

Summary:

Road traffic exposure and risk among high-risk groups in Norway

The Norwegian Public Roads Administration's research programme on high risk groups in road traffic identifies five such groups: younger and older car drivers, drivers of motorcycles, foreign car drivers from non-western countries, and drivers driving under the influence of drugs or alcohol (DUI). There are many indications and also documentation revealing that these groups are more at risk than the average driver. The present study is based on a comprehensive survey to the different high-risk groups aiming to collect exposure data in order to give more detailed risk estimates for these groups than previously given. The results reveal that the risk figures of car drivers are quite similar to what is found in previous studies - younger and older drivers are more at risk than others. We find that the traffic volume of motorcycles is far less than what is generally assumed based on previous studies, and accordingly the estimated accident risk is higher. Especially young drivers (16-17 years) of light motor cycles are at high risk in Norwegian road traffic. Immigrant car drivers of a non-western origin are also more at risk than the average Norwegian car driver. In accordance with previous studies we find that DUI drivers are on average 55 times more at risk of having fatal accident than ordinary car drivers.

Data from survey and roadside counts

The results presented are based on a comprehensive survey administered to car drivers and motor-cycle owners in the period from October 2007 to September 2008. Questionnaires were sent to ordinary Norwegian car drivers holding a driver licence for passenger cars but younger and older drivers were oversampled. In addition, questionnaires were also sent to car drivers from the largest non-western immigrant groups in Norway i.e. with background from Pakistan, Iraq, Poland, Vietnam and Somalia. They received questionnaires in the period October 2007-March 2008 and in June 2008.

Motorcycle owners received questionnaires during the typical motorcycle season in Norway, i.e. from April to October.

Sample

Car drivers and motor-cycle owners have been sampled from the Public Roads Administration's Driver licence register and Vehicle register. The driver licence register was linked by Statistics Norway to

their Immigrant register in order to sample immigrant drivers with a non-western origin.

The sample is large. A total of 58 000 questionnaires were distributed. Approximately 15 000 were filled in and returned, giving a reply rate of 27 per cent (non-answered returns excluded). The sample of drivers driving under the influence of alcohol or substances (DUI) was collected by use of a large roadside study conducted by The Norwegian Institute of Public Health in cooperation with the Police and with the Institute of Transport Economics from April 2005 to April 2006. Almost 12 000 drivers were stopped and tested (oral fluid tests).

Aggregation to total traffic volumes

Sample data are aggregated to total traffic volumes by multiplying average driving distances per month by twelve and then by the number of driving licenses within different age/gender groups. These figures are then summed over all age/gender groups in order to provide total traffic volume figures for light cars (<3.5 tons) in Norway.

For motorcycle riders similar procedures have been conducted to aggregate the sample results. For non-western car drivers risk estimates etc. are only based

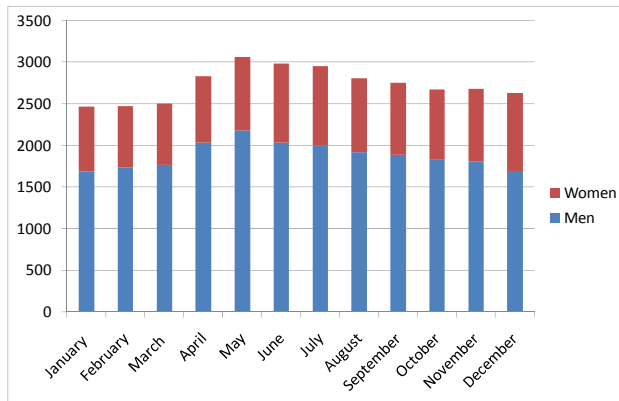
on disaggregate data, i.e. average driving distances per year. For DUI drivers a very simple aggregation method has been used. The results indicate that their yearly driving distance does not differ from that of the average driver. Thus we assume that the proportion of DUI drivers is representative to the proportion of the amount of DUI driving.

The amount of car driving corresponds to earlier findings

Even if there are uncertainties involved when aggregating sample results to population totals, our results concerning the total amount of car driving is quite similar to those obtained in other Norwegian studies.

