CHAPTER 20
Accommodating Older Drivers

KEY TOPICS

- design improvements (including right- and left-turn lanes)
- driver workload
- highway lighting
- pavement markings (including epoxy paint)
- signals (including green turn arrows)
- signing (including advanced warning signs)

GOALS

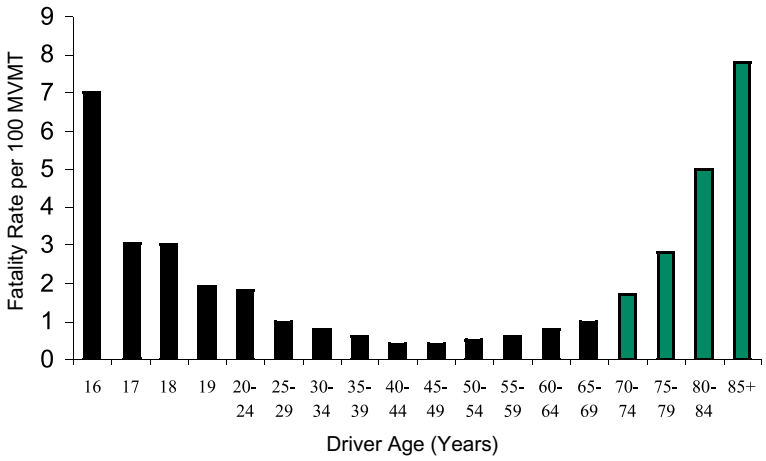
- Reduce the number of older driver fatalities and severe injuries by addressing specific roadway features known to be most difficult for older drivers.
- Use the older driver as the "design driver" when designing Iowa roadways.
- Improve existing roadway features to accommodate Iowa's aging drivers.
- Include alternate transportation systems in Iowa's lifelong safe mobility planning.

BACKGROUND

The increasing numbers and percentages of older drivers using the nation's highways in the decades ahead will pose many challenges to transportation engineers, who must ensure system safety while increasing operational efficiency. The 65 and older age group—33.5 million in the United States in 1995—will grow to more than 36 million by 2005 and will exceed 50 million by 2020, accounting for roughly one-fifth of the population of driving age in this country. In effect, if design is controlled by 85th percentile performance requirements, the "design driver" of the early 21st Century will be an individual over the age of 65.

As discussed in Chapter 8, Sustaining Safe Mobility in Older Drivers, and demonstrated in the figure, driver fatality rates increase for older drivers.

National Driver Fatality Rates by Age*



*Based on 1996 National Highway Traffic Safety Administration (NHTSA) data; MVMT = million vehicle miles traveled.

There are a number of roadway design and operational countermeasures that can mitigate the declining visual, physical, and mental capabilities in the increasing elderly driving population. These may include providing wider and more visible pavement markings, paved shoulders, more turn lanes at intersections, and limiting the amount of information to be processed in short intervals. Design and safety professionals can review these factors and address each with appropriate systemwide and site-specific mediation.

NATIONWIDE

As of 1999, there were 18.5 million older licensed drivers in the United States—39% more than a decade earlier. This number will only continue to increase as the huge baby boomer population begins to swell the ranks of older drivers. In contrast, the total number of licensed drivers increased by only 13%. Older drivers made up 10% of all licensed drivers in 1999, compared with 8% in 1989.

National Facts

The Federal Highway Administration's (FWHA) *Older Driver Highway Design Handbook* cites a number of older driver studies conducted in the early 1990s. These studies included detailed crash analysis, observational studies, plus subjective survey reports of both intersection difficulties and important highway features. One dramatic analysis of crashes for drivers over age 80 showed that more than half of the fatal crashes are at intersections, compared to 24% or less for drivers up to age 50. A survey of older drivers indicated a number of driver activities and highway features that became more difficult for them as they aged.

