

TRAFFIC ACCIDENTS IN FINLAND AND THE U.S.A.:
A CROSS-CULTURAL COMPARISON OF ASSOCIATED FACTORS

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Report No. UMTRI-92-26
August 1992

1. Report No. UMTRI-92-26		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle TRAFFIC ACCIDENTS IN FINLAND AND THE U.S.A.: A CROSS-CULTURAL COMPARISON OF ASSOCIATED FACTORS			5. Report Date August 1992		
			6. Performing Organization Code		
7. Author(s) Juha Luoma and Michael Sivak			8. Performing Organization Report No. UMTRI-92-26		
9. Performing Organization Name and Address The University of Michigan Transportation Research Institute Ann Arbor, Michigan 48109-2150 U.S.A.			10. Work Unit No. (TRAIS)		
			11. Contract or Grant No.		
12. Sponsoring Agency Name and Address The Academy of Finland Hämeentie 68 SF-00550 Helsinki, Finland			13. Type of Report and Period Covered		
			14. Sponsoring Agency Code		
15. Supplementary Notes					
16. Abstract <p>This report presents the results of a cross-cultural analysis of factors associated with traffic accidents in Finland and the U.S.A. The analysis was based on U.S. data from 1988 and Finnish data from 1987-89 and, whenever possible, on fatal accidents. The findings are presented in a tabular and figural form with an accompanying commentary for each table and figure. Because of the potential reporting differences in the two countries, the present findings should be interpreted with caution and should be viewed only as indicating possible trends. With this caveat in mind, the following are some of the factors with differential involvement in traffic accidents in the two countries.</p> <p>Proportionally more rural accidents occur in Finland than in the U.S. The fatality rate per vehicle mileage is higher in Finland, but the rate per per capita is higher in the U.S. The injury rates tend to be lower in Finland than in the U.S. There are proportionally less driver and passenger fatalities, and more pedestrian and bicyclist fatalities in Finland than in the U.S.</p> <p>There are proportionally less truck and motorcycle fatalities, but more passenger car and bus fatalities in Finland than in the U.S. The fatal accident rate for motorcycles is substantially higher in the U.S. than in Finland. The rate for mopeds is higher in Finland than in the U.S., and the rate for buses is somewhat higher in Finland than in the U.S.</p> <p>The Finnish fatal accidents peak in July, November, and December, while those in the U.S. peak in July through October. The Finnish fatal accidents peak on Fridays, while those in the U.S. peak more substantially on Saturdays. The Finnish fatal accidents are most numerous between the hours of 15:00 and 17:00, while the U.S. data show a less pronounced but more extended peak from 15:00 through 3:00. Proportionally more fatal accidents occur during the hours of darkness in the U.S. than in Finland. There are proportionally more fatal accidents in winter conditions in Finland.</p> <p>Proportionally more young motorcyclists, and old bicyclists and pedestrians are killed in Finland than in the U.S. Alcohol related accidents are more frequent in the U.S. than in Finland. In Finland (but not in the U.S.) the proportion of killed passengers in the vehicle of intoxicated drivers is greater than the proportion of all sober road-users killed.</p>					
17. Key Words fatal accidents, Finland, U.S.A., cross-cultural comparison			18. Distribution Statement Unlimited		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 28	22. Price

ACKNOWLEDGEMENTS

Appreciation is extended to Robert Schultz for his assistance with this research.

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INTRODUCTION

The aim of this study was to provide initial information concerning differences and similarities between traffic-accident trends in Finland and the U.S. for a planned empirical study on cross-cultural differences between these two countries. The emphasis in the analysis was on fatal accidents and fatalities, since it is well known that accidents involving nonfatal injuries are reported less reliably. The U.S. data are for 1988. The Finnish data, because of the smaller number of accidents, are (in most instances) for 1987-1989. The Finnish data are based on the information provided in three reports by the Central Organization for Traffic Safety in Finland (1987, 1988, 1989). The U.S. data are primarily from the *Fatal Accident Reporting System* (National Highway Traffic Safety Administration, 1988). The U.S. injury-accidents data in Table 1, as well as the U.S. data in Figures 2 and 3, are based on information in *Accident Facts* (National Safety Council, 1989). The U.S. exposure data in Figure 6 are based on information in United Nations (1989).

The data are presented in tabular form and in figures. Each table and figure is followed by brief comments on the main features. The table and figures cover the following areas: general statistics (Table 1, and Figures 1 through 4), vehicular factors (Figures 5 and 6), environmental factors (Figures 7 through 11), and human factors (Figures 12 through 18). (A category "unknown" was included only if it contained at least 1.0%.)

It is acknowledged that differences in the reporting systems of the two countries could be responsible for some of the obtained findings and only some data on exposure were available. Furthermore, no statistical tests of significance were performed. Consequently, the obtained differences should be viewed only as possible trends.

Finally, it should be noted that the sizes of the two countries are substantially different: Finland has a population of around 5 million whereas the population in the U.S. is around 245 million. Consequently, the variability of factors related to driving and traffic accidents in the U.S. is large compared with that of Finland.

COMPARISONS AND COMMENTS

Table 1. Basic fatality, injury, and accident statistics.

Measure	Total		Rural		Urban	
	Finland	U.S.A.	Finland	U.S.A.	Finland	U.S.A.
	1987-89	1988	1987-89	1988	1987-89	1988
Fatalities per year	656	47,093				
Injuries per year	11,568	1,800,000				
Fatal accidents per year	596	42,119	68.2%	57.8%	31.8%	42.2%
Injury accidents per year	8,699	1,200,000	39.5%	30.8%	60.5%	69.2%
Fatalities per accident with fatalities	1.1	1.1				
Injuries per accident with injuries	1.3	1.5				

Comments:

- (a) Proportionally more rural accidents occur in Finland than in the U.S.
- (b) Fatality rates per accident with fatalities, and injury rates per accident with injuries are similar in the two countries.

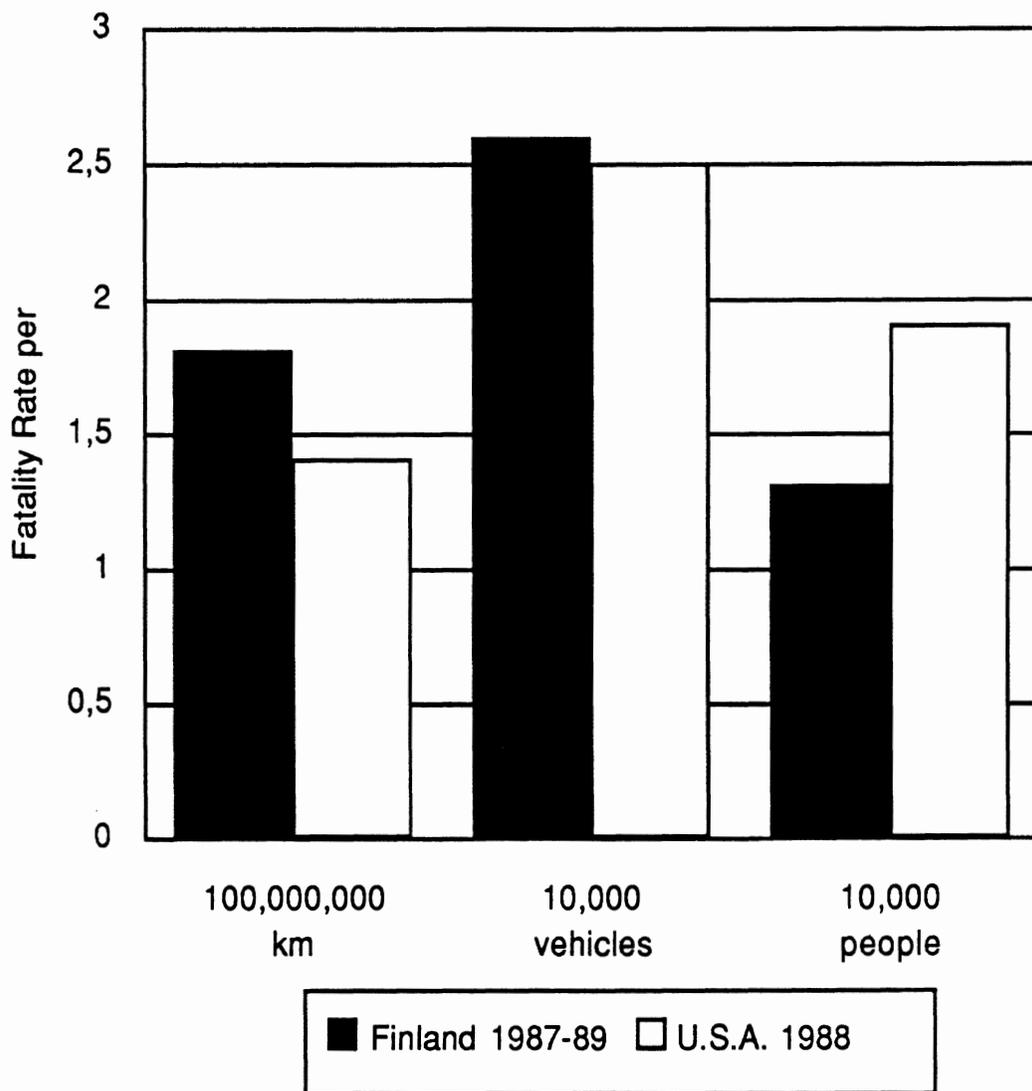


Figure 1. Fatality rates.

Comment:

The fatality rate per distance travelled is higher in Finland than in the U.S. On the other hand, the rate per capita is lower in Finland, most likely because the annual distance travelled per person in the U.S. is 70% higher than in Finland (per vehicle it is about 14% higher).

