Safety belts: their fitting and use

Enquiry 1968/1969
among road-users on roads outside built-up areas

Institute for Road Safety Research SWOV

Stichting Wetenschappelijk Onderzoek Verkeersveiligheid SWOV

P.O.Box 71, Deernsstraat 1, Voorburg 2110, The Netherlands

Publication 1970-2

Contents

Foreword

The Institute for Road Safety Research SWOV, in co-operation with the Institute for Road Vehicles TNO, Delft, the Institute of Biomechanics and Rehabilitation of the Free University, Amsterdam, and the College of Automobile Technology, Apeldoorn, is collecting information for statistical research into the relationships between car constructions and safety devices and injuries to occupants of cars in accidents.

Of existing safety devices which may have a favourable influence upon injuries, the safety belt is still regarded as the most important. It is true that in the United States the automobile industry has announced that the air-bag system is to be fitted in some makes and types of cars to supplement and/or replace safety belts, but it seems unlikely that this system will be generally applied in all types of passenger cars within the next eight to ten years. The main purpose of the above research is therefore to ascertain the effect of the various types of safety belts.

Collection of information for statistical accident research – started in September 1968 – is limited for organisational reasons to part of the car accidents in the Netherlands. As regards accidents outside built-up areas, until June 1969 only accidents were included which were known to the Royal Dutch Touring Club (ANWB) road patrols. Since 1st June 1969 a number of national police districts have also been notifying accidents known to them. As regards accidents inside built-up areas, The Hague city police notifications have been used since February 1969.

The volume of accident statistics needed for reliable conclusions depends on the percentage relating to safety-belt users. The research should compare accident data for about a thousand safety-belt users with those for non-users. In order to forecast the amount of information required it was necessary to know something about the percentage of car safety belts – subdivided by types – in actual use. In October and November 1968, therefore, an enquiry was made among motorists stopping at filling stations on main roads outside built-up areas patrolled by ANWB road patrols, for which accident records are kept.
As the intention was merely to gain an idea of the use of safety belts, the enquiry was not on a large-scale nor widely representative, although this did receive attention. It met its purpose; the results enabled provisional forecast to be made. Information also emerged which, allowing for enquiry's limited extent and representativeness, is interesting enough for publication. In order to continue studying the use of safety belts, for instance in order to make timely modifications in the plans for statistical research, it was decided to undertake further enquiries in 1969 and perhaps in 1970. These will be wider and more representative than the first.

This publication has been prepared by Th. P. M. de Grefte (Statistics and Documentation Department SWOV) and H. G. Paar (Road and Vehicle Department SWOV).

E. Asmussen
Director Institute for Road Safety Research SWOV

Conclusions

The 1968/1969 enquiry showed that outside built-up areas in the Netherlands 22% of passenger cars had safety belts.
Of these, 39% were really used by drivers. Hence, 8.5% of all passenger car drivers interviewed (outside built-up areas) used safety belts (see 5.3., Table 7).
Consequently, it was decided that the data required for accident research (see Foreword) would have to cover at least 10,000 drivers involved in accidents. This figure is based on the requirement of about 1,000 belt-using drivers concerned in accidents and the expectation that during the time data are being collected (about two years) the use of safety belts will increase so that an average usage of 10% will be likely.

Of the various types, the diagonal belt is fitted relatively more than others but is least used. The three point belt is used relatively more. No explanation of this can be indicated. Use of the lap belt is in between three point and diagonal belts (see 5.3., table 9).

If safety belts are fitted, men use them more than women (see 5.3., Tables 10 and 11).

Younger drivers (up to about 35) have fewer safety belts than other drivers (see 5.3., Table 15).

The newer cars are, the more safety belts tend to be fitted, with the exception of the years 1962 and 1963 (see 5.3., Table 18).

There is a correlation between make of car and the percentage of the type of safety belt (see 5.3., Tables 19 and 20). This is probably connected with the particular manufacturer's/importer's/dealer's attitude towards safety belts.

Figures for cars fitted with safety belts and the use of these by Volvo drivers (See 5.3., Tables 19 and 20), indicate that compulsory fitting of safety belts would not have enough effect unless they were in some way also made more attractive and/of more convenient to use.

Belts with metal to webbing buckles are used with less slack than those with metal to metal buckles (slack reduces the useful effect) (See 5.4., Table 22). Lap belts are used with less slack (between belt and pelvis) than diagonal and three point belts (between belt and breastbone) (See 5.4., Table 22).

A repetition of the investigation is advisable for the following reasons:
a. the area covered by the accident research has changed since November 1968 (see Foreword); usage of belts in this changed area is not known;
b. the fitting of belts and maybe their use is a function of time (See Table 18); it is useful to continue examining this trend for the purpose of the research;
c. it must be verified whether sampling at filling stations is representative of road traffic;
d. a number of data not recorded in the investigation (length of journey, type of car and car owner), are likely to be of importance for information about the fitting and use of belts; it would be useful to know to what extent this is so;
e. some non-significant results, owing to the limited number of observations, can be verified;
f. a number of significant but prima facie inexplicable results (for instance the high percentage of three point belts in use) might be explained by motivation research; whether this can be realised organisationally and scientifically justified requires further consideration.

The investigation

1. Objekt of investigation

As already mentioned in the Foreword, the main object of the investigation is to ascertain the extent to which safety belts are fitted and used in cars on the roads covered by accident research. As safety belts are hardly ever fitted in heavy vehicles, the interviews were limited to passenger cars, delivery vans and mini-buses. Also, since safety belts are hardly ever fitted for the rear seats, these were disregarded.

As the occupants of cars had to be approached personally anyway (see Section 2) the opportunity was also taken to collect information likely to be of value in considering measures for encouraging the proper use of safety belts. In order to obtain an idea of the structure of the group of safety-belt users and any differences as compared with other road users, therefore, the following information was recorded in addition to noting whether belts were fitted and used:

- make and year of manufacture of car;
- driver's age, sex and driving experience;
- sex of (front-seat) passenger.

