

Older drivers—a complex public health issue

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Abstract

Objectives

This article provides estimates of the percentage of seniors who are licensed to operate a motor vehicle. It describes the health characteristics of these license holders and reviews research relating to older drivers.

Data sources

The data are from the cross-sectional file of Statistics Canada's 1996/97 National Population Health Survey. The sample size of respondents aged 65 or older was 13,363, weighted to represent 3.4 million individuals. Supplementary data are from the 1991 Survey of Ageing and Independence, also conducted by Statistics Canada, and from Transport Canada.

Analytical techniques

The percentages of seniors with a license were calculated by age and sex. Percentages by presence of chronic conditions, disabilities and medication use were age-standardized to control for the increasing prevalence of illness at older ages.

Main results

The percentage of seniors who had a driver's license declined with advancing age. The negative association between disability and license holding was pronounced. The percentage of seniors with a driver's license was also relatively low among those with heart disease, arthritis, stroke or cataracts, and among those who reported taking selected medications in the last month.

Keywords

automobile driving, traffic accidents, aging, automobile driver examination

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Driving is a complex task requiring the integration of visual, cognitive and motor skills. While old age itself is not a contraindication to driving, the increasing prevalence of chronic diseases with advancing age may make it hazardous for elderly people to get behind the wheel.¹ Previous research has indicated that when exposure is controlled, the risk of motor vehicle accidents among seniors tends to approach that for young people, who have the greatest risk.²⁻⁸ Other studies have found that crash rates for older drivers, especially those over 75, are higher than rates for all drivers and similar to those of very young drivers (aged 16 to 19).^{9,10}

The potential risk that older drivers face and impose on others is important, because the demographic profile of drivers will change dramatically over the next two decades.¹¹ This, in turn, could be expected to affect patterns of risk associated with driving.

In 1996/97, seniors (those aged 65 or older) numbered 3.4 million and represented 12% of the Canadian population. By 2016, this group is projected to number 5.9 million or almost 16% of Canadians. As a result, both in absolute numbers and as a proportion, the elderly will constitute a growing segment of drivers. And many of

Methods

Data source

The data on license holding and health status come from Statistics Canada's National Population Health Survey (NPHS). The NPHS, which began in 1994/95, collects information about the health of the Canadian population every two years.^{12,13} It covers household and institutional residents in all provinces and territories, except people living on Indian reserves, on Canadian Forces bases, and in some remote areas. The NPHS has both a longitudinal and a cross-sectional component. Respondents who are part of the longitudinal component will be followed for up to 20 years.

This analysis uses cross-sectional data from cycle 2 of the NPHS, conducted in 1996/97. The data pertain to the household population in the 10 provinces.

The 1996/97 cross-sectional sample is made up of longitudinal respondents and respondents who were selected as part of supplemental samples, or buy-ins, in three provinces. The additional respondents for the buy-ins were chosen with the random digit dialing (RDD) technique and were included for cross-sectional purposes only.

Individual data are organized into two files: General and Health. Socio-demographic and some health information was obtained for each member of participating households. These data are found in the General file. Additional in-depth health information was collected for one randomly selected household member. The in-depth health information, as well as the information on the General file pertaining to that individual, is found in the Health file.

In households belonging to the cross-sectional buy-in component, one knowledgeable person provided the socio-demographic and health information about all household members for the General file. As well, one household member, not necessarily the same person, was randomly selected to provide in-depth health information about himself or herself for the Health file.

In households belonging to the longitudinal component, the person providing in-depth health information about himself or herself for the Health file was the randomly selected person for that household in cycle 1 (1994/95) and was usually the person who provided information about all household members for the General file in cycle 2.

The 1996/97 cross-sectional response rates for the Health file were 93.6% for the longitudinal component and 75.8% for the RDD component, yielding an overall response rate of 79.0%.

Data on possession of a driver's license and the health characteristics of the licensed population come from the 1996/97

cross-sectional Health file. The sample size of the population aged 12 or older was 81,804. This analysis focuses on the 13,363 respondents who were aged 65 or older, representing approximately 3.4 million individuals.

Supplementary data on the driving practices of older Canadians were obtained from Statistics Canada's 1991 Survey of Ageing and Independence. Data from Transport Canada were used to calculate motor vehicle accident mortality rates of the licensed population.

Analytical techniques

The percentages of license holders among seniors were calculated by age and sex. Percentages by presence of chronic conditions and disability and by drug use were age-standardized to control for the increasing prevalence of illness at older ages.

All estimates were weighted to represent the population at the date of the survey. The 1996/97 population (both sexes) was used as a reference population for direct age standardization of rates. Because of the complex nature of the survey design, bootstrap procedures were employed to derive the variances of the estimates, and to compare differences between percentages.^{14,15} The .05 level was used to denote statistical significance.

