

THE INTRODUCTION OF A STATUTORY BAC LIMIT OF 50 MG/100 ML IN
THE NETHERLANDS AND ITS EFFECT ON DRINKING AND DRIVING HABITS
AND TRAFFIC ACCIDENTS

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CONTENTS

Introduction

1. Research into drinking and driving habits
 - 1.1. Design and execution
 - 1.2. Results
 - 1.3. Conditions
 - 1.4. Personal characteristics
2. Accident data
3. Summary and conclusions

Figures 1-10

Tables 1-8

INTRODUCTION

Since November 1, 1974, a new legislation on driving while intoxicated has been in force in The Netherlands.

Its most important features are: a statutory BAC limit of 50 mg/100 ml, a higher concentration being punishable, maximum penalties of 5000 dutch guilders, 5 years of license suspension and 3 months imprisonment, the BAC can be checked with a blood test, the possibility of screening with a breath test and the possibility of banning the driver from driving in case of doubt or in case the driver makes ready to drive. In addition, the former law remains valid, whereby it is forbidden to drive when under the influence of alcohol or other substances to such an extent that the driver can no longer be considered to be capable of driving the vehicle properly. When the police suspect a driver of having been drinking, a breath test can be made with a 50 mg/100 ml - breath-test tube. Even if the result is negative but there is a slight discoloration of the breath-test tube the driver can be banned from driving. If the result is positive the driver is taken to the police station, where a second breath test is made, this time with a 80 mg/ 100 ml breath test tube. A negative result leads to a driving ban, while a positive result must be followed by a blood test.

Suspicion of drinking may be aroused by the manner of driving, during special police campaigns when all traffic is stopped or in case of an accident.

Thus there are certain differences as compared with the U.K. legislation, for example a lower limit, a second breath test, the possibility of police campaigns and the possibility of imposing a driving ban.

The introduction of the new legislation was accompanied by an extensive publicity campaign, focused on knowledge of the law with emphasis on the possible consequences of driving after drinking in any way whatsoever.

It is difficult to assess the extent of police supervision since the change in the law. The number of cases of driving while intoxi-

cated, recorded by the police, is given in Table 1. The figure in the last quarter of 1974 is slightly higher than those in the preceding quarters, and more than doubled in the course of 1975. The number of prosecutions for other criminal traffic offences was reduced only slightly in the same period. This indicates that the police acted on a wider scale against driving while intoxicated. A part of the prosecutions for driving while intoxicated is the result of regional or national campaigns, during which all the traffic is stopped at certain points. Such campaigns are held on weekend evenings all the year round. The results are published in the newspapers. 178,443 vehicles were checked in 1975 resulting in 867 prosecutions for driving while intoxicated, while in another 1697 cases driving bans were imposed. Other information on enforcement activities - e.g. BAC of suspects, number of driving bans or actual penalties - is not available.

With such radical countermeasures, it is important to establish to what extent they meet the objective, i.e. reduce drinking by road users and, as a consequence, improve road safety.

To establish the effect on drinking by road users, this has to be measured during periods before and after the introduction of the statutory limit.

1. RESEARCH INTO DRINKING AND DRIVING HABITS

1.1. Design and execution

The research into drinking and driving habits consists of a number of surveys starting in 1970 and repeated in 1971, 1973, 1974 and 1975.

The design of the surveys in 1970, 1971 and 1973 is comparable. In choosing the survey sites the aim was to obtain a representative national sample. For this purpose 30 municipalities were selected with a proportional representation of various regions and degrees of urbanisation. Within each municipality three sites were chosen. Owing to some practical reasons the ultimate sample has certain shortcomings. However, these are no obstacle to a comparison between successive years.

Each site is visited by a research team once a year. In each municipality each site was visited some time during the research period, in an arbitrary order, one on Friday night, one on Saturday night and one on Sunday night. Care has been taken to visit a municipality not more than once during a weekend.

The investigations cover ten successive weekends in September, October and November.

The surveys are limited to drivers of passenger cars. This programme required three research teams, each team visiting one site per weekend night between 22.00 and 04.00 hours.

At the site, at intervals of about 10 minutes, the first car arriving is directed to a member of the team, who gives a brief explanation about the survey and asks the driver to cooperate. Cooperation involves an interview of about 10 minutes, giving a blood sample and permitting two breath tests. The blood samples were analysed with a gaschromatograph. Different breath testing devices were used.

Drivers cooperate of their own free will and the strictest secrecy concerning personal particulars is guaranteed.

If it is evident that it would be better for the driver not to

carry on driving, a cab is provided for him or her. If drivers refuse to cooperate, some information is noted by the team members. At the survey site traffic volumes were counted during the hours of the survey.

In 1973 the survey was cut short after the 7th weekend due to the energy crisis.

In 1974 a survey of limited scope was carried out. It was aimed at studying the short-term effect of changing the law and at gaining experience in carrying out research under the changed conditions. The different objectives and the short time available for preparations necessitated some alternations compared with the practice in preceding years. In order to determine short-term effects, it has to be possible to study the results weekend by weekend.

Based on the fact that there are again three teams, this means increasing the processing capacity per team. This was achieved by shortening the questionnaire and by determining the BAC by breath test only.

The investigations were made at three weekends: the last weekend before November 1 (October 25, 26 and 27), two weeks later (November 8, 9 and 10) and again two weeks later (November 22, 23 and 24). The municipalities and sites were selected from those for the preceding investigations, again allowing for different regions and degrees of urbanisations. On account of the low traffic densities late at night, the survey was restricted to 22.00 to 03.00 hours (instead of 04.00 hours). Each team remained all night at the site.

The most important changes in 1975 were:

- the large-scale use of breath tests, performed with the "Intoxilyzer", a limited number of blood samples was analysed by ADH-method;
- movement of teams to another site either between 00.00 and 01.00 hours or between 01.00 and 02.00 hours (as a rule within the municipality), without losing information completely on this time period and requiring twice as many sites.

The increase in the number of sites - from 3 to 6 - in a munici-

pality also meant increasing the number of small municipalities in the sample. Thus, instead of one municipality with 6 sites there were two, with 6 sites together. These were comparable in regional character and degree of urbanisation. In this way, the number of municipalities was increased to 42. In municipalities included in earlier surveys it was examined whether the usual sites should be retained or replaced by others.

The schedule, i.e. the days on which the municipalities and sites were visited, had to be adjusted as well. The drivers checked, drivers refusing to cooperate and use of breath and blood tests are given in Table 2.

For statistical comparison of differences in BAC-distribution as between the years, the number of BAC-categories had to be limited, especially because other variables were involved in the comparison as well.

The following BAC-categories were used:

< 20 mg/100 ml; 20-50 mg/100 ml; 50-100 mg/100 ml and > 100 mg/100 ml. The analysis method is capable of analysing contingency tables after a correction of the numbers of each cell with a specific constant value. Such a Weighted Poisson Model (WPM), permits the testing of the main effects of variables and interaction with other variables for weighted numbers of drivers, and also the contribution to these effects made by specific combinations of categories within these variables. In this case the numbers of subjects are weighted on a basis of the ratio of subjects to the traffic volume per survey site per two hour period.

1.2. Results

From 1970 to 1973 it was established that there was increasing drinking by drivers. Whereas in 1971 the positive BAC-values were higher than in 1970 and 1973, the percentage of drinking drivers was between those for 1970 and 1973. The 1974-results are not incorporated in the statistical analysis. Yet it can be stated that immediately after the change in the law on November 1st 1974, there

were practically no drinking drivers at weekend nights. The last weekend before November 1st already shows a decrease in drinking as compared to earlier years. It is difficult to say what the pattern in 1975 would have been without the 1974 change in the law. However, at least the 1973 level of drinking could have been expected. The 1975 level is in fact even slightly below that of 1970 (see Figure 1 and Table 3).

