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INTRODUCTION

The annual number of traffic fatalities in the Netherlands has more than halved in twenty years: it dropped from over 3000 to less than 1400. The number of fatalities amongst moped riders declined even more: from 540 in 1970 to 95 in 1990, which represents a fall of over 80%.

If the development over that period is looked at more closely, we see that the downward trend was particularly marked up to the mid-1980s, while in recent years, the reduction is not continuing at anything approximating that rate.

Nevertheless, these figures certainly do not imply that more moped riders are involved in accidents. In this light, it is therefore interesting to note that insurance companies have reported that they are paying out more and more in response to accidents where moped riders were found to be the guilty party, such payments being made on the basis of third party insurance. Recently, a Dutch insurance company decided it would no longer include moped insurances in its portfolio; the premiums had to rise too much in order to be at least cost-effective.

This paper first offers a description of the developments that have taken place with respect to the ownership and use of mopeds, followed by a description and brief analysis of the road safety problems of moped riders, and finally formulates recommendations describing how the problem may be tackled. These include suggestions as to the contribution insurance companies can make.

MOPED OWNERSHIP AND USE

For many years now, the legal age at which one can ride a moped in the Netherlands has been 16 years. A moped (in Dutch bromfiets) is defined as a motorised two-wheeler which can travel at a maximum speed of 40 km/hr outside the built up area and at 30 km/hr inside the built up area. In 1975, the wearing of helmets was made compulsory, and compliance is almost 100%. One problem still encountered is that 2 out of 3 moped riders do not secure the chin strap (adequately). There is no obligation to follow driving lessons or pass a driving exam, although it has been announced that, in future, moped riders will have to obtain a certificate in the Netherlands by sitting a theory exam.

In addition to the standard moped, a light-weight version, the low-speed moped (in Dutch: snorfiets), is also in use in the Netherlands. At about the same time that moped riders were obliged to start wearing helmets, the low-speed moped was introduced: a vehicle which could travel at 25 km/hr (now increased to 30 km/hr), with no obligation to wear a helmet. Here, too, a minimum age of 16 years applies and no driving instruction is necessary.

The number of mopeds on Dutch roads has dropped dramatically. While in the early 1970s, over 300,000 new mopeds were sold annually and the total number of vehicles on the road nationwide was estimated at 1.9 million, sales hardly exceeded 40,000 in 1990 and the total number of vehicles had dropped to almost 500,000 (RAI, 1991). However, the drop in the number of mopeds has been compensated by the increased sale of low-speed mopeds in recent years. In 1985, the sale of low-speed mopeds was less than 5000, while this had escalated to 30,000 by 1990. Almost 90% of mopeds sold in 1990 were automatic models. This proportion was only 70% in 1986. The drop in the number of mopeds was associated with a drop in the number of kilometres travelled by mopeds: this figure halved over 10 years, from 3.5 to 1.5 thousand million kilometres. The share in the overall mobility is less than 1%, although here, too, there seems to be no further drop.

The majority of moped kilometres are covered by young people under twenty years of age. In recent years, the proportion of kilometres covered by 16 to 19 year olds fluctuated between 60-65%. Although exact figures are lacking in this regard, a significant proportion of mopeds and low-speed mopeds is 'souped up', so that they drive considerably faster than the permitted legal limit.

ACCIDENTS WITH MOPEDS

The majority of traffic accidents results in material damage only, while just a small proportion leads to physical injury. The road safety policy in the Netherlands devotes most attention to accidents that have a serious outcome. For example, the Dutch government has formulated its policy task as follows: 25% fewer road casualties in 2000. There is another practical reason why attention should be devoted to injury accidents, rather than to accidents involving material damage only: the registration of accidents.

A number of sources can be consulted in the Netherlands to describe road accidents. Of course, the most obvious is the registration of accidents by the police. This is the most important source, even if it is acknowledged that the realisation is far from perfect. It seems that the quality of police registration drops as the outcome of an accident becomes less serious. It is unclear to what extent police registration leads to over or under representation of certain types of accident. In general, it is safer to restrict oneself to the use of (registered) accidents with a serious outcome (death or hospital admission) when conducting research and in matters of policy.

However, this forced choice means that as a result, road hazard is not fully charted. This is also shown by an estimation of the social costs resulting from road accidents. A study using data from 1983 (McKinsey, 1985) indicated that road accidents result in damages of almost 6 thousand million guilders annually.

Over half was spent on material costs (3.4 thousand million), and these are the costs which motor vehicle insurers have to deal with.