Limitations

The major limitation of this analysis is that the NPHS asked only about possession of a driver's license, not about driving behaviour. Data from the Survey of Ageing and Independence were used to estimate the proportion of license holders who actually drive. However, it was not possible to make such estimates by chronic conditions, disabilities or medication use. Therefore, while the overall majority of elderly people who had a driver's license were drivers, the percentage could be considerably lower among those in poor health.

NPHS data on chronic conditions are subject to the problems inherent in self-reporting. Specifically, there was no independent source to verify whether people who reported having been diagnosed with a condition actually did have it. Nor was there any indication of the severity of the various conditions reported, which might affect driving ability.

Proxy respondents may have provided some of the data about chronic conditions. The degree of bias in such reporting may differ, depending on the disease. In fact, for some conditions, such as impaired cognitive function, proxy responses may yield more reliable information.

Table 1
Household population aged 65 or older with valid driver's license, by selected demographic characteristics, Canada excluding territories, 1996/97

	Population			Percentage with driver's license		
	Total	Men	Women	Total	Men	Women
		'000			%	
Total	3,416	1,479	1,937	59	77[†]	45
Age group[†]						
65-69	1,134	508	625	71	85	59
70-74	962	422	541	63	81	49
75-79	681	283	398	54	76	39
80-84	379	166	212	41	61	25
85+	261	100	161	23	49	8
Province						
Newfoundland	57	26	31	43 [§]	57	32
Prince Edward Island	16	7	9	67 ^{††}	92	47
Nova Scotia	114	48	66	61	79	48
New Brunswick	91	39	52	68 ^{††}	88	51
Québec	833	348	485	49 ^{‡‡}	77	29
Ontario	1,304	566	738	61	76	51
Manitoba	145	62	83	59	79	44
Saskatchewan	137	61	76	67	89	50
Alberta	257	115	142	61	74	52
British Columbia	461	207	255	63	78	51
Household income						
Lowest	656	204	452	44 ^{§§}	70	33
Lower-middle	1,190	553	637	57 ^{†††}	76	41
Upper-middle	748	368	380	70	83	57
Highest	147	83	64	77	92	55
Missing	674	270	405	57	71	48
Education						
Less than high school	1,725	744	980	50 ^{§§}	72	33
High school graduation	527	205	323	62 ^{‡‡‡}	81	50
Some post-secondary	495	216	279	69	86	56
Postsecondary graduation	618	285	333	72	82	64
Missing	51	29	22	42	51	30

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: All percentages are age-adjusted. Because of rounding, detail may not add to totals. Significant differences in percentage with driver's license are shown for total only. Where applicable, the p value was adjusted to take multiple comparisons into account.

† Significantly higher than women

‡ All differences between age groups in percentage with driver's license are significant.

§ Significantly lower than all provinces except Nova Scotia and Québec

†† Significantly higher than Québec

‡‡ Significantly lower than all provinces except Newfoundland and Nova Scotia

§§ Significantly lower than other items in category

††† Significantly lower than highest income

‡‡‡ Significantly lower than postsecondary graduation

these drivers will continue to rely on private transportation to maintain their independence and an active lifestyle.¹⁶

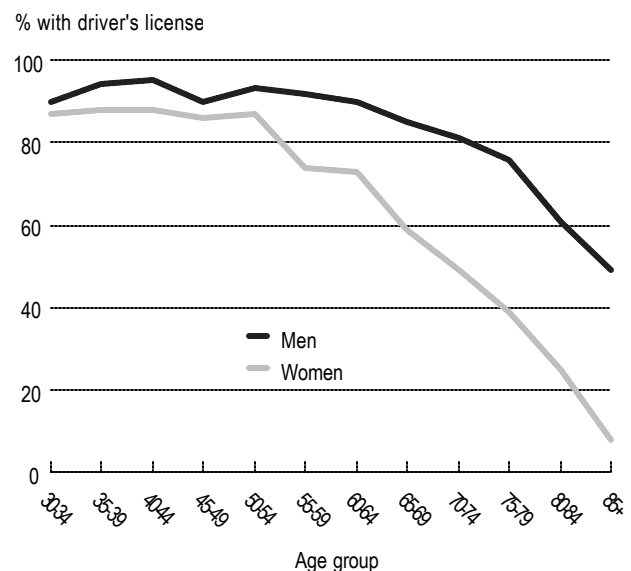
This article examines the health status of people aged 65 or older who reported having a valid driver's license. The findings are based on the 1996/97 National Population Health Survey (NPHS), supplemented by data from the 1991 Survey of Ageing and Independence and from Transport Canada (see *Methods* and *Definitions*). The results are discussed in the context of other research on older drivers.

License holding declines at older ages

In 1996/97, about 6 in 10 people aged 65 or older, just over 2 million individuals, held a valid driver's license. The rate dropped from 71% at ages 65 to 69 to 23% at age 85 or older (Table 1).

