

ROAD ACCIDENTS AT NIGHT IN THE NETHERLANDS

A National Analysis according to official road accident data

Contribution to OECD Research Group TS3 on Improving Road Safety
at Night

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FOREWORD

The Institute for Road Safety Research SWOV was the official Dutch representative in the OECD Research Group TS3 on Improving Road Safety at Night. One of the activities of the research group was a questionnaire about night-time accident data. The questionnaire was designed, and discussed by the participating countries in the summer of 1977. During the rest of 1977 and the beginning of 1978 the participating countries completed what they could of the questionnaire and forwarded their answers.

In the summer of 1978 it was decided that, using their already completed accident data questionnaire, each participating country should also write a National Analysis. Guidelines for the contents and presentation for writing the National Analyses were sent in June 1978 with the request for completion by September 1978.

The National Analysis for The Netherlands, which was completed in September 1978, follows the guidelines laid down, with one exception. Pedal cyclists are described as a separate group because of their important position in Dutch road safety problems.

This analysis of Dutch night-time road accident data does not, therefore, presume to be comprehensive. It is restricted in the first place to the contents of the questionnaire and in the second place to the guidelines laid down. Both questionnaire and guidelines were agreed to by the participating countries as being suitable for achieving the goals of the TS3 research group.

The questionnaire, and therefore this analysis, concerns the trends during the period 1970-1976, together with a detailed analysis of 1975, which was at the time the latest available year for most countries.

This report was written by S. Harris, M.A., Basis Data Section Manager of the SWOV, and the computerprogrammes were written by Mrs. J.E. van de Pol of the Basic Data Section.

1. INTRODUCTION

1.1. Sources

The road accident figures for The Netherlands are those reported by the police to the Central Bureau of Statistics in The Netherlands (CBS).

The necessary information was obtained from a SWOV copy of the CBS tape containing all registered fatal and injury accidents. Hours of darkness, and weather conditions were obtained from the Royal Dutch Meteorological Institute (K.N.M.I.).

1.2. Restrictions

1. The usual restrictions of official accident data apply here: viz. one is dependent on the accuracy of the reporting police officer, and he is partly dependent on deduced information.

2. By no means all injury accidents are reported to the police: the number and seriousness of the non-reported injury accidents is not known.

3. The registration of "alcohol accidents", in The Netherlands defined as those accidents in which at least one driver, rider, or pedestrian had consumed alcohol, is entirely dependent on the extent of policy activity. This is known not to be constant for all days of the week, hours of the day, and categories of road user. More attention is paid during the weekend and at night, and to drivers of motor vehicles.

Although we have provided all the information required about alcohol accidents asked for in the OECD questionnaire, we feel we can only use them as giving an indication of alcohol involvement in road accidents.

4. In The Netherlands very little exposure data are known which can be responsibly related to road accident data, and virtually none as far as the subject "accidents at night" is concerned.

1.3. Definitions

1. Daytime, Twilight and Night-time. The Dutch police report the light conditions directly on the accident registration form, based on their impression of the amount of light at the time. They also report the exact time of the accident and the date, but this was not used to determine the light condition at that moment because it is too dependent on weather conditions. It was felt that to derive "daytime" etc. from the exact time of day and the date would not result in a more reliable determination of light conditions. Unless stated "night-time" excludes twilight.
2. "Rural" means simply: outside the built-up area, which is defined by law and indicated by place-name boards.
3. A "fatal road accident" is by definition an accident on a public road involving at least one moving vehicle, in which at least one person died of his injuries within 30 days of the accident.
4. The word "occupants" is used to mean the sum of drivers and passengers.
5. A report on Translation into English of terms and definitions used in the road accident statistics of The Netherlands is published separately (SWOV, 1977; R-77-31).

1.4. Occurrence of night-time

In The Netherlands, as in other countries of N.W. Europe, periods of darkness coincide with peak traffic and accident periods during part of the year.

In January and December both morning and evening rush-hours are periods of darkness and in February and November only the morning rush hour and part of the evening rush hour. In March and October parts of both rush hours take place in darkness. During the summer months, however, it is light from approx. 4 a.m. to 9 p.m.

Summertime or Daylight Saving Time, was first introduced into The Netherlands in 1977 and so does not have to be taken into account in this report. It was not expected to have much effect anyway unless the summer evening exposure was to increase drastically.

2. OVERALL SERIOUSNESS OF THE NIGHT-TIME ACCIDENT PROBLEM

2.1. Related to exposure

In 1975, the year which will be studied in this national analysis, ca. 35% of all fatal road accidents occurred at night (i.e. during hours of darkness). Whether this was proportionally more than the share of the vehicle kilometres travelled at night is not possible to determine with any degree of exactitude.

The only reliable data is for Motorways in which ca. 23% of the traffic was at night during 1975. Motorways accounted for approx. 20% of all vehicle kilometres in 1975 and what the night-time traffic share on the other 80% was, is difficult to say.

If we assume that the night-time traffic share was higher than 23% because of a greater social activity at night which will generally speaking not take place on Motorways, the share would have to be 38% in order there to be a total night-time traffic share equal to the share of fatal accidents: viz. 35%.

We are of the opinion that it is extremely unlikely that the night-time traffic share on non-Motorways could be as high as 38%. It is therefore, correspondingly extremely likely that the night-time share of accidents is greater than the night-time share of traffic (vehicle kilometres). In other words the night-time fatal accident ratio per kilometre has to be higher than the daytime fatal accident ratio.

We cannot, however, say how much higher it is.

2.2. Related in absolute terms to daytime accidents

The letality (deaths per 100 casualties) of night-time road accidents was 4,7 in 1975 compared to 3,3 for daytime accidents (see Table 1 and 2). This difference of ca. 40% can probably not be explained away by a different level of registration at night for injury accidents (registering relatively less injury accidents at night than in the daytime).

Slightly more deaths per fatal accident (1,10) occurred in night-

time accidents than during daytime accidents (1,08). The difference is small but is found in all the years from 1970-1976. This could be caused by a higher proportion of cars involved at night in fatal accidents than in the daytime. Cars carry more occupants than other vehicles (except busses whose occupants are hardly ever killed) and the chance that more than one death occurs in a single accident is therefore higher.

The percentage of deaths that occurred at the scene of the accident was higher in night-time accidents (52%) than in daytime accidents (45%). This could, however, be the result of slower post-crash treatment at night.

The three above mentioned comparisons lead us to conclude that night-time accidents are more serious than daytime accidents. The seriousness of twilight accidents (only 2,5% of fatal and 3% of injury accidents) seems to lie in between that of night-time and daytime accidents.

2.3. A comparison of road user categories

Table 3 shows that as far as the three two-wheeler categories (cyclists, mopedists and motorcyclists) are concerned: the heavier and faster the vehicle the greater the percentage of night-time accident deaths (cyclists are included in this table because they account for ca. 20% of the road deaths in The Netherlands). Apart from the cyclists, whose proportion of night-time deaths is much lower than the rest, there is not a great deal of difference between the categories.

From the car occupants, the drivers are more frequently killed in night-time accidents (44%) than their passengers (38%). As far as the other types of vehicles are concerned, the numbers of passenger deaths is too small to analyse.

We are unable to relate the night-time shares in the deaths per road user category to their exposure at night.

