PEDESTRIAN ROAD SAFETY DEVELOPMENT AND RESEARCH IN THE NETHERLANDS

R-77-16
J.H. Kraay, Sociologist
Department Applied Research Pre-Crash Projects
Institute for Road Safety Research SWOV, The Netherlands

In many cases it will be impossible to prevent potential conflicts between pedestrians and wheeled traffic. Where potential conflicts exist, traffic conditions should vary as little as possible. Less variety increases the predictability of events, and information furnished to road users concerning such events will have more chance of success. This means that the task of road users is made easier and that consequently potential conflicts will occur in fewer cases.

Literature research by SWOV (Kraay, 1974; SWOV, 1974) has shown that measures aimed at influencing social behaviour do not have the desired effect on road safety. These include legal rules, technical measures such as zebra crossings, initiatives for children's road safety training, information and publicity campaigns.

An exception, a technical measure which did have some effect on pedestrian safety, is the construction of signal-controlled crossings, footbridges and pedestrian tunnels.

Comparative statistical research in fourteen Dutch towns has shown that the more signal-controlled crossings, footbridges and tunnels there are per kilometre road length the more pedestrian safety is improved (Figure 1).

This pattern is not confirmed by the construction of zebra-crossings, where no significant correlation (Figure 2) could be demonstrated (Kraay & Slop, 1974).

On the other hand, it is found that urban planning measures are likely to have more direct effect, with both a short and long-term influence on pedestrian behaviour.
Urban planning can be expected to produce more than merely a low percentage improvement in safety. Many potential conflicts between pedestrians and wheeled traffic can already be precluded in urban development projects.
The most obvious urban planning measure is the physical segregation of traffic categories, whereby the area is designed in such a way that hardly any more pedestrian/motorist conflicts occur. No law enforcement is needed, it is a clear, comprehensible system determined by its design. In other words, physical urban planning determines and stimulates certain forms of traffic behaviour.

Such measures, however, have a number of drawbacks:
a) their high absolute cost;
b) the lack of space or the structural impracticability of carrying out specific plans;
c) the difficulty of harmonising the various networks for pedestrians, cyclists, mopeds and fast traffic.

In view of a residential area's many social functions, it is questionable whether physical segregation of traffic is, in fact, desirable.

Since strict traffic segregation would put too many limitations

on the great variety of activities and contacts for which the direct residential surroundings are normally used, the Netherlands found a growing need for a new approach to road safety in residential areas, based on traffic integration. The benefits of physical segregation as just mentioned can also be built into mixed traffic.

A number of towns have made small-scale attempts to integrate traffic in a limited number of residential streets. For application to larger areas the Dutch examples of Delft, Emmen and other towns may be mentioned. They relate to both new and renovated neighbourhoods.
Urban planners in Delft and other towns in the Netherlands in designing residential areas have been guided by the principle that conflicts must be prevented. The planner's objective is:
..... to create an environment which children in particular can use more fully and in a more varied way without this causing conflicts with other users of the area or, if conflicts occur, they should be of the minimum severity.

Such mixed traffic in the immediate environment has led to the establishment of residential yards (Vereniging Nederlandse Gemeenten VNG, 1975).
Residential yards are areas where the space open to the public is designed primarily so that the sojourning functions of walking and playing should be done full justice to; and only local traffic is allowed in them.

Unlike incidential measures (such as simple thresholds, localised road narrowings) this involved a systematic approach in which areas are integrally designed or redesigned as residential yards. This relates to a complex of physical and visual measures in and upon the space open to the public.

The residential yard's function differs particularly from a conventionally designed residential street in that the same paved area can be and is (partly) used for various functions such as driving, playing, cycling, walking and parking. In a conventional street, the carriageway is already often used for walking and playing, though this is not allowed by law. This public area, of course, also has the function of opening up the yard, for wheeled traffic as well. But it has no function for "through" traffic.

But if traffic densities are very high with excessive parking, residential yards are not the solution. Other solutions will have to be found in such cases.

Special legal (behavioural) rules will apply to traffic in the residential yard.
In the Netherlands the most remarkable new traffic regulations applying in residential yards are:
- Roads located within a designated residential yard may be used over their entire width by pedestrians and children at play.

