The Rural Elderly: Driving Patterns and Accident Involvement

Eric D. Hildebrand, Ph.D., P.Eng.
Benjamin Myrick, B.S.
Tanya Creed, B.Sc.E.

University of New Brunswick
Transportation Group
Fredericton, N.B.
Canada

1.0 Introduction

There have been a number of studies which explore accident rates and characteristics of elderly drivers as a whole, but there has been little research into the accident characteristics and travel needs of the rural elderly. This group is delineated since they have few transportation alternatives and would be most adversely affected by imposed restrictions on licensing. Several jurisdictions either have or are considering implementing relicensing/retesting programs for the elderly (CCMTA, 1999).

This paper focusses on the characteristics of rural drivers over the age of 65 in New Brunswick. This group of drivers is examined on the basis of driving patterns and accident rates. This paper's premise assumes that significant differences exist between those who reside in rural versus urban areas. Comparisons are made with younger rural drivers and urban drivers in the same age groups.

2.0 Background

In the near future, demographic trends in the Canadian population will result in significant increases in the numbers and proportion of elderly people. Statistics Canada projects that the number of Canadians age 65 and over will increase from 3.8 million to 7.8 million by 2026 (2000). The corresponding percentage of the population age 65 and over will increase from 12.4 percent to 21.4 percent in 2026.

Future elderly populations are also likely to include higher percentages of licensed drivers. The main reasons for this include cohort effects of greater percentages of licensed females, and a more car-dependent, suburbanized population. There are also indications that future elderly populations will be more dependent on driving and less likely to self-impose restrictions on their driving (Zhou 1997).

During the aging process, numerous physiological and psychological changes occur which impair a person's ability to drive safely. Vision is the most important sense used in driving. Aging drivers are likely to experience losses in acuity, depth perception, light intensity, glare recovery time, and field of vision. These changes make it particularly difficult for older motorists to drive at night. Loss of hearing and range of motion are also likely the be problems for older drivers. A loss in musculature also results in a greater probability of injury or death when the elderly are involved in accidents (Evans 1991).

As a result of psychological changes elderly people have a reduced capacity to process multiple stimuli. The elderly also tend to make decisions more slowly, which can seriously inhibit their ability the take emergency actions. Loss of memory is another characteristic of aging which can affect driving skills.

3.0 Study Scope

Data for this study came from three sources. The first data set included 1342 responses from a 1988 University of New Brunswick (UNB) Transportation Group survey. This survey provided detailed information on the travel behaviour of New Brunswick drivers. Accident information was made available by the New Brunswick Department of Transportation (NBDOT) who provided files of accidents from 1997 and 1998. The NBDOT Motor Vehicle Branch contributed a list of all registered drivers in the province.

Using the date of birth from each data set, drivers were divided into five age categories. Younger drivers were considered those aged 16 to 25. Early middle-age included those 26 to 45 years, and late middle-

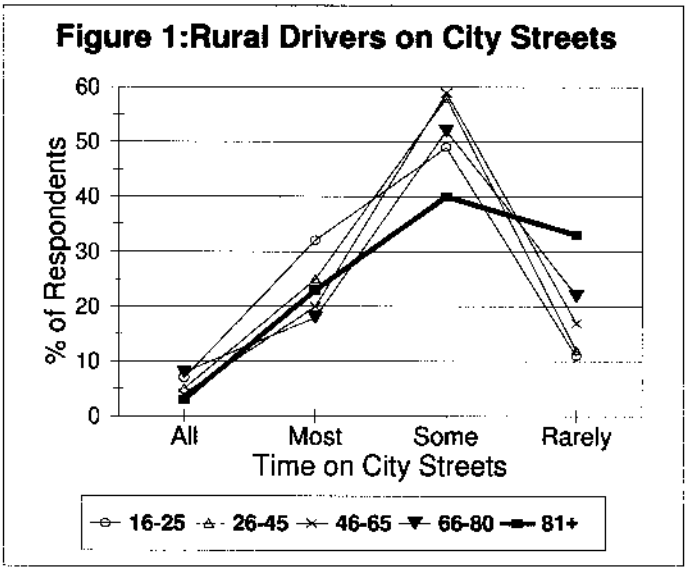
age covered ages 46 to 65. Although most studies define elderly drivers as those over 65, a fifth group was delineated for those over 80 to reflect dramatic changes in driving and accident patterns associated with the very old.

