Aggressive driving: A survey of attitudes, opinions and behaviors

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Corresponding Author: Mr. ward vanlaar, MA, MA, Drs.

Corresponding Author's Institution: Traffic Injury Research Foundation

First Author: ward vanlaar, MA, MA, Drs.

Order of Authors: ward vanlaar, MA, MA, Drs.; Herb Simpson; Dan Mayhew; Robyn Robertson

Abstract: Introduction: Aggressive driving encompasses a continuum of behaviors that range from extreme acts, such as shootings, to less severe manifestations, such as arguments and gestures. It is clear from the available data that aggressive driving is not uncommon and very risky. However, little is known about the opinions and practices of drivers. The purpose of this study was to help bridge these gaps. Methods: The data were gathered by means of a public opinion poll among a representative sample of 1,201 Canadian drivers. Univariate frequency distributions and 95% confidence intervals were calculated and logistic regression and generalized linear latent models were used to summarize the data. Results: It was found that the issue of aggressive driving is a significant one as a considerable percentage of drivers admits to it. The results coming from the logistic regression and the generalized linear latent model suggest that male and younger drivers are more likely to behave aggressively in traffic and that behaving more aggressively is associated with a history of traffic tickets. Discussion: When gauging people's attitudes, opinions, and behaviors, it becomes clear that aggressive driving is a considerable problem. There also seems to be a need for a better understanding of which specific behaviors respondents associate with the generic term "aggressive driving". Impact on Industry: Results from this study further emphasize the need of increasing the aggressive driving knowledge base.

1. Introduction

1.1 What is aggressive driving?

"Aggressive driving encompasses a continuum of behaviours that range from extreme acts (e.g., shootings or malicious assaults) to less severe manifestations (e.g., roadside arguments, confrontations, and gestures)." (Beirness et al. 2001: p. 4) Given this wide range of behaviors, it is not surprising that a consistent definition is lacking in the literature; a diversity of definitions can be found, for example, in Miles and Johnson 2003, James and Nahl 2000, Tasca 2000, Mizell 1997, Lajunen et al. 1998, Shinar 1998, and Ellison-Potter et al. 2001.

Despite the lack of a consistent definition, the element of intent – i.e., deliberately endangering others – is a recurrent theme. For example, Galovski and Blanchard (2005: p. 47) argued that "*Intent* is the key element in discriminating aggressive driving from driving error or lapses in judgment." However, a more liberal definition of aggressive driving does not include the element of intent. Behaviors such as street racing, excessive speeding, or speeding up to get through a traffic light might be considered aggressive by the public but are not necessarily intended to harm others.

1.2 Prevalence of aggressive driving

It has been argued that aggression is more frequent on the roadways than in any other human setting. Explanations include crowding/congestion, anonymity, frustration, and provocation; factors that may be present simultaneously while driving (McGarva 2005).

Given a lack of consistency in the definition of “aggressive driving”, it is not surprising that estimates of its prevalence are also variable. According to one study, almost 90% of drivers in the United States (US) have been involved in at least one incident of aggressive driving; and aggressive driving was found to have led to about 1,500 injuries and fatalities annually in the US (AAAFTS 1999).

A 2005 survey of Ontario students in Canada found that 53.2% had been victims of shouts, curses and rude gestures in the past year, while 8.9% were threatened with damage to their vehicle or personal injury, and 6.2% experienced attempted or actual damage to their vehicle or personal injury (Smart et al. 2007).

The impact of excessive speeding, a specific form of aggressive driving, has been identified as a contributing factor in up to 18% of fatal and personal injury crashes in Canada (Beirness and Simpson 1997). This corresponds to about 4,000 deaths and injuries that can be attributed to speed each year (Beirness et al. 2001). With respect to running red lights, a Quebec study found that it caused slightly more than one quarter of all traffic injuries at intersections with traffic lights (Brault et al. 2007). According to a comparable study in Ontario (Ministry of Transportation Ontario 1998), 18% of fatal crashes and 30% of personal injury crashes occur at an intersection, while disobeying the traffic signal is involved in 42% of fatal crashes and 29% of injury crashes. This means that approximately 61 fatal crashes and 4,800 injury crashes occur in Ontario each year due to drivers running red lights.