- Drivers must move with the greatest caution within a residential yard. They must allow particularly for the possible presence of pedestrians and children at play, for unindicated objects and irregularities in the road surface and route. In no event must they drive faster than walking pace.
- Drivers must not inconvenience pedestrians or playing children within a residential yard.
Pedestrians and children must not innecessarily obstruct the progress of drivers.
- Motor vehicles on more than two wheels can park in a residential yard only at places with a sign or a letter "P" in a space on the road surface.
- A new traffic sign indicates residential areas designated as residential yards.

If action in residential areas is to be taken on the basis of accident analyses, then there must be reliable accident statistics. They should also furnish the most detailed information possible. But it is a known fact that collection, recording and analysis of accident data have considerable drawbacks.
Some drawbacks are:
1. Accident statistics contain information only on recorded accidents and not unrecorded ones. But only part of all accidents are recorded. Calculations by SWOV suggest that only one-third of the actual number of traffic accidents in the Netherlands are recorded (SWOV, 1972).
2. In order to take action it is very important to have very

specific accident data. These are unfortunately not available. Since traffic accidents do not occur in sufficient numbers in a residential area for statistical research, it is impossible to use accidents as a criterion of traffic safety for short-term research.

Another indicator of the concept of traffic safety is the near-miss or serious conflict behaviour between road users. The number of near-misses, or such serious conflicts, is likely to be greater than the number of actual accidents.

As various conflict techniques in most cases so far have not proved to be reliable or valid enough, no opinion can as yet be expressed about road safety if it is desired to evaluate urban planning projects by using a conflict technique (Oppe, 1975).

For some years, there have been new trends in urban building in The Netherlands; they relate both to the renovation of old urban districts and the design of new residential areas as residential yards.

Research in other countries has shown that urban planning and infrastructural measures affect residents' behaviour more than legal rules and the influencing of social behaviour, for instance by publicity, information and campaigns. This has implications regarding overall living conditions in residential areas of which traffic behaviour and road safety form a part.

SWOV has the task of keeping track of these trends in the Netherlands and evaluating them in terms of road safety.
The development of a conflict observation technique usable as a reliable measuring instrument in various urban planning designs for determining road-user behaviour is therefore a primary requirement. With a view to this, SWOV requisitioned research from the Netherlands Institute for Preventive Medicine NIPG-TNO. This research concentrated on children as the most intensive users of the residential environment (NIPG-TNO, 1975 and 1976).

This research defines an encounter as a reaction by a party or both of the parties involved in a traffic situation towards the other, with a distance of 20 metres or less between those involved.
The various types of encounters are defined as follows:
Serious conflict: a sudden motor reaction by a party or both of the parties involved in a traffic situation towards the other with a distance of about 1 metre or less between those involved.
Furthermore there were distinguished a conflict, intensive contact-conflict, contact-conflict, intensive contact and contact.

It should of course be realised that any definition has its limitations. This research tried to give a definition of a serious conflict which would on the one hand be as close as possible to a traffic accident and is measurable, and on the other hand would provide enough serious conflicts to make the problem capable of investigation.

The first part of the research showed that it is quite possible in a test situation to make the developed conflict observation technique reliable.

As a new conflict technique should be applicable in a wide variety of neighbourhoods, two very differently planned parts of Delft were selected. The field research carried out here was the second part of the investigations.
One neighbourhood, Fledderus, was planned on traditional lines, including conventional traffic segregation (street and pavement) and tidy beds of greenery, plots (not for walking on) and paths. The other, the residential yard Gillis, was planned on the lines that the entire residential area should be usable and should also encourage possibilities of varied use. In other words, there are lawns that may be walked on, while the usual pavement - kerb - gutter - carriageway was changed into footpath - moledrain - carriageway, so that pedestrians, children at play and cyclists can utilise the entire space. Motor traffic is curbed by a number of physical obstacles (bumps in the road and trees) and psychological obstacles (for instance pavement tiles in the carriageway).

The method used here was that of "tailing" by observers. There were observations of both persons and sectors.
In observing persons, a child is followed for a maximum of 30 minutes. In the event of an encounter with a road user, this is characterised by reference to a number of variables. If a child

leaves the research area (by going indoors somewhere or leaving it) observation ceases.

In the case of sector observation, a number of sectors are observed every day for a fixed period. Each encounter during the observation period was recorded in terms of a number of variables. Sectors observed in this way are: areas near elementary and infants' schools in both neighbourhoods and two entries and exits for each area.

