IDENTIFYING FATALITY FACTORS OF RURAL AND URBAN SAFETY CULTURES

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Summary: The fatality rate in rural areas is considerably higher than it is in urban areas. In order to better understand the differences and similarities between attitudes and behaviors of drivers in different geographic areas, a large scale survey was conducted in both rural and urban counties within the state of Minnesota. As part of this survey, recipients were asked to rate the frequency and dangerousness of risk factors that play a role in fatal crashes. They were also asked to rate how effective and desirable a number of proposed safety interventions would be in their own communities. Though both urban and rural drivers reported practicing various unsafe driving behaviors, rural drivers engaged in particular factors, such as not wearing a safety belt, and did not recognize the true extent of these risks. Rural drivers also consistently felt that proposed safety interventions were less useful than did drivers from urban areas. It is hoped these results can be used to help instruct research efforts and inform policy decisions of the attitudes and beliefs of drivers who experience differing safety cultures.

INTRODUCTION

In the US, the total number of annual traffic fatalities and the rate of fatalities per vehicle mile traveled are both considerably higher in rural areas compared to urban areas (NHTSA, 2001). Persons involved in a rural crash are also three times more likely than those in an urban crash to suffer a fatality (NHTSA, 1996), and more likely to require hospitalization (NHTSA, 2001). The effect of the greater severity and crash fatalities in rural areas is compounded by lower rates of seat belt use by rural vehicle occupants, resulting in twice as many ejected occupants as compared to urban crashes.

Behavioral factors such as seat belt use, driving while intoxicated, and law compliance may hold the greatest opportunity for traffic safety researchers to study and decrease crash fatalities. Seat belt usage (NHTSA, 1996) and alcohol (Blatt & Furman, 1998) not only contribute significantly to the seriousness of crash injuries and fatalities but may also pose a greater risk in rural areas than in urban areas. Crash location is also confounded with type of driver, making it necessary to examine differences in personality, attitudes, and behaviors in relation to traffic safety that may distinguish between rural and urban resident drivers.

The objective of this project is to understand the behavioral and attitudinal risk factors of rural and urban residents that may be related to the significantly higher crash rate on rural roads compared to urban roads. To do this, we have conducted a large-sample survey of rural and urban residents to draw meaningful comparisons between sites with similar and differing crash

rates. This survey focused on known risk factors such as alcohol, speeding, seat belt usage, and attitudes towards current and proposed safety interventions. This type of methodology can be used to assess driver culture on both state-wide and regional levels to improve safety interventions proposed by policymakers and advocate groups. It also allows us to identify problem areas and groups so as to focus efforts where aid is necessary and with interventions that will be accepted by target populations.

METHODS

Participant Sample

Three urban and three rural Minnesota counties were selected based on population and fatality rate criteria. The rural counties were selected because they represent areas that do not have a major paved, undivided road with a speed limit greater than 60 mph within their boundaries, and do not contain a city with a population of over 5000 people. The rural counties also represent high, medium, and low fatality risks (2.82, 1.53, and 0.64 fatalities per 100 Million Vehicle Miles Traveled, respectively) while the urban counties have relatively low fatality risks per 100 Million VMT (0.75 – 0.54). In order to sample a wide range of experience, recipients were selected from three age groups: young (18-26 years), middle (30-50 years), and old (65 years and older).

Just under 5000 recipients were selected from Minnestoa driver's license data sampling evenly from the age and geographic (county) criteria listed above. Potential recipients were excluded if their license was expired or not valid, if they only held an ID card, or if they held a moped- or permit-only status.

The survey packet contained a welcoming letter, an instruction sheet, a questionnaire booklet (8 page booklet, folded and stapled), and a return envelope. They also received a postcard a few weeks after receiving the packet to remind them to answer the survey. Recipients who did not respond were sent a second questionnaire packet six weeks after the first. Recipients were also asked (through the survey) if they wished to take part in a $50 Target gift-card drawing; 20 winners were selected at random after all surveys were collected.

Response and Data Cleaning

We had a 34.3% response from rural and 30.4% response from urban areas, with over 1622 returned packets. Females (36.2%) were more apt to respond than males (29.3%). By age, we were more likely to receive a response from the Old age group (46%) than either the Middle (32%) or Young (21%) age groups.

Responses were removed if they did not match for age, gender, or zip code. We also asked participants what type of area they thought they were from: rural, suburban, or urban. We were interested in responses from people who perceive themselves from the corresponding geographic area. For this reason, we excluded participants from rural counties who responded that they lived in an urban or suburban area. Likewise, we excluded participants from urban counties who responded that they lived in a rural area.

The total number of valid responses was 1399, composed of 828 rural and 571 urban respondents. There were no differences between the two regions in overall gender composition. There was a significant difference in the mean age of respondents from rural and urban counties, as shown in Table 1.