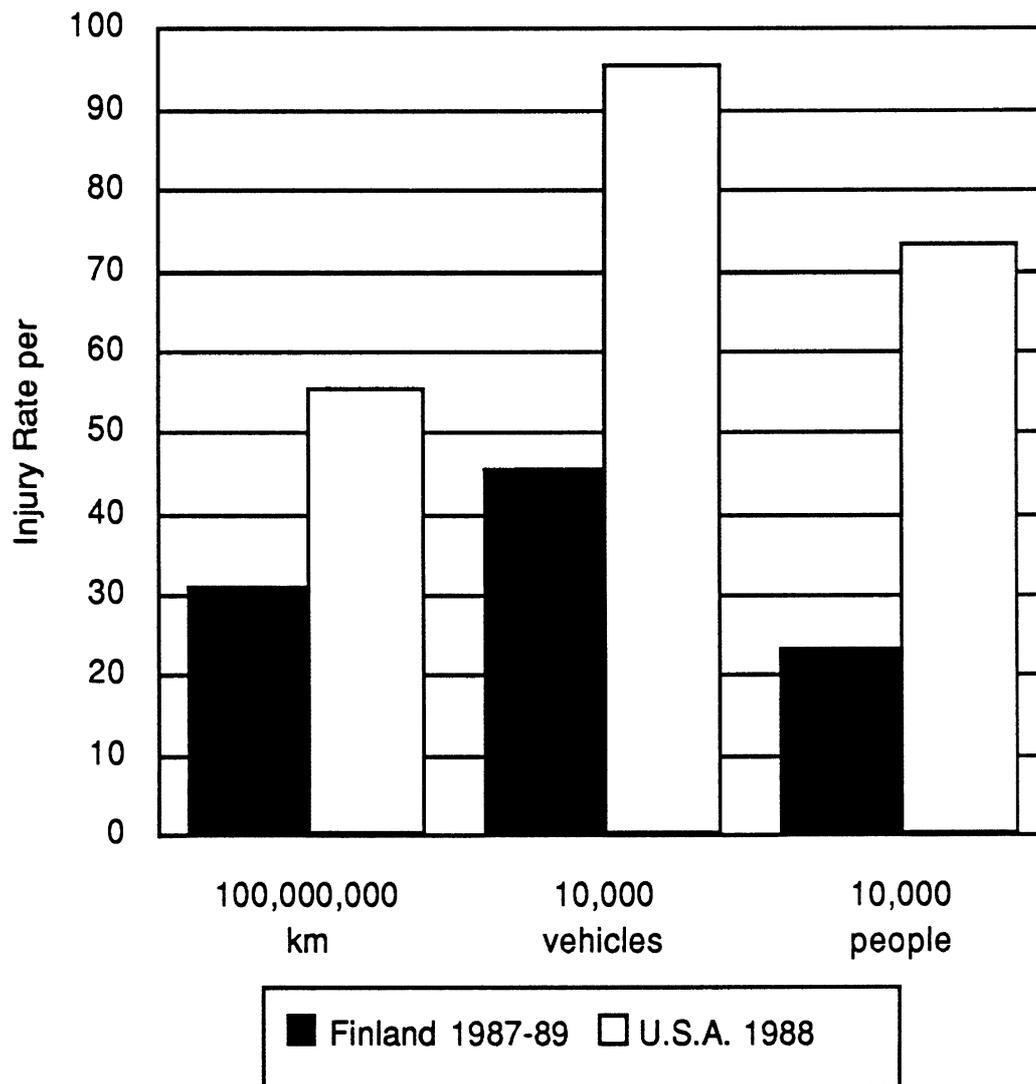


Figure 2. Injury rates.

Comment:

The injury rates should be interpreted with caution since the numbers of injuries are less reliable than the numbers of fatalities. Furthermore, the definitions of injury may differ between the two countries. Nevertheless, the injury rates tend to be lower in Finland than in the U.S.

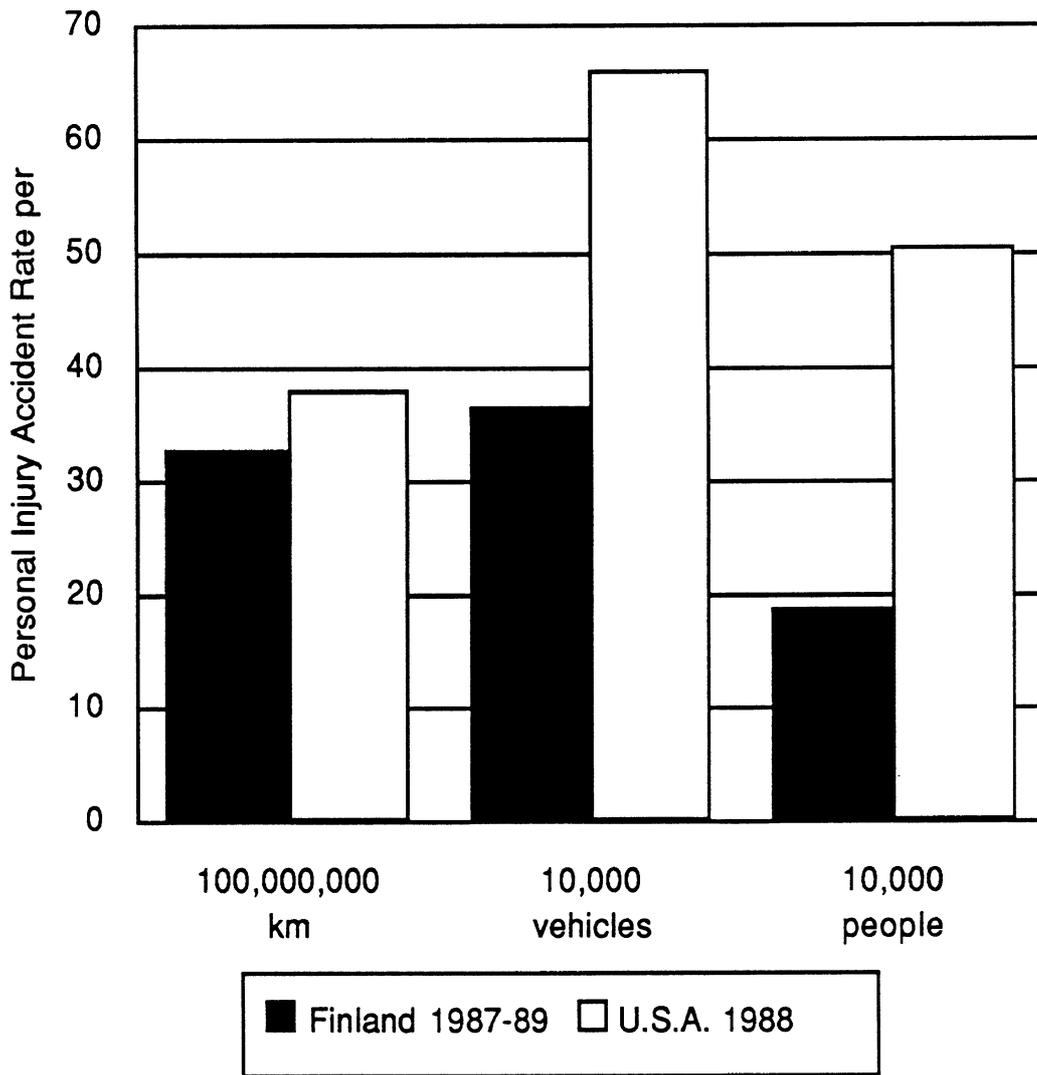


Figure 3. Personal injury accident rates.

Comment:

Personal injury accident rates tend to be lower in Finland than in the U.S., but the above indicated caution about the reliability of injury statistics has to be kept in mind.

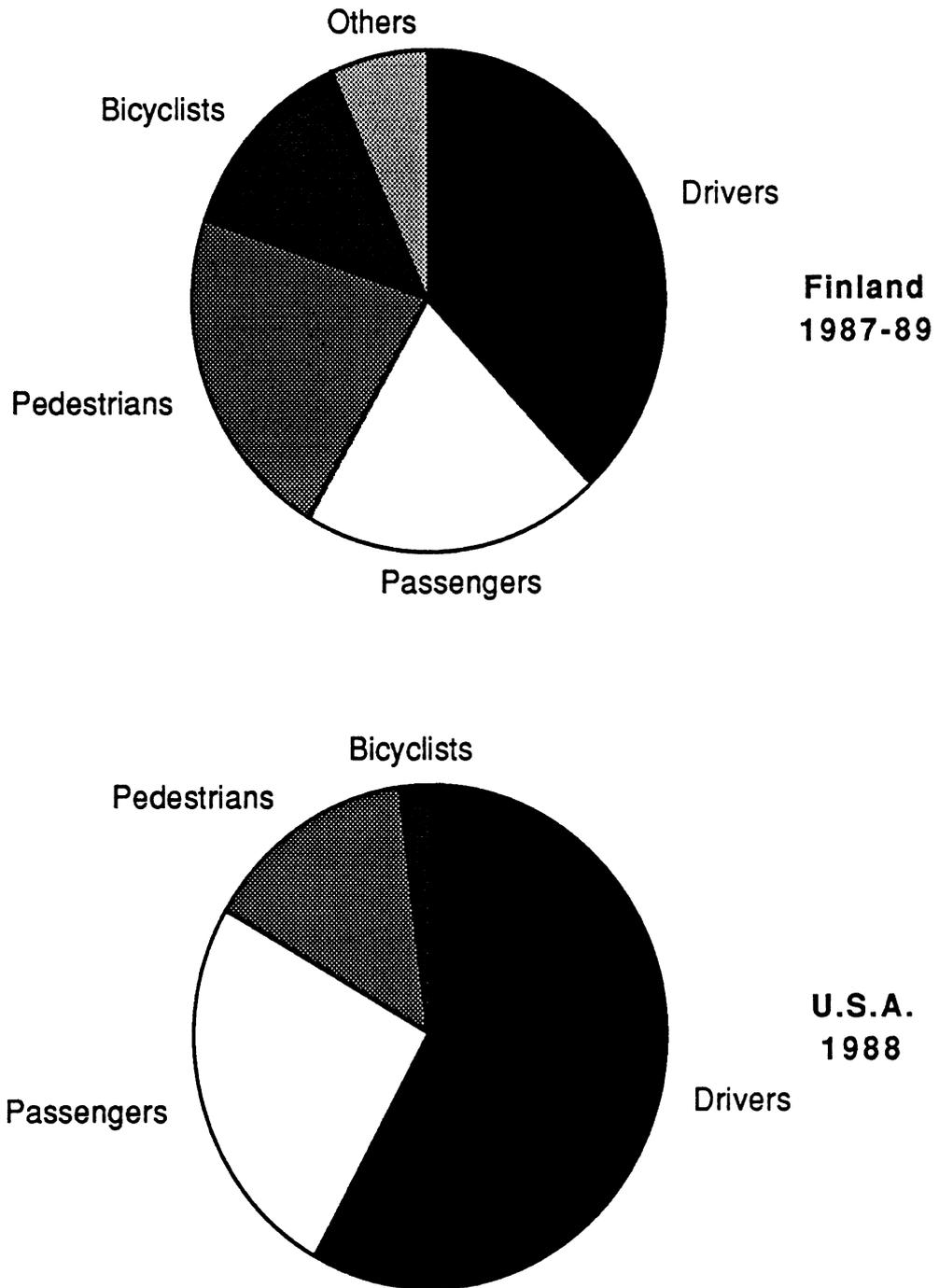


Figure 4. Fatalities by group of road users.