1.3. Conditions

The reduction in drinking in 1975 is not the same throughout the night (see Figure 2 and Table 4). After midnight the reduction is somewhat greater than before midnight. But in 1975 it can also be seen that: the later at night, the higher the percentage of drinking drivers and the higher the BAC's.

In 1975, between 02.00 and 04.00 hours 24% of all drivers still had a BAC above 50 mg/100 ml, 11% of them higher than 100 mg/100 ml. About 35% had a BAC higher than 20 mg/100 ml. 19% of the drivers with a BAC above 100 mg/100 ml were found before midnight, 38% between 00.00 and 02.00 hours and 43% between 02.00 and 04.00 hours (see Table 4).

On the other hand, traffic densities were as follows: 55% before midnight, 33% between 00.00 and 02.00 hours and only 12% between 02.00 and 04.00 hours.

These figures relate to Friday, Saturday and Sunday nights together. But, for instance, the 43% of drivers with a BAC higher than 100 mg/100 ml between 02.00 and 04.00 hours is subdivided into 19% for Friday night and 15 and 9% on Saturday and Sunday night respectively. One reason for this is that the reduction in drinking in 1975 was greater on Saturday and Sunday nights than on Friday night, as shown in Figure 3 and Table 5.

It was also examined whether the drivers trip origins, region or degree of urbanisation influenced the reduction in drinking in 1975. There was no indication of this. The relation between these variables and drinking by drivers, where it applies to all the years, will not be discussed further.

The reduction in drinking in 1975 may be either the result of moderation in drinking or of changes in traffic composition in ways connected with the drivers' drinking habits. Possible changes in the composition of car traffic in the weekend nights in 1975 as compared with the preceding years were investigated in connection with the variables of time of day, day, trip origin, region and degree of urbanisation. However, where differences exist, they are small and do not explain the reduction in drinking as a whole.

1.4. Personal characteristics

There are some differences in drinking by drivers of various age groups. Early in the night the percentage of older drivers who had been drinking is lower. Shortly after midnight the percentage of younger drivers who had been drinking is somewhat higher, but later in the night the increase in drinking in the other age groups is greater again. The data for 1975 are given in Figure 4 and Table 6. Of course, there are many drivers under 35 and, in addition, the percentage in the 25-35 age group increases the later it gets. This means that a large number of drinking drivers are under 35. In 1975, among drivers with a BAC higher than 100 mg/100 ml, for example, 34% were under 25, (10% of these between 02.00 and 04.00 hours) and another 40% between 25 and 35 (19% of these between 02.00 and 04.00 hours) (see Table 7). Otherwise the changes in drinking habits are about the same for all groups since the change in the law.

The percentage of drinking drivers in 1975 is lower, than in the preceding years, both for men and women (see Figure 5 and Table 8). Apart from this, the high BAC levels fell more among women. Finally in 1975, the percentage of women was higher (16%) than in the preceding years (1973: 9%, 1971: 8%; 1970: 8%). In 1974, after the change in the law, the percentage of women drivers had already increased during the hours investigated. Therefore the increase is probably due to the change in the law and connected with men leaving women to drive because they themselves had been drinking.

2. ACCIDENT DATA

The effect of the new legislation should preferably also be determined in terms of road accidents. It is not possible to make a simple calculation from the results of the research into drinking and driving habits. Though the general nature of the relationship between accident risk and BAC is known, its precise nature may vary and cannot be indicated, certainly as regards conditions in The Netherlands. Moreover, drinking and driving habits have been examined only at nights during the autumn weekend.

The number of fatal accidents, in which the police noted that one of the road users involved had been drinking is given in Figure 6 for several successive years. The figures are moving totals covering periods of twelve months and presented quarterly. The number decreased by about 130 at the end of 1975 as compared with over 370 per twelve months prior to November 1, 1974. Such records of drinking are of course far from complete and there is a danger of a change in the numbers being due to a different recording practice. These data can thus be regarded as no more than an indication of actual drinking the case of accidents. Besides this, the number of accidents in which alcohol was a contributory factor would still have to be deduced from them.

Since mid 1975 the police have also noted whether one of the road users involved is suspected of driving while intoxicated. But the definition of this was widened with the change in the law, and consequently the numbers before and after the change are not comparable. In addition, the police certainly do not record all cases of drunken-driving, and moreover drunken-driving does not necessarily mean that this is the cause of the accident. An independent investigation into drinking by road users involved in accidents has not proved possible in The Netherlands.

Any effect of the new legislation on road safety will therefore have to appear from the trend in the number of traffic accidents in the course of the years, in the absence of any knowledge about drinking. Fatal accidents have been chosen because registration of this type of accident is complete. The total number of fatal acci-

dents over a period of twelve months is set out quarterly in Figure 7. The number has shown a decrease since the end of 1973, which seems to have stopped at the end of 1975. There is no sudden change since November 1, 1974, and consequently it is very difficult to evaluate the effect of the new legislation.

The probable effects of the compulsory wearing of moped helmets and seat-belts, introduced on February 1, 1975, and June 1, 1975, respectively, must be allowed for. It is even possible that the factors which, since the energy crisis, led to fewer fatal accidents during the whole of 1974 than in the preceding year, brought about a still further reduction in 1975. In that event the new legislation would have had hardly an effect, or none at all, on the number of fatal accidents.

It is equally possible that any effect of the new legislation links up with that of the factors connected with the energy crisis and that by 1975 there were again factors working in the opposite direction.

In order to obtain a clearer assessment of the new legislation's effect, fatal accidents must be subdivided into accidents in which the legislation is likely to be very effective and those where it would have little effect.

Figure 8 distinguished between accidents involving at least one moving passenger car and other accidents, and between day and night (from 22.00 to 04.00 hours), since the legislation is likely to have more effect on drivers of passenger cars and at night-time. The number of accidents involving moving passenger cars fell greatly in day-time from the end of 1973 till the end of 1974. After this, there was a slight increase. After the end of 1973 there was a slight decrease in night-time and, in contrast to day-time this continued rather more strongly from the end of 1974 till the end of 1975. The different trend in the curves for day-time and night-time after the end of 1974 makes it probable that the night-time decrease after the end of 1974 was due to the new legislation. The reduction amounts to over 100 fatal accidents, leaving about 300 per twelve-month period.

As regards other accidents, there was a slight decrease in the

period 1970 and later, while a barely perceptible increase at night-time changed into a slight decrease at the end of 1974. Here again, therefore, the new legislation seems to have been the cause of the moderate decrease by about 50 to slightly fewer than 100 night-time accidents.

A subdivision into work days and weekends (weekend night refers to Friday, Saturday, Sunday night) has been made for fatal accidents involving moving passenger cars, because more effect can be expected during the weekend (Figure 9). This figure shows that the curves for day-time accidents on work days and at weekends run almost parallel.

After the end of 1973 there is again a slight decrease for weekend nights, which continues strongly from the end of 1974 till the end of 1975. This number of fatal accidents decreased by 100 to slightly below 200. This trend is hardly recognisable on work days.

Finally, only for fatal accidents involving moving passenger cars at night on work days and at weekends, a subdivision has been made into accidents with and without other road users being involved. It has repeatedly been found that drinking plays a part especially in single-vehicle (passenger car) accidents. From Figure 10 it can be seen that the decrease after the end of 1974 in accidents involving other road users is unexpectedly greater even than for single-vehicle accidents.