Table 1. Age group distribution observed and expected by geographic area

	Observed (Expected)	
Age Group	Rural	Urban
Young (18-26 years old)	**171 (163)**	105 (112)
Middle (30 - 50 years old)	**310 (289)**	178 (199)
Old (65 + years old)	342 (371)	**285 (256)**

A chi square analysis showed that there was a significant difference between the observed and expected number of respondents by age group and geographic area, $X^2 = 10.176$, $p \leq 0.01$. It appears that more older respondents than expected returned surveys from urban areas, while more young and middle-age respondents than expected were sampled in rural areas. Because of this, we controlled for age effects on the dependent variables by using age (birth year) as a covariate.

Measures & Analysis

Fatality Factors. A 16-item survey was created by the researchers in order to quantify the attitudes of respondents regarding types of high-risk driving behaviors. The activities represent driving activities that may be considered unsafe and are often linked to fatalities on the road (e.g., alcohol use, speeding, and seat belt usage). This analysis focuses on three risk factors that might be related to the difference in fatality risk between rural and urban populations: driving while intoxicated, speeding, and seat belt use.

The survey asked respondents to indicate how dangerous they thought each activity was on a six-point scale as follows: not at all dangerous, mostly not dangerous, somewhat not dangerous, somewhat dangerous, dangerous, extremely dangerous. The survey also asked respondents to indicate how frequently they have engaged in each activity on a six-point scale as follows: never, infrequently, somewhat frequently, frequently, always.

Safety Attitudes Towards Interventions. A 20-item survey was created by the researchers in order to quantify how surveyed drivers thought of proposed safety initiatives of the Minnesota Department of Transportation's (Mn/DOT) Towards Zero Deaths (TZD) Initiative. The safety initiatives are focus areas intended to lower the number of deaths (e.g., 'A law making seat belt usage mandatory,' or 'Increase law enforcement presence on roads').

The survey asked respondents to indicate how effective each intervention would be on a four-point scale as follows: ineffective, somewhat ineffective, somewhat effective, effective. This survey also asked respondents to indicate how desirable each intervention would be on a four-point scale as follows: undesirable, somewhat undesirable, somewhat desirable, desirable. A

utility score of these interventions was then computed by multiplying the effectiveness and desirability scores together for each of the 20 interventions.

A principal components analysis (PCA) was used to determine how interventions should be grouped as composite component measures. The components that emerged were subjected to a reliability analysis (Cronbach's alpha). In an exploratory analysis, such as the measures we created, a lenient cut-off of 0.6 is common (Garson, 2006). The following components were shown as sufficiently reliable and were used in our analysis below: Enforcement (Alpha = 0.84), Engineering / Crash-Impact Reduction (Alpha = 0.79), Education (Alpha = 0.68).

A 2 (area) x 2 (gender) between-subjects ANCOVA was performed using age (birth year) as a covariate. All assumptions for ANCOVA analysis (e.g., homogeneity of slopes) were tested and verified for all measures.

RESULTS

Fatality Factors

For all fatality factors there was a significant main effect for gender, where female respondents reported engaging in each factor less frequently and felt each factor was more dangerous than males did (all $p \leq 0.001$).

Driving While Intoxicated. Rural respondents perceived driving while intoxicated to be less dangerous (M = 5.5) than urban drivers (M = 5.7), $F(1,1324) = 7.14$, $p < 0.01$. There was no difference between rural and urban areas in terms of frequency of reported driving while intoxicated.

Speeding. There were no differences between rural and urban areas in the perceived dangerousness of speeding over the limit. Rural respondents reported driving 10 miles per hour (mph) over the limit less frequently (M = 2.18) than urban drivers (M = 2.39), $F(1,1382) = 24.94$, $p < 0.001$.

Safety Belt. Rural respondents perceived not wearing a seatbelt as less dangerous (M = 4.50) than urban respondents (M = 4.84), $F(1,1327) = 18.57$, $p < 0.001$, as shown in Figure 1. Rural respondents reported using a seatbelt less frequently (M = 1.89) than urban drivers (M = 1.44), $F(1,1381) = 4.38$, $p < 0.001$.

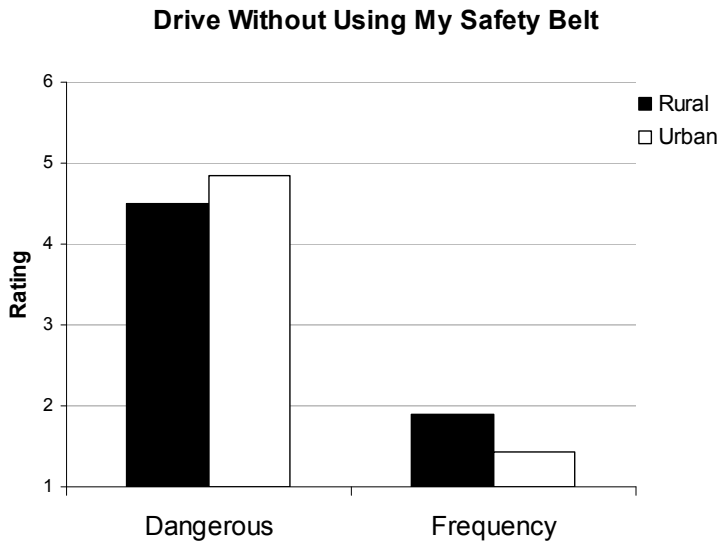

Figure 1. Dangerousness and Frequency ratings for driving without using a safety belt