The problems associated with police registration also mean, unfortunately, that a comparison using insurers' data is not really feasible. The increased payments made by insurance companies as a result of claims made on the third party insurance of moped riders (shown by a tripling of the premium in six years' time), even though the number of moped riders who become road casualties is declining, rather than increasing (Figure 1), is at odds with the oft-heard opinion that an increase in minor accidents will also lead to more serious accidents.

If we assume that a tripling of the insurance premiums for mopeds with gears cannot be explained as a catching up manoeuvre by insurance companies in an attempt to increase their percentage of cover, and the claim per accident has not increased markedly (this can be deduced from the fact that automobile premiums have not increased as such), then one is led to conclude that the number of accidents involving moped riders resulting in material damage only has increased considerably. And this increase occurred during the same period that the number of moped casualties remained virtually the same.

If this conclusion is correct, it means that there are two aspects associated with the problem of road safety - injury and material damage - that are not subject to the same development. From a social perspective, it is easy to defend the policy that the prevention of serious accidents should have priority. However, there is clearly another facet at work that has not been given enough attention and represents a considerable proportion of the social costs associated with road accidents: material damage.

INSURANCE DATA

A large insurance company in the Netherlands (representing approx 15% of the market) conducted a study in 1988 into moped claims (Van Bijnen, 1989). This involved 71,000 insured parties. During that year, 4.1% of insured parties claimed and received damage payments. For mopeds with gears, the figure was 7.6%, and for automatic models 2.8% (a factor of 2.7). The damage payments - in particular those representing material damage to the other party - were higher for mopeds with gears than for automatic mopeds (a factor of 1.37). If we assume that both types of moped are used under more or less the same conditions, the higher claim implies that mopeds with gears drive at higher speeds than automatic mopeds, since higher driving speeds are linked to higher collision speeds and therefore a more serious outcome or more damage when an accident occurs. Reducing the speed of mopeds will result in a lower damage claim per accident. It is therefore also in the interest of insurance companies to develop or support activities to lower the driving speeds of moped riders.

The insurance study also showed that 75% of claims involving moped riders related to collisions with cars, while the remaining 25% were equally distributed between collisions with bicycles and other moped riders. There is no difference between automatic mopeds and those with gears in this case.

Approximately 75% of people riding a moped involved in an accident was aged below 21. In the age group of 18-20, no difference was found between automatic mopeds and mopeds with gears (about 50%). For 16-17 year olds, the number of accidents involving a moped with gears was almost 30%, and with an automatic moped 22%.

The marked difference in the number and size of the claims ($2.7 * 1.37 = 3.7$) justifies the statement that road safety policy should devote more attention to the problem of mopeds with gears. It would be logical to devote particular attention to speeding behaviour (it is widely known that these types of moped are often 'souped up').

CASUALTIES AMONGST MOPEL RIDERS

The annual number of fatalities amongst moped riders has fallen by over 80%. From 601 in the peak year 1971, to 95 in 1990 (Figure 2). The drop in the annual number of fatalities has been more rapid for moped riders than for any other type of road user; the proportion of moped riders in the group overall has therefore dropped, from 17% in 1970 to 7% in 1990. The reduction amongst hospital admissions is less spectacular but is nevertheless a fact: from 27% in 1975 to 20% in 1990. During the last five years, this proportion has remained virtually the same.

The drop in the number of road accident casualties is both the result of a drop in the number of kilometres travelled and the reduced risk of having an accident per kilometre travelled (Figure 3). The 82% drop in the number of fatalities is due to a 70% reduction in the number of kilometres travelled and a 40% drop in the risk. It can also be noted that the drop in the distance travelled during the 20 year period proceeded more or less consistently, while the reduced risk was particularly apparent during the first 10 years and did not continue at this rate during the 1980s. In other words, the drop in the number of moped fatalities during the 1980s is almost entirely attributable to the fact that fewer kilometres were travelled, and not to a reduction in risk!

Since mopeds account for less than 1% of the overall mobility, while representing 7% of all fatalities and almost 20% of all hospital admissions, this would indicate that moped riders run a high risk. The average risk (fatalities per kilometre travelled) run by moped riders is about 12 times greater than for car passengers, 5 times greater than for cyclists and 1.5 times greater than for pedestrians, and in the same order of magnitude as for motor cycle riders.

The youngest group of moped riders runs the highest risk: for 16-17 year olds, the probability of suffering a fatal accident per kilometre covered is 3.6 times greater than for moped riders in the age group of 20-29 years; 18-19 year olds run a risk which is 1.5 times greater than for the 'expert group' (Figure 4).