Comment:

There are proportionally less driver and passenger fatalities and more pedestrian and bicyclist fatalities in Finland than in the U.S., due most likely to the increased pedestrian and bicyclist exposures in Finland.

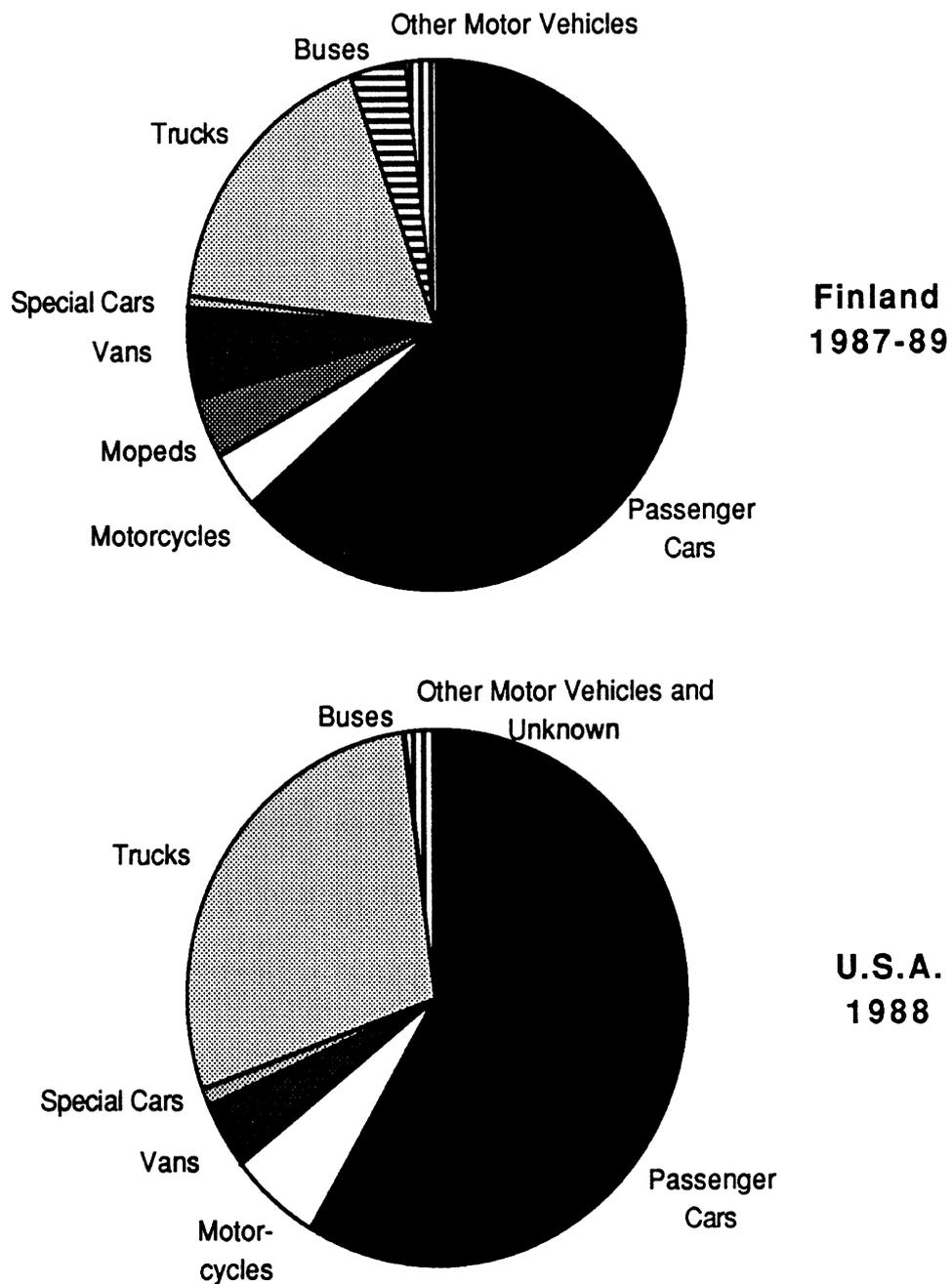


Figure 5. Type of vehicles involved in fatal accidents.

Comments:

- (a) The proportions of different types of vehicles involved in fatal accidents are relatively similar in the two countries. However, in Finland there are proportionally fewer truck and motorcycle fatalities but more passenger car and bus fatalities.
- (b) Figure 5 shows only proportions of different type of vehicles in fatal accidents. Fatal accident rates are presented in Figure 6.

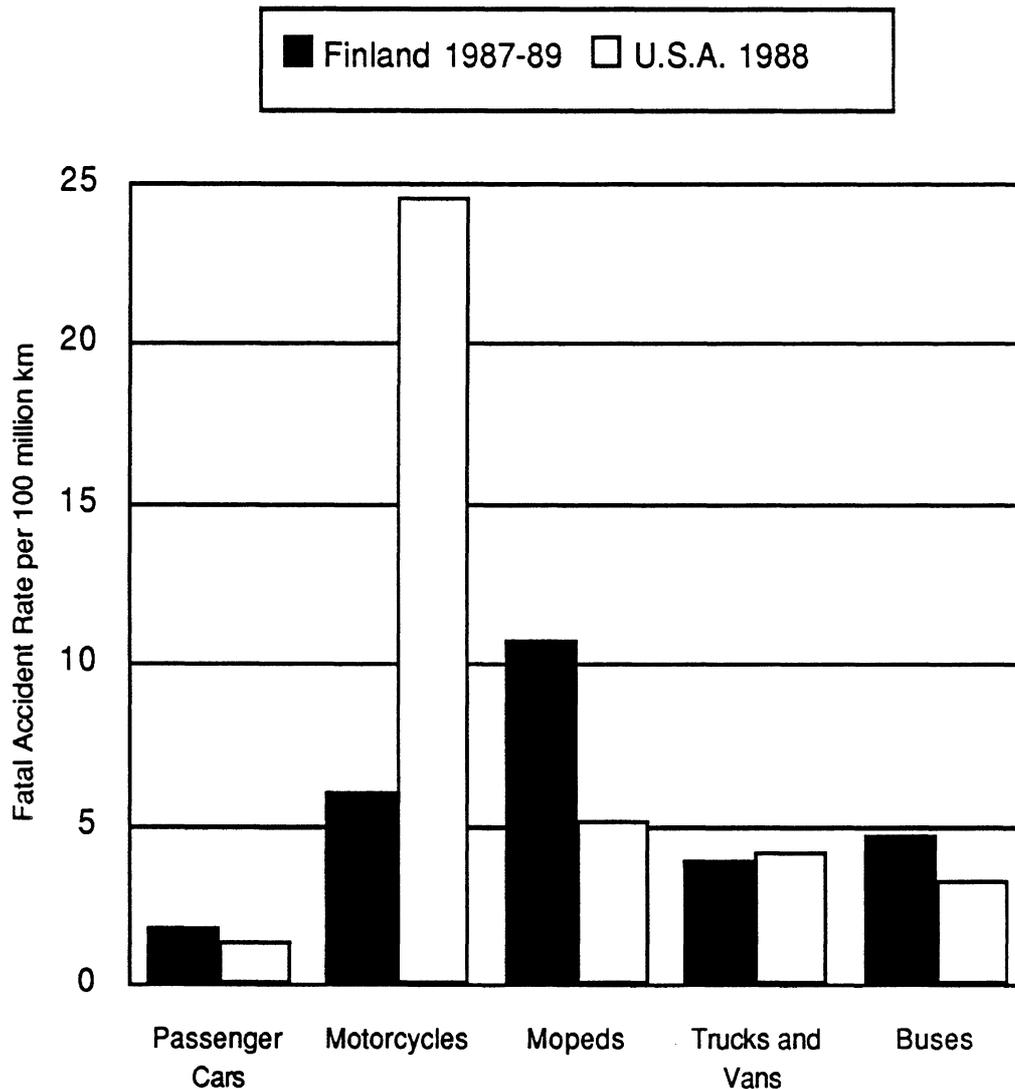


Figure 6. Number of vehicles involved in fatal accidents per 100 million vehicle kilometers.

Comments:

- (a) Since at least some of the exposure data are rough estimates, and the classification of vehicles (e.g., vans) in some sources is unclear, Figure 6 should be interpreted with caution. However, fatal accident rates of passenger cars, and trucks or vans seem to be quite similar in the two countries.
- (b) The fatal accident rate of motorcycles in the U.S. is about four times greater than in Finland (see also Figure 14). However, the number of mopeds is about two times higher in Finland than in the U.S.
- (c) The fatal accident rate of buses is slightly higher in Finland than in the U.S.

