SWOV Fact sheet

Road safety of children in the Netherlands

Summary
Compared to other ages groups, relatively few children in the Netherlands in the 0-14 age group are killed in traffic. What is more, the number of casualties in this age group has diminished considerably over the past twenty years, more than in other age groups. This is due to a combination of measures in infrastructure, vehicles, safety devices and education. In absolute numbers, children in the 10-14 age group of cyclists face the greatest safety risk − mainly because it is at that age that they more frequently participate in traffic as solo cyclists.

To further reduce the number of traffic casualties among children, additional measures are necessary, such as reducing driving speeds, separating slow and fast traffic, public information and improving the safety of vehicles.

Background
Children are a vulnerable group of road users. After all, they are still developing the skills they will ultimately use to participate in traffic in a responsible way. Furthermore, as independent road users their role is limited to that of pedestrians and cyclists, which are the most vulnerable road users. The question is, how safe is traffic for children and has that level of safety actually changed in recent years? Can those changes be explained, and is it possible to make more improvements? This fact sheet discusses these questions. When referring to children in this fact sheet, we specifically mean 0 to 14 year-olds. For more background information, see the detailed literature study on the development of road safety for children (Rijk, 2008).

How unsafe is traffic for children?
In the Netherlands, there are approximately 35 traffic fatalities among children in the 0-14 age group per year, and the records show that approximately 685 children in that age group are admitted to hospital (average figures over 2005-2007). However, the actual number of in-patients is significantly higher. An estimated 40% of child in-patients is registered by the police, whereas the average registration level for all hospital admissions is around 55%. This is explained by the fact that children are admitted to hospital after *bicycle crahses* relatively often and it is precisely bicycle crashes that are not registered adequately. This applies to 50% of child crash victims admitted to hospital. For that reason, this fact sheet deals only with the number of children that are killed in traffic.

Compared to other age groups, relatively few children die in traffic. To determine the *mortality rate*, we look at the annual number of fatalities per 100,000 of the population. In 2005-2007, there was an average of 1.2 deaths each year per 100,000 in the 0-14 age group. All other age groups together (aged 15 and over) had an annual average of 5.2 deaths during this period. The mortality rate among children increases with age. For the 0-4 age group, the mortality rate over the period 2005-2007 was 0.6 per year; for the 5-9 age group: 0.8 per year; for the 10-12 age group: 1.4 per year; and for the 12-14 age group: 2.5 per year.

How has road safety for children developed in recent times?
Over the past decades, road safety has improved more for children than for the rest of the population. In the mid-1980s, the number of fatalities among children was approximately 120 and in recent years it has been approximately 35. This is an annual reduction of 3.3%. In the other age groups, there was an annual reduction of 2.4% (*Figure 1*).

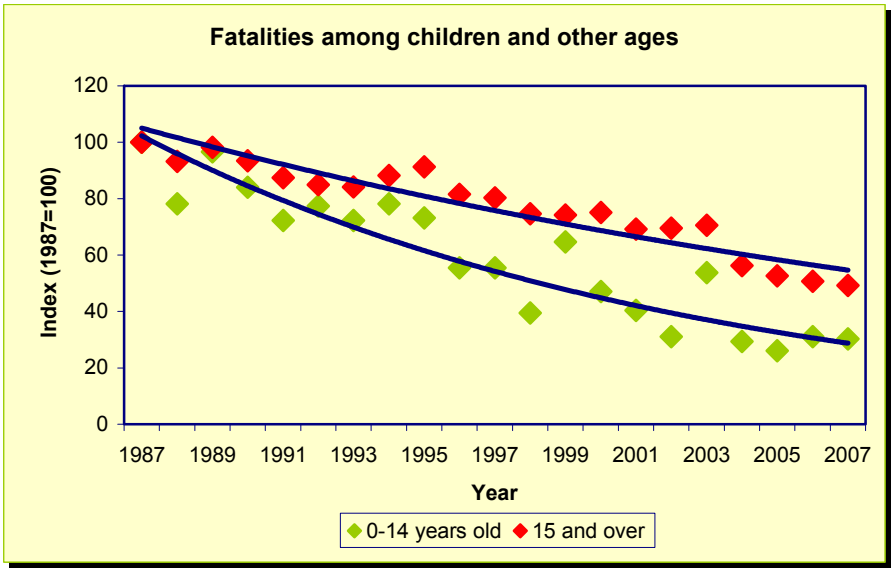

Figure 1. *The indexed development (1987=100) of the number of registered fatalities among children (aged 0-14) and other ages (aged 15 and over) in the period 1987-2007 (source: Road crash registration BRON).*

Also when we take the size of the population into account (and therefore look at the mortality rate) we see a strong increase in road safety for children (*Table 1*). During the past twenty years, the mortality rate among children has been declining by 57-81%, depending on the age group; the largest reduction was in the 5-9 age group, the smallest in the 12-14 age group. As will be indicated below, the decrease in the number of victims does not seem to be caused by children being exposed to traffic less through the years.

