The Risky Driver

An Annotated Bibliography
Of Recent Research

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Section I-Novice and Impaired Drivers

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Section I

Novice and Impaired Drivers

1. Prediction Models and Potential Ameliorating Conditions

Many models used to predict auto crash involvement were developed utilizing data from large databases. These models most often focused on prior violations, points accumulated and prior at-fault accidents. The probability of future accidents was predicted by analyzing both prior accidents and violations, with the prior accident focus being a better predictor than prior violation convictions. Certain violations, such as failure-to-yield and disobeying traffic signals, were the best predictors of future accidents after prior accidents. Models using both convictions and accidents have proven quite accurate, ignoring violation type and at-fault or not-at-fault classification. However, current point systems tend to be poor predictors of future accidents. The best accident prediction models use age, gender, total accidents and different conviction categories. These categories include the following: insecure load, truck weight offense, unsafe vehicle, failure to take an alcohol test, lack of driver's license, seat belt use, careless driving, disobeying lights, speeding and failure to yield.

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2. Driving Patterns

The latest *Facts* publication from the Insurance Institute for Highway Safety (IIHS) revealed that 16 to19-year-olds have four times the risk of crash involvement and death per mile driven then older drivers, with 16 and 17 year-olds evidencing the highest risk. Their driving behavior includes a high frequency of speeding and tailgating violations with single vehicle, run-off-the-road accidents being a frequent result. Since 1992, the population of 16 to19-year-olds has been increasing with the nation's population growth. Statisticians fear a new trend--an increase in motor vehicle deaths. When total deaths or deaths per population have been compiled for the last three years, this was found to be the case. Over the past three years, Maryland motor vehicle deaths have not decreased, reversing a trend noted by the State Highway Administration beginning in 1968. A peak in deaths per population occurs at age 18 for both males and females. Males have substantially higher levels than females, with fatal night crashes per miles driven being three to four times the rate for older drivers. One study separated youthful age and novice driving experience using insurance data for complete crash identification and found that "noviceness" best predicts at-fault crashes. Driving in the second and third years is associated with an increase in at-fault accidents attributable to alcohol, bad weather and high speed. It is estimated that restricting the novice driver of any age on the basis of any traffic law violation or accident occurrence would influence the occurrence of 40 percent of all serious crashes. Again the risky driving behavior noted for this young age group includes speeding, tailgating and other behaviors that bring the driver into conflict with other drivers, as well as impaired driving.

Looking at the patterns of risky driving for impaired drivers of any age around the world, the first thing noted for the past decade is a steady decrease in drinking and driving crashes with fatalities. This is true for data based on population or distance traveled. However, a note of caution is necessary. Certain groups, such as female drivers 21-24 years of age, are not following this trend. However, there is some concern that the trend may be reversing. Studies of randomly sampled drivers tested for the presence of alcohol show a similar decrease in drinking and driving over the period 1982-1992, with a one-third reduction in drivers evidencing BAC levels .05 or higher.

The involvement of alcohol in fatal or serious crashes using the case-control method reveals a pattern of risky behavior for those identified. One particularly disturbing study evaluated drivers admitted for minor or moderate injuries to Maryland's MIEMSS in Baltimore. They were judged impaired or not by the investigating police. An alcohol conviction rate of only 10.3 percent was reported for those in the impaired group, very low compared to the statewide conviction rate of 46.8 percent. The drivers in the impaired group had significantly poorer pre- and post-accident alcohol-related convictions. For this group of drivers, injuries appear to mask the consequences of their behavior.

While the largest category of impaired driving is alcohol-related, other instances include those drivers convicted of felony narcotic, felony marijuana, felony other drugs and felony dangerous drugs crimes, with associated poor driving records prior to and after incarceration for the noted offenses.

