

COVID-19 Impact Survey Results

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28 April 2020

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

##

AHS ARTS ENG ENV MATH SCI

107 141 239 106 122 106

##

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?

##

1 2 3 4 5 6 or more

383 221 89 71 34 23

##

What is your citizenship status?

##

Canadian Citizen Canadian Permanent Resident

517 42

International Student

262

##

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

##

Decreased Stayed the same Increased

```

##          228          575          18
##
## Approximately how much was your income reduced by?
##
##   <10% 10-25% 25-50% 51-75%  >75%
##     19    69    56    21    63
##
## Please rate the following statement regarding impact of COVID-19 measures on your finances:  You are
##
##           Strongly disagree          Disagree
##                   68                   152
## Neither disagree nor agree          Agree
##                   147                   227
##           Strongly agree
##                   227
##
## Which of the following activities did you plan to conduct in the Spring 2020 term (check all that apply)
##
## Wet lab research
##
## FALSE  TRUE
##   709   112
##
## Use of on-campus resources (e.g. physical book copies from the library)
##
## FALSE  TRUE
##   416   405
##
## In-person interviews (e.g. with study subjects for data collection)
##
## FALSE  TRUE
##   653   168
##
## Field work
##
## FALSE  TRUE
##   694   127
##
## Co-op placement
##
## FALSE  TRUE
##   789   32
##
## Internship
##
## FALSE  TRUE
##   734   87
##
## Program-specific in-person activity
##
## FALSE  TRUE
##   525   296
##
## Research which can be conducted off-campus on the computer

```

```

##
## FALSE TRUE
## 411 410
##
## I did not plan to conduct activities in Spring 2020
##
## FALSE TRUE
## 764 57
##
## Other
## activity_other
## Do you expect to graduate on time despite potential setbacks to your Spring 2020 plans?
##
## No Yes
## 245 576
##
## You anticipate that you will be set back by:
##
## 1 term 2 terms 3 terms 4 terms or more
## 144 76 16 9
##
## Will you be enrolled in classes for the Spring 2020 term?
##
## No Yes
## 502 319
##
## Please rate the following statement regarding the format of the Spring 2020 term: You feel comfortable
##
## Strongly disagree Disagree
## 51 97
## Neither disagree nor agree Agree
## 66 64
## Strongly agree
## 41
##
## Do you have any concerns about online course delivery?
##
## No Yes
## 427 394
##
## 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.
##
## FALSE TRUE
## 793 28
##
## Access to a reliable internet connection.
##
## FALSE TRUE
## 728 93
##
## Cognitive barriers (e.g. a learning disability that makes an online format more challenging for you)
##

```

```

## FALSE TRUE
## 770 51
##
## Physical barriers (e.g. a hearing or visual impediment that makes an online format more challenging :
##
## FALSE TRUE
## 785 36
##
## Quality of an online delivery format.
##
## FALSE TRUE
## 645 176
##
## Focusing on class while at home.
##
## FALSE TRUE
## 646 175
##
## How did you typically communicate with your supervisor before the University of Waterloo suspended o
##
## Email
##
## FALSE TRUE
## 333 488
##
## In person meetings
##
## FALSE TRUE
## 286 535
##
## Phone
##
## FALSE TRUE
## 759 62
##
## Online meetings
##
## FALSE TRUE
## 692 129
##
## Text or instant messaging
##
## FALSE TRUE
## 733 88
##
## How do you feel the suspension of on-campus activity has affected communication with your supervisor?
##
## Improved No change Worsened
## 29 308 280
##
## How have self-isolation and physical distancing impacted your mental health and general well-being?
##
## Significantly worsened Somewhat worsened No impact
## 173 479 111

```

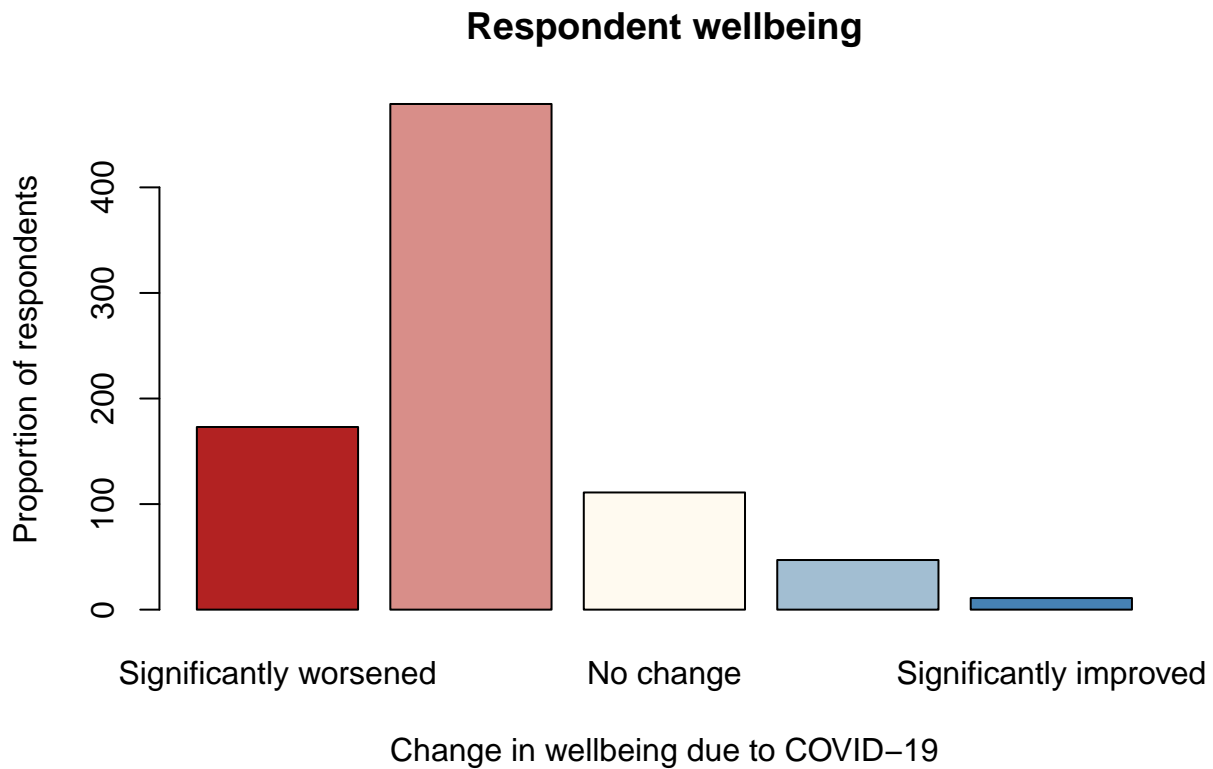
```

##      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
##
##      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
##
## No Yes
## 755 66
##
## Please rate the following statement regarding your use of the service: You found the service to be
##
##      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
##
## 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.

