
Summary:

Speed and age: Changes in speed level on Norwegian roads with 80 km/h limit

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Average speed on Norwegian roads with an 80 km/h speed limit has decreased by about 1 km/h during the last 5 years. This is partly due to an increase in the share of older drivers, and the fact that older drivers drive more slowly than younger drivers. This was shown in a three-phase project: A) Analysis of speed data from permanent traffic counting stations; B) Speed measurements combined with downstream driver interviews and with register data on vehicles and owners; and C) Estimation of changes in kilometres driven by older drivers, based on national travel surveys in 2009 and 2013/14. Even though the changed age composition of the driver population explains part of the speed decrease, most of the decrease is due to other factors, and probable explanations are increased traffic volume and decreased prevalence of large speeding violations.

Data from traffic counting stations administered by the Norwegian Public Roads Administration (NPRA) indicate that the speed level has decreased during the last decade. This tendency was also pointed out in a recent evaluation of the anti-speeding campaign “On the right side of the speed limit” run by the NPRA (TØI Report 1278/2013). The main purpose of the present project was to estimate the magnitude of the speed decrease and to investigate possible explanations. A specific issue to address was to what extent the increased share of older drivers has contributed to the speed decrease.

The project comprised three parts. Part A was an analysis of speed data from a sample of NPRA traffic counting stations on roads with 80 km/h speed limit, in order to estimate year-by-year speed changes for the period 2008-2014. Part B was a roadside study where speed measurements were combined with downstream interviews with a random sample of drivers, so that speed data could be matched to driver age and other background information. Based on number plate recognition, speed data were additionally matched to register data about vehicles and owners. Part C consisted of an analysis of two national travel surveys, to estimate changes in the age distribution of the driver population. This was used in combination with data on age-related speed differences found in Part B, to see to what extent the increased share of older drivers could explain the general speed decrease.

In Part A, a sample of 11 permanent traffic counting stations was selected for analysis of speed changes. Average speed, number of vehicles (by length class), time gaps, and several other indicators are aggregated for each hour, so that data from the counting stations are available as hour values. The sample of counting stations was supposed to be fairly representative for the road network. Changes were estimated for the years 2008-2014, by means of pairwise comparisons both from one year to the next and from the first to the last year. For each pairwise comparison we selected all hour values with valid data for both years. This number varied across

comparisons, due to some missing data for one or both years. In order to estimate freely chosen speeds (i.e. speeds where the driver was unlikely to be impeded by a lead car) we selected only hours with average speed above 70 km/h and less than 200 vehicles per hour.

The change in average speed for the whole period 2008-2014 was estimated to be a decrease of 1.05 km/h, with a 95 % confidence interval from 0.37 to 1.72 km/h. This corresponds to an average year-by-year decrease of 0.175 km/h. The decrease was somewhat larger for the 85- and 95-percent fractiles of the speed distribution, which indicates a decrease of the highest speeds. This is also supported by a decrease in the number of vehicles driving above 90 km/h, despite an increase in the total traffic volume.

The roadside study was carried out at four sites, each in proximity of a traffic counting station, which measured speed for all vehicles. A sample of cars were stopped at a service area some distance downstream of the counting station, and the drivers were interviewed by personnel representing the Institute of Transport Economics. The National Mobile Police Service (“Utrykningspolitiet – UP”) assisted in recording number plates of all vehicles, by means of an ANPR camera (“Automatic Number Plate Recognition”). In addition, UP assisted in stopping cars at the roadside interview sites, where they performed various controls at their own discretion, before asking drivers if they would like to participate in the interview survey. Number plate files were subsequently matched with speed files, using registration time code as matching key, so that speed data could be matched both to interview and register.

A total of 204 drivers were interviewed. At one of the sites a technical problem discovered after data collection implied that interview data could not be matched to speed for that site. For the remaining three sites there were also some missing data due to incorrect number plate identification. The remaining data set consisted of 92 interviews, which were matched with speed data. Matches with register data were obtained for a total of 3749 cars.

Analyses of relationship between speed and age were done separately for interview and register data, with age data for *drivers* and *owners*, respectively. By matching interviews to register data, and also asking drivers if they owned the car they were driving, we found that about two-thirds of the cars were driven by the owner. We consequently consider owner age as an acceptable proxy for driver age in our analyses, acknowledging though that this results in some underestimation of driver age differences, because average driver age is lower than owner age, and young drivers drive faster. The age groups used in the analyses were over and under 65 years.

Speed and interview data showed that drivers over 65 years of age drive between 1.5 and 4.4 % slower than those under 65 years old, whereas analyses using register data showed that cars with owners over 65 years old drive between 1.3 and 2.2 % slower than younger drivers. As expected, estimates were lower for owners than for drivers. Driving speed is highest for cars with owners aged 35 to 44 years and decreases with increasing age (see Figure S-1).