Despite the lack of consistency in the definition of aggressive driving, it is clear from the available data that aggressive driving is not uncommon and very risky. However, little is

known about the opinions and practices of drivers regarding aggressive driving. The purpose of this study was to help bridge such information gaps.

2. Method

2.1 Procedure

The data were gathered by means of a public opinion poll. The questionnaire included a set of demographic questions and a set of items designed to provide information on attitudes, opinions, and behaviors about aggressive driving. The survey required an average of approximately 15 minutes to complete. It was administered by telephone to a random sample of Canadian drivers by Opinion Search Inc., in September 2006. Criteria for inclusion were: having a valid driver's license and having driven in the past 30 days. To ensure bias due to refusal to participate was kept to a minimum up to eight call back attempts per sample record were carried out. Also, when the interviewer introduced the survey, it was explained that personal information would be kept confidential and the answers would be treated anonymously. Sponsorship was revealed such that participants knew that the nature of the survey was non-commercial. Among the 6,076 households contacted in which a person was asked to participate, 4,418 (73%) refused and 457 (7.5%) were not qualified.

2.2 Participants

The final group of respondents for the study included 1,201 Canadian drivers. The median age category was 45-49. Forty three percent of the participants were male.

2.3 Questionnaire

A series of closed-ended questions were designed to probe the respondents' attitudes, concerns, and self-reported behavior about aggressive driving. Generally speaking, the public may not distinguish between those behaviors that are clearly motivated by the intent to harm others and those that are not. Instead, they may likely respond more to the observed behavior and whether or not it seems like an aggressive manoeuvre. Accordingly, in this survey, a variety of specific driving behaviors were probed, including:

- running red lights, and speeding up to get through the light;
- street racing;
- excessive speeding, and driving well over the speed limit;
- swearing, and making rude signs at other drivers;
- using the horn when annoyed; and,
- taking risks, just for fun.

A variety of formats were used with the items in the questionnaire. Several used a six-point Likert-type scale, for example, in gauging the respondent's level of support for certain countermeasures (ranging from one for "strongly disagree" to six for "strongly agree") or the frequency of self-reported or observed behaviors (ranging from one for "never" to six for "very often"). Other questions/items used a dichotomous format, e.g., to determine whether the respondent thought there is more or less aggressive driving today compared to five years ago.

2.4 Data analysis

Data were weighted according to gender and age to avoid bias and ensure they were representative of the Canadian population. Stata, release 10 was used to calculate univariate frequency distributions and 95% confidence intervals (95%-CI) taking account of the stratified and weighted sampling design (see StataCorp. 2007 for details about the modeling procedures). Also, logistic regression in Stata and generalized linear latent modeling using GLLAMM (Rabe-Hesketh et al. 2002, 2004) were performed. GLLAMM is a Stata program to fit Generalized Linear Latent and Mixed Models (see also http://www.gllamm.org) that uses the adaptive quadrature method to obtain model estimates. The ordinal probit link was used for the conditional densities of the response variables. Details about this estimation method can be found in Rabe-Hesketh et al. 2004. Corresponding results from comparable studies in 2001 and 2002 (Beirness et al. 2001, 2002) are presented where available.

3. Results

3.1 Prevalence of aggressive driving

Respondents were asked to indicate on a six point scale how frequently they engaged in a variety of aggressive driving behaviors (where one means “never” and six means “often”). Figure 1 shows the percent of respondents who indicated they “often” engaged in these behaviors (five or six on the rating scale); corresponding results from the 2002 survey are also presented where available. In comparing the results from 2002 and 2006, it can be seen that they are very similar – differences between both years are no greater than 2%. For example, 22% of people admitted to swearing in 2002 and 20% in

2006; only 4% of drivers said that they make rude signs at other drivers in 2006, and 3% in 2002.

The results show how prevalent some of the aggressive driving behaviors are. In 2006, approximately 12% of drivers admitted to often driving well over the speed limit; the 95%-CI ranges from 10.2% to 14.3%. Based on an estimated population of 22.25 million licensed drivers, this corresponds to between 2,269,500 and 3,181,750 drivers. About 9% admitted to often speeding up to get through the light. According to the lower and upper bound of a 95%-CI (7.7%-11.4%), this corresponds to between 1,713,250 and 2,536,500 drivers. Almost 3% indicated they take risks while driving, just for the fun of it, which corresponds to between 378,250 and 823,250 drivers who knowingly put themselves and others at risk while driving as a result of their thrill-seeking behavior (95%-CI: 1.7%-3.7%).