Assuming that the conflict observation technique is also reliable under field conditions (for which there are some indications in the figures) a number of interesting differences in traffic behaviour emerge.

To sum up the Dutch research, the following can be said:

a) In the residential yard Gillis there are more encounters than in Fledderus. The obvious explanation is traffic integration.

b) The residential yard solution in Gillis does not produce less serious conflicts than the conventional Fledderus.

c) Fledderus was planned with traffic segregation so that wheeled traffic has priority. Here, the parents supervise and accompany their young children more than in the residential yard Gillis, so that children in Fledderus have fewer encounters and serious conflicts with wheeled traffic than in the residential yard Gillis. This is clearest of all in the up to 5 years old group who are most accompanied by adults in Fledderus.

d) In the residential yard Gillis, the layout and appurtenances

of the area make children visible only when they are on the wheeled traffic part. Anticipatory reactions by moving vehicles are hardly possible if children appear from the close-grown shrubbery, run round corners of blocks of flats or hide behind obstacles intended for wheeled traffic. The same pattern applies to anticipatory reactions by children.

e) The obvious assumption is that the parents of young school-children in Gillis have a feeling that the traffic is safe and hence accompany their children less than in Fledderus, so that the children perhaps get into more serious conflicts.

f) The research workers assumed that the severity of the consequences of any traffic accidents would be less in Gillis because its design would compel wheeled traffic to move slower than in Fledderus.

Nevertheless, timings have shown that the speeds of cars, mopeds and cycles in both areas hardly differ from each other.

g) These investigations have shown that the developed conflict observation technique is usable under field conditions. In a fairly short period it has been used to collect a quantity of information providing a good idea of what happens in a residential area.

h) Since the object of the research was to develop a <u>reliable technique</u>, nothing can be said at present about its <u>validity</u>, i.e. to what extent serious conflicts are also good predictors of traffic accidents. This is not, therefore, the place to state any findings regarding traffic safety.

i) Instead of such findings, the research does give a number of

indications regarding specific types of encounters in a residential area. Architects may consequently gain more understanding of the effects upon the various road users. And therefore urban planners can modify their projects in a short time and try to improve undesirable traffic situations.

As the various conflict techniques in most cases so far have not proved to be reliable or valid enough, it is advisable to use them in situations where very few accident statistics are available or where an initial impression of the situation is wanted.
Much development work will still have to be done before these techniques can be generally applied.

