

PROMISING APPROACHES FOR ENHANCING ELDERLY MOBILITY





SEPTEMBER 2003

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Michigan Office of Highway Safety Planning or the US Department of Transportation, National Highway Traffic Safety Administration. This material was developed through a project funded by the Michigan Office of Highway Safety Planning and the US Department of Transportation (Highway Safety Project DE-03-01, UMITRI Report No. 2003-24).

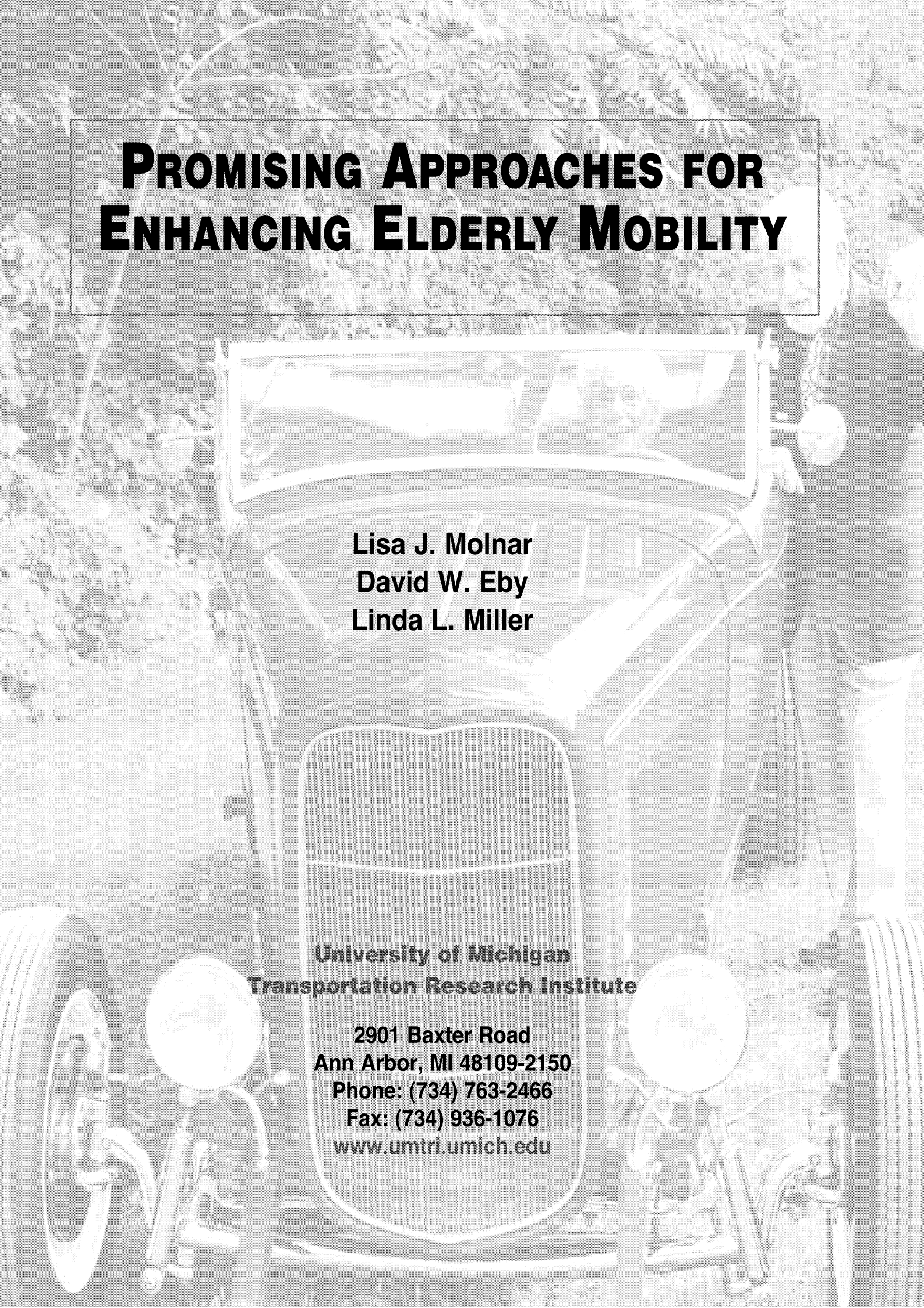
ACKNOWLEDGMENTS

We acknowledge several individuals who contributed to the completion of this project. Esther Wagner, Richard Miller, Betty Mercer, John Eberhard, Frank Cardimen, Tom Bruff, and Steve Betterly provided valuable input on identifying promising approaches for enhancing elderly mobility. Mary Chico assisted with report production. Esther Perlman, Betty Hammond, and Albert Gorlin appear in the photographs.

Lisa J. Molnar
David W. Eby
Linda L. Miller

Design and layout by Shekinah Errington.
Photographs by Gregory and Lidia Kostyniuk.
Printing by Spectrum Printers, Inc.

Vintage cars in photographs courtesy of RM Classic Cars, Ypsilanti, Michigan. Vintage cars include a 1932 Ford Roadster, 1932 Studebaker President Roadster, and 1936 Hudson Delux 8 Convertible Coupe.



PROMISING APPROACHES FOR ENHANCING ELDERLY MOBILITY

**Lisa J. Molnar
David W. Eby
Linda L. Miller**

**University of Michigan
Transportation Research Institute**

**2901 Baxter Road
Ann Arbor, MI 48109-2150
Phone: (734) 763-2466
Fax: (734) 936-1076
www.umtri.umich.edu**

TABLE OF CONTENTS

Introduction.....	1
Screening and Assessment.....	4
Education and Training.....	20
Vehicle Adaptations and Advanced Technology	29
Roadway Design	37
Alternative Transportation	43
Bibliography.....	57



INTRODUCTION

General background

There has been tremendous growth in the elderly population in the United States (US) in the past few decades and this trend is expected to continue. By 2030, one out of every five Americans will be over the age of 65, resulting in an elderly population of more than 70 million people. Although many people drive less as they get older, elderly drivers are more likely to be involved in a crash for every mile they drive than any other age group except the youngest drivers. They are also at increased risk of injury, given a crash. The increased crash risk of elderly drivers is likely due to declines in visual, cognitive, and psychomotor abilities related to driving. The increased injury risk is likely due to the fact that as people age, they tend to become more frail. Yet, most Americans consider driving to be essential to their independence and quality of life. Probably in no other country is mobility so closely linked to the personal automobile, and this is just as true for older drivers as for young people starting out their driving careers. In part, this is due to the values and traditions that have shaped our country and in part, it has been due to the absence of acceptable alternatives.

As elderly drivers have come under increased scrutiny, it has become apparent that it is not age, per se, that leads to problems with driving. It is the declines in driving-related abilities that often accompany aging or arise from medical conditions that make driving more dangerous. And because not all drivers experience these declines in the same way, or even experience them at all, there is widespread agreement that the focus of traffic safety efforts should be on helping older drivers who are able to continue driving safely, do so, rather than on restricting all older drivers, regardless of their ability to drive.

The federal government has for many years supported an ambitious program of research to better understand age-related declines in abilities and the driving problems that can result. Clearly, the more we know about the effects of aging on driving, the better able we will be to develop and put into place effective strategies for enhancing the mobility of older people.



We know that driving is a complex task that requires visual, cognitive, and psychomotor abilities. As people age, they may experience declines in these areas that compromise their ability to drive safely. The visual declines most likely to affect safe driving include reduced static and dynamic acuity, contrast sensitivity, sensitivity to changes in angular size and motion, pattern perception, visual attention, and visual search capability, as well as increased vulnerability to glare. Cognitive declines most likely to affect safe driving include a slowing of information processing leading to less efficient working memory, as well as declines in selective attention, divided attention, and attention switching. Psychomotor changes with adverse affects on driving include loss of limb strength, flexibility, sensitivity, and range of motion, and reduced head and neck mobility. Older people are also more likely than younger people to suffer from certain medical conditions like stroke and dementia that impair function.

Although the changes that accompany aging will eventually affect everyone's driving, there are tremendous differences from person to person in the rate of decline and what functions are affected—each individual is unique. And many individuals are able to compensate for declining abilities and continue to drive safely. For example, elderly drivers may stop driving at night, reduce their driving in unfamiliar areas, rely on a passenger to navigate or read road signs, or use less traveled roads. For people who continue to drive, declines in abilities can have very real implications for driving. Older drivers are more likely than younger drivers to be involved in crashes at intersections, especially when making left turns across traffic, and on limited access highways when merging, exiting, and changing lanes. Common areas of difficulty for older drivers include yielding to oncoming traffic, responding to road signs or signals, searching and scanning the road environment, staying in the lane, positioning the car for turning, maintaining regular speeds or keeping up with the traffic flow, passing other cars, and stopping.

The research on older drivers makes it clear that the issue of elderly mobility requires our attention. What is less clear is how communities can best respond and take effective action to enhance elderly mobility. How can communities decide what programs and practices will work for them? What are the necessary steps for planning successful efforts and carrying them out? What are the barriers communities might encounter and how can they be overcome?

A broad array of planning efforts has been undertaken at the federal and state level over the past several years to help communities plan for their elderly population's mobility needs. At the heart of these efforts is the recognition that elderly mobility is a complex issue that requires a multifaceted and comprehensive approach. The US Department of Transportation has identified three policy objectives—safety, individual personal mobility, and facilitating the eventual transition to mobility alternatives—that make up the strategic planning goal for the US transportation system.¹ These objectives are aimed at keeping people driving as long as they are able to do so safely; promoting technology and training that help drivers overcome or compensate for functional deficits; improving screening to determine when people should no longer be driving; bringing new emphasis to the provision of alternative transportation; and educating drivers about how to maintain safety and how to plan for a time they can no longer drive.

The American Association of State Highway and Transportation Officers (AASHTO), with support from the National Highway Traffic Safety Administration (NHTSA), Federal Highway Administration (FHWA), and Transportation Research Board (TRB), has developed a strategic plan that identifies sustaining the proficiency in older drivers as one of its goals for highway safety.² Strategies to accomplish this goal include: implementing processes to improve highway infrastructure to safely accommodate older drivers; implementing a comprehensive approach to assist older driver safety; and assessing the feasibility of Advanced Traveler Information Systems and Advanced Vehicle Control Systems for sustaining mobility and enhancing proficiency.

¹ These objectives are described in U.S. Department of Transportation. (1997). *Improving Transportation for a Maturing Society*. (Report DOT-P10-07-01). Washington, DC: Office of the Assistant Secretary for Transportation Policy.

² This plan is outlined in AASHTO. (1997). *AASHTO Strategic Highway Safety Plan*. <http://www.transportation1.org/SafetyPlan/plan/index.asp>.

Many states have developed task forces to address the needs of older drivers. The Michigan Elderly Mobility and Safety Task Force, convened in 1998, studied elderly population trends and travel patterns, reviewed the literature, and conducted a national forum and focus groups in order to develop a plan to guide state policy on older drivers.³ Recommendations were made in several areas including traffic engineering, alternative transportation, housing and land use, health and medicine, licensing, and education and awareness. Although the plan contained some summary information about existing Michigan-based programs (and a few outside the state), it also called for further investigation of promising practices or programs for enhancing elderly mobility.

The guide presented here was originally conceived of as way to update the efforts of the task force. However, it became apparent that by expanding the scope of the guide to include programs and practices beyond the state, and by organizing the guide around several of the general areas that show promise for successful intervention, the effectiveness of the guide could be enhanced.

Purpose of this guide and how to use it

This guide is intended as a resource for community professionals interested in developing programs to enhance elderly mobility. While each community will have to tailor its efforts to fit its own unique character and that of its elderly population, much can be gained from learning about existing programs and practices. Based on extensive review of the literature and discussions with several experts in aging-related fields, the guide identifies several areas in which promising approaches to enhancing elderly mobility have been developed in the US and elsewhere. These areas include screening and assessment, education and training, vehicle adaptations and advanced

technology, roadway design, and alternative transportation. For each area, the guide contains:

- An introductory section on why the area is important for enhancing elderly mobility
- A discussion of how efforts in the area can best enhance elderly mobility
- Descriptions of current practices and programs that appear especially promising for enhancing elderly mobility
- Brief summaries of these highlighted practices and programs, as well as other practices and programs that show promise for enhancing elderly mobility

Choosing promising practices and programs for enhancing elderly mobility can be a challenging task—this is especially true when many of the practices and programs have not been formally evaluated. In cases where we lacked objective information about program effectiveness, we used our best judgment to identify promising practices and programs. To the extent possible, we based these judgments on whether the practices and programs incorporated the components we consider important to enhancing elderly mobility. We highlighted some practices and programs that we felt stood out, particularly in terms of their scientific basis, comprehensiveness, or timeliness. The promising practices and programs included in this guide are in various stages of development. Some are, in fact, still considered experimental, but represent innovative approaches that have considerable potential for enhancing mobility. The list could change with new developments in aging-related research or as more programs undergo formal evaluation—thus it represents a snapshot of efforts that we are aware of, based largely on information from published materials. The five areas in the guide, while presented separately for ease of the reader, are clearly interdependent and mutually supporting, and should be viewed collectively as part of a comprehensive approach to enhancing elderly mobility.

³ These task force activities are further described in Bruff, J.T. & Evans, J. (1999). *Elderly Mobility and Safety-The Michigan Approach Final Plan of Action*. http://www.semco.org/Products/pdfs/eldmob_final.pdf; Evans, J. (1999b). *Elderly Mobility and Safety Background Paper #2: Literature Review and Resource Inventory*. Retrieved on March 24, 2003, from http://www.semco.org/Products/pdfs/eldmob_bp2.pdf; Evans, J. (1999c). *Elderly Mobility and Safety Focus Group Research Report*. Retrieved on March 24, 2003, from <http://www.semco.org/Products/pdfs/focus.pdf>.

SCREENING AND ASSESSMENT

The common-sense wisdom that “in order to figure out where you’re going, you first need to know where you are,” is particularly applicable when thinking about the importance of screening and assessment for enhancing elderly mobility. Making informed decisions about whether and how older drivers can continue to drive safely in the future requires meaningful information about the changes in driving-related abilities they are currently experiencing and how these changes are affecting their driving.

There are many ways in which this information can be ascertained. Licensing agencies have a unique opportunity to screen for fitness to drive because older drivers, like everyone else in the driving population, must go through a license renewal process. The general process of license renewal varies from state to state in terms of the length of the renewal cycle, requirements for in-person renewal, and requirements for vision testing (see Table 1). Fourteen states require accelerated renewal for older drivers, and close to half have special provisions requiring older drivers to renew in person or undergo vision screening. Even with these provisions, however, it may be several years before older drivers have to actually appear at a licensing agency to renew their license. Thus, licensing agencies also rely on review of driver history records and referrals from health professionals (e.g., physicians,

occupational and physical therapists, social workers, vision specialists), law enforcement officers, courts, and families and friends of older drivers, to alert them to situations in which an individual’s driving fitness may be in question. Current reporting requirements for physicians are shown in Table 2. Provisions vary from state to state—the majority of states do not require reporting, but instead encourage it or at least do not prohibit it. Close to half the states provide some



type of protection from liability for physicians, while a fewer number offer legal protection or anonymity.

Within the licensing agency itself, there are several potential mechanisms for screening older drivers for fitness to drive, including visual inspection of drivers’ appearance or demeanor when they first come to the counter, asking them questions about their health and medication use, reviewing their driving history,

Table 1. Licensing Provisions for Older Drivers

State	Length of Renewal Cycle	Accelerated Renewal; Other Provisions
Alabama	4 yr.	None
Alaska	5 yr.	None; Cannot renew by mail two consecutive times; 69 and older cannot renew by mail
Arizona	Until age 65	5 yr. for 65+; 70+ cannot renew by mail
Arkansas	4 yr.	None
California	5 yr.	70+ cannot renew by mail. No more than two sequential mail renewals for anyone
Colorado	10 yr.	5 yr. for 61+; 66+ cannot renew by mail. No more than two sequential mail renewals
Connecticut	4 yr. or 6 yr.	None; 65+ may choose 2- or 6-year renewal cycle.
Delaware	5 yr.	None
Dist of Columbia	5 yr.	None
Florida	6 yr., 4 yr. bad rec.	None; Only two successive renewals by mail.
Georgia	4 yr.	None
Hawaii	6 yr.	2 yr. for people 72 and older
Idaho	4 yr.	21-62 yrs get 4- or 8-yr. option; drivers 63+ have 4-yr. license
Illinois	4 yr.	2 yr. for 81-86yrs; 1 yr. 87+; 75 and older take road test
Indiana	4 yr.	3 yr. for drivers 75 and older
Iowa	5 yr.	2 yr. for drivers 70 and older
Kansas	6 yr.	4 yr. for drivers 65 and older
Kentucky	4 yr.	None
Louisiana	4 yr.	None; 70+ no mail. No more than two sequential mail renewals for anyone
Maine	6 yr.	4 yr. for drivers 65+; Vision test every year after age 62
Maryland	5 yr.	None
Massachusetts	5 yr.	None
Michigan	4 yr.	None
Minnesota	4 yr.	None
Mississippi	4 yr.	None
Missouri	6 yr.	3 yr. for drivers 70+ and 21 and younger
Montana	8 yr., 4yr. by mail	4 yr. for drivers 75 and older; No more than two sequential mail renewals for anyone
Nebraska	5 yr.	None
Nevada	4 yr.	None; 70+ must include medical report with renewal
New Hampshire	5 yr.	None; 75+ renewal applicants take road test
New Jersey	4 yr.	None
New Mexico	4 or 8 yr. option	4 yr. for drivers turning 75 in last half of an 8-yr. renewal cycle
New York	5 yr.	None
North Carolina	5 yr.	None; 65+ do not have to parallel park in road test.
North Dakota	4 yr.	None
Ohio	4 yr.	None
Oklahoma	4 yr.	None; Fees reduced/waived
Oregon	8 yr.	None; Vision screening every 8 yrs for 50+ drivers
Pennsylvania	4 yr.	None
Rhode Island	5 yr.	2 yr. for drivers 70 and older; none
South Carolina	5 yr.	None
South Dakota	5 yr.	None
Tennessee	5 yr.	None; Licenses for 65+ don't expire. Fees reduced for 60+ drivers
Texas	6 yr.	None
Utah	5 yr.	None; Vision test for 65+
Vermont	4 yr.	None
Virginia	5 yr.	None
Washington	5 yr.	None
West Virginia	5 yr.	None
Wisconsin	8 yr.	None
Wyoming	4 yr.	None

Adapted from *US Driver Licensing Renewal Procedures for Older Drivers as of June 2003*. Insurance Institute for Highway Safety, Highway Loss Data Institute. Available at <http://www.hwysafety.org/safety>.

Table 2. Physician Reporting Requirements

State	Reporting Required	Immunity Available	Legal Protection Available	Anonymity Available or Person Reporting Driver to DMV
Alabama	No, but encouraged	Yes	Yes	No
Alaska	No	No	N/A	N/A
Arizona	Yes	Yes	Reporting immunity is granted	Yes
Arkansas	No, but encouraged	No	No	N/A
California	Yes, certain conditions	Yes, if reporting required by law	Yes, if reporting required by law	Yes, unless court mandate
Colorado	No, but encouraged	N/A	Yes	No
Connecticut	No, but encouraged	Yes	Only for immunity laws	No
Delaware	Yes, certain conditions	Yes	N/A	Yes
District of Columbia	No, but permitted	No	No	Yes
Florida	No, but permitted	N/A	Yes	Yes
Georgia	No, but encouraged	No	No	No
Hawaii	No, but permitted	No	No	N/A
Idaho	Yes	No	Yes	No
Illinois	No, but encouraged	Yes	N/A	Yes
Indiana	No, but handicapped patients must report	No	N/A	N/A
Iowa	No, but permitted	Yes	Yes	No
Kansas	No		Patient permission to release info	No
Kentucky	Yes	Yes	No	No
Louisiana	No, but can file medical report	Yes, statutory		No
Maine	Yes	N/A	Yes	No
Maryland	No, but encouraged	N/A	Yes	No
Massachusetts	No, but encouraged	N/A	No	No
Michigan	No, but encouraged	No	No	Yes, unless a public official
Minnesota	No, but encouraged	Yes	Unknown	No
Mississippi	No, but encouraged	No	N/A	N/A
Missouri	No, but encouraged	Yes	Yes	Yes
Montana	No, but encouraged	Yes	N/A	No
Nebraska	No, but encouraged	No	No	No
Nevada	Yes, certain conditions	Yes	Yes	Yes
New Hampshire	No, but encouraged	N/A	No	No
New Jersey	Yes, certain conditions	Yes	No	No
New Mexico	Yes	Yes	Yes	No
New York	No, but permitted	No	N/A	No
North Carolina	No, but encouraged	Yes	No	No
North Dakota	No, but permitted	Yes	Yes	No
Ohio	No, but permitted	No	No	No
Oklahoma	No, but permitted	Yes	Yes	No
Oregon	Yes	Yes	Yes	No
Pennsylvania	Yes	Yes	Yes	No
Rhode Island	No, but permitted	Yes	N/A	N/A
S. Carolina	No, but permitted	No	N/A	N/A
South Dakota	No, but permitted	No		No
Tennessee	No, but permitted	Yes	No	No
Texas	No, but permitted	Yes	Yes	No
Utah	No, but permitted	Yes	No	No
Vermont	No, unless patient permission	No	No	No
Virginia	No, but permitted	No	Yes	No
Washington	No, but permitted	No	No	No
West Virginia	No, but encouraged	No	No	No
Wisconsin	No, but encouraged	Yes	Yes	No
Wyoming	No, but encouraged	Yes	N/A	N/A

Adapted from: American Medical Association. (2003). *Physicians Guide to Assessing and Counseling Older Drivers*. Washington, DC: U.S. Department of Transportation.

and conducting screening tests for visual, cognitive, or psychomotor deficits that may impair driving. Results of these initial screening activities are best used to determine whether more in-depth evaluation of fitness to drive is necessary. Based on the final outcome of these various screening and assessment activities, the licensing agency has several choices—it can allow the person to keep his or her license, refuse to renew the license, or suspend, revoke, restrict the license (e.g., prohibit night driving, require additional mirrors on vehicle, restrict driving to specific places or limited radius from the driver’s home), or shorten the renewal cycle. In making these choices, licensing agencies consider each individual’s abilities and circumstances, and the options available for driving compensation or remediation, as well as rely on the advice of their state medical advisory board if one is in place.

