

Crime, accidents and social control

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ABSTRACT *This paper addresses two questions. (1) Is there a demonstrable relation between accidents and crime, does this relation hold for each type of crime and each means of transport, and does it subsist after controlling for age and gender? (2) Can social control theory explain involvement in both delinquent behaviour and in accidents? Globally, the answer on these questions is affirmative. We established a relatively strong relation between crime and accidents. This relation was found for all types of crime and for all means of transport. It holds for boys and girls, and for all age categories. However, the relation is stronger for girls and younger respondents (12–14) and weaker for boys and older respondents (21–24). An explanation is offered in terms of the balance between exposure/opportunities and individual causes of crime. Finally it appears that, to some extent, social control variables related to crime can explain involvement in accidents, supporting the idea that, at least in part, the statistical association between crime and accidents is the result of a common causal process.*

INTRODUCTION

Only a small number of studies report a relation between criminal behaviour and accidents and/or injuries. Few authors discuss explicitly the possible relation and how it should be interpreted. There are however, a number of theories, such as antisocial personality theory and other personality theories such as risk taking, sensation seeking, arousal, or social control and self-control theory, which may predict a relation between accidents and crime. For others, such as

subculture and strain theory, this may be much more difficult. The theories mentioned above which endorse this relation all imply that the relation is spurious: the reason for a relation is the presence of a third variable which is causally related to both accidents and crime (see Junger, 1994; Junger & Wiegersma, 1995, for reviews). In this article we will examine the relation between accidents and crime. We investigate whether social control theory can provide an explanation of both crime and accidents. The article will start with a brief theoretical introduction. The following sections will present the research design, the results and, finally, a summary of the main findings and a brief discussion.

THEORETICAL BACKGROUND

The relation between accidents and crime can be examined from a criminological point of view or from the point of view of traffic research. The criminological point of view will be discussed first, and subsequently the traffic research findings will be discussed briefly.

Criminological considerations

Basically, it can be argued that there are two approaches to analysing crime (Gottfredson & Hirschi, 1990; Farrington, 1992), that is, studying crime, or studying individual differences. On the one hand one can study the fact itself, namely the crime. Crimes can be examined as specific acts. At what time do they occur, how much money do they provide, which objects are most vulnerable to crime, who are the victims of crime? These questions can be studied without knowledge of the criminal *per se*. To understand why certain crimes are committed at specific moments one has to understand situational circumstances. This approach is known as the 'opportunity' or the 'routine activity approach' (see, for example, Cohen & Felson, 1979; Cornish & Clarke, 1986; Felson, 1994). On the other hand one can study criminality as a characteristic of persons. This is the analysis of individual differences. Some people are more likely to commit crimes than others, in every situation. It should be mentioned that situations are not independent of individual differences and that people to some extent shape their own environment.

Several theoretical approaches (Gottfredson & Hirschi, 1990; Farrington, 1992; Felson, 1994) combine both levels of explanation. It has been argued that both approaches, that of *individual differences* and a *situational approach*, should be compatible with each other (Gottfredson & Hirschi, 1990). In the following paragraphs a number of theories on criminal behaviour, as an individual propensity, will be briefly described. However, it is important to note that both approaches, the situational approach and the individual differences approach, are necessary to understand crime. In addition, it will be proposed later that these two points of view (situational versus individual differences) can be applied to accident research.

Theories of individual propensities to commit crime

Until now there has not been much interest in accident involvement in criminology. Despite this lack of interest, there are, however, three relatively old studies which report a relation between criminal involvement and unintentional injuries (intentional injuries are crimes, suicide or self-mutilation). These are Glueck and Glueck (1950), Robins (1966) and West and Farrington (1977). However, as far as we know, these are the only studies on this subject from the criminological point of view. These authors do not discuss the importance or the meaning of the relation. Therefore, it is not surprising that, generally, theories or explanations of deviance do not discuss a possible relation between crime and accidents. There are, however, a number of theories which may provide an explanation for this relation. Theories which imply that various types of problem behaviour tend to come together in the same persons could furnish such an explanation. This implication has sometimes been labelled as the *generality of deviance* thesis (Gottfredson & Hirschi, 1990). To explain this clustering in the same persons it seems reasonable (from the perspective of parsimony) to attribute deviant behaviour in general to a single broad personal characteristic. This characteristic will then lead to various forms of risk taking, problem behaviour and crime. We will discuss examples of these approaches, namely personality theories and control theories.

Personality theories

An example of a personality theory is the anti-social personality theory of Robins (1966). Sociopathic individuals will exhibit a broad variety of antisocial and problematic forms of behaviour (Robins, 1966; Farrington, 1992). Globally, this approach states that 'there are changing manifestations of theoretical constructs at different ages' (Farrington, 1992, p. 259). Another broad personality characteristic is the concept of sensation seeking which was developed by Zuckerman (1979). Sensation seeking has been found to be related to criminal behaviour (White, Labouvie & Bates, 1985) and to driving behaviour (Heino, van der Molen & Wilde, 1992). A related approach is arousal theory (Ellis, 1990). Some authors have objected against the idea of risk taking or sensation seeking as a sufficient explanation of crime by arguing that withdrawal behaviour (the opposite of sensation or arousal seeking) is also related to crime (Gottfredson & Hirschi, 1990; see also Junger & Wiegersma, 1995).

Control theories of crime

Control theories all start with an assumption on human nature: *crime is given, non-crime has to be explained*. The tendency to act out of self-interest and to commit crimes does not have to be learned. It is present among all human beings. People are naturally inclined to pursue their own inclinations and

interests (see also Reiss, 1951; Briar & Piliavin, 1965; Hirschi, 1969, 1986; Nye, 1982). Consequently, in order to explain delinquency, the central question according to Hirschi is not 'why do they do it' but 'why don't we do it' (Hirschi, 1969, p. 34). According to control theories, control mechanisms are necessary to restrain people from getting involved in crime. We will discuss briefly *social control theory*. Hirschi (1969) argues that *the bond to society* acts as a control mechanism that inhibits our deviant tendencies. The social bond is the result of a socialisation process and has several components:

- *Attachment to significant others* is the emotional or affective element.
- *Commitment* to conventional subsystems is the 'rational component' of the bond: a desire to conform and to invest in the future in a conforming way. People are bound to society by what they have (and might lose) but also by what they hope to obtain: the probable rewards in the future. 'Thus, "ambition" and/or "aspiration" plays an important role in producing conformity' (Hirschi, 1969, pp. 20–21).
- *Involvement in conventional activities*: when people are strongly involved in conventional activities they probably have fewer opportunities to commit delinquent acts.
- *Beliefs* in conventional values constitute the moral element of the bond. Social control theory claims the existence of a common value system with respect to delinquency within society or in the group whose norms are violated. But, although this value system is generally accepted by everyone, not all people feel the same commitment to these values.

