

Review: **Older driver crash statistics**  
For: **Ministry of Transport**  
By: **Charles Sullivan, Capital Research**  
Date: **28 April 2004**

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# Summary and recommendations

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1. As specified by the Terms of Reference, I have consulted with Grey Power and the Land Transport Safety Authority (LTSA) while examining both the **reliability of the data** and the **crash risk conclusions derived** from the LTSA's analysis of older drivers' crash risk per kilometre driven. Consistent with the charts attached to the terms of reference, I focused on recent crash data rather than statistics used during the changes to older driver licensing policies in the late 1990s.
2. With respect to the reliability of data, I find no material problems. Consultations with Grey Power quickly showed that data reliability was not the focus of their concerns. Nor did my own brief examinations of numbers lying behind the graphs, documentation of the LTSA data sources, and some related international data, raise substantial concerns about data reliability.
3. With respect to the crash risk conclusions derived (from per kilometre driven statistics), major problems were quickly apparent. First, this was the focus of concern for the Grey Power members I consulted with (e.g. they questioned the legitimacy of formula use rather than the data going into the formula). Second, I find that they have good reason to dispute the crash risk conclusions apparently derived.
4. Two major reasons to dispute the older driver crash statistics per kilometre driven used in relation to licensing are:
  - **Distance driven**—older drivers typically drive much less annually than younger drivers, but emphasising the analysis in terms of risk per kilometre eliminates this factor by which older drivers substantially reduce the risk they create during the period of their licence (“self-regulate”).
  - **Fragility**—older drivers are more easily injured or killed than younger drivers; this can result in injury and fatality statistics substantially overstating the involvement of older drivers in actual collisions. Hence, it is important not to misinterpret crash statistics as indicators of driver ability unless appropriate correction for fragility has been applied.
5. The increase in crash risk associated with older drivers is much less if presented on a per licence holder basis (rather than per distance driven) and corrected for fragility. Such a graph was not among those in the Terms of Reference, but is produced in this review.
6. The LTSA now concedes that in some circumstances they may have overly emphasised the crashes per distance driven statistics in explaining older driver risk. They also acknowledge that driving ability is better measured when the effects of fragility are accounted for.
7. Some readers will struggle to understand precisely how the points above concerning distance driven and fragility relate to the crash statistics/graphs. This is instructive in itself. The **difficulty of**

**understanding and communicating** the issues precisely may be central to the need for this review. This difficulty explains why officials might sometimes confidently cite crash statistics/graphs as strong evidence relevant to driver licensing policy in a way that is unconvincing to others. It also explains why Grey Power may have found it hard to communicate their objections compellingly. The difficulty does not arise because of complex statistical/mathematical techniques but rather because it is surprisingly difficult to precisely understand the meaning and degree of relevance of key graphs.

8. None of these conclusions should be misinterpreted as a finding that licensing policy for older drivers should be changed. First, such policy decisions are explicitly excluded from the scope of this review. Second, the LTSA uses a wide variety of evidence, beyond the crash statistics that are the focus of this review, as a basis for such policy.
9. Recommendations:
  - a. Officials using such crash statistics to justify older driver licensing policy should be warned to take unusual care with graphs like those in the Terms of Reference. In particular, they should be advised that a burden of evidence lies with them to justify reliance on per kilometre results (rather than on results per licensed driver) or on results not adjusted for fragility.
  - b. Conclusions derived from the crash risk statistics (per kilometre driven) in the government's initial response to the Human Rights Commission (Crown Counsel letter, 4/7/03) should be reconsidered in the light of this review.

## **Background to this review**

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10. The Minister of Transport and the Minister for Senior Citizens requested an independent review of the Land Transport Safety Authority's analysis of risk per kilometre driven by age of driver. This type of analysis was germane to the decision in 1999 to move the age for the onset of on-road testing from 75 to 80.
11. Grey Power and 97 individuals dispute the analysis of risk per kilometre driven and have filed complaints with the Human Rights Commission (HRC) regarding the additional driver licence testing requirements placed on the elderly. The government view was that age-based testing, based on such analyses of crash related risk and other factors, is justified differentiation and consistent with New Zealand's anti-discrimination law.
12. The Terms of Reference for this review included as an attachment five charts of crash statistics. These proved central to the review and have been copied as Attachment 1, the only change being the addition of chart numbers as captions to facilitate cross-reference.
13. "The objective of the review is to examine the LTSA's analysis relating to older drivers' (specifically those aged 80 years of age and over) crash risk per kilometre driven and report on the reliability of the data and the crash risk conclusions derived." (Terms of Reference, p. 2)

## **Review process**

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14. As specified in the Terms of Reference, the review included consultation with both Grey Power and the LTSA.
15. Consultation with Grey Power involved members largely outside Wellington City and proceeded mainly by e-mail after introductory phone calls. Both primary contacts listed for Grey Power were contacted at the start, and e-mails were received from a further four people associated with them (around 20 e-mails received in total, and a similar number sent). For clarity about the perspective of the writer I have simply cited these emails as being from “Grey Power”, but this does not imply that these communications are formally agreed positions of that organisation. In contrast, a formal position is presented in various documents provided by the LTSA.
16. Consultation with the LTSA began with introductory phone calls and then I requested relevant documents and analysis. They promptly supplied several spreadsheets and documents concerning the data as well as several documents showing use of the data. From this material, and a few relevant papers I sourced independently, I prepared questions sent in advance (23/2 and 24/2) of two meetings involving five LTSA officials in total. At the end of the review time (17/3), I received a lengthy written response (LTSA, 2004).
17. Attachment 2 lists documents provided by the parties consulted where these are additional to emails exchanged and materials cited in the body of this review.

# Review findings

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## Introduction to findings

### *Broad context: Do not expect easy answers*

18. New Zealanders are not the only ones to have found interpreting graphs and crash statistics like those in the Terms of Reference difficult. After graphically showing crash statistics similar to some in the Terms of Reference, a major international report referred to both by the LTSA and by Grey Power noted:

In conclusion, none of the measures ... permits a straightforward conclusion about whether drivers' overall risk of accident involvement changes with age. Owing to the frailty bias and to the limitations of currently available exposure measurements, older drivers' apparent overrepresentation in fatality and perhaps serious injury data cannot be interpreted as heightened accident proneness. (OECD, 2001, p. 45)

19. Just because results are not straightforward does not mean that we entirely dismiss them. Hence, I reject the following type of argument from one Grey Power contributor to the review:

You have indicated that you have read the OECD Report related to the Aged and Transport. The judgement of that Report on the 100M kms approach to measuring the riskiness of drivers per age group is very clear. Several times in the report, the words "UNRELIABLE" and "IRRELEVANT" are used to describe the approach. (E-mail attachment, Grey Power, 25/2/04)

I could not find these words in the section on older driver safety on my own reading. The search facility within Adobe Acrobat did not find "unreliable" anywhere in my digital copy of the full report; "irrelevant" occurs only once, but in a section not about crash statistics. Admittedly, the OECD report does not see such results as compelling evidence for a policy of on-road testing internationally, but this does not mean that they should be totally ignored (particularly after correction for fragility has been applied).

