

# **Management of Functionally Impaired Drivers**

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## **Executive Summary**

American society is undergoing a major demographic transformation, which is resulting in a larger proportion of mature individuals in the population. Some believe this demographic change, coupled with the increasing mobility of the mature population poses a serious highway safety issue. Older drivers have specific issues that need to be addressed including changes in sensory, motor, and cognitive skills that may affect driving ability. Motor impairments include lack of neck and limb mobility, whereas sensory declines primarily involve visual impairments. Cognitive impairments include decreased speed of processing and reaction time as well as changes in visual search and visual attention. This issue is complicated since seniors want to maintain their independence, yet the nation needs to protect all drivers.

The major objectives of this research were to assess options available to the state of Alabama to protect older citizens, while allowing them personal mobility. This was accomplished through several approaches conducted at the University of Alabama in Huntsville. For example, drivers of all ages were asked to complete a survey examining knowledge of current re-licensure rules and attitudes towards screening methods. At the same time, the DRIVING HEALTH® battery was administered to numerous drivers at UAH to assess performance in visual, cognitive and physical attributes. An extensive literature survey was performed to document what other states have done to enhance older driver safety. Seven licensure alternatives were generated, assessed and linked to Alabama driver attitudes. As a result of this research, a recommendation was made that a comprehensive screening tool be implemented for older drivers at re-licensure within the state.

## Section 1 Introduction

### Scope of the Problem

More than 40,000 Americans die each year in motor vehicle crashes. In Alabama over 1,400 drivers are involved fatal crashes per year [CARE, 2005]. According to the National Highway Traffic Safety Administration the annual miles traveled begin to decline for adults in their forties, dropping down to 8000 miles for adults 65-69 years, and dropping as low as 4000 miles for adults 85 years and over [1985]. Even though seniors account for only about eight percent of the miles driven each year in the United States, many of the drivers involved in fatal crashes are over age 65. Recent statistics of drivers involved in fatal crashes are illustrated in Figure 1-1 below [Highway Safety, 2005]. Driver crash involvement rates per licensed driver decreases with age until the “greater than 74” range in Alabama. These statistics are likely to increase since "Drivers aged 65 and older... are expected to account for as much as 25 percent of total driver fatalities in 2030, compared to 14 percent currently [FHWA, 2005]."

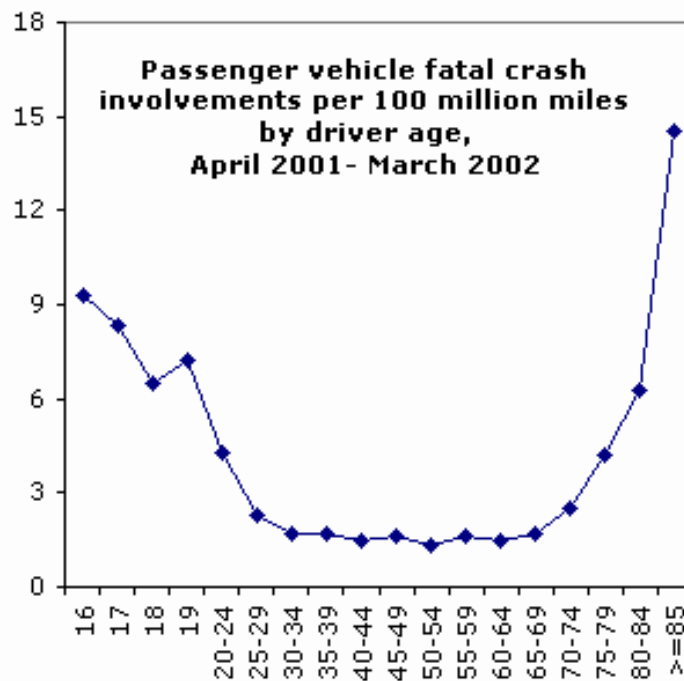


Figure 1-1 National fatal crash involvement by driver age

## **Objectives of Research**

American society is undergoing a major demographic transformation, which is resulting in a larger proportion of mature individuals in the population. Some believe this demographic change, coupled with the increasing mobility of the mature population poses a serious highway safety issue. This issue is complicated since seniors want to maintain their independence, yet the nation needs to protect all drivers. The major objectives of this research were the identification of *high-risk* older drivers and evaluation of options applicable to the State of Alabama to protect older citizens, while allowing them personal mobility.

## Section 2 Background

### Purpose of Research

The safety of older drivers is being recognized nationally as an important factor that needs to be considered in a state transportation safety plan. This is being handled in a variety of ways including recommendations for highway design changes, education, seatbelt laws, driver's license restrictions and other intervention legislation. For example, the Federal Highway Administration (FHWA) has published a handbook with design strategies to "provide remedies for design deficiencies that disproportionately penalize older road users due to changes in functional ability experienced with normal aging [FHWA, 2001]." The implementation of these strategies can minimize the risk and severity of crashes, and also minimizes the need for remedial works after construction. The engineering enhancements described in the manual may benefit all road users, not just older persons, thus justifying higher construction costs.

