Road Safety

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Action to reduce road casualties

Progress in road safety is reviewed with particular reference to radical measures that have proved beneficial in Australia. Community involvement in decision-making is vital if gains are to be made and sustained in this field.

The casualty rate per unit distance of road travel indicates how safely a road transport system operates. Fig. 1 shows the records of four countries in this matter between 1965 and 1987. All of these countries now have much the same level of safety—between 1.5 and 2 deaths per 100 million vehicle-kilometres—despite very different safety programmes. This indicates that the precise nature of the action taken is less important than its amount, provided that the individual measures are selected scientifically. It should also be noted that these countries formerly differed greatly in their levels of road safety, Australia and Japan having undergone particularly rapid improvement in this respect.

With regard to the number of casualties per head of population, which indicates the level of personal risk, the rate of improvement has been comparatively slow (Fig. 2). Furthermore, Japan and the United Kingdom present a much more favourable picture than Australia and the USA. The explanation, of course, is in the very different levels of motorization (Fig. 3). Clearly, for countries with similar safety per unit distance of travel, the numbers of casualties per head of population will vary with the volume of travel. This is often overlooked in the road safety debate, particularly when international comparisons are being made. It should be borne in mind that the mobility provided by road transport has danger as a by-product, which has major implications for strategic planning.

Government intervention

Why do most highly motorized countries have remarkably similar levels of safety per unit distance of travel? As a country motorizes it gradually improves its infrastructure to cope with additional traffic.
The vehicle industry matures and the quality of its products improves; the mechanisms for controlling traffic flow develop and the behaviour of road users becomes safer.

Much of the advance in safety has come from general improvements in road transport systems, specific measures having given additional gains. Such measures have to be tailored to each country's problems. In Australia, nearly 70% of the people who become casualties in road accidents are vehicle occupants, whereas in the United Kingdom the corresponding figure is just over 40% and in India it is only 5%; consequently, measures directed at the protection of occupants can be expected to have impacts on overall safety which differ considerably between these countries.

In Australia there has been a tendency for direct government intervention to control individual behaviour on the roads. The success of this approach is partly attributable to the powers held by the State governments in matters relating to road transport. Almost all of the country's major interventions commenced in one State and were later adapted by the others once success had been demonstrated. Most of these measures originated in Victoria, where an all-party parliamentary committee on road safety, established in the 1960s, paved the way for what many people consider to have been quite draconian measures.

There are two particularly effective road safety strategies. One is to seek to reduce levels of injury by means of protective devices. The other is to reduce the frequency of the forms of travel with the highest degrees of risk. Both require legislation and enforcement. In Australia, legislation on self-protection began in 1961 when Victoria made it compulsory for motorcyclists to wear crash helmets. The compulsory wearing of seat belts was introduced in Victoria in 1970 and in 1990 the same State introduced the compulsory wearing of helmets by cyclists. Victoria set a limit of 50 mg/100 ml for blood alcohol in 1966, required a blood sample to be obtained from every accident victim taken to hospital as from 1974, and introduced random breath testing in 1976. In 1984 Victoria introduced a zero blood alcohol limit for drivers with an initial, probationary licence. Learner motorcyclists are restricted to machines with an engine capacity of 250 cc or less, research having demonstrated

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that this category of road user has an especially high risk of crashing on powerful motorcycles.

Why have other countries with similar legislation not had the same success as Australia? And why do Australians tolerate a high level of government intervention? In Australia the public receive unambiguous messages. Thus in 1970 it was laid down that in all seating positions for which a belt was available it had to be worn. Even today there are very few countries in Europe which require seat belts to be worn in rear seating positions. In some countries, seat belts have to be worn only on high-speed roads. The clearer and simpler the message sent by governments, the higher is the probability of compliance.

Random breath testing, when introduced in Victoria, was not successful. It was not until several years later in New South Wales that legislation on random breath testing became effective. Random testing being a controversial issue, Victoria had proceeded too cautiously with only a low level of enforcement.

