LATENT CLASS CLUSTER ANALYSIS OF DRIVER ATTITUDES TOWARDS RISKY DRIVING IN NORTHERN NEW ENGLAND: IS THERE A RURAL CULTURE OF UNSAFE DRIVING ATTITUDES AND BEHAVIOR?

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ABSTRACT

The vastly higher rate of highway death experienced by rural residents, compared to urban and suburban residents, could be at least partially explained by the presence of a “rural culture” characterized by bad attitudes towards dangerous driving behaviors. This paper describes the application of a method of behavioral analysis borrowed from the field of market research, designed to apply a statistically-based model to the task of segmenting the driving population based on the similarities of drivers’ attitude and beliefs structures.

A survey of over 1,000 residents of Maine, New Hampshire, Vermont, New York and Massachusetts was conducted to study the driving behaviors and attitudes of New England residents. The study explored the frequencies of risky driving behaviors and attitudes to better understand the driving culture of the targeted areas.

The work described in this paper used latent class cluster analysis to identify segments of the driving population which exhibit distinct patterns of attitudes and behavior. The analysis identified four distinct segments, two of which correspond with extremes of attitudes, behaviors and outcomes and two of which are more nuanced. However, rural residents tend to fall more predominantly in the segments that exhibit the attitudes, behaviors and outcomes associated with safe driving. Thus, the analysis decidedly does not find evidence of a rural culture of unsafe driving. If anything, this study finds the reverse; that is, rural residents tend toward segments that exhibit attitudes and behaviors that support safer driving and have better self-reported outcomes.

INTRODUCTION

Background

The question of why people speed, and more generally undertake risky driving behaviors, is a major concern both for those who set public policy, and for those whose lives have been damaged by the harm inflicted by bad driving behaviors. Throughout the world, interventions are being undertaken to lower the rate of mortality on the highways and roadways. In order to create an effective public policy or intervention designed to change behavior, it is critical to first develop a better understanding of why people behave the way they do (*1, 2, 3*). This paper describes the application of a method of behavioral analysis borrowed from the field of market research, designed to apply a statistically-based model to the task of segmenting the driving population based on the similarities of drivers' attitude and beliefs structures.

Latent class cluster analysis allows the analyst to create market segments based on the similarities of their attitudes, beliefs and behaviors revealed *post hoc* from the analysis of those variables, rather than segments based on such easily definable *a priori* categories as age, income, education or place of residence *(4)*. The method is in commonly used in a wide variety of market research applications such as developing advertising campaigns targeted to specific market subgroups within the population. Logically, latent class analysis could help to reveal those variables which interact to define the key segments, which in turn can be rank ordered in terms of their propensity to undertake risky driving behavior. Based on established marketing procedures, specific messages could be targeted to the specific market segments revealed.

A specific concern addressed by the authors of this paper is the tenable hypothesis that the vastly higher rate of highway death experienced by rural residents, compared to the rate for urban and suburban residents, could be at least partially explained by the presence of a "rural culture" characterized by bad attitudes towards dangerous driving behaviors. The most recent data from the US DOT reports a national death rate for rural areas as 2.4 times that of the rate for urban areas (*5*). Other research on the death rate of young males only shows a ratio of 4:1 when the least dense quintile of residence (rural) is compared with most dense quintile (urban) (*6*).

Previous Research

Extensive research has been carried out over the past decades concerning the relationship between attitudes/beliefs and actual bad driving behavior. Fortunately, the published literature benefits from several comprehensive reviews in the field: highly recommended is "Traffic Psychology Theories: towards understanding Driving Behaviour and Safety Efforts", by the Finish researcher Heikki Summala *(7)*. Another comprehensive review widely cited is "Behavioral Correlates of Individual Differences in Road-Traffic Crash Risk," by Elander, West and French *(8)* which places the present concern with attitudinal variables into a wider context of roadway safety research (see pages 288 to 290 for review of personality- based theories).

By comparison with the more generic relationship between attitudes and dangerous driving, the analysis of differences between the driving behavior of rural vs. non-rural populations has received a relatively small amount of attention until recently in the published literature, given the vast differences in the mortality rates between the two groups *(9,10,11,12,13,14)*. The literature establishes that the residents of rural areas have fewer accidents than non-rural residents, but with higher rates of mortality per accident. It follows then, that a set of interventions might be designed to lower the rate of risky driving

behaviors, resulting in fewer rural accidents with the intention to lower the overall fatality level associated with those accidents. This research is focused on the relationship between attitudes and risky driving behaviors, as part of a longer terms research effort to deal with unique characteristics of rural driving behaviors.

Project Approach and Design

The New England Transportation Institute has commenced a multifaceted study of rural transportation issues focusing initially on the three northernmost states in New England. A major concern is the differences in attitudes towards driving behavior for rural, compared against more urban, population segments. In an early stage of the program, research summaries were commissioned with both the VTI, based in Sweden, and INRETS, based in France (Assailly, 2007 *(15),* and Forward, 2006 *(16)* for examples of the work that was reviewed). Representatives of both institutions came together with NETI researchers, and participated in the creation of a survey instrument which could be used to gain early insights concerning the possible role of a wide variety of theories current in the field of attitudes affecting driving safety. The set of theories to be explored was designed to be inclusive, rather than exhaustive for any one given theory. Particular emphasis was given to indicators for theories in applied social psychology.

