COVID-19 Impact Survey Results

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Introduction

In early April, 2020, the Graduate Student Association at the University of Waterloo (GSA) released a short survey to assess impact of COVID-19 on student wellbeing and experience. Many of the statistics of interest from this study were publicized in a petition posted in late April, but it is hoped that this report provides some context and additional analysis to readers.

Analysis

The Data

Below, find tables of the responses for each question printed:

## What is your Faculty

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHS</td>
<td>107</td>
</tr>
<tr>
<td>ARTS</td>
<td>141</td>
</tr>
<tr>
<td>ENG</td>
<td>239</td>
</tr>
<tr>
<td>ENV</td>
<td>106</td>
</tr>
<tr>
<td>MATH</td>
<td>122</td>
</tr>
<tr>
<td>SCI</td>
<td>106</td>
</tr>
</tbody>
</table>

## Which of the following describes your current program?

- I am a PhD student. 380
- I am a research-based master's student. 237
- I am in a course based, or professional master's program (may do an internship or a major paper). 204

## How many years have you been enrolled in your current program?

<table>
<thead>
<tr>
<th>Years</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>383</td>
</tr>
<tr>
<td>2</td>
<td>221</td>
</tr>
<tr>
<td>3</td>
<td>89</td>
</tr>
<tr>
<td>4</td>
<td>71</td>
</tr>
<tr>
<td>5 or more</td>
<td>34</td>
</tr>
<tr>
<td>6 or more</td>
<td>23</td>
</tr>
</tbody>
</table>

## What is your citizenship status?

- Canadian Citizen 517
- Canadian Permanent Resident 42
- International Student 262

## How has your income changed in the last month as a result of COVID-19 containment and control measures?

- Decreased 1
- Stayed the same 3
- Increased 3
## Approximately how much was your income reduced by?

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10%</td>
<td>19</td>
</tr>
<tr>
<td>10-25%</td>
<td>69</td>
</tr>
<tr>
<td>25-50%</td>
<td>56</td>
</tr>
<tr>
<td>51-75%</td>
<td>21</td>
</tr>
<tr>
<td>&gt;75%</td>
<td>63</td>
</tr>
</tbody>
</table>

## Please rate the following statement regarding impact of COVID-19 measures on your finances: You are concerned about ... term as a result of the COVID-19 containment and control measures (e.g. due to a loss of part-time job opportunities):

<table>
<thead>
<tr>
<th>Rating</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>68</td>
</tr>
<tr>
<td>Disagree</td>
<td>152</td>
</tr>
<tr>
<td>Neither disagree nor agree</td>
<td>147</td>
</tr>
<tr>
<td>Agree</td>
<td>227</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>227</td>
</tr>
</tbody>
</table>

## Which of the following activities did you plan to conduct in the Spring 2020 term (check all that apply):

<table>
<thead>
<tr>
<th>Activity</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet lab research</td>
<td>709</td>
</tr>
<tr>
<td>Use of on-campus resources (e.g. physical book copies from the library)</td>
<td>416</td>
</tr>
<tr>
<td>In-person interviews (e.g. with study subjects for data collection)</td>
<td>653</td>
</tr>
<tr>
<td>Field work</td>
<td>694</td>
</tr>
<tr>
<td>Co-op placement</td>
<td>789</td>
</tr>
<tr>
<td>Internship</td>
<td>734</td>
</tr>
<tr>
<td>Program-specific in-person activity</td>
<td>525</td>
</tr>
<tr>
<td>Research which can be conducted off-campus on the computer</td>
<td>296</td>
</tr>
</tbody>
</table>
I did not plan to conduct activities in Spring 2020

Do you expect to graduate on time despite potential setbacks to your Spring 2020 plans?

You anticipate that you will be set back by:

Will you be enrolled in classes for the Spring 2020 term?

Please rate the following statement regarding the format of the Spring 2020 term: You feel comfortable with the classes being fully online:

Do you have any concerns about online course delivery?