All of the data were divided into rural and urban categories based on postal code. The second character in a postal code is a number from "0" to "9". Codes with a "0" for this character indicate rural locations. Numbers from one to nine indicate urban locales of increasing size (Canada Post, 2000).

4.0 Driving Patterns of the Rural Elderly

In the first part of this study, the driving patterns of rural residents were compared for the five age groups. Drivers were compared by exposure to city driving, exposure to highway driving, time spent driving after dark, and most common times of day driven. All of the data for these comparisons came from the UNB Transportation group survey. The purpose of these comparisons is to identify changes related to aging and to gain insight into true exposure to the risk of an accident (beyond simple mileage estimates). Although all survey responses are subjective, the results do provide insight into changes related to aging.

The frequency of rural residents' use of *city* streets was compared for all age classes. The results are presented in Figure 1. The results show similar usage between all age groups except for those over 80 years. A disproportionately large percentage of very old drivers indicated that they rarely use city streets. Drivers in the 66 to 80 age group were also slightly less likely to drive on city streets. This suggests that elderly drivers are recognizing deterioration in their skills and restricting their exposure to city driving. This is supported by evidence that older drivers are involved in a disproportionate number of urban context collisions including failure to yield the right of way and improper turning, and less involved in single vehicle accidents involving speed (Taylor 1994). This indicates that aging drivers will face greater hazards on city streets.



Rural residents' use of *highways* showed trends similar to the previous comparison. Results are presented in Figure 2. Interestingly, elderly drivers indicated an even greater aversion to highway driving, than to city driving. Older drivers (66 to 80) were significantly less likely to respond that they use highways 'most of the time', but were only slightly more likely to 'rarely' use highways. This analysis also illustrates that elderly drivers are self-imposing restrictions on their driving. Those drivers aged 66-80 years appear to make some adjustments to their highway use, but their adjustments are minor compared to those over 80 years.

There were significant differences between age groups in their frequency of driving after dark. More than half of elderly drivers indicated that they 'seldom or never' drive after dark, and almost no drivers in these age groups indicated that they 'mostly or always' drive after dark. Elderly drivers were also less likely to drive after dark than older drivers. The results of this comparison are shown in Figure 3. Again, there are strong indications that elderly drivers are recognizing their limitations and adjusting their driving habits to compensate. In

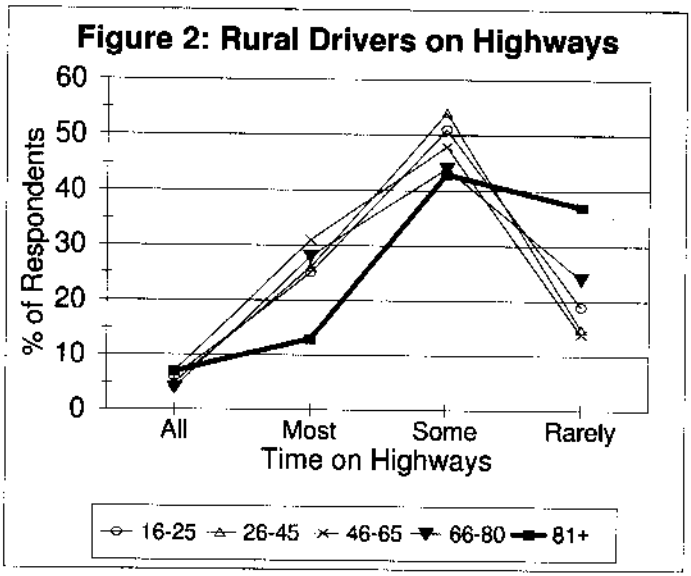


Figure 2: Rural Drivers on Highways
60
50
40
30
20
10
0
% of Respondents
All
Most
Some
Rarely
Time on Highways
16-25
26-45
46-65
66-80
81+

