Age, health and driving

Longitudinally observed changes in reported general health, in mileage, self-rated competence and in attitudes of older drivers

THE UNIVERSITY of MANCHESTER

Age and Cognitive Performance Research Centre

Foundation for Road Safety Research

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Foundation for Road Safety Research

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The AA Foundation for Road Safety Research

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Registered as a charity (number 295573), the objectives of the Foundation are:

- to carry out, or procure, research into all factors affecting the safe use of public roads;
- to promote and encourage the safe use of public roads by all classes of road-users through the circulation of advice, information and knowledge gained from research; and
- to conceive, develop and implement programmes and courses of action designed to improve road safety, these to include the carrying out of any projects or programmes intended to educate young children or others in the safe use of public roads.

Control of the AA Foundation is vested in a Council of Management under the chairmanship of Sir Brian Shaw, with day-to-day activity being the responsibility of the Foundation Management Committee. The Research Advisory Group recommends topics worthy of research to the Management Committee.

Members of the Advisory Group at the time this research was undertaken were: John Dawson, Managing Director, AA Foundation for Road Safety Research and AA Policy Director (Chairman); Professor Richard Allsop OBE, Centre for Transport Studies, University College London; Sir Peter Baldwin KCB, former Chairman of the AA Foundation for Road Safety Research; Rod Kimber, Technical Director, AA Foundation for Road Safety Research and Director Science and Engineering, Transport Research Laboratory; Brian Langer, Manager, AA Foundation for Road Safety Research; Professor Frank McKenna, Psychology Department, University of Reading; Kate McMahon, Economic Adviser, Road Safety Division, Department for Transport, Local Government and the Regions; Bert Morris, Manager, AA Motoring Policy; Howard Sherriff, Accident and Emergency Consultant, Addenbrooke's Hospital, Cambridge; Janet Swain, Principal Project Engineer, Accident Investigation Unit, Nottinghamshire County Council; and Keith Willett, Consultant Trauma and Orthopaedic Surgeon, Critical Care Centre, John Radcliffe Hospital, Oxford.

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- Amery-Parkes, Capital Bank, The Caravan Club, Centrica, Europcar (UK), Fennemores, Herbert Smith and Vodafone, and the following insurance companies:
- Allianz Cornhill, Axa, CGNU, Fortis, Groupama, Hiscox, MMA and Zurich.

Executive summary

During 1994–1995, the University of Manchester administered an older driver's questionnaire to 1780 drivers who were then aged between 54 and 99 years. The results were published as *When and why older drivers give up driving* by the AA Foundation for Road Safety Research in 1996. A subset of 395 of these individuals who were still active motorists again completed the same questionnaire during 1997–1998. Distributions of ages, gender socio-economic status and location were very similar for the two samples. Comparisons of the responses given by these individuals at these two time points provide longitudinal data on the effects of increasing age and changes in health on car use, and self-perceptions of driving competence and general mobility issues. This is of considerable potential value, because most conclusions about changes in driving behaviour in old age have been based on cross-sectional comparisons between groups of people of different ages. By contrast, longitudinal studies allow us to assess whether questionnaires or tasks not only indicate current performance but also predict future changes in performance.

Analysis of the comparative data showed that, while variations between individuals were very large, estimates of weekly mileage significantly declined with age. The two cross-sectional estimates of decline in mileage obtained in 1994–5 and 1998–9 agreed closely with each other, and with the longitudinally assessed reduction between these two time points. Reduction in mileage between 1994–5 and 1998–9 was predicted by health status in 1998–9 and by decline in health status between these time points. It is suggested that the sequence of causality is that reduced driving is related to changes in health, but the immediate factor in instigating these reductions is a decline in confidence in driving competence. That is, older drivers monitor their performance and react appropriately when they feel that their performance is becoming adversely affected by poor health, or for other reasons.

The data suggest that older people are sensitive to the effects of their ageing and their general health on their driving competence, and that their perceptions of these effects do significantly alter their driving behaviour. It seems that older drivers become aware of changes in their ability brought about by increasing age and worsening health, and they do respond to this realisation by reducing their involvement in driving. **This is a strong counter-argument to the idea that drivers not only become less competent, but also less conscious of their shortcomings and so more feckless as they grow older.**

In addition, drivers were asked about their attitudes towards current licensing regulations, sanctions that might be imposed on driving offenders and measures that might be taken to more closely check and regulate the driving competence of older motorists and of individuals convicted of driving offences. Analyses were also made of use of public transport and help in transport by friends and relatives, extent of social involvements, relative advantages of giving up and continuing driving, and attitudes towards possible restrictions that might be imposed on older drivers. Greater use of public transport and of assistance with transport from family and friends was predicted by poorer health in 1998–1999 and by worsening health between the two surveys. Attitudes towards other road-users and towards possible restrictions that might be imposed for traffic offences or on older drivers showed no substantive changes over the four years.

Most respondents felt that restriction of mobility and restriction of independence are the most serious problems entailed by giving up their cars. This agrees with the finding that most of them also felt that the public transport system available to them does not allow them the same level of mobility/independence as car ownership would. Similarly most respondents feel that giving up car ownership is impossible if one is

caring for a spouse or relative with limited mobility. This is also consistent with belief in the inadequacy of available public transport. Feeling on all of these statements was very strong.

As might be expected, the brief interval of three to four years between successive administrations of the questionnaire did not bring about any consistent or reliable changes in attitudes. Because these cross-sectional differences were broadly consistent between the two surveys they tend to endorse the reliability of the questionnaire and so, also, the reliability of the observations made on a much larger sample of drivers and ex-drivers reported on in the earlier AA Foundation study by Rabbitt *et al.* (1996).

KEY FINDINGS

- Older drivers are, in general, competent and responsible in monitoring and, if necessary, restricting their driving.
- Health, and particularly recent changes in health, are a major determinant of changes in driving patterns among older drivers.
- Older drivers hold stable opinions about mobility issues, valuing independence, but recognising the need for advice when appropriate.

Chapter 1: Introduction

1.1 Context

Nearly all of our information about changes in driving behaviour and attitudes with age has been derived from cross-sectional comparisons between separate groups of people of different ages (eg Ball, Owsley, Stalvey, Roenter, Sloane and Graves, 1998; Hutcherson, 1988; Rabbitt, Carmichael, Jones and Holland, 1996; Stamatiadis, 1996; Waller, 1991). Unfortunately, cross-sectional comparisons inevitably confound age, generation and period effects. For example within the population of drivers who are now aged between 50 and 90 years individuals in successive age decades have had very different driving careers and experiences. All drivers who are now in their 60's were obliged to take a driving test, but many who are now aged over seventy were not. Drivers who are currently in their 60's and those in their 80's gained their early driving experience in very different vehicles, traffic conditions and road systems. The proportion of women drivers has markedly increased between successive generations born between 1930 and 1950 (see Bly, 1993; Rabbitt, Carmichael *et al.*, 1996). Fifty years ago only the comparatively affluent, or those who drove professionally, could afford to own cars. Reduced income on retirement means that among people of modest means those who are still employed in their 60's may afford a car, but retired individuals aged 70 can no longer afford to do so. Thus samples of 60 year old and of 70 year old drivers are likely to differ markedly in terms of their current and average lifetime levels of socio-economic advantage and, consequently, also in their average levels of education and of general health. Socio-economic advantage, education and health are known to be associated with longer survival and maintenance of mental and physical competence in old age. For the same reasons samples of 60 and 70 year old drivers are also likely to differ in terms of their locations of residence and other demographic variables that are known to determine current and projected car use.

These problems are minimised by Longitudinal Studies in which the same individuals are repeatedly assessed at successive time points. A further, very important, advantage of longitudinal comparisons is that they allow us to assess the reliability of the questionnaires we use. If individuals give discrepant answers at successive time points we must conclude that a questionnaire has been poorly designed and that people's responses to it are unreliable. Another key advantage of extending a cross-sectional to a longitudinal study is that it allows us to ask which factors present at one time point are associated with changes that occur at a later time point. The unique advantage of longitudinal data is that it allows us to use measurements of variables at an initial time point to predict the future rate of change in driving competence and behaviour. Unfortunately, apart from Jette & Branch, (1992) little longitudinal data is available to validate inferences from cross-sectional comparisons.

During 1994–1995 1780 active drivers aged from 54 to 99 years completed a questionnaire on behaviour and attitudes of older drivers, and the Cornell Medical Inventory (CMI, Brodman *et al.* 1949). Four years later, during 1998–1999, 395 of these respondents again completed the same questionnaires. Comparison of their answers in 1994–1995 (Time Point 1, TP1) and in 1997–1998 (Time Point 2, TP2) allowed a check of the reliability of the questionnaire. The new data also allowed age–related changes in mileage per week (mpw) that had been computed from cross-sectional comparisons between groups of individuals of different ages to be compared against independent, longitudinal, estimates obtained from comparisons of the same individuals' reports of their current mpws at TP1 and TP2. Drivers' health status (CMI scores) and their ages at TP1, and the changes in health status they reported between TP1 and TP2, were individually and jointly assessed as predictors of changes in their reported mileages and self-rated confidence and competence as drivers between TP1 and TP2. Changes in drivers' self-rated confidence as they grew older, and changes in

their reported health status were also assessed as predictors of changes in their weekly mileages. Finally, repetition of the questionnaires allowed investigation of changes over a four-year period in drivers' attitudes to driving and to various hypothetical means of regulating older drivers and individuals convicted of driving offences.

1.2 Sample demographics

Demographics of the longitudinally tested sub-set and the population of 1780 initial respondents from which it was drawn were compared. The ages of the 1994–1995 sample ranged from 54.9 to 99.9 (mean 70.5) while those of the current sub-set ranged from 63 to 92 (mean 73.41). This slight difference is expected because a 4-year interval had elapsed. Of the re-tested sub-set 59.8 per cent were men and 40.2 per cent were women as compared with 55 per cent and 45 per cent respectively in the entire 1994–1995 sample. Details of distributions of ages, genders, socio-economic categories and locations of residence of the main sample and the current sub-set given in Tables 1.1, 1.2 and 1.3 below were also closely similar to those for the initial larger sample.

Table 1.1 The 1997–1998 sample classified by their ages and by gender

Age Group	Men	Women	Totals
61–65	16	24	40
66–70	51	49	100
71–75	80	37	117
76–80	53	29	82
81–85	16	11	27
86–92	18	7	25
Totals	234	157	391*

*4 individuals recorded no data on gender.

Table 1.2 The 1997–1998 sample classified by their ages and occupational categories

Age Group	Professional	Intermediate	Skilled Non-Manual	Skilled Manual	Semi-skilled	Unskilled
61–65	7	17	12	2	–	1
66–70	11	46	25	7	1	4
71–75	24	58	20	6	3	–
76–80	8	49	8	6	2	4
81–85	5	16	2	1	1	2
86–92	4	11	5	–	1	1
Totals	59 (15.9%)	197 (53.2%)	72 (19.6%)	22 (5.9%)	8 (2.2%)	12 (3.2%)

*25 individuals recorded no data on socio-economic group.

The types of environments in which respondents live may be expected to influence their needs for driving, and their driving habits. In Table 1.3 the sample are classified by location of residence.

