Student Commuters: Unpacking the Factors That Influence How High School Students Travel to School

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Research Article

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Seventeen years into the twenty-first century, the citizens of the industrialized world experience the influence of technology in almost every sphere of their lives, including recreation, politics, home life, work life, and transportation. As we take new technological developments as commonplace, especially in the sphere of transportation, we may not think twice about how modernization affects our safety, our social lives, or the well-being of the environment. Some impacts of modern transportation systems include growing obesity rates, a rise in chronic illness, and alarm over "nature deficit disorder" (Louv 2008; Sandry 2013). This deficit can have physical and psychological consequences. Though most people have some degree of choice about where they live, work, and go to school, much of modern American life is predicated on automobile-based transportation and related infrastructure.

Recent research suggests that millennials may be shifting away from single-user automobile use. Sivak and Schoettle (2011) found that young people are less likely than their parents to have their licenses. From 1983 to 2010, licensure among people thirty years old and younger has decreased (Sivak and Schoettle 2011). As someone who is looking away from car ownership myself, I became interested in how this trend applies to people in my local community. What may influence someone to go against the norm of using cars to travel to their destination? To investigate this, I applied for a 2016 Summer Undergraduate Research Fellowship (SURF) through the Hamel Center at UNH. My study provided insight into the relationships between student characteristics and transportation mode choices. I looked specifically at how environmental concern, self-esteem, peer influence, infrastructure, and perceptions of safety affect high school students' choice of transportation.

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My study differentiates passive and active modes of transportation. Passive transportation includes modes that do not take physical effort, such as driving a car or riding the bus, and active modes of transportation are those that take direct personal energy from the traveler, such as walking or bicycling. Not surprisingly, most people depend heavily on passive modes in their day-to-day lives.

Study Approach

I approached data collection in two ways: (1) a questionnaire and (2) a series of focus groups. I sampled students from three semirural high schools in the seacoast New Hampshire region: Newmarket High School (NHS), Oyster River High School (ORHS), and Winnacunnet High School (WHS). These schools differed in student enrollment and geographic area. Juniors and seniors from each school responded to the questionnaire. Due to its low response rate (less than 20 percent), I omitted Winnacunnet from both the questionnaire and focus group analyses. To ensure minimal risk for human subjects, the Institutional Review Board at UNH approved the questionnaires and focus group process. As part of the approval, I sent waivers to inform parents and students of what the study would involve and to obtain their agreement to participate.

The questionnaire included forty-four questions total, some of which were formatted in matrices to find out students' commuting mode frequencies, perceived peer perceptions of each mode choice, and environmental concern. It also included Rosenberg's Self Esteem Scale (Rosenberg 1965), which has been used as a reliable measure of an individual's self-esteem categorized in levels of low, normal, and high, based on responses to ten questions. See Appendix A for the complete questionnaire.

The focus groups consisted of an activity-based discussion, modified from David Wulff's Faith-Q Set (Wulff 2009). Wulff's method uses a series of statements, which the interviewee places on a continuum that ranges from strong negative association to strong positive association. After the interviewee finishes the activity, the interviewer asks open-ended questions based on the layout of the statements. For the focus groups in my study, I planned to ask the students, as a group, to arrange nine statements in order from strongly disagree to strongly agree. The statements were printed on slips of paper. Examples of these statements include "Our school is accessible by bike, foot, or skateboard" and "Students at our school are conscious of their impact on the environment." For a complete list of the focus group statements, see Appendix B. As the researcher, I was hands-off during the statement sorting activity, but I recorded the audio of the conversation, which I later transcribed. After the students organized the statements, I led a discussion based on their arrangement.

The Oyster River focus group took place during a short advisory period of twenty minutes, leading me to omit the statement sorting activity. While avoiding leading questions, I asked students to elaborate on themes that arose in my preliminary analysis of the questionnaire data. Both questionnaires and focus groups took place in the spring of 2016 at NHS, while the questionnaires were in the spring and focus groups were in the fall of 2016 at ORHS. This gap between the questionnaires and focus groups at Oyster River allowed me to analyze some of the survey data before facilitating the focus group.