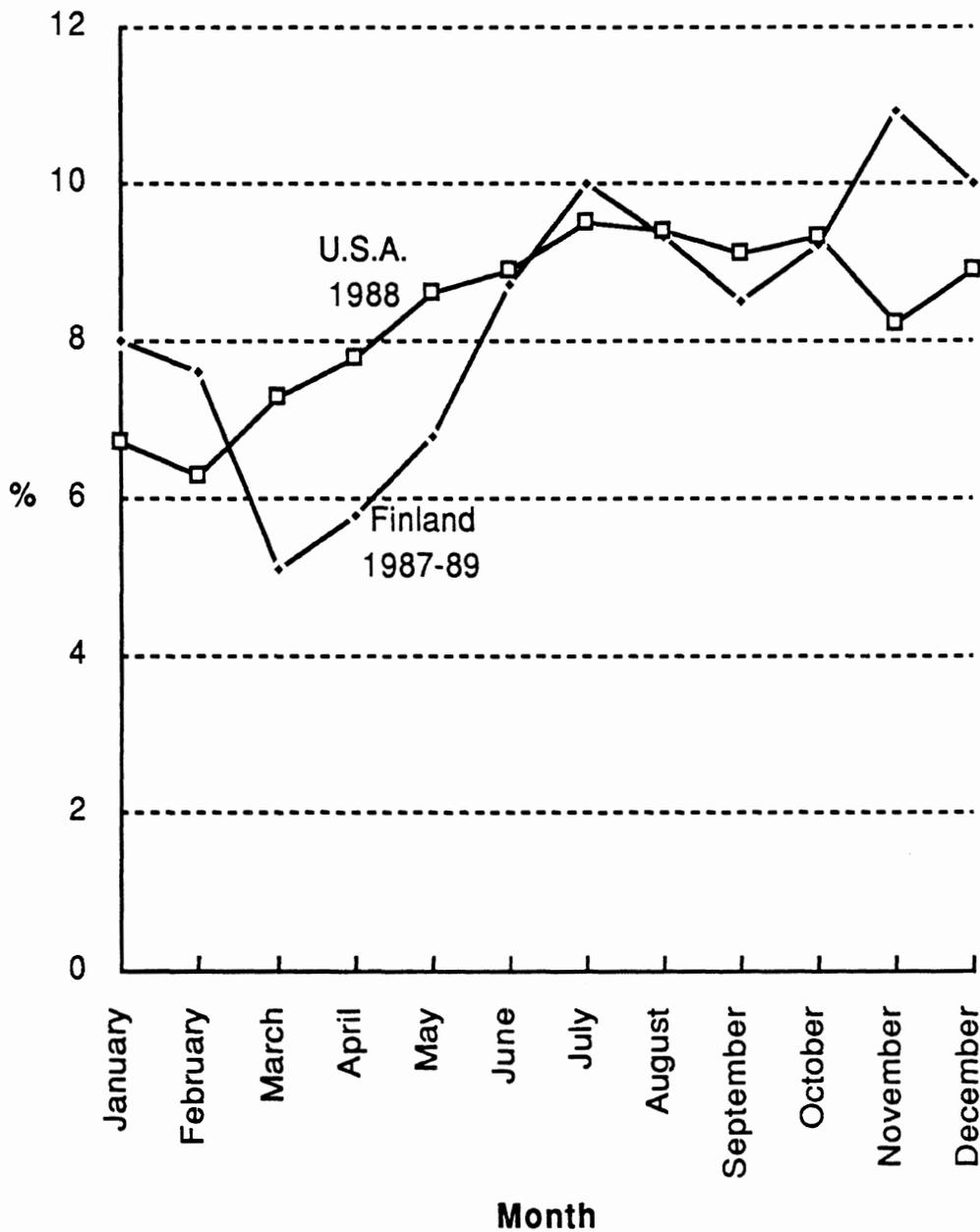


Figure 7. Fatal accidents by month. (For Finland, the entries are fatalities, while for the U.S. they are fatal accidents.)

Comments:

- (a) The peaks are in July, November, and December for Finland, and July through October for the U.S.
- (b) The increased exposure is the likely explanation for the U.S. peaks, and for the Finnish peak in summertime. However, the peaks in the Finnish data in November and December are most likely influenced by some other factors (e.g., weather and ambient light conditions).

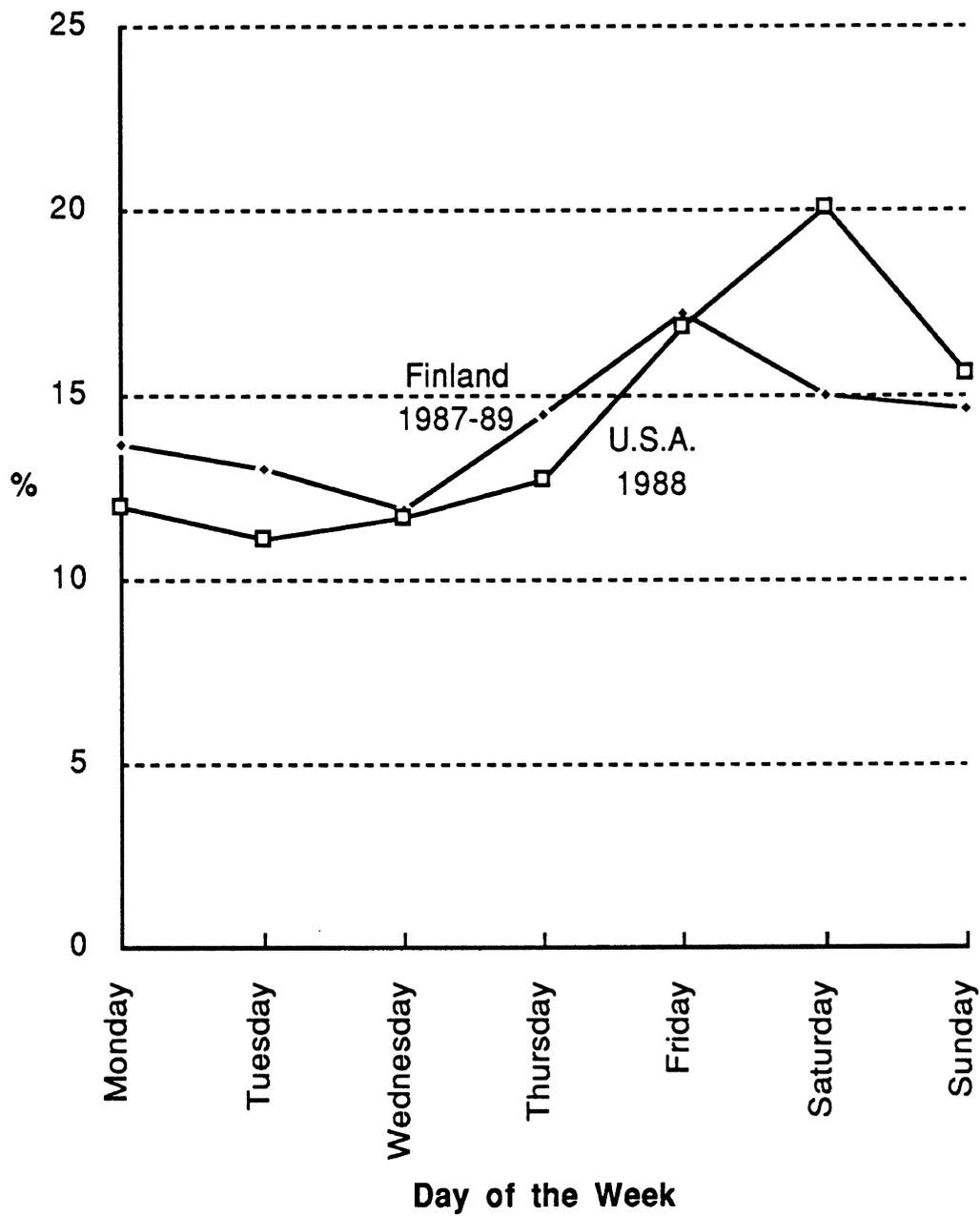


Figure 8. Fatal accidents by day of the week. (For Finland, the entries are fatalities, while for the U.S. they are fatal accidents.)

Comments:

- (a) Finnish fatal accidents peak on Fridays, while those in the U.S. peak on Saturdays.
- (b) The U.S. peak is more substantial than the Finnish peak.

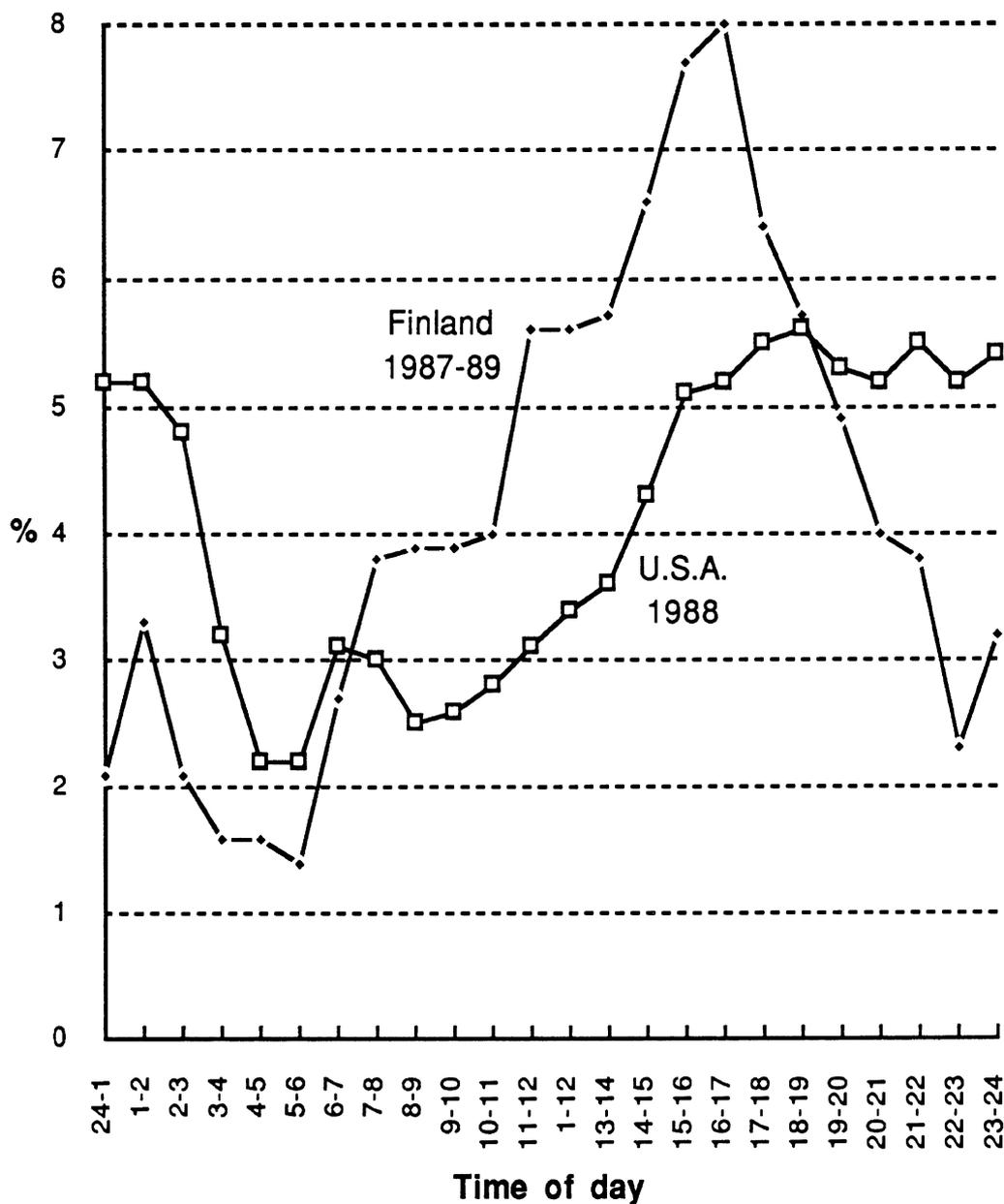


Figure 9. Fatal accidents by time of day. (For Finland, the entries are fatalities, while for the U.S. they are fatal accidents.)