There have been numerous studies to further understand the factors associated with crashes involving older drivers. For example, in a comprehensive study of Texas drivers 25 years of police-level crash data from nearly 4 million injury crashes were analyzed to determine the association between driver age and four factors: *fragility*—the likelihood of death among drivers involved in injury crashes; *illness*—the likelihood that drivers were ill or suffering from some other physical defect at the time of their crashes; *perceptual lapses*—the likelihood that drivers involved in crashes failed to yield the right of way or disregarded traffic signs or signals; and *left turns*—the likelihood that left turns were involved in injury crashes. The purpose of the study was to further understand these four factors and other variables and to portray in graphical format their association with crashes involving older drivers.

Since engineering countermeasures are well documented, this UTCA study focuses on driver countermeasures rather than the transportation design aspects. Currently older Alabama drivers are self-monitoring their road fitness. However, some drivers fail to recognize declining abilities. For example, older drivers with poor cognitive abilities are unlikely to adequately self-regulate their driving due to lack of insight into their impairments [Adler & Kuskowski, 2003, Cotrell & Wild, 1999]. Other older drivers may continue to drive despite functional limitations because ceasing to do so will make them permanently dependent on others. Accordingly, research has indicated that driving cessation leads to increased depression, decreased social interactions, and less access to healthcare [Marottoli, et al., 1999]. Other states and Europe have been wrestling with these issues for many years. According to the Insurance Highway Safety Institute's latest data, at least 18 states have implemented either accelerated renewal processes or other provisions applicable to older drivers. Recent research has indicated that such efforts result in reduced fatality rates particularly among drivers 85 years of age and older [Grabowski et al., 2004].



The general approaches deal with licensing renewal options, education, and various mandatory or voluntary testing procedures. For example, based on research funded by NHTSA/FHWA and the National Institutes of Health conducted in the state of Maryland Motor Vehicle Administration, AARP recently developed an on-line tool for assessing driving ability [AARP 2005, Ball, et al., 2002]. There are also numerous “tool kits” available for education of older drivers. Although, driver's education programs have not been found to consistently help mature drivers improve skills, recent advances in interventions aimed at enhancing the functional abilities of older adults have been successful in improving on the road driver performance [Roenker, et al., 2003]. Such advancements may allow states to implement driver license re-screening, not for the sake of revoking driver's licenses in the event of identified deficits, but rather with a goal to refer such individuals for remediation and enhance the overall safety of all drivers. Over the past five years, many states have pursued applying technological advances to enhance driver safety. For example, the state of Michigan has compiled a web site with many resources and links to assessment tools [Townsafety, 2005] to help drivers refine existing skills and develop safe, defensive driving techniques. Similarly, the state of Maryland evaluated the feasibility of implementing a state-wide functional evaluation aimed at identifying at-risk older drivers [Staplin, et al., 2003]. Thus there are numerous resources available for identifying older driver traffic safety issues and options that can be adapted to Alabama. However they need to be compatible with current regulations and drivers' attitudes, with special awareness of lifetime attitudes on drivers' rights.

## **Section 3 Methodology**

### **Research Goals**

Since the issue of older driver safety is very complex, there are numerous ways to address the problem. As stated in the previous section, road design improvements (better road markings, larger text signs, improved lighting, etc.) may help decrease crashes. However this study looked exclusively at driver intervention and education strategies. Although many states have implemented renewal policies aimed at assessing drivers' abilities, Alabama currently has no such policies to improve driver safety. An investigation of successful programs was conducted in this project to determine and define proven implementation programs. Elements from those programs are already being incorporated into the "Safe Home Alabama" program to improve Alabama driver safety.

This research project focused primarily on the following four tasks:

1. Performing a survey of Alabama drivers to ascertain knowledge and attitudes about re-licensure.
2. Assessing CARE statistics, existing screening data and accident reports of Alabama older drivers to determine which, if any, specific impairments can be associated with crash data.
3. Proposing several alternatives for relicensure guidelines and comparing them for costs and benefits.
4. Making recommendations for implementation of the preferred alternative.

### **Survey of Licensure Requirements in Other States**

In order to complete the first task, a comprehensive literature search was conducted to document regulations in other states. Table 3-1 is a summary of what states require at renewal or at a certain age or condition. Seventy percent or the majority of states (thirty five) do require vision testing at renewal for all drivers. Twenty seven (53%) of the total have no special requirements for older drivers, but eight have the "no renewal by mail" restriction for certain age groups. Fourteen states have accelerated renewal periods for people over a certain age and two states require road tests for drivers over 75 years. Alabama is in the minority, sixteen percent, who have no screening renewal requirements for all drivers or specific age groups.

**Table 3-1 Summary of license renewal requirements by state**

State	No tests for renewal	Vision test	Knowledge test	Road test	Other test	No special requirements for older drivers	No renewal by mail*
Alabama	1					1	
Alaska		1					69+
Arizona		1					70+
Arkansas		1	*			1	
California		1	1				70+
Colorado		1	conditional				66+
Connecticut		1					
Delaware	1					1	
Florida		1				1	
Georgia		1				1	
Hawaii		1					
Idaho		1		conditional			69+
Illinois		1	conditional				87+
Indiana				conditional			
Iowa*		1					
Kansas		1	1				
Kentucky	1					1	
Louisiana		1					70+
Maine							
Maryland		1				0	
Massachusetts		1				1	
Michigan		1	1			1	
Minnesota		1				1	
Mississippi		1				1	
Missouri		1			1		
Montana		1					
Nebraska		1	conditional			1	
Nevada							
New Hampshire		1					
New Jersey		1				1	
New Mexico		1	conditional	Conditional			
New York	1					1	
North Carolina		1			1	1	
North Dakota		1				1	
Ohio		1				1	
Oklahoma	1					1	
Oregon							

