Gauging Non-Traditional Mode Users' Safety in Mixed Traffic on Public Roadways

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Authorization to Submit Thesis

This thesis of Nickolas D. Schlotthauer, submitted for the degree of Master of Science with a Major in Civil Engineering and titled "Gauging Non-Traditional Mode Users' Safety in Mixed Traffic on Public Roadways," has been reviewed in final form. Permission, as indicated by the signatures and dates below, is now granted to submit final copies to the College of Graduate Studies for approval.

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Abstract

The goal of this project was to determine how residents of the Pacific Northwest perceived safety of non-traditional transportation mode operators in mixed traffic and whether their own learning methods and regular usage of these modes shaped their behavior. To achieve this goal, an examination of the literature was conducted to understand where gaps in the current research existed regarding user safety in mixed-use environments. Gaps were found on non-traditional transportation mode usage on public facilities and the users' perception of safety between traditional and non-traditional transportation modes. Therefore, to reduce the gaps in the literature, this project developed, conducted, and analyzed the results of a regional survey focused on user safety in mixed-use environments. The traditional and non-traditional transportation modes focused on during this project primarily included automobiles, motorcycles, all-terrain vehicles, agricultural vehicles, snowmachines/snowmobiles, dogsleds, pedestrians, and bicyclists.

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Chapter 1: Introduction

In the United States, about 9.1% of households do not own a personal automobile and approximately 13% of all age-eligible drivers do not drive [U.S. Census Bureau, 2015; Federal Highway Administration, 2011]. Trips by these people then require the use of other transportation modes. The presence of these other modes on public roadways create areas where multiple forms of travel are used which are commonly referred to as mixed-use environments. Since many of these other modes are not traditionally associated with travel on public roads, their presence can create confusion for and affect the behavior of traditional motor vehicle drivers. Additionally, with the physical capabilities and safety features of non-traditional modes differing from traditional vehicles, close proximity operations to each other potentially endangers all user modes. In rural areas and in locations with nearby recreational possibilities, non-traditional transportation modes such as all-terrain vehicles (ATVs), snowmobiles, bicycles and dog sleds are commonly used on public roads.

The perception of safety can affect where, when, and how people will travel on public roadways and how they will act on the road. In the United States, users of almost every non-traditional mode are not legally required to participate in operator-education courses. This freedom means that users are often unaware of specific safety procedures when operating a non-traditional mode on public roadways and other transportation facilities. For example, non-traditional modes such as ATVs are often used by underage operators who may be untrained and unfamiliar with the standards of safe and lawful roadway operation. This subsequently results in poor behavior and operating practices.

The goal of this project was to determine how Pacific Northwest region residents, specifically Alaskans and Idahoans, perceived safety of non-traditional transportation mode operators in mixed traffic and whether their own learning methods and regular usage of these modes shaped their opinion. To achieve this goal, an examination of the literature was conducted to understand where gaps in the current research existed regarding user safety in mixed-use environments. Gaps were found on non-traditional transportation mode usage on

public facilities and on the causes of crashes and fatalities between traditional and non-traditional transportation modes so this project consisted of developing, conducting, and analyzing the results of a regional survey focused on user safety in mixed-use environments.

This thesis describes the development of and results from the regional survey focused on mixed-use environments on public roadways and facilities as well as an analysis that explored how an individual's learning method shaped their personal perspectives and behavior. First, a literature review of related projects and studies involving non-traditional transportation mode safety and operational characteristics is described. Second, the methodology for developing and distributing the regional survey and the utilization of similar surveys are explained. Third, the results of this survey are presented. Fourth, the analysis of the survey is detailed. Finally, the conclusions and recommendations based of the results and analysis are presented.

Chapter 2: Literature Review

The use of transportation modes designed for recreation (i.e., ATVs and snowmachines) or crop management purposes (i.e., agricultural vehicles) on, adjacent to, or near public transportation facilities designed for automobiles, motorcycles, bicycles, and/or pedestrians causes potential safety risks to all users due to the mix of inconsistent sizes and varying travel speeds. Most non-traditional modes are smaller (i.e., ATVs) or larger (i.e., agricultural vehicles) than traditional vehicles, are not capable of the same performance measures, and lack the same safety features. This literature review focused on the non-traditional modes used in the statistical analysis which were ATVs, agricultural vehicles, bicycles, snowmachines, and dogsleds. Several studies and reports have examined the role of non-traditional modes in crashes in a mixed-use environment and on public facilities.

ATVs are designed for recreational and off-road use and in most states are illegal to use on public facilities. However, the largest number of ATV fatalities occur on paved roads [Garland, 2014]. An investigation into the differences in fatality and injury crash rates of ATVs on paved roads, unpaved roads, and off-road examined data from 1982 through 2012. The results showed that riding an ATV on a paved or unpaved road was significantly more dangerous than off-road riding [Pavilion, 2015]. An average of 144 children and 568 adult ATV-related fatalities occur nationwide each year, and the fatality and injury rates have been increasing in recent years [Topping et al., 2012].

A major part of the need to improve the safety for non-traditional mode users is the safety risk for underage operators. One study on ATV safety stated that “users seemed to accept the risk of children riding adult-sized quad bikes, as this was seen as preparing children to use and respect such vehicles as they grew up on the station or farm. These findings represent key aspects of what makes quad bike safety a wicked problem: the inconsistencies in concepts of safety and attitudes toward safe riding practices indicate confusion about these machines.” [McBain-Rigg et al., 2014]

Updated safety features and facility designs to reduce the risk of injuries and crashes for non-traditional mode users have had some success. One such study was conducted to

find ways to improve the safety for slow-moving vehicle such as ATVs, agricultural vehicles, and construction equipment. It concluded that in ATV/moped rural crashes, 17% of the drivers were under 15 years old and 60% were under 24 years old. For agricultural vehicles, the most common type of collision was a rear-end collision with 30% of these crashes occurring while vehicles were making left turns. For crashes that included agricultural vehicles, the agricultural vehicle was at fault for about 40% of rural multiple vehicle crashes. [Kinzenbaw, 2008]

Previous projects have researched crash data to find the causes of and types of crashes that involve slow-moving non-traditional modes. One such study investigated agricultural vehicle crashes in North Carolina to find possible ways to reduce crash rates. In 1999, the rate of fatalities in agriculture was 22.3 per 100,000 workers, and approximately 18% of these deaths were due to crashes on public roadways. This study found that a large proportion of agricultural vehicle crashes occurred while the agricultural vehicle was making a left turn and another automobile was passing. The study's recommendations included requiring all agricultural vehicles to have a slow-moving emblem on the back of the vehicle while on public roadways and to educate farmers on ways to reduce these crashes [Lacy et al., 2003]. Another study found that 43% of crashes that involved agricultural vehicles were rear-end collisions which occurred when both vehicles were driving straight. The second most frequent type of crash (24%) was when a vehicle was passing a left-turning agricultural vehicle. About 26% percent of these crashes had operators under the age of 16 years. [LeGarde, 1975]

Little research was found on snowmachine and dogsled or dog-powered safety on both private and public roadways. However, one study found that snowmachines contribute to approximately 200 fatalities and 14,000 injuries annually. The leading causes of snowmachine accidents are alcohol impairment, excessive speeds, and driver inexperience. [Pierz, 2003]

For bicyclists, approximately 25% of all deaths and injuries occur on rural highways [Federal Highway Administration, 2010]. This value demonstrates the importance of non-

traditional transportation mode safety. More specifically in rural areas, fatal and injury crash rates are higher than other areas, with some rates being up to twice as high in rural settings than in urban settings [Peek-Asa et al., 2007]. Although bicyclists are not particularly common on rural roads, when they are present they must maneuver alongside high speed traffic and large vehicles. Large shoulders and smoothly paved shoulders were recommended to allow a cushion of space between the mixed modes of travel. [Federal Highway Administration, 1998] Another publication concluded, with regard to bicycle and pedestrian crashes, that "rural two-lane roads had the greatest needs for safety improvements due to their high raw crash frequencies and crash rates per vehicle-mile." Some recommendations provided were to add paved shoulders, sidewalks, roadway lighting, pedestrian signals, marked pavement space for bicyclists, and barriers. [Federal Highway Administration, 2010]

Chapter 3: Methodology

In the beginning stages of this project, the traditional and non-traditional transportation modes that were considered included, but were not limited to: ATVs, golf carts, agricultural vehicles, walking/exercising pedestrians, bicycles, skateboards/longboards, Segways, snowmachines/snowmobiles, dog sleds, cars/trucks, semi-trucks, and RVs/motorhomes. This list was synthesized and prioritized based on the user groups in Alaska and Idaho and the modes selected for inclusion into the final survey included: cars or trucks (automobiles), motorcycles, bicycles, ATVs, snowmachines (snowmobiles), dogsleds (dog-powered modes), and agricultural vehicles.

To reduce the distribution time and eliminate possible responder issues, an online survey software and questionnaire tool was chosen as the engine for conducting and distributing the mixed-use survey. SurveyMonkey was used based on its advanced coding logic capabilities, reputation, and overall public familiarity and trust. When developing the survey, other surveys with similar demographics, context, and motivations were referenced. These surveys included the New England Transportation Survey, the National Household Travel Survey, and the 2009 Vermonter Poll. The New England Survey revealed the importance of having clear and brief section banners to keep respondents informed throughout the survey [Coogan et al., 2010]. This survey also demonstrated effective ways to present questions, such as matrix questions that minimized text length for similar questions. The National Household Travel Survey served as an example on formulating survey questions into a manner that would then be efficiently transformed into usable data for analysis, such as including the specific mode in each question [Federal Highway Administration, 2009]. In the 2009 Vermonter Poll, background computer coding logic showed how a survey could evolve as the respondent answered questions and progressed through the survey [University of Vermont, 2009].

The coding logic from the 2009 Vermonter Poll was used as an example to create the mixed-use survey. This logic removed questions or sections that did not apply to the respondent. For example, mode-specific questions were eliminated for each respondent if they never used that corresponding mode on, adjacent to, or near a roadway. In doing so,

the overall length of the survey was reduced which decreased the likelihood that a participant would abandon the survey before completion. Additionally, since responders were not provided further irrelevant questions, the likelihood of those questions being answered falsely or ignored was reduced. Due to the decision to incorporate the coding logic, the survey was restricted to electronic distribution.

The questions formulated were grouped into specific topic areas, and were based on either the gaps in the current literature or researcher interests. The topic areas included: household/residence characteristics, vehicle ownership, commute characteristics, frequency of vehicle/mode use, usage characteristics, mode education/training, recreational versus utilitarian use, road types used, safety perception, safety gear, crash questions, crash reporting, and respondent characteristics.

During the development of the survey, numerous revisions of the survey were performed. The revision process included conducting in-house reviews and testing along with requesting coworkers and classmates to complete and review the survey. Upon reaching an iteration of the survey that seemed suitable, a pilot survey was sent out to colleagues in the transportation civil engineering field to acquire feedback on the survey's appearance, flow, understandability, and quality. The feedback from the pilot survey provided a perspective of how people outside the project perceived and understood the survey. The reviews and feedback showed areas in the survey that needed cleaning up. This included reducing the total number of survey questions, adjusting the order of questions, adding concise text at the start of different sections in the survey, and providing a simple picture of the mode in the beginning of each mode's section. These changes helped to decrease the likelihood of incomplete responses, eliminate responders' confusion, and thoroughly inform the responders on the topic in question.

3.1 Household/Residence Characteristics

Specific questions were asked to each survey respondent regarding their type of residence, the types of homes surrounding their place of residence, and whether they resided in a rural or urban locale. For those living in a rural area, a follow-up question was

asked to determine which specific type of rural category best represented where their home was located. The rural subcategory options followed the EPA's Smart Growth designations and included: edge, traditional main street, gateway, resource dependent, and remote [Mishkovsky et al., 2010]. Specific questions were also asked to determine household size and if adequate parking, sidewalks, or walking paths were available near each respondent's home. The results to these questions were also used to determine relationships between personal travel behavior, transportation mode usage, and safety perceptions.

3.2 Transportation Mode Ownership, Commute Characteristics, and Frequency of Use

In order to quantify personal travel distance and mode preferences, each responder was asked to provide one-way commute distance to work and the distance to the nearest town center. Questions pertaining to the transportation mode used most often for trip purposes including work, school, shopping, entertainment, and grocery shopping, along with frequency of use, were also asked, and the options for transportation modes were: car or truck (for automobile), motorcycle, bicycle, ATV, snowmachine, dogsled, and agricultural vehicle. The frequency of use questions were framed to include the phrase "on or near the roadway" so that the survey focused on interactions of the chosen transportation mode while on or near these public facilities. Each household identified how many of each mode type they owned, and the results of the ownership questions helped link the use of transportation mode with mileage, hours of operation, and frequency of use.

At the end of the section, a question asked if a mode was omitted and if so, a follow-up question asked about the mode and its measurable usage. This question was created to ensure that other mode types not identified during the survey development were captured.

3.3 Mode Specific Questions

3.3.1 Usage Characteristics

This section focused on the usage of the transportation modes as a part of this mixed-use study since information on this subject is lacking. Specific questions were asked to determine the mileage, hours of operation, monthly usage, trip length, and number of years engaged. These questions were asked to determine the relationship between usage and

user-perceived safety while traveling on or near a roadway in or out of mixed traffic. In the mileage, hours of operation, daily usage, and years engaged questions, survey respondents were given ranges of miles, hours, days, and years to select from, respectively. The questions and ranges provided were based specifically on the mode in question to accommodate for the likely difference in mileage of certain modes; for example, travel distances were expected to vary between a car/truck user and a walking/exercising pedestrian. The ranges were broader and encompassed larger values for modes such as motorcycles and cars/trucks and were narrower and lower in numeric value for modes such as bicycles and walking/exercising pedestrians.

The results from these questions sought to establish the relationship between usage and how users learned to operate the mode.

3.3.2 Mode Education/Training

This section focused on the learning methods used by the respondent to operate a transportation mode. The methods were recognized as a possible variable that affected user behavior, safety perception, frequency of use, crash occurrences and reporting, use of safety gear, and reasons for use. As a result, a question was asked to determine the method of education or training the user received for each mode. The options included: self-taught, received training from friend or relative, and/organized training.

3.3.3 Reasons for and Methods of Use

There is a lack of knowledge on both the reasons for using and methods of using non-traditional modes. Specific questions were asked to determine if a mode was used for primarily recreation, utilitarian, or both, and what types of activities were included. A question asked if the mode was used for activities such as: commuting, exercise, and errands. The results from these questions were used to determine a relationship between where, when, or why these modes are being used and their perception of safety in mixed traffic.

