Investigating the Impact of COVID-19 on Commuting Using Survey Data

By

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CHAPTER I: Introduction

COVID-19 caught many organizations by surprise and telecommuting policies were rapidly

established, signaling a need to help organizations and communities prepare for future societal

disruptions. While the long-term impact the pandemic will have on transportation is still

unknown, the emergence of telecommuting as a primary "mode" is apparent.

However, the pandemic has also brought new dangers associated with shared

transportation modes, which are a key subset of commute modes that can lead us towards a more

environmentally sustainable future. These two developments have conflicting impacts, creating

a central tension/question for transportation researchers in the time of COVID-19. The objective

of this research, therefore, was to explore the preferences and behaviors associated with this

dilemma, and the extent to which these factors are transitory or permanent. This was

accomplished by administering a survey to help answer two questions that have arisen during

this time: 1) How will COVID-19 affect commute mode choice during and after the pandemic?,

and 2) How do the policies in place throughout various phases of the pandemic affect

commuters' preferences and actions? The survey questions can be found in Appendix A, while

the survey recruitment email appears in Appendix B.

Concurrent with conducting the survey, a literature search was performed to ascertain

similarities and differences between this study and research performed elsewhere.   We

discovered that no other work had surveyed such a large portion of the target population.

Moreover, there has been a paucity of research directed at the longitudinal impacts of commuting

behavior as pandemic policies have evolved.

The bulk of this thesis resides in Chapter II, which describes in detail the research

undertaking. Note that it is written in the style of a refereed journal manuscript, with the

expectation that it may eventually be submitted for publication consideration. For this reason, it is designed as both a stand-alone piece as well as the integral part of this thesis. Chapter 3 summarizes the contributions of this research, in addition to discussing future directions in which to advance our knowledge of this phenomenon.

CHAPTER II: Research Methodology

Introduction

The COVID-19 worldwide pandemic has touched every aspect of society since it first emerged in 2019. Much research has been performed examining societal disruption due to COVID-19, ranging from protections for different vulnerable groups (United Nations Office for the Coordination of Humanitarian Affairs, 2020) to understanding social and economic disruption through tweets (Shanthakumar, Seetharam and Ramesh, 2021).

The transportation sector not been left unscathed. COVID-19 has drastically impacted the way that various modes of transportation function, as well as travel behavior exhibited by different population groups. Whether this is a new normal or merely a moment in time remains to be seen.

While we continue to be in the midst of an ever-changing, ongoing pandemic, much can be learned from experience to date. This work endeavors to address these considerations. COVID-19 introduced telecommuting to the broad population and increased the risk of using shared modes of transportation. With these transformations, it is unclear as to how single occupancy vehicle (SOV) use will evolve.

To measure changes in personal attitudes and behaviors towards COVID-19, it is important to gather empirical data, in part to explain current practices, but importantly to also help predict responses to future pandemics or other major disruptions. Our study examines these considerations from administration of a unique survey instrument, characterized by a large sample size from a population experiencing the same policies and societal changes. This allows for tighter connections between survey results and policy analysis that have been difficult to achieve elsewhere.

The survey instrument was directed at two important questions: 1) How will COVID-19 affect commute mode choice during and after the pandemic?, and 2) How do the policies in place throughout various phases of the pandemic affect commuters' actions and preferences?

The aforementioned survey was distributed in Fall 2020 to all faculty, postdoctoral fellows, staff, and graduate/professional students at Vanderbilt University. During this time, survey respondents were actively experiencing Phase II+ of the Vanderbilt Return to Campus plan (see Appendix C). The survey collected data on respondents' mode share, attitudes towards mode choice, working status, and demographic information. From the more than 4,000 responses received, over 3,500 were complete and considered valid, representing 28% of the target population.

The data was analyzed from multiple perspectives. First, the results were segmented by demographic group to allow comparisons to other relevant studies and extend applicability of the data beyond just Vanderbilt. Second, the responses were separated into four COVID-19 policy phases, enabling a comparison of travel responses to policies in effect and the severity of COVID-19 at the time. Finally, the results were examined by commute mode.

The remainder of this work is organized as follows. We begin with a literature review to shed light on prior research that has been done examining the effect of COVID-19 on transportation. We then describe the survey content itself, followed by presentation of the analysis results and interpretation of the findings. We conclude by describing lessons learned and discussing future potential areas of research.

Literature Review

As transportation accounts for 29% of U.S. greenhouse gas emissions (United States Environmental Protection Agency, 2021), any change in transportation behavior can have a large impact on the environment. Yet many of the more sustainable modes, particularly public transit, are crowded environments which carry risk in the era of social distancing. Moreover, COVID-19 introduced telecommuting to the broader population, dramatically impacting travel frequency.

Research on COVID-19 and commuting has transcended discipline boundaries, from transportation and policy to psychology and biomedical. Early in the pandemic, researchers met the demand to provide knowledge quickly as a group effort to measure individual attitudes towards telecommuting (Beck and Hensher, 2020; Beck, Hensher and Wei, 2020).

A variety of studies also used existing data or capitalized on unusual data collection opportunities. Google mobility data from opted-in Google users was one such technique, with researchers reporting that decreases in mobility were associated with substantial reductions in case growth 2-4 weeks later (Wellenius *et al.*, 2021). Moreover, much of the change in transit activity preceded state-level, stay-at-home orders. Molloy et al. (2020) asked participants from a past study if they would be willing to reinstall an app enabling tracking of participant distance traveled. Other studies focused on specific transit modes and routes, including train delay data (Ohshima and Yamamoto, 2021) and automatic passenger count data from a transit route in Minneapolis/St. Paul (Kumar et al., 2021). Medlock, et al. (2021) used aggregated data to draw a connection between mode choice and the probability of COVID-19 transmission, while Yang et al. (2021) investigated how the built commuting environment relates to pandemic resilience.

Uniquely, Lokesh and Marsden (2021) used anonymized data from O2, a mobile network provider, and found that significant CO_2 reductions occurred in areas with high car ownership and industries that could easily shift to virtual work. Another group studied county-level health

factors for all 3,141 U.S. counties, finding that counties with longer commuters were more likely to have higher COVID-19 mortality (Pan et al., 2020), in the same realm as findings reported by Francetic and Munford (2021) that higher commuting flows are associated with higher COVID-19 mortality. Hu et al. (2020) used data from the American Community Survey to predict that travel times could increase by 5-10 minutes in high transit cities due to changing transportation mode share post-COVID-19. Basu and Ferreira (2021) surmised that "COVID-19 has highlighted the brittleness of non-car mobility choices, while reinforcing how sticky car-oriented travel behavior can be".

Regarding changing attitudes towards COVID-19 during the pandemic, Mirtich et al. (2021) laid the groundwork by examining the stability of transportation-related attitudes. They concluded that "attitudinal statements have moderate stability while factor-analyzed attitudes demonstrate moderately high stability." The significance of this stability finding suggests the potential to more accurately predict future travel behavior. Rural respondents in one study were less concerned by the pandemic and stayed home in lower proportions than other respondents (Chauhan *et al.*, 2021). Those "primarily concerned about the pandemic response" in another study "traveled the most using private vehicles" (Silva et al., 2021). Interestingly, Wolnowska and Kasyk (2021) observed no decrease in transport safety in a study of travelers in Szczecin, Poland; if anything, there was an increase.

A subset of attitudinal surveys examined people who were longing for their missed commute. One such study discovered that "time spent in transport was missed the most by public transport users, followed by push bike users, e-bike users, pedestrians, and finally drivers" (Aoustin and Levinson, 2021). Another study hypothesized about how to balance these desires in the future, by creating a system which "enables more commuting by cycling and walking" (Rubin *et al.*, 2020). As an overall sum of transportation attitudes, Thomas et al. (2021)

identified some recovery in attitude when respondents were asked to consider when travel restrictions were removed, but not to the levels of positivity from pre-COVID-19.