Which of the following concerns do you have about online course delivery? (check all that apply)

Access to an electronic device (e.g. a laptop) to access the class content.

Access to a reliable internet connection.

Cognitive barriers (e.g. a learning disability that makes an online format more challenging for you)
<table>
<thead>
<tr>
<th>True</th>
<th>False</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>51</td>
<td>770</td>
<td>721</td>
</tr>
<tr>
<td>36</td>
<td>785</td>
<td>821</td>
</tr>
<tr>
<td>176</td>
<td>645</td>
<td>821</td>
</tr>
<tr>
<td>175</td>
<td>646</td>
<td>821</td>
</tr>
</tbody>
</table>

Physical barriers (e.g. a hearing or visual impediment that makes an online format more challenging).

Quality of an online delivery format.

Focusing on class while at home.

How did you typically communicate with your supervisor before the University of Waterloo suspended on-campus activity?

- Email
- In person meetings
- Phone
- Online meetings
- Text or instant messaging

How do you feel the suspension of on-campus activity has affected communication with your supervisor?

- Improved
- No change
- Worsened

How have self-isolation and physical distancing impacted your mental health and general well-being?

- Significantly worsened
- Somewhat worsened
- No impact

<table>
<thead>
<tr>
<th>Significantly worsened</th>
<th>Somewhat worsened</th>
<th>No impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>173</td>
<td>479</td>
<td>111</td>
</tr>
</tbody>
</table>
## Somewhat improved Significantly improved
## 47 11

## Are you currently or will you be acting as a caregiver next term (e.g. to children, older adults)?
## No Yes
## 682 139

## Please rate the following statement regarding your caregiving responsibilities: As a caregiver, you have concerns about balancing your caregiving responsibilities and graduate work next term:
## Strongly disagree Disagree
## 5 5
## Neither disagree nor agree Agree
## 13 52
## Strongly agree
## 64

## Have you recently used a mental health and wellness service that offers confidential and accessible support, such as Empower Me and Good2Talk, to discuss how you are feeling or coping during this time?
## No Yes
## 755 66

## Please rate the following statement regarding your use of the service: You found the service to be sufficient in addressing your concerns:
## Strongly disagree Disagree
## 4 12
## Neither disagree nor agree Agree
## 22 24
## Strongly agree
## 4

## Please rate the following statement regarding the service: You did not receive this service because (check all that apply):
## The service was not required at the time.
## FALSE TRUE
## 306 515

## The service was fully booked with long wait times.
## FALSE TRUE
## 798 23

## Of a preference for video calls as the delivery format.
## FALSE TRUE
## 801 20

## Of a preference for texting or online messaging as the delivery format.
## FALSE TRUE
## 803 18

## Of a preference for in-person appointments as the delivery format.
But some of these questions are of particular interest... for example, how are students actually doing?

This result is rather unsurprising. Most students are doing worse as a result of the disruptions of COVID-19. More surprising is the small subset, around 9%, that are doing better. This result is worse than that obtained by a poll from the Angus Reid Institute. In their “COVID-19 Impact Index”, they found 50% of individuals surveyed were doing a little or much worse, 42% felt no change, and 7% were better. While our sample contains a comparable proportion of individuals doing better, far fewer have been unaffected, with a much larger majority of individuals experiencing negative effects.

There are mental health and wellness service that offers confidential and accessible support, such as Empower Me and Good2Talk. Are students using them and finding them to be sufficient in addressing their concerns?
Use of services

Number of respondents

No

Yes
Although few respondents are using these services, those that do tend to agree with or are neutral to the adequacy of these services.

There were quite a few respondents who did opted not to use these services. Let’s look into why that might be:
It appears that most respondents did not require the service at the time, however, issues with the service being fully-booked and preferences for other modes of mental health support were expressed.