I faced a series of challenges with the data that I collected. The wording of a set of questions in the questionnaire regarding the frequency that students use certain modes of transportation (bike, walk, drive, etc.) left room for interpretation on how to answer. Instead of circling "Never" if they never biked, respondents often left the question blank. I did not know if I could interpret this lack of response as the student not using that mode, or just not wanting to the answer the question. To address this, I assumed the student meant "Never" for a mode choice if they circled "Daily" for another mode choice. I consulted my mentor as an experienced resource to find ways to make up for

setbacks such as these. In the future, I would ask students to report what percentage of the time they used each mode choice to have more precise results and to avoid ambiguity.

Findings

Through analysis of the questionnaires, I can conclude that neither a student's environmental concern nor self-esteem have a relationship to his or her transportation mode choice. In the sample of Newmarket and Oyster River students, 44.48 percent have high environmental concern, yet only 19.93 percent of students take an active mode of transportation at least weekly. I also found no relationship between Rosenberg's measure of self-esteem and the use of active or passive modes of transportation. This disconnect suggests that factors other than environmental concern and self-esteem must have a stronger influence in how students decide to commute to school.

The data show that factors of infrastructure and safety do have a relationship to students' mode choice. Distance, school accessibility, perceived parental concern, and perception of the safety of driving all have a significant relationship to whether or not students take an active or passive mode of transportation. Although 76.3 percent of students report that they do not choose their mode of transportation based on safety, their parents, directly or indirectly, may be making this decision for them. When a student disagrees that their school is accessible by bike, foot, or skateboard, they are over twice as likely (2.6 times) to report that their parents would be worried about them taking an active mode of transportation to school. In addition, when students agree that their parents would be worried about them taking an active mode to school, they are 2.5 times less likely to take an active mode of transportation than if they disagreed that their parents would be worried. This implies that with improved infrastructure, parents might be less worried, and, in turn, students might commute to school by bike, foot, or skateboard more often.

To understand this more fully, I asked ORHS students what it meant for their school to be accessible by bike, foot, or skateboard:

STUDENT (OR): *I feel like it depends where you live. If you live, like, a mile out or something, sure you could walk. It wouldn't be too far. But if you live in, like, Barrington or something, it might take a little bit.*

STUDENT (OR): *I mean, like, if you are talking about accessible, some people can bike further ways than others, so it really depends on certain people—on what is accessible to them, I guess.*

FACILITATOR: *So, it's mainly distance?*

STUDENT (OR): *Yeah, and safety on where they are going. Say someone lived, like, three miles away, but to get there they had to go, like, all back roads, then that is pretty safe. But if someone lived the same distance away, but had to go on the highway, that is way less safe and less accessible.*

Both safety and distance play a role in accessibility and mode choice. As distance increases, students are less likely to take active modes. For students who take active modes, 53.7 percent live within 1

mile of school, 20 percent live between 1 and 3 miles, 15.1 percent live between 3 and 6 miles from school, and 11.3 percent live over 6 miles from school.For some students, biking or walking is not plausible because they live close to 10 miles away. Students in this situation would need to travel on a busy road, which implicates the effects of how spread out the community is, with much of the population living far from the town center. Figure 1 shows characteristics of real students and how these attributes affect their mode choice.

Figure 1: Student Profiles

	Oyster River	
	Student One	**Student Two**
Mode Choice	Bus	Ride from friend (carpool)
Reasoning	Doesn't have license, wouldn't be able to afford a car, car not family's priority	Convenience, neighbor is going anyway, saves time
Distance from School	8 miles	2 miles
Environmental Concern	8	7.5
Effects of: (1-10, weak-strong)		
Distance from School	10	5
Safety	1	1

	Newmarket	
	Student Three	**Student Four**
Mode Choice	Walk	Drive
Reasoning	Lived within twenty minutes walking from school, taking less time than driving	Laziness, parents probably wouldn't be okay with walking or biking
Distance from School	1.5 miles	2 miles
Environmental Concern	3, not concerned about climate change, though aware of causes and effects	7
Effects of: (1-10, weak-strong)		
Distance from School	6.5	8
Safety	3, has had no safety issues walking	4

Figure 1. Characteristics of actual students at ORHS and NHS pertaining to the research questions. Environmental concern is rated on a scale from 1 (lowest concern) to 10 (highest concern).

