

University of British Columbia

Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Undergraduate Students Transportation Behavior: A Report on How to Promote Active Transportation in a COVID Society

Prepared by: Afif Islam, Raymond Yeh, Tommy Ng, Tomoki Okamura

Prepared for:

Course Code: KIN 464

University of British Columbia

Date: 13 April 2021

Disclaimer: "UBC SEEDS Sustainability Program provides students with the opportunity to share the findings of their studies, as well as their opinions, conclusions and recommendations with the UBC community. The reader should bear in mind that this is a student research project and is not an official document of UBC. Furthermore, readers should bear in mind that these reports may not reflect the current status of activities at UBC. We urge you to contact the research persons mentioned in a report or the SEEDS Sustainability Program representative about the current status of the subject matter of a report".





THE UNIVERSITY
OF BRITISH COLUMBIA

Undergraduate Students Transportation Behavior: A Report on How to Promote Active
Transportation in a COVID Society

Afif Islam

Raymond Yeh

Tommy Ng

Tomoki Okamura

KIN 464

Project G: Group 13

Dr. Andrea Bundon

April 13, 2021

Executive Summary

The global pandemic has drastically changed how the world conducts itself, especially as the aspect of fear has greatly influenced how people view and use transportation (Labonté-LeMoyne et al., 2020). With more and more people turning to their own individual vehicles rather than public transit, the question arises whether the same is occurring at the University of British Columbia (UBC).

This study aimed to determine how the transportation modes of UBC students have changed throughout the COVID-19 pandemic and whether the modes are passive or active. This study also aimed to accelerate climate action, by providing recommendations on how more individuals can partake in active transportation (AT). The target population for this study was UBC undergraduate students that were regularly commuting to the UBC Vancouver campus during the pandemic. Undergraduate students were focused in particular as they are a vulnerable group towards not getting enough exercise, even more so due to the pandemic (Bertrand et al., 2021). Data was collected through online surveys conducted on Qualtrics. Surveys consisted of a consent form and 19 questions including open-ended, close-ended, and Likert-type style questions. Survey questions regarded: pre-pandemic and present-pandemic transportation methods, bike accessibility, AT, barriers towards AT (with the emphasis on biking), public transit, and motivation factors. Participants were recruited by sharing the survey via Facebook, UBC classes, and personal contacts. All participants were recruited through online methods due to the pandemic. Participants were incentivized by having their name entered into a draw for a FitBit and 2 \$25 gift cards towards the UBC bookstore/food services. The sample population involved 51 participants, where 42 completed the survey in its entirety, 5 partially completed, and 4 were deemed invalid as they did not provide consent towards the survey.

Key findings from this study included a decrease in public transportation usage (-42.22%) and an increase in car usage (+40%) when compared to pre-pandemic levels. In addition, it was found that the majority of UBC students were reliant on passive transportation (PT) rather than AT. Barriers towards the use of AT, with the emphasis on biking, included (in order) distance, not owning a bike, safety/health concerns, and security concerns. It was also found that students would like to engage in AT but lack the motivation to do so. Increasing the motivation of UBC students included (in order): increasing health and fitness, better bike security, group AT initiatives, and environmental campaigns. Based on these findings, recommendations were made relating to three categories: increasing group initiatives, promoting fitness campaigns, and implementing more bike-friendly public transportation.

Recommendations included creating an online community where members would connect through social media platforms, encourage, and motivate one another to participate in AT as a way to commute to campus; creating health and fitness campaigns where individuals would be able to participate safely and share their experiences through social media; and increased bike security and accessibility. Other recommendations included addressing the different barriers that students may face; such as taking public transit partway and using AT for the rest.

Introduction & Literature Review

From its origin in Wuhan, China to be the cause of hundreds of thousands of worldwide deaths, the novel coronavirus has greatly changed the landscape of human activities and the very climate itself by playing a prominent part in the reduction of CO₂ emissions (Liu et al., 2020). When compared to 2019, it has been seen that some of the largest COVID-related decreases in CO₂ emissions are due to the decreased ridership within the road transportation industry (Liu et al., 2020). Making it suffice to say that COVID-19 has played a vital role in how the world conducts itself; especially as the aspect of fear has been causing a surmountable difference in how people use transportation when compared to a pre-COVID-19 era (Labonté-LeMoyne et al., 2020), including students and faculty members at UBC.

In a pre-pandemic era, UBC saw approximately 148,800 people commuting to and from its Vancouver campus, with the most prevalent means of transportation being public transit and vehicles, both being passive forms of transportation (The University of British Columbia, 2020). While AT, transportation powered by humans themselves (i.e., walking and cycling), consisted of an insignificant portion of the UBC commuter population (The University of British Columbia, 2020; Okkels et al., 2020). However, these findings may not reflect the statistics of students who commute to and from UBC within the COVID-19 era, as in-person classes are being conducted primarily online. Meaning that the commute -either passive or active- to and from UBC is not necessary for the majority of UBC students and staff. Leading to the question of how the remaining students, staff, and faculty members are commuting themselves to the UBC campus during these trying times. Are they driving themselves to mitigate the risk of contracting/spreading COVID-19? Or are they bussing as they have no other option? These questions are important as the form of transportation that people take has environmental impacts.

Multiple recent research articles have examined the effects of the COVID-19 pandemic on transportation usage. For example, a study conducted by Labonté-LeMoyne et al. (2020) examined the expected usage of transportation during the pandemic in six major Canadian cities: Vancouver, Calgary, Toronto, Ottawa, Montréal, and Halifax. It was found that Canadians were less likely to travel using public transit because of the concerns for their safety and the longer service times. Many participants in their survey reported being fearful of using public transit due to the increased risk of contracting the virus from other passengers in an enclosed space (Labonté-LeMoyne et al., 2020). This change in behavior will cause a predicted increase in car use and a decreasing trend in mass transit use. However, public transport use can recover if more protective measures were implemented such as mandatory face masks, hand sanitizing, physical cleaning, and proper social distancing (Dzisi & Dei, 2020; Labonté-LeMoyne et al., 2020). Similar results were also found in Australia as there was a significant decline in public transit ridership of 80% during the start of the lockdown (Munawar et al., 2021).

In lieu of the economic and social hardships that the COVID-19 pandemic has caused, there have been indirect positive effects that have been made on the environment. Such as the reduction of waste and environmental noise levels within public areas due to social distancing measures and the decrease in transportation usage, specifically around parks and beaches (Zambrano-Monserrate et al., 2020). Researchers have also found that the reduction in transportation usage has greatly improved the air quality within China, France, Germany, Spain, and Italy, subsequently resulting in better overall health for their inhabitants (Zambrano-Monserrate et al., 2020). In another study, researchers have found that during the first quarter of 2020, global CO₂ emission was down 5.8% with a decline in ground transportation emissions - emissions from cars, trucks, etc.- by 8.3% (Liu et al., 2020). However, it is argued that this

temporary reduction in greenhouse gas (GHG) emissions has a negligible effect on the total concentrations of GHGs in the atmosphere (Rume & Islam, 2020; Zambrano-Monserrate et al., 2020). For a long-term solution, investing in more sustainable means of transportation and promotion of AT should be a priority in order to further diminish emissions (Labonté-LeMoyne et al., 2020).

As mentioned previously, there is an increasing discrepancy between public transportation use and car use. As travel restrictions begin to loosen and people are able to leave their homes, it is more likely for individuals to travel in private cars as it limits contact with other people; this means more sources of ground transportation and increasing levels of CO₂ emissions (Labonté-LeMoyne et al., 2020; Liu et al., 2020). An alternative solution to this would be a shift to more environmentally friendly and active modes of transportation such as biking. Biking allows people to travel while avoiding shared spaces with potentially contagious strangers. Additionally, it provides people with better control of their immediate environment (Abdullah et al., 2020). However, individuals may be hesitant towards biking as most cities lack proper bicycle infrastructures such as physical barriers, bike theft prevention measures, and bike-share programs to promote biking as a safe and viable alternative mode of transport (Okkels et al., 2020). Jonas De Vos (2020) suggests that transport planners and governments should utilize this opportunity to promote more active modes of travel.