Another key point of interest is the impact to student incomes. Let’s view the distribution for our respondents.
While some respondents have experienced a decrease in funding, a clear majority have seen no effect to their income, and a small minority has seen an increase. Perhaps they are writing articles or selling stockpiled masks? Let’s focus on those individuals that lost incomes:
Pay attention to the scale here compared to the previous scale, we are dealing with much smaller numbers. There are two large groups present in this data, those that have seen income losses of less than 25%, and those that have seen income losses of 75-100%. Looking at the distribution of faculties for these large losses:

```
# AHS ARTS ENG ENV MATH SCI
# 0.08 0.10 0.54 0.17 0.05 0.06
```

```
# AHS ARTS ENG ENV MATH SCI
# 0.13 0.17 0.29 0.13 0.15 0.13
```

We see a distribution in which engineering is overrepresented and math and science are under-represented, suggesting this impact is being felt most in engineering. We might wish to ensure this is not the result of random chance, however. Let’s perform a permutation test to check exactly that.

```
## Pearson’s Chi-squared test with simulated p-value (based on 2000 replicates)
## data:  table(faculty, income_decrease)
## X-squared = 29.195, df = NA, p-value = 0.08196
```

This indicates that we would expect a result this extreme about one out of every ten times if there really were no difference in income losses between faculties. I would not stake too much in this conclusion, then. It seems this income loss is hitting every faculty. How do students feel about this, though?
It seems that a majority of respondents are concerned about their finances, even if they have not yet felt any impact from COVID-19 to their income. Another key aspect of student life is graduate milestones, the largest of which is graduation. Do students feel delayed by COVID-19 shutdowns?
Only a minority of respondents feel as thought COVID-19 will delay their graduate date. Is this effect uniformly felt across faculties?

```r
## faculty
## grad.on.time AHS ARTS ENG ENV MATH SCI
## No  30  44  80  36  19  36
## Yes 77  97 159  70 103  70
```

This difference in distribution is rather rare based on our permutation test, occurring in less than one in 100 simulations. Math, arts, and AHS students, it seems, feel less impacted by the COVID-19 shutdowns, while engineering, environment, and science students feel more impacted.

Moving on to the administration of courses over the spring semester...
Are you enrolled in courses this spring?

Most respondents indicated they would not by taking classes. Focusing now on the roughly 300 respondents that will be, we might ask whether they are comfortable with courses being fully online.
This is not quite as clear-cut as previous outputs. While a plurality of respondents are not comfortable with classes being fully online, a majority are neutral or indicate comfort with online classes. By faculty,

<table>
<thead>
<tr>
<th>faculty</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neither disagree nor agree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHS</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>ARTS</td>
<td>19</td>
<td>26</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>ENG</td>
<td>25</td>
<td>46</td>
<td>27</td>
<td>15</td>
</tr>
<tr>
<td>ENV</td>
<td>2</td>
<td>3</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>MATH</td>
<td>2</td>
<td>11</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>SCI</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>faculty</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHS</td>
<td>19</td>
</tr>
<tr>
<td>ARTS</td>
<td>1</td>
</tr>
<tr>
<td>ENG</td>
<td>5</td>
</tr>
<tr>
<td>ENV</td>
<td>3</td>
</tr>
<tr>
<td>MATH</td>
<td>12</td>
</tr>
<tr>
<td>SCI</td>
<td>1</td>
</tr>
</tbody>
</table>

There are some serious differences by faculty. While most math and environment students are neutral or comfortable with online classes, a strong majority of arts and engineering students are not. But what concerns do respondents have with online delivery?
Two answers are dominant. Keeping in mind only 300 respondents saw this question, we can see that a majority of respondents are concerned about the quality of online courses, and equally about focusing on class while at home. Internet access is also a concern for a large proportion of respondents. Next, we might ask what planned activities have been disrupted by COIVD-19.
Finally, we might ask how students have had their communication with their supervisor impacted.
While a large fraction of respondents have seen their communication worsened by COVID-19 measures, a plurality has see no change, and a small fraction has seen an improvement.