Students talked at length in focus groups about how they have sports practices and homework, and how the extra time that it takes to bike or walk to school is used more effectively to gain another half hour of sleep. As an Oyster River student described in a focus group, "You don't really have that much time if you are always doing other homework, or trying to sleep, or doing sports, to actually fit in that extra thirty minutes of biking or walking every day." Other students stated that if they had friends to

walk to school with, they would be more likely to do it. This points to a social factor influencing transportation mode choice.

When looking at these findings it is important to keep community differences in mind, including each town's geographic size, traffic stress levels, and school accessibility, as well as the population's environmental concern and income levels.

District and Community Differences

Through the analysis of how the data related to my original research focus, it became clear that I needed to consider the many differences between the two groups of students from NHS and ORHS. Almost all variables differed significantly by district. To understand this, we can look at objective community differences.

Oyster River School District includes three towns (Durham, Lee, and Madbury). Some students from the town of Barrington (which does not have its own high school) also attend ORHS, and when you include Barrington's area, the geographic area of the district as a whole nearly doubles. Meanwhile, Newmarket School District includes only residents of Newmarket. The geographic area of the Newmarket School District is about one-quarter of Oyster River's (not including Barrington), resulting in much longer commutes for students in the Oyster River district. In terms of class size, there are approximately 320 students in the junior and senior classes, combined, at ORHS, compared to Newmarket's 122 students in the two classes combined (NHDOE2017).

Another difference between the districts is that Newmarket's median household income is $63,298 (US Census Bureau 2017) compared to Oyster River's $111,440 median (US Census Bureau 2017; Planning and Zoning 2015). These numbers show that Newmarket students are less affluent, which means that they may have more pressing concerns than climate change. This could explain why Newmarket students cited overall lower environmental concern than their Oyster River counterparts. Interestingly, though Oyster River students have higher environmental concern, Newmarket students use active modes of transportation more frequently, which release no pollutants and are more environmentally friendly (Frank et al. 2006). For a more complete analysis, we can look at where specific students live and at the safety of the roads between their homes and the school.

Student Profiles and Levels of Traffic Stress (LTS) Maps

Researchers in sociology have found that adults commute by bicycle less when it is raining, in hilly areas, or when they live further away from their work location (Heinen, Van Wee, and Maat 2009). Mekuria, Furth, and Nixon (2012) found evidence of higher rates of bicycle commuting in low-stress traffic environments. Blagden (2016) argues that the main reason that people do not commute by bicycle is a perception of danger. My research reflects these findings.

In the maps in Figures 2, 3, and 4, color coordination based on a model described by Makuria, Furth, and Nixon (2012) shows us the levels of stress that traffic places on a cyclist or pedestrian on particular roads. The students described in Figure 1 are placed on the maps according to where they live.
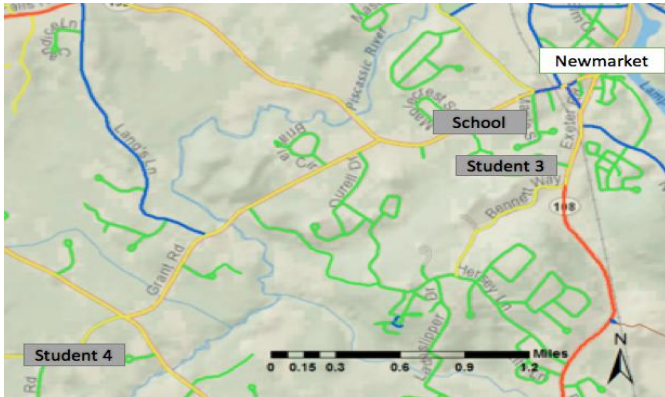
Figure 2. Map of Newmarket including levels of traffic stress of roads and the areas of residence for Students 3 and 4. KEY: 1 (Green) = Child could ride; 2 (Blue) = Most adults could ride; 3 (Yellow) = Enthused and confident could ride; 4 (Red) = Strong and fearless could ride.
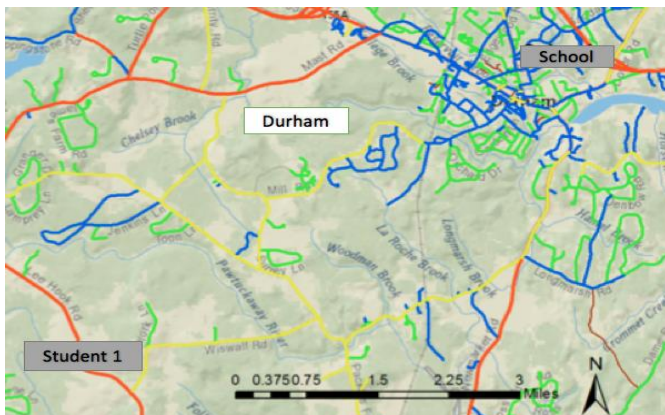