Meaningful assessment of older drivers by professionals and others in the community is clearly important for an effective referral system for licensing agencies. At the same time, efforts to assess older drivers’ abilities by people outside the licensing agency—particularly physicians and other health professionals, family and friends, and even older drivers themselves—play an important role well beyond that of providing referral information to licensing agencies. Many older drivers may be willing to take immediate action to voluntarily restrict or even stop their driving, based on the advice of trusted professionals or others in their lives. For example, many older former drivers report having stopped driving based primarily on the advice of their personal physician. Physicians are uniquely positioned to assess driving-related problems as part of more general medical treatment and care. To the extent that declines in abilities are identified early, opportunities for compensation or remedial action can be recommended and facilitated (e.g., vehicle adaptations, training). Other health professionals, such as occupational therapists, can also help older drivers, once declines have been identified, by assessing whether a return to driving is possible through training and rehabilitation, and by determining what specific remedial activities should be undertaken.

Self assessment can also be a useful tool, by providing cognitively capable older drivers with information about driving-related declines so that they can make better decisions about driving, and by facilitating discussions between older drivers and their families

about driving-related concerns. Because self-assessment can be done privately with the results remaining confidential, it may be less threatening than other types of assessment and something older drivers would be willing to do earlier in the aging process and to repeat over time. Clearly, older drivers must be honest in their responses and willing to follow through on suggested courses of action for the process to be of real benefit.

Each type of assessment carries with it different requirements and is associated with different strengths and weaknesses. Having available several types of assessment that can be done in different types of settings can serve to complement the screening and assessment process that goes on in licensing agencies and can contribute to a more comprehensive, multi-faceted approach for identifying older drivers who may be at risk.

How screening and assessment can best enhance elderly mobility

Screening and assessment efforts need to focus on the age-related abilities that actually affect driving. Many changes occur to people as they age, but not all of them compromise people’s ability to drive safely. While research efforts over the past several years have focused on identifying those age-related deficits most important for safe driving, findings need to be translated into practical, consistent, and up-to-date guidelines for physicians and others about what should be assessed and how it should be done. These guidelines should also address the specific medical conditions that adversely affect fitness to drive and the specific driving problems that may result from them. In addition, there should be training opportunities available for using the guidelines.

Important components of a promising approach for licensing agency screening and physician reporting are highlighted below:

- Strong legislation for accelerated or in-person license renewal

- High levels of reporting by physicians and other professionals
- Clear information for physicians on reporting requirements and procedures
- Strong and active medical review boards
- Clear guidelines for licensing examiners
- Valid and efficient screening procedures

The ability of licensing agencies to screen and assess older drivers can be enhanced in several ways.⁴ First, legislation can be encouraged in states that currently do not require accelerated or in-person renewal for older drivers so that there are more opportunities for direct contact between licensing agencies and older drivers. Second, appropriate referrals from physicians and others in the community can be encouraged or required, particularly since they are of such importance in bringing older drivers to the attention of licensing agencies. Physicians may be reluctant to report patients because of uncertainty about whether they represent a clear risk to public safety, or because of fears of legal ramifications or the potential to undermine the physician-patient relationship. Recommendations for improving the ability of physician's to identify potential problems and for making physician involvement more effective include having clear and publicized information available on: the role of physicians; their legal responsibilities for reporting, who to report to and what happens once a referral is made; what to look for that might signal problems with driving; and where to refer patients for further evaluation.⁵ Third, there is an opportunity for medical review boards to become more active in supporting licensing decisions regarding older drivers. Many states have relatively inactive medical review boards and some states lack them altogether. Making medical review boards more effective may require adding members with expertise in aging, and garnering more state support. Strong medical review boards can play an important role not only in assisting licensing agencies directly, but also in helping to educate and train physicians and other health professionals. Fourth, licensing agency examiners need guidelines that can help them decide when further evaluation is

called for, who can provide it, and in the event that remediation is necessary, what options are available. Finally, there are many practical considerations that affect the successful implementation of screening and assessment efforts in licensing agencies—screening procedures need to be valid and yet require minimal additional time, space, and resources.

Important components of a promising approach for other types of assessment, particularly self assessment are highlighted below:

- Use of incentives to increase participation
- Assessment tools based on aging-related research
- Assessment tools that are easy to use and understand
- Assessment tools that provide comprehensive information with individualized feedback
- Targeted to cognitively capable older drivers

Incentives may be effective in getting older drivers to voluntarily participate in assessment and follow-up remediation activities. For example, legislation has been passed in a number of states that require automobile insurance companies to provide discounts to people who have completed assessment and training classes. The effectiveness of self-assessment can be enhanced in several ways. Like assessment in general, self-assessment tools must be based on what is known about age-related declines and how they affect driving. Tools must be easy to use and understand, and provide concrete information about what older drivers can do to compensate for, or overcome, declining abilities, where to go for further evaluation, and how to plan for continued mobility when driving is no longer possible. Feedback should be individualized—that is, it should be linked to the identified problems of individual users. Because self assessment is especially useful for early detection of problems, it must be targeted and made available to appropriate groups of older drivers who are cognitively capable of completing a self-assessment tool and able to benefit from its feedback.

⁴ See CH2MHILL. (2002). *Guidance For Implementation of the AASHTO Strategic Highway Safety Plan: A Guide For Addressing Crashes Involving Older Drivers*. http://www.ch2m.com/nchrp/old_drvr/assets/ODguide.pdf for fuller discussion.

⁵ For a fuller discussion of how the physicians' role in assessment can be strengthened, see Marottoli, R.A. (2000). The physician's role in the assessment of older drivers. *American Family Physician*. 61(1): 39-42.

Descriptions of practices or programs that appear especially promising

The most promising approach for screening by licensing agencies is based on research initiated in 1996 and just recently completed and reported on in three final technical reports of the Model Driver Screening and Evaluation Program.⁶ The goal of the program is to keep people driving safely longer, while protecting the public through early identification of functionally impaired drivers. At the center of the program is a battery of functional tests that can be administered relatively quickly and inexpensively within licensing agencies to determine older drivers' functional status relative to vision, cognition, and physical movement. The battery, pilot tested over several years on more than 2,500 drivers, has been found to yield scientifically valid predictions about the risk of driving impairment. Because the test battery was designed to detect gross impairments, the results should be used to determine whether further evaluation is needed, and not as the basis for licensing actions. The test battery is summarized in Table 3.

Intended as a comprehensive approach to enhancing elderly mobility, the program also includes components that focus on how older drivers can initially be identified for functional testing (e.g., internal prescreening in licensing agencies, external referrals), as well as on



education and outreach efforts, referrals for remediation, and counseling to help older people maintain their mobility if they can no longer drive. Table 4 provides information about one prescreening component of the program that involves visual inspection by licensing agency examiners to identify older drivers who might need to undergo further functional screening. A second prescreening component of the program involves asking drivers about medical conditions or symptoms they may have had in the past 5 years (including diabetes, cardiovascular, pulmonary, neurologic, epilepsy, learning and memory, psychiatric, alcohol and drug, visual, musculoskeletal, functional motor impairment, and other health problems or use of medications).

One of the more promising approaches to self-assessment is the Driving Decisions Workbook, developed by the University of Michigan Transportation Research Institute and available on the World Wide Web at www.umtri.umich.edu/library/pdf/2000-14.pdf.⁷ The workbook is designed to increase

older drivers' self-awareness and general knowledge about driving-related declines in abilities, and to make recommendations about driving compensation and remediation strategies that could extend safe driving, as well as further assessment that might be needed. Development of the self-assessment instrument was based on a comprehensive review of the literature on older

drivers, a series of focus groups with older drivers and the adult children of older drivers, and a panel of

⁶ See Staplin, L., Lococo, K.H., Gish, K.W., & Decina, L.E. (2003a). *Model Driver Screening and Evaluation Program, Final Technical Report, Volume I: Project Summary and Model Program Recommendations*. (Report No. DOT HS 809 582). Washington, DC: U.S. Department of Transportation; Staplin, L., Lococo, K.H., Gish, K.W., & Decina, L.E. (2003b). *Model Driver Screening and Evaluation Program, Final Technical Report, Volume II: Maryland Pilot Older Driver Study*. (Report No. DOT HS 809 583). Washington, DC: U.S. Department of Transportation; Staplin, L. & Lococo, K.H. (2003). *Model Driver Screening and Evaluation Program, Final Technical Report, Volume III, Guidelines for Motor Vehicle Administrators*. (Report No. DOT HS 809 581). Washington DC: U.S. Department of Transportation.

⁷ See Eby, D.W., Molnar, L.J., Shope, J.T., Vivoda, J.M., & Fordyce, T.A. (in press). Improving older driver knowledge and awareness through self-assessment: The Driving Decisions Workbook. *Journal of Safety Research*; Eby, D.W., Shope, J.T., Molnar, L.J., Vivoda, J.M., & Fordyce, T.A. (2000). *Improvement of Older Driver Safety Through Self-Evaluation: The Development of a Self-Evaluation Instrument*. (Report No. UMTRI-2000-04). Ann Arbor, MI: University of Michigan Transportation Research Institute.

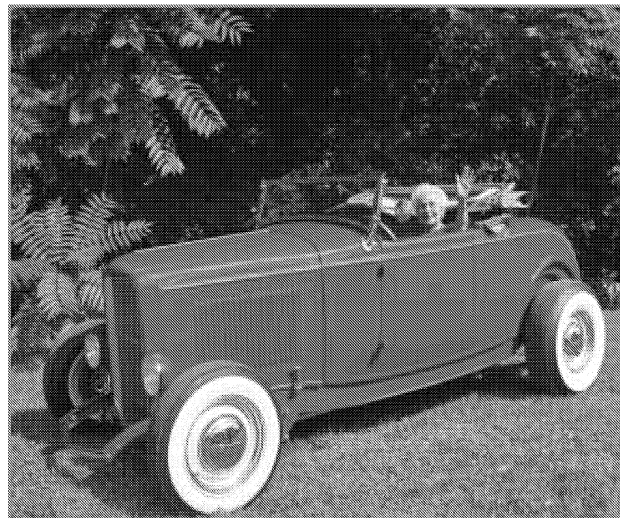
Table 3. Functional Abilities to Measure in a Driver Screening Program

Functional Ability	Screening Test
Visual Acuity	Wall charts, Stand alone testing machines, computer based programs
Visual Contrast Sensitivity	Wall charts, Stand alone testing machines, Computer-based programs
Field of View	Ophthalmological perimetry evaluation, UFOV subtest 2, Scan Chart test
Working Memory	Delayed Recall test from the Mini-Mental Status Evaluation (MMSE)
Directed Visual Search	Trail-making test, Part B
Visual (Divided) Attention Processing Speed	Trail-making test, Part B and a PC-based version of the Trail-making test, Part B ("Dynamic Trails"), UFOV subtest 2
Visualization of Missing Information	Motor-Free Visual Perception Test (Visual Closure subtest)
Lower Limb Strength and Mobility	Rapid Pace Walk, Foot Tap tests
Upper Body Flexibility	Arm Reach test and Head-Neck Rotation test
Head-neck Range of Motion	Head-neck Rotation test

Adapted from Staplin, L. & Lococo, K.H. (2003) and Staplin, L., Lococo, K.H., Gish, K.W., & Decina, L.E. (2003b).

experts on older driver abilities and evaluation. Based on findings from these activities, a model of the influences on driving decisions was developed with three domains for assessing potential problems with driving—health (medical conditions and medication use); driving abilities (vision, cognition, and psychomotor); and experiences, attitudes, and behavior. Declines in any of these domains can lead directly or indirectly to negative self-appraisal of one’s driving, which in turn can influence driving decisions, such as adopting driving compensation strategies.

The Driving Decisions Workbook includes 37 assessment areas linked to the three domains. For each assessment area, a set of questions is used to identify potential driving-related problems. Response categories that indicate problems are visually linked to feedback presented in the form of general knowledge (e.g., prevalence, effects on driving), self-awareness (e.g., the likelihood that the user has the problem), recommendations for further assessment (e.g., driving evaluation, vision screening), or suggestions for driving compensation (e.g., avoiding night driving). Both the questions and feedback were pilot tested in structured interviews with small groups of older drivers, age 65–74 and age 75 and



older, resulting in revisions to improve clarity and sharpen focus.

In preliminary testing, the workbook was found to correlate with an on-road driving test, as well as several functional tests, most of which are part of the test battery from the Model Driver Screening and

Evaluation Program. Although additional testing is planned to determine what changes people actually make and what actions they pursue as a result of using the Driving Decisions Workbook, the early results suggest that it can reinforce what older drivers already know about age-related declines, help them discover changes in themselves they had not been aware of before, and

lead to, at the very least, stated intentions to make changes in driving or to seek further evaluation.

One of the most promising approaches in the area of physician assessment is the just published Physician’s Guide to Assessing and Counseling Older Drivers.⁸ Based on the scientific literature and views of experts as of May 2003, it is intended to help physicians and other health professionals in assessing the ability of their older patients to operate a motor vehicle safely as part of their everyday personal activities.

⁸ See Wang. (2003). *Physicians Guide to Assessing and Counseling Older Drivers*. Chicago, IL: American Medical Association.

Table 4. Evaluating Functional Ability by Visual Inspection in a Licensing Agency

Functional Ability	Observations
Lower body strength, range of motion, mobility and coordination	Person is able to walk without assistance, no partial or full loss of a leg or foot, and no excessive shaking, tremors, weakness, rigidity, or paralysis.
Upper body strength, head and neck range of motion, hand mobility, and coordination	Person can turn both head and upper body and has full use of arms and hands, no partial or full loss of arm, no excessive shaking, tremors, weakness, rigidity, or paralysis.
Adequate hearing	With or without a hearing aid, person is able to hear the normal spoken voice during licensing process.
Adequate vision	Person must pass a vision screening by the DMV or a vision specialist.
Cognitive skills	Person responds to instructions and questions without disorientation.
Maintain normal consciousness and bodily control	Person does not experience excessive shaking, tremors, weakness, rigidity, paralysis, or obvious disorientation.
Maintain normal social, mental, or emotional state	Person does not display an excessively hostile and/or disruptive, aggressive behavior, or acts out of control. No obvious disorientation.

Adapted from Staplin, L. & Lococo, K.H. (2003) and Staplin, L., Lococo, K.H., Gish, K.W., & Decina, L.E. (2003b).

The guide provides information about: specific red flags for medically impaired driving; a test battery, the Assessment of Driving-Related Skills (ADReS) to assess the key areas of function; how to interpret performance on the test battery through scoring cut-offs, as well as examples of interventions to help physicians manage and treat functional deficits identified; driving rehabilitation specialists and how they can be of help; how to counsel drivers who should no longer be driving; physician’s legal and ethical responsibilities; state-by-state licensing requirements, licensing renewal procedures, reporting procedures, and contact information for each state’s driver licensing agency and medical review board; and a reference list of medical conditions and medicines that may impair driving skills and consensus recommendations for each one regarding driving restrictions. The reference list is grouped into several broad areas: vision; cardiovascular diseases; cerebrovascular diseases; neurologic diseases; medications; psychiatric diseases; metabolic diseases; peripheral vascular diseases; renal diseases; respiratory diseases; effects of anesthesia and surgery; and miscellaneous conditions. The guide represents a resource for physicians and other health professionals that provides practical and up-to-date information for assessing older drivers.

Summaries of promising practices and programs

Brief summaries of the highlighted practices and programs in the area of screening and assessment are presented in this section, as well as other practices and programs that appear to have promise for enhancing elderly mobility.

Model Driver Screening and Evaluation Program

Objective

To screen for functional deficits of older drivers in a licensing agency setting, and develop a program that will keep people driving safely for as long as possible.

Description

The program involves a battery of functional tests that can be administered relatively quickly and inexpensively within licensing agencies to determine older drivers’ functional status relative to vision, cognition, and physical movement. Intended as a comprehensive approach to enhancing elderly mobility, the program also includes components that focus on how older drivers can initially be identified for functional testing (e.g., internal prescreening in licensing agencies, external referrals), as well as on education and outreach efforts, referrals for remediation, and counseling

to help older people maintain their mobility if they can no longer drive. Pilot testing funded by NHTSA.

Study information

In pilot testing, trained staff administered and scored the test battery and obtained information on the driving habits of over 2500 older drivers. Researchers used crash records one year prior to the screening, and two years following, to evaluate the relationship between the screening and involvement in any type of crash, at-fault plus unknown-fault crashes, and at-fault crashes only. Results suggested that fast and efficient functional capacity screening can lead to valid predictions about the risk of driving impairment.

Contact information

Office of Research and Traffic Records
National Highway Traffic Safety Administration
400 Seventh Street, S.W., Room 6240
Washington, DC 20590
Web: www.nhtsa.gov

Driving Decisions Workbook

Objective

Increase older drivers' self-awareness and general knowledge about driving-related declines in abilities, and make recommendations about driving compensation and remediation strategies that could extend safe driving, as well as further assessment that might be needed.

Description

Development of the self-assessment instrument was based on a comprehensive review of the literature on older drivers, a series of focus groups with older drivers and the adult children of older drivers, and a panel of experts. The workbook is divided into five topic areas that influence safe driving behaviors—on-the-road, seeing, thinking, getting around, and health. Readers circle the answer that best describes their situation. Feedback (information and suggestions on dealing with a specific problem) is provided when appropriate. The end of the workbook contains a general question and answer section with additional information and resources. Funded by General Motors Corporation.

Study information

In preliminary testing, the workbook was found to correlate with an on-road driving test, as well as several functional tests, most of which are part of the test battery from the Model Driver Screening and

Evaluation Program. Although additional testing is planned to determine what changes people actually make and what actions they pursue as a result of using the Driving Decisions Workbook, the early results suggest that it can reinforce what older drivers already know about age-related declines, help them discover changes in themselves they had not been aware of before, and lead to, at the very least, stated intentions to make changes in driving or to seek further evaluation.

Contact information

Dr. David W. Eby
The University of Michigan
Transportation Research Institute
2901 Baxter Road
Ann Arbor, MI 48109-2150
Tel: 734-763-2466

Physician's Guide to Assessing and Counseling Older Drivers

Objective

Assist physicians in evaluating their older patients' ability to safely operate a motor vehicle.

Description

The guide assists physicians' in planning for older driver safety and provides information on how to informally and formally assess an older driver. Formal assessment includes the Assessment of Driving Related Skills (ADReS) Score Sheet and the Trail-Making Test, Part B. Based on the results of the assessments, information is provided on how to interpret the scores, and guidance on how a physician can intervene and help manage and treat the patient. It also outlines information a physician should know prior to referring patients to a driving rehabilitation specialist, how to counsel a patient, legal and ethical responsibilities of the physician, state licensing policies and reporting laws, and medical conditions that may affect driving. Funded by US Department of Transportation.

Contact information

Catherine J. Kosinski, MSW
Older Drivers Project
American Medical Association
515 N. State Street
Chicago, IL 60610
Tel: 312-464-4179
Email: catherine_kosinski@ama-assn.org

LICENSING AGENCY ASSESSMENT

Assessing Medically Impaired Older Drivers in a Licensing Agency Setting

Objective

Identify impaired older drivers in a licensing agency.

Description

This is a three-tiered assessment program that incorporates sensory, perceptual, psychomotor, and cognitive assessment tools. The first tier consists of brief and inexpensive screening tests to identify impaired license applicants whose driving is likely to be impaired. The second tier consists of longer and more elaborate tests to identify drivers who might do poorly on an actual road test. Second-tier assessments are administered to applicants who fail the first-tier tests and to drivers referred to the licensing agency for re-examination. The third tier consists of an on-road test. Pilot testing funded by NHTSA.

Study information

In exploratory pilot testing of the program, it was found that the tests used in each of the tiers were fairly successful in differentiating between drivers with age-related medical conditions and otherwise healthy older drivers. In addition, performance on the on-road test could be moderately predicted by results of some of the first and second tier tests. It was recommended that a larger validation study be undertaken.

Contact Information

Mary Janke
California DMV
1st Avenue, Mail Station F-126
Sacramento, CA 95818
Tel: 916-657-7032
Fax: 916-657-8589
Email: mjanke@dmv.ca.gov

California Department of Motor Vehicles
Research and Development Branch - F126
P.O. Box 932382
Sacramento, CA 94232-3280

Oregon's Re-Examination Evaluation Program

Objective

Assess a person's ability to drive and recognize problems that might affect his or her driving skills, including medical history, medication use, reflexes and response time, driver judgment, awareness, and thinking skills.

Description

Individuals who are referred to the program meet with a driver counselor who is specially trained in the area of driving skills and in identifying potential impediments to driving. Each driver undergoes testing of knowledge and ability to determine if he or she understands the laws and rules of the road. The counselor also assesses whether or not the driver's mental and physical health are satisfactory and administers an on-road driving test. Counselors determine if the driver's license should remain valid or if further testing is needed. If additional testing is required, the driver counselor will assist individuals in preparing for the tests. Counselors can require drivers to cease or restrict driving, or can require drivers to obtain a physician's verification of fitness to drive. Funded by Oregon Department of Motor Vehicles.

Contact information

DMV
Driver Safety Unit
1905 Lana Avenue NE
Salem, OR 97314
Tel: 503-945-5086
Web: www.odot.state.or.us/dmv

Utah Licensing Program to Restrict Drivers with Medical Conditions

Objective

Use a special licensing program to regulate drivers with medical conditions.

Description

This is a specialized licensing program for drivers with medical conditions. The program identifies drivers whose functional abilities may be impaired by their

medical conditions, assigns them a functional ability level, and regulates how and when they may legally drive (e.g., through area or time-of-day restrictions), based on their ability level.

Study information

Comparisons of crash rates were made between drivers licensed with and without medical conditions. Drivers in the medical conditions program generally had higher crash rates than comparison groups, although the differences were relatively modest, and most of the subgroups of medical conditions associat-

ed with increased crash risk were at the least restricted functional ability levels.

Contact information

NHTSA
U.S. Department of Transportation
400 7th Street, S.W.
Washington, DC 20590
Web: www.nhtsa.gov

SELF-ASSESSMENT

Creating Mobility Choices: Older Driver Skill Assessment and Resource Guide

Objective

Increase self-awareness and provide driving compensation strategies for older drivers through self-assessment.

Description

The guide contains a combination of survey questions and self-administered tests to assess reaction time, attention, vision, driving behavior, and near-crash experiences followed by a discussion and educational information for improving driving skills or awareness. The booklet also informs readers about automobile safety equipment and provides contact information and other resources for follow-up. Funded by the American Association of Retired Persons (AARP) and the ITT Hartford Insurance Group.