Given the research done, there are gaps in the literature to consider, specifically about the means of transportation. For instance, Labonté-LeMoyne et al. (2020) talked about the fears and perceptions towards PT, leaving one to wonder if the same fears and perceptions can be applied to AT within the COVID-19 era. In addition, the aforementioned articles stated how AT would be considered better for the environment, but neglected to mention how specifically one would

go on to promote the use of AT over the use of PT. Furthermore, Liu et al. (2020) explained how CO₂ emissions have decreased as ground transportation levels have decreased, but neglected to mention if the individuals that had relied on PT had found other active means to travel. Gaps in the literature also exist about the age and occupation of the sampled participants. For instance, Labonté-LeMoyne et al.'s (2020) study had a very broad sample population, where the majority of participants were above the age of 30 and where students made up only 6% of the respondents. This leaves one to wonder whether the same perceptions are necessarily reflecting the students that are commuting during COVID-19, hence the purpose of this study. Other studies also had sample populations that took place in other parts of the world, leaving one to again wonder if the same would apply towards UBC, hence the purpose of this study.

This study will try to determine how UBC undergraduate students have changed their modes of transportation throughout the pandemic and whether the modes are either passive or active. This study will also aim to accelerate climate action, by encouraging and providing recommendations as to how more individuals can partake in AT. This will be done by highlighting the advantages of AT, specifically when it comes to cycling.

Methods

Our research project examined the behaviors of 47 UBC undergraduate students within the age range of 19 to 24 who commute to the University of British Columbia Vancouver (UBCV) campus regularly at least once a week and that does not live in residences. University students were the focus of our study because they are a vulnerable group for insufficient physical activity and increased sedentary behaviour during the pandemic (Bertrand et al., 2020).

To measure these behaviors, we created a survey that consisted of both open and close-ended questions (e.g. choose one option) as well as a few Likert scale questions that would provide more context as to the barriers that may affect one's desire to bike to campus (Appendix B) (Shorten & Smith, 2017). Prior to interacting with the survey, a consent form was shown to our respondents that stressed the right to withdraw from the research at any time in addition to keeping the anonymity of each participant as a priority. We recruited our sample electronically through convenience sampling via Facebook and Canvas and ended data collection once we obtained 40 responses. Finally, we used descriptive statistical analysis and found trends in our data by comparing the results of each respondent.

The rationale behind choosing surveys to collect data was because it allowed us to gather a higher quantity of responses more efficiently while maximizing the quality of the responses by formulating detailed survey questions. This is done through using a multitude of different types of questions in our survey which helps provide a more "in-depth understanding of the participant's personal barriers that prevent cycling to campus," thereby allowing us to draw conclusions more confidently (Shorten & Smith, 2017). Additionally, our survey questions were only relevant to the features and layout of the UBCV. We excluded graduate students, students who commute to the University of British Columbia Okanagan campus (UBCO) regularly, students attending online classes, students living on residence, and UBC faculty and staff. The exclusion criteria were determined by finding the inverse of our inclusion criteria. Furthermore, students who only attended online courses and/or lived on residence did not require to take any means of transportation to attend class, therefore the pandemic was less likely to have affected their transportation habits. Lastly, we excluded UBC faculty and staff because we wanted to mainly focus on the experiences and behaviors of undergraduate students.

Regarding AT, we focused specifically on biking rather than other forms of AT (e.g. walking, running, skateboarding, etc.). The rationale behind this decision is that these other forms of AT are more inconvenient and unlikely. With W. 4th Ave, W. 10th Ave, and W. 16th Ave having approximate walking times between 30 to 45 minutes to UBCV, and with SW Marine Drive having an approximate walking time of 1 hour and 15 minutes to UBCV, it was reasonable to assume that students who do participate in AT are mainly biking (Google, n.d.-a; Google, n.d.-b; Google, n.d.-c; Google, n.d.-d). We chose these four locations as reference points as they are the most accessible entryways leading to UBCV.

Results

Of the 51 participants that responded to the survey, 5 responses were incomplete. 4 were invalid as they did not consent to participate in the survey. The results found included the responses of both the complete and incomplete surveys. Our results show that, following the COVID-19 pandemic, there is a clear shift in reliance on cars from public transit as seen in Figures 1 and 2. We also wanted to gauge the reliance of our respondents on public transit to get to class, so we included Likert scale questions in our survey from 1 (not at all) to 5 (very dependent). The results indicated that the majority of the responses were very dependent on public transit to get to class with the mean value at 4.62 as seen in Figure 3. However, in regards to the shift from PT to AT, there was only one person who started to bike after the pandemic with two more people commuting by other means. Unfortunately, these other means are not specified so it is difficult to understand if these are active or passive means of transportation. Furthermore, we decided to include an open-ended question asking those who are dependent on transit, the time it takes to get to the bus stop. All but three of our respondents stated that it took anywhere between one to 15 minutes to walk to the bus stop, with two stating that they “drive

midway” to their stop which takes between 15 to 20 minutes, and the last statement that it takes “1 hour [to] skytrain and bus to the 99 B-Line.”

We asked an open-ended question regarding what other types of AT that our respondents may partake in, and the answers were quite similar. All but 12 of our respondents stated that they only partook in walking and running, nine stating “no,” and the remaining three stating that they liked to longboard, skateboard, and rollerblade as an alternative.

To understand what underlying factors may exist that limit other individuals to start biking, we asked our respondents questions regarding their biking behaviors. These questions included if they have access to a bike (Figure 4), if they have ever biked from UBCV from where they reside (Figure 5), and if there are any perceived barriers to biking to campus (Figure 6). We can also use these data as a guideline for what barriers we should meditate on to motivate the greatest number of individuals to start biking. According to the results, the distance between UBCV and their homes was the biggest barrier, followed by not owning a bike, safety/health concerns, security concerns, and ‘other’. Hygiene and not knowing how to ride a bike was the smallest barrier (Figure 6).

We wanted to understand the importance of the benefits obtained by AT such as personal health benefits and environmental benefits by asking Likert scale questions, with 1 (strongly agree) and 5 (strongly disagree). It appeared that personal health benefits were perceived as more important than environmental benefits, where the majority leaned towards agreeing as seen in Figures 7 and 8.

To gauge the motivation of our respondents, we asked questions on how motivated they are to commute to campus via AT, motivating factors that would help them engage in AT, and if

there are any other suggestions that may encourage undergraduate students to start biking to campus. In regards to how motivated they are to commute to campus via AT, our respondents agreed that they would like to engage in AT but are limited due to their lack of motivation, with the most prominent answer being ‘somewhat agree’ (Figure 9). According to the results, the factors that would motivate the majority of our respondents to start to partake in AT to campus would be to increase their health and fitness levels, followed by having better bike security on campus, having active group transportation initiatives, hosting environmental awareness campaigns, and having a more accessible bike programs as seen in Figure 10. Finally, some interesting suggestions that we have found to help encourage undergraduate students to start biking to campus is to make “SkyTrains more bike friendly” and to “provide subsidies/benefits for students who cannot afford a bicycle.” These can be initiatives that UBC Rec could look to implement to encourage AT.