Most driving on weekdays and in the summertime

The amount of driving differs between gender and age groups, between months and between weekdays. In total male drivers drive twice as much as female drivers. Both for male and female drivers the amount of driving is larger in the summer months cf. figure 1.

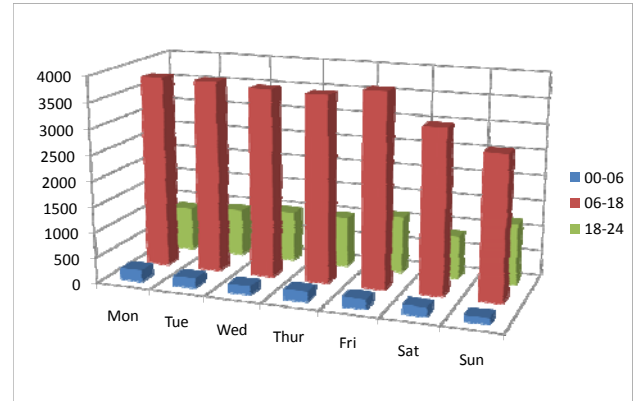


Source: TØI report 1042/2009

Figure 1: Kilometres driven by car drivers distributed by month and gender. Million vehicle kilometres 2007-2008.

When distributing the amount of driving over the week and time of day it is clear that most car driving is conducted during normal work days, cf. figure 2.

There are differences in the distributions over day of week and time of day between age and gender groups. Elderly choose not to drive in the night-time, whereas young drivers (18-24 years) are those with the largest proportion of night driving. Elderly female drivers drive very little during the winter months when driving conditions in Norway can be very difficult.



Source: TØI report 1042/2009

Figure 2: Kilometres driven by car drivers distributed by day of week and time of day. Million vehicle kilometres. 2007-2008

Less motorcycle driving than before

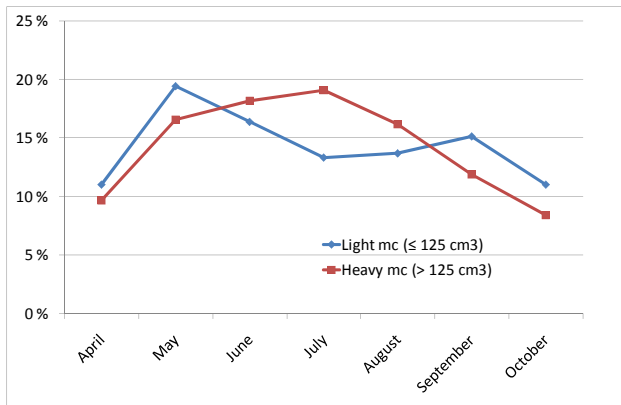
We find that the volume of motorcycle driving is clearly reduced compared to what has generally been assumed based on previous studies. In particular light motorcycles ($\leq 125 \text{ cm}^3$) are driven less than before.

The main reason for this is that light motorcycle now has become quite popular among middle aged groups as a convenient transport mode to and from work. Earlier light motorcycles were almost exclusively driven by very young drivers. Middle aged drivers typically use the motor cycle less than young drivers. Young drivers yearly driving distance is as before. It is accordingly the changed proportion of young versus middle-aged driver that is the main reason for the overall driving reductions.

The use of heavy and light motorcycles differs

Heavy motorcycles ($> 125 \text{ cm}^3$) are typically used for holiday and recreation purposes to a greater extent than light motorcycles. The latter are typically used to and from school or work. Accordingly there are clear differences in the distribution of driving by months between the two types of motorcycles cf. figure 3.

Heavy motorcycles are predominantly used in mid-summer i.e. in the summer holiday. On the contrary, light motorcycles are mostly driven in the months before and after the summer holiday; in May, June and September.

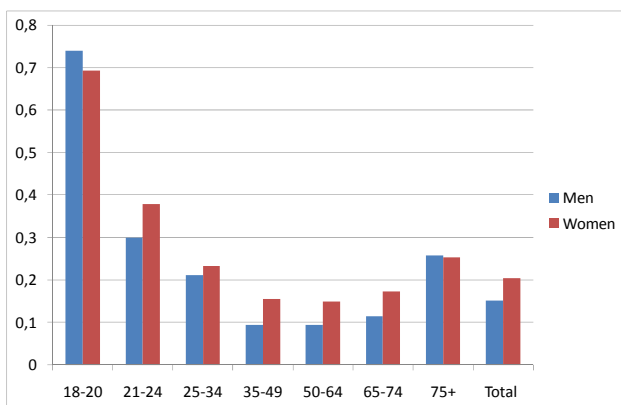


Source: TØI report 1042/2009

Figure 3: Motor cycle riding in Norway by month and type of motor cycle. Per cent.