Contact information

AARP
601 E Street, NW
Washington, DC 20049

Drivers 55 Plus: Check Your Own Performance

Objective

Increase self-awareness of driving abilities and educate drivers about driving compensation strategies through self-assessment.

Description

The self-assessment instrument contains 15 questions, along with information on how to compute a score for the survey and what the score means, and suggestions for improving driving performance. Recommendations for restricting driving and warnings for older drivers to prepare for the day when they can no longer drive are also included. Funded by contributions from motor clubs associated with the American Automobile Association (AAA) and the Canadian Automobile Association, individual AAA club members, and AAA-affiliated insurance companies. Development of the instrument was based on the results of research conducted for AAA by researchers from the Safety Research and Education Project.

Contact information

AAA Foundation for Traffic Safety
1440 New York Avenue, Suite 201
Washington, DC 20005
Tel: 202-638-5944

Driving Safely While Aging Gracefully

Objective

Use self-assessment to provide information on the physical changes associated with aging, as well as tips on coping so that older drivers can continue driving safely for as long as possible.

Description

The booklet, which can be accessed on-line, discusses changes in abilities related to vision, physical fitness, attention, and reaction time, and provides suggestions on what drivers can do if they are experiencing problems in any of these areas. Information is also provided on who to contact for help, and options for alternative transportation. Funded by the USAA Educational Foundation, AARP, and NHTSA.

Contact information

The USAA Educational Foundation
9800 Fredricksburg Road, D3E
San Antonio, TX 78288
Tel: 1-800-531-8159
Web: www.usaaedfoundation.org

The Older and Wiser Driver: A Self-Assessment Program

Objective

Encourage older drivers to self-assess their driving skills.

Description

Program information is based on AAA Foundation for Traffic Safety publications and includes a video and a

handbook about the issues facing senior drivers, including tips for safe driving and alternative transportation. A self-assessment form is provided so seniors can test themselves and identify areas in need of improvement. Based on responses to the assessment instrument, users receive a numeric score that is linked to recommendations about whether drivers should continue or stop driving. The handbook is available on line or individuals can obtain a copy of the handbook and video. Funded by Manitoba Seniors Directorate and Manitoba Public Insurance.

Study information

Six 90-minute driving self-assessment educational sessions using voluntary participants recruited through flyers were conducted. Participants completed two surveys regarding driving history, knowledge and attitudes, and driving self-assessment. A final questionnaire was given to assess the usefulness and relevance of the educational session. The driving self-assessment survey found that two thirds of the participants were aware of factors that contribute to unsafe driving and were utilizing this knowledge. Participants reported the educational sessions as valuable and indicated that they plan to make changes to their driving behaviors as a result of the information received from the session. The impact of these educational sessions on participants' subsequent behavior has not yet been assessed.

Contact information

Centre on Aging, University of Victoria
PO BOX 1700, STN CSC
Victoria, BC
Canada V8W 2Y2
Tel: 250-721-6369
Fax: 250-721-6499
Web: www.coag.uvic.ca

PHYSICIAN AND OTHER PROFESSIONAL ASSESSMENT

Assessing Fitness to Drive

Objective

Help health care professionals use uniform criteria when assessing a patient's fitness to drive.

Description

Information is provided about various mental and physical conditions, and habits that can affect driving safety. These materials for health care professionals have been accepted by all licensing authorities in Australia. Funded by Austroads—an association of Australian and New Zealand road transport and traffic authorities.

Contact information

Austroroads
PO Box K659
Haymarket, NSW, 2000
Australia

Assessment of the Older Adult Driver

Objective

Assist physicians in gathering patient information relating to driving ability.

Description

Included are recommendations on: how to obtain information on patients' driving history, medication use, medical illnesses, and functional ability levels, including vision and attention; how to assess alcohol-related problems, using the CAGE questionnaire; what to do if a patient does not follow a physician's advice to stop driving; and where to refer patients for further information or rehabilitation.

Contact information

David B. Carr, M.D.
Division of Geriatrics and Gerontology
Washington University School of Medicine
4488 Forest Park Blvd.
St. Louis, MO 63108
Email: dcarr@imgate.wustl.edu

Determining Medical Fitness to Drive: A Guide for Physicians

Objective

Assist physicians in identifying potential driving impairments and help them impose "common sense restrictions" on patient's driving.

Description

The guide provides a detailed review of various medical, mental, and emotional factors that could influence an individual's fitness to drive. Also provided are information and descriptions from the licensing authority regarding medical fitness to drive, contact information for reporting unfit drivers, locations of driver assess-

ment centers, and diagnostic tools to assess driving ability. Funded by Canadian Medical Association.

Contact information

Member Service Centre
Canadian Medical Association
1867 Alta Vista Drive
Ottawa ON K1G 3Y6
Tel: 888-855-2555 or 613-731-8610x2307

Drive-Ability Program

Objective

Provide comprehensive pre-driver evaluations and provide recommendations based on a person's needs and abilities.

Description

The program offers individual evaluations by trained occupational therapists for people referred to program by a physician. Evaluations can include any of the following: medical and driving history, visual and perceptual assessment, physical abilities' evaluation, cognitive testing, on-road driving testing, or a written test of driving rules and regulations. Following the evaluation, specific recommendations regarding vehicle adaptations, vehicle selection, and equipment recommendations. Some funding provided by The University of Michigan Hospitals.

Contact information

University of Michigan Health Systems
Paula Kartje, Drive-Ability Program
355 Briarwood Circle
Ann Arbor, MI 48108
Tel: 734-998-7911

DriveABLE

Objective

Identify medically impaired drivers who are unsafe on the road.

Description

DriveABLE is a two-phase assessment program that is offered in 16 centers in Canada. The first phase involves an in-office assessment of mental and motor

functions needed for driving, using computer-based tests. Participants not identified as potential risks in the first phase are given an on-road driving assessment in the second phase. Scores from each phase are sent electronically to an evaluation center to ensure consistency among all assessment centers. Funded by the Health Services Research and Innovation fund and the Alberta Mental Health Research Fund administered by Alberta Heritage Fund for Medical Research.

Study information

DriveABLE was developed based on research on the types and severity of driving errors that medically impaired drivers make and how these errors can be identified through road testing. Drivers with cognitive impairments were more likely than other drivers to commit errors in turning (too wide or too narrow) and to drive too close to lane markings or too slowly. There were no differences in speeding errors or failure to come to a complete stop.

Contact information

Allen R. Dobbs
University of Alberta Dept. Psychology, Edmonton
Alberta, Canada T6G 2E1
Tel: 001 403 438 1507
Email: adobbs@cyber.psych.ualberta.com

DriveABLE
10050 - 112 St., Suite 202
Edmonton, AB Canada T5K 2J1
Tel: 780 433 1494
Fax: 780 433 1531
Email: info@driveable.com

Getting in Gear

Objective

Assess older drivers to identify declines in driving-related abilities and other driving problems.

Description

Getting in Gear is a free senior driving assessment program in Pinellas and Hillsborough Counties in Florida. Its battery of screening tests include: simple tasks to assess physical and cognitive abilities (foot-tapping, head and neck rotation, arm raising, and memory recall); a computer test with a joystick to assess attention, perception, memory, vision, and reaction time; a useful field of view (UFOV) test which

uses a computer to assess peripheral vision and the processing speed of visual information, and a 30-minute road test to assess merging, lane changing, safe driving distances, and ability to follow directions and execute turns. Participants are offered case management services including counseling, rehabilitation services, referrals, medical care, occupational therapy, and information on adaptive equipment use, as well as mobility management services, which help drivers assess whether to reduce or stop driving.

Contact information

Susan Samson, Project Director
Getting in Gear
Area Agency on Ageing
9455 Koger Blvd.
St. Petersburg, FL 33702
Tel: 727-570-5151 ext. 234

How to Assess and Counsel the Older Driver

Objective

Provide health care professionals with information on how to assess driving risk, decide if further assessment or rehabilitation is needed, and offer advice on how to approach patients with this sensitive information.

Description

Recommendations are provided on information a physician should gather regarding a patient's driving history, physical, visual, and mental health, and driving abilities, how to counsel the patient, and the legal implications on reporting an at-risk older driver.

Contact information

The Cleveland Clinic, Main Campus
W.O. Walker Building
9500 Euclid Avenue
Cleveland, OH 44195
Tel: 216-445-7350
Fax: 216-444-9971

Community Assessment and Intervention Program

Objective

Help those who are experiencing age-related changes, a progressive disease, or an acute illness to continue driving safely.

Description

The administering hospital partners with various agencies in order to assess the current driving skills of seniors. A comprehensive evaluation is conducted by an occupational therapist, a driving instructor, a physician in geriatric medicine, and a clinical nurse specialist. Participants receive information on how to continue driving safely. The administering hospital also works with community agencies and organizations to develop and enhance systems for alternative transportation. Federally funded.

Contact information

Flower Hospital
5200 Harroun Rd.
Sylvania, OH 43560
Tel: 419-824-1444

Older Driver: Cues for Law Enforcement

Objective

Provide law enforcement officers with information to help them determine whether or not an older driver is capable of safely operating a motor vehicle.

Description

The pamphlet contains information on how police officers can use visual and verbal cues to determine motorists' fitness to drive, and includes specific questions that can be asked of older drivers. Also included are suggestions about how to offer assistance to older drivers when intervention is necessary. Funded by NHTSA.

Study information

The suggestions provided in the pamphlet were field tested by Florida State Troopers in Pinellas County.

Contact information

U.S. Department of Transportation
400 7th Street, S.W.
Washington D.C. 20590
Tel: 202-366-4000 or 1-888-327-4236
Web: www.nhtsa.gov

Older Driver Evaluation Program

Objective

Help older drivers increase or maintain safe driving skills and independence through self assessment.

Description

The Older Driver Evaluation Program uses physical, visual, and cognitive assessments along with a driving simulator and an on-the-road driving assessment. County courts have adopted the program as an alternative to license removal. Judges can choose to send a driver to this program for evaluations and testing prior to recommencing driving. The program has also been extended to Toledo Hospital and Flower Outpatient Rehabilitation Services through a license agreement with the Ohio State University (OSU) Medical Center. Funded by OSU Medical Center, the Office of Geriatrics and Gerontology, and the Department of Internal Medicine.

Contact information

The OSU College of Medicine and Public Health
370 West 9th Avenue
Columbus, Ohio 43210
Tel: 614-293-3377
Web: <http://medicine.osu.edu/geriatrics/91.cfm>

SAFE DRIVE Checklist: Risk Factors for Driving Problems

Objective

Provide a quick and easy way for physicians to identify seniors who may be unsafe drivers in need further assessment.

Description

Provides physicians with a mnemonic device (SAFE DRIVE) that will help them quickly recall the various characteristics and factors necessary to assess older

drivers' fitness to drive. The risk factors outlined in SAFE DRIVE include the driver's safety record, attentional skills, family concerns, use of ethanol or drugs, reaction time, intellectual impairment, vision/visuospatial function, and executive functions. Regardless of the outcome of the SAFE DRIVE assessment, patients and family members wishing to receive additional testing or evaluation generally need to obtain a referral to a specialist. Older drivers without any risk factors are advised to periodically reassess.

Contact information

University of Arkansas
Fayetteville, Arkansas 72701
Tel: 479-575-2000
Web: <http://www.uark.edu/>

UAB Driving Assessment Clinic

Objective

Help older drivers to continue to drive safely.

Description

Older drivers can be referred by health care professionals, family members, or self-referred. Vision, useful field of view (UFOV), memory, and attention screening, as well as an on-road driving tests are used to evaluate a person's ability to drive. Certified driving specialists accompany participants through the driving test. Results from the assessment are reported to the patient and the referring physician. The clinic also educates participants on alternative transportation options and "rules of the road." Funded by University of Alabama at Birmingham.

Study information

In prior testing, the UFOV test was able to predict at a high level of sensitivity and specificity, which older drivers had a crash history. Older adults with a sizable limitation of their UFOV were six times more likely to have been involved in a crash in the past 5 years.

Contact information

University of Alabama at Birmingham
UAB Driving Assessment Clinic
Bob Shephard
Tel: 205-325-8646 or 800-822-8816.
Fax: 205-488-0708
Email: driving@eyes.uab.edu.

Years Ahead— Road Safety for Seniors Program

Objective

Promote behaviors conducive to safe driving, encourage older drivers to take responsibility for the future of their driving, increase knowledge and awareness, and promote self-assessment of driving abilities.

Description

Program development was based on a literature review of issues related to older drivers, discussion groups with both drivers and nondrivers, and consultation with experts in the area of older drivers. The program consists of a 50-minute PowerPoint presentation with an 8-minute video entitled "Your Driving Future," presented by local semi-retired professionals. The program also publishes a biannual newsletter for past participants intended to keep older drivers informed and to reflect on safe driving habits. Funded by the Royal Automobile Club of Victoria.

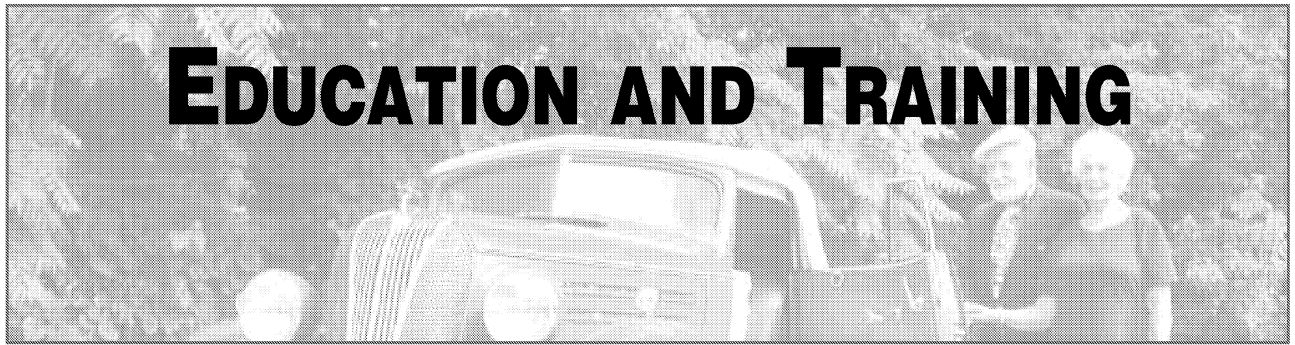
Study information

An evaluation consisting of a retrospective and prospective survey found that individuals who attended the Years Ahead session exhibited a significant increase in their knowledge and awareness of road safety. It was also found to have a positive impact on participants' views and attitudes. Evaluations could not determine the extent to which the program affected actual driving behavior.

Contact information

Royal Automobile Club of Queensland
Driver Education Unit
Tel: (07) 3361 2744
Email: safety@racq.com.au
Web: http://www.racq.com.au/03_car/42_drivereducation.htm

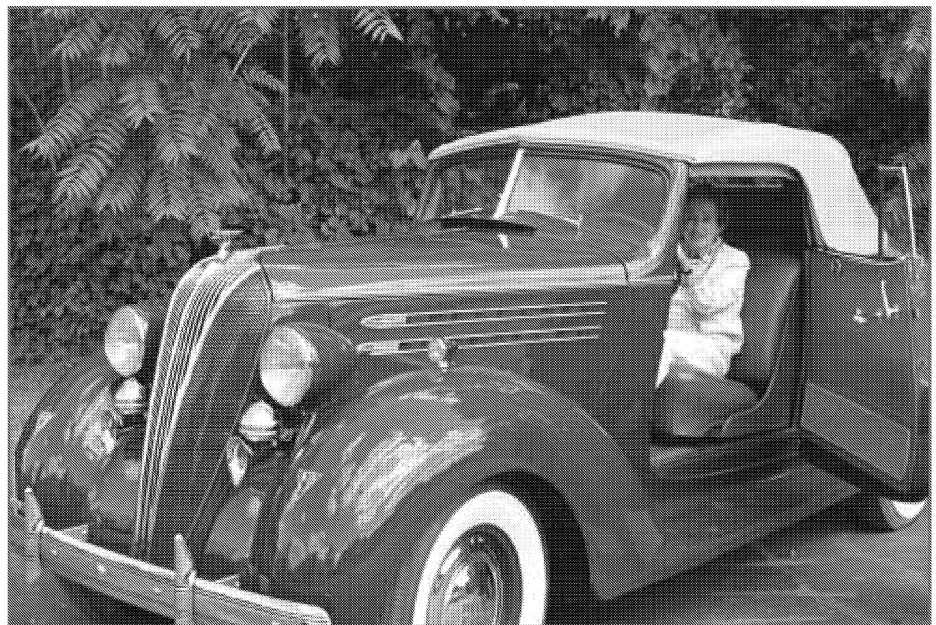
EDUCATION AND TRAINING



The aging process affects everyone in one way or another and most older drivers will eventually be faced with questions about their ability to continue to drive safely. How they answer these questions and even whether they are willing to consider them depends to a great extent on the information available to them about age-related declines in abilities that can affect driving, strategies for compensating for, or overcoming, these declines, and how to plan for a time when driving is no longer possible. For those older drivers who come to the attention of licensing agencies or have impairments that require medical intervention, answers may be forced upon them (e.g., having their license taken away). However, many older drivers will, at least initially, have to wrestle with these issues on their own or with help from their families. Thus, the availability of sound education and training can be essential to enhancing elderly mobility.

While many older drivers do recognize their declining abilities and take steps to adjust their driving, others are unaware of the changes they are experiencing and the implications of these changes for safe driving. Thus, one focus of many education programs is simply to increase older drivers' awareness and knowledge about these issues. Other programs combine education with some type of training to help older drivers compensate for, or when

possible, to overcome age-related declines. Driver refresher courses, for example, use classroom instruction to reinforce older drivers' existing driving skills and knowledge, and teach them about new traffic laws and practices for defensive driving. National programs of this type include 55 Alive/Mature Driving, sponsored by AARP, Safe Driving for Mature Operators, sponsored by AAA, and Coaching Mature Drivers, sponsored by the National Safety Council. On-road driver training programs for older drivers focus on enhancing driving skills by providing opportunities for behind-the-wheel practice. Programs of this type



include the Driving School Association of the Americas, the Driver Skill Enhancement Program, and on-road add-ons to some of the AAA driving refresher courses. While little is known about the impact of driver refresher courses and on-road driver training on actual crash risk, these efforts appear to, at the very least,

help older drivers overcome problems related to lack of knowledge, and thus be of some value in enhancing elderly mobility.

Various types of fitness training programs seek to help older drivers overcome declines in psychomotor abilities that have been found to be amenable to remediation (e.g., shoulder flexibility and trunk rotation). Improving range of motion can help older drivers do a better job of scanning the rear, backing up, and turning their head to see their blind spot, while they are driving. There have also been efforts to train older drivers to overcome some deficits in attention and information processing, although these are still under study (e.g., useful field of view).

How education and training can best enhance mobility

Important components of a promising approach for education and training are highlighted below:

- Program development/design based on age-related research
- Strong marketing approach to ensure public awareness of program and participation by older drivers
- Accessible to older people
- Incorporation of basic learning principles into program design

Effective education and training efforts must build on what is known about age-related declines, how they affect driving, and what can realistically be done to address the declines. In the case of declines that cannot be reversed, this may mean simply increasing knowledge and personal awareness so that older drivers can make informed decisions about how to recognize declines, and how to reduce or stop their driving if safe driving is no longer possible. In the case of declines that can be overcome, it may mean teaching older people to do new things or to do things in a different way (e.g., learning to do stretching and strengthening exercises). In many cases, the focus of training is not so much on individual declines, but on general driving skills that need to be improved because of lack of knowledge about new traffic laws or safe driving practices (e.g., stopping distances on wet versus dry pavement). In these cases, the goal of train-

ing is to provide the necessary information and practice opportunities to improve driving skills.

Regardless of the program focus, older drivers must not only be made aware of the program, but believe that they can benefit from it. Because many older drivers are unwilling or unable to recognize deficits in their driving-related abilities, self-assessment is often a useful first step in getting people to take action about their driving. The challenge, of course, for both self-assessment efforts and education and training efforts, is to get people to participate, and that means that programs must be effectively marketed. One successful approach for doing this has been to apply the principles of consumer marketing to the promotion of health and safety behavior, a practice called social marketing.

Programs must also be accessible to the elderly population they are trying to serve. One way of making programs accessible is to offer them through existing programs or organizations that are known to and used by the elderly. Fitness training programs, for example, can be developed and delivered through existing community or senior centers, recreation centers, public health departments, housing authorities, and religious institutions.

Effective education and training efforts take into account what is known about how people learn, especially older adults. We know that for classroom learning, the physical environment is important—room size and seating arrangements should be responsive to potential vision and hearing deficits of participants. Legibility of written and visual materials is important. Other general learning principles also apply to the elderly—for example, providing opportunities for interactive learning, and for learning both inside and outside the classroom, finding ways to make the learning as interesting and understandable as possible, and making participants feel like they have some control over their learning. Finally, important information should be presented in a variety of ways so that it can be retained by older drivers.

Descriptions of practices or programs that appear especially promising

There is certainly no shortage of education and training efforts directed at older drivers. The most promising approaches to enhancing elderly mobility have more to do with making older drivers aware of what is available, helping them find the best fit for their needs, and encouraging them to participate in existing programs, than with devising new programs. One example of this kind of approach is the creation of resource centers within communities to promote safe mobility choices. As described in *Guidance for Implementation of the AASHTO Strategic Highway Plan*,⁹ older drivers and their families would be able to call a one-stop hotline to get guidance and assistance with all aspects of driving and transportation.

Hotline personnel (sometimes referred to as personal mobility managers) would provide information and materials to help older people make informed decisions about continuing or stopping driving, and would be trained to make referrals for driving assessments, driver rehabilitation and training, vehicle adaptations, alternative transportation



options, and other needed services. Such a resource center could be housed within a department of motor vehicles or state office on aging at the state level, or a driver license office, area agency on aging, or senior center at the local level. Variations of this model are being offered in a number of areas (e.g., New York State's Help Network¹⁰ initiative which builds on their When You Are Concerned handbook). While this approach is still relatively new, it has received positive feedback where it has been implemented and repre-

sents a promising approach to helping older drivers actually make use of all the resources available for enhancing elderly mobility. However, just as individual education and training efforts must be marketed to older people, so too would a resource center intended to provide information about those efforts. Thus, for this approach to be successful, it will need to include a carefully thought out marketing strategy.

