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Study of the causes of pedestrian accidents by severity

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Three methods were used to analyze 55 reports of actual pedestrian accidents randomly selected from police records in the Ivory Coast. Each method revealed a particular aspect of pedestrian accident causation according to accident severity. A quantitative analysis showed that fatal pedestrian accidents most often occurred when vehicles were speeding or on roads outside the city. A causality-tree analysis showed that the circumstances in which fatal pedestrian accidents occur are somewhat different from those of accidents involving injury only. However, in many cases, the pedestrian was running to cross the road or was hidden by an obstacle, so the driver was startled and reacted too late. Finally, an analysis of the spontaneous causal explanations given by the involved persons made it clear that pedestrians and drivers explain accidents in a defensive way by stressing factors that tend to incriminate the other party. In the conclusion, we point out the utility of an approach that combines several methods of accident analysis and we consider some ways to improve the use of accident reports for prevention purposes.

Keywords: accident report, causal attribution, causality tree

Trois méthodes différentes sont appliquées à l'analyse de 55 rapports d'accidents réels choisis au hasard. Chaque méthode révèle un aspect particulier de la genèse des accidents piétons en fonction de leur gravité. L'analyse quantitative permet d'observer que les accidents piétons mortels se produisent davantage lorsque les véhicules roulent à une grande vitesse ou hors agglomération. L'analyse par la méthode de l'arbre des causes, montre que les accidents mortels et les accidents avec blessés se produisent dans des circonstances différentes. Cependant, très fréquemment, le piéton court pour traverser et est masqué par un objet et le conducteur réagit tardivement. Enfin, l'analyse des explications causales spontanées montre que piétons et automobilistes expliquent les accidents de façon défensive, en invoquant des facteurs qui mettent plutôt en cause l'adversaire. On conclut sur l'utilité d'une telle démarche qui combine plusieurs méthodes pour l'analyse des accidents et sur la manière d'optimiser l'exploitation des rapports d'accidents à des fins de prévention.

Mots clés: arbre des causes, attribution causale, gravité de l'accident, Piéton, rapport d'accident

Introduction

In certain countries, especially developing ones, walking is a daily routine for the less well-to-do and is sometimes even the only means of connection between certain remote areas. However, even though walking is the principal mode of transportation, one is forced to agree in the light of the number and severity of accidents involving pedestrians, that persons using this means of locomotion are still at considerable risk. Conflicts and collisions between pedestrians and other users of the roads and streets (motorists, motorcyclists, cyclists) are frequent, although a decrease has been noted in some of the world's more developed countries (Fontaine, Gourlet and Ziani 1995, Keall 1995). Statistics show that pedestrians are in fact the most vulnerable population of road users. In France, a little more than 13% of the persons killed on the road in 1994 were pedestrians (Roche 1995). In Sweden, nearly a quarter of the road accidents involve a person on foot (Gärder 1989). The most exposed and most vulnerable pedestrian groups appear to be children under 10 and persons over 60 (Bezzaoucha 1988, Christoffel, Schofer, Jovanis, Brandt, White and Tanz 1986, Keall 1995, Stevenson and Sleet 1997). The figures are all the more worrisome in developing countries. In Madras, India, for example, 45% of road-accident victims are pedestrians and nearly a quarter of these victims are children under 16 (Victor 1990). In Abidjan (Ivory Coast), pedestrians almost always represent 2/3 of the injured and 3/4 of the deaths from car accidents (BCEOM–ONSER–SCETIVOIRE 1984, Kouabenan 1996).

Various studies devoted to characterizing pedestrian accidents and setting forth some hypotheses regarding their causes (Isabeaux and Karnas 1981, Muhlrad 1986, Gärder 1989, Kouabenan 1990, Victor 1990, Keall 1995, Fontaine, Gourlet and Ziani 1995, Stevenson and Sleet 1997) have pointed out a number of accident factors, including driver and pedestrian behaviour, road infrastructures and the environment. Crossing the street is a difficult task for pedestrians, even in so-called 'protected' crosswalks. Although it is true, as Keall (1995) mentions, that pedestrians run fewer risks if they stay within pedestrian crosswalks, Victor (1990) found that crosswalks are still dangerous since 10% of drivers continue moving forward onto crosswalks when pedestrians are crossing and only 2% stop to let pedestrians by.

