

TRB TRANSPORTATION RESEARCH BOARD

ABSTRACTS

**Emerging Issues in Safe and Sustainable
Mobility for Older People**

August 30–September 1, 2011



*Mandarin Oriental Hotel
Washington, D.C.*

Tuesday August 30th

Plenary Session 1: Changing Demographics 10:00 am - Noon

The Travel of Older Adults: Highlights from the 2009 National Household Travel Survey

Jana Lynott

TRB's conference is perfectly timed to share current information about the travel patterns of older Americans. The AARP Public Policy Institute anticipates the release of its second in a series of publications documenting the travel patterns of older adults through analysis of the 2009 National Household Travel Survey. The first publication (<http://www.aarp.org/home-garden/transportation/info-04-2011/fs218-transportation.html>) was released in April. It provides a broad overview of the changing travel patterns of older adults, showing that older adults comprise an increasing share of the nation's travel in terms of trips, miles and number of drivers. Older adults' changing modal preferences are also discussed, as is the fact that overall travel by all age groups is on the decline and the possible policy implications of these changes. PPI's second release will provide an in-depth analysis of older non-drivers:

- their numbers,
- their trip-taking (number of trips by mode and trip purpose)
- the medical conditions that impact their travel
- the number of rides family and others provide
- the extent to which they would like to get out more
- the problems they encounter with their transportation system (e.g., traffic congestion, cost, lack of available public transportation, safety and security, and lack of adequate sidewalks).

The analysis will differentiate between those who never drove and those who gave up driving, those who live in urban areas versus those who live in rural areas, and other demographic variables. The analysis will also look at differences between drivers and non-drivers, as well as between drivers who are mobile versus those that take very few trips.

Mobility Characteristics of U.S. Older Adult Drivers and Non-drivers

Rebecca Naumann, Ann Dellinger, Judy Stevens, and Grant Baldwin

Background: Many older adults must confront the decision to reduce or stop driving. Examining how driving status (e.g., driver, non-driver, restricted driver) relates to other mobility measures, such as the ability to walk outside, can help us understand the abilities of older adults and provide insight into future mobility needs.

Methods: The Second Injury Control and Risk Survey, Phase 2 (ICARIS2-P2) was a nationwide cross-sectional telephone survey conducted in 2007-2008. ICARIS2-P2 included questions about self-reported driving status, recent falls, and other mobility-related characteristics. Prevalence estimates were calculated for the U.S. and multivariable logistic regression was used to explore associations between driving status and measures of mobility.

Results: Of the 705 older adults (ages 65+) surveyed, 15% had not driven in the past year. Of these non-drivers, more than a third lived alone and nearly a third lived below the poverty threshold. Thirty-seven percent of non-drivers reported being unable to walk outside for 10 minutes compared to 13% of drivers ($p < 0.001$). However, among those that were able to walk for 10 minutes, a similar proportion of drivers and non-drivers (about 66%) reported that they would walk if they had to travel 3-4 blocks to visit a friend. While there was no difference in the proportion of recent falls among non-drivers and drivers, 36% of non-drivers and 14% of drivers reported that they limited walking because of a fear of falling ($p < 0.001$).

Conclusions: This study provides recent national prevalence estimates of the walking and driving abilities of US older adults. These findings reveal the diverse characteristics and abilities of older adult drivers and non-drivers. The results reinforce the importance of considering how many factors, including driving abilities, walking abilities, concerns (e.g., fear of falling), and personal characteristics (e.g., income), together affect older adults' mobility.

Comparison of Older Road User Crash Risk and Driver Travel Patterns and Practices in a High-income Country and a Low-income Country

Jennifer Oxley, Judith Charlton, Sharifah Norazizan, Syed Abdul Rashid, and Mohamad Fazdillah Bagat

A key issue in older driver safe mobility is the consideration of reducing and stopping driving and one of the widely held assumptions about older drivers is that there is a high level of self-regulation. This assumption is based on studies predominantly in high-income countries and, while similar trends may be expected in middle-income countries, to date, comparatively little is known about older driver safety and mobility in these countries. This paper compared crash patterns of older road users between Australia and Malaysia as well as self-reported information on driving patterns. The results show that we don't see the typical U-shaped curve for driver fatalities in Malaysia. Unlike Australia, older Malaysian drivers are not over-represented in fatal crashes, however, older passengers are at increased risk. Importantly, the U-shaped curve is apparent for motorcycle rider fatalities, with high over-representation amongst older riders. Older pedestrians, too are at very high risk of death. Amongst older drivers, differences in driving practices were found, for example weekly driving distance less than 50km (Aust: 13% vs My: 60%), high confidence in driving situations (overall: Aust: 71% vs My: 51%). Further, differences in predictors of self-regulatory practices were found: Aust: female, older, retired, with arthritis, good/fair/poor ratings for decision-making, not the principal driver and not married vs My: older, good psychomotor ability, no crash history, positive attitudes and knowledge of road safety and confident. There are cultural, demographic, economic, vehicle ownership and traffic condition differences that may account for some of these differences, as well as a lack of awareness of ageing issues and systems in place in Malaysia to manage older driver safe mobility. Implications of these findings on addressing and managing the emerging older road user 'problem' in Malaysia are discussed.

Plenary Session 2: Changing Health Care Environment 2:00 p.m. - 4:00 p.m.

Acceptance of Driver Support Systems by Drivers Over 65 Years Old

Yvonne Barnard, Natasha Merat, Mike Bradley, and Ashley Lloyd

New technologies are becoming available for cars, offering information and support in the driving task. Especially older drivers could benefit from these systems, providing support for driving tasks that become more difficult as they age, allowing them to stay on the road for longer whilst remaining safe. However, not everyone easily accepts new systems. The reasons for non-acceptance vary; besides economic reasons, people may not find systems useful, or believe them to be difficult to understand, or unreliable. This paper reports a study conducted on older drivers, as part of a UK funded project (BRIDGE: Building Relationships with the Invisible in the Digital Global Economy) investigating the reasons underlying non-adoption of digital technologies. In order to make support systems more acceptable, understanding the reasons for non-acceptance is necessary. First, a questionnaire was administered to 33 older drivers. Next, we conducted focus groups and individual interviews with 18 drivers over 70 years old. Many of them did not use new technologies like navigation systems in the car, or computers in daily life. To facilitate the discussion we demonstrated a desk-top simulation of a highly automated driving system, which managed both lateral and longitudinal control of the vehicle. A large number of factors were identified that influenced acceptance or non-acceptance. Using the Unified Theory of Acceptance and Use of Technology (UTAUT) as a starting point, a more detailed classification of these factors was made. We will discuss these factors, as well as

observed differences between people using other technologies such as computers, and non-users. Special attention will be paid to factors such as the perceived usefulness, the need to feel in control, trust in the system, understanding of new systems and worries about losing skills when automation takes over certain aspects of the driving task.

Accident Involvement in Older Drivers in Britain

Britta Lang, Andrew Martin Parkes, and Michael Gormley

Older drivers' accident involvement has been subject to considerable research around the world (e.g. McGwin & Brown, 1999; Li, Braver & Chen, 2003; Langford & Koppel, 2006, OECD, 2001). The current paper provides a comprehensive update on the older driver situation in Great Britain based on a variety of large data sources.

In 2005 Great Britain introduced the regular collection of 77 so-called Contributory Factors into its injury accident database, STATS19. These data are gathered by police forces using a standardized form for all persons injured and all vehicles involved in an injury accident.

In addition to accident involvement rates based on National Travel Survey data, the current study explored the patterns of contributory factors of (non-professional) car drivers involved in injury accidents in 2005 and 2006 (n=472,451 cases) and differentiated them by driver age and gender.

The analysis indicates two different types of accident patterns in older drivers; one group of accidents seems to be associated with the deterioration of the visual system and the greater prevalence of illness and disability. The second group of causation factors, e.g. poor maneuvering and failures to stop, is also found in younger driver groups; however, their relative importance is increased for older drivers.