To account for the scarcity of documented information on the use of dog sled or dog-powered modes as transportation, individuals who used this mode were asked a series of follow-up questions focused on racing, skijoring, bikejoring, mushing, and carting activities.

3.3.4 Road Types, Walking Paths, Bike Paths Used, and Trail Access

This section focused on the road types, walking paths, and bike paths used by non-traditional transportation modes. Specific questions were asked to determine if non-traditional mode users operated on, adjacent to, or near roadways, walking paths, and bike paths. To understand how responders access trails, questions were asked on the availability of, methods for accessing, and distance travelled to reach trails. To ascertain travel patterns of bicycle users, survey respondents were asked if there were bike paths, bike lanes, or shared-use paths within a quarter mile of where they lived. If so, a follow-up question asked if responders would not use bike paths or bike lanes. These results were used to establish a relationship between roadway/path usage and user safety perception.

3.3.5 Safety Perception

This section focused on the safety perception by survey respondents while operating a non-traditional transportation mode in mixed traffic conditions since safety perception can affect how one operates a mode. It was recognized that if a non-traditional mode user felt unsafe, they may have altered choices when operating a mode. For example, a user riding a bicycle in the bike lane might choose to ride on the sidewalk if he or she felt unsafe riding in mixed traffic. Specific questions were asked about operating non-traditional modes in mixed traffic and about how various road characteristics changed their perception of safety. The road characteristic options included: signage that cautions automobile drivers that non-traditional and non-motorized vehicles may be present, pavement markings that section off an area for non-traditional and non-motorized vehicle use, wider lanes, wider shoulders, and lighting.

The results of these questions were used to determine the relationship between the effects of certain road characteristics and how the user learned to operate the mode, determine the relationship between comfortability with mixed traffic and how the user

learned to operate the mode, and to determine the relationship between user comfort in mixed traffic and where on or near the road the user travels.

3.3.6 Safety Gear

This section focused on the use of safety devices when operating a given travel mode. Individuals are not always required to wear or utilize safety gear when traveling on one of the transportation modes included as part of this mixed-use study. As a result, questions were asked to determine the extent of usage and determine if there was a correlation between the use of safety gear and how safe a user feels when traveling on or near the roadway and with or without the presence of mixed traffic. Individuals were asked to specifically identify how they made themselves more visible, and the options included: wearing bright colors, wearing fluorescent or reflective clothing, wearing other lights on oneself or other belongings, using additional reflectors, or accessorizing with flags or other similar objects. Survey respondents were asked if this usage applied during the daytime, nighttime, or during both times, and how often they wore a helmet.

These safety gear results were used to establish two key relationships. The first relationship is between the method of learning and how a user applies or addresses safety during the mode operation. The second relationship is between the method of learning and how a user perceives their safety in mixed traffic.

3.3.7 Crash Questions

This section focused on crashes involving at least one non-traditional transportation mode. It was recognized that a lack of detailed crash data exists for the non-traditional modes examined in this study. As a result, two sets of specific questions were asked to determine crash characteristics, locations and causes. The first set asked about crashes that involved at least one traditional and one non-traditional mode, and the second set asked about crashes that specifically involved two non-traditional modes. These questions were asked to help determine areas of hazard for both traditional and non-traditional transportation modes.

The results from these questions were used to determine the relationships between crash occurrence and either the method that the user learned to operate their mode or their perception of safety after being involved in a crash.

3.4 Crash Reporting

This section focused on unreported crashes experienced by the survey respondent on public property while operating a non-traditional transportation mode. It was recognized that a potentially large number of non-traditional mode crashes go unreported. These unreported non-traditional mode crashes could hide trends about underage user crash statistics, mode specific crash rates, and injury and property damage statistics. As a result, specific questions were asked to determine how many crashes were unreported and the crash characteristics of unreported non-traditional crashes. These questions asked what modes were involved, if any operators under sixteen years of age were involved, and why the crash was left unreported.

The results of these questions were used to attempt to develop a relationship between unreported crashes and the perception of safety in mixed traffic. It was recognized that there could be sensitivity associated with a crash that a respondent may have been involved in, so they were given the option to not answer any of the questions in this section.

3.5 Respondent Characteristics

Questions were asked to determine the respondent's employment status, occupation, job category, age, sex, marital status, highest education level, annual household income, state of residence, zip code, and if they had a driver's license. The results from these questions were used to attempt to establish a relationship between different demographics and their perception of safety in mixed traffic.

At the end of the survey, responders were provided with a comment box to allow for general comments, feedback about the survey, and any additional information the responder desired to provide.

3.6 Survey Characteristics

The survey included an initial page of text that described the survey, its intent, and the survey drawing process along with the contact information of the survey creators and basic instructions for navigating the survey. The complete survey included 206 questions. The targeted time for respondents to complete the survey was twenty minutes.

3.7 Survey Distribution

The chosen target audience of the survey were people likely to use non-traditional transportation modes. This was done to gather a significant sample of these users without needing to get the largely disproportionate number of responders that had nothing to do with non-traditional modes. To reach the target audience, a list of these people and their contact information was needed. Since finding every individual within our target audience was a seemingly impossible task, a decision was made to research public and private organizations, businesses, and clubs, primarily in Alaska and Idaho, that were associated with non-traditional transportation modes. As a result of this research, a list of groups with their contact information was then generated. The survey was then distributed via e-mail to the appropriate leader of each group on the list. Upon contact, each leader was asked to distribute the SurveyMonkey URL for the mixed-use survey to their members and employees.

As an incentive to participate in the mixed-use survey, each responder could enter their contact information into a random drawing that awarded one of twenty $25 Amazon.com gift cards. The survey questions and methods were reviewed and approved by the University of Idaho's and University of Alaska Fairbanks' Institutional Review Board.

Chapter 4: Results

A total of 480 individuals provided responses to the online SurveyMonkey survey instrument between August 22nd and October 31st, 2016. Of the 480 responders, the total number of valid responses from Alaska and Idaho amounted to 206 and 214, respectively. (The remaining responses were either invalid or represented individuals from other states. Since this research focused on Alaskan and Idahoan data, those results were not incorporated.) The results from the mixed-use survey were categorized into broad groups including: responder demographics; operation on, adjacent to, or near roadways by mode; learning methods by mode; crash involvement by mode; use of visibility equipment by mode; helmet use by mode; unreported crashes; and perception of safety in mixed traffic by mode. Each of these categories were described in detail on the sections that follow.

4.1 Demographics

Respondents were asked to provide their age, sex, occupation, annual household income, and highest achieved level of education. The age distribution of responders showed that Alaskans tended to be younger, with a higher percentage in the 31-40 and 41-50 age groups, while Idahoans gravitated to the older age groups of 51-60 and over 60 years of age (see *Figure 1*).

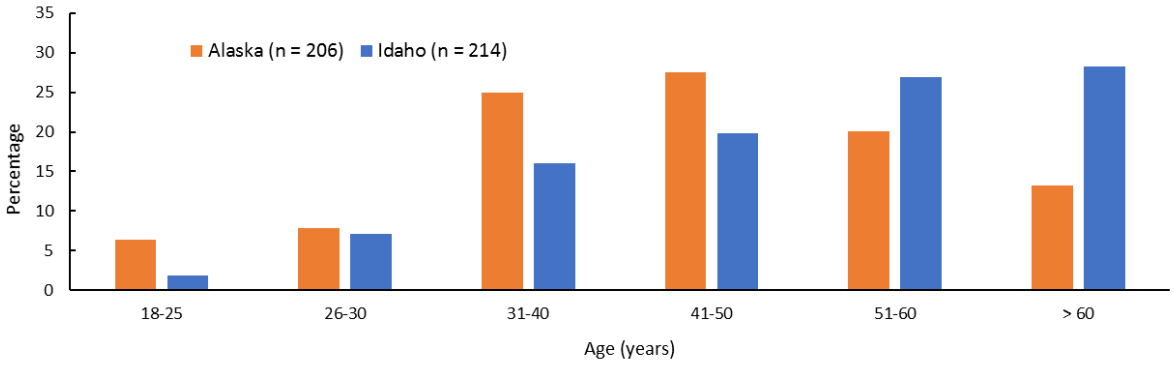

Figure 1. Respondent Age Distribution

The gender distribution of responders determined that Idaho had a larger sample of males (70%) compared to females while male and female responders in Alaska were approximately even. The occupation distribution of responders showed around 70% of both states' responders were salaried/employed but retirees represented 21% of Idahoan

responders. All of the other occupation categories had less than 10%. The household income distribution of responders showed an approximately even distribution of around 20% for all the income categories except the less than $25,000 category which consisted of less than 9%. The education distribution of responders showed little difference between Alaska and Idaho responders. Responders with a bachelor's degree or higher composed of about 70%, while some college but no degree composed of almost 20%, and the other categories each composed of less than 10%. This information is summarized in *Table 1*.

Table 1. Respondent Demographics

Sex	**Alaska**	**Idaho**
Male	46%	70%
Female	53%	30%
Occupation	**Alaska**	**Idaho**
Salaried / Employee	77%	68%
Self-Employed	6%	8%
Student	7%	1%
Retired	6%	21%
Other	4%	3%
Household Income	**Alaska**	**Idaho**
< $25,000	8%	2%
$25,000 - $49,999	12%	16%
$50,000 - $74,999	18%	31%
$75,000 - $99,999	18%	20%
$100,000 - $124,999	19%	14%
$125,000 +	26%	16%
Education Level	**Alaska**	**Idaho**
Less than high school diploma	1%	1%
High school diploma or equivalency	5%	5%
Some college, no degree	16%	20%
Associate degree	4%	8%
Bachelor's degree	37%	41%
Graduate or professional degree	38%	26%

4.2 Household Locale

Respondents were asked to provide their residential area type, rural or urban. The residential area type for responders for rural and urban was approximately 57% and 43% for Alaska and 29% and 71% for Idaho, respectively (see *Figure 2*).

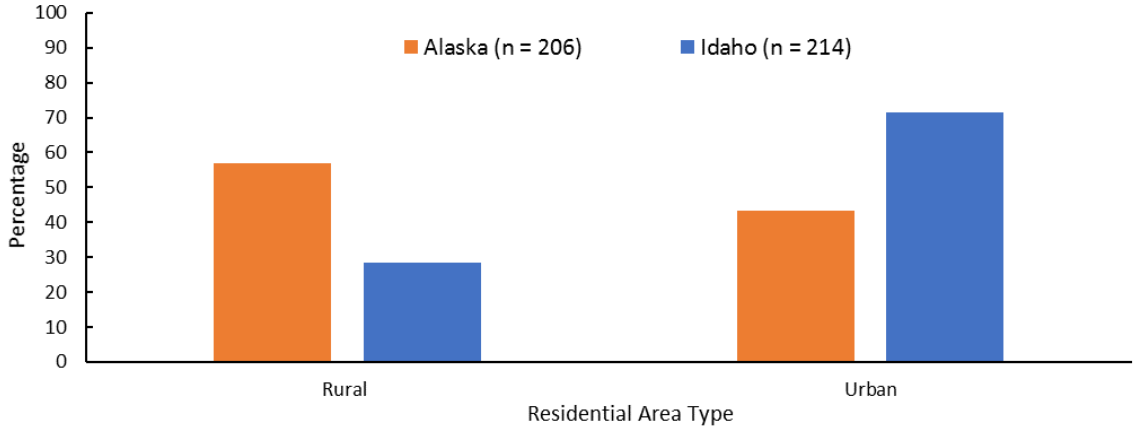

Figure 2. Respondent Residential Area Type

4.3 Transportation Mode Ownership and Use

Respondents were asked to provide how many of each transportation mode they owned and the frequency of use. The Alaska and Idaho household ownership distribution of transportation modes were similar (see *Figure 3* and *Figure 4*). The distributions for owning zero, one, two, three, four, or 5+ of a specific mode for each mode showed a downward trend for all modes other than automobiles and bicycles. Respondents that did not own a motorcycle, ATV, snowmachine, dogsled, or agricultural vehicle represented at least 40% for each of these modes. The automobile distribution shows a positive trend from zero vehicles, representing 1%, to two vehicles, representing about 40%, and then a negative trend to five or more, or about 4%. The bicycle ownership showed an almost even distribution with minimum and maximum values around 7% to 30%.

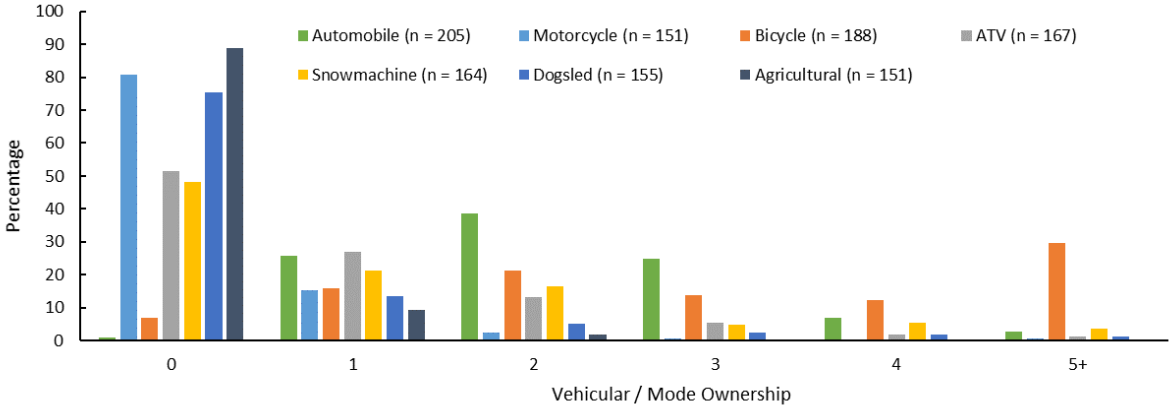

Figure 3. Household Transportation Mode Ownership in Alaska

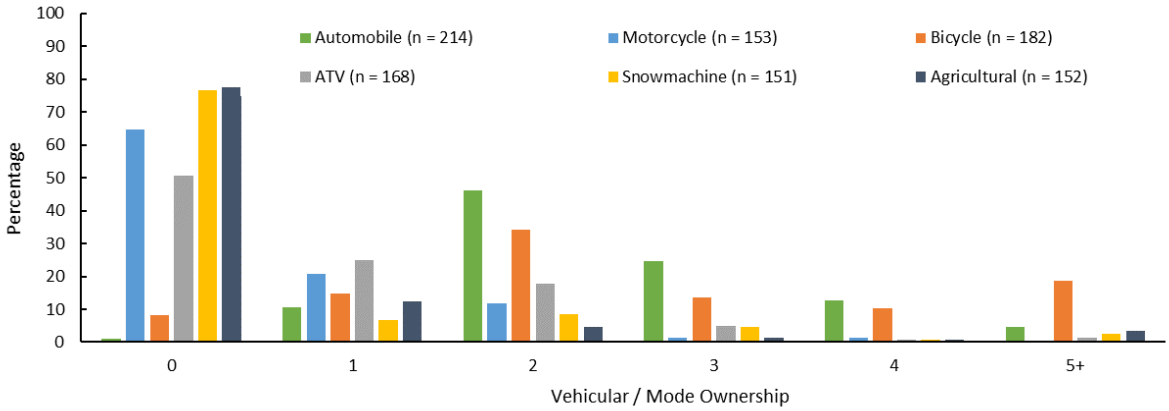

Figure 4. Household Transportation Mode Ownership in Idaho

Respondents were asked to identify how frequently (i.e. always, often, or sometimes) they used each transportation mode on, adjacent to, or near a roadway. Alaska and Idaho were similarly distributed across all modes except for dogsled, as Idaho did not have any dogsled responders. The distribution had a declining trend starting near 100% and ending near 10%. The order was automobiles, pedestrians, bicycles, ATVs, snowmachines, dogsleds, agricultural, and other modes type (see *Figure 5*).