The public debate surrounding the introduction of random testing legislation led to a short-term reduction in alcohol-related crashes as motorists overestimated their chances of being apprehended. Within about six months this effect disappeared. The authorities then embarked on evaluation programmes. In 1978 and 1979 the Melbourne police conducted intensive random testing on a rotational basis in the four sectors into which the city was divided. Alcohol-related crashes were reduced only during and for two to three weeks immediately after testing. What mattered was not the actual experience of providing a breath sample but the intensity and visibility of enforcement. At a time when casualties in New South Wales were especially high, intensive random breath testing was introduced: a million people are tested annually in a population of just under three million licensed drivers, and the frequency of alcohol-related crashes has fallen markedly.

As regards the acceptance of so much government intervention, the explanation lies in the fact that legislative action is but one link in an integrated chain of measures. Let us consider Victoria’s legislation requiring cyclists to wear approved helmets. Although it was introduced in 1990 the story begins in 1983. Most of the cyclists who suffered injury or death on the roads were children, and among the most serious casualties about three-quarters were found to have significant head injuries. However, a roadside survey revealed that less than 4% of child cyclists and only 15% of adult cyclists wore helmets. Few people accepted that helmets were necessary or effective and the available helmets were expensive, uncomfortable, inconvenient and unattractive.
A major educational campaign was conducted over five years. A concerted effort was made to get schools both to encourage the wearing of helmets and to provide secure storage for them. Publicity on television and radio was directed principally at parents, they being in the best position to influence children's behaviour. Victoria implemented a rebate scheme whereby the purchaser of a helmet could get a 25% rebate from the government. Within about three years, roadside surveys revealed that the wearing of helmets had risen dramatically. For young children the wearing rate between home and school exceeded 50%; for older children it was about 20% and for adult commuters it was about 40%. Two years later, even though the intensity of the educational effort had been maintained, the wearing rates had not improved, suggesting that no further progress could be achieved voluntarily.

A further significant development helped to pave the way for the legislation. The major obstacle to helmet wearing, shown by market surveys, was that the helmets were heavy, hot and unattractive. The enormous increases in wearing rates generated by the educational campaign created an expanding market which led manufacturers to redesign helmets so as to improve their competitive position.

When the legislation was introduced there had been five years of intense educational effort. This had led the public to recognize the value of helmets in reducing injury, had brought to the market a range of helmets acceptable to the consumer, had reduced their cost, and had produced an atmosphere in which the majority of parents favoured the legislation because it simplified their own attempts to ensure that their children were adequately protected.

The success of the measures was due to the attention paid to inducing supportive social change. This model is fairly typical of Australian road safety interventions. Legislation normally only follows educational efforts aimed at encouraging the desired behaviour and other efforts designed to remove obstacles to a sustained change in behaviour. The legislative approach has created a willingness among Australians to mandate self-protection and to limit the forms of travel carrying the highest risks.

**Road safety strategies**

Road safety did not come into its own until the late 1960s. Previously, separate authorities had been responsible for road building, traffic control, traffic law
enforcement and public education. There was little integration of activity and no joint strategic planning.

William Haddon, the inaugural head of the Road Safety Agency in the USA, pointed out that road accidents were associated with numerous problems, each of which needed to be addressed separately (1). He also demonstrated the value of comprehensive and reliable accident data systems. Without adequate data the problems and solutions can only be matters of speculation. If, on the other hand, reliable data are available, the problems become identifiable and sensible decisions can be made about the priorities to be given to them.

The importance of distinguishing between the magnitude of a problem and the level of risk involved is now understood. It is known, for example, that an inexperienced motorcyclist on a powerful motorcycle is about 20 times more likely to be killed in a crash than is the driver of a car. However, almost 70% of all crash casualties in Australia are car occupants, whereas less

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The Haddon matrix (Fig. 4) indicates all the options available for dealing with any particular safety problem. Let us examine the question of crashes involving vehicles running into roadside power poles. In Australia this type of crash accounts for about 10% of deaths in urban areas. Let us look initially at the road user in the pre-crash phase (see Fig. 4). How might such accidents be prevented through behaviour change? Most of them involve skidding, so it might be advantageous to have a training programme in which people are taught how to correct a skid. Such training is unlikely to be completely successful, but injuries might be reduced further if legislation is passed requiring the wearing of seat belts. In the post-crash phase, if most of the population has had first-aid training it might be possible to keep accident victims alive until paramedical help arrives. Let us now look at vehicle-based measures. We might prevent crashes by fitting vehicles with anti-skid brakes. We might minimize injury by having collapsible steering columns. We might insist on burst-proof fuel tanks to prevent post-crash fires. As regards the road traffic environment, crashes might be prevented if road surfaces were skid-resistant; the severity of impacts could be reduced if frangible poles were used; and identifying numbers might be placed on poles so that a passer-by could indicate the exact location of a crash when telephoning for an ambulance.