Although the original intention was to ask about car owners' motives for not fitting and using safety belts, this was abandoned because it would have made the interviews too long (see Section 3).

There are a number of factors determining a safety belt's effect in an accident. For instance, the type of belt combined with the car's dimensions and the build of the occupants, the amount of slack in the belt during using and the way it is fitted. In accident research it will often be possible to obtain most of this information after the event, but not that about slack between belt and body. In order to ascertain more about this per type of belt in practice, this was measured during the investigations and it was examined what safety-belt factors influence it.

2. Method of investigation

Whether safety belts are fitted and used in cars driving on certain roads could be ascertained as follows:
a. by means of a (written) enquiry based on a random sample from registration number records;
b. by visual observation of road traffic, followed if need be by a written enquiry covering observed registration numbers;
c. by stopping and interviewing road users on the roads concerned;
d. by interviewing road users at points where they have to stop.

2.1. Sample from registration number records

Advantage:
A widely representative sample of car owners.

Disadvantage:
The sample is not representative of drivers on given roads. Drivers of hired cars, chauffeurs etc. will not appear in the sample and car owners not driving on the roads in question will appear in it. Selection according to road or area thereby becomes very difficult.

The disadvantage is so great that this method is not practicable.

2.2. Visual observation

Advantage:
1. Comparatively little work is involved.
2. All passing traffic can be observed (giving a very accurate sample).

Disadvantages:
1. Some types of belt (especially the lap belt) are hard to observe, especially when not being used; it will also be hard to distinguish between (not-used) three point and diagonal belts.
2. No additional information about belt, car or occupants can be noted.

Especially the first disadvantage is so great that visual observation alone is not a feasible method of ascertaining fitting and use of safety belts. It could be used to verify the pattern of a sample obtained by other means (for instance to check make and type of car).
The drawbacks could be met by tracing owners of passing cars from their registration numbers and sending them a questionnaire. This involves the problem of the no-response group that inevitably occurs with such questionnaires, which might greatly affect the results, especially as regards the use of belts. Nor would this method reveal after the event whether belts were worn slack or tight.

This method alone is therefore unsuitable for this enquiry. It might, however, be combined with those mentioned in 2.3. and 2.4. On the spot interviews could then be kept very short – with the least possible delay for the driver – and most data could be collected afterwards in writing. There would also be a good check on the no-response group.
Although this combination is attractive, it was rejected for present purposes as too cumbersome and expensive.

2.3. Interviewing by stopping drivers

With this method, often used for origin and destination research, all or part of the traffic is stopped and interrogated on the road in question.

Advantages:
1. A very representative sample.
2. Within reasonable limits, a fairly extensive enquiry is possible.

Disadvantages:
1. Organisation involves much work as police and road authorities have to help.
2. There are some traffic hold-ups at interview points.

Because of these drawbacks, the method was not chosen although its advantages make it scientifically the best.

2.4. Interviewing at points where traffic has to stop

There are many places where traffic has to stop a while. Apart from irregular stoppages (for instance at traffic lights, car parks, etc.) which are thus not very suitable for our investigation, a definite stopping place is a filling station, and drivers can be interviewed there.

Advantages:
1. Organisation is comparatively simple, certainly as compared with stopping cars.
2. If the interview is the right length and properly carried out, there need be no extra traffic hold-ups.

Disadvantages:
1. Various circumstances may prevent the sample from being properly representative. For instance, fuel consumption and/or tank capacity may differ, so that one make and type of car has to re-fuel oftener than another, and drivers' re-fuelling habits may also differ.
2. The interview must be kept comparatively short, as additional delay would otherwise be caused and both interviewee and station manager may object (see also 3.2.).

Ultimately this method was chosen because its organisational advantages were expected to outweigh any disadvantages. To a limited extent it can be checked whether the sample is representative by comparing some enquiry data with data from other sources.

3. Scheme of investigation

3.1. Interview form design

Appendix 1 shows the form originally designed for the investigations (translated). Questions 1 to 3 furnished general information on the vehicle and its occupants. The year of manufacture could usually be deduced from the registration number.
These data were used to establish relationship regarding fitting and use of belts and to check whether the sample was representative.
Questions 4 and 5 gave information on the journey that was being interrupted for re-fuelling. These questions were included because a connection was assumed to exist between these data and the use of safety belts.
Questions 6 to 8 furnished information on driving experience. Here again, a connection was assumed to exist with fitting and use of belts, while the information could also be used to check whether the sample was representative.
Questions 9 to 17 concern safety belts. Some questions asking for an opinion were included to obtain an idea of drivers' views on safety belts and their use or non-use.
For answering question 17 – regarding slack – blocks were placed between belt and body, similarly to British investigations. *

3.2. Pilot interviews

In order to check the questions on the form and to find the best interviewing method, pilot interviews were held on 27th September 1968.
As soon as a car drove up to the filling station, Questions 1 and 2 were completed by the interviewer. Immediately the pump attendant started supplying the driver's order – when the driver had a short time to spare – the rest of the interview was completed.
Whenever possible, the use of a safety belt was verified by the interviewer himself. Otherwise, the driver was asked whether 'he had just been using a safety belt'. If there was a passenger, the interviewer could nearly always see for himself whether a belt was being used. For the interview to go well, the pump attendant must on no account be inconvenienced (for instance by losing time), because the filling station manager's co-operation depended on this. It was soon found, however, that this requirement could not be complied with, especially if the occupants used belts. Sometimes, drivers declined to co-operate.

The form was then cut down as in Appendix 2. The type of car and some information on the driver's journey were omitted. It subsequently transpired that this information should have been included, and in any subsequent interviews it will be recorded. All questions asking for opinions were also omitted. This was possible because they were not essential to the main purpose of the interviews.

Lastly, the method of checking slack was simplified. It was now determined by asking the belt user to lift the belt with one finger and measuring the space between belt and body with a rule: the lap belt at the pelvis, the three point and diagonal belts at the breastbone.

The rest of the pilot interviews with the modified procedure went much quicker and there was no further inconvenience to the pump attendant or refusals by motorists. It was decided to use this method for the acutal interviews.