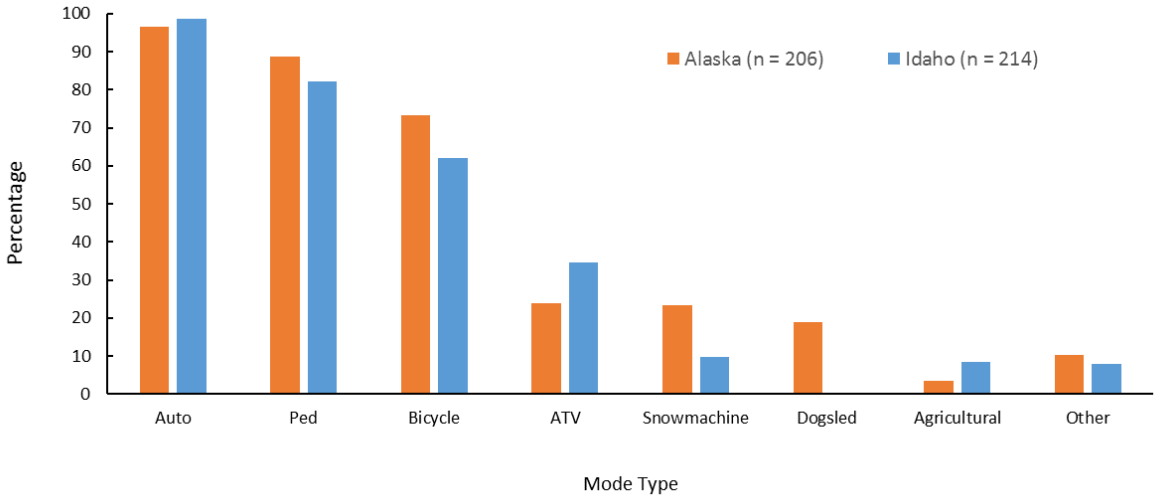

Figure 5. Operation On/Adjacent/Near Roads by Mode

4.4 Learning Method

Respondents were asked to identify how they learned to operate each transportation mode. Respondents were allowed to select all options that applied. With the exceptions of

dogsled and agricultural modes, Alaskans and Idahoans responded similarly (see *Figure 6* and *Figure 7*). For all modes except automobile, users primarily received training from a friend or relative or were self-taught.

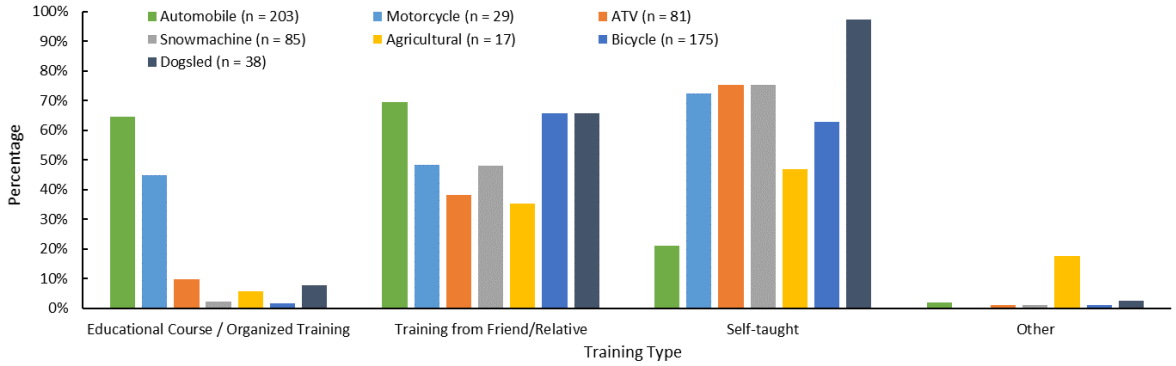

Figure 6. Learning Method by Mode in Alaska

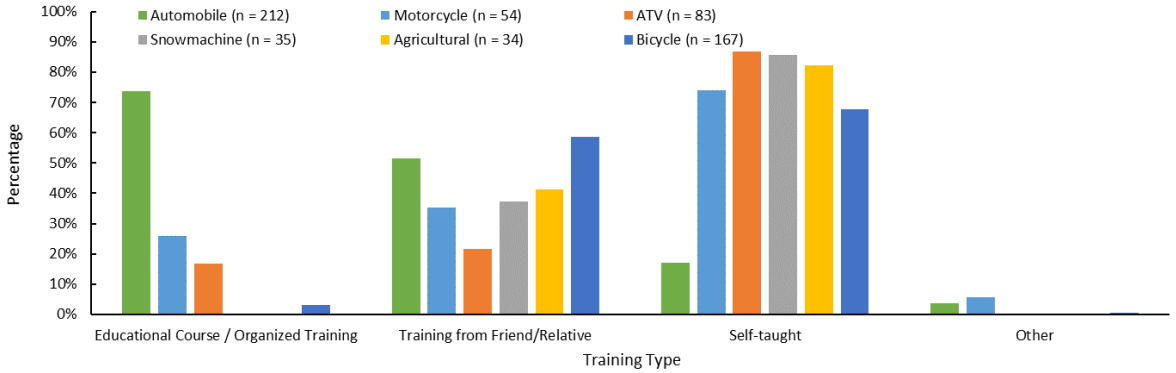

Figure 7. Learning Method by Mode in Idaho

In the statistical analysis, an adjustment was made for responders that selected more than one of the learning methods. Organized training was identified as the default choice when this option and other methods were selected by a single responder. Training from a friend or relative was the default when training from a friend or relative and self-taught were selected. Self-taught was only depicted when a single responder selected no other learning methods. This adjustment made it possible to include this section in the statistical test performed during the analysis.

4.5 Crash Involvement

Non-traditional mode user respondents were asked to identify if they had been in a crash with an automobile or with a different non-traditional mode. Each response was

broken into two sections, auto and other (see *Figure 8*). For Alaska and Idaho, less than 6% of ATV, snowmachine, agricultural, and pedestrian users were involved in a crash. Fourteen percent of bicycle users in Idaho had been involved in an automobile crash and 6% had been involved in a crash with another non-traditional mode, while in Alaska the percentages were 20% and 7%, respectively. The one dogsled mode user in Idaho had been involved in both an automobile and non-traditional mode crash, while the cumulative results for all Alaskans were 2% and 13%, respectively. Since the Idaho dogsled crash results only had one respondent, it was excluded from *Figure 8*. Agricultural vehicle responders were not involved in any reported crashes. In *Figure 8*, the numbers in the parentheses represent the sample sizes of the crash frequencies per mode for Alaska (left side) and Idaho (right side).

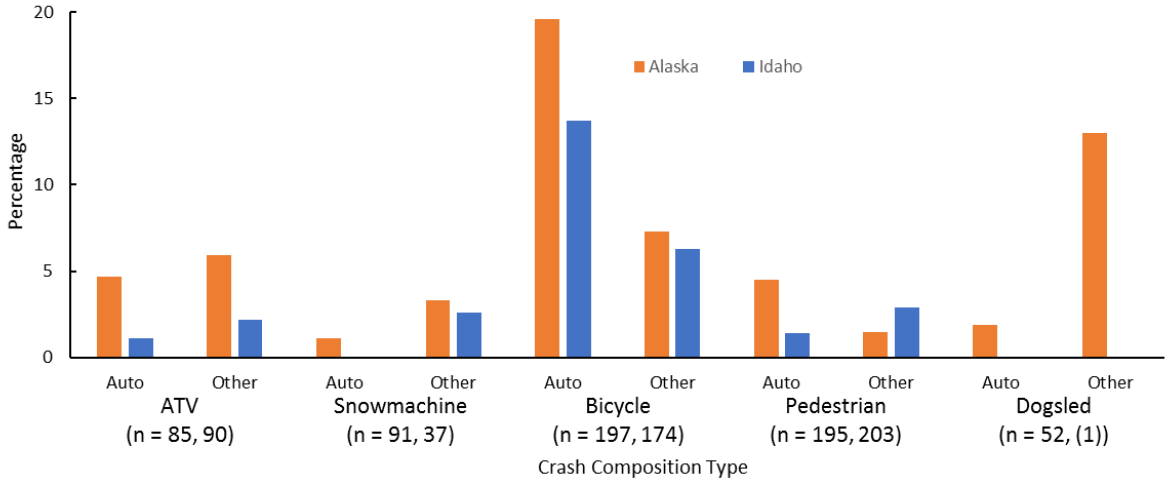

Figure 8. Crash Involvement by Mode Composition

4.6 Visibility Equipment and Helmet Use

Respondents were asked to identify their use of visibility equipment. Headlights and taillights represented the options for bicycle users. For both Alaska and Idaho, about 50% of bicycle users used headlights and taillights (see *Figure 9* and *Figure 10*). For Alaska, more users reported wearing visibility equipment than using additional reflectors and safety accessories. Dogsled mode users reported proportionally higher usage of each safety equipment category than all other modes. For Idaho, no single piece of equipment exceeded 50% by any of the mode group users.

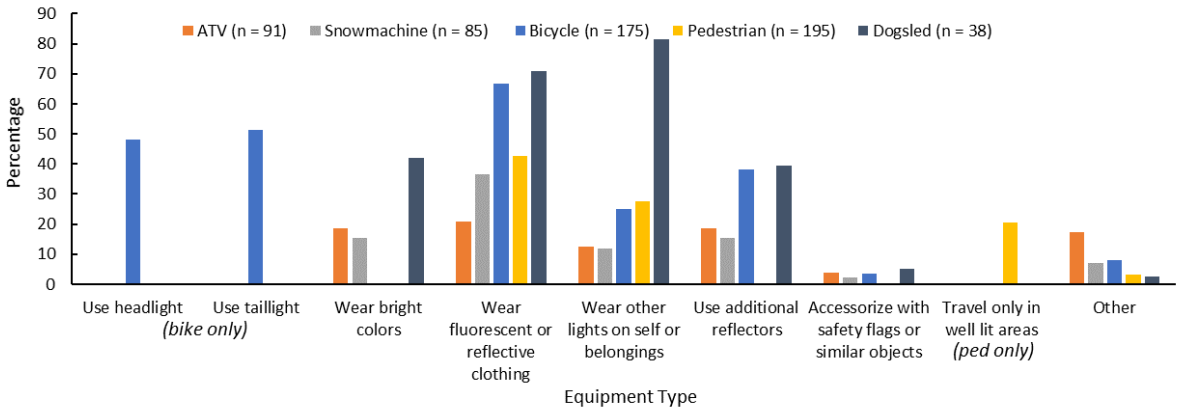

Figure 9. Visibility Equipment Use by Mode in Alaska

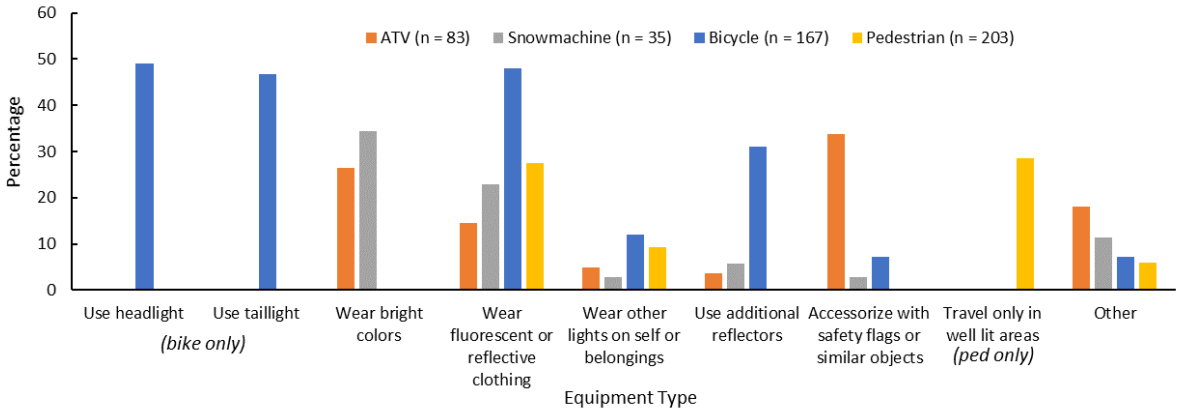

Figure 10. Visibility Equipment Use by Mode in Idaho

Respondents were asked to identify how frequently they used a helmet while operating an ATV, a snowmachine/snowmobile, a bicycle, or dogsled mode. Dogsled mode users in Alaska never wore a helmet 78% of the time (see *Figure 11*). 50% of the users from Alaska reported always, often, or sometimes wearing a helmet compared to 70% for Idahoans (see *Figure 12*). Since Idaho only had one dogsled respondent, it was excluded from *Figure 12*.