Thus, the introduction of the new legislation on November 1, 1974, probably reduced the number of fatal accidents, the reduction being in the order of 100 (or 35%) during one year for accidents involving moving passenger cars during weekend nights. Related to all fatal accidents during a twelve-month period the reduction represents a reduction of less than 5%. This decrease cannot be expressed as a more exact number since it is not known whether without the new legislation there would have been a slight increase (just as in day-time), due to the combined effect of other factors and measures. In combination with the results of the road-side surveys it can be concluded that most of the effect on accidents is due to lower

blood alcohol levels. However, information on the total traffic volume during the hours under consideration - which is another explanatory factor - is missing.

3. SUMMARY AND CONCLUSIONS

On November 1, 1974, a statutory BAC limit of 50 mg/100 ml was introduced in The Netherlands. The effect of this has been investigated by studying the drinking and driving habits of car drivers during weekend nights and by means of available accident data. Immediately after the introduction of the new legislation, there was practically no drinking-driving during weekend nights. There was also less drinking a year later than in the years preceding the new law while, without it, an increase might even have been likely. The reduction in drinking was greater after midnight and on Saturday and Sunday nights. The percentage of women drivers increased during weekend nights after the change in the law.

Among women, not only the percentage of positive BAC's decreased, but high BAC levels fell more compared with those of male drivers. From the available accident statistics it is not possible to conclude directly how many accidents are alcohol-related. The different trend in the number of fatal accidents in day-time and at night-time after November 1, 1974, makes it probable that the reduction at night-time is due to the new legislation. The greatest part of this reduction occurs in the case of accidents involving moving passenger cars during weekend nights, which fell by about 100 during 1975 to slightly below 200.

In spite of this, a year after the new law, drinking by drivers during weekend nights is still so high that supplementary measures are necessary. Thus, after 02.00 hours, one in every three drivers has a BAC exceeding 20 mg/100 ml, one in every four has a BAC exceeding the statutory limit of 50 mg/100 ml, while more than one in every ten has a BAC higher than 100 mg/100 ml. Furthermore the effects may be expected to wear off.

Such supplementary measures might include in the field of enforcement: informing the police of the probable number of offenders based on the results of the road-side surveys, improved screening facilities, simplified and quicker processing of the cases of drunken drivers; with regard to the public: informing the public about police enforcement and the results obtained so far in terms of road accidents and about what drinking and driving behaviour is in fact permitted and the provision of more public transport services.

FIGURES 1-10

Figure 1. BAC-distribution by year

Figure 2. BAC-distribution by year and time

Figure 3. BAC-distribution by year and day

Figure 4. BAC-distribution by age and time for 1975

Figure 5. BAC-distribution by year and sex

Figure 6. Moving twelve-month total of fatal accidents involving alcohol

Figure 7. Moving twelve-month total of fatal accidents

Figure 8. Moving twelve-month total of fatal accidents by type of vehicle and time of day

Figure 9. Moving twelve-month total of fatal accidents involving passenger cars by day and time of day

Figure 10. Moving twelve-month total of fatal accidents involving passenger cars at night.