Our studies on developing countries have brought out some of the attitudes and dangerous behaviours of pedestrians in traffic: one finds too hesitant or over-cautious attitudes in individuals from rural areas and older persons who are apparently uncomfortable with so many cars; casual or daring attitudes in city dwellers who sometimes linger in the street or dart in and out of vehicles; innocent and playful attitudes in children; and reckless attitudes in certain pedestrians who brave dangerous situations or deliberately break safety rules (Kouabenan 1990). A comparable picture was painted by Jorgensen (1988), who distinguished three behaviours characteristic of careless pedestrians who disobey traffic lights and are therefore more accident-prone: 'late walkers' who hope to get across before the light turns green for vehicles on the street they are crossing; 'risky walkers' who insist on crossing when the cars have the green light; and 'early walkers' who move out onto the pavement as soon as the traffic light turns red, but before the walk sign turns green.

It is not our intention here to review all the hypotheses forwarded so far to account for pedestrian accidents. This would be a difficult if not impossible task given the complexity of the many interrelated factors and the current impoverished state of research in this field. We only hope to make a modest contribution to clarifying this etiology through an analysis of a series of pedestrian accident reports. We shall combine three approaches to do so: a descriptive analysis, a case-study analysis using the causality-tree method and an analysis of naive explanations given by various protagonists (drivers, pedestrians, witnesses).

The descriptive analysis of the factors behind accidents, based on the accident reports studied, should allow us to single out the principal characteristics of accidents, as well as the most obvious circumstances in which they occur. This type of quantitative analysis will tell us whether serious pedestrian accidents occur under the same conditions as minor ones as observed by Salminen, Saari, Saarela, and Räsänen (1992) in a study on occupational accidents. To supplement the descriptive analysis, a more qualitative analysis of pedestrian accidents should help us uncover the accident-triggering process. Such an analysis, based on the causality-tree method (Monteau 1979), aims at determining the typical event sequences both of minor pedestrian accidents and of serious pedestrian accidents and examines to what extent these sequences differ or overlap. Finally, it seems useful to try to gain insight into how pedestrian accidents are explained by persons involved in one way or another and whether the explanations given vary with the severity of the accident. A number of studies have shown that the accident explanations of ordinary individuals who have to cope directly with risks and accidents can provide a wealth of information for understanding accident causation (Kouabenan 1985, 1998, 1999, 2000a, 2000b, 2001). Granted, these 'naive' explanations are subjective and often biased, but they nevertheless remain a key to understanding certain risk-taking behaviours or lack of concern for accident-prevention measures. Naive analyses are known to be biased by factors specific to the person making the explanation, to the type of relationship that the person has with the victim and to the characteristics and circumstances of the accident. (Kouabenan 1985, 1999, 2002, Kouabenan, Gilibert, Medina and Bouzon 2001). The findings suggest that victims of pedestrian accidents do not explain the accident in the same manner as their opponents, the drivers, or simple witnesses, friends, or relatives on either 'side'.

Basic materials

The materials for the study consisted of 55 reports of pedestrian accidents that took place in the Ivory Coast. The reports were drawn at random from among all pedestrian accidents submitted to the national board in charge of driver's licence withdrawal over two consecutive years. The accident reports involving a casualty were written up either by city policemen or highway patrolmen. They were divided almost equally on the basis of the severity of the consequences into 27 non-fatal accidents and 28 fatal accidents. The reports included information about the circumstances and characteristics of the accident, the road conditions and environment, the characteristics of the involved persons and vehicles and individual testimonies about the circumstances of the accident according to the driver or a related person (vehicle owner, apprentice) or to the pedestrian victim or a related person (relative or friend).

Procedure and results

Descriptive analysis of accident circumstances by severity

Method

The reports were examined one after the other in order to pinpoint the variables likely to cause an accident. Drawing from knowledge gained in past road-safety studies, we retained the following variables: place where the accident occurred (in or out of the city), amount of light (night, day, visibility), type of pavement or lack of it (paved or dirt road), whether the accident happened at an intersection, the road conditions (wet, dry), the driving speed (above or below the speed limit) and the victim's age (under 16 vs 16 or over). For each report, the presence or absence of these items was noted. Then the relative frequency of the items was examined for each accident-severity level. The differences were analyzed using a chi-square test (X^2).