* 'Safety belts', an unpublished enquiry by Consumers Association 'Which', January 1967.

3.3. Preparing for actual interviews

3.3.1. Distribution

The interview points had to satisfy certain requirements. They had of course to be located on ANWB-patrolled roads, because at that time accident research was also limited to these roads. It was not feasible to have interviews on all of them, and a choice had to be made. As the type of road (for instance motorway, two-lane road, etc.) was expected to influence the use of safety belts, the distribution of interview points over these roads had to be representative of the length of the various types of roads in the ANWB's road patrol district.

As it was also conceivable that fitting and use of safety belts might depend on the district, the Netherlands was divided into four areas:
North: the provinces of Groningen, Friesland and Drente;
East: the provinces of Overijssel and Gelderland;
West: the provinces of Utrecht, Noord-Holland and Zuid-Holland;
South: the provinces of Zeeland, Noord-Brabant and Limburg.

In these areas, the number of interviews had to be related to the volume of traffic. Figures were not known for this, however, but were known for the number of vehicles per area relative to the national total (about 10%, 20%, 50% and 20% respectively) and this was allowed for. Motor traffic and car ownership in an area were assumed to be directly related, as indicated by other research.
For conclusions to be reliable, also in area comparisons, it was considered advisable to have at least 400 interviews in the 'smallest' area. The total sample therefore had to cover at least 4,000 interviews.
Organisationally, it was advisable not to have too many interview points. About twenty were expected to suffice.

To recapitulate, the selection of interview points had to allow for:
a. location on an ANWB-patrolled road;
b. 'reasonable' distribution over types of road;
c. distribution per area allowing for car ownership;
d. at least 4,000 interviews nationally;
e. not more than about twenty interview points.

For organisational reasons, it was decided that interviews would take place on working days only from 8.0 a.m. to 6.0 p.m., most of both peak periods thus being included.

A number of filling station proprietors were thereupon asked to collaborate. They were selected on the basis of location, and density of re-fuelling vehicles (as estimated by the station manager). Ultimately twenty filling stations were selected.

3.3.2. Planning

The month of October was chosen because the pattern of that month's traffic is believed to be closest to the average for the year.
Organisational needs required the interviews to be completed within three weeks, there were five interviewers (working students) divided into two teams.

To make the investigations as efficient as possible, plans were drawn up on the basis of the numbers of passenger cars calling at the filling station as estimated by the station managers.

The result was that one team (2 men) operated daily from The Hague, while another (3 men) stayed overnight near the interview point. A SWOV employee was attached to each team to regulate and check the interviewers' work.

The filling station managers were given written particulars of the days and times the interviewers would attend at their stations.

4. Effectuation and processing

4.1. Effectuation

After the first week, the number of persons interviewed proved to be about 40% below forecast. The filling station managers had been rather optimistic in their estimates, probably because the summer bustle had only just finished.

In order to reach the required number of interviews, the SWOV employees, in consultation with SWOV, approached several other filling station managers in all areas, mostly on the same roads. The stations were selected so as to satisfy the requirements mentioned in 3.3.1.
The interviews were adjusted so that where the plans provided for two interwiewers, one was transferred to a new filling station. This was possible because one interviewer was sufficient even at busy stations.
Covering these extra stations made the interview period several days longer and the investigations were not ended until 5th November 1968.

Otherwise, the interviews went according to plan and there were no problems.

4.2. Processing

In view of the large number of interviews, it was decided to have the results, except for coding processed by an outside firm.
The IBM computer centre, Rijswijk, was engaged for this work, as it has complete programming facilities for easy processing of interview results. Coding was carried out by SWOV employees.

5. Results

5.1. Accuracy of results

Results obtained with a sample must be interpreted with a certain degree of probability. From probability theory, the degree of accuracy, the margin, can be calculated which indicates the maximum percentage whereby the percentage found in the sample or sub-sample deviates in 9 out of 10 cases from the actual percentage.
These margins are given in Tables 1 to 21.
They have been into account in drawing conclusions from the observations. The average slack in Tables 22 to 26 has been tested with Student's t-test. Significant differences only are given in the conclusions.

5.2. Representativeness of sample

Table 1 shows the number of passenger car drivers interviewed in each area. The required percentage is that mentioned in 3.3.1. Comparison of car owner percentages (required percentage) and traffic percentages (in the interviews) is not completely possible because some roads have more through traffic, i.e. coming from other areas, than others. Moreover, the interviews were not held inside built-up areas. This may be why the Western area is given a little more emphasis mainly at the expense of the Southern area.

Table 2 lists the nine most popular makes of passenger cars and Volvo, as covered by the interviews. Volvo is mentioned specially because new Volvos are fitted with a three point belt as standard equipment. The table shows that the ten makes appear in the interviews to practically the same extent (79.5%) in the total number of cars (79.4%). If the cars are considered make by make, however, some striking differences are found. For instance too many Citroëns, Fords and Mercedes and too few DAF's, Renaults and Volkswagens were represented in the interviews. The range of each of these makes, except for small Citroëns, differs little from the others and this cannot explain the differences therefore. Research elsewhere has often shown that outside built-up areas Fords and Mercedes occur relatively more, probably because they are used for business purposes. Adequate verfication is only possible however by observing makes of cars driving by that do not stop at the filling station during the interviews. This visual method was not applied because it would have greatly increased the amount of work; but it will be done in any subsequent investigations.

Table 3 gives the age groups of all passenger car drivers interviewed. The first column gives figures obtained in interviews by Shell in 1965 (car owners), the next column figures from similar interviews in 1967/1968 and lastly the figures from SWOV's 1968/1969 interviews (car drivers outside built-up areas). There is a big trend towards young drivers which, besides the 'normal' movement of recent years, can be explained by the difference in interview procedure. These figures cannot therefore be used to see whether the sample was representative.

Sub-division according to sex gives a fair idea of car ownership by men and women (Table 4). The relative increase in the number of women drivers is about 1% per annum.