Figure 1. BAC-distribution by year

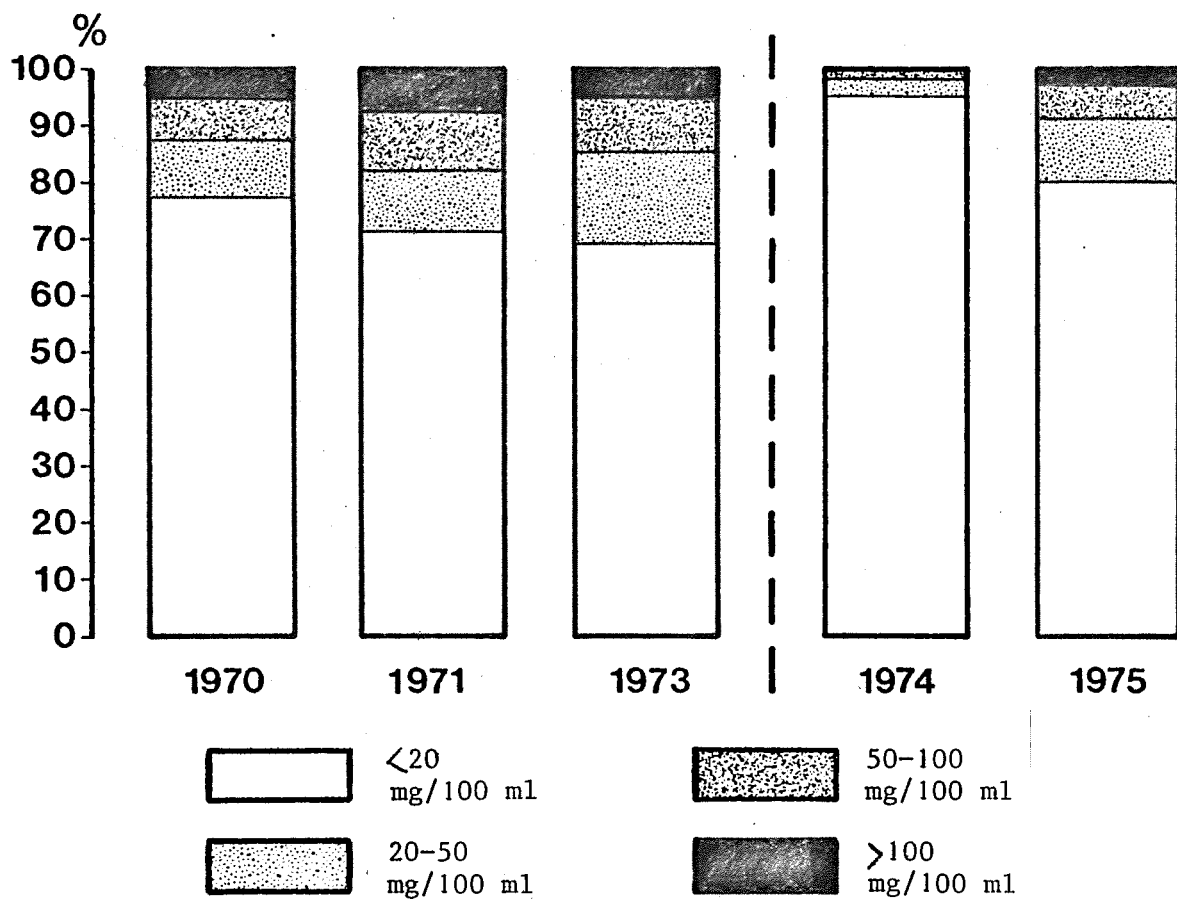


Figure 2. BAC-distribution by year and time

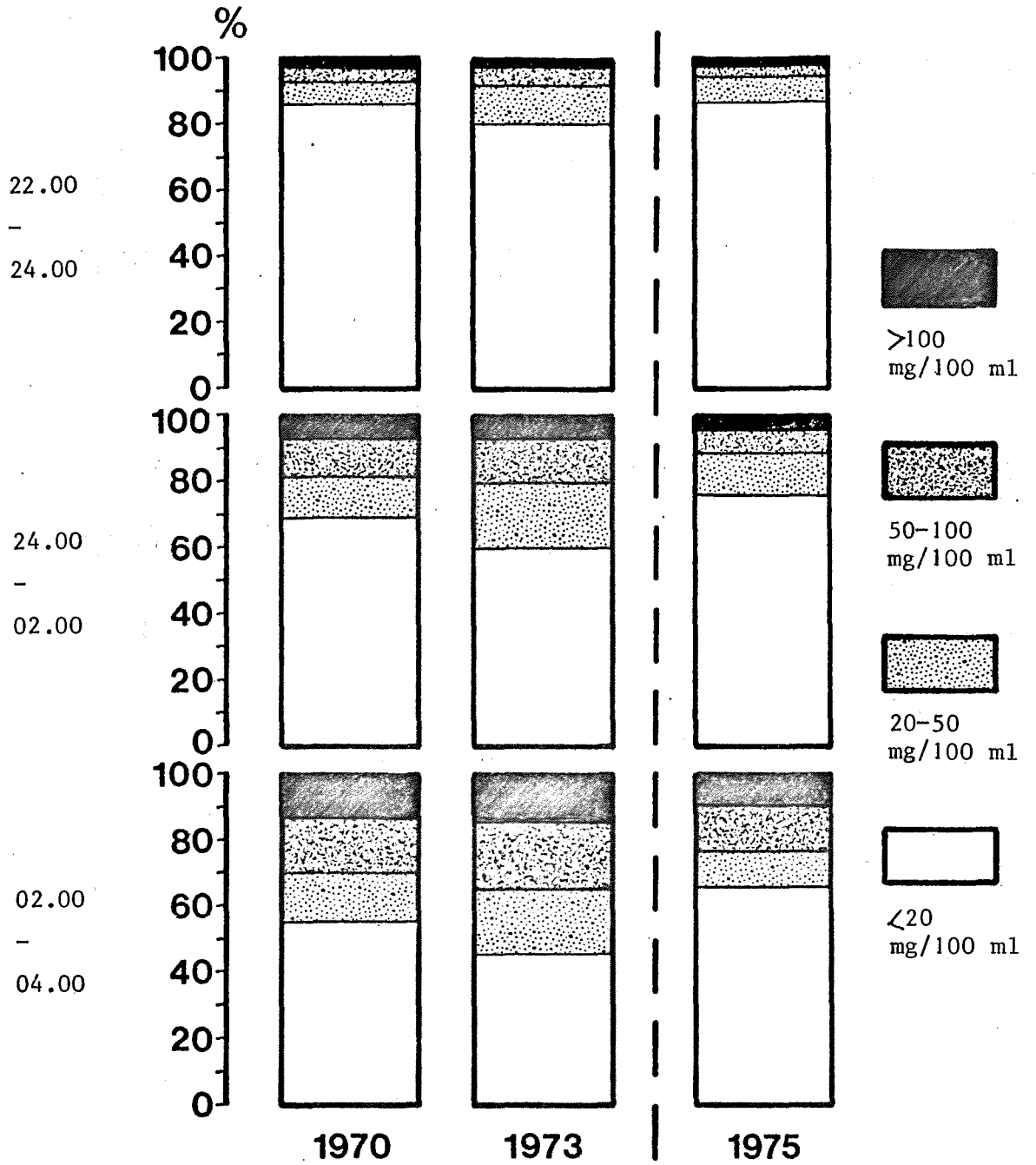


Figure 3. BAC-distribution by year and day

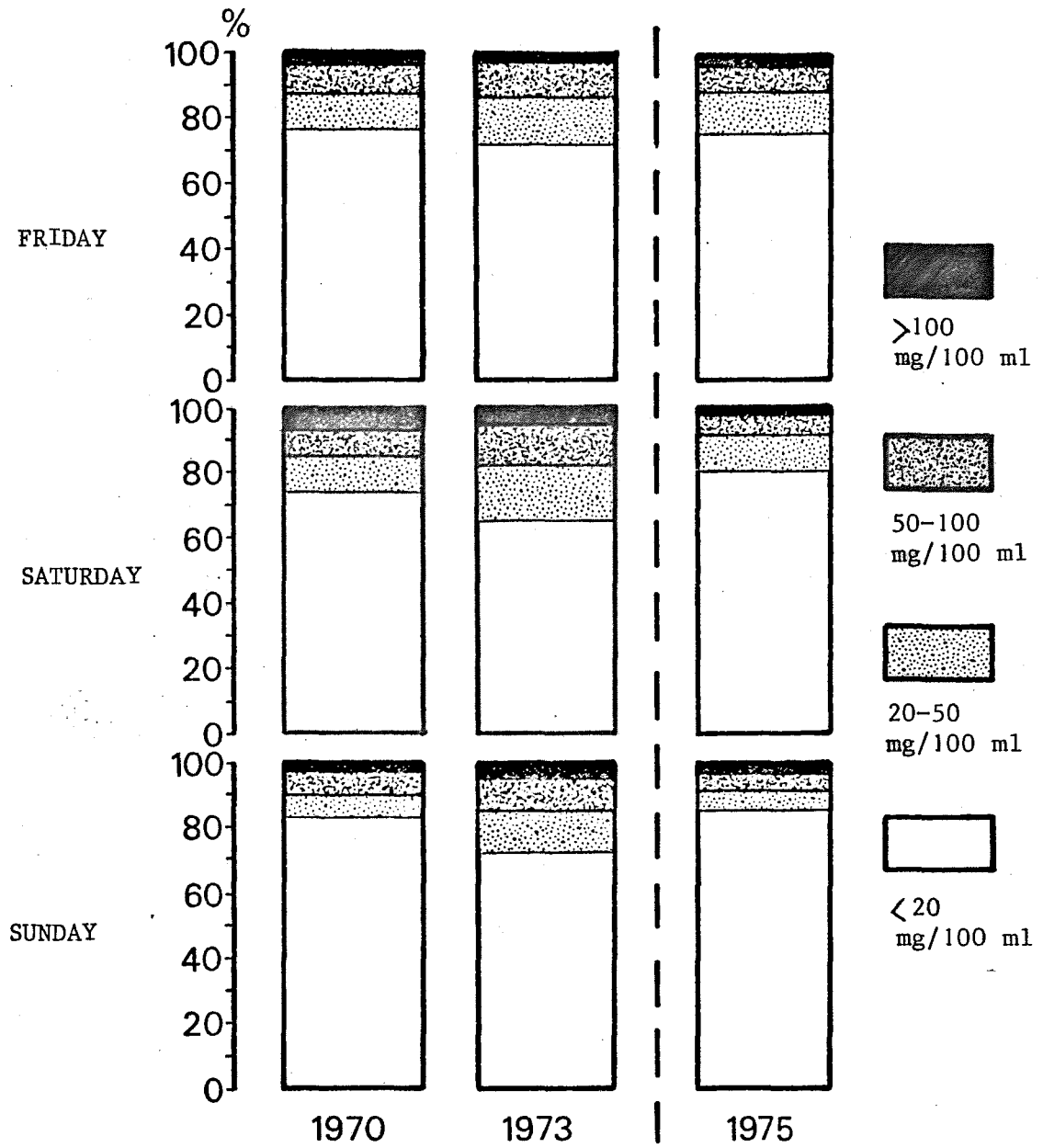