Results

Table 1 summarizes the data. The descriptive analysis revealed that most of the pedestrian accidents examined happened in the city (78%). However, accidents outside the city were more serious ($X^2 = 4.76$, $P < 0.05$). Most accidents occurred under apparently normal driving conditions: during the day or at night with proper lighting (75%), on a paved road (91%), on a straight road (93%), on dry pavement (87%) and not at an intersection (62%). These results confirm earlier observations (Kouabenan 1996). For each of these conditions, the percentages did not differ significantly across severity levels. On the other hand, fatal accidents occurred especially when the vehicle was moving at a speed above the authorized limit ($X^2 = 5.90$, $P < 0.03$). Note finally, that the majority of the victims were under 16 years old.

Analysis of the sequence of events leading up to the accident

Method

The purpose of this second analysis was to describe the chain of events that favoured the occurrence of an accident. The causality-tree method was used. This technique was developed by the INRS (French National Institute for Research and Safety) and recommends looking for deviations that might have triggered the accident. The deviations in question occur with respect to regulations, to the proper way to performing the task at hand ('the way things should be done'), or to any habitual, predictable or planned situation or sequence of events. A causality tree is a graphic representation of the logical chain of events that provoked the accident. To build such a tree, one starts from the consequences of the accident and then moves back up through the preceding events, in a systematic step-by-step manner, by asking the following questions for each event encountered: for example, what had to happen or exist for this event to occur? Did anything else have to happen or exist? The goal is to backtrack as far as possible (i.e. as far as the accident data allows) while keeping to the facts. A certain number of symbols are used to depict the various items and their order of occurrence (Monteau 1979, Chesnais 1989, Chesnais and Lemarchand 1989). Unlike the statistical approach, this approach focuses on particular cases.

Proceeding in this manner for each of the 55 accidents, we generated a causality tree by matching the information from various sources (city police, highway patrolmen, experts, victims, drivers, witnesses, innocent bystanders). Based on these trees, a table (Table 2) was drawn up containing the accident factors by frequency of occurrence for each severity level (see Kimmel 1993). A causal factor was retained if it appeared at least three times. This apparently arbitrary cutoff point was designed to avoid including purely incidental factors in the sequence analysis while still retaining some of the isolated factors that might have causal significance. From the data thus obtained, a 'typical' causality tree was generated for fatal accidents (Figure 1) and for non-fatal accidents (Figure 2) while retaining only those factors that appeared in at least 25% of the cases at each severity level. This gave us trees showing the representative causes at each level. The trees were then compared. It also seemed useful to conduct a comparative analysis of the chain of factors contributing to fatal pedestrian accidents in and out of the city, so causality trees were generated for this purpose (Figures 3 and 4).

Results

The event-sequence analysis revealed the different accident-triggering processes for fatal and non-fatal accidents, although there were many similarities between the two. The same can be said about accident location (in or out of the city).

Typical accident sequence by severity

The typical non-fatal accident was the result of a collision between a pedestrian who suddenly darted out into the street, usually running, and a moving vehicle whose driver put on the brakes too late, probably startled by the pedestrian who often came out from behind an object. The typical fatal accident was characterized by a larger number of factors that often had a joint impact. Generally, a moving vehicle hit a pedestrian who started crossing suddenly; this startled the driver, who was unable to put on the brakes in time. So far, these are the same factors as found for non-fatal accidents. But the reasons behind the slammed brakes and the driver's surprise were different: in addition to being triggered by a running pedestrian who was hidden by an object, serious accidents occurred especially at night on a poorly-lit, downhill road and involved a vehicle that was speeding. This last factor, speeding, appears to be the major cause of the severity of road-accident casualties (Kouabenan 1996).

