



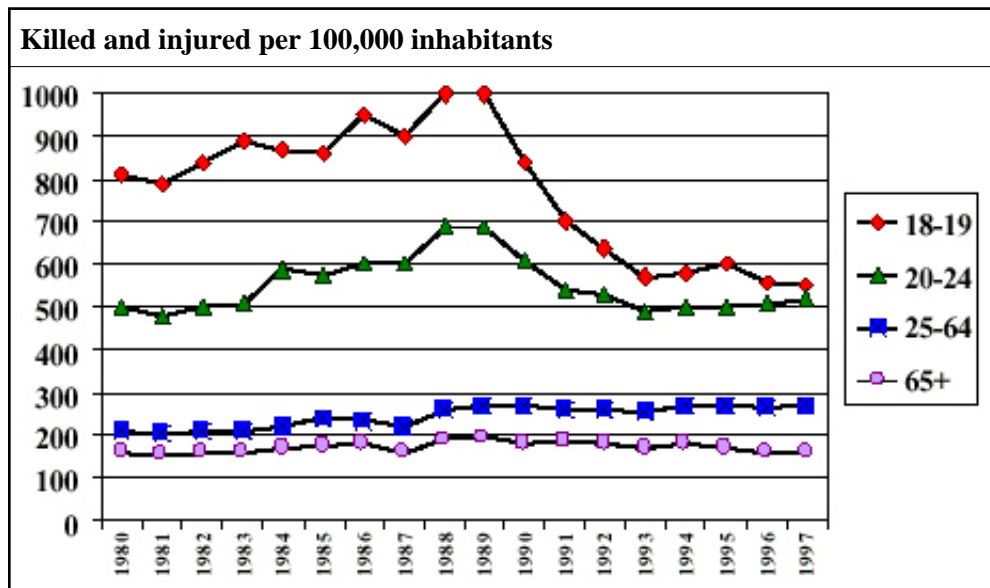
## Changes to the licensing system in Sweden

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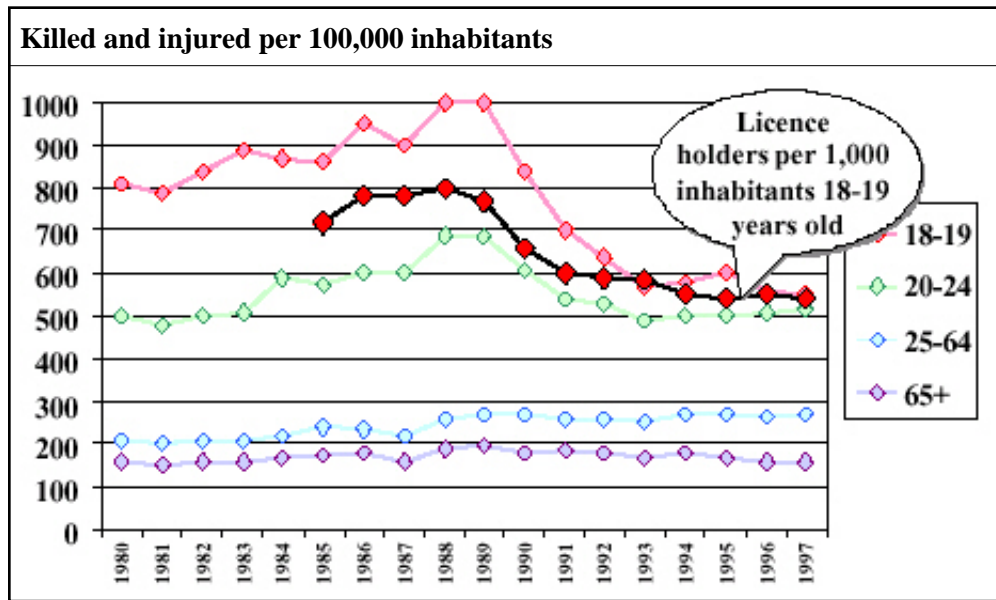
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#### Introduction

During the last decade there has been a good development of safety among young drivers in Sweden. As shown below the decrease in number of killed and injured per 100,000 of population has been reduced with almost 50% since 1990.