Figure 4. BAC-distribution by age and time for 1975

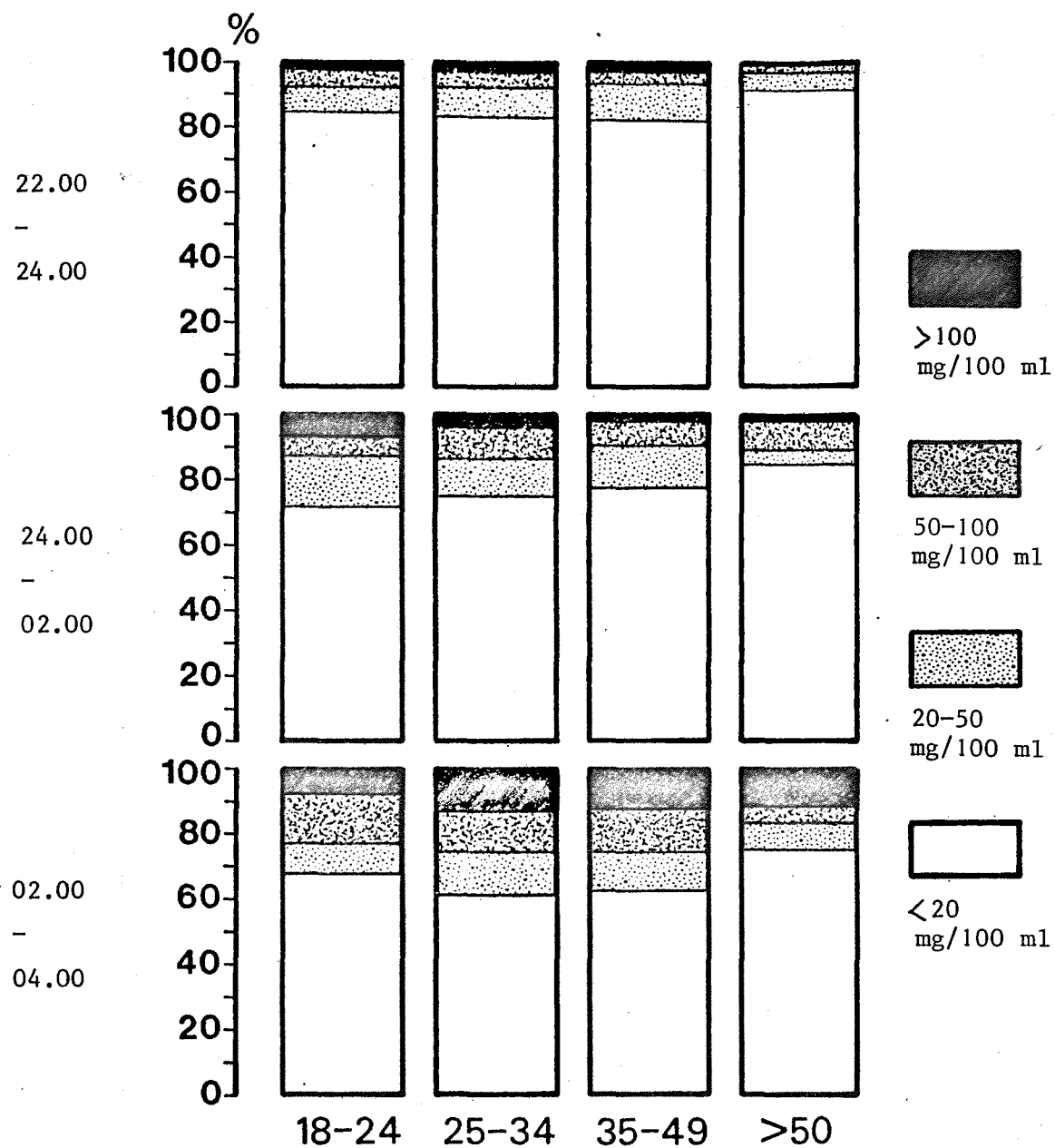


Figure 5. BAC-distribution by year and sex

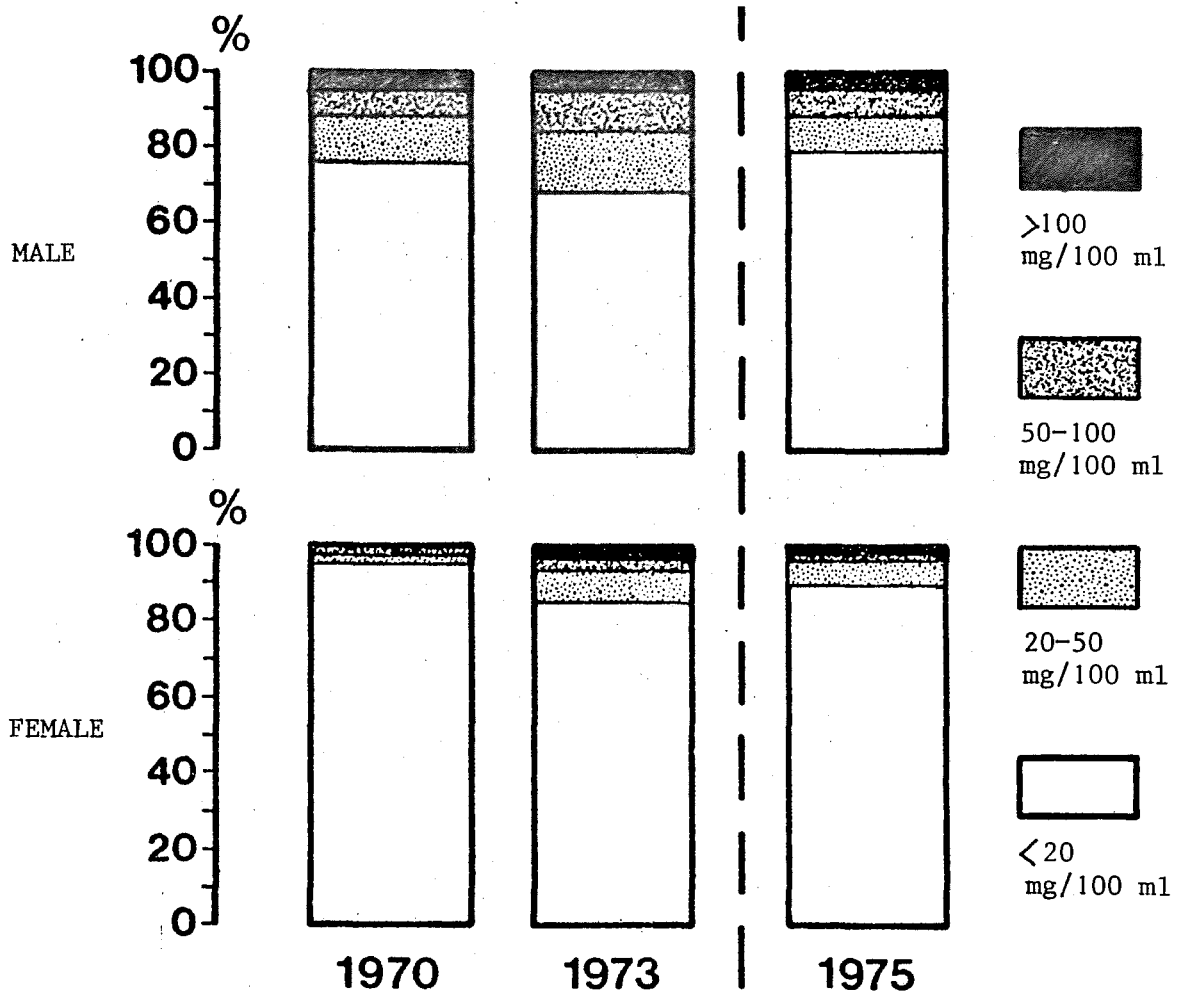


Figure 6. Moving twelve-month total of fatal accidents involving alcohol

