial assistance

come fall 2020. It is not unreasonable to expect the Canadian authorities to dampen the funding troubles of graduate students by funneling resources into research departments and allowing the creation of side opportunities for graduate students as they await their research to start back up. For example, current strategies predict a vast number of qualified persons will be needed to implement “test and contact trace” programs across Canada. This could be a potential avenue where graduate students could invest productivity through recognized volunteering with a forthcoming federal contact tracing facility, where some of the work can even be done from home with a phone. Such temporary programs could utilize the potential that the highly skilled graduate students possess, while allowing them to substitute teaching assistantships and research assistantships with a needed effort. These types of programs already exist in certain municipalities, like the COVID-19 Contact Tracing Initiative launched by Public Health Ontario, which allows medical students to assist in efforts to combat the spread of COVID-19, while giving students new opportunities to expand their skill set (Herhalt 2020; Public Health Ontario 2020; University of Toronto 2020c).

A report released by the C.D. Howe institute indicates that Canada is already in a recessionary economic state brought on by the lockdowns and cessation of nonessential activity (C.D. Howe Institute 2020). As expected, the loss of economic activity presents a bleak outlook for graduating students. Almost half (49%) of the participants in the Statistics Canada survey reported loss of job prospects, while around three-quarters (76%) of students that held a job in March had their employment plans change, either having reduced work hours, losing their job or having been laid off (Statistics Canada 2020a). Stanford’s Institute for Economic Policy Research projects that students who graduate into a recession are due to earn less for anywhere from 10 to 15 years after they have left school (Schwandt 2019). Graduates of every academic level may find themselves returning to school for further specialization within their field in hope of expanding their skill set to fill a necessary niche. However, not all future outlook is bleak; human ingenuity drives us to be creative with our knowledge and experiences, as was seen in the post-2008–2009 recession economy with creation of novel start-ups and establishment of new fields where graduate students excel, such as biotech and data science.

Immediately following relaxation of rules and permission to resume their research, lab-based graduate students may struggle to pick up where they left off. Potential delays in reinstating normal cellular and animal work may occur as students are allowed back on a gradual, potentially shift-like schedule. In addition to new working hour timetables, hospitals the world over still require adequate stockpiles of personal protective equipment and various reagents that may deprive non-COVID19 research labs of them, resulting in delays that go beyond the lockdown. For example, Bloomberg Law predicts a shortage in syringes and needles, both common tools used in research labs (Stein 2020). Graduate students in these cases may fall back on older techniques that require fewer specialized reagents or pivot experimentation towards other techniques. This shift, in turn, may potentially affect the quality and quantity of results and skills learned by the student over the course of their degree. Additionally, there is no doubt that any kind of delay to delicate program timelines can distort overall graduation goals set by graduate students and affect career progression. The ICPPS survey highlighted that participants are concerned the pandemic may impact their grades (63%) and the value of their program and credentials (40%) (Statistics Canada 2020a).

As COVID-19 makes very few exceptions regarding who it affects worldwide, it is anticipated universities, funding agencies, governments, and employers will be lenient and adapt their programs and processes for such unprecedented circumstances. We have already noted many programs and resources available to target students’ difficulties surrounding their mental health, finances, education, research results, and overall career. The initiatives mentioned in this discussion are but a small fraction of those to mitigate the effect of the pandemic on graduate students’ lives and serve as a

foundation to raise awareness among scientists, universities, and funding agencies alike. The drive to succeed is one that is very common among graduate students, and it may very well manifest in more novel ways to tackle the challenges that the COVID-19 lockdown has imposed.

Author contributions

VM and EY conceived and designed the study. VM and EY performed the experiments/collected the data. VM and EY analyzed and interpreted the data. VM and EY contributed resources. VM and EY drafted or revised the manuscript.

Competing interests

The authors have declared that no competing interests exist.

Data availability statement

All relevant data are within the paper.

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