Interestingly, Suchman (1970), independently of Hirschi (1969) argued that social controls serve to restrain criminal behaviour as well as accident involvement. He reports a relation between injury liability and deviant behaviour and argues that social controls provide (one of) the process(es) leading to a relation between accidents and social deviance (Suchman, 1970). According to Suchman, social controls serve to protect the individual from harm:

Social controls may also serve to regulate hazardous consumer products such as poisons and lethal weapons. Obviously, a great many social controls, traffic laws and safety regulations, for example are aimed directly at reducing harmful anti-social behaviour. To the extent that social controls are violated by the individual, we may hypothesize that he places himself in a situation of additional risk of injury or death. (1970, p. 5)

In the present study social control theory was used as a theoretical framework. It provides us with the background variables to which accidents and crime will be related.

Similarity to traffic research

Comparable to the distinction between crime (the fact) and criminality (indi-

vidual differences in crime-proneness) in accident research one can distinguish between the attributes of the individual and situational characteristics and exposure.

(1) Situational approach

The study of the situations in which accidents occur is an important area of research. For example, neighbourhoods having relatively dense traffic and relatively few playgrounds have higher accident rates among children than neighbourhoods with less traffic and more playgrounds. Weather conditions are also related to accident rates (for more information on situational factors, see, for example, Foot, Chapman & Wade, 1982; a special issue of *Social Problems* (1987); Elander, West & French, 1993).

(2) The study of accident liability

In the field of traffic research, the interest in the individual characteristics of those involved in accidents was an important subject of inquiry before and just after the Second World War. At that time 'accident-proneness' was the term used. Although in some respects these studies seem 'old fashioned', many controlled for confounding factors (such as driving experience and exposure), were careful in the data acquisition process, and were attentive to possible flaws such as differential validity of self-reports on accidents (see also Sorensen, 1994). An example of this type of research is the study on the 'accident-prone automobile driver' by Tillmann and Hobbs (1949). They describe two studies which compared high-accident drivers with low-accident drivers. The first study concerned taxi drivers. They found that high-accident taxi drivers differed from low-accident drivers on almost all the background factors which were studied. In childhood they showed more conduct disorders, at school they had higher records for truancy, their work record was poorer (more short-time jobs, less well adjusted in their jobs), their social adjustment was poorer (e.g. less friends), when married they were more often unfaithful to their wives, they had a history of childhood accidents, and finally, their driving habits were worse. These results were checked on drivers with high and low accident records selected from the general population. The results confirmed the first study. For example, it was shown that low-accident drivers were known to juvenile and adult courts in only 1% of the cases. For high-accident drivers the figures were 17% and 34%, respectively. The well-known conclusion of the authors is that 'a man drives as he lives' (Tillmann & Hobbs, 1949, p. 329).

After the Second World War the term accident-proneness was abandoned. The search for individual differences received less attention until the last decade (see Lester, 1991). These 'individual characteristics' include deviance. West, Elander and French (1993) looked at the connection between the intention to commit crimes and accident rates. They find a relatively strong relation which is in part mediated by thoroughness and speed. Other examples

of research investigating the relation between traffic behaviour and deviance can be found in Sivak (1983, 1987), Hansen (1988), Hilakivi et al. (1989), Rothengatter (1993), Parker et al. (in press). For thorough reviews we refer to, among others, Lester (1991) and Elander, West and French (1993).

To conclude, this article will address two questions. First: is there a relation between accidents and crime and, second: are background factors which are known to predict delinquency also predictors of accident involvement? If the answer to this last question is affirmative this will support the spuriousness thesis by showing that a third factor may explain the relation between accidents and crime. To find out whether there is support for this 'common aetiology thesis' a series of background variables generally known to be related to crime have been related to accident involvement. As stated above, the suggestion is that if both dependent variables are to a certain extent the product of the same individual differences, there should be overlap between the correlates of crime and the correlates of accident involvement. Up to now there has been a lot of indirect evidence in support of the spuriousness thesis (see Junger, 1994, for a review). But no study up to now has investigated directly whether or not accidents and crime have common correlates among theoretically relevant variables. The variables used in the present study cover the main aspects of adolescent life: family, school and leisure. The variables and the scale construction are based on Hirschi's (1969) social control theory. More information on the scale construction can be obtained from the first author.

RESEARCH DESIGN

The data from the present research come from a study conducted by the University of Utrecht. For the part on delinquent behaviour, the University of Utrecht collaborated with the Ministry of Justice. The sample consists of youngsters aged 12–24 who belong to a random sample of 9000 households. The households are representative with respect to the number of persons in the household, the age of the head of the household and the region. The non-response rate is 34.5%. The non-response rate was computed without counting the number of people who moved, or could not be located. In total 2918 adolescents were interviewed. These types of samples provide a good picture of relatively 'average adolescents' but ethnic minority youngsters and very deviant adolescents (e.g. drug users) are probably undersampled.

The data were gathered by means of interviews. However, for reasons of privacy, the questions on delinquent behaviour were asked by means of a small written questionnaire at the end of the interview (for more information see Meeus & 't Hart, 1993; Rutenfrans & Terlouw, 1994).

The delinquency measures

Twenty-eight questions were asked about delinquency and deviant behaviour.

Although a few questions do not concern delinquent acts, for practical reasons we will refer to the scales as 'delinquency scales'. All questions had a similar structure. The first question is: 'have you ever...'. After a positive answer the following question is 'how often during the last year'. The answers have been summed to form various scales. First, two general scales are available:

- a *delinquency ever* scale, which is a count of the different types of self-reported offences ever committed by each respondent;
- a *delinquency scale last year*, which is the sum of the frequency scores for all self-reported offences committed during the preceding year.

Second, the 28 questions have been divided into four subscales on substantive grounds:

- *property crimes* which include such offences as using public transport without a valid ticket; shoplifting, stealing things at school, stealing a bike or a moped, pickpocketing and burglary;
- *violence against persons* which includes such offences as carrying a weapon, threatening someone with physical violence, fighting and hurting someone with a weapon;
- *vandalism*, including such offences as graffiti, destruction and arson;
- *alcohol and drugs*, including questions about consumption of hashish, marijuana, heroin, speed, LSD and alcoholic beverages.

The last four scales have an *ever* and a *last year* version. Table 1 presents the frequency distribution of the scales used in the following analysis. Globally the delinquency scales are in line with what self-report studies usually find.

The self-report method has been found to be sufficiently valid and reliable for aetiological research where the goal of the study is to order the children from low to high on a deviance or delinquency scale (see Elliott & Ageton, 1980; Hindelang, Hirschi & Weis, 1981; Junger, 1990).

The accident measures

Accidents have been measured by the following questions:

We would like to know whether you have ever been involved in a traffic accident or another type of accident. Could you tell us whether this has ever happened to you? If so, could you say whether this was last year or prior to that?

The answers are summed up and combined into two traffic accident scales, *ever* and *last year*. A separate question was asked about having been involved as a passenger in a traffic accident. This was done to make explicit to the respondent that this type of accident should not be confused with the other types of accidents (in which the respondent is the driver). The reason for this is that acci-

dents in which one is involved as a passenger will generally not be the responsibility of the respondent.

A second question concerns other types of accidents.

Were you ever involved in another accident, such as a fall? Did you fall into the water (almost drown), get injured by fire from fireworks, during a fight, by machines or anything else?