Table 1.3 The 1997–1998 sample classified by locations of residence

Location of Residence	Number	Percentage
City	23	5.9%
Town	97	24.7%
Suburb	134	34.1%
Rural Area	130	33.1%
Other	9	2.2%
Totals	393*	100%

*Two respondents recorded no data on location of residence.

As is typical for older samples of drivers there were more men than women in this sample (see Bly, 1993). Respondents for this study were contacted by advertisements in club magazines and news-sheets and through media appeals. As in all studies in which volunteers are self-selected, occupations are biased towards the professional and intermediate categories with much smaller proportions of semi-skilled and unskilled individuals than are found in the population at large. The distribution of location of residence is less demographically atypical. The proportion of respondents from rural areas is larger than would be expected from a random sample taken from the UK population, but this is consistent with the freer choice of lifestyle that becomes possible on retirement.

Chapter 2: The relative effects of increasing age, changes in general health and of self-perceptions of driving competence on changes in driving behaviour.

2.1 Changes in reported mileages between 1994–5 and 1998–9

Drivers reported their estimated weekly mileages during the four years preceding each administration of the questionnaire and their self-perceived changes in their abilities to cope with particular, specified, driving situations over the four years preceding each Time Point (TP) at which the questionnaires were administered. This allowed us to check the relative extents to which these changes were related to their ages at the times when they answered the questionnaires and to demographic factors such as level of socio-economic advantage, gender and location of reside which the earlier AA Foundation survey had identified as influential. Self-reports of health on the Cornell Medical Index (CMI, Brodman et al. 1949) at TP1 and TP2 allowed us to check whether the reported changes in weekly mileages over a four-year interval were related to their initial health status at TP1, to their final health status at TP2 and to changes in their health status between TP1 and TP2. The questionnaire also queried the extent to which individuals felt confident in 14 different driving scenarios. This allowed us to check the extent to which changes in ages, their general health status and their feelings of confidence in their capabilities interacted to affect their reported mileages and reductions in mileages.

2.2 Changes in weekly mileage

Respondents estimated their weekly mileages over the last three years preceding Time Point 1 (1994–1995) and Time Point 2 (1998–1999). Pooling data across all age groups, the average estimate at TP1 was 139.50 miles per week (mpw) (sd 104.05) and at TP2 134.68 mpw (sd 98.41). This difference was statistically reliable. Thus, over all age groups, the average reduction in estimates over the 3-year period between TP1 and TP2 averaged 4.82 mpw, or 1.6 mpw for each year of increasing age.

A further question was whether some age groups reported greater reductions in mileage than others; that is whether the average amounts by which mileage is reduced over the 4-year period between TP1 and TP2 depended on the average age of the group considered. Table 2.1 compares mean mpws reported over the 3 years preceding TP1 and over the 3 years preceding TP2 for successive 5-year age samples of individuals (based on their ages in 1994–5). The Pearson's rank order correlation between estimates made at TP1 and at TP2 was r=0.66, (p=0.001). This indicates that individuals' estimates of their mileages at the two time points remained consistent relative to each other and usefully confirms that the Test/Re-test reliability of the questionnaire is robust.

Table 2.1 Changes in estimated mileage between 1994–1995 and 1997–1998 for successive age groups

Age Group (In 1997–1998)	MPW at TP1	MPW reported at TP2	Change TP1 to TP2
62–65 years N = 32	186 (sd 135)	157 (sd 133)	– 29 mpw
66–70 years N = 93	140 (sd 115)	135 (sd 82)	– 5 mpw
71–75 years N = 109	156 (sd 121)	140 (sd 117)	– 16 mpw t=2.08 (Df 108) p=0.04
76–80 years N = 70	136 (sd 82)	139 (sd 128)	+ 3 mpw
81–85 years N = 25	125 (sd 60)	101 (sd 118)	– 24 mpw
86–92 years N = 19	92 (sd 50.1)	69 (sd 38)	– 23 mpw t=2.77 (Df 18) p=0.014

NB only 327 respondents provided information on mileage at both TP1 and TP2. Figures are rounded off to eliminate fractions of a mile. Sd = Standard deviation.

The overall relationship between age and mileage reduction was not statistically significant (F=2.2). All groups except those aged between 76 and 80 years (N=70) reported lower average weekly mileages during the three years from 1994–1995 through 1997– 1998 than during the preceding three years between 1991–1992 and 1994–1995. Within age groups the correlations between estimates of mileage made at TP1 and TP2 varied from r=0.56 to r=0.76. This again confirms that the rank order of individuals' estimates of their mileages was consistent between the two Time Points. Note that cross-sectional comparisons between age groups at both TP1 and TP2 show declines in reported mileages with group age. At both TP1 and TP2 there was substantial variation in the mileages reported by individuals in each age group. As a result the differences in average mileages reported at TP1 and TP2 do not show a clear-cut trend with group age. The extremely high variability in individuals' estimates probably also explains the fact that declines in mileage between TP1 and TP2 are statistically reliable only for respondents aged between 71 and 75 years and between 86 and 92 years. In the latter case this seems a quite plausible representation of reality but the relative size, and robustness, of the change for the 71–75 year olds remains unexplained.

2.3 Checking validity of cross-sectional against longitudinal estimates of mileage reduction with increasing age

Although individual drivers reported very different reductions in weekly mileages over a 4-year period and, indeed, some reported increases in mpw, the significant rank-order correlations (r=0.56 to r=0.74) between their reported mileages at TP1 and TP2 show that their estimates remained reasonably consistent relative to each other. Cross-sectional comparisons between different age groups at TP1 and TP2 allow an estimate of the mean reduction in mpw per year of increasing age over the average period of 20 years separating individuals then aged 60 to 65 years from those then aged 80 to 85 years. Data for TP1 gives an estimate of 61/20 = 3.1 mpw per year of age and data from TP2 gives an average of 46/20 = 2.3 mpw per year of age. The independent longitudinal estimate, derived from members of the sample of all ages, was derived by subtracting the average mpw reported at TP2 (135.6, sd 101.5) from that reported at TP1 (143.6, sd 101.5), ie a difference of 8 mpw. This was equivalent to a reduction of mileage of 2.7 mpw per increasing year of age. Note that variability in the mileages reported by individuals of all ages was very high and that estimates from cross-sectional data were derived from 20 year age-differences between different age groups while the longitudinal estimates were means derived over a 3-year interval between two successive reports from respondents covering the entire age-range. Given the marked differences in estimates made by different age groups the level of agreement is encouraging since it means that values for average changes in weekly mileage with age derived from cross-sectional comparisons between different individuals in different age groups are closely consistent with values obtained from the same individuals' reports of their mileages on two successive occasions, four years apart.

These consistencies reassure us that estimates of mean rates of change from these questionnaire data do have objective validity. We therefore computed the difference between mileages reported at TP1 and TP2 by each respondent and used these as an index of average mileage reduction against which to assess the effects of other variables such as Age, Gender, Socio-Economic Advantage and Occupational Status and general Health.

Table 2.2 shows the results of linear regression analyses examining predictions of mileages at TP1 and TP2 from drivers' ages and their Cornell Medical Index (CMI) scores. The CMI (Brodman, Erdman and Wolff, 1949) consists of 11 sections, each of which interrogates a different aspect of physical or mental health. As is usual with volunteers for gerontological studies respondents were atypically healthy for their ages and, as a result, the average numbers of complaints that they reported within each of the 11 sub-categories were too few to allow meaningful comparisons between the

affects of particular pathologies. Accordingly all categories of complaints made in Sections 1 through 3, which deal with physical rather than mental illnesses, and in Section 4, which deals with mental problems, were summed to give total CMI scores at TP1 and at TP2. Average numbers of complaints (at TP1 mean =7.54, sd 5.97 and at TP2 mean = 7.09, sd 4.93) were lower than is usual for a sample of this age range. Across all age groups there were significantly more complaints of pathologies at TP2 than four years earlier at TP1: (t=2.075, DF=375, p=0.034). Cross-sectional comparisons did not show any significant increases with age in the numbers of complaints at TP1 and TP2.

Individuals' ages and their CMI scores at TP1 and TP2 were compared as predictors of their changes in weekly mileage over the four intervening years. These are shown in Table 2.2.

Table 2.2 Results of linear regression analyses of predictions from respondents' ages at 1997–1998 and from their scores on the Cornell Medical Index (CMI) of differences in their estimates of their average weekly mileages made at two Time Points four years apart

Predictor Variable	Dependent Variable	R	R^2	F	Reliability
Age, 59 to 89 years at TP1	Mileage estimate at TP1	0.185	0.032	13.04	P=0.0001
Age, 62 to 92 years at TP2	Mileage estimate at TP2	0.082	0.009	0.964	P=0.327
Total CMI scores at TP1	Mileage estimate at TP1	0.050	0.002	0.964	P=0.372
Total CMI scores at TP2	Mileage estimate at TP2	0.034	0.001	0.432	P=0.511

At TP1 drivers' ages significantly predicted their estimated weekly mileages over the three preceding years. The relationship is positive indicating that the amount of reduction in weekly mileage over a three-year period increases with age. However, this is not the case at TP2.

Individuals' Cornell Medical Index (CMI) scores at TP1 and TP2 did not reliably predict their average weekly mileages during the period preceding either Time Point. This conclusion may be misleading because, as is typical of samples who volunteer for studies of this kind, and as is confirmed by their CMI scores, these drivers were healthier than average for their age groups. Gross comparisons of this kind have limited reliability for two reasons. First, the effects of differences in CMI scores may not be apparent at low CMI ranges because the differences in health status indicated in these ranges are relatively trivial. Second, within this unusually healthy population only very few individuals have high CMI scores. Since only these individuals can be expected to reduce their mileage because of poor health this means that CMI scores account for only a small proportion of the total variation in mileage between individuals that linear regressions and correlational statistics compute. Consequently, effects of CMI scores on mileage may only be apparent when mileages for very healthy drivers with atypically low CMI scores are compared with mileages for relatively unhealthy drivers with atypically low CMI scores. To check this we computed the weekly mileages for the three years preceding TP2 estimated by the 10 per cent of individuals who had the highest CMI scores, ie greater than or equal to 10 and the 10 per cent who had the lowest CMI scores, ie equal or less than three. For the highest CMI scorers the mean mileage was 181.7 mpw (sd 182.4) and for the lowest CMI

scorers it was 226.45 mpw (sd=245.4). This difference is statistically robust (t=6.6, df=32, p<0.001). It is also substantial, amounting to 44 mpw or a 20 per cent reduction in mileage associated with a difference in health.

Longitudinal data allow us to study the effects of changes in health between TP1 and TP2 on the changes in mileages that occurred during this period. Table 2.3 shows the results of linear regression analyses checking predictions for reductions in mileages between TP1 and TP2 by age at TP2, by CMI scores taken at TP1 and at TP2 and also by changes in CMI scores (increases in numbers of symptoms or conditions reported) between TP1 and TP2.