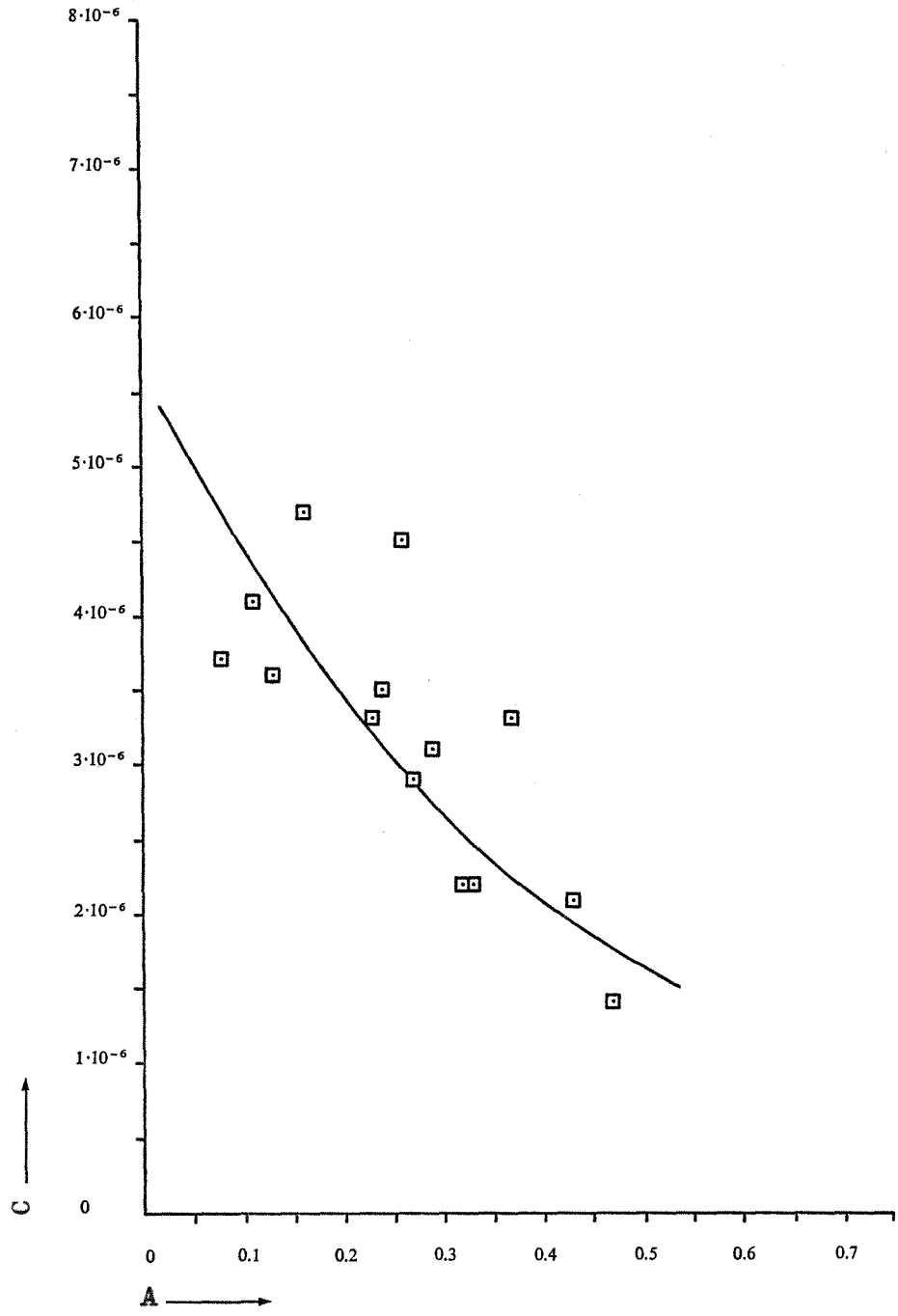

Figure 1. Relationship between the numbers of signal controlled crossings, footbridges and tunnels per km of road (A) and the relative risk (C) in the Netherlands (Kraay & Slop, 1974).