Whilst it is possible that inaccurate or inconsistent labeling by the police accounts for differences between age groups, the researchers also had access to a sample of (n=495) STATS19 forms, completed for the same accident by both police and trained accident investigators. Findings from the reliability check of the data indicate only small differences in reporting between the two groups and provide confidence in the accuracy of the larger dataset.

This exploration of contributory factors develops our understanding of older drivers' specific driving-related risks and can inform the development of measures aimed at promoting older drivers' safe mobility.

Driving as an IADL in the Medical Setting: A Model for Intervention and Referral

Anne Dickerson, Elin Schold Davis, and Felicia Chew

The American Occupational Therapy Association and Genesis Rehabilitation Services have created a framework that addresses the IADL of driving and community mobility as a part of occupational therapy practice. There are three major issues when considering driving competence: 1) finding the appropriate mix of assessments to identify those at risk, 2) the availability of driving evaluators, and 3) reimbursement for driving evaluations. This presentation will present a model project that addresses these three issues.

The concept starts with occupational therapy practitioners not specializing in driving and community mobility (referred to as generalists). It is within these generalist practitioners' responsibility to initially interpret the medically-at-risk client's goal of "driving" in its broader context of safe mobility while in the general setting, optimizing their skills needed for driving (safe transportation), enhancing client and family awareness of risk factors, and preparing for necessary transitions. Addressing driving does not automatically require the high end results obtained from a comprehensive driving evaluation when the generalist's evaluation looks at the same underlying cognitive, visual/perceptual, and motor skills needed for all ADL and IADLs. Through optimized communication and referral systems, the generalist practitioner can identify a client's strengths and weaknesses in relation to driving and augment the extensive and, arguably excessive, testing available from the highly trained driving rehabilitation specialist. This project seeks to identify the criteria that warrants and justifies a comprehensive driving evaluation (e.g.,

performance in context behind the wheel, candidacy for adaptive equipment) in order to refer to the driving specialist. To accomplish this task, language and terminology must be consistent, reimbursement areas identified appropriately, effective referrals networks created, and most importantly, the educational support systems needed for the generalists and other health care professionals. Genesis and AOTA have engaged in a research project addressing the contextually relevant resource development (education and key personnel called "Champions") and measuring their impact on practice. This presentation will describe the overall project, initial findings on the educational component, and discuss how to incorporate the broader message with a goal to increase the capacity to address driving and community mobility with all medically-at-risk individuals.

Factors Associated with Age-Related Differences in Crash Injury Types, Causation and Mechanisms
Stephen A. Ridella, Kristin Poland, and Amanda M. Byersmith

Injury tolerance is not exclusively based on chronological age but rather on the many biological, physiological and environmental aspects that define the aging process. Thus, it is difficult to identify a single age at which a person's risk of vehicle crash-related injury substantially increases. This paper attempts to determine how age-related and other contributing factors, restraint interaction and crash conditions may affect injury causation, mechanisms and outcome observed in different age groups for each gender.

All data in the paper comes from over 1300 cases in NHTSA's Crash Injury Research Engineering Network (CIREN). Furthermore, only injuries from occupants that were put through the BioTab injury causation coding method were used. These cases were separated into five age groups: <25, 25-44, 45-64, 65-74 and => 75. Of these cases, 217 cases (nearly 20%) involved occupants 65 years old or older. Cases were separated such that descriptive statistics could be done to make comparisons of injuries and factors associated with the injuries across age groups.

Compared to younger counterparts, older occupants were more often a passenger (not driver), were more often obese (Body Mass Index >30) and drove in newer vehicles. Head and thoracic injuries dominated all age groups, however, injury scenario analysis indicated differences in the age groups. Dominant injury type, especially for the thorax, changed from soft to hard tissue injury as occupant age increased. Although mechanism was similar, the crash severity was lower and age-related factors likely contributed to the increased risk of fatality in the older occupant groups.

The serious injuries sustained by the occupants in each age group will be described and the injury causation, mechanisms and outcome of those injuries will be compared across age groups. Specific cases will be highlighted to support data and conclusions.

Wednesday August 31st

Plenary Session 3: Changing Health Care Environment

8:30 a.m. - 10:30 a.m.

Going Viral: A Web Curriculum that Educates Physicians Regarding Assessing, Counseling, and Treating Older Drivers

Cheryl A. Irmiter, Joanne G. Schwartzberg, Lela D. Manning, and Karen E. Peters

As the number of older drivers with medical conditions rise, patients and their families will increasingly turn to physicians for guidance on safe driving. Physicians will be asked to assess, treat and counsel their patients facing medical impairments that may affect their driving abilities. A web based curriculum was designed to meet the needs of both residents and practicing physicians.

A mixed method study collected data from 7 sites (3 physician practices and 5 resident programs). Descriptive statistical data highlights that the participants increased their knowledge and level of confidence about the content after the educational session. From pre/post surveys, participants (N=225) were queried about the level of knowledge, knowledge gained, and practice improvement implications. The program included case examples, questions, resources, portfolio documents, notes, and legal information to allow both residents and practicing physicians to complete performance improvement activities.

Moreover, the participants (N=225) agreed to strongly agreed (90%) that the course (1 hour) and its educational resources were beneficial for practice. Ninety-three percent (93%) of individuals who completed the program reported that they were now more comfortable to assess, counsel and treat older drivers about driving or driving retirement. Participants rated the recommended interventions (93%) as providing the most significant amount of new information, as compared to the assessment (80%), ethical/legal (80%), or counseling (78%). Inferential statistics will compare pre/post tests by group (resident, physician, and healthcare provider).

This presentation will highlight that the majority of practicing physicians and resident physicians are interested in more knowledge to assess, treat, and counsel older drivers in healthcare environments. By attending this presentation, individuals will have an increased understanding of how to impact behavior change and introduce the important differences of participants for a web based curriculum designed to address older adult driving.

Policy Changes to Reduce Motor Vehicle Collisions via Earlier Cataract Surgery

Stephen Thomas Mennemeyer, Cynthia Owsley, and Gerald McGwin

Older adults who undergo cataract extraction have roughly half the rate of motor vehicle collision (MVC) involvement per mile driven compared to cataract patients who do not elect cataract surgery. Currently in the U.S., most insurers do not allow payment for cataract surgery based upon the findings of a vision exam unless accompanied by an individual's complaint of visual difficulties that seriously interfere with driving or other daily activities. As a consequence, surgery tends to occur after significant vision problems have emerged. We hypothesize that a policy encouraging cataract surgery earlier for a lesser level of complaint would significantly reduce MVCs among older drivers. We used a Monte Carlo model to simulate the MVC experience of the U.S. population from age 60 to 89 under alternative protocols for the timing of cataract surgery which we call "Current Practice" (CP) and "Earlier Surgery" (ES). Our base model finds, from a societal perspective with undiscounted 2010 dollars, that switching to ES from CP reduces by about 21 percent the average number of MVCs, fatalities, and MVC cost per person. The net effect on total cost – all MVC costs plus cataract surgery expenditures -- is a reduction of about 16%. Quality adjusted life years would increase by about 5%. From the perspective of payers for healthcare, the switch would increase cataract surgery expenditure for ages 65+ by about 8% and for ages 60 to 64 by about 47% but these expenditures are substantially offset after age 65 by reductions in the medical and emergency services component of MVC cost. Similar results occur with discounting at 3% and with various sensitivity analyses. We conclude that a policy of ES would significantly reduce MVCs and their associated consequences.