Table 2.3 Individuals' ages from 62 and 92 years as predictors of their reported reductions in weekly mileages between TP1 (1994–1995) and TP2 (1997–1998)

Predictor Variable	R	R^2	F	Level of Reliability
Age at TP2	0.08	0.008	2.8	P=0.086
Total Cornell Medical Inventory Scores at TP1	0.23	0.001	0.180	P=0.671
Total Cornell Medical Inventory Scores at TP2	0.205	0.042	14.6	P=0.0001
Changes in Cornell Medical Inventory Scores between TP1 and TP2	0.268	0.072	25.41	P=0.0001

At TP2 age between 62 and 92 years weakly predicts individuals' cross-sectionally reported reductions in their mileages over the preceding five years It is not surprising that this prediction borders on, but does not attain, statistical reliability because, as Table 2.1 shows, changes in mileage between TP1 and TP2 were not significant within all age groups and, indeed, some age groups reported an increase rather than a decline in mileage during this period. However, as in all previous studies of changes in everyday activities in later life, 'Calendar Age' is only a very rough index of age and health related biological changes that proceed at markedly different rates in different individuals. The finding that predictions from CMI scores are much stronger and statistically more reliable than those from current Calendar Age illustrates that indices of biological age have greater predictive value than does simple years since birth. It is particularly noteworthy that increases in individuals' CMI scores between 1993–1994 and 1997–1998 robustly predicted reductions in their mileages over the same period.

The strength of the effects of changes health on amount of driving can be better appreciated by examining data for those individuals who did, and did not, report more illnesses at TP2 than at TP1. Of the entire sample, 20.5 per cent reported no increases in numbers of illnesses, and 42.3 per cent reported fewer illnesses at TP2 than at TP1. The 47.2 per cent of individuals who reported some increase in number of illnesses averaged a reduction in mileage of 22.75 (sd 183.87) per week. The 20.5 per cent who reported no increases in CMI scores reported slightly smaller reductions in mileages averaging 17.86 (sd=128.19) per week. In contrast, the 37.7 per cent who reported *fewer* illnesses in 1997–1998 than they had in 1993–1994 reported an average *increase* in mileages of 13.69 (sd 171.1) per week. The reliability of predictions of mileages from changes in CMI scores is further emphasised if we consider the 10 per cent of individuals who reported an increase of four or more illnesses on the CMI during 1997–8 than during 1993–4. For these, the reduction in weekly mileages averaged 43.85 mpw (sd 264.39).

When computed in this way the trend for a reduction in mileage with increase in CMI scores is robustly significant by Chi-squared test (p<0.0001) and confirms the unsurprising, but previously undocumented, point that while increasing age, on its own, does not necessarily lead to reductions in driving, declining health, which often

accompanies increasing age, very evidently does. This is consistent with the idea that individual older motorists continue driving until the accumulation of pathologies that accompany with advancing age, rather than the simple weight of years gradually causes them to reduce their weekly mileages and, finally, to give up driving. This evidence that older individuals appropriately adapt their driving behaviour to changes in their health may be taken as an encouraging sign of their ability to monitor their own condition and of their responsibility as road users.

Since the effects described here are, statistically, quite modest, it is important to point out factors that disguise the full strength of the relationship between health and mileage in the present data. First, gross CMI scores are relatively crude indices of changes in health status. This is because some symptoms reported may be relatively trivial which others are much more powerful in their effects on comfort, confidence and competence while driving. A second more powerful, and more general, reason is that, as we have seen above, relationships that appear modest when assessed within an entire, unusually healthy, population may be strong, and even dramatic, when assessed within particular groups of individuals who are markedly less well than their age peers. A third factor that weakens the apparent strength of these relationships is that the variation in the mileages that individuals report is strikingly large because they markedly vary in their driving needs. For example, changes in individuals' mileages are powerfully affected by age-related transitions between social roles, such as occur at retirement, when they are no longer compelled to drive to maintain employment. Such 'Role transitions' can entail abrupt changes in responsibilities, in socially imposed demands and in disposable income and be quite unrelated to any slow and continuous process of 'Calendar' or even of 'Biological' ageing or even to the onset of health problems. Bearing this in mind it is informative to check whether predictions of declines in mpw differ between the four age-decades represented in this sample.

2.4 Reduction of mileage with increasing age

Table 2.4 compares the effects of calendar age on reported weekly mileage for the entire sample, and separately for four age decades from 60 to 80+. These suggest that an overall, marginally reliable, trend towards reduced mileage with increasing age reflects marked, and statistically robust, reductions that occur between 62 and 70 years but much smaller, and only marginally significant, further reductions that occur between 71 and 80 years. The finding that reductions in weekly mileages are particularly marked between the ages of 62 and 70 years probably occurs because it is during this period of life that people usually retire from full time employment and no longer need to drive as part of their work and, simultaneously, usually suffer a marked reduction in disposable income which may cause them to restrict their driving. This emphasises that changes in individuals' involvement in driving in old age may be determined as much by socio-economic factors as by changes in their driving competence and confidence brought about by the effects of increasing age or of worsening health. It is also crucial to bear in mind that in this study, as in all others in the literature, respondents were self-selected as being active drivers in their particular age groups. Thus while individuals in their 60's are still driving, the effects of future changes in health on their careers as septuagenarian drivers still remains uncertain. In contrast, respondents who are still driving in their 70's and 80's have, by that token, been able to continue to do so because they have remained in relatively good health, and even after experiencing the marked changes in responsibilities and in disposable income that retirement in their 60's may have entailed. This selective dropout of less able, less healthy and perhaps also less affluent respondents affects all gerontological investigations (Rabbitt, Watson, Donlan, Bent, McInnes and Abson, 1994). Hence, because individuals who continue to be able or willing to provide data are increasingly 'elite' members of their generations, age related changes in performance are typically underestimated relative to their actual size in the population at large.

Unfortunately, more exact information about the effects of retirement on driving habits was not available from this study because most individuals only reported their occupations without mentioning whether or when they had retired from them.

Table 2.4 Predictions of changes in estimated weekly mileages at TP1 and TP2 by age within the entire sample and within successive decades

Age Range	R	R^2	F	Level of Reliability
62–92 (whole sample)	0.08	0.008	2.8	P=0.086
62–70 years	0.179	0.32	4.05	P=0.04
71–80 years	0.138	0.019	3.416	P=0.06
81–92 years	0.237	0.056	2.37	P=0.131

Table 2.4 shows that reductions in driving are relatively marked between the ages of 62 and 70, when retirement and other socio-economic factors probably intervene, but appear to plateau thereafter, being only marginally reliable between 71 and 80 years and not significant between 81 and 92 years. This suggests that, after the age of 70, individuals adopt a new 'career' as drivers, during which they maintain relatively low mileages, and do not greatly change their average mileages over a 4-year interval.

It is also informative to note the difference between the 'forward' and 'backward' predictions from total CMI scores of changes in weekly mileages. CMI scores obtained at TP1 do not predict the observed mileage reduction over the following 4 years until TP2. **However**, CMI scores obtained at TP2 do reliably predict individual differences in reports of reductions in mileage since TP1, that is, during the three years preceding TP2. This once again illustrates the benefits of longitudinal over cross-sectional data. Individuals whose CMI scores indicate worsening health between TP1 and TP2 reduced their mileages, but individuals whose CMI scores remained stable did not. Thus a failure of prediction of future reductions in mileage from current CMI status does not mean that individuals' current states of health do not predict the mileages that they currently, or will subsequently undertake. It rather means that average level of health at TP1 predicts changes in amounts of driving between TP1 and TP2 more weakly than do any changes *in health* that may occur between TP1 and TP2. Rabbitt, Carmichael and Jones, (1996) found that motorists believed that their future state of health would be one of the most important factors that would determine how long they would continue to drive. The present analyses provide corroborative evidence that while individuals' mileages do decline as they grow older, the rates at which they do so does not depend on their Calendar Ages but rather on a number of different factors that are associated with their calendar ages: notably declines in their general health but also changes in their social roles and responsibilities and associated changes in their disposable incomes.

When interpreting longitudinal data obtained from volunteer samples it must always be borne in mind that the most frail, and so the least able, individuals tend to drop out of a study resulting in a progressive bias towards an 'elite' cadre. This selective dropout is always greatest in the oldest groups in any sample (see Rabbitt, Watson, Donlan *et al.* 1994). There is evidence that bias in the current sample because although, in the population at large, prevalence of pathologies increases steadily with advancing age between 60 and 80+ years, in this self-selected group individuals' Calendar Ages did not predict their total CMI scores, either at TP1 (R=0.034; R^2=0.001; F=0.432; p=0.511) or at TP2 (R=0.050; R^2=0.002; F=0.964; p=0.327). This suggests that the older individuals in this sample were elite survivors whose health has remained relatively unaffected as they have grown old. It also raises the interesting possibility that if individuals fall below a particular threshold of health they may give up driving – and also, of course, give up answering questionnaires.

A different point is that the impacts of declines in health probably markedly differ between successive age groups. Even quite marked changes in health may not cause relatively young adults to give up driving, or even to greatly reduce their weekly mileages. This is because many illnesses may spare overall competence and, in any case, may have to be tolerated in order to continue to meet day-to-day responsibilities. Equivalent declines in health may more drastically affect the competence of older individuals who have already become frail for other reasons. Cessation of obligations to drive may also mean that problems that young drivers find relatively minor, and tolerable under necessity, may be more discouraging for the elderly and cause them to reduce their mileages to an essential minimum. In sum, one consequence of increasing health problems may well be an increasing reluctance to drive unless this is absolutely necessary. (Another may be an increasing unwillingness to complete lengthy questionnaires on driving behaviour – or indeed on any other topic).

2.5 Effects of other demographic and individual variables on changes in weekly mileage

In a previous cross-sectional survey Rabbitt, Carmichael and Jones (1996) found that individuals' expectations of how long they would continue to drive were not only determined by their ages and general health status but also by demographic factors such as their genders and levels of disposable income, as indexed by occupational category. We accordingly examined the effects of these factors on longitudinally estimated reductions in mileage per week. The results are given in Table 2.5.

Table 2.5 Reductions in mileage per week between TP1 and TP2 predicted by gender, occupation and residential environment

Predictor Variable	R	R^2	F	Level of reliability
Gender	0.26	0.001	0.239	0.63
Occupation	0.50	0.002	0.806	0.370
Residential environment	0.35	0.002	0.4	0.519

In this sample neither gender, occupation (and so, implicitly, level of socio-economic advantage) nor area of residence affected longitudinally reported changes in weekly mileage over the three years between TP1 and TP2.

2.6 The effects of changes in self-reported health on self-reported driving competence

The number of complaints that respondents reported on the CMI significantly increased between TP1 and TP2. Increases in complaints on the CMI significantly predicted concomitant reductions in average mileage per week. This makes it reasonable to ask whether health changes also contributed to changes in their perceptions of their competence in particular driving situations. At each administration of the questionnaire respondents rated the extent to which their ability to cope with each of 13 different driving scenarios such as parking, night driving etc, had changed over the last four years. To do this they used a 5-point scale categorising themselves as having become much better, better, having remained the same or having become worse or much worse over this period. Rabbitt, Carmichael and Jones, (1996) have reported cross-sectional analyses of the ways in which individuals' perceptions of their competence in particular traffic scenarios changed with the average age of the groups from which they were drawn. The present analysis obtained average numbers of each level of rating for all driving scenarios for each individual. Table 2.6 compares means of these means at TP1 and TP2.