Some researchers have explored commute mode shift and mode choice. Large shifts from shared modes to virtual and private modes have been reported, including bicycle use (Bhaduri *et al.*, 2020; Lock, 2020). Among the changes however, there was still a "significant inertia to continue using the pre-COVID modes" (Bhaduri *et al.*, 2020). Often, changes in commute choice were made due to COVID-19 risk. In a Philadelphia study, almost one-half of respondents changed their mode of choice during the pandemic, most often to limit exposure to COVID-19 (Cusack, 2021). Among the various modes, those commuting by transit were most likely to choose another mode in order to avoid COVID-19 risk (Harris and Branion-Calles, 2021; Shibayama *et al.*, 2021). Other characteristics also affected mode choice. Tan and Ma (2021) found that occupation and walking time from a commuter's residence to the nearest subway station had a significant effect on whether commuters chose rail transit. Das et al. (2021) found that commuters' socio-economic characteristics significantly influence mode switch preferences and Matson et al. (2021) observed that commuters with higher incomes exhibited the largest shift to no commuting into the office.

During the pandemic, telecommuting rose to previously unseen heights of popularity. As a powerful tool for decreasing emissions and providing employees with alternative choices, telecommuting is an interesting and important area of study. Brynfolfsson et al. (2020) identified younger survey respondents as more likely to switch to remote work, and that the percentage of people "switching to remote work can be predicted by the incidence of COVID-19".

Another study investigated the changes in productivity as a result of telecommuting (Shi *et al.*, 2020). Of survey respondents who were telecommuting, "23.8% reported an increase in productivity, 37.6% no change, and 38.6% a decrease in productivity compared to working at

their prior workplace". Furthermore, those who previously commuted in an SOV were more likely to increase or maintain their productivity level when switching to telecommuting, while those with longer walking commutes were more likely to decrease productivity.

Many studies explored whether changes in mode choice and commute behavior will persist after the pandemic (Shamshiripour *et al.*, 2020). Employees surveyed in Sweden do not foresee a drastic change in how they work and collaborate with colleagues, but many do believe they will be better at virtual collaboration (Hiselius and Arnfalk, 2021). Almost one-half of U.S. employees, however, expect to have telecommuting as an option, of which "71% expect to work from home at least twice a week after the pandemic" (Javadinasr *et al.*, 2021). These beliefs change depending on demographic characteristics; Salon et al. detected (2021) that those who "hold a bachelor's degree or reside in households earning over $100,000 per year are twice as likely to expect to telecommute at least a few times a week post-pandemic".

Company executives are an important group to survey, since they decide how companies will be operate post-pandemic. Of 1,500 hiring managers surveyed, 61.9% said their workforce will be more remote going forward (Ozimek, 2020). Gehlot and Sonwaney (2020) shared advice on how to bring people back into the office post-COVID-19 for companies who need their workforce in-person. Finally, the future does not just consist of a return back to normal, but also to potential future societal disruptions. To prepare for such disruptions, Tardivo, et al. (2021) recommend walking through the 5 Rs (resilience, return, reimagination, reform, and research) to help create infrastructure that can handle future crises.

As the pandemic progressed, research regarding COVID-19 was able to become more in-depth. Some studies used existing data streams, while surveys arose as a well-suited method of obtaining more COVID-specific data than existing streams (and of doing so quickly). As

COVID-19 risk spreads, mode choice has shifted, bringing about the meteoric rise of telecommuting. Studies have begun to estimate what commuting post-COVID will look like.

Our research questions strive to fill existing gaps in the literature. We will contribute to the growing database of how mode choice has shifted during the pandemic, comparing our results to those of other studies, as well as discovering more about mode choice post-pandemic, a vastly uncharted territory. Furthermore, this study will survey a population that was experiencing the exact same policies and societal changes, creating insight into connections between policy and survey data that has not been possible elsewhere.

Data and Methods

To address the aforementioned research questions, our survey focused on the intersection of commuting and COVID-19 and was distributed to all Vanderbilt University (VU) faculty/postdoctoral fellows, staff, and graduate/professional students. The survey was designed to inquire about attitudes and behaviors associated with four different COVID-19 policy phases at VU so that individual responses from faculty, staff, and students could be compared temporally (see Appendix C):

- Pre-COVID-19
- During "Safer at Home" and Vanderbilt Phase I (March 23-June7, 2020)
- Vanderbilt Phase II (June 8-August 9, 2020)
- Present (Vanderbilt Phase II+, starting August 10, 2020)
    - *The survey was open from October 14th, 2020 to November 15th, 2020*
    - *All "present" responses pertain to this period of time*

Areas of interest included mode choice, mode desirability (how comfortable survey respondents would feel on available travel modes even if they were not actively taking them), and work status (whether respondents were allowed/required to telecommute with how often they elected to do so). The full survey instrument appears in Appendix A.

Demographic data collection was also an extremely important facet of the survey. VU is comprised of faculty, staff, and students. Moreover, Vanderbilt is also the second largest private employer in the State of Tennessee (*Vanderbilt reports record $11.9 billion economic impact in Tennessee*, 2019). As the University population is an important segment of a larger, more general population, survey results hold promise for providing insights for travel in the region and potentially beyond.

The survey was administered during Fall 2020, several months after the pandemic began. This was advantageous, as it coincided with a period when some respondents had resumed commuting, while others were telecommuting. At this point, the COVID-19 pandemic had been present for several months and had already dramatically impacted society at large. Consequently, respondents were able to comment on potential changes in attitudes and behaviors after experiencing the beginning of COVID-19.

The survey was formatted using Qualtrics, an online survey software, with the participant pool consisting of all 12,800 Vanderbilt University faculty, staff, postdoctoral fellows, and graduate/professional students. The only group not recruited for the survey were undergraduate students, as Vanderbilt has a residential requirement resulting in nearly all undergraduate students living on campus, meaning they do not have a commute option.

Participants for the study were recruited via email. As shown in Appendix B, the recruitment email emphasized the survey relevance to those who currently commute to campus as well as those operating remotely. The survey was closed after a month so the responses would be close enough time-wise to be comparable.

A total of 4,277 responses (33% response rate) were received, 3,575 of which were considered complete submissions (28%). A complete submission is one in which the respondent clicked the submit button at the very end of the survey. The incomplete submissions consist of

respondents who started but did not submit the survey. All questions in the survey were optional, so a complete submission may not have an answer to every single question. Only the complete submissions were used for data analysis. Before performing analysis, the data was anonymized by removing any personally identifiable information., in line with the requirements of the Institutional Review Board approved protocol.

Analysis Results

Demographic Composition

The survey data is segmented according to demographic characteristics to facilitate direct comparison to results from other COVID-19 mobility studies, in particular the study performed by researchers at UC Davis (Matson et al., 2021). The Matson et al. and Vanderbilt survey results are comparable according to the following delineations:

- Days per week telecommuting (one, two,…, seven days)
- Two phases: pre-pandemic (denoted T1), and during the lockdown period (denoted T2)
  - *Matson et al.-defined lockdown:* March-April 2020
  - *Vanderbilt-defined lockdown:* Nashville "safer at home" and Vanderbilt Phase I (March 23-June 7, 2020)
- Ranges of annual household income:
  - *High income:* at least $75k/year
  - *Medium income*: between $50,000 to $74,999/year
  - *Low income*: less than $50,000/year

As shown in Table 2.1, the results show generally similar trends between the two different surveys. There is a substantial increase in the number of respondents who telecommute 5 days a week when comparing period T1 to period T2. Similarly, there are large decreases from T1 to T2 in the number of respondents who telecommute zero days a week.