3. TRENDS SINCE 1970

3.1. General

The proportion of total fatal road accidents occurring at night has not fluctuated very much since 1970, viz. between 35% and 41% (Figure 1). From 1970 until 1974 there was a tendency for the night-time share to increase slightly. In 1975 the share dropped from 41% to 35%, probably as a result of the new alcohol law of 1st November 1974. For approx. six months after the law coming into effect there was a sharp decline in alcohol accidents and therefore also in night-time accidents. Since then, however, much of the effect has worn off and the proportion of night-time fatal accidents is tending to climb again and has reached the level of the years 1972-1974 (ca. 40%). The absolute numbers of night-time accidents is also increasing to that level.

What has been said of fatal accidents also applies to the numbers of road deaths whereby the number of deaths per fatal accident has remained virtually unchanged. The slightly higher figures for night-time accidents (see para. 2.2.) has remained stable since 1970.

The proportion of injury accidents at night is lower than that of fatal accidents (night-time accidents have a higher letality (see para. 2.2.) and as with the fatal accidents it has not changed very much over the last years (Figure 1). From 1970 to 1974 there was a constant share of 28% - 30%, which dropped to 26% in 1975 probably for the same reason as the fatal accidents. In 1976, however, the proportion was still only 27%.

3.2. Trends in letality

In para. 2.2. we established that the letality of night-time accidents was approx. 40% higher than that of daytime accidents. This has been true in every year since 1970 and has fluctuated between 37% and 59%. There is, however, no particular trend in the difference.

The letality of daytime accidents seems to be decreasing. Although not every year is lower than the year before there seems to be a trend. The letality of night-time accidents shows no such development although the letality of the years 1974-1976 are lower than those of 1970-1973.

It is, however, possible that these small improvements in letality are the result of a slightly more complete registration of injury accidents.

The proportion of night-time accident deaths which occur at the scene of the accident has in recent years been consistently higher (ca. 55%) than in the case of daytime accident deaths (ca. 45%).

3.3. Trends in urban-rural distribution

The proportion of night-time accident deaths since 1970 has always been slightly higher in rural areas (between 38% and 45%) than it has been in urban areas (between 32% and 39%) (Table 4 and 5), probably due to less public lighting in rural areas. The difference was, however, never more than 7% points and in 1972 was only 1% point. The absolute decrease in night-time accident deaths in 1975 was as great in urban as in rural areas but the relative decrease was greater in the urban areas (Table 4 and 5). The increase in 1976 and 1977 has been relatively greater in the rural areas.

In 1976 the number of night-time accident deaths was in rural areas approx. 84% of the 1970 level, whereas in urban areas the number was still only approx. 70% of the 1970 level.

3.4. Trends in pedestrian deaths

The number of pedestrian deaths has, in keeping with the trend of roads deaths in general, been generally decreasing since 1972, but the decrease has been slower for night-time accident deaths (Table 6). The absolute number of daytime deaths has been decreasing steadily since 1970, but the downward trend in night-time deaths did not start until 1974. This decrease in pedestrian deaths has

occurred without the passing of any road-safety laws specifically aimed at pedestrians.

From 1970 until 1974 the proportion of night-time pedestrians deaths increases gradually from ca. 36% to ca. 43%. In 1975, as in the case of the other categories of road users, the proportion fell, to ca. 38%. In 1976 it rose again to ca. 41%.

In 1976 the number of daytime pedestrian deaths was approx. 60% of the 1970 level, but night-time pedestrian deaths were at approx. 76%.

3.5. Trends in bicycle deaths

Although not included in the OECD questionnaire, we wish to include bicycle deaths in this report because they account for ca. 20% of all road deaths in The Netherlands and the moment of writing there were about 10 million bicycles in use for a population of approx. 14 million.

As we saw in para. 2.3. the cyclists have by far the smallest proportion of night-time deaths of any mode of transport.

Neither the night-time or the daytime absolute number of bicycle deaths have changed very much since 1970 and the night-time share varied only from 21% to 25% (Table 7). There is no real trend. As in the case of the other categories of road users, the night-time share of bicycle deaths rose in 1974 to drop again in 1975 and to rise again in 1976.

In 1976 the number of daytime bicycle deaths stood at 98% of the 1970 level, as did the number of night-time bicycle deaths.

The reason why the number of deaths among cyclists has not shown the downward trend of the other categories can lie in the fact that no specific safety measures have been taken for cyclists in The Netherlands or the fact that bicycle useage is supposed to have increased. The most important new laws (maximum speeds, crash helmets, and seat belts) do not effect them directly.

3.6. Trends in moped deaths

Since the introduction of compulsory crash-helmet wearing in 1974 helmet usage rose to practically 100% and the number of moped deaths has decreased sharply (Table 8), although part of this decrease is probably due to the decreasing popularity of mopeds as shown by the declining numbers. The decreasing useage of mopeds was probably hastened to some extent by the crash-helmet legislation. In 1976 the Dutch version of the Mofa, known as the "Snorfiets" was introduced but sales have been so marginal as to hardly have effected road safety.

In 1974 the daylight moped deaths decreased considerably whereas the night-time deaths remained stable thus resulting in a high proportion of night-time deaths (ca. 42%). However, in 1975 the night-time moped deaths dropped much faster resulting in a low proportion (ca. 34%). In 1976 both decreased the same amount, again resulting in a 34% share.

Daytime moped deaths stood in 1976 at approx. 56% of the 1970 level, and night-time moped deaths at approx. 47%.

3.7. Trends in motorcycle deaths

In recent years the motorbike has made a come-back in The Netherlands resulting in much larger numbers on the roads. They are mainly the heavier bikes (350 c.c. and upwards) and are driven mainly by young men in the age-group from 18-24 years.

The number of motorcycle deaths has also increased (Table 9), but the number (120 in 1976) is too small to analyse. The night-time share fluctuates strongly from year to year.

It is unlikely that this has much to do with night-time conditions, it is probably the result of statistical fluctuations which all small numbers are susceptible to.

3.8. Trends in car deaths

The number of car deaths in general was fairly stable until 1974 when it fell 27% (from 1357 in 1973 to 986 in 1974) and continued

to fall in 1975 (Table 10). The main cause seems to have been what is known in The Netherlands as "the oil crisis effect" as a result of the Arab oil embargo. Not that it reduced travel much but seemed to change driver behaviour in a way that it lead to considerably fewer car deaths. The most noticeable change was the slower driving speed. In time 1975 seat-belt usage became compulsory and the law raised the level of overall seat-belt wearing from ca. 20% to over 50%.

The number of car deaths are on the increase again as a result of increased total mileage, increasing speeds, and a stagnated use of seat belts.

Up to 1973 the number of daytime car deaths remained stable whereas the night-time accident deaths increased slightly, thus slightly raising their share of total car deaths. In 1974 daytime deaths decreased slightly more than night-time deaths raising their share again. In 1975 we see the effect of the alcohol law of 1st November 1974 (see para. 3.1.) in that whereas daytime accident deaths increased, night-time deaths dropped by 19% mainly during the first half of the year. The night-time share dropped sharply as a result, from ca. 50% to 42% in 1975. In 1976, the alcohol law had already lost much of its deterrent effect being partly responsible for an increase of 25% in night-time car deaths against a slight decrease in the daytime deaths. The night-time share rose again to ca. 47%. The number of daytime car deaths in 1976 was ca. 75% of the 1970 level, whereas the night-time car deaths stood at 85%.