Identification of individual programs that show promise for enhancing elderly mobility must take into account what each program is trying to accomplish. For example, some programs are intended to educate older drivers about rules of the road. Others provide training to improve general driving skills, and still others provide training to improve actual visual, cognitive, or psychomotor abilities (e.g., fitness training, useful field of view). Because of the wide variety of programs and the different objectives they have, it would be difficult, and have limited utility, to pull out

a few from all the promising programs and highlight them here. Thus, all promising individual programs are summarized in the following section.

⁹ See CH2MHILL (with Maron Engineering, BMI, Midwest Research Institute, Northwestern University Center for Public Safety, UNC Highway Research Center, Waller, P.) (2002). *Guidance For Implementation of the AASHTO Strategic Highway Safety Plan: A Guide For Addressing Crashes Involving Older Drivers*. http://www.ch2m.com/nchrp/old_drvt/assets/ODguide.pdf.

¹⁰ See <http://www.ncoa.org/content.cfm?sectionID=98&detail=276> for information on the Help Network hotline.

Summaries of promising practices and programs

Brief summaries of practices and programs in the area of education and training that appear promising for enhancing elderly mobility are presented in this section.



When You Are Concerned: A Handbook for Families, Friends, and Caregivers Worried About the Safety of an Aging Driver (and Help Network)

Objective

Provide information about issues and resources regarding older drivers to friends, family members, and caregivers.

Description

The handbook, found online or in hardcopy, is organized into eight chapters. The chapters include an overview of concerns faced by family and friends regarding an older driver, how and where to find help, interventions, how to help the former driver cope with driving cessation, alternative transportation options, keeping an older driver driving safely, and how to prepare for future driving cessation. Based on this handbook, the Help Network initiative was developed as a one-stop hotline to assist older drivers and their families obtain information on driving safety. Calls are directed to the Department of Senior Services, the lead agency. Help network member agencies take referrals from the lead agency and work directly with families where necessary. Each member shares the network services directory and can also cross-refer families to other services. Funded by New York State Governor's Traffic Safety Committee & Allstate Insurance Foundation.

Contact information

New York State Office for the Aging
2 Empire State Plaza
Albany, NY 12223-1251
Tel: 800-342-9871 or 518-474-5731
Fax: 518-486-2225
Email: nysofa@ofa.state.ny.us

AARP 55 Alive/ Driver Safety Program

Objective

Help drivers enhance existing skills and develop defensive driving techniques.

Description

A nominal fee is charged for a 2-day, 8-hour course, taught, promoted, and administered by volunteers. AARP members and non-members are eligible for the program. Among the topics discussed are the effects of medication and aging on driving ability, reaction time changes, left turns and other right-of-way situations, new traffic laws, and how to overcome difficult driving situations. Successful completion may result in lower auto insurance rates. Funded by AARP and NHTSA.

Study information

Volunteer subjects from AARP in four states were randomly assigned to attend the session or to receive no training. Researchers examined driving practices, medical problems, traffic problems, violations, and crashes. The training was found to be effective in increasing subjects' general knowledge of safe driving, with subjects' knowledge retained throughout the 14-month evaluation period. There were no statistically significant differences in crash involvement between the trained and untrained group, although annual violation rates were significantly lower among the trained group. Only 21 percent of the 10,000 volunteers who agreed to participate in the training actually completed it and provided crash data. Although a similar proportion of the control group provided follow-up crash data, by the end of the study, the remaining participants in the two groups no longer represented a random sample.

Contact information

AARP
601 E. Street NW
Washington, DC 20049
Tel: 1-800-424-3410
Web: www.aarp.org

American Association of Motor Vehicle Administrators (AAMVA)— Getting Around Safe and Sound

Objective

Educate the public about issues surrounding aging and driving in order to raise public awareness and change behavior.

Description

The program uses a social marketing approach based on the media, Internet, toll-free number, brochures, and a speakers' bureau, to raise public awareness. AAMVA partnered with a marketing communications firm to help execute the program. They will define test markets, duration, and methodologies for the public information and education campaigns. Funded by the AAMVA.

Study information

Formal evaluation is planned following the first phase of campaigns. In preliminary focus groups conducted by AAMVA, participants responded positively to the program concept.

Contact information

AAMVA
4301 Wilson Blvd., Suite 400
Arlington, VA 22203
Tel: 703-522-4200
Fax: 703-522-1553
Web: www.aamva.org

Coaching the Mature Driver

Objective

Educate drivers about ways to adapt to technological changes in vehicles as well about physical changes commonly associated with aging.

Description

This 2-day, 8-hour interactive course provides a review of basic driving techniques, and introduces skills that can help offset the effects of the aging process on driving performance. Instructors are certified by the National Safety Council. Funded by the National Safety Council.

Contact information

National Safety Council
1121 Spring Lake Drive
Itasca, IL 60143-3201
Tel: 630-285-1121
Fax: 630-285-1315
Email: info@nsc.org

Driving Decisions for Seniors (DDS)

Objective

Educate seniors about mobility issues and options, and provide supportive and educational interventions for elderly drivers.

Description

DDS is a grass-roots volunteer organization. Bi-monthly support groups allow seniors to discuss issues related to driving, alternative transportation, and independence. Trained elderly volunteers help facilitate discussions regarding what is best for each person's individual situation. They also use "proactive rehearsal" as a method for reviewing alternative choices and experiencing consequences in a safe environment. They share information about community resources and plan frequent bus expeditions to events and sites so that public transit is seen as fun, convenient, and easy to use. Originally funded through a grant from the Oregon Council on Senior Citizens, but currently funded through donations.

Study information

Over 200 volunteers, family members, and clients involved with DDS were observed and interviewed

over a 5-year period. Among the reported findings were that the program helped seniors to competently manage their own mobility decisions and respond to informal consultations given by their peers. Language intervention appeared to have potential for altering risk-disposition, and redefining the status of public bus transportation was shown to encourage its use.

Contact information

Ethel Villeneuve
Driving Decisions for Seniors
2529 Willakenzie #2
Eugene, OR 97401
Tel: 541-344-4381

Expanding the Useful Field of View (UFOV)

Objective

To improve the UFOV through training.

Description

Training on a radial localization task takes place over a 5-day period using two exercises in an attempt to expand the UFOV of drivers. Preliminary testing funded by Robert Wood Johnson Foundation and National Institute of Health.

Study information

Twenty-four subjects in three different age groups (22–33, 40–49, and 60–75 years) participated in training on a radial localization task. Researchers investigated four factors that influence the field of view. Follow-up evaluations over a period of 6 months were conducted to assess the longevity of the improved visual performance. The size of the UFOV varies by age, and typically diminishes with age; however, findings indicated that some of the shrinkage can be reversed with a small amount of practice. The effects of training were found to persist over time (at least 6 months).

Contact information

Karlene K. Ball
Department of Psychology, Western Kentucky
University
Bowling Green, KY 42101

Flexibility Fitness Training Package for Improving Older Driver Performance

Objective

Provide older drivers with tips to improve flexibility as it relates to driving.

Description

A brochure identifies exercises and stretches to improve neck, shoulder, trunk, back, and overall body flexibility. Written directions are accompanied by graphics demonstrating the stretching exercises. Funded by AAA Foundation for Traffic Safety. Based on research indicating that higher levels of fitness among older drivers are associated with better driving performance.

Contact information

AAA Foundation for Traffic Safety
1440 New York Avenue, NW, Suite 201
Washington, DC 20005
Web: www.aafoundation.org

How to Help an Older Driver

Objective

Provide older drivers and their friends and family with information about the impact of aging and medications on driving skills, and to offer suggestions and resources for further information.

Description

The 30-page booklet provides readers with details of how age and medications affect a person's driving skills, how to assess an older driver's skills both through self-assessment and by observing various factors, how to help an older driver by ensuring they exercise and see a physician regularly, and what features to look for in choosing a car. It also provides a list of driver refresher courses and offers suggestions for how to help older drivers cope and plan for driving cessation, and how to overcome the fear of losing independence. Finally, it provides contact information for every state department of motor vehicles. Funded by AAA Foundation for Traffic Safety.

Contact information

AAA Foundation for Traffic Safety
1440 New York Avenue, NW, Suite 201
Washington, DC 20005
Tel: 202-638-5944
Web: www.aafoundation.org

Mature Driver Improvement Program

Objective

Educate drivers on the effects of medication, fatigue, alcohol, and visual/auditory impairments on driving performance, and provide strategies for defensive driving.

Description

The course includes roughly 7 hours of classroom time scheduled in one or two sessions. There is a small fee for the course and for a department of motor vehicles (DMV) certificate to demonstrate completion of the program. Funded by DMV Research and Development Section, California Department of Motor Vehicles.

Study information

Researchers compared 3-year prior and 6-month post driving records of a group of drivers who participated in the course with a demographically similar group of drivers who did not. In a 1995 study, researchers found that crash and violation rates of participants who took the classroom course, participants who took a home-study version of the course, and a control group, were not statistically different. However, for drivers with recent prior violations, both the home-study and classroom sessions seemed to be effective in reducing further violations.

Contact information

Department of Motor Vehicles
Traffic Violator School Unit
Attn: Mature Driver Program
P.O. Box 825383 Mail Station N-229
Sacramento, CA 94232-5383

Mature Driver Retraining Workshop

Objective

Help older drivers evaluate and improve their driving skills, and continue to drive for as long as it is safe.

Description

Topics discussed in the program include the effects of aging and medication on driving, physical limitations, defensive driving skills, current traffic laws, and crash prevention. Psychosocial evaluations are conducted in order to measure brake reaction time, peripheral vision and depth perception, visual acuity, and glare recovery. Results are confidential, although instructors provide feedback on potential problems in driving behavior and offer suggestions for enhancing current driving skills. The 2-day, 4-hour workshop, typically conducted by retired law enforcement officers, concludes with an optional in-vehicle road test in the participant's vehicle. Funded by Traffic Improvement Association.

Study information

Comments from participants indicate that many of them have found the program useful, that the information provided influenced their driving, and that they would recommend the program to others.

Contact information

Traffic Improvement Association
2187 Orchard Lake Road, Suite 140
Sylvan Lake, MI 48320
Telephone: 248-334-4971
Fax: 248-334-2060

Safe Driving for Mature Operators

Objective

Provide older drivers with tips for improving driving skills and knowledge of driving in order to compensate for the effects of aging.

Description

Most participants are referred to the program, which consists of a 2-day, 8-hour course. There is a nominal fee charged to participants. The course educates participants about the effects of aging on driving and reviews safe driving habits. Instructors take a 40-hour certification course every 3 years. In some automobile

clubs, the course also includes a physical test and vision screening, as well as an on-road driving evaluation. All results are confidential. Funded by AAA.

Study information

This program was included in a study measuring the effectiveness of several countermeasures in improving the driving performance of older drivers. The program resulted in a 7.9 percent overall improvement in driver performance, as measured by on-road driver performance. However, the small sample size made it difficult to generalize the findings.

Contact information

AAA Exchange Manager
Public Affairs MS 72
1000 AAA Drive
Heathrow, FL 32746
Email: publicaffairs@national.aaa.com
Web: <http://www.aaapublicaffairs.com/Main.asp>

Seniors on the Go

Objective

Connecting training and licensing so that seniors can continue to drive safely longer.

Description

This is a free, voluntary program that includes both assessment and educational components. Participants attend a 2-hour course including information on license renewal, a review of safe driving techniques and state traffic laws, and a practice written exam. Participants can also take an optional vision exam required to obtain or renew a license, as well as practice their driving skills through a driving simulation. Participation in all portions of the session, including the vision test and driving simulation, qualifies drivers for a certificate good for 1 year indicating they are eligible for a driver's license renewal. Funded by Department of Motor Vehicles/Secretary of State.

Contact information

Illinois Secretary of State
213 State Capitol
Springfield, IL 62706
Tel: 800-252-8980
Web: www.sos.state.il.us/home.html

Wiser Driver Program

Objective

Promote road safety for older drivers and educate and provided assistance to drivers regarding driving cessation.

Description

Initiated by the Hawthorn Community Education Project, Inc., the program represents a partnership between older people, adult educators, and government and non-government agencies. Topics include changes in traffic laws, building confidence, driving conditions, licensing, as well as the effects of aging and medical conditions on driving. Information is also provided about crashes, ensuring automobiles are safe for the road, pedestrian safety, and planning for the future. The 2-hour courses are held over a 4-week period with 10–15 volunteer participants working with older adults trained as facilitators and tutors. The workshops also feature guests such as pharmacists, police officers, and opticians. Funded by Hawthorne Community Education Project, Inc.

Study information

The project will be formally evaluated and funded by the Australian Transport Safety Bureau. Researchers plan to conduct surveys before and after training to assess the impact of the course and its usefulness to older drivers. Informal feedback indicates that participants found the course to be a helpful and positive experience. Participants reported increased knowledge of road safety, as well as a willingness to adapt their driving habits. Program costs and lack of access were the only reported drawbacks.

Contact information

Hawthorne Community Education Project, Inc.
24 Wakefield Street
Hawthorn Vic. 3122
Tel: 9819 5758 or 9819 5771
Email: hcepinc@internex.net.au

VEHICLE ADAPTATIONS AND ADVANCED TECHNOLOGY

Vehicle adaptations and advanced technology provide an opportunity for older drivers to compensate for some age-related abilities that can lead to unsafe driving, such as reduced strength, flexibility, and range of motion, and vision-related deficits. Vehicle adaptations help older or disabled drivers do things like get in and out of the car, fasten and unfasten their safety belt, and exert control in operating the car (e.g., steer, accelerate, brake, use control levers). While vehicle designs can be altered or adapted by automobile manufacturers to make driving easier, more comfortable, and safer (e.g., by modifying door height and width, seat positioning and adjustability, dashboard controls), the focus of this area is on adaptive equipment that can be added to cars after they have reached the market. Common types of adaptive equipment include hand-controls, spinner knobs, signal switches, and spot mirrors. Table 5 identifies several categories of ability deficits and the adaptive equipment that may help compensate for them.

In addition to vehicle adaptations, advanced technology systems for vehicles have the potential to increase the safety and mobility of older drivers. Intelligent Transportation Systems (ITS) combine advances in wireless communication technologies, automotive electronics, computing, and global positioning systems. The most promising ITS for older drivers appear to include route guidance, emergency vehicle location and response, vision enhancement systems, adaptive cruise control, and collision warning systems. For example, drivers who have difficulty seeing at night could benefit from a vision enhancement system that extends a driver's visibility range by detecting and displaying upcoming objects on a head-up display. The US Department of Transportation has

supported a number of projects to develop design guidelines for various ITS applications that take into account the needs and preferences of system users. Most of the guidelines published from these efforts have focused on the general population and do not specifically address the unique needs of older drivers.



Table 5. Impairments, Problems, and Adaptive Equipment for Elderly Drivers

Impairment	Problems	Adaptive Equipment
Increased reaction time Difficulty dividing attention between tasks	Difficulty driving in unfamiliar or congested areas	Navigation/route guidance traffic information, VMS
Deteriorating vision, particularly at night	Difficulty seeing pedestrians and other objects at night, and reading signs	Night vision enhancement, in-vehicle signs
Difficulty judging speed and distance	Failure to perceive conflicting vehicles, crashes at junctions	Collision warning, automated lane changing
Difficulty perceiving and analyzing situations	Failure to comply with yield signs, traffic signals, and rail crossings, slow to appreciate hazards on highways	In-vehicle signs and warnings, intelligent cruise control
Difficulty turning head, reduced peripheral vision	Failure to notice obstacles while maneuvering. Worries over merging and lane changes	Blind spot/obstacle detection, automated lane changing and merging
More prone to fatigue	Tired on long journeys	Intelligent cruise control, automated lane following
Lack of manual dexterity	Limited ability to grasp and turn steering wheel, grasp and operate ignition key and dashboard controls, difficulty releasing hand-operated parking brake	Steering wheel spinner, ignition key holder, foot-operated parking brake, extension loop on the parking brake handle
Lack of range of motion—arms	Limited ability to turn steering wheel, possible difficulty operating dashboard controls, gear shift, turn signal, and/or parking brake release	Extension of the steering column and a small steering wheel complete with a spinner knob, extensions on or adaptations of dashboard controls, gear shift lever, turn signal, parking brake release
Lack of range of motion—shoulders	Limited ability to turn steering wheel, possible difficulty operating dashboard controls, gear shift, ignition key, and parking brake release, limited ability to see the full field of traffic	Extension of steering wheel column and small wheel with spinner knob or foot-operated steering if limitation is severe, extensions or adaptations of dashboard controls, gear shift lever, turn switch and ignition switch, and foot-operated parking brake, convex or 48 rear and side view mirrors
Lack of range of motion—hips	Difficulty using brake and accelerator, clutch, possible difficulty turning to watch rear view while backing up, possible difficulty entering and leaving car	Hand-operated brake and accelerator, dimmer switch, parking brake, automatic transmission, convex or 48 rear mirror, grab bar or strap, power seats
Poor muscle control	Difficulty controlling steering wheel, uncontrolled involuntary movement, or spasms of rigidity	Steering wheel spinner, device to secure legs close to seat if spasms occur in the legs and hand controls are used (consult physician or driving specialist)
General effects of aging	Concerns about inability to cope with a breakdown, driving to unfamiliar places, at night, or in heavy traffic	Emergency callout (Mayday), vehicle condition monitoring, ATIS
Impairments that vary in severity from day to day or lead to tiredness	Concern over fitness to drive	Driver condition monitoring

Adapted from Mitchell & Suen, 1997 & Mitchell, C.G.B. (1997). *The Potential of Intelligent Transportation Systems to Increase Accessibility to Transport for Elderly and Disabled People*. (Report No. TP 12926E). Montreal, Quebec: Transportation Development Centre; Staplin, L., Lococo, K. H., Stewart, J., & Decina, L. E. (1999). *Safe Mobility for Older People: Notebook*. (Report No. DOT HS 808 853). Washington, DC: National Highway Traffic Safety Administration.

How vehicle adaptations and technology can best enhance mobility

Important components of a promising approach for enhancing elderly mobility through adaptive equipment are highlighted below:

- Appropriate choice of equipment
- Installation and monitoring for fit
- Training and practice opportunities

Effective use of adaptive equipment requires not only selecting the right equipment, installing it, and checking it for fit, but also receiving training on how to use it and having an opportunity to practice with it under low risk conditions. Occupational therapists can be very helpful in making recommendations for adaptive equipment as part of their assessment of the impact of functional impairments such as decreased shoulder range of motion due to arthritis, fracture, stroke, or Parkinson's disease on driving. Older drivers not working with an occupational therapist may be able to get advice from a rehabilitation agency or hospital about who to contact to assist them in identifying and obtaining appropriate equipment, installing it, and providing the necessary training (e.g., a driving rehabilitation specialist).

Important components of a promising approach for enhancing elderly mobility through ITS are highlighted below:

- Affordable applications
- Easy to use and understandable
- Technology that enhances rather than detracts from safety
- Opportunities for training

Successful ITS applications, particularly for older drivers, need to be affordable, relatively easy to use, and work to enhance safe driving rather than produce additional driver distractions that may actually increase crash risk. One way to promote affordability is to develop systems that are flexible enough to benefit drivers of all ages, yet are still able to help older drivers compensate for diminished abilities. This gen-

eral idea—that what works for the elderly will also benefit other drivers—is the basis of many successful approaches in the areas outlined in this guide. However, in the area of ITS, the impacts on driver safety and mobility, especially for older drivers, are still not well understood. Early research suggests that older drivers appear to have more trouble learning to use some ITS applications like in-vehicle navigation systems than younger drivers and find them less functional. And while older drivers compensate to some degree for the increases in attention demanded by the systems, they still seem to make more safety-related errors than younger drivers. To achieve widespread use of ITS by older drivers, future ITS applications will need to be carefully designed to ensure that safety is enhanced rather than reduced. In addition, effective training will need to be available to help older drivers learn how to use the systems and to overcome any fears they may have about the technology.

Descriptions of practices and programs that appear especially promising

Each driver has unique needs and preferences that will determine which adaptive equipment is likely to best enhance his or her safe driving—there is no one set of equipment that is right for everyone. Thus, the most promising approach in this area is one that helps older drivers through the entire process required to make vehicle adaptations, including assessment of the need for adaptive equipment (by a driving rehabilitation or other specialist), choice of the appropriate equipment, installation, training, practice, and ongoing monitoring to make sure it is working as intended.

For older drivers who are being treated by an occupational therapist or in a rehabilitation facility, there are typically resources to help them with this process. Other older drivers may be considering vehicle adaptations but do not know how to proceed. Both groups of drivers can benefit from publications that provide information about the steps that should be taken to make vehicle adaptations and identify resources for each part of the process. The website INFINITEC.ORG contains information (or links to

other sites with information) on where to get a driving assessment and what to expect from it, what types of adaptive equipment are available, where to purchase adaptive equipment, and options for funding vehicle adaptations. The brochure *Adapting Motor Vehicles for People with Disabilities*, published by NHTSA¹¹ focuses on assessing needs, choosing the right vehicle, choosing a qualified dealer to modify the vehicle, training, and maintaining the vehicle. There is also information about cost savings, licensing requirements, and organizations to contact for help. The *Disabled Driver's Mobility Guide*, published by AAA¹² contains information on choosing the right equipment and a listing of equipment dealers, along with model numbers and types of available equipment. Additional resources are listed, by state, for different types of assessment (e.g., arthritis/muscle fatigue, vision, hearing), driver training, adaptive equipment (e.g., foot and hand controls), and other services (e.g., licensing, enforcement).

The development of ITS is still in the early stages. And while there are considerable efforts underway to develop general guidelines for ITS, very few of the published results have focused specifically on the needs of older drivers. While it is beyond the scope of this guide to recommend specific ITS applications and products, it is useful to examine some of the recommended guidelines that have come out for the development of ITS that do explicitly take older drivers into account. For the most promising systems for enhancing the mobility of older drivers will likely be those that are designed in strict accordance with what is known about the aging process and its effects on driving and use of technology.

The Human Factors Design Guideline Handbook was developed by the Battelle Seattle Research Center with support from FHWA¹³. It contains guidelines for the design of advanced traveler information systems (ATIS), based on what is known about a driver's ability to effectively and comfortably use ATIS under

different operating conditions, driving tasks, and demographic characteristics (identified through review of the literature and analysis). Guidelines that specifically include special design considerations for older drivers are summarized below:

- Symbols that are familiar or intuitive can be used without accompanying text labels. Unfamiliar symbols should be accompanied by a text label. (Symbols should be chosen that are easily comprehended by both younger and older drivers. Older drivers tend to have lower comprehension levels than younger drivers for automotive symbols, perhaps due to their greater experience, familiarity, and level of comfort with text-based messages.)
- Minimum contrast ratios for daytime and nighttime use should be 1.4:1 and 2.1:1, respectively.
- Minimum symbol height should be 45 arcmin. for titles and other key elements, 20 arcmin. for dynamic or critical elements, and 16 arcmin. for static or other non-critical elements.
- Driver should be able to tailor the presentation of ATIS information to their own preferences and driving requirements, particularly for information requiring immediate compliance. (Issue of decrements in visual acuity associated with older drivers is important.)