The problem has increasingly focused on the youngest age group: the 16-17 year olds represent a share of about 36%. The share of 18-19 year olds rose from 12.6% in 1970 to 20.2%, but subsequently dropped again to 14.7% (Figure 5). A similar development can be noted in the number of persons injured. If the number

of casualties in 1970 is set at 100 for the various age groups (Figure 6), then we see that the drop in 1980 and 1990 was greatest for the age group over 20 years, and smallest for 16-17 year olds. This further confirms the correctness of the statement that the problem is concentrating increasingly on the youngest age group. Although data on the development in the number of vehicle kilometres for these specific age groups is not available, one can reasonably assume that the increase in the ownership and use of cars after 1970 has led to moped kilometres being substituted by car kilometres in the over 20 age group, and that after 1980, the 18-19 year old age group also underwent a drop in moped use, probably substituted by car kilometres.

The low-speed moped is growing rapidly in popularity, particularly amongst young people. This type of moped is often 'souped up', and because helmets are not compulsory, the 'old situation' seems to have surfaced again. Of the 95 fatalities in 1990, 81 were moped riders and 14 were low-speed moped riders. In years prior to that, the number of fatalities amongst low-speed mopeds was less than 5.

Almost 60% of moped casualties is the result of a collision with a car. Collisions with other mopeds, cyclists, vans, single collisions and collisions with obstacles each account for about 7%. It is striking to note that collisions with obstacles have a relatively serious outcome, so that this type of collision compares unfavourably with the others. Men represent 70% of road casualties amongst moped riders, while their share of participation in all other forms of traffic is 60%.

The framework of this report does not allow us to analyse exactly how youthful (and therefore largely inexperienced) moped riders differ from the 'experts'. We can suffice by concentrating on one aspect. It is known that novice car drivers, aside from having poor control over their vehicle, also have difficulty in recognising hazards as they occur, since attention is focused more on static objects and less on moving objects. This second, more serious failing also seems to apply to moped riders. A comparison between colliding parties and objects for various age groups shows that 16-17 year old moped riders have relatively few accidents involving a collision with an obstacle or a skid, while they have relatively many accidents involving fast traffic. This leads to the conclusion that inexperienced moped riders are less often in trouble as a result of poor control over their vehicle, but rather because they fail to anticipate changing traffic conditions. Here we can draw a parallel with the young, inexperienced car driver. Knowledge about this group of road users could be interpreted for moped riders, and perhaps used to set up and realise a driving instruction course for them.

Research has shown that the risk (accidents per kilometres travelled) drops as driving experience increases. The risk over the first number of kilometres (< 5000 km) is twice the average risk for moped riders, and 1.5 times as great up to 10,000 km. After that point, the risk averages out. This presents a fundamental problem when we realise that on average, a moped rider covers 3500 km per year, and the great majority of moped riders moves on to a different mode of transport after three years. For this reason, a policy that is based on improving the experience of moped riders will hardly have any effect. Risk reduction will have to be realised from the start: good initial driving instruction, a vehicle that meets the legal requirements - also in practice - and an optimal positioning on the road are the ingredients needed to effect this aim.

MEASURES TO IMPROVE ROAD SAFETY FOR MOPED RIDERS

The high risk moped riders face of getting a serious accident, the fact that the number of accidents with material damage only has risen markedly in recent years, combined with the fact that the number of accidents amongst moped riders does not seem to be falling any more (7% of the fatalities and 20% of serious injuries), and the fact that mobility and the number of mopeds on Dutch roads has stabilised, justifies the need for renewed attention to be focused in the Netherlands on road safety policy for this category of road users.

One way to do so is to categorise motorised two-wheelers. In this context, it is most important to impose technical requirements on the vehicle and enforce these, such that the speed limit will no longer be broken. Of course, a proper driving education will have to form part of this package of measures. It would seem obvious to aim for a uniform European policy in this regard. The overview in Figure 7 (Huijbers, 1990) also shows great variations between different EC countries.

With regard to categorising the vehicles, the principle could be as follows:

- it should not be possible to drive a motorised two-wheeler without minimum training and an assessment of ability;
- categorise mopeds on the basis of light or heavy categories. The maximum speed for the light moped is 25 km/hr and for the heavy moped 40 km/hr. Neither limits should permit the 'souping up' of vehicles. For both categories, theoretical knowledge should be a requirement, and for the heavy moped, an additional practical driving exam and a suitable driving instruction course should be made compulsory. The helmet should be compulsory for a heavy moped, but not for a light one. This set-up agrees with the proposals of the so-called 'Gerondeau Group' (CEE, 1991).