Table 2.1: Telecommuting days per week, segmented by income, comparison between Vanderbilt and Matson et al. surveys

| Telecommuting Days Per Week										
Income Level	Survey	Time Period	Percent of Respondents (%)							
			0 days	**1 day**	**2 days**	**3 days**	**4 days**	**5 days**	**6 days**	**7 days**
High Income (≥$75,000)	Matson et al (N=290)	T1	61.32	12.54	8.36	4.53	1.39	8.71	2.09	1.05
		T2	11.5	3.48	5.92	8.36	7.32	48.08	6.62	8.71
	Vanderbilt (N=1556)	T1	56.98	9.45	9.45	3.06	2.35	14.67	1.56	2.48
		T2	7.20	1.36	1.62	2.66	3.24	61.09	4.86	17.96
Medium Income ($50,000 to $74,999)	Matson et al (N=175)	T1	67.63	10.98	4.62	4.05	3.47	8.09	0.58	0.58
		T2	32.95	2.31	7.51	5.78	6.36	34.68	4.05	6.36
	Vanderbilt (N=633)	T1	61.22	6.89	4.49	2.56	1.92	20.67	1.12	1.12
		T2	6.84	1.27	2.86	2.70	4.29	66.45	3.02	12.56
Low Income (<$50,000)	Matson et al (N=107)	T1	66.67	5.71	3.81	1.9	4.76	8.57	5.71	2.86
		T2	45.71	3.81	3.81	10.48	5.71	23.81	1.9	4.76
	Vanderbilt (N=744)	T1	56.61	7.30	8.54	3.03	1.38	16.80	2.07	4.27
		T2	9.19	1.65	1.78	2.47	4.25	46.64	4.25	29.77

There are two notable ways in which the survey responses differ. The first involves the combination of low income and telecommuting three days a week (highlighted in blue in Table 2.1). Matson et al. reported an increase in telecommuting three days a week from 1.9% in T1 to 10.48% in T2, while Vanderbilt respondents reported a decrease from 3.03% in T1 to 2.47% in T2. This may indicate slightly more flexibility in telecommuting on some, but not all, days for Matson et al. survey respondents.

The second distinction involves those telecommuting "zero days a week" compared to those telecommuting "five days a week" (highlighted in pink in Table 2.1). There is a much higher percentage of people who telecommute five days a week among Vanderbilt respondents for both T1 and T2. Correspondingly, there is a much higher percentage of people who telecommute zero days a week among the Matson et al. population. This could indicate stricter stay-at-home requirements in Nashville than in the various cities surveyed by Matson et al., or a greater ease of shifting much of the academic environment at Vanderbilt online than in the more

general population surveyed by Matson et al. Determining the exact cause will require further investigation.

The Vanderbilt survey results can also be examined in demographic groups not yet evaluated in earlier works. As an academic institution, Vanderbilt has a particular set of affiliations: faculty, postdoctoral fellow, graduate or professional student, and staff. This enables an examination of two additional considerations along the lines of affiliation: commute distance and car ownership.

The commute distance data, as seen in Figure 2.1, speaks to the economic ramifications of various job affiliations. Faculty members tend to earn greater incomes than staff, which allows them to live closer to campus, many areas of which have been gentrified and have higher home values. Moreover, in Nashville, affordable housing is increasingly hard to find close to campus. This pushes lower income households further away from campus, often where transit does not offer frequent or proximate service. Consequently, those who move far from campus may be required to use a car. One notable exception is in the graduate and professional student affiliations, which also live close to campus.
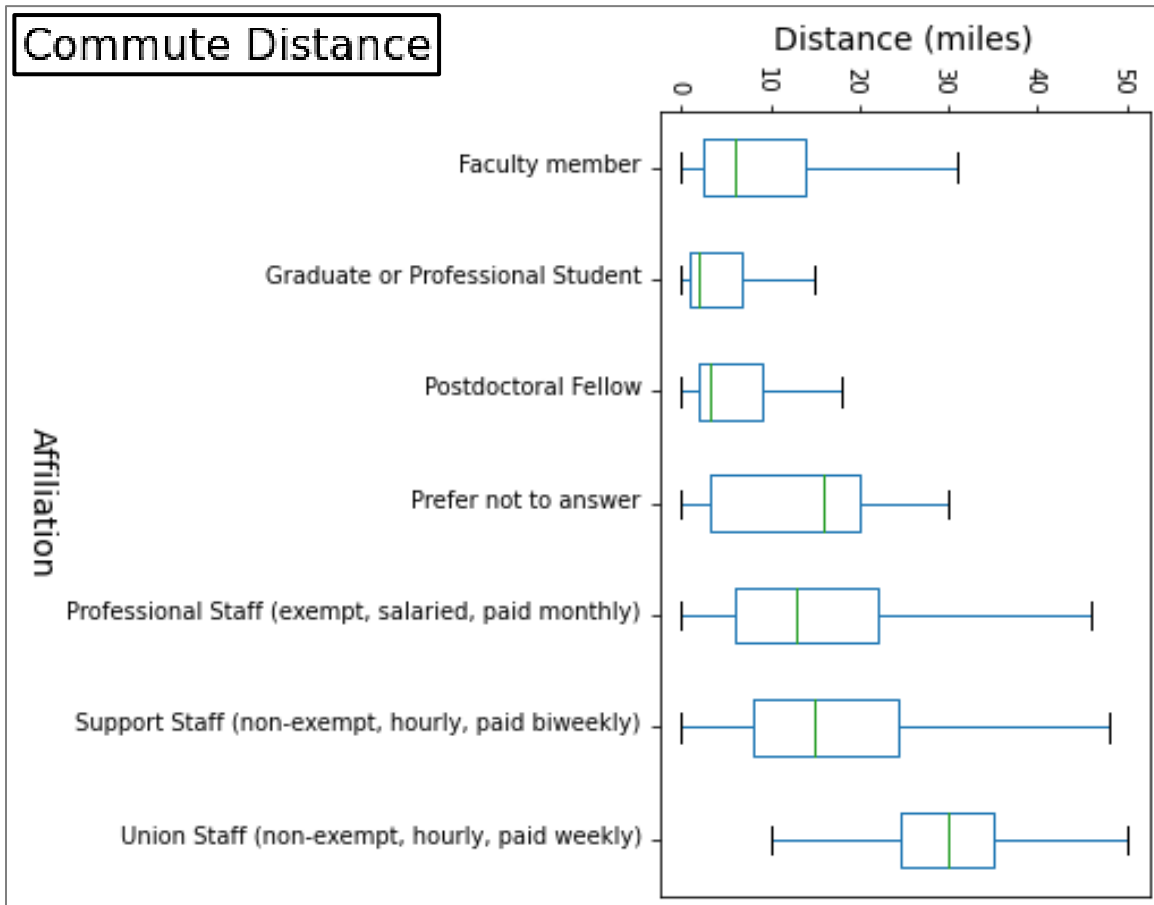
Figure 2.1: Distance travelled to campus by various affiliation groups.

When examining car ownership (Table 2.2), graduate and professional students are once again the special case. They have a much higher percentage of "sometimes" having access to a car than either of the other two demographic groups. This makes sense, as they tend to live closer to campus (as shown in Figure 2.1).

Table 2.2: Personal automobile availability for commute to campus, broken down by various affiliations.

	Car Availability					
	Faculty/Post Doc		**Grad/Prof Student**		**Staff**	
	Count	**Percent (%)**	**Count**	**Percent (%)**	**Count**	**Percent (%)**
Yes	622	**92.3**	829	**83.9**	1815	**96.0**
Sometimes	27	**4.0**	113	**11.4**	38	**2.0**
No, never	25	**3.7**	46	**4.7**	38	**2.0**
SUM:	674		988		1891	

Table 2.3 ties commute distance and car availability back into income. Faculty have the largest percentage of respondents in the "high income" bracket, substantiating their ability to live so close to campus as well as having a higher percentage of car availability. Staff have a significantly smaller proportion of respondents in the "high income" bracket and as a result tend to live further from campus, yet are more in need of access to a personal vehicle since walking, biking, and public transport are less feasible.

Table 2.3: Percent of each affiliation group that falls into each of the income brackets.

Affiliation and Income			
	Faculty/Post Doc	**Grad/Prof Student**	**Staff**
High Income (≥$75,000)	75.88%	16.35%	48.84%
Medium Income ($50,000 to $74,999)	10.29%	11.47%	25.42%
Low Income (<$50,000)	1.18%	58.98%	12.82%
Prefer not to answer	12.65%	13.20%	12.92%
SUM	100.00%	100.00%	100.00%

*Comparing Vanderbilt Policies and COVID-19 Metrics to Survey Responses*

A unique aspect of the Vanderbilt study is that its entire survey population was experiencing nearly the same policies and environmental surroundings. The policies associated with each phase are described in Table 2.4. Note that more significant policy changes were implemented in moving from Phase II to Phase II+ than between Phase I and Phase II.

Table 2.4: Vanderbilt policies throughout the four phases.