20. One complication is that crash statistics reflect policy in place at the time. For example, if testing of older drivers removes those most likely to cause crashes, then current crash statistics for older drivers will understate the risk that older drivers would pose without testing (see also paras 74,75 below).
21. Without straying beyond the scope of this review (which specifically excludes policy decisions such as the introduction of the Older Driving Test), I should very briefly describe international policy stances. I see sufficient variability between jurisdictions as to oblige readers to grapple with the issues involved as they apply in New Zealand, rather than

assuming that there is an easy answer from international precedent. For example, in contrast to New Zealand's on-road testing every two years from age 80, some European countries, (e.g. Germany, Sweden, France, and Belgium) do not have special licence renewal procedures for older drivers (OECD, 2001, p. 82). In Australia, several jurisdictions (Victoria, Northern Territories, South Australia, ACT, and Queensland) do not have mandatory road tests for older drivers (LTSA, 1996, p.21). Several US states have vision or medical requirements, but only a couple have mandatory road tests for older drivers<sup>1</sup>.

***The review objective leads to two major sections***

22. The findings naturally fall into two parts, consistent with the objective of the review as stated in the Terms of Reference (quoted in paragraph 13 above):
- reliability of the data
  - crash risk conclusions derived.

**Reliability of the data**

23. Initial consultations with Grey Power showed quickly that the focus of their concerns was about the crash risk conclusions rather than about the reliability of the data (e.g. email from Grey Power 20/2/04). Furthermore, I received a variety of objections about the classic U-shaped graph of risk per kilometre (Chart 2 in Attachment 1) but not about the preceding graph showing the raw data about the drivers involved in crashes and distance driven. This focus of concern is consistent with previous objections from Grey Power. For example, “we do not believe that the number of crashes per 100 million kms is the correct yardstick for impact of driver age on road trauma” (letter to Director LTSA, 5/11/01, sender name removed for privacy).
24. Nor did my own brief examination of numbers behind key graphs or background to data sources suggest major concerns requiring detailed follow-up (e.g. obvious inconsistencies).
25. Similarity to comparable results from overseas jurisdictions indicated that, even if closer examination of data reliability did suggest some changes and improvements, they would probably be relatively minor.
26. Such factors led me to examine the data reliability only briefly and to focus the review on the area of contention: crash risk conclusions. Focusing tightly on the area of disagreement seemed appropriate given that this is a small-scale review planned to take only a few days of the reviewer's time and to be completed within around one month. I did not take this step lightly—in previous reviews I have exposed major errors in fundamental data processing, calculation of sampling error, etc.

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<sup>1</sup> [www.highwaysafety.org/safety\\_facts/state\\_laws/older\\_drivers.htm](http://www.highwaysafety.org/safety_facts/state_laws/older_drivers.htm), accessed 8/3/04

### **Data source/collection**

27. I briefly examined standard documentation concerning crash data reported by the LTSA (LTSA, 2003a). This material reflects careful work and appropriate attention to details such as definitions and distinctions. For example, it records that a fatal injury is one that results in death within 30 days of the crash, which is consistent with the international definition. It also reports on weaknesses of the data collection system. In particular, despite legal requirements, apparently only about one half of injury crashes are reported. The LTSA also provided an instruction sheet showing how to complete Traffic Crash Reports. This instruction sheet showed a high level of care in design.
28. Perfection is not to be expected with such large practical data collection systems here or in other countries. I see the crash data as usefully reliable and relevant to assessment of safety risk associated with older drivers.
29. I have extensive familiarity with the LTSA source for distances travelled by different age groups, the New Zealand Travel Survey 1997/98. Again, perfect data is not to be expected. For example, 75% of households sampled provided a full response from all household members (LTSA, 2000, p. 9) rather than the ideal of 100%. This response rate of 75% is actually an indicator of unusually high quality—it is distinctly higher than the vast majority of surveys of the general public (in my extensive experience of these as a former partner in a substantial market research company). Age group was unknown for only 6 of 14,250 respondents (LTSA, 2000, p. 17). Again, in my view, the data source is of sufficient reliability.
30. Given the context of the review, the lack of dispute about underlying data, and the relatively short timeframe for the review, I did not consider it worthwhile investigating further data sources (e.g. the administrative database concerning car licence holders).

### **Numerical details of key graphs**

31. The LTSA promptly supplied me with spreadsheets containing the numbers behind the graphs in the Terms of Reference (and also for other graphs in other documents relating to older driver licensing), solid background material about correction for fragility (Evans, 1991), and even detailed calculations illustrating the process of correcting for fragility. This very open provision of statistics would have allowed me to make a wide range of numerical checks if I chose to (as I have done in other reviews). As it turned out, the focus of this review needed to be elsewhere and so I only checked a handful of the formulae and calculations underlying graphs.
32. I did not find any material concerns about reliability of these numerical details. Some **minor** points in relation to the key graphs in the Terms of Reference (and copied as Attachment 1) are:
  - a. The graphs appear to have been compiled from a variety of sources created for different reasons rather than tailored for this review, hence some inconsistencies in presentation occur. For example, Chart 3 (Attachment 1) shows results for 75+, which is not ideal

given that the Terms of Reference specifies a focus on drivers aged 80+. (Combining all groups 75+ in this graph is defensibly prudent statistical practice given the relatively large margins of error associated with the distance driven for the age group 80+.)

- b. Chart 5 I see as going too far to the other extreme, of disaggregation. In particular, I suggest we essentially disregard the right-most bar concerning the 95-99 age group as insufficiently reliable (it is based on only 2 crashes and 79 drivers in the age group). I fully accept the LTSA explanation that this extreme disaggregation was done at the insistence of another government agency rather than because they saw it as statistically optimal. Objections to aggregation of age groups are apparent in Grey Power sources (e.g. letter to LTSA 26/6/01): “Some other LTSA diagrams are slanted in that they compare the age group 80 to 99 with 5 year groups below age 80”.
  - c. In future, I suggest that, wherever allowable in terms of data reliability (e.g. margins of error) and consistency of presentation, graphs particularly concerning older drivers split off at least the 80–84 year-old age group from those older. In this way, it can be clear what the safety risk is for those aged around 80 (where regular on-road testing begins to be required), rather than allowing the suspicion that their risk is misrepresented by being combined with drivers aged 85+.
33. The margin of error/sampling error associated with the estimate of distance driven for those aged 80+ in Chart 1 (and hence affecting the per km results shown in subsequent charts) is relatively large (LTSA, 2000, p. 108). This stems from the sample size for drivers aged 80+ naturally being smaller than for younger age groups. Even with 14,250 respondents, the survey has only 305 aged 80+ (LTSA, 2000, p.17), and only around half of these are licensed drivers. However, the uncertainty associated with margin of error can affect the distance driven and hence the crash risk in either direction (i.e. either up or down). Furthermore, results in Chart 2 are broadly consistent with international results, and the sampling errors available (which concern all driving) are not precisely applicable to the results in the graphs (which concern driving light vehicles only). Thus, it did not seem worthwhile working through the impact of such sampling error in this review.