Figure 3. Map of Durham including levels of traffic stress of roads and area of residence for Student 1. KEY: 1 (Green) = Child could ride; 2 (Blue) = Most adults could ride; 3 (Yellow) = Enthused and confident could ride; 4 (Red) = Strong and fearless could ride.
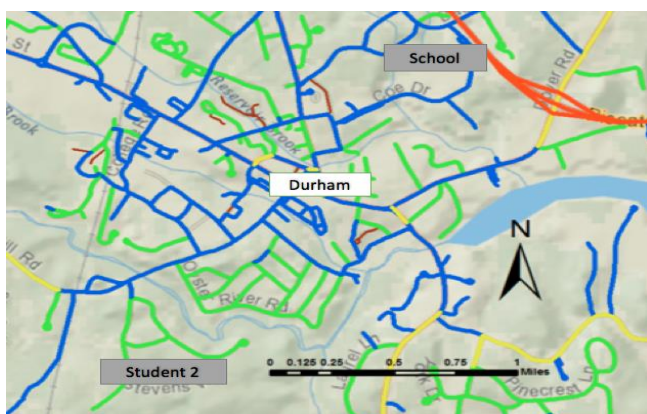

Figure 4. Map of Durham including levels of traffic stress of roads and area of residence for Student 2. KEY: 1 (Green) = Child could ride; 2 (Blue) = Most adults could ride; 3 (Yellow) = Enthused and confident could ride; 4 (Red) = Strong and fearless could ride.

At first glance, it appears that the roads near ORHS seem to be more bike friendly and walkable than those near NHS, where the high school is located on a road with moderately high traffic stress. (See Figures 2, 3, and 4.) However, outside of downtown Durham, many of the roads are rated with moderately high to high stress. Because many ORHS students live three to six miles from school, they likely would need to travel on these higher-stress roads to get to school. Similarly, although many of the neighborhoods in Newmarket are conducive to bicycling, they are connected to the school by more dangerous roads. Therefore, the poor bicycle infrastructure in both towns is one way of explaining why there is a low rate of students who cycle to school.

However, traffic stress levels alone do not fully explain why so few Newmarket students walk to school. Looking at the maps, it becomes apparent that sidewalks may be partly to blame. Even though the high school is located on a busy road, there are sidewalks connecting some neighborhoods and the downtown area to the school, providing greater pedestrian safety. Student 3 takes advantage of this and walks to school because it is more time efficient. However, many students, such as Student 4, live on or near Grant Road, which does not have sidewalks connecting it to school.

When looking at the relationship of distance and traffic stress, Student 1 lives eight miles from ORHS and must travel on high and moderately high stress level streets. (See Figure 3.) This is also a hilly route. Student 2 commutes only about two miles to ORHS, with mainly low or moderately low stress level streets on the route. (See Figure 4.) The strange thing about this situation, though, is that despite better route quality and shorter distance for Student 2, both students take passive modes of transportation.