By Faculties

Let’s take another look at wellbeing, as we are ultimately mostly concerned with helping student wellbeing. Are there large differences by faculty?

```
# Significantly worsened 17 36 49 25 20 26
# Somewhat worsened 65 81 138 67 68 60
# No impact 19 15 33 10 22 12
# Somewhat improved 5 7 15 4 9 7
# Significantly improved 1 2 4 0 3 1
```

```
# Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)
# data: wellbeingFac
# X-squared = 16.44, df = NA, p-value = 0.6987
```

There do not seem to be. A permutation test indicates that our particular distribution of responses is not particularly extreme. More clearly, we can conclude that every faculty is experiencing wellbeing issues in roughly the same way.
Money doesn’t buy happiness...

This is rather indirect, however. We might wish to ask more directly whether income loss impacts respondent wellbeing in this data. Below is a table and, you guessed it, another permutation test.

<table>
<thead>
<tr>
<th>income</th>
<th>Decreased</th>
<th>Stayed the same</th>
<th>Increased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significantly worsened</td>
<td>55</td>
<td>115</td>
<td>3</td>
</tr>
<tr>
<td>Somewhat worsened</td>
<td>132</td>
<td>335</td>
<td>12</td>
</tr>
<tr>
<td>No impact</td>
<td>31</td>
<td>79</td>
<td>1</td>
</tr>
<tr>
<td>Somewhat improved</td>
<td>7</td>
<td>39</td>
<td>1</td>
</tr>
<tr>
<td>Significantly improved</td>
<td>3</td>
<td>7</td>
<td>1</td>
</tr>
</tbody>
</table>

### Pearson's Chi-squared test with simulated p-value (based on 2000 replicates)

```r
data: table(wellbeing, income, exclude = "")
X-squared = 8.959, df = NA, p-value = 0.3143
```

This indicates an important result that is somewhat spoiled by the section header. Respondents seem to be affected by COVID19 in ways which are not simply economic, as income change and wellbeing change are likely independent in our data. Addressing the wellbeing concerns of students is clearly about much more than making sure they have income.

...so what does?

Let’s cast a broader net, though. What variables are most associated with wellbeing in this data?

```r
# online.concern supervisor_person
# 0.00009999 0.00009999
# wellbeing service_notrequired
# 0.00009999 0.00009999
# service_personpref grad.on.time
# 0.00009999 0.00019998
# supervisor.change service
# 0.00039996 0.00049995
# enrolled_comfort.online finances
# 0.00079992 0.00089991
# activity_camupres citizenship
# 0.00229977 0.00269973
# online.concern_device.access service_booked
# 0.00459954 0.00799920
# service_textpref online.concern_internet.access
# 0.01269873 0.01539846
# caregiver_balance enrolled
# 0.02699730 0.03919608
# online.concern_cognitive activity_field
# 0.09399060 0.10028997
# activity_intern income_decrease
# 0.10478952 0.12048795
# supervisor_online comments
# 0.13748625 0.14008599
```

Above is a list of p-values for the association of variables to wellbeing. I want those of you that understand p-values to forget everything you know about them. Here, we are not trying to use them to make a statistical
statement, but instead are using p-values as a conveniently scaled measure of association. A smaller value indicates a stronger association. These permutation p-values indicate how frequently samples as extreme as that viewed occurred in simulation.

We can see immediately that a number of variables are strongly related to wellbeing. Primary among those are the concern over online course administration, typically contacting supervisors in person, use of services, a preference for in-person services, appraisal of on-time graduation, and concern over finances. A handful of these are printed in contingency tables below for your perusal. It’s a good exercise to view these and try to note the differences in column and row distributions.

```r
## grad.on.time
## wellbeing No Yes
## Significantly worsened 70 103
## Somewhat worsened 148 331
## No impact 14 97
## Somewhat improved 12 35
## Significantly improved 1 10

## online.concern
## wellbeing No Yes
## Significantly worsened 58 115
## Somewhat worsened 264 215
## No impact 70 41
## Somewhat improved 29 18
## Significantly improved 6 5

## service_notrequired
## wellbeing FALSE TRUE
## Significantly worsened 116 57
## Somewhat worsened 162 317
## No impact 15 96
## Somewhat improved 9 38
## Significantly improved 4 7

## service_personpref
## wellbeing FALSE TRUE
## Significantly worsened 118 55
## Somewhat worsened 411 68
## No impact 107 4
## Somewhat improved 44 3
## Significantly improved 10 1

## citizenship
## wellbeing Canadian Citizen Canadian Permanent Resident
## Significantly worsened 0.23 0.19
## Somewhat worsened 0.59 0.43
## No impact 0.13 0.17
## Somewhat improved 0.05 0.21
## Significantly improved 0.01 0.00

## citizenship
## wellbeing International Student
## Significantly worsened 0.18
## Somewhat worsened 0.60
## No impact 0.14
## Somewhat improved 0.05
## Significantly improved 0.02
```
Themes