License holding was more common among senior men than women—77% versus 45%—a gap that widened at older ages. This sharp divergence reflects historical differences in the division of labour in the household and in the workforce. As successive cohorts of women move through the life cycle, the sex difference in license-holding rates among seniors will probably narrow (Chart 1).

Chart 1
Household population aged 30 or older with valid driver's license, by age group and sex, Canada excluding territories, 1996/97



Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

The lowest percentages of license holders among the elderly were in Newfoundland (43%) and Quebec (49%). Percentages in other provinces did not differ significantly. Income was also a factor: only 44% of seniors in the lowest income group had a license, compared with 77% in the highest income group. There was a similar gradient by level of education. Seniors with higher education were significantly more likely than those with relatively little education to have a driver's license.

Exposure to risk

Of course, a driver's license alone is not a good measure of exposure to risk.⁴ It is necessary to know if elderly license holders actually drive, and how frequently they do so.⁵ While such information was not collected by the 1996/97 NPHS, the 1991 Survey of Ageing and Independence did ask about driving behaviour. Between the two surveys, the estimate of the proportion of seniors with a driver's license rose only slightly, from 56% in 1991 to 59% in 1996/97.

The 1991 data showed that the majority of seniors who had a license—93% of men and 67% of women—were drivers (Table 2). As well, the

Table 2
Motor vehicle use among household population aged 65 or older, by age group and sex, Canada excluding territories, 1991

	Population	Percentage with driver's license	License holders who:	
			used vehicle as driver	drove 3 or more times/week
	'000	%	%	%
Total	2,764	56	83	72
65-69	1,011	66	81	75
70-74	770	61	84	71
75-79	513	50	84	71
80+	470	30	90	68
Men	1,187	80	93	81
65-69	467	86	94	86
70-74	340	84	94	79
75-79	208	79	91	77
80+	172	58	93	71
Women	1,577	37	67	58
65-69	544	49	62	58
70-74	430	43	69	57
75-79	305	31	72	60
80+	298	13	82	62

Data source: 1991 Survey of Ageing and Independence

Note: Because of rounding, detail may not add to totals.

percentage of drivers among elderly license holders did not decrease at older ages. Nonetheless, the low rates of license holding among the elderly mean that, for seniors overall, the degree of exposure to the risks associated with driving is small compared with younger age groups. In fact, just 40% of the total population aged 65 or older drove three or more times a week (data not shown).

The drop in license holding at older ages may be attributable to changing roles, such as the end of commuting to work after retirement. But the decrease may also be related to diminished ability to operate motor vehicles.

Health problems increase at older ages

With advancing age, the prevalence of various chronic conditions tends to increase (Appendix Table A). For instance, in 1996/97, just 21% of 45- to 64-year-olds reported that they had been

Physician's Guide to Driver Examination

The Canadian Medical Association's *Physician's Guide to Driver Examination*¹ (currently under revision) presents guidelines and expert opinions designed to help physicians assess their patients' medical fitness to drive. The *Guide* does not have the force of law; responsibility for issuing a driver's license rests with provincial and territorial licensing authorities. However, most jurisdictions have regulations that require physicians to report medically unfit drivers.⁶ An additional consideration is the degree to which physicians may be held liable if they fail to report a patient who is subsequently involved in a motor vehicle accident.

The *Guide* emphasizes that as long as an elderly person remains free of impairing conditions, there is no reason why he or she may not drive without restriction. Nevertheless, a number of age-related conditions that may affect a driver's ability are identified: mental deterioration, visual impairment, cardiovascular disease, diabetes mellitus (which increases the risk of visual impairment and hypoglycemia), musculoskeletal conditions, multiple conditions, and the effects of drugs (such as antihypertensives, sedatives and tranquilizers).

The *Guide* recommends a medical examination to assess driving fitness every two years from ages 70 to 80, and annually thereafter. This assessment should include an evaluation of both physical and mental status.

diagnosed with arthritis/rheumatism. However, among people aged 65 to 74, 40% had arthritis, and at age 85 or older, the proportion was 53%. Similarly, the prevalence of heart disease rose steadily, from 5% at ages 45 to 64 to 22% at age 85 or older. The pattern was similar for glaucoma, cataracts, stroke and diabetes.

Not surprisingly, the percentage of people reporting disabilities also increased at older ages. An estimated 5% of seniors had an uncorrected vision problem, or a mobility problem for which they required personal aid (Appendix Table B). About 4% had an uncorrected hearing problem; 3% had a serious problem with cognition, and 2% reported a problem with manual dexterity. By age 85 or older, the prevalence of each of these disabilities was much higher. In comparison, no more than 1% or 2% of people aged 45 to 64 reported such disabilities.

Age alone is not a risk factor for involvement in motor vehicle accidents. The onset of driving difficulties occurs at different ages for different individuals.¹⁷ As well, some chronic conditions, and even some disabilities, may not seriously affect driving ability. The degree of impairment associated with a given condition may be quite variable, as the same conditions can have markedly different functional consequences for different individuals.¹⁸ Some conditions, however, can severely impair the ability to drive (see *Physician's Guide to Driver Examination*).