4. STUDY OF MULTIDIMENSIONAL ACCIDENT TABLES FOR 1975

4.1. Age and category of road user casualties

Each category of road user can be divided into three age groups to indicate youthful participants, experienced participants, and the old age pensioners (65 years and older). In the case of cars, mopeds, and motorcycles the youngest group extends to 24 years and for cyclists and pedestrians to 14 years. Not only is a differing degree of traffic experience between the three age groups supposed; there is an implicate assumption that the young cyclists and pedestrians have a relatively low night-time exposure, there are, however, no reliable figures for The Netherlands to back this assumption. Only the car occupants have been split into drivers and passengers because the number of passenger casualties in the other groups is small (cyclists 3%, mopedists 10%, motorcyclists 17%). In cars ca. 42% of the casualties are passengers.

As shown in Table 11 very few children are injured at night as a pedestrian or cyclist, presumably because they neither walk nor cycle much when it is dark. Only a small minority of the elderly pedestrians are injured at night and few cyclists, probably for the same reason. A large proportion of older children and adult pedestrians are injured at night, in fact the largest proportion of any category in this age group. Only a quarter of the 15-64 year group of cyclists is injured at night.

Comparatively few moped users are injured at night although there are no reasons to assume that mopeds are not used much at night. There is not so much difference in the night-time shares of the children and adults but, as in the case of the cyclists, very few elderly mopedists are injured at night.

The distribution of the motorcyclists (by far the smallest group of road user) is identical to that of the mopedists. No share for the elderly motorcyclists can be given because there were only 18 casualties - there are also few elderly motorcyclists.

The distributions of car drivers and passengers do not differ very

much presumably because most drivers are carrying passengers in their own age group. Practically half the young car drivers (the minimum age is 18 years) are injured at night, and over a third of the "adult" group. Approximately 80% of the elderly car drivers are injured during daylight hours.

In absolute numbers and shares the most important groups of night-time road accident casualties are given in Table 12.

Although few of these eight groups form a surprise (the "adult" group contains the largest group of road users, and car casualties practically always form a large group in any analysis of road accidents) the youthful mopedists do seem to form a special problem group in The Netherlands. Seeing recent trends of more young people buying the so-called "heavy" mopeds with gears and an (unofficial) maximum speed of ca. 80 km.p.h. (ca. 50 m.p.h.) we can expect this group to present even more of a problem in the future.

The youthful car drivers seem to be a high risk group, because although little is known of their night-time mileage, it is certain that their share of the car-driver night-time accidents is far higher than their share of night-time car drivers.

The two problem groups have at least one thing in common: they are both under 25 years old. Also, many of the youthful mopedists of today are the young car drivers of tomorrow.

4.2. Weather conditions

4.2.1. Incidence of occurrence

Weather data which is of relevance to road safety research is hard to obtain. In this report we have confined ourselves to a few figures which will help to indicate the exposure of the three weather-types considered in the OECD questionnaire.

In 1975 it rained in The Netherlands for approx. 480 hours or about 5,5% of the time. To what extent the rain fell at night is unknown to us, as is the length of time in which the roads were wet. An approximation of the latter would be ca. 10% of the time.

There were only 20 days of ice or snow and only 53 days with fog or mist. In The Netherlands these conditions can be local, making them more dangerous because of a possible unexpected confrontation. Main roads are usually de-iced in winter and vehicle lighting is obligatory when visibility is bad - including heavy rainfall. The obedience to this obligation seems to be good, although we know of no measurements for 1975.

Although adverse weather conditions make road usage more hazardous, it is not known to what extent it is compensated in The Netherlands by a higher level of driver concentration on the one hand and to less road usage or switch of modal split on the other hand.

4.2.2. Rain and wet road surfaces

In 1975 when it rained for ca. 5% of the time and the road surfaces were wet for perhaps 10% of the time, ca. 12% of all road deaths occurred during periods of rain and ca. 25% during periods of wet road surfaces.

During the daytime ca. 9% of all casualties fall during periods of rain, whereas at night 20% occur during rainy periods (Table 13). Although rain forms a hinderance to visibility at all times, the combination of falling rain and darkness (with the accompanying glare of headlights and reflections of vehicle and street lighting on both road surface and rain drops) seems to be a special hazard. This was well known theoretically, but now seems to be justified by the relevent casualty figures.

Although it rained for approx. 5% of the time in 1975 we do not as yet know if this was equally divided between night and day. It is, however, certain that the ratio of ca. 2:1 in the percentages of casualties during rain was much higher than the ratio of hours of rain between night and day.

As Table 13 shows, there is also quite a lot of difference between the categories of road users.

The difference between daytime and night-time is much smaller in the case of the car occupants and their large numbers of casualties

lowers the ratio of all the categories together. Both the motorcycle percentages are lower than the other categories giving them a similar ratio.

What in The Netherlands are known as the two most "vulnerable" categories (pedestrians and cyclists) have the highest ratio's followed by the motorised two-wheelers, with the least "vulnerable" category, car occupants, having the lowest ratio. In other words the less protected the category the greater the relative risk of the combination of night-time and rain in comparison with night-time and rain.

Except for cyclists, the proportion of night-time casualties that occur during rain gets larger as the age of the victim gets older (see Table 14 and Figure 2).

Higher proportions of night-time casualties fall during periods of wet road surfaces as comparison of Table 15 and 16 shows. In all categories a higher percentage of urban night-time casualties occur in accidents on wet road surfaces than outside the built up area (Table 17).

There does not appear to be a pattern in the distribution: the two-wheelers are not more susceptible to injuries in accidents on wet road surfaces than the four-wheelers; pedestrians do not appear to be more susceptible than cyclists or car occupants. The proportion of night-time casualties in accidents on wet road surfaces is high considering the much smaller proportion of the year in which road surfaces are wet.

In absolute terms the greatest number of night-time/wet road accident casualties are the car occupants both in rural and in urban areas and the second largest are the mopedists; the other groups are much smaller (see Table 18). In urban areas the number of moped casualties is not much smaller than the number of car occupant casualties. In rural areas the share of car occupants injured in night-time/wet road accident is greater than in urban areas. For mopedists, cyclists, and pedestrians it is the other way around.

4.2.3. Winter conditions

Both the winters of 1974/75 and of 1975/76 were mild in The Netherlands as in other parts of N.W. Europe, resulting in only 20 days of snow or ice in 1975. Not only were there few days, but the snow or ice was not present for all of the time during those 20 days. We do not know to what extent these conditions were present at night although we may assume that there was more often snow or ice at night than during the daytime due to lower night-time temperatures. It is certain that conditions of ice and snow were present for only a small percent age of the time.

Of all night-time casualties only half a percent occurred during winter conditions and there was no measurable difference between urban and rural areas (Table 19). The absolute numbers are almost insignificant in comparison to other problems viz 89 casualties of which 60 in urban areas. There were no measurable differences between the categories of road user and if one may speak of a concentration then it was between 8 and 10 o'clock in the evening.

During a year with a more "normal" winter it is possible that snow and ice accidents at night take on a greater importance, but it is unlikely that it can ever be a great problem. During the extremely cold winter of 1963 conditions were so extreme as to have had a positive effect on road safety.