Typical fatal-accident sequence by location

When fatal pedestrian accidents occurring in the city were separated from fatal accidents occurring outside the city, the urban accidents were found to be triggered by a driver who

Table 1: Characteristics and circumstances of accidents analyzed

		Total		Non-fatal accidents		Fatal accidents		Statistical test	
		n	%	n	%	n	%	X^2	P
Location	In city	43	78	25	93	18	64	4.76	0.05
	Outside city	12	22	2	7	10	36		
Visibility (amount of light)	Night, poorly lit, fog, smoke	14	25	5	19	9	32		n.s.
	Day, well-lit night	41	75	22	81	19	68	0.45	
Outline of road	Straight	51	93	26	96	25	89	0.23	n.s.
	Curved	4	7	1	4	3	11		
Type of pavement	Unpaved, dirt, holes, gravel	5	9	1	4	4	15		n.s.
	Paved (asphalt, tarred)	50	91	26	96	23	85	0.88	
Intersection	At intersection	21	38	11	41	10	36	0.15	n.s.
	Not at intersection	34	62	16	59	18	64		
Road condition	Wet road	7	13	4	15	3	11	0.00	n.s.
	Dry road	48	87	23	85	25	89		
Age of victim	Under 16	34	62	18	67	16	57	0.20	n.s.
	16 or over	21	38	9	33	12	43		
Speed	Over speed limit	20	36	5	19	15	54		
	Under speed limit	35	64	22	81	13	46	5.90	0.03

Table 2: Tally of recurring causes in causality trees, $X^2 = 59.81$, $P < 0.001$

	Total (n = 55)		Non-fatal accidents (n = 27)		Fatal accidents (n = 28)	
	n	%	n	%	n	%
Pedestrian was running	30	55	18	67	12	43
Pedestrian was crossing	40	73	21	78	19	68
Pedestrian was on road	6	11	2	7	4	14
Pedestrain was on shoulder	5	9	1	4	4	14
Driver maneuvered to avoid pedestrian	11	20	7	26	4	14
Driver put on brakes too late	27	49	18	67	9	32
Driver was taken by surprise (no tyre marks on road)	15	27	4	15	11	39
Driver was speeding	20	20	5	19	15	54
Pedestrian was hidden at first	15	27	7	26	8	29
Pedestrian darted out suddenly	18	33	8	30	10	36
Pedestrian was doing something else or was talking	11	20	5	19	6	21
Night, little or no light	12	12	4	15	8	29
A relative is on the other side of the street	7	13	3	11	4	14
Downhill road	9	16	1	4	8	29
Vehicle skidded	4	7	1	4	3	11
Vehicle went off road	4	7	0	0	4	14