Comments:

- (a) The Finnish fatal accidents are most numerous in the afternoon (15:00-17:00), corresponding to the time of day with most travel.
- (b) The U.S. data show a relatively flat maximum from midafternoon until early morning (15:00-3:00).

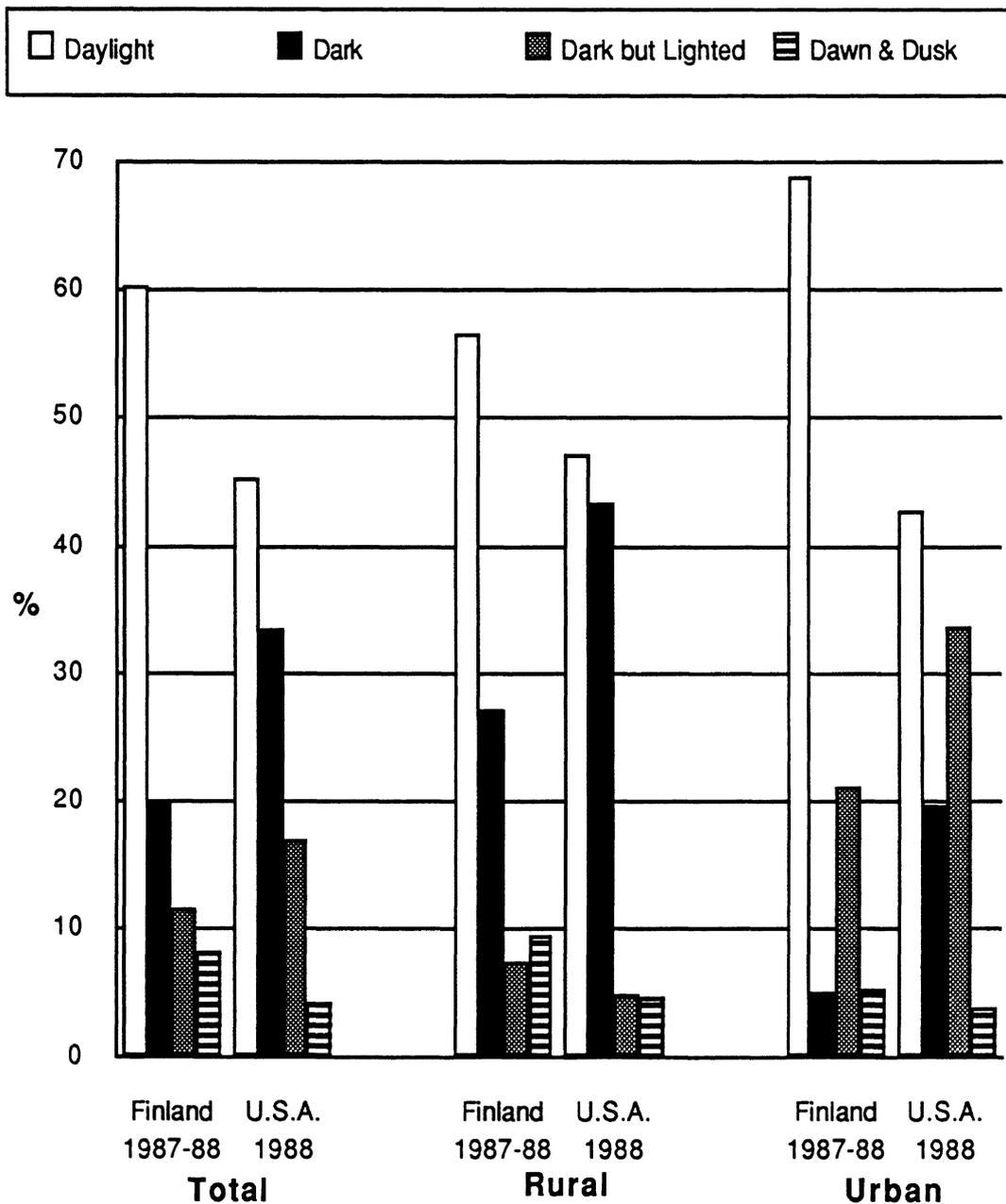


Figure 10. Light conditions in fatal accidents.

Comments:

- (a) Proportionally more fatal accidents occur in dark (and dark but lighted) conditions in the U.S. than in Finland.
- (b) No data about the exposure in different light conditions were available. However, it is reasonable to assume that in the U.S. there is proportionally more travel during the hours of darkness, because many stores and other facilities remain open during evening and early night hours.

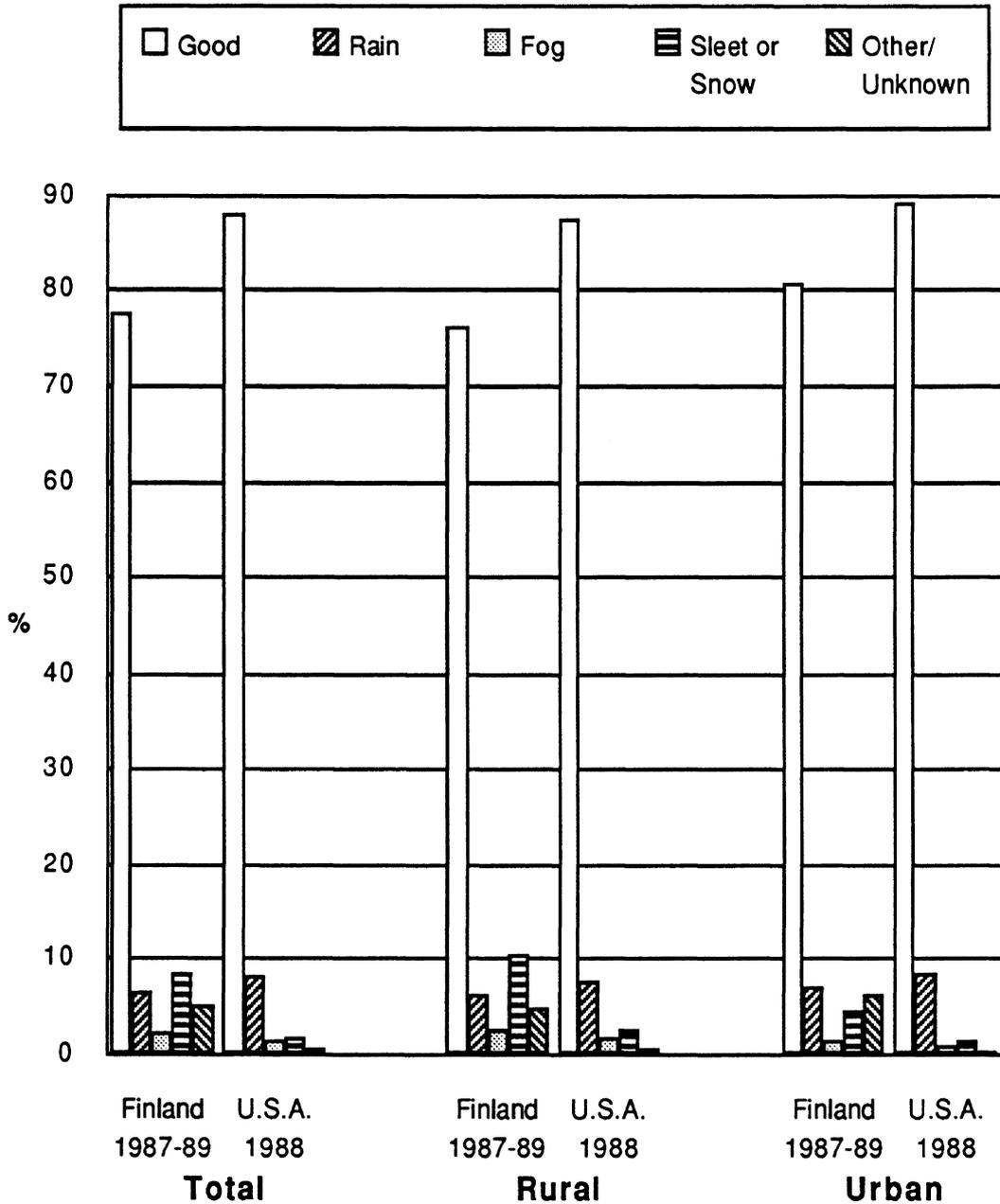


Figure 11. Atmospheric conditions in fatal accidents. (For the U.S., the fog category also includes fog and rain, and the sleet and snow category also includes sleet and fog.)

Comments:

- (a) More than 85% of U.S. and more than 75% of Finnish fatal accidents occur in good conditions.
- (b) Proportionally more fatal accidents in winter conditions occur in Finland, consistent with the fact that the frequency of winter conditions is higher in Finland.