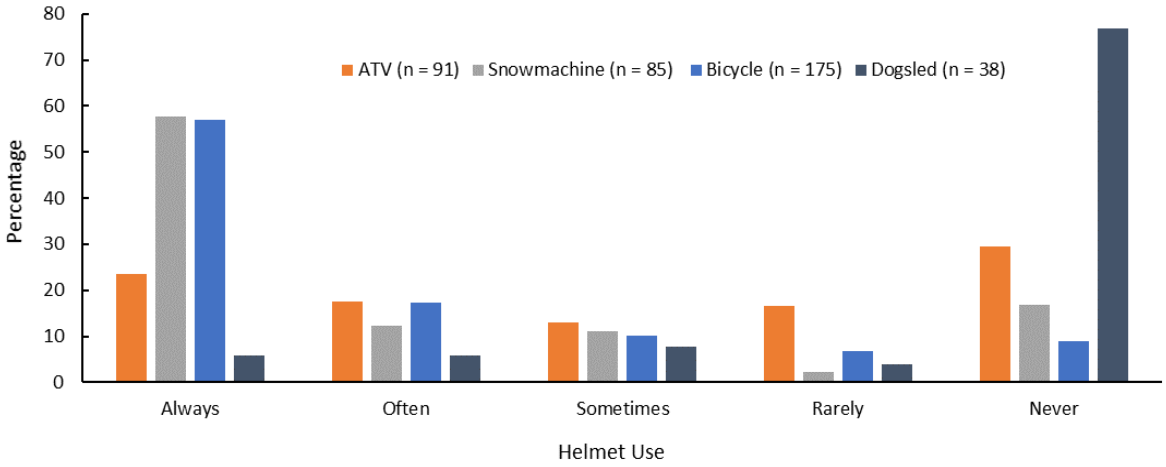

Figure 11. Helmet Use by Mode in Alaska

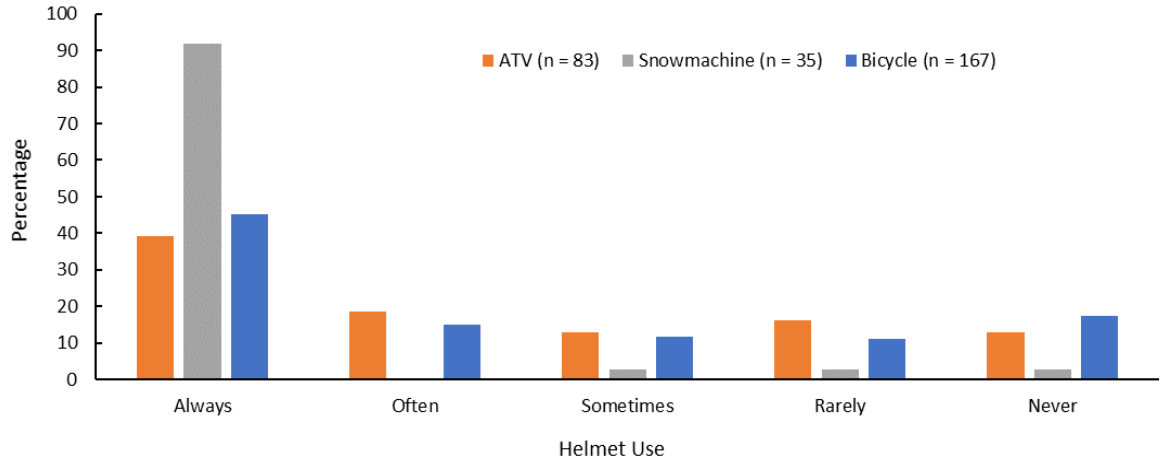

Figure 12. Helmet Use by Mode in Idaho

4.7 Perceived Safety in Mixed-Use Traffic

Respondents were asked to identify if operating a non-traditional vehicle in mixed traffic seemed to reduce their safety. In Alaska, 40% of ATV, 46% of snowmachine, 14% of agricultural, and 62% of dogsled users reported feeling less safe in mixed traffic. In Idaho, 52% of ATV, 44% of snowmachine, and 40% of agricultural mode users reported feeling less safe in mixed traffic (see *Figure 13*). Since the Idaho dogsled crash results only had one respondent, it was excluded from *Figure 13*.

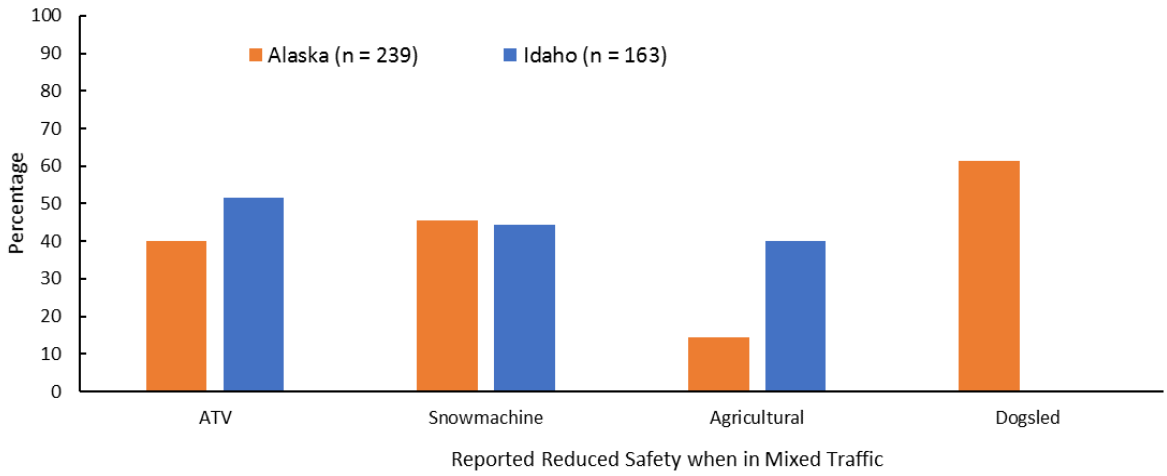

Figure 13. Perceived Safety in Mixed-Use Traffic

4.8 Unreported Crashes

Respondents were asked to identify if they had been in an unreported crash as either: an ATV, snowmachine, agricultural vehicle, or dogsled users with an automobile, a bicyclist or pedestrian with an automobile, or between two non-automobile modes. Responders from Alaska and Idaho identified an aggregate total of 16 and 15 unreported crashes, respectively. Unreported crashes with an automobile totaled 5 and 4 for Alaska and Idaho, respectively, while unreported crashes involving a bicyclist or pedestrian and an automobile (7 and 5) and two non-automobile modes (4 and 6) were also noted (see *Table 2*).

Table 2. Unreported Crashes (Last Five Years)

Crash Type	**Frequency**	
	Alaska	Idaho
Unreported Crash as ATV/Snowmachine/Ag. Veh./Dogsled with an Automobile	5	4
Unreported Crash as Bike or Ped with an Automobile	7	5
Unreported Crash with two Non-Automobile Modes	4	6
Total	16	15

Chapter 5: Analysis

Several statistical tests were considered for the analysis of the mixed-use survey. When the results of the survey were analyzed, several issues were encountered including small sample sizes for specific modes, questions, and answers; lack of normality among parts of the results; dichotomous and categorically dependent and independent variables; lack of homogeneity of variances; numerous outliers throughout the results; and the presence of multicollinearity between multiple sets of questions. Statistical tests such as chi-square, *t*-Test, analysis of variance (ANOVA), multivariate analysis of variance (MANOVA), and Poisson regression could not be performed since at least one assumption from each of these tests were violated. The chi-square test was unusable because the sample size assumption was not met. The *t*-Test, ANOVA, and MANOVA could not be used because the survey data failed to follow a normal distribution. A Poisson regression could not be used because the data did not follow a Poisson distribution. However, the binomial logistic regression model had four assumptions that were all met with the survey results.

A binomial logistic regression model predicts the probability that an observation will be one of the two categorical options of the dependent variable using one or more categorical or continuous independent variables. The four assumptions of a binomial logistic regression were: 1) the dependent variable had to be dichotomous, 2) at least one categorical or continuous independent variable had to be included, 3) the observations had to be independent and the dependent variable had to have mutually exclusive and exhaustive categories, and 4) there had to be linearity of independent variables and log odds. For a binomial logistic regression model, the desired sample size contained at least ten times the number of independent variables included in the model. An alpha level of 0.05 was used as a significance criterion for all statistical testing, indicating that there was only a 5% chance to make a Type I error. A Type I error is a type of error that occurs when the null hypothesis is incorrectly rejected. The null hypothesis was defined to be that the dependent variable was not affected by or related to any combination of the independent variables, and the research (alternative) hypothesis was defined to be that the dependent variable was affected by or related to any combination of the independent variables.

To conduct the binomial logistic regression analysis, the SPSS Statistics software was used. The results of the binomial logistic regression in SPSS contained three factors used to determine if the model was statistically significant. These factors were the p value of the omnibus test, p value for the Hosmer and Lemeshow test, and classification accuracy. The omnibus test in SPSS was used to show if the explained variance is significantly greater than the unexplained, which results in a p value that had to be less than alpha level to be statistically significant. The Hosmer and Lemeshow test is a goodness of fit test, which results in a p value that had to be greater than the alpha level to be statistically significant. The classification accuracy was used to measure how well the binomial logistics regression model predicted the categorical output. The classification accuracy had to be above 65% for the model to be considered accurate.

The results of the binomial logistic regression analysis contained a table of the independent variables included in the model along with each standard error, equation slope, and odds ratio. The standard error depicts the dispersion of the survey data, with values less than one meaning there were low amounts of dispersion and values much greater than one meaning either the input data were largely dispersed and/or the variable's category had a small sample size. The equation slope, signified by the capital letter B, was used to compute the odds ratio by raising the base of the natural log to the B^{th} power. B was also used to create the logistic regression equations, which are in log-odds units. The odds ratio depicted the effect of the independent variable as compared to its base case on the outcome of the dependent variable. The odds ratio can have values between zero and infinity with the value of one being neutral. Odds ratio values greater than one indicate that a variable has that amount times higher chance of having the dependent variable be affected than the base case for the variable, and odds ratio values less than one have the opposite effect.

The regression prediction equation follows the form of:

$$\ln(\text{Odds Ratio}) = C + B_1 * x_1 + B_2 * x_2 + B_3 * x_3 + \ldots + B_n * x_n \quad \text{(Eq. 1)}$$

where n is the total number of independent variable options excluding the base case options, C is the constant's B, x_n is the independent variable option (which will be a 0 when not applicable and 1 when applicable), and B_n is the B that corresponds to the x_n.

5.1 Statistical Model Development

To build statistical models showing the effects of learning methods and mode use on the perception of safety of non-traditional transportation mode users in mixed traffic, the SPSS binomial logistic regression analysis was used. The analysis used the combined survey data from Alaska and Idaho. The focus of the analysis was on the non-traditional transportation modes of ATVs, snowmachines, bicycles, agricultural vehicles, and dogsleds. The variables considered to affect a user's perception of safety in mixed traffic included, but were not limited to: learning method, mileage, hours of operation, use of reflective/visibility safety equipment, use of a helmet, involvement in reported and unreported crashes, traveling with or facing traffic, purpose of using the mode (recreation versus utilitarian), frequency of riding on the shoulders of paved roads, the presence of certain road characteristics that made them feel safer, days out of the month the users operate the mode, average trip length, number of years engaged in use of the mode, possession of a state issued driver's license, age range, sex, employment status, marital status, and household income.

The process of the SPSS binomial logistic regression analysis involved an iterative process that used different combinations of some or all the considered variables to create models for each non-traditional mode. Each combination of variables for each mode created a different model. The models that were not statistically significant were discarded, and the remaining models only included the ATV, snowmachine, agricultural vehicle, and bicycle modes. For the agricultural mode, only one statistically significant model was developed. However, since most of the odds ratio values within each variable were on the extreme ends of the possible range, meaningful comparisons between a variable's base case and category could not be made. Therefore, a relationship between agricultural vehicle users' perception of safety in mixed traffic and any combination of the considered variables was not found. ATVs and bicycles had statistically significant models that contained relationships between the perception of safety and some of the variables including the learning method. The snowmachine mode did not have any statistically significant models that incorporated the relationship between the perception of safety and the learning method; however, the

snowmachine mode a had statistically significant model that included the relationship between the perception of safety and some of the other factors. If a mode had two or more models that were statistically significant, then the models were compared to each other by the three SPSS output factors for determining if a model was statistically significant and the number of odds ratios with values near the extremes of the possible range. The model with the best overall values for these factors was selected.

5.2 Statistical Model Findings

The bicycle model was validated based on the following results: N>80 for the sample size, a $p<0.05$ for the omnibus test, a $p>0.05$ for the Hosmer and Lemeshow test, and a >65% classification accuracy, which signifies that the model is statistically significant. *Table 3* summarizes these results.

The bicycle model shows the significant association between the perception of safety in mixed traffic, age, sex, monthly bicycle usage, learning method, direction of travel relative to traffic, crashes with automobiles, crashes with non-tradition transportation modes, and frequency of wearing a helmet (see *Table 4*). It should be noted that the standard error in the bicycle (and snowmachine) models is large for some of the variables due to the small sample size. However, the large standard errors do not discredit the overall model.

Table 3. Bicycle Model Validation

Selected Cases	N=324
Omnibus test	p=0.003
Hosmer and Lemeshow test	p=0.305
Classification accuracy	87.0%

Table 4. Bicycle BLR Model Variables

Variable		**B**	**S.E.**	**O.R.**
Age Range (base=18-25)				
	26-30	-0.27	0.89	0.76
	31-40	-19.68	7620	0
	41-50	-1.29	0.63	0.28
	51-60	-0.87	0.56	0.42
	> 60	-1.09	0.56	0.34
Days used out of the month (base=1-3)				
	4-6	1.07	0.90	2.92
	7-10	0.28	1.03	1.32
	11-15	1.42	0.98	4.14
	16-20	-18.28	7728	0
	21-31	-18.14	7245	0
Learning Method (base=organized training)				
	Received training from friend or relative	2.16	1.39	8.71
	Self-taught	0.39	0.44	1.48
Direction when traveling in roadway (base=facing traffic)				
	With Traffic	-0.42	0.52	0.66
Crash with automobile (base=yes)				
	No	-0.09	40909	0.92
	I prefer not to answer	0.17	40909	1.19
Crash with non-traditional mode (base=yes)				
	No	-0.28	0.82	0.75
Wearing a helmet (base=always)				
	Often	-1.50	0.56	0.22
	Sometimes	-0.42	0.55	0.66
	Rarely	-0.63	0.65	0.53
	Never	0.04	0.68	1.04
Sex (base=male)				
	Female	-0.13	0.41	0.88
Constant		-1.39	40909	0.25

In the bicycle model, bicyclists over the age of 25 are more likely to feel unsafe in mixed traffic than riders ages 18 to 25. These results may be due to younger people tending to be more reckless and less concerned for their safety. Bicyclists that ride every other day or more are not at all likely to feel unsafe in mixed traffic compare those that ride a couple days out of the month, while those that ride between 4 and 15 days out of the month are

more likely to feel unsafe than those who ride a couple days out of the month. This may be due to the large comfortability of riders that bike so frequently that they are now accustom to mixed traffic, and the 4 to 15 days out of the month riders may understand the risk more than those that infrequently ride in mixed traffic.

Bicyclists that received training from a friend or relative or were self-taught are less likely to feel unsafe in mixed traffic compared to those that learned to ride through organized training. This may be due to the different information bicyclists are being told as they learn to ride, which then effects how and what they perceive as dangerous.