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than 10% are motorcyclists. It is necessary to consider the likely effectiveness of the measures under consideration and then to decide, in terms of the estimated total casualty reduction, which problems and measures should have first call on funds.
It is not difficult to devise two or three solutions for each cell in the matrix. This kind of approach brings discipline to the analysis of each identified safety problem. After the identification of potential solutions the likely effectiveness of each has to be assessed. This is a function not only of the value of the measures but also of the probability that they can be implemented in a given sociopolitical climate. A single measure should never be selected to deal with a problem; instead a package of measures should be chosen with the intention of implementing them in an integrated manner.

Haddon’s matrix provides guidance on the fundamental strategies of accident prevention, injury reduction and enhanced post-crash treatment. Each strategy can be implemented through behaviour modification and/or environmental change to either the vehicle or the road and traffic system. The conceptualization of strategies is very useful but has shortcomings. It fails to give prominence to one of the most effective strategies, namely the reduction of high-risk forms of travel. Restricting learner motorcyclists to the less powerful motorcycles, imposing a zero blood alcohol limit on learner drivers, prohibiting cyclists on motorways, imposing high fuel taxes to discourage the use of powerful cars, and prohibiting the sale of alcohol to people under the age of 21, are examples of measures that seek to control high-risk behaviour. Furthermore, the Haddon matrix has the drawback of focusing attention on the micro level. A specific problem is examined, only the immediate causes are considered, and an attempt is made to identify potential solutions. It is relatively uncommon for the broad picture of safety to be critically analysed, something that has become urgently necessary. As previously indicated, most motorized countries have achieved roughly the same level of safety in the operation of their road transport systems. Road infrastructures are now mature in these countries. At the same time an anti-car movement has developed in response to congestion on the roads and to the emission of greenhouse gases. These questions are constraining investment in road infrastructures but seem to be having little effect on the growth in traffic. In Australia the number of cars in use continues to grow at around 3% per annum, while the number of lorries grows at more than double that rate. A 30% reduction in the death rate per 100 million vehicle-kilometres is needed in Australia just to hold the total number of deaths in the year 2000 at today’s level.

Safety and environmental goals are sometimes in conflict. In order to reduce greenhouse gas emissions and to conserve fuel, smaller cars are coming to the fore. In the USA it has been estimated that an improvement of a mile per gallon (35 km/100 l) in fuel efficiency resulting from the use of smaller vehicles translates into a 4% increase in the death rate per vehicle. It is often suggested that the compulsory use of car lights during daytime would improve safety, yet such a move would run counter to the aims of fuel efficiency and restriction of greenhouse gas emission.

As motorization proceeded, advances in safety were derived in considerable measure.
from steady improvements in road and traffic systems. Today, governments consider that it is no longer feasible to match demand by increasing supply, and are talking about restricting demand in accordance with the availability of road space. Road pricing is the new hope for combating congestion. However, little is known about the impacts on safety of the broader transport decisions taken with a view to environmental protection or the better management of mobility requirements.

**New trends**

Strategic planning for road safety at the macro level is beginning to take its place in Australia, New Zealand, the USA and many European countries (2–7). While this is a good trend, such plans must not be accepted uncritically. Some of the strategic plans that have been produced have had the following disappointing aspects.

- While most plans make passing reference to the need for trade-off decisions to balance safety, mobility and environmental objectives, none considers these issues in detail.
- Some plans propose numerous specific measures without considering the barriers to implementation or how they might be overcome. In the European Community, for example, differences in practices between Member States create a major difficulty in the way of harmonization. It is important that harmonization should not result in acceptance of the lowest common denominator.