Approach

In the spring of 2009, NETI worked with Resource Systems Group, Inc. to conduct the NETI Rural Safety Study of residents of Maine, New Hampshire, Vermont, New York and Massachusetts. The purpose of the survey was to study the driving behaviors and attitudes of New England residents. The study explored the frequencies of risky driving behaviors and attitudes to better understand the driving culture of the targeted areas.

Particular importance was placed on understanding the culture of rural, young male drivers, as they are far more likely to be involved in fatal car crashes than their more urban counterparts.

Sampling Plan

The sampling plan was designed to obtain a representative sample of residents less than 30 years old and those 30 years old or older residing in rural, suburban and urban areas within each of the three states. The use of 30 years of age to define the category was designed to capture a sharp peak of accidents at around 25 years, with a sharp decline over the next years (4). The survey targeted a sample of 1,000 residents across Maine, Vermont and New Hampshire; due to difficulty in filling certain low-incidence sub-quota cells within this geographic area, some residents from Massachusetts and New York were also surveyed.

The 2007 American Community Survey (ACS) data for the states of Maine, New Hampshire, and Vermont provided by the U.S. Census Bureau was used to develop the sampling plan. For each state, the proportion of the population residing in rural, suburban, and urban areas was determined using the "percent rural" statistic provided in the ACS data set. For the sampling plan purposes, zip codes identified as being 90 to 100 percent rural were classified as "rural", zip codes identified as 20 to 89 percent rural were classified as "suburban", and zip codes falling within 0 to 19 percent rural range were classified as "urban." The ACS data set also provided the proportion of the population less than 30 years old and 30 years old or older and the proportion of men/women in the population.

Using these sets of proportions (rural/suburban/urban, under 30/30 plus, and gender), target sample numbers were developed, and matched to the sets of zip codes representing rural, suburban and urban for each of the three states.

Survey Administration

The survey approach employed an online survey using an internet-based computer-assisted self-interview (CASI) technique developed by Resource Systems Group, Inc. Potential respondents received an email invitation with a link to the survey and in total, 1,033 online surveys were completed.

Survey Questionnaire

A questionnaire was developed to collect data in order to better understand the driving and health habits of rural New Englanders. The questionnaire included five sections preceded by a screening section:

- Screening: A series of demographic questions to determine if the respondent qualified for the survey;
- About you and where you live: Questions regarding household characteristics, daily activities and distances to living necessities;
- An imaginary situation: Participants were presented with a common driving situation in a rural town setting and rated the extent to which they agreed with statements regarding the situation;
- Where you live and how you travel: Questions regarding exercise and types of transportation used;
- Another imaginary situation: Participants were presented with a second common driving situation in a rural highway setting and rated the extent to which they agreed to statements regarding the situation; and
- Thoughts about driving: Participants shared the frequency they engaged in certain driving behaviors and how they viewed themselves as drivers.

Themes explored in the survey

The survey instrument was designed to allow for a wide variety of concepts to be explored, both individually and in combination. Individual questions were designed to explore the possible roles of:

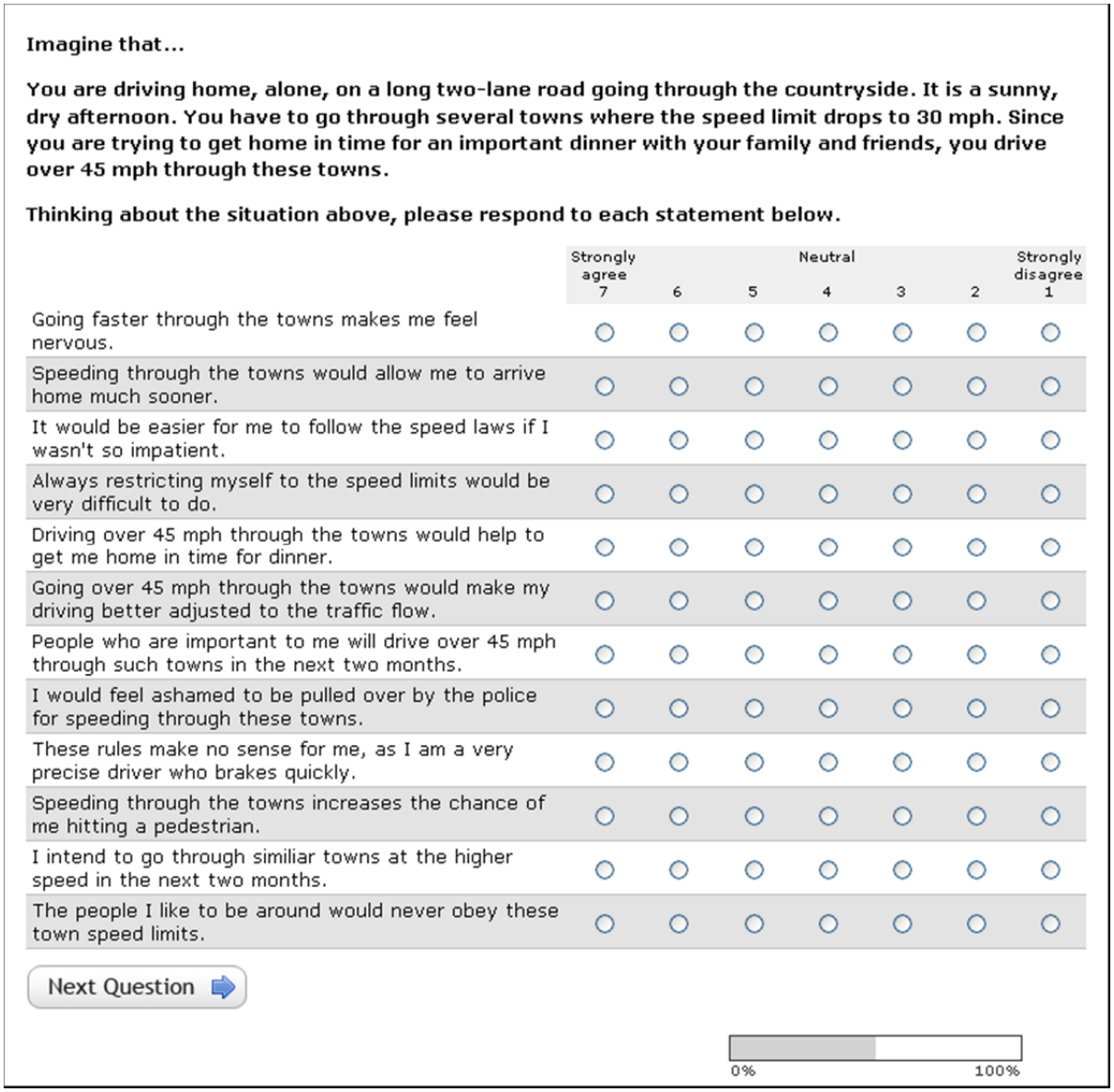
- Objective norm (The people I like would speed)
- Injunctive norm (The people I like would approve of me speeding)
- Attitude –Instrumental (Speeding would get me home sooner)
- Attitude – Affective (I would be annoyed to be behind the slow car)
- Denial of risk-general (There is no danger is driving close)
- Denial of risk- personal (I am a better driver, so there is no danger in my driving close)
- Sensation seeking – intensity (How often do you do dangerous things, just for fun?)
- Sensation seeking – novelty (I prefer friends who are exciting and unpredictable)
- Social capital (I go to public meetings)
- Antisocial behavior (Take time off from work to have fun)
- Self efficacy (I can usually manage whatever I need to manage)
- Personal norm (I would be ashamed to be pulled over for speeding)
- Self Efficacy/control (I am confident I could speed less if I wanted to)
- Other rural issues (there is nothing to do here at night)