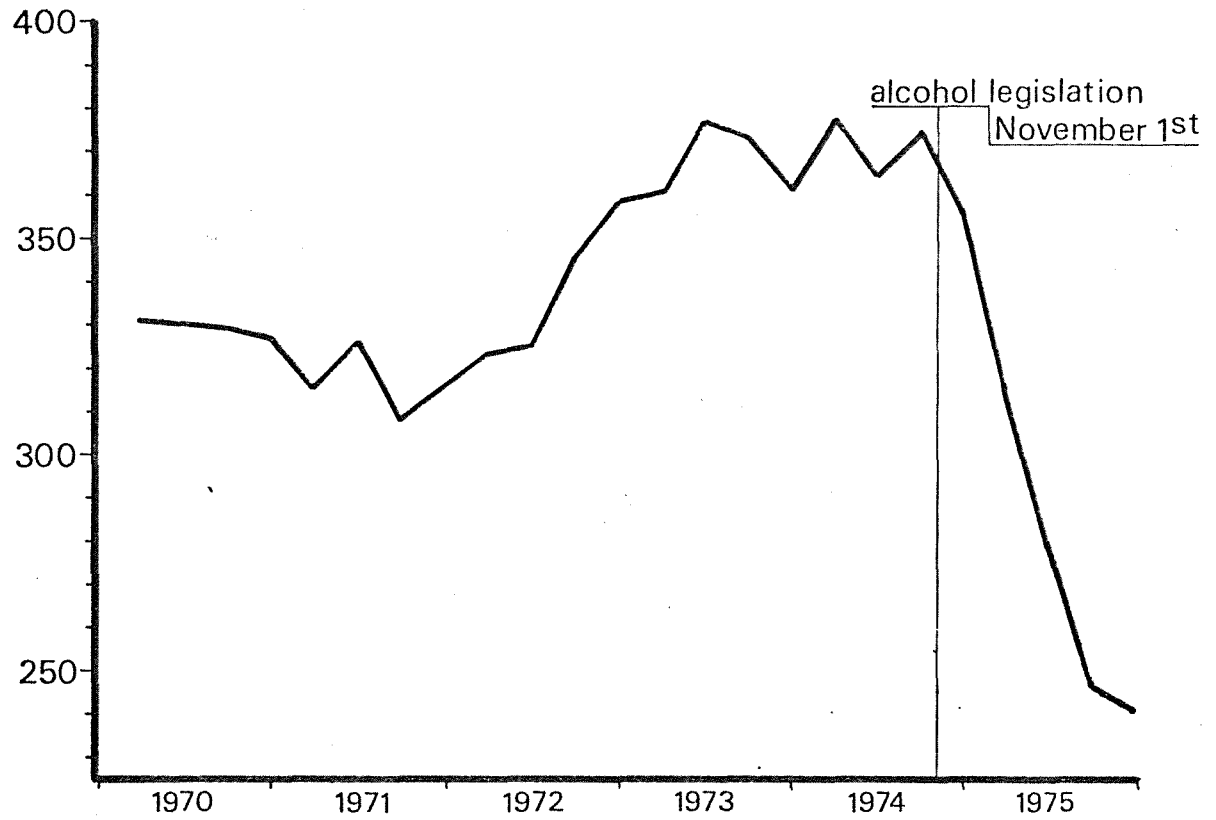


Figure 7. Moving twelve-month total of fatal accidents

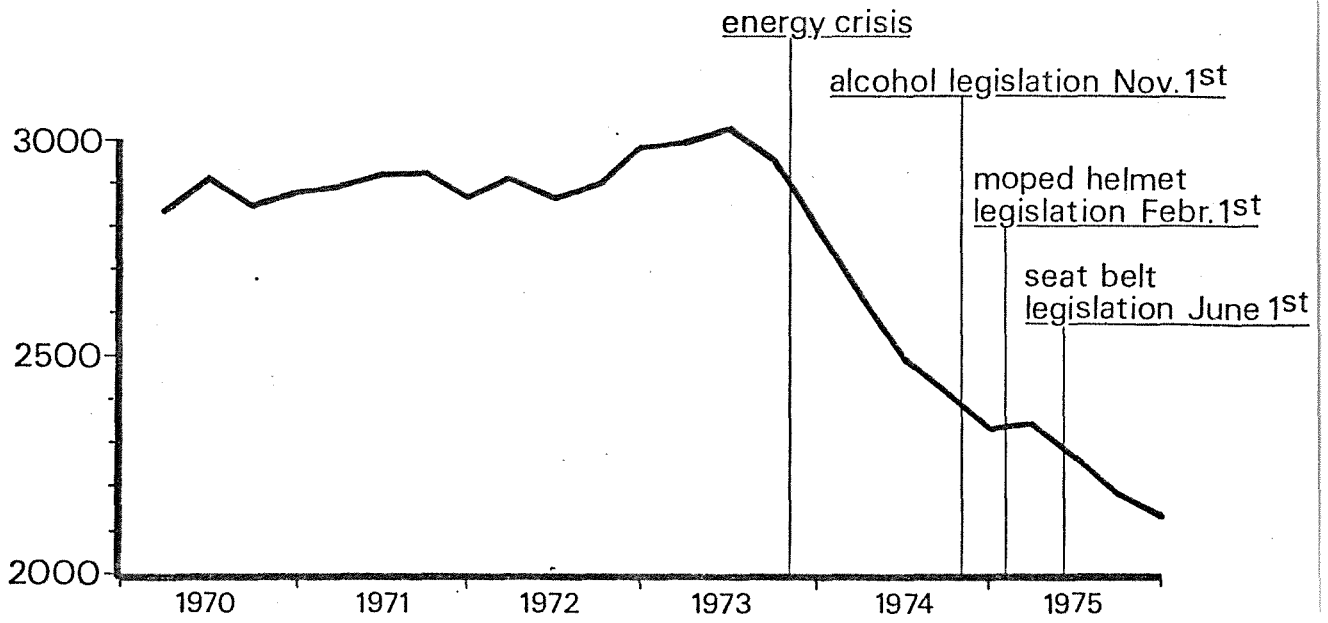


Figure 8. Moving twelve-month total of fatal accidents by type of vehicle and time of day