4.2.4. Fog and haze

In 1975 The Netherlands had 53 days of fog or haze. As in the case of ice and snow we do not know if it was continuous and how much was at night.

There were 519 night-time fog accident casualties, which means about 3% of all night-time casualties (see Table 20). Although ca. 35% of all night accident casualties were involved in rural accidents, ca. 69% of the night-time fog casualties were rural. There are two probable explanations for this difference: one is that fog dispenses quicker in urban areas due to the heat radiation of buildings (a lesser exposure) and the other is that practically all urban streets

in The Netherlands are lit whereas relatively few rural roads have street lighting. At night-time the larger the vehicle and thus the greater the visibility of a vehicle to other vehicles, the greater is the proportion of fog accident casualties.

The only groups with any relatively large fog casualties were the young (< 25 years) mopedists and car occupants.

4.3. Alcohol

4.3.1. Driving under influence

As said in the beginning we do not regard the Dutch "alcohol accident" figures as being any more than an indication of problem areas. Not only is the extent unknown to which alcohol tests of drivers involved in accidents are consistently made; the official statistics give no indication as to whether alcohol consumption was a contributing factor to the accident.

The general consumption of alcohol in The Netherlands has been gradually rising during the last ten years and it will probably go on increasing. We do not know how much of this alcohol is drunk in places which necessitate travel after drinking (pubs, bars, restaurants, and at other peoples homes). It is generally assumed that there is much more drinking (and driving) in the evening and at night than during the morning and afternoon.

The SWOV road-side survey of drinking and driving (during autumn weekend nights, in and around all but the smallest towns and villages) is held once every two years. The results show a gradual increase in drinking and driving in the years before the alcohol law (1 November 1974) a drastic drop shortly afterwards and a general increase after that whereby the 1977 level was approximately that of 1973. In other words the effect of the law has largely worn off. In the 1975 survey approximately 9% had a B.A.C. (Blood Alcohol Content) of 0,5 o/oo or more and ca. 80% had a B.A.C. lower than 0,2 o/oo. These figures are more favourable than the present situation. There are no reliable figures for periods outside weekend nights.

Although there are no figures to back it up, we may assume that most people in The Netherlands, who drink, do so more in the evening and at night than in the morning or afternoon. How much more is unknown. It is also unknown, but generally assumed that more alcohol is drunk at the weekend than during the week. In other words the drinking hours are those outside "normal" working hours.

4.3.2. "Alcohol accidents"

In 1975 the periods of large numbers of accidents in which at least one driver involved had drunk alcohol; the so-called "alcohol accidents", were Friday 23h to Saturday 3h, Saturday 22h to Sunday 4h, and Sunday 17h to Monday 2h. The "alcohol weekend" therefore extends from Friday evening until Monday morning and is confined mainly to night-time periods. Saturday has the "longest" night and Sunday "night" begins and ends the earliest. Although the weekend nights are the peaks, the weekday nights also account for far more alcohol accidents than during the daytime during weekdays.

The share of alcohol accidents in the total number of accidents shows the same pattern as the absolute number of alcohol accidents (see Table 21 and Figure 3).

During the hours in which it is always dark in The Netherlands (22h-4h) the percentage of alcohol accidents is about 35 times the percentage during hours in which it is always light (9-17h). In the SWOV road-side survey it was found that the percentage of drinkers grew as the night got older.

Between 10 p.m. and midnight the percentage of car drivers with a B.A.C. of more than 0,5 o/oo, was ca. 5%, between midnight and 2 a.m. ca. 12%, and between 2 a.m. and 4 a.m. ca. 24%.

This increase is also shown in the alcohol accident statistics: 10 p.m. to midnight 21%, midnight to 2 a.m. 33%, 2 a.m. to 4 a.m. 38%.

The accident figures show a similar pattern for the various categories of drivers. Table 21 shows for each category the percentage of drivers involved in night-time alcohol accidents.

Even if the police figures do not exactly reflect actual behaviour it is clear that the peak hours for heavy drinking and a high proportion of alcohol accidents is in the early morning. At this time the effects of alcohol are aggravated by extreme tiredness but on the other hand they are driving at a time of very low traffic density.

As far as age is concerned, if we discount the youngest pedestrians and cyclists who had only sporadically drunk at the time of an accident, the younger road users are almost as often under the influence of alcohol as are the adult group. In the case of cars slightly more so. The elderly are much less involved, except in the case of pedestrians and cyclists where the percentage of elderly casualties of alcohol accidents was not much lower than among the adult group.

For every age group within every category of road user the percentage of males in the night alcohol casualties lies between 70% and 90%. Among the elderly the percentage of men is higher than among the adult group, except in the case of the car occupants.

5. SUMMARY

1. The night-time accident ratio per vehicle kilometre is higher than the daytime ratio: the difference is unknown.
2. Night-time accidents have a higher letality: night-time fatal accidents involve more deaths per accident, and a higher proportions of the deaths died at the scene of the accident. Night-time accidents can therefore said to be more serious.
3. Cyclists are less frequently killed at night than the other categories of road users.
4. The proportion of night-time deaths is getting higher: after a sharp decline in 1975, probably as a result of the alcohol law of 1st November 1974, the share is increasing again. This applies to all categories of road users.
5. The young are relatively speaking the most involved in night-time accidents and the elderly much less. This applied especially to the young mopedists and car drivers.
6. Rain at night seems to be a far greater hazard than rain during the daytime. The less protected the category the greater the extra hazard.
7. The older the occupant the higher the proportion of night-time rain accidents.
8. Ice and snow are no great problem at night.
9. At night fog is a greater hazard in rural than in urban areas. The larger the vehicle the greater the proportion of night-time accident casualties during fog. Young mopedists and car occupants have relatively large fog casualties.

10. The effect of the 1974 alcohol law is wearing off. The percentage of alcohol accidents at night is many, many times higher than during the daytime. The peak periods are the early hours of Saturday, Sunday, and Monday morning. This applies to all categories of road users.

11. Young road users had drunk alcohol proportionally as often in night-time accidents as adults, and in the case of car occupants more so. The elderly are much less involved.

TABLES 1-21

Table 1. Numbers of fatal and injury road accidents and of deaths and injured due to daytime, twilight and night-time road accidents (1970-1976).

Table 2. Letality (deaths per 100 casualties) of daytime, twilight and night-time road accidents (1970-1976).

Table 3. Proportion of road deaths per road user category according to daytime, twilight and night-time accidents (1975).

Table 4. Numbers of road deaths due to daytime, twilight and night-time accidents in urban areas (1970-1976).

Table 5. Numbers of road deaths due to daytime, twilight and night-time accidents in rural areas (1970-1976).

Table 6. Numbers of pedestrian deaths due to daytime, twilight and night-time road accidents (1970-1976).

Table 7. Numbers of bicycle deaths due to daytime, twilight and night-time road accidents (1970-1976).

Table 8. Numbers of moped deaths due to daytime, twilight and night-time road accidents (1970-1976).

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Table 19. Numbers of casualties in night-time road accidents during winter conditions (ice/snow) according to place of accident (urban or rural area) and road user category in 1975.

Table 20. Numbers of casualties in daytime, twilight and night-time road accidents during fog/haze and the night-time share according to road user category for different age groups in 1975.

Table 21. Numbers of drivers involved in all night-time road accidents and numbers and percentages of drivers then involved in alcohol accidents according to periods of time of day and road user category in 1975.