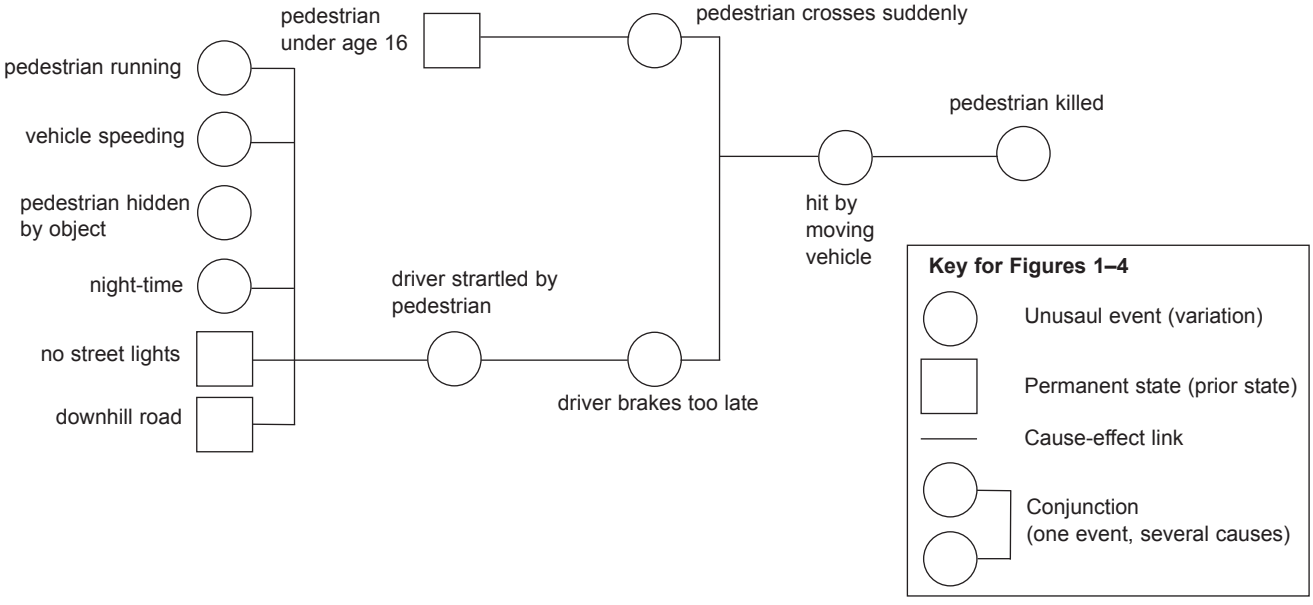

Figure 1: Typical causality tree for fatal pedestrian accidents

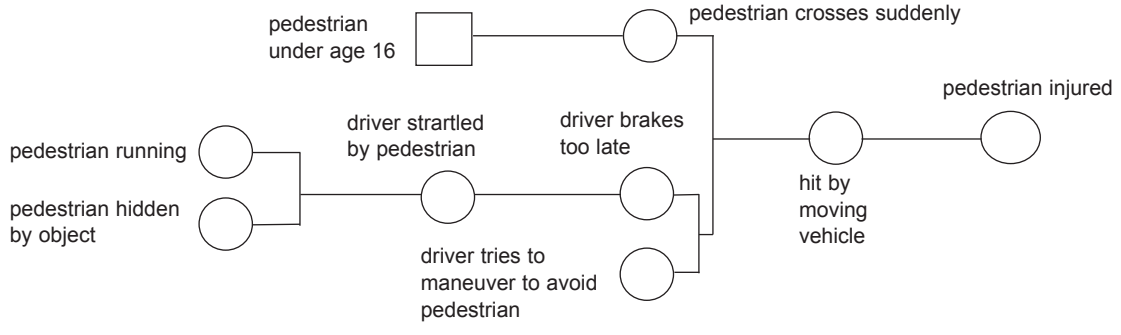

Figure 2: Typical causality tree for non-fatal pedestrian accidents

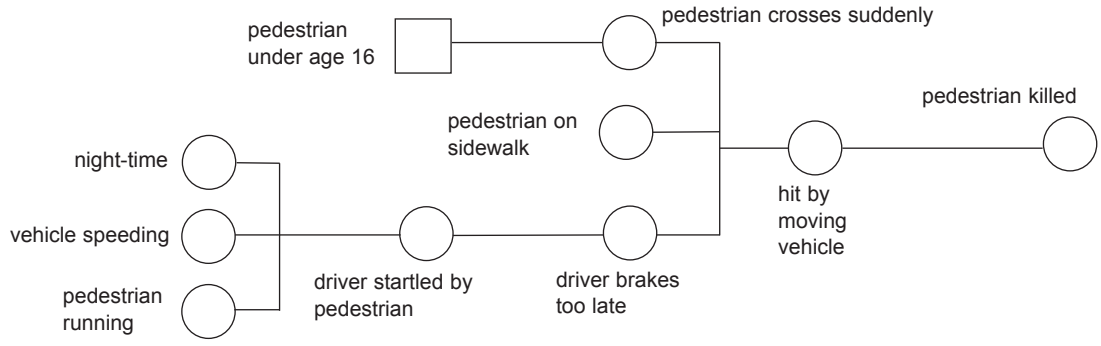

Figure 3: Typical causality tree for fatal pedestrian accidents in the city

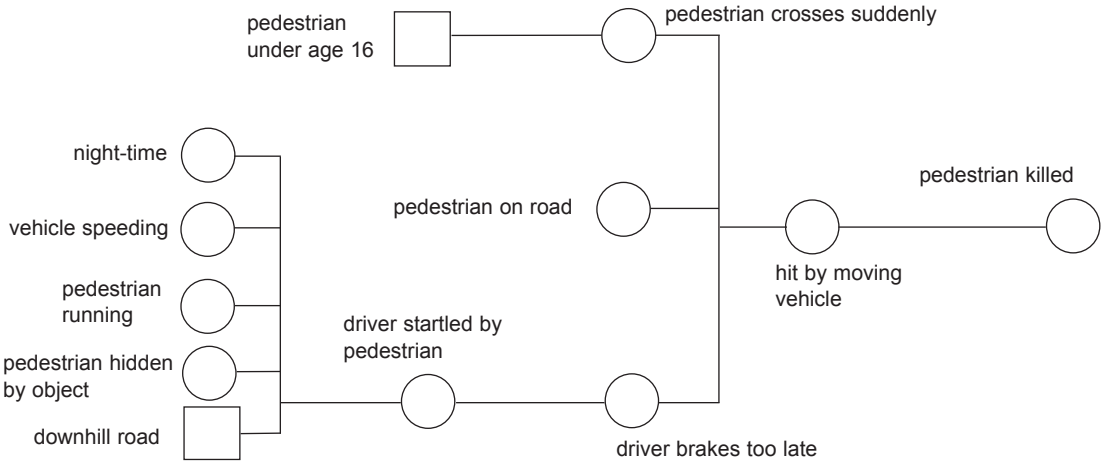

Figure 4: Typical causality tree for fatal pedestrian accidents outside the city

was startled and put on the brakes too late. These reactions were caused by a running pedestrian who darted out suddenly, or sometimes, by a pedestrian who was simply on the sidewalk. These factors acted in conjunction with speeding and the fact that it was night-time. The same initial sequence was found for accidents outside the city (except for the pedestrian being on the sidewalk). However, the rural accidents differed from the urban ones in that they occurred on a downhill road where the pedestrian was either talking to someone or carrying out another activity. Once again, for urban accidents, the additional conditions were especially night driving and speeding.

Analysis of spontaneous explanations in accident report testimonies

Method

In each report, where possible, we identified the causal explanations spontaneously made by the drivers and related individuals (relatives, vehicle owner, employer, hereafter grouped under the heading 'motorist') and the explanations given by the victims or related persons (relatives, friends, hereafter grouped under the heading 'pedestrian'). The causal attributions were analyzed according to whether they blamed the driver, the pedestrian, the traffic conditions or fate, and according to whether they were internal or external in nature. An explanation was said to be internal when the person attributed the accident to his/her own characteristics or negligence. It was said to be external when, on the contrary, outside factors such as another person, physical factors, traffic conditions, or fate were blamed. Finally, the causal attributions were examined by accident severity, known to affect people's explanations (Kouabenan 1985, 1998, 1999).