Driver activities becoming more difficult with age:

Reading street signs in town	27%
Driving across an intersection	21%
Finding the beginning of a left-turn lane at an intersection	20%
Making a left turn at an intersection	19%
Following pavement markings	17%
Responding to traffic signals	12%

Highway features becoming more difficult for drivers with age:

Lighting at intersections	62%
Pavement markings at intersections	57%
Number of left-turn lanes at an intersection	55%
Width of travel lanes	51%
Concrete lane guides (raised channelization) for turns at intersections	47%
Size of traffic signals	42%

Older drivers experience the following physical and mental capacity changes:

- Declining vision and visual field cognition (see figures for examples)
- Slowed decision making
- Slowed perception reaction time
- Increased difficulty in dividing attention between potential conflicts and traffic information
- Reductions in strength and flexibility
- Decreased motion sensitivity
- Decreased dark adaptation
- Increased sensitivity to glare
- Restrictions in area of visual attention
- Reductions in contrast sensitivity
- Decreased working memory

National Public Opinion

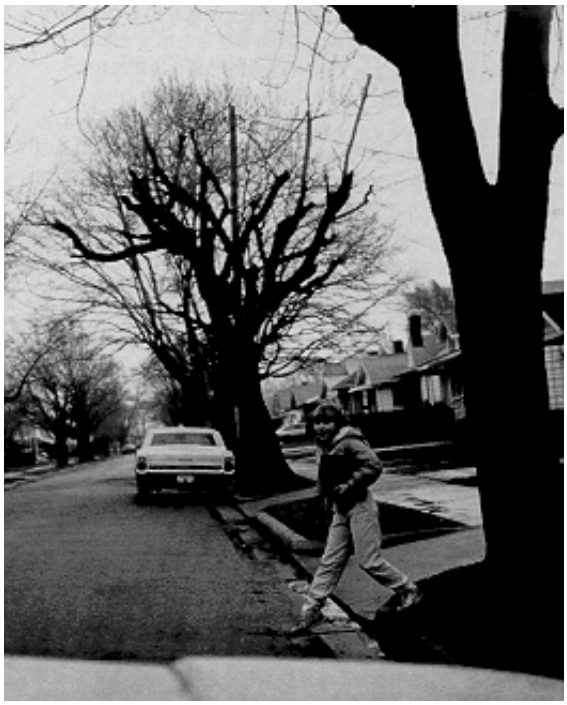
A 1999 Louis Harris Poll conducted for the Advocates for Highway and Auto Safety reported that 83% of those polled support more frequent testing for older drivers (and 72% of those polled support more frequent license testing for younger drivers).

View of Road Sign with Normal Contrast Sensitivity*

View of Road Sign with Cataract Condition*

*From Federal Highway Administration (FHWA) presentation on *Older Driver Highway Design Handbook*.

View with Good Acuity*



View with Poor Contrast Sensitivity*

Normal Attentional Window*

Reduced Attentional Window*

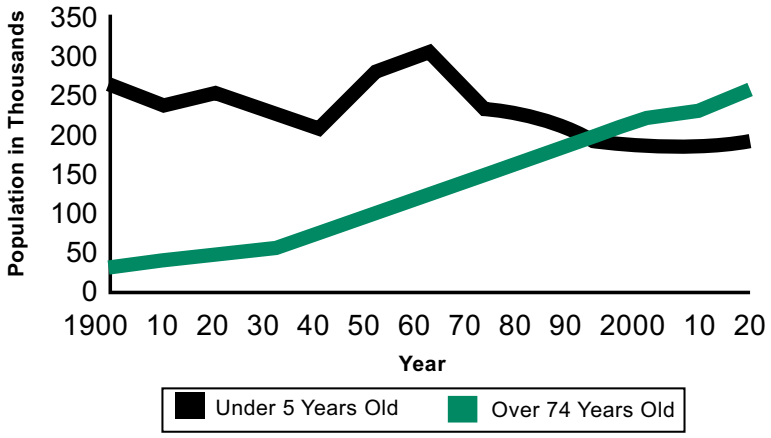
Severely Resected Attentional Window *

*From FHWA presentation on *Older Driver Highway Design Handbook*.

IOWA

Iowa's population is aging. In 1990—for the first time in Iowa's history—the number of Iowans over the age of 75 exceeded the number of Iowans under the age of 5 (see chart). Iowa has approximately 741 individuals age 100 years and older. This indicates a marked change in Iowa's demographic makeup and serious implications for those engaged in planning for the future needs of Iowans.

Age Trends in Iowa*



*Post-1990 data are projected. Based on *Iowa's Changing Population,* Iowa State University Census Services.