Vanderbilt COVID-19 Polices				
	Pre-COVID	**Phase I**	**Phase II**	**Phase II+**
On-campus research ramp-up	100% capacity	33% capacity	up to 50% capacity	up to 70% capacity
Graduate and professional instruction	On-campus activity	- Online - Preparation for on-campus activity continues	*No change from Phase I*	Hybrid learning -Partially virtual -Partially on-campus
Undergraduate instruction	On-campus activity	- Online - Preparation for on-campus activity continues	*No change from Phase I*	Hybrid learning -Partially virtual -Partially on-campus
Gatherings	No limit on gathering size	No gatherings allowed	Up to 10 people (with physical distancing and masking)	*No change from Phase II*
Staff	Majority of staff working on campus at least several days a week	- Staff recalled to campus when needed on campus to directly support research, instruction and residential living - Others working remotely - Only those who need to be on campus to directly support activity ramp-up will be requested to return to campus	*No change from Phase I*	- Staff recalled to campus when needed on campus to directly support research, instruction and residential living - Others working remotely
Experiential Learning				Enable certain experiential learning programs through the School of Nursing and Vanderbilt University Medical Center to occur on campus
Other				Testing and tracing command structure set up by August 10, 2020

The working status of respondents during the various phases is shown in Figure 2.2. It is important to note that this figure shows what was required/allowed of respondents, not what choices they actually made. As expected, there is a large jump in the percentage of respondents telecommuting during Safer at Home (Vanderbilt Phase I). During this phase, the vast majority of respondents reported "Required to work from home", which indicates very little flexibility in

choosing when to telecommute. There is even less flexibility ("can work at either location", blue line) during Phase I than prior to the pandemic. On-campus, no gatherings were allowed, and generally only essential research was permitted to be in-person. Moving out of Phase I, it is interesting to observe the "flexible" option of "can work at either location" rise as the phases progress.
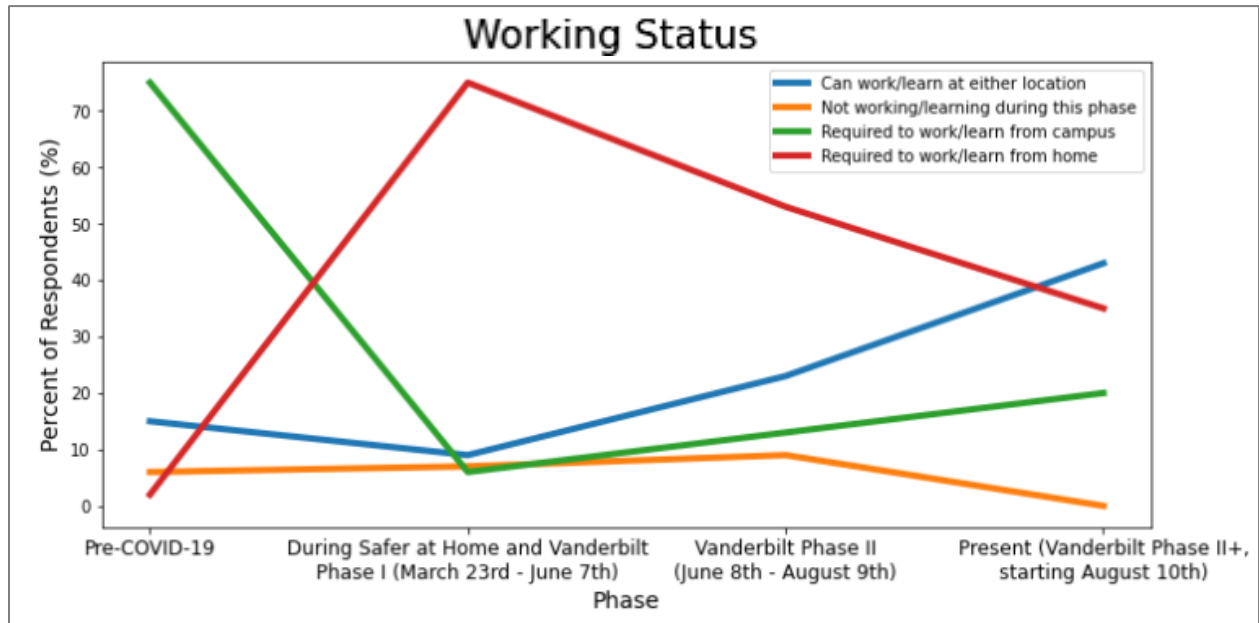
Figure 2.2: Working status percentages during various Vanderbilt phases.

Days spent telecommuting, displayed in Figure 2.3, show the actual choices made by respondents within the boundaries of what was required/allowed. Only 11% of people reported working exclusively from campus in the "present" (Vanderbilt Phase II+, starting August 10th). Many respondents took advantage of that flexibility to learn/work several days a week from home and several on-campus.
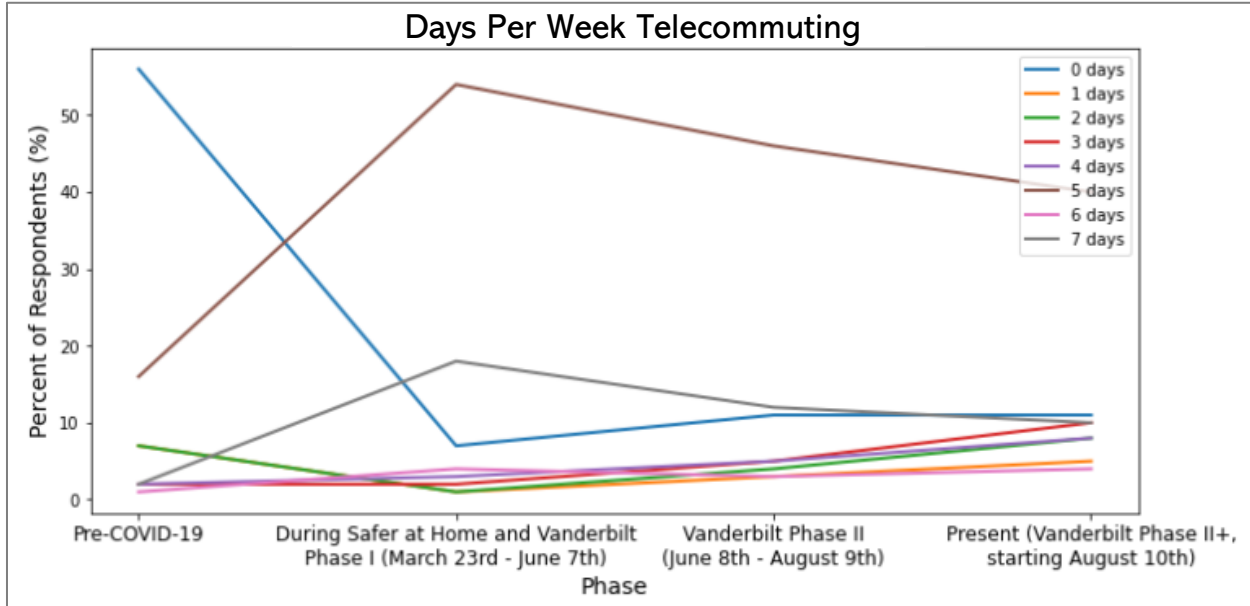
Figure 2.3: Days per week telecommuting for various Vanderbilt phases.

Mode Share and Attitudinal Data

Mode recovery examines which modes have been the slowest to recover, comparing pre-COVID-19 mode share and "present" mode share. Due to a differing number of total respondents between the pre-COVID-19 and the "present" responses, mode recovery is presented as a ratio of the "present" mode share percent over the pre-COVID-19 mode share percent. It is important to note that the "present" is the month that the survey was open, from October 14th, 2020 to November 15th, 2020, and takes place during Vanderbilt Phase II+ (started August 10th, 2020). As shown in Table 2.5, all forms of public transit, along with vanpooling, have been the slowest to recover. This aligns with expectations since these are modes in which respondents must appear with others for an extended period. These results also comport with similar results from other studies that investigated mode share, as mentioned in the literature review (Bhaduri *et al.*, 2020; Das *et al.*, 2021; Harris and Branion-Calles, 2021).

Table 2.5: Mode share recovery; ratio of "present" mode share percent over the pre-COVID-19 mode share percent.