```

```
##
## FALSE TRUE
## 690 131
##
## Other
## service_other
```

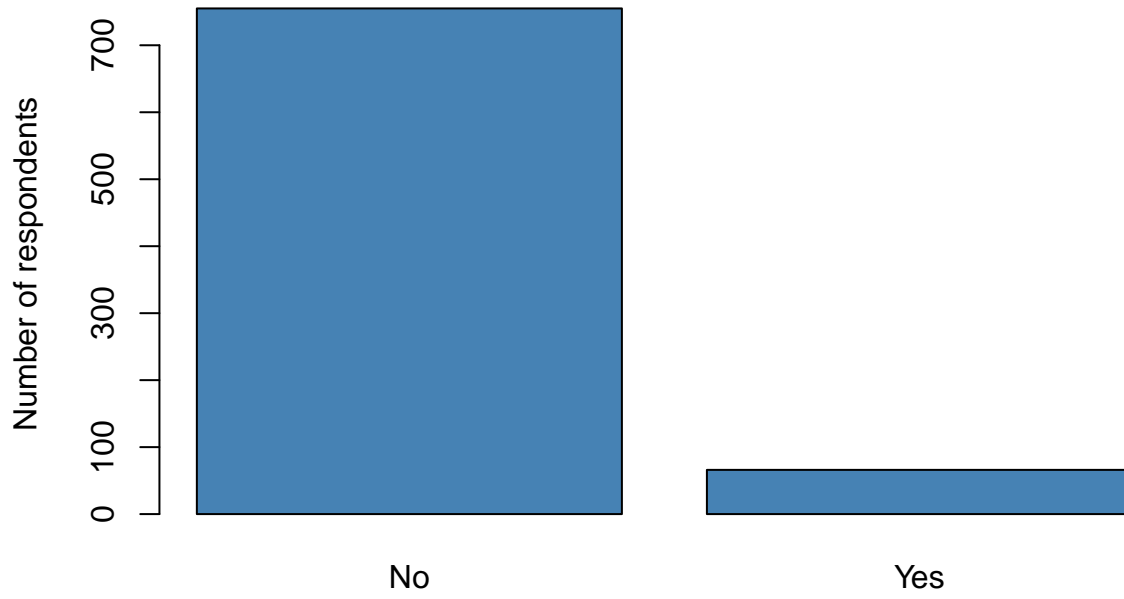
But some of these questions are of particular interest... for example, how are students actually doing?

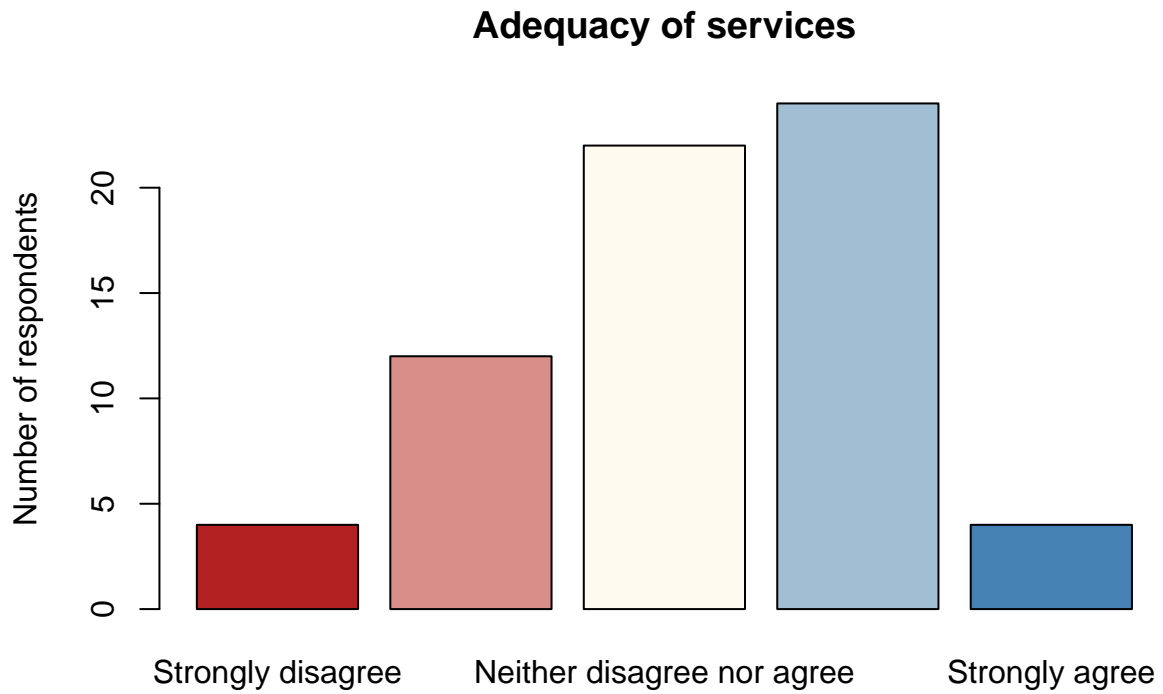


This result is rather unsurprising. Most students are doing worse as a result of the disruptions of COVID-19. More surprising is the small subset, around 9%, that are doing better. This result is worse than that obtained by a poll from the Angus Reid Institute. In their “COVID-19 Impact Index”, they 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