The answers on this additional question were added to the previous two scales. This results in two accident total scales, *ever* and *last year*, which con-

TABLE 1: Percentage of self-reported behaviour, ever and last year (n = 2918)					
No. of crimes (variety)	Property	Vandalism	Violence against persons	Drugs	Total
<i>Ever:</i>					
None	38.2	57.1	65.5	66.2	23.8
1	21.9	33.5	23.0	28.9	17.4
2	13.8	8.4	9.0	4.5	12.9
3	10.1	2.1	2.0	0.4	11.2
4	6.5	-	0.4	-	8.7
5	4.0	-	-	-	6.8
6	2.5	-	-	-	5.1
7	1.5	-	-	-	3.9
8	0.6	-	-	-	3.1
9	0.4	-	-	-	2.1
10 or more	0.2	-	-	-	5.1
Total	100	100	100	100	100
<i>Last year:</i>					
None	68.8	86.4	80.0	83.7	51.9
1	17.7	11.4	15.9	15.1	21.3
2	8.4	1.9	3.5	1.1	11.4
3	2.9	0.2	0.4	0.1	6.9
4	1.1	-	0.1	-	3.2
5	0.7	-	-	-	2.2
6	0.2	-	-	-	1.0
7	0.2	-	-	-	0.7
8	-	-	-	-	0.8
9	-	-	-	-	0.3
10 or more	-	-	-	-	0.2
Total	100	100	100	100	100

tain the information on traffic accidents and other types of accidents.

It should be noted that the wording of the second question, which asks, among other things, about injuries as a result of a fight, produces a contamination problem with respect to the main goal of this study which is the relation between crime and accidents. Getting injured in a fight may lead to a positive score on the delinquency scale as well as on the accident scale. But in this example both scores result from the same event. This is not what this study aims to measure. To diminish the effect of this possible problem all analyses were performed for the 10 measures of delinquency (property, vandalism, violence, drugs, and total, all five in an *ever* and *last year* variety) in relation to the four accident scales (total, and traffic accidents only, both *ever* and *last year*) separately. The frequency distribution of the accident scales is shown in Tables 2 and 3.

	None	Last year	Previous to last year	n
Traffic:				
as pedestrian	94.2	0.4	5.4	2915
as cyclist	74.3	5.6	20.1	2909
driving moped	87.3	3.6	9.1	2909
driving motor-cycle	99.5	0.3	0.2	2910
driving car	92.4	3.5	4.0	2908
As passenger	74.4	4.2	21.4	2904
Other types of accidents	68.9	6.6	24.5	2893

Accidents	Traffic		Total*	
	Last year	Ever	Last year	Ever
	87.1	58.0	81.7	41.9
	12.4	33.3	16.7	38.2
	0.5	7.3	1.4	15.6
		1.1	0.1	3.7
		0.1		0.4
				0.2

Note: *Traffic and other accidents

Social control measures

A short review of the scales and the variables used in the following analysis is presented below. Whenever a scale was used, the number of variables on which the scale is based and Cronbach's alpha are given in brackets. Examples of the type of questions included in the scale are given as well. The variables

and scales pertain to bonds with parents and friends, school and orientation towards the future, dating and working, values, leisure time activities and exposure.

Attachment: bonds with parents/friends

1. *Family integration* (three questions) measures the extent to which the respondents feel attached to their family. For example, the respondent was asked whether the family members 'usually go their own way' (Cronbach's alpha: 0.81).
2. *Family climate* (two questions) measures whether the respondents like their parents and the degree of supervision they experience, e.g. 'when I go out my parents know where I go' (Cronbach's alpha: 0.71).
3. *Affective bond with parents* (two questions) measures the affective bond between the parent and the child. Respondents are asked to what extent they 'can talk with their parents' and to what extent they consider 'their parents as their best friends' (Cronbach's alpha: 0.77).
4. *Attachment to friends* (six questions) measures the extent to which one's best friends contribute to feelings of security (questions were selected from the Utrecht-Groningen Identity Development Scale; see Meeus & Dekovic, 1993; Cronbach's alpha: 0.89).

Commitment: school and orientation towards the future

5. *Importance of school* (six questions) is a scale which measures the degree to which respondents think school and education are important (Cronbach's alpha: 0.84).
6. *Orientation towards the future* (six questions) measures the degree to which respondents are committed to education in relation to their future, e.g. 'one has to work hard to achieve something in life' (Cronbach's alpha: 0.68).
7. *Pleasure in study* (five questions) is a scale which measures the extent to which respondents find pleasure in their school work, e.g., 'I like to work hard' (Cronbach's alpha: 0.70).
8. *Work ethics* (five questions) is a scale based on questions such as 'A permanent job is a source of happiness', 'a career is important' (Cronbach's alpha: 0.80).

Dating and work

According to Hirschi a child has to develop career lines in relation to education, a future profession and the 'passage to adult status'. These career lines are 'surrounded by conventional evaluations of appropriateness with respect to timing and by conventional evaluations of success or failure' (Hirschi, 1969, p. 162). Dating and having a job while at school has been interpreted by

Hirschi (1969) as showing a lack of commitment towards conventional goals and conventional patterns of behaviour for children.

9. *Dating*: 'Do you have a boy/girlfriend?'
10. *Number of dates*: 'How many dates/relationships have you had before your actual boy/girlfriend?'
11. *Having a job*.
12. *Do you get pocket money* from your parents?'
13. *Actual net income*.

Values

14. *Values towards violence* (six questions) measures the opinion of the respondents towards a number of violent offences, e.g., 'a boy threatens someone with a knife' (Cronbach's alpha: 0.96).
15. *Values towards vandalism* (five questions) measures the opinion of the respondents towards various forms of vandalism, e.g. 'destroying someone's moped on purpose' (Cronbach's alpha: 0.88).
16. *Values towards fencing* (two questions) measures the opinion of the respondents towards two questions on fencing, e.g. 'buying something you know has been stolen' (Cronbach's alpha: 0.91).

It should be noted that the frequency distribution of these three value scales is very skewed. When the scales are categorised into five categories (of equal ranges) it appears that: (1) 98.9% of the respondents condemn violence 'very strongly'; (2) 0.2% and 96.7% of the respondents condemn vandalism 'very strongly' and 'strongly', respectively; (3) 0.2% and 96.5% of the respondents condemn fencing 'very strongly' and 'strongly' respectively. Apparently all respondents strongly condemn delinquent behaviour.

Leisure-time activities

Similarly to dating and having a job, leisure-time activities are indicative of the extent to which children wish to conform and invest in their future educational and professional careers (Hirschi, 1969, p. 191).

17. *Number of friends* the respondent goes out with.
18. *Number of evenings spent away from home* (*your home*).
19. *Where do the respondents usually go when they go out*, coded in conventional versus non-conventional activities ('conventional' meaning: family, cinema, theatre..., and 'unconventional' meaning: going to the station to hang around, going to coffee shops...).
20. *Being bored* ('How often do you feel bored?').