Although general guidelines can also be useful for developing ITS for older driver use, the guidelines must be carefully analyzed and often modified before they can be applied to older drivers. As part of a project by the University of Calgary¹⁴, guidelines related either to older drivers or to vision enhancement systems were compiled from numerous international and US sources. These guidelines present a snapshot of the more promising thinking about ITS design and are worth including here. Clearly, as work continues in this area, guidelines will be refined and further developed. While true state-of-the-art ITS guidelines for older drivers may lag somewhat behind actual system development, they can still be useful as technologies

¹¹ Available at www.nhtsa.dot.gov or by calling the Department of Transportation Auto Safety Hotline at 888-327-4236

¹² To obtain a copy, contact AAA Traffic Safety at 1000 AAA Drive, Heathrow, FL 32746-5063.

¹³ For further information, see Campbell, J.L., Carney, C., & Kantowitz, B.H. (1997). *Advanced Traveler Information Systems (ATIS) and Commercial Vehicle Operations (CVO) Components of the Intelligent Vehicle Highway System (IVHS)*, Draft Human Factors Design Guidelines for ATIS/CVO. (Report No. 0034). Arlington, VA: Federal Highway Administration.

¹⁴ These guidelines are discussed in Caird, J.K., Chugh, J.S., Wilcox, S., & Dewar, R.E. (1998). *A Design Guideline and Evaluation Framework to Determine the Relative Safety of In-Vehicle Intelligent Transportation Systems for Older Drivers*. (Report No. TP 13349E). Montreal, Quebec: Transportation Development Centre.

evolve and systems undergo change. Fundamental design principles include:

- Be consistent
- Make operations of greatest frequency or impact on safety the easiest to perform
- Place controls, displays, and elements that are used together near each other
- Design controls and displays to function the way people expect them to function
- Minimize what users must remember and keep users in control
- Use metaphors and conceptual models to simplify operation
- Provide support for expert and novice users of interfaces
- Consider users with the greatest difficulties in developing design parameters

Driver information guidelines include:

- Limit the amount of information presented to the driver
- Ensure that information reflects the physical characteristics of the roadway
- Use natural hierarchies to indicate priority and importance
- Limit the need for manual user input while driving
- Place frequently used or critical controls close to the predominate hand position
- Select the appropriate type of control for each task
- Limit controls to single, discrete activations to reduce complexity
- Select appropriate forces/switch movements for operation control and feedback
- Use color coding or shapes to group controls and represent their function
- Make errors difficult to commit and be forgiving of user errors

Visual display guidelines include:

- Use sensible color coding that meets accepted human factors standards
- Choose display parameters that optimize legibility
- Use international symbols to supplement words
- Use light characters on a dark background
- Use perceptual groupings to separate and aggregate elements on the text displays
- Use natural hierarchies to indicate priority and importance
- Left justify free text in fields and right justify numbers when they are alone
- Use consistent rules when creating abbreviations so people can reconstruct them

Display location guidelines include:

- Consider the reasons for information displays and avoid nonessential information
- Place commonly used or critical displays close to the line of sight

In-vehicle display design guidelines include:

- Minimize eye movements to visual information
- Maximize legibility of information (e.g., by using plain typeface)
- Provide adequate luminance and contrast for range of driving lighting conditions
- Use mixed case instead of all capital letters for messages of more than 2–3 words
- Make all lines and gaps between lines at least 0.6 mm (0.025 inches) wide
- Use discriminable colors
- Use graphics and words that are understood by the greatest number of users
- Minimize the attentional demand of displays
- Allocate as many tasks as possible to pre-driving
- Allocate functions to a zero speed category to increase in-transit functionality

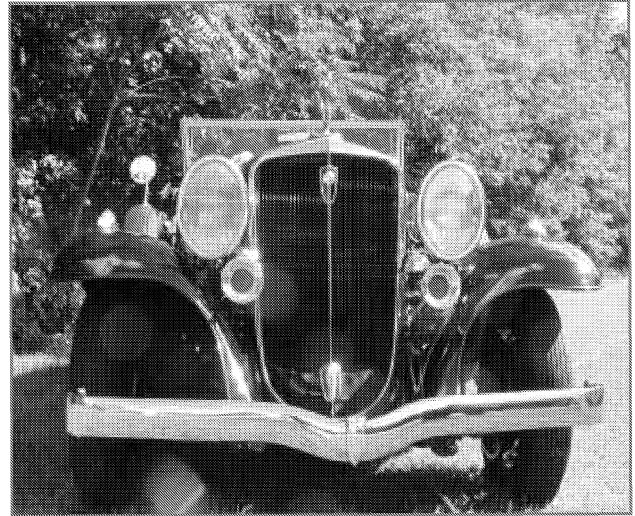
- Provide timely information to the driver with sufficient time for driver response
- Make sure that all information is accurate and reliable
- Provide efficient and effective training for ITS applications
- Provide flexibility in terms of the sequence of events
- Make errors difficult to commit and be forgiving of user errors

Guidelines specific to older drivers include:

- Provide advanced road hazard warning systems to compensate for slower reaction times
- Use colors of yellows, oranges, yellow-greens, and whites on contrasting backgrounds
- Use icons to improve display visibility of information systems and increase character size of text labels to improve performance problems experienced by all drivers
- Match tests of visual ability carefully to the visual task
- Enhance legibility by increasing illumination and contrast
- Avoid glare and UV exposure
- Use larger color contrast steps when short-wavelength discriminations are required
- Use nonphysical cues to enhance depth perception (texture gradient, relative size)
- Enhance conspicuity of critical stimuli through changes of size, contrast, color, or motion
- Reduce delays between information presentation and use in order to increase retention

Summaries of promising practices and programs

Brief summaries of the highlighted practices and programs in the area of vehicle adaptations and advanced technology are presented in this section, as well as other practices and programs that appear promising for enhancing elderly mobility.



Infinitec—Assistive Technology

Objective

Provide web-based information on vehicle adaptations to help older and disabled drivers drive safely and comfortably.

Description

The website provides information on places to find adaptive equipment and common modifications prescribed by driving rehabilitation specialists. Modifications include automatic transmissions, power steering, stability management systems, siren detectors, bioptics for improved vision, steering devices, raised roof or dropped floors, pedal extenders, seats, and safety belts. Things to consider when choosing vehicles are also addressed.

Contact information

Web: www.infinitec.org/live/driving/carmods.htm

Adapting Motor Vehicles for People with Disabilities

Objective

Educate drivers about the process of getting a motor vehicle adapted.

Description

The brochure provides information about the process that individuals should go through when in need of adaptive technology, including evaluating needs, identifying the right vehicle for those needs, finding a qualified dealer to modify the vehicle, getting trained, and maintaining the vehicle. Information is provided about programs/agencies that will assist with costs, how to find a qualified evaluator and dealer, and how to obtain training to use the new equipment. A resource list is also provided. Funded by NHTSA.

Contact information

<http://www.nhtsa.dot.gov>
Tel: 888-327-4236
Tel (TDD): 800-424-9153

Disabled Driver's Mobility Guide

Objective

Serve as a resource for drivers about adaptive equipment, driver training, and related services.

Description

The guide includes information on vehicle equipment and selection, and a listing of manufacturers and dealers of adaptive equipment. There are also state-by-state listings for insurance commissioners' offices, agencies and organizations that assist with travel, AAA clubs, and various agencies, organizations, and companies associated with adaptive technology. Funded by AAA.

Contact information

AAA Traffic Safety Department
MS 76
1000 AAA Drive
Heathrow, FL 32746-5063

Draft Human Factors Design Guidelines for ATIS/CVO

Objective(s)

Provide design guidelines for advanced traveler information systems (ATIS).

Description

Guidelines are provided for the design of ATIS, based on what is known about a driver's ability to effectively and comfortably use ATIS under different operating conditions, driving tasks, and demographic characteristics (identified through review of the literature and analysis). Wherever possible, design guidelines specifically aimed at older drivers are included. Funded by U.S. Department of Transportation.

Contact information

FHWA
400 7th Street, SW
Washington, D.C. 2059

A Design Guideline and Evaluation Framework to Determine the Relative Safety of In-Vehicle Intelligent Transportation Systems for Older Drivers

Objective(s)

Provide guidelines on vision enhancement systems (VES) for older drivers

Description

A review of infrared and ultraviolet vision enhancement systems is provided along with guidelines related both to older drivers and vision enhancement systems. These guidelines were compiled by the Transportation Development Centre at the University of Calgary in Canada from various international and domestic sources.

Contact information

Transportation Development Centre (TDC)
800 Rene Levesque Blvd. West, Suite 600
Montreal, Quebec H3B 1X9



National Mobility Equipment Dealers Association

Objective

Increase independence for people with disabilities by unifying and improving the mobility equipment industry.

Description

The association establishes national guidelines, provides resources, ensures overall quality through a quality assurance program, and offers training opportunities. Guidelines on recommended practices for equipment modification and installation are updated on a yearly basis. Members are required to follow these guidelines as well as NHTSA's safety standards. Funded by membership dues.

Contact information

NMEDA Headquarters
11211 N. Nebraska Avenue, Suite A-5
Tampa, Florida 33612
Tel: 800-833-0427 or 813-977-6603
Fax: 813-977-6402

ROADWAY DESIGN

Thinking about the types of problems that older drivers have on the road, it is apparent that roadway design can play a key role in enhancing safe driving among the elderly, whether in terms of designing new roads or redesigning existing ones. For example, intersections are especially dangerous for older drivers. Yet, it is possible to reduce the crash risk of older drivers at intersections through changes in roadway design related to protected left-turn signals, stop signs, signal timing, roundabouts, and walk signs. Similarly, well-maintained roadway markings (e.g., painted edgelines, raised pavement markers, post-mounted markings) can enhance safety by providing visual cues to drivers to help them stay in their lane. Some aspects of freeway driving can be problematic for older drivers—for example, merging on entrance and exit ramps, and driving through construction

zones—and may be made easier by changes in roadway design. Collectively, improvements in roadway design can serve to make the roadway more forgiving

not only to older drivers and the mistakes they make, but also to the general population of drivers on the road. In addition, design improvements at intersections can benefit older pedestrians who are considerably more likely to be killed by automobiles than younger pedestrians.

To a great extent, the existing road system in the US was built using design standards that did not specifically take into account the needs of an aging population of drivers. Given the tremendous growth in the older population, and the fact that elderly people today are more likely to use the road system (by taking more trips and driving more miles) than earlier cohorts, it is clearly time to revisit many of the roadway design standards of the past.



How roadway design can best enhance mobility

Important components of a promising approach for enhancing elderly mobility through roadway design are highlighted below:

- Design guidelines responsive to needs of older drivers
- Uniform guidelines across jurisdictions
- Effective implementation of guidelines

The first requirement for success in this area is the development of design guidelines that are responsive to the needs of older drivers. That is, design standards must take into account the specific driving-related declines that can occur with aging and how these declines impact the ability of older drivers to negotiate the roadway. For example, we know that information processing is slowed for many older drivers, making it more difficult for them to read signs clustered together at an intersection. Improvements in sign placement and design can help older drivers respond more quickly to make important driving decisions such as when to brake and then to execute those decisions.

The second requirement for success is that there be a uniform set of standards that can guide the design of new roads and redesign of existing roads across states and local communities. This is important not only so that drivers find consistency in the designed roadway environment regardless of where they are traveling, but also so that valuable resources are not wasted by having to start from the beginning each time design solutions are needed. To this end, the Federal Highway Administration began an initiative several years ago that resulted in the 1998 publication of the *Older Driver Highway Design Handbook*, which included recommendations for geometrics, signing, and pavement markings in four major areas of roadway design—intersections, interchanges, roadway curvature and passing zones, and construction/work zones. Feedback from workshops conducted

across the US with state and local design and traffic engineers responsible for day-to-day design decisions led to development and publication of an updated handbook, the *Highway Design Handbook for Older Drivers and Pedestrians*, in 2001.

Finally, to be effective in promoting safety, design standards must be effectively implemented. Roadway designers and traffic engineers at both the state and local levels must be aware of available standards and understand when and how standards should be implemented. To this end, publication of the 2001 *Highway Design Handbook for Older Drivers and Pedestrians* was accompanied by a technology transfer initiative to make practitioners aware of it and assist them in applying its recommendations. A condensed version of the handbook, *Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians*, was also created to facilitate ease of use.

Descriptions of practices and programs that appear especially promising

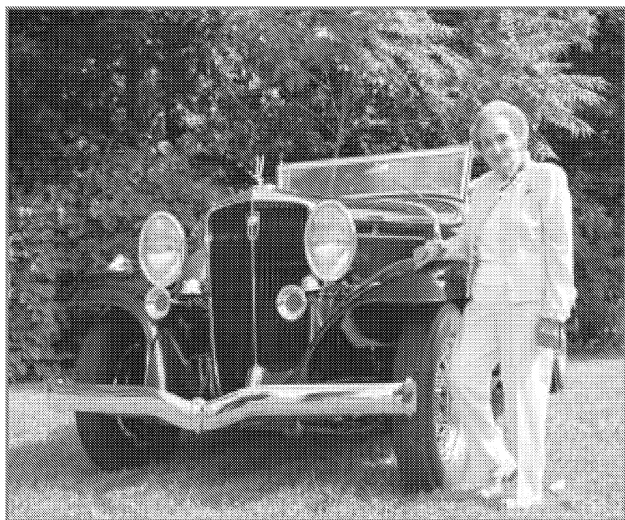
The 2001 *Highway Design Handbook for Older Drivers and Pedestrians* (and the condensed version *Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians*) represents an especially promising tool for enhancing elderly mobility. As the authors note in the handbook, it “provides practical guidance to engineers to accommodate the needs and functional limitations of an aging population of road users. The recommendations provide guidance that is firmly grounded in an understanding of older driver’s and pedestrian’s needs and capabilities, and can significantly enhance the safety and ease of use of the highway system for older drivers and for the driving population as a whole.”¹⁵ The authors point out that recommendations do not constitute new standards of required practice—but instead are intended to supplement existing standards and guidelines in the areas of highway geometry, operations, and traffic control devices.

¹⁵ For further information on designing highways for older drivers, see Staplin, L. Lococo, K., Byington, S. & Harkey, D. *Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians*. (Report No. FHWA-RD-01-051). Washington, DC: U.S. Department of Transportation; and Staplin, L. Lococo, K., Byington, S. & Harkey, D. (2001b). *Highway Design Handbook for Older Drivers and Pedestrians*. (Report No. FHWA-RD-01-051). Washington, DC: U.S. Department of Transportation.

Guidelines are identified for five general types of sites, each having one or more specific roadway features with associated design elements. These include at grade intersections (chosen because they are older drivers' most serious crash problem area); interchanges (chosen because of problems with merging/weaving and changing lanes); roadway curvature and passing zones (chosen because of problems from increased steering demands and potential for unexpected events); construction/work zones (chosen because of problems from increased steering demands and potential for unexpected events); and highway-rail grade crossings.

The handbook contains several elements that increase its potential effectiveness for enhancing elderly mobility. Each design recommendation is based on what is known about age-related declines in driving and extensive background material on the rationale and supporting evidence for each recommendation. There is also a section intended to help designers and engineers decide when to implement the recommendations. A three-part process is presented that includes problem identification, identification of handbook applications, and implementation decision, with worksheets provided for each step.

Reproducing the more than 100 specific design elements recommended in the handbook is beyond the scope of this guide and of limited usefulness to general readers of this guide. What may be more instructive is to get a feel for the broader strategies that have likely helped to shape some of the specific



design elements. The recently-released report entitled Guidance For Implementation of the AASHTO Strategic Highway Safety Plan compiled promising strategies to improve the roadway/driving environment to better accommodate the special needs of older drivers. These include:

- Provide advance warning signs to inform drivers of existing or potentially hazardous conditions on or adjacent to the road
- Provide advance guide signs and street name signs to give older drivers additional time to make necessary lane changes and route selection decisions, and reduce or avoid excessive or sudden braking behavior
- Increase size and letter height of roadway signs to better accommodate reduced visual acuity of older drivers
- Provide longer clearance intervals at signalized intersections to accommodate slower perception-reaction times of older drivers
- Provide more protected left turn signal phases at high-volume intersections to avoid difficulties older drivers have with determining acceptable gaps and maneuvering through traffic streams when there is no protective phase and understanding the rules under which permitted left turns are made
- Provide offset left-turn lanes at intersections to reduce potential for crashes between vehicles turning left from a major road and through vehicles on the opposing road because of blocked views
- Improve lighting at intersections, horizontal curves, and railroad grade crossings to help older drivers compensate for reduced visual acuity and provide additional preview distance and more time to prepare for planned actions
- Improve roadway delineation so older drivers have better visual cues to recognize pavement markings along the roadway as well as raised channelization at intersections to enable them to maintain their lane and to safely negotiate through an intersection
- Replace painted channelization with raised channelization to give drivers better indication of the proper use of travel lanes at intersections by providing better contrast and help drivers

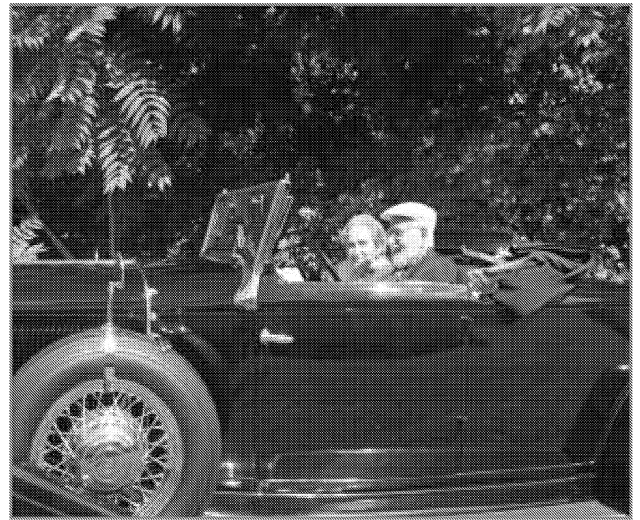
detect downstream geometric features such as pavement width transitions, channelized turning lanes, and island and median features

- Reduce intersection skew angle to lessen amount of head and neck rotation required of older drivers and provide a wider field of view for the driver to recognize conflicts and select appropriate gaps (by meeting a 90 degree angle or be skewed as little as possible)
- Improve traffic control at work zones to improve driver expectancy by providing adequate notice to drivers describing the condition ahead, the location, and the required response

Concurrent with federal efforts to improve roadway design have been more localized efforts focusing on a limited number of roadway features. One noteworthy project is the AAA Michigan Road Improvement Demonstration Program¹⁶, initiated in 1996 to reduce the frequency and severity of crashes at high-risk urban intersections. The program focused on the safety of all drivers, not just older drivers. However, it targeted a roadway feature—intersections—that is particularly problematic for older drivers and therefore has the potential to provide increased benefits for older drivers. Partnerships of private and public sector representatives were set up in two urban areas of Michigan (Detroit and Grand Rapids) to plan and implement low-cost safety improvements to traffic signals, pavement markings, and signs (e.g., creating left-turn lanes and left-turn signals, increasing the diameter of traffic signal lenses, increasing traffic flow by improving light timing). AAA has reported preliminary reductions in crashes of 26 percent.

Summaries of promising practices and programs

Brief summaries of the highlighted practices and programs in the area of roadway design are presented in this section, as well as other practices and programs that appear promising for enhancing elderly mobility.



¹⁶ For additional information, see Zein, S. & Mairs, A. (2002). *AAA Michigan Road Improvement Demonstration Program Evaluation*. British Columbia: G.D. Hamilton Associates.

Highway Design Handbook for Older Drivers and Pedestrians

Objective

Update, revise, and expand the Older Driver Highway Design Handbook published in 1998.

Description

The new guidelines are based on research, technical developments, and feedback from state, county, and municipal engineers who reviewed and implemented recommendations from the previous handbook. A technology transfer component was included to make practitioners aware of the guidelines and assist them in applying recommendations. Both printed and electronic materials accompany the guidelines and help to facilitate practitioner workshops. All guidelines focus on changes with modest financial implications and the potential for future cost savings. Funded by FHWA.

Contact information

Office of Safety R&D
FHWA
6300 Georgetown Pike
McLean, VA 22101-2296

AAA Road Improvement Demonstration Program (RIPD)

Objective

Improve traffic safety by focusing on urban signal controlled intersections.

Description

RIPD represents a partnership among public and government agencies/organizations as well as the cities of Detroit and Grand Rapids. AAA worked with transportation engineers to make low cost improvements (e.g., increasing the lens size of traffic signals, changing signal timing, incorporating left-turn only lanes, adding pedestrian signal displays and overhead traffic signals, and improving placement of traffic signals) at 162 high-crash signalized intersections, with 130 more planned. Funded by AAA Michigan, federal, state, county, and city economic development and safety funds.

Study information

Improvements were not specifically targeted toward older drivers, although their driving needs were taken into account. The frequency and severity of crashes and injuries at a sample of the intersections were compared before and after changes. Declines in crashes and injuries were reported in both cities, resulting in significant cost savings. In Detroit, the design changes had the greatest impact on severe crashes. In Grand Rapids, crashes were reduced at 17 of the 26 test sites.

Contact information

Richard Miller, AAA Michigan
1 Auto Club Drive
Dearborn, MI 48126
Tel: 313-336-1412
Email: rjmiller@aaamichigan.com

Older Driver Pilot Program

Objective

Develop and pilot test highway safety improvements that will benefit the mobility and safety of older drivers.

Description

Roadway improvements to pavement markings, street name signs, and traffic signals were implemented through eight projects in Arizona, Nevada, and Florida. Funded by FHWA, Federal Aid Hazard Elimination, and state funds.

Study information

A survey of drivers' reactions to the improvements, as well as pre-post comparisons of crashes, were used to assess the effectiveness of the improvements. The time period following the changes was generally too brief and the sample sizes too small to reach definitive conclusions, although reductions in crashes were found for all drivers, not just older drivers. Survey respondents for one of the projects reported that raised pavement markers, overhead street sign names, and wider pavement markings provided the most assistance to drivers.