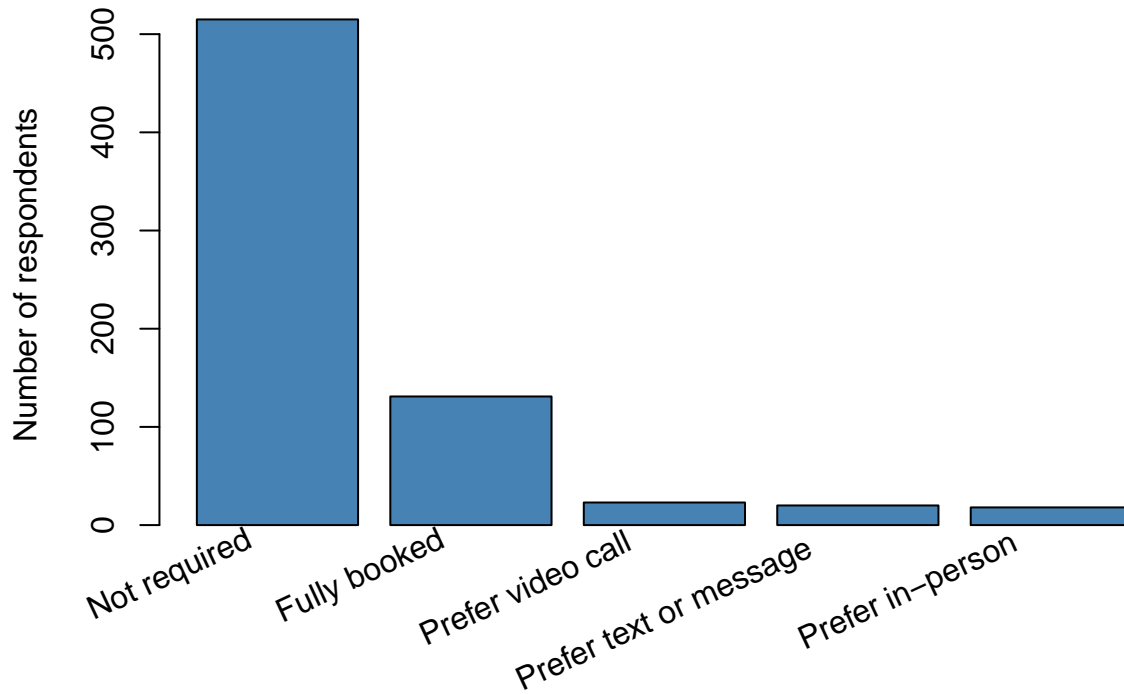




Although few respondents are using these services, those that do tend to agree with or are neutral to the adequacy of these services.

There were quite a few respondents who did opt not to use these services. Let's look into why that might be:

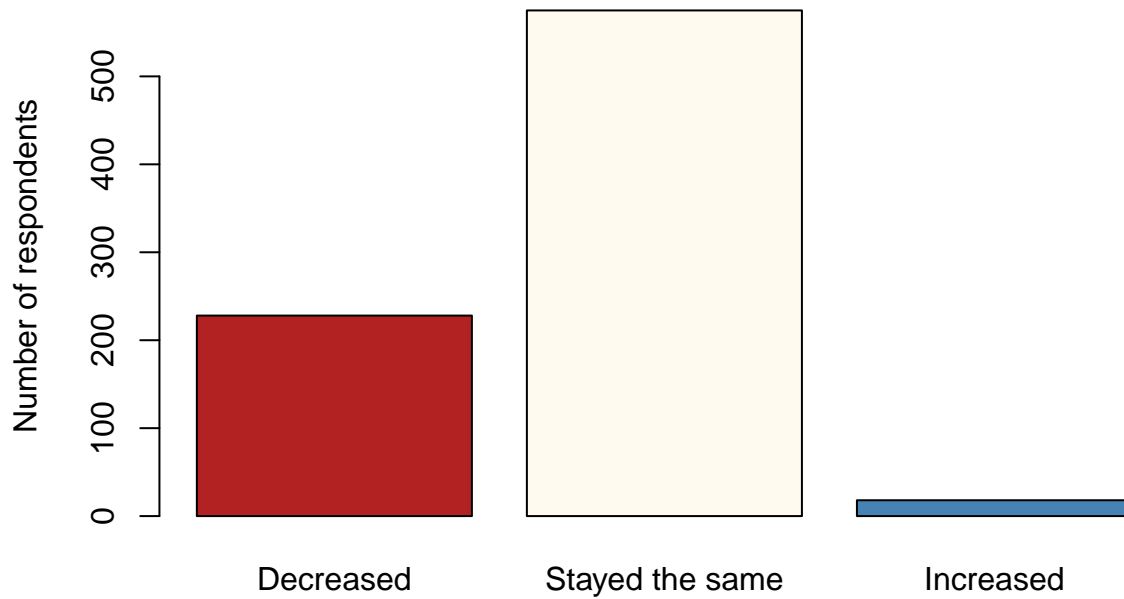
Reasons for not using service



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.

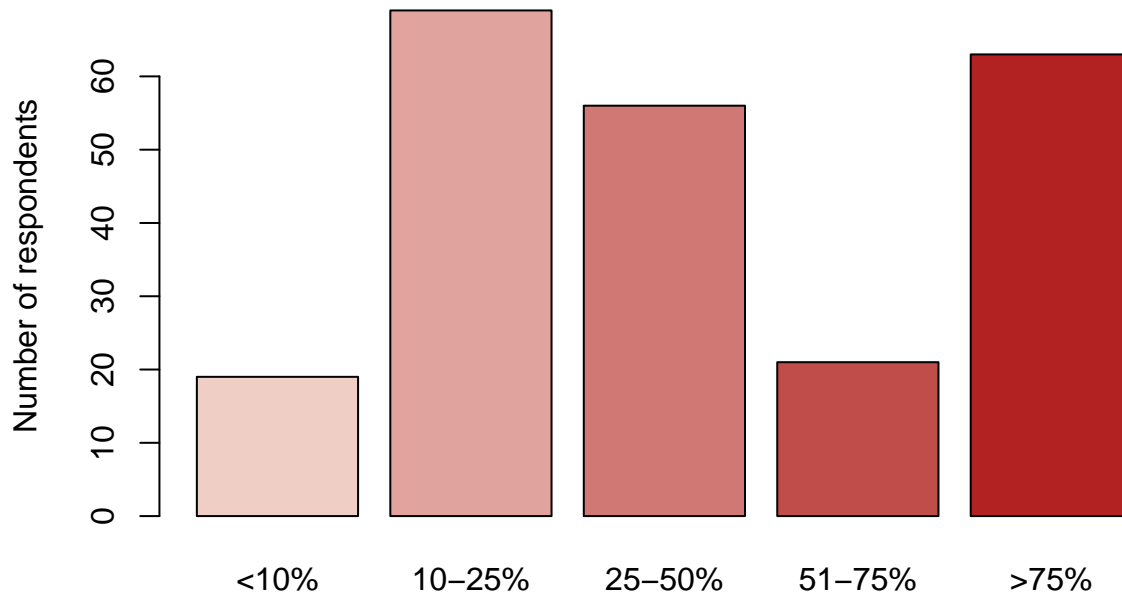
Another key point of interest is the impact to student incomes. Let's view the distribution for our respondents.