In 2001, Iowa has 347,397 licensed drivers over the age of 65. This is nearly 16% of all the licensed drivers in the state. NHTSA *Research Notes* listed Iowa as having the fourth highest percentage in the nation of licensed drivers over the age of 65. Iowa ranks well above the national average in the ratio of older drivers to total population and in fatalities per 100,000 older population (see table). And the 65-year-old-and-older age group in Iowa is expected to increase by about 50% in the next 20 years!

Older Driver Ratios

Ratio	Iowa	United States
Older drivers to total population	16.0	13.0
Fatalities per 100,000 older population	16.5	12.2
Fatalities per 100,000 licensed drivers	3.6	2.3
Fatalities per 100,000 registered vehicles	2.2	1.9

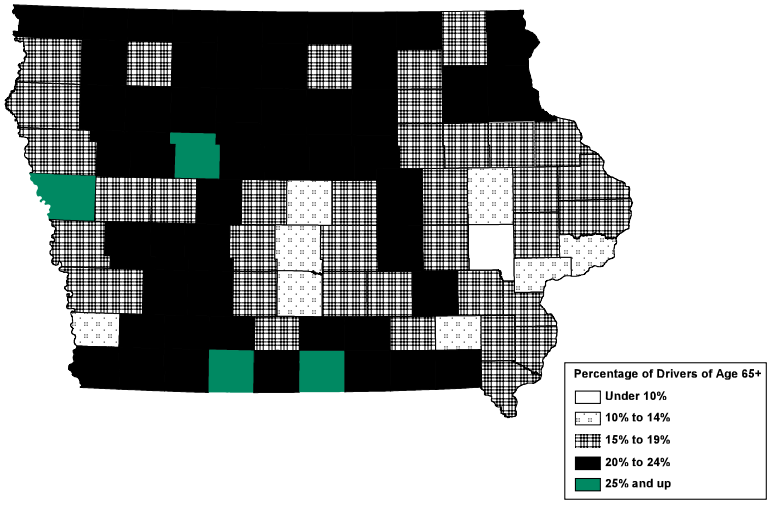
The ratio of older drivers to the total population of licensed drivers is particularly high in Iowa's rural, low-population counties. Iowa now has four counties where 25% of licensed drivers are aged 65 or older. In another 50 counties, 20%–25% of licensed drivers are age 65 or older. This trend is demonstrated in the table with ratios of older drivers to total drivers by county and in the map of counties by percentage of drivers 65 or older.

Ratios of Older Drivers to Total Drivers by Iowa County

County	Percent of Older Drivers to Total Drivers
Wayne	25%
Ringgold	25%
Calhoun	25%
Monona	25%
. . .	
Warren	14%
Linn	14%
Scott	13%
Story	12%
Polk	12%
Johnson	9%

There are important consequences of these changing demographics in Iowa's driving population. Traffic volumes will increase; problems with congestion will become more widespread in our urban areas and on our rural interstate highways. The demands on drivers will grow beyond present-day operating conditions.

Percentage of Drivers 65 Years of Age or Older by County



Iowa Facts

The Iowa Governor's Traffic Safety Bureau (Iowa GTSB) reported the following data from the Iowa Department of Transportation (Iowa DOT) and NHTSA (*Traffic Safety Facts—Older Population*):

- During 2000, 90 people age 65 or older were killed in Iowa traffic crashes. Over 20% of all traffic fatality victims were age 65 or older.
- Since 1998, 285 people age 65 and older have died in an Iowa traffic crashes—an average of 95 per year. Of these victims, 173 were age 75 or older.
- More than one Iowa driver in six is age 65 or older. Nearly 350,000 Iowa drivers are 65 or older.
- Iowa has the second highest percentage of licensed drivers over age 85, trailing only Florida.
- Drivers ages 85 and over, 75–84, and 65–74 represent Iowa's fastest, second fastest, and third fastest growing groups of drivers, respectively.

Iowa Public Opinion

Iowa SMS Public Opinion Survey
The 1999 Iowa Safety Management System (Iowa SMS) *Iowa Strategic Highway Safety Plan* included a number of potential strategies for dealing with some of these risk elements. The Iowa SMS public opinion survey asked over 1,000 Iowans whether they would support these strategies.