Contact information

FHWA
400 7th Street, SW
Washington, D.C. 20590

Florida's Elder Road User Program

Objective

Develop a roadway plan designed for older drivers.

Description

Based on findings from the Older Driver Pilot Program, short term and long-term roadway improvements were identified and implemented. Short-term improvements, implemented throughout Florida, included reflective pavement markers (most effective), larger lettering on overhead street signs, wider pavement markings that clearly define the travel path, street signs in place prior to the intersection, improved pedestrian crossings, more clearly defined travel paths, and temporary reflective pavement markers in work zones. Long-term improvements included increased sign visibility, advance notice of signage, supplemental pavement markings, and improved intersection techniques. Funded by Florida Department of Transportation.

Contact information

Florida Department of Transportation
605 Suwannee Street
Tallahassee, FL 32399-0450
Tel: 850-414-4100

Roundabouts: An Informational Guide

Objective

Act as a source of comprehensive information regarding all types of roundabouts for a variety of audiences.

Description

The guide defines roundabouts and reviews general characteristics, as well as the geometric design for each type of roundabout, traffic design and landscaping, system and traffic signal considerations, costs, education and public involvement, and policy considerations. It also provides a planning guide to determine location selection and feasibility, analyze the operational factors, and assess safety implications. Funded by FHWA.

Study information

The guide was developed partly in response to study findings that roundabouts allow for higher capacity and less delay than intersections with a traffic control device for all legs of traffic, and contribute to reduced injury rates, although the number of crashes may not be lower.

Contact information

FHWA
Turner-Fairbank Highway Research Center
6300 Georgetown Pike, HSR 20, Room T301
McLean, VA 22101

ALTERNATIVE TRANSPORTATION

While many older drivers are able to compensate for declines in age-related abilities and continue to drive safely for some time, others stop driving, often suddenly, because of health conditions, medical problems, being involved a crash, or just recognizing that they are no longer safe drivers. Elderly people who are no longer able to drive must still be able to meet their transportation needs in order to retain their mobility and hence quality of life. This can be especially challenging given the increasing trend for people to “age in place.” By staying in their own homes (particularly in rural and suburban areas) they may have fewer transportation resources available to them than if they sought out more transportation-friendly retirement areas.

Unfortunately, few people plan for the time when they will no longer be able to drive. When the time comes, they often rely on friends and relatives to drive them. There are, however, a number of alternative transportation options including traditional mass transit (e.g., buses), paratransit and shared rides, hired drivers, and volunteer services. The extent to which these services are available varies from community to community. There is also considerable variation among the various services in terms of how aware people are of the services, how difficult the services are to use, and how much they cost.

Public transportation, the most traditional form of alternative transportation, is not available for much of the population—over a third of American households do not have public bus service within two miles of their homes, and in rural areas, over three-quarters of the population lack these services. When public transportation is available, it is often not used by older people—public transportation accounts for only

about 3 percent of trips by older people. To some extent, this is because many of the same deficits in abilities that are problematic for driving also discourage the use of public bus services. In particular, elderly people may have difficulty walking to the bus stop, waiting for the bus to arrive, climbing aboard, standing



if no seats are available, and knowing when to get off at their stop. Other reasons for not using public transportation include safety concerns, lack of knowledge regarding use, and inconvenience.

Other alternative transportation options have emerged that seek to overcome some of the barriers posed by public transportation. Paratransit or shared ride services, for example, often offer door-to-door service, but may not be available when needed or may require scheduling well in advance. Volunteer ride programs may be more affordable and acceptable than public transportation, but also tend to have restricted hours and requirements for advanced scheduling. Collectively, alternative transportation options in communities are often fragmented and uncoordinated. There is clearly an opportunity to examine the broad array of alternative transportation services and identify opportunities for better meeting the needs of the elderly.

How alternative transportation can best enhance elderly mobility

Important components of a promising approach for alternative transportation are highlighted below:

- Availability
- Accessibility
- Acceptability
- Adaptability
- Affordability
- Coordination and collaboration

One widely used measure of the effectiveness of a transportation service is the extent to which it is available, accessible, acceptable, adaptable, and affordable. First and foremost, transportation must be available, and this means not just that it exists but that it is in operation when people need it. Accessibility has to do with whether people can get to and physically use the service. For public transportation

buses, for example, this means being able to get to the bus stop, having a safe and comfortable place to wait for the bus, being able to enter and exit the bus, and having the necessary information to plan and complete a bus trip. Acceptability has to do with how well the service meets the personal standards of users relative to such things as cleanliness of the vehicle, safety of the waiting area if there is one, and politeness of the driver. Adaptability has to do with whether the service is flexible enough to be responsive to the special needs of individual users, such as accommodating a person in a wheelchair or someone needing to make multiple stops on the same trip. Affordability has to do with whether the costs are within reach of users and if there are options for reducing out-of-pocket costs through such things as discounts, vouchers, or coupons.

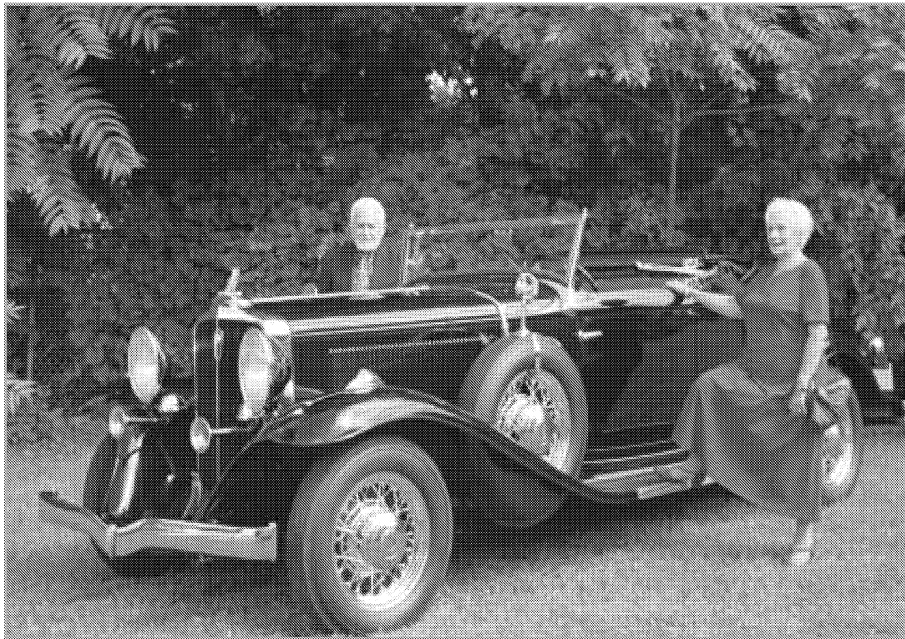
Improving the availability, accessibility, acceptability, adaptability, and affordability of alternative transportation services can go a long way toward enhancing the mobility of older people. In the case of public transportation, for example, this might mean expanding hours of service, improving schedule reliability, making it easier for older drivers to enter and exit the bus by reducing physical barriers such as steps, having more seats reserved for older riders, and calling out the name of stops. Public transit agencies can also provide better information for trip planning and trip taking, using advanced technologies to generate real time arrival and departure information. In addition, they can partner with other community agencies to better serve the specialized needs of the elderly.¹⁷

Focusing on individual transportation services to make sure they are responsive to the needs of older people is an important part of enhancing mobility. However, it is also important to view individual transportation services within a community as part of a system, and to determine where there may be gaps and where there may be opportunities for improved coordination and collaboration. Communities, working in concert with state and federal agencies, have an opportunity to forge alternative transportation systems comprised of different types of transportation services at different prices, that best meet unique community

¹⁷ Strategies for improving alternative transportation can be found in Burkhardt, J.E., McGavock, A.T., & Nelson, C.A.(2002). *Improving Public Transit Options for Older Persons, Volume 1: Handbook*. [Electronic Version] (Report No. 82). Washington, DC: Transportation Research Board.

needs. It is this type of approach, rather than the “one size fits all,” that has the most promise for enhancing the mobility of not just the elderly but of all community residents.

While this is no simple task, it must begin at the local level, with community agencies taking the lead in identifying goals for community-wide mobility and for the provision of comprehensive transportation services for the elderly. Communities can then reach out to state and federal agencies like the Department of Transportation and Health and Human Services,



who are able to fund comprehensive programs that provide transportation services for the elderly. Some communities may find that their needs will be best served by a broader regional approach to transportation planning. Opportunities for increased coordination and collaboration at the local level include forming alliances between public transportation agencies and nontraditional partners such as social service agencies, community-based organizations, volunteer groups, and businesses.

Descriptions of practices or programs that appear especially promising

There are many promising alternative transportation programs that all fall within the general category of supplemental transportation program (STPs). STPs are formal or informal community-based transportation programs for older people that are generally more flexible than traditional transportation alternatives

and highly responsive to individual needs. In 2000, the Beverly Foundation (a private foundation in California that created the term STP) chose 11 STPs as “programs of excellence.” We highlight them here because of the promise they show relative to availability, accessibility, acceptability, adaptability, and affordability. Of the programs, five were chosen to represent relatively small and informal programs, with community-based organization sponsorship (Area IV Agency on Aging, Jefferson County Service Organization, San Felipe Elderly Transportation Program, Shepherd’s Escort Transportation, West Austin Caregivers). Six were chosen to represent more formalized programs, providing extensive and complex services, with budgets ranging from \$220,000 to over 5.6 million (Gadabout Transportation Services, Inc., Gold Country Telecare, Inc., Independent Transportation Network, Lauderhill Transportation Program, Ride Connection, Inc., Transportation Reimbursement and Information Program). While these programs vary considerably in term of location, organization, and services offered, the common theme is that they provide realistic options that allow older people to stop driving without losing their mobility. Additional program information can be found in the Beverly Foundation report Supplemental

Transportation Programs for Seniors prepared for the AAA Foundation for Traffic Safety¹⁸.

A more general practice that can foster coordination and collaboration among alternative transportation services, and hence shows promise for enhancing elderly mobility, is the use of mobility management. A small but growing number of local transportation agencies have become mobility managers—that is, they go beyond the traditional mission of transit by brokering, facilitating, encouraging, coordinating, and managing both traditional and nontraditional (e.g., volunteer and community-based) services to expand the array of alternative transportation options available to the community.¹⁹ Some do this directly, some work in collaboration with other organizations, and some rely extensively on contracting. Regardless of the approach used, effective mobility management requires viewing the alternative transportation system as a whole. Thus, while the focus of mobility management is on the entire community and not just on the elderly population, older people can derive much benefit from a more coordinated transportation system. One noteworthy mobility manager is the Tri-County Metropolitan Transportation District of Oregon (Tri-Met)²⁰ which created a nonprofit agency with about 30 vans and station wagons that it assigns to a network of 25 private, nonprofit providers including the American Red Cross, Metropolitan Family Services, and Volunteers of America.

Summaries of promising practices and programs

Brief summaries of the highlighted practices and programs in the area of alternative transportation are presented in this section, as well as other practices and programs that appear promising for enhancing elderly mobility.



¹⁸ To obtain report see <http://www.seniordrivers.org/research/stp.pdf> or contact AAA Foundation for Traffic Safety at www.aaafoundation.org or 202-638-5944.

¹⁹ Mobility management, as used here, should not be confused with the concept of a personal mobility manager—someone who serves a one-stop resource for individual older drivers (e.g., through a telephone hotline) to provide information on all aspects of maintaining mobility.

²⁰ See <http://www.trimet.org/index.shtml> for further information on mobility management and Murray, G., Koffman, D., Chambers, C., & Webb, P. (1997). *Strategies to Assist Local Transportation Agencies in Becoming Mobility Managers*. (TCRP Report No. 21). http://gulliver.trb.org/publications/tcrp/tcrp_rpt_21-a.pdf for additional information on mobility managers.

Area IV Agency on Aging Transportation Program

Objective

Provide a broad range of transportation services for seniors and disabled adults.

Description

Both volunteer and paid drivers provide transportation throughout urban and rural areas. Through contractual agreements, the program uses service providers to provide curb-to-curb, door-to-door, door-through-door, and escorted rides Monday through Friday and on weekends (using a taxi service). Funded by Idaho Department of Transportation, Idaho Senior Service Act, and The College of Southern Idaho.

Study information

A case study by the Beverly Foundation found that the greatest strength of the program was its ability to provide a wide range of transportation. The Foundation has recognized it as an award-winning program.

Contact information

College of Southern Idaho
P.O. Box 1238
Twin Falls, Idaho 83303-1238
Tel: 208-736-2122
Fax: 208-736-2126

Gadabout Transportation Services, Inc.

Objective

Provide door-to-door transportation services to seniors and disabled adults in both urban and rural areas.

Description

Gadabout is a nonprofit organization with a Board of Directors responsible for policy guidance and oversight. Both paid and volunteer drivers provide transportation using buses during weekday, daytime hours. Typically, rides are scheduled 24 hours in advance and riders are charged a flat rate fee. Gadabout collaborates with the Social Services Department to provide escorts for riders. Drivers are screened and trained. Funded by State and Federal funds (grants through the Federal Urban Mass Transit Act), tax revenue, and rider fees.

Study information

In a case study performed by the Beverly Foundation, Gadabout was found to be acceptable to riders, accessible due to the specially equipped vehicles, and adaptable because it provides escorted transportation when needed.

Contact information

Gadabout Transportation Services, Inc.
Judith E. Willis
737 Willow Avenue
Ithaca, NY 14850
Tel: 607-273-1878
Fax: 607-277-9551

Gold Country Telecare, Inc.

Objective

Provide transportation to seniors and adults with disabilities so that they can remain independent and continue participating in the community.

Description

The nonprofit program has six staffed divisions with paid employees and volunteers. Telecare has established service relationships with various senior residential and medical facilities. They provide door-to-door service 7 days a week, but riders must make a reservation 24 hours in advance. The Area IV Agency on Aging assists low-income seniors with vouchers. Drivers receive mileage reimbursements. Initial funding provided by a sponsoring church and private donations, and current funding provided by county funds, special events, grants (California DMV, Area IV Agency on Aging, and the United Way), and fund raising.

Study information

In a case study by the Beverly Foundation, the program was found to be available, affordable, acceptable, accessible, and adaptable to the elderly and has been recognized as an award-winning program.

Contact information

Gold Country Telecare, Inc.
Don Martin
13076 Ridge Road
Grass Valley, CA 95945
Tel: 530-274-8264
Fax: 530-272-1349

Independent Transportation Network (ITN)

Objective

Provide on-demand, door-to-door transportation.

Description

Rides can be scheduled 7 days a week, 24 hours a day, either in advance (earning a discount) or on-demand, and paid for through pre-paid accounts. Riders can turn in their vehicle and receive mileage credit. Riders must become members of ITN and live within the ITN service area. A small annual membership fee provides access to a bi-monthly newsletter and a gift certificate on the member's birthday. The program uses volunteer drivers who use their own vehicles to transport riders (and receive mileage reimbursement) as well as paid drivers, who use one of the program's vehicles. ITN has developed GIS software that also includes payment and billing functions. Funded by grants, rider and membership fees, donations, and local business participation.

Study information

In a case study by the Beverly Foundation, ITN services were found to be available, affordable, acceptable, accessible, and adaptable. ITN's founder has been charged with developing a model suitable for replication elsewhere.

Contact information

ITN
Katherine Freund
90 Bridge Street
Westbrook, ME 04092
Tel: 207-854-0505
Fax: 207-854-1026

Jefferson County Service Organization

Objective

Provide demand response transportation service throughout the county.

Description

This program, the only alternative transportation option for residents in this area, includes paid staff members and volunteers. Each community in which it

operates has its own drivers and an individual who schedules rides. Rides can be scheduled for the same day on weekdays and by appointment on weekends. Drivers typically stay with passengers until they are ready to return home, and often assist the riders. Funded by Kansas Department of Transportation, rider fees/donations, United Way, property taxes, and Area Agency on Aging.

Study information

The Beverly Foundation found that the drivers set this program apart from many others because they provide hands-on assistance to riders, and has recognized it as an award-winning program.

Contact information

Lynn Luck, Jefferson County Service Organization
610 Delaware Street
Oskaloosa, Kansas 66066
Tel: 785-863-2637
Fax: 785-863-3460

Lauderhill Transportation Program

Objective

Provide demand-response, door-to-door transportation for the elderly.

Description

Lauderhill, in association with the Social Services Department, operates a fleet of vehicles able to provide transportation to large groups or individuals. Most trips are scheduled on weekdays, with some weekend and evening hours. The program includes both full- and part-time employees and volunteers. Riders are encouraged to purchase Trip Passes, good for 10 one-way rides. Vehicles funded by Urban Mass Para Transit Authority and additional funding provided by city funds.

Study information

The Beverly Foundation found the program to be available, affordable, acceptable, accessible, and adaptable to the elderly and has recognized it as an award-winning program.

Contact information

P.A.L.S. OFFICE
1900 NW 55 Avenue
Lauderhill, FL 33313
Tel: 954-730-3080
Web: www.lauderhill.net/dept_pals_hss.html

Ride Connection, Inc.

Objective

Provide assistance to seniors and people with disabilities who do not have alternative transportation.

Description

Created in response to a community needs assessment, the program has a Board of Directors with fundraising and transportation expertise, and employs both full- and part-time employees as well as volunteers. It has formed service relationships with various providers and riders are referred to the closest provider when they call to request a ride. Aside from rural county travel, riders are not charged a fee, however, donations are accepted. Funded by Oregon Department of Transportation, Public Transit Division, and Tri-Met.

Study information

The Beverly Foundation found the program to be available, affordable, acceptable, accessible, and adaptable to the elderly and has recognized it as an award-winning program.

Contact information

2145 NW Overton
Portland, OR 97210
Tel: 503-413-8924
Email: ride@rideconnection.org
Web: www.rideconnection.org/index.html

San Felipe Elderly Transportation Program

Objective

Provide transportation options to seniors and individuals with disabilities.

Description

Created in response to a community needs assessment, the program provides scheduled service for the same day or through appointments. Longer trips require advance notice. Rides are free, but donations are accepted. Escorts are available. The program employs both volunteer and paid drivers. Funded by state funds, Title VI funds, Older Americans Act, United Way, Casino Hollywood (the pueblo's casino), the Tribe, and the America Indian Society.

Study information

Reviewed by the Beverly Foundation and recognized as an award-winning program.

Contact information

Emily Velasquez
P.O. Box 4352
San Felipe Pueblo, NM 87001
Tel: 505-867-2349
Fax: 505-771-8685

Shepherd's Center Escort Transportation

Objective

Provide transportation options to seniors.

Description

Volunteers provide escorted rides in their own vehicles and stay with clients to provide assistance. Rides are free, but donations are accepted. An Escort Transportation Committee oversees the program. Service relationships have been established with various agencies and medical facilities. Rides must be scheduled more than 2 days in advance, and typically occur during daylight hours, Monday through Thursday. A different person coordinates the scheduling each week by matching drivers with riders. The volunteer drivers contact riders to confirm arrangements. Funded by Rider donations/contributions and a local church.

Study information

The Beverly Foundation found the escort service to be an important part of the program, but noted that mileage reimbursement for volunteer drivers was lacking. They recognized it as an award-winning program.

Contact information

Joanne DeKoekkoek
1833 So. Burdick Street
Kalamazoo, MI 49001
Tel: 616-383-1122
Fax: 616-344-6170

Transportation Reimbursement and Information Program (TRIP)

Objective

Help people find and pay for volunteers to drive and escort them to various locations and provides free information on the availability of public transportation in the county.

Description

The program represents a partnership between non-profit and government sectors. Through HelpLink, TRIP's toll-free helpline, specialists discuss transportation needs with callers, make referrals to providers who can assist them, send out brochures, route schedules, and refer people to the American Disabilities Act certification process of transit agencies. A committee evaluates each applicant for the program in order to determine eligibility. TRIP reimburses its clients for mileage, and clients in turn reimburse their volunteer drivers. Staff includes part-time employees and volunteers. Funded by tax support, SunLine Transit Agency, Riverside County Office on Aging, and charitable contributions.

Study information

In a survey of program participants, many reported that TRIP has improved their life and allows them to meet their travel needs. The Beverly Foundation found the program to be available, affordable, acceptable, accessible, and adaptable to the elderly and has recognized it as an award-winning program.

Contact information

Richard Smith
6296 Rivercrest Drive, Suite K
Riverside, CA 92507
Tel: 909-697-4697
Fax: 909-697-4698
Web: www.livingpartnership.org/trip.html

West Austin Caregivers

Objective

Offer a wide range of services so that older adults can maintain their independence and improve their quality of life.

Description

Sponsoring interfaith congregations help to recruit volunteer drivers who use their own vehicles to provide a wide range of transportation options. Clients request services through a volunteer receptionist who then matches a volunteer driver with the client's needs. Drivers are responsible for contacting the riders in order to confirm reservations. Funded by grants, church sponsors, contributions, interest and dividends, and special fundraising.

Study information

The Beverly Foundation identified the program's unique feature to be its service agreement with the Junior League to provide volunteers, and has recognized it as an award-winning program.

Contact information

Jean Barrett-Teel
2601 Exposition Boulevard, Room 205
Austin, TX 78703
Tel: 512-472-6339
Fax: 512-472-7158
Web: www.io.com/~wacgive/

Tri-Met and Volunteer Transportation, Incorporated (VTI)

Objective

Provide safe and reliable transportation services.

Description

Tri-Met partners with human services agencies in the area and provides fixed-rail, fixed-route, paratransit, and demand-response service 7 days a week using wheelchair accessible vehicles. The paratransit services are provided to ADA-certified passengers with 24-hour advance notice. Tri-Met has also created a non-profit agency called Volunteer Transportation, Inc. (VTI), in order to be eligible for special education funding. VTI has vehicles that provide transportation to private, nonprofit organizations and agencies, ensuring that the vehicles are used efficiently and effectively through vehicle loans among the agencies or vehicle sharing. VTI provides transportation for individuals who do not qualify for ADA and do not have fixed-route service available. Drivers are able to use their own cars and are provided training through VTI. Funded by payroll related taxes, passenger revenue, cigarette tax, interest, and other sources.

Contact information

4012 SE 17th Ave.
Portland, OR 97202
Tel: 503-962-2100
Web: <http://www.trimet.org/index.shtml>

ACCESS Transportation System

Objective

Provide transportation services.

Description

The program provides paratransit, shared-ride, or door-to-door transportation countywide. Human service agencies in the county use ACCESS who provides rides through contracts with for-profit and nonprofit carriers. Complaints regarding the service are addressed and monitored. Funded by local funds.