Results

The results are presented in Tables 3 and 4. Table 3 shows that among the four potential sources of accidents (driver, pedestrian, driving conditions, fate) the pedestrian victim was usually considered the main cause of the accident (49%). However, when we look at who furnished the causal explanation, we find a very sharp contrast between motorists and pedestrians in what causal factor was regarded as the most important. The figures show that motorists and persons on the motorist's side gave more explanations that blamed the pedestrian (62% of their explanations), whereas those on the pedestrian's side supplied more explanations that incriminated the driver (68%). Note also that, in addition to blaming the pedestrian, the motorists ascribed the accident

Table 3: Causal attributions of motorists and pedestrians, X^2 = 15.84, P < 0.001

	Motorists		Pedestrians		Total	
Factors	n	%	n	%	n	%
Victim	40	62	7	23	47	49
Road conditions	23	35	1	3	24	25
Fate	2	3	2	6	4	4
Total	65	100	31	100	96	100

Table 4: Internal or external nature of explanations by type of attributo, X^2 = 15.84, P < 0.001

	Motorists		Pedestrians		Total	
Factors	n	%	n	%	n	%
Internal	0	0	7	23	7	7
External	65	100	24	77	89	93
Total	65	100	31	100	96	100

to traffic conditions (35%), but never to the driver of the vehicle. The pedestrian / motorist difference was significant (X^2 = 59.81, P < 0.001) and confirms Kouabenan's earlier findings (1990, 2000b) on this issue.

When the explanations were grouped together on the basis of their internality or externality (Table 4), it turned out that most explanations were defensive, i.e. both parties attributed the causes of the accident to external factors (X^2 = 15.84, P < 0.001).

It was difficult to test the effect of accident severity on these data since, no matter how serious the accident was, most of the explanations were external.