Table 5 compares the numbers of annual driven kilometres with those previously found in interviewing car owners. As the SWOV interviews took place outside built-up areas, on through roads and on weekdays, a difference in average annual driven kilometres is of course likely. No such investigations have previously been made outside built-up areas, however, so an adequate check is not possible.
The average annual driven kilometres found in these interviews was about twice the national average for car owners.

Table 6 compares the age of the vehicles with data found in other investigations. The first column gives the age according to 1966 data. The second column gives the same figures moved up two years. The third column gives SWOV estimates based on Netherlands Central Bureau of Statistics CBS figures and the last column the SWOV data. There is a trend towards newer cars, while the years 1965 and 1966 show big differences. The latter feature is due to the increase in car prices on 1st January 1966. The SWOV estimates do not take this into account.

It will be clear that verifying whether the sample was representative by referring to existing information proved less than was at first expected. Nothing can therefore be said about this. It will receive special attention in any further investigations.

5.3. Fitting and use of safety belts

A general compilation of the principal information obtained in the 1968/1969 SWOV interviews is given in Table 7. As the proportion of delivery vans/minibuses is fairly small and especially because there are few safety belts in this category, the other tables show only interviewed passenger car drivers and their passengers. Safety belts were noted in 22% of the passenger cars, and 39% of these are used by the drivers. In other words: 8.5% of the interviewed car drivers use safety belts outside built-up areas.
The percentage of safety belts and the percentage of users on motorways and other roads show no pronounced differences (Table 8).

Table 9 is a compilation of the various types of safety belts and their use by the interviewed drivers.
The diagonal belt is found to be the most commonly fitted, but the least used.
The three point belt, which is less frequently fitted, is much more widely used. This is rather surprising; of the three types, the three point belt is generally the most inconvenient and causes most trouble to put on (properly). The 47% users is higher still if the Volvo belts are disregarded (See also Tables 19 and 20), then it rises to 51%. No explanation of this high percentage can be indicated from the interviews.

Tables 10 and 11 distinguish between male and female drivers. They show that women have a somewhat higher percentage of diagonal belts fitted, at the expense of the other two types. It is interesting to note the slightly lower use of all types by women drivers. Perhaps women object more to their use than men.

Tables 12 to 14 indicate the fitting and use of safety belts according to area. Drivers at least, have more belts in the west and east than in the north and south. No difference in use is detectable.

Table 15 shows that younger drivers (up to about 35) possess fewer belts than other drivers. The percentage of use by other age groups, however, fluctuates so much that no correlation is evident between these percentages and age.

Tables 16 and 17 show that the use of safety belts bears no direct relationship to driving experience.

Table 18 might suggest that there tends to be a bigger percentage of safety belts in newer cars. The respective numbers of different types fluctuate greatly from year to year and no opinion can be expressed about this. In any event, the public have shown no preference in purchasing particular types in recent years.

Tables 19 and 20 show the safety belts fitted and used for a number of makes of car. These makes are the nine most common ones met with in the investigations, plus Volvo which occupies a distinctive place because it has for some time been fitted with (three point) belts as standard equipment. This stands out in the percentage of cars with belts. The figures for other makes fluctuate, perhaps partly due to belts being advocated to a varying extent by manufacturers/importers/dealers. This may also explain the big differences in distribution of the various types of belt per make of car. The high percentages of diagonal belts in Volkswagens and DAFs and, of course, the high percentage of three point belts in Volvos are striking.
Going by the in-use percentage for Volvos, making the fitting of safety belts compulsory is likely to cause an absolute increase in their use, but the percentage of users may then fall considerably owing to persons being forced to own belts which they do not wish to wear. This has been the experience of the U.S.A., Sweden and other countries *.

5.4. Slack in safety belts

The slack between the safety belt and the body largely determines the belt's effectiveness in an accident; the less slack there is the more effective it will be. During the interviews, therefore, the slack in belts was measured wherever possible with a view to learning something about the factors influencing this. The measurement method is discussed in 3.2.

In order to see whether any average slack could properly be determined in the various sub-divisions, the distribution of the various types of belt over the various sub-divisions is first determined in Table 21. No particularly great deviations are found, and the noting of difference in average slack as between the various sub-divisions is definitely valuable. The choice of belts was governed by the types fitted. For instance, no inertia-reel belts were noted during the interviews.

Table 22 shows the average slack in the various types of belt used by car occupants. A distinction is made between belts with metal to metal buckles (putting on the belt and adjusting length are two distinct operations) and belts with metal to webbing buckles (putting on and adjusting are a single operation). The type of fastening clearly influences the average slack; metal to webbing buckled belts are better in this respect. Lap belts are also used with less slack than three point and diagonal belts, though the difference in place of measurement (pelvis and breastbone) must be borne in mind.

As the driver had often undone the belt before measurement in order to talk better to the pump attendant, the sub-division in Tables 23 and 24 examines whether this influenced the slack measured when the belt was fastened again before driving off; cheating is possible expecially with the metal to webbing buckle. The difference found among drivers between metal to webbing and metal to metal buckles (Table 23) – which (owing to the large number of drivers) mainly determines the difference already noted in Table 22 – is also found to exist equally – though not significantly – among passengers (Table 24). We have the impression that drivers complied properly with the request to fasten their belts in the way they usually did. The sub-division in Tables 25 and 26 shows that women use their safety belts looser than men. But this difference was not significant as there were comparatively few women occupants.

* See, for instance, Arthur Stern, Seatbelt Utilization, ACIR Bulletin No. 8, January 1966.

As regards the measured slack it can on the whole be said that it does not indicate the forward movement of the body in a head-on collision. The movement is much greater owing to the elasticity of the occupants' clothing and bodies and the elasticity of the belt itself. Where the measured slack is less, the forward movement of the body will be less as well.

Interviews	Areas				
	North	East	West	South	Total
Number	383	664	2311	656	4014
Percentage of national total	9	17	57	17	100
Margin	±1	±1	±2	±1	
Required percentage	10	18	51	21	100

Table 1. Passenger car drivers interviewed per area.