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3. Correlates of Risky Driving

In a telephone survey, age was found to be a correlate of drinking and driving with drivers' aged 20-24 reporting a greater frequency of this type of behavior than any other age group. Conversely, respondents in this same age category reported having a friend or relative who had driven after drinking during the past three years. Drivers in this age group also reported less probability of being impaired and of being apprehended by the police while impaired. Drivers aged 16-24 reported that they engage in aggressive driving most often, aggressive driving meaning they lose their temper while driving, make nasty gestures at others, enjoy passing other drivers, find enjoyment to weaving through heavy traffic, etc. Those reported as driving the fewest number of miles and making the fewest number of trips were aged 16-19, and over 65. Drivers aged 16 to19 achieved the highest number of violations with the 20 to 24 -year-olds, who are most likely of any age group to have their license suspended, following second. The 20 to 24-year-olds reported the highest number of drinking, with many indicating they ought to cut down-- generally a symptom of problem drinking. The reported incidence of illicit drug use was very small but occurred most often in the group aged 16-24. Most important, different types of risky behaviors were significantly intercorrelated. These behaviors included accident involvement, drinking and driving, riding with a DWI, driving aggressively, heavy drinking and so forth. Female drivers evidence the same pattern as male drivers, with males producing higher levels of risky driving behavior until age 24 when such behavior dropped rapidly.

Education has also been found to correlate with risky driving behavior, with those having more than a high school education being more likely to speed and be involved in a crash. Those motorists who make indecent gestures and argue with other motorists are most likely to commit unlawful acts. Thus, youth and hostility are important predictors of risky driving.

Personality characteristics of individuals apprehended for DUI following an accident and violation include high levels of hostility and sensation seeking and low levels of social responsibility. After drinking, these individuals, whose alcohol consumption was the highest in the group, perceive their risk of being in an accident as unchanged. Problem driving, psychosocial unconventionality, risk taking, hostility and aggression predict almost 60 percent of the variance in young adult drinking and driving behavior. Finally, social deviance was found to be a good predictor of accident rates for a sample of drivers 23-70 years of age.

Looking at a sample of high school students, social influences were found to be important in predicting DUI behavior or riding with a driver exhibiting DUI behavior. These social influences included partying and being with those who drink.

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4. Risk Perceptions

Adolescence is hypothesized to be a time of risk taking as individuals strive for autonomy and identity. Some view risk taking during this period as part of the normal developmental sequence, with biology and the social environment interacting to influence this behavior. One's self-esteem, cognitive function and established peer group norms also play a role.

Gender differences appear in studies comparing judgements of self-driving skill and danger in comparison with peers and the average driver. They also appear in studies analyzing risky behavior judgements in various driving scenarios. Young males expressed more optimism when judging their own skill and magnitude of dangerous driving behavior. This is an interesting mix of estimated of driver skill, diminished dangerous driving behavior and decreased accident-prone consequences.

The potential presence of a risky behavior syndrome is supported by research reporting high intercorrelation among a variety of self-reported measures. These measures include risk perceptions, driving practices and alcohol influenced lifestyles. Risky behavior syndrome and its varying degrees could be measured in adolescents with an appropriate instrument. However, this can only be done with the assumption of its existence.

Another approach views risk as a type of decision-making process that can be distinguished from the driver's skill and occurs when the driver gets behind the wheel. This approach stresses the importance of decision frames (outlooks) for young people. The individual visualizes the act, outcome and contingencies associated with a particular choice, then appraises the threat of the situation. Threat is inferred if the situation is viewed as beyond the individual's ability to cope. An emotional reaction occurs when the individual perceives the threat and takes steps to either change the external situation or adapt to its demand.

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DeJoy, D. M. (1992). An examination of gender differences in traffic accident risk perception. Accident Analysis and Prevention, 24, 237-246.