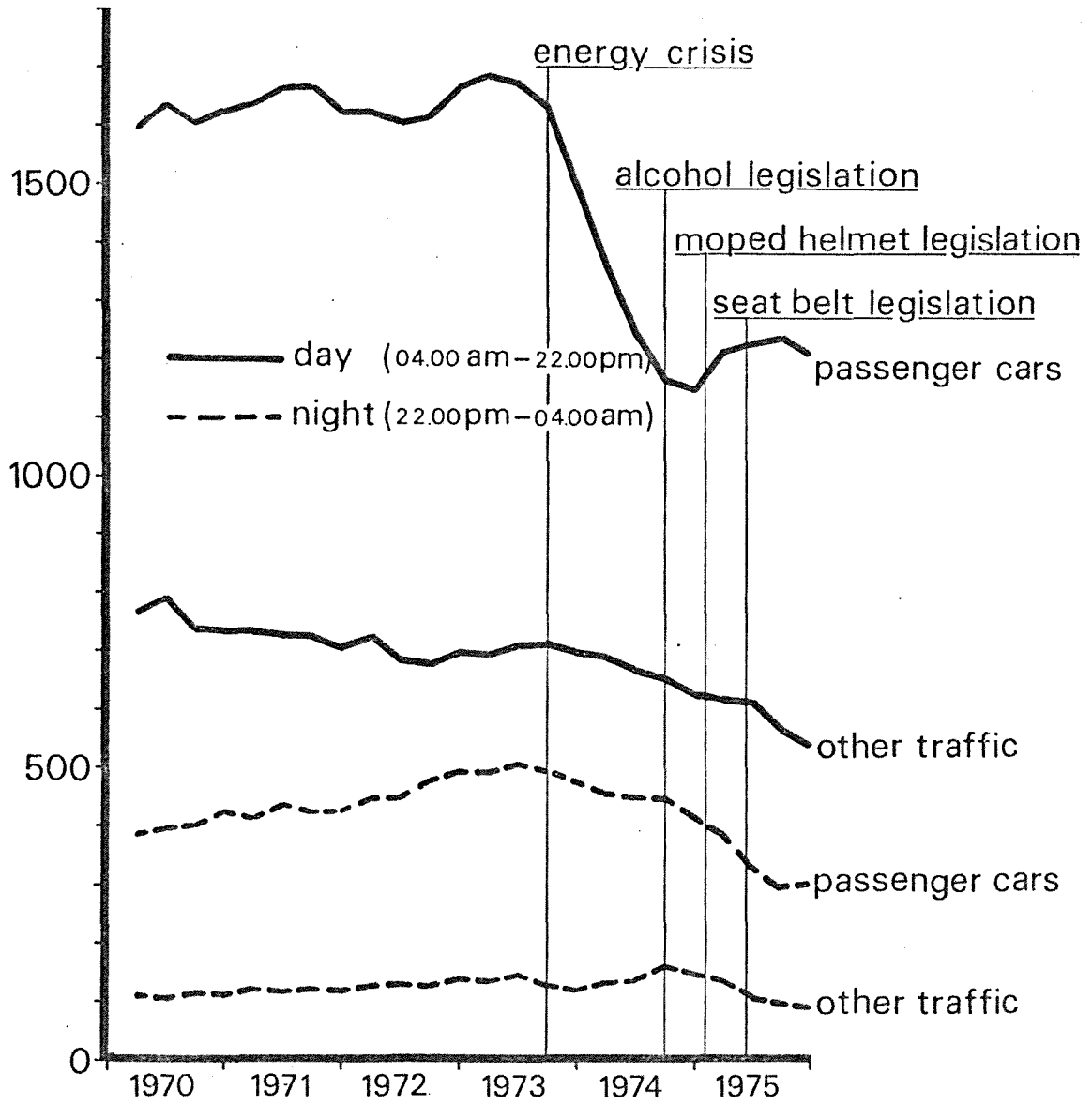


Figure 9. Moving twelve-month total of fatal accidents involving passenger cars by day and time of day

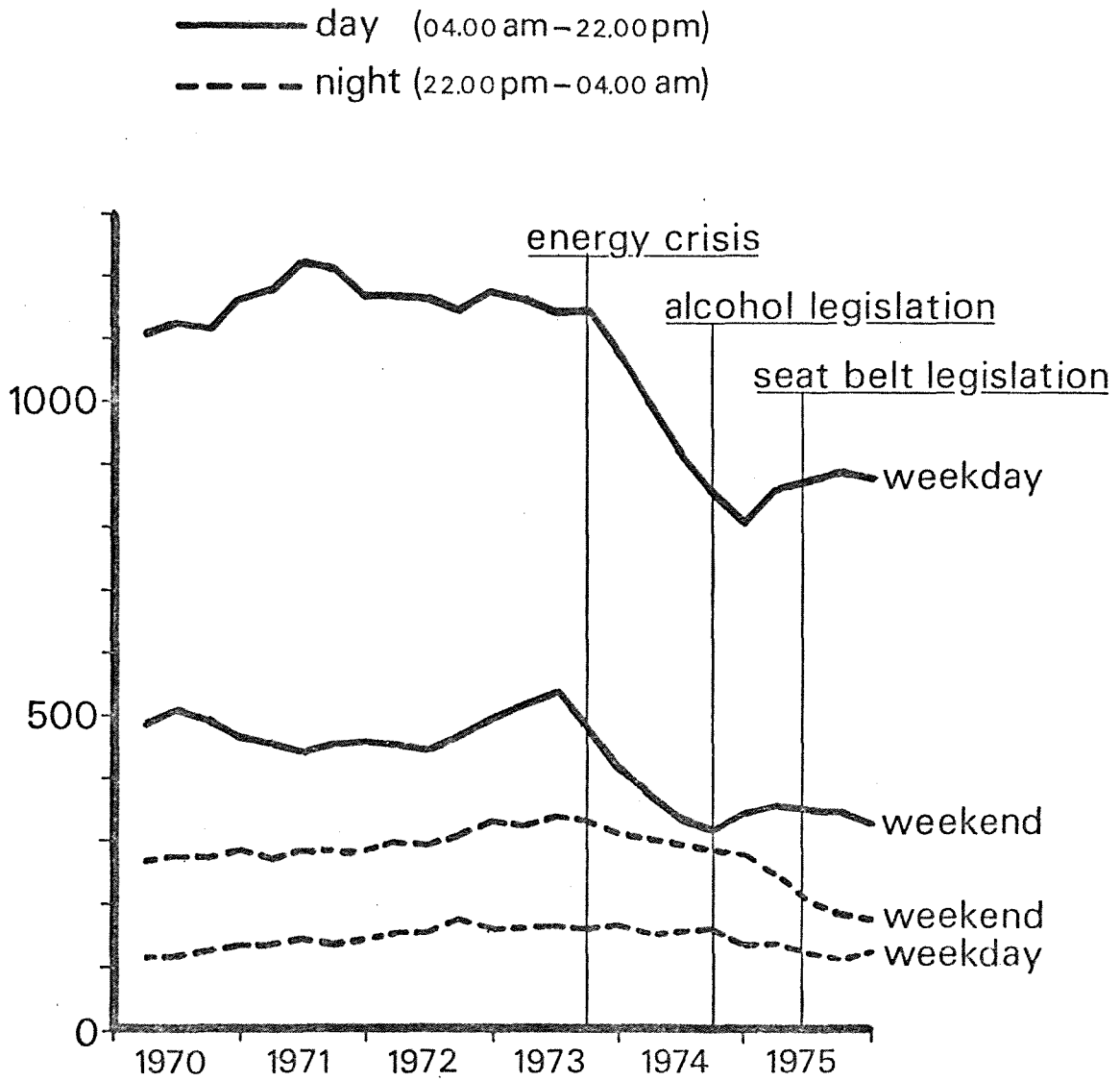
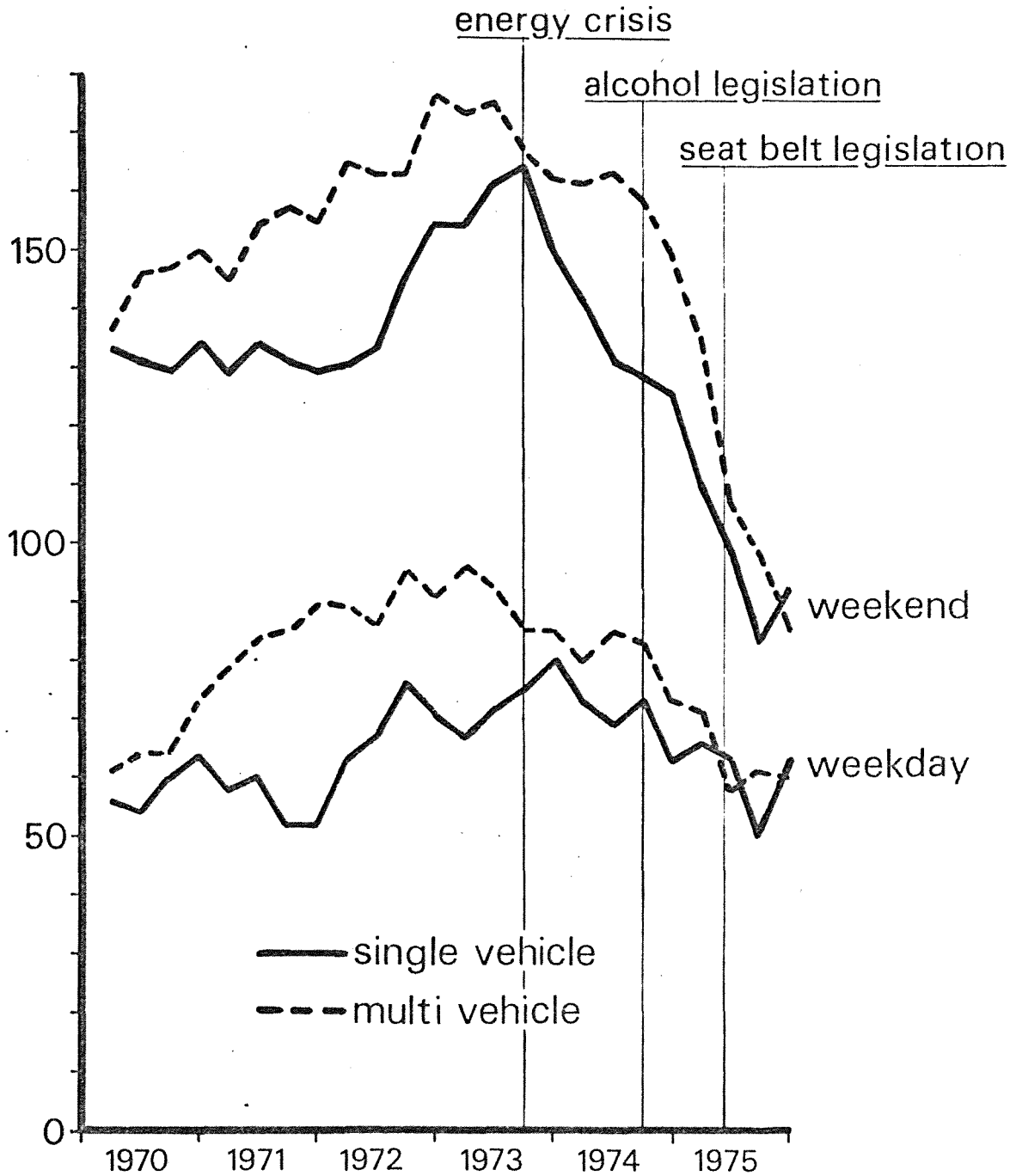