Respondents were also asked to indicate how often they observed a variety of aggressive driving behaviors by giving a number between one (never) and six (very often). Figure 2 displays the average perceived frequency of six aggressive driving behaviors in 2006 and comparable results from 2001. As can be seen, results for both years are very similar with the possible exception of running red lights and excessive speeding (note that in 2006 respondents were asked to rate “excessive speeding”, while in 2001 they were asked about “speeding”).

When respondents were asked whether there is more or less aggressive driving, the majority of respondents (88%) believed there is more aggressive driving today compared to five years ago. However, the results from Figure 2 suggest that there has not been a change in the perceived frequency of aggressive driving behaviors. In other words, the

public's perception of the magnitude of aggressive driving may be influenced by certain behaviors that were not probed in this survey such as extreme cases of aggression. This will be discussed in more detail in the discussion section.

3.2 Concern about aggressive driving

Survey respondents were asked to indicate their level of concern about a variety of road safety issues, including several behaviors that can be regarded as aggressive. They rated the seriousness of each problem on a six-point scale from one (not a problem at all) to six (extremely serious problem). Figure 3 shows the percent of respondents who thought the issue was very serious or extremely serious (a rating of five or six). About 76% of Canadians think drivers who run red lights are a very or an extremely serious problem (95%-CI: 72.6%-78.2%); 73% have the same opinion about street racing (95%-CI: 70.2%-76.0%) and 66% about excessive speeding (95%-CI: 63.0%-69.0%). Significantly more Canadians are concerned about drinking drivers (point estimate=88%; 95%-CI: 85.9%-89.9%). This represents a difference of 12% compared to running red lights (S.E.=1.5%, t=-8.57, p=0.000). Overall, however, running red lights, street racing, and speeding excessively are of concern to a substantial portion of the public.

3.3 Profile of aggressive drivers

Based on each respondent's self-reported frequency for the aggressive driving behaviors listed in Figure 1, an "aggressiveness" score was calculated by summing the respondent's responses for each of these behaviors. The cut-off score of this crude aggressiveness scale (ranging from 6-36) to distinguish between "aggressive drivers" and "non-aggressive drivers" was set at 18. The relationship between this

aggressiveness score, recoded as a dummy variable (0=”not aggressive” and 1=”aggressive”) and age and gender was then investigated using multivariate logistic regression. Other covariates, such as mileage, income, and family status were included in the model as well, although only age and gender were found to be significant. The results from a model containing the significant coefficients are presented in Table 1.

As can be seen, female drivers and drivers aged 45 and older are less likely to be categorized as aggressive compared to their male and younger counterparts (odds ratio of 0.35 compared to males and odds ratio of 0.39 compared to drivers aged 16-44, respectively). Expressed in percent, this means that 16% of males were classified as aggressive, while only 6% of females were classified as such; out of all drivers aged 16-44, 15% could be considered aggressive, while only 6% of those 45 and older could be considered aggressive.

This crude approach was refined in a second step using GLLAMM. This time, the six aggressive driving behaviors that are listed in Figure 1 were used as observed indicator variables of the unobserved latent variable “aggressive driving”. As such, an item response model with explanatory variables gender and age was fitted using the ordinal probit link function. The model is shown in Figure 4 using a path diagram. By using such a path model it is recognized that “aggressive driving” is an abstract construct that can only be observed through several indicators; and that each of these indicators by themselves may not be reliable, but taken together the measurement of aggressiveness while driving becomes more reliable. The logistic model that was fitted previously would not compensate for measurement error in each of these items, while the latent model does. As such, the latent model is a more reliable way of modeling the data. The results of the latent model are also summarized in Table 1.