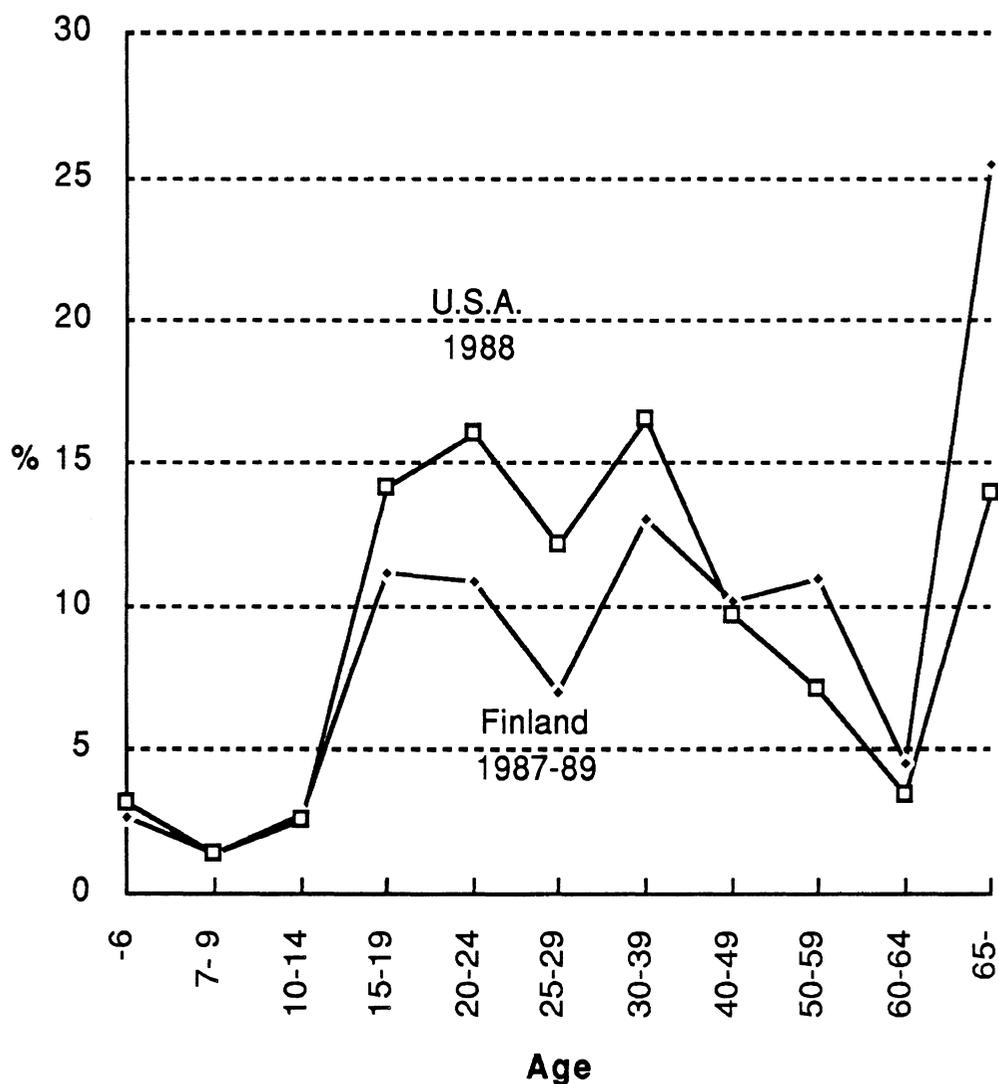


Figure 12. Age distribution of all fatalities.

Comments:

- (a) The proportion of killed young people (less than 15 years) is similar in the two countries.
- (b) Proportionally more older people (more than 64 years of age) are killed in traffic accidents in Finland than in the U.S.
- (c) Since the fatality patterns of road-user groups are somewhat different, it is more meaningful to consider separately the data for different road users (see discussions following Figures 13-16).

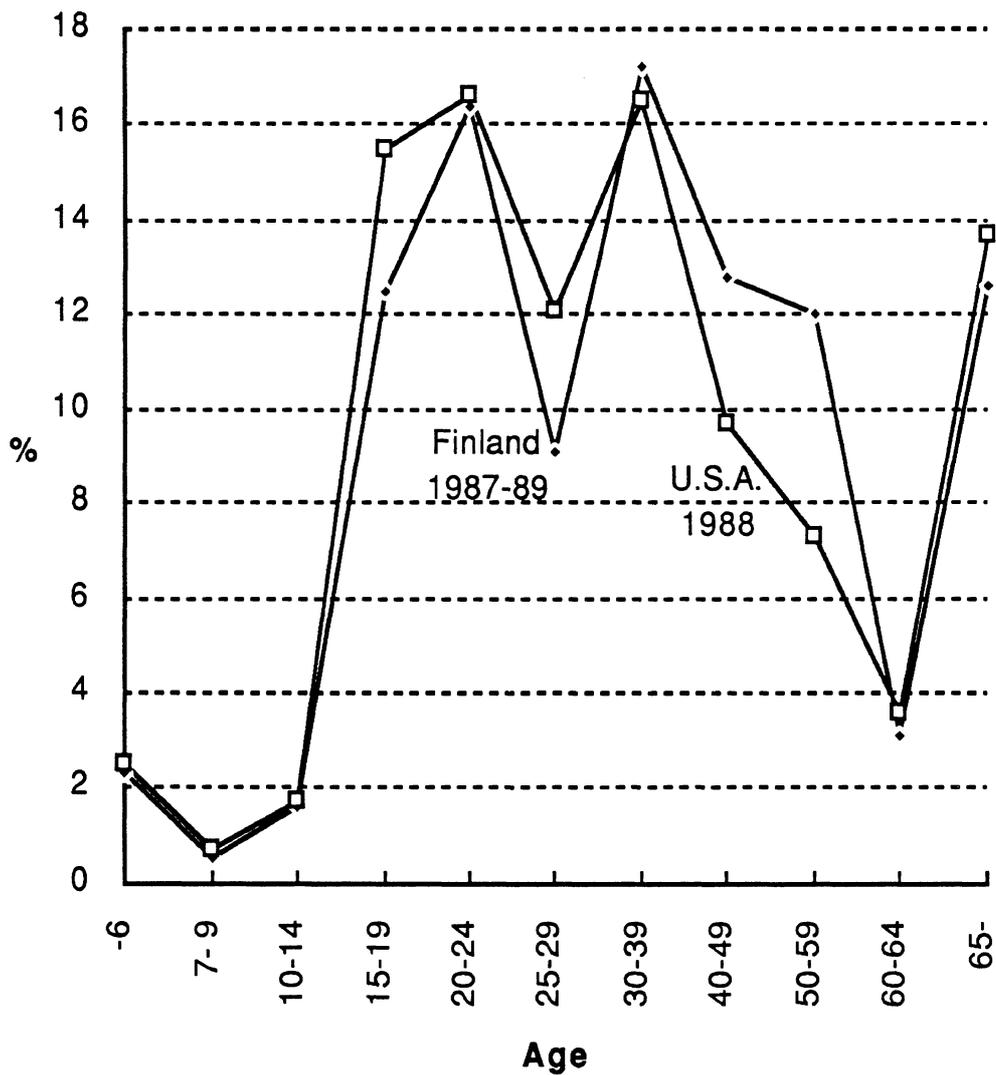


Figure 13. Age distribution of killed car drivers and passengers.

Comment:

Age distributions of killed car drivers and passengers in the two countries are similar. There is an especially close correspondence for persons 14 and under, and 60 and over.

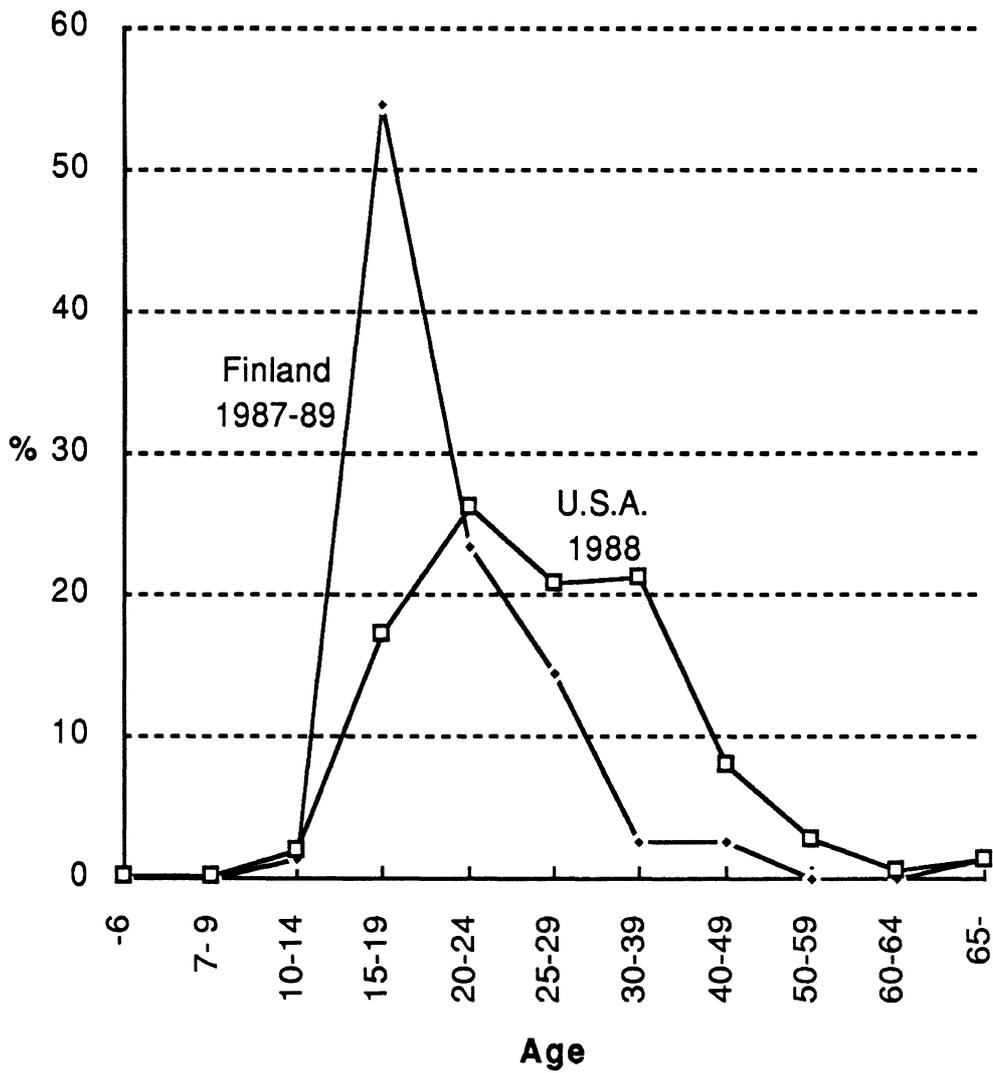


Figure 14. Age distribution of motorcyclists killed.

Comment:

Three times as many young motorcyclists (15 to 19 years of age) are killed in Finland than in the U.S.