Of course, the interests of safety are not served by lowering the permissible age for riding a moped. In the Netherlands, European harmonisation leading to a lower minimum age would therefore be unfavourable from the point of view of road safety; this is also true if the speed limit were raised to 45 km/hr. Also, making the 'souping up' of mopeds less attractive by offering a light motor cycle as an alternative has negative safety consequences with respect to a situation where the existing law is simply enforced. In addition, this alternative does nothing to deal with the problem. A true solution would actually limit the cylinder capacity, or the capacity/weight ratio, thereby combating the 'souping up' of mopeds.

Given the fact that most people only ride a moped for a few years, after which they move on to a car, the safety of moped riders should be worked on from the beginning, and not according to a more stepwise or phased set-up. Perhaps the road traffic code can be taught through the secondary schools.

THE ROLE OF INSURANCE COMPANIES

It is in the interest of insurance companies to contribute towards improving road safety for moped riders. The constant rise in moped premiums re-

presents a financial disadvantage to companies if premiums are set in retrospect. There is a high probability that many young moped riders with a low spendable income decide to drive around without insurance, with all the negative consequences this implies, or to move over to a 'souped up' low-speed moped with a low premium.

On the other hand, a high premium will have a negative influence on moped ownership, and hence use.

Insurance companies could support attempts made in Europe to categorize moped riders, such that this would best serve the interests of safety. In addition, they could stimulate social developments that would stop the 'souping up' of mopeds (e.g. by stimulating innovative research).

In the short term, it would be interesting to support activities that would lead to a driving instruction course for moped riders in the Netherlands as soon as possible (both theoretical and practical), preferably in harmony with the practice adopted in other European countries. Such a course ought to be obligatory. When - in the meantime - such courses are voluntary insurance premiums could set lower for those who followed the course.

In addition, it would serve the interest of insurance companies if police were to supervise speed infringements by moped riders more strictly. Perhaps insurance companies could make the purchase (use of) speed measurement equipment financially attractive for the police.

Another possibility is to include a brochure - if a company communicates in writing with the policy holder - containing tips to moped riders on safe behaviour in traffic.

Finally, it would be most useful for insurance companies to make their data available to road safety research for the purposes of analysis. The results would then be used, for example, in order to set up a driving course. In this way, an explanation can perhaps be found for the rise in premiums, and for the discrepancy in the development of injury accidents and accidents involving material damage only.

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Figure 1.
DEVELOPMENTS OF INSURANCE PREMIUMS FOR MOPEDS AND OF CASUALTIES UNDER MOPED RIDERS (1985=100)