As can be seen, the direction of the probit coefficients for gender and age coming from the latent model is the same as the direction of the odds ratios obtained with the logistic model. Both probit coefficients have a negative sign, indicating that female drivers are, on average, less aggressive and that older drivers are less aggressive as well. This corresponds to the odds ratios for female and older drivers from the logistic model that were smaller than one. Likelihood ratio tests were carried out to test whether both coefficients were significant according to the latent model. These tests again confirmed the findings of the logistic model. The likelihood ratio for a latent model containing gender compared to a latent model that only includes the constant (i.e., the null model) was 49.84 with one degree of freedom; the p-value of this test was .0000. The likelihood ratio for a latent model containing age and gender compared to a latent model that only includes gender was 72.61 with one degree of freedom; this yields a p-value of .0000. Note that the variable age in the latent model was scaled differently compared to the logistic regression model. In the latent model age was used in its original measuring format, consisting of 17 categories, rather than a dichotomous variable consisting of the age categories 16-44 and 45 and older.

Finally, using multivariate logistic regression, it was also found that behaving more aggressively in traffic (i.e., scoring higher on the aggressiveness scale) corresponded to a greater chance of admitting to having had at least one traffic ticket, excluding parking tickets. Of all drivers that can be considered aggressive, 29% admitted to having had at least one traffic ticket (excluding parking tickets), compared to only 10% of non-aggressive drivers (Pearson Chi-square=22.4; df= (1; 1,164); p=0.0000). No relationship was found between level of aggressiveness and collisions.

3.4 Level of support for various measures

A series of questions were asked to gauge the level of support for various measures that can be used to address the issue of aggressive driving. Respondents indicated their level of support on a six-point scale (ranging from one for “strongly disagree” to six for “strongly agree”).

Sixty-three percent agreed that aggressive driving should be a higher priority for police enforcement efforts (95%-CI: 59.6%-65.7%). This level of support has not changed a lot over the past several years – in 2001 and 2002, the level of agreement was 60% (Beirness et al. 2001) and 62% (Beirness et al. 2002), respectively. Not only is there support for more enforcement, there is support for enhanced penalties for aggressive driving as well as 51% indicated that the penalties for aggressive driving should be equal to those for drinking and driving (95%-CI: 48.0%-54.3%). There is also considerable support for equipping vehicles with devices to prevent excessive speeding: 43% agreed with this measure (95%-CI: 40.0%-46.1%).

4. Discussion

To date, no consistent definition of aggressive driving is available in the literature. Some argue that a key element in defining aggressive driving is “intent”, i.e., deliberately endangering others. However, generally speaking, the public may not distinguish between those behaviors that are clearly motivated by intent to harm others and those that are not. They may likely respond more to the observed behavior and whether or not it seems like an aggressive manoeuvre. Accordingly, a variety of specific driving behaviors were probed in the present study, including running red lights, speeding up to

get through the light, street racing, excessive speeding, driving well over the speed limit, swearing, making rude signs at other drivers, using the horn when being annoyed, and taking risks while driving, just for fun. Little is known about the opinions and practices of drivers regarding aggressive driving. The purpose of this study was to help fill such information gaps.

As explained in the methods section, the telephone survey was carried out carefully to ensure refusal rates were kept to a minimum. For example, the survey firm conducted up to eight call back attempts per sample record; and, the interviewers emphasized that the nature of this survey was non-commercial and that all the information obtained from participants would be treated anonymously and kept confidential. The non-response rate, however, was rather high. While this may have biased the results, data were weighted according to gender and age to ensure sample distributions of these two variables were representative of the Canadian population. Furthermore, certain results from this survey are consistent with other research and such comparisons can be used to validate the findings, albeit within certain limits. For example, 30% of respondents admit to swearing under their breath (20% in 2006), using the horn when they are annoyed (6% in 2006) and making rude signs at other drivers (4% in 2006). A 2005 survey of Ontario students found that about 53% had been victims of shouts, curses and rude gestures (Smart et al. 2007). It is reasonable to assume that perpetrators of these acts repeat their behavior and this would indeed lead to a higher percent of victims among the population of drivers (i.e., 53%) compared to the percent of perpetrators (i.e., 30%). The results from the logistic regression model and generalized linear latent model are also useful to validate findings. For example, both models suggest especially young males behave aggressively in traffic, a finding consistent with other research, not only in the field of traffic safety. Finally, the set of questions about aggressive driving was part of

a larger questionnaire that also included questions on drinking-driving and distracted driving. No inconsistencies about these two topics, suggesting the sample may have been seriously biased, were found.