Measures of exposure

- 21. *Moped.* No direct information on moped ownership was available. But, in a question on hobbies, respondents could mention their moped. Respondents who mentioned their moped as a hobby were considered to be moped owners. In this way a proxy of moped ownership was obtained. It seems plausible that actual ownership might be higher. The problem is that boys who mention their moped as a hobby may not constitute a random sample of the entire group of moped owners. Therefore, the answer on this question may in part reflect the types of hobbies people have rather than of ownership. However, as not many measures of exposure are available this question was kept in the analysis.
- 22. *Doing sports in a club* or another organisation.
- 23. Number of *hours of sport* per week.

RESULTS

The first question this study attempts to answer is: is there a relation between crime and accidents?

The relation between crime and accidents

The results for the *ever* and the *last year* data are presented in Figures 1 and 2. A higher involvement in delinquency is positively correlated with accidents.

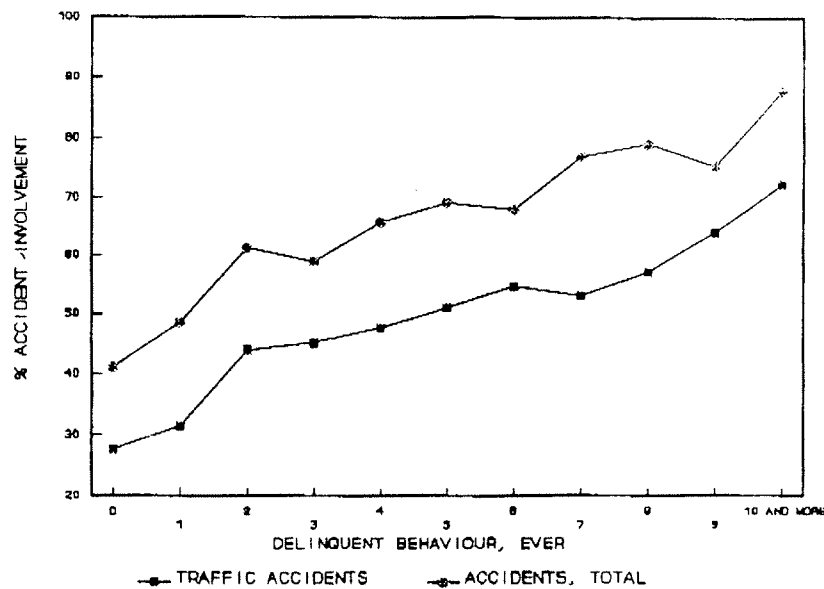


FIGURE 1: Accidents total (1 or more) and traffic accidents (1 or more) in relation to delinquency (0-10 and more); *ever* scales

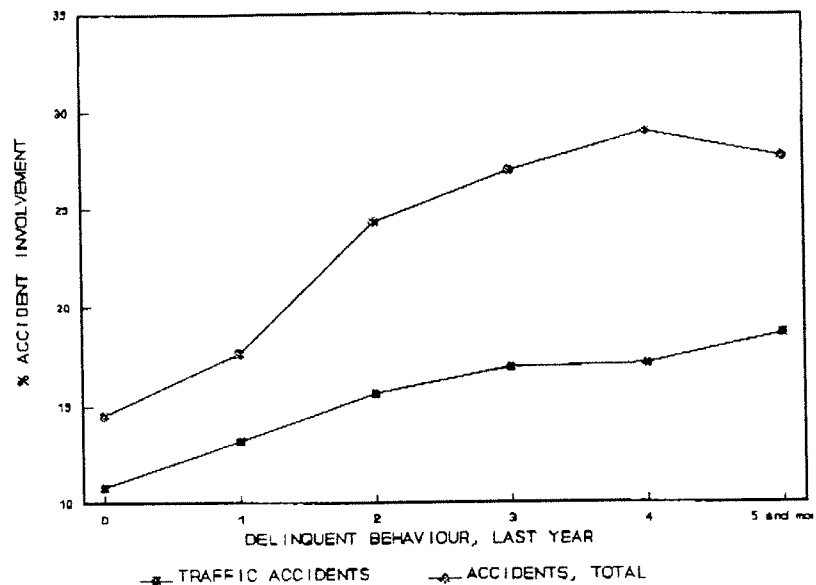


FIGURE 2: Accidents total (1 or more) and traffic accidents (1 or more) in relation to delinquency (0–5 and more); last year scales

Both figures suggest that the relation is linear. The odds ratios show that this is, indeed the case (see below). Further analyses investigate whether the relation holds for different types of accidents, for different types of crimes and for various age and gender categories.

Types of crime

Our data show that the relation between crime and accidents holds when controlled for type of crime. All results concerning the *ever* scales are significant. For the *last year* scales all the tables are statistically significant with the exception of alcohol/drug use and vandalism which are not significantly related to traffic accidents *last year*. For vandalism, however, there clearly is a trend with traffic accidents increasing from 12.6% (no vandalism) to 20.6% (highest vandalism score). Figure 3 illustrates these results for accidents *ever* in relation to the five delinquency scales *ever*.

Differences according to mode of transportation

Figure 4 shows the relation between delinquency and different types of accidents, namely pedestrian accidents, cyclists, motor-cyclists and car drivers. Figure 4 is based on (1) the total sample for 'accidents as a pedestrian or as a cyclist'; (2) only on the respondents of 16 years and older for 'accidents while driving a motor-cycle'; and (3) on the respondents of 18 years and older for 'accidents while driving a car'. The selections result from the legal minimum age to drive a

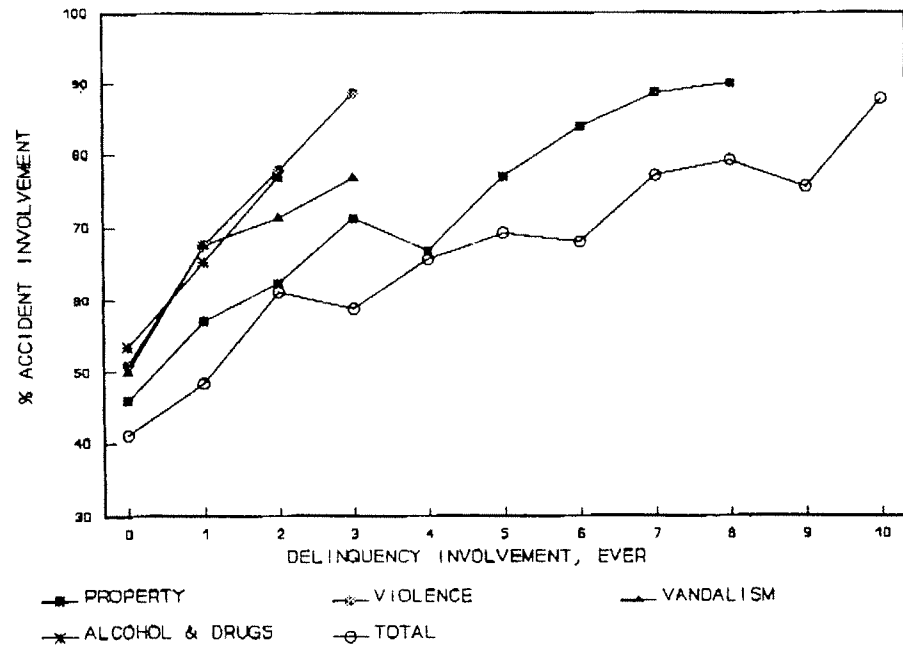


FIGURE 3: Accident involvement (1 and more) in relation to property crime (0–8 and more), violence against persons (0–3 and more), vandalism (0–2 and more), alcohol and drugs (0–2 and more), and delinquency total (0–10 and more); *ever* scales

moped or a car in the Netherlands. The results show that overall the relation remains unchanged. Generally, involvement in delinquency is positively related to involvement in accidents for the *ever* and the *last year* data. There are two exceptions: car drivers' accidents and pedestrians' accidents (both for the *last year*). As for pedestrians, though statistically non-significant, the percentages increase in the expected direction. It should be noted that the numbers for the *last year* data are quite small for pedestrian accidents and accidents as a car driver.