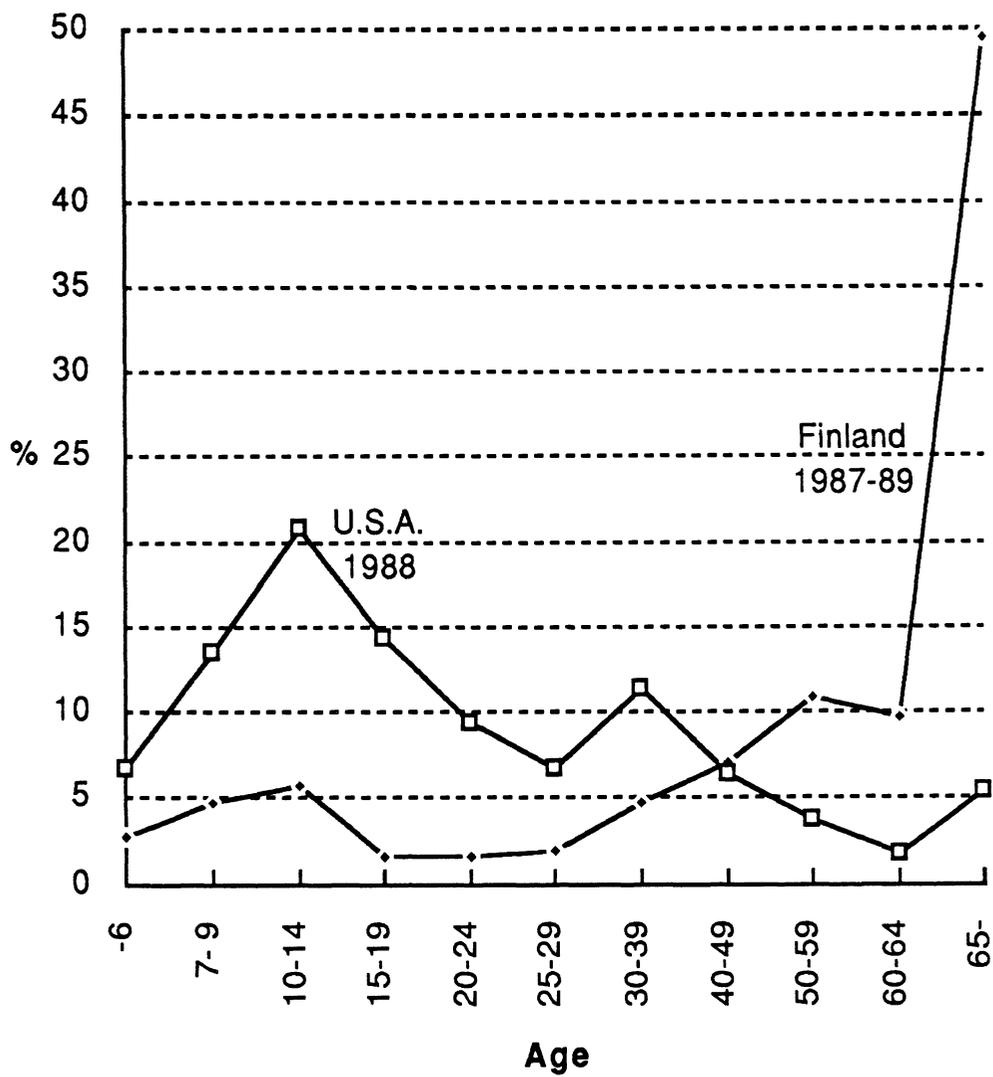


Figure 15. Age distribution of bicyclists killed.

Comment:

Proportionally more old bicyclists (especially those more than 65 years of age) are killed in Finland than in the U.S.

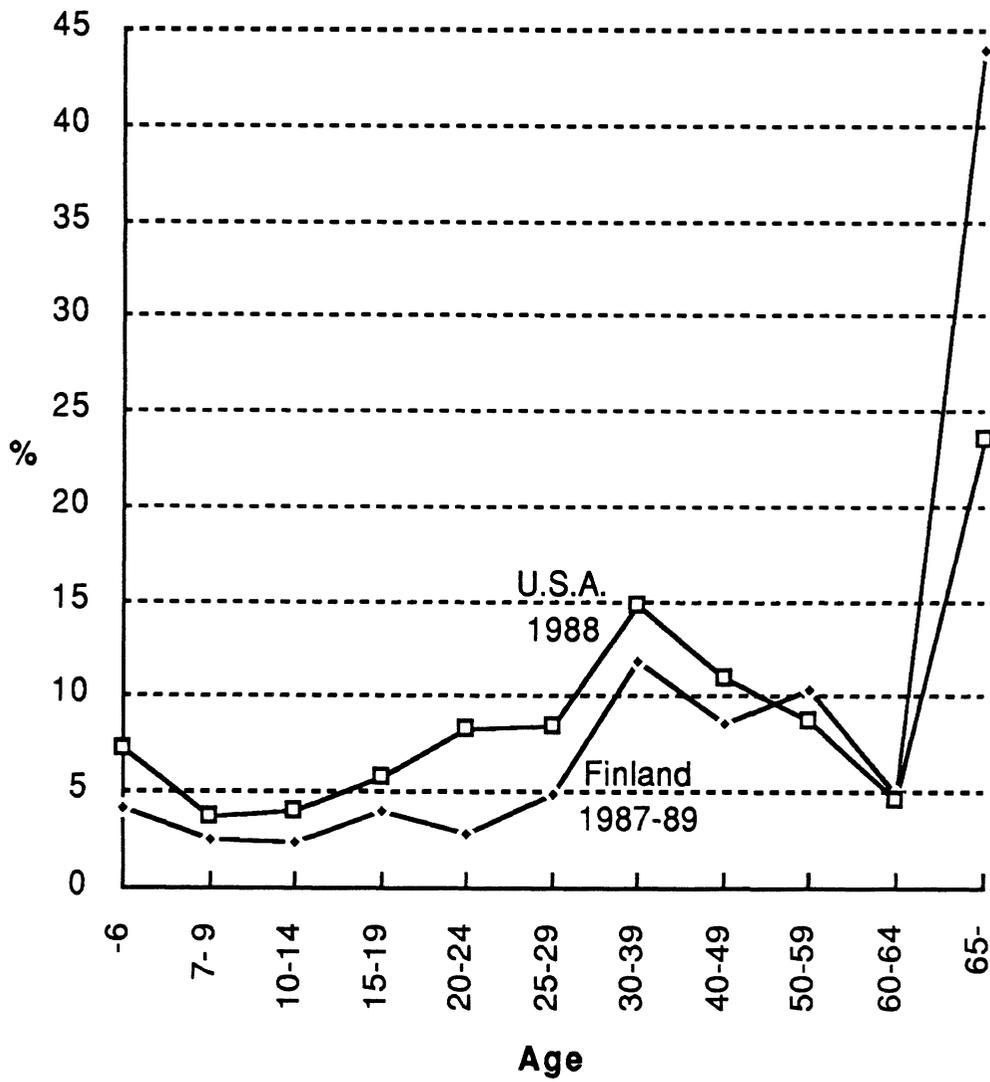


Figure 16. Age distribution of pedestrians killed.

Comment:

Proportionally more old pedestrians (more than 65 years of age) are killed in Finland than in the U.S.

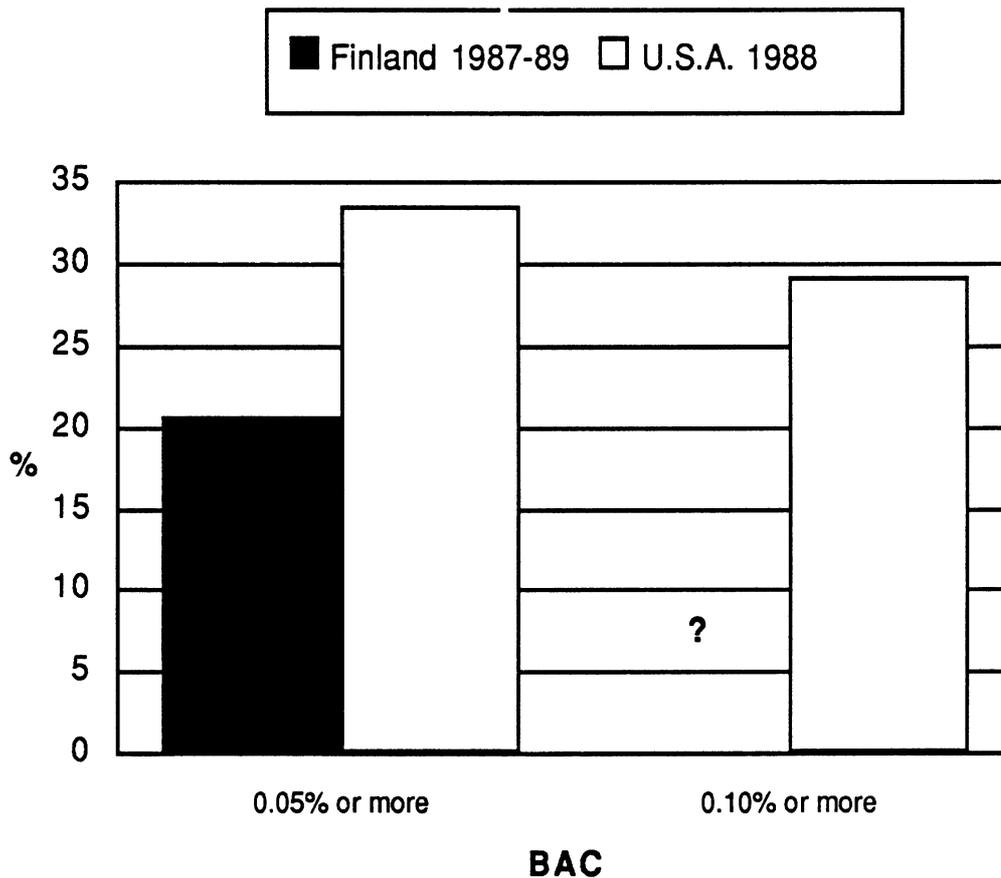


Figure 17. Alcohol involvement in fatal accidents. The entries are proportions of fatal accidents with at least one operator (driver, pedestrian, bicyclist, motorcyclist, or moped operator) intoxicated. (The legal BAC limit in Finland is 0.05%, and there is no exact information about the proportion of fatal accidents where at least one operator's BAC was 0.1% or more. The legal limit in the U.S. is 0.1%, except for five states.)

Comments:

- (a) The available statistics for both countries likely underestimate the proportion of alcohol-related accidents. Of all U.S. fatal accidents, only 66.1% had at least one operator with a valid BAC test result for which the maximum BAC was known. If we eliminate the missing data and calculate proportion of alcohol-related accidents for accidents with a valid BAC test result (not shown above), the proportion of BAC 0.05% or more is 50.5% and the proportion of BAC 0.10% or more is 44.2%. These values are comparable to estimates made by Evans (1991). For Finland we have no information on the proportion of fatal accidents that had at least one operator with a valid BAC test result. Pikkarainen (1992) estimates that in Finland the proportion of BAC 0.05% or more in fatal accidents is about 30%. (The proportion of intoxicated drivers—more than the legal limit—after midnight is estimated at about 0.5 % in Finland and about 14% in the U.S. (Government of Norway, 1987).)
- (b) Although the statistics are not very reliable, it appears that alcohol-related accidents are more frequent in the U.S. than in Finland.