Mode Recovery:	$\left(\dfrac{\text{"present" mode share percent}}{\text{Pre-COVID-19 mode share percent}} \right)$
Mode	**Ratio (%)**
Carpool (2 or more people in vehicle)	48.6
Drive alone (or with children under 16)	50.8
Other	35.4
Ride Hail (Uber/Lyft/Taxi)	72.9
Ride WeGo Star (formerly Music City Star)	12.7
Ride a WeGo Local bus (formerly MTA)	23.3
Ride a WeGo Regional Commuter (formerly RTA)	12.2
Ride a bicycle	82.0
Ride a motorcycle	72.9
Ride an e-scooter	97.3
Telecommute or work remotely	1467.6
Vanpool	24.3
Walk	79.7

Figure 2.4 looks at mode desirability, in which respondents evaluated the desirability of each mode, from "very undesirable" (quantified as "1") to "very desirable" (quantified as "5"). The full list of desirability options can be found in Appendix A. Figure 2.4 is interesting in that respondents offered opinions on all modes, including those that they reported were available to them, as well as available modes they do not use. Note that mode desirability focuses on respondents' attitudes towards these options, while mode share percentages in Table 2.5 reflect only their chosen mode.
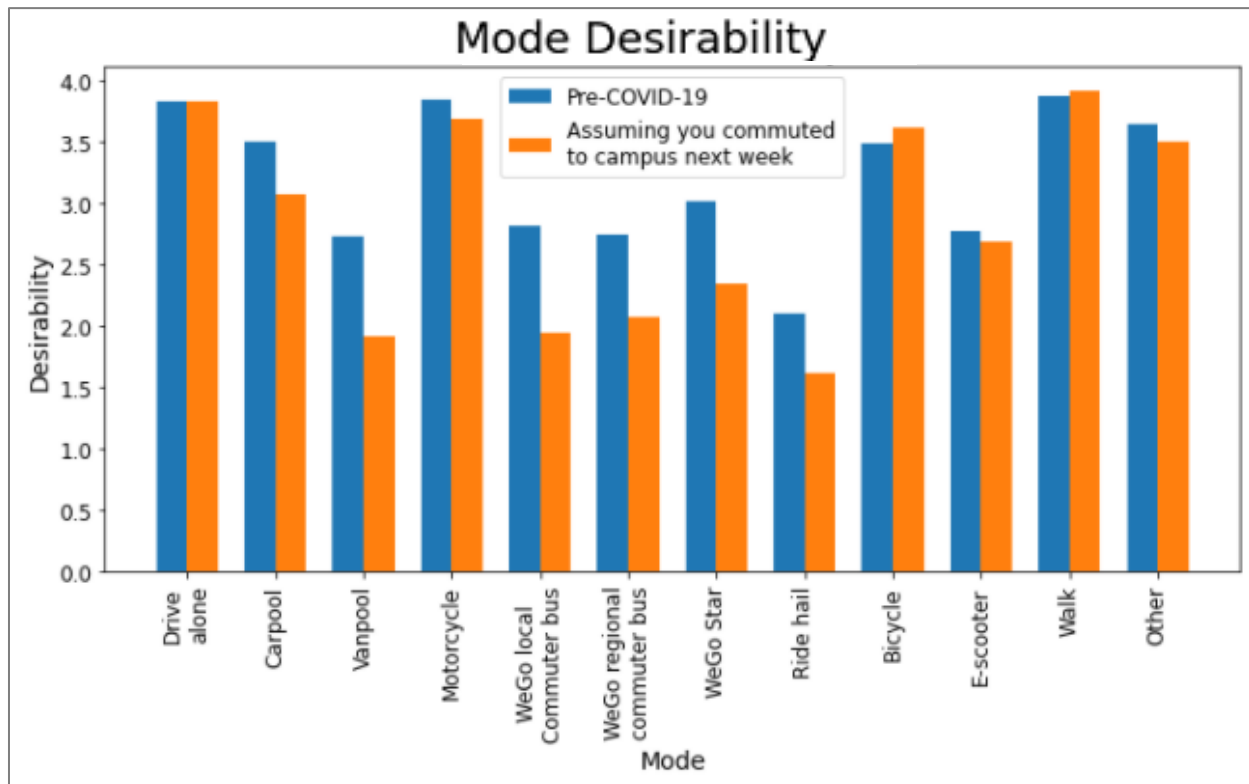
Figure 2.4: Mode desirability pre-COVID-19 vs. "present" for various modes.

Drive alone desirability stayed relatively constant while walking and biking increased in desirability. All other modes decreased in desirability, once again most significantly public transit modes. Note that this survey question did not include telecommuting because many people had not really pondered the concept/availability of telecommuting pre-COVID-19 and it would have been difficult to provide an unbiased answer to the pre-COVID-19 portion of the question.

A comparison of mode choice and modes available provides insight into the number of alternatives SOV commute respondents have available but are electing not to use. As we look toward a future post-COVID, these results may help in messaging to encourage a mode choice other than SOV to help mitigate traffic and decrease greenhouse gas emissions. The data in Table 2.6 highlights specific areas of opportunity. 17.6% of respondents have a WeGo local bus

available, but only 2.8% of respondents capitalize on this availability. Similarly, 22% of

respondents list walking as an option, and 15.7% of respondents have biking as an option, but

only 10.3% and 3.4%, respectively, select these as their mode of choice. Note, however, that

there may be limitations in pursuing these opportunities due to the difference between a mode

being available and the corresponding level of service and safety that would be provided. For

example, a respondent may have a bus "available" to them, but it may be a 1.5-hour commute on

the bus compared to a 30-minute commute in a SOV; this issue was not explored in this study.

Table 2.6: Mode choice percent compared to what percent of respondents have that mode
available to them

Mode Choice vs. Modes Available		
	Pre-COVID Commute mode choice percent (%)	Commute modes available percent (%)
Carpool (2 or more people in vehicle)	4.9	17.3
Drive alone (or with children under 16)	71.1	92.2
Other	2.0	2.2
Ride Hail (Uber/Lyft/Taxi)	0.2	19.2
Ride WeGo Star (formerly Music City Star)	0.7	4.3
Ride a WeGo Local bus (formerly MTA)	2.8	17.6
Ride a WeGo Regional Commuter (formerly RTA)	0.5	2.9
Ride a bicycle	3.4	15.7
Ride a motorcycle	0.4	2.0
Ride an e-scooter	0.1	4.0
Telecommute or work remotely	3.3	n/a
Vanpool	0.2	0.8
Walk	10.3	22.0

One way to motivate SOV commuters to adopt more sustainable transport modes is

through improved biking and pedestrian infrastructure. Public transit could become more viable

by offering improved bus frequency. In a study by the University of Utah of 157 cities,

researchers found that "increasing the frequency of service on current routes was about 20

percent more effective at increasing ridership than adding more routes" (Higashide, 2019).
Frequent buses allow for spontaneous decisions about when to leave and where to go.

Another area of opportunity is policy modifications, particularly those which would allow for more flexibility in the work hours and work environment. This could manifest itself in the form of an individual telecommuting several days a week, or arrive and depart from campus during less congested time periods. Even for those remaining in a SOV, a shift by others away from SOVs would result in less traffic, which equates to lower emissions.

Finally, employers could provide incentives for choosing a more sustainable commute option. For example, Vanderbilt community members enrolled in a daily parking program pay only for days they drive to campus, while receiving a $0.50 reward every time they choose a more sustainable commute. This includes walking, biking, public transit, carpooling, and vanpooling.