Bicyclists that travel with traffic are less likely to feel unsafe in mixed traffic than those who travel against traffic. This may be due to the lower approach speed of vehicles if the bicyclists are traveling the same directions as the motorists compared to those going against traffic. Bicyclists that have not been involved in a crash with automobiles or other non-traditional modes are less likely to feel unsafe in mixed traffic compared to those that have been in a crash. This is probably due to the induced fear of other modes because of a past collision. Bicyclists that wear a helmet often, sometimes, or rarely are less likely to feel unsafe in mixed traffic than those who always or never wear a helmet. Female bicyclists are less likely than male to feel unsafe in mixed traffic. The cause of this is unknown currently.

An example for a regression prediction equation of the bicycle model is shown in *Equation 2*.

ln(Odds Ratio) = - 1.39 - 0.27 * (age 26 to 30) - 19.68 * (age 31 to 40) - 1.29 * (age 41 to 50) - 0.87 * (age 51 to 60) - 1.09 * (age >60) + 1.07 * (days 4 to 6) + 0.28 (days 7 to 10) + 1.42 * (days 11 to 15) - 18.28 * (days 16 to 20) - 18.14 * (days 21 to 31) + 2.16 * (training) + 0.39 * (self-taught) - 0.42 * (with traffic) - 0.09 * (no crash with auto) + 0.17 * (prefer not to answer) - 0.28 * (no crash with non-traditional) - 1.5 * (often) - 0.42 * (sometimes) - 0.63 * (rarely) + 0.04 * (never) - 0.13 * (female) (Eq. 2)

Using *Equation 2*, a 42-year-old, self-taught female bicyclist that rarely wears a helmet while riding a bicycle with traffic about 6 days of out the month that has never been in a crash would be represented by the following equation:

ln(Odds Ratio) = - 1.39 - 0.27 * (0) - 19.68 * (0) - 1.29 * (1) - 0.87 * (0) - 1.09 * (0) + 1.07 * (1) + 0.28 (0) + 1.42 * (0) - 18.28 * (0) - 18.14 * (0) + 2.16 * (0) + 0.39 * (1) - 0.42 * (1) - 0.09 * (0) + 0.17 * (0) - 0.28 * (0) - 1.5 * (0) - 0.42 * (0) - 0.63 * (1) + 0.04 * (0) - 0.13 * (1) = - 2.79

Therefore, the equation can be transformed into: Odds Ratio = $e^{-2.97}$ = 0.061. This means she is 0.061 times less likely to feel less safe in mixed traffic than someone who matches all variable base case conditions.

The ATV model was validated based on the following results: N>60 for the sample size, a p<0.05 for the omnibus test, a p>0.05 for the Hosmer and Lemeshow test, and a >65% classification accuracy, which signifies that the model is statistically significant (see *Table 5*).

The ATV model shows the significant association between the perception of safety in mixed traffic, age, sex, yearly mileage, learning method, using visibility equipment, and frequency of wearing a helmet (see *Table 6*).

Table 5. ATV Model Validation

Selected Cases	N=118
Omnibus test	p=0.014
Hosmer and Lemeshow test	p=0.695
Classification accuracy	72.0%

Table 6. ATV BLR Model Variables

Variable		**B**	**S.E.**	**O.R.**
Age Range (base=18-25)				
	26-30	3.58	1.96	35.95
	31-40	1.89	1.29	6.60
	41-50	3.32	0.92	27.74
	51-60	2.49	0.82	12.10
	> 60	1.63	0.72	5.11
Sex (base=male)				
	Female	0.10	0.55	1.10
Learning Method (base=organized training)				
	Received training from friend or relative	0.22	0.79	1.25
	Self-taught	-0.37	0.64	0.69
Yearly Mileage (base=less than 100)				
	100-250	-1.56	1.84	0.21
	251-500	-1.04	1.76	0.35
	501-1000	0.65	1.78	1.92
	1001-2000	1.53	1.84	4.64
	2001-4000	1.10	1.76	3.01
	More than 4000	1.69	2.03	5.39
Wearing a helmet (base=always)				
	Often	0.46	0.68	1.59
	Sometimes	0.18	0.80	1.19
	Rarely	-0.88	0.85	0.41
	Never	0.80	0.85	2.23
Use Visibility Equipment (base=yes)				
	No	-0.43	0.53	0.65
Constant		-2.19	1.95	0.11

In the ATV model, ATV riders over the age of 25 are more likely to feel unsafe in mixed traffic than riders ages 18 to 25. Female ATV riders are more likely to feel unsafe in mixed traffic than male riders. These results may be due to younger males tending to be more reckless and less concerned for their safety. ATV riders that received training from a friend or relative are less likely to feel unsafe in mixed traffic compared to those that learned to ride through organized training, while those that were self-taught are more likely to feel unsafe compared to riders that had organized training. This may be due to the different information riders are being told as they learn to ride, which then effects how and what they

perceive as dangerous. ATV riders that ride more than 500 miles annually are more likely to feel unsafe in mixed traffic than riders who ride less than 100 miles annually. This is probably due to the increase in comfortability with ATVs the more the users operate them.

ATV riders that wear a helmet often, sometimes, or never are less likely to feel unsafe in mixed traffic than riders that always wear a helmet. ATV riders that rarely wear their helmet are more likely to feel unsafe than riders that always wear their helmet. ATV rider that do not use visibility equipment are less likely to feel unsafe in mixed traffic than those that do. This may be due to riders that are using visibility gear already feeling unsafe to begin and the gear has not removed that perception of reduced safety while in mixed traffic.

The snowmachine model was validated based on the following results: an N>70 for the sample size, a $p<0.05$ for the omnibus test, a $p>0.05$ for the Hosmer and Lemeshow test, and a >65% classification accuracy, which signifies that the model is statistically significant (see *Table 7*).

The snowmachine model shows the significant association between the perception of safety in mixed traffic, age, sex, yearly hours of operation, using visibility equipment, crashes with automobiles, frequency of paved shoulder use, and frequency of wearing a helmet (see *Table 8*).

Table 7. Snowmachine Model Validation

Selected Cases	N=78
Omnibus test	p=0.028
Hosmer and Lemeshow test	p=0.552
Classification accuracy	83.3%

Table 8. Snowmachine BLR Model Variables

Variable		**B**	**S.E.**	**O.R.**
Sex (base=male)				
	Female	-2.00	0.84	0.14
Frequency of paved shoulder use (base=always)				
	Often	-1.07	1.42	0.34
	Sometimes	-2.67	1.41	0.07
	Rarely	-3.86	1.45	0.02
	Never	-0.61	0.80	0.54
Crash with automobile (base=yes)				
	No	1.67	2.34	5.33
Use Visibility Equipment (base=yes)				
	No	-1.07	0.76	0.34
Wearing a helmet (base=always)				
	Often	0.99	1.02	2.70
	Sometimes	-20.67	15515	0.00
	Rarely	0.05	1.40	1.05
	Never	-22.77	40193	0.00
Hours of operation (base=less than 50)				
	50-100	-3.11	1.54	0.05
	101-200	-2.02	1.42	0.13
	201-400	-1.45	1.51	0.23
	401-600	-3.40	2.12	0.03
	More than 600	2.84	1.94	17.13
Age Range (base=18-25)				
	26-30	42.81	29599	3.92E+18
	31-40	2.08	1.46	8.03
	41-50	0.96	1.43	2.61
	51-60	0.74	1.09	2.11
	> 60	0.37	1.17	1.45
Constant		2.60	2.06	13.40

Female snowmachine riders are substantially less likely to feel unsafe in mixed traffic than male snowmachine riders. The reason for this large difference is unknown currently. Snowmachine riders that do not always use paved shoulders are more likely to feel unsafe in mixed traffic than those that always use paved shoulders. This may be due to the lack of familiarity and comfortability of riders that do not always use paved shoulders.

Snowmachine riders that have not been involved in a crash with automobiles are more likely to feel unsafe in mixed traffic compared to those that have not been in a crash. This is possibly due to the induced fear of the possibility of having a crash while riding in mixed traffic. Snowmachine riders that do not use visibility equipment are less likely to feel unsafe in mixed traffic than those that do. This may be due to riders that are using visibility gear already feeling unsafe to begin and the gear has not removed that perception of reduced safety while in mixed traffic.

Snowmachine riders that wear a helmet often or rarely are more likely to feel unsafe in mixed traffic than riders who always wear a helmet, while those that sometimes or never wear a helmet are not likely to feel unsafe compared to those that always wear a helmet. The cause of this is unknown currently. Snowmachine riders that ride more than 50 hours annually are more likely to feel unsafe in mixed traffic than riders who ride less than 50 hours annually. This is possibly due to the increase understanding the risk of riding in mixed traffic at least until they are very experienced at which point they become more accustomed to mixed traffic. Snowmachine riders over the age of 25 are more likely to feel unsafe in mixed traffic than riders ages 18 to 25. These results may be due to younger people tending to be more reckless and less concerned for their safety.

A statistically significant relationship between the learning methods of snowmachine riders and their perception of safety could not be found. This is probably due to almost complete the lack of riders that learned to ride a snowmachine through any organized training.

The results from these binomial logistic regression models can be used to ascertain which groups of people need the most assistance to increase their safety while using certain non-traditional transportation modes on public roadways. For example, the regression model for bicycle users shows that people who ride a bicycle on or near public roads every few days against the flow of traffic need more assistance to increase their safety than those who ride at least every other day with the flow of traffic.

Chapter 6: Conclusions

The goal of this project was to determine how residents of the Pacific Northwest perceived safety of non-traditional transportation mode operators in mixed traffic and whether their own learning methods and regular usage of these modes shaped their behavior. Gaps were found in the literature regarding non-traditional transportation mode and mixed-use environment safety. Therefore, to reduce the gaps in the literature, this project developed, conducted, and analyzed the results of a regional survey focused on user safety in mixed-use environments.

The binomial logistic regression analyses produced reasonable and statistically significant models for ATV, snowmachine, and bicycle modes. The models for these modes showed the relationship between an individual's perception of safety in mixed traffic and many of the variables considered, such as the user's age and helmet use. The relationship between learning methods and the perception of safety in mixed traffic was found for the ATV and bicycle mode models but not in the model for snowmachines.

These binomial logistic regression models can be used to ascertain which groups of people need the most assistance to increase their safety while using certain non-traditional transportation modes on public roadways.

6.1 Limitations and Future Work

During the survey development, a goal of the project was to build statistical models showing the effects of learning methods and mode use on the crash involvement of non-traditional transportation mode users, both reported and unreported. However, the limited number of responses that claimed involvement in reported and/or unreported crashes using non-traditional transportation modes made performing statistical tests that result in statistically significant models or relationship unfeasible.

One limitation of the results and analysis came from one type of question type that was used in the mixed-use survey. This question type was multiple choice with the possibility to select more than one answer. During the results and analysis, comparing responders based on this type of question proved to be difficult and in some cases, impossible when the question's options were unable to be ranked or given priority over one another. Future

survey developers are recommended to avoid such question types without considering other options.

In the future, more research could be conducted to collect more responses for the mixed-use survey to reveal more significant relationships between these variables. Further research into unreported crashes involving non-traditional transportation modes may reveal unknown causes and patterns of crashes and injuries. Research into the cause of the increasing rates of ATV related injuries and fatalities may help to establish relationships between the variables used in this project.

References

Coogan, M., Gibson, L., Campbell, M. (2010). *Design and Collection of the NETI New England Travel Survey*. New England Transportation Institute, University of Vermont, and Research and Innovative Technology Administration. UVM TRC Report # 10-013.

Federal Highway Administration (1998). *Implementing Bicycle Improvements at the Local Level*. U.S. Department of Transportation. Publication No. FHWA-98-105.

Federal Highway Administration (2009). *2009 National Household Travel Survey*. National Household Travel Survey.

Federal Highway Administration (2010). *Factors Contributing to Pedestrian and Bicycle Crashes on Rural Highways*. McLean, VA: U.S. Department of Transportation.

Federal Highway Administration (2011). *Our Nation's Highways 2011*. U.S. Department of Transportation. Publication No. FHWA-PL-11-028.

Garland, S. (2014). *National Estimates of Victim, Driver, and Incident Characteristics for ATV-Related, Emergency Department-Treated Injuries in the United States from January 2010-August 2010*. Bethesda, MD: Consumer Product Safety Commission.

Kinzenbaw, C. R., (2008). *Improving safety for slow-moving vehicles on Iowa's high speed rural roadways*. Iowa State University.

Lacy, J.K., Hunter, W., and Huang, H. (2003). *Study of Farm Vehicle Crashes in North Carolina*. In Transportation Research Record: Journal of the Transportation Research Board, No. 1840, Transportation Research Board of the National Academies, Washington, D.C.

LeGarde, John C. (January 1975). *An Analysis of Farm Equipment Accidents on North Carolina Public Roads*, North Carolina Department of Human Resources.

McBain-Rigg, K., Franklin, R., McDonald, G., and Knight, S., (January 2014). *Why Quad Bike Safety is a Wicked Problem: An Exploratory Study of Attitudes, Perceptions, and Occupational Use of Quad Bikes in Northern Queensland, Australia*. Journal of Agricultural Safety and Health.

Mishkovsky, N., Dalbey, M., Bertaina, S., Read, A., & McGaillard, T. (2010). *Putting Smart Growth to Work in Rural Communities*. Washington, D.C.: International City/County Management Association.

Pavilion, Roy C. (June 2015) *All-Terrain Vehicle Fatalities on Paved Roads, Unpaved Roads, and Off-Road: Evidence for Informed Roadway Safety Warnings and Legislation*. University of Iowa.

Peek-Asa, C., Sprince, N., Whittem, P., Falb, S., Madsen, M., & Zwerling, C. (2007). *Characteristics of crashes with farm equipment that increase potential for injury*. Journal of Rural Health 23(4), 339-347.

Pierz, J. (2003). *Snowmobile Injuries in North America.* Clinical Orthopedics and Related Research.

Topping, J., and Garland, S. (2012). *2012 Annual Report of ATV-Related Deaths and Injuries*. Bethesda, MD: U.S. Consumer Product Safety Commission, Division of Hazard Analysis.

U.S. Census Bureau (2015). *Selected housing characteristics, 2011-2015 American Community Survey 5-year estimates*.

University of Vermont (2009). *2009 Vermonter Poll*. Center for Rural Studies.

Appendix

Mixed-Use Survey transferred from SurveyMonkey.

Welcome to the Pacific Northwest Transportation Survey!

Your input is important and will help transportation professionals develop a better understanding of travel and infrastructure needs in the Pacific Northwest (AK, ID, OR, and WA). The survey will take about **20 minutes of your time** and you must be **18 years or older to participate**.