Discussion

In a pre-pandemic world, our study has found that 73.3% of UBC student participants were using public transportation for commuting to/from UBC (Figure 1). In addition, through our qualitative analysis, it was found that the majority of students who take public transportation take active methods of transportation to/from the bus stop- the most prominent method being walking. This is more optimal than PT as a few minutes of AT is better than nothing, especially when the benefits are related to health (Ma, 2021). However, due to the pandemic, the percentage of participants using cars had increased from 11.11% to 51.1%, while public transportation usage had decreased to 31.11% (Figure 1, Figure 2). This is unfortunate as driving is a strictly passive mode of transportation, causing students to miss out on the benefits of AT, even if it was a few minutes a day. However, this was expected as studies have found that

students feel safer driving in cars where it is easier to isolate themselves from the public, unlike public transportation where students are contained with strangers in close proximity (Labonté-LeMoyne et al., 2020). The shifting reliance on cars may also be explained as the majority of participants (64.28%) were dependent-very dependent on public transit (Figure 3). This shows that the students who used public transit lived further from campus, making AT more inefficient and time-consuming than using a car. It should also be noted that students who were reliant on strictly AT methods -walking and biking- had decreased due to the pandemic, from 11.11% to 8.88%, with both methods decreasing (Figure 1, Figure 2). Interestingly, our study had found that other than their main method of transportation, students were more reliant on cars (55.26%) than they were on public transit (26.67%) (Figure 12). Furthermore, it was seen that 13.33% of participants were reliant on AT means besides their primary mode of transportation (Figure 12).

When it comes to biking specifically, our study had found that 48.89% of participants did have access to a bicycle, with 31.82% of them using it regularly (Figure 4, Figure 11). Similar results were found by Ali et al. (2020), where less than 50% of their participants did not have access to a bike due to a number of reasons including expenses, bike theft, lack of storage, and concerns for safety. To address the accessibility problem, they advocated for bike-sharing programs, better bike security, and incentive programs (Ali et al., 2020). According to Okkels et al. (2020), physical safety when biking is a major deterrent, which is reflected by the mean rating of 2.95 that our participants gave when asked to rate their feeling of safety on a scale of 1-5 with 1 being “not safe.” This can explain why our participants were found to use their bikes mainly for exercise rather than transportation. The reason is that commuting on a bike involves many risks while biking for exercise is usually in a safer environment. Our study has also found that 21.43% of participants had biked from their area of residence towards campus; however, the

distance traveled was not recorded (Figure 5). Further research can be conducted on whether the students that had biked to campus lived near or far from campus.

Application of the Theory of Planned Behaviour

The purpose of this study is to learn more about the change in transportation methods and to encourage more AT. Specifically, we are interested in how we can create recommendations to motivate more students to engage in biking. The theory of planned behaviour (TPB) can be applied to our research to gain a better understanding of our participants' travel behaviour and to investigate how we can implement changes to their current behaviours. The TPB links an individual's beliefs with their intentions or motivation to perform a certain behaviour (Ajzen, 1991). The model states that an individual's intention to perform a behaviour is motivated by three constructs: attitude, subjective norms, and perceived behaviour control (PBC) (Figure 13). Attitude refers to an individual's feelings and evaluations of the behaviour. Subjective norms are the perceived social pressure to engage or to not engage in the behaviour. Lastly, PBC refers to the individual's belief in their ability to perform the behaviour (Ajzen, 1991). A large portion of our participants agreed that they would like to engage in AT but lack the motivation to do so (Figure 9). Our results indicate that participants value the health and environmental benefits that AT offers (Figure 7, Figure 8). Additionally, participants indicated that "increasing health and fitness" would motivate them to engage in more AT. This means that participants have evaluated the outcome of biking and that they have a positive attitude towards it. Subjective norms were also taken into consideration as 15.94% of respondents indicated that group active transportation initiatives would motivate them to engage in AT (Figure 10). However, the influence that subjective norms have on an individual's behaviour may be less important now and harder to

change due to the social distancing measures of the pandemic. Lastly, it was found that the biggest barrier to biking to campus is that the travel distance is too far (Figure 6). Our findings are similar to studies conducted by Carse et al. (2016) and Okkels et al. (2020), where the most prevalent barrier that individuals face towards AT is distance. This means that participants' PBC is low due to them perceiving distance as a deterrent for biking. Our findings indicate that we should target our recommendations on improving PBC as it would have the greatest effect on motivating more students to engage in biking.

Limitations

The biggest limitations faced during this research study arise from the participants surveyed. As this study was directed towards UBC undergraduate students, the results found may not necessarily reflect graduate students, faculty members, staff, and others who may commute to UBC. Further research is recommended on how the pandemic has changed the transportation on these demographics. In addition, at least a quarter of the participants were kinesiology (KIN) students, possibly limiting the findings from being generalized to the target population. This is due to the survey being distributed primarily through kinesiology networks, such as UBC KIN Facebook pages, KIN classes, and peers in the faculty of KIN. Since students within the KIN faculty are aware of the benefits of AT, they may be already motivated to partake in it. To reiterate, the results found within this study may not reflect students in other faculties. Future studies may want to involve a wider variety of students from other faculties. Furthermore, limitations arose as the gender of the survey respondents was not recorded. Therefore, the findings in this study may not reflect the results of the different genders accurately. If gender was recorded then better recommendations could be made on how to better accommodate the person's gender.

Other limitations faced during this study are made through the survey itself. This is prominent as the survey asked general questions relating to barriers rather than going into the specifics. For instance, as it was seen that distance was by far the biggest barrier towards AT, the survey did not ask how large the distance was, as mentioned above. If distance was measured, then more specific recommendations could have been made for students living at varying distances from campus. In addition, the survey could have used more qualitative response collection as better connections may have been drawn. For instance, it was seen that safety and security concerns were ranked 2nd and 3rd for the barriers of AT. Better recommendations on how to address these barriers could have been made if the survey had asked specifically about what safety and security were concerning; an area for consideration for future studies.

Future Research

Future research within this topic can be done comparing how the transportation methods of students commuting to UBC have changed post-pandemic (i.e., 6 months or 1 year) to the current state. Questions arise as to whether this shift from public transit to vehicle use is permanent or if it will go back to pre-pandemic levels. Will students who have begun using cars as their primary method of transportation not prefer public transit anymore? Will the fear of not just coronavirus, but any type of sickness deter students from taking public transit in the near future? Will recommendations regarding the use of public transit be more significant than AT? All these questions and more can be further expanded upon in a post-pandemic world.

Recommendations

Based on the data provided by survey respondents, our groups have made recommendations pertaining to short-term and long-term goals. For the short-term goals, we focused on overcoming the problem of motivation and distance that respondents listed. For the long-term goals, our group thought of more strategies to motivate AT usage among UBC students, as well as solutions to increase public transit usage.

For the short-term goal, we suggested creating a community within UBC where members encourage each other to participate in AT. Community members would be connected through social media platforms and other fitness apps (i.e. Strava) to record their progress and motivate each other to increase physical and mental well-being. For instance, we could have a campaign promoting AT along University Blvd, where students would bike, walk, or run towards campus. Winners of the campaign would receive prizes such as Fitbits and gift cards, and the winners can be in different categories - such as fastest time, most frequent, and most unconventional method of AT. Providing prizes may incentivize and motivate students to participate in this campaign, as through our survey we found that people lack the motivation to do AT. We believe that the sense of community would encourage others to stay active, help other community members out, and inform each other on the benefits of AT. To address students who may face the barrier of distance, we would recommend them to bus part way towards campus; and then use AT for the rest of their trip.

As stated in question 17, a large majority of survey respondents reported that they lack the motivation to bike to campus. To mitigate this issue, we suggested a long-term goal that UBC should promote AT campaigns, where individuals could use apps like Strava to track their progress and post about it to groups to motivate each other. Our group also created solutions to

increase the accessibility of bikes on public transit. On question 19 of our survey, several respondents reported that they wished there were more bike-friendly options on busses and SkyTrains. To mitigate this issue, our group suggested that there be a greater number of bike racks for bikes to be parked on the front of busses to allow for more bike users to participate in longer methods of AT. We also suggested that SkyTrains could have separate cars for users to park their bikes in while they ride, as well as adding more bike lockers similar to what VCC Clark Station has. Lastly, our group sought to motivate public transit usage by creating a cleaner environment on busses and SkyTrains, therefore reducing the chances of contracting the COVID-19 virus as research stated that people were more fearful of public transit due to the pandemic. Our groups suggested that by having extra workers on busses to sanitize the surfaces more frequently, we could mitigate this issue. However, more research can be done on this topic to see what can motivate people to take public transit during the pandemic.