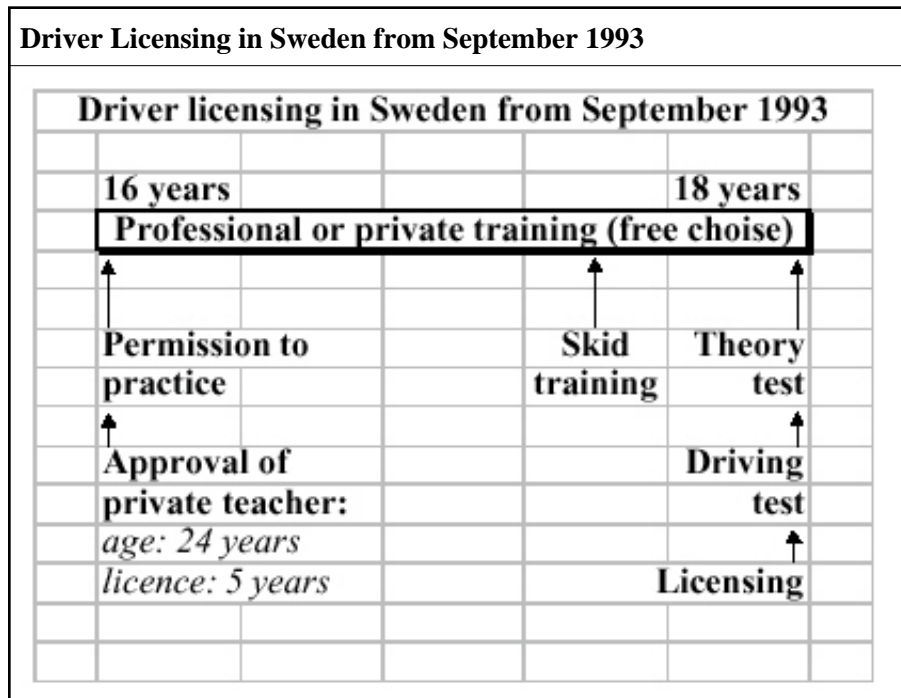
The reason for this is, however, not only that the drivers have become safer and better drivers. The main reason is that the number of licence holders in the lower age groups have decreased, which is shown below.



## Current driver education system

The current structure of the Swedish driver education is a program which can begin at the age of 16 and provide a full licence at 18. An application for a learner's permit and for a supervisor's permit must be sent to the authorities. A supervisor must have had a driving licence continuously for the past 5 years without it having been recalled by the authorities and must be at least 24 years old. Skid training is mandatory and the learner is otherwise free to choose between learning to drive with a lay instructor or a professional teacher. The secondary school has to some extent included road user education or driver instruction in its curriculum, but it is each school that has to decide if this should be offered or not.

The goals of the Swedish education are specified in a national curriculum, which is mandatory to everyone irrespective if they are using a driving school or parents. The reality, however, is that the curriculum is used only by the driving schools. There are no built-in control systems for lay instruction other than the written and driving tests for the licence. The tests are, however, relating to the aims, which also influences the content of the education. The available theory books are also developed in accordance with the curriculum.



The idea of the curriculum is that theory and practice should be integrated. The education starts with the basic parts of vehicle knowledge and manoeuvring and develops successively with increased difficulty to the final parts with driving on low friction and in darkness. The overall goal for the education is to develop attitudes, knowledge and skills which are needed to fulfil the demands from the society on a correct traffic behaviour.

VTI has performed an evaluation of lowering the age limit for practising to 16 years. The evaluation includes several sub-studies such as analysing how the new system is used and what effects it has on attitudes, driving behaviour and accident involvement. The change was introduced in September 1993 and the effects during the first two years after licensing have been analysed.