**Table 3-1 Summary of license renewal requirements by state (cont'd)**

State	No tests for renewal	Vision test	Knowledge test	Road test	Other test	No special requirements for older drivers	No renewal by mail*
Pennsylvania							65+ optional
Rhode Island		1					70+
South Carolina		conditional	conditional			1	
South Dakota		1				1	
Tennessee	1					1	
Texas		1				1	
Utah							
Vermont	1					1	
Virginia		1	conditional	Conditional		1	
Washington		1			conditional	1	
West Virginia	1					1	
Wisconsin		1				1	
Wyoming		1				1	
Total (not including conditional or optional)	8	35	3	0	2	27	9
(*) Denotes special requirements for older drivers							

## **Section 4**

### **Project Results**

#### **Tasks Completed**

There have been numerous studies on aspects of sensory and cognitive functions that are needed for safe driving. It has also been documented in literature that these functions become impaired in later adulthood [AARP]. These include visual reductions in acuity, contrast sensitivity, visual field, visual attention, dark adaptation, etc. Other impaired functions are attention-related, perception-reaction time, and memory limitations. Physical impairments such as reduced flexibility, range of motion and strength issues are also an important consideration for older drivers. The objective of this research was not to duplicate this type of research, but rather to adapt or modify research findings for implementation in Alabama. The following tasks were completed to achieve the desired goal of management of older drivers.

#### **Task 1. Driver Attitudes' Survey Results**

A questionnaire regarding general attitudes toward state driver safety issues was developed (see Appendix) and administered to 323 individuals (51 percent females) residing in Alabama. 270 of the respondents were Alabama-licensed drivers. The ages of the sample population ranged from 18 to 93 years and included 83 percent Caucasian and 10 percent African-American individuals who had education levels ranging from 3<sup>rd</sup> grade to a doctoral degree (average education was vocational training or some college). The majority of those surveyed (85 percent) agreed that there is a safety issue with respect to impaired drivers on the road. With regard to current state practice of driver re-screening, 30 percent of respondents were unaware of whether or not screening is required for renewal of drivers' licenses and 6 percent incorrectly assumed that this was the current practice in Alabama. 72 percent of respondents agreed that the state of Alabama should require screening for renewal of drivers' licenses. Table 4-1 is a summary of the survey with break outs for age groups and total percentages for the pertinent questions regarding driver safety and renewal screening:

*Question 5. There is a safety issue with respect to impaired drivers on the road (with regards to vision, reaction time, etc.).*

*Question 7. The state of Alabama should require screening for renewal of driver's licenses.*

It appears that age of the respondents had very little to do with how they answered question 7. The percentage that agreed or strongly agreed that screening should be performed at license renewal varied from 72-77 percent for each range. Taking into account the sample population size and deviations, this study found that age had no significant effect on opinion.

Participants were also asked to provide their opinions on what the State of Alabama could do to improve driver safety. There were numerous answers, but the applicable comments were compiled and percentages calculated (from total number of surveys) as tabulated in Table 4-2 below. One-third of the respondents made comments related to relicensure issues, the most frequent of which was screening either everyone at renewal or drivers who have reached a certain age. Some even made recommendations for annual screening or screening after a major illness, such as heart attack or stroke. Other people thought that stricter enforcement would make a positive impact on traffic safety in Alabama. A large group favored using education to make roads safer and others thought that roads could be made safer for all drivers. A literature review found that the Insurance Safety Institute has performed studies that found no increase in older driver safety after completing education courses, so that was not addressed in this research.

**Table 4-1 UTCA impaired driver attitude survey results**

Question	Respondents' Age Group				
	Under 30 yrs	31-45 years	46-60 years	Over 60 yrs	All pages
<b>#5: There is a safety issue with respect to impaired drivers.</b>					
Strongly Agree	40%	42%	40%	53%	46%
Agree	41%	42%	47%	36%	40%
Neutral	14%	0	13%	8%	11%
Disagree	3%	8%	0	2%	2%
Strongly Disagree	1%	0	0	2%	1%
<b>#7 AL should require screening at DL renewal?</b>					
Strongly Agree	33%	42%	47%	38%	35%
Agree	39%	33%	27%	39%	38%
Neutral	19%	0	13%	17%	17%
Disagree	6%	25%	7%	3%	6%
Strongly Disagree	3%	0	7%	3%	4%

## Task 2. Data Assessment – DHI & Accident Status

In addition to the survey, we examined performance and attitudes of licensed drivers using the DRIVINGHEALTH<sup>®</sup> Inventory. This computerized inventory was recently developed through research funded by the National Highway Traffic Safety Administration and the National Institutes of Health. This is an attractive option in that a version of the battery (Roadwise) is currently offered by AARP for older drivers to self-assess their abilities. Thus, the program is inexpensive, widely available, and ready to use via personal computer. The DRIVINGHEALTH<sup>®</sup> Inventory is easy to administer to assess sensory, motor, and cognitive functions that may decline with age and yet are necessary for safe driving. These include Visual Acuity (High/Low contrast), Leg Strength and General Mobility [Marital, et al., 1994)], Head/Neck Flexibility [Marital, et al., 1998], Memory [Hun, et al., 1998; McKnight & McKnight, 1999], Visualization of Missing Information [Trelawney, et al., 1993; Ball et al., 2006], Visual Information Processing Speed [Ball & Owsley, 1991; Owsley et al., 1998] and Divided Visual Search [Trails B].