Effects of Training in Cognitive Exercises on Mobility Among the Elderly

Ryosuke Shigematsu, Tomohiro Okura, and Masaki Nakagaichi

Many elderly people face difficulties in sitting on and getting up from a car seat. While driving, it is important that they react quickly and appropriately. Since their fitness levels decrease with age, they should exercise to maintain them. Square-stepping Exercise (SSE) is a novel form of exercise and comprises various stepping actions. SSE requires participants to remember step patterns demonstrated by an instructor. Further, the SSE program has 200 stepping patterns, which are organized by the complexity involved in stepping actions. After participants master a pattern, the instructor presents more complex patterns. Therefore, participants need to remember patterns and to execute the steps quickly and correctly on the basis of their recall. This implies that SSE can improve functional fitness of the lower extremities. This study aimed to explore the effects of SSE among the elderly. Twenty-two community-dwelling persons (76.1 ± 5.5 yrs) participated in a six-month SSE program. Their score on the Mini Mental State Examination (MMSE) at the beginning of the program averaged 26.0 and ranged from 21 to 30. At the beginning and end of the program, three functional fitness items were measured. After six months, the time required for five chair stands (7.4 ± 2.1 to 6.6 ± 1.3 s) and choice reaction times (0.993 ± 0.156 to 0.923 ± 0.143 s) improved significantly. The Timed Up & Go Test revealed that walking times did not change significantly (6.0 ± 1.4 to 5.9 ± 1.1 s). The association between the MMSE score and changes in each fitness test were not significant. Finally, SSE can help improve functional fitness so that the elderly can sit on and get up from a car seat smoothly, and react quickly and appropriately when driving. Further, such effects may be seen among the elderly regardless of cognitive function differences.

Reducing automobile insurance company ultimate loss ratios with cognitive training

Peter B. Delahunt & Henry W. Mahncke

Reductions in Useful Field of View (UFOV) lead to higher rates of automobile crashes. UFOV can be improved using computer-based training resulting in improvements in driving safety. Recent results show large reductions in at-fault crash rates in the 5-year period following training. Automobile insurance companies have shown interest in this technology as a way to improve driving safety and reduce costs. One approach insurance companies use to evaluate emerging safety technology is to estimate reductions in the ultimate loss ratio (ULR). ULR is defined as the total cost of the policy to the insurance company divided by the premium. The current study reports initial results using this approach to evaluate cognitive training.

The Hartford insurance company partnered with Posit Science to offer the Drivesharp visual training program. Drivesharp contains three exercises including the latest version of UFOV training. A mass mailing was sent to 100,000 policyholders aged 50 and above resulting in 8,962 requests for the program. A total of 5,143 started training with 1,710 completing 10 hours of training. Usage data from Posit Science and policy data from The Hartford were matched and anonymized by a third party for analysis.

Users were divided into three groups (Poor/Average/Good) based on initial assessment performance. Crash rates in the previous 5 years were highest for the Poor category. ULRs were also highest for the Poor category indicating that the baseline cognitive assessments provide an additional risk factor independent of other known factors. Training improved performance on the Drivesharp tasks providing an initial indication that ULRs will also improve after training.

Papers: 11:00 a.m. - noon

Strengthening State Medical Referral and Review Systems for Potentially Medically At-Risk Drivers

Jacob Allen Nelson, Jane Stutts and Jean Wilkins

In recognition of the need to consider the unique situations of motorists thought to be medically at-risk in terms of their functional fitness to drive safely, many states have established various protocols designed to permit the referral and review of these drivers (e.g., medical advisory boards) resulting in a licensing decision. The objective and overall specific aim of this paper is to reach conclusions about the most effective structure and mode of operation for these systems as supported by current scientific evidence. The paper will offer legislative or policy recommendations only in areas where evidence exists. Current knowledge regarding all areas of structure and functioning of these systems is summarized according to their overall effectiveness and contributions the licensing process.

Conditions and Characteristics of Serious and Fatal Crashes Involving Older Rural Drivers

James P. Thompson, Matthew R. J. Baldock, Jane L. Mathias, and Lisa N. Wundersitz

Motor vehicle crashes involving rural drivers aged ≥ 75 years are more than twice as likely to result in a serious or fatal injury as those involving their urban counterparts. The current study examined some of the reasons for this using a database of police-reported road crashes (2004 - 2008) to determine the conditions (road, light, weather) and characteristics (driver error, crash type, vehicle age, road layout, road surface, speed limit) that are more likely to be associated with the crashes of older rural drivers. It also examined whether these conditions and characteristics are associated with an increased likelihood of serious or fatal injury in younger drivers for whom frailty is not a contributing factor. A number of characteristics were more frequently associated with the crashes of older rural drivers and increased injury severity in younger drivers; these being crashes that involved hitting a fixed object and rolling over, as well as crashes on undivided, unsealed, curved and inclined roads, and in areas with a speed limit of 100km/h or greater. Moreover, a crash that occurred on a road with a speed limit of 100km/h or more was seven times more likely to lead to serious or fatal injury in drivers aged ≥ 75 years. Even when speed limit was statistically controlled, crashes that involved hitting a fixed object and rolling over, and crashes that occurred on undivided, unsealed and curved roads all independently increased the risk of a serious injury in older drivers. Changes, such as reduced speed limits, greater protection of fixed roadside objects, and the provision of divided and sealed roads, appear to be indicated in order to improve the safety of the rural driving environment for drivers of all ages. Additionally, older rural drivers should be encouraged to reduce their exposure to these risky circumstances.

The Driving and Dementia Toolkit for Persons with Dementia (PWD) and Caregivers

Anna Byszewski, Faranak Aminzadeh, Kelly Robinson, Frank Molnar, William Dalziel, Malcolm Man Son Hing, Lynn Hunt, and Shawn Marshall

Background: As population ages dementia prevalence increases, affecting over 8% of those over age 65 and 35% of those over 85 years old. Many older drivers continue to drive safely but dementia negatively affects the ability to drive safely. This includes ability to self-regulate driving behaviours, plan for the eventual driving cessation, and cope with the consequences. Family caregivers often play a key role in identifying safety risks, reinforcing driving decisions, and meeting the transportation needs of persons with dementia (PWD). Objective: This presentation will describe an evidence-based and comprehensive Toolkit for PWD and their caregivers. It is a companion toolkit to the "Driving and Dementia Toolkit for Health Professionals". Methods: The Toolkit was developed by an interdisciplinary team of professionals, based on comprehensive review of the literature, focus groups with patients and caregivers, as well as the authors' collaborative research. Results: The presentation identifies the educational, decisional and instrumental support needs of PWD who drive and their caregivers. Some of the themes covered in the workbook are as follows: a) what is the impact of dementia on driving safety and what are the warning signs, b) how to make the right decisions, c) what emotions to expect and how to respond, d) how to build social support to meet

the transportation needs of the PWD, and listings of resources. Conclusion: This Toolkit is a valuable resource for PWD and their caregivers and the content can guide those seeking information about this challenging topic. It includes a section that can be adapted to local resources. The toolkit can be provided to PWD and their caregivers and it is also available on line.

The Impact of Social Supports on the Travel Behaviors of Senior Non-Drivers

Dennis McCarthy

Access to transportation is a primary determinant of community mobility among seniors, especially for those who do not drive. Having available social supports, such as family and friends to provide rides, may enable non-driving seniors to be more active and engaged in their communities. The purpose of this study was to examine the impact of having nearby family and friends on the travel behaviors of seniors.

Seventy-four non-driving seniors completed a travel survey and were divided into two groups: those who lived with someone (50%) and those who lived alone (50%). There were no significant differences in age, gender, or self-reported health between the groups, although ethnicity differed substantially as 73% of those living with someone were Hispanic compared to only 32% of the live alone group. Additionally, while 57% seniors who lived alone had one or more children living within 20 miles of their home, 73% of seniors living with someone did.

Seniors living alone most often received rides from family (79%) whereas those living alone relied on some form of public transportation (58%) with family providing only 24% of their rides. Relatively few seniors (24%) who lived with someone reported having difficulty with transportation while 60% of seniors living alone reported problems. With regard to destinations and frequency of travel, seniors living with someone visited family and friends more often, while seniors living alone travelled more frequently to religious services and places of recreation.

Seniors who had nearby friends and family were more likely to receive rides from them while seniors who lived along relied more on public transportation. The significant difference in ethnicity between the two groups suggests that Hispanics families are more closely knit, at least geographically, and therefore, non-driving Hispanics may be at a lesser risk for some of the mobility challenges faced by seniors.

Plenary Session 4: Changing/Emerging Caregivers 1:00 p.m. - 3:00 p.m.