Association with chronic conditions

For several chronic conditions, license-holding rates between seniors who did and did not report having the condition differed significantly. For instance, 36% of seniors who reported having had a stroke were license holders, compared with 59% who had not had a stroke (Table 3). The percentages for heart disease, arthritis and cataracts were also significantly low.

The amount of pain caused by a chronic condition may be just as much a factor in license holding as the condition itself. Severe pain can affect concentration and limit freedom of movement to an extent that makes driving extremely dangerous.¹ In fact, only 49% of seniors who reported suffering severe chronic pain had a driver's license.

Table 3
Household population aged 65 or older with valid driver's license, by sex and selected chronic conditions,[†] Canada excluding territories, 1996/97

	Total		Men		Women	
	Total number	With driver's license	Total number	With driver's license	Total number	With driver's license
	'000	%	'000	%	'000	%
Total	3,416	59	1,479	77	1,937	45
Heart disease						
Yes	548	54 [‡]	267	71	281	37
No	2,864	59	1,211	78	1,654	45
Missing	4	--	1	--	3	--
Arthritis						
Yes	1,448	55 [‡]	504	77	944	43
No	1,966	61	974	77	992	46
Missing	2	--	--	--	2	--
Diabetes						
Yes	357	53	184	75	174	30
No	3,057	59	1,295	77	1,762	46
Missing	1	--	--	--	1	--
Effects of stroke						
Yes	134	36 [‡]	73	46	61	24 [§]
No	3,281	59	1,405	79	1,876	45
Missing	1	--	--	--	1	--
Glaucoma						
Yes	166	54	65	71	100	43
No	3,247	59	1,412	77	1,835	44
Missing	4	--	--	--	3	--
Cataracts						
Yes	513	51 [‡]	177	70	336	41
No	2,901	60	1,301	78	1,599	45
Missing	3	--	--	--	2	--
Number of chronic conditions						
None	1,345	63	643	78	702	49
1	1,276	59	525	80	752	45
2 +	795	50 [‡]	311	70	484	37
Chronic pain						
No pain	2,571	62 ^{††}	1,141	80	1,430	47
Mild/Moderate	668	50	281	67	387	37
Severe	161	49	51	73	110	38
Missing	16	--	5	--	10	--

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: All percentages are age-adjusted. Because of rounding, detail may not add to totals. Significant differences in percentage with driver's license are shown for total only. Where applicable, the p value was adjusted to take multiple comparisons into account.

[†] Diagnosed by a health professional

[‡] Significantly lower than other item(s) in category

[§] Coefficient of variation between 16.6% and 25.0%

^{††} Significantly higher than other items in category

-- Nil

-- Coefficient of variation too high to provide reliable estimate

Table 4
Household population aged 65 or older with valid driver's license, by selected disabilities† and sex, Canada excluding territories, 1996/97

	Total		Men		Women	
	Total number	With driver's license	Total number	With driver's license	Total number	With driver's license
	'000	%	'000	%	'000	%
Total	3,416	59	1,479	77	1,937	45
Cognitive						
No problem	2,391	60	1,013	79	1,378	47
Some problem	921	57	419	76	501	40
Serious problem	92	26‡	42	32	50	21
Missing	13	--	4	--	9	--
Manual dexterity						
No problem	3,333	59	1,449	78	1,884	45
Problem	81	37‡§	28	45§	53	34††
Missing	3	--	2	--	1	--
Mobility						
No problem	2,934	62	1,288	81	1,646	47
Problem, no aid needed	65	46	29	46§	36	43§
Problem, needs technical aid	258	47††	114	65	144	31
Problem, needs personal aid/cannot walk	157	16‡§	46	25††	110	11††
Missing	2	--	--	--	--	--
Vision						
No problem	578	61	284	77	294	46
Corrected problem	2,636	60	1,136	79	1,499	46
Uncorrected problem	185	34‡	52	43	133	30§
Missing	18	--	--	--	12	--
Hearing						
No problem	2,927	60	1,212	80	1,715	45
Corrected problem	334	56	184	66	150	40
Uncorrected problem	149	47††	78	61	71	32§
Missing	7	--	--	--	2	--

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: All percentages are age-adjusted. Because of rounding, detail may not add to totals. Significant differences in percentage with driver's license are shown for total only. Where applicable, the p value was adjusted to take multiple comparisons into account.

† Diagnosed by a health professional

‡ Significantly lower than other item(s) in category

§ Coefficient of variation between 16.6% and 25.0%

†† Coefficient of variation between 25.1% and 33.3%

‡‡ Significantly lower than no problem

-- Nil

-- Coefficient of variation too high to provide reliable estimate

Strong link with disability

Not only were chronic conditions associated with license holding, but as might be expected, so were disabilities, which may or may not have resulted from such conditions (Table 4). About 60% of seniors who did not report a disability had a driver's license. Among those with a disability, the proportions holding a license were consistently lower, although how much lower depended on the disability.