Control for gender and age

Finally, it was investigated whether the relations between crime and accidents also hold when controlling for gender and age. (Control for socioeconomic status was not performed, as delinquency is basically unrelated to socioeconomic status in this study as in most self-report studies; see Rutenfrans & Terlouw, 1994; also Junger, 1990.) To this end, a log-linear analysis was performed on cross-tables of the five delinquency measures and the two accident measures controlling for gender and age simultaneously. For each of the 10 cross-tables of delinquency and accidents we investigated whether the odds ratios were different for boys and girls, for different ages, and for different gender-age combinations (see the Appendix for more details on the model used). The most parsimonious model that was selected was (1) non-significant, and (2) for which the difference with a less restrictive model was non-significant as well. For each of the 10 cross-tables the odds ratios are presented in Tables

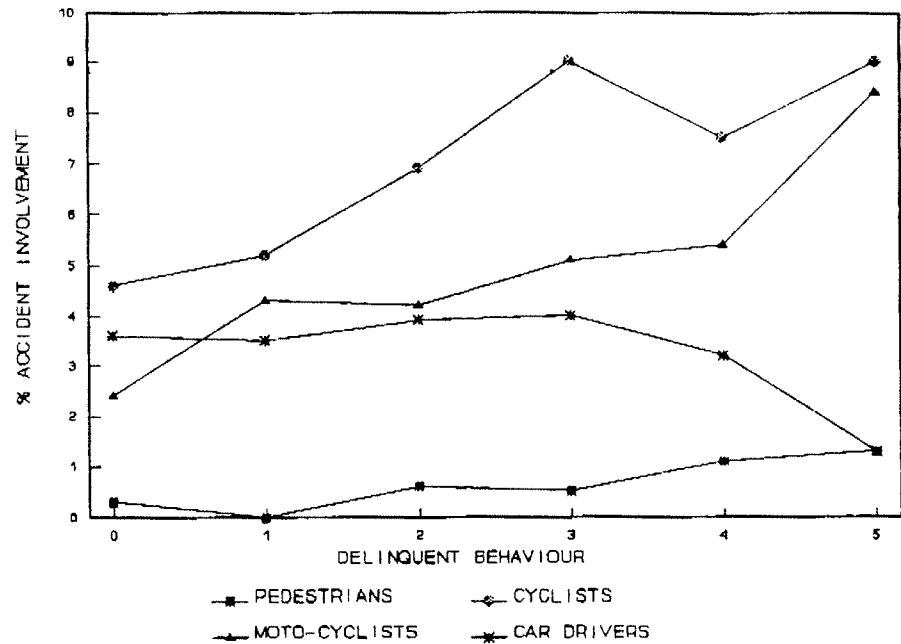


FIGURE 4: Pedestrian accidents (1 or more), bicycle accidents (1 or more), motor-cycle accidents (1 or more), and car accidents (1 or more) in relation to delinquency (0-5 or more); last year scales

4 and 5. From Table 4 it can be concluded that there is a gender effect for *delinquency total*, which is why the odds ratios are presented for boys and girls separately. For *property offences by accidents total* there is an age effect and the odds ratios are presented for the lowest and the highest age category. For *property by traffic accidents* there is a gender and an age effect which is why the results are presented in Table 5. We present odds ratios for adjacent cells, as well as for the four most extreme cells, in the table. The latter odds ratios show how extreme the relations in the contingency table may become. We believe that in this way we better illustrate the strength of the effects that are found. For example, from Table 4 in the first cross-table analysed (*delinquency total by accidents total*) it appears that the odds ratio for adjacent cells is 1.114 for boys and slightly higher for girls, namely 1.162. However, our cross-tables are relatively large, given that the delinquency scales vary in number of categories from 3 (for vandalism and alcohol and drugs) to 11 (delinquency total) and the accidents scales have 3 (traffic accidents) and 4 categories (accidents overall). Thus, in the first cross-table in Table 4 (*delinquency total by accidents total*) the odds ratio based on the cells 0,0 (0 delinquency, 0 accidents), 0,3 (0 delinquency, 3 accidents), 10,0 (10 delinquency, 0 accidents), 10,3 (10 delinquency, 3 accidents) is 25.53 for boys, and 90.02 for girls. This means that, among boys, the likelihood of three or more accidents for those who are strongly involved in delinquency is 25.53 times higher than for those not involved in delinquency. For girls this likelihood is even larger, namely 90.02.

TABLE 4: For the most restrictive model: the relevant odds ratios for the adjacent cells and for the maximally opposite cells in a cross-table of: *delinquency (five measures)*; by *accidents (2 measures)*; by *gender by age*

Accidents (min.-max.)	Odds ratios Adjacent cells			Odds ratios Maximally opposite cells		
	Man	Woman	21-24	Man	Woman	21-24
Accidents total (0-3):						
1. Delinquency total (0-10)	1.114	1.162	-	25.53	90.02	-
2. Property (0-8)	-	-	1.411	-	-	3850.66
3. Violence (0-3)	1.372	1.702	-	17.18	120.06	-
4. Vandalism (0-2)	-	1.45	-	-	9.15	-
5. Alcohol and drugs (0-2)	-	1.28	-	-	4.39	-
Traffic accidents (0-2):						
1. Delinquency total (0-10)	1.103	1.169	-	2.66	4.76	-
2. Property (0-8)	see table 5	see table 5	see table 5	see table 5	see table 5	see table 5
3. Violence (0-3)	1.381	1.759	-	3.64	9.58	-
4. Vandalism (0-2)	-	1.41	-	-	5.45	-
5. Alcohol and drugs (0-2)	-	1.30	-	-	2.87	-

TABLE 5: For the most restrictive model: the relevant odds ratios for the adjacent cells and for the maximally opposite cells in the cross-table of: *property crime by traffic accidents by gender by age*

Accidents (min.–max.)		Odds ratios Adjacent cells		Odds ratios Maximally opposite cells	
		Men	Women	Men	Women
Traffic accidents (0–2) by property (0–8)	12–14	1.385	1.516	184.196	777.435
	21–24	1.068	1.169	2.875	12.134

The results can be summarised as follows:

- The relation crime–accidents still exists when controlling for age and gender. The five (*ever*) delinquency scales are positively related to both accident scales.
- The relationship is linear in terms of log–odds ratio.
- The most complicated interaction effects are unnecessary. The relation between crime and accidents does not differ for interactions of age and gender.
- Differences exist in the strength of the relation for different categories according to gender (in five of the 10 tables) and age (two of the 10 relations). Globally, the relation between crime and accidents is stronger for girls than for boys and stronger for younger adolescents in comparison with older adolescents.