There was no significant relationship between speed and driver gender based on interview data. For the only site with average speed above the speed limit, cars with female owners drove significantly slower than those with male owners, although this effect disappeared in a multivariate analysis including additional vehicle register data.

The multivariate analysis showed a positive relationship of speed to engine power. In addition, there was a significant relationship of car model year to speed, to the effect that newer cars drove faster. The effect was estimated at 0.165 km/h per year of car age, with a 95 % confidence interval from 0.026 to 0.304. There were no effects of car makes on speed.

The relationship of model year to speed may have implications for analyses of car age and accident risk, since a possible higher risk among older cars to some extent will be moderated by lower speed.

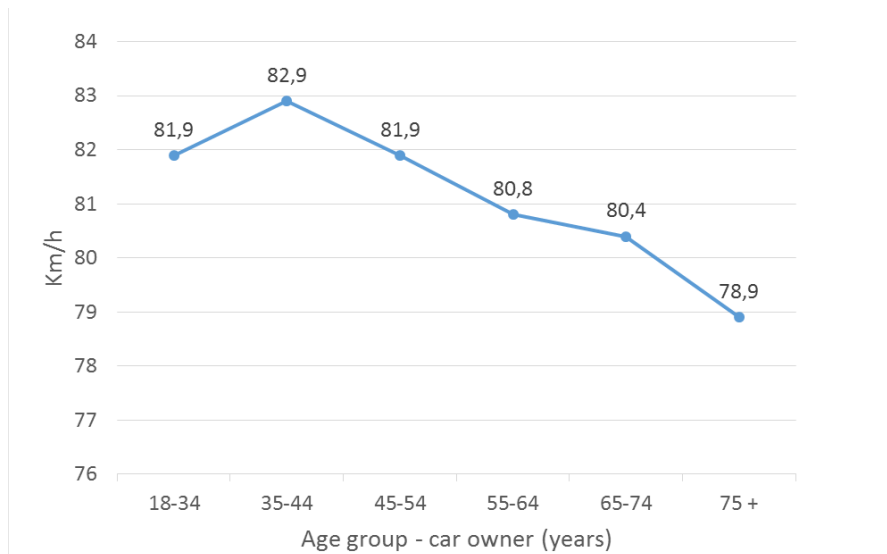


Figure S-1. Mean speed (km/h) for cars at the site with the highest speed level, by age group of car owner. Only vehicles with time headways above 5 sec to lead vehicle.

The analyses in Part C showed that the age group above 65 years old increased their share of driving exposure from 10 to 14 % from 2009 to 2014, as estimated from national travel surveys. Since this age group also drives slower than the average driver, as shown in Part B, the increased exposure results in a reduction of the general speed level. The combined effect of increased share of exposure and lower speed for drivers above 65 years old was estimated at a reduction of the total speed level between 0.05 and 0.13 km/h from 2009 to 2014, depending on different estimation assumptions. This corresponds to between 6 and 15 % of the speed reduction observed in Part A.

In addition to this *direct* effect of 6 – 15 %, there is an *indirect* effect due to other drivers having to reduce their speeds because of a slower driver in the car ahead. Data from the site with the highest speed level showed that cars with owners above 65 years old had significantly shorter time headways to the next three following cars, compared to younger drivers. We estimated the share of cars owned by the older age group being the first vehicle in the queue, and the number of vehicles in the queue, finding that on average every second car restricted the freely chosen speed of one additional vehicle. This means that the indirect effect can be estimated – very tentatively – at about one half of the direct effect, implying that the total effect of older drivers on driving speed amounts to between 9 and 23 % of the total speed decrement.

Thus, it seems to be clearly documented that a higher share of older drivers has contributed to lower mean speeds. However, most of the total decrease must be explained by other factors.

Increased traffic volume is one possible explanation. During the period from 2008 to 2014 the traffic volume increased by about 9 % for the sites and hours included in our analyses. Even though we have limited the data to hours with less than 200 vehicles, the increased volume may have had some effect on the speed.

It should also be added that increased traffic volume may reinforce the indirect effect of more older drivers, since the probability of a queue caused by a slow driver will increase with higher traffic volumes. Thus, there seems to be an interaction between traffic volume and age effects on speed.

Another contributing factor to the speed decrement could be reduced prevalence of large speeding violations, as indicated by decreased 85 and 95 percentile speeds as well as fewer cars with speeds above 90 km/h.

To further increase our understanding of the implications of an ageing driver population on the general speed level it could be useful to carry out similar studies also on roads with lower speed limits, in order to investigate possible age differences regarding speed adaptation to different driving environments.