Strategies:

- 84% of respondents support providing wider pavement markings.
- More than half also support
  - o Improving design and operation of intersections (61%)
  - o Increasing rumble strip and warning devices (57%)
  - o Improving roadways and signs for older drivers (52%)

POTENTIAL STRATEGIES

Legislation, Policy, and Enforcement

- Retain a 65 mph speed limit on four-lane limited-access highways.
- Implement the best national efforts that the Iowa DOT determines are appropriate for Iowa, including recommendations found in research publications.
- Require use of daytime running lamps or require lights to be on while operating windshield wipers.
- Establish a fog-light alignment standard.
- Support and participate in national efforts.
- Improve alternative transportation options for those who cannot benefit from restricted licensing.
- Identify, support, promote, and use appropriate alternative transportation options for older citizens.
- Study the maintenance impact on markings and signing and make appropriate operations or material changes.

Education and Public Awareness

- Develop a handbook and frequently asked questions (FAQ) sheets for improving local transit options through such entities as local agencies on aging (see Successes and Strategies Implemented section in this chapter).

- Use local media to instruct motorists on how to cross and enter a four-lane rural expressway.
- Include roadway factors in education materials and videos for older drivers (see Successes and Strategies Implemented section in this chapter).
- Develop a resource for local officials and others to use in answering basic highway safety questions (see Successes and Strategies Implemented section in this chapter).
- Identify newer roadway designs that older drivers find confusing. Offer public service announcements and other communications to provide instructions (see Successes and Strategies Implemented section in this chapter).
- Sponsor training on the FHWA's *Older Driver Highway Design Handbook* for engineers, planners, and public works officials.
- Include training on older driver accommodation in safety courses for safety, maintenance, and traffic design engineers at both state and local levels.
- Continue to support human factors research projects that evaluate the effectiveness of new technologies and strategies in Iowa's highway design, pavement markings, and signs.

Design and Technology

- Review and implement the recommendations found in the FHWA's *Older Driver Highway Design Handbook* where appropriate for Iowa.
- Research and apply best practices and technologies for assisting older drivers.
- Continue to research successful engineering strategies from other states that accommodate older drivers and include this topic in the Iowa SMS Older Drivers Peer Exchange agenda (Florida, Oregon, and Pennsylvania Department of Transportation models) (see Successes and Strategies Implemented section in this chapter).
- Increase recognition of roadway features through the use of strategies such as increased lighting, more visible pavement markings, clearer signing, increased delineation, and clearer geometric design.
- Assess the feasibility of advanced traveler information systems (ATIS) and advanced vehicle control systems (AVCS) for sustaining mobility and enhancing proficiency.
- Additional countermeasures: Consider implementing the following design and operation strategies to mitigate the declining visual, physical, and mental capabilities in Iowa's increasing elderly driving

population. This is a compilation of suggestions from focus groups of AARP, retired transportation engineers, and others. These enhancements will assist all drivers in reducing the driver workload, and improve safety for older drivers.

Design

- Construct offset left- and right-turn lanes at high-volume intersections.
- Increase use of protective movements at signalized intersections.
- Limit the amount of information to be processed in short time.
- Eliminate skewed intersections of less than 80-degree angles.
- Maintain 12-foot lane widths.
- Increase perception-reaction time in sight distance calculations.
- Enlarge curb radii at intersections and high-volume driveways.
- Use parallel entrance ramps at interchanges.
- Lengthen right- and left-turn lanes at rural intersections to reduce speed reduction conflicts in through traffic lanes.
- Construct more right- and left-turn lanes at rural intersections.
- Lengthen merging/weaving areas.
- Use more consistent interchange designs.
- Provide paved highway shoulders.
- Install rumble strips in paved shoulders.
- Increase access control along arterial roadway.
- Increase use of rumble strips prior to rural stop signs. Where appropriate, use oversize stop signs.
- Maintain 65 mph rural four-lane speed limit.
- Improve delineation of curbs and medians.
- Install deceleration lanes on all four-lane rural corridors.
- Increase use of glare screens on applicable multilane highways.
- Limit undesirable features to one per roadway section (e.g., avoid narrow bridge at the end of a curve).
- Convert four-lane, undivided highways with high accident rates to three-lane roadways where appropriate.

Highway Lighting

- Increase use of highway lighting at rural intersections.
- Increase use of highway lighting along urban corridors.

Pavement Markings and Delineation

- Provide more visible and durable pavement markings (e.g., epoxy paint and milled-in tape).
- Use wider pavement markings.
- Use raised pavement markings selectively.
- Increase use of durable paint pavement markings.
- Repaint pavement markings more often.
- Continue using roadway post delineation in all four-lane rural corridors.
- Add a contrasting black edge on pavement markings applied to portland cement concrete pavement.