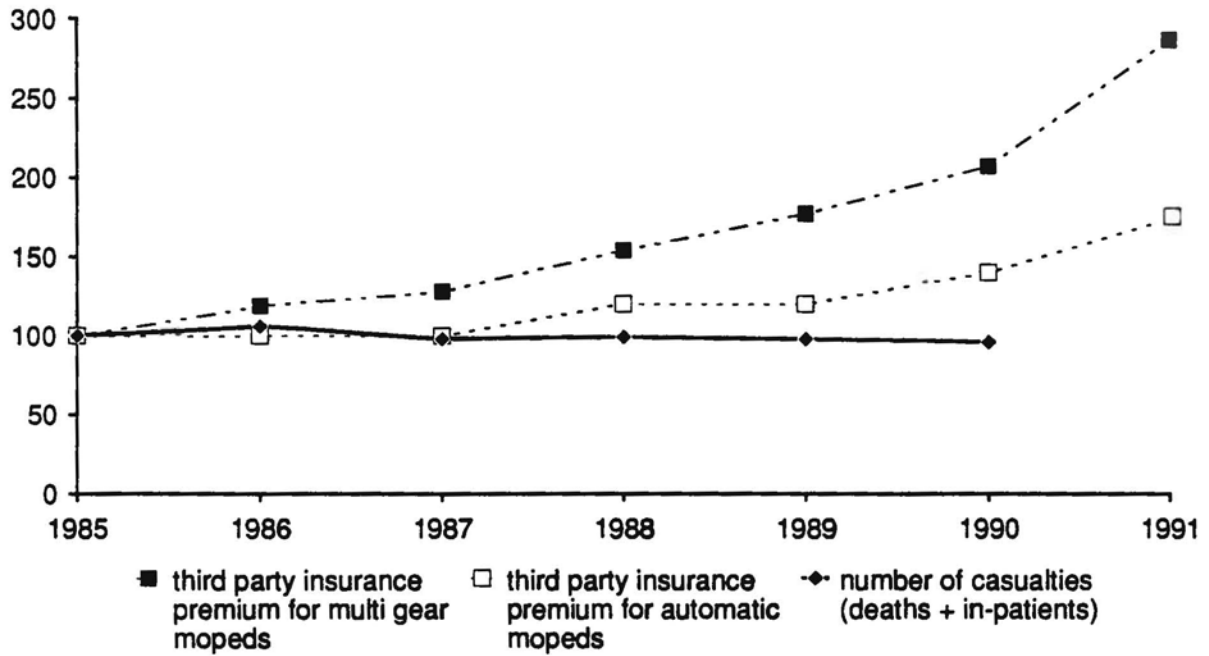


Figure 2.
ROAD DEATHS UNDER MOPED RIDERS IN THE NETHERLANDS FROM 1970

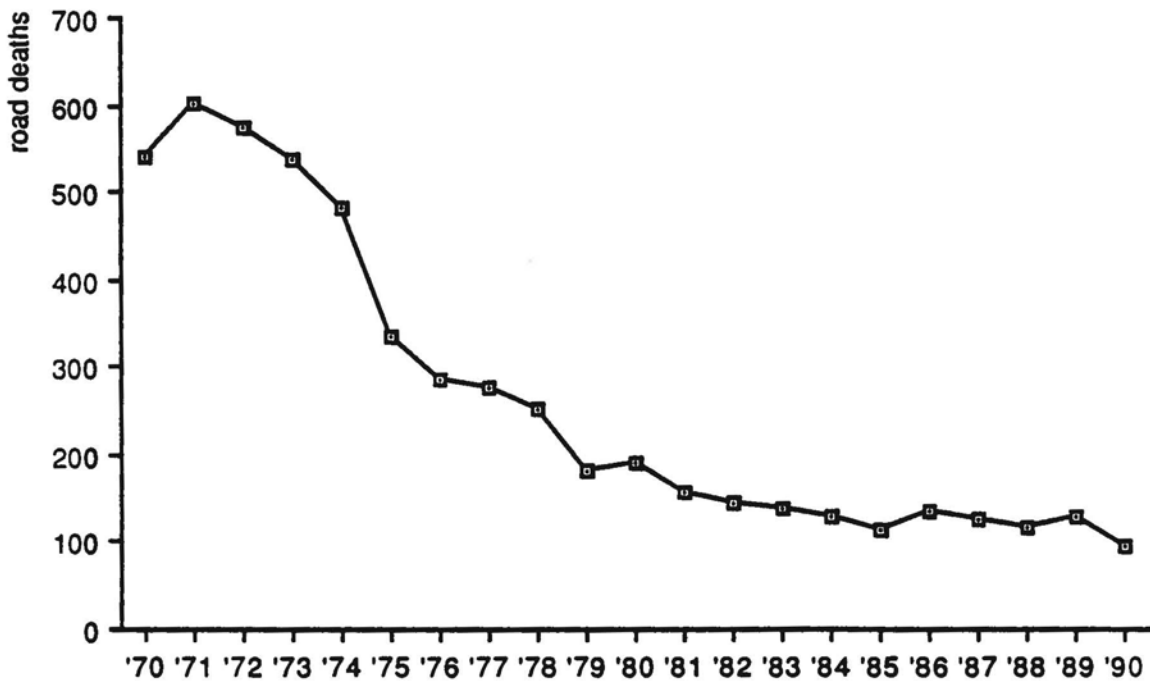


Figure 3.