The main idea behind the lowered age limit was to enable the learner drivers to practice more and thus to increase their experience behind the wheel before they are left alone as drivers. The hypothesis was that this increased experience would also lead to a reduction in accident involvement.

These expectations was based on the theory of skill acquisition that was formed by Rasmussen in 1984<sup>24</sup>. He describes three stages of behavioural control, the knowledge based, the rule based and the skill based level. The essence of the theory, when applied to driving is that a development takes place from initial conscious problem solving through gradual construction of mental rules to automation and reduction of mental workload. In the process the driver will become more and more familiar with traffic situations, construct rules of how to behave and through the automation release mental capacity for tasks that are important for safe driving such as co-operating with other road users, predict oncoming traffic situations etc.

In summary, the results show that approximately 45-50% of the population in this age group has received a learner permit at an age younger than 17½ years which was the age limit for practising in the old system. To some extent the group which makes use of the lowered age limit is special. The results show that 5-10% have a better socio-economic background.

The learner drivers who start earlier increase their hours of practising by 2.5 to 3 times to 118 hours. This is to be compared with an average of 47 hours in the old system and 41 among those in the new system who are not making use of the lowered age limit.

The youngest (16 - 17½ years) were not involved in more accidents during practising than the older ones (17½ - 18 years), calculated as accidents per learner driver or as accidents per hours of practising. Even if the risk is not higher among the youngest learner drivers there are accidents during practising among all ages. These accidents are relatively few compared to the number of accidents the first years after licensure, but the problem is large enough to need to be solved.

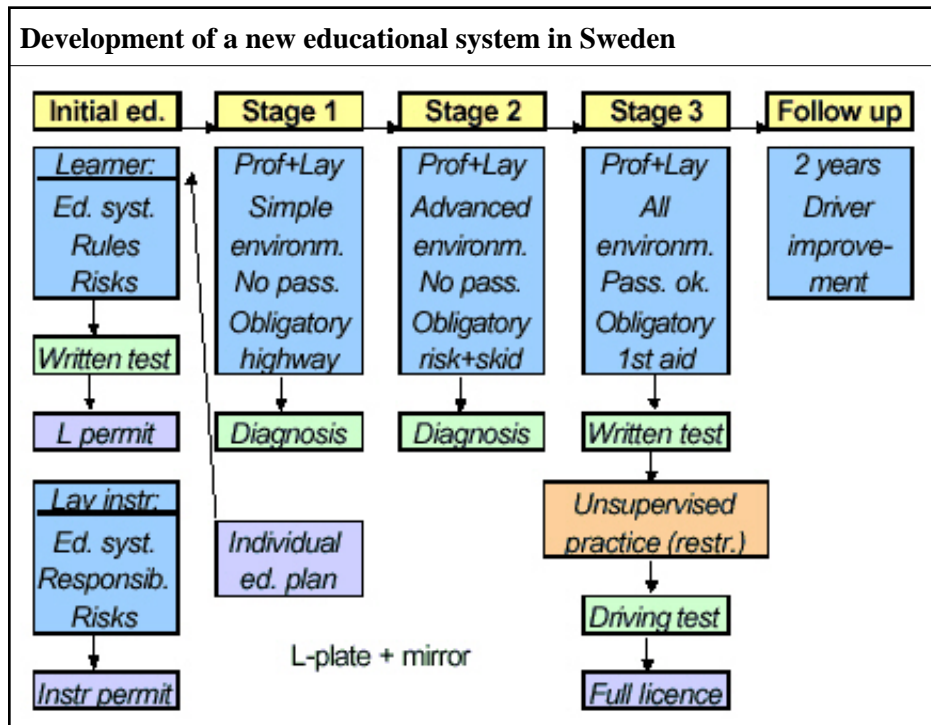
Those who start practising earlier were found to have 46% lower accident risk (accidents per kilometre) the first two years after licensure compared to the control groups. Part of this difference is due to socio-economic differences and other confounding factors, but a reduction of approximately 24-39 percent is calculated as an effect of the lowered age limit and the increased experience. Calculated as the total effect of the reform, that is without dividing drivers into those who utilise the new possibilities and those who are not, but including calculations of confounding factors, the national accident risk (mileage related) has decreased with approximately 15 percent.