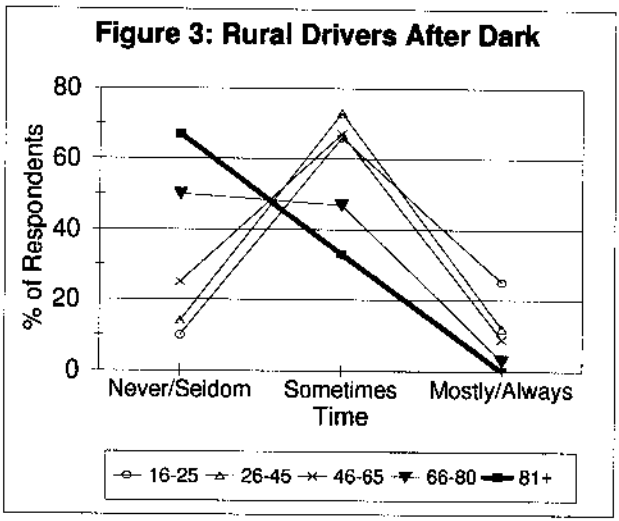
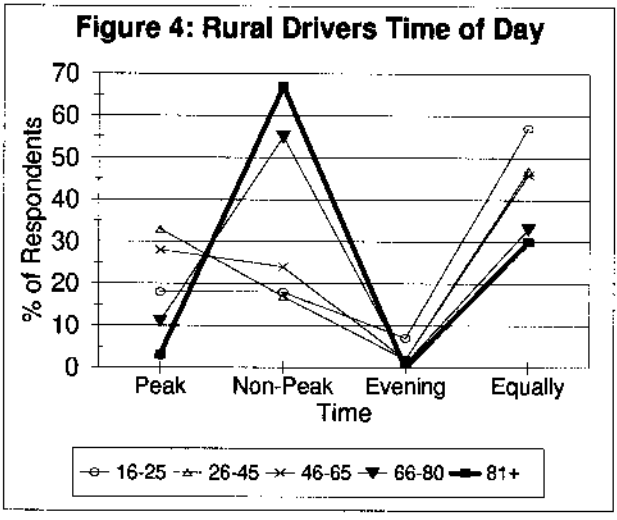


Figure 3: Rural Drivers After Dark
80
60
40
20
0
% of Respondents
Never/Seldom
Sometimes
Mostly/Always
Time
16-25
26-45
46-65
66-80
81+

the case of driving after dark, the age group 66-80 years differs from younger groups more significantly than in previous comparisons.

Figure 4 presents a comparison of the differing amounts of driving undertaken by each age group according to the time of day. Not unexpectedly, a majority of elderly drivers indicated that they drive primarily during off-peak periods. This may be largely a function of retirement rather than any conscious decisions made by drivers. By avoiding peak traffic, older and elderly drivers are also reducing their risks of collision. Despite this reduced risk, Taylor found that the distribution of accidents shift from single to multi-vehicle collisions as drivers age.



Based on the preceding comparisons, it is possible to draw some conclusions about how elderly rural drivers behave compared to other age groups. Older rural drivers do not demonstrate characteristics which are substantially different from younger age groups. The younger elderly group (66-80) of rural drivers are nearly as likely as younger drivers to venture onto urban streets and highways. They do

differ from younger age groups in that they are more likely to drive during daytime and non-peak hours. Both of these distinctions should work to offset risks caused by deterioration of driving skills.

The older elderly group (81+) of rural drivers differs substantially from all other age groups. They are less likely than other groups to expose themselves to city and highway driving. Substantial majorities of elderly drivers also avoid driving during peak hours and after dark. Clearly, there is a propensity among rural drivers to lower their exposure to difficult driving conditions. These results are consistent with surveys in which elderly drivers indicated increasing difficulties with intersections, turn movements, and vision after the age of 65 (Bishu, 1991).