**Table 4-2 Comments from Driver Surveys**

<b>1. Stricter traffic law enforcement</b>	<b>61 comments</b>
more/better patrols	4.7%
Speeding	3.7%
DWI	1.9%
harsher punishment	1.2%
keep drunk drivers off the road	0.6%
tailgating	0.6%
passing lanes	0.6%
Driving without license	0.6%
running red lights	0.6%
turn signals	0.6%
Require automobile inspection annually	0.3%
<b>2. Implement new laws</b>	<b>106 comments</b>
screening/retesting	30.1%
elderly	9.9%
impaired	1.2%
reckless	0.3%
adolescent	1.6%
accident history	0.9%
health issues - après stroke/heart attack	0.6%
All Drivers Screening	9.9%
every license renewal	4.3%
10 yr interval at renewal	0.9%
20 yr interval at renewal	0.3%
Only Elderly Screening	10.6%
Every renewal for over 60 yr age (5 yrs)	3.4%
Every 2-4 yrs for over 60 yr age	1.6%
Every year for over 60 yr age	0.9%
ban cell-phone use	1.9%
graduated license program - restrictions	1.6%
raise legal driving age	1.2%
periodic check of safety equipment	0.6%
<b>3. Driver testing procedures</b>	
initial driver's test more challenging	<b>33 comments</b>
consistently, properly administering drivers test (tester bias?)	5.6%
test knowledge of signs	0.9%
parallel park	0.3%
take AARP tests or State Farm test	0.3%
test knowledge of new laws	0.3%

**Table 4-2 Comments from Driver Surveys**

<b>4. Drivers' education</b>	
required to receive license	22 comments
continued education	
offer drivers ed classes	1.6%
required for license renewal	1.2%
improve high school driver ed	0.6%
Better inform drivers of laws	0.6%
required based on accident history	0.6%
offer education before high school	0.3%
provide practice for drivers	0.3%
remind people of dangers of speeding	0.3%
"this is your speed" signs	0.3%
<b>5. improve roads/conditions</b>	
keep road paint bright	29 comments
more cameras	0.9%
Better placement of signs	0.9%
wider roads	0.9%
improve traffic density	0.6%
quicker road repairs	0.6%
improve access roads	0.6%
improve use of timed stoplights	0.3%
less road construction	0.3%
more caution/warning signs	0.3%
<b>6. Misc. Issues for Elderly / Impaired</b>	2 comments
Better public transportation	0.3%
Dedicated bicycle paths	0.3%

The past 10 to 20 years have been marked by technological advances in both evaluation and intervention approaches aimed at extending safe driving among older adults. Although highway safety researchers have long sought to determine the characteristics that make some drivers, young and old alike, safer than others, until recently this research has met with limited success. The reason for this lack of success has been that few measures have adequately captured the individual characteristics that underlie differences in driving performance. Over the past decade, however, research has pinpointed several factors that reliably predict decrements in driving performance and increased risk for crash among older drivers. Of even more benefit to the present proposal is that a substantial portion of this research has been conducted with samples of older drivers licensed in Alabama [Owsley, 1998; Ball & Owsley, 1991; Ball et al., 1998].

To test for age differences in performance on the DHI, MANOVA was conducted to compare the two age groups across all seven subtests of the inventory. Overall, older drivers performed less successfully on the DHI than did younger drivers,  $F(7, 181) = 15.58, p < .001$ . Follow-up



univariate ANOVAs indicated that such performance differences were evident across all of the DHI subtests ( $p$ 's < .015). Results are presented below in Table 4-3.

To further examine older drivers' performance, these participants ( $n=87$ ) were divided into two groups based upon crash involvement over the prior two years (no crashes vs. one or more crashes). MANCOVA was conducted to compare performance across DHI subtests by crash status with miles driven per year was used as a covariate. A significant main effect of crash status was found,  $F(7, 74) = 5.17$ ,  $p = .015$ . Follow up univariate ANCOVAs indicated that after adjusting for miles driven, older adults with a history of crashes performed worse on the following DHI subtests: UFOV,  $F(1,80) = 5.56$ ,  $p = .021$ , Trails B,  $F(1,80) = 10.57$ ,  $p = .002$ ,

**Table 4-3 DRIVINGHEALTH® inventory performance by age group**

Driving Health Inventory Subtest	< 65 years			>= 65 years		
	m	sd	n	m	sd	n
Visual Acuity Low Contrast (# incorrect)	0.25	0.62	84	1.21	1.24	109
Leg Strength Mobility (time in seconds)	5.27	1.15	84	6.49	1.85	109
Working Memory (# incorrect)	0.14	0.39	84	.65	.808	110
Visualization of Missing Info (# incorrect)	1.51	1.64	84	2.18	2.06	110
Divided Visual Search with Divided Attention (time in seconds)	58.92	21.57	84	118.13	61.72	109
Processing Speed UFOV (time in milliseconds)	30.14	52.35	84	122.07	143.09	107

Leg Strength and General Mobility,  $F(1,80) = 5.17$ ,  $p = .026$ . These results provide evidence of the validity of the DHI in that it can distinguish among older drivers with and without crashes. Clearly these results indicate that this battery captures age-related decline that has been shown by prior research to impact driving capacity. Further research is needed to examine the predictive validity of the inventory. Recent prospective research [Ball et al., 2006] conducted in the Maryland Motor Vehicle Administration with a large sample indicated that performance on both UFOV® and Visualization of Missing Information subtests were predictive of at-fault crashes among drivers 65 years of age and older. Thus, this battery has potential to be helpful in identifying impaired older drivers. Furthermore, these two subtests in particular may be selected from the battery to provide a brief, objective, performance-based assessment of older-driver fitness.

