Traffic Accidents Involving Accompanied and Unaccompanied Children in the Federal Republic of Germany

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Investigated in this study are accidents involving accompanied or unaccompanied children in road traffic. The study is based on 3,716 accident reports by the police on children involved in traffic accidents in the state of Hessen, Federal Republic of Germany. The term "children" refers in this study to all persons under 18 years of age. A literature review showed that children are involved with road traffic with the consent of their parents at a relatively young age, and often without being accompanied. Some of the findings of this research that were noted are as follows: (a) Children become road traffic users at an early age, often without any surveillance by adults; (b) in all observed age groups and accident severity classes, the accident involvement of boys was significantly higher than that of girls; (c) the overwhelming majority of children involved in accidents were accompanied; (d) the degree to which accident-involved children are accompanied by an older person correlates with the age of the children; (e) children who are involved in traffic accidents are far more likely to be active than passive traffic participants; and (f) the frequency of injuries suffered by unaccompanied children involved in traffic accidents is significantly higher than that of accompanied children.

The involvement of children in traffic accidents is a critical issue in the Federal Republic of Germany. As Table 1 indicates, the Federal Republic of Germany has the highest casualty rate (per 100,000 children) and one of the highest fatality rates (per 100,000 children) in Western Europe.

Between 1976 and 1986, the Federal Republic of Germany experienced a reduction in this casualty rate for the age group under 6 but a slight increase for those 6–14 (see Table 2).

Analysis of accident statistics indicate countermeasures that could help reduce the risk for children in road traffic. However, research experience has shown that investigations dealing with accidents involving children lie mostly between two extremes: the investigation is based either on a large accident data base provided by governmental agencies or on a small sample size of accidents obtained, for example, from questionnaires.

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In the first case, large data bases are usually available, but the data are highly summarized; thus, from these data bases only simple questions can be addressed and answers to more profound questions are not often achievable.

In the second case, considerably more parameters for identifying possible accident causes can be investigated. But because of the small accident sample sizes used in these investigations, it is often impossible to achieve statistically reliable results.

To adopt a middle course between the two extremes, a research study of accidents involving children (*3*), on which this paper is based, was conducted in the state of Hessen, Federal Republic of Germany. For this research study, a large sample of accidents involving children was obtained. The study was based on original accident reports provided by the police, which constitute, in a less detailed form, the basis for the federal government accident statistics. Overall, 3,716 police reports on children involved in road traffic accidents were considered.

LITERATURE REVIEW

Comparative analyses of traffic accident characteristics in the United States and Western Europe have been conducted by the authors for approximately a decade (*4–9*). These investigations mostly identified the involvement of different age and road user groups in road traffic accidents.

Available reports on the involvement of children in road traffic accidents are largely based on highly summarized (i.e., few parameters to describe accident causes) data bases. Therefore, relying on these reports to identify probable causes of accidents involving children may not result in a comprehensive and complete picture. This is especially true for the question of whether children who are involved in traffic accidents were "alone" or "accompanied" at the time of the accident.

A study conducted by Grayson (*10*) reported that less than half of the children in his study who were involved in road traffic accidents were alone on the road at the time of the accident. Grayson indicated that children under 6 generally are accompanied by adults.

An investigation by Schulte (*11*), based on interviews with parents of 2,990 young children under 18, revealed the obvious: that with increasing age, children, often unaccompanied, participate in road traffic. For instance, Schulte found that on

TABLE 1 CASUALTIES AND FATALITIES FOR CHILDREN UNDER 15 YEARS OF AGE FOR DIFFERENT EUROPEAN COUNTRIES (*1*)

	DK	D	A	F	GB	NL	CH	S
Casualties per 100,000 Children	156	508	386	243	442	218	230	115
Fatalities per 100,000 Children	6.1	5.9	5.7	5.7	5.0	4.7	4.6	3.2

Legend:

Casualties: Injured and Fatally Injured Children

DK: Denmark; D: Federal Republic of Germany; A: Austria;

F: France; GB: Great Britain; NL: The Netherlands;

CH: Switzerland; S: Sweden

TABLE 2 NUMBER OF CASUALTIES AND CASUALTY RATES FOR CHILDREN IN THE FEDERAL REPUBLIC OF GERMANY (*2*)

	Age	1976	1980	1984	1985	1986
Casualties	0-5	14,233	12,181	11,011	10,548	10,930
	6-14	52,528	47,751	37,472	33,077	33,727
Casualty Rate (Dif. Age Groups)	0-5	360	345	308	295	296
	6-14	589	623	628	585	617

the way to playgrounds, kindergarten and sports activities, 62 percent of children up to 6 were escorted by adults, 13 percent were accompanied by other children, and 24 percent were unaccompanied. On the way to and from school, 58 percent of children between 7 and 12 were accompanied by other students; however, only 12 percent of children in this age group were accompanied by adults to playgrounds and sports. Schulte summarizes the accompanying of children while playing and on their way to playgrounds, related to high-volume and low-volume roads, as follows:

Percent Accompanied by Type of Road

	High Volume			*Low Volume*		
Age (years)	*Not*	*Adults*	*Children*	*Not*	*Adults*	*Children*
Up to 6	26	56	18	50	19	31
7 to 12	41	5	54	47	5	48

Schulte also indicated that most children in the first grade are escorted to and from school by adults.

