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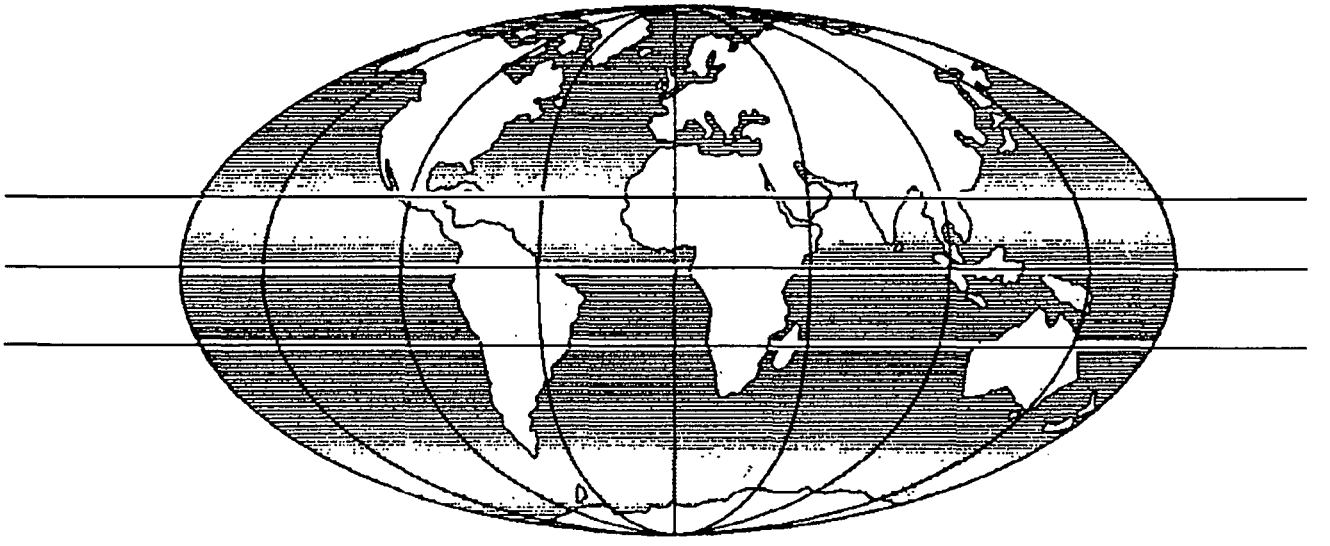

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Costing Road Accidents in Developing Countries

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ABSTRACT: In many Asian and African countries road accidents are a major problem but within the boundaries of the transport sector, hard decisions have to be taken on the resources that any government can devote to road safety. In order to assist in this decision-making process, it is essential that a method be devised to determine the national cost of road accidents and the value of preventing them. A second need for road accident cost figures is to ensure that the best use is made of any investment and that the best (and most appropriate) safety improvements are introduced in terms of the benefits that they will generate in relation to the cost of their implementation.

1 INTRODUCTION

It is now well established that many Asian and African countries have a serious road accident problem (Jacobs and Cutting 1986). Fatality rates (per licensed vehicle) are high in comparison with those in developed countries and whilst in Europe and North America the situation is generally improving, many developing countries face a worsening situation. For example, over the period 1969 to 1986, the number of people killed in road accidents in 12 European countries combined actually fell by about 20 per cent. In eight Asian countries combined there was, over the same time period, an increase in the number killed of over 150 per cent.

Whilst these trends give cause for concern in developing countries, road safety is but one of the many problems demanding its share of funding and other resources. Within the boundaries of the transport and highway sector, hard decisions have to be taken on the resources that any government can devote to road safety. In order to assist in this decision-making process it is essential that a method be devised to determine the cost of road accidents and the value of preventing them.

2 WHY COST ROAD ACCIDENTS?

The first need for cost figures is at the level of national resource planning to ensure that road safety is ranked equitably in terms of investment in its improvement. Fairly broad estimates are usually sufficient for this purpose, but must be compatible with the competing sectors. For example, in a recent road safety study undertaken in a particular country by TRL, it was shown that the annual cost of road accidents nationally was about £20 million. A series of safety improvements were outlined which, it was estimated, would reduce the national cost of accidents by 5 per cent per annum (ie saving £1 million pa). These improvements (in highway-design and layout, education, training and enforcement) were estimated to cost £500,000 in a programme of measures set out over a five year period (ie at an average annual cost of £100,000). The average First Year Rate of return on investment was therefore about 1000 per cent and the Benefit : Cost ratio about 10:1. High rates of return such as these are fairly common in road safety appraisals and, apart from the humanitarian aspects, illustrate the economic benefits of investing in national road safety programmes.