Make of car	Interviews			Percentage of national total (1968)	Frequency ratio *
	Number	Percentage of total	Margin		
Citroën	231	5.7	±0.8	4.6	124
DAF	144	3.6	±0.6	5.7	63
Fiat	393	9.8	±1.0	9.5	103
Ford	606	15.1	±1.2	13.8	109
Mercedes	158	3.9	±0.6	2.1	186
Opel	599	14.9	±1.2	15.2	98
Renault	239	5.9	±0.8	7.0	84
Simca	161	4.0	±0.6	4.6	87
Volkswagen	601	15.0	±1.2	16.1	93
Volvo	64	1.6	±0.4	0.8	200
Others	818	20.5	±1.3	20.6	99.5
Total	4014	100.0		100.0	—

Table 2. Interviews with drivers of ten makes of passenger car.

* Frequency ratio is quotient of interview percentage and total percentage.

Age	Car owners (Shell)				Drivers (SWOV)	
	1965		1967/1968		October 1968	
	Percentage	Margin	Percentage	Margin	Percentage	Margin
18–24	7	±1	9	±1	14	±1
25–34	22	±2	24	±2	29	±1
35–44	29	±2	29	±2	26	±1
45–54	25	±2	22	±2	19	±1
55–64	13	±2	12	±1	9	±1
65 and older	4	±1	4	±1	3	±½
Total	100 (=1991)		100 (=2200)		100 (=4014)	

Table 3. Percentage distribution by age of car owners and drivers in various investigations.

Sex	Car owners						Drivers	
	1963		1965		1967/1968		October 1968 (SWOV)	
	Percentage	Margin	Percentage	Margin	Percentage	Margin	Percentage	Margin
Men	94	±1	92	±1	90	±1	88	±1
Women	6	±1	8	±1	10	±1	12	±1

Table 4. Percentage distribution by sex of car owners and drivers in various investigations.

	Car owners			Drivers
	1963	1965	1967/1968	October 1968 (SWOV)
Annual driven kilometres	18,400	16,500	16,150	30,300

Table 5. Average annual driven kilometres of car owners and drivers in various investigations.

Year of manufacture	1966 CBS	1968 CBS *	1968 SWOV estimate	October 1968 SWOV interviews	
	Percentage	Percentage	Percentage	Percentage	Margin
1968	—	8	12	17	±1
1967	—	20	23	24	±1
1966	8	15	18	13	±1
1965	20	13	13	18	±1
1964	15	9	9	8	±1
1963	13	8	5	7	±1
1962 and earlier	44	27	20	12	±1
Not known	—	—	—	1	±½

Table 6. Comparisons of age of passenger cars.

* 1968 CBS is 1966 CBS moved along two years.

Type of car	Interviews	Belts fitted			Belts used				
	Number I	Number II	Percent. of I	Margin	Number III	Percent. of I	Margin	Percent. of II	Margin
Passenger cars	4014	868	22	±1	342	8.5	±1	39	± 3
Delivery vans/Minibuses	322	35	11	±4	8	2.5	±2	23	±10
Total	4336	903	21	±1	350	8	±1	39	± 3

Table 7. Fitting and use of safety belts (by drivers) in two types of vehicles.

Type of road	Interviews			Belts fitted			Belts used				
	Number I	Percent. of total	Margin	Number II	Percent. of I	Margin	Number III	Percent. of I	Margin	Percent. of II	Margin
Motorways	2616	65	±2	576	22	±2	237	9	±1	41	±4
Other roads	1398	35	±2	292	21	±2	105	7.5	±2	36	±6
Total	4014	100		868	22	±1	342	8.5	±1	39	±3

Table 8. Passenger car drivers interviewed on two types of road.

Type of belt	Belts fitted			Belts used		
	Number I	Percent of total	Margin	Number II	Percent. of I	Margin
Three point	270	31	±3	127	47	±6
Diagonal	392	45	±3	126	32	±5
Lap	206	24	±3	90	44	±7
Total	868	100		343	39	±3

Table 9. Fitting and use (by drivers) of various types of safety belt in passenger cars.

Type of belt	Belts fitted			Belts used		
	Number I	Percent. of total	Margin	Number II	Percent. of I	Margin
Three point	244	32	±3	117	48	±6
Diagonal	339	44	±4	111	33	±5
Lap	186	24	±3	83	45	±8
Total	769	100		311	40	±4

Table 10. Fitting and use (by male drivers) of various types of safety belt in passenger cars.

Type of belt	Belts fitted			Belts used		
	Number I	Percent of total	Margin	Number II	Percent of I	Margin
Three point	26	26	± 9	11	42	±19
Diagonal	53	54	±10	14	26	±12
Lap	20	20	± 8	7	35	±21
Total	99	100		32	32	±10

Table 11. Fitting and use (by women drivers) of various types of safety belt in passenger cars.

Area	Interviews	Belts fitted			Belts used		
	Number I	Number II	Percent of I	Margin	Number III	Percent. of II	Margin
North	442	84	19	±4	31	37	±11
East	890	195	22	±3	80	41	± 7
West	2612	676	26	±2	257	39	± 4
South	881	152	17	±3	67	44	± 8

Table 12. Fitting of safety belts and use by occupants of passenger cars, by areas.

Area	Interviews	Belts fitted			Belts used		
	Number I	Number II	Percent of I	Margin	Number III	Percent. of II	Margin
North	383	63	16	±4	23	37	±12
East	664	153	23	±3	62	41	± 8
West	2311	538	23	±2	208	39	± 4
South	656	114	17	±3	49	43	± 9

Table 13. Fitting and use of safety belts by passenger car drivers, by areas.

Area	Interviews	Belts fitted			Belts used		
	Number I	Number II	Percent of I	Margin	Number III	Percent. of II	Margin
North	59	21	36	±12	8	38	±21
East	226	42	19	± 5	18	43	±15
West	301	138	46	± 6	49	36	± 9
South	225	38	17	± 5	18	48	±16

Table 14. Fitting of safety belts and use by passengers seated next to drivers of passenger cars, by areas.