Age group	Mortality (annual number of fatalities/100,000 of the population)		Decrease in twenty years (%)
	1987-1990	2005-2007	
Aged 0-4	2.2	0.6	- 74%
Aged 5-9	4.1	0.8	- 81%
Aged 10-11	4.7	1.4	- 69%
Aged 12-14	5.9	2.5	- 57%
Aged 15 and over	10.9	5.2	- 52%

Table 1. *Development of mortality by age category (source: Road crash registration BRON; Statistics Netherlands, Population).*

How do children die in traffic?

As can be seen in *Figure 2*, child cyclists in the 12-14 age group have by far the highest mortality rate, followed by child cyclists in the 10-11 age group. This can be explained by children more often participating in traffic as cyclists as they grow older . The mortality rate for children as pedestrians and car passengers also increases with age, but not as rapidly.

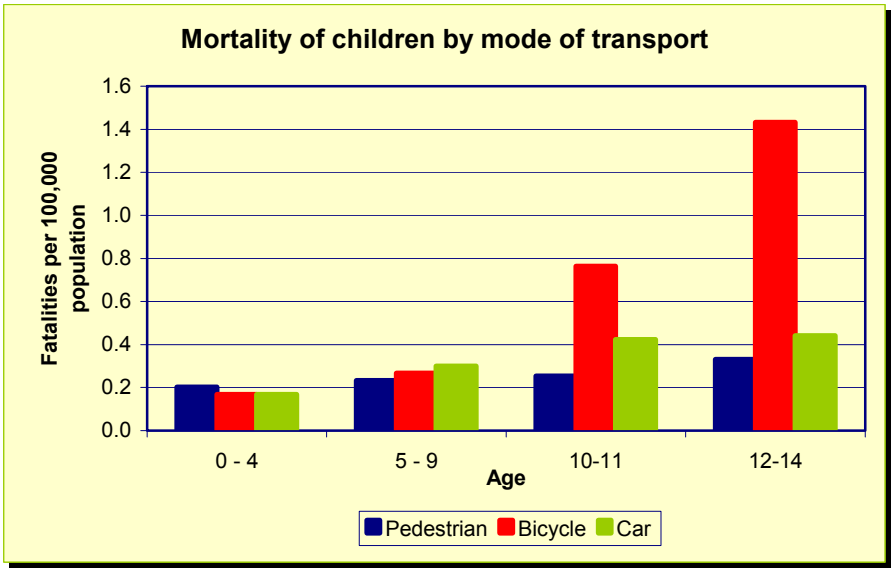

Figure 2. *Mortality rate of children by mode of transport, averages over 2005-2007 (source: Road crash registration BRON; Statistics Netherlands, Population).*

Almost all fatal crashes involving children have a motor vehicle as the crash opponent (*Table 2*). For child pedestrians, cars are relatively often the crash opponent, for child cyclists the crash opponents are relatively often heavy vehicles (light goods vehicles or lorries). Only in fatal car crashes are obstacles the crash opponent.

Child's transport mode	Crash opponent (percentage of total)				
	Car	Heavy vehicles	Obstacle	Other	Total
Pedestrian	56%	26%	0.4%	18%	100%
Cyclist	47%	35%	8%	10%	100%
Car occupant	19%	22%	56%	3%	100%

Table 2. *The two crash opponents in fatal crashes involving children in the 0-14 age group, averages over 2005-2007 (source: Road crash registration BRON).*

How often are children exposed to traffic?