In summary, strictly speaking it is not possible to guarantee that a sample is completely unbiased, especially not when the refusal rate is high. However, the sample in this study was obtained by careful and meticulous data collection. Also, certain results are consistent with other research and seem to suggest that the sample was not seriously biased.

The issue of aggressive driving is a significant one. For example, about 12% or some 2.7 million Canadians admitted to often driving well over the speed limit; 9% or 2 some million admitted to often speeding up to get through a traffic light; and, about 3% or 670 thousand said they take risks while driving, just for the fun of it. Although 88% of Canadians believe there is more aggressive driving today than five years ago, other evidence – self-reported frequencies of aggressive driving behavior and how often Canadians see others behave aggressively in traffic – suggests that the magnitude of the problem did not change between 2001 and 2006.

A possible explanation of this apparent disparity may be that people associate the generic term “aggressive driving” with behaviors that were not probed in this survey, and that respondents associate it with other behaviors that easily come to mind such as extreme cases of road rage because of heightened media attention. This hypothesis cannot be confirmed or rejected in this study, but it is an important one because it bears on the issue of whether or not people perceive themselves as aggressive drivers. Simply put, if people freely associate “aggressive driving” with something they would never do

(e.g., displaying extreme violence), they may never realize that they actually display behaviors that can be regarded as aggressive such speeding excessively or speeding up to get through the light. Given the high number of drivers engaging in aggressive behavior on the road according to the definition that was adopted in this study, this perception may be an important obstacle in changing attitudes and behaviors. More research is needed to investigate this hypothesis.

The disparity regarding the perceived and actual growth of the problem may also be related to locus of control, which is known to influence levels of concern (Wåhlberg 2001). Believing that the hazards imposed by aggressive driving can be controlled by one's own behavior tends to reduce the level of concern. However, if people believe aggressive driving is not something they typically do, but rather something extreme, done by others, they will feel less in control, which should heighten their level of concern. In this regard, it would be instructive to contrast the level of concern about aggressive driving, probed as a generic term, with levels of concern about specific behaviors. A limitation of this study is that only levels of concern about specific behaviors were available. It was found that about 76% of Canadians think drivers who run red lights are a very or extremely serious problem; 73% have the same opinion about street racing, and 66% about excessive speeding.

Not surprisingly, the data captured in this survey revealed the following characteristics of aggressive drivers:

- there were more than twice as many aggressive male drivers as aggressive female drivers;

- younger drivers (notably drivers aged 16-44) were more likely to behave aggressively in traffic, compared to older drivers (notably drivers aged 45 and older); and,
- aggressive drivers are more likely to admit to having had at least one traffic ticket, excluding parking tickets.

As explained previously, these findings correspond to the well-documented phenomenon that males and young drivers are more prone to risk-taking and to displaying aggressive driving behaviors such as speeding excessively (Mayhew et al. 2006). It would also be expected that aggressive drivers should be cited for traffic violations more often than those who are not aggressive.

In conclusion, the issue of aggressive driving is not well documented. For example, beyond the need for a consistent definition, there is a need for a better understanding of which specific behaviors respondents associate with the generic term of “aggressive driving”. Such a discussion is important because it bears on obstacles to influence the public’s attitudes and behavior. Also, when gauging people’s attitudes, opinions, and behaviors about specific issues, it becomes clear that aggressive driving is a considerable problem. As such, it is recommended research be conducted into people’s perception of aggressive driving. Given the state of knowledge it may be useful to use focus groups first to qualitatively gauge what behaviors people think about when asked about aggressive driving. Such information could be used to develop a quantitative data collection instrument to obtain data on a larger scale. Results from such a study could then be used to get a better handle on the prevalence of aggressive driving, to help

understand the issue better, and – on a more practical level – to better reach target groups in advertizing campaigns.

4.1 Impact on industry

Results from this study further emphasize the importance of increasing the aggressive driving knowledge base. Several avenues to achieve this have been suggested in this paper.