Table 2.6 Means of categories of respondents' self-assessments of their competence in a range of different driving scenarios

Nature of change reported over the last 3 years	Mean of reports at TP1	Mean of reports at TP2	T for paired comparison	Level of reliability
Got much better	0.27	0.12	–1.71	0.088
Got better	0.53	0.49	–0.35	0.725
Stayed the same	12.04	11.90	–0.93	0.35
Got worse	1.14	1.32	2.15	0.032
Got much worse	0.002	0.008	1.28	0.202

Respondents reported some significant reduction in their driving competence during the four years between TP1 and TP2. Generally, numbers of reports that ability to cope had become 'much better', 'better' or had 'stayed the same' reduced, while reports that ability to cope had become 'worse' or 'much worse' correspondingly increased. This overall trend was reliable (p=0.050). There was a marginally reliable reduction in reports of 'Got much better' (p=0.088) and a reliable increase in reports of 'Got Worse'. (p=0.032).

A natural question was whether respondents' perceptions of reductions ability to cope with driving problems between TP1 and TP2 were most affected by their ages, by their concurrent CMI reports at TP2 or by changes in their CMI reports between TP1 and TP2. Table 2.7 shows these analyses.

Table 2.7 Predictions of changes in reports of competence at driving between TP1 and TP2 by respondents' ages, by their CMI scores at TP2 and by increases in their CMI scores between TP1 and TP2

Prediction	R	R^2	F	Level of reliability
Total 'Much Worse' scores from Total CMI scores at TP2	0.124	0.015	5.85	P=0.016
Total 'Much Worse' scores from increase in CMI between TP1 and TP2	0.097	0.009	3.48	P=0.063
Total 'Worse' scores from Total CMI scores at TP2	0.378	0.159	7.12	P=0.0001
Total 'Worse' scores from increase in Total CMI scores between TP1 and TP2	0.102	0.010	3.48	P=0.06
Total of 'Worse' scores predicted by age	0.003	0.000	0.003	P=0.958
Total of 'Much Worse' scores predicted by age	0.085	0.007	2.805	P=0.095

The more complaints respondents reported on the CMI at TP2, the more likely they were to feel that their performance had become 'Worse' or 'Much Worse' over a range of different driving scenarios over the last four years. Increases in CMI scores between TP1 and TP2 also gave marginally reliable predictions of perceptions of declines in ability to cope over the same period. In contrast respondents' Calendar Ages, taken on their own, did not reliably predict their perceptions of changes in driving competence over a four year period.

These relationships are key to the most important questions that we need to ask about older drivers: how far their perceptions of changes in their driving ability relate to changes in their health and, perhaps more crucially, whether their self-monitoring, as expressed in their assessments of their ability to cope, affects their driving behaviour, as expressed in their weekly mileages.

To do this we examined correlations between the numbers of scenarios in which individuals reported that they were Very Good, Good, Average, Poor or Very Poor, at

TP2, their CMI scores at TP2 and their mileages for the last three years before TP2. Pilot analyses had shown that no other relationships were statistically robust. Because very few individuals rated themselves as 'Very Poor' in any driving scenario, ratings of 'Poor' and 'Very Poor' were pooled to make the comparisons discussed below.

Table 2.8 Correlations between self-rated ability scores at TP2, CMI scores at TP2 and reported weekly mileages for the period between TP1 and TP2

Self ratings at TP2	CMI scores at TP2	Mileages during period TP1–TP2
Very Good	R = –0.161 (p=0.004)	R = 0.144 (p=0.009)
Good	R = –0.157 (p=0.005)	R = –0.005 (not sig)
Average	R = 0.224 (p=0.0001)	R = –0.176 (p=0.001)
Poor/Very Poor	R = 0.337 (p=0.0001)	R =–0.139 (p=0.001)

These comparisons show that, at TP2, the numbers of scenarios on which individuals rate themselves as 'Very Good' or 'Good' at TP2 inversely predict their CMI scores, while the number of scenarios on which they rate themselves as 'Average' or 'Poor/Very Poor' directly predict their CMI scores. The number of scenarios on which drivers rate themselves as 'Very Good' at TP2 also significantly and directly predicts their reported mileages over the last three years. The numbers of scenarios on which individuals rate themselves as 'Good' do not predict their mileages. Finally, the numbers of scenarios on which individuals rate themselves as 'Poor' or 'Very Poor' negatively predict their reported mileages over the last three years.

In summary, individuals who rate themselves as 'Very Good' on many scenarios tend to report few illnesses and have unusually high mileages. Individuals who often report themselves as 'Good' also report few illnesses but do not have exceptional mileages. Individuals who often report themselves as 'Average', or 'Poor/Very Poor' report more illnesses than average, and lower than average mileages.

An obvious issue of interest is the direction of the causal relationship. That is, whether people's mileages are primarily determined by their self-evaluations, or by their states of health – which are, as we have seen, significantly correlated with their self-evaluations. To examine this, stepwise linear regressions assessed the strength of predictions of mileages from self-ratings of competence in driving scenarios after variance associated with CMI scores had been taken into consideration. For contrast these were carried out on the two limiting cases: collapsing self-ratings of 'Very Good' and 'Good' and of 'Poor' and 'Very Poor'.

The numbers of scenarios on which individuals rated themselves as 'Very Good' and 'Good' positively predicted their mileages even after variance associated with their CMI scores had been taken into consideration (Beta, 0.128; $F=5.74$, $p<0.017$). The numbers of scenarios on which they rated themselves as 'Poor' and 'Very Poor' negatively predicted their mileages, even after variance associated with their CMI scores had been considered (Beta=-0.140; $F=6.860$; $p<0.009$). In both cases CMI scores, on their own, made no independent prediction.

This suggests that individuals' perceptions of their own driving competence influence the amount that they drive more directly than do their CMI scores. In other words, worse CMI scores, by themselves, do not seem to lead to a reduction in amount of driving unless they are also associated with perceptions of a loss of driving competence or confidence.

It is useful to explore the implications of these analyses further because they seem to offer an important clue as to how, and why, people alter their driving behaviours as they grow older. As a population of drivers grows older increasing numbers of its

members begin to experience poor health. Poor health is associated with a reduction in driving, and with a decline of self-confidence in a range of driving scenarios. However individuals do not seem to reduce their driving because they perceive changes in their health, but rather because they appropriately monitor, and appropriately react to, changes in their self-perceived driving competence and confidence. It seems that it is perceptions of changing competence and confidence, perhaps associated with declining health, rather than the experience of declining health *per se*, that brings about appropriate modifications of driving behaviour.

We may ask the further question whether drivers' ages affect their self-ratings of their own ability, and whether it is their ages or their perceptions of their ability that more powerfully determine how much they drive. Drivers' Calendar Ages did not significantly predict the number of scenarios on which they rated themselves as 'Very good', 'Good' or 'Average' but did positively predict the number of driving scenarios in which they rated themselves as 'Poor' or 'Very Poor' (Beta=0.142; F=7.95; $p<0.005$). To examine whether individuals' ages or their self-assessments of their driving competence were the more important factors in determining the trend to reducing mileage with increasing age a stepwise linear regression examined the prediction of current mileage from the number of scenarios in which drivers had rated themselves as 'Poor' or 'Very Poor' after variance associated with their ages had been partialled out. Numbers of scenarios rated poor or very poor inversely predicted current mileages (Beta=-0.140; F=7.104; $p<0.008$) after variance associated with age, which made no significant additional prediction, had been taken into consideration.

We conclude that we find no evidence that individuals' ages, or their states of health, *per se*, affect the amount that they choose to drive. Individuals do reduce their mileages as they grow old, but this reduction is more strongly related to their self-assessment of their driving competence than to increasing age or to declining health. Of course it is the case that individuals tend to drive less as they grow older and as their health declines. However these analyses offer no evidence increasing age or frailty alter people's driving behaviour until they notice impairments in their driving ability.

These relationships are statistically reliable. It is not surprising that they are also weak. As we have noted, the CMI is only a crude general index of health factors that might affect driving. Individual differences in mileages are very great, and are strongly determined by a range of other factors such as need to drive, level of disposable income, extents of social involvements and habit. Nevertheless these results can be taken as evidence that older drivers' road use is directly, and appropriately, determined by their self-monitoring and self-assessment of their driving capabilities. It is a strong counter-argument to the idea that drivers not only become less competent, but also less conscious of their shortcomings and so more feckless as they grow older.

2.7 Conclusions

Members of a population aged from 62 to 92 years who remain well enough to continue driving, and motivated enough to volunteer to answer a long driving questionnaire, nevertheless reduce their weekly mileage by an average of 2.5 to 3.0 miles per week. Successive cross sectional estimates of declines in mileage per year obtained by comparing groups of people of different ages on two occasions four years apart are consistent with each other. They are also consistent with independent, longitudinally computed, estimates obtained by tracking the same individuals over a period of four years. Note, however, that very marked variations between individuals warn us that these figures are only useful as a global population estimate and are poor guidelines for individual cases.

Longitudinal comparisons show that the declines in average weekly mileage over a four-year period are significant when data are pooled across all age groups. Decline in

weekly mileage is associated with significant increases in the number of adverse health symptoms and increases in reports of poor competence in a variety of driving scenarios. Previous cross-sectional studies have found that older drivers are indeed sensitive to changes in their own competence, that older drivers do reduce the distances that they drive and that older drivers do adapt their driving behaviour in other ways to increase safety (Rabbitt, Carmichael and Jones, 1996).

The amounts of variance between individuals (R^2) for which age and health account are never greater than one per cent. In other words up to 99 percent of variance in weekly mileages and in self-perceived driving competence seems to be due to factors other than increasing age and declining health. This is highlighted by the finding that individual differences in mileages are very large: they are up to two orders of magnitude greater than are the differences in mean mileages associated with differences in age or in CMI scores. We might conclude that, within this particular sample of drivers, health and age are statistically reliable, but quite minor, factors in predicting individual differences in driving confidence and mileages.

It is important to recognise that this conclusion is misleading. This volunteer sample was, evidently, unusually healthy and competent. The small minority of individuals who experienced considerable numbers of health problems reduced their mileages by substantial amounts: in absolute terms, on average, 44 mpw, or in relative terms a 20 per cent drop in comparison with their much healthier co-evals. However because only a minority if individuals experienced poor health their substantial consequential reductions in mileage contributed very little to estimates of the total amounts of variance for which CMI scores account.

A new finding is that the same minority of relatively unhealthy individuals gave increasingly pessimistic self-ratings of their driving competence as they grow older. However this perceived loss of competence is not directly predicted by increasing age, *per se*, but rather by declines in general health that accompany increasing Calendar age. Individuals' self-assessments of their current levels of competence in particular driving scenarios predict the weekly mileages that they undertake. Although these predictions are modest they are statistically robust. It is not surprising that individuals' self-assessments also become more pessimistic as they become less healthy. A new finding is that changes in health do not affect driving behaviour unless they are also accompanied by changes in driving confidence associated with self-assessed changes in driving competence. To put this another way, these data are consistent with the idea that worsening health reduces mileage mainly to the extent to which it results in a perceived loss of driving competence. Thus these analyses provide evidence both that older drivers do monitor and assess their own competence, and that these self-assessments determine their driving behaviour.