By clicking the "Next" button at the bottom of this page you consent to participating in the survey. The survey is anonymous, but if you would like to be entered into the drawing for one of **twenty $25 Amazon.com gift cards** you will be required to provide a name and a valid e-mail address so we can contact you if you are selected.

If you have questions about the survey, contact:
Dr. Nathan Belz, University of Alaska Fairbanks (npbelz@alaska.edu or 907-474-5765) or Dr. Kevin Chang, University of Idaho (kchang@uidaho.edu or 208-885-4028).

If you have questions or concerns about your rights as a research participant, contact the UAF Office of Research Integrity at uafirb@alaska.edu or 1-866-876-7800.

NOTE: After starting the survey, if you need to revert back to a previous page in the survey, use the **"Prev"** button located at the bottom of the page. **DO NOT USE THE BACK BUTTON ON YOUR BROWSER** as this action will take you out of the survey and you will lose your responses.

Let's begin!

(click "Next" below)

Household/Residence Characteristics

1. How would you best describe your primary residence?

- ○ House (not on farmland or open space)
- ○ House (on working farmland, in major open space, or secluded wooded area)
- ○ Apartment, townhouse, condominium, multi-family house
- ○ Dormitory or other institutional

Other (please specify)

2. In general, what types of housing can be found within a half a mile of your current home?

- ☐ House (not on farmland or open space)
- ☐ House (on working farmland, in major open space, or secluded wooded area)
- ☐ Apartment, townhouse, condominium, multi-family house
- ☐ Dormitory or other institutional

Other (please specify)

3. How many adults 18 years old or older, including yourself, are currently living in your home?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5+

4. How many children under the age of 18 are currently living in your home?

- ○ 0
- ○ 1
- ○ 2

- [ ] 3
- [ ] 4
- [ ] 5+

5. My neighborhood has an adequate number of good sidewalks or walking paths.

- [ ] Strongly Agree
- [ ] Agree
- [ ] Neither Agree nor Disagree
- [ ] Disagree
- [ ] Strongly Disagree
- [ ] Don't know or Not Applicable

6. My residence has adequate parking for my car(s).

- [ ] Strongly Agree
- [ ] Agree
- [ ] Neither Agree nor Disagree
- [ ] Disagree
- [ ] Strongly Disagree
- [ ] Don't Know or Not Applicable

* 7. In which one of the following areas do you consider your current home to be?

- [ ] Rural area (open land with few homes and buildings)
- [ ] Urban area (region in or surrounding a city)

Household/Residence Characteristics

8. Select a rural subcategory that best describes where your home is.

- ◯ Edge (at the fringe of metropolitan areas and typically connected to them by state and interstate highways)
- ◯ Traditional Main Street (have compact street design that is often accessible to a transportation hub; historically significant architecture and public spaces)
- ◯ Gateway (adjacent to high-amenity recreational areas such as National Parks, National Forests, and coastlines)
- ◯ Resource Dependent (surrounded by or in proximity to single industries i.e., agriculture and mining)
- ◯ Remote (tribal, village, and/or isolated)

Vehicle Ownership

9. How many of each transportation mode listed below does your household own?

	0	1	2	3	4	5+
Car or Truck	◯	◯	◯	◯	◯	◯
Motorcycle	◯	◯	◯	◯	◯	◯
Bicycle	◯	◯	◯	◯	◯	◯
ATV (All-terrain vehicle)	◯	◯	◯	◯	◯	◯
Snowmachine/Snowmobiles	◯	◯	◯	◯	◯	◯
Dogsled or Dog-powered	◯	◯	◯	◯	◯	◯
Agricultural Vehicle	◯	◯	◯	◯	◯	◯

Commute Characteristics

10. What is your ONE-WAY commute distance to work?

- ◯ Less than one mile
- ◯ 1-5 miles
- ◯ 6-15 miles

- ◯ 16-30 miles
- ◯ 30+ miles
- ◯ Not applicable

11. What is your ONE-WAY commute distance to the nearest town center?

- ◯ Less than one mile
- ◯ 1-5 miles
- ◯ 6-15 miles
- ◯ 16-30 miles
- ◯ 30+ miles
- ◯ Not applicable

12. For each trip purpose below, select the transportation type that you use most often.

	Car or Truck	Motorcycle	Walk or Jog	Bicycle	ATV	Snowmachine or Snowmobiles	Dog Sled or Dog-Powered	Agricultural Vehicle	Other	N/A
To go to work	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
For work	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
To go to school	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
To go shopping	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
To go to out for fun/entertainment	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
To go grocery shopping	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

Frequency of Vehicle/Mode Use

* 13. How frequently do you drive an automobile on, adjacent to, or near a roadway?

- ◯ Always
- ◯ Often
- ◯ Sometimes

- ◯ Rarely
- ◯ Never

* 14. How frequently do you ride a motorcycle on, adjacent to, or near a roadway?

- ◯ Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

* 15. How frequently do you walk on, adjacent to, or near a roadway?

- ◯ Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

* 16. How frequently do you ride a bicycle on, adjacent to, or near a roadway?

- ◯ Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

* 17. How frequently do you ride an ATV on, adjacent to, or near a roadway?

- ◯ Always
- ◯ Often
- ◯ Sometimes

◯ Rarely

◯ Never

18. How frequently do you ride a snowmachine/snowmobile on, adjacent to, or near a roadway?

◯ Always

◯ Often

◯ Sometimes

◯ Rarely

◯ Never

* 19. How frequently do you use dog-powered assistance (e.g. dogsled, skijoring, bikejor) on, adjacent to, or near a roadway?

◯ Always

◯ Often

◯ Sometimes

◯ Rarely

◯ Never

20. How frequently do you drive an agricultural vehicle on, adjacent to, or near a roadway?

◯ Always

◯ Often

◯ Sometimes

◯ Rarely

◯ Never

* 21. Do you travel on, adjacent to, or near a roadway using a different mode (or type) of transportation that was not previously mentioned?

- ◯ Yes
- ◯ No

Estimate of Miles/Hours of Use

22. For the mode of transportation previously not mentioned, what type is it and how many hours and miles do you travel by this mode in a year?

Type:	
Hours:	
Miles	

Automobiles

The following questions are about your personal automobile ownership and use.

23. How many individuals, including yourself, drive an automobile in your household?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6+

24. On average, how many miles do you drive your personal automobile in a year?

- ◯ Less than 10,000
- ◯ 10,000-20,000
- ◯ 20,001-40,000

- [ ] 40,001-60,000
- [ ] More than 60,000

25. How did you learn to drive an automobile? Select all that apply.

- [ ] Driver Education Course
- [ ] Received training from friend or
- [ ] Self-taught
- [ ] Other (please specify)

Motorcycles

The following questions are about your motorcycle ownership and use.

26. How many individuals, including yourself, ride a motorcycle in your household?

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6+

27. On average, how many miles do you ride a motorcycle in a year?

- [ ] Less than 10,000
- [ ] 10,000-20,000
- [ ] 20,001-40,000
- [ ] 40,001-60,000
- [ ] More than 60,000

28. How did you learn to ride a motorcycle? Select all that apply.

- ☐ Driver Education Course
- ☐ Received training from friend or
- ☐ Self-taught
- ☐ Other (please specify)

ATVs

The following questions are about your ATV ownership and use.

29. How many individuals, including yourself, ride an ATV in your household?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6+

30. How many of these individuals are under the age of 16?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6+

31. On average, how many miles do you ride an ATV in a year?

- ◯ Less than 100
- ◯ 100-250
- ◯ 251-500
- ◯ 501-1,000
- ◯ 1,001-2,000
- ◯ 2,001-4,000
- ◯ More than 4,000

32. On average, how many hours do you put on your ATV in a year?

- ◯ Less than 50
- ◯ 50-100
- ◯ 101-200
- ◯ 201-400
- ◯ 401-600
- ◯ More than 600

33. I ride my ATV for:

- ◯ Only recreational uses (e.g., hunting, trail riding, etc.)
- ◯ Mostly recreational uses
- ◯ Some recreational and some utilitarian uses
- ◯ Mostly utilitarian uses (e.g., errands, daily travel, etc.)
- ◯ Only utilitarian uses

34. How frequently do you ride your ATV on the following types of road components?

	Always	Often	Sometimes	Rarely	Never
On the shoulders of two lane roads (paved)	○	○	○	○	○
On the shoulders of two lane highways (paved)	○	○	○	○	○
On the shoulders of multilane highways (paved)	○	○	○	○	○
Bike lanes on roads	○	○	○	○	○
Sidewalks	○	○	○	○	○
Bike/walking path/trail	○	○	○	○	○

35. How did you learn to ride an ATV? Select all that apply.

☐ Organized training

☐ Received training from friend or

☐ Self-taught

☐ Other (please specify)

* 36. I feel that there are adequate trail opportunities to ride my ATV near my home.

○ Strongly Agree

○ Agree

○ Neither Agree nor Disagree

○ Disagree

○ Strongly Disagree

○ Don't Know or Not Applicable

37. How do you typically access those trails?

- ◯ Ride directly from my
- ◯ Haul them by trailer to a
- ◯ Other (please specify)

38. How far do you travel to reach opportunities to ride ATVs?

- ◯ Less than one mile
- ◯ 1-5 miles
- ◯ 6-15 miles
- ◯ 16-30 miles
- ◯ 30+ miles
- ◯ Not applicable

39. Why do you most commonly ride an ATV? Select all that apply.

- ☐ Commuting or for
- ☐ Commuting or for school
- ☐ Recreation/Exercise
- ☐ Personal trips (i.e., errands, picking up someone, visiting others)
- ☐ Other (please specify)

* 40. Have you ever been in a crash with an automobile while riding an ATV?

- ◯ Yes
- ◯ No
- ◯ I prefer not to answer

41. Did your last crash with an automobile occur on public or private property?

- ○ On public property
- ○ On private property

42. While riding an ATV, where did your last crash with an automobile occur?

- ○ Off-road/Trail
- ○ At or in an intersection
- ○ Non-intersection road crossing
- ○ Along the roadway
- ○ Other (please specify)

43. Which of the following occurred as a result of the crash with an automobile? Select all that apply.

- ☐ No damage or injury
- ☐ Property damage only
- ☐ Personal injury/Injury to others
- ☐ Fatality
- ☐ Other (please specify)

44. In your opinion, what might have been done to prevent the crash with an automobile?

45. Does riding an ATV in mixed traffic seem to reduce your safety?

- ○ Yes
- ○ No
- ○ N/A

46. What are some road characteristics you have observed that made you feel safer while riding in mixed traffic? Select all that apply.

- [ ] Signage that cautions automobile drivers that non-traditional and non-motorized vehicles (i.e. ATVs) may be present
- [ ] Pavement markings that section off an area for non-traditional and non-motorized vehicle (i.e. ATVs) use
- [ ] Wider lanes
- [ ] Wider shoulders
- [ ] Lighting
- [ ] Not applicable
- [ ] Other (please specify)

* 47. Have you ever been in a crash riding an ATV that involved a different non-traditional and/or nonmotorized mode (such as pedestrians, snowmachines, or bicycles)?

- ○ Yes
- ○ No
- ○ I prefer not to answer

48. Did this crash occur on public or private property?

- ○ On public property
- ○ On private property

49. Where did this crash occur?

- ○ Off-road/Trail
- ○ At or in an intersection
- ○ Non-intersection road crossing
- ○ Along the roadway
- ○ Other (please specify)

50. Which of the following occurred as a result of the crash? Select all that apply.

- ☐ No damage or injury
- ☐ Property damage only
- ☐ Personal injury/Injury to others
- ☐ Fatality
- ☐ Other (please specify)

51. In your opinion, what might have been done to prevent this crash?

52. Do you make yourself more visible when riding an ATV? Select all that apply.

- ☐ Wear bright colors
- ☐ Wear fluorescent or reflective clothing
- ☐ Wear other lights on self or belongings
- ☐ Use additional reflectors
- ☐ Accessorize with safety flags or similar objects
- ☐ N/A
- ☐ Other (please specify)

53. If you use these features to make yourself more visible, when do you use them?

- ◯ Day time only
- ◯ Night time only
- ◯ Both
- ◯ N/A

54. How often do you wear a helmet when riding?

- ◯ Always
- ◯ Often
- ◯ Sometimes
- ◯ Rarely
- ◯ Never

Snowmachines/Snowmobiles

The following questions are about your snowmachine/snowmobile ownership and use.

55. How many individuals, including yourself, ride a snowmachine in your household?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6+

56. How many of these individuals are under the age of 16?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6+

57. On average, how many miles do you ride a snowmachine in a year?

- ◯ Less than 100
- ◯ 100-250
- ◯ 251-500
- ◯ 501-1,000
- ◯ 1,001-2,000
- ◯ 2,001-4,000
- ◯ More than 4,000

58. On average, how many hours do you put on your snowmachine in a year?

- ◯ Less than 50
- ◯ 50-100
- ◯ 101-200
- ◯ 201-400
- ◯ 401-600
- ◯ More than 600

59. I ride my snowmachine/snowmobile for:

- ◯ Only recreational uses (e.g., hunting, trail riding, etc.)
- ◯ Mostly recreational uses
- ◯ Some recreational and some utilitarian uses
- ◯ Mostly utilitarian uses (e.g., errands, daily travel, etc.)
- ◯ Only utilitarian uses

60. How frequently do you ride on the following types of road components?

	Always	Often	Sometimes	Rarely	Never
On the shoulders of two lane roads (paved)	◯	◯	◯	◯	◯
On the shoulders of two lane highways (paved)	◯	◯	◯	◯	◯
On the shoulders of multilane highways (paved)	◯	◯	◯	◯	◯
Bike lanes on roads	◯	◯	◯	◯	◯
Sidewalks	◯	◯	◯	◯	◯
Bike/walking path/trail	◯	◯	◯	◯	◯

61. How did you learn to ride a snowmachine? Select all that apply.

- ☐ Organized training
- ☐ Received training from friend or relative
- ☐ Self-taught
- ☐ Other (please specify)

  [ ]

* 62. I feel that there are adequate trail opportunities to ride my snowmachine near my home.

- ◯ Strongly Agree
- ◯ Agree
- ◯ Neither Agree nor Disagree
- ◯ Disagree
- ◯ Strongly Disagree
- ◯ Don't Know or Not Applicable

63. How do you typically access those trails?

- ◯ Ride directly from my home
- ◯ Haul them by trailer to a trailhead
- ◯ Other (please specify)

64. How far do you travel to reach opportunities to ride snowmachines?

- ◯ Less than one mile
- ◯ 1-5 miles
- ◯ 6-15 miles
- ◯ 16-30 miles
- ◯ 30+ miles
- ◯ Not applicable

65. Why do you most commonly ride a snowmachine? Select all that apply.

- [ ] Commuting or for work
- [ ] Commuting or for school
- [ ] Recreation/Exercise
- [ ] Personal trips (i.e., errands, picking up someone, visiting others)
- [ ] Other (please specify)

* 66. Have you ever been in a crash with an automobile while riding a snowmachine?