Importantly, individual variables were analyzed separately so they could be clustered with other variables initially assumed to be part of different attitudinal categories.

To better define dangerous driving behavior, several questions were taken directly from the Driver Behaviour Questionnaire (DBQ) *(14),* and subjected to confirmatory factor analysis. Six variables (known in the literature as ‘violations’) were used in the analysis of behavior which is overtly dangerous

to others. For example, not wearing a seat belt is a negative behavior, but does not form a threat to others. In addition, the format of the DBQ was used as often as possible, while recognizing that our set of attitude variables was different from those of the original authors of the DBQ. The format for creating a scenario for the respondent to react to "It is a clear summer day, and the road is dry…." (Figure 1) was used to the maximum extent possible for possible later comparison with other studies utilizing the DBQ *(17).*

FIGURE 1: SCREENSHOT OF DBQ SCENARIO QUESTION IN WEB SURVEY



Imagine that…

You are driving home, alone, on a long two-lane road going through the countryside. It is a sunny, dry afternoon. You have to go through several towns where the speed limit drops to 30 mph. Since you are trying to get home in time for an important dinner with your family and friends, you drive over 45 mph through these towns.

Thinking about the situation above, please respond to each statement below.

	Strongly agree 7	6	5	Neutral 4	3	2	Strongly disagree 1
Going faster through the towns makes me feel nervous.	○	○	○	○	○	○	○
Speeding through the towns would allow me to arrive home much sooner.	○	○	○	○	○	○	○
It would be easier for me to follow the speed laws if I wasn't so impatient.	○	○	○	○	○	○	○
Always restricting myself to the speed limits would be very difficult to do.	○	○	○	○	○	○	○
Driving over 45 mph through the towns would help to get me home in time for dinner.	○	○	○	○	○	○	○
Going over 45 mph through the towns would make my driving better adjusted to the traffic flow.	○	○	○	○	○	○	○
People who are important to me will drive over 45 mph through such towns in the next two months.	○	○	○	○	○	○	○
I would feel ashamed to be pulled over by the police for speeding through these towns.	○	○	○	○	○	○	○
These rules make no sense for me, as I am a very precise driver who brakes quickly.	○	○	○	○	○	○	○
Speeding through the towns increases the chance of me hitting a pedestrian.	○	○	○	○	○	○	○
I intend to go through similiar towns at the higher speed in the next two months.	○	○	○	○	○	○	○
The people I like to be around would never obey these town speed limits.	○	○	○	○	○	○	○

Next Question

0% 100%

Early projects in the NETI Rural Safety program

The early analyses from these survey data applied a basic descriptive analysis based on the statistically significant comparison of means, which suggest that; 1) there is no significant culture of bad driving on the part of the rural segment of our sample: and 2) their set of attitudes are far more pro-safety than either their urban or suburban counterparts (*18*). The study team was not entirely satisfied by the results from these standard descriptive analyses comparing rural and urban drivers, thus the team decided to

investigate alternate approaches to analyzing the data that would allow them to explore more nuanced and latent differences between groups that could not be easily parsed via standard analysis methods.