RELATIONSHIP BETWEEN ROAD DEATHS, KILOMETRES AND DEATH RATES OF MOPED RIDERS IN THE NETHERLANDS

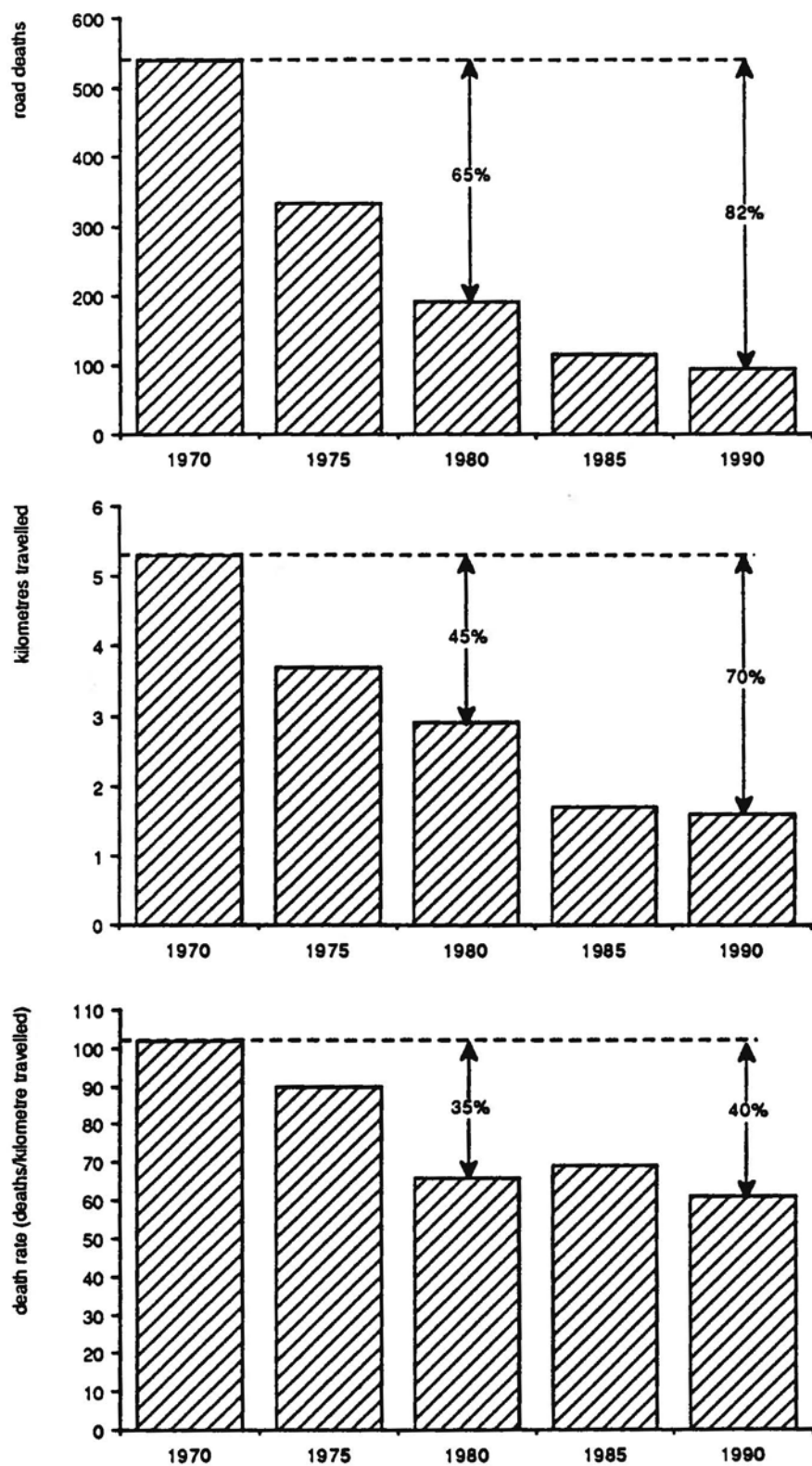


Figure 4.
DEATH RATE (DEATHS PER KILOMETRE TRAVELLED) BY AGE GROUP (1985-1990)