Signals

- Assume slower walking speeds for pedestrian signal timing.
- Install additional traffic signal heads (near right side) and back plates at signalized intersections.
- Use "green arrow" (protected left turn) signal phasing at high-speed traffic interestions.
- Install more overhead traffic signals.

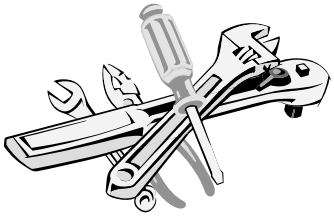
Signs

- Use bigger and brighter traffic signs, larger legends, and more print contrast.
- Review and implement more overhead placement of signs and signals.
- Decrease redundant signing.
- Use positive guidance through major intersections.
- Increase advance warnings of sight-restricted locations.
- Install stop signs and centerlines in rural expressway medians.
- Increase use of 48-inch stop signs.
- Install more overhead lighted advance signing prior to major intersections. Include lane markings on signs.
- Install more mid-block advance signing of cross streets.

- Increase nighttime sign reflectivity quality surveys by city, county, and state staff.
- Use more schematic advance signing for interchanges for expressways and interstates.
- Place lane assignment signing prior to interchange.
- Add chevrons and advance warning signing to more horizontal curves.
- Place directional arrow in middle of curves with chevrons.
- Monitor results of Pennsylvania pilot program for low-cost gap warning sign system at select intersections (e.g., wait if vehicle is in marked area).
- Use oversized high-reflectivity chevrons and advanced warning signs on selected horizontal curves.

Other Initiatives

- Study the effectiveness of Iowa's completed traffic safety improvement projects (see Successes and Strategies Implemented section in this chapter regarding the *Effectiveness of Roadway Safety Improvements* report).



SUCCESSES AND STRATEGIES IMPLEMENTED

- Improved crash data and analysis tools are available or under development (see Chapter 25, Improving Information and Decision Support Systems).
- The Iowa DOT sponsored a study of traffic safety improvement projects. The *Effectiveness of Roadway Safety Improvements* study (conducted by the Center for Transportation Research and Education) of 94 traffic safety projects concluded that there was a mean crash reduction rate of 23% on these hazard elimination and safety improvement fund projects.
- The *Traffic and Safety Informational Series* is sponsored by the Iowa Department of Transportation Office of Traffic and Safety. The goal of this project was to make available clear, concise, and consistent answers to 25 traffic and safety questions, commonly asked by local officials and the public. The information may be altered, distributed, and used as seen fit by area officials and/or transportation professionals. It is available in print, on disk, and on the web.
- The Iowa DOT Office of Traffic and Safety is developing the "TAS" manual for highway safety practitioners and engineers at the state and local levels (to be available in print and on the Office of Traffic and Safety web site in 2002).

- The Iowa DOT Office of Traffic and Safety sponsors the annual Traffic and Safety Forum each fall to help city, county, state, and consulting highway safety engineers stay up-to-date on recent developments in highway safety technology and practice.
- Iowa SMS sponsored a multistate highway safety peer exchange in October 2000, where older driver issues were discussed with representatives from other states.
- Iowa SMS approved funding in April 2001 for a FAQ handbook for improving rural transit.
- Iowa SMS approved funding in January 2001 for an older drivers video development (including highway features) through the Iowa DOT Office of Driver Services for use in driver's license stations and other venues.
- A multidisciplinary older drivers conference sponsored by Iowa SMS and its partners is scheduled for June 2002.
- Iowa SMS approved funding in April 2001 for a systemic spatial analysis of crash characteristics regarding older drivers.
- Iowa SMS includes Older Iowans Legislature (OIL) representatives and the Department of Elder Affairs (which coordinates the legislature) in its membership.
- Iowa SMS has utilized the AARP chapter as an elderly drivers focus group to explore the concerns of older drivers.
- Retired traffic engineers met in November 2000 to review older driver issues for this toolbox. They listed a wide range of potential design elements to address and prioritized them by category. These strategies were their top priority design elements for older drivers:
  - Design: Use more consistent interchange design.
  - Highway lighting: Install glare screens for cross-traffic confusion; mandate vehicle fog light alignment.
  - Pavement markings: Increase use of epoxy paint pavement markings and paint other markings more often.
  - Pedestrian signs: Assume slower speed for pedestrian light timing.
  - Signs: Reduce redundant signing.
  - Miscellaneous: Pilot the effectiveness of low-cost gap warning systems at selected intersections ("wait if vehicle is in marked area").
- More partially paved shoulders are being installed on Iowa's primary highways.