Year	Fatal accidents			Injury accidents			Total		
	Day	Twilight	Night	Day	Twilight	Night	Day	Twilight	Night
1970	1720	85	1074	38664	1474	15866	40384	1559	16940
1971	1753	77	1038	41072	1586	16727	42825	1663	17765
1972	1702	95	1187	38807	1520	17014	40509	1615	18201
1973	1609	84	1109	38732	1651	17071	40341	1735	18180
1974	1299	76	963	36870	1729	16410	38169	1805	17373
1975	1308	70	753	35507	1569	13158	36815	1639	13911
1976	1303	83	852	36604	1557	13922	37907	1640	14774
	Deaths			Injured			Total		
1970	1880	101	1200	45901	1790	20534	47781	1891	21734
1971	1914	84	1169	48719	1971	21477	50633	2055	22646
1972	1846	125	1293	46222	1874	21986	48068	1999	23279
1973	1769	90	1233	46322	2031	22008	48091	2121	23241
1974	1399	85	1062	43262	2065	20885	44661	2150	21947
1975	1419	77	825	41465	1846	16668	42884	1923	17493
1976	1391	97	944	42761	1846	17695	44152	1943	18639

Table 1. Numbers of fatal and injury road accidents and of deaths and injured due to daytime, twilight and night-time road accidents (1970-1976)

Lortality	1970	1971	1972	1973	1974	1975	1976
Day	3.9	3.8	3.8	3.7	3.1	3.3	3.2
Twilight	5.3	4.1	6.3	4.2	4.0	4.0	5.0
Night	5.5	5.2	5.6	5.3	4.8	4.7	5.1
Total	4.5	4.2	4.5	4.2	3.7	3.7	3.8

Table 2. Lortality (deaths per 100 casualties) of daytime, twilight and night-time road accidents (1970-1976)

Road deaths 1975	Pedestrians	Cyclists	Mopedists	Motor- cyclists	Car occupants	Rest	Total
Day	59%	76%	63%	54%	54%		61%
Twilight	3%	3%	3%	2%	4%		3%
Night	38%	21%	34%	44%	42%		36%
Total	100%	100%	100%	100%	100%		100%
N =	396	456	334	101	968	66	2321

Table 3. Proportion of road deaths per road user category according to daytime, twilight and night-time accidents (1975)

Year	Road deaths in urban areas			% at night
	Day	Twilight	Night	
1970	813	30	476	36.1%
1971	807	28	451	35.1%
1972	776	30	516	39.0%
1973	775	34	468	36.6%
1974	638	24	403	37.8%
1975	585	23	289	32.2%
1976	587	32	337	35.3%

Table 4. Numbers of road deaths due to daytime, twilight and night-time accidents in urban areas (1970-1976)

Year	Road deaths in rural areas			% at night
	Day	Twilight	Night	
1970	1067	71	724	38.9%
1971	1107	56	718	38.2%
1972	1070	95	777	40.0%
1973	994	56	765	42.1%
1974	761	61	659	44.5%
1975	834	54	536	37.6%
1976	804	65	607	41.1%

Table 5. Numbers of road deaths due to daytime, twilight and night-time accidents in rural areas (1970-1976)

Year	Pedestrian deaths			% at night
	Day	Twilight	Night	
1970	377	13	217	35.7%
1971	353	9	191	34.5%
1972	351	9	228	38.8%
1973	289	14	201	39.9%
1974	230	11	180	42.8%
1975	234	13	149	37.7%
1976	225	14	164	40.9%

Table 6. Numbers of pedestrian deaths due to daytime, twilight and night-time road accidents (1970-1976)

Year	Bicycle deaths			% at night
	Day	Twilight	Night	
1970	382	10	120	23.4%
1971	420	9	120	21.9%
1972	407	14	137	24.6%
1973	385	18	106	20.8%
1974	327	17	116	25.2%
1975	346	13	96	21.1%
1976	375	16	118	23.2%

Table 7. Numbers of bicycle deaths due to daytime, twilight and night-time road accidents (1970-1976)

Year	Moped deaths			% at night
	Day	Twilight	Night	
1970	323	12	206	38.1%
1971	372	14	214	35.7%
1972	324	20	232	40.3%
1973	320	13	205	38.1%
1974	266	15	202	41.8%
1975	210	10	114	34.1%
1976	181	6	98	34.4%

Table 8. Numbers of moped deaths due to daytime, twilight and night-time road accidents (1970-1976)

Year	Motorcycle deaths			% at night
	Day	Twilight	Night	
1970	45	4	36	42.4%
1971	61	6	28	29.5%
1972	43	2	48	51.6%
1973	50	5	34	38.2%
1974	47	6	50	48.5%
1975	54	2	44	43.6%
1976	71	7	42	35.0%

Table 9. Numbers of motorcycle deaths due to daytime, twilight and night-time road accidents (1970-1976)

Year	Car deaths			% at night
	Day	Twilight	Night	
1970	672	59	589	44.6%
1971	652	45	591	45.8%
1972	661	64	625	46.3%
1973	662	34	661	48.7%
1974	463	32	491	49.8%
1975	523	35	407	42.2%
1976	506	52	500	47.3%

Table 10. Numbers of car deaths due to daytime, twilight and night-time road accidents (1970-1976)

Casualties 1975	Day	Twilight	Night	% at night
<u>Pedestrians</u>				
under 15 years	2912	79	237	7%
15 - 64 years	1298	98	1009	42%
over 64 years	854	38	349	28%
<u>Cyclists</u>				
under 15 years	3166	104	289	8%
15 - 64 years	4191	185	1349	24%
over 64 years	1400	28	184	11%
<u>Mopedists</u>				
under 25 years	9784	452	3952	28%
25 - 64 years	3500	141	986	21%
over 64 years	591	14	67	10%
<u>Motorcyclists</u>				
under 25 years	1244	59	507	28%
25 - 64 years	405	8	109	21%
over 64 years	14	-	4	-
<u>Car drivers</u>				
under 25 years	1666	128	1739	49%
25 - 64 years	5055	287	2952	36%
over 64 years	468	14	103	18%
<u>Car passengers</u>				
under 25 years	2207	103	1755	43%
25 - 64 years	2382	105	1411	36%
over 64 years	608	11	178	21%
<u>Others</u>				
under 25 years	608	25	155	20%
25 - 64 years	464	36	156	24%
over 64 years	7	1	-	-

Table 11. Numbers of casualties in daytime, twilight and night-time road accidents and the night-time share according to road user category for different age groups in 1975

Night-time casualties 1975		Absolute number	% of all night-time casualties	% of all casualties
Mopedists	<25 y	3952	23%	6.3%
Car drivers	25-65 y	2952	17%	4.7%
Car passengers	<25 y	1755	10%	2.8%
Car drivers	<25 y	1739	10%	2.8%
Car passengers	25-65 y	1411	8%	2.3%
Cyclists	15-65 y	1349	8%	2.2%
Pedestrians	15-65 y	1009	6%	1.6%
Mopedists	25-65 y	986	6%	1.6%
Total			88%	24.3%

Table 12. The most important groups of night-time road accident casualties in absolute numbers and percentages of all night-time casualties and of all casualties in 1975