Income change as a result of COVID-19



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:

Income loss due to COVID-19



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
```

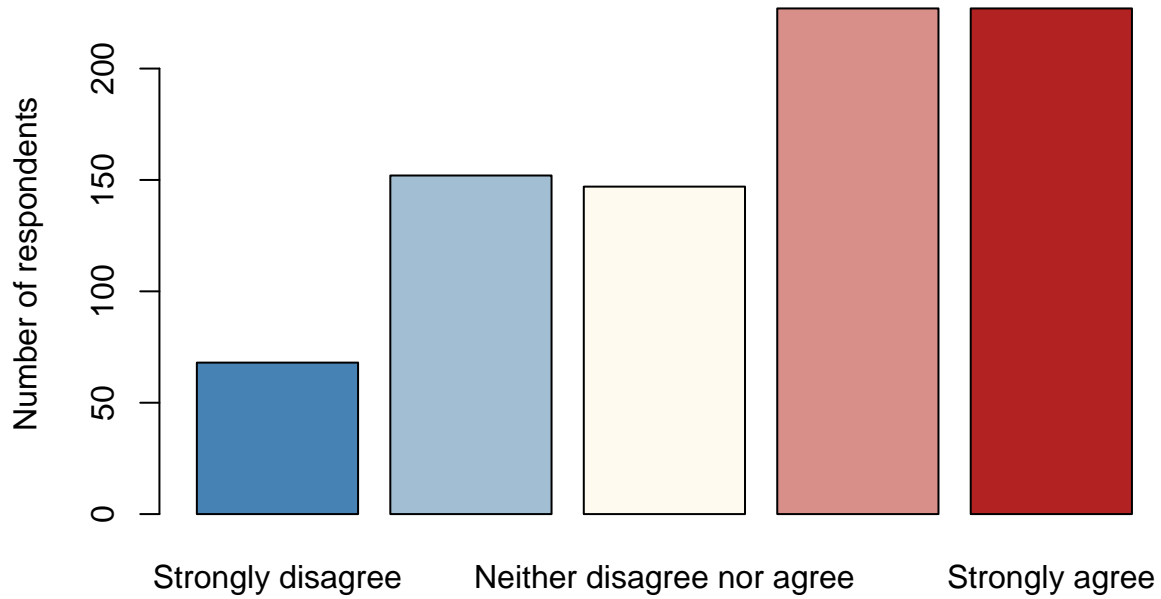
```
##  
## AHS ARTS ENG ENV MATH SCI  
## 0.13 0.17 0.29 0.13 0.15 0.13
```

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
```

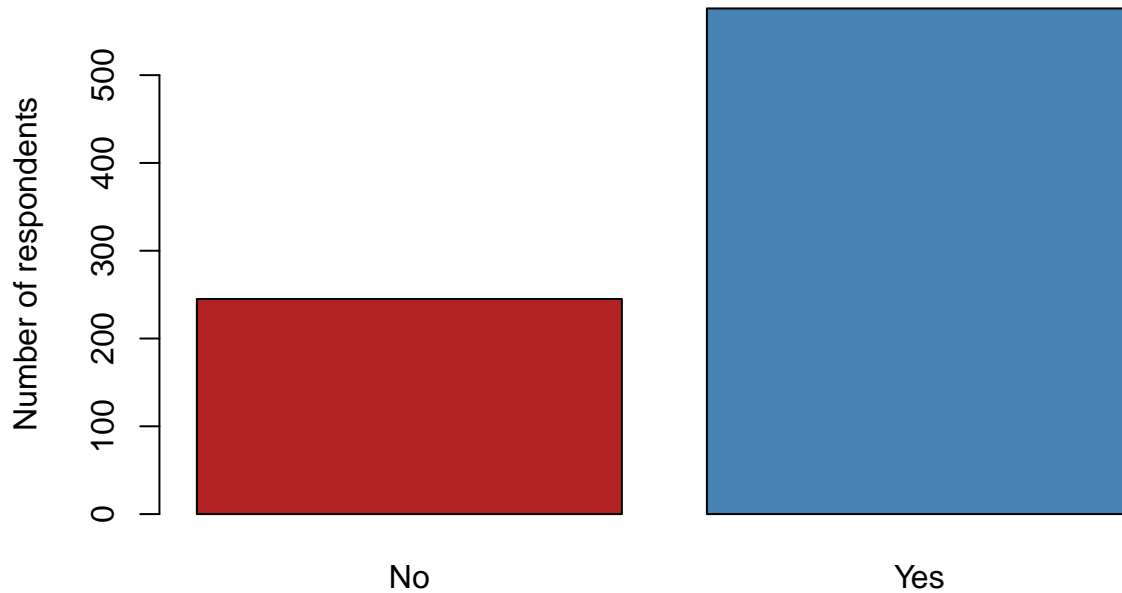
This indicates that we would expect a result this extreme about one out of every ten times if there really were no difference in income losses between faculties. I would not stake too much in this conclusion, then. It seems this income loss is hitting every faculty. How do students feel about this, though?

Are you concerned about your finances?



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?

Do you think you will graduate on time?



Only a minority of respondents feel as though COVID-19 will delay their graduate date. Is this effect uniformly felt across faculties?

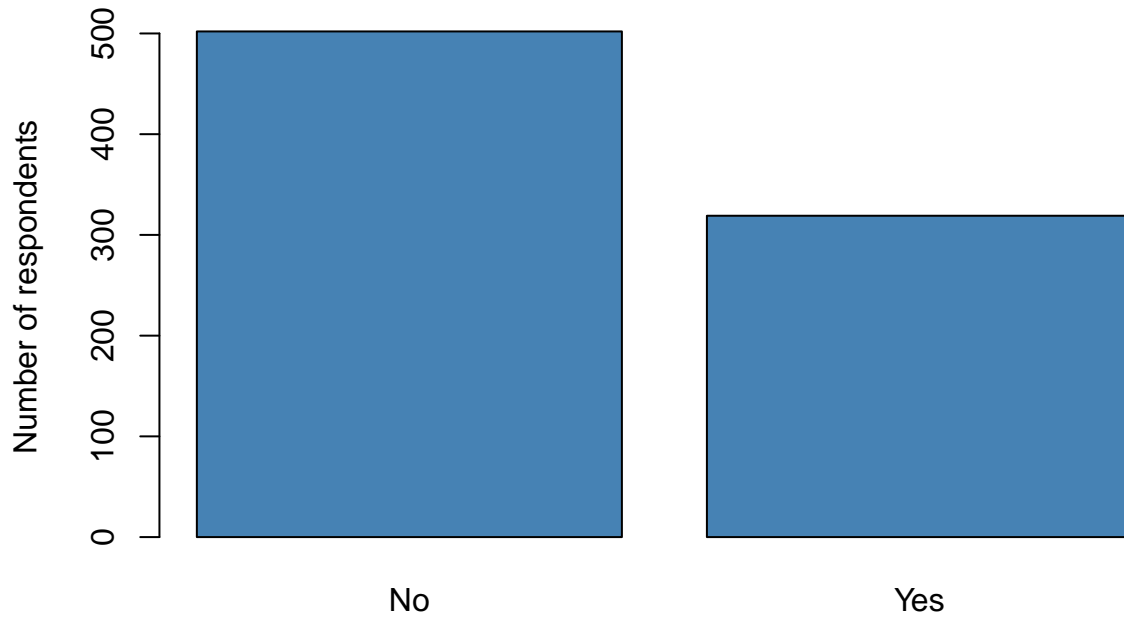
```
##          faculty
## grad.on.time AHS ARTS ENG ENV MATH SCI
##           No  30  44  80  36   19  36
##           Yes  77  97 159  70  103  70

##
## Pearson's Chi-squared test with simulated p-value (based on 2000
## replicates)
##
## data:  grad.on.time and faculty
## X-squared = 15.379, df = NA, p-value = 0.008996
```

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.