Figure 10. Moving twelve-month total of fatal accidents involving passenger cars at night.



TABLES 1-8

Table 1. Number of criminal traffic offences registered by the police

Table 2. Number of subjects, refusal rates and BAC determination

Table 3. BAC-distribution by time of day and year

Table 4. Distribution of drivers with BAC > 100 mg/100 ml by time of day and day of week: 1975

Table 5. BAC-distribution by day of week and year

Table 6. BAC-distribution by time of day and age: 1975

Table 7. Distribution of drivers with BAC > 100 mg/100 ml by time of day and age: 1975

Table 8. BAC-distribution by sex and year

Table 1. Number of criminal traffic offences registered by the police

1971	Drunken driving	Other criminal traffic offences
1st quarter	2418	7019
2nd quarter	2537	7157
3rd quarter	2527	6828
4th quarter	2768	7466
Total	10250	28470
1973		
1st quarter	2679	7023
2nd quarter	2707	6972
3rd quarter	2595	7130
4th quarter	2791	7328
Total	10772	28346
1974		
1st quarter	2906	7138
2nd quarter	2839	7777
3rd quarter	2862	7220
4th quarter	3137	7572
Total	11744	29707
1975		
1st quarter	4012	6274
2nd quarter	4883	5847
3rd quarter	5352	5734
4th quarter	6061	6849
Total	20308	24704

Table 2. Number of subjects, refusal rates and BAC determination

	Year				
	1970	1971	1973	1974	1975
1. Number of drivers asked for cooperation	3141	3417	2617	1946	4039
2. Number and percentage of refusals	451 14%	434 13%	483 18%	67 3%	455 11%
3. Number and percentage of 1 for whom complete information available	2675 85%	2967 87%	2109 81%	1748 90%	3544 88%
4. Number and percentage of 3 for whom BAC based on blood analysis	2305 86%	2413 81%	1125 53%	-	311 9%
5. Number and percentage of 3 for whom BAC based on breath analysis	370 14%	554 19%	984 47%	1748 100%	3233 91%

Table 3. BAC-distribution by time of day and year

Time of day	BAC (mg/100 ml)				total
	20	20-50	50-100	100	
1970					
22.00 - 24.00 hours	86	8	4	2	100
24.00 - 02.00 hours	69	13	12	7	100
02.00 - 04.00 hours	54	15	17	14	100
Total	78	10	8	5	100
1971					
22.00 - 24.00 hours	82	9	5	4	100
24.00 - 02.00 hours	61	15	13	11	100
02.00 - 04.00 hours	47	15	20	18	100
Total	72	12	9	8	100
1973					
22.00 - 24.00 hours	80	13	6	2	100
24.00 - 02.00 hours	59	20	14	7	100
02.00 - 04.00 hours	45	19	20	16	100
Total	69	16	10	5	100
1974 ¹					
Total	80	8	9	3	100
1974 ²					
Total	95	3	1	-	100
1975					
22.00 - 24.00 hours	85	10	4	1	100
24.00 - 02.00 hours	76	13	8	4	100
02.00 - 04.00 hours	65	11	13	11	100
Total	80	11	6	3	100

¹ results of last weekend before November 1st, 1974

² results of two weekends after November 1st, 1974

Table 4. Distribution of drivers with BAC > 100 mg/100 ml by time of day and day of week: 1975

Time of day	Day of week			total
	Friday	Saturday	Sunday	
22.00 - 24.00 hours	4	5	10	19
24.00 - 02.00 hours	17	10	11	38
02.00 - 04.00 hours	19	15	9	43
Total	40	30	30	100

Table 5. BAC-distribution by day of week and year

Day of week	BAC (mg/100 ml)				total
	<20	20-50	50-100	>100	
1970					
Friday	77	12	8	4	100
Saturday	74	11	8	7	100
Sunday	82	7	7	3	100
Total	78	10	8	5	100
1971					
Friday	73	12	8	8	100
Saturday	67	13	12	7	100
Sunday	75	9	8	8	100
Total	72	12	9	8	100
1973					
Friday	71	15	10	4	100
Saturday	65	18	11	6	100
Sunday	73	14	9	5	100
Total	69	16	10	5	100
1975					
Friday	75	13	8	4	100
Saturday	79	12	6	2	100
Sunday	85	7	5	3	100
Total	80	11	6	3	100

Table 6. BAC-distribution by time of day and age: 1975

Time of day	Age	BAC (mg/100 ml)				total
		<20	20-50	50-100	>100	
22.00 -	< 25 years	85	9	6	1	100
	25-35 years	83	11	5	2	100
24.00 hours	35-50 years	82	13	3	2	100
	> 50 years	91	6	2	-	100
	Total	85	10	4	1	100
24.00 -	< 25 years	72	16	5	7	100
	25-35 years	76	12	10	3	100
02.00 hours	35-50 years	78	14	8	1	100
	> 50 years	86	5	9	1	100
	Total	76	13	8	4	100
02.00 -	< 25 years	68	9	15	8	100
	25-35 years	62	13	13	13	100
04.00 hours	35-50 years	63	11	14	12	100
	> 50 years	75	9	6	11	100
	Total	65	11	13	11	100

Table 7. Distribution of drivers with BAC > 100 mg/100 ml by time of day and age: 1975

Time of day	Age				total
	<25	25-35	35-40	>50	
22.00 - 24.00 hours	2	8	8	1	19
24.00 - 02.00 hours	22	12	3	1	38
02.00 - 04.00 hours	10	19	11	3	43
Total	34	40	21	5	100

Table 8. BAC-distribution by sex and year

Sex	BAC (mg/100 ml)				total
	<20	20-50	50-100	>100	
1970					
Male	76	11	8	5	100
Female	87	10	3	1	100
Total	78	10	8	5	100
1971					
Male	70	12	10	8	100
Female	90	4	4	2	100
Total	72	12	9	8	100
1973					
Male	68	16	11	5	100
Female	85	10	3	3	100
Total	69	16	10	5	100
1975					
Male	78	11	7	4	100
Female	88	11	1	1	100
Total	80	11	6	3	100