A second need for road accident cost figures is to ensure that the best use is made of any investment and that the best (and most appropriate) safety

improvements are introduced in terms of the benefits that they will generate in relation to the cost of their implementation. Failure to associate specific costs with road accidents will almost certainly result in the use of widely varying criteria in the choice of measures and the assessment of projects that affect road safety. As a consequence it is extremely unlikely that the pattern of expenditure on road safety will, in any sense, be `optimal'. In particular, if safety benefits are ignored in transport planning then there will inevitably be an under-investment in road safety.

3 VALUE OF LIFE

From the above it can be seen that rational decisions on the allocation of resources to road safety will require the use of cost-benefit analysis, with explicit costs of accidents and values of accident prevention. Ways in which such costs and values can be defined and estimated are described in the next section. However, to some people the monetary valuation of human life and safety may appear immoral and it should be stressed that at no point does this paper lay claim that it is possible to find a numerical sum which can be said to be the absolute "value of human life", as such. Rather, what this paper examines are the various methods that can be used to estimate the value that should be placed on various safety-improving activities (and the costs that should be associated with increases in risk) on the roads of developing countries.

4 THE DIFFERENT APPROACHES TO ACCIDENT COSTING/VALUATION

In their papers on the cost of traffic accidents and evaluation of accident prevention in developing countries, Hills and Jones-Lee (1981) (1983) identified six different methods that have been proposed for placing a cost on road accidents. All of the methods outlined were applicable to non-fatal as well as to fatal accidents but, for reasons of clarity and simplicity, they concentrated on describing accidents involving one fatality only. They made the point that the appropriate method to use in any particular context may depend upon the objectives and priorities of those who intend to use the costs and values concerned (see later).

a) The "gross output" (or human capital) approach

In this method, the cost of a traffic accident involving a fatality can be divided into two main categories. Firstly there are the costs that are due to a loss or diversion of current resources and secondly there are the costs that are due to a loss of future output. Included in the former will be the cost of vehicle damage, medical treatment and police/administration costs and usually there is little disagreement as to what should be included here. Determining loss of future output of the person(s) killed however is less clear cut. Usually average wage rates are used (gross of tax) to determine lost output both for the year in which death occurred and then for future years. Costs in future years that the casualty might have lived have to be discounted back to give present day values. This is not done separately for every individual killed (or injured) in a road accident; estimates are based on average (ie national) output or earnings data together with appropriately estimated damage, medical and police costs. In some variants of this approach, a significant sum is added to reflect the "pain, grief and suffering" of the accident victim and to those who care for him or her (see below).

b) The "net output" approach

This differs from a) in that the discounted value of the victim's future consumption is subtracted from the gross output figure. Again, it may be difficult to visualise how an estimate can be derived of what a person "consumes" (in terms of food, fuel etc.) throughout his or her lifetime. When this method was used in the UK to cost road accidents (being replaced in the early 1970's by the gross output approach), the "total consumer expenditure and the public authorities' current expenditure on goods and services" was divided by the total population. A crude estimate of "consumption per head" was thus obtained. In this approach the difference between an individuals gross output and future consumption may be regarded as a measure of the rest of society's economic interest in his or her continued survival.

c) The "life-insurance" approach

In this method the cost of a road accident or the value of accident prevention is directly related to the sums for which `typical' individuals are willing (or even able) to insure their own lives (or limbs). However, whilst the amount of insurance cover provided might be considered to be some estimate by the insured person of the value of his life to his

dependents, it says nothing whatsoever about the value of life to the insured person himself. Thus a wealthy bachelor with no dependents may have little or no life cover, whilst a much poorer person with several children may have his or her life insured for a much greater sum. The wealthy bachelor may well, nonetheless, place a very high value indeed upon his own continued survival. Another problem with this approach is that the level of life insurance cover may be well below what it `ought' to be if the intention is to provide sufficient income on which his or her dependents are to survive. Further, to base any analysis on the insured population alone is almost certainly to choose a biased sample. This approach is of particularly limited value in developing countries where relatively few people carry life insurance.

d) The "court award" approach

With this approach, the sums awarded by the courts to the surviving dependents of those killed or injured as a result of either crime or negligence are regarded as an indication of the cost that society associates with the road accident or the value that it would have placed on its prevention. In the UK, the sum awarded by the court must take into account complex issues such as degree of negligence of the defendant, whether the person killed or injured was partly to blame, whether or not the employer of the injured person is continuing to pay them any wages and whether industrial injury benefits are to be paid. In addition, any sum awarded by the court will have all taxes removed. From the above it can be seen that to use court awards as implied values for the loss of life (or limb) in a road accident would be very much an imperfect solution.

e) The "implicit public sector valuation" approach

With this method an attempt is made to determine the costs and values that are implicitly placed on accident prevention in safety legislation or in public sector decisions taken either in favour of or against investment programmes that affect safety. Unfortunately, an examination of some values as derived in Britain reveals a very wide range of implied values of life not only between different sectors but also within the same sector (Mooney 1977). Thus following the partial collapse in London of a block of high-rise flats, changes were made to building regulations. According to estimates made (Sinclair et al 1972), a few lives may have thus been saved at very high cost giving an implied minimum valuation of life at over £20 million. However it was also claimed at about the same time (Heys et al 1968) that a method of preventing stillbirths could be standard practice at a cost of only £50 per life saved. Since this method was not widely practised in the UK at the time, it suggests that £50 could be regarded as a maximum value for life, giving from the two examples a range of less than £50 to over £20 million per life saved. These examples provide at the very least an indication that there is (or was) some misallocation of resources in life-saving activities and suggests that this would be a very imprecise method for valuing human life.