In order to better understand attitudes which are associated with dangerous driving behavior, the Rural Safety research program decided to apply two separate approaches. Under the first approach, not covered by this paper, all potential theories were reviewed for inclusion in a structural equation model (SEM) involving the creation of 'latent factors' to explore the interaction of several factors concerning attitudes, and their relationship with the factor representing risky driving behavior *(19)*. The application of the SEM revealed, as expected, that only a small number of attitude-based latent factors were needed to predict risky driving behavior in a model with a satisfactory level of "goodness of fit." The resulting model was then run simultaneously for one urban sample, and one non-urban sample to allow the direct comparison of model parameters. That research method suggested that sensation seeking may be far more relevant for the non-rural group, with a comparatively larger role for denial of risk in the rural group.

Concerning the second approach, the study team desired to go beyond the "urban vs. rural" dichotomy, and apply a modeling process which would reveal as accurately as possible how the population might be segmented into the most meaningful and usable market segments. This paper discusses this segmentation approach and the results of this analysis.

LATENT CLASS ANALYSIS OF DRIVING ATTITUDES AND BEHAVIORS

Latent Class Technique

Previous analyses of the NETI rural safety survey focused on the development of methods which linked attitudes and behavior. Those models were tested for different population segments that were identified *a-priori* based on characteristics such as age, gender or residence location (rural vs. urban). And, while significant differences were found in the models for each of these population segments, differences in attitudes and behavior are likely more complex and must instead be explained by multiple factors.

The analysis described in this paper complements the previous work by identifying segments of the population that emerge post-hoc from patterns of attitudes that are shared by those different groups. Latent class modeling assumes that the population can be segmented into a finite number groups, or classes, according to some combination of characteristics. The individuals within each of the groups share similar characteristics and are dissimilar from those in other groups according to those same characteristics. Latent class cluster methods use a statistical model-based approach to determine the nature of those groups and the membership of individuals in them based on patterns of the characteristics observed in the data, rather than *a priori* as in simpler segmentation approaches. Class membership is assumed to be probabilistic so each individual can, in theory, possess characteristics of each class, to varying degrees according to their class membership probabilities. Standard statistical tests can be used to determine the most appropriate number of segments (clusters) that should be used to classify the population according to the characteristics selected for the segmentation. Once the classes are defined, the members of those classes can be profiled along with the characteristics used to define the classes as well as any other variables that are not used to define the classes.

In this study, the latent class modeling was conducted using the set of drivers' attitudes and hypothetical behavioral situations as the basis for defining the classes. Since attitudes affect behavior in some way, understanding the sets of attitudes that correspond to certain patterns of behavior can provide indications of which attitudes must be affected to, in turn, affect behavior.

The latent class cluster model described in this paper was estimated using Latent GOLD 4.5. The technical documentation for Latent GOLD describes in detail the specification and estimation of latent class cluster models (*4*).

Latent Class Results

The latent class modeling effort is an iterative process, which starts with a large number of variables (called "indicators") used in the specification. The large set of variables is narrowed down throughout the process and results in a core set of variables that each have significant effects on cluster classification; this is determined based on the computed R^2 of each variable. This value represents the explanatory strength of the variable in determining cluster membership. TABLE 1 shows the indicator variables used in the final model developed for this analysis, sorted by their associated R^2 values.

TABLE 1: LATENT CLASS MODEL INDICATOR VARIABLES

Indicator Variables	R^2
Tailgating the car in front of me would increase the chance of having a bad accident	0.42
Disregard the speed limit on a two-lane highway	0.38
I am confident that if I wanted to, I could drive within the town speed limits	0.36
I am confident that I could resist the temptation to tailgate if I wanted to	0.36
Go more than 75 mph on an interstate	0.34
I would feel ashamed to be pulled over by the police for tailgating the slow car	0.32
Hurting someone else with my car would scar me for life	0.32
Disregard the speed limit on a residential road	0.31
Go more than 80 mph on an interstate	0.30
I think it's okay to speed if the traffic conditions allow you	0.29
Speeding through the towns increases the chance of me hitting a pedestrian	0.29
Driving close to the car in front of me would make me nervous	0.27
Race away from traffic lights with the intention of beating the driver next to you	0.26
I like new and exciting experiences, even if I have to break the rules	0.25
I usually go through towns at the higher speed (over 45 mph)	0.25
I would feel ashamed to be pulled over by the police for speeding through these towns	0.24
There is a good chance the police will pull me over for going over 45 mph in these towns	0.23
It is dangerous to drink and drive	0.23
Always restricting myself to the speed limits would be very difficult to do	0.22
I intend to go through similar towns at the higher speed in the next two months	0.22
It is mostly up to me whether or not I drive close to the car in front of me	0.21
How often do you do exciting things, even if they are dangerous?	0.18
I would feel really annoyed if I had to drive behind such a slow vehicle	0.18
How often do you do dangerous things for fun?	0.17
How often have you taken sick time off work when you have something more interesting to do?	0.17
The people I like to be around will tailgate a slow car in the next two months	0.17

Additionally, other statistics are used to determine the model fit and the optimal number of classes or clusters. This modeling effort resulted in a four-class model which was developed to understand driving attitudes and behaviors.

Once the clusters are determined, they can be examined in terms of various demographics and other data in order to better understand the make-up of each cluster. TABLE 2 includes a summary of demographic variables and more tangible measures of driving behavior (i.e., the percentage of respondents who have received traffic tickets and/or been in a car crash).