Wittenberg et al. (*12*) repeated the study conducted by Schulte 10 yr earlier. Their findings confirmed his results.

Note that the above percentages may not be comparable with United States figures. One reason for this is that because of shorter travel distances in Europe, children typically walk or bicycle. Children in the United States, because of longer travel distances, often are occupants of cars or school buses.

Even though accompanying children in road traffic may provide a feeling of security, many parents in the Federal Republic of Germany believe that their young children are mature enough to participate alone in road traffic. An investigation by Guenther (*13*), based on questionnaires to parents with preschool children, revealed that 70 percent believed that full-time surveillance of their youngsters was unnecessary. Furthermore, half of the sampled parents did not insist on keeping their children away from road traffic, and a majority of the parents thought that being near traffic routes does not endanger children under 6. In conclusion, Guenther indicated the following: "In many ways, parents' attitude toward providing security for their children in road traffic has to be evaluated as unreliable."

A study by Kueting et al. (*14*) of children riding bicycles determined that nearly half of the children were unaccompanied in road traffic. When children were accompanied, it was not by experienced adults, but mostly by friends, brothers or sisters.

Hohenadel (*15*) summarizes the experiences gained in Europe as follows:

> Parents are often unable to educate their children (3 to 8 years of age) about the possible danger of being involved in road traffic. This is especially true for parents in the Federal Republic of Germany, who are obviously little concerned about when, where and how their children come into contact with road traffic. . . . Therefore, these parents should be considered as accessories in the occurrence of accidents involving children. This is especially true for young children who are involved in traffic accidents.

DATA COLLECTION AND REDUCTION

Police reports on accidents involving children from September 1, 1977, to February 28, 1978, were obtained by official decree from the Minister of the Interior, State of Hessen, Federal Republic of Germany. The time period could not be extended because of personnel, economic, and especially legislative constraints, although the authors are aware that a time period of a full year might have reduced the chance of a biased sample. The half-year period covers a typical school-year term without long vacation times.

Police reports are used in this study as the only source of accident information. It is well known that police reports of accidents may be biased, particularly for pedestrian, bicycle, and motorcycle accidents, which represent the main categories related to accidents involving children (*7,9*). Despite these reservations, it should be noted that the present data base is unique concerning the issue of accompanied or unaccompanied children in road traffic accidents, and the German accident reporting system regarding personal injuries appears to be very accurate. For example, Table 1 reveals a high proportion of casualties versus fatalities in the Federal Republic of Germany as compared with other European countries, which cannot be explained by the actual differences in accident severities alone.

Furthermore, the state of Hessen, in the center of the Federal Republic of Germany, which represents about 10 percent of its population, is considered representative of German conditions and is often selected for case studies in different research fields, accident characteristics included. In many ways, the state of Hessen is comparable with the state of Ohio with its large urban, suburban, and industrialized areas on the one hand and, on the other hand, with its extended rural areas. Because of the above discussed considerations, the present data base appears to be useful for the following investigations.

With the exception of the internal research report to the Minister of the Interior (*3*), the results of this investigation were not made public for approximately a decade because of data protection laws. (Today, a study of this kind could not be conducted because of new data protection laws that do not allow direct examination of police accident reports by researchers.) However, the results are still of great interest to traffic safety because more recent official yearly statistics in Germany show that the involvement of children in traffic accidents has not improved markedly, and the rate has even increased over the years (see Table 2).

As mentioned earlier, 3,716 police reports on fatal, injury, and property damage accidents involving children under 18 were obtained for this study. For every child involved in an accident, 22 parameters were identified to describe the child's age and sex, the accident type, the accident location, traffic participation, and other relevant information.

Contrary to many accident investigations, the analysis conducted in this study is not based on exposure units, accidents per million entering vehicles (for spots) or accidents per million vehicle miles (for sections), but rather on absolute numbers and percent distributions. This is because the study is based on children under 18, for whom exposure data are not available in the Federal Republic of Germany, especially data concerning accompanied or unaccompanied children in road traffic.