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5. Interventions

Novice driver risky behavior was the subject of a workshop sponsored by the U. S. DOT-NHTSA in April 1993. Suggestions for risk prevention included a complete analysis of the driving process with incorporation of the findings into a driver-training program. The program would also contain a risk management component. In addition, the use of graduated licenses with full licensure obtained only after two years of experience was proposed. The aim of such a program would be to teach safe driving skills, not simply techniques to pass the driving test. Components might include the use of divided attention techniques, feedback systems for line-of-sight problems, speed control, a standardized road test shown to be correlated with crash exposure, alcohol use reduction, altering DWI norms, risk arousal, etc.

Various interventions for risky drivers have been assessed. One program exposes drivers to a study guide and test for safe driving practices and skills to help eliminate conflict situations. All drivers in the state with a moving violation in one four-month period were exposed to the new treatment. Their subsequent violation-accident records were compared to other state drivers with the same prior driving violations. These drivers, the control group, who had just taken a re-test behind the wheel. Treatment produced significant reductions at three and six-month intervals for subsequent multiple vehicle chargeable accidents. There was also a significant decrease in all violations, especially moving/point violations at three, six, nine and 12 months after exposure. Cost savings of the new program were also evident.

Participants in a traffic violator school program, however, did not evidence a subsequent reduction in risky driving when compared to a similar group convicted of the same violations. The masked conviction record of the attendees was not an incentive to eliminate future problem driving.

Interventions to reduce drinking and driving have been substantial. One study introduced feedback of a personal and general nature to tavern patrons at the beginning of the night, but had little effect on the patrons' consumption of alcohol or subsequent driving. A publicized police surveillance reduced drinking and driving for only a short interval.

Looking at habitual offenders offers the opportunity to evaluate a variety of intervention modes. Classification and adjudication reduces traffic violations for all but extensive DUI offenders. Regardless of the offender's official status, the probability of committing future DUI offenses is high. For this particular group, treatments that combine strategies such as education, therapy and continued monitoring hold the most promise in reducing DUI behavior.

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6. Licensing Issues

Different teenage licensing practices have been compared in proximate states. Early licensing is associated with high crash involvement rates for 16-year-olds. Delayed licensure until age 17 ensures lower crash rates for those aged 16 years. States that did not allow 16-year-olds to drive at night fell in between, while states that did not allow unsupervised driving had the lowest crash rates. These comparisons lend support to the use of graduated licensing for teenagers, including delaying full-privilege licensure and forbidding night driving. Supervised practice using Oregon's provisional licensing program was evaluated using teenage drivers who were licensed before and after the enactment of the statute. Although provisional licensing allowed teenagers to pass the driver test in larger numbers, subsequent driver records indicated no differences in traffic violations. However, young male drivers licensed under the provisional restrictions produced 16 percent fewer accidents in their first year of driving when compared to males not licensed provisionally.

An evaluation of a current program to regulate and control persistent DUI offenders found numerous implementation problems. For example, license suspension has been shown to be effective when utilized; however, enforcement difficulties abound. The FARS report of fatal accident drivers for 1991 and 1992 indicated this fact, with 13 percent of the drivers having suspended or revoked licenses. Mandatory license suspension is more effective than discretionary suspension with special respect to DUI recidivism. The effectiveness results from the role of reduced exposure with no evidence of driving behavior changes for these individuals.

Administrative license suspension has been only recently evaluated and its role as a deterrent has not substantiated. Establishing contingencies for re-licensing the DUI driver has promise, as evidenced in several European countries with re-instatement a function of successful treatment regimen completion. In Germany, one-third of the drivers is permanently revoked after assessment of the problem, for they are judged as untreatable. Vehicle incapacitation might be in order. Identification of persistent DUI offenders necessitates utilizing the BAC level, number of priors and total number of accidents and violations. Subsequent actions might include a series of steps differentiating BAC levels with different associated sanctions. Possible license strategies might include enforcing all stated sanctions. Complete records of offenses would be a part of the driving record available at DMV for seven or ten years. Lifetime revocation would be available for chronic repeaters.