In the Netherlands, children in the 0-14 age group travel a total of more than 18 billion kilometres per year. Most of these kilometres are travelled as car passengers: 75% of the kilometres travelled. Bicycle kilometres (solo or as passengers) make up 14% of the total. Pedestrian kilometres play a minor role: 3% of the total. The number of kilometres travelled by children as car passengers decreases with age: from 6 billion kilometres per year for 0-4 year-olds to 2.1 billion kilometres for 12-14 year-olds. Conversely, the number of bicycle kilometres increases with age: from 0.5 billion kilometres for the 0-4 age group to 1.3 billion kilometre for 12-14 year-olds. The increase in mortality that we see for young cyclists therefore indeed seems to be the consequence of a shift in the modes of transport being used.

Over the past fourteen years, the mobility of children has increased by almost 1 billion kilometres (5.5%). This increase can almost completely be attributed to cars. During this period, the number of bicycle and pedestrian kilometres have remained almost the same. However, it should be noted that these statistics do not take children playing in the streets into account. Exposure to traffic will therefore be greater than shown by these statistics, but unfortunately there is no data to determine its scale.

How high is the fatality rate for children in traffic?

The number of fatalities per kilometre travelled gives an indication of the risks that children face in traffic. When we look at the number of fatalities per kilometre travelled (*Figure 3*), car kilometres are relatively safe for children, which is also the case for adults (aged 15 and over).

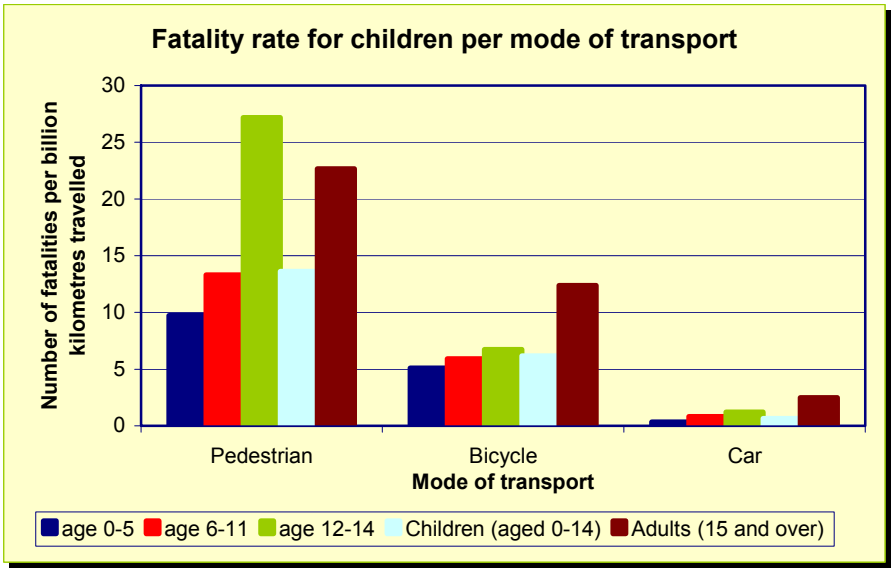

Figure 3. *Number of fatalities per billion kilometres travelled for different modes of transport and different age groups, averages for the period 2005-2007 (source: Road crash registration BRON; Statistics Netherlands, Population).*

Bicycle kilometres and especially pedestrian kilometres are clearly the more dangerous. This is the case for both children and adults, where it should be noted that the fatality rate for adults for each of these modes of transport is higher than that for children. The highest fatality rate is for 12-14 year-old pedestrians. Given that exposure while playing in the street is not included in the kilometres travelled, the fatality rates for children that are given here may be an overestimation (after all, greater exposure and an unchanged number of crashes result in a lower rate).

For children, the fatality rate increases with age, as also applied to the mortality rate. For all transport modes together, for every billion kilometres travelled by children aged 0-5: one fatality. For 6-11 year-olds this is 1.8, and for 12-14 year-olds it is 3.7 (2005-2007 period). For adults (aged 15 and over), there are 4.2 fatalities.

Which measures have contributed to the positive development?
All kinds of measures have probably contributed to the increase in road safety in general and therefore also to the increase in road safety for children. The increased safety is due to a combination of measures in the areas of infrastructure, vehicles, safety devices and education. The exact contribution of each of the measures is not known.

Infrastructure
In the area of infrastructure, contributions have probably been made by the increase in the number of 30 km/h zones, the more frequent physical separation of fast traffic and slow traffic, the greater number of roundabouts and the 'moped on the carriageway' law. These aspects of Sustainable Safety have a direct impact on all cyclists and pedestrians, and therefore also on child cyclists and pedestrians (see also the SWOV fact sheet *Vulnerable road users*).