One reason for the apparently slight effects of age and health in this study is that, like all who volunteer for studies of this kind, these respondents are certainly an atypically healthy and competent sample of the population at large. They were not only self-selected as being active drivers during 1994–1995 but as continuing to remain active drivers over the next four years until 1997–1998. By this token none of them, by 1997–8, had yet experienced a decline in health sufficiently great to cause them to give up driving. Details of their CMI reports confirms that although there were significant increases in the total numbers of reported medical complaints between TP1 and TP2 these reflected quite minor changes in health status and did not include onsets of serious medical conditions or of severe health problems which were likely directly to affect driving competence. Further, while many of the TP1 respondents who survived as active drivers and agreed to answer questionnaires four years later do report some loss of driving competence over the last four years these losses have, by definition, not yet been sufficiently great to cause them to give up driving. The experiences of those other members of the Rabbitt, Carmichael, Jones and Holland

(1996) sample who have since given up driving, or who may have experienced major changes in health go unrecorded.

There are two different ways in which it is possible to interpret this clear evidence of self-selection. The first is to conclude that selective bias towards good health and high performance in volunteer populations, and most particularly the selective attrition of less well and able members of longitudinally studied samples, causes us grossly to underestimate how strongly relationships between age, health and perceived competence determine in the population at large. An alternative, and in our view better considered, conclusion is that while self-selection does indeed have these marked effects, self-selection and attrition among volunteers for questionnaire studies are paralleled by equally stringent self-selection and equally marked selective drop-out from the population of drivers at large. As earlier cross-sectional analyses by Rabbitt et al (1996) suggest, the principal reasons for giving up driving in later life are perceptions of worsening health, competence and safety. On the assumption that elderly drivers are sensitive to changes in their health and competence, and withdraw from driving in good time, relationships between ages, health, perceived competence and involvement in driving are bound to be slight within groups of active drivers because they are 'capped' by the timely withdrawal of individuals who have experienced marked changes.

These analyses also suggest that another reason why individual differences in health and age have very modest effects is because driving is also strongly, and perhaps mainly, determined by economic necessity, by opportunity and by social demands and responsibilities. People drive because they like to do so, but they also drive because they must, or because driving allows them to engage in other desirable activities that they would have to forego if they gave up. This would account for a significant decline in weekly mileages with age between TP1 and TP2 for respondents aged between 62 and 70, a period in which changes of lifestyle associated with retirement usually occur, contrasting with comparative stability of driving in other, older, groups who have adapted to a retired lifestyle (except, understandably, among octogenarians). These data show that to the extent that increasing age and declining health alter people's confidence in their own competence they also do limit the amounts that people drive. However they also strongly suggest that socio-economic factors, such as reductions in income and in obligations to drive that occur at about national retirement age may have an even greater effect. The data also suggest that older drivers become aware of changes in their driving competence caused by increasing age and worsening health, and that they respond to this realisation by reducing their involvement in driving.

Chapter 3: Public transport and mobility issues

3.1 Prodecures and findings

At both TP1 and at TP2 drivers were asked to estimate the average number of times in a month that they would make use of alternatives to their own cars such as public transport, taxis, rental cars or lifts from friends and family. They gave estimates for the three years immediately before, and for the period from three to six years before, each TP. Table 3.1 shows means and sds for their estimated use of public transport, car hire and use of taxis at TP1 and at TP2.

Table 3.1 Estimated use of public transport, car hire and taxis at TP1 and TP2

	TP1		TP2	
	Last 3 years	**3–6 years before**	**Last 3 years**	**3–6 years before**
Public transport	2.90 (6.25)	2.36 (5.42)	2.55 (6.63)	2.04 (5.61)
Taxis	0.696 (0.192)	0.349 (1.33)	0.472 (1.25)	0.282 (0.873)
Rental car	0.082 (0.403)	0.138 (0.699)	0.136 (0.712)	0.130 (0.741)

The fact that 'three to six years before' at TP2, and 'last three years' at TP1 correspond to the same period of time makes it possible to check the consistency between estimates given at these time points. Rank order correlations were robustly significant (r=0.64 to 0.78). This encourages confidence that their answers reflect objective reality. However for all alternatives, except for rental car hire, the estimates that individuals gave for this identical time period at TP2 were lower than those that they gave at TP1. This probably indicates some failure of recollection over time of particular instances of use of alternative transport. Nevertheless there are also trends that suggest that individuals felt that their use of alternative transport had increased as they grew older. At both TP1 and TP2 respondents estimated that they had used public transport significantly more often during the last four years (ie present –3 through present –1) than during the four years before that (i.e. present – 6 through present – 3) ($F=5.98$, $p=0.001$ for TP1 and $F=11.038$, $p=0.001$ for TP2). Similarly, at both TP1 and TP2, respondents estimated that they had used taxis significantly more often during the last four years (present – 3) than they had in the three years before that (ie present – 3 through 6) ($F=11.28$, $p=0.001$; for TP1 and $F=22.93$, $p<0.0001$ for TP2). Responses at TP1 and TP2 also suggest some decline in use of self-drive rental cars consistent with increasing reluctance to drive.

It is possible that use of public transport may be strongly determined by attitudes towards the prospect of giving up driving. That is, people who are still driving but who are beginning seriously to consider giving up may display different patterns of use of alternative transport than those who intend indefinitely to continue. As in the previous report by Rabbitt, Carmichael, Jones and Holland, (1996) it was possible to divide the sample into those who were willing to suggest a future date at which they would give up driving and those who were unwilling to do so and who said that they intended to keep on driving indefinitely.

We may speculate that drivers who are considering giving up may have already begun to use public transport more frequently. Unfortunately statistical comparisons are not reliable because of the very small number of drivers, who are considering giving up, relative to a much larger number of drivers who intend to carry on,

However, as an illustration, Table 3.2 shows, the estimated use of public transport and of taxis by 'give up' and 'carry on' groups for the four years preceding each questionnaire.

Table 3.2 Estimated use of public transport and taxis by 'give up' and 'carry on' groups

		'Carry on' drivers	'Give up' drivers
TP2	Public transport	2.95 (6.34)	3.00 (6.20)
	Taxis	0.656 (1.79)	0.700 (1.89)
TP1	Public transport	2.56 (6.67)	2.08 (5.70)
	Taxis	0.47 (1.24)	0.27 (0.83)

Comparisons between TP1 and TP2 show an overall increase in the use of alternative transport over a four-year interval by both 'give up' and 'carry on' groups. Comparisons between these two groups at each time point give inconclusive results. At TP1, unexpectedly, the 'carry-on' group uses both public transport and taxis more than does the 'give up' group. At TP2 such small difference as exists is in the opposite direction. This absence of difference between groups also certainly reflects the fact that the decisions about use of public transport that people make are mediated by a very wide range of factors, quite other than their ages. These include their states of health, or even in their confidence in their driving ability and their predictions of the periods for which they will be able to continue driving but also local availability of public transport, and its suitability for their particular travelling needs. For example, both in the previous analyses of data from the entire population of volunteers by Rabbitt, Carmichael *et al.* (1996) and in the present analysis of a subset of these individuals, those persons who maintained that they anticipated no definite conclusion to their driving careers were not only more self-confident and healthy than those who foresaw a point at which they would give up but they also reported higher mileages and, equally importantly, were relatively advantaged socio-economically. In other words, individuals who were not only generally more active and engaged in life, but who were also better off may be expected to have more frequent need for alternative transport and also to be better able to afford it.

Thus drivers' responses that they are likely to carry on driving indefinitely reflects a combination of advantages, of which relatively good health is only one. To more directly investigate the influence of health on use of alternative transport CMI scores at TP2 were entered as predictors of use of public transport, use of taxis and reliance on friends or relatives for lifts at TP2. In all cases CMI scores at TP1 gave a significant, though modest, positive predictions ($R=0.19$ to $R=0.23$ $p<0.001$ in all cases) of future use of public transport and dependence on help from others. Statistically robust positive predictions of use of alternative transport were also made by changes in CMI scores between TP1 and TP2 ($R=0.16$ to $R=0.21$) and by CMI scores at TP2 ($R=0.19$ to $R=0.25$). It appears that poorer health is associated with reduced driving and so, unsurprisingly, with increased use of alternative forms of transport and of help from family and friends.

Respondents also reported how often they see their family and friends or receive lifts from family and friends. Table 3.3 shows averages of estimates made for 'present minus three years' and for 'present minus three to six years' at each Time Point.

Table 3.3 Average estimates of seeing and receiving lifts from family and friends at each Time Point

	TP1		TP2	
	Last 3 years	**3–6 years before**	**Last 3 years**	**3–6 years before**
How often do you get lifts from family or friends?	2.05 (3.81)	1.72 (3.34)	1.62 (2.25)	1.29 (2.13)
How often does a family member drive you somewhere in your own car?	1.40 (3.78)	1.18 (3.66)	1.56 (3.97)	1.21 (3.49)
How often do you visit friends or relatinves in their homes?	6.48 (8.82)	6.11 (9.38)	5.57 (5.96)	5.24 (5.51)
How often do friends or relatives visit you at home?	6.65 (13.93)	6.93 (19.79)	5.43 (6.78)	5.14 (6.76)
How often are you on the telephone with friends or relatives?	20.41 (25.52)	19.66 (37.79)	19.90 (18.21)	17.82 (17.67)

The cross-sectional comparisons illustrated in Table 3.3 show that, at each TP, respondents reported relying more on family and friends during the 'present minus three years' than during the 'present minus three to six years'. This is consistent with an assumption of increased dependency on others with increasing age. However the finding of no changes in reliance on family and friends were reported between TP1 and TP2 is inconsistent with this conclusion.

3.2 Conclusions

The main finding from these analyses was the consistency between these older drivers' descriptions of their use of public transport and their reliance on help from family and friends and the descriptions given by the entire sample and reported by Rabbitt, Carmichael, Jones and Holland, (1996). The high level of consistency between individuals' responses at TP1 and TP2 is another indication of the reliability of the Older Driver Questionnaire (ODQ).

Chapter 4: Attributions of causes of driving accidents

4.1 Procedures and findings

The questionnaire also included 26 questions on issues such as the responsibility of the driver for the safety of others, levels of agreement or disagreement with stereotype statements about the loss of driving skill in old age, and issues regarding the desirability of owning a car, possible reasons for continuing to own, or giving up a car, and possible alternatives to car ownership. Each question was framed as a statement to which volunteers responded by rating their extent of agreement on a five-point scale from 'strongly disagree' to 'strongly agree'. The statements were divided into topic groups. The first group was concerned with possible causes of accidents that were not under the driver's control. These were:

1. It is difficult to prevent accidents in bad weather conditions such as darkness or rain.
2. Most accidents are due to pedestrians not following the rules of the road.
3. Accidents are mainly due to various unpredictable events.
4. Driving with no accidents is largely a matter of luck.

Table 4.1 shows the percentages of drivers who agreed (rated 1 or 2) and the percentages who disagreed (rated 4 or 5) with the statement at each time of completion of the questionnaire.