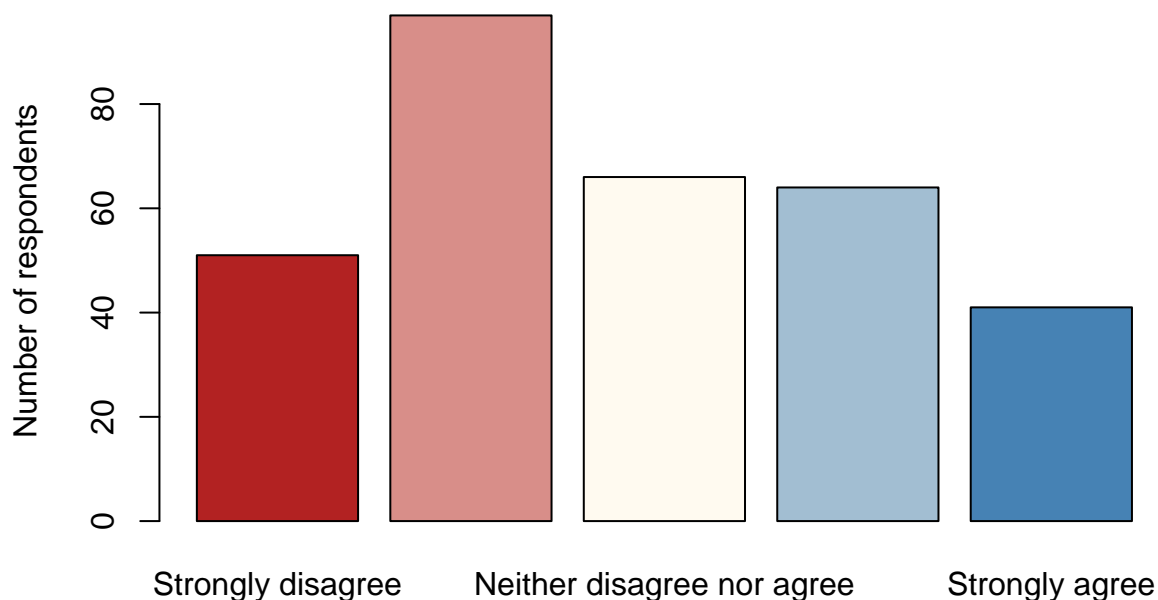
Moving on to the administration of courses over the spring semester...

Are you enrolled in courses this spring?



Most respondents indicated they would not be taking classes. Focusing now on the roughly 300 respondents that will be, we might ask whether they are comfortable with courses being fully online.

Are you comfortable with classes being fully online?

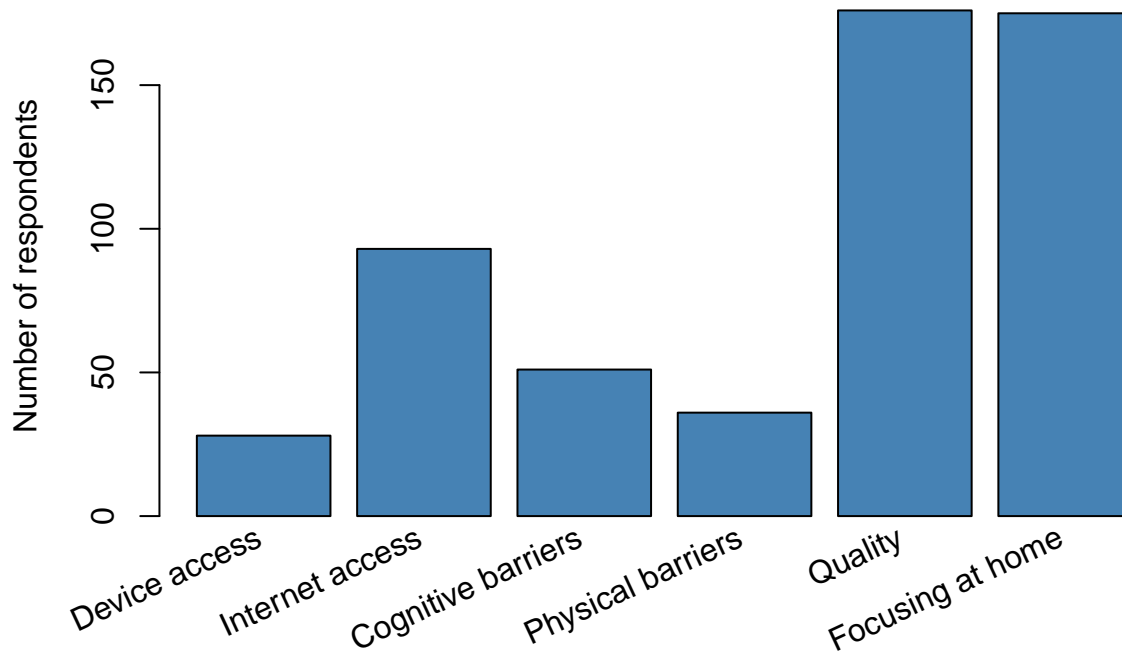


This is not quite as clear-cut as previous outputs. While a plurality of respondents are not comfortable with classes being fully online, a majority are neutral or indicate comfort with online classes. By faculty,

```
##          enrolled_comfort.online
## faculty Strongly disagree Disagree Neither disagree nor agree Agree
##  AHS                1         5                5      12
##  ARTS               19        26                7       8
##  ENG                25        46               27      15
##  ENV                 2         3                9      11
##  MATH                2        11               12      10
##  SCI                 2         6                6       8
##          enrolled_comfort.online
## faculty Strongly agree
##  AHS                19
##  ARTS                1
##  ENG                 5
##  ENV                 3
##  MATH               12
##  SCI                 1
```