OUTCOME OF THE ANALYSIS

Of the 3,716 children who were involved in traffic accidents, 37 suffered fatal injuries (death within 30 days), 941 suffered

serious injuries (more than a day in a hospital), 2,016 suffered light injuries (one day or less in a hospital), and 722 were unharmed. Of all these children, 24 percent were pedestrians, 19 percent were bicyclists, 41 percent were riders of light powered two-wheelers (e.g., mopeds) or motorcyles, and 15 percent were passenger-car occupants. Note that 60 percent of these children were riders of powered and nonpowered two-wheeled vehicles. The results showed that the mean age of children involved in traffic accidents was 9.6 years for pedestrians, 12.3 years for bicyclists, 16.6 years for riders of light powered two-wheelers or motorcycles, and 13.1 years for passenger-car occupants.

Male children are more likely to be involved in traffic accidents (*4*,*5*) than female children. For instance, Table 3 reveals that the percentage of male children under 14 greatly outnumbers female children as traffic accident victims; for children between 15 and 17, the percentage of male involvement in traffic accidents is dramatically higher than that for females.

Comparing the active traffic participation of children (as pedestrians or riders of bicycles or mopeds) to the passive traffic participation (as passengers of two-wheelers or cars) clearly shows that the overwhelming majority of accident-involved children actively participated in road traffic (see Table 3).

The conclusion was reached that in all age groups observed, male children are significantly more involved in accidents than female children. Children who are involved in traffic accidents are far more likely to be pedestrians or two-wheeled operators (active) than to be passengers (passive).

In all severity classes, distinct differences between active and passive traffic participation by male and female children were also noted from the data base (see Table 4). In all classes, actively participating male children were significantly more involved in accidents than female children.

Table 4 reveals that 90 percent of the male children who were involved in traffic accidents actively participated in road traffic. The comparable figure for female children was 70 percent. These statements are more or less true for the accident-severity classes light injury, serious injury, and fatal injury. *T*-test results indicated for most of the observed cases that the differences were statistically significant at the 95 percent level of confidence.

The active traffic participation of male and female children is mainly related to their being pedestrians, bicyclists, moped operators, and motorcycle operators. On the other hand, passive traffic participation is predominantly confined to being passenger-car occupants, which accounts for about 75 percent; only 13 percent of children's passive traffic participation is as passengers of mopeds and motorcycles.

It was concluded that in all observed accident severity classes, the accident involvement of male children is significantly higher than that of female children. Both male and female children involved in accidents are likely to be active rather than passive participants in traffic; this is especially true for males.

To evaluate the accident situation involving children, it is important to learn whether or not the children were alone or accompanied by adults or older children at the time of the accident. An overview of percent distributions of children who

TABLE 3 ACCIDENT PERCENT DISTRIBUTIONS, SUBDIVIDED BY SEX AND BY ACTIVE AND PASSIVE TRAFFIC PARTICIPATION

	Age Groups			
	0 - 5	6 - 9	10 - 14	15 - 17
Male	62.1	61.8	64.0	81.1
Female	37.9	38.2	36.0	18.9
Active	64.1	85.0	86.2	86.0
Passive	35.9	15.0	13.8	14.0

Legend:

Active: Pedestrian or Vehicle Operator

Passive: Occupant

Male children represent in all age groups about 51% of the population.

TABLE 4 ACCIDENT SEVERITY DISTRIBUTIONS, SUBDIVIDED BY SEX AND BY ACTIVE AND PASSIVE TRAFFIC PARTICIPATION (*3*)

	Accident Severity Class					
	none	light	serious	fatal	all	percent
Male	624	1,372	663	26	2,685	100
Active	611	1,196	587	22	2,416	90
Passive	13	176	76	4	269	10
Female	94	626	272	11	1,003	100
Active	87	397	208	6	698	70
Passive	7	229	64	5	305	30

TABLE 5 ACCIDENT PERCENT DISTRIBUTIONS, SUBDIVIDED BY ROAD USER GROUP AND WHETHER CHILDREN WERE ACCOMPANIED OR NOT IN ROAD TRAFFIC (*3*)

	Road User Groups					
Accompany	Pedest.	Bicycl.	Moped.	Motorcyc.	Car*	Total
No	81.2	91.3	90.1	83.2	13.9	75.0
Same Age	12.0	7.1	8.0	12.7	5.4	9.7
Older Children	1.8	0.7	1.2	3.5	24.1	5.2
Adults	5.1	1.0	0.7	0.5	56.7	10.2

* Includes Other Motor Vehicles, e.g., Agricultural Vehicles.

were involved in traffic accidents subdivided into different road user groups and classified as accompanied or unaccompanied in road traffic is provided in Table 5. This table clearly indicates that between 80 and 90 percent of the children were unaccompanied at the time of the traffic accident. These results mostly refer to all road user groups with the exception of car passengers. Children in the latter road user group are usually accompanied by adults or older persons, because a driver's license is only issued to those over 18 in the Federal Republic of Germany. Therefore, children in passenger cars usually are passive traffic participants.