- ○ Yes
- ○ No
- ○ I prefer not to answer

67. Did your last crash with an automobile occur on public or private property?

- ○ On public property
- ○ On private property

68. While riding a snowmobile, where did your last crash with an automobile occur?

- ○ Off-road/Trail
- ○ At or in an intersection
- ○ Non-intersection road crossing
- ○ Along the roadway
- ○ Other (please specify)

69. Which of the following occurred as a result of the crash with an automobile? Select all that apply.

- [ ] No damage or injury
- [ ] Property damage only
- [ ] Personal injury/Injury to others
- [ ] Fatality
- [ ] Other (please specify)

70. In your opinion, what might have been done to prevent the crash with an automobile?

71. Does riding a snowmachine in mixed traffic seem to reduce your safety?

- ◯ Yes
- ◯ No
- ◯ N/A

72. What are some road characteristics you have observed that made you feel safer while riding in mixed traffic? Select all that apply.

- [ ] Signage that cautions automobile drivers that non-traditional and non-motorized vehicles (i.e. ATVs) may be present
- [ ] Pavement markings that section off an area for non-traditional and non-motorized vehicle (i.e. ATVs) use
- [ ] Wider lanes
- [ ] Wider shoulders
- [ ] Lighting
- [ ] Not applicable
- [ ] Other (please specify)

* 73. Have you ever been in a crash riding a snowmachine that involved a different non-traditional and/or non-motorized mode (such as agricultural vehicles, ATVs, or bicycles)?

- ◯ Yes
- ◯ No
- ◯ I prefer not to answer

74. Did this crash occur on public or private property?

- ◯ On public property
- ◯ On private property

75. Where did this crash occur?

- ◯ Off-road/Trail
- ◯ At or in an intersection
- ◯ Non-intersection road crossing
- ◯ Along the roadway
- ◯ Other (please specify)

76. Which of the following occurred as a result of the crash? Select all that apply.

- ☐ No damage or injury
- ☐ Property damage only
- ☐ Personal injury/Injury to others
- ☐ Fatality
- ☐ Other (please specify)

77. In your opinion, what might have been done to prevent this crash?

78. Do you do anything to make yourself more visible when riding a snowmachine? Select all that apply.

- [ ] Wear bright colors
- [ ] Wear fluorescent or reflective clothing
- [ ] Wear other lights on self or belongings
- [ ] Use additional reflectors
- [ ] Accessorize with safety flags or similar objects
- [ ] N/A
- [ ] Other (please specify)

79. If you use these features to make yourself more visible, when do you use them?

- ○ Day time only
- ○ Night time only
- ○ Both
- ○ N/A

80. How often do you wear a helmet when riding?

- ○ Always
- ○ Often
- ○ Sometimes
- ○ Rarely
- ○ Never

Agricultural Vehicles

The following questions are about your agricultural vehicle ownership and use.

81. How many individuals, including yourself, drive an agricultural vehicle in your household?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6+

82. How many of these individuals are under the age of 16?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6+

83. On average, how many hours do you put on your agricultural vehicle on or near roads in year?

- ○ Less than 50
- ○ 50-100
- ○ 101-200
- ○ 201-400
- ○ 401-600
- ○ More than 600

84. How frequently do you drive on the following types of road components?

	Always	Often	Sometimes	Rarely	Never
On the shoulders of two lane roads (paved)	○	○	○	○	○
On the shoulders of two lane highways (paved)	○	○	○	○	○
On the shoulders of multilane highways (paved)	○	○	○	○	○
Bike lanes on roads	○	○	○	○	○
Sidewalks	○	○	○	○	○
Bike/walking path/trail	○	○	○	○	○

85. How did you learn to drive an agricultural vehicle? Select all that apply.

☐ Organized training

☐ Received training from friend or relative

☐ Self-taught

☐ Other (please specify)

* 86. Have you ever been in a crash with an automobile while driving an agricultural vehicle?

○ Yes

○ No

○ I prefer not to answer

87. Did your last crash with an automobile occur on public or private property?

○ On public property

○ On private property

88. While driving an agricultural vehicle, where did your last crash with an automobile occur?

- ◯ Off-road/Trail
- ◯ At or in an intersection
- ◯ Non-intersection road crossing
- ◯ Along the roadway
- ◯ Other (please specify)

89. Which of the following occurred as a result of the crash with an automobile? Select all that apply.

- ☐ No damage or injury
- ☐ Property damage only
- ☐ Personal injury/Injury to others
- ☐ Fatality
- ☐ Other (please specify)

90. In your opinion, what might have been done to prevent this crash with an automobile?

91. Does driving an agricultural vehicle in mixed traffic seem to reduce your safety?

- ◯ Yes
- ◯ No
- ◯ N/A

92. What are some road characteristics you have observed that made you feel safer while driving in mixed traffic? Select all that apply.

- [ ] Signage that cautions automobile drivers that non-traditional and non-motorized vehicles (i.e. ATVs) may be present
- [ ] Pavement markings that section off an area for non-traditional and non-motorized vehicle (i.e. ATVs) use
- [ ] Wider lanes
- [ ] Wider shoulders
- [ ] Lighting
- [ ] Not applicable
- [ ] Other (please specify)

93. Have you ever been in a crash riding an agricultural vehicle that involved a different non-traditional and/or non-motorized mode (such as ATVs, bicycles, or pedestrians)?

- ○ Yes
- ○ No
- ○ I prefer not to answer

94. Did this crash occur on public or private property?

- ○ On public property
- ○ On private property

95. While driving an agricultural vehicle, where did this crash occur?

- ◯ Off-road/Trail
- ◯ At or in an intersection
- ◯ Non-intersection road crossing
- ◯ Along the roadway
- ◯ Other (please specify)

96. Which of the following occurred as a result of the crash? Select all that apply.

- ☐ No damage or injury
- ☐ Property damage only
- ☐ Personal injury/Injury to others
- ☐ Fatality
- ☐ Other (please specify)

97. In your opinion, what might have been done to prevent this crash?

Bicycles

The following questions are about your bicycle ownership and use.

98. How many individuals, including yourself, ride a bicycle in your household?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6+

99. How many of these individuals are under the age of 16?

- ◯ 0
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6+

100. On average, how many miles do you travel by bike in a month?

- ◯ Less than 10
- ◯ 10-50
- ◯ 51-100
- ◯ 101-250
- ◯ More than 250

101. On average, how many days out of the month do you ride a bicycle?

- ◯ 1-3
- ◯ 4-6
- ◯ 7-10
- ◯ 11-15
- ◯ 16-20
- ◯ 21-31

102. I ride my bicycle for:

- ◯ Only recreational uses (e.g., exercise, trail riding, etc.)
- ◯ Mostly recreational uses
- ◯ Some recreational and some utilitarian uses
- ◯ Mostly utilitarian uses (e.g., errands, daily travel, etc.)
- ◯ Only utilitarian uses

103. What is the average length of your trip using a bicycle?

- ○ Less than 1 mile
- ○ 1-3 miles
- ○ 4-6 miles
- ○ 7-10 miles
- ○ 11-15 miles
- ○ 16-20 miles
- ○ 21-30 miles
- ○ 30+ miles

104. How did you learn to ride a bicycle? Select all that apply.

- ☐ Organized training
- ☐ Received training from friend or relative
- ☐ Self-taught
- ☐ Other (please specify)

105. Why do you most commonly ride a bicycle? Select all that apply.

- ☐ Commuting or for work
- ☐ Commuting or for school
- ☐ Recreation/Exercise
- ☐ Personal trips (i.e., errands, picking up someone, visiting others)
- ☐ Other (please specify)

106. How frequently do you ride on the following types of road components?

	Always	Often	Sometimes	Rarely	Never
On the shoulders of two lane roads (paved)	○	○	○	○	○
On the shoulders of two lane highways (paved)	○	○	○	○	○
On the shoulders of multilane highways (paved)	○	○	○	○	○
Bike lanes on roads	○	○	○	○	○
Sidewalks	○	○	○	○	○
Bike/walking path/trail	○	○	○	○	○

107. When traveling in the roadway, which way do you mostly face?

○ Facing traffic (i.e. against the direction of traffic)

○ With traffic (i.e. traveling in the same direction as traffic)

* 108. Are bike paths or shared-use paths available within a quarter mile of where you live? (Bike paths are typically separated facilities located away from a roadway.)

○ Yes

○ No

109. Are there any reasons why you choose not to use bike paths? Select all that apply.

☐ Poor surface condition

☐ Doesn't lead where I need to go

☐ Too crowded

☐ Doesn't feel safe

☐ Other (please specify)

_____

* 110. Are bike lanes on a roadway available within a quarter mile of where you live? (Bike lanes are facilities typically located on a roadway.)

- ◯ Yes
- ◯ No

111. Are there any reasons why you choose not to use bike lanes if they are available? Select all that apply.

- ☐ Poor surface condition
- ☐ Don't feel comfortable with cars
- ☐ Too crowded
- ☐ I feel safer on the sidewalk
- ☐ Other (please specify)

112. If you have felt unsafe while riding your bike on or near a roadway, why? Select all that apply.

- ☐ Presence of motorists
- ☐ Uneven walkways or roadway surfaces
- ☐ Dogs or other animals
- ☐ Other bicycle or pedestrian traffic
- ☐ Lack of room
- ☐ Obstacles blocking path
- ☐ Not maintained
- ☐ Not applicable
- ☐ Other (please specify)

113. If a motorist made you feel unsafe, how did they do so? Select all that apply.

- [ ] Cut me off
- [ ] Honked at me
- [ ] Almost hit me/near miss
- [ ] Just the presence of the motorist was threatening
- [ ] Drove too fast
- [ ] Not applicable/Don't make me feel unsafe
- [ ] Other (please specify)

* 114. Have you ever been in a crash with an automobile while riding a bicycle?

- ◯ Yes
- ◯ No
- ◯ I prefer not to answer

115. Did this crash with an automobile occur on public or private property?

- ◯ On public property
- ◯ On private property

116. While riding a bicycle, where did this crash with an automobile occur?

- [ ] Off-road/Trail
- [ ] At or in an intersection
- [ ] Non-intersection road crossing
- [ ] Along the roadway
- [ ] Other (please specify)

117. Which of the following occurred as a result of the crash with an automobile? Select all that apply.

- [ ] No damage or injury
- [ ] Property damage only
- [ ] Personal injury/Injury to others
- [ ] Fatality
- [ ] Other (please specify)

118. In your opinion, what might have been done to prevent the crash with an automobile?

119. What are some road characteristics you have observed or place that made you feel safer while riding in mixed traffic? Select all that apply.

- [ ] Signage that cautions automobile drivers that non-traditional and non-motorized vehicles (i.e. ATVs) may be present
- [ ] Pavement markings that section off an area for non-traditional and non-motorized vehicle (i.e. ATVs) use
- [ ] Wider lanes
- [ ] Wider shoulders
- [ ] Lighting
- [ ] Not applicable
- [ ] Other (please specify)

* 120. Have you ever been in a crash riding a bicycle that involved a different non-traditional and/or nonmotorized mode (such as ATVs, snowmachines, or pedestrians)?

- ◯ Yes
- ◯ No
- ◯ I prefer not to answer

121. Did this crash occur on public or private property?

- ○ On public property
- ○ On private property

122. While riding a bicycle, where did this crash occur?

- ○ Off-road/Trail
- ○ At or in an intersection
- ○ Non-intersection road crossing
- ○ Along the roadway
- ○ Other (please specify)

123. Which of the following occurred as a result of the crash? Select all that apply.

- ☐ No damage or injury
- ☐ Property damage only
- ☐ Personal injury/Injury to others
- ☐ Fatality
- ☐ Other (please specify)

124. In your opinion, what might have been done to prevent the crash?

125. Do you do anything to make yourself more visible? Select all that apply.

- [ ] Use headlight
- [ ] Use taillight
- [ ] Wear fluorescent or reflective clothing
- [ ] Wear other lights on self or belongings
- [ ] Use additional reflectors
- [ ] Accessorize with safety flags (or similar objects)
- [ ] Other (please specify)

126. If you use these features to make yourself more visible, when do you use them?

- ○ Day time only
- ○ Night time only
- ○ Both
- ○ N/A

127. How often do you wear a helmet when riding?

- ○ Always
- ○ Often
- ○ Sometimes
- ○ Rarely
- ○ Never

Pedestrians

The following questions are about walking/exercising as a pedestrian.

128. How many individuals, including yourself, walk as a means of traveling in your household?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

129. How many of these individuals are under the age of 16?

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6+

130. On average, how many miles do you travel by walking in a month?

- ☐ Less than 10
- ☐ 10-25
- ☐ 26-50
- ☐ 51-100
- ○ More than 100

131. On average, how many days out of the month do you walk as a means of traveling?

- ◯ 1-3
- ◯ 4-6
- ◯ 7-10
- ◯ 11-15
- ◯ 16-20
- ◯ 21-31

132. I walk for:

- ◯ Only recreational uses (e.g., exercise, trail walking/hiking, etc.)
- ◯ Mostly recreational uses
- ◯ Some recreational and some utilitarian uses
- ◯ Mostly utilitarian uses (e.g., errands, daily travel, etc.)
- ◯ Only utilitarian uses

133. What is the average length of your walking trip?

- ◯ Less than 1 mile
- ◯ 1-3 mile
- ◯ 4-6 miles
- ◯ 7-10 miles
- ◯ 11-15 miles
- ◯ 16-20 miles
- ◯ 21-30 miles
- ◯ 30+ miles

134. Why do you most commonly walk as a means of traveling? Select all that apply.

- [ ] Commuting or for work
- [ ] Commuting or for school
- [ ] Recreation/exercise
- [ ] Personal trips (i.e., errands, picking up someone, visiting others)
- [ ] Required for my job
- [ ] Drop off/Pick up someone
- [ ] Visit a friend or relative
- [ ] Other (please specify)

135. How frequently do you travel on the following types of road components as a pedestrian?

	Always	Often	Sometimes	Rarely	Never
On the shoulders of two lane roads (paved)	○	○	○	○	○
On the shoulders of two lane highways (paved)	○	○	○	○	○
On the shoulders of multilane highways (paved)	○	○	○	○	○
Bike lanes on roads	○	○	○	○	○
Sidewalks	○	○	○	○	○
Bike/walking path/trail	○	○	○	○	○

136. Are walking path(s) available within a quarter mile of where you live?

- ○ Yes
- ○ No

137. If there are walking paths available, how often do you use them?

- ○ Always
- ○ Often
- ○ Sometimes
- ○ Rarely
- ○ Never
- ○ N/A or not available

138. Are there any reasons why you choose not to use these paths? Select all that apply.

- ☐ Poor surface condition
- ☐ Doesn't lead where I need to go
- ☐ Too crowded
- ☐ Doesn't feel safe
- ☐ Other (please specify)

* 139. Are sidewalks available within a quarter mile of where you live?