Risk figures for car drivers are stable

When estimating accident risks for car drivers distributed by age and gender we get the traditional U-curve: Young and elderly drivers are most at risk, cf. figure 4.



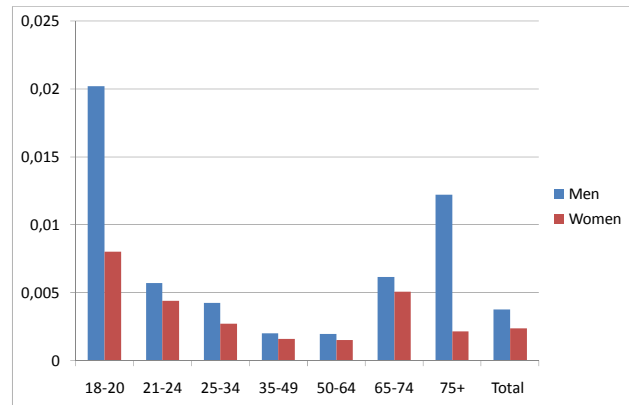
Source: TØI report 1042/2009

Figure 4: Car drivers injured or killed per million vehicle kilometers distributed by gender and age. Average 2007-2008.

Risk differences between men and women

Female drivers are more at risk of being injured than male drivers, except among young and elderly drivers. Male drivers are on the other hand more at risk of being killed in road accidents cf. figure 5.

Young male drivers are most at risk of being killed in road accidents. More surprisingly is perhaps the high risk of being killed among elderly male drivers, especially compared to that of elderly female drivers.



Source: TØI report 1042/2009

Figure 5: Car drivers killed per million vehicle kilometers distributed by gender and age. Average 2007-2008

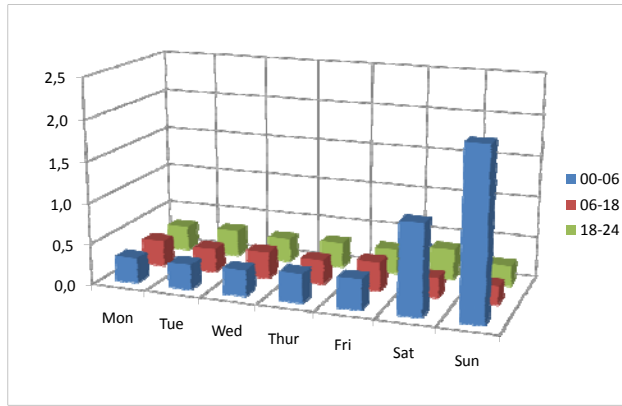
The reason for the risk differences between elderly male and female drivers is probably that fatal accidents typically take place in high speeds on highways and motorways. Among elderly couples it is typically the husband that drives when they go together on longer trips and thus there will be an elderly man behind the wheel when elderly drive on motorways etc. with high speeds. Fatal accidents are generally associated with high speeds so fatal car accidents involving elderly will normally have a male driver (and very often a female passenger).

This mechanism can probably also partly explain why male drivers in general are more at risk of being killed than female drivers; typically male drivers go faster because they are most often the ones driving on long trips. In addition fatal accidents are often associated with DUI driving, something that is more typical among male drivers.

The reason why female drivers are more at risk of being injured is probably that they are somewhat more vulnerable to injuries when accidents happen. The risk of being involved in an accident is more or less the same for male and female drivers.

Night-time traffic at week-ends is the most dangerous

It is well documented in previous studies that night-time traffic at week-ends is the most dangerous. These findings are reproduced here, cf. figure 6.



Source: TØI report 1042/2009

Figure 6: Car drivers involved in accidents per million vehicle kilometers distributed by day of week and time of day. Average 2007-2008.