The question is how this last result can be explained. Our interpretation is based on the two main approaches in the study of crime: opportunity and individual differences. Our suggestion is that when adolescents grow up, the effect of opportunity on delinquent behaviour increases whilst the effect of individual propensities (proportionately to opportunity) weakens. Opportunities for crime may also be related to gender. It is well known that delinquents spend more time away from their home than non-delinquents (see Junger, 1990; Junger & Wiegersma, 1995). Similarly, girls spend less time outside home and are supervised more closely by their parents than boys (see for example Junger-Tas & Junger, 1984). This is also found in the present data. It appears that the number of evenings out (per week) is 3.8 for boys and 3.5 for girls ($P < 0.0001$). Among the youngest respondents this is 2.6 whereas it is 4.1 for the oldest respondents (18 and older [$P < 0.0001$]; there is no interaction between age and gender). Being away from home is a risk factor for crime as well as for accidents. Consequently, boys and older adolescents are more at risk for crime and for accidents than girls and younger adolescents (see also Zager, 1994). Our measures of crime and accidents result both from individual

differences in 'propensity for crime' and 'accident-proneness' as well as from individual differences in exposure and opportunity. In this study we would like to investigate the relation between crime and accidents only in so far as they are the result of individual differences in crime-proneness and accident-proneness. However, we are unable to control for exposure and opportunity. Thus, from the perspective of individual differences in crime-proneness and accident-proneness our measures of crime and accidents are both measured with error. Generally, in studying relations between variables, when the error in variables becomes larger, the relation between such variables becomes weaker. This might explain why the relation between crime and accidents is stronger in demographic groups with few opportunities for crime and accidents (girls and young adolescents) and weakens in demographic groups with more opportunities for crime and more exposure to accidents (boys and older adolescents). In other words, when there is more exposure we find weaker relations; when there is less exposure, we find stronger relations. It should be noted that Pearson correlations computed between crime and accidents for the different age and gender groups show the opposite: stronger effects for boys and for older children and weaker effects for girls and younger children. Although correlations are often reported in studies like ours, it would be better to refrain from doing this. The reason is that correlations are only a good measure for association between variables if the two variables follow a bivariate normal distribution. Bivariate normality presupposes normality of each of the variables separately. The marginal totals of the two variables crime and accidents show that both variables are not normally distributed. The uniform association model does not assume anything about the distribution of the margins, because it is based on the odds ratio, and the odds ratio is a measure that is independent of the margins. This means that groups with lower crime rates show a relatively strong relation whereas groups with higher crime rates produce a relatively weak relation.

Social control, accidents and crime

The second research question is whether social control variables can predict accident involvement as well as involvement in crime. Table 6 presents the simple and the multiple correlations between the background variables and delinquent behaviour and traffic accidents. The findings for accidents in general in total are analogous to those for traffic accidents, which is why only the findings for the latter are reported.

The main conclusions can be summarised as follows. Of the 23 variables 14 are related significantly to delinquent behaviour as well as to accident involvement in the same direction. In one case (values towards violence) no relation is found for both dependent variables. So there clearly is an overlap in the results of the correlates of crime and accidents for 15 variables. Globally, it would appear that children who are low on the delinquency scale and have few accidents are characterised by a strong family integration, a good

TABLE 6: Correlations and multiple correlations between the background factors and delinquency and between the background factors and traffic accident involvement		
	Delinquency	Traffic acc.
Bonds with family/friends:		
1. Family integration (strong)	-0.15**	-0.08**
2. Family climate (weak)	0.19**	0.08**
3. Affective bond parents (weak)	0.14**	0.03
4. Bond with friends (weak)	-0.06**	-0.08**
School factors:		
5. Importance of school (none)	0.13**	0.01
6. Orientation towards the future (yes, much)	-0.15**	-0.08**
7. Pleasure in study (much)	-0.29**	-0.09**
8. Work ethics (poor)	0.10**	0.03
Dating/work:		
9. Dating (yes)	-0.16**	-0.14**
10. Number of dates (many)	0.30**	0.15**
11. Employment (yes)	-0.19**	-0.15**
12. Pocket money (no)	0.15**	0.19**
13. Having money (much)	0.18**	0.20**
Values:		
14. Towards violence (positive)	-0.02	-0.01
15. Towards vandalism (positive)	0.09**	-0.003
16. Towards fencing (positive)	0.16**	0.02
Leisure time:		
17. Number of friends you go out with (many)	0.10**	0.01
18. Going out (yes)	0.30**	0.16**
19. Place to go out (unconventional)	0.12**	0.04
20. Boredom (often)	0.03	-0.07**
Exposure var.:		
21. Motor-cycle (yes)	0.09**	0.14**
22. Sport (no)	0.06*	0.07**
23. Hours of sport (many)	0.15**	0.07**
Multiple R (23 independent variables)	0.51	0.31
Notes: *0.01 > P >0.001; ** P <0.001		

family climate and orientation towards the future. These children enjoy school and their study, do not date often, have no job and have little money to spend, and do not go out a lot. In addition exposure correlates positively with delinquency and with accidents.

It should be noted that a number of variables predict involvement in crime in the opposite direction from what is usually assumed. Some authors (Sampson & Laub, 1993; Farrington, 1995) have found that having a partner and having a job inhibit delinquent behaviour. The present study suggests the opposite trend, considering that this sample is much younger and most are still unmarried, and assuming that dating is an equivalent to marriage. Dating, having a job and (as a result of the job) having money to spend increases the likelihood of delinquent behaviour. As mentioned above, Hirschi (1969) argues that these findings can be understood by considering the *meaning* of these variables instead of considering a partner and work to be good in themselves. In childhood, dating and working should be seen as operationalisations of a lack of commitment, for example, to education. Children strongly committed to education and to conventional values do not have time for a job, and therefore have less money to spend. And children strongly bonded to their parents will probably not date at an early age.

Overall, it appears that it is easier to predict (statistically) delinquency than to predict traffic accidents. The multiple correlation for delinquent behaviour is higher than for traffic accidents (0.51 versus 0.31). It appears more difficult to predict (statistically) accidents than it is to predict involvement in delinquent behaviour. This should not come as a surprise. As mentioned above, it is well known that many situational factors influence the occurrence of accidents. West, French and Elander (1990) reported a correlation of 0.305 between accidents in one year and accidents in the previous three years. They state that this size of a correlation 'provides a broad upper limit on the likely size of any correlations between predictor variables and accident rates' given the fact that so many situational elements and random factors influence the occurrence of accidents (West, French & Elander, 1990, p. 5).