Age	Interviews	Belts fitted			Belts used		
	Number I	Number II	Percent. of I	Margin	Number III	Percent of II	Margin
18–24	560	78	14	± 3	22	28	±11
25–34	1149	204	18	± 2	93	26	± 6
35–44	1026	262	26	± 3	113	43	± 6
45–54	776	208	27	± 3	70	34	± 7
55–64	373	77	21	± 4	27	35	±12
65 and older	125	36	29	± 8	15	42	±16
Not known	5	3	60	±44	2	67	±54

Table 15. Fitting and use of safety belts by passenger car drivers, showing driver's age.

Driving experience (per annum)	Interviews	Belts fitted			Belts used		
Kilometres	Number I	Number II	Percent. of I	Margin	Number III	Percent. of II	Margin
< 7,500	135	25	19	±7	7	28	±18
7,500–12,500	484	71	15	±3	30	42	±12
12,500–17,500	418	75	18	±4	30	40	±12
17,500–22,500	655	116	18	±3	46	40	± 9
22,500–27,500	369	86	23	±4	46	54	±11
27,500–32,500	445	105	24	±4	48	46	±10
32,500–37,500	210	51	24	±6	22	43	±14
37,500–42,500	359	98	27	±5	38	39	±10
42,500–52,500	436	113	26	±4	30	27	± 6
52,500–62,500	207	64	31	±7	28	44	±13
> 62,500	291	64	22	±5	17	27	±11
Not known	5	—	—	—	—	—	—

Table 16. Fitting and use of safety belts by passenger car drivers, showing annual driven kilometres.

Driving experience (life)	Interviews	Belts fitted			Belts used		
Kilometres	Number I	Number II	Percent. of I	Margin	Number III	Percent. of II	Margin
< 25,000	293	46	16	±4	12	26	±13
25,000– 50,000	321	46	14	±4	13	28	±13
50,000–100,000	521	90	17	±3	53	59	±11
100,000–200,000	696	131	19	±3	58	44	± 9
> 200,000	2160	555	26	±2	206	37	± 4
Not known	23	—	—	—	—	—	—

Table 17. Fitting and use of safety belts by passenger car drivers, showing total driven kilometres.

Year car manufactured	Interviews	Type of belt fitted																	
		All belts			Three point belts					Diagonal belts					Lap belts				
	Number I	Number II	Perc. of I	Margin	Number III	Perc. of I	Margin	Perc. of II	Margin	Number IV	Perc. of I	Margin	Perc. of II	Margin	Number V	Perc. of I	Margin	Perc. of II	Margin
1968	667	169	25	± 3	68	10	±2	40	± 8	62	9	±2	37	± 7	39	6	±2	23	± 6
1967	956	235	25	± 3	73	8	±2	31	± 6	104	11	±2	44	± 6	58	6	±1	25	± 6
1966	512	115	23	± 4	27	5	±2	24	± 8	49	10	±3	43	± 9	39	8	±2	34	± 9
1965	731	161	22	± 3	48	7	±2	30	± 7	81	11	±2	50	± 8	32	4	±1	20	± 7
1964	320	65	20	± 4	15	5	±2	23	±10	36	11	±4	55	±13	14	4	±2	22	±11
1963	281	40	14	± 4	13	5	±3	33	±15	19	7	±3	48	±16	8	3	±2	20	±13
1962	163	22	14	± 5	6	4	±3	27	±19	15	9	±5	68	±20	1	1	±2	5	± 9
1961	118	18	17	± 7	6	6	±4	33	±22	8	7	±5	45	±24	4	4	±4	22	±20
1960	96	17	18	± 8	8	8	±6	47	±24	5	5	±5	29	±22	4	4	±4	24	±21
Earlier than 1960	113	17	15	± 7	2	2	±3	12	±16	12	11	±6	71	±22	3	3	±3	18	±19
Not known	57	9	17	±10	4	8	±7	45	±33	1	2	±4	11	±20	4	8	±7	45	±33

Table 18. Fitting of safety belts at driver's seats of passanger cars, showing manufacturing year of car.

Make of car	Interviews	Type of belt fitted											
		All belts			Three point belts			Diagonal belts			Lap belts		
	Number I	Number II	Percent. of I	Margin	Number III	Percent. of II	Margin	Number IV	Percent. of II	Margin	Number V	Percent. of II	Margin
Ford	606	128	21	±3	30	24	± 8	56	44	± 9	42	33	± 8
Volkswagen	601	107	18	±3	19	18	± 7	75	70	± 9	13	12	± 6
Opel	599	89	15	±3	31	35	±10	41	46	±10	17	19	± 8
Fiat	393	79	20	±4	26	33	±10	36	46	±11	17	22	± 9
Renault	239	53	22	±5	12	23	±12	25	47	±13	16	30	±12
Citroën	231	41	18	±5	9	22	±13	12	29	±14	20	49	±16
Simca	161	22	14	±6	11	50	±21	7	32	±20	4	18	±16
Mercedes	158	43	27	±7	14	33	±14	22	51	±15	7	16	±11
DAF	144	40	28	±7	3	8	± 8	28	70	±14	9	23	±13
Volvo	64	57	89	±8	46	81	±10	10	10	±10	1	2	± 4
Others	818	209	26	±3	69	33	± 6	80	38	± 7	60	29	± 6

Table 19. Fitting of safety belts in passenger cars, showing make of car and type of belt.