- Conversion of many high-accident, four-lane undivided urban highways have been successfully implemented.
- High-accident, rural curves have been identified, and funding has been provided to improve signing.

NOTE

The potential strategies in this chapter do not represent specific recommendations of the Iowa SMS Coordination Committee or any agency, group, or individual represented in Iowa SMS. The strategies represent a range of alternatives for legislators, department or agency directors, local governments, and citizen groups to consider when they elect to address a specific highway safety concern.

This toolbox is a living document that will continue to provide information, direction, and ideas for highway safety decision makers. Any strategies selected for implementation by Iowa SMS or any other entity will require further development through identifying potential partners, entities impacted, potential funding, steps for implementation, evaluation, and other pertinent tasks.

RESOURCES

Information in this chapter is drawn from many individuals and sources. Known sources are listed here. **Contributors:** Tom Welch (primary), Steve Gent, Becky Hiatt, Dave Little, Andy Loonan, Tom McDonald, John Nervig, Jaime Reyes, Randy Schlei, and Don Tebben.

Advocates for Highway and Auto Safety
www.saferoads.org
Stuck in Neutral: Recommendations for Shifting the Highway and Auto Safety Agenda into High Gear

American Association of State Highway and Transportation Officials
Strategic Highway Safety Plan (Sept. 1997):
A comprehensive plan to substantially reduce vehicle-related fatalities and injuries on the nation's highways.
safetyplan.tamu.edu/plan/toc.asp

Center for Transportation Research and Education, Iowa State University
www.ctre.iastate.edu/index.html
Effectiveness of Roadway Safety Improvements:
www.ctre.iastate.edu/Research/detail.cfm?projectID=386

Federal Highway Administration
safety.fhwa.dot.gov
Older Driver Highway Design Handbook: Recommendations and Guidelines (FHWA-RD-97-135) (1998):
safety.fhwa.dot.gov/programs/olderdriver.htm
Older Driver Facts:
safety.fhwa.dot.gov/fourthlevel/pro_res_olderdriver_facts.htm
Improved Highway Travel Considerations for an Aging Population:
National Highway Institute Course No. 13353.

Center for Transportation Research and Education, Iowa State University
www.ctre.iastate.edu/index.html
Effectiveness of Roadway Safety Improvements:
www.ctre.iastate.edu/Research/detail.cfm?projectID=386

Iowa Department of Transportation Office of Traffic and Safety
www.dot.state.ia.us/traffic_safety/index.htm
Traffic and Safety Informational Series:
www.ctre.iastate.edu/pubs/tsinfo/index.htm
Traffic and Safety ("TAS") Manual (Jan. 2002)

Iowa Governor's Traffic Safety Bureau
Older Drivers Fact Sheet (April 2001):

Iowa Safety Management System
www.IowaSMS.org
Iowa Strategic Highway Safety Plan (Aug. 1999):
www.iowasms.org/pdfs/ishsp.pdf
Iowa Strategic Highway Safety Plan Goals and Strategies: Statewide Survey of Adults (Oct. 2000):
www.iowasms.org/pdfs/publicopinionsurveyexecsumm.pdf

Iowa State University Census Services
Iowa's Changing Population: A Brief Review of Trends (Mar. 2001):
http://www.soc.iastate.edu/census/Data/Iowa/Iowa%20Trends%20Mar%202001.pdf

National Highway Traffic Safety Administration
www.nhtsa.dot.gov
Safe Mobility for Older People—Notebook:
This notebook is intended as a resource. Topics covered include identification of high-risk older drivers, counseling and remediation of at-risk drivers, public information and education tools, and mobility options and alternative transport programs.
www.nhtsa.dot.gov/people/injury/olddrive/safe/
Intersection Negotiation Problems of Older Drivers:
www.nhtsa.dot.gov/people/injury/olddrive/oldvol1/vol1tablecontent.html
Research Notes (Nov. 2000)