**Table 4-4 Older Drivers' DRIVINGHEALTH® inventory performance by crash status**

	Self-Reported Crashes in Prior 2-Years	m	sd	n
Processing Speed UFOV® (time in Milliseconds)	No Crashes	101.29	127.27	69
	1 or more Crashes	184.93	149.40	14
Visualization of Missing Info (Number Incorrect)	No Crashes	2.35	2.28	69
	1 or more Crashes	2.21	1.81	14
Leg Strength and General Mobility (Time in Seconds)	No Crashes	6.31	1.70	69
	1 or more Crashes	7.36	1.70	14

Spearman correlations were conducted to examine the relationship between DHI performance and self-perception of driving ability. No significant correlations were found. The lack of relationship between self-ratings and performance on the inventory provides support for the use

of mandatory, performance-based testing of driving fitness rather than allowing self-regulation of driving with advancing age.

We conducted an analyses of a contemporary dataset of over 900 older drivers (64 to 97 years of age, 87 percent Caucasians, 53 percent females) licensed by the state of Alabama who completed assessments of sensory, physical, and cognitive abilities between 2000 and 2003. UTCA project funds were utilized to purchase crash records of 911 of these elderly drivers in April of 2005.

We obtained 255 crash records from this request, which covered a 1.5 to 4.5 year period.

Sixteen percent of the participants were involved in a crash over this time period. The records received were coded by three raters as either at-fault or not at-fault and the data was entered. Due to the higher rate of crashes than expected, our funds were not sufficient to purchase additional crash records as to have at least three years of data for each participant and therefore adequate statistical power to examine predictors of crash risk. We have at least three years of data for 413 of the participants. We are currently seeking funds in order to obtain the rest of the data and complete these analyses. In addition to the crash records, three-year follow-up interviews of the health and driving habits of these elder Alabamians began in 2003 and were concluded in October of 2006. To date, 575 follow-up interviews have been completed. We will use these data to examine the association between crash involvement and sensory, physical, and cognitive abilities among older Alabamians. The results of these analyses will be submitted for publication and included in a future UTCA report.

An intensive older driver pilot study was conducted by the State of Maryland [Stapling, 2003]. Part of their research involved screening performed at various sites around the state. The study involved the brief UFOV as an indicator of the relationship of involvement in selected intersection crash types and measures of attention and pre-attention behavior. Correlations were made among UFOV scores and other assessment tools to determine which tool best predicted crash risks. This study reinforced the idea that *“functional screening to assure the ‘driving health’ of older persons is rightfully viewed in the context of injury prevention.”* They determined that the potential benefits of such screening to individuals and to society are profound, if integrated with education and counseling. It is thought that such a management plan will improve awareness about risks associated with functional loss, and make referrals for remediation of functional loss whenever possible to assure the independent mobility of affected drivers.

### **Task 3. License Renewal Alternatives Generated**

Currently there are no tests for driver license renewal in Alabama, regardless of age or physical condition. However information from the Alabama Department of Public Safety (DPS) Driver License Division does have a restriction for renewals: “When it appears that you have some physical or mental impairment which might affect your driving ability, you may be required to furnish a statement by a doctor showing your medical history and present condition as it pertains to your driving ability. Under some circumstances, you may be required to appear before a driver license examiner at any time after you have been issued a license to prove your ability to drive a motor vehicle. If you fail to report for such a driver test or fail to submit any required

statements from your doctor, your driver license can be revoked.” This is a rather nebulous approach since the burden of proof is not on the driver, but on the reporting of a health professional. In Alabama, this is a rather rare occurrence.

This study and the survey results were used to formulate seven distinct alternatives for possible implementation in Alabama. Several alternatives were generated as a result of this study, some based on regulations in other states, and some based on expert recommendations. The “do nothing” or no action alternative was the baseline against which that other alternatives were assessed. A short discussion of each alternative is given below, including advantages and disadvantages. The impacts on three categories (safety, personal expense, state expense) are summarized in Table 4-5 with positive or negative impacts. The highest positive impact rating is plus five (+5) and the highest negative is negative five (-5). Since the major objective of the alternatives is increased safety of the drivers and the general population of Alabama, the largest weight (10 points) is given for that column. Expense, although an important consideration is secondary to the safety issue, and is given a rating of five points.

***Alternative 1 – Visual testing of all drivers in the state of Alabama at renewal***

- 1a. At county expense;
- 1b. At driver expense (using approved testing standards at personal optometrist or medical doctors);

The positive impact is that it will test all drivers’ eyesight and may catch some problems with any age; the negative is that it will cause more paperwork and time/expense for either the State or the driver and benefit/cost ratio may be low since all drivers will be tested.