5.0 Comparison of Travel Behaviour Between Rural and Urban Elderly Drivers

The driving behaviour of elderly rural drivers was compared with the behaviour of urban drivers in the same age groups. The purpose of this exercise was to identify any substantial differences between the rural and urban groups. Data for this part of the study came from the 1988 UNB Transportation Group driver survey.

In the first part of this analysis, rural driver exposure to city streets was compared to urban driver exposure to rural roads. The results for drivers aged 66-80 years are shown in Table 1A and for those over 80 in Table 1B. The survey data indicate that rural drivers in both age groups are more likely to drive on city streets than urban drivers are to drive on rural roads. This is probably caused by the greater need of rural drivers to use city-based services. Conversely, urban residents on aggregate likely have less need to travel into rural areas. This is shown by the relatively large percentages of urban drives who 'rarely' use rural roads. It is also noteworthy that a more significant pattern shift is shown between both elderly age groups for those living in rural areas versus urban.

Table 1A: Exposure to Classes of Roads Different Than Near Residence, 66-80 yrs.

	Percent of Respondents			
	All	Most	Some	Rarely
rural	8	18	52	22
urban	2	7	48	43

Table 1B: Exposure to Classes of Roads Different Than Near Residence, 81+ years

	Percent of Respondents			
	All	Most	Some	Rarely
rural	3	23	40	33
urban	0	14	45	41

The survey data were then used to compare rural and urban exposure to highway driving. The results are shown in Tables 2A and 2B. While both urban and rural elderly drivers show a decreased propensity to use highways with advancing age, the shift seems more prevalent among those living in rural areas.

Table 2A: Exposure to Highways, 66-80 years

	Percent of Respondents			
	All	Most	Some	Rarely
rural	4	28	44	24
urban	5	16	49	20

Table 2B: Exposure to Highways, 81+ years

	Percent of Respondents			
	All	Most	Some	Rarely
rural	7	13	43	37
urban	2	24	45	31

The next comparison documented in Tables 3A and 3B contrasted exposure to driving after dark among those living in urban versus rural areas. For both elderly age groups, rural drivers indicated that they are less likely to drive after dark than their urban counterparts. A possible explanation for this disparity is that urban drivers use mostly city streets which are often artificially illuminated, therefore alleviating some of the difficulties associated with driving after dark.

Table 3A: Driving After Dark, 66-80 years

	Percent of Respondents		
	Never/Seldom	Sometimes	Mostly/Always
rural	50	47	3
urban	41	55	4

Table 3B: Driving After Dark, 81+ years

	Percent of Respondents		
	Never/Seldom	Sometimes	Mostly/Always
rural	67	33	0
urban	58	34	7

The final comparison, summarized in Tables 4A and 4B, contrasted the times of day driven by rural and urban drivers. The data show that the rural and urban drivers aged 66-80 years distribute their driving almost identically. For elderly drivers over 80 years of age, both groups heavily concentrate their driving in non-peak hours. This increased use of non-peak hours is slightly more evident among those living in urban areas.

Table 4A: Peak Hour Exposure, 66-80 years

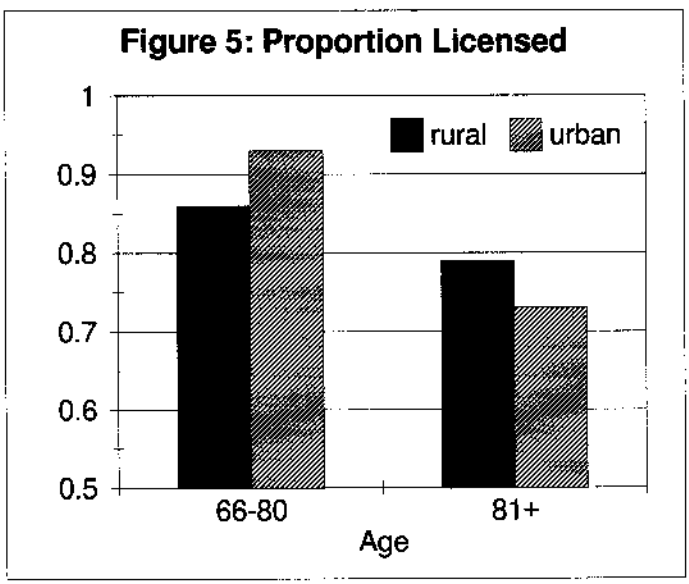
	Percent of Respondents		
	Peak	Non-Peak	Equally
rural	11	55	33
urban	11	52	37