### **Summary**

34. With respect to the reliability of data, I found no material problems (from a justifiably brief examination).

## **Crash risk conclusions derived**

35. Before looking closely at any crash risk conclusions, we must understand the differences in meaning between key graphs precisely. At a casual glance for those not familiar with the issues, graphs in the Terms of Reference (reproduced in Attachment 1) may appear to have a similar message, that is, that older drivers are associated with substantially higher safety risks. To soundly assess crash risk conclusions and to

assess whether or not objections to these conclusions are valid, we must develop much finer discrimination of the underlying issues. In particular, we must clarify the relevance of:

- distance driven
- correcting for fragility.

***Distance driven: Are per km graphs more relevant or less relevant than per licence holder graphs?***

36. The LTSA now makes the following concession:

We concede that in some circumstances we may have overly-emphasised the crashes per distance driven statistics in explaining older driver risk. (LTSA, 2004, p.6)

It remains worthwhile outlining the related issues in this review to understand crash risk conclusions and earlier disagreements (e.g. with Grey Power).

37. Chart 2 (in Attachment 1) is a valid and useful graph providing insight into safety risks. Similar ones are produced routinely by other countries. However, Grey Power objects to its use with respect to licensing of older drivers. For example:

“The argument is that, on the basis of per kilometres driven, the comparative accident rate of the older driver rises. But that approach, by ignoring the *actual* annual mileage by each age group of drivers, offers no valuable information about the *actual* impact of older drivers on road trauma statistics.” (Grey Power, e-mail attachment, 28/2/04)

38. The quote immediately above may slightly overstate the point, but has a valid core. There is evidence in New Zealand (as in several other countries) that older drivers typically drive much less. For example, the average distance age groups 20-59 years report driving cars in a year is three to four times higher than the average distance reported by those aged 80+ years (NZ Travel Survey, 1997/98, my calculation from the database). That older drivers drive so much less clearly reduces the risk that they will cause an accident of concern (other things being equal<sup>2</sup>), and can be seen as evidence of "self-regulation".

39. Yet, by definition, analyses **per kilometre driven** (or equivalently per 100 million km driven, as in Chart 2)<sup>3</sup> eliminate the main effect of

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<sup>2</sup> For example, I note but do not deal with in detail possible complexities such as Finnish data showing that driver groups with small yearly mileage have higher accident rates than those with large yearly mileages (independent of age). That paper concludes that when older drivers were compared with younger drivers with similar yearly driving exposure, there was no age-related risk increase in accidents per km (Hakamies-Blomqvist et al., 2002). A major international report also noted: "Accident rate per mile driven is higher for low-mileage drivers than for high-mileage drivers at any age" (OECD, 2001, p. 45). This complication is potentially important because older drivers drive so much less.

<sup>3</sup> For brevity, I cease repeating that these charts are in Attachment 1. To prevent confusion with the graphs in the body of the review, the graphs in the body are captioned "Figure 1" etc. in contrast to Chart 1.

differences in distance driven annually. Because of this, analyses per kilometre driven may be less relevant to older driver licensing policy than analyses per licensed driver (e.g. Chart 5).

40. This interpretation is consistent with a recent paper for an international journal about older drivers written by LTSA staff (admittedly with the usual disclaimer that it does not necessarily represent the views of the LTSA):

As this is a study evaluating aspects of a licensing system, the most appropriate measure of crash liability is one that does not take driver exposure (amount of driving) into account, but considers crash liability per licensed driver per year. (Keall & Frith, in press)

41. The degree of relevance of per km analyses seems to have remained unresolved for quite some time. Hence, in the interests of clarity, here is one alternative way of showing that there is a good argument about this (while keeping separate various components of the argument which may be open to dispute or misunderstanding):

- a. Older drivers are licensed to drive for two years, not for a certain number of kilometres.
- b. During a year, older drivers typically drive a much lower distance than others and this materially reduces the number of crashes they are likely to cause (other things being equal).
- c. Therefore, graphs which allow a lower distance driven to be reflected in lower crash risk (e.g. per licensed driver graphs) may be more relevant to older driver licensing than graphs which eliminate the effect of the lower distance driven annually (e.g. per km driven graphs).

42. Such arguments establish some relevance for per licensed driver graphs and that unquestioning acceptance of per km driven graphs is not be expected. The question as to whether per licensed driver or per km driven graphs are more relevant to New Zealand older driver licensing policy remains unresolved in this review. The answer provided in the LTSA's written response to this review is a pragmatic step forward:

The answer is both have their value and where both are available both should be used. The per distance driven rate (where caveats regarding fragility and network use are kept in mind) is the better indicator of driving ability. The other is the better indicator of the overall safety of the group (taking into account their level of travel self-regulation).

Crashes per distance and crashes per licence holder data both have strengths and limitations. (LTSA, 2004, p. 5)

43. Both approaches could not be used before 1999 because accurate driver licensing data by age was not available then. However, both types of graphs were not used in important recent documents: the LTSA presentation to the Grey Power AGM (LTSA, 2003b), and the government's initial response to the Human Rights Commission (Crown

Counsel, 2003). In both documents, per km graphs were presented but not per licence holder graphs. Thus, the position quoted above that “both should be used” is welcome as a constructive step forward for such documents and presentations in the future.

44. In the timeframe of this review, it has not proved possible to take a further possible step and establish greater clarity about the degree of relevance of per licence holder graphs and per km graphs. That would require a more detailed logic chain connecting the crash statistics to older driver licensing policy than the paragraphs quoted above (para. 42). For example, those paragraphs do not explain to what extent “driving ability” is more relevant or less relevant than the “overall safety” of the age group.