Contact information

701 Smithfield St.
Pittsburgh, PA 15222
Tel: (412) 562-5353
Fax: (412) 391-0594

Antelope Valley Transit Authority (AVTA)

Objective

Provide affordable and accessible alternative transportation options.

Description

AVTA offers a shared-ride program in both urban and rural areas. It provides curb-to-curb service for seniors and individuals with disabilities. In rural areas, service is available to everyone Monday through Friday. Advance notice of 1-3 days is required for trips, but same-day service is available. They also provide group discounts. AVTA provides a shuttle that is available on Tuesdays for transportation to certain medical facilities in the Los Angeles area. Funded by federal and local grants and state funding.

Contact information

AVTA
1031 West Avenue L-12
Lancaster, CA 93534
Tel: 661-945-9445
Web: www.avta.com/

Capital Area Transit Authority (CATA)

Objective

Provide affordable and accessible transportation.

Description

CATA provides demand-response service using wheelchair accessible and low-floor vehicles. The service also provides travel training for seniors and people with disabilities.

Contact information

420 South Grand Avenue
Lansing, MI 48933
Tel: 517-394-1000

Capital Metro Transportation Authority

Objective

Provide affordable and accessible transportation.

Description

The program uses lift-equipped vehicles to provide transportation as well as assistance with boarding the buses. Seniors age 65 and older ride free of charge. An EasyRider program provides free transportation for senior groups. Some funding provided by sales tax.

Contact information

2910 East 5th Street
Austin, TX 78702
Tel: 512-389-7400

Choice Ride

Objective

Help older adults remain independent by providing door-to-door transportation.

Description

For a prepaid fee, older adults receive rides in a personal vehicle with a driver. Participants receive credit on their auto insurance policies if they agree to use their own vehicles only in an emergency. Rides are available 24 hours per day, 7 days per week by the Mears Transportation Group, and can be scheduled up to 1 day in advance. Riders can try out the program on a trial basis. Three pricing plans are available for riders. Funded by USAA Insurance Company.

Study information

Following 2 years of development, the program was field tested during an 18-month period in Orlando, FL, and began on July 1998.

Contact information

USAA Insurance Company
9800 Fredericksburg Road
San Antonio, TX 78288
Tel: 800-535-8695

Connect-a-Ride

Objective

Act as a transportation resource center for aging adults.

Description

Connect-a-Ride is a free transportation "help-line" that organizes and disseminates information about the cost, eligibility requirements, and availability of public and private transportation services, and connects older adults with providers who can accommodate their transportation needs. It also helps organizations develop and provide senior transportation services. Counselors work with seniors to identify needs, eligibility, and program availability. Funded by Jewish Council for the Aging.

Contact information

Harriet Shapiro
JCA-Connect-A-Ride
11820 Parklawn Drive, Suite 200
Tel: 301-255-4207
Email: hshapiro@jcagw.org

Easy Lift Organization

Objective

Provide affordable and accessible alternative transportation options and assist riders with navigation.

Description

Easy Lift provides rides for seniors through a door-to-door, 7 day a week, dial-a-ride program. The program operates on a first call, first served basis but can be contracted out for larger groups such as group homes. Easy Lift also provides riders with the option to organize more cost-effective trips with larger groups. Mobility trainers are available to work with individuals to teach them the necessary skills to use public transit. Trainers are available to ride with program participants until they feel comfortable navigating the bus system on their own. The program utilizes a radio network to dispatch over 40 vehicles from non-profit agencies. Funded by fundraising, grants, and public transit money.

Contact information

Easy Lift Organization
53 Cass Place, Suite D
Goleta, CA 93117
Tel: (805) 681-1181
Email: info@easylift.org
Web: <http://www.easylift.org/>

ElderNet

Objective

Help older adults remain independent by providing free services including transportation.

Description

Three professional social workers and 180 trained volunteers answer phone calls, assess needs, provide transportation, help the homebound with various services, and provide emergency assistance, among other things. Funded by fundraising, Montgomery County Office on Aging, Lower Merion Township, the Borough of Narberth, community donations, and government/foundation sources.

Contact information

ElderNet
9 South Bryn Mawr Avenue
Bryn Mawr, PA 19010
Tel: 610-525-0706
Web: <http://www.eldernetonline.org/>

Flagler County Council on Aging (COA)

Objective

Provide transportation in an area with no fixed-route service.

Description

COA coordinates the county's first fixed-route service for the disadvantaged, with 22 buses/vans and 3 passenger cars that provide service 7 days a week with 24-hour advanced notice required. The program is web-based and uses real-time bus locaters.

Contact information

1000 S. Belle Terre Pkwy
P.O. Box 352080
Palm Coast, FL 32135
Tel: 386-437-7283

Great Falls Transit District

Objective

Provide transportation services within the district boundaries.

Description

The program provides fixed-route and demand-response service (through a contract with a taxicab company) 7 days a week. A paratransit service is also available for adults 65 years and older who apply and obtain medical verification of a disability. The maximum length of the fixed route is 30 minutes.

Contact information

3905 North Star Boulevard
Great Falls, MT 59405
Tel: 406-727-0382

LIFT Transportation

Objective

Provides ADA-certified paratransit services to residents of northern San Diego County.

Description

The county transit development board contracts with North County Lifeline, Inc. to act as the coordinated transportation service agency providing technical information and assistance for specialized transportation needs. The program provides rides 7 days a week in suburban and rural areas using vehicles equipped with lifts. Twenty-four-hour advance notice is required and reservations can be made up to 1 week in advance. LIFT contracts with various taxicab companies to handle any overflow. Route assistance, general information, and referral services are provided.

Contact information

North County Transit District
810 Mission Avenue
Oceanside, CA 92054
Tel: 760-966-6500

Mountain Empire Older Citizens

Objective

Provide transportation services in the rural and mountainous regions.

Description

The program offers a variety of services tailored to the individual requirements of riders, with higher-level services identified through caseworker assessment. Clients who are especially frail are eligible for one-on-one service with a driver who transports and accompanies them to appointments, the pharmacy, or shopping. Drivers will also grocery shop for a client or move a client into an elderly care facility or apartment.

Contact information

Mountain Empire Older Citizens, Inc.
P.O. Box 888
Big Stone Gap, VA 24219
Tel: 276-523-4202 or 800-252-6362
Email: meoc@meoc.org
Web: <http://www.meoc.org/>

NAPA Valley Transportation / Valley Intra-City Neighborhood Express (VINE) / Transportation Users Assistance Program

Objective

Provide fixed-route services for older and disabled persons.

Description

Fixed-route service is provided countywide using two services: Napa Valley Transportation (NVT) and Valley Intra-city Neighborhood Express (VINE). Service is available 7 days a week and includes kneeling buses and buses equipped with wheelchair lifts. They also provide an Ambassador Program that offers personal orientation for new users.

Contact information

VINE Transit Center
1151 Pearl St.
Napa, CA 94559-2528
Tel: 707-255-7631 or 800-696-6443

OATS, Inc.

Objective

Meet the transportation needs of those who have little or no alternative transportation options.

Description

Prospective riders can call a volunteer contact person, or an area office. First time riders are asked to fill out an information form for record keeping purposes, and to receive the OATS quarterly publication. Each of the eight offices throughout the state are individually responsible for handling reservations and dispatching vehicles. Rides are available from 6:00 a.m. to 6:00 p.m., but special appointments can be made for trips outside of the normal hours of operation. There is no fee, but each vehicle has a suggested donation amount, which riders are encouraged to contribute. OATS employs hundreds of staff and nearly a thousand volunteers. The volunteers in each area are responsible for organizing, scheduling, fund raising, advertising, and marketing. Funded by federal, state, and private funds, donations, and rider fees.

Study information

A case study of OATS indicated that its success is related to management style, volunteer spirit, and local control and ownership of resources.

Contact information

OATS office in Shelbina, MO

Tel: 800-654-6287

Web: www.kahoka.com/services/oats.html

Sedgwick County Transportation Brokerage (SCTB)

Objective

Provide door-to-door transportation to residents in Sedgwick County.

Description

SCTB consists of a network of companies experienced in transporting older, disabled, or ill adults. Riders must submit an application in order to use the services. Using a database of users and providers, the brokerage matches riders with the appropriate transportation service provider. Transportation is available 24 hours a day, 7 days a week, with a 24–48 hour advance reservation. Due to various grants, some riders ride free of charge, or are charged a flat rate or fee based on the rider's income. Funded by federal, state, local, and private funding sources.

Contact information

Sedgwick County Transportation Brokerage

1015 Stillwell, 2nd Floor

Wichita, KS 67213

Tel: 313-660-5150 or 800-367-7298

Fax: 313-383-7324

Southeastern Pennsylvania Transportation Authority (SEPTA)

Objective

Provide affordable and accessible alternative transportation options.

Description

The Shared-Ride Program is a door-to-door, advance-reservation, ride-sharing service. Seniors must be unable to use a fixed-route bus for some or all of their transportation needs, and must apply in order to use the service. The service area covers the city of Philadelphia and any location within a 3-mile perimeter of the city's border. The trip cost is dependent on whether the customer is registered through the Americans with Disabilities Program or the Shared Ride Program. With proper identification, seniors can receive free transportation services on regular SEPTA buses or trolleys. Funded by state funds and the Lottery Fund of the Pennsylvania Department of Transportation.

Contact information

Tel: 215-580-7800

Web: www.septa.org/



BIBLIOGRAPHY

- AAA Foundation for Traffic Safety. (1994). *Drivers 55 Plus: Check Your Own Performance*. Washington, DC: AAA.
- AAA Foundation for Traffic Safety. (1989). *A Flexibility Fitness Training Package For Improving Older Driver Performance*. Washington, DC: AAA.
- AAA Foundation for Traffic Safety. (2000). *How to Help an Older Driver: A Guide for Planning Safe Transportation*. Retrieved on March 11, 2003, from <http://www.aaafoundation.org/pdf/ODlarge.pdf>.
- AAA Foundation for Traffic Safety. (2000). *The Disabled Driver's Mobility Guide*. Heathrow, FL: AAA.
- AASHTO. (1997). *AASHTO Strategic Highway Safety Plan*. Retrieved February 7, 2003, from <http://www.transporatation1.org/SafetyPlan/plan/index.asp>.
- Alicandri, E., Robinson, M., & Penney, T. (1999). *Designing Highways With Older Drivers in Mind*. Retrieved June 25, 2003, from <http://www.tfsrc.gov/pubrds/mayjun99/olddrvrs.htm>.
- American Association of Motor Vehicle Administrators. (2001). *GrandDriver: Getting Around Safe and Sound*. Retrieved June 25, 2003, from http://www.aamva.org/documents/evt_presentations/dlcworkshiop01/evtgettingaroundsafeandsound.ppt.
- American Association of Motor Vehicle Administrators. (2003). *Aging Drivers: Getting Around Safe and Sound Maintaining Independence for Life*. Retrieved June 25, 2003, from www.aamva.org/drivers/drv_AgingDriversGettingAround.asp.
- American Association of Retired Persons. (1992). *Creating Mobility Choices: Older Driver Skill Assessment and Resource Guide*. Washington, DC: AARP.
- American Association of Retired Persons. (1998). *55 Alive/Mature Driver Safety Program*. Washington, DC: AARP.
- Applegate, W.B, Blass, J.P., & Williams T. F. (1990). Instruments for the functional assessment of older patients. *Current Concepts in Geriatrics*, 322(17): 1207-1214.
- Austroroads. (2001). *Assessing Fitness to Drive: Guidelines and Standards for Health Professionals in Australia* (2nd ed.). Sydney, Australia: Austroroads, Inc.
- Ball, K.K., Beard, B.L., Roenker, D.L., Miller, R.L., & Griggs, D.S. (1988). Age and visual search: expanding the useful field of view. *Journal of the Optical Society of America*, 5(12): 2210-2219.
- Ball, K.K., Owsley, C., Stalvey, B., Roenker, D.L., Sloane, M.E., & Graves, M. (1998). Driving avoidance and functional impairment in older drivers. *Accident Analysis and Prevention*. 30(3): 312-322.
- Berube, E. (1994). *Annual Tabulations of Mature Driver Program Driving Record Comparisons—1993*. Sacramento, CA: California State Department of Motor Vehicles.
- Berube, E. (1995). *Evaluation of Mature Driver Improvement Program Home-Study Courses*. (Report No. CAL-DMV-RSS-95-157). Sacramento, CA: California Department of Motor Vehicles' Research and Development Section.
- Beverly Foundation, The (2001). *Supplemental Transportation Programs for Seniors*. Retrieved March 11, 2003, from <http://www.seniordrivers.org/research/stp.pdf>.
- Bittner, J.J., Long, J.D., & Szylow, L. (2000). *Mobility in an Aging America: Design, Licensing, and Alternative Transportation Options*. Retrieved March 11, 2003, from <http://www.lafollette.wisc.edu/Research/Publications/StudentPapers/1999-2000/Spring/PA869/transportation.pdf>.

- Bruff, J.T. & Evans, J. (1999). *Elderly Mobility and Safety—The Michigan Approach Final Plan of Action*. Retrieved on March 24, 2003, from http://www.semco.org/Products/pdfs/eldmob_final.pdf.
- Burkhardt, J.E. (1999). Mobility changes: their nature, effects, and meaning for elders who reduce or cease driving. *Transportation Research Record*, 1671: 11–18.
- Burkhardt, J.E., McGavock, A.T., & Nelson, C.A. (2002). *Improving Public Transit Options for Older Persons, Volume 1: Handbook*. [Electronic Version] (Report No. 82). Washington, DC: Transportation Research Board.
- Burkhardt, J.E., McGavock, A.T., Nelson, C.A., & Mitchell, C.G.B. (2002). *Improving Public Transit Options for Older Persons, Volume 2: Final Report*. [Electronic Version] (Report No. 82). Washington, DC: Transportation Research Board.
- Burns, P.C. (1999). Navigation and the mobility of older drivers. *The Journals of Gerontology*, 54B: S49–S55.
- CH2MHILL (with Maron Engineering, BMI, Midwest Research Institute, Northwestern University Center for Public Safety, UNC Highway Research Center, Waller, P.) (2002). *Guidance For Implementation of the AASHTO Strategic Highway Safety Plan: A Guide For Addressing Crashes Involving Older Drivers*. Retrieved March 4, 2003, from http://www.ch2m.com/nchrp/old_drvt/assets/ODguide.pdf.
- Caird, J.K., Chugh, J.S., Wilcox, S., & Dewar, R.E. (1998). *A Design Guideline and Evaluation Framework to Determine the Relative Safety of In-Vehicle Intelligent Transportation Systems for Older Drivers*. (Report No. TP 13349E). Montreal, Quebec: Transportation Development Centre.
- Campbell, J.L., Carney, C., & Kantowitz, B.H. (1997). *Advanced Traveler Information Systems (ATIS) and Commercial Vehicle Operations (CVO) Components of the Intelligent Vehicle Highway System (IVHS), Draft Human Factors Design Guidelines for ATIS/CVO*. (Report No. 0034). Arlington, VA: Federal Highway Administration.
- Canadian Medical Association. (2000). *Determining Medical Fitness to Drive: A Guide for Physicians* (6th ed.). Retrieved March 27, 2003, from www.cam.ca.
- Carr, D.B. (2000). The older adult driver. *American Family Physician*, 61(1): 141–146.
- Carr, D.B., LaBarge, E., Dunningan, K., & Storandt, M. (1998). Differentiating drivers with dementia of the Alzheimer type from healthy older persons with a traffic sign naming test. *The Journals of Gerontology*, 53A(2): M135–M139.
- Cushman, L.A. & Cogliandro, F. (1997). Cognitive capacity: its relationship to safety in older drivers. *American Driver and Traffic Safety Chronicle*, 45(2): 8–11.
- Decina, L. & Staplin, L. (1993). Retrospective evaluation of alternative vision screening criteria for older and younger drivers. *Accident Analysis and Prevention*, 25(3): 267–275.
- Dellinger, A.M., Sehgal, M., Sleet, D.A., & Barrett-Conner, E. (2001). Driving cessation: what older former drivers tell us. *Journal of the American Geriatrics Society*, 49: 431–435.
- Demick, J. & Harkins, D. (1999). Cognitive style and driving skills in adulthood: Implications for licensing of older drivers. *IATSS Research*, 23(1): 42–57.
- Diller, E., Cook, L., Leonard, D., Reading, J.; Dean, J. M.; Vernon, D. (2001). *Evaluating Drivers with Medical Conditions in Utah, 1992–1996*. (Report No. DOT HS 809 023). Washington, DC: U.S. Department of Transportation.
- Dingus, T., Hulse, M.C., Mollnehauser, M.A., Fleischman, R.N., McGehee, D.V., & Manakkal, N. (1997). Effects of age, system experience, and navigation technique on driving with an advanced traveler information system. *Human Factors*, 39(2): 177–179.
- Dobbs, A.R., Heller, R.B., & Schopfloch, D. (1998). A comparative approach to identify unsafe older drivers. *Accident Analysis and Prevention*, 30(3): 363–370.
- Dobbs, B.M. (1997). Driving and Dementia: Consequences of Evaluation and De-licensing. *Proceedings of the 50th Annual Scientific Meeting The Gerontological Society of America*, Cincinnati, OH.
- DriveABLE. (n.d.). *Assessments For Medically At-Risk Drivers*. Retrieved May 22, 2003, from <http://www.driveable.com/>.
- Duchek, J.M., Hunt, L., Ball, K., Buckles, V., & Morris, J. (1998). Attention and driving performance in Alzheimers disease. *The Journals of Gerontology*, 53B(2): 130–141.
- Eby, D.W., Molnar, L.J., Shope, J.T., Vivoda, J.M., & Fordyce, T.A. (in press). Improving older driver knowledge and awareness through self-assessment: *The Driving Decisions Workbook*. *Journal of Safety Research*.

- Eby, D.W., Shope, J.T., Molnar, L.J., Vivoda, J.M., & Fordyce, T.A. (2000). *Improvement of Older Driver Safety Through Self-Evaluation: The Development of a Self-Evaluation Instrument*. (Report No. UMTRI-2000-04). Ann Arbor, MI: University of Michigan Transportation Research Institute.
- Eby, D. W., Trombley, D. A. Molnar, L. J. & Shope, J. T. (1998). *The Assessment of Older Drivers' Capabilities: A Review of the Literature*. (Report No. UMTRI-91182). Ann Arbor, MI: University of Michigan Transportation Research Institute.
- Evans, J. (1999a). *Elderly Mobility and Safety Background Paper #1: Traffic Pattern and Crash Characteristic Analysis, State of Michigan*. Retrieved on March 24, 2003, from http://www.semco.org/Products/pdfs/eldmob_bp1.pdf.
- Evans, J. (1999b). *Elderly Mobility and Safety Background Paper #2: Literature Review and Resource Inventory*. Retrieved on March 24, 2003, from http://www.semco.org/Products/pdfs/eldmob_bp2.pdf.
- Evans, J. (1999c). *Elderly Mobility and Safety Focus Group Research Report*. Retrieved on March 24, 2003, from <http://www.semco.org/Products/pdfs/focus.pdf>.
- Evans, J. (1999d). *Elderly Mobility and Safety Forum Proceedings*. Retrieved on March 24, 2003, from http://www.semco.org/Products/pdfs/eldmob_forum.pdf.
- Federal Highway Administration (1989). *Workshop on Roadway Improvements for the Mobility and Safety of Older Drivers and Pedestrians*. Washington, DC: U.S. Department of Transportation.
- Federal Highway Administration (1990). *Older Driver Pilot Program*. (Report No. FHWA-SA-90-016). Washington, DC: U.S. Department of Transportation.
- Federal Highway Administration (2001). *Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians*. (Report No. FHWA-RD-01-051). Washington, DC: Federal Highway Administration.
- Fildes, B., Pronk, N., Langford, J., Hull, M., Frith, B., & Anderson, R. (2000). *Model License Re-Assessment Procedure for Older and Disabled Drivers*. (Report No. AP-R176). Sydney, Australia: Austroads, Inc.
- Fildes, B., Pronk, N., & Charlton, J. (2001). Development of a National License Assessment Program for Older Drivers in Australasia. *Proceedings of the First International Driving Symposium on Human Factors in Driver Assessment, Training and Vehicle Design*. Aspen, CO.
- Florida Department of Transportation. (1999). Florida's elder road user program. *Traffic Engineering Manual* (Topic No. 750-000-005). Retrieved on April 4, 2003, from <http://www11.myflorida.com/trafficoperations/temanual/Chapter6/6.1.pdf>.
- Freedman, M., Decina, L. E., & Knoebel, K. Y. (1986). *Analysis of Pennsylvania's Driver Re-Examination Program*. Final Report. (Report No. RR 84-7/ 3807). Harrisburg, PA: Pennsylvania Department of Transportation.
- Gallo, J.J., Rebok, G.W., & Lesikar, S. E. (1999). The driving habits of adults aged 60 years and older. *Journal of the American Geriatrics Society*. 47(3):335–341.
- Graham, J.R., King, L.E., Naylor, D., & Blakely, S. (1995). *Intersection Design Decision/Reaction Time for Older Drivers*. (Report No. FWHA/NC/95-002). Charlotte, NC: University of North Carolina at Charlotte, Department of Civil Engineering.
- Greene, F. A., Koppa, R.J., Rodriguez, K., & Wright, S. (1996). *Positive Guidance and Older Motorists—Guidelines for Maintenance Supervisors*. (Report No. SWUTC/96/72197-2). College Station, TX: Texas Transportation Institute.
- Haddon, W., Jr. (1980). Options for the prevention of motor vehicle crash injury. *Israel Journal of Medical Science*, 16(1): 45–68.
- Hakamies-Blomqvist, L. (1996). Medical screening of older drivers as a traffic safety measure—a comparative Finnish-Swedish evaluation study. *Journal of American Geriatric Society*. 44: 650–653.
- Hanowski, R.J., Bittner, A.C., Jr., Knipling, R.R., Byrne, E.A., & Parasuraman, R. (1995). Analysis of Older Driver Safety Interventions: A Human Factors Taxonomic Approach. *Proceedings of the ITS America Conference*, Washington, DC.
- Hawthorne Community Education Project, Inc. (2002). *Older Driver, Wiser Drivers: About The Wiser Driver Program*. Retrieved March 30, 2003, from <http://www.saferoads2002.com/papers/Elsworth,J.pdf>.
- Heckman, T. & Duke, L.F. (1997). *Driving Decisions for Seniors: a Practical Model of Elders Assisting one Another to Manage Their own mobility choices*. Warren, MI : General Motors Corporation, Research and Development Center.
- Hewitt, B. & Evans, J. (1999). *Elderly Mobility and Safety—The Michigan Approach, Background Paper #2 Literature Review and Resource Inventory*. Detroit: Southeast Michigan Council of Governments (SEMCOG).