Make of car	Type of belt used													
	All belts					Three point belts			Diagonal belts			Lap belts		
	Number	Percent. of I *	Margin	Percent. of II *	Margin	Number	Percent. of III *	Margin	Number	Percent. of IV *	Margin	Number	Percent. of V *	Margin
Ford	36	6	± 2	28	± 8	10	33	±17	12	21	±11	14	33	±15
Volkswagen	40	7	± 2	37	± 9	10	53	±23	24	32	±11	6	46	±28
Opel	37	6	± 2	42	±10	17	55	±18	13	32	±15	7	41	±24
Fiat	38	10	± 3	48	±11	12	46	±20	21	58	±16	5	29	±22
Renault	25	11	± 4	47	±14	8	67	±27	6	24	±17	11	69	±23
Citroën	16	7	± 3	39	±15	3	33	±31	2	17	±22	11	55	±22
Simca	13	8	± 4	59	±21	7	64	±29	3	43	±37	3	75	±43
Mercedes	16	10	± 5	37	±15	8	57	±26	5	23	±18	3	43	±37
DAF	15	10	± 5	38	±15	1	33	±54	10	36	±18	4	45	±33
Volvo	16	25	±11	28	±12	13	28	±13	3	30	±29	0	0	± 0
Others	90	9	± 2	43	± 7	38	55	±12	26	33	±11	26	44	±13

Table 20. Use of safety belts by passenger car drivers, showing make of car and type of belt.

* These figures refer to the appropriate columns in Table 19.

Type of belt used	All occupants *			All drivers			All frontseat passengers			All male occupants			All famale occupants		
	Number	Percent.	Margin	Number	Per cent.	Margin	Number	Percent.	Margin	Number	Percent.	Margin	Number	Percent.	Margin
Three point (metal to metal)	109	25	±4	90	26	±5	19	20	± 8	91	27	±5	17	21	± 9
Three point (metal to webbing)	52	12	±3	37	11	±3	15	16	± 8	42	12	±3	8	10	± 7
Total three point belts	161	37	±5	127	37	±5	34	36	±10	133	39	±5	25	31	±10
Diagonal (metal to metal)	113	26	±4	82	24	±5	31	33	±10	77	22	±4	31	38	±11
Diagonal (metal to webbing)	56	13	±3	43	13	±4	13	14	± 7	43	13	±4	11	13	± 7
Total diagonal belts	169	39	±5	125	37	±5	44	47	±10	120	35	±5	42	51	±11
Lap (metal to metal)	51	12	±3	45	13	±4	6	7	± 5	43	13	±4	8	10	± 7
Lap (metal to webbing)	54	12	±3	45	13	±4	9	10	± 6	46	13	±4	7	8	± 6
Total lap belts	105	24	±4	90	26	±5	15	17	± 8	89	26	±5	15	18	± 8
Total metal to metal	273	63	±5	217	63	±5	56	60	±10	211	62	±5	56	69	±10
Total metal to webbing	162	37	±5	125	37	±5	37	40	±10	131	38	±5	26	31	±10
Total belts	435	100		342	100		93	100		342	100		82	100	

Table 21. Distribution of safety belts used in passenger cars, showing type of belt.

* Including 11 passengers sex not noted.

Type of belt used	Slack								
	Not known Number	0–1 cm Number	2–5 cm Number	6–9 cm Number	10–13 cm Number	14–17 cm Number	18–21 cm Number	>21 cm Number	Average cm
Three point (metal to metal)	6	17	20	19	31	9	6	1	8.3 *
Three point (metal to webbing)	1	7	18	14	8	4			6.4
Total three point belts	7	24	38	33	39	13	6	1	7.7 *
Diagonal (metal to metal)	2	5	25	24	35	14	5	3	9.5 *
Diagonal (metal to webbing)	1	8	15	17	11	4			6.8
Total diagonal belts	3	13	40	41	46	18	5	3	8.6 *
Lap (metal to metal)		13	19	8	9	1		1	5.4 *
Lap (metal to webbing)	6	20	17	5	5	1			3.7
Total lap belts	6	33	36	13	14	2		1	4.6 *
Total metal to metal	8	35	64	51	75	24	11	5	8.3 *
Total metal to webbing	8	35	50	36	24	9			5.7
Total belts	16	70	114	87	99	33	11	5	7.3 *

Table 22 Slack between safety belt and body measured for passenger car occupants, showing type of belt used (including 11 passengers sex not noted).

* In calculating average slack, the average for the class >21 cm was taken as 23.5 cm.

Type of belt used	Slack								
	Not known Number	0–1 cm Number	2–5 cm Number	6–9 cm Number	10–13 cm Number	14–17 cm Number	18–21 cm Number	>21 cm Number	Average cm
Three point (metal to metal)	5	13	17	18	24	8	4	1	8.3*
Three point (metal to webbing)		5	15	9	5	3			6.1
Total three point belts	5	18	32	27	29	11	4	1	7.6*
Diagonal (metal to metal)	1	4	18	21	23	10	2	3	9.3*
Diagonal (metal to webbing)	1	6	12	13	8	3			6.7
Total diagonal belts	2	10	30	34	31	13	2	3	8.4*
Lap (metal to metal)		12	18	7	8				4.7
Lap (metal to webbing)	5	18	14	5	3				3.2
Total lap belts	5	30	32	12	11				4.0
Total metal to metal	6	29	53	46	55	18	6	4	7.9*
Total metal to webbing	6	29	41	27	16	6			5.4
Total belts	12	58	94	73	71	24	6	4	7.0*

Table 23. Slack between safety belt and body measured for passenger car drivers, showing type of belt used.

* In calculating average slack, the average for the class > 21 cm was taken as 23.5 cm

Type of belt used	Slack								
	Not known Number	0–1 cm Number	2–5 cm Number	6–9 cm Number	10–13 cm Number	14–17 cm Number	18–21 cm Number	> 21 cm Number	Average cm
Three point (metal to metal)	1	4	3	1	7	1	2		8.6
Three point (metal to webbing)	1	2	3	5	3	1			7.1
Total three point belts	2	6	6	6	10	2	2		7.9
Diagonal (metal to metal)	1	1	7	3	12	4	3		10,2
Diagonal (metal to webbing)		2	3	4	3	1			7.0
Total diagonal belts	1	3	10	7	15	5	3		9.2
Lap (metal to metal)		1	1	1	1	1		1	10,3 *
Lap (metal to webbing)	1	2	3		2	1			6.3
Total lap belts	1	3	4	1	3	2		1	8.0 *
Total metal to metal	2	6	11	5	20	6	5	1	9.7 *
Total metal to webbing	2	6	9	9	8	3			6.9
Total belts	4	12	20	14	28	9	5	1	8.6 *

Table 24. Slack between safety belt and body measured for passengers seated next to drivers of passenger cars, showing type of belt used (including 11 passengers sex not noted).