***Fragility: To correct for fragility or not?***

45. The Terms of Reference specifically request an examination of crash risk “per kilometre driven”. Focus so far has been on the first such graph (Chart 2); this type of graph appears in several documents concerning older driver licensing provided, including the initial response to the Human Rights Commission (Crown Counsel, 4/7/03) and from the LTSA to Grey Power (7/8/01). Chart 3 from the Terms of Reference is also on a basis of per kilometre driven, but with correction for fragility. Is Chart 3 more relevant or less relevant to older driver licensing than Chart 2?
46. Grey Power see fragility as an objection to graphs like Chart 2: “Key points include the fact that it is 'natural' that older people will sustain higher injuries...point being assessment of risk is not actual driver related” (e-mail from Grey Power, 20/2/04). Another Grey Power document suggested that the crash statistics as presented were unreliable “because serious injuries and deaths are assumed to be the result of poor driving skill and not in some measure due to physical vulnerability because of age” (attachment to e-mail from Grey Power, 25/2/04).
47. In short, we must distinguish carefully between being injury prone versus accident prone, and Chart 2 confounds the two.
48. This raises a valid objection to relying too much on Chart 2 with respect to older driver licensing. International evidence clearly shows that the greater fragility of older drivers has a substantial effect. It is not just a minor issue changing things at the margins:

Fragility... increased steadily with advancing age, accounting for about 60-95% of the excess death rates per VMT [vehicle miles travelled] in older drivers, depending on age group and gender.  
(Li et al., 2003, p. 227)
49. Note too that the greater fragility of older people also increases their risk as passengers and even pedestrians, rather than being specific to drivers. This raises the question of how relevant statistics affected by fragility are to older **driver** licensing policy (which presumably relates more to things such as ability).

50. The LTSA accepts the relevance of fragility:

... fragility does not necessarily mean a person is a less capable driver. Driving ability is better measured when the effects of fragility are removed. (LTSA, 2004, p.4)

51. Again, this point seems to have been unclear at times<sup>4</sup>. Hence, in the interests of clarity, here is one alternative way of making the point and keeping separate various components of the argument which may be open to misunderstanding:

- a. Driver testing substantially concerns **ability** (as documented in reasons why testing is a more important policy tool for older than younger drivers, Crown Counsel 2003, para. 34).
- b. Chart 3 in Attachment 1 (with correction for fragility) is more closely related to ability than Chart 2 (where the risk shown for older drivers is substantially increased by their greater fragility).
- c. Therefore, Chart 3 (with correction for fragility) is more relevant to older driver licensing than Chart 2.

***Combined impact of both issues: a per licence holder graph corrected for fragility***

52. Given that there are good arguments both for presenting crash risk on a per licence holder basis and to use the correction for fragility, it seems appropriate to view a per licence holder graph corrected for fragility.

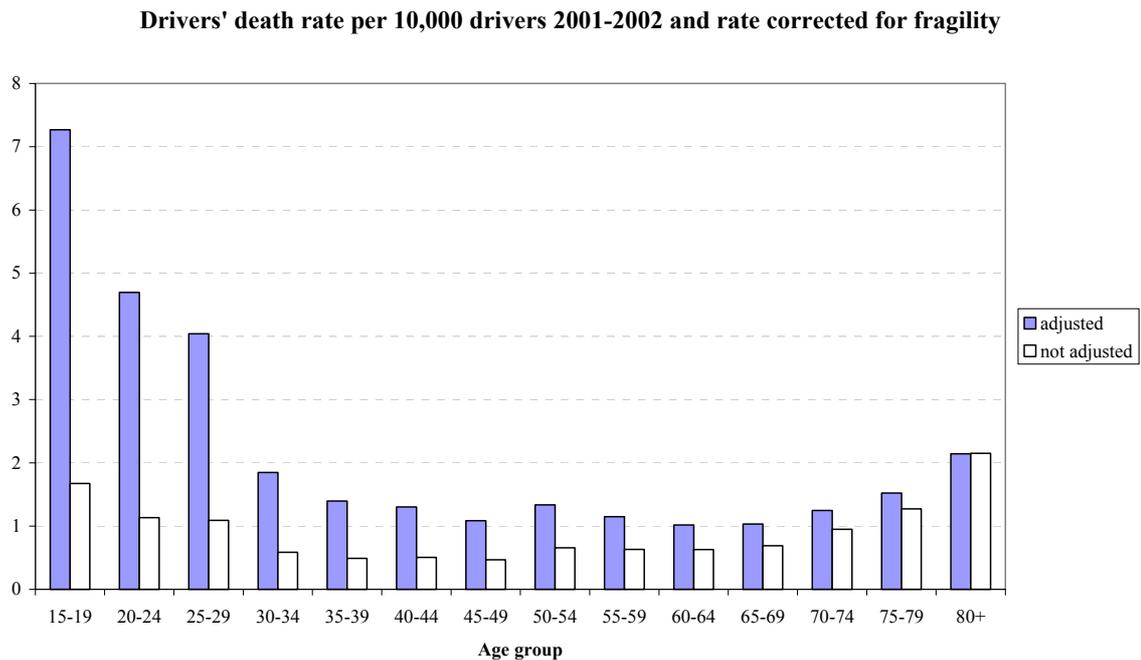
53. The LTSA readily supplied such a graph (Figure 1), where the bars labeled "adjusted" are those corrected for fragility<sup>5</sup>. I have simply changed the format of the graph they supplied, for visual consistency with all the graphs in the Terms of Reference (the content should be identical to the line graph in the LTSA's written response to the review; LTSA, 2004, Attachment 5).

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<sup>4</sup> For example, it is surprising that even the LTSA response to this review accepting the importance of fragility later cites as "reinforcing evidence" and "substantial increases in risk" two graphs that do not appear to be corrected for fragility (LTSA, 2004, pp. 4–5 & Attachments 6,7). It is vital for readers of such documents to not be swayed by the sheer volume of graphs that can be produced showing dramatic increases in risk associated with older drivers.

<sup>5</sup> The shape of the unadjusted bars differs from Figure 2 not just because of the different scale down the lefthand side but because Figure 1 concerns fatalities only.

**Figure 1: Death rate on a per licence holder basis and with correction for fragility**



54. The death rate corrected for fragility in Figure 1 does still increase for the oldest age groups. But this increase is now much less marked. The graph conveys a materially different impression of the risk associated with older drivers than Chart 2 or even Chart 5 (in Attachment 1).
55. Such a graph (i.e. NZ crash data on a per licence holder basis and corrected for fragility) was not included among the graphs in the Terms of Reference, nor in any of the documents provided as relevant by the LTSA at the start of this review. Given that the impression this graph gives of safety risks associated with older drivers is distinctly different from that in the graphs more commonly presented (e.g. Chart 2), the omission seems telling. The omission suggests that crash conclusions derived have overemphasised results on a per kilometre driven basis (as now conceded by the LTSA, para. 36 above) and/or results not corrected for fragility.