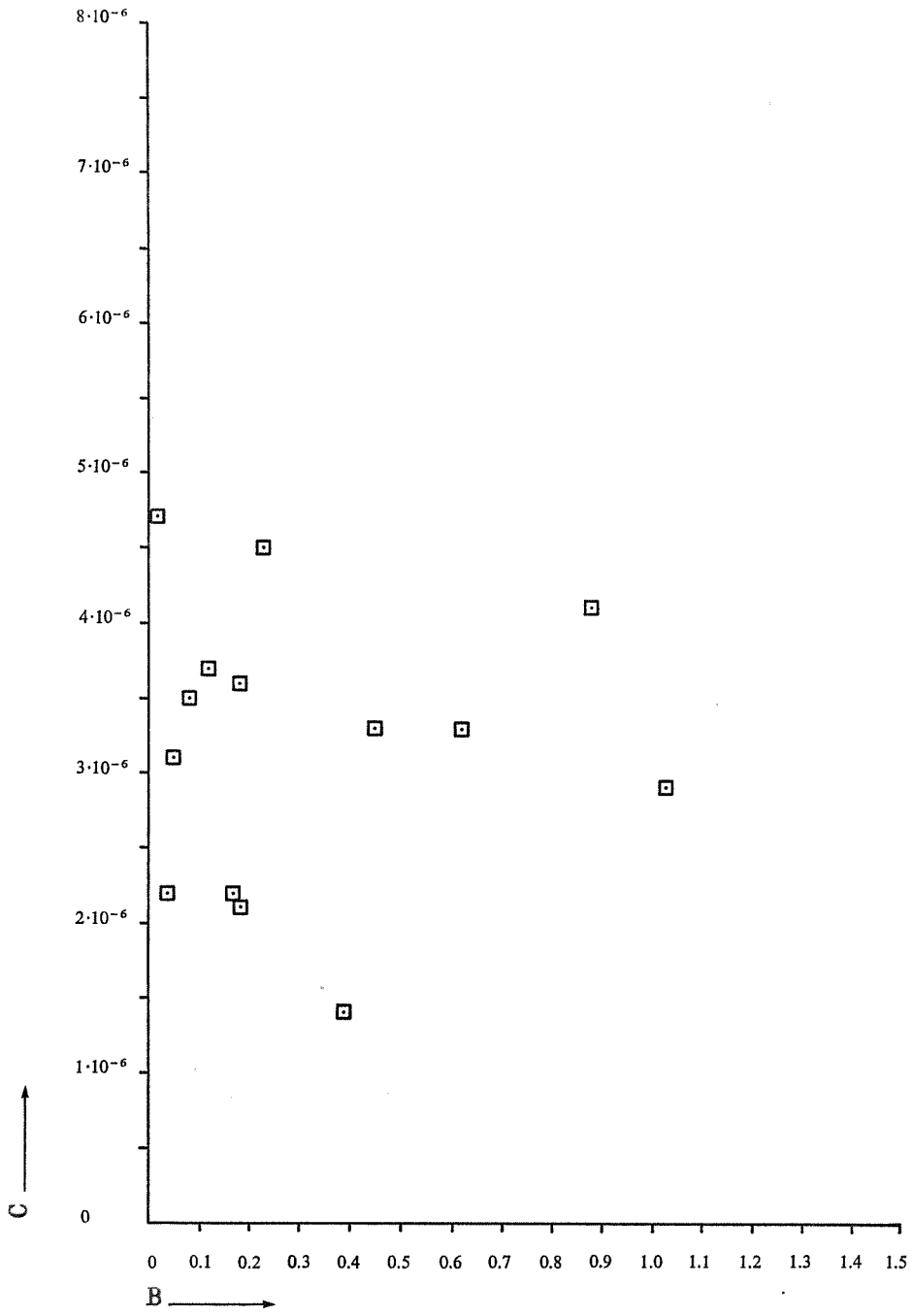

Figure 2. Relationship between the numbers of zebra crossings per km of road (B) and the relative risk (C) in the Netherlands (Kraay & Slop, 1974).

REFERENCES

Kraay, J.H. & Slop, M. Safety of pedestrian crossing facilities: An international comparative research on the effect of variously composed sets of pedestrian crossing facilities on pedestrian safety in towns. Publication 1974-2E. Institute for Road Safety Research SWOV, Voorburg, The Netherlands, 1974.

Kraay, J.H. Countermeasures in the field of human factors in relation to pedestrian behaviour, regulations and law enforcement. In: Pedestrian Safety Project. Committee on the Challenges of Modern Society CCMS Report No. 27. U.S. Department of Transportation, 1974.

Nederlands Instituut voor Praeventieve Geneeskunde TNO (Güttinger, V.A.). Veiligheid van kinderen in woonwijken. Deel 1: Conflictmethode, operationalisatie en betrouwbaarheid. NIPG-TNO, Leiden, 1975.

Nederlands Instituut voor Praeventieve Geneeskunde TNO (Güttinger, V.A.). Veiligheid van kinderen in woonwijken. Deel 2: Toepassing van de conflictmethode in een veldonderzoek. NIPG-TNO, Leiden, 1976.

Oppe, S. Traffic conflict analysis, a road safety research technique. In: Conflict analysis techniques for road safety research: Contributions to OECD Special Research Group on Pedestrian Safety. Institute for Road Safety Research SWOV, Voorburg, The Netherlands, 1975.

Vereniging van Nederlandse Gemeenten VNG. Woonerven. Groene reeks No. 21. VNG, The Hague, The Netherlands, 1975.

SWOV (Blokpoel, A. & Carlquist, J.C.A.). Schade-aangifteformulieren en ongevallenregistratie. Publikatie 1972-2N. Stichting Wetenschappelijk Onderzoek Verkeersveiligheid SWOV, Voorburg, 1972.

SWOV (Kraay, J.H.). Oversteekplaatsen voor voetgangers: Studie gebaseerd op bestaande Nederlandse en buitenlandse literatuur. Stichting Wetenschappelijk Onderzoek Verkeersveiligheid SWOV, Voorburg, 1974.

SWOV (Kraay, J.H.). Pedestrians, two-wheelers and road safety: A statistical comparison of pedestrian, cyclist and moped-rider road-traffic fatalities in The Netherlands from 1968 to 1972. Publication 1976-3E. Institute for Road Safety Research SWOV, Voorburg, The Netherlands, 1976.