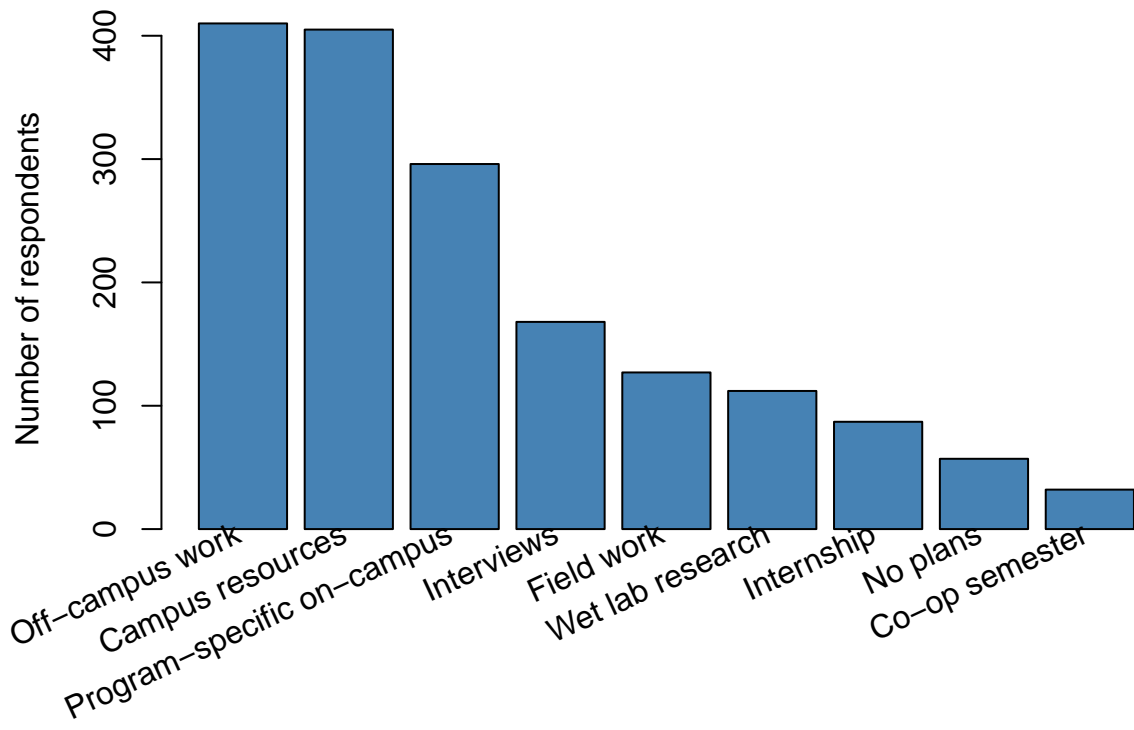
There are some serious differences by faculty. While most math and environment students are neutral or comfortable with online classes, a strong majority of arts and engineering students are not. But what concerns do respondents have with online delivery?

Online course concerns



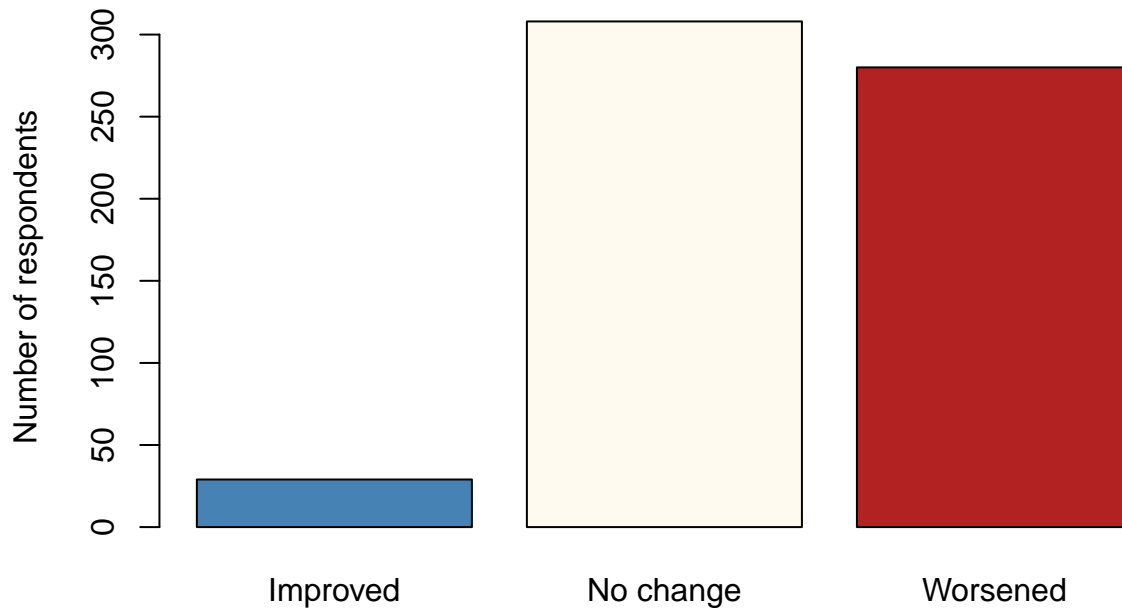
Two answers are dominant. Keeping in mind only 300 respondents saw this question, we can see that a majority of respondents are concerned about the quality of online courses, and equally about focusing on class while at home. Internet access is also a concern for a large proportion of respondents. Next, we might ask what planned activities have been disrupted by COVID-19.

Planned spring activities



Finally, we might ask how students have had their communication with their supervisor impacted.

Impact on supervisor communication



While a large fraction of respondents have seen their communication worsened by COVID-19 measures, a plurality has seen 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?

```
##                AHS ARTS ENG  ENV  MATH  SCI
## 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.

```
##                               income
## wellbeing      Decreased Stayed the same Increased
## Significantly worsened      55          115         3
## Somewhat worsened          132          335        12
## No impact                   31           79         1
## Somewhat improved           7           39         1
## Significantly improved       3           7          1
##
## Pearson's Chi-squared test with simulated p-value (based on 2000
## replicates)
##
## 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?

```
##           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_campusres      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.

```
##                                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

