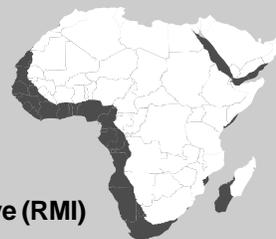


Africa Transport

Technical Note

Road Management Initiative (RMI)



Note no. 11

December 1997

The Economics of Traffic Safety

by Jorgen Karthum Hansen

This note, one of three notes on Traffic Safety, is based on a paper titled "Traffic Safety as an Economic Issue of Developing and Industrialized Countries" by Jorgen Karthum Hansen, which was presented at the World Bank/US-FHWA/3M sponsored Seminar on "Keys to Sustainable Road Safety" on December 4, 1997.

Jorgen Hansen is a Norwegian economist working in transport, health, and environmental economics.

The purpose of this series is to share information on studies of the SSATP. The opinions expressed in the studies are those of the authors and do not necessarily reflect the views of the World Bank or any of its affiliated organizations.

For information on these notes, contact Leita Jones in the Africa Region of the World Bank, Washington, DC. Internet address: ljones2@worldbank.org.

Transport in general, and road traffic in particular, have significant costs to societies in the form of delays, health and environment damages from pollution, and, not least, through injuries and loss of life from traffic accidents. Every year in the European Community (EU), about 50,000 individuals are killed and 3.3 million people are injured in transport accidents, virtually all of them in road accidents. Road accidents are the number one cause of death among under 40-year olds and thus responsible for the greatest loss in terms of years of life; on average a road accident fatality represents 40 lost years while deaths from cancer and cardiovascular disease represent around 10 lost years.

There are several possible entry points for debating the economics of traffic safety: (a) the *supply side approach*, which addresses the cost of accidents to society and those affected; (b) the *demand side approach*, which address the willingness of people to pay to avoid or curb accidents; (c) the *macroeconomic consequences* of traffic accidents and of measures to improve safety, which raises questions on the impact of traffic safety on economic growth — an issue subject to much misunderstanding; and (d), *who is responsible or who should pay*. Increasingly, and partly due to structural reform programs, the so-called polluter pays principle is being adopted to justify (full resource cost-based) user charges worldwide. These entry points are complementary rather than substitutes because each applies to different economic issues and perspectives. Traffic safety at the macro level must be addressed when policy strategies and legislation are being decided, and as a microeconomic issue at the local level for specific actions.

Macroeconomic perspective

The European Commission in 1996 estimated that (a) the costs of one year's road accidents in EU amounted to approximately ECU 15 billion in medical,



administrative, and damage repair expenditures alone; (b) the future net loss in output would be around ECU 30 billion; and (c) that road users might be willing to pay more than ECU 100 billion to prevent all accidents in the EU from happening. By contrast, in 1996, the European Conference of Ministers of Transport estimated that the total external costs of accidents for the European part of the OECD amounted to a total of USD 225 billion. As the variation in these estimates indicate, the concept of costs in relation to accidents is complicated, both from the perspective of economic theory as well as from the ethical and assigned value side. However, while such estimates may be controversial, the fact is that the numbers remain large in absolute terms as well as in relative terms of conventional macroeconomic indicators such as GDP.

The GDP is the most commonly used indicator of a nation's economic performance. However, in recent years, the rate of growth in GDP has been criticised for not being matched by an equivalent rate of growth in quality of life. Such criticism has led to proposals which allow for the adverse changes in the quality of life not directly reflected in the conventional GDP measure. These corrections promote a «green GDP» allowing, for example, the loss of environmental capital not measured in the conventional national accounts. One proposed correction is to deduct costs associated with preventing or repairing damages due to pollution, traffic accidents, and so forth.

It can be argued that such corrective proposals are ill-founded. First, it is not certain that GDP grows when the number of traffic accidents increases, resulting in increased hospitalization of victims. Doctors treating victims of accidents would have performed other highly valued medical services in absence of accidents. Most countries have waiting lines at hospitals, which suggests no lack of tasks for medical personnel. Also, a persistently high level of traffic accidents requires maintaining a correspondingly high emergency capacity at hospitals to handle traffic casualties. Human and physical capital would thus be locked in to do such tasks rather than other GDP enhancing tasks in the field of health care or — if accident rates could

be permanently reduced — in completely different sectors of the society requiring highly skilled and motivated personnel. Also, traffic casualties could otherwise have been productively employed.

This implies that the net effect of traffic accidents on the GDP may well be negative even if conventionally measured and other welfare-related aspects of an accident are not measured and monetized — such as, suffering by victims and their loved ones, or by people waiting in hospital lines because of scarce medical help attending to traffic accidents victims. Finally, an efficient hospital sector is a good welfare sign in itself for the traffic casualties. Hence, including the costs of treatment of injured persons in the GDP need not be such a misleading indicator of welfare, let alone output.

In sum, traffic safety measures curbing the number of accidents could free up human and physical capital resources to investments and operating activities in other productive sectors of the economy. Such changes will be absorbed by the conventional GDP and thus reflect the output changes and important aspects of the welfare changes that we really want to measure.

Valuation of traffic accidents

The costs of traffic accidents consists of two components:

- the costs of premature loss of life and reduced quality of health, and
- the loss of income (output) and remedial expenditures (medicinal and material).