Overall, we believe that through implementing these potential solutions to the issues the respondents of our survey reported, we could increase the level of participation in AT for UBC students.

References

- Abdullah, M., Dias, C., Muley, D., & Shahin, M. (2020). Exploring the impacts of COVID-19 on travel behavior and mode preferences. *Transportation Research Interdisciplinary Perspectives*, 8, 100255. <https://doi.org/10.1016/j.trip.2020.100255>
- Ali, H., Courtney, C., Lam, C., Ng, A., Reiter, E., & Yeung, W. (2020). Factor affecting potential cyclists in the UBC community. *UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program*.
https://sustain.ubc.ca/sites/default/files/seedslibrary/KIN_464_Factors%20Affecting%20Potential%20Cyclists%20in%20the%20UBC%20Community_FinalReport.pdf
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Bertrand, L., Shaw, K. A., Ko, J., Deprez, D., Chilibeck, P. D., & Zello, G. A. (2021). The impact of the coronavirus disease 2019 (COVID-19) pandemic on university students' dietary intake, physical activity, and sedentary behaviour. *Applied Physiology, Nutrition, and Metabolism*, 46(3), 265–272. <https://doi.org/10.1139/apnm-2020-0990>
- Carse, A., Goodman, A., Mackett, R.L., Panter, J., & Ogilvie D. (2016). The factors influencing car use in a cycle friendly city: the case of Cambridge. *Journal of transport and geography*. 28 (67-74).
- Dzisi, E. K. J., & Dei, O. A. (2020). Adherence to social distancing and wearing of masks within public transportation during the COVID 19 pandemic. *Transportation Research Interdisciplinary Perspectives*, 7, 100191. <https://doi.org/10.1016/j.trip.2020.100191>

Google. (n.d.-a). [Google Maps directions to walk from Southwest Marine Drive to UBC].

Retrieved February 24, 2021, from <https://goo.gl/maps/4SK2eVq1NzfsKXW49>

Google. (n.d.-b). [Google Maps directions to walk from W 16th Ave to UBC]. Retrieved

February 24, 2021, from <https://goo.gl/maps/UAiLadizi11RXJmc7>

Google. (n.d.-c). [Google Maps directions to walk from W 4th Ave to UBC]. Retrieved February

24, 2021, from <https://goo.gl/maps/MREiKfTcJr3QgDFx5>

Google. (n.d.-d). [Google Maps directions to walk from W 10th Ave to UBC]. Retrieved

February 24, 2021, from <https://goo.gl/maps/jPomRdBCzwFwUwws5>

Hensher, D. A., Wei, E., Beck, M. J., & Balbontin, C. (2021). The impact of COVID-19 on cost

outlays for car and public transport commuting - The case of the Greater Sydney

Metropolitan Area after three months of restrictions. *Transport Policy*, 101, 71-80.

<https://doi.org/10.1016/j.tranpol.2020.12.003>

Labonté-LeMoyne, É., Chen, S., Coursaris, C. K., Sénécal, S., & Léger, P. (2020). The

unintended consequences of COVID-19 mitigation measures on mass transit and car use.

Sustainability, 12(9892), 9892. <https://doi.org/10.3390/su12239892>

Liu, Z., Ciais, P., Deng, Z., Lei, R., Davis, S. J., Feng, S., Zheng, B., Cui, D., Dou, X., He, P.,

Zhu, B., Lu, C., Ke, P., Sun, T., Wang, Y., Yue, X., Wang, Y., Lei, Y., Zhou, H., . . .

Schellnhuber, H. J. (2020). *COVID-19 causes record decline in global CO2 emissions*.

<https://escholarship.org/uc/item/2fv7n055>

Ma, J. (2021). 1a- Course Introduction and the 24-hour movement guidelines [PowerPoint

slides].

- Munawar, H. S., Khan, S. I., Qadir, Z., Kouzani, A. Z., & Mahmud, M. A. (2021). Insight into the impact of COVID-19 on Australian transportation sector: An economic and community-based perspective. *Sustainability*, 13(3), 1276.
<https://doi.org/10.3390/su13031276>
- Okkels, A., Orallo, C., Wong, M., Poquiz, R., & Copping, S. (2020). Cycle works - Barriers and solutions for students biking to UBC. *UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program*.
https://sustain.ubc.ca/sites/default/files/seedslibrary/KIN_464_Cycle%20Works%20-%20Barriers%20and%20Solutions%20for%20Students%20Biking%20to%20UBC_FinalReport.pdf
- Rume, T., & Islam, S. D. U. (2020). Environmental effects of COVID-19 pandemic and potential strategies of sustainability. *Heliyon*, 6(9), e04965.
<https://doi.org/10.1016/j.heliyon.2020.e04965>
- Shorten, A., & Smith, J. (2017). Mixed methods research: Expanding the evidence base. *BMJ Journals*, 20(3), 74-75. <http://dx.doi.org/10.1136/eb-2017-102699>
- The University of British Columbia (2020). UBC Vancouver Transportations Status Report Fall 2019. https://planning.ubc.ca/sites/default/files/2020-05/UBC2019-TransportationStatusReport-Mar5-2020_0.pdf
- Vos, J. D. (2020). The effect of COVID-19 and subsequent social distancing on travel behavior. *Transportation Research Interdisciplinary Perspectives*, 5, 100121.
<https://doi.org/10.1016/j.trip.2020.100121>

Zambrano-Monserrate, M. A., Ruano, M. A., & Sanchez-Alcalde, L. (2020). Indirect effects of COVID-19 on the environment. *Science of the Total Environment*, 728, 138813.