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Section II

Elderly Drivers

1. Prediction Models and Potential Ameliorating Conditions

Drivers above 70 years of age appear at greater risk for future accidents in comparison to other drivers. Using fewer prior convictions, it is possible to identify potentially accident-prone older drivers. This elevated risk potential occurred only among older drivers with 3 or more points during the prior 3-year period. Intersections requiring a left turn are risky for the elderly driver. This risk factor may be lessened by utilizing a protected phase for a larger percent of the turning volume and increasing the amber interval, usually set between 3-5 seconds as the speed limit increases.

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2. Driving Patterns

A number of features characterize the behavior of elderly drivers. Patterns identified include the increased likelihood of a fatality following an accident, higher rates of citation for failure to yield the right-of-way as well as illegal turns and improper lane changes. Accidents involving elderly drivers frequently occur at intersections outside of cities. Elderly drivers report driving less as they age, avoiding night driving, avoiding driving during peak hours, avoiding driving on limited access highways, driving at slower speeds and carrying fewer passengers. The problems they encounter in highway driving include having a fear of large trucks, maintaining the necessary speeds to continue traffic flow and disliking the rudeness of other drivers.

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3. Sensory/Perceptual/Cognitive and Psychomotor Correlates of Risky Driving

Various sensory, perceptual, cognitive and psychomotor measures have been administered with performance on these measures correlated with different measures of driving, including accepted measures of risky driving. Significant correlations in the .20 to .38 range included depth perception, peripheral vision measures and visual discrimination, figure/ground response time, visual memory response time and mental status. Daily diary entries of driving experiences were used in conjunction with the Mini-Mental State Exam. Specific driving problems significantly correlated with measures of dynamic visual acuity in the .34 to .36 range. Measures of peripheral vision were in the .20 to .21 range while performance subtests of the Wechsler Adult Intelligence Scale measured .20 to.34. Psychomotor measures including simple and choice reaction times and tracking correlated in the .21 to .38 range. However, the nature of the test using reaction time and the measure of driving can influence this relationship for elderly drivers. Laboratory measures of reaction time, categorization and discrete choice showed no significant relationship to response measures while driving in a platoon car driving task. Finally, visual field defects correlated with accident occurrence and performance and driving simulator performance. Combining measures such as visual acuity, horizontal visual field and contrast sensitivity produced a significant correlation with accidents. A model combining the perceptual measures of useful field of vision and cognitive measures of mental status, or the Mattis Organic Mental Status Syndrome Examination, has been created and is currently being tested. Together, these measures predict 20 percent of the variation in state reported accidents attributable to elderly drivers.

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Tarawneh, M. S., P. T. McCoy, R. R. Bishu and J. L. Ballard (1993). Factors associated with driving performance of older drivers. In Transportation Research Record, 1406, 64-71. Washington, D.C.: National Research Council, Transportation Research Board.

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Wood, J. M. and R. J. Troutbeck (1994). Effect of age and visual impairment on driving and vision performance. In Transportation Research Record, 1438, 84-90. Washington, D.C.: National Research Council, Transportation Research Board.

4. Predicting Accidents and Insurance Claims Using a Battery of Tests and Measures

Demographic characteristics, driving history, visual measures, perceptual measures, cognitive measures, personality measures, interests and insurance rating/underwriting variables were used as predictors of at-fault accidents. Correlations of significant magnitudes varied from .05 to .18. The following test measures were combined to predict subsequent at-fault accidents: contrast sensitivity, visual detection, performance on a simulator, internal-external locus of control, annual mileage, age, marital status, gender, insurance-rated territory, prior at-fault accidents and violations, prior non-fault accidents and insurance claims. Test results produced a 16.4 percent prediction of subsequent at-fault accidents.

Brown, J., K. Greaney, J. Mitchel and W. S. Lee (1993). Predicting accidents and insurance claims among older drivers (ITT Hartford Insurance Group and AARP). Southington, CT.