- Holland, C.A. & Rabbitt, P.M.A. (1994). The problems of being an older driver: comparing the perceptions of an expert group and older drivers. *Applied Ergonomics*, 25(1): 17–27.
- Hunt, L.A., Murphy, C.F., Carr, D., Duchek, J.M., Buckles, V., & Morris, J.C. (1997). Reliability of the Washington University Road Test: A performance-based assessment for drivers with dementia of the Alzheimer type. *Archives of Neurology*, 54(6): 707–712.
- Insurance Institute for Highway Safety. (2003). *U.S. Drivers Licensing Renewal Procedures for Older Drivers, as of June 2003*. Retrieved July 7, 2003, from http://www.hwysafety.org/safety_facts/state_laws/older_drivers.htm.
- Infinetec. (n.d.). *Vehicle Modifications*. Retrieved on June 25, 2003, from <http://www.infinetec.org/live/driving/carmods.htm>
- Janke, M.K. (1999). *3-Tier assessment system. California Department of Motor Vehicles Research Notes—Fall 1999*. Retrieved April 4, 2003, from http://www.dmv.ca.gov/about/profile/rd/resnotes/3_tier.html.
- Janke M.K. (2001). Assessing older drivers: Two studies. *Journal of Safety Research*. 32: 43–74.
- Janke M.K. & Eberhard J.W. (1998). Assessing medically impaired drivers in a licensing agency setting. *Accident Analysis and Prevention*. 30(3): 347–361.
- Janke M.K. & Hersch, S.W. (1997). *Assessing the Older Driver: Pilot Studies*. (Report No. RSS-97-172). Sacramento, CA: California State Department of Motor Vehicles, Research and Development Section.
- Johansson, K., Bronge, L., Lundberg, C., Persson, A., Seideman, M., & Viitanen, M. (1996). Can a physician recognize an older driver with increased crash risk potential? *Journal of the American Geriatrics Society*, 44(10):1198–1204.
- Knoblauch, R.L., Nitzburg, M., & Seifert, R.F. (1995). Older driver freeway needs and capabilities. *Proceedings of the 65th ITE Annual Meeting and 1995 District 6 Annual Meeting*. Denver, CO.
- Koepsell, T., McCloskey, L., Wolf, M., Moudon, A.V., Buchner, D., Kraus, J., & Patterson, M. (2002). Crosswalk markings and the risk of pedestrian-motor vehicle collisions in older pedestrians. *JAMA*, 288(17): 2136–2143.
- Koppa, R.J. (1999). Motor Vehicle Adaptive Equipment and Modifications. *Proceedings from the Transportation Research Board Conference on Transportation in an Aging Society*, Bethesda, MD.
- Kostyniuk, L.P. & Shope, J.T. (in press). Driving and alternatives: older drivers in Michigan. *Journal of Safety Research*.
- Kostyniuk, L.P., Streff, F.M., & Eby, D.W. (1997). *The Older Driver and Navigation Assistance Systems*. (Report No. UMTRI-97-47). Ann Arbor, MI: University of Michigan Transportation Research Institute.
- Lepore, P.R. (2000). *When You are Concerned—A handbook for families, friends, and caregivers worried about the safety of an aging driver*. Albany: New York State Office for the Aging.
- Lewis, D. (1999). Mature driver roadway improvements benefit all. *Traffic Safety*, 99(3): 14–15.
- Malfetti, J.L., Winter, D.J., & Schwendiman, F.C. (1988). *Older Drivers in the United States and Canada: Regulations and Programs of State and Provincial Motor Vehicle Agencies*. New York, NY: Columbia University, Teachers College.
- Malfetti, J.L. & Winter, D.J. (1990). *A Graded License for Special Older Drivers: Premise and Guidelines*. Safety Research and Education Project. New York, NY: Columbia University, Teachers College.
- Marottoli, R.A. (2000). The physician's role in the assessment of older drivers. *American Family Physician*. 61(1): 39–42.
- Marottoli, R.A. & Drickamer, M.A. (1993). Psychomotor mobility and the elderly driver. In Retchin, S. M., ed. *Clinics in Geriatric Medicine: Medical Considerations in the Older Driver*. Philadelphia, PA: W. B. Saunders Company.
- Marottoli, R.A., Richardson, E.D., Stowe, M.H., Miller, E.G., Brass, L.M., Cooney, L.M., & Tinetti, M.E. (1998). Development of a test battery to identify older drivers at risk for self-reported adverse driving events. *Journal of the American Geriatric Society*. 46: 562–568.
- Marshall, S.C., & Gilbert, N. (1999). Saskatchewan physicians' attitudes and knowledge regarding assessment of medical fitness to drive. *Canadian Medical Association Journal*, 160: 1701–1704.
- Mason, J.M. Jr., Patten, M.L., Micsky, R.J., Tarris, J.P., & Brydia, R.E. (1992). *Further Promotion of Safe Driving Strategies, Volume III: Elderly Drivers*. (Report No. PTI 9312). Harrisburg, PA: The Pennsylvania Department of Transportation.
- McCoy, P.T., Tarawneh, M.S., Bishu, R.R., Ashman, R.D., & Foster, B.G. (1993). Evaluation of countermeasures for improving driving performance of older drivers. *Transportation Research Record*, 1405: 72–80.

- McGee, P. & Tuokko, H. (2003). *The Older & Wiser Driver: A Self-Assessment Program*. Retrieved March 30, 2003, from http://www.coag.uvic.ca/research/pdfs/Older_WiserdriverReport.pdf.
- McGwin, G., Jr., Chapman, V., & Owsley, C. (2000). Visual risk factors for driving difficulty among older drivers. *Accident Analysis & Prevention*, 32: 735–744.
- McKnight, A.J. (1988). Driver and pedestrian training. *Transportation Research Board Special Report*, 2(218): 101–133.
- McKnight, A.J., Simone, G.A., & Weidman, J.R. (1982). *Elderly Driver Retraining. Final Report*. (Report No. DOT HS 806 336). Washington, DC: U.S. Department of Transportation.
- Messenger-Rapport, B. (2002). How to assess and counsel the older driver. *Cleveland Clinic Journal of Medicine*, 69(3): 184–192.
- Michigan Department of State. (n.d.). *Driving for Life: A Guide for Older Drivers and their Families*. Retrieved March 23, 2003, from http://www.michigan.gov/documents/Older_Driver2_38985_7.pdf
- Middleton, H. & Westwood, D. (2001). Specification of older driver requirements for technologies to enhance capability. *Proceedings from the Automotive and Transportation Technology Congress and Exhibition*. Barcelona: Society of Automotive Engineers.
- Miller, W.J. (1999). Older drivers—a complex public health issue. *Health Reports*, 11(2): 59–71.
- Mitchell, C.G.B. (1997). *The Potential of Intelligent Transportation Systems to Increase Accessibility to Transport for Elderly and Disabled People*. (Report No. TP 12926E). Montreal, Quebec: Transportation Development Centre.
- Mitchell, R.K., Castelden, C.M., & Fanthome, Y.D. (1995). Driving, Alzheimer's Disease and ageing: A potential cognitive screening device for all elderly drivers. *International Journal of Geriatric Psychiatry*, 10: 865–869.
- Mollenhauer, M.A., Dingus, T.A., & Hulse, M.C. (1995). *The Potential for Advanced Vehicle Systems to Increase the Mobility of Elderly Drivers*. Iowa City: University of Iowa.
- Munns, K. (1980). Exercise and aging: The scientific basis. In Smith, E.L. & Serfass, R.C. (eds.) *Proceedings of the American College of Sports Medicine Annual Meeting*. Las Vegas: Enslow Publishers.
- Murray, G., Koffman, D., Chambers, C., & Webb, P. (1997). *Strategies to Assist Local Transportation Agencies in Becoming Mobility Managers*. (TCRP Report No. 21). Retrieved on July 25, 2003, from http://gulliver.trb.org/publications/tcrp/tcrp_rpt_21-a.pdf.
- National Highway Traffic Safety Administration. (1998). *Older drivers: Cues for law enforcement*. Retrieved March 26, 2003, from <http://www.nhtsa.dot.gov/people/injury/olddrive/cuesindex.html>.
- National Highway Traffic Safety Administration. (2000). Florida Getting in Gear. *Traffic Safety Digest*. Summer, 2000.
- National Highway Traffic Safety Administration. (2001). *Older Road User Research Plan*. [Electronic version] (Report No. DOT HS 809 322). Washington, DC: U.S. Department of Transportation.
- National Highway Traffic Safety Administration. (2001). *Adapting Motor Vehicles For People With Disabilities*. [Brochure]. Washington, DC: U.S. Department of Transportation.
- National Highway Traffic Safety Administration (2003). *Intelligent Transportation Systems*. Retrieved June 27, 2003, from <http://www.its.dot.gov/>.
- National Highway Traffic Safety Administration. (n.d.). *Driving Safely While Aging Gracefully*. Retrieved March 26, 2003, from <http://www.nhtsa.dot.gov/people/injury/olddrive/Driving%20Safely%20Aging%20Web/>
- National Mobility Equipment Dealers Association. (2001). Retrieved June 25, 2003, from <http://www.nmeda.org/>.
- National Science and Technology Council (1998). *Transportation Technology Plan*. Washington, DC: U.S. Department of Transportation.
- National Science and Technology Council (2000). *National Transportation Technology Plan*. Washington, DC: U.S. Department of Transportation.
- Odenheimer, G.L., Beaudet, M., Jette, A.M., Albert, M.S., Grande, L., & Minaker, K.L. (1994). Performance-based driving evaluation of the elderly driver: Safety, reliability, and validity. *Journal of Gerontology: Medical Sciences*, 49(4): M153–M159.
- Ohio Highway Safety Program (2001). *Annual Evaluation Report*. Retrieved May 8, 2003, from <http://www.state.oh.us/odps/oghsr/ghsoevalreport.pdf>.

- Oregon Department of Transportation Driver and Motor Vehicle Services. (n.d.). *Oregon's Re-Examination Evaluation Program*. Retrieved on March 25, 2003, from <http://www.odot.state.or.us/forms/dmv/6889.pdf>.
- Oregon Department of Transportation Driver and Motor Vehicle Services. (2000). *Report of the Older Driver Advisory Committee*. Retrieved on March 25, 2003, from http://www.odot.state.or.us/dmv/pdf/ODAC_Final_Recommendation.pdf
- Ostrow, A.C., Shaffron, P., & McPherson, K. (1992). The effects of a joint range-of-motion physical fitness training program on the automobile driving skills of older adults. *Journal of Safety Research*, 23: 207–219.
- Owsley, C., Stalvey, B.T., & Phillips, J.M. (2003). The efficacy of an educational intervention in promoting self-regulation among high-risk older drivers. *Accident Analysis and Prevention*, 35: 393–400.
- Owsley, C. & Ball, K. (1993). Assessing visual function in the older driver. In Retchin, S. M., ed. *Clinics in Geriatric Medicine: Medical Considerations in the Older Driver*. Philadelphia, IP PA: W. B. Saunders Company.
- Oxley, J. & Fildes, B. (1999). *Safety of Older Pedestrians*. (Report No 157). Victoria, Australia: Monash University Accident Research Centre.
- Oxley, J., Corben, B., & Fildes, B. (2001). Older Driver Highway Design: The Development of a Handbook and Training Workshop to Design Safe Road Environments for Older Drivers. *Proceedings of the Conference Traffic Safety on Three Continents* (pp. 301–312). Linköping: National Road and Transport Research Institute.
- Parker, D., McDonald, L., Rabbitt, P., & Sutcliffe, P. (2000). Elderly drivers and their accidents: the Aging Driver Questionnaire. *Accident Analysis & Prevention*, 32: 751–759.
- Perel, M. (1998). Aging drivers ahead: design with care. *ITS World* 3(2): 29–32.
- Pope, E. (1999, October 26). Relearning to drive. *St. Petersburg Times Online*, Retrieved March 21, 2003, from http://www.sptimes.com/News/102699/Seniority/Relearning_to_drive.shtml.
- Popkin, C.L., Stewart, J.R., Martell, C., & Little, C. (1991). *The N.C. Programs for Assuring the Safe Mobility of Older Drivers: Alternative Transportation and Driver Medical Evaluation, Final Report*. (Report No. HSRC-PR182). Raleigh, NC: North Carolina Governor's Highway Safety Program.
- Raymond, P., Knoblauch, R., and Nitzburg, M. (2001). *Older Road User Research Plan*. Great Falls, VA: Center for Applied Research.
- Retchin, S.M., Cox, J., Fox, M., & Irwin, L. (1988). Performance-based measurements among elderly drivers and nondrivers. *Journal of the American Geriatrics Society*, 36(9):813–819.
- Reuben, D.B. (1993). Assessment of older drivers. In Retchin, S. M., ed. *Clinics in Geriatric Medicine: Medical Considerations in the Older Driver*. Philadelphia, PA: W. B. Saunders Company.
- Road Information Program, The. (2000). *Traffic Safety and Older Americans: Making Roads Safer for Motorists*. Retrieved March 27, 2003, from <http://www.tripnet.org/OlderDriversStudyOct2000.PDF>.
- Roberts, W.N. & Roberts, P.C. (1993). Evaluation of the elderly driver with arthritis. In Retchin, S. M., ed. *Clinics in Geriatric Medicine: Medical Considerations in the Older Driver*. Philadelphia, PA: W. B. Saunders Company.
- Robinson, B.W., Rodegerdts, W.S., Kittelson, W., Troutbeck, R., Brilon, W., Bondzio, L., Courage, K., Kyte, M., Mason, J., Flannery, A., Myers, E., Bunker, J., & Jacquemart, G. (2000). *Roundabouts: An informational guide*. (Report No. FHWA-RD-00-067). Washington, DC: U.S. Department of Transportation.
- Rock, S. (1998). Impact from changes in Illinois drivers license renewal requirements for older drivers. *Accident Analysis and Prevention*, 30(1): 69–74.
- Rosenbloom, S. & Winsten-Bartlett, C. (2002). Asking the right question: understanding the travel needs of older women who do not drive. *Transportation Research Record*, 1818: 78–82.
- Salzberg, P. & Moffat, J. (1998). *The Washington State Department of Licensing Special Exam Program: An Evaluation*. Olympia, WA: Washington Traffic Safety Commission.
- Seymour, R. & Harris, A. (2002). *Years Ahead—Road Safety for Seniors Program*. Retrieved May 8, 2003, from <http://www.saferoads2002.com/papers/Seymour,R.pdf>.
- Schiff, W. (1996). Assessing senior drivers' performance with critical driving incidents. *IATSS Research*. 20(1):48–56.
- Shaheen, S.A. & Niemeier, D.A. (2001). Integrating vehicle design and human factors: minimizing elderly driving constraints. *Transportation Research Part C*, 9: 155–174.

- Sirén, A., Heikkinen, S., & Hakamies-Blomqvist. (2001). *Older Female Road Users: A Review*. (Report No. VTI rapport 467A). Linköping: Väg-och transportforskningsinstitutet.
- Stamatiadis, N. (1998). ITS and human factors for the older driver: the U.S. experience. *Transportation Quarterly* 52(3): 91–101.
- Staplin, L., Gish, K.W., Decina, L.E., Lococo, K.H., & McKnight, A.S. (1998). *Intersection Negotiation Problems of Older Drivers, Volume I: Final Technical Report*. (Contract No. DTNH22-93-C-05237). Washington, DC: U.S. Department of Transportation.
- Staplin, L., Harkey, D.L., Lococo, K.H., & Tarawneh, M.S. (1997a). *Intersection Geometric Design and Operational Guidelines for Older Drivers and Pedestrians, Volume I: Final Report*. (Report No. FHWA-RD-96-138). Washington, DC: U.S. Department of Transportation.
- Staplin, L., Harkey, D.L., Lococo, K.H., & Tarawneh, M.S. (1997b). *Intersection Geometric Design and Operational Guidelines for Older Drivers and Pedestrians, Volume II: Executive Summary*. (Report No. FHWA-RD-96-138). Washington, DC: U.S. Department of Transportation.
- Staplin, L., Harkey, D.L., Lococo, K.H., & Tarawneh, M.S. (1997c). *Intersection Geometric Design and Operational Guidelines for Older Drivers and Pedestrians, Volume III: Guidelines*. (Report No. FHWA-RD-96-138). Washington, DC: U.S. Department of Transportation.
- Staplin, L. & Lococo, K.H. (2003). *Model Driver Screening and Evaluation Program, Final Technical Report, Volume III, Guidelines for Motor Vehicle Administrators*. [Electronic Version] (Report No. DOT HS 809 581). Washington DC: U.S. Department of Transportation.
- Staplin, L., Lococo, K., Byington, S. & Harkey, D. (2001a). *Guidelines and Recommendations to Accommodate Older Drivers and Pedestrians*. (Report No. FHWA-RD-01-051). Washington, DC: U.S. Department of Transportation.
- Staplin, L., Lococo, K., Byington, S. & Harkey, D. (2001b). *Highway Design Handbook for Older Drivers and Pedestrians*. (Report No. FHWA-RD-01-051). Washington, DC: U.S. Department of Transportation.
- Staplin, L., Lococo, K.H., Gish, K.W., & Decina, L.E. (2003a). *Model Driver Screening and Evaluation Program, Final Technical Report, Volume I: Project Summary and Model Program Recommendations*. [Electronic Version] (Report No. DOT HS 809 582). Washington, DC: U.S. Department of Transportation.
- Staplin, L., Lococo, K.H., Gish, K.W., & Decina, L.E. (2003b). *Model Driver Screening and Evaluation Program, Final Technical Report, Volume II: Maryland Pilot Older Driver Study*. [Electronic Version] (Report No. DOT HS 809 583). Washington, DC: U.S. Department of Transportation.
- Staplin, L., Lococo, K. H., Stewart, J., & Decina, L. E. (1999). *Safe Mobility for Older People: Notebook*. (Report No. DOT HS 808 853). Washington, DC: National Highway Traffic Safety Administration.
- Sterns, H.L., Sterns, R., Aizenberg, R., & Anapole, J. (2001). *Family and Friends Concerned About an Older Driver*. (Report No. DOT HS 809 307). Washington, DC: National Highway Traffic Safety Administration.
- Stutts, J.C., Stewart, J.R., & Martell, C.M. (1996). Can Screening for Cognitive Impairment at License Renewal Identify High Risk Older Driver? *Proceedings of the 40th Annual Association for the Advancement of Automotive Medicine*, Vancouver, British Columbia, 335–350.
- Stutts, J.C., Stewart, J.R., & Martell, C.M. (1998). Cognitive test performance and crash risk in an older driver population. *Accident Analysis and Prevention*, 30(3): 337–346.
- Suen, S.L. & Parviainen, J.A. (1993). Advanced travel accessibility systems for the elderly and disabled: A conceptual framework. *Proceedings of the IEEE—IEEE Vehicle Navigation and Information Systems Conference* (pp. 375–380), Canada.
- Sundet, K., Goffeng, L., & Hofft, E. (1995). To drive or not to drive: Neuropsychological assessment for driver's license among stroke patients. *Scandinavian Journal of Psychology*, 36: 47–58.
- Traffic Improvement Association. (n.d.). *Mature Driver Retraining Workshops*. Retrieved March 27, 2003, from <http://www.tiami.org/MATUREDRIVERS.htm>.
- TranSafety, Inc. (1997). Licensing Older Drivers—Part I. *Road Management and Engineering Journal*, Retrieved May 30, 2003, from <http://www.usroads.com/journals/rej/9703/re970302.htm>.
- TranSafety, Inc. (1998). Computer-based techniques help screen older drivers for age-related declines in driving ability. *Auto and Road User Journal*, Retrieved May 13, 2003, from <http://www.usroads.com/journals/aruj/9804/ru980401.htm>.

- Transportation Research Board (1999). *TCRP Web Document 7: Using Public Transportation to Reduce the Economic, Social and Human Costs of Personal Immobility*. Washington, DC: National Academy Press.
- Transportation Research Board. (2001). *Highway Safety Research: A National Agenda*. Retrieved March 27, 2003, from http://gulliver.trb.org/publications/rtforum/safety_agenda_july_2001.pdf.
- Transportation Research Board (2002). *Critical Issues in Transportation 2002*. Retrieved March 27, 2003, from http://gulliver.trb.org/publications/trnews/2002_critical_issues_article.pdf.
- University of Alabama Department of Ophthalmology. (2002). *Driving Assessment Clinic*. Retrieved May 13, 2003, from <http://www.eyes.uab.edu/driving/how.html>.
- University of Michigan Department of Physical Medicine and Rehabilitation (1998). *Drive-Ability Program*. Ann Arbor, MI.
- U.S. Department of Transportation. (1997). *Improving Transportation for a Maturing Society*. (Report DOT-P10-07-01). Washington, DC: Office of the Assistant Secretary for Transportation Policy.
- Vernon, D., Diller, E., Cook, L., Reading, J., Dean, J. M. (2001). *Further Analysis of Drivers Licensed with Medical Conditions in Utah*. (Report No. DOT HS 809 211). Washington, DC: U.S. Department of Transportation.
- Waller, P.F. (2002). Challenges in motor vehicle safety. *Annual Review of Public Health*, 23: 93–113.
- Wang, C.C., et al. (2003). *Physician's Guide to Assessing and Counseling Older Drivers*. Chicago, IL: American Medical Association.
- White, S. & O'Neill, D. (1999). Health and relicensing policies for older drivers in the European Union. *Gerontology*, 46: 146–152.
- Wilkins, J.W., Stutts, J.C., & Schatz, S.J. (1999). Premature reduction and cessation of driving: preliminary study of women who choose not to drive or to drive infrequently. *Transportation Research Record*, 1693: 86–90.
- Williams, C. & Graham, J.D. (1995). Licensing standards for elderly drivers. *Consumer's Research Magazine*, 78(12): 18–22.
- Wiseman E.J. & Souder E. (1996). The older driver: A handy tool to assess competence behind the wheel. *Geriatrics*, 51: 36–45.
- Zein, S. & Mairs, A. (2002). *AAA Michigan Road Improvement Demonstration Program Evaluation*. British Columbia: G.D. Hamilton Associates.
- Zur, A. & Shinar, D. (1998). Older people's driving habits, visual abilities, and subjective assessment of daily visual functioning. *Work* 11:339–348.