Table 4.1 Percentages of drivers agreeing/disagreeing with statements on accident causes

	TP1		TP2	
Statement; accidents are often due to	**% agree**	**% disagree**	**% agree**	**% disagree**
Poor driving conditions	33.9	48.5	29.6	55.7
Poor pedestrian behaviour	24.1	46.8	22.0	51.4
Unpredictable events	36.2	46.1	35.2	47.3
Luck	26.3	60.5	18.7	66.6

Table 4.1 shows that more drivers disagreed than agreed with each of the four statements. Numbers of disagreements increased from TP1 to TP2, but this difference was significant in only two cases: at TP2 ratings to the statements "It is difficult to prevent accidents in bad weather conditions" and "Driving with no accidents is mainly a matter of luck" were more dismissive than at TP1 ($t=-2.48$, $p=0.014$; $t=-2.99$, $p=0.003$ respectively). Thus at TP2 respondents were less willing to accept that the cause of an accident may be out of a driver's control. Although more respondents disagreed with attributions of accidents to factors uncontrollable by drivers at TP1 than at TP2, at both time points most respondents did not accept that accidents were mainly caused by events outside the control of the driver.

The significant increases in disagreement with two proposals between time points indicates that many participants who had agreed with these proposals, or had expressed neutrality, at TP1 began to disagree with them at TP2. This allowed respondents to be divided into two groups: those who had moved from agreement or neutrality to disagreement, and those who had either not altered their ratings or had moved towards agreement. Because these groups were very different in size statistical comparisons were not meaningful. Table 4.2 gives the mean ages, weekly mileages and numbers of accidents and minor mishaps reported by these two groups over the three years between TP1 and TP2.

Table 4.2 Responses to statement: "it is difficult to prevent accidents in bad weather conditions such as darkness or rain".

	Change to disagree (N=62)	Remain constant or change to agree (N=319)
Mean age	74.67 (7.15)	72.89 (5.82)
Average weekly mileage	149.30 (134.65)	135.41 (108.73)
Road accidents	0.15 (0.39)	0.11 (0.42)
Minor mishaps	0.65 (1.43)	0.39 (0.71)

The group who change their opinions to disagree with attributions of causes of accidents being beyond drivers' control are slightly older and have slightly higher weekly mileages than the group who changed their opinions towards attributions of accidents to drivers' responsibility. Perhaps of more interest is that groups who alter their opinions to disagree that accidents are due to causes beyond drivers' control report a somewhat higher rate of 'minor mishaps' during the four years. This is, perhaps, consistent with the speculation that there own driving lapses have made them more willing to believe that drivers are responsible for their own safety. This is a reassuring point, since it suggests that, rather than attributing causes of their lapses to others, or to external agencies, older drivers do learn caution from their mistakes.

Table 4.3 Responses to statement: "driving with no accidents is mainly a matter of luck"

	Change to disagree (N=60)	Remain constant or agree (N=327)
Mean age	74.02 (6.92)	73.10 (6.00)
Average weekly mileage	162.4 (163.07)	132.78 (100.80)
Road accidents	0.10 (0.30)	0.13 (0.43)
Minor mishaps	0.43 (1.28)	0.43 (0.79)

The group who alter their opinions towards disagreement with this statement at TP2 again tend to be somewhat older and to have a higher weekly mileage than the group who altered their opinions towards agreement. However drivers who altered their views towards disagreement did not report more accidents or minor mishaps than those who altered their views towards agreement, or who did not change their ratings.

Four further statements were also concerned with accidents but emphasized the personal responsibility of drivers for their occurrence. They were:

1. Accidents are often caused by drivers not paying full attention to their driving.
2. Most accidents are the result of driver error.
3. A careful driver can prevent most accidents.
4. Most accidents are caused by inexperienced drivers.

Table 4.4 shows the percentages of drivers who agreed (rated 1 or 2) and who disagreed (rated 4 or 5) with each of these statements on each occasion when they answered the questionnaire. Respondents generally strongly agreed that much of the responsibility for accidents lies with the driver. Consistently with declines of ratings of statements attributing accidents to causes out of drivers' control there was, if anything, an increased tendency to attribute responsibility to drivers between TP1 and TP2. It is not remarkable that this trend failed to reach significance since there is an obvious 'ceiling effect' with levels of agreement at both TP1 and TP2 almost at maximum for all except the last statement: "inexperienced drivers cause most accidents" on which a less decisive line was taken.

Table 4.4 Responses to statements attributing responsibility for accidents to the driver

	TP1		TP2	
Statement	**% agree**	**% disagree**	**% agree**	**% disagree**
Inattention by driver	94.7	0.8	97.5	0.8
Driver error	83.3	5.6	84.8	5.6
Careful driver can prevent most accidents	89.9	3.3	90.9	3.3
Inexperienced drivers cause most accidents	49.1	24.8	51.1	24.8

4.2 Conclusions

These results are again consistent with those obtained from the entire parent sample and reported by Rabbitt, Carmichael, Jones and Holland (1996).

An important implication is that they strongly counter the impression that older drivers become more feckless in their perceptions of the causes of accidents, and in their own responsibility for accidents. On the contrary, both cross-sectional and longitudinal comparisons show that as drivers age they tend to take their responsibility for road safety increasingly seriously. This is particularly true of individuals who have, themselves, experienced accidents or mishaps.

Chapter 5: Attitudes towards car ownership and perceptions of advantages and disadvantages of giving up car ownership

5.1 Procedures and findings

Respondents also rated seven statements probing attitudes towards car ownership. Four statements were concerned with positive aspects of car ownership while a further four were concerned with the positive aspects of giving up a car. These statements were:

1. A car is an important status symbol.
2. Driving enhances a person's independence.
3. Driving is vitally important to most people today.
4. Giving up driving will save me a lot of money.
5. Travelling by car is more expensive than travelling by public transport.
6. Giving up driving will simplify my life.
7. Giving up driving will relieve me of unwanted responsibility.

Table 5.1 Percentages of drivers who agreed (rated 1 or 2) and the percentages who disagreed (rated 4 or 5) with the seven statements at TP1 and TP2

	TP1		TP2	
Statement	**% agree**	**% disagree**	**% agree**	**% disagree**
Status symbol	15.4	57.7	17.0	49.9
Independence	90.4	2.3	92.4	1.8
Vitally important	76.2	6.8	82.0	6.3
Save money	54.9	22.5	57.0	23.3
Public transport cheaper	40.3	37.7	45.6	34.4
Simplify my life	12.4	70.9	8.9	72.2
Relief from unwanted responsibility	16.2	57.0	13.9	61.5

Most respondents disagree with the statement that a car is an important status symbol. Disagreement was significantly stronger at TP1 than at TP2 ($t=3.00$, $p=0.003$). At both TP1 and TP2 respondents strongly believed that owning a car enhances a person's independence, and ratings of this statement did not change over the four year interval between ratings. This was probably due to a ceiling effect. Similarly, more than three quarters of respondents felt that owning a car is vitally important to people today. There was a slight decline in disagreement with this statement between TP1 and TP2 but this is not statistically reliable.

On the four statements suggesting positive aspects of giving up driving most respondents agreed that they would save money if they gave up their cars and this, to some extent, was reflected in their responses to the statement that using public transport is cheaper than using ones own car. Participants strongly disagreed with the suggestion that giving up driving would simplify their lives or relieve them of unwanted responsibility. This suggests that, at least for this relatively affluent sample, the everyday convenience and advantages of owning a car outweigh the advantages of saving money by giving up a car. In all cases differences between TP1 and TP2 were not statistically significant.

Seven statements concerned some of the potential disadvantages of giving up driving. These were:

1. Without a car older people are at greater risk of being victims of violence
2. Giving up driving will restrict my mobility
3. Giving up driving will restrict my independence
4. Giving up driving will mean letting down people who rely on me
5. Giving up driving will cause me difficulties due to unsuitable public transport
6. Giving up driving will limit my ability to make even the shortest journey
7. Giving up driving is not an option for anyone who has a mobility impaired spouse or relative.

Table 5.2 Percentages of drivers who agreed (rated 1 or 2) and the percentages who disagreed (rated 4 or 5) with each statement at TP1 and TP2

	TP1		TP2	
Statement	**% agree**	**% disagree**	**% agree**	**% disagree**
Violence	51.4	19.5	52.4	17.7
Restricted mobility	92.7	3.0	93.4	3.8
Restricted independence	90.4	4.6	91.6	3.0
Letting people down	58.0	12.7	59.7	14.9
Difficulty with public transport	84.1	7.3	81.5	9.4
Limit even short journeys	56.5	28.1	51.1	31.4
Not an option for a carer	78.2	3.8	77.2	4.8

Most respondents agreed with all seven statements at both TP1 and TP2. Perhaps unsurprisingly most respondents felt that restriction of mobility and restriction of independence are the most serious problems entailed by giving up their cars. This agrees with the finding that most of them also felt that the public transport system available to them does not allow them the same level of mobility/independence as car ownership does. Similarly, most respondents felt that giving up car ownership is impossible if one is caring for a spouse or relative with limited mobility. This is also consistent with belief in the inadequacy of available public transport. Feeling on all of these statements was very strong and with this ceiling level of agreement it is not surprising that there was no statistically significant change in attitudes between TP1 and TP2.

5.2 Conclusions

The main findings were, again, consistency of attitudes on these issues with those expressed in the larger sample analysed by Rabbitt *et al.*, (1996) and the close consistency of answers given at TP1 and TP2.

Chapter 6: Attitudes towards older drivers

6.1 Procedures and findings

Respondents evaluated three statements specifically related to the attitude of older drivers towards older drivers. These were:

1. Anyone who continues to drive after the age of 70 puts both themselves and others at risk
2. People should be free to continue driving whatever their age so long as they can demonstrate adequate driving ability if called upon to do so
3. People should be free to continue driving whatever their age so long as they feel confident about their own driving ability. Responses are shown in Table 6.1 below.

Table 6.1 Percentage agreement/ disagreement with statements about older drivers

	TP2		TP1	
Statement	**% agree**	**% disagree**	**% agree**	**% disagree**
Over 70's are risky drivers	8.6	81.5	9.1	76.7
No age limit if ability is shown	92.2	3.3	94.9	2.3
No age limit if self-confident	61.5	28.1	61.5	26.3

Perhaps not surprisingly most of these respondents disagreed with the statement that drivers over the age of 70 represent a risk to themselves and others. This view significantly strengthened between TP1 and TP2 ($t=1.5$, $p=.001$). Consistently with this attitude drivers also agreed that there should be no age limit on driving as long as ability can be demonstrated if required. There was no change in the strength of expression of this attitude between TP1 and TP2. Most also agreed with the statement that there should be no age limit on driving as long as drivers remain confident of their ability. However this statement was less strongly supported than was the statement implying that the criterion for decision should be objectively demonstrated ability rather than self-confidence ($t=0.6$, $p<0.001$). This suggests that at least a quarter of respondents sensibly take the point that older individuals' confidence in their own driving ability may not be an entirely reliable index of their actual performance, and that older drivers bear some responsibility to demonstrate their ability if they are required to do so. There was no apparent shift in attitudes on this issue between TP1 and TP2.