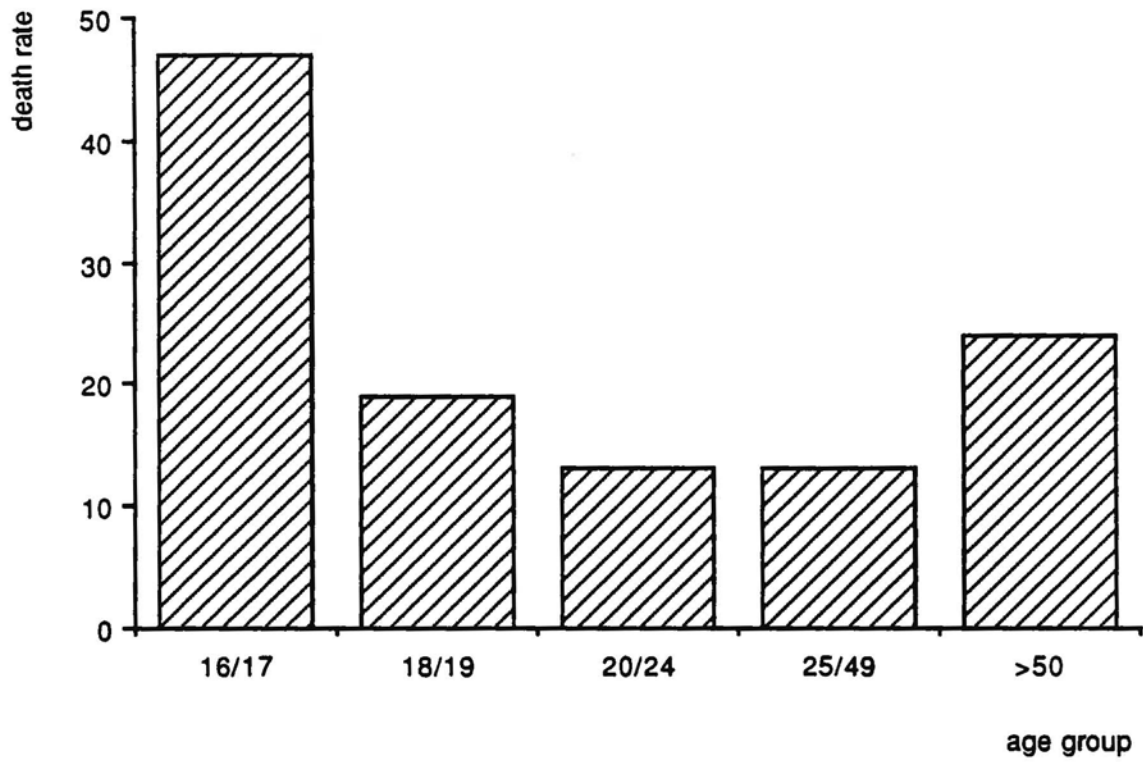


Figure 5.
 SHARE OF THREE AGE GROUPS (16/17, 18/19 AND OTHERS) IN TOTAL AMOUNT OF CASUAL-
 TIES (DEATHS + IN-PATIENTS) FOR 1970, 1980 AND 1990

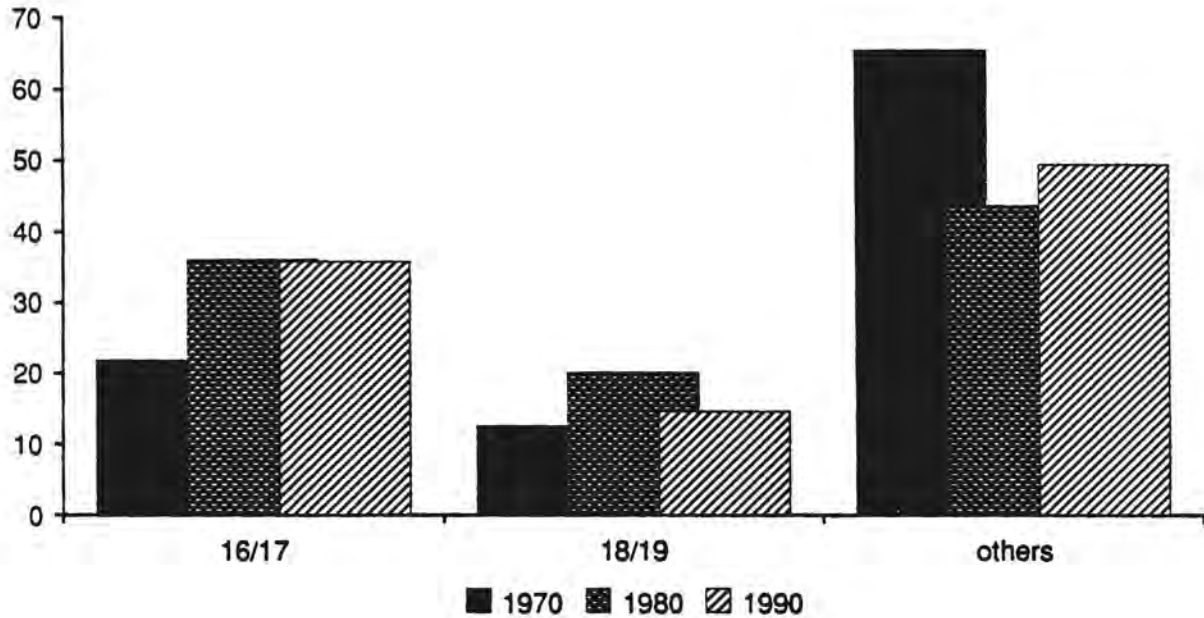


Figure 6.
 REDUCTION IN ROAD CASUALTIES FOR THREE AGE GROUPS (16/17, 18/19 AND OTHERS) FOR
 1970, 1980 AND 1990 (1970=100)