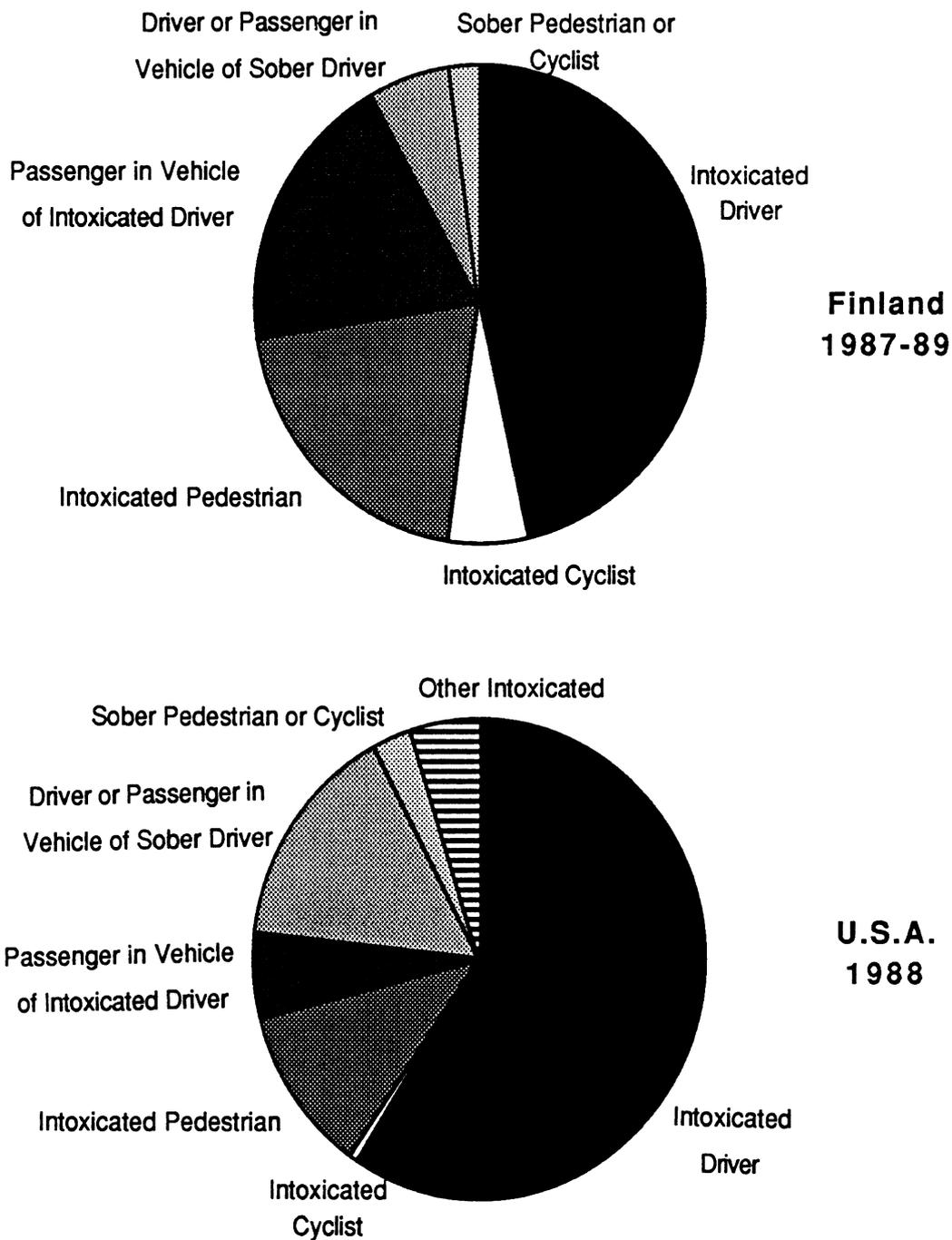


Figure 18. Road-user fatalities in alcohol-related accidents (with at least one operator intoxicated—BAC 0.05% or more).

Comments:

- (a) For both countries, about three quarters of fatalities in alcohol-related accidents are intoxicated persons.
- (b) In Finland (but not in the U.S.) the proportion of passenger fatalities in the vehicles with intoxicated drivers is greater than the proportion of all sober road user fatalities.
- (c) The pattern for the U.S. is essentially the same whether the BAC criterion is 0.05% or 0.10% (not shown).

CONCLUSIONS

The present results suggest the following trends:

General Statistics

- (1) Proportionally more rural accidents occur in Finland than in the U.S. Fatality rates per accident with fatalities, and injury rates per accidents with injuries are similar in the two countries.
- (2) The fatality rate per vehicle-distance travelled is higher in Finland than in the U.S., but the rate per capita is lower. This probably reflects the greater travel per vehicle (and per person) in the U.S.
- (3) There are proportionally fewer driver and passenger fatalities, and more pedestrian and bicyclist fatalities in Finland than in the U.S., due most likely to the greater pedestrian and bicycle exposures in Finland than in the U.S.
- (4) The injury rates tend to be lower in Finland than in the U.S.

Vehicular factors

- (5) The proportions of different types of vehicles in fatal accidents are generally similar in the two countries. However, there are proportionally fewer truck and motorcycle fatalities but more passenger car and bus fatalities in Finland than in the U.S.
- (6) The comparison of fatal accident rates showed the following trends: the rates for passenger cars, and trucks and vans are quite similar in the two countries; the rate for motorcycles is substantially greater in the U.S.; the rate for mopeds is higher in Finland; and the rate for buses is slightly higher in Finland.

Environmental Factors

- (7) The Finnish fatal accidents peak in July, November, and December, while those in the U.S. peak in July through October. The increased exposure is the likely explanation for the U.S. peaks, and for the Finnish peak in summertime. However, the peaks in the Finnish data in November and December are most likely influenced by some other factors (e.g., weather and ambient light conditions).
- (8) The Finnish fatal accidents peak on Fridays, while those in the U.S. peak (and more substantially so) on Saturdays.
- (9) The Finnish fatal accidents are most numerous in the afternoon (15-17). The U.S. data show a relatively flat maximum from midafternoon until early morning (15-3).
- (10) Proportionally more fatal accidents occur during the nighttime in the U.S. While no data on the exposure in different light conditions is available, this effect is likely due to the greater exposure in the U.S. during the nighttime.

- (11) More than 75% of fatal accidents occur in good atmospheric conditions in the two countries. There are proportionally more fatal accidents in winter conditions in Finland than in the U.S.

Human Factors

- (12) Proportion of fatalities of young people (14 years of age and younger) is similar in the two countries. Proportionally more older people (65 years of age and older) are killed in traffic accidents in Finland than in the U.S.
- (13) Age distributions of killed car drivers and passengers are similar in the two countries, especially for the very young and old people. Proportionally three times as many young motorcyclists (15 through 19 years of age) are killed in Finland than in the U.S. Proportionally more older bicyclists and pedestrians are killed in Finland than in the U.S.
- (14) Alcohol-related accidents appear to be more frequent in the U.S. than in Finland (although the statistics are not very reliable). Furthermore, the exposure of intoxicated drivers is many times higher in the U.S. than in Finland.
- (15) About three-quarters of the fatalities in alcohol-related accidents in both countries are intoxicated persons. In Finland (but not in the U.S.) the proportion of the fatalities in the vehicle of intoxicated drivers is greater than the proportion of all sober road-user fatalities.

IMPLICATIONS

One aim in performing cross-cultural comparisons of accident patterns is to derive suggestions concerning areas amenable to improvement. The underlying logic is that if country A shows a lower rate for a certain combination of circumstances than does country B, it might be of benefit to ascertain the reasons for this difference as a clue for actions to be taken by country B.

In general, the accident patterns in Finland and the U.S. proved to be relatively similar. This is not surprising, since both Finland and the U.S. are developed countries in which the car plays a dominant role (although that dominance is more pronounced in the U.S.). Consequently, the results suggest that the similar underlying traffic systems in the two countries produce generally similar accident patterns. However, those differences that were ascertained allow us to discuss the possible implications for the two countries.

One difference is that the fatality rate per distance driven is higher in Finland than in the U.S., and especially so for rural roads. Much has been done in Finland during the past few decades to reduce the fatality rate. Examples include the introduction of speed limits, improvement in the design of intersections, developing a separate network for bicyclists and pedestrians, mandatory seat belt laws for all occupants, and motorcycle/moped helmet laws. That the rate per distance still remains higher in Finland than in the U.S. is likely a consequence of more frequent use in Finland of two-lane rural roadways where head-on collisions and accidents with pedestrians and bicycles are more frequent than on limited-access roadways.

There are several approaches for improving Finnish traffic safety. The first approach would involve building limited-access roadways. This would improve safety in terms of fatality rates per distance travelled. However, the increase in efficiency of such roadways would probably increase the exposure (people would drive more), and consequently might lead to a counterbalancing increase in accidents. Furthermore, this option is an expensive one, and subject to increasing environmental concerns. The second approach would be to foster public transportation, which is substantially safer per distance travelled than passenger-car transportation. (This would not reduce the rate per distance travelled in a passenger vehicle, but it would reduce the rate per distance travelled in all modes of transportation.) The third approach includes several partial countermeasures, such as lower speed limits, further development of the separate road network for bicyclists and pedestrians, improved roadway lighting, mandatory helmet use for bicyclists, etc. Many of these countermeasures would be of special benefit to subpopulations and situations found in this study to be of particular concern in Finland (i.e., pedestrians and bicyclists in general and older ones in particular, traffic safety in late fall, etc.).

In contrast to Finland, the traffic safety problems in the U.S. lie more in urban areas. Furthermore, while the overall fatality rate per distance is lower than in Finland, the fatality rate per capita is higher. The most likely reasons for this are that the U.S. urban areas are more dispersed, private vehicles are available to all segments of the society, and public transportation is less developed.

The present analysis found that the largest difference between the two countries is in the fatal accident rates of motorcycles, with the U.S. rate being about four times higher than the rate in Finland. Since motorcycles are used primarily by young people, motorcycle accidents are likely to reflect a combination of risk taking and lack of riding skills.

About three-quarters of all fatalities in alcohol-related accidents in both countries are intoxicated persons. However, alcohol appears to be involved in substantially greater proportion of fatal accident in the U.S. than in Finland. Whether this is a consequence of different laws or different societal approaches is unclear.

In summary, the present findings indicate that the U.S. lags behind Finland in motorcycle safety and in the prevention of drunk-driving accidents in general, and thus improvements in these two areas should be possible using realistic countermeasures.

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