Your Family, Our Family, Our Mobility Options

Jon Edgar Burkhardt

The family of services concept is one commonly applied to transportation services for seniors. This paper describes how changing demographics among the elderly will necessitate changes to transportation services that should shift mobility policies towards the family of services concept. As more seniors outlive their abilities to drive, more public transit operators begin to encourage greater senior ridership through travel training and other strategies, more policymakers begin to understand the necessity for door-through-door transportation planning and services, and more communities adopt service strategies for seniors akin to those offered by the Independent Transportation Network, a serious re-thinking of transportation service strategies for seniors must emerge. All of these service strategies need to support the overall goal of mobility and independence. This paper reviews the benefits to seniors and to society as a whole of supporting mobility and independence for seniors. Strategies and programs examined include, on the public sector side, coordination, mobility management, and the Livable Communities efforts. On the private side, we'll examine not-for-profit and for-profit options as well as services provided by family caregivers. In most communities, successful application of a variety of options is likely to require an intelligent and well-informed oversight function.

This paper includes a list of innovative solutions now being applied in a number of communities in this country and abroad.

Without increased mobility options, we face prospects of an increasing number of drivers with reduced skills, increased safety risks, and increased numbers of isolated seniors. We face a fundamental tradeoff: increased mobility or vastly increased expenses. It is demonstrably less expensive to keep seniors mobile and living independently in their own homes than to rely on nursing home care, emergency medical care, and ambulances. In the long run, mobility is the new ticket to independence.

A Simulation-Based Approach to Increase Safety in Cognitively Impaired Senior Drivers

Kevin F. Hulme, Robert Stall, Lisa Thorpe, Alan Blatt, and Robert Sugarman

Statistics show that in the U.S., there are about 38 million licensed drivers over age 65. Thirteen percent of all Americans over the age of 65 (5.2 million) are diagnosed with Alzheimer's Disease (AD), and more with other forms of dementia. By 2030, the number of people aged 65 and older with Alzheimer's disease in the U.S. is estimated to reach 7.7 million. Two-thirds of the AD group is women. Seniors overall are also driving more miles and continue driving longer than in the past. It is therefore imperative that we know how to assess the driving capabilities of older adults with cognitive impairment in order to maximize their quality of life and functional ability, and to ensure that those who continue to drive can do so safely.

This paper describes a novel pilot study (N=30), in which our interdisciplinary research team will analyze the impact of using state-of-the-art driving simulation technologies to complement traditional driver evaluation methods for senior drivers with cognitive impairment. Driving simulation scenarios will specifically challenge study participants in known high risk senior driving situations that cannot be routinely and safely addressed in traditional behind-the-wheel assessments. We hypothesize that traditional driving evaluation protocols alone are not sufficient to adequately assess the competence of senior drivers with cognitive impairment, and that cognitively impaired study participants will exhibit a marked performance decline in high-risk simulated driving scenarios as compared to the control group.

This hybrid blend of driving assessment methodologies is novel in the field of senior driver assessment. We anticipate this approach will benefit the safety of senior drivers with known or suspected cognitive impairment, caregivers, and create reproducible models for the field of Driver Rehabilitation.

Self-rated Driving Among Older Adults with Normal Cognition, Mild Cognitive Impairment, and Dementia

Melissa Lunsman O'Connor, Yvonne Bannon, Elizabeth M. Hudak, Christine Haley, Carol Peronto, and Jerri D. Edwards

Failure to recognize reduced driving abilities may have dangerous safety consequences for drivers with dementia or mild cognitive impairment (MCI). Older adults with MCI may perform better than individuals with dementia, but worse than individuals with normal cognition, on complex functional tasks (Farias et al., 2009). However, it is unclear whether cognitively impaired individuals report adjusting their driving behaviors in accordance with their abilities. The current study investigated self-reported driving habits among adults age 60 and older with clinically diagnosed MCI (N=43), clinically diagnosed dementia (N=39), and normal cognition (N=43). On items from the Mobility Questionnaire (Stalvey et al., 1999), participants reported their driving status, driving frequency (days per week), and how often they avoided accessing the community, making left turns, driving at night, driving in unfamiliar areas, driving on high-traffic roads, and driving in bad weather. Six normal, ten MCI, and ten dementia participants had ceased driving. The ratio of drivers to nondrivers did not differ significantly between diagnostic groups, $\chi^2=1.78$, $p=0.41$. After adjusting for age and gender, a MANCOVA revealed no significant group differences in terms of driving frequency, avoidance of night driving, and avoidance of bad weather. There were significant group differences for avoiding left turns, $F(2,92)=4.15$, $p=0.02$, high-traffic roads, $F(2,92)=5.02$, $p=0.01$, accessing the community, $F(2,92)=4.27$, $p=0.02$, and unfamiliar areas, $F(2,92)=6.94$, $p<0.01$. MCI and dementia

participants avoided unfamiliar areas and high-traffic roads significantly more than normal participants; dementia participants also avoided left-hand turns and accessing the community more than normal and MCI participants. These findings suggest that older adults with clinically diagnosed MCI and dementia may recognize their reduced abilities and avoid some complex driving situations. Further research is needed to determine how such self-regulation affects driving safety. Furthermore, neither diagnostic group drove less or ceased driving more than cognitively normal individuals, which could have safety implications.

Criterion Validity of the Safe Driving Behavior Measure: Predicting Older Adults Passing/Failing an On-Road Driving Evaluation

Sherrilene Classen, Yanning Wang, Sandra M. Winter, Craig A. Velozo and Desiree N. Lanford

Background. We previously tested the face, content, and construct validity as well as rater reliability and rater effects of the Safe Driving Behaviors Measure (SDBM) for older adults and their family members/caregivers. **Objective.** To determine the concurrent criterion validity of the SDBM to on-road outcomes (passing/ failing the on-road test as determined by a certified driving rehabilitation specialist), among older drivers and their family members/caregivers (N= 324). **Methods.** We included a162 older drivers (mean age = 73.0 years, SD \pm 5.2, mainly well educated Caucasians, mean MMSE = 27.9, SD \pm 1.8) and 162 family members/caregivers (mean age = 63.94, SD \pm 13.97, 72.2% female, well educated, mainly Caucasians, 82.7% being family members vs. caregivers). Receiver Operating Characteristic (ROC) curves were calculated for drivers and family members/caregivers' SDBM ratings including sensitivity, specificity, positive predictive value, negative predictive value and area under the curve (AUC). **Results.** The ROC curve for the drivers showed AUC = 0.61, 95% CI= 0.50 - 0.71, $p = 0.06$. The family members/caregivers AUC = 0.74, 95% CI = 0.64 - 0.85, $p = 0.01$. **Conclusion.** Older drivers show poor validity between their self ratings of safe driving behaviors and an on-road test; however family members/caregivers show concurrent predictive validity of their ratings to the criterion gold-standard (on-road driving) test. Future steps are to test the effectiveness of a family member/caregiver training protocol to further improve the accuracy of their ratings and completing a web-accessible application of the tool.

Plenary Session 5: Policy Changes 3:30 p.m. - 5:30 p.m.

Limiting the allowed driving distance from home may not lead to a reduced crash risk for older drivers

Catarina Lundberg and Kurt Johansson

To satisfy the mobility needs of older drivers with different physical and cognitive impairments while limiting their crash risk, license restrictions represent a possible solution. Such restrictions are seen as reducing exposure to demanding driving situations and exist in the licensing regulations of many countries, mainly in North America and Australia. One type of license restriction limits driving to a certain radius within the driver's residence. To examine the possible safety effect of this measure, the present study focuses on the location of the crashes in two samples of unrestricted drivers, 65 years and older, in Sweden. The shortest distance between the place of the crash and the driver's residence was calculated by using the respective coordinates of the two locations.

In the first sample, derived from a longitudinal, prospective study of older drivers living in the Stockholm region, 151 crashes were registered, half of which were parking-related. Five of these occurred on long-distance trips and two others during a holiday stay. After removing these seven crashes, the median distance between the crash sites and the drivers' homes was 2.8 km (M = 10.5, SD = 19 km). Twenty-seven crashes occurred close to or within 300 meters of the drivers' homes.

