

Risk of apprehension for traffic law violations

Estimates for 2006-2022

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Traffic law violations, including speeding, impaired driving and non-use of seat belts has been a major road safety problem for a long time, both in Norway and in many other countries. Enforcement remains the most important measure taken to reduce the amount of traffic law violations and the risk of injury attributable to them. This report presents updated estimates of the risk of apprehension for traffic law violations in Norway. The main findings can be summarised as follows:

1. The risk of apprehension for impaired driving, non-use of seat belts, use of hand-held mobile phone and violations of hours of service and rest has declined in recent years. The risk of apprehension for speeding has increased.
2. There are very few reactions against speeding by less than 6 km/h.
3. For speeding by more than 6 km/h, the risk of apprehension increases as the severity of speeding increases.
4. The mean risk of apprehension for speeding is a little more than 10 per million kilometres driven while speeding. Statistically, one may therefore drive close to 100,000 kilometres while speeding before getting caught.
5. It was not possible to estimate how the risk of apprehension for drinking and driving varies according to blood alcohol concentration. Previous estimates of this must be regarded as highly uncertain.
6. Road users overestimate the risk of apprehension for speeding. To keep the subjective risk of apprehension high, enforcement should be random, highly visible and publicised in mass media.
7. There are many cost-effective measures that can be taken to reduce traffic law violations and the risk associated with them.

Violations included in the study

The study included violations for which there exist sufficient data to estimate how widespread they are. This includes these violations:

- Speeding
- Impaired driving (by alcohol or legal or illegal drugs)

- Non-use of seat belts
- Use of hand-held mobile phone while driving
- Violating regulations for hours of service and rest

Violations are estimated in terms of kilometres driven and are termed violation-kilometres. Driving 1 kilometre above the speed limit, for example, constitutes 1 violation-kilometre. The risk of apprehension is estimated as:

$$\text{Risk of apprehension} = \frac{\text{Number of detected violations}}{\text{Million violation-kilometres}}$$

For speeding, a distinction is made between several levels of speeding (e.g. by 10-15 km/h, 16-20 km/h, etc.). Similar categories could not be defined for other violations due to lack of data. The study covers the period from 2006 to 2022 and therefore includes the years covered by the previous studies (2010 and 2014).

Risk of apprehension

Figure S 1 shows estimated risk of apprehension in 2022, indicated as the number of detected violations per million violation-kilometres driven. For impairment by drugs, the estimates refer to 2017.