Discussion

Our quantitative analysis of the accident data revealed that the circumstances in which pedestrian accidents occur appear to vary with accident severity on two factors: driving speed and accident location. Accidents that happened outside the city were more serious than those in the city. They were also more serious when the driver was speeding. These two factors are closely related since speed limits are much higher in non-urban areas. The results obtained here are in line with the literature on accidents (Muhlrad 1986) and confirm the popular saying that 'speed kills'. Moreover, and quite curiously, it turned out that accidents happened more often when the driving conditions were good (straight road, pavement in good condition, fair weather, no intersection). These findings support earlier results showing that pedestrian accidents involving children occur primarily in residential areas during the day, on straight roads that are paved and dry (Kouabenan 1996, Stevenson and Sleet 1997). One can hypothesize that drivers are less careful in such situations, although hasty conclusions should not be drawn. Given the small size of the sample examined here, these results should be validated on a larger and more representative sample of accident reports.

Furthermore, as in many other studies (Christoffel *et al.* 1986, Fontaine *et al.* 1995, Stevenson and Sleet 1997), the pedestrian's age was found to have an effect. In comparing the percentage of pedestrian casualties under age 16 (62%) with the percentage of children in this age range in the parent population (48% — see Internet WORLD ATLAS 1995), we can see that the child age group is over-represented in road accidents. Several explanations are possible. First, youth get around more on foot than adults do; also, the physical and psychological immaturity of children under 11 or 12 years old certainly makes them more vulnerable than adults (Kouabenan 1994). Authors like Stevenson and Sleet (1997) or Christoffel *et al.* (1986), who took an interest in the etiology of pedestrian accidents involving children (5–9 years old), noted that such accidents may be triggered by several factors related to the child's biological characteristics (sex, age, maturity), psychological characteristics (impulsiveness, hyperactivity, daring, aggressiveness, emotivity, attention-seeking, extroversion, relational problems), behaviour in traffic (carelessness, absentmindedness while crossing, contentedness to go home), the home environment (poverty, unemployment, large family, poor supervision, lack of safe playgrounds) or the road environment (speed of vehicles, presence of crosswalks, characteristics of vehicles and drivers), as well as interactions between the child and that environment (length of exposure, presence of obstacles that block visibility). Note, however, that Stevenson and Sleet (1997) recommend exercising caution in the interpretation of certain relations between the child's behaviour and the risk of a pedestrian accident. Finally, as in Kouabenan's (1985) study, the fatal-accident files examined here contained much more information than those reporting accidents involving injury only. This difference in the amount of attention paid to the two types of accidents paints an incorrect and incomplete picture of the set of all accidents and precludes learning from smaller incidents that could help enhance prevention of a larger range of accidents (Webb, Redman, Wilkinson and Sanson-Fischer 1989). Despite their importance, fatal accidents only represent a minute proportion of all accidents.

Our case-by-case analysis, aimed to recount the sequence of events leading to each pedestrian accident, pointed out that non-fatal accidents typically occurred in the city, with a driver who slammed on the brakes in an attempt to avoid a pedestrian under 16 who was suddenly running across into the street after darting out from behind an object. In the case of fatal accidents, a greater number of factors were at play. Speeding had a substantial impact, but environment-related factors that worsened the situation also entered into the picture (night-time, no street lights, a downhill road). In systemic theory, all of these factors constitute perturbations of the milieu. Deviations from the ordinary, in conjunction with other task-linked or person-linked factors, contribute to the occurrence of accidents. An important remark is called for here: in most of the accidents analyzed, a startled driver hit a pedestrian who was running across the street or suddenly started to cross, coming as it were out of nowhere. It is worth noting that the majority of the pedestrian accidents happened while the person was crossing the street, a potential source of anxiety and difficulty for young and old alike, especially in big cities or areas where traffic is

heavy. Running across the street is commonplace in children, but also in some young people and adults as well. As regards prevention, we might mention that running across the street puts the pedestrian in a state of imbalance and makes it difficult for drivers to produce the proper avoidance maneuvers when they suddenly sense the danger or see the obstacle. A final point was made clear by the sequence analysis. When the fatal accidents were separated by location, speed was found to have a differential effect: driving over the speed limit seems to be a more common phenomenon in serious accidents in the city (78%) than in those that occur in non-urban areas (less than 25%), which is normal considering that the speed limit is lower in the former than in the latter. This finding is in line with the observations made in the ONSER (Muhlrad 1986).