<https://doi.org/10.1016/j.scitotenv.2020.138813>

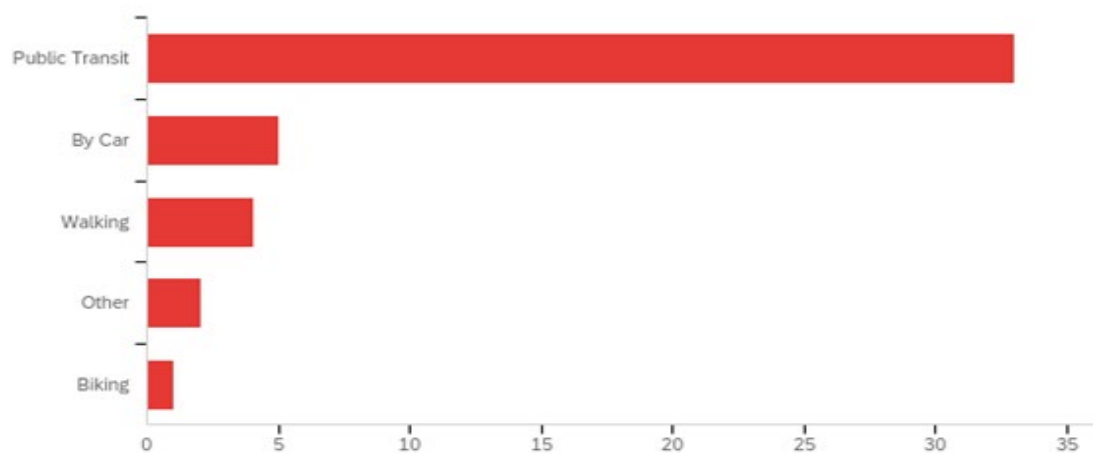
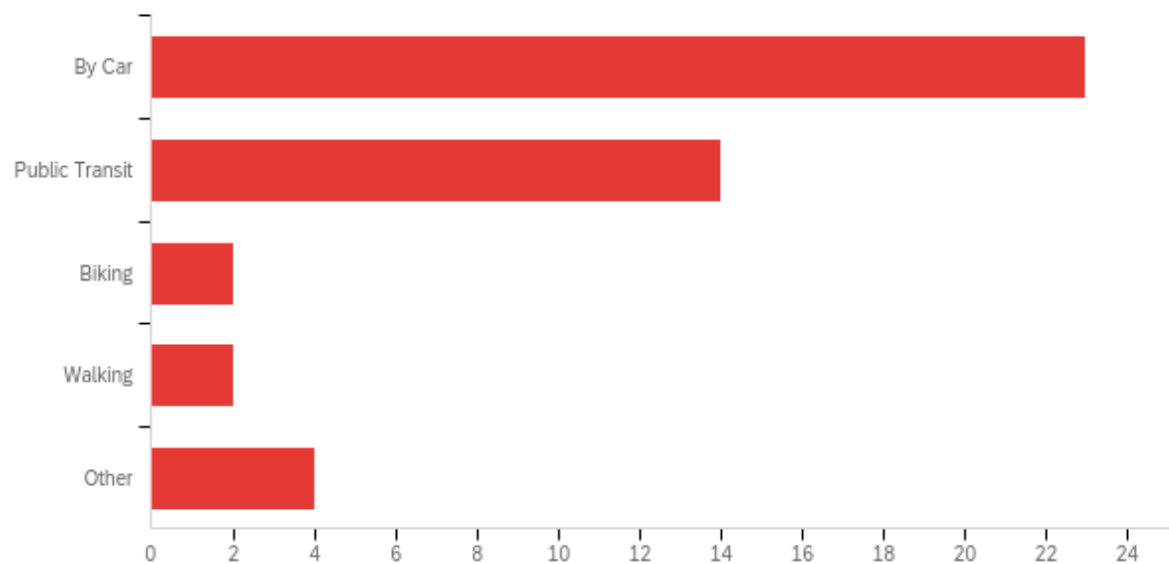
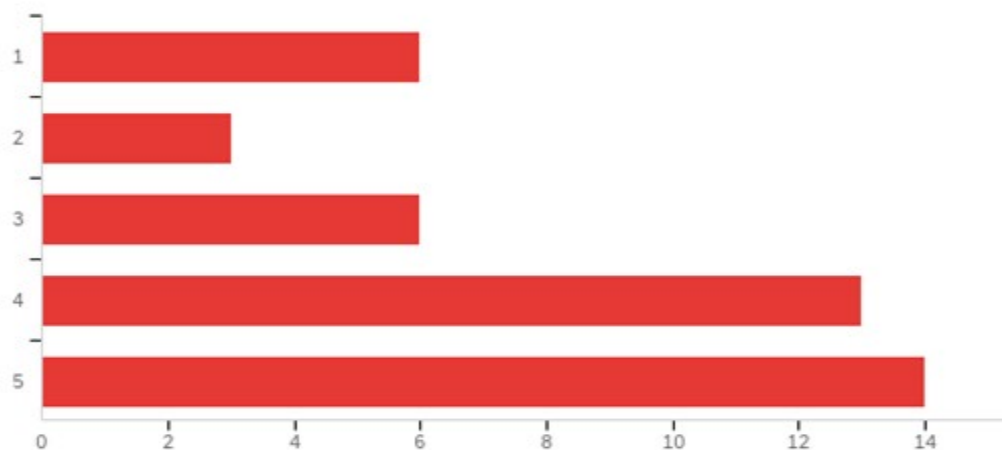
Appendix A:**Figure 1****Pre-COVID Method of Transportation****Figure 2****Method of Transportation During COVID**

Figure 3

How dependent are you on public transit to get to class? 1: Not at all. 5: Very dependent

**Figure 4**

Do you currently have access to a bike?

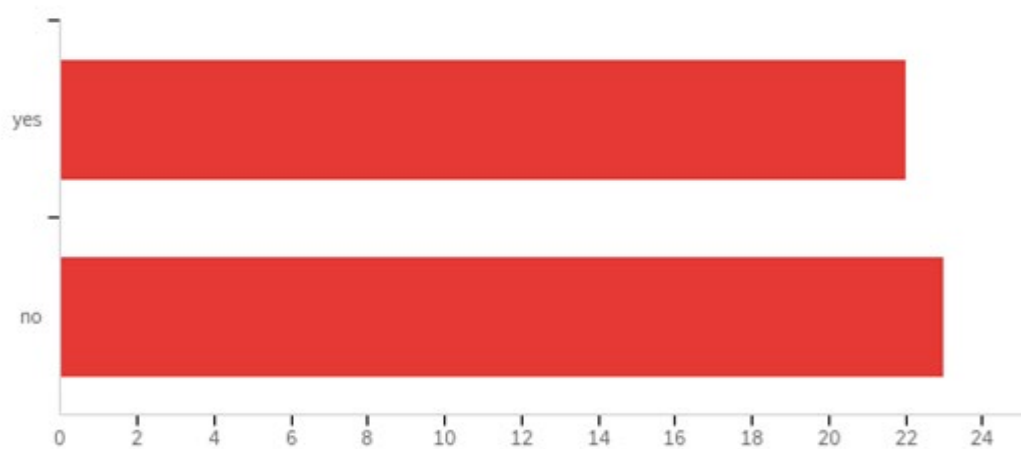
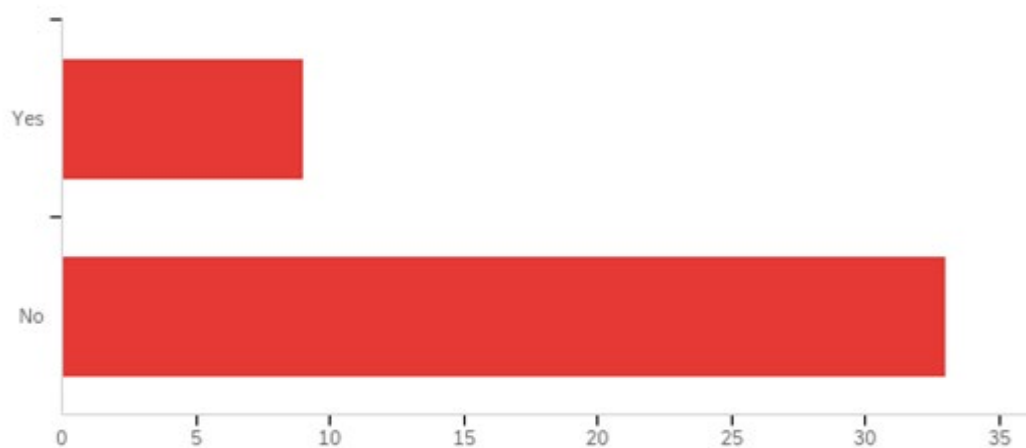


Figure 5

Have you ever biked to campus from your area of residence?