***Crash risk conclusions in government's initial response to the Human Rights Commission (4/7/03)***

56. The crash risk conclusions in this letter (Crown Counsel, 2003) merit special attention in this review. This review is a “separate exercise” (Terms of Reference, p. 1) from the HRC dispute resolution process. However, the crash risk conclusions in the letter are relatively recent, specifically relate to the Grey Power complaint to the HRC mentioned in the Terms of Reference, and derive conclusions in detail from one of the LTSA graphs in the Terms of Reference. Furthermore, the LTSA supplied the letter at the start of this review in response to my general request for relevant documents (i.e. it was not specifically requested by me), and the conclusions in it were perhaps the most detailed and relevant crash risk conclusions brought to my attention by either the

LTSA or Grey Power. With respect to the objective in the Terms of Reference, although perhaps not part of “the LTSA's analysis”, they are “crash risk conclusions derived”.

57. The LTSA concession that they may have over-emphasised crashes per distance driven statistics in some circumstances (see para. 36) may or may not be directly related to the letter, but the letter is a most useful illustration of the dangers of such an overemphasis.
58. First, let us consider the consistency and accuracy of the crash risk conclusions as they stand, before moving on to make use of the arguments developed above with respect to distance driven and correction for fragility.
59. Immediately under the heading “Statistical analysis of accident risk”, the letter states:

The justification for the practical driving test for persons aged 80 years and over is in the **dramatically** [emphasis added] increased safety risk for this group. On a per kilometre driven basis, the 80+ group has the **second highest** [emphasis added] fatal crash risk of any age group (after 15-19 year olds). This is illustrated by the graph in **Annex 3**.... (para. 20)

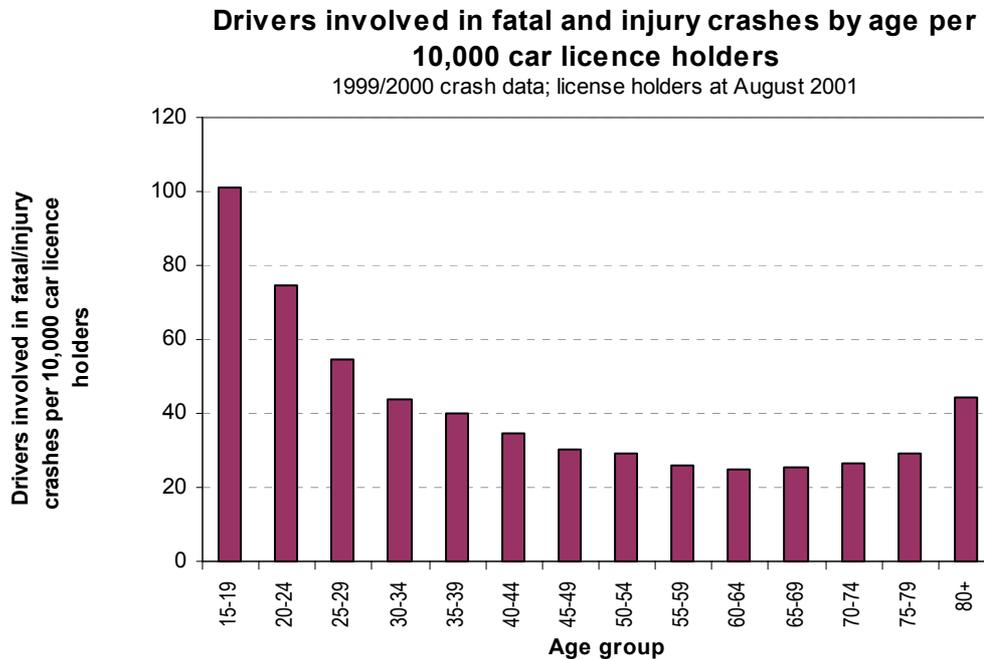
The **same** [emphasis added] pattern of risk for drivers 80 years of age and over is produced when crash risks are analysed per licence holder and per journey. (para. 21)

60. Note that the graph in Annex 3 of that letter is essentially identical to Chart 2 in Attachment 1 of this review. A minor point is that the graph shows fatal and injury crashes, not only fatal crashes as implied by the second sentence quoted.
61. The claim quoted above that the “same pattern of risk” is produced when crash risks are analysed per licence holder is puzzling. Using data supplied by the LTSA, Figure 2 shows fatal and injury crash risk using age groups comparable to those in Chart 2 (and hence comparable to the graph in the Crown Counsel letter). Contrary to the second sentence of para. 20 quoted above, the 80+ group has the **fourth** highest crash risk, not the second. (Indeed, if the 80–84 age group is split out separately, as in Chart 5 Attachment 1, then that age group has the **sixth** highest crash risk.) It also seems very questionable if the increased risk apparent in Figure 2 for the 80+ age group can reasonably be described as “dramatically increased”. The increased risk for 80+ in Figure 2 is certainly less marked than in Chart 2.
62. In addition, Figure 2 hardly seems to be showing the “same pattern of risk” with respect to the crash risk conclusions following:

The graph...shows that a person's crash risk begins to increase noticeably from around 70 years of age. There is a significant difference between the crash risk for 75–79 year olds compared to 65–69 year olds. Because of this significant increase, drivers aged 75 are required to undergo a medical test to show that they are medically fit to drive. (Crown Counsel, 2003, para. 22)

The crash risk shown in Figure 2 for the 75–79 age group is lower than for all age groups from 15 through to 49 years.

**Figure 2: Chart 5 from Attachment 1 redrawn to make age groups comparable to Chart 2**



63. Let us move on to the implications of the earlier arguments with respect to distance driven and fragility.
64. It is of concern that the only crash risk graph in the letter is on a distance driven basis and not corrected for fragility, and that the letter does not carefully justify such apparent reliance on a per kilometre basis and lack of correction for fragility. As argued above, there are good arguments to consider a per licence holder basis and results corrected for fragility as being more relevant to older driver licensing policy. Also, the current LTSA position is that both per km and per licence holder graphs should be used (see para. 42 above).
65. In particular, let us see if the conclusions appear to be justified if a well-justified alternative graph is used (Figure 1, on a per licence holder basis and corrected for fragility). The crash risk conclusions quoted above seem difficult to sustain from Figure 1. In particular, I query whether the risk for those aged 80+ can really be described as "dramatically increased" when they look very similar to those for the 30–34 age group.
66. Later, immediately under the heading "Conclusion", the letter continues:

There is a statistically verifiable increase in road safety risk from drivers over the age of 75. (Crown Counsel, 2003, para. 37)

A statistically verifiable increase in risk may well still be found, but the much-reduced size of this increase suggested by graphs in this review might be sufficient to alter conclusions derived. I also suggest that

careful attention should be paid as to whether the safety risk being described is really "from" older drivers or "to" them. The evidence concerning fragility strongly suggests that much of the increased risk is clearly **to** older drivers rather than **from** them, and thus the single graph attached to the letter is materially ambiguous with respect to risk from older drivers.