Carr, D., T. W. Jackson, D. J. Madden and H. J. Cohen (1992). The effect of age on driving skills. Journal of American Geriatrics Society, 40, 567-573.

5. Physical Fitness and the Relationship to Normal Driving

Measurements of cardiorespiratory fitness, reaction time, movement time and joint flexibility were analyzed to determine their relationship to a field-based assessment of driver performance. The Automobile Driving On-Road Performance Test (ADOPT), was determined for a group of adult drivers aged 20-25 years and 60-75 years. For the older drivers, the higher the proficiency scores on aspects of fitness such as joint flexibility and reaction time, were found to be the best predictors of good driving ability. Simple reaction time was related to safe practices, maintaining speed and observing aspects of driving ability, not the more complex driver-processing requirements.

McPherson, K., A. Ostrow, P. Shaffron and R. Yeater (1988). Physical fitness and the aging driver (AAA Foundation of Traffic Safety). Washington, D.C.

6. Attitudes Toward Driving

An investigation of the function of a self-bias in evaluating one's own driving performance in comparison with one's peers and other driving groups was conducted for drivers aged 50 to 79 years. The amount of positive self-bias decreased with age but increased with amount of current driving exposure and amount of perceived control measured on the locus of control scale. In studies of specific accident situations known to be associated with large percentages of adult at-fault elderly drivers, drivers recognized difficulties but didn't perceive their driving as contributing to this type of accident-failure to yield the right-of-way. Accident data indicated that the elderly participant in an accident was probably judged more at-fault than the middle-aged driver. Finally, almost all of the elderly drivers perceived themselves to have an average or better than average driving ability with no decrease with age. An investigation of driving and decision-making styles revealed that for elderly driver, lower thoroughness scores, higher hesitancy scores and faster driving predicted higher accident rates. All other variables including sex, age and annual mileage were not involved.

Cooper, P. J. (1990). Elderly drivers' views of self and driving in relation to the evidence of accident date. Journal of Safety Research, 21, 103-113.

French, D. J., R. J. West, J. Elander and J. M. Wilding (1993). Decision-making style, driving style, and self-reported involvement in road traffic accidents. Ergonomics, 36, 627-644.

Holland, C. A. (1993). Self-bias in older drivers' judgements of accident likelihood. Accident Analysis and Prevention, 25, 431-441.

7. Interventions

A review of research concerning a variety of visual measures documents the deterioration of such functions with age, particularly dynamic visual acuity, affect visual field size and contrast sensitivity. Assuming this deterioration may be undetected in many elderly drivers, the establishment of adequate screening tests to detect initial deterioration with potential training to improve skills such as search and localization within a cluttered visual field, must be developed. Possible automobile design changes to reduce glare, change headlight configuration or introduce near-obstacle detection systems were discussed. Roadway changes to increase sign size, redundant signs, enhance sign brightness, etc. was proposed. Finally, licensing changes such as a 2-tiered system of initial followed by more sensitive screening or state-specified screening by a vision specialist as part of an annual or biannual vision exam was presented. The latter, introduced in Israel for all drivers older than 65, resulted in identification of 16 percent of the population with vision problems with 39 percent previously unaware of their problem. Specific attempts to improve actual driving through physical therapy, perceptual therapy, driver-education and design changes resulted in a cost-effective 7.9 percent improvement in driving for a group of elderly drivers 65 and older, after the interventions. The role of state driver licensing agencies in detecting and correcting problems evidenced by the elderly driver was examined, including suggestions for screening and improving driving performance and drivers' functional, vision, and physical capabilities.

Coleman, S. (1994). Rehabilitation of elderly drivers. In Transportation Research Circular, 429, 7-19. Washington, D. C.: National Research Council, Transportation Research Board.