***Alternative 2 – Driving battery (possibly DHI) of all drivers in the state of Alabama at renewal using computer-based assessment tool***

- 2a. At state facility and expense – could be accomplished at a computer terminal next to renewal desk;
- 2b. At personal expense (using computer based assessment tool similar to that used for boating license);

The positive impact is that it will test all drivers’ abilities and may catch some problems with any age. The negative is that it will cause more paperwork and time/expense for all drivers and may not be effective for the benefit/cost ratio.

***Alternative 3 – Visual testing of all drivers over a certain age (65, 70, 75, 80) at renewal***

- 3a. At state facility and expense – could be a computer “game” type of kiosk at renewal site;
- 3b. At driver expense (using approved testing standards at personal optometrist or medical facility);

The positive impact is that it will test at risk drivers’ eyesight so benefit/cost ratio may be high. The negative is that it only tests eyesight and not other problem areas for older drivers. Also will cause more paperwork and time/expense for either the state or driver.

***Alternative 4 – driver battery (cognitive, physical, & visual) testing drivers over a certain age or at accelerated renewals***

- 4a. At state site and expense – same as 2a;

4b. At driver expense (using approved testing standards at personal optometrist or medical doctor);

The positive impact is that it will test at-risk drivers for cognitive, visual and physical abilities. The negative is that it will cause more paperwork and time/expense for either the DPS or the driver.

***Alternative 5. Required driver education course for older drivers (similar to AARP course)***

The positive impact is that it will enlighten drivers to their limitations and may lower their insurance rates. There are limited benefits in that drivers may surrender their licenses if made aware of disabilities. The negative is that it will cause more paperwork and time/expense for the State to keep records and send notices. Education has not been as effective as other screening methods in impacting driver safety.

***Alternative 6. Restricted License for older drivers (similar to young drivers)***

Limited times /distances for driving – may only allow day driving;

The positive impact is that it will alert older drivers to check for limitations. The negative is that it will not improve driving skills or stop impaired drivers.

***Alternative 7. No change – only use self monitoring or physician/family reporting for suspension***

The negative is that it will not check drivers for competency and accident rates will not improve. The positive impact is that it will not cost anything to the state or the driver. Currently a physician or family member can report “Any person afflicted with or suffering from a physical or mental impairment which, in the opinion of the Director of Public Safety or examining officer, will prevent such person from exercising reasonable and ordinary control over a motor vehicle”

**Table 4-5 Driver’s license renewal alternatives with weighting factors**

Alternative	AL Safet y Impa ct	Perso nal Cost	Cost to DPS	Total weigh t	Ratin g of Altern ative (1 is best)
1a visual tests – all ages – state expense	+2		-4	0	
1b visual tests – all ages - driver expense	+2	-4		0	
2a driver battery all ages – state expense	+3		- 4	10	3 <sup>rd</sup>
2b driver battery all ages - driver expense	+3	-4		10	3 <sup>rd</sup>
3a visual tests – at certain age – state expense	+4		-4	20	2 <sup>nd</sup>
3b visual tests – at certain age – driver expense	+4	-4		20	2 <sup>nd</sup>
4a driver battery @ certain age – state expense	+5		-4	30	1 <sup>st</sup>
4b driver battery @ certain age – driver expense	+5	-4		30	1 <sup>st</sup>
5 driver education required @ certain age	+1	-1	-	5	
6 restricted license	0	0	0	0	
7 no change	0	0	0	0	
<i>Weighting Factors, Safety = 10 pts, Cost = 5 pts</i>					

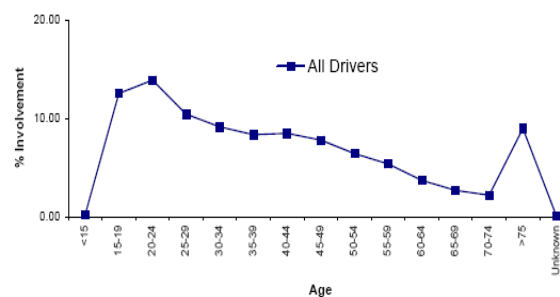
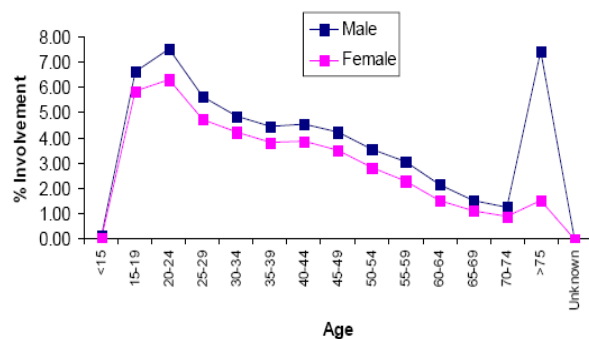
The right hand column in the table is the total of the impact factors multiplied by the importance weighing factor. Based on this analysis the preferred alternative is a total driver screening tool focused on targeted impaired driving populations. The second best alternative would be the visual testing of targeted populations at license renewals. The third is having all age drivers screened at renewal.

#### Task 4. Attitudes Regarding Screening Age

In UTCA report 99238, Owsley and colleagues found through interactions with DPS License Examiners, Medical Unit Staff, and other personnel that many expressed the need for mandatory re-screening at the license examination level [Owsley, et al., 2001]. In the meantime, substantial research has been conducted with the goal of translating our knowledge about the functional abilities required for safe driving into assessment measures that can be implemented by State Departments of Motor Vehicles [Ball, et al., 2002]. Although research has focused on determining what skills are needed for safe driving and how such skills can be assessed, older adults' attitudes regarding these assessment measures in particular and driver re-screening policies overall have not been examined.