- In the United Kingdom it has been proposed that, wherever possible, the strategy should avoid legislative controls on people (5). Yet if the Australian experience has any single message it is that legislative interventions can be both successful and widely accepted without any perceived loss of freedoms.
- Reference is made in several strategic plans to involvement of the community and consultation with affected institutions and organizations. To be effective, consultation and institutional integration should be accompanied by the acceptance of meaningful accountability for the achievement of goals. In New Zealand, a country with under four million people, no fewer than 28 public and 45 nongovernmental agencies were identified as essential to the networking process, yet there was no discussion as to how each could become accountable for its contribution (6).
- There is a tendency to place the onus for safety on the individual road user. Of course, the individual’s behaviour is a critical determinant of her or his safety, and communal behaviour likewise has a vital influence on the community’s safety. However, it is not acceptable that governments should absolve themselves of responsibility. Where improved behaviour is needed the authorities should promote it by every possible means.
- In general the widespread use of cost-benefit analysis in decision-making is to be applauded. However, it is
important to see things in their true perspective. It is preferable to spend a sum of money on a major problem with a cost-benefit return of 2 to 1 than on a minor problem with a cost-benefit return of 20 to 1. Furthermore, a slavish adherence to cost-benefit analysis tends to inhibit the testing of innovative solutions.

Despite the above concerns, the strategic plans undoubtedly hold promise of progress, as outlined below.

- There is a clear recognition that the political and community profile of road safety should be raised. It is necessary to increase community awareness of the key problems and to provide opportunities for wider participation in decision-making if road safety is to obtain an adequate share of resources and if governments are to be encouraged to take difficult decisions.

- There is a public acknowledgement of the need for integrated efforts across traditional institutional boundaries. Although there seems to be no clear plan for implementing institutional accountability, hopeful signs exist. It has been suggested, for example, that there should be routine independent safety audits of road networks. This would bring accountability to the authorities responsible for road construction and maintenance. Another possibility would be to require safety impact statements in respect of major decisions on land-use planning and liquor licensing. It is now recognized that institutional fragmentation of responsibility has been the largest single barrier to progress in the safety field. Integration, cooperation and consultation are excellent first steps but may come to nothing if true institutional accountability is not achieved.

- Formal targets are being set as part of the new approach to planning. In the United Kingdom the goal is to reduce the number of casualties by a third by the year 2000 (5). The European Community seeks to reduce the number of serious casualties by 20–30% by the same date (4). In Australia, Victoria has set itself a target of a 30% reduction (2) and New South Wales aims to achieve a 25% reduction (3), again by the year 2000. All of these targets have been expressed in terms of absolute numbers of deaths and serious injuries, which is what the public is most interested in. However, in the USA the target is given as a reduction in the fatality rate per 100 million vehicle-miles (7); in other words, mobility is put first and the aim is to have the safest possible transport system on that basis. The Europeans, in contrast, are talking about limiting mobility as a means of improving safety. Target-setting is the first step towards achieving accountability. Thus in the United Kingdom the Department of Transport has to submit an annual report on progress in achieving the targets that have been laid down (8). At present the institutions setting targets in various countries are monitoring their own performance. It would clearly be preferable, however, for targets to be set for each institution and for independent audits of performance to be conducted.

- There is clear evidence of improvement in the utilization of limited resources and of more effective management and coordination of safety programmes. The critical factor in the long term will be the degree to which accountability can be placed upon each institution.

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Hope comes from the growing frequency with which safety measures are being
selected scientifically. We are beginning to recognize that road safety does not exist in a vacuum and that pressures against it have to be countered. There is widespread acceptance of the critical role played by diverse public and private institutions and of the need for institutional cooperation, programme integration, and genuine accountability for performance.

What else could be done to improve road safety?

- Vehicle manufacturers could install speed-limiting devices, ignition interlocks to prevent drink-drivers from starting their vehicles, and better occupant protection systems.

- Independent bodies could be established to conduct regular safety audits of the activities of the institutions involved in road construction, traffic management, traffic law enforcement, land-use planning, public health and education. This would allow pressure to be applied for the achievement of targets and for proper attention to be paid to institutional obligations.

- A systematic long-term programme could be implemented with a view to changing social attitudes on car use.

References