67. In summary, the government's initial response to the HRC appears to over-emphasise a single graph showing crashes per distance driven (not corrected for fragility). The crash risk conclusions derived, as presented in that letter, appear neither convincing nor soundly based.

## Other matters raised

68. There is not the time and space to deal rigorously and in detail with all the issues raised during this review. Some remaining issues are thus dealt with briefly below.

### **Communication in this area demands special care**

69. Many readers will struggle to precisely understand some of the issues in this review. This is instructive in itself rather than a flaw. The **difficulty of understanding and communicating** the issues may be central to the chain of events causing this review and central to avoiding unnecessary dispute in the future.
70. This difficulty explains why officials (other than research/statistics specialists) might sometimes confidently cite crash statistics/graphs as strong evidence relevant to driver licensing policy in a way that is unconvincing to others. For example, it is relatively easy to simply see undesirable risk (and social cost) associated with the older drivers in graphs such as Chart 2 and not necessarily to rigorously question the extent of its relevance to older driver licensing (e.g. the effect of fragility). Indeed, this has posed a problem for the review's examination of crash risk conclusions derived—conclusions derived are often not sufficiently explicit, perhaps because the implications of the graphs were assumed to be obvious. A more explicit logic chain, connecting statistics and conclusions derived to policy, would help.
71. The difficulty of understanding and communicating also explains why Grey Power may have found it hard to communicate their objections compellingly. For example, although accepting that they were circling around a valid point, I rebutted some specific arguments raised

### **Box 1: Communication illustration**

“Why extend such a small mileage to a 100 million - surely this must result in a distortion?” (email from Grey Power, 20/2/04)

“The risk calculations are based on a distance-travelled ratio. Older people travel 3-5 km on average in any trip, however, this distance is extrapolated to 100,000 km distorting reality.” ([http://homepages.ihug.co.nz/~grums/july\\_03\\_03.html](http://homepages.ihug.co.nz/~grums/july_03_03.html), accessed 16/2/04)

As discussed in the review, the distance driven graphs are not without problems in their interpretation. But I see the concerns above as a misunderstanding rather than substantial. Explaining this is, however, not easy. An attempt follows:

- Translate Chart 2 from being per 100 million km driven to being per 1 km driven.
- The new graph would have an identical shape with identical meaning.
- The main visible change would be that the numbers on the left-hand side of the graph would all be inconveniently small. Instead of the result for age 75-79 being 60 drivers involved, it would be something like 0.0000006 (60÷100,000,000).
- Such tiny numbers are not easy to read or think about.

In short, I see extension to 100 million kilometres not as distortion but as a reasonable presentation choice that neither enhances nor detracts from the underlying legitimacy.

by Grey Power with respect to per kilometre statistics (see Box 1).

72. The difficulty does not arise particularly because of complex statistical techniques but rather because it is surprisingly difficult to precisely understand the meaning and degree of relevance of key graphs that are reasonably simple in their origins. (To be sure, the exact process of correcting for fragility is complex, but the core principle can be widely understood.) For example, I have not come across contention about the meaning of Chart 1. This stands in sharp contrast to the lively dispute about Chart 2. But the numerical difference between the two is essentially only a matter of division, as taught in primary school arithmetic. The main difficulty lies in the meaning and interpretation, not complex statistical/mathematical operations.
73. The process of this review necessarily involved grappling with communication difficulties and a few inevitable misunderstandings. From this, I suggest that particular care be taken with the following:
  - a. Understanding that **“crash”** is commonly defined to be a crash that results in injury or death (and hence is affected by the fragility of those involved) rather than referring to a physical collision defined independently of the people involved (and independent of their relative fragility).
  - b. Presenting **isolated graphs**. For example, simply presenting risk results such as Charts 2 or 5 without the simpler graphs preceding each may suggest that the presenter is overlooking the relatively small absolute numbers of older drivers actually involved in fatal and injury crashes. In addition, the importance of showing results corrected for fragility does not mean that I would like to see such graphs presented in isolation. In my view, they would often be confusing and unconvincing if their foundation in more straightforward data is no longer clear.

***Is lengthy discussion about these graphs missing the real point?***

74. As Grey Power point out (e.g. email from Grey Power, 23/2/04), the impact of testing is not directly shown by crash statistics and graphs focused on in this review. However, directly quantifying the impact of older driver testing would be surprisingly difficult. I still see graphs as shown here as one strand of evidence relevant to older driver licensing policy.
75. In addition, a recent paper by LTSA staff accepted by an international journal does show some association between on-road driving test performance and crash liability among older drivers under the current licensing system (Keall & Frith, in press). The results suggest that the on-road driving test does identify older driver behaviours or limitations that are related to crash liability.

***Why pick on older drivers?***

76. “Why older people not younger or other, people?” (e-mail from Grey Power, 20 February, 2002). To me, reasons like those below seem a

reasonable start (albeit without getting into the probably complex policy area of appropriate trade-offs between mobility and safety):

Rather than re-testing, LTSA uses advertising and education programs targeted to these high-risk groups, and police target enforcement at these groups. This is seen as more effective than re-testing for younger drivers. Also, testing is about ability; most younger offending is not related to functional ability but to wilful violation of safe driving behaviours. Therefore, the test might show a younger driver to perform well, but that wouldn't change their crash risk if they drive in a risky manner on the road. (Crown Counsel, 2003, para. 34)

***Timing: Are crash statistics available before 1999 more relevant?***

77. Grey Power stated a view that material in LTSA reports prior to 1999 that was used to develop the current policy should be of primary importance for this review. Many if not all of the graphs in the Terms of Reference used data not available prior to 1999, as did a highly relevant letter to the HRC (Crown Counsel, 2003). Hence, I chose to focus on the more recent statistics and to complete the review following the existing Terms of Reference.
78. Note that full results from the 1997/98 New Zealand Travel Survey used were not available until around 2000. I also understand that accurate statistics of license holders by age group only became available in recent years.

***Other evidence about older drivers***

79. The LTSA repeatedly emphasised that much other evidence concerning safety risk associated with older drivers was also used in policy formation. For example, they provided an article showing medical concerns (Pachana & Long, 2000) and cited a wide range of other considerations including an economic evaluation, measures of culpability when a crash occurs, and submissions/views from a range of stakeholders (LTSA, 2004, p.5).
80. I agree that using a wide range of relevant evidence is good practice. The focus of this review on a small number of graphs should **not** be misinterpreted as indicating that the other evidence lacks relevance. Rather it is because the Terms of Reference naturally led to such a focus and because such a focus could contribute usefully to resolving long-lasting misunderstandings.