**Figure 6**

Barriers of Biking to Campus

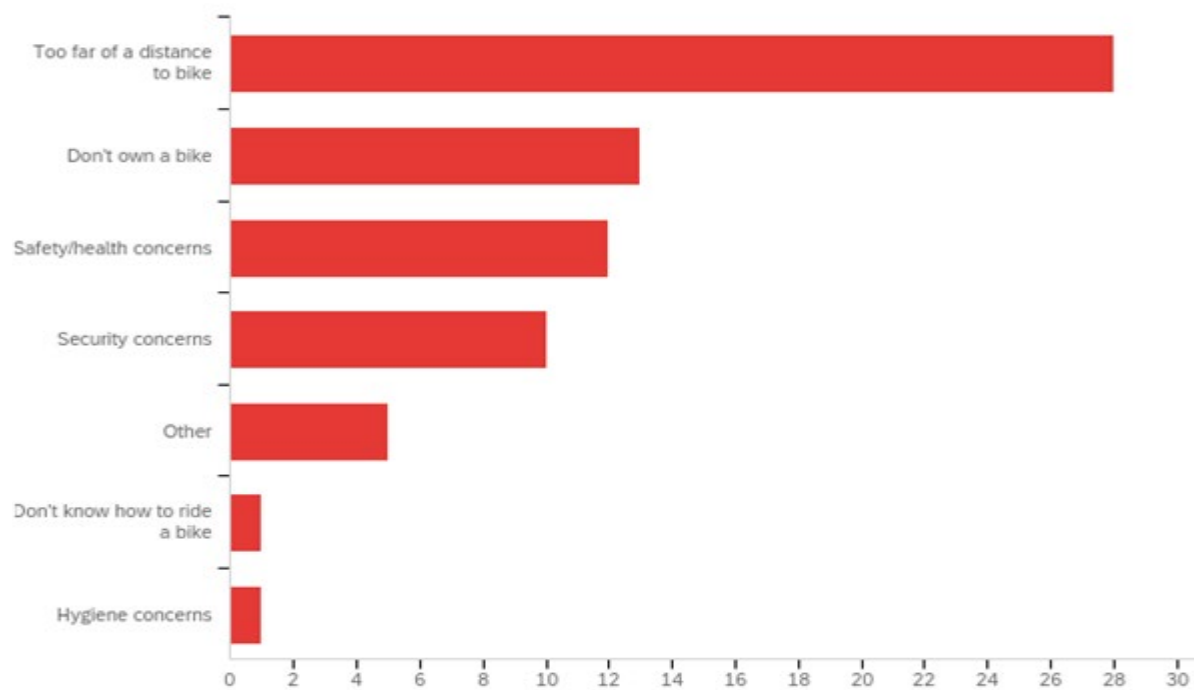
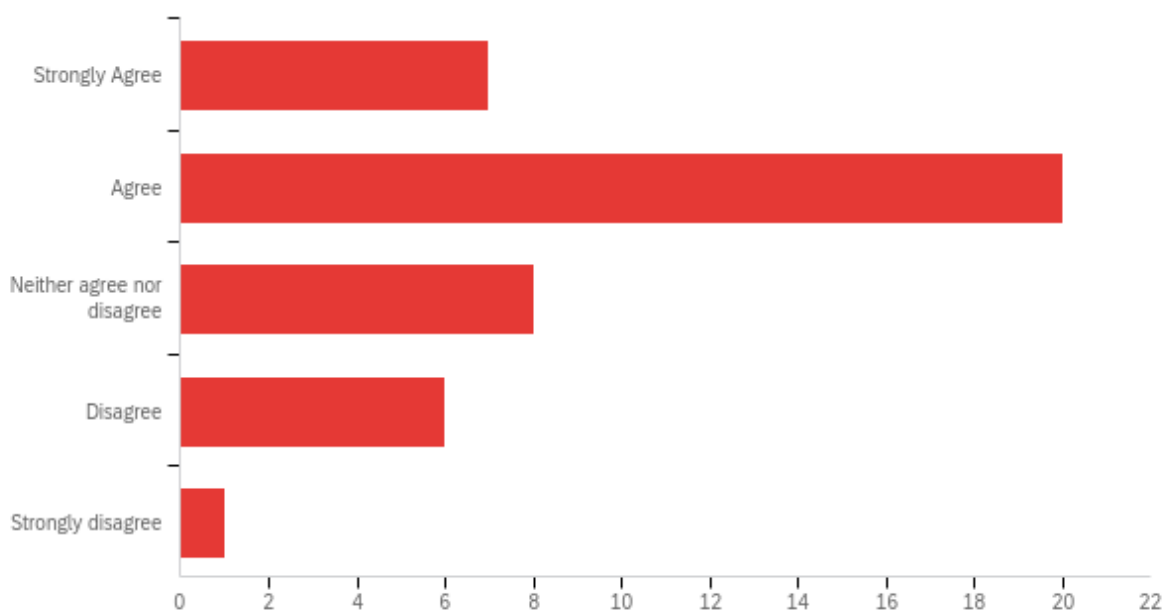


Figure 7

The health benefits that come from active transportation are important to me

**Figure 8**

The environmental benefits that come from active transportation are important to me

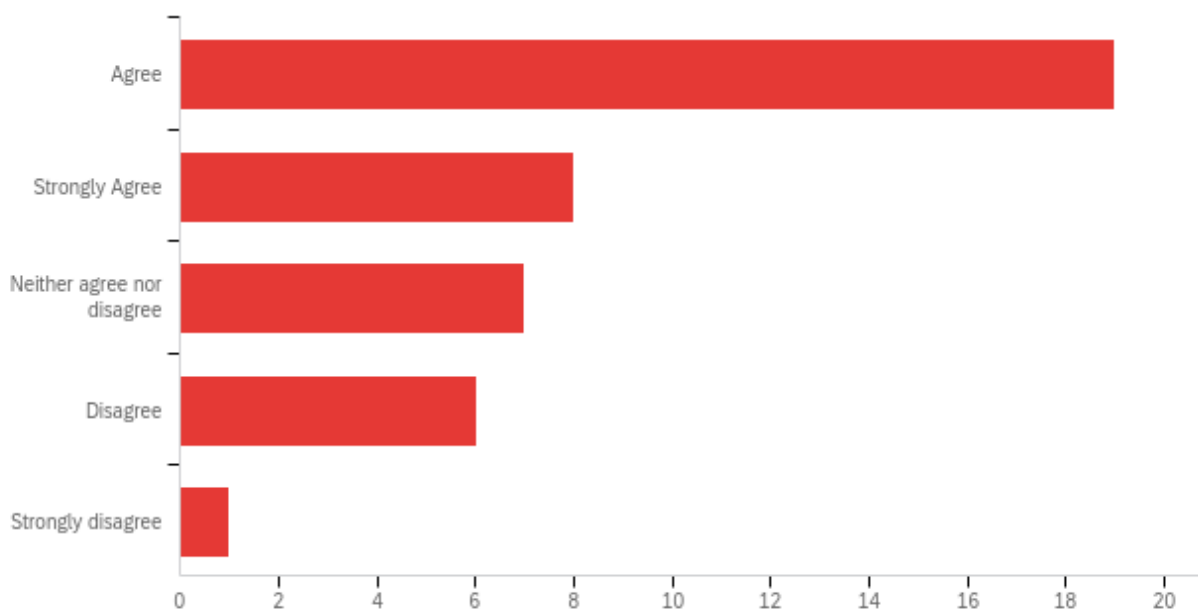
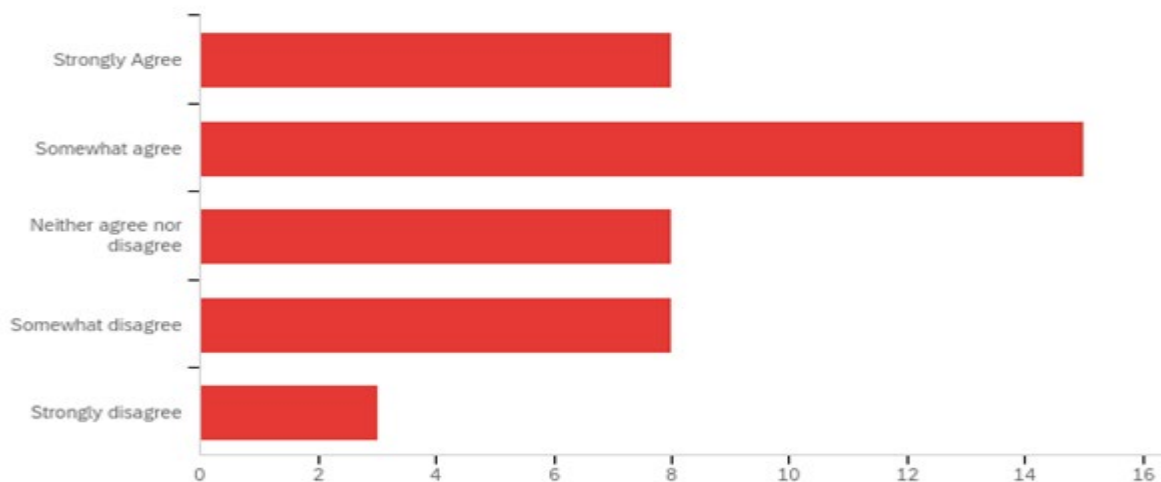


Figure 9

I would like to engage in active transportation towards campus, but I lack the motivation to do so

**Figure 10**

What would motivate you to engage in active transportation towards campus?