Just 26% of elderly people with a serious cognitive problem had a driver's license. But considering the nature of the disability, this is a relatively high percentage. Cognitive function involves memory, information processing, and decision-making, all of which are essential to safe driving. A number of studies have shown an increased risk of accidents among people with cognitive impairment.¹⁹⁻²² However, a study in the United Kingdom found that many patients with dementia continued to drive despite a striking deterioration in driving performance.²³ For about 18% of patients, deterioration in driving skills was one of the first signs of dementia.²³ As well, the decision to stop driving was often initiated by family members and physicians rather than by the patients with dementia themselves.²⁴

About a third (34%) of seniors with an uncorrected vision problem and 37% with a manual dexterity problem were licensed to drive. For those with a serious mobility problem, the rate was much lower: 16% who needed personal aid had a license. The rate was higher for seniors who reported an uncorrected hearing problem, nearly half of whom had a driver's license.

Medication use

At older ages, as the number of chronic conditions and disabilities increases, so does the use of medications,²⁵ some of which may hinder driving ability. In 1996/97, 45% of seniors who reported taking tranquilizers in the month before their interview were license holders, as were 48% who had taken antidepressants, and 52% who took sleep medications (Table 5). The proportions of license holders among those who took diuretics, antihypertensives or heart medication were higher:

54% or 55%. Nonetheless, in all cases, the proportion of license holders was significantly lower among seniors taking these medications than among those who were not.

The literature on the effects of drugs on driving

Table 5
Household population aged 65 or older with valid driver's license, by selected medications and sex, Canada excluding territories, 1996/97

Medication use in past month	Total		Men		Women	
	Total number	With driver's license	Total number	With driver's license	Total number	With driver's license
	'000	%	'000	%	'000	%
Total	3,416	59	1,479	77	1,937	45
Tranquilizers						
Yes	169	45 [†]	50	61	119	39
No	3,226	60	1,419	78	1,808	45
Missing	21	--	10	--	11	--
Antidepressants						
Yes	150	48 [†]	60	71	90	32
No	3,247	59	1,412	77	1,834	45
Missing	20	--	7	--	13	--
Sleep medications						
Yes	269	52 [†]	101	72	168	40
No	3,131	59	1,371	78	1,759	45
Missing	17	--	6	--	11	--
Diuretics						
Yes	377	54 [†]	128	68	249	46
No	3,020	59	1,344	78	1,677	44
Missing	19	--	7	--	11	--
Antihypertensives						
Yes	1,112	55 [†]	423	77	690	41
No	2,285	61	1,048	78	1,236	46
Missing	19	--	8	--	11	--
Heart medications						
Yes	643	55 [†]	311	73	332	38
No	2,756	60	1,161	79	1,594	46
Missing	18	--	7	--	11	--
Number of selected medications used in past month						
None	1,939	62 [‡]	930	78	1,009	47
1	988	54	371	75	617	41
2 +	489	54	178	74	312	42

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Notes: All percentages are age-adjusted. Because of rounding, detail may not add to totals. Significant differences in percentage with driver's license are shown for total only. Where applicable, the *p* value was adjusted to take multiple comparisons into account.

† Significantly lower than not taking medication

‡ Significantly higher than other items in category

-- Coefficient of variation too high to provide reliable estimate

is inconclusive. In a retrospective cohort study of four categories of drugs—benzodiazepines, cyclic antidepressants, oral opioid analgesics and antihistamines—the relative risk of injurious crash involvement for the use of any one of these drugs was 1.5.²⁶ Among people taking at least two of these drugs, the relative risk increased if one of them was a benzodiazepine or a cyclic antidepressant. As well, for both drugs, the relative risk increased with dose and was substantial at high doses. Another study concluded that benzodiazepines approximately double the risk of motor vehicle accidents; the risk for older drivers was higher when they took longer-acting and large quantities of benzodiazepines.²⁷ By contrast, a population-based matched case-control study found no evidence of a dose-related effect among persons who used benzodiazepines.²⁸ And a recent Canadian study concluded that while exposure to long half-life benzodiazepines was associated with an increased risk of motor vehicle accidents, there was no elevated risk for short half-life benzodiazepines.²⁹

Older drivers at higher risk?