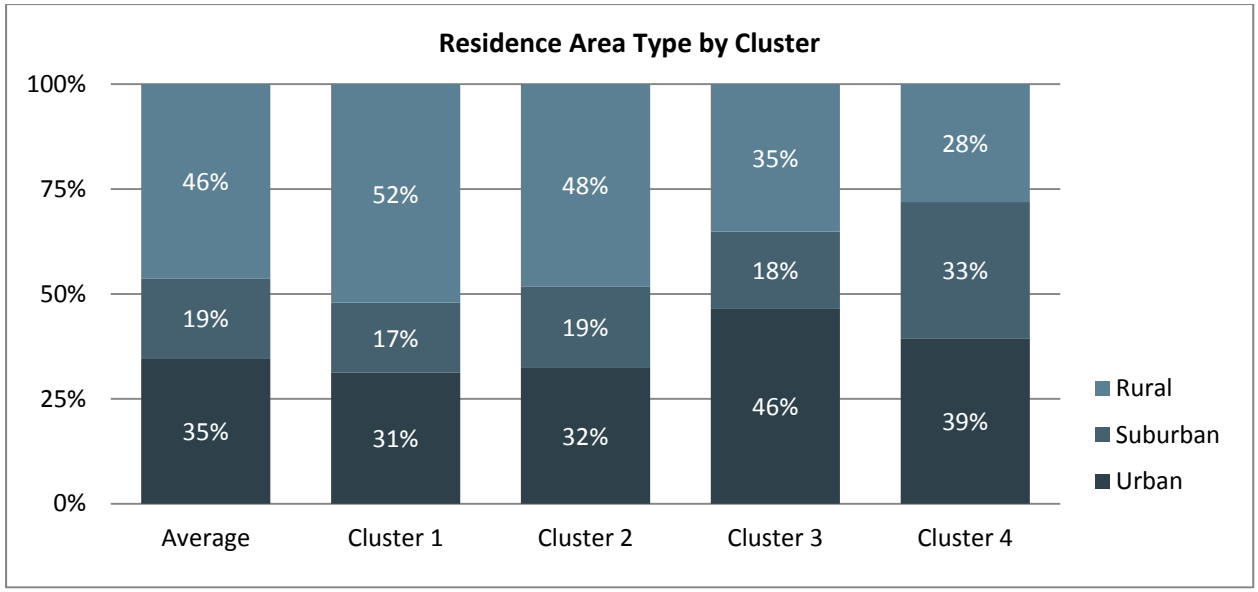
TABLE 2: SUMMARY OF DEMOGRAPHICS BY CLUSTER

Cluster	% of sample	Geography	Age	% with one or more tickets	% with one or more crashes
Cluster 1	48%	More rural	Older	39%	20%
Cluster 2	28%	More rural	Mix	47%	27%
Cluster 3	16%	More urban	Younger	42%	23%
Cluster 4	9%	More suburban	Younger	60%	37%

Cluster 1 is the least likely to have received a traffic ticket (39%) or be in a crash (20%) and Cluster 4 is the most likely (60% and 37%, respectively), suggesting that attitudes about driving manifest in measurable driving outcomes (tickets and crashes). If risky attitudes about driving could be altered, perhaps this would lead to safer driving.

Clear differences can be seen between the clusters when examining the density of the area where they live (FIGURE 1 1). Roughly half of those in Cluster 1 and 2 live in a rural area, while nearly half of Cluster 3 lives in an urban environment. Cluster 4 is *least rural* of the four clusters, and the most suburban, with a third of those in this cluster living in the suburbs. Importantly, the more rural clusters are *less* likely to participate in risky driving behaviors, which reinforces the conclusions of earlier work utilizing this dataset, as well as the reported work of others (see AAA Safety Foundation, *(20) and Rackauskus (11)*). Comparing the clusters in the present analysis, some of this may be due, in part, to the fact that they tend to be older than the Cluster 3 and 4.

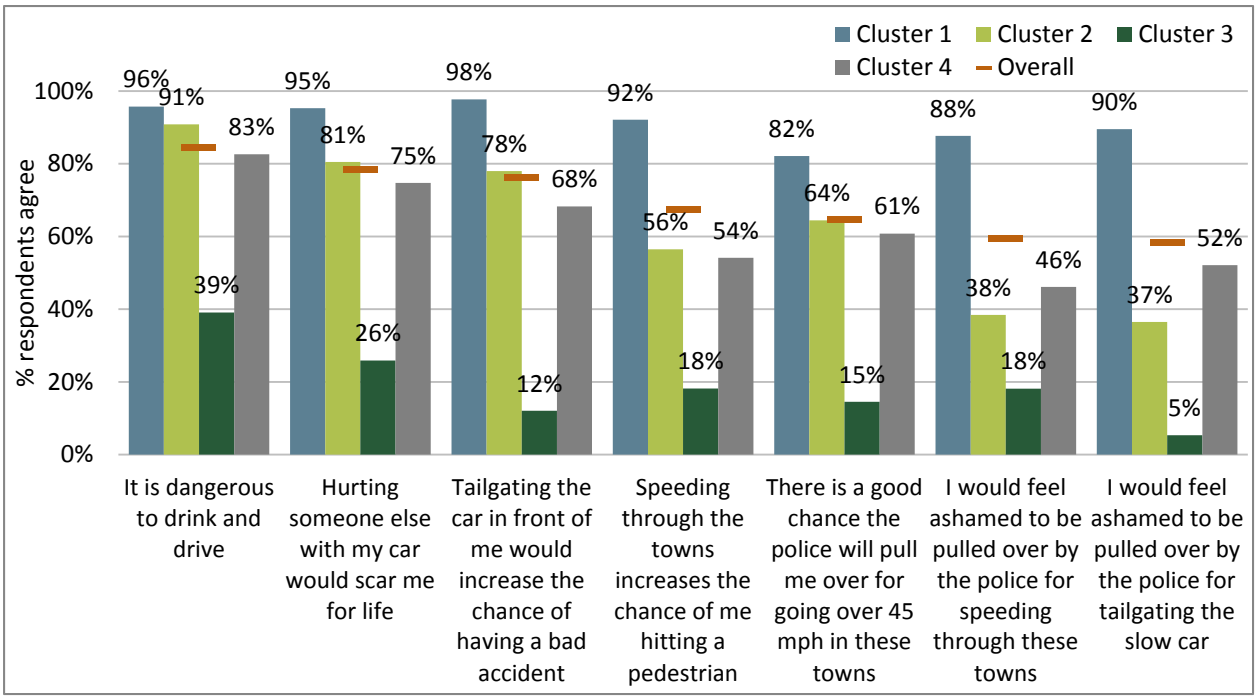
FIGURE 1: RESIDENCE AREA TYPE BY CLUSTER