In the second sample, from the "Karolinska Older Driver Autopsy Study", 277 older drivers who were killed by crashes in various parts of Sweden were included. Here, the median distance between the crash sites and the drivers' homes was 8.5 km ($M = 41.9$, $SD = 108.6$).

Most of the minor crash events as well as the fatal crashes involving older drivers occurred quite close to their homes. This leads to the conclusion that a geographical limitation of their trips would have prevented only a small number of these crashes.

Addressing Elderly Mobility Issues in Wisconsin

Jason J. Bittner, Patrick J. Fuchs, Timothy David Baird, and Teresa M. Adams

By 2035, the number of Wisconsinites age 65 and over will grow by 90 percent, compared to a 15 percent increase in total population. Over that time every county in the state will experience an increase in elderly population share. The extrapolation of current modal choice data suggests an overwhelming majority of Wisconsin's future elderly residents will be accustomed to driving, yet elderly persons are vulnerable to declines in visual, cognitive, and psychomotor skills. To address this, a University of Wisconsin research team completed a comprehensive analysis of transportation issues facing Wisconsin's older citizens for the Wisconsin Department of Transportation (WisDOT). Collaborating with regional aging offices, the research team received over 4500 detailed surveys completed by older residents to gauge current transportation habits and current and future needs, including rationales for modal choice, reasons for mobility difficulty, and licensing and adaptive equipment challenges. The research team hosted 17 focus groups in geographically and demographically diverse areas to receive detailed user input. The project combines these results with demographic projections, state and local current practice assessments, and national best practices to develop strategies for addressing transport issues. Among the primary recommendations were state-led roundabout education programs and inter-regional coordination efforts. The researchers also recommended improved information technology systems for program evaluation and a new emphasis on local evening and weekend service provision. Roundabout education programs would address the most commonly cited concern with driving, while improved inter-regional coordination and expanded evening and weekend service would address some of the most frequently named challenges with public and specialized transit. With enhanced information technology systems, WisDOT can better evaluate the effectiveness of these recommendations and establish an evidence-based model for ameliorating the most salient issues. This paper details the survey data collected, the recommendations presented, best practices findings, and other observations.

California DMV: Supporting and Improving Relationships with Constituents

Linda Louise Hill, Charles Fenner, and Jill Rybar

Older driver safety requires a multidisciplinary approach, including the DMV, physicians, law enforcement and the general public. The DMV and UC San Diego collaborate to improve the communication between the DMV and the other constituents. California is unique in having a Senior Driver Ombudsman Program (SDOP) that helps senior drivers negotiate the DMV process. Since its inception in 2006, 9,000 persons utilize the services each year. California is one of nine states with mandated reporting laws; physicians are required to report lapses of consciousness, including dementia. In California, with 98,816 physicians and 4.1 million persons over 65, DMV communications suggest the number of impaired drivers referred from physicians is a fraction of those who require reporting. Since 2009, over 900 physicians have been trained by this group on age-related driving disorders, including reporting requirements. In physician surveys, only 42% responded that they had reported patients with seizures to the DMV in the last year, but 26% had never done so, and only 31% reported dementia in the last year, and 46% had never done so. Post-training, 93.8% agreed or strongly agreed they had a better understanding of California's mandatory reporting laws and 72% indicated support for the laws. Law enforcement officers in CA also have a

mechanism to report impaired drivers to the DMV, but have cited barriers to do so. Since 2011, this group has trained over 150 officers on the recognition of impaired drivers and referral of drivers for re-examination. Post training, 96% of officers' state they are likely or very likely to use the "Notice of Priority Re-examination of Driver" if they suspect impairment. California's proactive model has been shown to improve the relationship and function of the DMV with their three major constituents, resulting in improved outcomes for both the individual citizen and the public safety.

The Experience Age: Medical Record Review of Outcomes from the Adaptive Driving Program

Nahom Minassie Beyene, Amy Lane, and Rosemarie Cooper

Driver license renewal has life altering consequences if denied to an experienced driver. In the balance between age-based license renewal and mandatory physician reporting laws, the impact to older drivers is a critical factor to consider as we promote policy recommendations for society. Driver safety expectations should be the same among drivers in general while performance might be allowed to vary according to the demands of routine travel needs. This study presents the findings of a medical record review from the 2009 client base (N=132) of the Adaptive Driving Program. Within four age group classifications (Explore – 16 to 34, Excel – 35 -54, Endure, 55 – 74, Exist, 75 and above), results showed comparative shifts in outcomes among clients interested in resuming or beginning driving. Demographics at intake, on road evaluation findings, and case recommendations were compared in order to track factors by age group when leading to driver cessation or barriers to licensure. Conclusions from the study present opportunities for emerging intelligent transportation systems (ITS) safety features in vehicle to enhance driver rehabilitation program models beyond the clinical setting, with potential policy considerations that could strengthen the decision pathway for driver licensure.

Thursday, September 1st

Plenary Session 6: 8:30 a.m. - 10:30 a.m.

Drivers in Their 60s, 70s and Older: Analyses of FARS and GES Data

Kathy J. Sifrit, Jane Stutts, Carol Martell, and Loren Staplin

Analyses of National Highway Traffic Safety Administration's fatal and police reported crash data from 2002 – 2006 revealed characteristics associated with older drivers' crashes. Analyses of two-vehicle crash data within the FARS and GES databases provided ratios of the likelihood that a given characteristic played a role in the crashes of drivers of various age cohorts (<20 to 80+, segregated in 10-year cohorts). The ratios reflect exposure-adjusted relative crash involvement and support comparisons between individual age cohorts and overall. The FARS analyses showed that under most conditions drivers in their 60s exhibited crash involvement characteristics similar to those of drivers in their 30s, 40s and 50s. Those in their 70s were about twice as likely as all drivers to have been assigned driver related factors (e.g., failure to yield), and those 80 and older were about four times more likely. Analyses of police reported crash data showed a more moderate effect of age, with drivers in their 60s again performing similarly to drivers in their 30s, 40s and 50s, while those in their 70s were only slightly more likely to have been assigned critical pre-crash events than all drivers. Drivers 80 and older had a two-fold elevation in critical pre-crash events as compared to all drivers. Older drivers were particularly at risk at intersections controlled by yield or stop signs, which require drivers to judge when to enter or cross oncoming traffic. Signalized intersections, which only require the driver to attend and respond appropriately to a light, appeared to be protective, particularly for the oldest drivers.

In addition to the information associated with the above publications, Ms. Lynott will present data that shows interesting gender differences in travel, in particular the impact of rising licensing rates among women and declining rates among men, as well as gender differences across the lifespan.

The Licensing and Safety of Older Drivers in Britain

Christopher G B (Kit) Mitchell

Driving license holding in Britain is increasing for older people, particularly older women. License holding by men aged 40 to 69 has saturated at about 90 per cent, and for women aged 40 to 49 at about 78 per cent. Drivers begin to surrender licenses after age 70. By age 80, 8 per cent of women who held a license at age 70 have surrendered it, as have 5 per cent of men. By age 90, 43 per cent of women and 25 per cent of men who had held a license at 70 have surrendered their licenses.

The paper will show trends in the numbers of car drivers of different ages killed and injured in accidents since 1975 and the fatality and casualty rates per population and per driver. The safety of older drivers is improving at least as rapidly as that of younger age groups. It then uses demographic projections and the trends in casualty rates to project the numbers of fatalities and injuries for drivers of different ages in Britain. This shows that fatalities among drivers aged under 30 are likely to continue to outnumber those for drivers aged over 70. There are significant safety differences between male and female drivers.

In Britain, the number of car driver fatalities aged 70 and over was highest between 1990 and 2004, and has subsequently reduced by almost 40 per cent. For drivers aged 80 and over, the peak was in 2004 and the number has subsequently reduced by almost 50 per cent. Fatality rates for older road users are increased by the fragility of older persons, which is shown for men and women separately. This disguises the fact that the accident involvement rate for older drivers does not increase with age until after age 75.