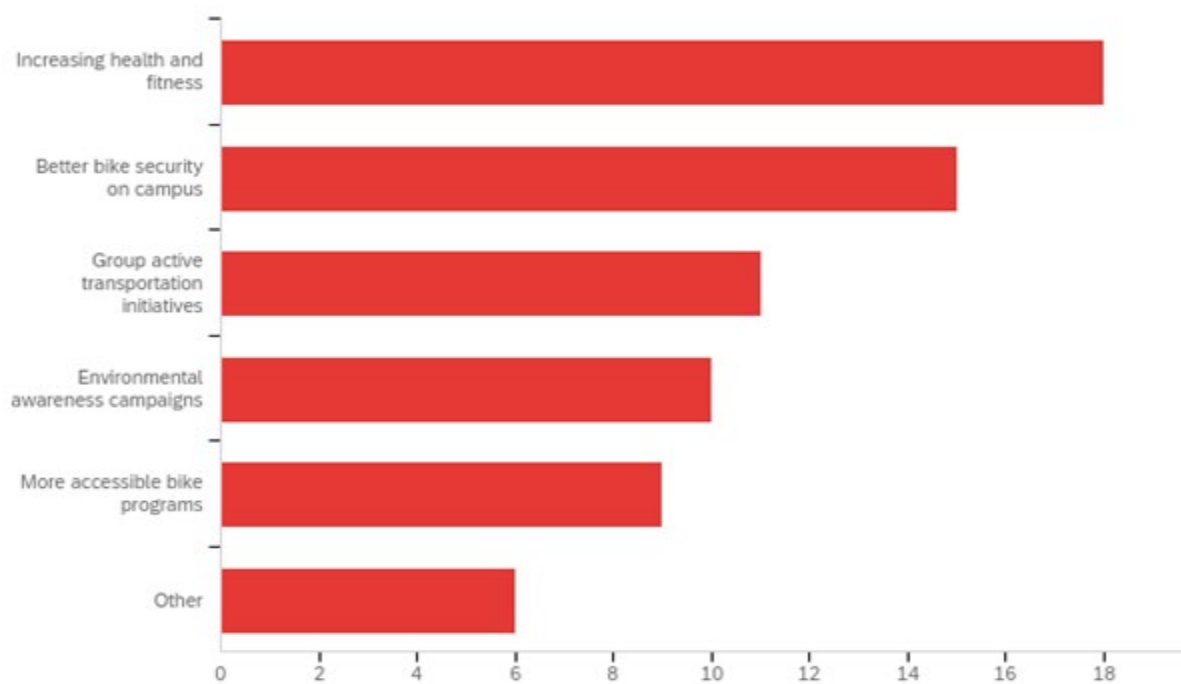
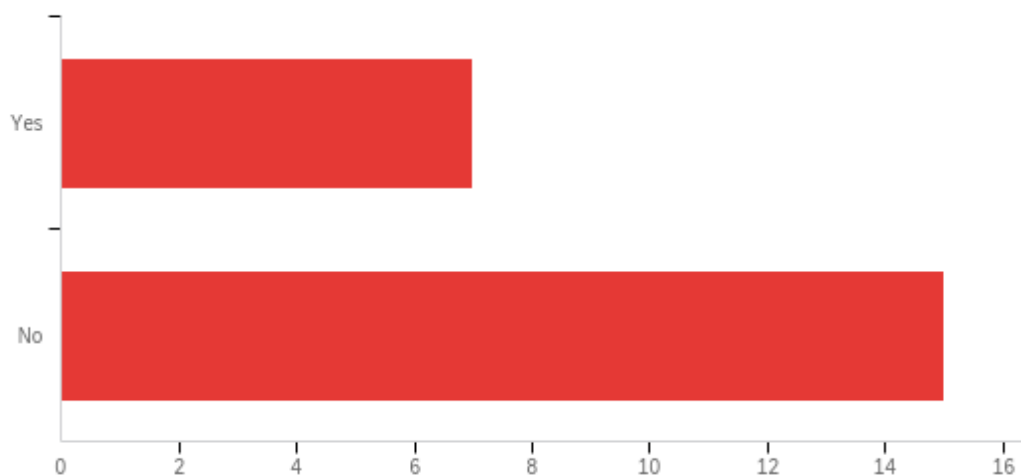


Figure 11

If you do have a bike, do you use it regularly?

**Figure 12**

How else do you get to campus besides your main method of transportation?

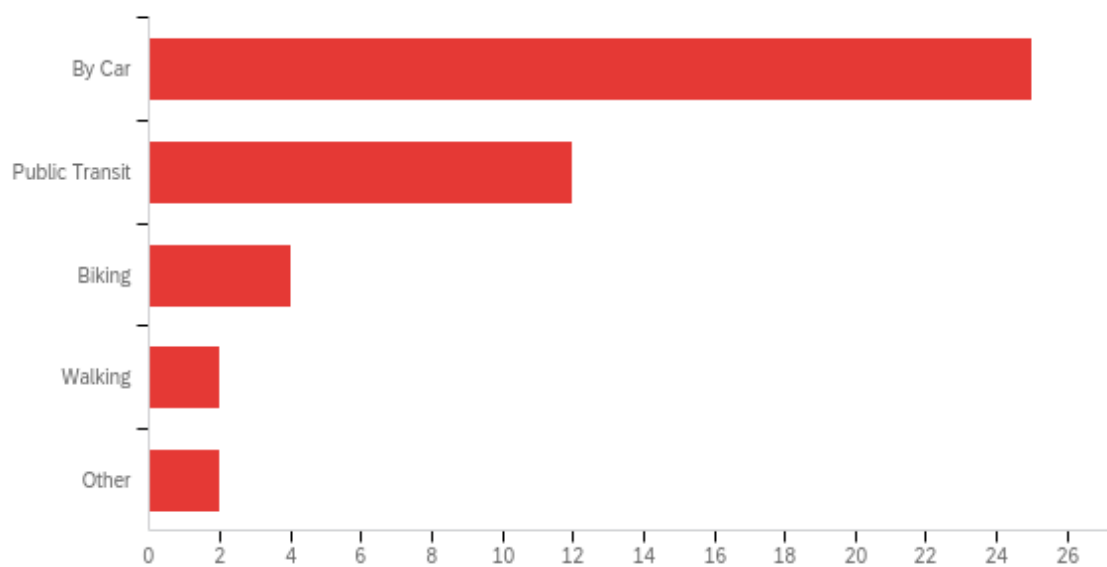
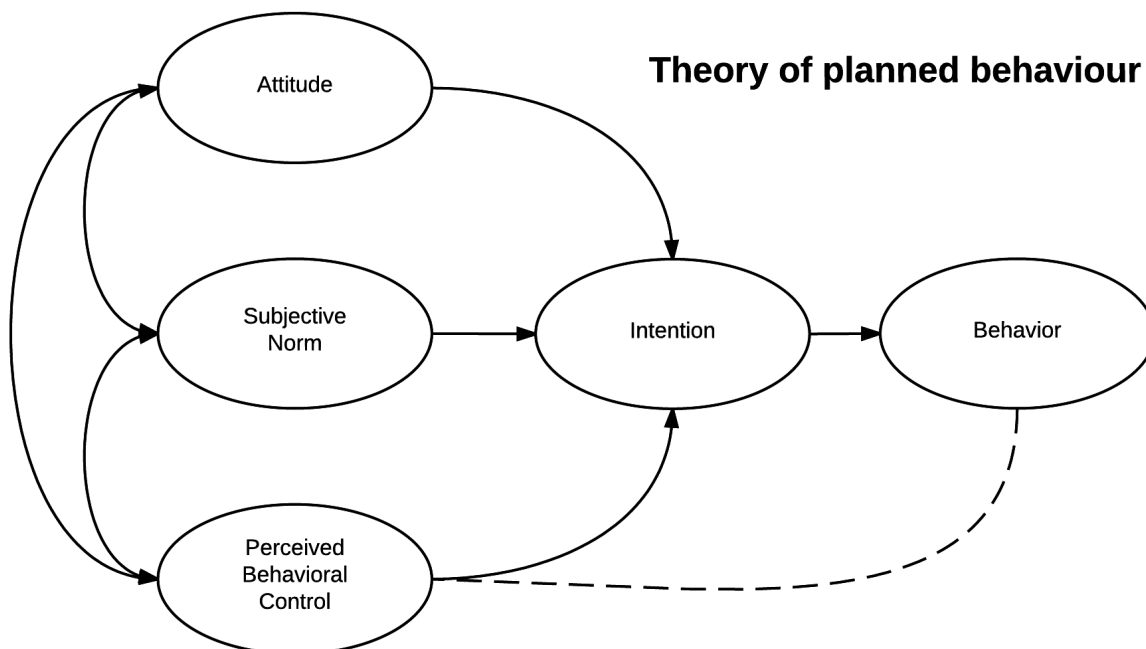