Observations by groups of key variables

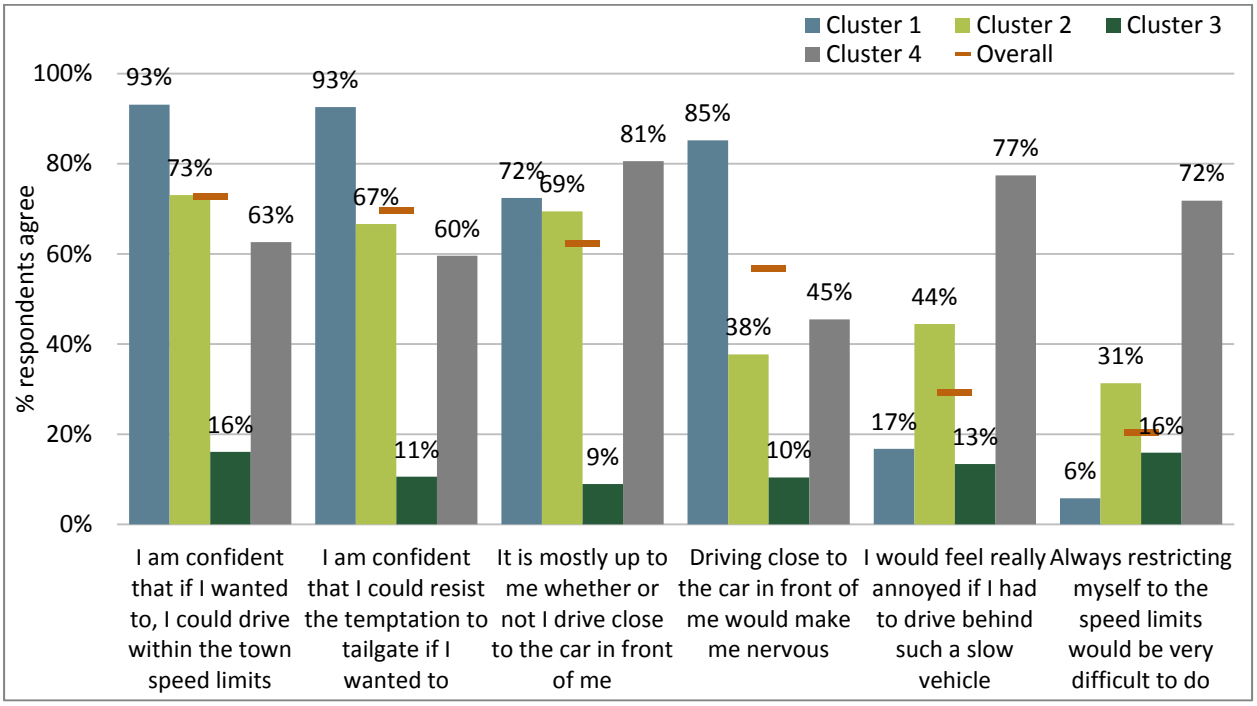
Each of the four clusters was reviewed in terms of the percent of members of each cluster that agreed with key attitude statements in several areas, three of which are reported here: a) Acceptance of Danger /Feeling of Shame, b) Self control/Self efficacy; and, c) Sensation Seeking. Each cluster was then reviewed in terms of bad driving habits, number of tickets received, and number of crashes experienced.