Transportation and Health Care Use for Older Adults in Rural and Small Urban Areas

Jeremy Wade Mattson

Transportation is a vital issue for access to health care, especially in rural areas where travel distances are great and access to alternative modes such as transit is less prevalent. This study estimates the impacts of transportation and geography on utilization of health care services for older adults in rural and small urban areas. Using data collected from a survey, a model was developed based on the Health Behavior Model that considered transportation and distance as factors that could enable or impede health care use. A random sample of individuals aged 60 or older living in North Dakota, South Dakota, Montana, and Wyoming was surveyed by mail. With a response rate of 20%, responses were received from 543 individuals. An ordered probit model was used to estimate trip frequency, and a binary probit model was used to estimate the likelihood that an individual would miss or delay a health care trip. Distance and transportation variables were not found to significantly influence the total number of routine or chronic care trips made overall, while emergency care visits were impacted by transportation options. However, additional results showed that those who cannot drive make more trips if someone else in the household can drive; distance and access to transportation impact the likelihood that someone will miss or delay a trip; and difficulty reported in making trips is significantly affected by distance and transportation options. The greatest problems for people using public transportation for health care trips is inconvenient schedules, the need to match transit and medical schedules, and infrequent service. Additional analysis is conducted to estimate differences between those in the 60-74 age group versus those aged 75 or older. Results have important policy implications regarding how transportation resources should be allocated to meet the needs of older adults.

Systematic Assessment of Elderly Persons' Ability to Drive: Are Policies Evidence-Based?

Louis-Rachid Salmi , Sandy Leproust, Catherine Helmer and Emmanuel Lagarde

Background: Because policies on systematic assessment of unsafe driving due to ageing have public health relevance, their usefulness should be judged using criteria usually applied to screening for disease. Using criteria suitable to judge the opportunity of screening for unsafe driving, we assessed whether current policies in the USA, Canada, Australia, and the European Union, were justified by evidence that they can effectively improve road safety.

Methods: According to World Health Organization, and our adaptation (Leproust et al. BMC Public Health. 2008;8:27), a policy recommending a systematic assessment of unsafe driving in the elderly should document: 1) the magnitude of the problem of road safety related to inability to drive in the elderly; 2) the average length of the unsafe driving period; 3) the reliability and accuracy of procedures used to test for unsafe driving; 4) the efficacy of early interventions proposed to elderly drivers diagnosed unsafe; 5) the fact that the policy can result in more good than harm; and 6) the acceptability of needed resources to implement the policy. These criteria were applied to background texts used to justify existing policies.

Results: Most states, provinces and countries have policies based on minimal medical norms, specified in general terms or applied to specific disorders. Background documentation systematically lacks argumentations based on scientific evidence. Whenever some scientific documentation exists, for instance in the US consensus statement on dementia, none of the criteria are fully discussed nor documented.

Conclusion: Current policies are not evidence-based; their effectiveness remains to be demonstrated.

Safe Multi-Modal Travel for Older Adults: Adopting Effective Complete Streets Policies

Barbara McCann and Jana Lynott

America needs streets designed to be safe and convenient for travel by automobile, foot, bicycle and transit regardless of age or ability. As the nation ages, Complete Streets policies present an opportunity to increase the safety and availability of older adults' travel options. Complete Streets policies require

transportation professionals to include the needs of all users, of all ages and abilities, when planning, designing, constructing, operating, or maintaining community streets.

This presentation will focus on the link between older adults and the value of Complete Streets policies, drawing from recommendations from the recently released Complete Streets Policy Analysis 2010: A Story of Growing Strength. This report updates the policy analysis information available in the AARP Public Policy Institute's Complete Streets for an Aging America.

As the first step in ensuring all users are accommodated on our streets, well-written Complete Streets policies are vital to ensuring change on the ground. Based on Complete Streets Policy Analysis 2010, we will discuss best practices in policy writing, with examples from cities, states, and regions across the country. We will also discuss how to best implement the vision of a Complete Streets policy so that older adults are a routine part of transportation planning and design. Complete Streets for an Aging America names three basic principles: to slow down, take it easy, and enjoy the view. We will discuss each and how to balance the sometimes competing needs of multiple users.

The Impact of Urban Form on Older Adults: Neighborhood Design and Baby Boomers' Local Behavior
Jae Seung Lee, P. Christopher Zegras, and Eran Ben-Joseph

The aging of the baby boom generation in the United States has socio-spatial implications, related to residential and lifestyle choices and their impact on well-being and healthy aging. As baby boomers enter retirement age, experiencing social and physical changes, urban spatial patterns exert greater influence on their well-being. The research attempts to reveal how urban form affects baby boomers' local travel behavior and social interactions. Specifically, the research objectives include: (1) identifying latent psychological constructs that influence baby boomers' residential choice procedures, in order to shed light on their underlying desires related to residential environments, and (2) assessing the causal impact of neighborhood-level urban form and spatial patterns of crime and traffic accidents on baby boomers' travel/social behavior, based on individuals' approximate residential location. Toward these ends, the research strives to answer two questions: (1) what are the spatial patterns of baby boomers' demographic and latent psychological characteristics? and (2) do neighborhood characteristics causally affect baby boomers' travel behavior? The empirical evidence is drawn from urban neighborhoods in Boston. A mail-back survey collected data on 55-to-65-years old residents' travel and social behavior, travel attitudes, residential preferences, perceptions of environmental qualities, and levels of residential satisfaction. The research objectively measures local urban form and spatial distribution of individuals and destinations at a highly disaggregated level, based on each individual's residential location. The broader aim of this study is to improve neighborhood environments, so as to promote older adults' sustainable mobility (e.g., non-motorized and public transportation), as well as active and safe aging (e.g., physical and social activity promotion with less threat of crime and traffic accidents). The project will benefit society by identifying urban planning/design and transport policy interventions that will help municipalities, service organizations, and real estate developers to improve residential environments and provide more aging-friendly residential options.

POSTERS

A Critical Review of Evidence on Meanings, Decision Making & Quality of Life Outcomes of Driving Retirement for Older Adults

Faranak Aminzadeh

Background: In today's car culture, transportation has become vital to individual well-being. Thus, driving retirement is increasingly recognized as an important late life transition. Objective: To synthesize the

evidence on the meanings, decision making processes, quality of life outcomes, and coping responses of older persons to driving retirement. Methods: Relevant papers were identified by an English language search of Medline, Embase, Cinahl, Ageline, and Current Contents 2000 to 2010. This search was supplemented with literature from reference sections of the retrieved publications, relevant books and grey literature. Results: Literature points to the profound practical and symbolic meanings of driving for older persons. Driving has been associated with: a) a sense of autonomy, self-reliance, competency, and self-worth, b) spontaneity, convenience, and freedom of action, c) socialization, sense of belonging, and connection with community, and d) more positive psychosocial outlook towards life. The findings pertinent to the self-regulatory behaviours of older persons, the key referents influencing their driving decisions, the perceived barriers to having constructive dialogue with health care professionals will be discussed. Conclusion: The complex interaction of many demographic, biographic, clinical and social factors determine driving behaviours and decisions of older persons. Thus, the approach to enhance driving decisions and promote safe mobility in later life should be comprehensive, integrated and balanced. Based on the results, strategies to promote a proactive and enabling approach to will be discussed.

Engaging Older Adults in Safe and Active Transportation and Mobility Policymaking

Rhianna Babka and Wendy Alfsen

As the population ages, more and more older adults will become non-drivers, and many will walk for both transportation and physical activity. Walking is a sustainable and healthy transportation option, and increasing the safe mobility of older pedestrians is beneficial for all ages. Unfortunately, walking is not always safe, especially for older adults. In the US, persons 65 years of age and older have the highest pedestrian fatality rate than any other age group, with 803 fatalities and serious 9,000 injuries (2008). In addition, falls are the leading cause of injury death for older adults, and it is estimated that in 2007 over 18,000 older adults died from falls (CDC). Improving the pedestrian environment can help mitigate pedestrian-auto related injuries and fatalities as well as falls from inadequate/unmaintained pedestrian facilities that contribute to functional decline and death among older adults.