6.2 Conclusions

Again the most interesting conclusion is the realism of older drivers in perceiving that age may reduce driving competence, and that older individuals' opinions of their own levels of competence may not be reliable guides to their actual capacity.

Chapter 7: Acceptability of proposals and sanctions to increase safety of older drivers

7.1 Procedures and findings

Respondents rated the acceptability and effectiveness of 16 different courses of action that might be taken to examine and regulate the efficiency of older drivers. They made their responses on a seven-point scale with '1' indicating 'unacceptable/ineffective' and '7' indicating 'highly acceptable/effective' As in the earlier study on the larger population from which this sub-set was drawn (Rabbitt, Carmichael, Jones and Holland, 1996), rather than using averages of ratings the percentages of individuals who declared either clear positive or clear negative votes are compared for each proposal. Table 7.1 shows the percentages of positive and negative votes for the acceptability of each proposal at both TP1 and TP2.

Table 7.1 Percentages of positive and negative votes for the acceptability of the 16 proposals at TP1 and TP2

	TP1		TP2	
Acceptable:	**Yes**	**No**	**Yes**	**No**
Current testing and licensing system	69.6	12.2	68.6	14.9
Retest every ten years after initial test	36.7	49.6	30.4	60.5
Retest every five years after the age of 60	32.4	49.4	30.4	59.2
Retest after any accident	32.9	51.6	33.9	55.2
Retest after any ban	69.6	18.7	72.4	18.0
Retest after any driving conviction	51.4	34.2	54.2	36.2
Assessments should be available but at the responsibility of the driver	54.7	30.4	58.7	29.6
Medical examination at the age of 60	48.6	38.5	50.4	38.7
Opticians should inform the DVLA of any problem which might affect driving	66.8	22.0	66.1	24.8
GP's should inform the DVLA of any problem which might affect driving	67.1	23.0	70.1	23.3
Drivers themselves should inform the DVLA of any problem which might affect driving	75.7	11.9	83.3	10.6
The police should have the power to insist on a retest for anyone driving in a risky fashion	49.6	33.7	47.3	41.0
The police should have the power to insist on an assessment for anyone driving in a risky fashion	64.1	18.2	65.9	23.5
New licensing system which flexibly limits driving with regard to health, ability and driving record	43.8	34.9	49.9	35.2
'DIY' driver evaluation kit to indicate whether drivers should seek further advice	44.3	39.0	50.1	38.7
Booklets and courses should be available with advice on issues for older drivers	70.6	13.2	74.9	15.7

Regression analyses were undertaken separately for data from TP1 and TP2 to test whether respondents' ages, their current mileages, and their ratings of their general health on the CMI (that is, total scores on sections 1–3 of the CMI which relate to physical health) predicted their responses to these questions.

Age was entered first as a predictor of ratings for each proposal in turn. When age as measured cross-sectionally between individuals of different ages at TP1 was entered as a predictor in a regression equation it did not affect average ratings of acceptability of sanctions for any of the 16 proposals. However at TP2 an equivalent analysis found that acceptability of two of the proposals reduced with age. These are that drivers should be re-tested every ten years after their initial test (F=3.90, p=0.049, variance accounted for by age = 0.01 per cent) and that drivers should be re-tested every five years after the age of 60 (F=6.54, p=0.011, variance accounted for by age = 0.01 per cent).

A second analysis considered whether the extent of individuals' car use might influence their attitudes to these proposals. To test this, respondents' estimated weekly mileage over the three years preceding each Time Point was considered as a predictor of ratings for each proposal in turn. At TP1 average ratings of acceptance of proposals did not significantly vary with average mileage. At TP2 ratings of the acceptability of the current testing and licensing system were found to decrease as average weekly mileage increased (F=3.95, p=0.048, variance accounted for by mileage = 1.1 per cent). Ratings of the acceptability of a DIY kit by which drivers could evaluate key driving basics increased significantly with average weekly mileage (F=4.47, p=0.035, variance accounted for by average weekly mileage = 0.13 per cent).

Taken on their own these findings are inconclusive, but it suggests an insight into the ways in which older drivers' attitudes towards sanctions are affected by the levels of driving that they maintain. Older drivers are, understandably, aware that their driving careers must eventually terminate and that people of their generation are frequently represented in the media as being a particular risk to themselves and others. It seems likely that individuals who maintain higher mileages are somewhat more defensive of their current degree of involvement and of their ability appropriately to assess their own competence, and somewhat more apprehensive of external measures that may be taken to regulate their driving. Hence, perhaps, the paradox that individuals who continue to maintain higher mileages as they age should become more supportive of a measure, DIY testing, that they believe is likely to be ineffective but which has the advantage that it would allow individuals to make their own decisions about their fitness to drive.

To test whether respondents' attitudes to the proposals regarding medical issues might be influenced by their own health status, summed scores for Sections 1 through 3 of the CMI were evaluated as predictors of ratings for each proposal in turn (Sections 1–3 of the CMI interrogate physical health, while the remaining sections examine addictive behaviour and mental health). At both TP1 and TP2 ratings of four of the proposals were found to significantly increase with numbers of health problems reported on the CMI. Perhaps the strongest relationship was that the more health probems that participants reported on the CMI the more acceptable they found the proposal of a compulsory medical examination at the age of 60 (At TP1 and TP2 respectively F=7.84, p=0.034, variance accounted for by CMI = 2 per cent; and F=4.52, p=0.034, variance accounted for by CMI = 1.2 per cent). This suggests that drivers who have experienced more health problems may, accordingly, have become more sensitive to the effects of poor health on driving confidence and ability and so become more likely to accept the value of a medical examination as a measure to ensure driver safety. At both TP1 and TP2 larger numbers of health problems reported on the CMI were also associated with greater acceptance of the proposal regarding re-testing every ten years after the initial driving test (at TP1 and TP2 respectively F=3.89, p=0.049, variance accounted for by CMI = 1 per cent; and F=4.05, p=0.045, variance accounted for by CMI = 1.1 per cent). The same was true of ratings of the proposal for re-testing every five years after the age of 60 (At TP1 and TP2 respectively F=7.32,

p=0.007, variance accounted for by CMI = 1.9 per cent; F=5.25, p=0.023, variance accounted for by CMI = 1.4 per cent). Taken together with the more positive attitude to compulsory medical examinations expressed by individuals with higher CMI scores this suggests that these drivers' awareness of the effects of poor health has made them more conscious of the importance of monitoring health as an aid to maintaining safe driving, and also, implicitly, of the risks run by individuals who suffer from health problems.

Because the number of health problems from which individuals suffer tends to increase as they age it is important to determine whether their concomitant changes in attitude are related to declining health, (Biological Age) or rather to increases in time since birth (Primary Ageing related to Calendar Age). Stepwise regressions were run to compare the relative strengths of predictions from Calendar Age and from CMI scores. At TP1 Calendar Age did not significantly predict ratings for any of the four proposals that were predicted by CMI scores and, consequently, the percentage of variance accounted for by CMI score was unaffected by the inclusion of age in the regression equation. However at TP2 while CMI scores remained a significant predictor of ratings of the proposal to retest every five years after the age of 60, age also emerged as a significant independent predictor (F=6.76, p=0.0001, r^2 = 0.019, Age; t=-2.91, p=0.004, CMI; t=2.56, p=0.001).

A further issue was whether attitudes to the different sanctions had altered between TP1 and TP2. The first seven proposals are concerned with the testing and re-testing of drivers. In five of these cases Table 6.1 shows that respondents did not change their attitudes between TP1 and TP2, though the predominant attitude tended to be slightly stronger at TP2. That is to say, in general, respondents considered the current licensing system to be acceptable; they were in favour of re-testing after any ban or conviction but not after any accident, and they considered that driving assessments should be made available for older drivers, but at the request of the driver rather than enforced by law. However at TP2 significantly more respondents actively opposed the proposal of re-testing every 10 years after the initial driving test and also the proposal of re-testing every five years after the age of 60 (ie both proposals are rated as significantly less acceptable at TP2 than at TP1; t=3.89, p<0.0001; and t=3.44, p=0.001 respectively). It is interesting that significant changes in attitude were found in the particular two of the seven proposals that might be considered by older drivers to be the most threatening to their independence in deciding how long they should continue to drive. Possible factors influencing the change in attitude to these particular proposals will be investigated in a later section.

The next four proposals relate to general health status and to responsibility for reporting health problems to the Driver Vehicle Licensing Agency (DVLA). No changes in attitude were apparent between TP1 and TP2. Once again the attitudes predominant at TP1 seem, if anything, to have become more pronounced at TP2. Respondents were largely unconvinced by the acceptability of a medical examination at age 60 but found very acceptable the proposals that Opticians, GP's and drivers themselves should be required to inform the DVLA of any medical problem that might affect their patients' abilities to drive.

Four proposals were concerned with the powers of the police and possible restrictions on driving. Though average shifts between time points appear quite large they failed to reach significance.

Finally, two proposals were concerned with means of providing help and information to older drivers. For both of these acceptability slightly, but not significantly, increased between TP1 and TP2.

Thus while for most of these proposals there was little change in ratings of acceptability between TP1 and TP2, for two of them there was a significant and

interesting change. These were proposals that might be seen as restrictive of older drivers' freedom to make their own, independent decisions as to how long to continue to drive. The statistically reliable shift in ratings to these two proposals indicates that a number of individuals who had found these proposals acceptable or neutral at TP1 changed their minds as they grew older and rated them as unacceptable at TP2.

To quantify this trend respondents were divided into two groups: those who had changed their ratings from acceptance or neutrality at TP1 to a negative rating at TP2 and those who had either remained consistent or become increasingly accepting at TP2. In response to the proposal that all drivers should be re-tested every ten years after taking their initial driving test, 39 respondents shifted from acceptance or neutrality at TP1 to disagreement at TP2. These respondents did not differ significantly from the other members of the sample in respect of their ages, their average weekly mileages or their health scores on the CMI questionnaire. In response to the proposal that drivers should be re-tested every five years after the age of 60, 34 respondents changed from acceptance or neutrality at TP1 to disagreement at TP2. Again there was no evidence that these respondents differed significantly from others in terms of their ages, average weekly mileages or CMI scores.

Because of the substantial difference between the numbers of drivers who changed to a negative rating from a neutral or positive rating, and those drivers who remained either neutral, positive or negative it was not possible to make statistically meaningful comparisons between groups. However it was possible to explore some possible explanations for shift in attitude within the group of drivers who changed from a positive or neutral rating at TP1 to a negative rating at TP2. For example it was possible that drivers' changes in attitude towards proposals for introduction of driving tests might reflect an increasing lack of confidence in their ability to pass. To investigate this, drivers' ratings of their driving ability at TP 2 were compared to their previous ratings at TP1. Drivers rated their ability in 14 situations on a five-point scale (five corresponds to 'much worse than before') so that a high total score reflects a perceived decline in driving ability. As can be seen from Table 7.2 there was no evidence that drivers who changed from a neutral or positive towards a negative attitude towards the acceptability of further driving tests also, concomitantly, reported greater perceived declines in their own driving abilities.