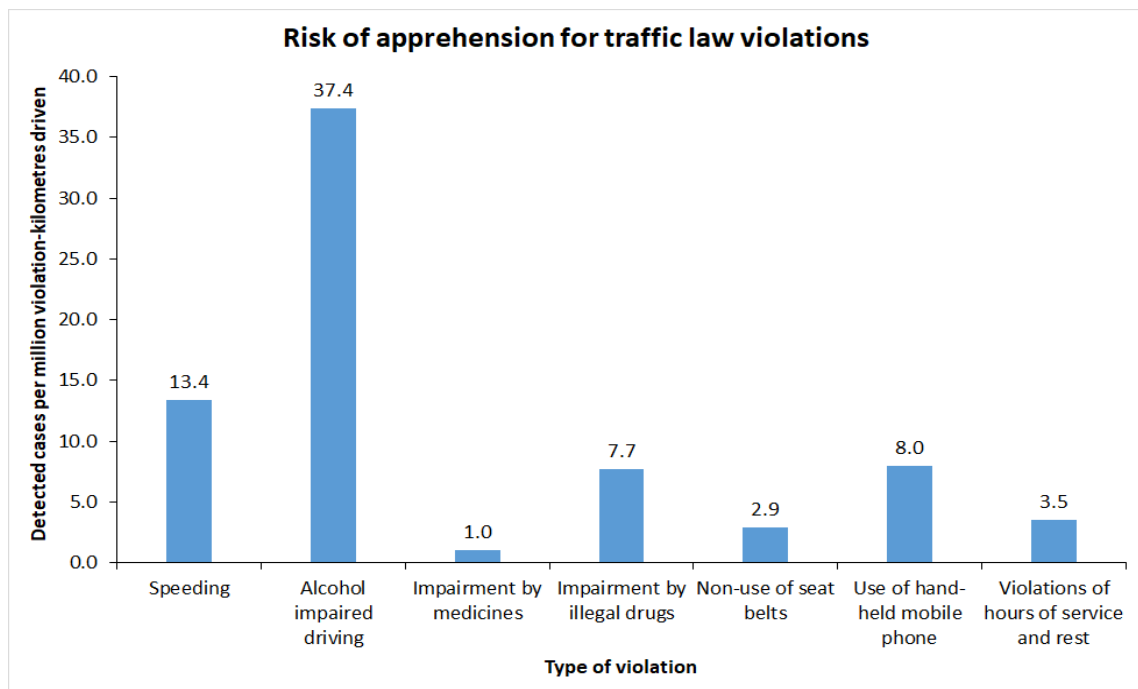


Figure S 1: Risk of apprehension for traffic law violations by type of violation

Driving while impaired by alcohol has the highest mean risk of apprehension. The risk of apprehension for speeding varies according to the severity of the offence. It increases with the severity of speeding. If a driver speeds by more than 35 km/h on a road with a speed limit of 80 km/h, the risk of apprehension in 2022 was 184 per million speeding-kilometres.

Previous studies (2010 and 2014) estimated the risk of apprehension for alcohol-impaired driving according to different levels of blood alcohol concentration. This was not possible in the present study. It relied on results of roadside surveys made by the traffic police. In these surveys, blood alcohol concentration was not recorded. A breath test was taken, and the

instrument indicated whether alcohol in breath was above or below a level corresponding to a blood alcohol concentration corresponding to 0.02 %.

Changes over time in risk of apprehension

Figure S 2 shows changes from 2006 to 2022 in the risk of apprehension. For impairment by drugs (legal or illegal) the changes are from 2006 to 2017. For use of mobile phones, the change is from 2008 to 2022. Finally, for hours of service and rest, the changes are from 2017 to 2022.

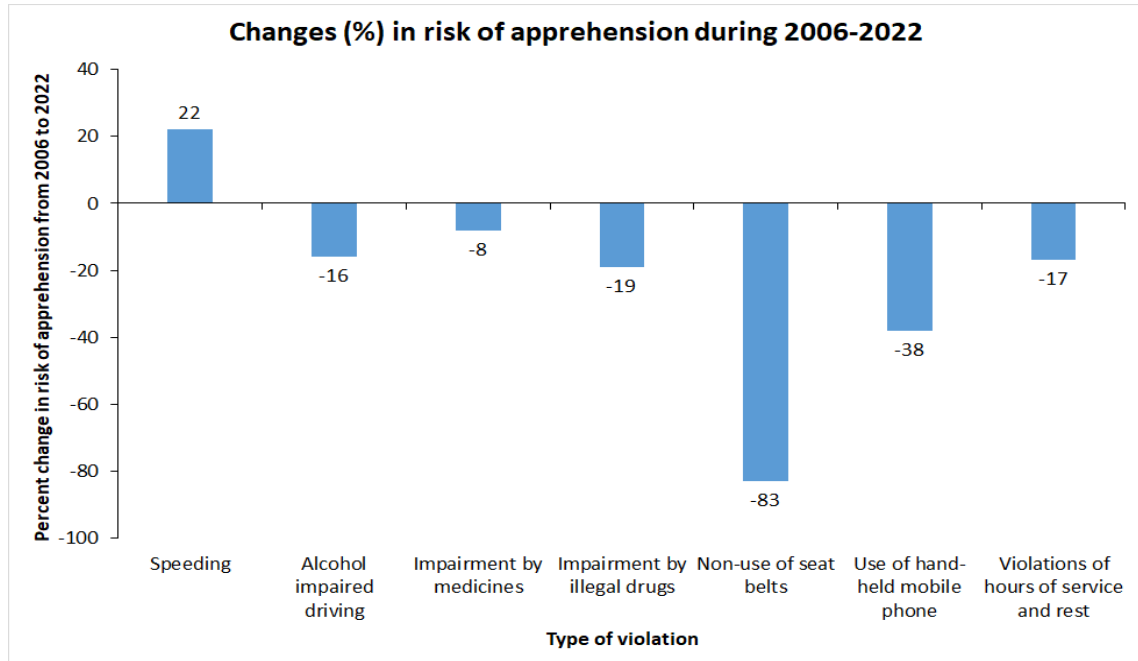
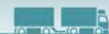