In conclusion, the overwhelming majority of children involved in accidents for the different road user groups were unaccompanied at the time of the accident.

A corresponding overview of percent distributions of children who were involved in traffic accidents subdivided into different age groups and classified as accompanied or unaccompanied in road traffic is provided in Table 6.

The degree to which accident-involved children are accompanied by adults or older children in road traffic strongly correlates with the age of the children. Table 6 indicates that between 50 and about 80 percent of the children were unaccompanied at the time of the traffic accident in the different age groups. It is interesting to note that in the group up to age 5, about 45 percent of the children were involved in traffic accidents despite the fact that they were accompanied by an older person. Table 6 also reveals that in the same age group about 50 percent of the children involved in traffic accidents were unaccompanied and that in the 6–9 age group, the corresponding percentage increased to about 64 percent.

These findings may support the results of the literature review that revealed parents in the Federal Republic of Germany as believing that accompanying their children at relatively young ages is not necessary.

It may be concluded that the degree to which accident-involved children are accompanied by adults or older children in road traffic strongly correlates with the age of the children. It appears that parents in the Federal Republic of Germany believe that accompanying children in road traffic in general is only important during the preschool ages.

Finally, with regard to the severity of accidents, Table 7 indicates that unaccompanied children in road traffic accidents suffer about 2.5 times more from light and serious injuries than do accident-involved children who are escorted. Although these differences are significant at the 95 percent level of confidence, one should not conclude that a lack of surveillance by parents is the only reason for this significant difference. For instance, there may be a correlation between the age of the children and their participation in road traffic. It is nearly impossible for parents to supervise their children constantly once they have reached the age when they can ride bicycles, mopeds, or motorcycles.

The conclusion was reached that the frequency of light and serious injuries suffered by unaccompanied children involved in traffic accidents is significantly higher than that of accompanied children involved in traffic accidents.

CONCLUSIONS

This case study is based on 3,716 police accident reports on children involved in traffic accidents in the State of Hessen, Federal Republic of Germany. The term "children" refers in this study to all persons under 18 years of age.

For every child involved in an accident, 22 parameters were identified to describe the individual, the accident location, the accident type, traffic participation, and other relevant information, including whether a child involved in an accident was accompanied or not at the time of the accident.

The literature review clearly showed that children participate in road traffic with the consent of their parents at a relatively young age, and often without being accompanied.

In general, the following conclusions were drawn:

1. Children become road traffic users at an early age, often without any surveillance by adults.
2. In all observed age groups male children were found to be more involved in accidents than female children.
3. Children who are involved in traffic accidents are far

TABLE 6 ACCIDENT PERCENT DISTRIBUTIONS, SUBDIVIDED BY AGE GROUP AND WHETHER CHILDREN WERE ACCOMPANIED OR NOT IN ROAD TRAFFIC (*3*)

	Age Groups				
Accompany	0-5	6-9	10-14	15-17	Total
No	49.2	63.9	75.6	78.4	75.0
Same Age	5.7	22.0	9.9	9.9	9.7
Older Children	2.9	0.9	2.9	7.7	5.2
Adults	42.2	13.3	11.6	4.0	10.2

TABLE 7 NUMBER OF ACCIDENTS INVOLVING CHILDREN, SUBDIVIDED BY SEVERITY CLASS AND WHETHER CHILDREN WERE ACCOMPANIED OR NOT IN ROAD TRAFFIC (*3*)

	Accident Severity Class		
Accompany	Light	Serious and Fatal	Total
No	1,417	720	2,137
Yes	591	252	843

more likely to be active traffic participants than to be passive traffic participants.

4. In all observed accident severity classes, the accident involvement of male children was significantly higher than that of female children.

5. The overwhelming majority of children involved in traffic accidents for different road user groups were unaccompanied (the obvious exception is children in cars).

6. The degree to which accident-involved children are accompanied by older persons in road traffic correlates with the age of the children.

7. The frequency of light and serious injuries suffered by unaccompanied children involved in traffic accidents is significantly higher than that of accompanied children involved in traffic accidents.

On the basis of these conclusions, it seems logical that any future safety work regarding children has to begin with parents before their children reach school age. As long as the majority of parents are not committed to the questions of when, where, and how their children participate in road traffic, the success of any safety measures will remain incomplete.

ACKNOWLEDGMENTS

The authors wish to thank the Ministry of Economy and Technique of the State of Hessen, Federal Republic of Germany. Special thanks go to J. Wacker and D. Felke of the Division of Traffic Safety for their invaluable assistance.

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Publication of this paper sponsored by Committee on Pedestrians.