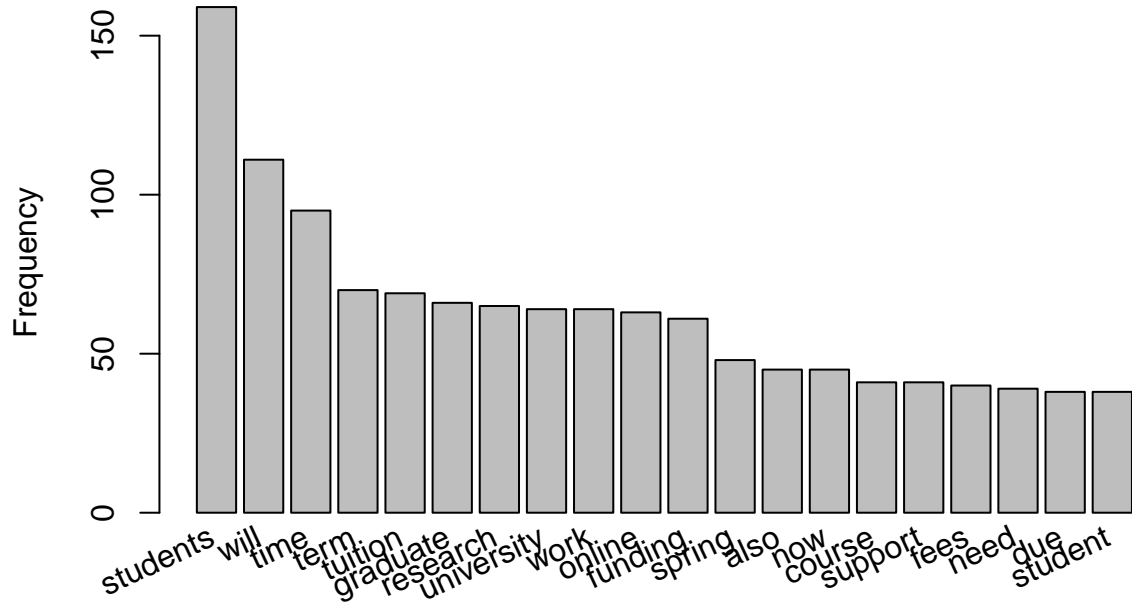
##                                citizenship
## wellbeing                       Canadian Citizen Canadian Permanent Resident
## Significantly worsened                                0.23 0.19
## Somewhat worsened                                  0.59 0.43
## No impact                                           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
```

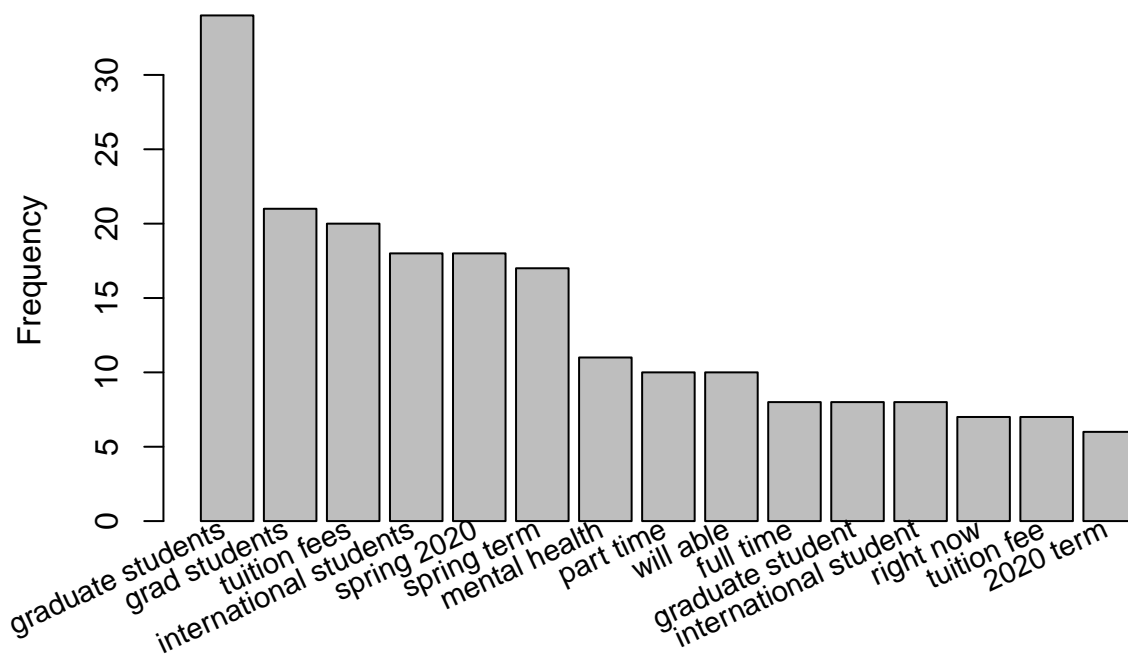
Themes

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):

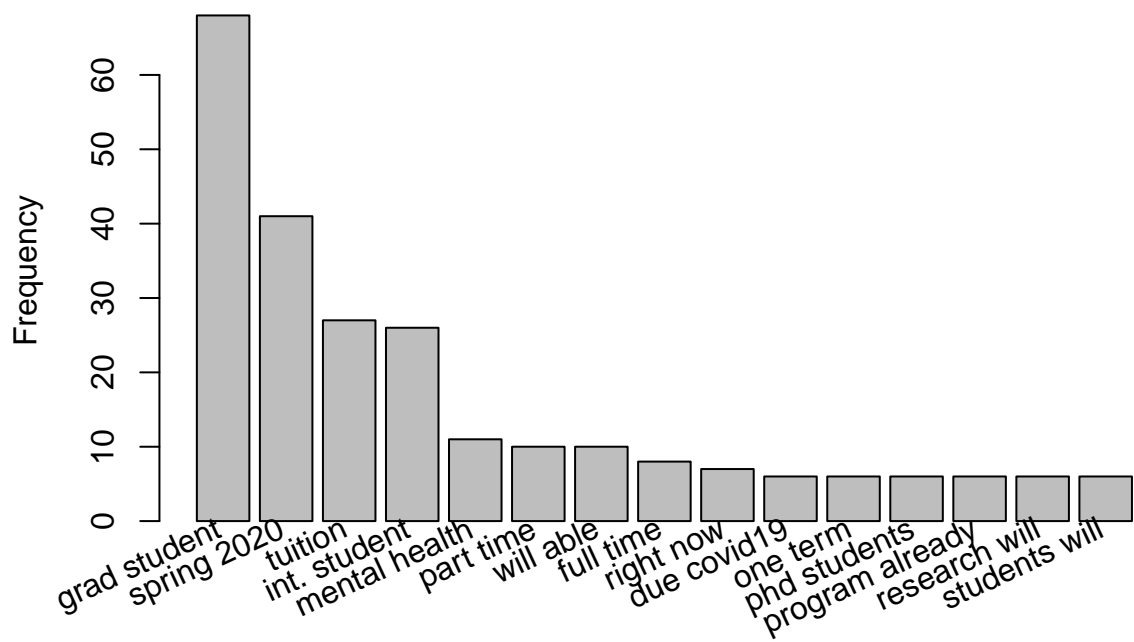
```
## Loading required package: NLP
```



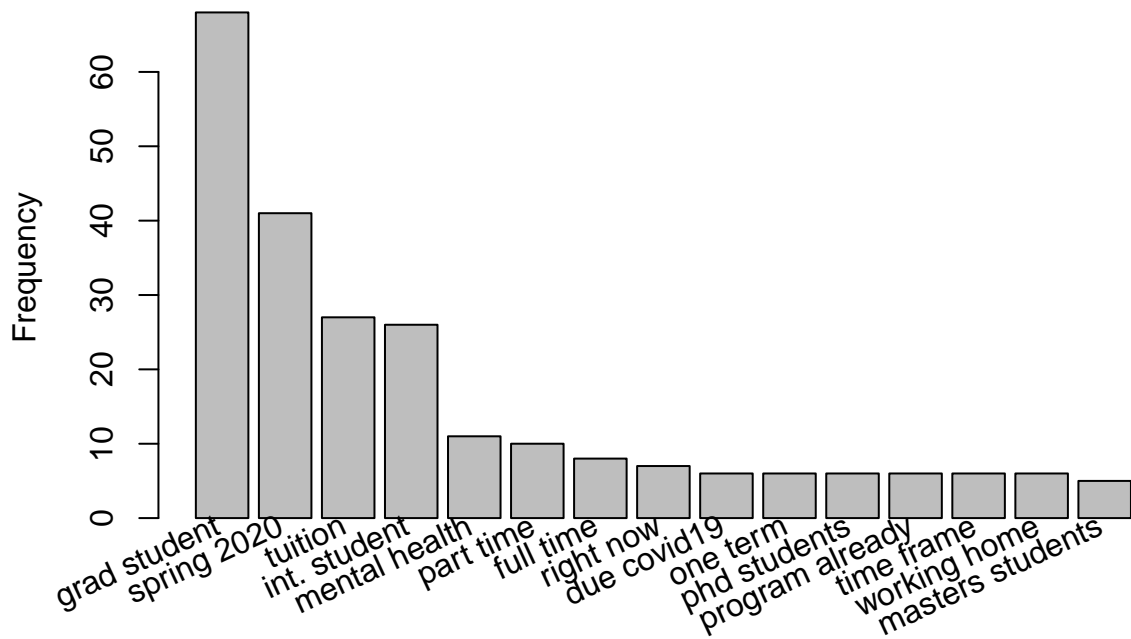
Unsurprisingly, the terms “student” and “graduate” appear very frequently, as do other uninformative terms, such as “university” and “work”. What about pairs of terms?



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