f) The "value of risk change" or "willingness to pay" approach

This approach is based on the fundamental premise that decisions made in the public sector concerning the allocation of scarce resources should reflect the preferences and wishes of those individual citizens who will be affected by the decisions (Jones-Lee 1976, 1989). Accordingly, the value of a given improvement in road safety (ie a reduction in risk) is defined in terms of the aggregate amount that people are prepared to pay for it. Conversely the cost of a reduction in safety is defined in terms of the amount people would require in compensation for the increased risk. More specifically, the value of a particular safety improvement is defined as the sum of all the amounts that people (affected by the improvement) would be willing to pay for the (usually very small) reductions in risk provided by the safety improvement. Thus the value of prevention of one accident involving one fatality is defined as the total amount that all affected individuals would pay for the very small risk-reduction, both for themselves and for those they care about.

Estimation of willingness-to-pay costs and values is far from straightforward. Various methods have been used and include an approach where estimates are obtained by observing situations where people actually do trade off wealth or income for physical risk. Another approach uses a complex questionnaire where samples of individuals are asked more or less directly how much money they would be willing to forfeit in order to obtain a small reduction in their own or other people's risk.

For example, a detailed questionnaire might indicate that drivers were prepared to pay, on average, £5 for a risk reduction of one chance in 500,000 that they would be killed on a particular journey. Then the `value of an average life' in this instance would be £5 x 500,000 ie £2.5 million.

5 WHICH METHOD TO USE?

Not surprisingly, these six approaches produce substantially different costs and values for accidents involving one fatality. Typically figures derived from studies carried out in developed countries over the period 1965-1978 ranged from about £1500 to over £20 million. As stated earlier, Hills and Jones-Lee 1981, 1983) emphasise the point that the method used for costing road accidents depends on the objectives being pursued in a country by those planners and economists responsible for investment planning. The reasons for costing road accidents are most likely to be either the maximisation of national output or the pursuit of social welfare objectives (such as the minimisation of injury accidents or fatalities in relation to traffic). The only accident costing/valuation methods that appear to be directly relevant to these two objectives are:-

a) the "gross output" method (well suited to the objective of maximising the wealth of a country) and

b) the "willingness to pay" method (especially for social welfare maximisation and for use in cost-benefit analyses).

If accident costs and values are ultimately intended for use in conventional cost-benefit analyses in order to determine the most efficient way of allocating scarce financial resources, then the most appropriate method to use by far is the willingness-to-pay approach. However, whilst this method has been adopted in countries such as UK, USA, New Zealand and Sweden, the difficulty of obtaining reliable empirical estimates has been considerable. Furthermore, whilst the willingness-to-pay approach was adopted in the UK in 1988 to cost fatal accidents, the use of the method to cost non-fatal accidents presented certain problems which have only fairly recently been resolved (Jones-Lee et al 1993, Hopkin and O'Reilly 1993). Even in the case of fatal accidents, a wide range of empirical estimates was obtained from various studies and `a considerable element of judgement' was necessary (McMahon 1991) in order to derive a value that was regarded as `a reasonable working basis for the value of a fatal casualty for use in appraising transport investments'.

The willingness-to-pay approach as used in the UK can also be criticised on the ground that values are obtained directly for adults only, since children are being unable to complete the complex questionnaires used to derive values. Children form a very high proportion of people killed or injured in developing countries (about twice that of the UK) and the willingness-to-pay approach would therefore appear, at the moment, to be inappropriate. Similarly the method is used in the UK to obtain values for drivers or passengers of motor vehicles only. Again this weakens the case for its use in developing countries where significant proportions of people killed and injured are pedestrians and pedal cyclists.

6 SUMMARY

It seems unlikely therefore that reliable willingness-to-pay based costs and values will be available for use in most Asian and African countries for some time. (Certainly until detailed studies of its use and application have been carried out in one or two countries.) It is therefore recommended that the gross output approach is used to cost road accidents in the emerging counties of Asia. However, in order to try to capture some of the `humane' considerations reflected in the willingness-to-pay approach, gross output values should be augmented by a further allowance for `pain, grief and suffering' of those involved in road accidents. This, in fact was the approach employed in the UK prior to the recent adoption of the willingness-to-pay approach. The way in which such an allowance might be added to fatal, serious and slight accidents to reflect pain, grief and suffering needs careful consideration. Finally, it is suggested that it is better to use any recommended method, whatever its limitations, than not to cost accidents at all.

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