In order to research alternatives for solving problems associated with older drivers, we explored the possibility of the State requiring driver-license renewal screening. The purpose of such screening would be to identify at-risk older drivers based upon known age-related risk factors for crash involvement.

To determine the best age to require testing in Alabama the researchers looked at the traffic crash statistics for the current year. Traffic accidents actually decreased with drivers' age until the over-75 year range as illustrated in Figure 4-1a. The statistics shown in Figure 4-1b prove that when the genders are separated, the percent of accidents for the male over-75 group is actually as high as the 20-24 male range. The percent crashes for female drivers over 75 increases less than one percent. National statistics show that if crash data is plotted in terms of miles driven, then the ages between 65 and 70 are the breakpoint.



**4-1a Pe 4-1b Percent of drivers involved in traffic  
crashes by age & gender  
[CARE, 2005]**

We first examined knowledge and attitudes of drivers residing in Alabama regarding driver-license re-screening. Next, we reviewed research on the factors that lead to crash involvement among older adults. Through this research, we identified an automated inventory that was recently developed for the purpose of identifying high-risk older drivers in a Department of Motor Vehicles Setting, the DRIVINGHEALTH® Inventory. We administered this battery to Alabama-licensed drivers and examined both their attitudes about the battery as well as their performance.

We utilized UTCA funds to recruit and test 258 drivers residing in Alabama and ranging in age from 18 to 87 years with this technological assessment of driving fitness. Additionally, 220 of these participants completed a questionnaire which we designed to examine attitudes toward this inventory in particular as well as driver re-screening in general (See Appendix). Participants rated each of the following statements on five-point Likert scales ranging from “strongly agree” to “strongly disagree”:

- “The State should require screening of older drivers for renewal of licenses”
- “The DHI accurately assessed my driving abilities”
- “The DHI should become part of the licensing process”
- “Older adults should be required to take the DHI to renew their driver’s license”

Results of the survey indicate that 90 percent of licensed drivers agree that the state should require screening for older-drivers’ license renewal. 65.2 percent of the respondents agreed that the DHI accurately assessed their driving abilities. 67.8 percent agreed that the battery should be used as part of the initial licensing process, while 72 percent agreed that these tests should be used for license renewal.

Participants also responded to the question: “If screening was used as part of the licensing process, at what age should the screening be done?” Choices were: all ages, 55 +, 65 +, 75 +, 85 +, or other. The responses are presented in Table 4-6 below. Only 30 percent of respondents indicated that such screening should be done at all ages.

**Table 4-6 Licensed drivers’ opinions regarding  
about the age at which screening should be conducted**

Driver age for screening	% endorsed
85 and older	4.1
75 and older	18.6
65 and older	32.3
55 and up	13.2
All ages	29.5
Other ( responses included 60+, 70+, or 80+)	2.3

The attitudes of younger participants and older participants were compared using Mann-Whitney U tests. Overall, younger and older adults felt the same about the DHI and mandatory testing, with one exception. Surprisingly, younger drivers were more likely to support screening for all ages while older drivers were more likely to endorse screening for older drivers only, ( $z = -3.13$ ,  $p = .002$ ). Overall, both younger and older drivers believe that the DHI is an appropriate screening tool and should be used as part of the licensing process ( $p$ 's  $> .05$ )

## **Recommendations for Implementation**

There are a myriad of issues to consider when recommending changes which affect people outside the decision process. It is typical of human nature to resist change even if the change is beneficial. There are many reasons for this resistance including, but not limited to, fear of the unknown, loss of control, lack of understanding, and disagreement with the decision. Resistance is not necessarily a negative occurrence, but can be used as a forcing function for verification that the decision is indeed appropriate, to make sure the people affected have had input, to encourage complete communication of the change decision, and to ensure dissenting views have been considered and addressed [Schermerhorn, et al., 1997]

Based on studies in other states and statistics and data completed in this study, it is recommended that Alabama consider a renewal screening method for older drivers. The preferred method would be a screening tool that would rate not only visual skills, but also cognitive and physical capacities for at risk drivers. This would increase safety of all drivers in Alabama by preventing and minimizing impacts on both senior driving crashes and fatalities. A good screening model is the DRIVING HEALTH Inventory which is a software adaptation of the Gross Impairment Screening Battery of General Physical and Mental Abilities (GRIMPS) Test. The program takes user input and indicates severity of impairment in several given areas. The end result is that the software can assess people's visual, physical and mental abilities, which are thought to be important for driving.

Alabama law under Title 32 Motor Vehicles and Traffic states that “A person who secures a renewal of a license in the manner provided by law shall not be required to take the examination unless the Director of Public Safety deems it advisable to require the person to take the examination. If the Director of Public Safety deems it advisable, the director shall notify the person in writing by letter sent to the address given on the application of the person at least 10 days before the date on which the examination or test is given of the time and place of the examination. The examination given to such a person shall be conducted in the same manner and the result of the examination ascertained and reported in the same way as examinations are given to persons applying for an original driver's license.” [Code of Alabama]. This regulation seems to open the way for screening of driving population under certain conditions. Although this is open to political and legal debate, other states have implemented screening of certain driving populations, so it is a possibility.