Table 4B: Peak Hour Exposure, 81+ years

Percent of Respondents			
	Peak	Non-Peak	Equally
rural	3	67	30
urban	10	72	17

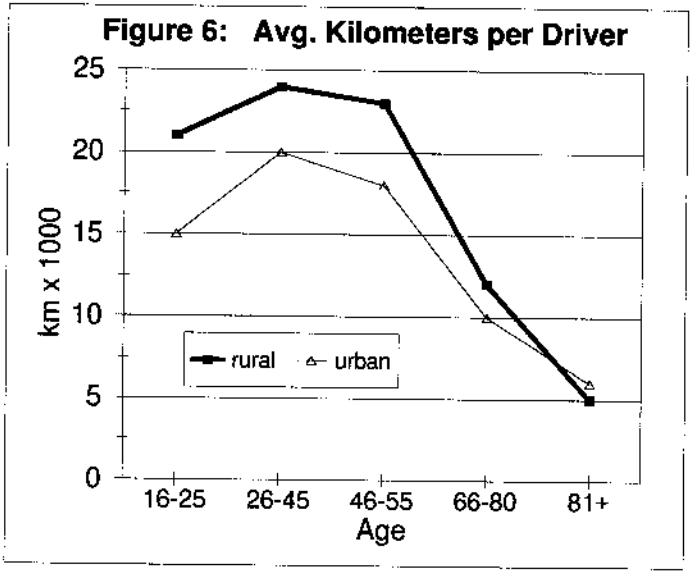
6.0 Rural Elderly Demand for Driving

An indication of the demand or need for driving among older rural drivers is the likelihood that drivers will relinquish their licences. This demand was estimated by comparing the proportion of rural (and urban) drivers to the total provincial population for each elderly age group. The results of this analysis are synthesized in Figure 5.



It is shown that the rate of attrition of licensed drivers is less for rural drivers compared to their urban counterparts. This implies that the rural elderly have a greater demand/need for driving than the urban elderly perhaps due, in part, to the lack of alternative transportation resources in rural areas.

Another indicator of demand for driving and exposure to the risk of an accident is the number of kilometres driven per year. Data from the survey were used to calculate the average distance driven by the rural and urban populations of each age group. The results are summarized in Figure 6.



Not unexpectedly, it was found that rural residents tend to drive greater distances overall than urban drivers. This is not surprising since rural residents must travel greater distances to reach services and workplaces. A significant finding was that among those over 80 years of age, it was shown that urban residents actually drive more than rural residents.

It is suggested that a number of factors contribute to the reduced amount of driving observed among the very old living in rural areas. In the absence of convenient transportation alternatives, rural residents are likely to be highly dependent on driving and were shown to retain their licences longer than their urban counterparts. It is not unreasonable to assume that this group compensates by driving even fewer annual kilometres despite the necessity for longer individual trips to access services. This means that the rural elderly make fewer total trips than the urban elderly. It would be interesting to understand whether they sacrifice participation in discretionary activities requiring travel (in favour of mandatory activities) as part of their compensation for decreased abilities. Hildebrand has demonstrated that engagement in all activities away from the home dramatically begins to decline beginning at about age 75, however, the proportion of mandatory activities (versus discretionary) remains constant (1998).