When asked what would make their return to campus easier, survey respondents overwhelmingly indicated interest in precisely such daily parking program, which had not yet been implemented when the population was surveyed. The other top answers, as seen in Figure 2.5, were incentives for sustainable commutes and short-term parking. These three policies were all already in the works pre-COVID-19 and are now actively implemented. Vanderbilt's decision to implement these policies demonstrates excellent resilience, as the policies were put into motion prior to the existence of COVID-19 and worked effectively to serve the survey population in the midst of a pandemic no one was expecting.
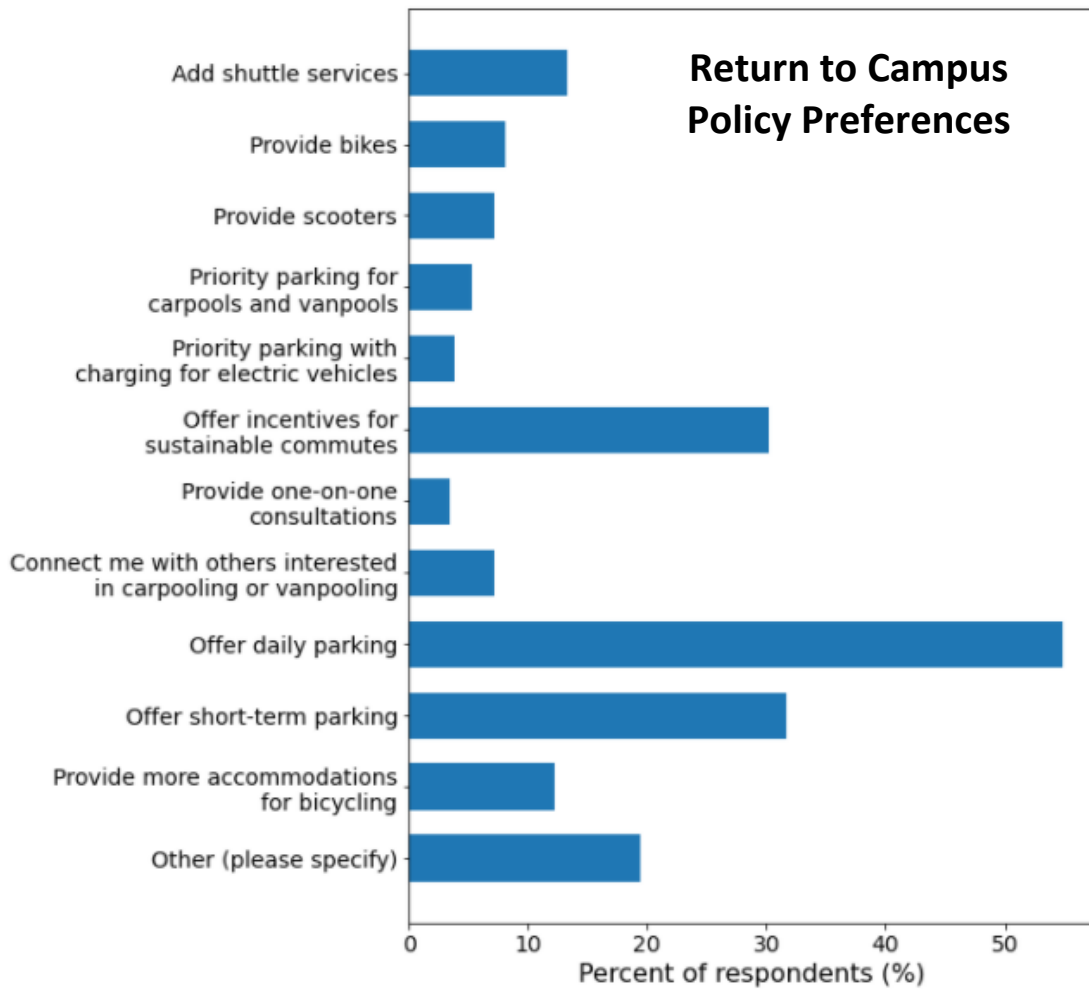
Figure 2.5: Survey respondents' preferences for what could make their return to campus easier

The potential policy preferences in Figure 2.5 hold power for other communities and organizations as well. As the second largest employer in Tennessee, as well as an organization with a diverse array of employees (from professors and academic community members to a variety of staff), Vanderbilt is representative of a larger, more general population. The survey results, therefore, could be relevant and applicable far beyond the walls of Vanderbilt. The potential policies of Figure 2.5 are achievable, actionable steps that many organizations can take to serve their constituents as they come back to work post-COVID-19, while also encouraging more sustainable commutes.

Discussion

A wealth of data was found to answer the part of our first research question, regarding how COVID-19 has affected mode choice during the pandemic. There was a dramatic increase in telecommuting, even when telecommuting was not required. Shared modes, such as public transit and carpooling, were struggling the most to recover to their pre-pandemic mode share percentages.

We experienced limitations on the depth to which commute mode choice after the pandemic could be ascertained. Questions about the future could potentially have made respondents feel as though they were being promised some form of telecommuting as an option post-pandemic, as long as they indicated that they were interested in that, which the University could not guarantee (i.e., a professor may indicate a desire to work entirely virtually post-COVID-19, but their course load and profession do not allow for that). Furthermore, data that could be collected would represent only respondents' belief about how they may act post-pandemic, and not a guarantee of certain mode share percentages. The research performed did, however, identify key areas in which organization leaders and policy makers could act to influence mode choice, shedding some light on what the future might look like.

As the pandemic progressed, respondents' actions changed in concert with evolving policies, answering our second research question. As the University progressed from complete lockdown to different stages of opening, the percentage of those working from home one to four days a week increased, as respondents took advantage of the new flexibility offered to them.

While much has happened with COVID-19 since this survey was administered, many challenges remain. At the time of writing, Europe is experiencing a fourth wave in November 2021 and the United States is headed into a fifth wave as the 2021 holiday season approaches (Wilson, 2021). Providing flexibility to telecommute enables commuters to respond to the ever-

changing nature of COVID-19. To encourage use of public transit and vanpool, operators could enact and emphasize their cleanliness procedures, as many cities and transit networks have done. Beck and Hensher (2020) suggest that it may be helpful for riders to see the cleaning happening. Operators and city officials can also share study results showing how public transit with the correct reduced capacity and cleaning measures is quite safe (Culbertson and Aguilar-Garcia, 2020; UITP, 2020).

Post-COVID-19, employers may wish to reinforce some mode shifts induced by the pandemic to improve longer term sustainability goals. Although not the primary focus of our study, the survey results highlighted that many users had environmentally sustainable modes available that they were not utilizing. To motivate greater use, one could enact infrastructure, policies, and incentives. Long term allowance of increased telecommuting could lead to reduced emissions associated with commuting.

Concluding Remarks

COVID-19 has had a significant and lasting impact on the transportation sector since first emerging in December 2019. Behavioral changes in mode choice have been significant, including a dramatic increase in telecommuting. The extent to which these changes are permanent is unknown at this time. Through a survey of Vanderbilt community members, with respondents representing 28% of the total population, two research questions were examined: 1) How has COVID-19 affected commute mode choice during and after the pandemic?, and 2) How do the policies in place throughout various phases of the pandemic affect commuters' actions and preferences?

The change in mode choice during the pandemic was identified, with a dramatic increase in telecommuting and less use of shared modes, but results for the mode choice post-pandemic

were limited, with most data identifying avenues in which future mode choice could be affected and not actual behavior. As VU's policies changed in response to pandemic conditions, survey respondents took advantage of the flexibility provided to them by telecommuting and altered their mode choice accordingly, opting to work several days-a-week from home as policies loosened.

Survey results were consistent with other research studies according to the attitudes and behaviors of different demographic groups. Additionally, consideration of mode recovery, mode desirability, and mode availability highlighted where policy and infrastructure changes could be made post-COVID-19 to encourage more environmentally sustainable commutes, when they are necessary. Knowledge collected on how COVID-19 is impacting transportation helps in the creation of a more reliable and resilient transportation system for the future.

Apart from this study, it would be beneficial to conduct a second survey as COVID-19 persists or potentially post-COVID to see how respondents' attitudes and actions have changed. Explicit research on the best ways to encourage commuters to take advantage of available environmentally sustainable commute modes would be an extension of the recommendations offered in this paper.

CHAPTER III: Final Thoughts

As equity and environmental impacts of transportation are an important part of any conversation about commuting, this study has recognized the potential power in how telecommuting and the availability of alternatives to SOV use can be used to produce a more environmentally sustainable future. However, this work provides only a glimpse of what might be possible, which will only become clearer with additional examination.

For example, designing and administering an additional survey measuring change in commute mode choice would generate information on the change (hopefully a decrease) in greenhouse gas emissions. If a significant decrease is apparent, the extent to which such results are scalable and transferable becomes an important conversation.

As mentioned earlier, within the Vanderbilt community, a potential follow-up survey focused on telecommuting was not able to be performed; administering this survey would be insightful.

2020 Commute Survey (COVID-19)

Q1
Commuter Survey

This survey includes questions related to your attitudes and behaviors towards commuting in light of the COVID-19 pandemic. Additional surveys will be administered in subsequent phases of Vanderbilt's return to campus plan. Your feedback will help inform mobility and transportation efforts and scholarly research.