Figure 13



Appendix B:

Social media recruitment form



KIN 464: Health Promotion and Physical Activity Class-based Project

**If COVID-19 has affected your commute
to UBC we would love to speak with
you!**

As part of a course-based research project (KIN 464), we are conducting a study on UBC students to determine how their method of transportation has changed due to the COVID-19 pandemic.

If you are an undergraduate student (age 19-24) who commutes to UBC campus regularly we would love to hear from you/for you to complete a survey. More information at

https://ubc.ca1.qualtrics.com/jfe/form/SV_6PW82cucwtspwpx

Please note that this post is public and anyone who likes, comments or shares the link will, by doing so, be associated with the study. The Principal Investigator on this project is Dr. Andrea Bundon (andrea.bundon@ubc.ca).

Sample Survey

CLASS PROJECT: Health Promotion and Physical Activity (KIN 464) Participant Consent Form
The Effects of COVID-19 on Perceptions and Actions Regarding Modes of Transportation
Group 13 Project G

Principal Investigator:

Dr. Andrea Bundon (Assistant Professor, School of Kinesiology, Faculty of Education)

The purpose of the class project:

To gather knowledge and expertise from community members on how the COVID-19 pandemic has shifted the transportation methods of UBC undergraduate students that are commuting to the Vancouver campus .

Study Procedures:

With your permission, we are asking you to participate in a survey. With the information gathered, students will critically examine how different individuals understand or engage in health-promoting activities or health promotion initiatives.

You may only complete the survey once.

With the information gathered, students will critically examine how different individuals understand or engage in health-promoting activities or health-promoting activities or health promotion initiatives.

Project outcomes:

The information gathered will be part of a written report for the class project. The written report will be shared with campus partners involved in the project. Summaries of findings will also be posted on the following websites. No personal information/information that could identify participants will be included in these reports or shared with campus partners.

UBC SEEDS Program Library:

<https://sustain.ubc.ca/courses-degrees/alternative-credit-options/seeds-sustainability-program/seeds-sustainability-library>

Potential benefits of the class project:

There are no explicit benefits to you by taking part in this class project. However, the interview will provide you with the opportunity to voice your opinion on your experiences with health-promoting activities or initiatives in a broad sense and will provide the students with an opportunity to learn from your experiences.

Confidentiality:

Maintaining the confidentiality of the participants involved in the research is paramount, and no names of participants will be collected. At the completion of the course, all data (i.e. notes) and signed consent forms will be stored on a secure electronic drive by Dr. Bundon. All data and consent forms will be destroyed 1 year after completion of the course.

Risks:

The risks associated with participating in this research are minimal. There are no known physical, economic, or social risks associated with participation in this study. You should know that your participation is completely voluntary and you are free to withdraw from the study and there will not be negative impacts related to your withdrawal. If you withdraw from the study, all of the information you have shared up until that point will be destroyed.

Contact for information about the study:

If you have any questions about this class project, you can contact Andrea Bundon by phone at 604-822-9168 or by email at andrea.bundon@ubc.ca Research ethics complaints: If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or e-mail RSIL@ors.ubc.ca . or call toll free 1-877-822-8598.

Consent:

Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time.

- ☐ I consent
☐ I do not consent

What was your method of transportation to/from UBC prior to the COVID-19 pandemic?

- ☐ By Car
- ☐ Public Transit
- ☐ Biking
- ☐ Walking
- ☐ Other

What is your current method of transportation to/from UBC?

- ☐ By Car
- ☐ Public Transit
- ☐ Biking
- ☐ Walking
- ☐ Other

How else do you get to campus besides your main method of transportation?

- ☐ By Car
- ☐ Public Transit
- ☐ Biking
- ☐ Walking
- ☐ Other

Do you currently have access to a bike?

- ☐ yes
- ☐ no

→

Have you ever biked to campus from your area of residence?

- ☐ Yes
☐ No

What are some barriers of biking to campus? (select all that apply)

- ☐ Too far of a distance to bike
☐ Don't own a bike
☐ Don't know how to ride a bike
☐ Safety/health concerns
☐ Security concerns
☐ Hygiene concerns
☐ Other

Active transportation is any means of transportation powered by the human body (Biking is just one of many). Are there other forms of active transportation you do/like to engage in?

On a scale of 1-5, how dependent are you on public transit to get to class?

1: Not at all.

5: Very dependent

- ☐ 1
☐ 2
☐ 3
☐ 4
☐ 5

If you are dependent on transit, how do you get to the bus stop? How long does it take?

On a scale of 1-5, how safe do you feel biking to campus with the bike lanes provided?

1: Not safe

5: Safe

- ☐ 1
☐ 2
☐ 3
☐ 4
☐ 5

On a scale of 1-5, how likely are you to take forms of active transportation to campus?

1: Very Unlikely

5: Highly likely

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5

The health benefits that come from active transportation are important to me

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Somewhat disagree
- ☐ Strongly disagree

The environmental benefits that come from active transportation are important to me

- ☐ Strongly Agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Somewhat disagree
- ☐ Strongly disagree

I would like to engage in active transportation towards campus, but I lack the motivation to do so

- ☐ Strongly Agree
- ☐ Somewhat agree
- ☐ Neither agree nor disagree
- ☐ Somewhat disagree
- ☐ Strongly disagree

What would motivate you to engage in active transportation towards campus?

- ☐ Better bike security on campus
- ☐ Group active transportation initiatives
- ☐ More accessible bike programs
- ☐ Increasing health and fitness
- ☐ Environmental awareness campaigns
- ☐ Other

Do you have any further ideas on what UBC Rec can further pilot/look into to encourage undergraduate students to bike to campus?

Do you have any other comments or feedback pertaining to your transportation at UBC?

→

Thank you for completing the survey. You will be redirected to another survey if you wish to be entered into a draw for 2 \$25 gift cards for the UBC bookstore/food services and 1 Fitbit. The group number is 13.

→