As mental and sensory abilities decline, many seniors make compensatory changes in their driving behaviour that may reduce their overall exposure to risk.^{30,31} The elderly may also be more flexible in their use of time and may have more choice about when and where they drive.^{32,33} They are less likely than middle-aged people to drive at night and during peak hours. Seniors tend to avoid limited access highways and to drive at lower speeds. A recent study linking police accident records to hospital discharge data found little evidence that drivers aged 65 to 74 imposed excess risk of injury or death on other drivers at both aggregate and individual levels of analysis.³⁴

In addition, research on the risk of accidents among elderly drivers with specific diseases is ambiguous. A study in the province of Québec suggested that elderly people with impairments or chronic diseases were not at increased risk of road accidents.³⁵ Another Québec study of men aged 45 to 70 showed no increased risk of accidents for drivers suffering from cardiovascular disease.³⁶ And

an earlier report found no clear evidence that ocular disease, impaired vision, or diminished hearing increased the risk of motor vehicle accidents among older drivers.³⁷ On the other hand, a more recent study concluded that impaired visual processing and

glaucoma may play a role in crashes involving older drivers.⁴⁰

However, researchers' conclusions about the risk posed by older drivers depend largely on the statistical indicators they choose. For example, if absolute numbers are considered, younger drivers would warrant closer scrutiny than older drivers. But if collisions or injuries per kilometre driven are used, older drivers have rates similar to those of young adults (see *Motor vehicle mortality*).

Motor vehicle mortality

Research has shown that compared with younger age groups, older drivers are more likely to be seriously injured or to die in motor vehicle collisions, assuming comparable speeds and similar vehicles.⁵⁻⁸

In 1996, seniors represented 11% of licensed drivers, but accounted for 18% of people killed in motor vehicle collisions. The age-specific motor vehicle traffic accident mortality rate for all licensed drivers was 16.4 deaths per 100,000.³⁸ The rate peaked among 15- to 19-year-olds at 40.6 deaths per 100,000, and was also relatively high (25.1) at ages 20 to 24. Among license holders aged 25 to 64, the rate did not rise above 14.0. However, the mortality rate at age 65 or older—27.2—was higher than at ages 20 to 24.

These rates do not consider the relatively low level of exposure among older drivers. Since accident risk is proportional to the frequency of vehicle use or annual kilometres,³⁹ if exposure had been controlled, mortality rates for older drivers might have been higher.

Motor vehicle accident mortality, by age group, both sexes, Canada, 1996

Age group	Popu- lation '000	Licensed popu- lation '000	Deaths per 100,000:		
			Deaths	popu- lation	popu- lation
Total	28,641.5	18,700.0	3,062	10.6	16.4
0-4	1,234.6	...	39	3.2	...
5-14	3,963.0	...	129	3.3	...
15-19	2,110.7	937.0	380	18.0	40.6
20-24	1,872.6	1,564.0	393	21.0	25.1
25-34	4,471.5	3,959.7	537	12.0	13.6
35-44	5,237.6	4,780.0	429	8.2	9.0
45-54	3,770.5	3,361.4	346	9.2	10.3
55-64	2,564.9	2,099.0	265	10.3	12.6
65+	3,416.1	1,998.9	544	15.9	27.2

Data sources: 1996/97 National Population Health Survey, cross-sectional sample, Health file for licensed population; Transport Canada for mortality (Reference 39)

... Not applicable

Screening high-risk older drivers

If age-related health conditions are associated with driving ability, it seems logical to suggest that licensing agencies screen older drivers. But while individuals with severe and obvious impairments are easy to identify, for the many elderly drivers without gross deficits, fitness to drive may be difficult to assess.^{18,24}

A range of tests to evaluate the driving performance of elderly people has been proposed.^{23,41-43} However, NPHS estimates of the number of elderly license holders with chronic conditions or disabilities suggest that identifying and testing them would be a massive and expensive undertaking (see *Health problems among older license holders*). And even if such tests were administered, correlations of test scores with crash or violation rates would be confounded by the possibility that those with better scores will have more accidents because they drive more.⁴⁴

The question of screening older drivers places unique pressures on physicians,⁹ who must consider the welfare of the community, the welfare of their patients, and the confidentiality of the doctor-patient relationship.⁴⁵ This has become even more of an issue in jurisdictions where physicians can be held liable for accidents caused by older drivers who have obvious functional impediments. A study of physicians' attitudes concluded that they generally believed that they had a legal responsibility to assess driving ability, but that they were uncertain about how to do so and about their responsibility toward their senior patients who drive.⁴⁶

Health problems among older license holders

The prevalence of chronic conditions and disabilities that might affect driving ability was generally higher among seniors who were unlicensed than among those who were licensed. Nonetheless, substantial numbers of elderly people with a driver's license reported having such health problems. For instance, in 1996/97, an estimated 776,000 elderly license holders had arthritis, and 280,000 had been diagnosed with heart disease. While far fewer had disabilities, 101,000 elderly license holders required technical aid with mobility, and 17,000 needed personal aid. About 63,000 reported an uncorrected hearing problem. As well, substantial numbers of elderly license holders were taking medications that could affect their ability to drive.