```
## 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
##
## -----
## int. student
##
## student      int.  tuition  students  time university  part
##      33      26      13      11      9      8      7
## covid19      due  especially  spring  us  also  can
##      6      6      6      6      6      5      5
## fees financial  help  pay  support  term  concern
##      5      5      5      5      5      5      4
## crisis      get  grad  health  many  situation  work
##      4      4      4      4      4      4      4
## able      burden
##      3      3
##
## -----
## mental health
##
## mental      health  income  tuition  student  time university
##      12      11      8      7      6      6      6
## family      also  financial  funding  online  pandemic  research
##      5      4      4      4      4      4      4
## resources  can  care  decreased  department  go  grad
##      4      3      3      3      3      3      3
## increased  isolated  much  now  stress  students  well
##      3      3      3      3      3      3      3
## work      year
##      3      3
##
## -----
## part time
##
## time      us  student  part university  due  int.
##      13      13      12      10      8      5      5
## jobs  students  also  concern  course  covid19  different
##      5      5      4      4      4      4      4
## financial  funding  grad  pay  can  crisis  even
##      4      4      4      4      3      3      3
## fees      get  help  job  like  paying  people
##      3      3      3      3      3      3      3
## situation  tuition
##      3      3
##
## -----
## full time
##
## time      full  work  tuition  support university  financial
##      14      9      9      7      6      5      4
## inactive  lot  parttime  pay  student  community  course
##      4      4      4      4      4      3      3

```

```

##      hours      make      now      part  research      spring      week
##        3        3        3        3        3        3        3
##      2020        7      able      also      can      child  complete
##        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
## donâ\200\231t      family      need      support      things      year  concerned
##        4        4        4        4        4        4        3
##      go      going      income      later      matter      may      one
##        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
## graduate  graduating      int.      still      us      work      2020
##        3        3        3        3        3        3        2
## additional  education      family      fees      finances      funding      help
##        2        2        2        2        2        2        2
##      local      pay      plan      please  situation      spring      term
##        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      donâ\200\231t      program      committee
##          8              6          4              4              3
##      concerns      funding      grad          like      rental
##          3              3          3              3              3
##      already          can      concerned      covid      delays
##          2              2          2              2              2
##      dissertations      focused      fulltime      iâ\200\231m      losing
##          2              2          2              2              2
##          order          pay      professional      still      student
##          2              2          2              2              2
##          terms          time      university      value      wife
##          2              2          2              2              2
##
## -----
##      program already
##
##          program      online      already      students      much
##          8              7          6          6              5
##          content      concerns      fully      grad      university
##          4              3          3          3              3
##          based      complete      covid      entirely      fulltime
##          2              2          2          2              2
##          life      losing      many      now      professional
##          2              2          2          2              2
##          rental      say      since      still      student
##          2              2          2          2              2
##          well accommodating      also      amount      are
##          2              1          1          1              1
##
## -----
##      time frame
##
##          frame      time      research      thesis      now      also
##          6              6          5          5          4          3
##          change      conduct      fieldwork      access      accommodate      available
##          3              3          3          2          2          2
##          concern      feel      funding      grad      gsa      hard
##          2              2          2          2          2          2
##          however      impacted      inactive      know      need      program
##          2              2          2          2          2          2
##          provide      shorter      since      student      students      supposed
##          2              2          2          2          2          2
##
## -----
##      working home
##
##          student      working      grad      home      capacity
##          7              7          6          6          3
##          challenges      covid      many      online      productivity
##          3              3          3          3          3
##          solutions      students      waterloo      care      expectations
##          3              3          3          2          2
##          extra      funding      incredibly      individual      managing
##          2              2          2          2          2

```

```

##      messages          met      office      people      productive
##          2              2          2          2          2
##      really      response      saying significantly      slow
##          2              2          2          2          2
##
## -----
## masters students
##
##      masters      students      based      course      student      deadlines
##          5          5          4          4          4          3
##      made      research      time      week      already      also
##          3          3          3          3          2          2
##      grad      grades      receive      stressed      undergrad      1
##          2          2          2          2          2          1
##      all      allocation      another      back      busiest      busy
##          1          1          1          1          1          1
##      can      chose      concentrate      concerns      considering      context
##          1          1          1          1          1          1
##
## -----
## support students
##
##      grad      student      students      support      time      many
##          7          7          7          7          5          4
##      now      funding      one      supervisors      breaks      capacity
##          4          3          3          3          2          2
##      care      covid      day      extra      later      matter
##          2          2          2          2          2          2
##      may      money      need      no      physical      really
##          2          2          2          2          2          2
##      right      social      term      thank      things      trying
##          2          2          2          2          2          2
##
## -----

```

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:

```

## 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.

```