This survey is intended to gather information about the university community's preferences and is not a guarantee of future program offerings or policy changes.

The survey should take approximately 5 minutes to complete.

Statement of Confidentiality

This survey collects identifiable information via SSO authentication. Your information will be kept strictly confidential and will only be utilized as the Division of Administration compiles data from this survey to update the university's commute mode share, enhance MoveVU programs, and inform scholarly research. With respect to the presentation of the data collected, all data will be presented in de-identified aggregate form.

We appreciate your time and cooperation in completing this survey.

For questions or issues regarding this survey, please contact Matthew Sinclair, Survey Administrator, at pie@vanderbilt.edu.

Thank you, again, for providing your feedback.

Eric Kopstain
Vice Chancellor for Administration

Commuter Questions

Q1: Please indicate your working/learning status during each of the following phases:

	Required to work/learn from campus (1)	Required to work/learn from home (2)	Can work/learn at either location (3)	Not working/learning during this phase (4)
Pre-COVID 19 (1)	○	○	○	○
During "Safer at Home" and Vanderbilt Phase I (March 23rd-June 7th) (2)	○	○	○	○
Vanderbilt Phase II (June 8th - August 9th) (3)	○	○	○	○
Present (Vanderbilt Phase II+, starting August 10th) (5)	○	○	○	○

Q2: How many days per week did/do you work/learn from home during each of the following phases?

	Number of days
Pre-COVID 19 (1)	▼ Select from dropdown a number from 0-7 days or "Not working/learning during this phase"
During "Safer at Home" and Vanderbilt Phase I (March 23rd-June 7th) (2)	▼ Select from dropdown a number from 0-7 days or "Not working/learning during this phase"
Vanderbilt Phase 2 (June 8th - August 9th) (3)	▼ Select from dropdown a number from 0-7 days or "Not working/learning during this phase"
Present (Vanderbilt Phase II+, starting August 10th) (5)	▼ Select from dropdown a number from 0-7 days or "Not working/learning during this phase"

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Q3: How many miles did/do you commute to your usual on-campus location (one-way)?

○ Miles commuted (one-way) (2)

_____

Q4: In a typical week, what type of transportation did/do you use most often to commute TO your usual on-campus location? Select one mode of transportation from each column.

If you used more than one type, fill in the type used for the LONGEST DISTANCE. Select "Carpool" only if at least one other person age 16 or older was in the vehicle. Select "Telecommute" if you eliminated a commute trip by working or studying at home or another location besides campus. If you telecommuted part of the day then went to your usual campus location, indicate how you got to your usual campus location.

	Tele-commute or work remotely (12)	Drive alone (or with children under 16) (1)	Carpool (2 or more people in vehicle) (2)	Vanpool (3)	Ride a motorcycle (4)	Ride a WeGo Local bus (formerly MTA) (5)	Ride a WeGo Regional Commuter (formerly RTA) (6)	Ride WeGo Star (formerly Music City Star) (7)	Ride Hail (Uber/ Lyft/ Taxi) (8)	Ride a bicycle (9)	Ride an e-scooter (10)	Walk (11)	Other (13)
Pre-COVID-19 (1)	○	○	○	○	○	○	○	○	○	○	○	○	○
During "Safer at Home" and Vanderbilt Phase I (March 23rd-June7th) (2)	○	○	○	○	○	○	○	○	○	○	○	○	○
Vanderbilt Phase II (June 8th - August 9th) (3)	○	○	○	○	○	○	○	○	○	○	○	○	○
Present (Vanderbilt Phase II+, starting August 10th) (4)	○	○	○	○	○	○	○	○	○	○	○	○	○

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Q5: Do you have a personal automobile available for your commute to campus?

○ Yes (1)

○ No, never (2)

○ Sometimes (3)

Q6: What could make your return to campus easier? Please select up to three choices.

☐ Add shuttle services for trips around campus (1)

☐ Provide bikes for trips around campus (2)

☐ Provide scooters for trips around campus (3)

☐ Offer priority parking for carpools and vanpools (4)

☐ Offer priority parking with charging for electric/plug-in vehicles (5)

☐ Offer incentives for sustainable commutes like riding the bus, walking, bicycling, carpooling, or vanpooling (6)

☐ Provide one-on-one consultations to assist me with transportation options to campus (7)

☐ Connect me with others interested in carpooling or vanpooling (8)

☐ Offer daily parking where I pay a daily fee to park on campus (9)

☐ Offer short-term parking where I pay for 2 to 4-hour parking increments on campus (10)

☐ Provide more accommodations for bicycling such as maintenance stations, racks, and shower facilities (11)

☐ Other (please specify) (12)

_____

Q7: Which commute modes do you have available to you?

☐   Drive alone   (1)

☐   Carpool (2 or more people in vehicle) (2)

☐   Vanpool (3)

☐   Ride a motorcycle (12)

☐   Ride a WeGo Local Commuter bus (formerly MTA) (4)

☐   Ride a WeGo Regional Commuter bus (formerly RTA) (11)

☐   Ride WeGo Star (formerly Music City Star) (5)

☐   Ride Hail (Uber/Lyft/Taxi) (6)

☐   Ride a bicycle (7)

☐   Ride an e-scooter (8)

☐   Walk (9)

☐   Other: (10) _____

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Q8: How desirable were/are the following modes to you during the specified time periods?

Display This Question:

Only display the modes that were selected in the previous question, Q7

Each "▼ dropdown box" shows the following five options:
- *Very undesirable: 1*
- *Slightly undesirable: 2*
- *Neutral: 3*
- *Slightly desirable: 4*
- *Very desirable: 5*

	Pre-COVID-19	Assuming you commuted to campus next week
Drive alone (1)	▼ *dropdown box*	▼ *dropdown box*
Carpool (2 or more people in vehicle) (2)	▼ *dropdown box*	▼ *dropdown box*
Vanpool (3)	▼ *dropdown box*	▼ *dropdown box*
Ride a motorcycle (12)	▼ *dropdown box*	▼ *dropdown box*
Ride a WeGo Local Commuter bus (formerly MTA) (4)	▼ *dropdown box*	▼ *dropdown box*
Ride a WeGo Regional Commuter bus (formerly RTA) (11)	▼ *dropdown box*	▼ *dropdown box*
Rode WeGo Star (formerly Music City Star) (5)	▼ *dropdown box*	▼ *dropdown box*
Ride Hail (Uber/Lyft/Taxi) (6)	▼ *dropdown box*	▼ *dropdown box*
Ride a bicycle (7)	▼ *dropdown box*	▼ *dropdown box*
Ride an e-scooter (8)	▼ *dropdown box*	▼ *dropdown box*
Walk (9)	▼ *dropdown box*	▼ *dropdown box*
Other: (14)	▼ *dropdown box*	▼ *dropdown box*

Q9: If your commuting preferences have changed as a result of the COVID-19 pandemic, please explain why.

_____

_____

_____

_____

_____

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A Little More About You

Q10: Which one of the following best describes your affiliation with Vanderbilt?

○ Faculty member (1)

○ Graduate or Professional Student (2)

○ Postdoctoral Fellow (3)

○ Professional Staff (exempt, salaried, paid monthly) (4)

○ Support Staff (non-exempt, hourly, paid biweekly) (5)

○ Union Staff (non-exempt, hourly, paid weekly) (6)

○ Prefer not to answer (7)

Q11: Which of the following best describes your position(s):

○ Full-time, fully-benefits-eligible (1)

○ One or more part-time assignments (2)

○ Prefer not to answer (3)

Q12: What is your total annual household income?

○ Less $50,000 (1)

○ $50,000 - $74,999 (2)

○ $75,000 - $99,999 (3)

○ $100,000 - $149,999 (4)

○ $150,000 or more (5)

○ Prefer not to answer (6)

Q13: Please choose the category below that best fits your gender identity. We recognize that these categories may not capture or represent all genders or gender identities.