Fonseca, A. M. (1994). Training elderly drivers. In Transportation Research Circular, 429, 21-23. Washington, D. C.: National Research Council, Transportation Research Board.

Hunt, L. A. (1993). Evaluation and retraining programs for older drivers. Clinics in Geriatric Medicine, 9, 439-448.

Janke, M. K. (1994). Mature driver improvement program in California. In Transportation Research Record, 1438, 77-83. Washington, D. C.: National Research Council, Transportation Research Board.

McCoy, P.T., M. S. Tarawneh, R. R. Bishu, R. D. Ashman and B. G. Foster (1993). Evaluation of counter measures for improving driving performance of older drivers. In Transportation Research Record, 1405, 72-80. Washington, D. C.: National Research Council, Transportation Research Board.

Maryott, D. W. (1994). Education, counseling, and forms of support. In Transportation Research Circular, 429, 19-21. Washington, D. C.: National Research Council, Transportation Research Board.

Miller, T. L. (1994). Licensing restrictions. In Transportation Research Circular, 429, 15-17. Washington, D. C.: National Research Council, Transportation Research Board.

Shinar, D. and F. Schieber (1991). Visual requirements for safety and mobility of older drivers. Human Factors, 33, 507-519.

8. The Relationship of Symptoms, Disease and Medications to Accidents and Driving Cessation

Studies conducted on specific geriatric populations revealed a variety of relationships between physical conditions and accident occurrence. The presence of bursitis, cold sensation in the extremities when exposed, protein in the urine and irregular heartbeat predicted accidents in elderly Florida drivers. Women from this population were more likely than men to willingly stop driving. Drivers who reported an awareness of macular degeneration, stroke, recent hospitalization, eye problems and parkinsonism were also more likely to stop driving. Conversely, the use of alcohol and magnesium hydroxide were predictors of continued driving. In a population of rural drivers, the presence of arthritis, rheumatism, cataracts and macular degeneration were reported to interfere with driving. Back pain, use of non-steroid anti-inflammatory drugs and poor free recall were predictors of accidents for elderly in the rural community. Finally, in a study of the elderly in an urban setting, accidents were more common for those who were poorer, copying designs on the Mini-Mental State Exam, walked fewer blocks and had more foot abnormalities. The risk of an accident increased with the presence of each predictor.

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Klein, R. (1991). Age related eye license, visual impairment, and driving on the elderly. Human Factors, 33, 521-525.

Marottoli, R. A., L. M. Conney, D. R. Wagner, J. Doucette and M. E. Tinetti (1994). Predictors of automobile crashes and moving violations among elderly drivers. Annals of Internal Medicine. 121, 842-846.

Persson, D. (1993). The elderly driver: Deciding when to stop. The Gerontologist, 33, 88-91.

Stewart, R. B., M. T. Moore, R. G. Marks, F. E. May and W. E. Hale (1993). Driving cessation and accidents in the elderly: An analysis of symptoms, diseases, cognitive dysfunction and medications (AAA Foundation for Traffic Safety). Washington, D. C.

9. Diagnosis of Dementia

A review of the dimensions for initial screening for dementia including Alzheimer's disease, the most common ailment accounting for about 70% of dementia cases, was presented. Using the recommendations developed by the American Academy of Neurology proves quite costly. Current diagnostic practices distinguish between early Alzheimer's disease and normal aging using the impairment of verbal memory and category naming functions.

Geldmacher, D. S. and P. J. Whitehouse (1996). Evaluation of dementia. New England Journal of Medicine, 335, 330-336.