In additional analyses, not reported here, it was checked whether these relations still hold after controlling for gender and age. Overall this appears to be the case. In some cases it appears that variables are related to the dependent variables at some ages but not at others. This appears to be the case for variables such as going out dating, having a job and having money. Globally, the importance of these variables as predictors of crime diminishes as children grow older. Details can be obtained from the first author.

CONCLUSIONS

In this article two questions were investigated. First: is there a relation between accidents and crime? Second: are background factors which are known to predict delinquency also predictors of accident involvement?

The results show that the answer to the first question is positive. There is a relatively strong relation between accidents and crime. This relation holds globally for different types of crime, for different types of traffic accident (accidents as pedestrians, while driving a bicycle, a motor-cycle or a car) and for

the total number of accidents. It also holds after controlling for age and gender. The relation appears to be linear. The higher respondents score on the delinquency scales, the more likely they are to have been involved in an accident. Finally, it appears that the relation is stronger among girls and among young adolescents than among boys and older juveniles.

This last finding might be explained if one accepts the idea that individual factors are more important as causes of crime among groups with fewer opportunities for crime, such as girls and young children, and that opportunity factors play a stronger causal role in groups with more opportunities for crime, such as boys and older children. Although results from the literature support the idea that crime and accidents may be related (see above), few studies show so clearly a strong relation between these two concepts. As our findings are relatively new, a task for future research would be to try to replicate the present results, preferably with better measures of accidents.

The answer to the second question is also positive. Twenty-three independent variables have been related to involvement in crime and involvement in accidents. There is a comparatively large overlap between the correlates of crime and of accidents: 14 variables predict crime as well as accidents. Generally, children who function well in their family, are future orientated and like school, do not date, do not have a job and who do not go out are unlikely to have been involved in delinquent behaviour and are also unlikely to have been involved in an accident. Exposure to accidents, measured by motor-cycle ownership and sporting activities, increases the likelihood of accidents as well as the likelihood of delinquency. The dating and working variables seem to be, as a group, the strongest correlates of accident involvement.

These results support the idea that accidents and crime share, to some extent, a common aetiology. However, the causal process(es) cannot be deduced unequivocally from the present analysis. The fact that measures of social control (based on Hirschi, 1969) predict accidents as well as crime supports the thesis that social control mechanisms work as a protective mechanism against involvement in both, as was suggested by Suchman (1970). The results support the generality of deviance thesis, which states that broad categories of deviant behaviour are interrelated.

When looking at the results in very general terms, there is strong evidence that socialisation is related to crime and accidents, considering the relations of the family and school variables with both accidents and crime. The results can be explained from the point of view of self-control theory too, as Gottfredson and Hirschi (1990, see also Hirschi & Gottfredson, 1994) explicitly argued that their theory expects a relation between accidents and crime. But other interpretations cannot be excluded. It is possible that temperamental factors such as sensation seeking, or other theoretical approaches such as arousal theory or antisocial personality, can (also) explain the present results. Future research should try to sort out with more precision how processes leading to deviance may also lead to accident involvement. There are a number of

intervening processes in terms of risk-taking/risk-seeking behaviour, choice of speed, time spent outside, etc., which should be investigated. A few points should be noted in conclusion:

- It is known that surveys of the general population, such as the present study, have difficulties in reaching the most delinquent and the most problematic youths (for example, because these youngsters are less often at home when an interviewer tries to reach them). They usually also undersample ethnic minorities (Hindelang, Hirschi & Weis, 1981; Elliott & Ageton, 1980). This means that the present sample is probably slightly biased towards the more conventional, non-delinquent part of the youth population from which it is drawn.
- The present data do not include information on whether or not the youngster bears (some) responsibility for the accident. It should be noted that accidents which involve a particular youngster can be the result of deviant behaviour of another child or an adult. Not all accidents which happen to individuals are the result of risks taken by themselves. Elander, West and French (1993, p.282) mention that, when one considers accidents for which the individual can be held responsible (because of driving too fast or drinking alcoholic beverages), associations between individual characteristics and accident involvement become much stronger. However, some findings show that violations of traffic regulations (which are a strong correlate of accidents) are associated equally with passive accidents (for which the driver is not responsible) and with active accidents (for which the driver can be held responsible; Parker et al., in press). The authors suggest that passive accidents should not be construed in terms of simply bad luck. They state that individuals involved in these passive accidents in one reporting period have a higher risk of involvement in similar accidents in a second reporting period. Future research should investigate this in more detail.

To conclude, we think the relation between accidents and crime, if confirmed by future research, is a relatively new fact in the field of criminology, traffic and accident research. It challenges all disciplines involved to search for an adequate explanation.

Finally, the present findings may eventually have policy implications. It could be argued that if there is a relation between accidents and deviant behaviour, then health authorities, accident prevention authorities and crime prevention authorities share an interest in common background factors: crime prevention programmes and health policies will need, to a certain extent, to focus on the same variables and on the same persons.

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REFERENCES

- AGRESTI A. (1990). *Categorical Data Analysis*. New York: Wiley.
- BRIAR, S. & PILIAVIN, I. (1965). Delinquency, situational inducements and commitment to conformity. *Social Problems* 13, 413–423.
- COHEN, L.E. & FELSON, M. (1979). Social change and crime rate trends: a routine activity approach. *American Sociological Review* 40, 588–608.
- CORNISH, D.B. & CLARKE, R.V. (Eds) (1986). *The Reasoning Criminal*. New York: Springer-Verlag.
- ELANDER, J., WEST, R. & FRENCH, D. (1993). Behavioral correlates of individual differences in road-traffic crash risk: an examination of methods and findings. *Psychological Bulletin* 113, 279–292.
- ELLIOTT, D.S. & AGETON, S.S. (1980). Reconciling race and class differences in self-reported and official estimates of delinquency. *American Sociological Review* 45, 95–110.
- ELLIS, L. (1990). Universal behavioral and demographic correlates of criminal behaviour: toward a common ground in the assessment of criminological theories. In: Ellis, L. & Hoffman, H. (Eds) *Crime in Biological, Social, and Moral Contexts*. New York: Praeger.
- FARRINGTON, D.P. (1992). Explaining the beginning, progress and ending of antisocial behavior from birth to adulthood. In: McCord, J. (Ed.) *Advances in Criminological Theory, Facts, Frameworks and Forecasts*, Vol. 3. New Brunswick, NJ: Transaction.
- FARRINGTON, D.P. (1995). The development of offending and antisocial behaviour from childhood. The twelfth Jack Tizard Memorial Lecture. *Journal of Child Psychology and Psychiatry* 36, 929–964.
- FELSON, M. (1994). *Crime and Everyday Life*. Thousand Oaks, CA: Pine Forge Press.
- FOOT, H.C., CHAPMAN, A.J. & WADE, F.M. (Eds) (1982). *Pedestrian Accidents*. Chichester: Wiley.
- GLUECK, S. & GLUECK, E. (1950). *Unravelling Juvenile Delinquency*. New York: Commonwealth Fund.
- GOTTFREDSON, M.R. & HIRSCHI, T. (1990). *A General Theory of Crime*. Stanford, CA: Stanford University Press.
- HANSEN, C.P. (1988). Personality characteristics of the accident involved employee. *Journal of Business and Psychology* 2, 346–365.
- HEINO, A., VAN DER MOLEN, H.H. & WILDE, G. (1992). *Risk-homeostatic Processes in Car-following Behaviour: Individual Differences in Car-following and Perceived Risk*. Haren: Verkeerskundig Studiecentrum VSC, Rijksuniversiteit Groningen.
- HILAKIVI, I., VEILAHTI, J., ASPLUND, P., SINIVUO, J., LAITINEN, L. & KOSKENVUO, K. (1989). A sixteen-factor personality test for predicting automobile driving accidents of young drivers. *Accident Analysis and Prevention* 21, 413–418.
- HINDELANG, M.J., HIRSCHI, T. & WEIS, J.G. (1981). *Measuring Delinquency*. Beverly Hills: Sage.
- HIRSCHI, T. (1969). *Causes of Delinquency*. Berkeley: University of California Press.
- HIRSCHI, T. (1986). On the compatibility of rational choice and social control theories of crime. In: Cornish, D.B. & Clarke, R.V. (Eds) *The Reasoning Criminal*. New York: Springer-Verlag.
- HIRSCHI, T. & GOTTFREDSON, M. (1994). The generality of deviance. In: Hirschi, T. & Gottfredson, M. (Eds) *The Generality of Deviance*. New Brunswick, NJ: Transaction.
- JUNGER, M. (1990). *Delinquency and Ethnicity. An Investigation on Social Factors relating to Delinquency among Moroccan, Turkish, Surinamese and Dutch Boys*. Deventer: Kluwer Law and Taxation.
- JUNGER, M. (1994). Accidents. In: Hirschi, T. & Gottfredson, M. (Eds) *The Generality of Deviance*. New Brunswick, NJ: Transaction.