As a final piece of analysis on this data, we might want to view the comments and determine what they concern. Some simple processing allows us to take the broadest view first and view the simple word frequencies in the comments (note that uninformative “stop words” are removed before this plot is displayed):

## Loading required package: NLP

Unsurprisingly, the terms “student” and “graduate” appear very frequently, as do other uninformative terms, such as “university” and “work”. What about pairs of terms?
That’s interesting, some terms are expected from the single-word analysis, such as “graduate student” and “grad student”, but a few pairs of terms which are more informative seem to pop out. In particular, we can see that tuition fees, the spring term, and mental health are key concerns. Additionally, the two pairs “part time” and “full time” appear frequently in the data, suggesting that students have questions about strategic choices related to their enrolment status. There also appears to be a sense of urgency, “right now” is one of the most common pairs of terms. Many students might feel compelled to go inactive or into part-time studies in order to save on tuition, and the comments seem to reflect this dilemma. Let’s clean these up a bit by combining some common occurrences to see a little more:
The context of “will” in all of these seems highly uninformative, let’s try that again with it removed.
That makes some concerns that were hidden before very obvious, we can see that some students are also mentioning “work[ing from] home”, a comment we couldn’t see before. At this point all of these frequencies are quite low, however. There were over three hundred comments, after all. We could continue up to triplets or more of variables, but let’s take a different approach. For each of these pairs, we might ask what other words occur in the same comments. Let’s take a look. The tables below give word pairings and then prints below these pairings the counts of other words which occur in the same comments

```markdown
## grad student
##
## student grad research funding time students university
##  82   69  23  21  21  19  18
## support tuition access need work online program
##  15   14  12  12  12  11  11
## us made term working also many now
##  11  10  10  10   9  9  9
## can graduate available even home impacted may
##  8   8  7  7  7  7  7
## pandemic since
##  7   7
##
## _______
## spring 2020
##
## spring 2020 tuition course time online research courses
##  43  39  19  12  12  11  11  10
## due term situation student students also fall full
##  9  9  8  8  8  7  7  7
```
## funding need campus concerned fees reduced work access
## 7 7 6 6 6 6 6 5
## continue grad increased know lab offered
## 5 5 5 5 5 5 5 5
##
##
## ---
## int. student
##
## | student | int. | tuition | students | time | university | part |
## |---------|------|---------|----------|------|-----------|------|
## | 33      | 26   | 13      | 11       | 9    | 8         | 7    |
##
## | covid19 | due especially | spring | us also | can |
## | 5       | 5     | 5       | 5       | 5   |
##
## | fees | financial help pay support term concern |
## | 5     | 5     | 5       | 5       | 5   |
##
## | crisis | get grad health many situation work |
## | 4     | 4     | 4       | 4       | 4   |
##
## | able | burden |
## | 3    | 3     |
##
##
## ---
## mental health
##
## | mental health | income tuition student time university |
## |---------------|----------------------------------------|
## | 12            | 11                                     |
##
## | family also financial funding online pandemic research |
## | 5             | 4                                      |
##
## | resources can care decreased department go grad |
## | 4             | 3                                      |
##
## | increased isolated much now stress students well |
## | 3             | 3                                      |
##
## | work year |
## | 3           | 3                                      |
##
##
## ---
## part time
##
## | time | us student part university due int. |
## |------|------------------------------------|
## | 13   | 13                                 |
##
## | jobs students also concern course covid19 different |
## | 5    | 5                                  |
##
## | financial funding grad pay can crisis even |
## | 4    | 4                                  |
##
## | fees get help job like paying people |
## | 3    | 3                                  |
##
## | situation tuition |
## | 3    | 3                                  |
##
##
## ---
## full time
##
## | time | full work tuition support university financial |
## |------|-----------------------------------------------|
## | 14   | 9                                             |
##
## | inactive lot parttime pay student community course |
## | 4    | 4                                             |
##
## |          | 4 | 4 | 4 | 3 | 3 |
## |          | 5 | 5 | 4 |
##
## 25
## hours make now part research spring week
## 3 3 3 3 3 3 3 3
## 2020 7 able also can child complete
## 2 2 2 2 2 2 2 2
## days despite
## 2 2
##
## _______
## right now
##
## now right funding grad student students work
## 10 7 6 5 5 5 5 5
## don't family need support things year concerned
## 4 4 4 4 4 4 4 3
## go going income later matter may one
## 3 3 3 3 3 3 3 3
## research summer term time university 2020 able
## 3 3 3 3 3 2 2
## also arts
## 2 2
##
## _______
## due covid19
##
## due covid19 graduation need student students support
## 8 6 4 4 4 4 4 4
## graduate graduating int. still us work 2020
## 3 3 3 3 3 3 3 2
## additional education family fees finances funding help
## 2 2 2 2 2 2 2 2
## local pay plan please situation spring term
## 2 2 2 2 2 2 2 2
## this tuition
## 2 2
##
## _______
## one term
##
## term one funding now access
## 10 7 5 5 4
## extended year graduate many physical
## 4 4 3 3 3
## time 1 also amount back
## 3 2 2 2 2
## books comprehensive copies exam extra
## 2 2 2 2 2
## go impacts just least longer
## 2 2 2 2 2
## need pay pushed resources terms
## 2 2 2 2 2
##
## _______
## phd students
## students phd don’t program committee