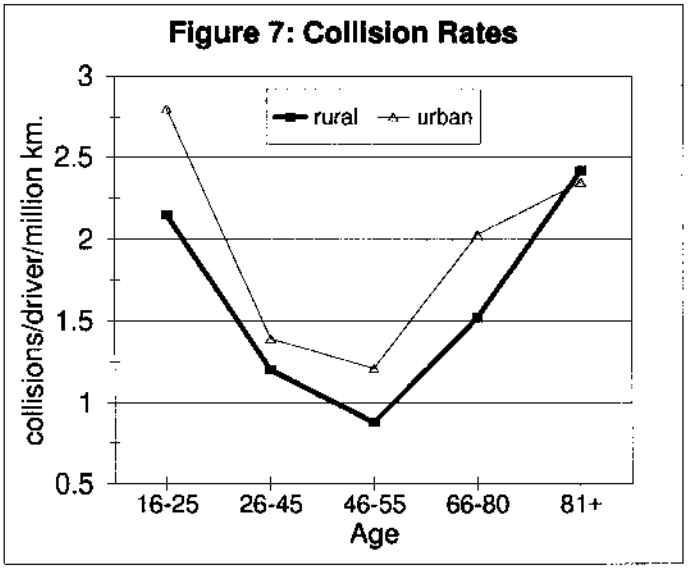
The relatively low average kilometres driven by the rural elderly in New Brunswick can be interpreted to mean that this group experiences unmet demand for mobility assuming their desire to access activities outside the home does not wain relative to their urban counterparts.

7.0 Safety of Older Rural Drivers

In order to provide an estimation of the safety of older rural drivers, accident rates per million kilometres were determined and contrasted with other age groups. The number of accidents for each age group was determined using the 1996 and 1997 accident files provided by NBDOT. Accidents were delineated for those residing in both rural and urban areas based on postal code, and into age groups based on

date of birth. The total numbers of drivers by age group used in determining the accident rate were extracted from the file of New Brunswick drivers provided by the NBDOT Motor Vehicle Branch. The average kilometres driven per year for each age group was estimated from the UNB Transportation Group survey results.

The resulting pair of "U" shaped curves is shown in Figure 7. The overall pattern closely resemble those of other studies including McKelvey (1988), TRB (1988) and NHTSA (1999). In the younger age group, the accident rate is high due to inexperience. The accident rate decreases through the middle age groups as driver experience increases. In the older age groups the accident rate increases due to a loss of driving skills caused by the aging process.



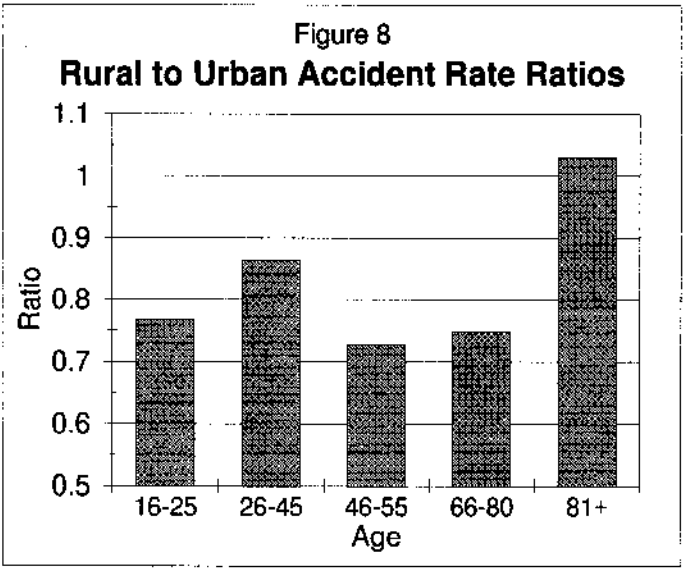
An important characteristic of these U- shaped curves is that all groups of rural drivers have lower accident rates than urban drivers. This is not surprising since those residing in urban areas are exposed to higher

traffic volumes and more vehicle conflict points resulting in increased risk levels. It is significant that the accident rates of rural versus urban drivers *converge* for those over 80 years of age. This is further evidence of a problem area associated with the mobility needs of this specific group.