Rain casualties 1975	Night	Day	Night/Day ratio
Pedestrians	23%	7%	3.3
Cyclists	25%	7%	3.6
Mopedists	20%	8%	2.5
Motorcyclists	13%	5%	2.6
Car occupants	20%	14%	1.4
Total (incl. others)	20%	9%	2.2

Table 13. Share of casualties of road accidents during rain for night-time and daytime and ratios in 1975

Rain casualties 1975	Day	Twilight	Night	% at night
<u>Pedestrians</u>				
under 15 years	178	10	36	16.0%
15 - 64 years	117	31	233	61.1%
over 64 years	76	8	105	55.5%
<u>Cyclists</u>				
under 15 years	207	16	83	27.1%
15 - 64 years	343	48	328	45.6%
over 64 years	85	5	42	31.8%
<u>Mopedists</u>				
under 25 years	840	93	755	44.7%
25 - 64 years	299	27	209	39.0%
over 64 years	26	1	17	38.6%
<u>Motorcyclists</u>				
under 25 years	58	8	64	49.2%
25 - 64 years	18	1	18	48.6%
over 64 years	1	-	1	50.0%
<u>Car occupants</u>				
under 25 years	534	42	608	51.3%
25 - 64 years	1029	89	919	45.1%
over 64 years	144	10	67	30.3%
<u>Others</u>	109	13	61	33.3%

Table 14. Numbers of casualties in daytime, twilight and night-time road accidents during rain and the night-time share according to road user category for different age groups in 1975

Night-time casualties 1975	Urban areas		Rural areas incl. Motorways		Total No.
	No.	% of total	No.	% of total	
<u>12 a.m. - 8 p.m.</u>					
Pedestrians	183	84.7	33	15.3	216
Cyclists	202	81.1	47	18.9	249
Mopedists	269	76.2	84	23.8	353
Motorcyclists	36	73.5	13	26.5	49
Car occupants	188	41.7	263	58.3	451
Others	5	33.3	10	66.7	15
<u>8 - 10 p.m.</u>					
Pedestrians	573	80.3	141	19.7	714
Cyclists	694	80.4	169	19.6	863
Mopedists	1619	79.5	418	20.5	2037
Motorcyclists	181	68.3	84	31.7	265
Car occupants	1384	51.3	1312	48.7	2696
Others	58	56.3	45	43.7	103
<u>10 p.m. - 2 a.m.</u>					
Pedestrians	397	80.4	97	19.6	494
Cyclists	377	80.2	93	19.8	470
Mopedists	1426	70.8	589	29.2	2015
Motorcyclists	158	66.1	81	33.9	239
Car occupants	1817	54.3	1531	45.7	3348
Others	66	61.7	41	38.3	107
<u>2 - 6 a.m.</u>					
Pedestrians	68	76.4	21	23.6	89
Cyclists	64	87.7	9	12.3	73
Mopedists	200	75.8	64	24.2	264
Motorcyclists	29	76.3	9	23.7	38
Car occupants	756	60.4	495	39.6	1251
Others	22	42.3	30	57.6	52
<u>6 - 12 a.m.</u>					
Pedestrians	56	69.1	25	30.9	81
Cyclists	127	76.0	40	24.0	167
Mopedists	224	66.7	112	33.3	336
Motorcyclists	16	55.2	13	44.8	29
Car occupants	173	44.0	220	56.0	393
Others	14	38.9	22	61.1	36

Tabel 15. Numbers of casualties in all night-time road accidents in urban and rural areas according to periods of time of day and road user category in 1975

Night-time/wet road casualties 1975	Urban areas		Rural areas incl. Motorways		Total No.
	No.	% of total	No.	% of total	
<u>12 a.m. - 8 p.m.</u>					
Pedestrians	104	88.1	14	11.9	118
Cyclists	116	82.9	24	17.1	140
Mopedists	136	77.3	40	22.7	176
Motorcyclists	15	62.5	9	37.5	24
Car occupants	114	44.4	143	55.6	257
Others	3	42.9	4	57.1	7
<u>8 - 10 p.m.</u>					
Pedestrians	253	87.8	35	12.2	288
Cyclists	311	85.0	55	15.0	366
Mopedists	607	83.5	120	16.5	727
Motorcyclists	38	66.7	19	33.3	57
Car occupants	644	55.1	524	44.9	1168
Others	27	62.8	16	37.2	43
<u>10 p.m. - 2 a.m.</u>					
Pedestrians	160	86.0	26	14.0	186
Cyclists	116	85.9	19	14.1	135
Mopedists	406	71.7	160	28.3	566
Motorcyclists	36	70.6	15	29.4	51
Car occupants	712	60.3	468	39.7	1180
Others	22	56.4	17	43.6	39
<u>2 - 6 a.m.</u>					
Pedestrians	27	84.4	5	15.6	32
Cyclists	17	89.5	2	10.5	19
Mopedists	53	81.5	12	18.5	65
Motorcyclists	11	84.6	2	15.4	13
Car occupants	285	61.8	176	38.2	461
Others	7	46.7	8	53.3	15
<u>6 - 12 a.m.</u>					
Pedestrians	36	72.0	14	28.0	50
Cyclists	84	77.1	25	22.9	109
Mopedists	127	66.8	63	33.2	190
Motorcyclists	7	53.8	6	46.2	13
Car occupants	90	45.2	109	54.8	199
Others	7	46.7	8	53.3	15

Table 16. Numbers of casualties in night-time road accidents on wet road surfaces in urban and rural areas according to periods of time of day and road user category in 1975

Night-time/wet road casualties 1975	Urban areas	Rural areas	Total
Pedestrians	45%	30%	42%
Cyclists	44%	35%	42%
Mopedists	36%	31%	34%
Motorcyclists	25%	26%	25%
Car occupants	42%	37%	40%
Others	40%	36%	38%
Total	40%	35%	38%
N =	4571	2138	6709

Table 17. Night-time share of casualties in road accidents on wet road surfaces according to place of accident (urban or rural area) and road user category in 1975

Night-time/wet road casualties 1975	Urban areas		Rural areas		Total	
Pedestrians	580	13%	94	4%	674	10%
Cyclists	644	14%	125	6%	769	11%
Mopedists	1329	29%	395	18%	1724	26%
Motorcyclists	107	2%	51	2%	158	2%
Car occupants	1845	40%	1420	66%	3265	49%
Others	66	1%	53	2%	119	2%
Total	4571	100%	2138	100%	6709	100%

Table 18. Numbers and percentages of casualties in night-time road accidents on wet road surfaces according to place of accident (urban or rural area) and road user category in 1975

Night-time/ice- snow casualties 1975	Urban areas	Rural areas	Total
Pedestrians	4	0	4
Cyclists	5	2	7
Mopedists	30	5	35
Motorcyclists	2	0	2
Car occupants	15	22	37
Others	4	0	4
Total (N =)	60	29	89

Table 19. Numbers of casualties in night-time road accidents during winter conditions (ice/snow) according to place of accident (urban or rural area) and road user category in 1975