## concerns funding grad like rental

## already can concerned covid delays

## dissertations focused fulltime i’m losing

## order pay professional still student

## terms time university value wife

## -------
## program already

## program online already students much

## content concerns fully grad university

## based complete covid entirely fulltime

## life losing many now professional

## rental say since still student

## well accommodating also amount are

## -------
## time frame

## frame time research thesis now also

## change conduct fieldwork access accommodate available

## concern feel funding grad gsa hard

## however impacted inactive know need program

## provide shorter since student students supposed

## -------
## working home

## student working grad home capacity

## challenges covid many online productivity

## solutions students waterloo care expectations

## extra funding incredibly individual managing
These are very suggestive groupings, and perusing them gives some sense of what concerns are present among students about these different paired word topics. More complex and sophisticated methods were attempted, including hierarchical clustering and factor analysis, but these failed to prove very insightful. The broad commonalities in the above comments appear to be matters of funding and access to support in the short term or immediately.

We can summarize these more simply with a word cloud of term frequencies:

```r
# Loading required package: RColorBrewer

# Warning in wordcloud(names(newTwograms)[1:30], newTwograms[1:30]): spring 2020
# could not be fit on page. It will not be plotted.
```
A grad student program already supports masters students in mental health full time with financial support even though the fall term was able to access conduct research able to complete the long term project. An international student was able to complete the fall 2020 masters program even though fees increased due to the lack of support students due to COVID. Part time PhD students were able to access course delivery support students due to COVID. One term based masters students conducted research full time right now. Due to fees increased, even though fees increased, even though due to COVID long term, due to COVID 19, working from home tuition support students due to COVID.
term access may people students international program now terms lot tuition like home campus due increased family support labcourses work time research much students time term much course access increased home lot like us can need able program family concerned much health concerned much will funding will net