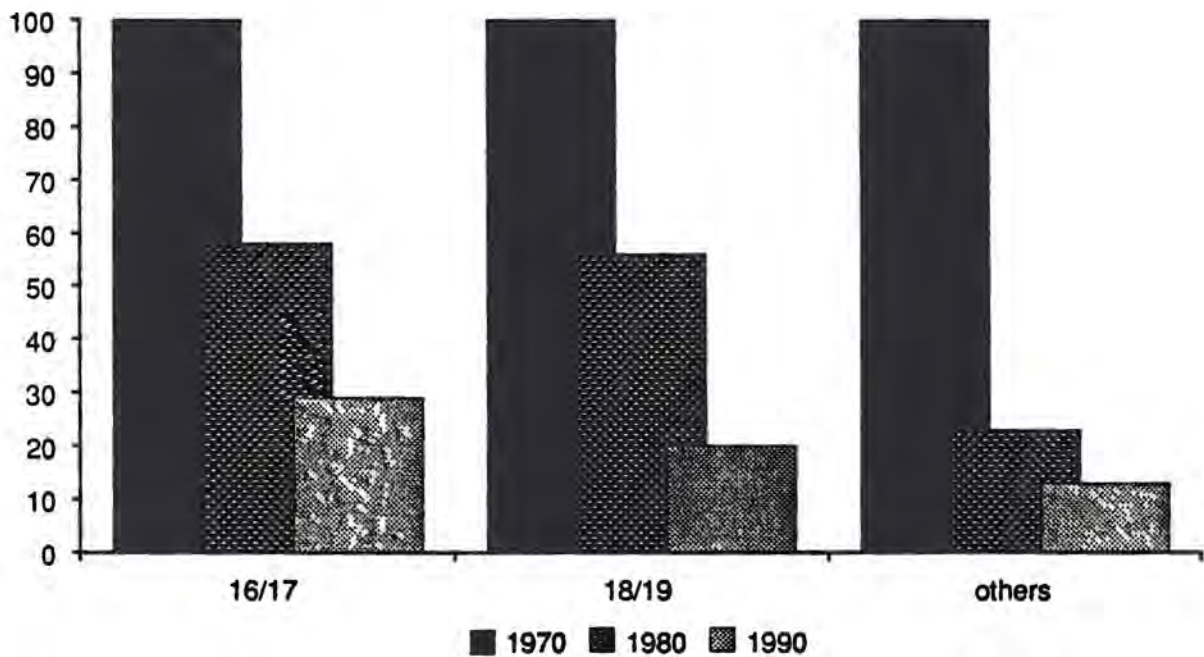


Figure 7.
CLASSES OF THWO-WHEELERS IN EC-COUNTRIES (SOURCE: HUIJBERS, 1990)

Country	Piston displacement (CC)	Original name	Speed limit		Minimal age rider (years)	Driving licence
			Inside (km/h)	Outside (km/h)		
Belgium	< 50	bromf. A	25	25	16	no
	< 50	bromf. B	40	40	16	A 3
	< 400	motorfiets	60	90-120	18	A 2
	> 400	motorfiets	60	90-120	18	A 1
Denmark	< 50	moped	30	30	16	no
	< 400	motorcycle	-	-	18	yes
France	< 50	moped	45	45	14	no
	51 80	moto legere	60	75	16	A 1
	81 125	velomoteur	60	110-130	17	A 1
	> 125	motocycles	60	110-130	18	A
Germany	< 30	leichtmofa	25	25	15	no
	< 50	mofa	25	25	15	no
	< 50	Moped-kick	40	40	16	4
	< 80	L.kraftrad	50	50	16	1 B
	-	motorrad	50	100	18 20	1 A
Great Britain	< 50	moped	30 m/h	30 m/h	16	yes
	< 125	learner	30 m/h	30 m/h	17	yes
	> 50	motorcycle	40 m/h	40 m/h	18	yes
Greece	< 50	motorcycle	40	50	16	yes
	> 50	two-wheel	50	70	18	yes
	> 50	three-wheel	50	60	18	yes
Ireland	< 150	motorcycle	48	88	16	yes
	> 150	motorcycle	48	88	18	yes
Italy	< 50	ciclomotori	40	40	14	no
	< 150	motoveicoli	50	90	16	yes
	> 150	motoveicoli	50	90-130	18	yes
Luxembourg	< 50	bic motor	50	50	16	-
	> 50	motocycle	60	-	18 21	-
The Netherlands	< 50	snorfiets	25	25	16	no
	< 50	bromfiets	30	40	16	no
	> 50	motor	50	80-100-120	18	A 1
Portugal	< 50	moped	40	40	16	yes
	> 50	motorcycle	60	90-120	18	yes
	> 50	m.c.zijspan	50	60 90	18	yes
Spain	< 50	moped	40	40	16	no
	50 75	motorcycle	60	90-120	16	yes
	> 75	motorcycle	60	90-120	18	yes