Vehicle safety
In recent years, car fronts have been made safer, which has resulted in a reduction in the severity of crashes involving pedestrians and cyclists. At the end of 2003, EU regulations in this area came into force, mainly for the protection of *pedestrians*. The regulations for car fronts could be made even stricter to improve the safety of cyclists, with special attention for 'small' cyclists (Schoon, 2004).

In the EU, visibility improvement systems are mandatory for lorries; these include blind spot mirrors and cameras. Such systems reduce the number of crashes between cyclists and lorries turning right. However, this type of crash has not yet been eliminated completely. Short-term measures to further reduce this type of crash include the physical separation of freight traffic and cyclists at locations where freight traffic can turn right; writing a code of behaviour for cyclists and informing the public

about it, and information on the more effective use of mirrors and cameras by drivers (Schoon et al., 2008).

Safety devices
There has also been a significant increase in the use of child safety devices in recent years, partly due to new regulations. Most children shorter than 1.35 m are currently transported in child restraint seats; in 2004, children often sat in the back seat with a seat belt. The number of children using no safety device whatsoever has decreased substantially in recent years, from 25% in 2004 to 10% in 2006 (see the SWOV fact sheet *Seatbelts and child restraint seats*). The wearing of bicycle helmets has also increased in recent years, but especially by cyclists under 6 years old (see the SWOV fact sheet *Bicycle helmets*).

Education
Road user education has probably always been the best-known way of improving road safety for children (see the SWOV fact sheet *Traffic education of children 4-12 years old*). There are many initiatives, not just in the area of formal education by schools, but also in the area of informal education by parents. Although education is vitally important for preparing children properly for traffic participation, the measurable effects are usually limited (Twisk et al., 2007). For one thing, that is because education can only partially speed up the mental and biological development of children. In addition, children find it very difficult to apply 'abstract' knowledge to concrete situations and to use what they have learned in new situations (Dragutinovic & Twisk, 2006).

Which measures can bring about further improvements?
Most serious crashes involving children are collisions with a motorized vehicle. In such crashes, the collision speed is one of the most important factors that determine the severity of the injury. Therefore, speed reduction at locations and times where children and motorized traffic can coincide (in residential areas, near schools, at pedestrian crossings) remains one of the spearheads of road safety policy for children. ISA (Intelligent Speed Assistance) is expected to play an important role in this, alongside the requisite infrastructure measures (see the SWOV fact sheet *Measures for speed management*).

Given that there are many cyclists in the Netherlands, many more cyclists are involved in crashes involving cars in this country than in most other EU countries. That is why safe car fronts are very important here. The regulations for car fronts can be tightened, specifically aimed at *cyclists,* with extra attention for young cyclists (Schoon, 2004). Proportionally, young cyclists are often severely injured in collisions with light goods vehicles or lorries. Concrete measures to reduce the number of blind spot crashes include the following (Schoon et al., 2008):
- better separation of cyclists and heavy traffic;
- extra attention for the blind spot problem in the driver training;
- a code of behaviour for cyclists;
- a mandatory front view system for all lorries.

Lastly, the use of bicycle helmets by children should be stimulated − and not only in children younger than 6 years old. Also children who are older are often involved in serious bicycle crashes that relatively often result in head injuries, including severe brain injury (Van Kampen, 2007). Good public information, particularly aimed at parents and their exemplary role, is a good way of encouraging children to wear bicycle helmets.

Conclusion
Compared to other age groups, there are relatively few fatalities among 0-14 year-olds in the Netherlands. Moreover, the safety has increased substantially for this age group over the past twenty years, more than for other age groups. A combination of measures in the areas infrastructure, vehicles, safety devices and education has helped to achieve this. In absolute numbers, the most serious safety problem concerns child cyclists in the 10-14 age group. This is mainly due to the fact that children often start participating in traffic as solo cyclists at that age.

Measures to improve the safety of children in general and of cycling children in particular include:
- mandatory lower driving speeds for motorized traffic at locations and times where many children are present;
- making the requirements stricter for car fronts, mainly aimed at cyclists;
- stimulating the use of bicycle helmets;

- separating slow and fast traffic with specific attention for the separation of cyclists and light goods vehicles and freight traffic at intersections;
- teaching children how to act in situations involving freight traffic at intersections.

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