The parties paying these costs are the direct victims of the accidents, the relative of the victims, private sector third parties, and the public sector. In other words, the value to society of avoiding a traffic accident is the sum of the benefits to each of the above affected parties. Whereas lost incomes and remedial expenditures can be estimated based on available statistics, the value of life lost and reduced health quality, which completely dominate such valuation and costing estimates, are usually estimated based on willingness to pay studies. For both categories of costs, the

level and distribution of income will affect the actual estimates because such costs reflect opportunities foregone in the country.

Incorporating a value on loss of life and reduced health quality has only recently been included in road traffic planning and design procedures, and is not applied universally. As late as 1991, only twelve of twenty OECD countries valued loss of quality of life due to deaths and injuries in traffic in their accounts and design criteria, whereas all twenty countries value loss of output and direct material and medical costs resulting from accidents.

Variations in estimated costs between countries

Among the reasons why traffic accident costs vary between countries, the following country specific characteristics have been listed in recent studies:

- speed limit variations and their monitoring and enforcement
- overtaking practices and distance-to-vehicle-ahead rules and their enforcement
- compulsory use of headlights during daytime
- regulations about driving and alcohol consumption and their enforcement
- monitoring and enforcement of seat belt regulations
- rules and enforcement of vehicular and tire safety controls
- road standards and the maintenance of roads, and signposting practices
- car density and vehicle fleet composition
- GDP per capita systems risk and health risk.

Given the level of GDP, the total accident costs are higher in countries with high health and systems risks. Health risk is measured as the annual number killed in traffic accidents per 100,000 inhabitants, whereas systems risk is defined as the same numerator per 100,000 vehicles. Statistics on these risk measures could, however, be misleading when comparing countries at different stages in economic development: The less economically developed a country is, the more bias there is towards serious underreporting of accidents and overreporting of vehicle fleet because of not deleting scrapped vehicles from vehicle registers. These statistical biases combine to indicate much less difference in the traffic safety risk measures between developed and developing countries than is in fact the case.

Despite the statistical biases mentioned above, the registered systems risks are substantial in the developing

Table 1. Inter-country variation in systems risks and health risks for traffic accidents, 1991

Country	Norway	Japan	Germany	USA	France	Portugal	Côte d'Ivoire	Benin
Health Risk	7.6	11.6	14.2	16.9	18.5	32.2	4.0	5.9
Systems Risk	14.6	22.4	26.1	21.5	39.0	93.5	287.5	232.6

countries examined compared to the system risks in industrialized countries. On the other hand, the observed health risks are low in the two developing countries in Table 1 because a very large share of the population is not exposed to the road network and to vehicular traffic at all. If it were possible to disaggregate the health risk to population segments characterized by their degree of such exposure, one would expect the corresponding segment specific developing country health risks to be substantially higher as well.

The economics of traffic safety measures

In industrialized and developing countries alike, violation of traffic rules is probably the most common form of legal

Table 2. Potential reduction in traffic casualties in Norway by full compliance with road traffic laws

Category of law/regulation	Injured	Killed
Speed limits	-9% (+/-5%)	-15% (+/-8%)
Use of safety belt and motorcycle helmets	-5% (+/-3)	-14% (+/-8%)
Drunken driving rules	-3% (+/-2%)	-10% (+/-7%)
Other behavioural rules in traffic	-8% (+/-6%)	-7% (+/-5%)
Technical vehicle requirements	-1% (+/-1%)	-1% (+/-1%)
Health and age requirements of drivers	-1% (+/-1%)	-1% (+/-1%)
<i>Total potential reduction</i>	<i>-27% (+/-18%)</i>	<i>-48% (+/-30%)</i>

Source: *Elvik (1997 [95% confidence interval in brackets])*

violation, and only a tiny fraction of these violations are detected by the authorities. A cross-country comparison of the role of violations on the level of traffic safety is, however, complicated by the fact that what is violation in one country may be perfectly legal in another. This actually applies to certain acts that are important for traffic safety, e.g., drunken driving rules, regular vehicle controls, speed limits, compulsory use of safety belts, and the use of headlights.

Traffic safety levels vary enormously between countries as a result of variations in the existence and practice of laws and regulations, and because traffic safety is generally highest in industrialized countries where enforcement of strict rules is strong. But even in Norway — where initial adherence to the law is presumably among the highest in the world because of a high initial level of monitoring and controls, and where the laws are among the strictest in the world — the potential for improving traffic safety if the various elements of the traffic law were fully adhered to is substantial (Table 2). It seems reasonable to assume that the effects in many other countries, and in particular developing countries, would be much larger.

Road Management Initiative

The RMI was launched in 1988 by the United Nations Economic Commission for Africa (UNECA) and the World Bank, under the auspices of the Sub-Saharan Africa Transport Policy Program (SSATP). The countries taking part in the RMI are Cameroon, Kenya, Madagascar, Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe. Others receiving assistance from the program include Benin, Ethiopia, Ghana, Lesotho, Malawi, Mozambique, and Togo. RMI is administered by the World Bank's Africa Region, and is co-financed with the governments of Denmark, France, Germany, Japan, the Netherlands, Sweden, Switzerland, and the European Union. France, Japan and Norway provide senior staff members to work on the Program.