Safety Interventions

For all safety intervention types there was a significant main effect for gender, where female respondents felt that the enforcement, education, and engineering interventions were more useful (i.e., they reported each one was more effective and desirable) than males did (all $p \leq 0.001$).

Enforcement. Rural respondents thought that safety interventions relating to enforcement were of lower usefulness (M = 9.88) than did urban respondents (M = 10.77), $F(1,1362) = 59.03$, $p < 0.001$, as shown in Figure 2.

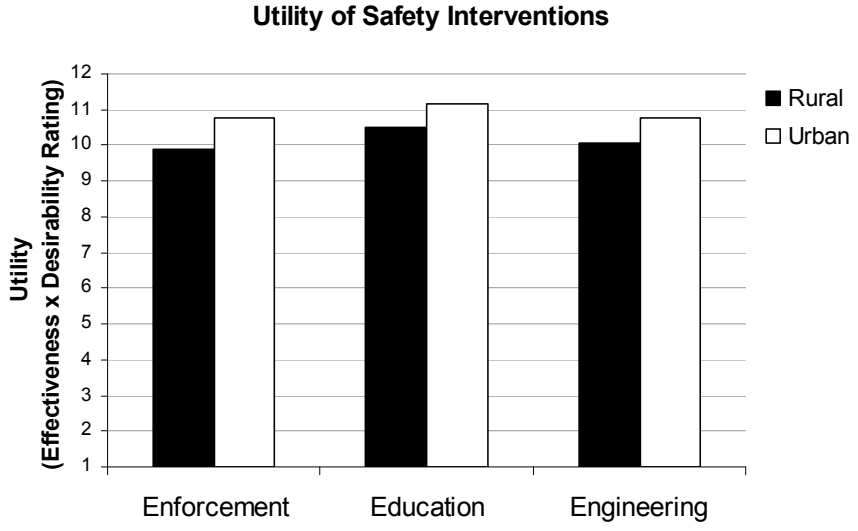

Figure 2. Utility scores for enforcement, education, and engineering types of safety intervention

Education. Rural respondents thought that safety interventions related to education were of lower usefulness (M = 10.48) than did urban respondents (M = 11.17), $F(1,1359) = 10.07$, $p < 0.01$, as shown in Figure 2.

Engineering. Rural respondents thought that safety interventions related to engineering and crash impact reduction were of lower usefulness (M = 10.08) than did urban respondents (M = 10.76), $F(1,1359) = 13.89$, $p < 0.001$, as shown in Figure 2.

CONCLUSIONS

Rural drivers also reported less frequent usage and thought that not wearing a seatbelt was less dangerous than did urban drivers. This reflects the higher fatality rates in rural areas as a serious safety concern, as both the perception and actions of rural drivers suggest that they do not respect the benefits of seatbelt compliance.

Rural respondents perceived driving while intoxicated to be less dangerous than urban drivers did, which seems to agree with the higher fatal crash risk that is prevalent in rural counties. As for speeding, rural drivers reported doing so less frequently than urban drivers. This may result from a combination of factors that are not limited to the types of roads driven, the speed limits on said roads, or an adaptive response to often being alone on remote roads.

Rural drivers rated all three types of interventions to be significantly less useful than urban drivers did. Perhaps because research has shown rural communities tend to have deterministic views (about traffic safety) and tend to distrust government involvement (Roth, Roth, & Elgert, 2003), our rural respondents perceived the interventions to be less useful than urban respondents.

There was a pervasive effect for gender in the intervention and fatality risk results. Specifically, females reported seeing more utility in all types of safety intervention, thought all risk factors were more dangerous, and engaged in risk factors less frequently than males. This may suggest that females invest more mental and behavioral effort into driving safely, and as such appreciate the benefits of safety interventions.

Survey methodology can be used to assess driver culture unobtrusively, and to then inform policy. By understanding these psychological differences, it may be possible to target specific community interventions based on education and enforcement that may be more valid and effective for rural populations. The next stage of the project will allow us to compare and extend these findings to driving behavior in a driving simulator. By linking dangerous tendencies identified in the survey with dangerous driving habits, we can enlighten and strengthen our suggestions for policy change where problems exist in both rural and urban areas.

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