In the detailed analysis of accidents it was found that the 16-year group were involved in relatively less complicated accidents than the control groups.

## **Development of a new educational system in Sweden**

In the development of a new system for driver education in Sweden the different graduated licensing systems around the world have been examined. There is a major difference between the GLS and the Swedish system concerning the situation before any change. In the case of GLS most countries have introduced this from a full licensing age of 16 years. The GLS components have been used in the age-period where the drivers previously were allowed to drive with a full licence. In Sweden a staged system will be introduced before the existing full-licence age limit. The system that was originally presented is shown in Fig 3. The education was suggested to start with a mandatory introduction for lay instructors and learners. The introduction should focus on the structure of the educational system, the most important traffic rules and the risks that are present when practising on the road with a lay instructor.

After passing a short written test the learner is allowed to start the real training in three stages with increasing level of difficulty. Between each stage a professional instructor must make an on the road diagnosis where the learner must pass. In each stage there is a mandatory course for 1)highway driving, 2)risk awareness/skid training and 3)first aid. In the 3rd stage after passing the final written test the learner may practice unsupervised but under restrictions. Full licence is obtained after passing a final driving test at 18 years of age or later.



During the period after the presentation of this model in Sweden there has been a debate on costs for obtaining a licence. It was suggested that the increase of mandatory parts would increase the costs and make it impossible for certain groups to obtain a licence. As an option for the Government it was thus suggested that an initially suggested dual-brake-system for lay instruction and the initial mandatory course for the lay instructor and the learner could be withdrawn. There final decision on this matter is expected later year 2000.

## Educational content

In the development of the Swedish system there has also been a debate concerning educational content. From the researcher's perspective there is much knowledge on the situation for young novice drivers that can be used for an improvement of the curriculum. It has been decided that the national curriculum shall be renewed in Sweden and input has been requested from the research field.

One important task in the development of a new Swedish driver education is to introduce new aspects that have not been systematically dealt with earlier. One such aspect is to make learner drivers realise their own limitations and thus counteract overestimation of own ability and skill. A second aspect is to become aware of the influence of personal preconditions, social norms and motivational factors on driving behaviour and risk. Yet another aspect that has been covered earlier but needs to be emphasised much more is the concept of risk perception and risk awareness.

The decision to emphasise these aspects more has emerged from the discussion during the two previous decades concerning the effectiveness of driver training programs. Several evaluation studies have failed in proving safety effects of such efforts which has lead us to a careful analysis of why young novice drivers are overrepresented in accidents and how driver education should be designed to reduce the problem. A conclusion that is commonly agreed upon is that training that focuses on providing car control skills,

especially in critical situations, may lead to unexpected effects which even may increase the risk. A skilled driver is not necessarily a safe driver. It depends on what the skills are used for. It may be used for example for the pleasure of driving faster or competing with other car drivers or for other purposes where the potential safety margin of the training is compensated by other needs. If, in addition, the benefits of the training are overestimated, the net effect may even be negative from a safety point of view.