Figure S 2: Changes in risk of apprehension during the time period 2006-2022, by type of violation

The risk of apprehension has been reduced for all types of violations except for speeding. Changes during the 2006 to 2022 time period have been different for the different types of violations. For speeding, it declined in the first half of the period, but then increased again and was higher in 2022 than it was in 2006. The risk of apprehension for driving while impaired by alcohol increased from 2006 to 2019, but then declined from 2019 to 2022, and was lower in 2022 than in 2006. The risk of apprehension for non-use of seat belts was considerably higher until 2017 than it was in 2022. Between 2017 and 2022 it declined very rapidly. The use of seat belts remains high, possibly because most cars in Norway (more than 90 %) have seat belt reminders. The risk of apprehension for violating hours of service and rest declined during the Covid-19 pandemic but increased again in 2022 and 2023. However, it remains below 2017 numbers.

Perceived risk of apprehension

Surveys of samples of driving licence holders in 2010, 2014 and 2024 have been used to assess how drivers perceive the risk of apprehension for traffic law violations. With a couple of exceptions, the perceived risk of apprehension cannot be directly compared to the actual risk. For the cases where a comparison is possible, drivers are found to overestimate the risk of apprehension.



Drivers were asked for which of the following violations the risk of apprehension is greatest: (1) Speeding by more than 10 km/h; (2) Driving with a blood alcohol concentration of 0.02 % or more; (3) Not wearing seat belts. The correct answer is offence (1), speeding by more than 10 km/h. The percentage giving this answer was 61 % in 2010, 56 % in 2014 and 77 % in 2024.

In one question, it was assumed that a driver was constantly speeding by 15 km/h on a road with a speed limit of 80 km/h but no speed camera. Drivers were then asked how often they believed this driver would be caught. Possible answers were: the first year, within three years, within six years, and so on, until: he will never be caught. These answers can be converted into an expected annual frequency of getting caught: 1.00, 0.33, 0.17 etc. The expected annual frequency stated by drivers can be compared to the actual frequency with which such a driver will be caught. We found that drivers overestimate the risk of getting caught considerably. In 2010, perceived risk was about 5 times higher than actual risk. In 2014, the ratio had declined slightly to between 3.7 and 4.5 (depending on assumptions made about annual driving distance). In 2014, it had declined further to between 2.2 and 2.4. Those who drive long annual distance have the most realistic perception of the risk of apprehension.

Another question where the answers given by drivers can be compared to a correct answer concerns the number of fixed speed cameras deployed along roads in Norway. The median number of speed cameras stated by drivers exceeded the actual number of cameras by a factor of 1.6-2.2 in 2010, 2014 and 2024. A median driver thinks that there are 60 % to 120 % more speed cameras than there actually are.

Measures to increase the risk of apprehension

The study included cost-benefit analyses of measures that can increase the risk of apprehension and reduce the incidence of violations.

Tabell S 1 lists these measures and the estimated reduction in the number of killed or seriously injured road users if the measures are implemented to an optimal extent.

Table S 1: Estimated reduction in the number of killed or seriously injured road users by optimal use of measures influencing the risk of apprehension for traffic law violations

Measure	Estimated annual reduction of killed or seriously injured road users
1. Three times the current level of police enforcement	113
2. Four times the current number of police checks of drivers of heavy goods vehicles	9
3. 70 % increase of roadside inspections of heavy goods vehicles	10
4. 120 additional speed cameras	6
5. 120 additional kilometres of road with section control	4
6. Mandatory intelligent speed adaptation on all cars	107
7. Seat belt reminders increasing to 100 % market penetration	2
8. Seat belt ignition interlock in all cars	29
9. Alcohol ignition interlock for one year's cohort of drinking drivers	35

The baseline number of killed or seriously injured road users (value fitted by trend lines) is 634.

Estimated effects cannot be added. They nevertheless indicate that it is possible to considerably reduce the number of killed or seriously injured road users by reducing the incidence of traffic law violations.