- ○ Yes
- ○ No

140. If sidewalks are not available, where do you walk?

- ○ In the road
- ○ On the shoulder of the road
- ○ Along the side of the road
- ○ N/A
- ○ Other (please specify)

141. When walking on the roadway, which direction do you mostly face?

- ◯ Facing traffic (i.e. against the direction of traffic)
- ◯ With traffic (i.e. traveling in the same direction as traffic)
- ◯ I don't walk on the roadway

142. What are some road characteristics you have observed or place that made you feel safer while walking in mixed traffic? Select all that apply.

- ☐ Signage that cautions automobile drivers that non-traditional and non-motorized vehicles (i.e. ATVs) may be present
- ☐ Pavement markings that section off an area for non-traditional and non-motorized vehicle (i.e. ATVs) use
- ☐ Wider lanes
- ☐ Wider shoulders
- ☐ Lighting
- ☐ Not applicable
- ☐ Other (please specify)

143. If you have felt unsafe while walking on or near a roadway, why? Select all that apply.

- ☐ Presence of motorists
- ☐ Uneven walkways or roadway surfaces
- ☐ Dogs or other animals
- ☐ Other bicycle or pedestrian traffic
- ☐ Lack of room
- ☐ Obstacles blocking path
- ☐ Not maintained
- ☐ N/A
- ☐ Other (please specify)

144. If a motorist made you feel unsafe, how did they do so? Select all that apply.

- [ ] Cut me off
- [ ] Honked at me
- [ ] Almost hit me/near miss
- [ ] Just the presence of the motorist was threatening
- [ ] Drove too fast
- [ ] Not applicable/Don't make me feel unsafe
- [ ] Other (please specify)

* 145. Have you ever been hit by an automobile while walking?

- ( ) Yes
- ( ) No
- ( ) I prefer not to answer

146. Were you hit by an automobile on public or private property?

- ( ) On public property
- ( ) On private property

147. While walking, where were you hit by an automobile?

- ( ) Off-road/Trail
- ( ) At or in an intersection
- ( ) Non-intersection road crossing
- ( ) Along the roadway
- ( ) Other (please specify)

148. Which of the following occurred as a result of this incident? Select all that apply.

- [ ] No damage or injury
- [ ] Property damage only
- [ ] Personal injury/Injury to others
- [ ] Fatality
- [ ] Other (please specify)

149. In your opinion, what might have been done to prevent the crash with an automobile?

* 150. Have you ever been hit when walking by a non-traditional and/or non-motorized vehicle (i.e. ATV or bicycle)?

- ○ Yes
- ○ No

151. Where you hit on public or private property?

- ○ On public property
- ○ On private property

152. While walking, where were you hit?

- ○ Off-road/Trail
- ○ At or in an intersection
- ○ Non-intersection road crossing
- ○ Along the roadway
- ○ Other (please specify)

153. Which of the following occurred as a result of this incident? Select all that apply.

- [ ] No damage or injury
- [ ] Property damage only
- [ ] Personal injury/Injury to others
- [ ] Fatality
- [ ] Other (please specify)

154. In your opinion, what might have been done to prevent this?

155. Do you do anything to make yourself more visible as a pedestrian? Select all that apply.

- [ ] Wear fluorescent or reflective clothing/shoes
- [ ] Wear other lights on self or belongings
- [ ] Travel only in well-lit areas
- [ ] N/A
- [ ] Other (please specify)

156. If you use these features to make yourself more visible as a pedestrian, when do you use them?

- ◯ Day time only
- ◯ Night time only
- ◯ Both
- ◯ N/A

Dogsled/Dog-Powered Transportation

The following questions are about dogsleds and dog-powered modes of transportation.

157. How many individuals, including yourself, use dog-powered modes of transportation in your household?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6+

158. How many of these individuals are under the age of 16?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6+

159. In which of the following ways do you typically use your dog/dog team? Select all that apply.

- ☐ Transportation
- ☐ Racing-related activities (competitive, sprint, distance, clubs, etc.)
- ☐ Other recreational activities (camping, skijoring, bikejoring, etc.)
- ☐ Gathering Resources (trapping, hauling wood or water, etc.)
- ☐ Other (please specify)

[ ]

160. On average, how many miles do you travel by dog sled or another dog-powered mode in a year?

- ○ Less than 100
- ○ 100-250
- ○ 251-500
- ○ 501-1,000
- ○ More than 500

161. Which types of activities do you typically engage in with your dog/dog team? Select all that apply.

- ☐ Sledding/Mushing
- ☐ Skijoring
- ☐ Scootering
- ☐ Bikejoring
- ☐ Carting/Rig/Sulkie
- ☐ Sulkie
- ☐ Canicross
- ☐ Other (please specify)

162. I ride my dogsled/dog-powered mode for:

- ○ Only recreational uses (e.g., hunting, trail riding, etc.)
- ○ Mostly recreational uses
- ○ Some recreational and some utilitarian uses
- ○ Mostly utilitarian uses (e.g., errands, daily travel, etc.)
- ○ Only utilitarian uses

163. In general, how did you learn to use these dog-powered modes of transportation? Select all that apply.

- [ ] Formalized Training
- [ ] Received training from friend or relative
- [ ] Self-taught
- [ ] Other (please specify)

164. How many years have you been engaged in dog-powered travel/activities?

- ○ Less than 1
- ○ 1-2
- ○ 3-5
- ○ 6+

165. On average, how many days out of the month do you use a dog-powered mode of transportation?

- ○ 1-3
- ○ 4-6
- ○ 7-10
- ○ 11-15
- ○ 16-20
- ○ 21-31

166. Are there adequate trails near where you live?

- ○ Yes
- ○ No

167. How do you typically access these trails?

- ○ Using dog-powered mode directly from my home
- ○ Haul dogs/gear by automobile to trail head
- ○ Other (please specify)

168. On average, how far do you typically travel to access trail systems?

- ○ 0 - 1 miles
- ○ 2 - 5 miles
- ○ 6 - 10 miles
- ○ 11 - 20 miles
- ○ 20+ miles

169. How frequently do you travel across the following types of road components with your dog/dog-team?

	Always	Often	Sometimes	Rarely	Never
On the shoulders of two lane roads (paved)	○	○	○	○	○
On the shoulders of two lane highways (paved)	○	○	○	○	○
On the shoulders of multilane highways (paved)	○	○	○	○	○
Bike lanes on roads	○	○	○	○	○
Sidewalks	○	○	○	○	○
Bike/walking path/trail	○	○	○	○	○

170. If traveling with your dog/dog-team in the roadway, which way do you mostly face?

- ○ Facing traffic (i.e. against the direction of traffic)
- ○ With traffic (i.e. traveling in the same direction as traffic)
- ○ Not applicable

171. Why do you most commonly use a dog-powered mode of transportation? Select all that apply.

- [ ] Commuting or for work
- [ ] Commuting or for school
- [ ] Recreation/Exercise
- [ ] Personal trips (i.e., errands, picking up someone, visiting others)
- [ ] Other (please specify)

172. If you have felt unsafe while traveling with your dog/dog-team on, adjacent to, or near roadways, select all that apply.

- [ ] Motorists (while operating on or near roads)
- [ ] Road crossings on blind corners
- [ ] Road or driveway crossing that is higher than trail
- [ ] Obstacles blocking path (such as debris or berms of snow)
- [ ] Narrow trail or path
- [ ] Too much mushing traffic
- [ ] Other non-motorized user traffic (skiing, fatbiking, snowshoeing, etc.)
- [ ] Other motorized user traffic (such as snowmachines/snowmobiles)
- [ ] N/A
- [ ] Other (please specify)

173. If a motorists made you feel unsafe, select all that apply.

- [ ] Cut me off
- [ ] Drove very close to me
- [ ] Honked at me
- [ ] Almost hit me
- [ ] Drove too fast
- [ ] Just the presence of the motorist was threatening
- [ ] N/A
- [ ] Other (please specify)

* 174. Have you ever been in a crash with an automobile while using your dog/dog-team?

- ◯ Yes
- ◯ No
- ◯ I prefer not to answer

175. Did your last crash with this automobile occur on public or private property?

- ◯ On public property
- ◯ On private property

176. While using your dog/dog-team, where did your last crash occur?

- ◯ Off-road/Trail
- ◯ At or in an intersection
- ◯ Non-intersection road crossing
- ◯ Along the roadway
- ◯ Other (please specify)

177. Which of the following occurred as a result of this crash with an automobile? Select all that apply.

- [ ] No damage or injury
- [ ] Property damage only
- [ ] Personal injury/Injury to others
- [ ] Fatality
- [ ] Other (please specify)

178. In your opinion, what might have been done to prevent this crash with an automobile?

179. Does riding with your dog/dog-team in mixed traffic seem to reduce your safety?

- ○ Yes
- ○ No
- ○ N/A

180. What are some road characteristics you have observed in another town or place that made you feel safer? Select all that apply.

- [ ] Signage that cautions automobile drivers that non-traditional and non-motorized vehicles (i.e. ATVs) may be present
- [ ] Pavement markings that section off an area for non-traditional and non-motorized vehicle (i.e. ATVs) use
- [ ] Wider lanes
- [ ] Wider shoulders
- [ ] Lighting
- [ ] Not applicable
- [ ] Other (please specify)

* 181. Have you ever been in a crash while riding with your dog/dog-team that involved a different nontraditional and/or non-motorized vehicle (for example ATVs, snowmachines, skiers, pedestrians, or bicycles)?

- ○ Yes
- ○ No
- ○ I prefer not to answer

182. Did this crash occur on public or private property?

- ○ On public property
- ○ On private property

183. While using your dog/dog-team, where did this crash occur?

- ○ Off-road/Trail
- ○ At or in an intersection
- ○ Non-intersection road crossing
- ○ Along the roadway
- ○ Other (please specify)

184. Which of the following occurred as a result of the crash? Select all that apply.

- ☐ No damage or injury
- ☐ Property damage only
- ☐ Personal injury/Injury to others
- ☐ Fatality
- ☐ Other (please specify)

185. In your opinion, what might have been done to prevent this crash?

186. Do you do anything to make yourself more visible when riding with your dog/dog-team? Select all that apply.

- [ ] Wear bright colors
- [ ] Wear fluorescent or reflective clothing
- [ ] Wear other lights on self or belongings
- [ ] Ensure I have reflectors
- [ ] Accessorize with safety flags or similar objects
- [ ] N/A
- [ ] Other (please specify)

187. If you use features to make yourself more visible when riding with your dog/dog-team, when do you use them?

- ○ Day time only
- ○ Night time only
- ○ Both
- ○ N/A

188. How often do you wear a helmet when riding with your dog/dog-team?

- ○ Always
- ○ Often
- ○ Sometimes
- ○ Rarely
- ○ Never

Crash Reporting

The following questions are about unreported crashes that occurred on public property.

* 189. As either an ATV, snow machine/snowmobile, agricultural vehicle, or dogsled/dog-powered mode user, have you been involved in an unreported crash on public property involving an automobile in the last five years?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer
- ◯ Question does not apply to me

* 190. As either a bicyclist or pedestrian, have you been involved in an unreported crash on public property involving an automobile in the last five years?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer
- ◯ Question does not apply to me

* 191. In the last five years, have you been involved in an unreported crash on public property involving two non-automobile modes (i.e., ATV and bicycle, snow machine and dogsled, etc.)?

- ◯ Yes
- ◯ No
- ◯ Prefer not to answer
- ◯ Question does not apply to me

192. Consider your most recent unreported crash on public property. What transportation type were you using when this crash occurred?

- ○ ATV
- ○ Snowmachine/snowmobile
- ○ Agricultural vehicle
- ○ Dogsled/dog-powered mode
- ○ Bicycle
- ○ Pedestrian/walking
- ○ Other (please specify)

193. Consider your most recent unreported crash on public property. Why was this crash unreported? Check all that apply.

- ☐ No property damage
- ☐ No personal injury
- ☐ Property damage only (minor)
- ☐ Personal injury (minor)
- ☐ Lack of reportable information
- ☐ Prefer not to answer

Other (please specify)

194. Did this unreported crash on public property involve any operators under the age of 16?

- ○ Yes
- ○ No
- ○ Prefer not to answer

Respondent Characteristics

The questions in this section help us to ensure that we have obtained a representative sample of the population. Please be reminded that your responses are anonymous.

195. Do you have a (State Issued) Driver's License?

- ◯ Yes
- ◯ No

196. What is your employment status?

- ◯ Employed full-time
- ◯ Employed part-time
- ◯ Not currently employed

197. What description best describes your occupation?

- ◯ Salaried / Employee
- ◯ Self-Employed
- ◯ Student
- ◯ Retired
- ◯ Homemaker
- ◯ Other (please specify)

198. How would you best describe your job category?

- ◯ Sales/Service
- ◯ Clerical/Admin support
- ◯ Manufacturing, construction, maintenance, or farming
- ◯ Professional, managerial, or technical
- ◯ Other (please specify)

199. What age range describes you?

- ☐ 18-25
- ☐ 26-30
- ☐ 31-40
- ☐ 41-50
- ○ 51-60
- ☐ Over 60

200. What is your sex?

- ☐ Male
- ☐ Female
- ○ Other

201. What is your marital status?

- ☐ Single
- ☐ Married or with partner
- ○ Separated, divorced, or widowed
- ○ Other (please specify)

202. What is your highest completed education level?

- ☐ Less than high school diploma
- ☐ High school diploma or equivalency
- ☐ Some college, no degree
- ☐ Associate degree
- ☐ Bachelor's degree
- ☐ Graduate or professional degree

203. What is your approximate annual household income?

- ○ Under $25,000
- ○ $25,000 - $49,999
- ○ $50,000 - $74,999
- ○ $75,000 - $99,999
- ○ $100,000 - $124,999
- ○ $125,000 or more

* 204. What state do you primarily live in?

- ○ Alaska
- ○ Idaho
- ○ Washington
- ○ Oregon
- ○ Montana
- ○ Other (please specify)

205. What is the zip code of the community that you primarily live in?

206. Please feel free to provide any general comments or feedback about the survey or additional information here.