FIGURE 2: ACCEPTANCE OF DANGER/FEELING OF SHAME



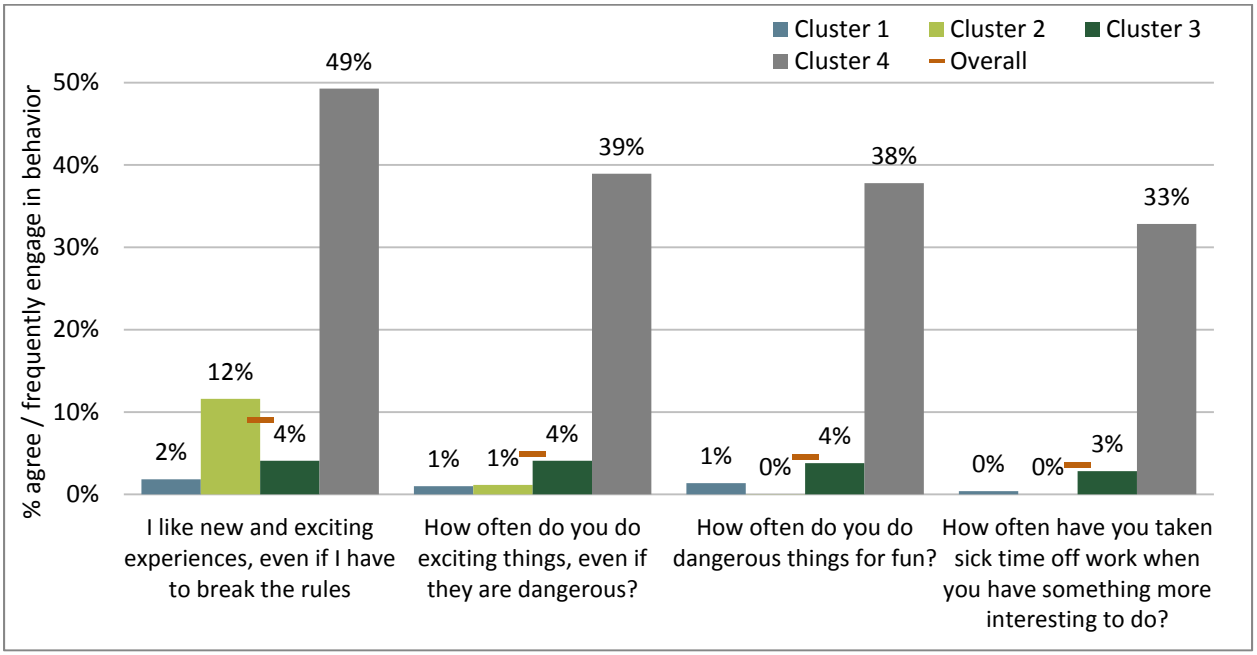
Cluster 1 strongly identifies with the attitude statements involving acceptance of dangers and responsibilities for their actions. Cluster 2 and 4 are also concerned when there is a chance they could hurt someone else; however they are not as concerned about what others think. Cluster 3 does not recognize that their driving could hurt others and does not accept the concept of shame for these behaviors.

FIGURE 3: SELF CONTROL/SELF EFFICACY



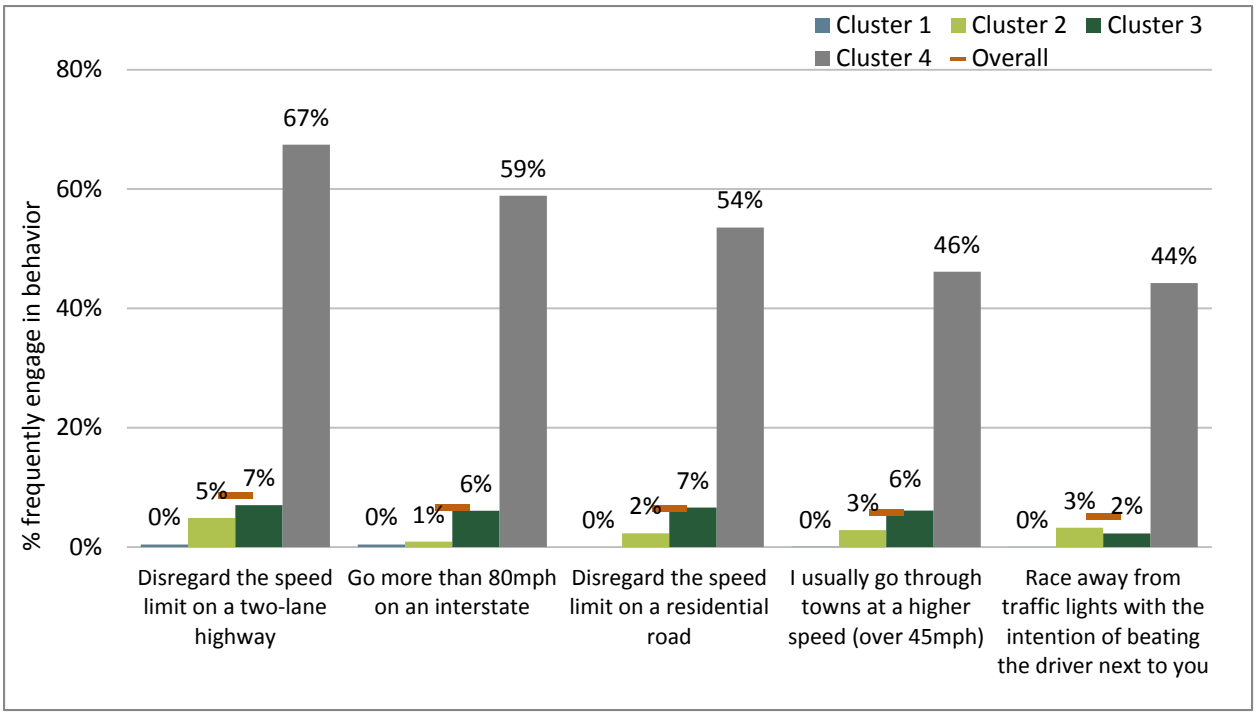
Cluster 1 members believe they can control their actions and resist temptation. Cluster 2 believes they can control their behavior, though to a lesser extent; but they are more likely to feel annoyed by slow drivers. Cluster 4 is less likely to believe they can control their actions and resist temptation—despite realizing their driving could hurt others. Cluster 3 is the least likely to feel they have control over a potential change in their behavior, consistent with their lack of belief that there really is a problem.