It is also interesting that even when students share a similar level of environmental concern, they still don't choose active modes of transportation. Student 1 would have more difficulty biking or walking to school and must take the bus because of lack of access to a car. The school is more accessible to Student 2 via active modes of transportation, but this student has a convenient ride to school and chooses to take that instead. Student 4 lives only two miles from Newmarket High School but on a road that is dangerous for biking. Student 4 is not willing to dismiss safety and convenience for environmental well-being, so this student drives to school. The examples shown here exemplify how environmental concern has little impact on mode choice.

From looking at the maps, it is clear that infrastructure and distance have a large effect on students' mode of transportation, but social factors may become involved as well. Furness (2010) would look to social pressures, likely from media sources and Hollywood. Characters such as Pee-wee Herman or the "40-Year-Old Virgin" create connections between bicycle riders and "childishness and social ineptitude" (Furness 2010, 111). As measured quantitatively in the questionnaire, bicycling, walking, and skateboarding to school are perceived as much less socially acceptable than using a car. This emphasizes the importance of social pressures to conform to the rest of society and peer groups, especially in times of youth development. Yet, this claim is not reflected in the questionnaire data when comparing perceptions of peer acceptance and mode choice, providing opportunity for further investigation.

Moving Forward

Advocacy groups and public campaigns can use the results of my research to make informed decisions about the distribution of government and private resources for school programs and infrastructure development. These initiatives can encourage more people to look away from car dependency and toward cycling and walking for transportation. Based on my research, I see several steps that communities could take to encourage students to bike or walk to school for their own health and the health of the planet. One step would be to facilitate discussion among students to determine what neighborhoods people live in and whom they could walk with. Another step would be to have a day where class starts thirty minutes later, giving students the opportunity to try an active mode of transportation without needing to wake up earlier. This might raise awareness and make people realize they could enjoy starting their day this way. When you remove as many barriers as possible, such as time and convenience restrictions, students may be more likely to act in ways that benefit themselves and the planet.

In my current role as a community member and my future career as an urban planner, I hope to help remove barriers to promoting healthy living. Because of my research, I now have a better understanding of the importance of recognizing unique attributes of specific communities to effectively address needs and make meaningful change.

Throughout the duration of the study, I learned about the usefulness of asking for help and not assuming that I know or can figure out best practices without the guidance of others who are more experienced than I. Nearly all aspects of life rely on cooperation and interdependence. Future employers will look for the ability to work with others, build off their work, and cooperate.

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Author and Mentor Bios

Newmarket, New Hampshire native **Alex Chase** began his Summer Undergraduate Research Fellowship (SURF) project "curious about why I, and people like me, often do not act in line with our beliefs." Alex's SURF and senior thesis research looked specifically at what factors motivate area high school students to choose their modes of transportation to school. Through his project, Alex learned the realities of independent research—the intension needed to complete each phase successfully, the solo nature of much of the data analysis, the exciting potential for using geographic modelling, and the importance of sharing conclusions with a wider audience. He decided to write for *Inquiry* to share his results with the local community, for whom his research is most relevant. Alex will graduate in May 2017 with a sociology major (Honors in Major) and minors in outdoor education and in women's studies, and then he plans to continue pursuing these interests by working as a community planner. He aims to advocate for people who have disadvantaged situations and help provide all community members with equitable access to healthy behavior through infrastructural and sustainable development practices.

Cliff Brown, associate professor in the Department of Sociology, has taught at UNH for over twenty years. He specializes in teaching and research in the areas of race and ethnic relations, social inequality, social movements, and the environment. Dr. Brown became involved in this research project after Alex took his Environment and Society class, which addressed themes similar to those of Alex's proposed research. A veteran mentor for students conducting Summer Undergraduate Research Fellowship (SURF) projects, writing senior theses, and participating in the McNair program, Dr. Brown enjoyed working with Alex, who he says "has a great sense of humor . . . is extremely personable . . . [and] is an intrepid researcher." Dr. Brown found it interesting to learn about the differences among the local schools that Alex worked with and developed a better understanding of how high school students think about transportation issues. This experienced researcher and educator says that writing for *Inquiry*'s broader audience is "always useful, and certainly for students in sociology."