California WALKS is working with communities throughout California to directly engage older adults as effective community advocates to improve their environment and increase the walkability of their communities through active transportation policymaking activities. This presentation will highlight case studies from work in Alhambra and Oakland, California.

We will discuss successful strategies employed to engage older adults (initial and continued engagement). Specific strategies include workshops, political support, media involvement, existing conditions - pedestrian and vehicle volume and other health data collection, Video Voice, civic engagement and policy advocacy. We will provide an overview of the two communities, outcomes, and lessons learned in working with the older adult population.

Learning Objectives:

1. Demonstrate elements of conducting a community older adult pedestrian safety engagement workshop.
2. Identify lessons learned, understanding of local challenges and local action priorities in community-based older adult walkability work.
3. Identify strategies for a successful older adult pedestrian/walkability action plan in other communities.

Older Adults and Safe Mobility: A Market Segmentation Perspective

Ann M. Dellinger, Moshe Engelberg, Heidi Keller, and Rebecca B. Naumann

Objectives: The purpose of this study was to develop a framework that would facilitate a richer understanding of older adult mobility in America and guide future research. Methods: We conducted expert

interviews, reviewed the literature, and identified the main variables and influences that may affect safe mobility. Using an interdisciplinary approach that included marketing science theory, we created hypothetical profiles and a market segmentation scheme based on age, health, safety, travel environment, income, driving ability, and social support.

Results: Eight segmentation profiles were established. Differences can describe a person's mobility status and where they lie on a mobility continuum. For example, the mobility level of a person who has some physical impairments, lives in a less safe travel environment (e.g., no sidewalks, poor lane markings), but has income adequate to overcome these mobility barriers by owning a newer car with the latest technology (e.g., collision warning systems) differs from another person who lives on a fixed income, owns an older car, but lives in a "safer" neighborhood that has sidewalks, traffic calming, and safe and convenient public transportation options.

Discussion: Market segmentation involves clustering populations into homogeneous groups based not only on demographics but also on lifestyle and personal values and helps inform decisions related to tailoring research and interventions to specific target populations. This study provides a hypothetical framework to more broadly examine and understand the factors that affect older adult mobility and the different "segments" of mobility. Future efforts will build off this work to test and refine the framework and segmentation scheme and to develop an Older Adult Mobility Tool, which will link mobility domains together and empower individuals with a way to improve their mobility.

Impacts of Activity Attributes on Elderly Safety, Health and Lifestyle

Behzed Karimi, Taha Hossein Rashidi, Anam Ardeshiri and Abolfazl Mohammadian

Several studies have described the baby-boom generation's socio-demographic attributes. Nonetheless, it is not easy to find detailed analyses discussing different travel behavior aspects of this generation. Over 80% of all Americans will have a driver's license by 2020, including more than 95% of retired men and 60-90% of retired women. These people will likely continue to drive at pre-retirement levels, since studies have shown that people tend to maintain their travel behavior even after lifecycle changes. Therefore, society is likely to observe a mutation in the intra-city travel behavior of elderly and non-elderly citizens as a result of considerable socio-demographic changes in near future. This mutation necessitates immediate attention and an attempt to reverse the over-reliance on driving.

To counter the lack of sufficient research on the study of intra-city travel behavior of seniors during the next couple of decades, this paper presents a detailed descriptive analysis on activity generation, the planning and scheduling behaviors of seniors and non-seniors. A GPS-based prompted recall activity-travel survey, which collected data for a year in the Chicago region, is utilized in this paper. This disaggregate survey enables us to distinguish the preferences and flexibilities of seniors in daily activities. Furthermore, by comparing the activity attributes of elderly versus non-elderly people, travel behavior changes over time and in senescence is carefully analyzed. This study focuses on a diverse set of activities including: work, school, personal, religious, healthcare, services, errands, discretionary, and shopping. For these activity types, activity duration, time-of-day and planning horizon for the elderly and non-elderly are studied, analyzed and discussed. Based on the findings of this paper, the question of how much elderly safety and health are affected by their activity attributes, is addressed. Moreover, it is discussed in this paper how and to what extent seniors contribute to air pollution and congestion of large metropolitan areas.

Analysis of Highway Safety for Elders in Tanzania: A Case study of TANZAM Highway (Kibaha – Chalinze Section)

Doreen Clemence Kobelo, Salome Kitinya, and Judith Mwakalonge

Roadway safety in Tanzania has continued to degrade despite of numerous efforts made by the government and transportation agencies to make them safer. The causes and contributing factors to unsafe

roadways span from roadway design deficiencies, road user behavior, and enforcement. For example, majority of major highways are undivided two-lane without overtaking/passing lanes resulting in frequent head-on fatal collisions. Furthermore, most highways pass through urban and rural areas with high volume of pedestrians, bicyclist, and animals without pedestrian crossing marking. Importantly, even those with pedestrian crossing marking, most drivers do not yield to pedestrian and instead pedestrian yield to motorists. This causes numerous fatal collisions between pedestrians and motorists and creates difficult conditions especially for older people to cross a highway and/or share with other motorists. The objective of this study is to analyze the causes and contributing factors affecting safety of the road users particularly older people along major highways in Tanzania. To accomplish this objective, a 70km (43.5 miles) section of the TANZAM (Tanzania-Zambia) highway will be used as a case study. This section is a paved, two-lane undivided highway and is one of the highest traffic carrying roads in Tanzania. The highway carries most of the traffic from the business city Dar-es-Salaam to other 24 regions in the country. Additionally, this highway connects the Dar-es-Salaam port to neighboring countries namely Congo, Rwanda Burundi, Malawi and Zambia. The study will analyze in detail critical issues related to road user characteristics, roadway characteristics, traffic characteristics, and enforcement. Data used in this study include traffic crashes, roadway conditions, and road users' questionnaire. The results of this case study will provide an insight on the causes and contributing factors on highway safety for older people. To that end, the results will assist policy makers and transportation agencies in evaluating proposed short-term and long-term strategies, policies, and interventions/countermeasures to improve highway safety.

Older Adults in Motor Vehicle Crashes: Does Pre-Injury Morbidity Differ in Drivers, Pedestrians, and Passengers?

Kelly D. Lloyd, Mona Baumgarten, and Gordon S. Smith

Motor vehicle crashes (MVC) are the second most frequent cause of injury-related death in adults age 65 and over. It is unknown if the prevalence of pre-injury morbidity differs by whether the victim was a driver, pedestrian, or passenger. We hypothesized that, among older adults involved in MVC, drivers would have fewer pre-injury medical conditions than pedestrians or passengers. We examined trauma registry data for patients age ≥ 65 admitted to a large level I trauma center between 2000 and 2009 (n=1458). Average age (\pm standard deviation) was 75.1 \pm 7.1 years; 48.1% were female, 81.8% were Caucasian, and 86.0% had one or more medical conditions listed in their record. The median number of conditions was 2 for each group (drivers, passengers, and pedestrians). The prevalence of hypertension (53.1%), cardiovascular disease (21.6%), diabetes (17.0%), cancer (8.2%), respiratory disease (6.5%), neurological disease (4.4%), and mental illness (4.1%) did not differ significantly between drivers, pedestrians, and passengers. Drivers, pedestrians, and passengers had significant differences in the prevalence of drug addiction (0.9%, 0.6%, 0.0%, respectively), gastro-intestinal disease (1.3%, 1.8%, 2.2%, respectively), HIV (0.1%, 4.0%, 0.0%, respectively), and renal disease (0.7%, 0.0%, 1.6%, respectively). In-hospital mortality did not differ by MVC involvement (11.7% of all patients injured in MVC died in-hospital). These results suggest that injured older drivers do not appear to be more or less healthy than pedestrians or passengers, as indicated by the number of comorbidities. Despite the significant differences between the three groups in the prevalence of drug addiction, gastro-intestinal disease, HIV, and renal disease, the differences were small and the overall prevalence of these conditions was low. Although underlying medical conditions are important determinants of complications and poor long-term recovery in older patients seriously injured in MVC, this study suggests the frequency of comorbid conditions does not differ by type of MVC involvement.