There are challenges in implementing this recommendation since changes must be made in licensure requirements. However if constituents are included in the decision-making process a smooth transition is more likely to occur. In fact, using the Alabama boating license laws as a management and safety model should help immensely. Recommendations for implementation include the adoption of a pilot program in a limited area that would test the screening tool and assist in doing a full cost benefit analysis for the state. Information gleaned from a pilot study could include measurement of resistance, methodology constraints, logistical assessments, and effectiveness of the program.



## **Significance and Benefits of Project**

The primary benefit of this study is that it used existing Alabama traffic crash data (CARE), and developed specific data from the Alabama driving population to develop alternatives to increase traffic safety. Studies done in other states were also used as a baseline to effectively identify and evaluate the ability of drivers to continue to operate vehicles safely with functional impairments. Finally a recommendation was made in favor of licensure screening for “at-risk” drivers. The actual screening tools and delivery mechanism will be the topic of the second phase of this project.

## **Student Involvement**

An additional benefit involves diversity since funding of this project supported two undergraduate and one post-graduate student (all female) in commencing transportation research. Other students volunteered to help take the surveys. Additionally, this project enhanced a multi-discipline approach to solving this problem with the collaboration of co-PIs from three distinct disciplines, two of whom had not received UTCA funding previously.

## **Section 5**

### **Project Conclusions**

As stated in the previous chapter, it is recommended that Alabama consider a renewal screening method for older drivers since it has the highest benefit to cost ratio in increasing safety of older drivers. The preferred method would be a screening tool that would rate not only visual skills, but also cognitive and physical capacities for at risk drivers. The age of automatic implementation would be in the 70-75 year range for best results. Obviously the management of older drivers needs to be within an integrated framework that also includes roadway improvements that follow current FHWA guidelines for an aging population, as well as improvements in alternative transit for older drivers within rural areas of the state.

#### **Technology Transfer Activities**

One of the goals of this project was to ascertain how other communities are addressing the concerns and constraints of an aging population, thus technology transfer was accomplished to Alabama safety advocates during this study. The team members documented their activities in as a UTCA final report (i.e., this document), and presented their recommendations to the Alabama Strategic Highway Safety Planning subcommittee for Older/Restricted Drivers. Dr. Edwards attended the National Association of Psychological Sciences meeting in Washington, DC and presented two papers from these results. The first paper, “Age Performance, and Attitudes Regarding mandatory Driver-License Testing” summarized the survey data gleaned from the UTCA study over the past 12 months. Overall, younger and older adults felt the same about the DHI and mandatory testing, with one exception. Surprisingly, younger drivers were more likely to support screening for all ages while older drivers were more likely to endorse screening for older drivers.

The second APS paper was titled “Drivinghealth® Inventory (DHI) Performance and Self-Perceptions among Older Drivers”. The results of testing at UAH provided evidence of the validity of the DHI in that it could distinguish among older drivers with and without crashes. The lack of relationship between self-ratings and performance on the inventory provide support for the use of mandatory, performance-based testing of driving fitness rather than allowing self-regulation of driving with advancing age. Further research will examine the predictive validity of the inventory. Additionally, a manuscript documenting the research results will be submitted to a peer-reviewed journal for publication.

#### **Research Relevance and Impacts to Alabama**

This project addressed the mission and several major goals of the UTCA. The major benefit was increased driver safety through data acquisition and statistical analysis of older driver screening. Additionally the project focused on generating driver attitude data and looked at accident reports. The project also addressed the technology transfer goal of UTCA since the investigators reported on the findings at a state safety committee, presentation at a national conference and submitting the final report to UTCA.

## Section 6

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# **APPENDIX** **Copy of Driver Attitude Survey**

Record Date \_\_\_\_\_ (MM/DD/YYYY)

Indicate Respondent's Gender: (0) Female (1) Male

1. What is your date of birth? \_\_\_\_\_ (MM/DD/YYYY)

2. What Race do you consider yourself?:

White/Caucasian (1)

Asian (3)

American Indian/Alaska Native (5)

Bi-Racial (6)

Black/African-American (2)

Native Hawaiian (4)

Hispanic (5.5)

Other (7)

3. What was the highest grade-level that you completed?

1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup> 4<sup>th</sup> 5<sup>th</sup> 6<sup>th</sup> 7<sup>th</sup> 8<sup>th</sup> 9<sup>th</sup> 10<sup>th</sup> 11<sup>th</sup> 12<sup>th</sup> grade

Vocational Training/Some College (13)

Associates Degree (14)

College Graduate BA/BS (16)

Some Professional School after college graduation (17)

Masters Degree (18)

Doctorate Degree (PHD, MD, DVM, DDS, JD) (20)

4. Are you a current driver licensed by the state of Alabama? Yes (1) No (0)

4a. If no, Are you currently licensed by another state? Yes (1) (Specify) \_\_\_\_\_ No (0)

5. There is a safety issue with respect to impaired drivers on the road (with regards to vision, reaction time, etc.).

Strongly  
Agree

Somewhat  
Agree

Neutral

Somewhat  
Disagree

Strongly  
Disagree

6. Does the state of Alabama require retesting or screening for drivers' license renewal?

Yes

No

Do Not Know

7. The state of Alabama should require screening for renewal of driver's licenses.

Strongly  
Agree

Somewhat  
Agree

Neutral

Somewhat  
Disagree

Strongly  
Disagree

8. What can the state of Alabama do to improve driver safety?