Acknowledgements

TO BE COMPLETED

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Figure

Figure 1: Percent of six self-reported aggressive driving behaviors in 2002 and 2006

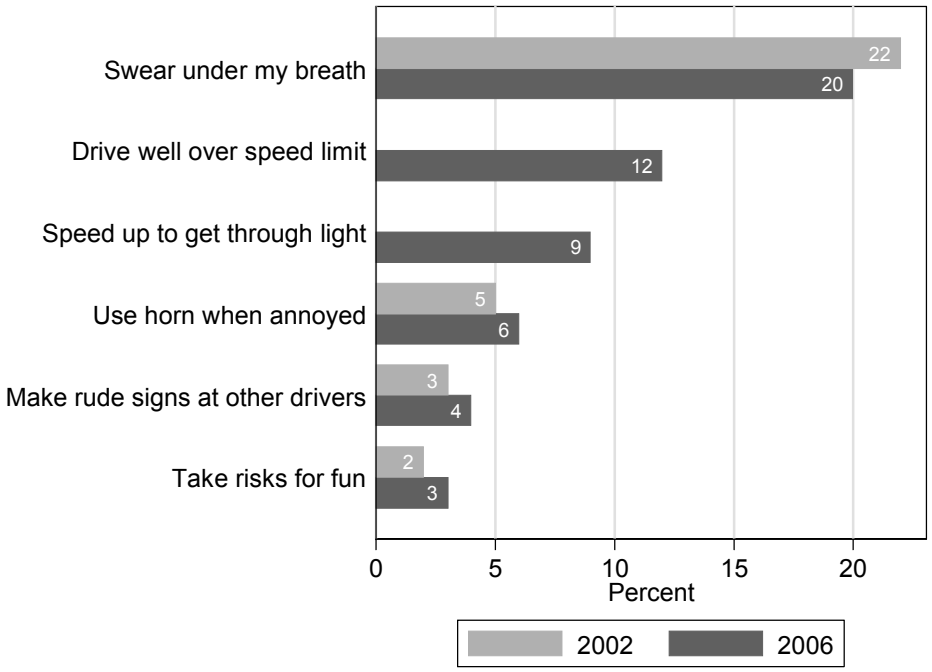


Figure 2: Average perceived frequency of six aggressive driving behaviors in 2001 and 2006