Policy Considerations for Ensuring Personal Mobility in a Region with Limited Opportunities for Mass Transit

Richard Perrin

Like many other areas in the U.S., the Genesee-Finger Lakes Region is predominantly car-based. This reflects the region's highly dispersed settlement pattern, with one major city (Rochester), many smaller urban centers, and dispersed residential suburbs. The region covers nine counties and 4,000 square miles. About three-quarters of region's 1.2 million residents live on less than 10 percent of the region's land area in Rochester and its immediate suburbs.

Suburban and rural areas are experiencing the region's fastest growth in elderly and low-income populations, and the provision of public transportation to these areas is a challenge. The Genesee Transportation Council is engaged in integrated transportation planning that aims to increase access for everyone to affordable, convenient transportation by promoting an unconventional — but potentially very powerful — policy framework based on universal design, car-sharing services, and the legalization of private jitneys in New York State.

Imputation of a Motor Vehicle Collision to an Elderly Driver's Health Status: A Bayesian Approach

Louis-Rachid Salmi and Catherine Helmer

Background: Many factors can potentially explain the occurrence of motor-vehicle collisions in elderly drivers. Imputation of a collision to specific disorders, therefore, is difficult. A method based on the Bayes theorem is proposed to assess the role of a disorder in the occurrence of a collision.

Methods: In epidemiology, causality assessment deals with four types of persons defined by exposure (health status) and the occurrence of a collision. We linked this epidemiological approach to imputation, which only considers persons who have both a disorder and have been involved in a collision. Based on methods previously developed in occupational and pharmaco-epidemiology, imputation was formulated using Bayes theorem, relating epidemiological knowledge on causes, a patient's history, and the posterior odds that the collision was caused by the disorder. Data needed to apply the bayesian method include relative risks for different causes, frequency of the disorder in the population of elderly drivers, and the frequency of a positive relevant characteristic in elderly drivers with no disorder. Illustrations are proposed using published data and hypothetical cases.

Results: Identified relevant characteristics include characteristics of the disorder, social and psychological variables, occupation and leisure activities, age and gender. Cases illustrate that the bayesian approach allows switching from major uncertainty to ruling in or out easily a causal relationship between a disorder and a collision.

Conclusion: As in other fields of application, the bayesian approach to imputation could become a powerful tool for experts involved in litigation of motor-vehicle related injuries; full application of the method will require more epidemiological documentation of relevant data.

Aging in Place for Vulnerable Older Adults: The Importance of Access to Transportation

Lorilei Michaud Richardson, Chae Man Lee, and Elizabeth Dugan

Objective: After attending this session participants will be able to describe the views about aging in place held by a sample of older adults.

Objective2: After attending this session participants will be able to describe the role of access to transportation (e.g., driving, transit, other) to aging in place.

Most adults hope to age in place. Yet few have considered the home modifications or possible services needed to achieve this goal. Driving cessation is a transition that may impact the feasibility and safety of aging in place. Barriers to transportation put older adults at a greater risk for nursing home placement and dependency.

The objective of this study was to explore preferences and expectations related to aging in place and to understand the role that transportation plays.

The sample for this study includes N=414 vulnerable older adults age 75 and over (Ages 75-84 n=331, Ages 85 and older n=83). The sample includes 286 women and 128 men,

The data are from the Community Partnerships for Older Adults (CPFOA) Program Survey of Older Adults (2008), an initiative of the Robert Wood Johnson Foundation aimed at promoting improvements in the organization and delivery of long-term care and supportive services for older adults. The study surveyed adults regarding supportive and long-term care services for older adults.

Desire to age in place, expectation to age in place, demographic variables (e.g., age, gender, family proximity), health variables, and service variables were all explored.

Nearly all (96%) participants expected to stay in their communities and 84% said it was important to remain in their home. Most frequently, transportation was reported as a change needed to make the community more senior friendly. A significant relationship ($p < 0.05$) was found between expectation to live in their communities in the next five years and availability of transportation.

Ride or Relocate

Del Peterson

The American population continues to mature with an impending 'aging tsunami' just a few years away. It is projected that by 2030, more than 1 in 5 Americans will be sixty-five years of age or older. Public transportation provides freedom to much of the aging population who would otherwise be forced to give up their lifestyles.

The objective of this research was to quantify the cost of living at home and riding transit in North Dakota versus relocating to an assisted living facility. Special attention was paid to three different home living situations including homeowners with and without mortgages as well as apartment dwellers. The point at which those living at home should consider a move to assisted living was another objective considered in this study.

Overall, simulation results indicated that the cost of assisted living was almost always higher than the other three alternatives. Homeowners without mortgages had the lowest costs followed by apartment dwellers and homeowners with mortgages. Without a monthly mortgage payment to make, homeowners were in the best position to remain in their current location and ride public transit. They were also gaining equity in their home that was making them money every month. Homeowners with mortgages also increased the equity in their homes monthly, but at a lesser level due to the fact they did not own the entire property. Apartment dwellers gained no equity by remaining in their living situation, but had lower overall costs compared to both categories of homeowners. Finally, although cost is important, every senior's situation is unique and other factors such as amenities and safety may contribute more to quality of life and peace of mind for them and their families.

Addressing Older Pedestrian Injuries in a Community Context

Nancy C. Pullen-Seufert, Lauren M. Marchetti, and Seth Lajeunesse

Whether using transit, getting from a store through a parking lot or walking from home to a destination, older adults are at risk of injury or death as pedestrians. Older pedestrians are disproportionately represented in pedestrian deaths (NHTSA, 2011). However, walking can serve as an important transportation mode and as a source for maintaining or improving health status. Therefore, addressing older pedestrian safety issues in a community context is timely and critical. The UNC Highway Safety Research Center, through a project for the National Highway Traffic Safety Administration, developed and evaluated a community-based workshop to convene stakeholders including public works, transportation

engineers, law enforcement, public health, older adults, aging services and others, to improve walking conditions for older adults and ultimately decrease injuries.

The presentation will provide a brief overview of the workshop, a description of the evaluation that examined individual, organizational and community changes, and findings based on approximately 45 workshop deliveries at twelve demonstration sites. Preliminary results reveal that older participants increased knowledge regarding critical safety behaviors, and professional participants significantly enhanced their stated motivation to improve walking conditions for older pedestrians. Final results including content analysis of demonstration site interviews to assess workshop-related organizational- and community-level changes will be presented. The workshop materials and instructor training are freely available for use at <http://www.rsa.unc.edu/psw/> and early results appear to indicate that it can help motivate communities to take action to improve safety and walking opportunities for older adults. These outcomes are vitally important to make it possible for individuals to age in place with the best quality of life possible.

Training and Licensing of Senior Drivers

Thomas N. Tsai

The current changing demographics produced much debate on immigration reform and related state regulations over the last few years. One issue raised in some states is whether undocumented aliens should be granted the privilege of driving. Often lost in the debate was if states should provide proper driver training to older novice drivers (between 30 and 60 years old)--a segment of the population comprising a large part of undocumented aliens and legal immigrants. On the other hand, safety practitioners have known for a long time that changes in the training and licensing methods are needed to meet the needs of this large and fast increasing group.

Previous researches have included many studies on the training of young novice drivers and the special needs of some older drivers. However, these studies understandably assume that most drivers learn driving in their youth and older drivers, having had such early training, already know how to drive.

Regrettably, none of the studies have focused on the special needs of older adults who first learn to drive at the ages of 30 and above. Also, most of those adults were born abroad with little exposure of our culture.

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This paper analyzes issues involved in teaching mostly older immigrants, majority of them are women and aged 30 and older, deficient in oral English-speaking skills, how to drive. It is based on 20 years of on-the-road experience of driver training in Maryland, Virginia, and the District of Columbia. The issues of age, unfamiliarity with local culture and language, mental stress, and practicing without proper supervision will be included. In addition, experience gained in helping senior adults to renew their driver license will also be discussed. As a part of this study, this paper suggests several changes to the training and licensing of senior drivers for a possible national uniform assessment method.