As a primary summary of the existing knowledge concerning young drivers the following two lists were presented, the first showing the competences needed for safe driving and the second showing a hierarchy of driving behaviour.

| <b>A safe driver is not only skilled, but also sensible and wise</b>  |
|---|
| <ul style="list-style-type: none"><li>● Knows how to control the car</li><li>● Knows and understands the rules</li><li>● Knows how to drive in traffic</li><li>● Has much experience</li><li>● Has calibrated own skill Is aware of risks</li><li>● Is planning trips safely</li><li>● Is aware of the influence of social and personal preconditions</li><li>● Does not drive with dangerous motives</li></ul> |

- Drives with large safety margins
- Recognizes hazardous situations
- Controls the car in hazardous situations
- Avoids serious injury in a crash

Within the EU-project GADGET a further development of the safedriver competences has resulted in a matrix of 4 x 3 cells (Hatakka, Keskinen, Gregersen, Glad 1999). The matrix is based on the hierarchical description of the driving task presented by Keskinen (1998), which much resembles the wellknown Michon hierarchy but with the addition of a fourth level "Goals for life and skills for living". In the other dimension, three columns are describing the competences that a driver need. Three aspects are included, the skill/knowledge, the risk increasing factors and the self assessment. Within each cell goals for driver education could be defined.

The GADGET-matrix has been used in the discussion of a new curriculum in Sweden, but has been adjusted to a certain extent. In the following Fig 4 the Swedish application of the Gadget-matrix is shown. The aspect that are mentioned in each cell should be regarded as examples of aspects that need to be covered in a driver education, theoretically or practically.

### **Driver competence matrix**

|   | <b>Knowledge and skill</b>  | <b>Risk increasing aspects</b>   | <b>Self assess</b>   |
|---|---|--|--|
| <b>Preconditions and ambitions for life</b> | Relations lifestyle, age, group etc. and driving behaviour                | Sensation seeking<br>Group norms<br>Peer pressure                      | Introspective competence<br>Own preconditions<br>Impulse control |
| <b>Transport and driving</b>                | Modal choice<br>Choice of time<br>Role of motives                         | Alcohol, fatigue<br>Low friction<br>Rush hours                         | Own motives influencing choices<br>Self-critical thinking        |
| <b>Driving in traffic</b>                   | Traffic rules<br>Co-operation<br>Hazard perception<br>Automatization      | Disobeying rules<br>Close-following<br>Low friction<br>Vulnerable r.u. | Calibration of driving skill                                     |
| <b>Vehicle construction and control</b>     | Car functioning<br>Protection systems<br>Vehicle control<br>Physical laws | No seatbelts<br>Breakdown of vehicle systems<br>Worn-out tyres         | Calibration of car control skill                                 |

## Skid training - a symbol for change of educational focus

The Swedish national curriculum of the mandatory skid training has since it became mandatory focused on skill training to handle skids, to perform evasive manoeuvres, optimal use of the brakes etc., heavily focused on critical situations. In 1988 a Norwegian report was published <sup>(Glad 1988)</sup> which showed that a similar skid training program in Norway increased the accident involvement among male drivers. This warning was the introduction of more than 15 years of research and development, which now has resulted in a new set of regulations concerning skid-training. The set comprises a new curriculum for skid training, demands for special education of skid-pan instructors etc. The goals of the curriculum is still to provide some elementary skills in driving on low friction but to focus on risk awareness and the need to drive with large safety margins in order to prevent critical situations to occur. The changes of the skid training are currently being evaluated. The change in curriculum is illustrated by the quotations below from the old and the new versions.

### Old and new curriculum

| Old   | New  |
|---|--|
| <p><b>To perform:</b></p> <ul style="list-style-type: none"><li>● Start and acceleration</li><li>● Emergency stop</li><li>● Brake-avoidance</li><li>● Eliminate skid</li><li>● etc.</li></ul> | <ul style="list-style-type: none"><li>● Realise importance of risk avoidance/large safety margins</li><li>● Realistic assessment of own abilities</li><li>● Experience consequences of overestimation</li><li>● Realise the relation between speed and car control</li><li>● (Limit car control training</li></ul> |

## Conclusions

- Changes in the licensing system can make better drivers and save lives
- There is still a large potential for improvement of driver education