Number of driver's license holders aged 65 or older with selected health conditions, by sex, Canada excluding territories, 1996/97

	Total	Men	Women
	'000	'000	'000
Total license holders	1,999	1,139	860
Chronic conditions			
Heart disease	280	185	95
Arthritis	776	383	393
Stroke	42	31 [†]	11 [†]
Glaucoma	84	45	39 [†]
Cataracts	229	116	114
Diabetes	189	137	52
Severe chronic pain	73	37 [†]	36 [†]
Disabilities			
Serious cognitive problem	17 [†]	12 [†]	5 ^{††}
Manual dexterity problem	28	11	16
Mobility			
Needs technical aid	101	66 [†]	35
Needs personal aid	17	8 ^{††}	—
Uncorrected vision problem	50 ^{††}	20	30 ^{††}
Uncorrected hearing problem	63	44	18 ^{††}
Medication use in past month			
Tranquilizers	76	32 [†]	44
Antidepressants	72 [†]	44	28 ^{††}
Sleep medications	133	71	61
Diuretics	196	86	110
Antihypertensives	602	325	277
Heart medications	334	221	114

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

Note: Because of rounding, detail may not add to totals.

[†] Coefficient of variation between 16.6% and 25.0%

^{††} Coefficient of variation between 25.1% and 33.3%

— Coefficient of variation too high to provide reliable estimate

The decision to quit

Despite the uncertainty individual physicians may have about their role in the licensing process, their input can be crucial. In a study of residents of a retirement community, over one-quarter of respondents (27%) who had quit driving said they had done so based on “advice from a physician.” A further 20% mentioned “nervousness behind the wheel,” and an almost equal number said they had trouble seeing cars or people.⁴⁷

Other research, too, has shown that driving cessation may be influenced by health status.^{48,49} A study of community-dwelling elderly people found that six conditions explained about half the decisions to stop driving: macular degeneration, retinal hemorrhage, any deficit in activities of daily living, Parkinson's Disease, effects of a stroke, and syncope (episodes of sudden unconsciousness).⁵⁰

Because motor vehicles are such an important feature of modern life, the decision to stop driving is very difficult for many elderly people. And although the health of seniors may affect their ability to drive, the mobility afforded by driving can also affect their health and well-being.^{45,51,52} Aside from convenience, driving is a symbol of autonomy and competence.⁴⁷ Driving cessation may entail the loss of self-esteem and change the overall quality of life.⁵³ A longitudinal analysis showed substantial increases in depressive symptoms among elderly people who stopped driving, even after accounting for demographic characteristics and health-related factors.⁵⁴

Driving cessation also has implications for seniors' ability to function independently and their participation in the community. The decision may be influenced by the availability of alternative transportation or of other people who can take over driving responsibilities.^{48,49} In fact, according to the 1991 Survey of Ageing and Independence, 30% of seniors who were drivers reported that public transportation was not available where they lived. For older people in rural areas or in areas without access to public transportation, an end to driving may necessitate moving, with the consequent disruption of the person's sense of community.^{16,55}

Definitions

Information about possession of a *driver's license* was obtained by asking National Population Health Survey (NPHS) respondents, "Do you have a valid driver's license for a motor vehicle?" (include cars, vans, trucks, motorcycles).

Respondents' *education* was divided into four categories: less than high school graduation, high school graduation, some postsecondary, and postsecondary graduation.

Household income was based on a derived variable that accounted for the number of people living in the household. Income was divided into quartiles: lowest, lower-middle, upper-middle, and highest.

Respondents were asked if a health professional had diagnosed them as having selected *chronic conditions*. Based on a review of the literature, the following conditions were selected for this article: heart disease, arthritis or rheumatism, diabetes, the effects of a stroke, glaucoma, and cataracts.

In addition, respondents were asked about the presence of *disabilities* related to cognition, manual dexterity, mobility, vision, and hearing.

A variable derived from a question on thinking ability and another question on memory was created to determine *cognitive function*. The categories were: no cognitive problems, some difficulty thinking, somewhat forgetful, somewhat forgetful/difficulty thinking, very forgetful/unable to remember/to think. For this analysis, respondents were considered to have a cognitive problem if they were in either of the last two categories.

A derived variable was created to assess manual *dexterity*. Respondents were divided into those with and those without a manual dexterity problem. Respondents with a problem included those who had a problem but needed no help, along with those who had a problem and needed equipment, help with some tasks, help with most tasks, or help with all tasks.

A derived variable was created to classify *mobility* problems. Mobility status was divided into four categories: no problem; problem, no aid needed; problem, needs technical aid (mechanical support or wheelchair); and problem, needs personal aid/cannot walk.

Hearing was classified into the following six categories: no hearing problem, problem hearing group/corrected, problem hearing group and individuals/corrected, problem hearing group and individuals/not corrected, and cannot hear. For this article, hearing was classed as: no problem, corrected problem, and uncorrected problem.

A derived variable was created that classified *vision* according to the following categories: no problem, problem corrected by lenses, uncorrected problem seeing close, uncorrected problem seeing distance, problem seeing close and distance/no sight. In this analysis, vision was categorized as: no problem, corrected problem, and uncorrected problem.