Fog/haze casualties 1975	Day	Twilight	Night	% at night
<u>Pedestrians</u>				
under 15 years	4	-	2	33.3%
15 - 64 years	6	2	14	63.6%
over 64 years	5	-	3	37.5%
<u>Cyclists</u>				
under 15 years	10	-	8	44.4%
15 - 64 years	22	3	23	47.9%
over 64 years	2	1	3	50.0%
<u>Mopedists</u>				
under 25 years	49	6	87	61.2%
25 - 64 years	9	8	20	54.0%
over 64 years	1	-	2	66.6%
<u>Motorcyclists</u>				
under 25 years	10	-	11	52.3%
25 - 64 years	5	-	4	44.4%
over 64 years	-	-	-	-
<u>Car occupants</u>				
under 25 years	69	4	163	69.0%
25 - 64 years	110	19	153	54.2%
over 64 years	9	-	8	47.0%
<u>Lorries</u>				
under 25 years	2	1	9	75.0%
25 - 64 years	13	-	9	40.9%
over 64 years	-	-	-	-
<u>Others</u>				
	4	-	-	-

Table 20. Numbers of casualties in daytime, twilight and night-time road accidents during fog/haze and the night-time share according to road user category for different age groups in 1975

Drivers involved in night-time accidents 1975	All accidents	"Alcohol accidents"	% of total
<u>12 a.m. - 8 p.m.</u>			
Pedestrians	609	4	1%
Cyclists	704	6	1%
Mopedists	1086	14	1%
Motorcyclists	122	1	1%
Car drivers	1576	42	3%
Others	255	2	1%
<u>8 - 10 p.m.</u>			
Pedestrians	363	44	12%
Cyclists	512	53	10%
Mopedists	1460	94	6%
Motorcyclists	194	10	5%
Car drivers	4704	438	9%
Others	391	27	7%
<u>10 p.m. - 2 a.m.</u>			
Pedestrians	517	86	17%
Cyclists	524	77	15%
Mopedists	2040	329	16%
Motorcyclists	222	32	14%
Car drivers	4511	1108	25%
Others	322	54	17%
<u>2 - 6 a.m.</u>			
Pedestrians	99	37	37%
Cyclists	74	17	23%
Mopedists	266	70	26%
Motorcyclists	36	11	31%
Car drivers	1296	448	34%
Others	549	19	3%
<u>6 - 12 a.m.</u>			
Pedestrians	83	-	0%
Cyclists	191	5	3%
Mopedists	371	1	x
Motorcyclists	31	1	3%
Car drivers	743	19	3%
Others	451	3	1%

x = < 0.5%

Table 21. Numbers of drivers involved in all night-time road accidents and numbers and percentages of drivers then involved in alcohol accidents according to periods of time of day and road user category in 1975

FIGURES 1-3

Figure 1. Development of the night-time share of fatal and injury road accidents 1970-1976. (Source CBS)

Figure 2. Percentages of casualties during rain in night-time road accidents according to road user category and age group in 1975

Figure 3. Percentages of "alcohol accidents" in all road accidents according to hour of the day in 1975

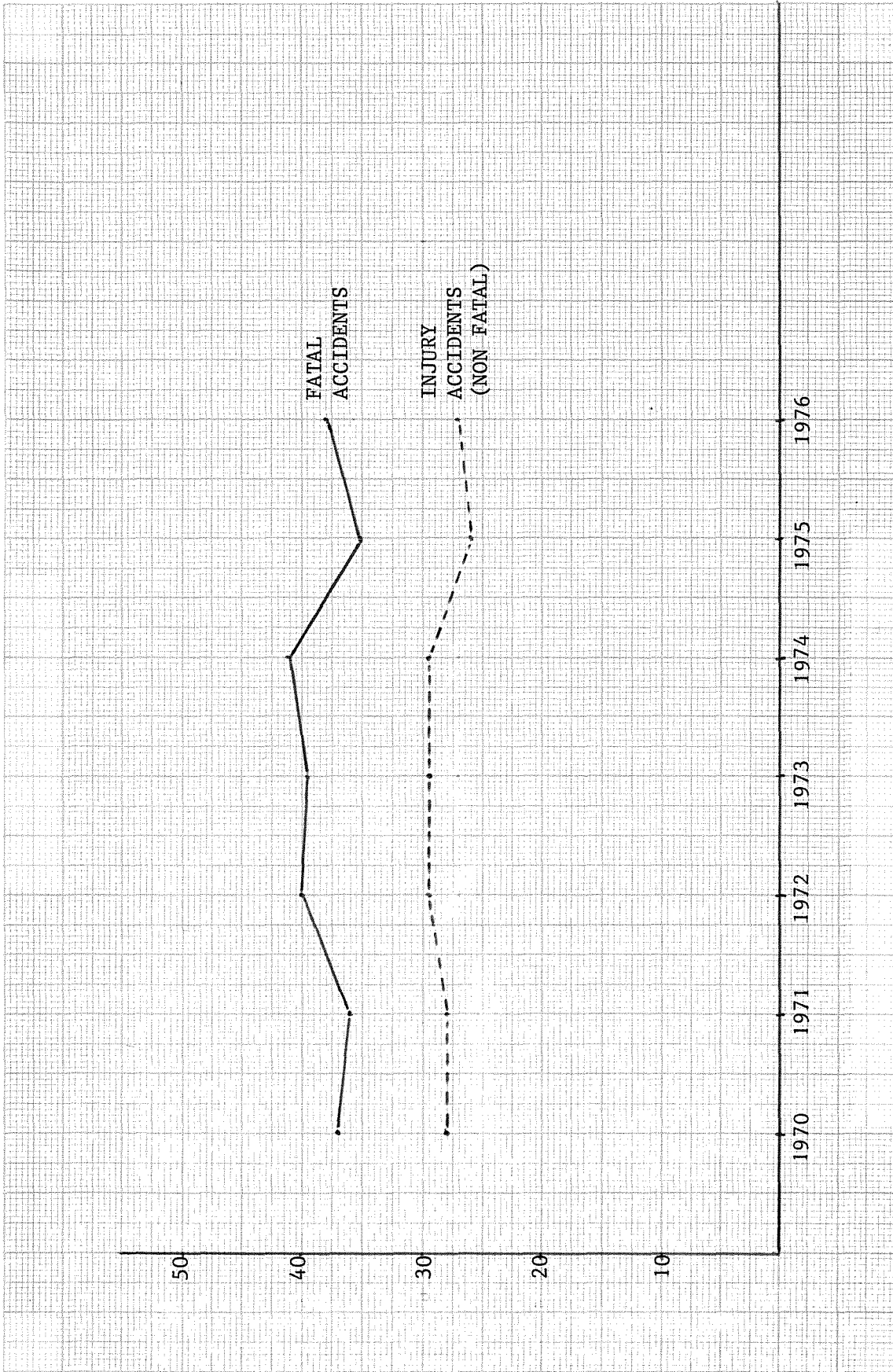


Figure 1. Development of the night-time share of fatal and injury road accidents 1970-1976. (Source CBS)