To further explore the relationship of rural and urban drivers, the ratios of rural to urban accident rates were calculated. The results are shown in Figure 8.

The calculated ratios suggest that the accident rate for the rural elderly is higher than it should be. The ratio for all other age groups is between 0.73 and 0.85, however, for the elderly this ratio increases sharply to 1.03. Based on the rates of other rural drivers and urban drivers, one would expect the accident rate for the rural elderly to be around 1.70, not the observed value of 2.42.

Figure 8



There are some probable explanations why the rural elderly have a disproportionate number of accidents compared to the urban elderly. Previous findings suggest that a disproportionate percentage of very old rural drivers maintain their licenses relative to urban drivers. This means that it is likely that there are more drivers with significantly diminished skills among the rural elderly. Since the rural elderly drive fewer kilometres on average than the urban elderly, it is possible that they do not drive enough to keep their skills sharp. It should be noted that the accident rate for older drivers increases despite notably less exposure to peak traffic and driving after dark.

8.0 Conclusions

The behaviour and accident rates of older rural drivers are comparable to those of older urban drivers. As with other age groups, rural older drivers have a lower accident rate and drive farther than the corresponding urban age group. Compared to younger age groups, rural older drivers have a higher accident rate despite somewhat less exposure to hazardous conditions.

The behaviour of rural elderly drivers in New Brunswick suggests that they are substantially less likely than other age groups to expose themselves to unfamiliar and challenging driving conditions. Despite these precautions, the rural elderly have a higher accident rate than middle-aged groups and are disproportionately over-represented compared to their urban counterparts.

There are three significant trends which emerge when rural elderly drivers are compared to urban elderly drivers. First, the attrition rate of licensed drivers due to aging seems to lessen among those living in rural areas. Secondly, on average, the rural elderly drive fewer miles than the urban elderly. Finally, very old (81+ years) rural drivers were shown to have the highest accident rate, and were the only age group to exceed their urban counterparts. These trends suggest that the rural elderly are highly dependent on driving, but drive fewer miles than expected and have a disproportionately high accident rate.

References

Bishu, Ram. Foster, Betty. and McCoy, Patrick. 1991. *Driving Habits of the Elderly: A Survey.* in Proceedings of the Human Factors Society 35th Annual Meeting.

Canada Post. The Postal Code. Http://www.canadapost.ca/CPC2/addrm/pclookup/pcinfo.html, February 2, 2000.

Canadian Council of Motor Transport Administrators (CCMTA). 1999. National Maturing Driver Workshop, Ottawa, Oct. 22.

Evans, Leonard. 1991. *Older-Driver Risks to Themselves and to Other Road Users.* in Transportation Research Record, No. 1325. Transportation Research Board, Washington D.C.

Hildebrand, Eric. 1998. *An Activity-Based Travel Needs Model for the Elderly*, Ph.D. dissertation. University of Waterloo Department of Civil Engineering, Ontario, Canada.

McKelvey, Francis. Maleck, Thomas. Stamatiadas, Nikiforos. and Hardy, Daniel. 1988. *Highway Accidents and the Older Driver.* in Transportation Research Record, No. 1172. Transportation Research Board, Washington D.C.

NHTSA. 1999. Traffic Safety Facts 1999: Older Population. National Center for Statistics and Analysis. Washington D.C.

Taylor, William. Ahmad, Zubair. and Stamatiadis, Polychronis. 1994. *Profile of the Accident Prone Older Driver.* Journal of Advanced Transportation. Vol. 1, pp. 89-105.

TRB. 1988. Special Report 218. Vol. 1, Committee Report and Recommendations. Transportation in an Aging Society: Improving Mobility and Safety for Older Persons. National Research Council, Washington D.C.

Zhou, Min. and Lyles, Richard. 1997. *Mobility Patterns of the Next Generation of Older Persons.* in Transportation Research Record, No. 1573. T.R.B., Washington D.C.