Data on *medication use* were based on responses to the question, "In the past month, did you take any of the following medications?" The interviewer then read a list of medications and marked all that applied. Those used for this analysis were antidepressants, diuretics or water pills, medicine for blood pressure, medicine for the heart, sleeping pills, and tranquilizers such as Valium.

Estimates of the proportion of older Canadians who *drove* were obtained from the 1991 Survey of Ageing and Independence. During a telephone or a face-to-face interview, respondents were asked if they had a valid driver's license and if anyone in the household owned a vehicle. This question was followed with: "Does the respondent use this vehicle mostly as a driver or as a passenger?" To obtain an approximation of the degree of *exposure to driving*, the survey asked, "How often does the respondent drive?" Response options were: not applicable, more than 3 times per week, 1 to 3 times per week, 1 to 3 times per month, less than once a month, and never.

Concluding remarks

The consensus emerging among researchers tends to be that decisions about licensing people with age-related disorders should be based on functional measures rather than on diagnostic labels.^{18,56,57} Older drivers are not a homogeneous group, and there does not appear to be a predictable pattern of risk.^{30,34,58}

The public health response to the reality of an aging population and the consequent increase in the

number of older drivers could involve a wide range of measures. For instance, some researchers have argued that policy and program administrators must consider providing alternate transportation to meet the needs of elderly people who can no longer drive.⁵¹

Training or retraining older drivers may improve their driving performance,⁵¹ and a number of jurisdictions have introduced defensive driving courses specifically for seniors. In some areas, older

drivers who successfully complete the courses are eligible for automobile insurance discounts.⁵⁹

It is also important to consider the technological and environmental context in which all drivers function. Improvements in highway and motor vehicle design could benefit everyone, not just elderly drivers.⁹

In the future, elderly drivers may have much different characteristics than the current cohort. And because of changes in the design of cars and highways, in enforcement practices, and in norms relating to driving, the risk patterns associated with older drivers may also change.⁵¹ Therefore, it is difficult to assess the risk that senior drivers will impose on themselves or on others in the future. ●

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Appendix

Table A
Prevalence of chronic conditions, household population aged 45 or older, by age group and sex, Canada excluding territories, 1996/97

	Total	Men	Women
	%		
Heart disease			
45-64	5	6	4
65+	16	18	14
65-74	13	16	11
75-84	20	22	18
85+	22	20 ^{††}	23
Arthritis			
45-64	21	14	27
65+	42	34	49
65-74	40	32	46
75-84	45	36	52
85+	53	43 [†]	59
Diabetes			
45-64	5	6	4
65+	10	12	9
65-74	10	11	9
75-84	11	14	10
85+	--	--	--
Effects of stroke			
45-64	1	1 [†]	1 [†]
65+	4	5	3
65-74	3	4 [†]	2 [†]
75-84	5	7 [†]	4
85+	8	8	8 ^{††}
Glaucoma			
45-64	1	1 [†]	1 [†]
65+	5	4	5
65-74	4	4 [†]	4
75-84	7	6 [†]	7 [†]
85+	7	4 ^{††}	9 [†]
Cataracts			
45-64	2	2 [†]	2
65+	15	12	17
65-74	9	7	11
75-84	23	19	26
85+	31 [†]	29 ^{††}	33

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

† Coefficient of variation between 16.6% and 25.0%

†† Coefficient of variation between 25.1% and 33.3%

-- Coefficient of variation too high to provide reliable estimate

Table B
Prevalence of disabilities, household population aged 45 or older, by age group and sex, Canada excluding territories, 1996/97

	Total	Men	Women
	%		
Serious cognitive problem			
45-64	1	1 [†]	1
65+	3	3	3
65-74	1	2 [†]	1 [†]
75-84	3	4 [†]	3 [†]
85+	9 [†]	7 [†]	11 [†]
Manual dexterity problem			
45-64	1	1	1
65+	2	2	3
65-74	2 [†]	1 [†]	--
75-84	2	2 ^{††}	2
85+	5 [†]	--	5 [†]
Mobility problem (needs personal aid)			
45-64	1	1 [†]	1 [†]
65+	5	3 [†]	6
65-74	2	1 [†]	2
75-84	7	5 ^{††}	8
85+	19	--	23
Uncorrected vision problem			
45-64	2	2	2
65+	5	4	7
65-74	3	2	4
75-84	7	4 [†]	9
85+	15	12	18
Uncorrected hearing problem			
45-64	1	2	1
65+	4	5	4
65-74	3	4	2
75-84	5	7	4
85+	11 [†]	9	11 [†]

Data source: 1996/97 National Population Health Survey, cross-sectional sample, Health file

† Coefficient of variation between 16.6% and 25.0%

†† Coefficient of variation between 25.1% and 33.3%

-- Coefficient of variation too high to provide reliable estimate