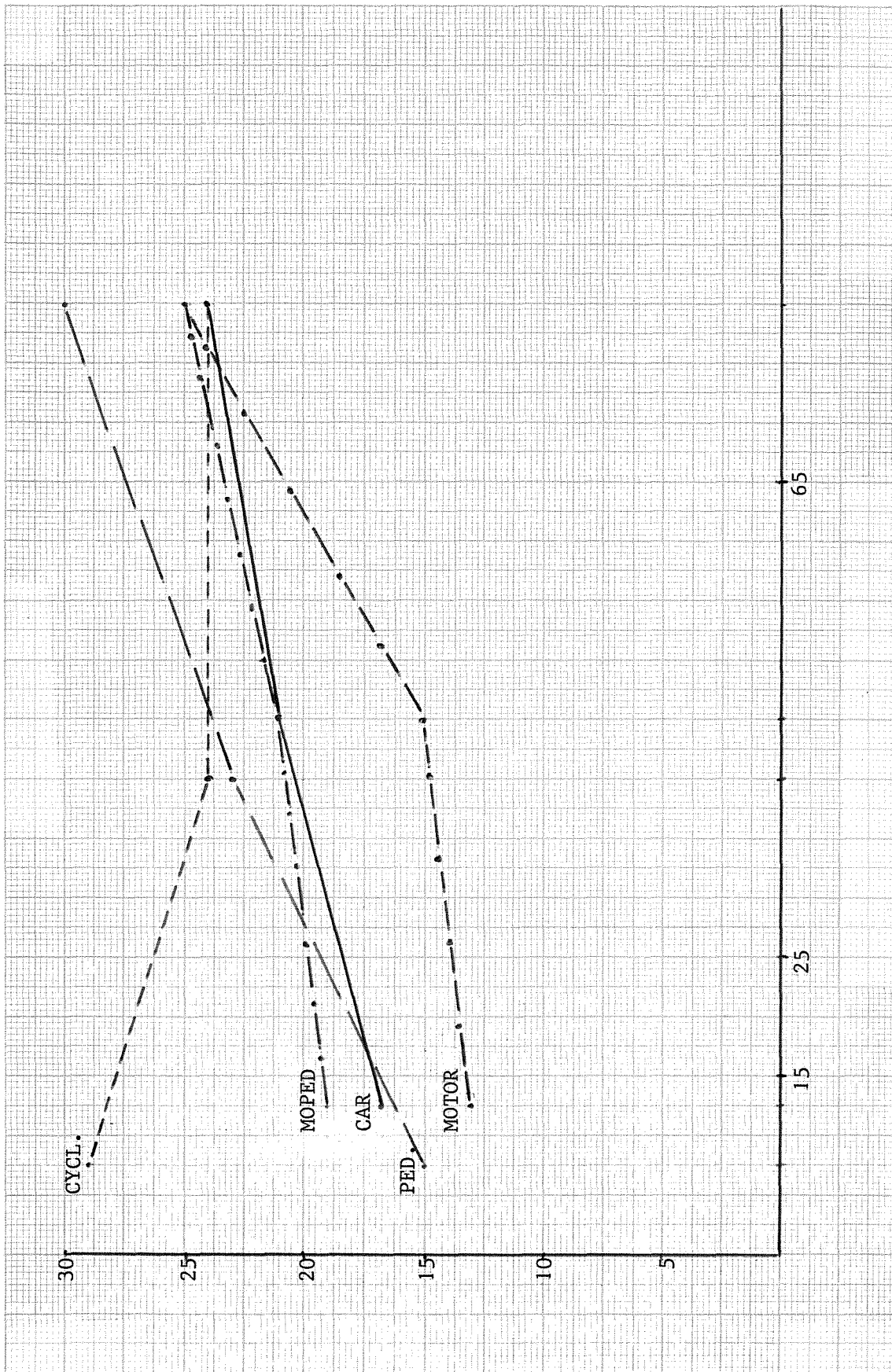


Figure 2. Percentages of casualties during rain in night-time road accidents according to road user category and age group in 1975

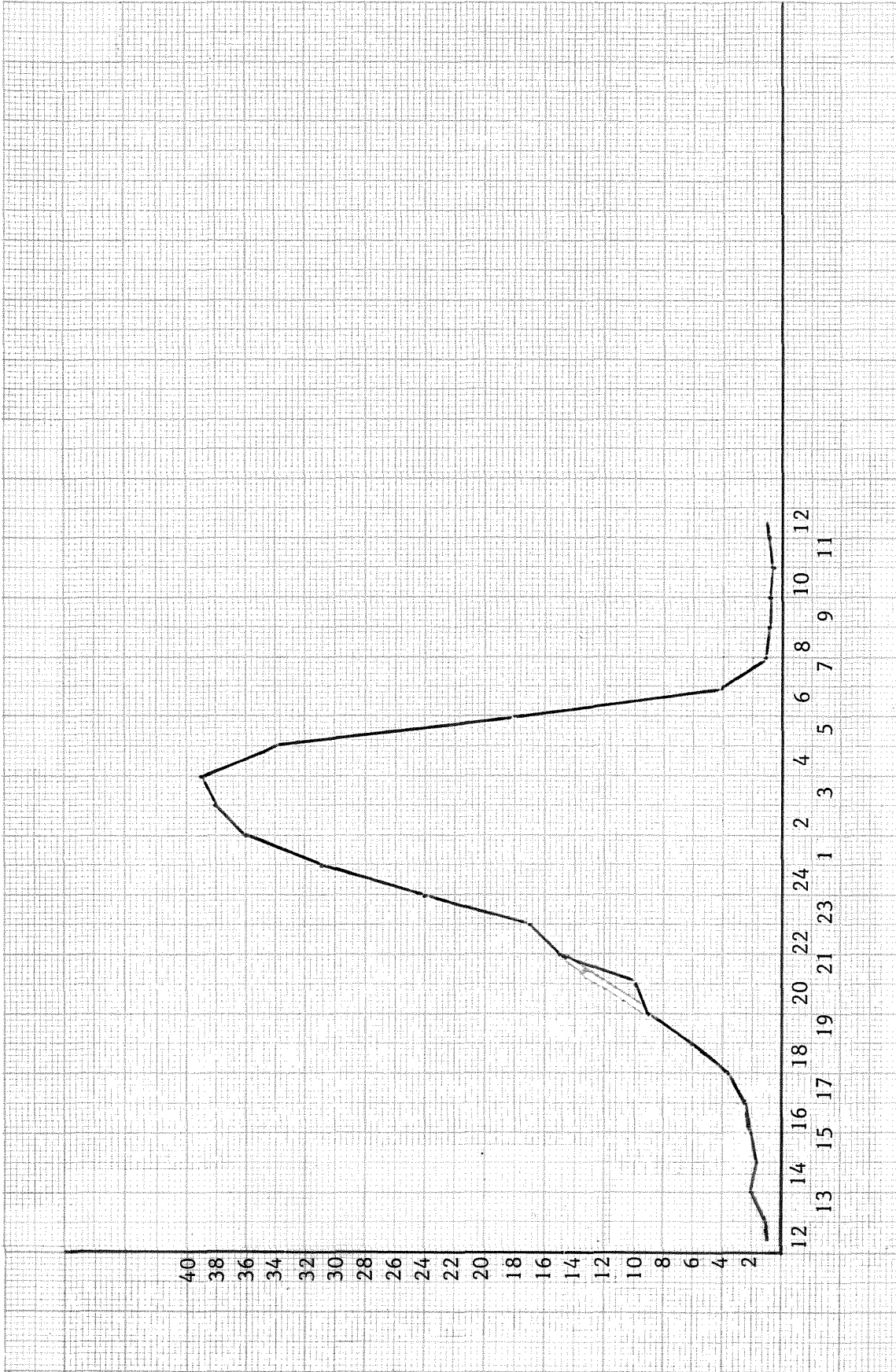


Figure 3. Percentages of "alcohol accidents" in all road accidents according to hour of the day in 1975