* In calculating average slack, the average for the class > 21 cm was taken as 23.5 cm.

Type of belt used	Slack								
	Not known Number	0–1 cm Number	2–5 cm Number	6–9 cm Number	10–13 cm Number	14–17 cm Number	18–21 cm Number	> 21 cm Number	Average cm
Three point (metal to metal)	5	13	17	17	25	8	5	1	8.4 *
Three point (metal to webbing)		6	17	11	6	2			5.8
Total three point belts	5	19	34	28	31	10	5	1	7.6 *
Diagonal (metal to metal)	1	4	16	20	21	11	1	3	9.3 *
Diagonal (metal to webbing)	1	8	12	10	9	3			6.5
Total diagonal belts	2	12	28	30	30	14	1	3	8.3 *
Lap (metal to metal)		11	16	7	8	1			5.1
Lap (metal to webbing)	5	18	14	5	4				3.4
Total lap belts	5	29	30	12	12	1			4.3
Total metal to metal	6	28	49	44	54	20	6	4	8.1 *
Total metal to webbing	6	32	43	26	19	5			5.3
Total belts	12	60	92	70	73	25	6	4	7.0 *

Table 25. Slack between safety belt and body measured for male occupants of passenger cars, showing type of belt used.

* In calculating average slack, the average for the class > 21 cm was taken as 23.5 cm.

Type of belt used	Slack								
	Not known Number	0–1 cm Number	2–5 cm Number	6–9 cm Number	10–13 cm Number	14–17 cm Number	18–21 cm Number	>21 cm Number	Average cm
Three point (metal to metal)	1	3	3	2	6	1	1		8.2
Three point (metal to webbing)		1	1	2	2	2			9.1
Total three point belts	1	4	4	4	8	3	1		8.5
Diagonal (metal to metal)	1		7	4	13	2	4		10.4
Diagonal (metal to webbing)			3	5	2	1			7.9
Total diagonal belts	1		10	9	15	3	4		9.7
Lap (metal to metal)		2	3	1	1			1	6.8*
Lap (metal to webbing)	1	2	3			1			4.5
Total diagonal belts	1	4	6	1	1	1		1	5.8*
Total metal to metal	2	5	13	7	20	3	5	1	9.2*
Total metal to webbing	1	3	7	7	4	4			7.5
Total belts	3	8	20	14	24	7	5	1	8.7*

Table 26. Slack between safety belt and body measured for women occupants of passenger cars, showing type of belt used.

* In calculating average slack, the average for the class > 21 cm was taken as 23.5 cm.

INSTITUTE FOR ROAD SAFETY RESEARCH SWOV

SAFETY BELTS INTERVIEW FORM

Filling station _____ Start of interview _____ hr _____ min Date _____

1. Make of car: _____ Type: _____ Reg. No. _____
2. Number of occupants: _____
3. Driver's age: _____ Sex: male ☐ female ☐ Sex passenger next to driver: male ☐ female ☐
4. What is the probable distance of this journey? _____ km
5. Business or private? business ☐ private ☐
6. Can you estimate the number of your annual driven kilometres?

less than 7,500 km ☐	17,500–22,500 km ☐
7,500–12,500 km ☐	more than 22,500 km ☐
12,500–17,500 km ☐	don't know ☐

7. What percentage do you drive outside built-up areas?

0–25% ☐	50–75% ☐
25–50% ☐	75–100% ☐
	don't know ☐

8. What is the number of your total driven kilometres (life)?

less than 5,000 km ☐	40,000–100,000 km ☐
5,000–10,000 km ☐	100,000–200,000 km ☐
10,000–20,000 km ☐	more than 200,000 km ☐
20,000–40,000 km ☐	don't know ☐

9. Has your car got safety belts? Yes ☐ No ☐

If not, why not? _____

IF NO BELTS END INTERVIEW	Driver		Passenger next to driver	
10. What type of belt?	Three point	☐	☐	
	Diagonal	☐	☐	
	Lap	☐	☐	
11. What type of fastening?	Metal to webbing	☐	☐	
	Metal to metal	☐	☐	
12. Have you just been using them?	Yes ☐	No ☐	Yes ☐	No ☐
13. When do you use the belt?	Never	☐	☐	
	Occasionally	☐	☐	
	Outside town	☐	☐	
	In town	☐	☐	
	Always	☐	☐	
14. Why do you use the belt or why not?				
15. Have you any objections to it?	Yes ☐	No ☐	Yes ☐	No ☐
16. Do you prefer a different one?	Yes ☐	No ☐	Yes ☐	No ☐
IF BELT WAS WORN ON ARRIVAL				
17. Would you please try to insert some blocks between your body and the belt to measure the slack (or use the rule)?	_____ bl flat		_____	
	_____ bl short		_____	
	_____ cm		_____	cm

END OF INTERVIEW _____ hr _____ min

Appendix 1 Original safety belts interview form

date:			beginning:					fuel station:							
car			safety belts											driving exp.	
			driver					passenger next to driver							
		number occupants	belt fitted 1)	belt used 2)	slack	age and sex 3)		belt fitted 1)	belt used 2)	slack	sex 4)			per annum x 10³ km	total (life) 5)
reg no.	make					m	f				m	f			
end															

Appendix 2. Safety belts interview form as used.

1) Three point =3, Diagonal =D, Lap =H, Metal to metal =C, Metal to webbing =S
2) Yes =x, No =–
3) Enter age in appropriate column.
4) Enter x only
5) > 25,000 km – 1; 25,000–50,000 km =2; 50,000–100,000 km =3; 100,000–200,000 km =4; > 200,000 km =5; not known =6

Designed by Cees van Dorland, Krommenie, The Netherlands
Printed by Meijer Wormerveer nv, The Netherlands