Table 7.2
Mean self-ratings of driving competence by individuals who altered or maintained their ratings of acceptability of two proposals for re-testing at intervals after the initial driver licensing examination

	Rating changed to negative	**Rating remained constant**
Proposal to retest every ten years after initial test	42.78 (2.15)	42.92 (4.11)
Proposal to retest every five years after reaching age 60	42.59 (2.21)	43.02 (3.79)

As we have seen, a significant number of individuals who had found these proposals acceptable or neutral at TP1 changed their attitudes and found them unacceptable by TP2. However those individuals who changed their attitudes did not differ from all others in terms of their ages, CMI scores or average weekly mileages. Table 7.1 shows that they also did not differ from other respondents in terms of perceived changes in their own driving ability over the three years preceding TP2.

Respondents were also asked to rate the effectiveness of the same 16 proposals concerning possibilities of interventions to regulate driving in ways that would affect older motorists. Table 7.3 below shows the percentage of respondents who gave either a clear positive or a clear negative vote regarding the effectiveness of the proposal at the first and second time of completion of the questionnaire.

Table 7.3 Percentages of positive and negative votes for the effectiveness of the 16 proposals at TP1 and TP2

	TP1		TP2	
Effective %	**Yes**	**No**	**Yes**	**No**
Current testing and licensing system	52.9	25.6	49.4	26.3
Retest every ten years after initial test	51.9	31.6	52.9	34.9
Retest every five years after the age of 60	50.4	30.6	50.4	32.4
Retest after any accident	43.5	41.0	47.6	39.0
Retest after any ban	73.7	13.4	74.9	13.9
Retest after any driving conviction	54.7	27.3	55.4	28.6
Assessments should be available but at the responsibility of the driver	41.5	41.0	35.9	49.9
Medical examination at the age of 60	54.2	30.4	57.2	29.9
Opticians should inform the DVLA of any problem which might affect driving	72.7	15.7	77.2	16.7
GP's should inform the DVLA of any problem which might affect driving	73.4	15.2	78.5	15.2
Drivers themselves should inform the DVLA of any problem which might affect driving	54.4	28.4	68.9	19.7
The police should have the power to insist on a retest for anyone driving in a risky fashion	56.7	26.6	57.5	30.4
The police should have the power to insist on an assessment for anyone driving in a risky fashion	60.5	19.5	66.6	23.0
New licensing system which flexibly limits driving with regard to health, ability and driving record	43.3	30.9	52.4	34.9
'DIY' driver evaluation kit to indicate whether drivers should seek further advice	29.1	52.4	30.9	54.4
Booklets and courses should be available with advice on issues for older drivers	49.9	27.1	52.2	30.1

Table 7.3 shows that most respondents considered most of the proposals to be effective. At TP1 the proposals considered most effective, were, in rank order: that GP's should inform the DVLA of any medical problem which might affect driving (78.5 per cent); that opticians should similarly inform the DVLA of any problems (77.2 per cent); that drivers should face a re-test after any ban from driving (74.9 per cent); that drivers should themselves be responsible for informing the DVLA of any medical problems (68.9 per cent) and that the police should have the power to insist on a driving assessment for anyone that they consider to be driving in a 'risky' fashion (66.6 per cent). The proposals considered least effective at TP1 were a proposal for a DIY driver evaluation kit to help drivers to decide whether they should seek further advice (54.4 per cent) and a proposal that driving assessments should be available, but at the discretion of the driver (49.9 per cent).

Responses at TP2 followed a similar pattern. The proposals found most effective, in rank order, were: that drivers should face a re-test after any ban from driving (73.7 per cent); that GPs should inform the DVLA of any medical problem that might affect

driving (73.4 per cent); that Opticians should inform the DVLA of any problems that might affect driving (72.7 per cent). that the police should have the power to insist on an assessment for anyone driving in a 'risky' fashion (60.5 per cent) and that the police should have the power to insist on a retest for anyone driving in a 'risky' fashion (56.7 per cent). The proposals considered least effective were again the provision of DIY driver evaluation kits to allow drivers to assess whether they should seek further advice (52.4 per cent) and that driving assessments should be available but at the discretion of the driver (41.0 per cent). Thus the rank order of effectiveness of proposals was essentially the same at TP1 and TP2.

There was little change in the ratings of the effectiveness of the first six of the seven proposals that were concerned with introduction of driving tests. However the proposal that assessments should be made available at a driver's request was judged as significantly more effective at TP2 than at TP1 (t=2.26, p=0.024). This may indicate that, four years on, respondents had become aware of changes in their own driving ability and consequently more accepting of the potential benefits of assessment. This possibility was further explored by examining the responses of drivers who had rated the proposal neutrally, or negatively, at TP1 but positively at TP2, to see whether they had perceived a greater decline in their own driving ability than had the group who did not show this change towards acceptance.

Because of the difference in group size statistical comparisons are not reliable. However the data shown in Table 7.4 provide no evidence that changes in acceptability were associated with average ages, average weekly mileages or with self-perceived changes in driving ability (a high score indicates greater perceived decline in ability over four years).

Table 7.4 Changes in ratings by age, weekly mileage and self-perceived driving ability

	Change to positive (N=79)	**Remain constant or change to negative (N=284)**
Driving ability	43.16 (3.43)	42.96 (3.78)
Age	73.58 (6.16)	72.94 (5.98)
Weekly mileage	131.46 (92.18)	134.44 (106.64)

In responses to the next four proposals, which are concerned with health issues, there was no apparent change in opinion between TP1 and TP2 as regards the effectiveness of compulsory medical examinations at the age of 60, or the effectiveness of the proposal that GPs and opticians should inform the DVLA of any problem that might affect their patients' driving. There was a significant shift in opinion on the effectiveness of the proposal that drivers themselves should inform the DVLA of any health problems. Interestingly, this proposal was rated as being significantly less effective at TP2 than at TP1 (t=2.26, p=0.024).

To investigate possible reasons for this shift in attitudes total scores on sections 1-3 of the CMI (relating to physical health) were compared between drivers who had changed from acceptance or a neutral rating to disagreement and drivers whose attitudes had either remained unchanged or become more accepting of the proposal that drivers should have the responsibility to notify DVLA of significant health changes. These data are shown in Table 7.5. They provide no statistically reliable evidence that individuals who changed or maintained their attitudes differed in their average ages, in their average weekly mileages or in the number of clinical conditions that they reported on the CMI.

Table 7.5 Changes in ratings by age, weekly mileage and CMI scores

	Change to negative (N=76)	Remain constant or change to positive (N=281)
CMI	3.99	3.94
Age	71.98	73.40
Weekly mileage	137.65	131.40

The remaining five proposals explored attitudes to sanctions that might be imposed to restrict driving by individuals convicted of driving offences or by older drivers. Most respondents considered that the proposal that police should have the power to insist on a driving re-test after convictions for risky driving would be effective. This proposal was considered to be less effective at TP2 than it had been at TP1 (66.6 per cent of respondents considered this to be an effective proposal at TP1 while only 60.5 per cent considered it effective at TP2 but this difference was not statistically reliable). There was also no significant shift in opinion on the effectiveness of the proposal for a new licensing system with flexible driving limits depending on health, ability and driving record. This was considered to be marginally effective at TP1 (52.4 per cent rated effectiveness between 5 and 7 on the scale) but less so at TP2 (only 43.3 per cent of respondents rated the effectiveness between 5 and 7 on the scale). Finally, there was no evidence of change in attitude towards the two proposals concerned with providing help and information to the older driver. At both TP1 and TP2 the proposal for a DIY driver evaluation kit was considered to be largely ineffective while the provision of booklets and courses aimed at the older driver was considered to be marginally effective.

In general there was little change in opinion between TP1 and TP2 in regard to either the effectiveness or the acceptability of the proposals. Differences in ratings were no greater than the slight random fluctuations that might be expected when a large number of people answer the same questions on different occasions. Two proposals did show a significant shift in attitude to acceptability and two showed a significant shift in rating of effectiveness. Interestingly those particular proposals that showed a change in rated acceptability were not the same ones that showed a change in rated effectiveness. Though provocative, these differences in attitude shifts remain unexplained.

7.2 Conclusions

Again the general message from these analyses is that older drivers maintain sensible and open attitudes towards various measures that might be taken to ensure road safety, though they are, naturally, concerned that some of these measures may reduce their autonomy of decision as to when to give up driving.

Chapter 8: Relative values placed on different sources of advice on changing driving behaviour as age advances

8.1 Procedures and findings

In addition to the 16 proposals that have been discussed above respondents also rated (on a scale of 1–7) the relative influence that various sources of advice might have in leading them to give up driving, for example, advice from GPs, opticians, family and friends, the DVLA, the police and from the law courts. Average ratings for influence of each of these sources at each Time Point are shown in Table 8.1 below. Also included are the percentages of respondents who rated sources as having low (1–3) and high influence (5–7).

Table 8.1 Mean ratings for influence of sources of advice on changes in driving behaviour

	TP1			TP2		
Source	**Mean rating**	**% rating low influence**	**% rating high influence**	**Mean rating**	**% rating low influence**	**% rating high influence**
GP	6.56	2.5	94.4	6.55	2.5	92.2
Optician	6.42	3.5	91.4	6.47	3.0	89.9
Family	4.15	35.2	48.4	4.33	30.6	45.8
Police	5.43	18.7	72.2	5.50	14.4	70.4
DVLA	4.40	33.9	52.4	4.66	28.9	52.9
Court	5.57	18.0	72.2	5.65	13.4	70.4

At both TP1 and TP2 respondents said that they valued advice from their GPs more than from any other source. Advice from family and friends was seen as far less influential than advice from professional bodies. The rank order of mean ratings was the same at TP1 and at TP2 though there were, naturally, some slight, non-significant fluctuations in ratings between TP1 and TP2.

8.2 General conclusons

Cross-sectional comparisons between age groups did indicate some differences in attitudes. Because these cross-sectionally determined age differences were highly consistent between assessments at TP1 and TP2 they endorse the reliability of the questionnaire and so, also, the reliability of the observations made on the much larger sample of drivers and ex-drivers polled by Rabbitt *et al.* (1996). Within the longitudinally examined sub-set there were no substantive changes in attitudes between 1994–1995 and 1997–1998. Such slight changes as did occur can be attributed to slight random changes in individuals' responses between successive administrations of the questionnaire. An exception is the findings that, over this brief period of four years, drivers increasingly began to appreciate the impact that worsening health may have on driving ability. This shift in attitudes was, unsurprisingly, more marked in individuals who suffered from poor health or who had experienced declining health.

The main substantive findings from these analyses of attitudes is the striking stability of older drivers' attitudes as they grow older towards causes of accidents, responsibility for accidents, the desirability and effectiveness of sanctions on individuals who may be, or become, unsafe drivers and towards difficulties with driving that may begin to occur in old age. An implicit, and reassuring, finding is that the Older Drivers

Questionnaire is a reliable measuring instrument that picks up consistent differences between groups of people of different ages, and within the same group of people as they age. This allows correspondingly greater faith in the reliability of the information that it has provided on the changing relationships between age, health, driving confidence and self-rated driving competence in the large sample of drivers first interrogated by Rabbitt, Carmichael, Jones and Holland (1996) and in a smaller sub-set of this sample four years later.

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