FIGURE 4: SENSATION SEEKING



From the four indicators we utilized, it is clear that membership in Cluster 4 is very much influenced by propensity towards sensation seeking. From the point of view of attitudes and personality, sensation seekers appear in Cluster 4. The importance of this becomes more clear in the next graph which shows the relationship of Cluster 4 membership to risky driving behavior (the questions used in the survey instrument concerning Sensation Seeking were influenced by a key paper on how to collect this information on a cost effective basis, *Stevenson, et al.* (21)).

FIGURE 5: RISKY DRIVING BEHAVIOR



Risky Driving Behaviors, Number of Tickets and Crashes

As expected based on the attitudinal variables, Cluster 1 is the most law abiding group, with only 30% of the members report receiving traffic tickets, with almost no member reporting a risky behavior. It is perhaps surprising that Cluster 3, with their denial of risk and refusal to report shame, emerges as slightly better in terms of the number of tickets received than does Cluster 2. Cluster 4 emerges as expected as the least law abiding group, with 47% reporting having received at least one ticket while fully two thirds reported at least one act of risky behavior.

This group ranking remains unchanged when observing the number of crashes, with only 20% of Cluster 1 reporting any crashes and 23% of Cluster 3. With 27% of Cluster 2, and 37% of Cluster 4 reporting crashes, the position of Cluster 4 as the most dangerous group on the road is reinforced.

Summary of Clusters

Cluster 1 tends to identify with the statements regarding acceptance of danger, self control and being safety conscious; they are not sensation seekers and do not engage in risky driving behaviors. This cluster is more rural than the other clusters. Members tend to be older than the other clusters, with a mean age of 46 years old, which may also contribute to this group being safer drivers. As one would expect from the attitudes held by this group, they have much safer driving behavior—receiving the lowest number of traffic tickets and being less likely to be in a car crash.

Cluster 2 is aware of the risks associated with driving, but less likely to be ashamed if they are caught participating in risky behavior. They feel they can control their behavior at times, though to a lesser extent than Cluster 1. This group generally does not engage in risky driving behaviors as a default, though they can be driven to when outside factors (e.g., slow drivers) incite them to. Similarly, while they are less likely to report that “people they like” will tailgate a car than the problematic Cluster 4, they

report doing so at a rate twice that of Cluster 1 or 3. Cluster 2 is younger than Cluster 1, with a mean age of 37 years old, and contains people from a mix of urban, suburban, and rural areas.

Cluster 3 simply denies the existence of risk and danger in driving, and seems to have no interest in forming feelings of confidence that they *could* change their behavior. But, in evident contradiction to this pattern, they don't feel inclined to participate in risky driving habits. The mean age for this cluster is 31 years old, making these respondents younger than the previous clusters. This group is the most urban of the clusters, with 46% living in an urban environment.

Respondents in Cluster 4 tend to be sensation seekers and are the most likely group to participate in risky driving behaviors. They seem to acknowledge the dangers associated with risky driving, though sensation seeking appears to be a stronger driver of behavior. This problematic group is the least rural, and the most suburban. Like Cluster 3, this cluster tends to be younger, with a mean age of 30 years old; they are also the most likely to have received a ticket or been in a crash, which is consistent with their attitudes about driving and safety.

CONCLUSIONS

Latent class cluster analysis, along with other methodologies, such as Structural Equations Modeling, can be used to better understand drivers' attitudes that affect their driving behaviors. Results can be used to better target safety messaging to the various groups of risky drivers—appealing to their sense of self control, redirecting sensation seeking, or informing them of the risks of their driving behaviors.

The work described in this paper used latent class cluster analysis to identify segments of the driving population which exhibit distinct patterns of attitudes and behavior. As might be expected, the two extremes are represented in distinct segments: one which has attitudes and behavior supporting safe driving and the other whose attitudes and behavior suggest unsafe driving with correspondingly unfavorable outcomes (number of speeding tickets and number of crashes). And, as expected, the former is a much larger fraction of the population (almost half of the total), while the later is a much smaller portion (less than 10%). There are, however, two intermediate and more nuanced segments whose attitudes and behaviors could potentially be affected positively by campaigns focused on the elements that drive their behavior – for example, for Cluster 2, focusing on the specific events that incite them to react unsafely in certain circumstances and for Cluster 3, providing evidence of the dangers of unsafe driving habits.

The primary purpose of this work was to determine whether there are significant differences in attitudes and behavior among rural residents that could contribute to the higher crash and fatality rates on rural roads. Any conclusions should be couched within the context of the study that was conducted here, including the fact that it covers only residents of northern New England and that the behaviors and outcomes are self-reported. Clearly, an intervention that is based on a solid understanding of the attitudes and beliefs of the rural driver could logically have the effect of lowering the accident rate, resulting with fewer overall rural accidents, with their concomitant high propensity to result in fatalities.

However, the analysis has not found consistent evidence of an overall rural culture of unsafe driving attitudes and behavior. If anything, this study finds the reverse; that is, rural residents in northern New England tend toward the segments that exhibit attitudes and behaviors that support safer driving and have better self-reported outcomes. This suggests that the overall worse outcomes on rural roads could come from the characteristics of those roads (e.g., predominance of 2-lane roads without access control)

and from use of those roads by residents of other areas but is unlikely to be due to a culture among these rural residents of unsafe driving behavior.

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