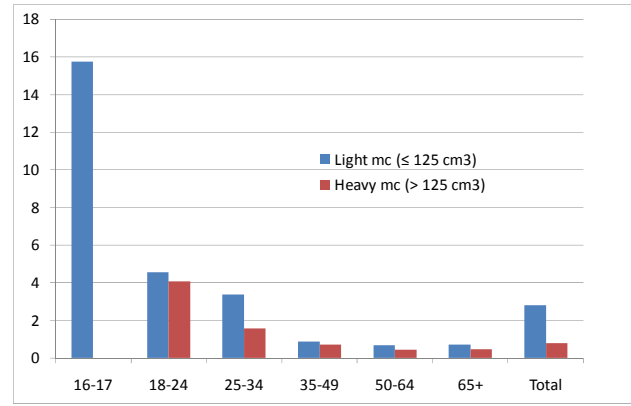
The pattern of the risk distribution over week-days and time of day are quite similar for young and middle-aged drivers; i.e. also the latter is more at risk during the night-time and in particular at week-ends. Among elderly drivers, there is no such pattern; they are most at risk during daytime on ordinary work-days.

Immigrant drivers are more at risk

Previous Swedish and Norwegian studies have revealed that immigrants with a non-western origin are more at risk than ordinary Swedish/Norwegian drivers. In these studies risk has been calculated as accidents per driving licence. One objection to such a risk measure is of course that there are great variations in driving distances that are not taken account for, and it is likely that some immigrant groups drive longer distances than the average Norwegian driver. We find that some immigrant groups work as professional drivers (taxi) to a greater extent than Norwegians, and accordingly they do have longer driving distances. Our risk calculations based on driving distances as exposure nevertheless reveals that immigrants of non-western origin are somewhat more at risk than the average Norwegian driver.

Young motor cycle riders are most at risk

Although light motorcycles are not a predominantly teen-age vehicle anymore, teen-agers are to a very large degree those who are victim of accidents with light motorcycles. According to our estimates, 16-17 year-olds riding on light motorcycles are 15 times more at risk than the average motor cycle rider (both types). Figure 7 clearly illustrates this.



Source: TØI report 1042/2009

Figure 7: Motorcycle riders injured or killed per million vehicle kilometer distributed by age of rider and size of cycle. Yearly averages: injuries 2006-2008, driving distance 2007-2008

However, we need to make certain reservations here. It is possible that some young drivers use motorcycles that are registered in the name of their parents (in order to save insurance costs) and thus young drivers driving distances will be underestimated. Still, there can be no doubt that the youngest motorcycle riders are most at risk.

DUI-driving is very risky

The results of the road side test for DUI-driving revealed that a very small proportion of drivers were influenced by alcohol or illegal substances. The BAC limit in Norway is 0.2 and only 0.3 per cent of drivers had illegal BAC levels. This proportion is similar to what was found in a previous study in the early 1980s. Drunken driving seems furthermore not to be typical of young drivers. Among drivers with illegal BAC levels male drivers between 25 and 60 years dominate. Illegal substances (drugs) are more typical among young drivers and among motor cycle riders. However, the number of motorcyclists in the sample is low, so the results for motorcyclists could be random.

According to the results DUI-driving does not seem to be very typical for night-time driving at week-ends. However, a reservation must be made here. For different reasons these periods are underrepresented in the sample.

Yearly driving distances of DUI-drivers are more or less similar to those of the average driver, so it is reasonable to assume that the proportion of DUI-drivers is representative for DUI-driving. Thus one can calculate relative risks by using the ratio between the proportion in traffic and the proportion in accidents. Such calculations indicate that the risk of being

involved in a fatal accident is 55 times higher for DUI-drivers than for the ordinary driver (all BAC-levels).

Conclusion

We must be careful in our conclusion because the response rates are rather low. Thus it is difficult to judge how representative our results are. Nevertheless many of our results correspond to what has been revealed in previous studies. In particular the risk distributions among car drivers correspond well to

similar estimates based on the National Norwegian Travel Survey from 2005.

An important aim of the present study has been to get better exposure data for high risk groups that has often been lacking in earlier studies. In particular for young and elderly drivers and motorcyclists data has been lacking. Our results confirm that such groups are at high risks and give some important insights into the risk profiles of such groups.