Signed: Charles Sullivan  
Director, Capital Research

## References

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- LTSA. 2003b. Older drivers and LTSA: Presentation for the Grey Power 2003 AGM.
- LTSA. 2004. Further information for independent peer review of LTSA older driver statistics. Document from Craig Hill, General Manager Policy Division. 17 March 2004.
- OECD. 2001. *Ageing and transport: mobility needs and safety issues*.
- Pachana, N & Long, N. 2000. Another Y2K problem: New Zealand's ageing drivers. *The New Zealand Medical Journal*, 113, no. 1104, 25 February 2000.

# Attachment 1:

## Charts depicting drivers' risk of death or injury by age (from Terms of Reference)

Chart 1

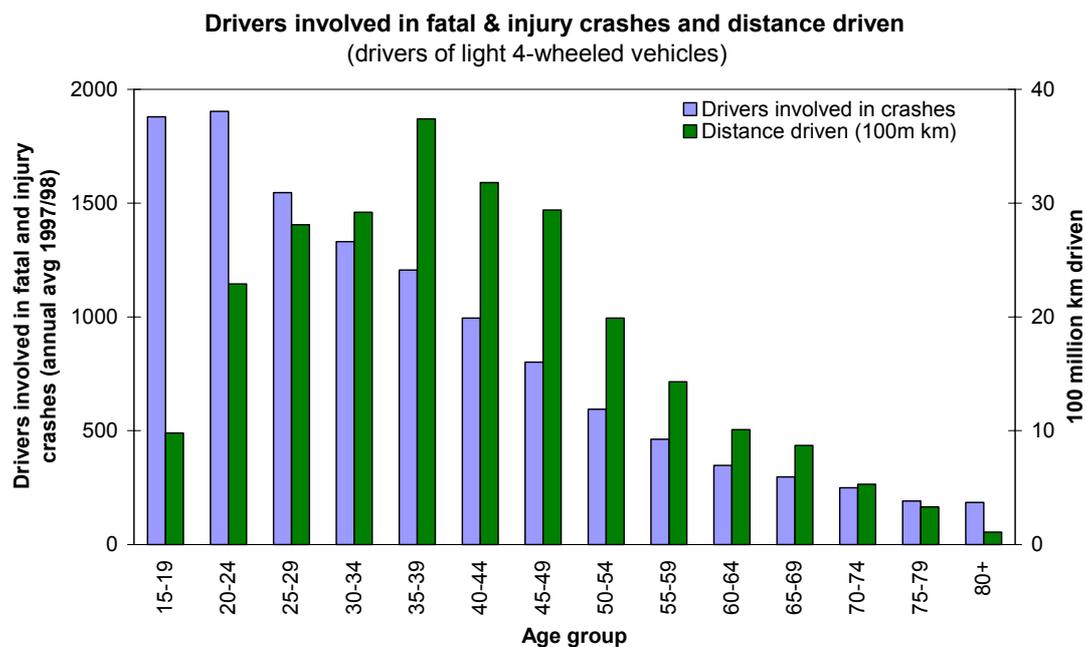


Chart 2

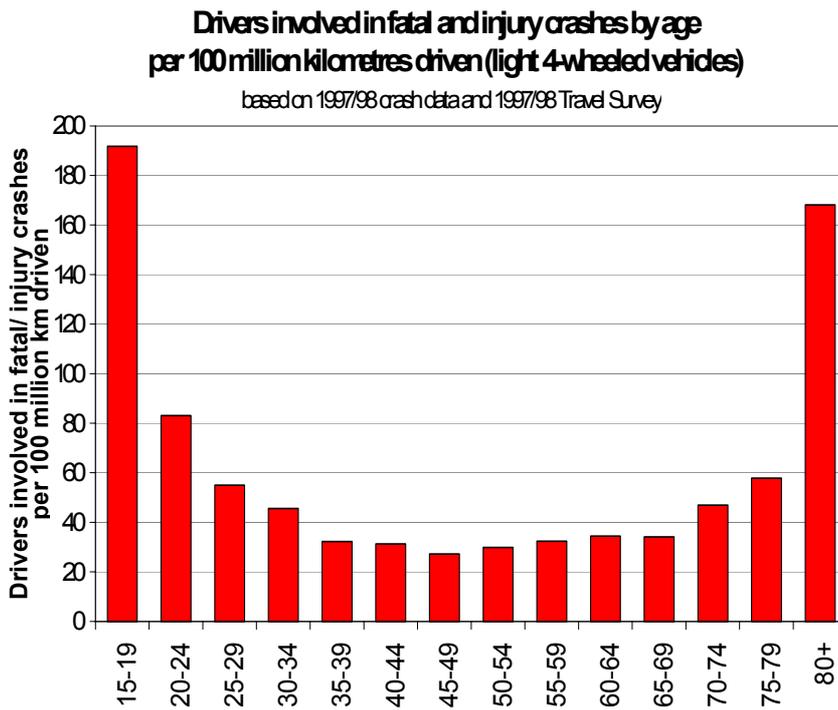


Chart 3

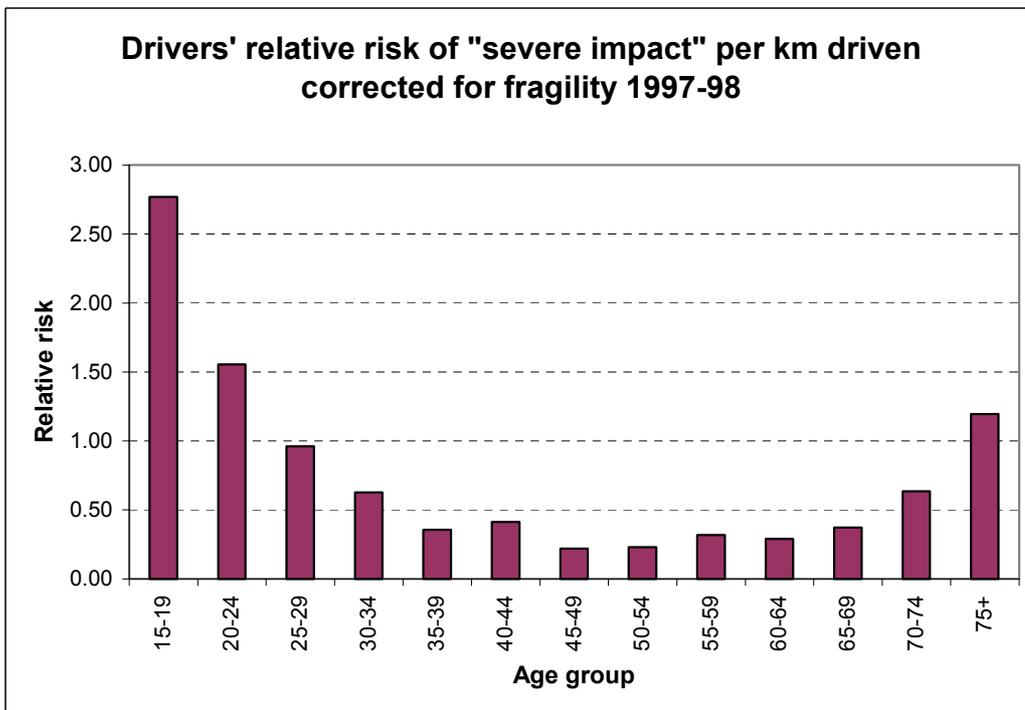


Chart 4

**Drivers involved in fatal & injury crashes and car licence holders**

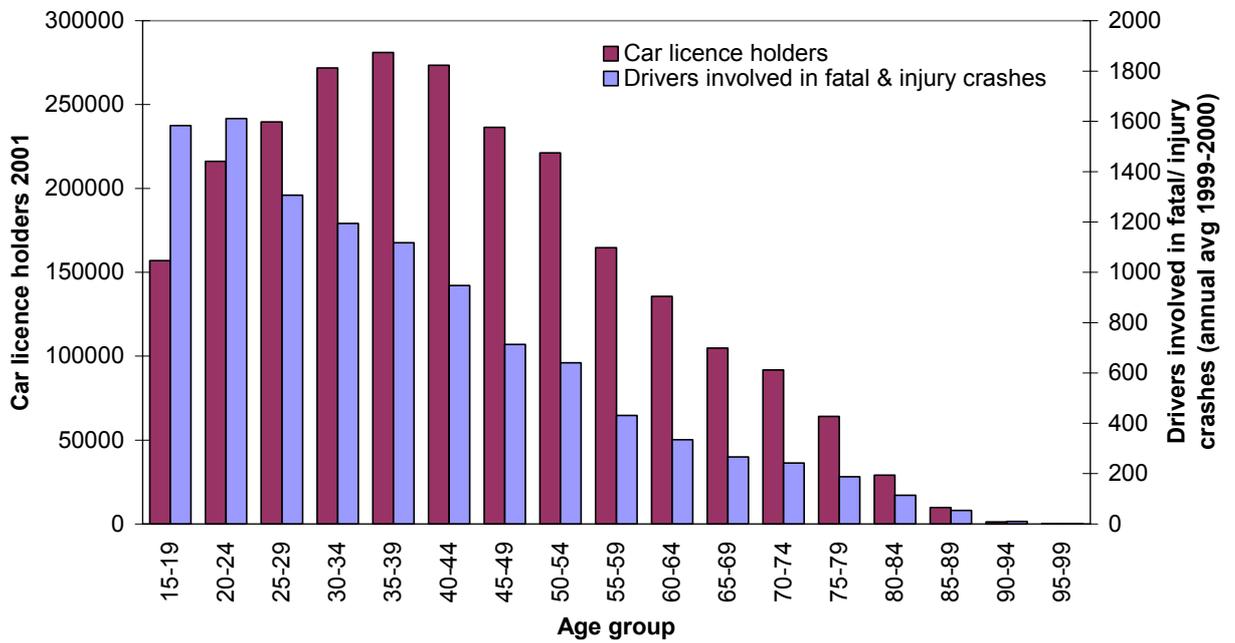
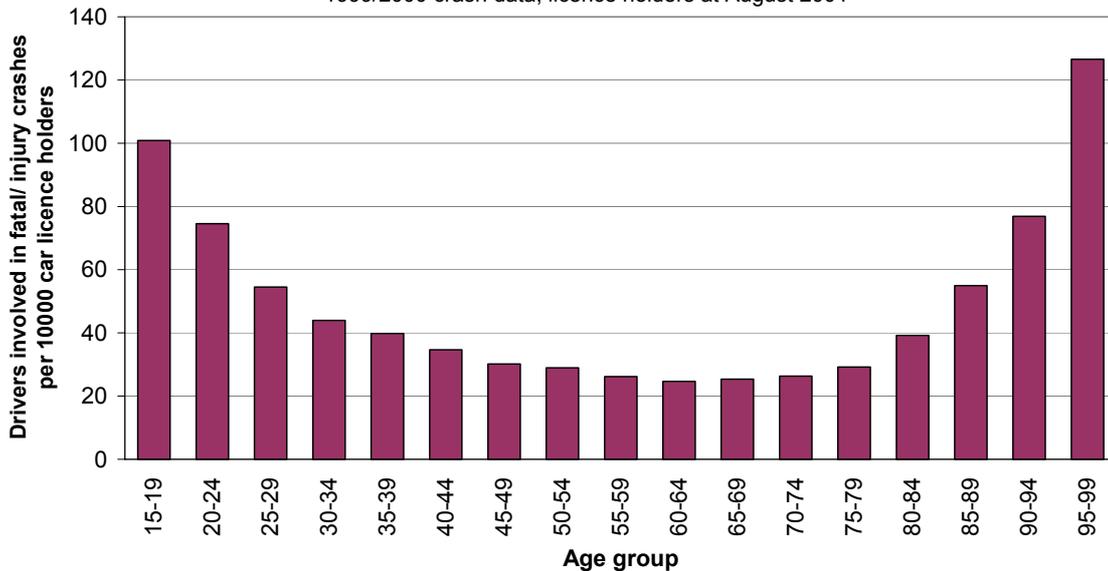


Chart 5

**Drivers involved in fatal and injury crashes by age per 1000 car licence holders**

1999/2000 crash data; licence holders at August 2001



## **Attachment 2:**

### **Data and documents supplied (other than those cited in body of the review)**

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#### **Supplied by the LTSA:**

Keall, M. D. 1995. Pedestrian exposure to risk of road accident in New Zealand. *Accident Analysis & Prevention*, 27, 729-740.

Keall, M. D. & Frith, W. J. (Undated) Crash related risks in New Zealand in 1989-90 and 1997-98.

Spreadsheets with:

- Culpability data by age (drivers with primary responsibility for the crash)
- Passenger and pedestrian casualties by age group

Older driver key summary paper 26/09/03 (pages 12-16; graphs)

Status Report 38, No. 3, March 15, 2003. Insurance Institute for Highway Safety (US).

#### **Supplied by Grey Power:**

Grey Power did not supply any lengthy formal documents. In addition to the various emails and email attachments sent were:

- Letter to R Hesketh, Human Rights Commission 12/3/03
- Draft to M Singham, Human Rights Commission (undated)