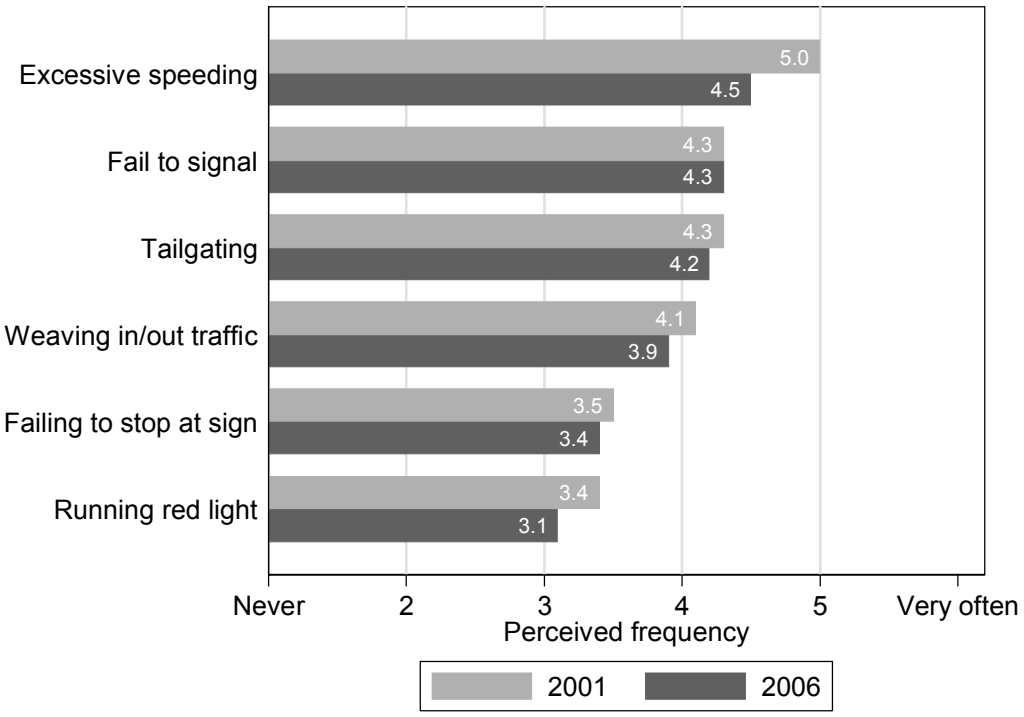


Figure 3: Percent concerned about road safety issues

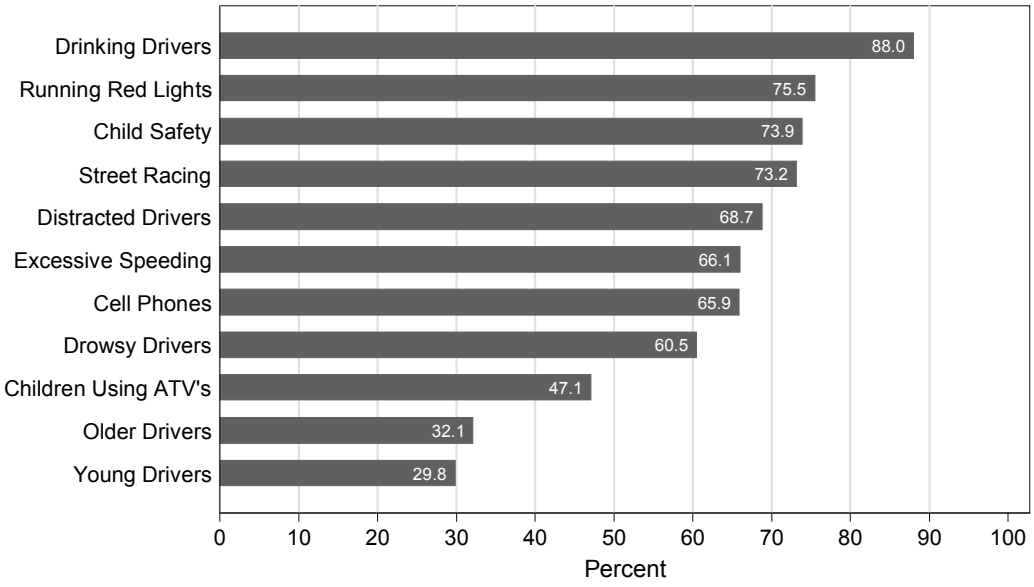
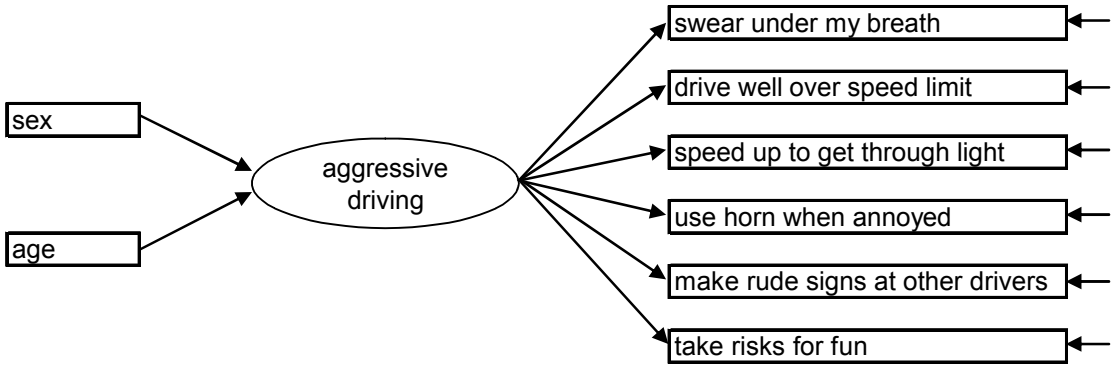


Figure 4: Path diagram of the relationship between the independent variables sex and age and the dependent latent variable “aggressive driving” as measured by six observed variables



Rectangles represent observed variables and ovals represent latent variales; arrows between variables represent linear relations and the arrows pointing to the rectangles represent residual errors

Table 1: Results from the logistic regression model and the generalized linear latent model of the relationship between age, gender and aggressive driving

Logistic regression model					
Variable	Odds ratio	Linearized S.E.	t	p	Reference category
Female	0.35	0.09	-4.28	0.000	Male
Aged 45 and older	0.39	0.09	-4.25	0.000	16-44

Generalized linear latent model		
Variable	Probit coefficient	Reference category
Female	-0.40	Male
Age	-0.08	N/A