- JUNGER, M. & WIEGERSMA, A. (1995). The relation between accidents, deviance and leisure time. *Criminal Behaviour and Mental Health* 5, 144-173.
- JUNGER-TAS, J. & JUNGER, M. (1984). *Juvenile Delinquency: Backgrounds of Delinquent Behaviour*. The Hague: Ministry of Justice, Netherlands.
- LESTER, J. (1991). *Individual Differences in Accident Liability: a Review of the Literature*. Crowthorne: Transport and Road Research Laboratory, Department of Transport.
- MEEUS, W. & DEKOVIC, M. (1993). *Identity Development, Parental and Peer Support in Adolescence: Results of a National Dutch Survey*. Utrecht: Utrecht University.
- MEEUS, W. & 'T HART, H. (1993). *Jongeren in Nederland (Youngsters in the Netherlands)*. Amersfoort: Academische Uitgeverij.
- NYE, I.F. (1982). The basic theory. In: Nye, I.F. (Ed.) *Family Relationships, Rewards and Costs*. Beverly Hills: Sage.
- PARKER, D., WEST, R., STRADLING, S. & MANSTEAD, A.S.R. (in press). Behavioural characteristics and involvement in different types of traffic accidents. *Accident Analysis and Prevention*.
- REISS, A.J. (1951). Delinquency as the failure of personal and social controls. *American Sociological Review* 16, 196-207.
- ROBINS, L.N. (1966). *Deviant Children Grown Up*. Baltimore: Williams & Wilkins.
- ROTHENGATTER, J.A. (1993). *De risico's van rijplezier (The Risks of Driving)*. Groningen: R.U. Groningen.
- RUTENFRANS, C.J.C. & TERLOUW G.-J. (1994). *Delinquentie, sociale controle en life events (Delinquency, Social Control and Life Events)*. Arnhem: Gouda Quint.
- SAMPSON, R.J. & LAUB, J.H. (1993). *Crime in the Making: Pathways and Turning Points through Life*. Cambridge, MA: Harvard University Press.
- SIVAK, M. (1983). Society's aggression level as a predictor of traffic fatality rate. *Journal of Safety Research* 14, 93-99.
- SIVAK, M. (1987). A 1975 forecast of the traffic safety situation: what did we learn from an inaccurate forecast? In: Rothengatter, J.A. & de Bruin, R.A. (Eds) *Road Users & Traffic Safety*. Assen: Van Gorcum.
- SOCIAL PROBLEMS (1987). Children's injuries prevention and public policy. *Social Problems* 43, 1-162.
- SORENSEN, D.W.M. (1994). Motor vehicle accidents. In: Hirschi, T. & Gottfredson, M. (Eds) *The Generality of Deviance*. New Brunswick, NJ: Transaction.
- SUCHMAN, E.A. (1970). Accidents and social deviance. *Journal of Health and Social Behaviour* 11, 4-15.
- TILLMANN, W.A. & HOBBS, G.E. (1949). The accident-prone automobile driver. *American Journal of Psychiatry* (November), 321-331.
- WEST, D.J. & FARRINGTON, D.P. (1977). *The Delinquent Way of Life*. London: Heinemann Educational.
- WEST, R., ELANDER, J. & FRENCH, D. (1993). Mild social deviance, type A behaviour pattern and decision making style as predictors of self-reported driving style and traffic accident risk. *British Journal of Psychology* 84, 207-219.
- WEST, R., FRENCH D. & ELANDER, J. (1990). The bases of differential accident liability: cognition, motivation or motivated cognition. In: Grayson, G.B. & Lester, J.F. (Eds) *Behavioural Research in Road Safety*. Crowthorne: Transport and Road Research Laboratory.
- WHITE, H., LABOUVIE, E.W. & BATES, M.E. (1985). The relationship between sensation seeking and delinquency: a longitudinal analysis. *Journal of Research in Crime and Delinquency* 22, 197-211.
- ZAGER, M.A. (1994). Gender and crime. In: Hirschi, T. & Gottfredson, M. (Eds) *The Generality of Deviance*. New Brunswick, NJ: Transaction.
- ZUCKERMAN, M. (1979). *Sensation Seeking: Beyond the Optimal Level of Arousal*. Hillsdale, NJ: Lawrence Erlbaum.

APPENDIX

We used the conditional uniform association model. For a two-way table the uniform association model can be written as

$$\log \pi_{ij} = u + u_{1(i)} + u_{2(j)} + \phi_{ij}$$

where π_{ij} is the probability for cell (i,j) ($i=1,\dots,I; j=1,\dots,J$); u , $u_{1(i)}$ and $u_{2(j)}$ are marginal effects. Interest goes out to the term ϕ_{ij} , since it is directly related to the log odds ratio as

$$\log (\pi_{ij} / \pi_{i'j}) / (\pi_{ij'} / \pi_{i'j'}) = \phi_{(i-i')(j-j')}.$$

For adjacent cells in the table the uniform association model states that the log-odds ratio is constant, and equal to ϕ , since for adjacent cells $i-i' = 1$ and $j-j' = 1$. The odds ratio is then equal to $\exp \phi$. The conditional association models estimate separate parameters ϕ for each of the eight levels of the stratifying variables, which are here age a and sex s . Thus the parameter ϕ_{as} indicates the strength of the association in table (a,s) as measured by the log-odds ratio (for more details, see Agresti, 1990 or contact the third author).