Finally, it stands out from the causal-attribution study that people's spontaneous attributions, when available, were largely external. The various protagonists explained pedestrian accidents in terms of factors that deny their own responsibility or role. Most of the pedestrians considered the accident to be due mainly to driver-related factors, whereas the drivers ascribed the event principally to the carelessness of pedestrians and, to a lesser extent, to road infrastructures. These observations confirm Kouabenan's (1990) results and support the defensive-explanation hypothesis (Shaver 1970, Shaw and McMartin 1977): protagonists of an accident attribute it to external causes, especially ones involving the other party, no doubt for reasons of self-protection. Being struck by an accident without being able to ascribe it to some kind of external cause poses a threat to people's personal safety and moral integrity. Indeed, the penal, financial, psychological and moral implications of an accident are such that both parties very often need to find an external cause. Such explanations provide reassurance and a means of self-defense, at the same time as they protect self-esteem.

In conclusion, one of the important contributions of the present study is that it showed how one can gain considerable insight into the causality of accidents through the joint use of several methods for analyzing the same material. Accident prevention campaigns, more particularly in developing countries where walking is a rather common means of locomotion in urban areas, must stress the necessity for pedestrians to not run to cross roads and streets. It must also underline the need for drivers to observe speed limits and to keep watchful particularly when the driving conditions seem to be good. Both drivers and pedestrians must be made conscious of their proper role in traffic accident causation and its prevention. Furthermore, when properly filled-out, accident reports are a precious tool for causal diagnosis. For this reason, particular care should be taken in designing accident write-up forms. They should make room for as much information as possible, both about the accident itself and about the circumstances in which it occurred. The need for accurate and thorough information must be stressed and the utility of such reports for prevention should be made clear. Similarly, individuals in charge of preparing accident reports must be trained to describe every minute detail of the accident, while being careful to separate facts from interpretations. These considerations apply to minor accidents as well as to serious ones. Minor incidents and accidents — generally more numerous and easier to gather information about — are useful in improving our understanding of such incidents, in view of preventing catastrophes that might ensue. Writing accident reports should not be regarded as a time-consuming, accessory task (Adams and Hartwell 1977). Biases observed in spontaneous explanations of accidents provide incentive for diversifying the testimonies included in accident reports. Testifying individuals react in accordance to their own fears about an accident, and may therefore be tempted to 'stretch the truth' in order to avoid being held responsible. Accordingly, in the subsequent use of accident reports, the investigator should not only take the source of the testimony into account, but also the addressee. A report submitted to an inspection office or to management will not necessarily contain the same information as one prepared for an accident prevention bureau or an insurance company.

We hope that other studies will follow this rather illustrative study (small size of sample), so that in spite of the protection and discretion they are legitimately accorded, accident reports will finally be taken out of drawers, processed using methods other than mere statistics and put to good use in accident prevention.

Notes

[1] The word naive is taken from Heider (1958) who talked about naive analysis of action in his work on 'The psychology of interpersonal relations'. It is often used in the framework of attribution theory to refer to spontaneous attribution given by laymen.

[2] In the Ivory Coast, an interministerial board composed of representatives from different branches of various ministries (ministry of transportation: head office of transportation, road safety bureau; ministry of national security: city police, highway patrol; ministry of justice, etc.) is in charge of examining cases of accident-causing offences involving a casualty. The board is authorized to impose penalties ranging from a simple fine to withdrawal of the offender's driver's license after a hearing of the protagonists whenever that is still possible.

[3] We purposely chose to have an equal number of accidents in each category rather than attempting to obtain a representative sample. This fact must be kept in mind when considering the conclusions of this study. We only had a few cases because not all available reports were information-packed. Generally it is difficult to get access to the accident reports under the pretext of confidentiality.

[4] In the Ivory Coast, as in most African countries, mass-transit vehicles with 10 or more passenger seats have what is called an 'apprentice' on board in addition to the driver. The apprentice helps passengers in and out, collects the fare during the trip and maintains order in the vehicle. Originally, this job provided the only means of learning to drive, hence the term 'apprentice'.

[5] *Office National de Sécurité Routière* (National Safety Office)

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