○ Male (1)

○ Female (2)

○ Another Identity (3)

○ Prefer not to answer (4)

Q14: How would you describe yourself? (select all that apply)

☐   American Indian/Alaskan Native/Hawaiian (1)

☐   Arab-American/Middle Eastern (2)

☐   Asian or Pacific Islander (3)

☐   Black/African American (4)

☐   Hispanic/Latino (5)

☐   White/Caucasian (6)

☐   Multiracial (7)

☐   Another Identity (8) _____

☐   Prefer not to answer (9)

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Q15: Thank you for your time and cooperation in completing this survey. If you have any additional comments or questions, please note them here.

_____

_____

_____

_____

_____

End of Block: Block 3

Appendix B: Email Recruitment

Draft Return to Campus Commute Survey Email

The Division of Administration is conducting a series of return to campus commute surveys to gain a better understanding of attitudes and behaviors toward commuting in light of the COVID-19 pandemic. This survey is intended to gather information about the university community's preferences and is not a guarantee of future program offerings or policy changes. Results from the survey will inform mobility and transportation efforts and scholarly research.

This survey is for members of the Vanderbilt community who:

- **Currently commute to campus to work or study**

    AND
- **Those working or studying remotely**

A brief survey will be administered during each of Vanderbilt's ramping up phases.

Take the survey for Phase 2+ by clicking the link below:

2020 Commute Survey [ADD LINK]

Or, copy and paste this link into your web browser: [ADD LINK]

The survey will remain open for the duration of Phase 2+. A reminder email to complete the survey will be sent in advance of the university moving into the next phase.

Appendix C: Vanderbilt Return to Campus Phases

GUIDING PRINCIPLES

Vanderbilt University's policies and protocols for responding to the COVID-19 pandemic are rooted in safety for staff, faculty, students, invited guests (e.g., contractors), and the public with whom we interact. The health and well-being of our community are critical. Protecting the health of the Vanderbilt community will require long-term effort and commitment, cooperation, teamwork and understanding — all values that our community has shown in a multitude of ways in recent months.

As we confront this health crisis, Vanderbilt University will remain steadfast in the constant pursuit of our mission and ideals outlined in the Academic Strategic Plan. Therefore, the university will ramp up in phases with primary mission activities at the heart of all decision making. Mission-centric activities are any required on-campus activities that fulfill Vanderbilt's core mission of teaching and research.

Radically different ways of deploying VU campus resources, including physical spaces, will be necessary as part of establishing a new normal. As we move forward, flexibility will be critical. Vanderbilt University's return to learning and discovering on campus will occur in phases of increased activity and will involve the careful evaluation of data, models and public health recommendations. Protocols will be pragmatic and will evolve over time.

Vanderbilt University's plans for expanding operations and increasing the presence of faculty, staff and students will be guided by the following criteria:

- The intentional effort by all faculty, staff and students to exercise both personal and community responsibility. The combined efforts by all members of the Vanderbilt community will create a culture that sustains a healthy and safe on-campus environment.

- Existing and projected government restrictions (e.g., safer-at-home orders, masking requirements, physical distancing, gatherings, etc.).
- Public health status: recommendations from the federal government (recently released Opening Guidelines), the Centers for Disease Control and Prevention, and Vanderbilt University Medical Center.
- Resource availability, including personal protective equipment for students, faculty and staff.
- Contact tracing and case management protocols.
- Physical distancing strategies.
- Financial feasibility.
- Alignment with Vanderbilt's strategic framework that the ramp-up of on-campus activities will support primary mission objectives of the institution (on-campus research, on-campus teaching and instruction, on-campus residential living and learning).
- ***Flexibility and adaptability to respond to the constantly evolving nature of the pandemic.***

Vanderbilt University's plans will also take into account local orders and ordinances of the City of Nashville, Davidson County and the Nashville Metropolitan Statistical Area (MSA), as well as the State of Tennessee's "Tennessee Pledge: Reopening Tennessee Responsibly."

The [Roadmap for Reopening Nashville](#) follows a four-phase approach. The Vanderbilt University Return to Campus Plan acknowledges the triggers and phases of ramp-up for the city in which Vanderbilt is located and identifies which activities ramp up on campus and when. The Vanderbilt University activities that will ramp up are identified below in each corresponding phase. **Vanderbilt's ramp-up may lag the Nashville ramp-up and will be tailored to our own unique density, operations, and other considerations as a residential education institution.** The university will communicate with the VU community in advance of each phase. If metrics of COVID-19 transmission and health system capacity change significantly, and Metro Nashville returns to a prior phase, Vanderbilt may also return to a prior phase and re-impose restrictions on activities.

- [On-campus research ramp-up](#) to no more than 33% capacity, subject to minimum 6 feet of physical distancing and other safety protocols (e.g., face masks/coverings)
- Graduate and professional student field-based training/learning allowed as informed by on-campus research activities phased opening and/or clinic/occupational site authorization.
- Graduate and professional instruction online and preparation for on-campus activity continues.
- Undergraduate instruction online and preparation for on-campus activity continues.
- On-campus residential education preparing for on-campus activity continues.
- Staff recalled to campus when needed on campus to directly support research, instruction and residential living. Others working remotely.
- Staff who are to be recalled to campus will be notified by their supervisors, and only those who need to be on campus to directly support activity ramp-up will be requested to return to campus. Others will continue working remotely.
- All those on campus must abide by the protocols outlined on this site (e.g., symptom monitoring, face masks/coverings, physical distancing, etc.).
- No [gatherings](#) allowed
- ***Specific details may be adapted in response to current conditions.***

- On-campus research and scholarly activities will transition to Phase 2 of the [4-Phase Research Ramp-up Plan](#), with all COVID-19 related safety guidelines in place (e.g., physical distancing, use of personal protective equipment, etc.)
- Graduate and professional student field-based training/learning allowed as informed by on-campus research activities phased opening and/or clinic/occupational site authorization.
- Graduate and professional instruction online and preparation for on-campus activity continues.
- Undergraduate instruction online and preparation for on-campus activity continues.

- On-campus residential education preparation for on-campus activity continues.
- Staff recalled to campus when needed on campus to directly support research, instruction and residential living. Others working remotely.
- Staff who are to be recalled to campus will be notified by their supervisors, and only those who need to be on campus to directly support activity ramp-up will be requested to return to campus. Others will continue working remotely.
- All those on campus must abide by the protocols outlined in the Return to Campus Plan (e.g., symptom monitoring, face masks/coverings, physical distancing, etc.).
- Gatherings up to 10 as long as physical distancing can be maintained and safety protocols (e.g., face masks/coverings) are followed.

- Vanderbilt *Phase II+* allows for on-campus residential living, activities and education, including multiple course delivery options, as the university prepares to host in-person classes for the fall semester beginning August 24.
- Vanderbilt's *Phase II+* includes stricter health and safety guidelines than Metro Nashville's modified Phase II plan and was designed with the university's residential education and research environment in mind.
- *Phase II+* will also enable certain experiential learning programs through the School of Nursing and Vanderbilt University Medical Center to occur on campus.
- If there are high-priority research needs that cannot be advanced at the currently approved Phase II capacities, research operations will have the opportunity to request an increase up to 70% capacity with stringent approvals and appropriate COVID-19 safety precautions.
- All those on campus must abide by the protocols outlined in the Return to Campus Plan (i.e. symptom monitoring, face masks/coverings, physical distancing, etc.)
- Gatherings continue to be limited to <u>10 people</u> while abiding by the university's physical distancing requirement.
- Testing and tracing incident command structure and contact tracing and symptom monitoring system will launch August 10. That system will include symptom monitoring, follow-up with those students who do not complete mandatory daily symptom monitoring (symptom monitoring is required of all undergraduates and some professional students), and tracking and follow up with those who report symptoms.
- Building certifications and circulation plans will be complete for all *Phase Two+* facilities by August 10.
- Detailed plans will be submitted, reviewed and endorsed for all *Phase Two+* activities by August 10.
- University-sponsored international travel to any country, and university-sponsored domestic travel, remains restricted under *Phase Two+.*
- The university strongly recommends that everyone reconsider personal travel.

- All students are discouraged from traveling out of the Nashville area during the semester.
- Graduate and professional student field-based training/learning allowed as informed by on-campus research activities phased opening and/or clinic/occupational site authorization.
- Staff recalled to campus when needed on campus to directly support research, instruction and residential living. Staff who are to be recalled to campus will be notified by their supervisors. Others working remotely.

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