10. Driving with Dementia

Elderly drivers referred from Virginia and other state assessment clinics were evaluated on a variety of dimensions. In one study, comparisons were made among cognitively impaired patients, diabetics of the same age, a healthy geriatric group from the community and a healthy younger group from the community on a variety of dimensions including road test scores, attention measures, perceptual measures and memory measures. The dementia group received the lowest road test scores, significantly different from all of the other groups. The control groups did not differ significantly, regardless of age. Short-term memory, visual tracking and Mini-Mental State Examinations correlated significantly with driving scores. In addition, driving scores correlated with number of collisions and moving violations per 1000 miles driven. Of those elderly persons referred to an outpatient geriatric assessment center, 23 percent were current drivers evidencing below normal performance on the Mini-Mental State Examination. Looking only at those still driving, 40 percent were diagnosed as having Alzheimer's with 26 percent needing assistance in daily living activities such as dressing or bathing. However, retrospective analysis of driving records or report of crashes by caregivers of diagnosed Alzheimer's patients for the 5 years prior to the study versus age-matched controls and young controls did not reveal a significantly higher risk ratio for the Alzheimer's patients. On average, patients diagnosed with this disorder drive more than 2 years after diagnosis, with gradual driving cessation.

Carr, D., T. Jackson and P. Alquire (1990). Characteristics of an elderly driving population referred to a geriatric assessment center. Journal of the American Geriatrics Society, 38, 1145-1150.

Carr, D., K. Schmader, C. Bergman, T. C. Simon, T. W. Jackson, S. Haviland and J. O'Brien (1991). Journal of American Geriatrics Society, 39, 1132-1136.

Drachman, D. A. and J. M. Swearer (1993). Driving and Alzheimer's disease: The risk of crashes. Neurology, 43, 2448-2456.

Dubinsky, R. M., A. Williamson, C. S. Gray and S. L. Glatt (1992). Driving in Alzheimer's disease. Journal of the American Geriatrics Society, 40, 1112-1116.

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Friedland, R. P., E. Koss, A. Kumar, S. Gaine, D. Metzler, J. V. Haxby and A. Moore (1988). Motor vehicle crashes in dementia of the Alzheimer type. Annals of Neurology, 24, 782-786.

Gilley, D. W., R. S. Wilson, D. A. Bennett, G. T. Stebbins, B. A. Bernard, M. E. Whalen and J. H. Fox (1991). Cessation of driving and unsafe motor vehicle operation by dementia patients. Archives of Internal Medicine, 151, 941-946.

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Logsdon, R. G. and T. L. Larson (1992). Driving and Alzheimer's disease. Journal of General Internal Medicine, 7, 583-588.

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Rebok, G. W., F. W. Bylsma and P. Keyl (1990). The effects of Alzheimer's disease on elderly drivers. Paper presented at the annual meeting of the Gerontological Society of America, Boston, MA.

11. Licensing Issues

Licensing issues for the older driver emerged after conferences and reports sponsored by various organizations, including the AAA and Transportation Research Board. Based on crash statistics, older drivers were judged as more likely to be involved in fatal accidents based on miles of exposure, but have the same crash rates per licensed driver as middle-aged drivers. Elderly drivers are more likely to die than the very young drivers, with those 80 years and older having more than 3 times the risk because of physical frailty. Can older drivers regulate removing themselves from behind the wheel? If aware of their limitations, many older drivers do so. The critical word appears to be "aware." Whether the options are graduated licenses or engineering changes in the automobile or environment, the development of tests and procedures to identify problems is essential. Coordination of evaluation criteria for safe driving will be necessary support services for identifying risky driving among the elderly to the individual and state. Criteria would include the selection and training of licensing personnel and educating law enforcement personnel, physicians and medical advisory boards.

Eberhard, J.W. (1994). Mobility and safety: The mature driver's challenge. Proceedings of the Fourteenth International Technical Conference on Enhanced Safety of Vehicles, Munich, Germany, 1, 376-382.

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Miller, D. J. and J. E. Morley (1993). Attitudes of physicians toward elderly drivers and driving policy. Journal of the American Geriatric Society, 41, 722-724.

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Shinar, D. (1994). Vision screening. In Transportation Research Circular, 429, 11-12. Washington, D. C.: National Research Council, Transportation Research Board.

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