

Comparative assessment of transport risks — how it can contribute to health impact assessment of transport policies

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Abstract Health impact assessment (HIA) and comparative risk assessment (CRA) are important tools with which governments and communities can compare and integrate different sources of information about various health impacts into a single framework for policy-makers and planners. Both tools have strengths that may be combined usefully when conducting comprehensive assessments of decisions that affect complex health issues, such as the health risks and impacts of transport policy and planning activities. As yet, however, HIA and CRA have not been applied widely to the area of transport. We draw on the limited experience of the application of these tools in the context of road transport to explore how comparative assessment of transport risks can contribute to HIA of transport policies.

Keywords Transportation; Motor vehicles; Accidents, Traffic; Environmental pollution; Vehicle emissions; Automobile driving; Public policy; Risk assessment; Health status; Comparative study (*source: MeSH, NLM*).

Mots clés Transports; Véhicule motorisé; Accident circulation; Pollution environnement; Gaz échappement automobile; Conduite automobile; Politique gouvernementale; Evaluation risque; Etat sanitaire; Etude comparative (*source: MeSH, INSERM*).

Palabras clave Transportes; Vehículos a motor; Accidentes de tránsito; Contaminación ambiental; Emisiones de vehículos; Conducción de automóvil; Política social; Medición de riesgo; Estado de salud; Estudio comparativo (*fuentes: DeCS, BIREME*).

الكلمات المفتاحية: النقل، عربات آلية، حوادث، حوادث الطرق، تلوث البيئة، انبعاثات من العربات، قيادة العربات، السياسات العمومية، تقييم الخطر، الوضع الصحي، دراسة مقارنة. (المصدر: رؤوس الموضوعات الطبية، المكتب الإقليمي لشرق المتوسط).

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Introduction

Health impact assessment (HIA) and comparative risk assessment (CRA) have been lauded as useful tools to bring research into policy- and decision-making. To date, little systematic investigation has been made of how CRA can contribute to HIA. Both tools have considerable potential to address the complex issues of health risks and impacts of transport policies and planning activities and to incorporate transport choices as a part of the complex picture of what constitutes a healthy society. As yet, however, they have not been applied widely to transport decisions. We draw on the limited application of these tools in the context of road transport to illustrate the potential benefits that comparative assessment of transport risks could bring to HIAs of transport policies.

What are HIA and CRA?

In general terms, HIA is a framework within which a wide range of health impacts of a specific project or policy can be assessed. CRA is a method used to compare different health risks in a population, and it can be used to help set policy priorities to achieve, for example, “a healthier society”. Both HIA and CRA draw on scientific research from a range of disciplines and assimilate them into frameworks through which comparisons between different issues and information sources and judgements can be made.

The most commonly cited definition of HIA is that of the Gothenburg consensus paper: “a combination of proce-

dures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.” (1). (See Krieger et al. (2) for a sample of currently used definitions.) The term “impact” indicates that consideration is restricted to the most likely anticipated effect or influence on health of a particular decision. Such consideration typically is applied prospectively (that is, to a proposal) rather than retrospectively (to a completed policy or project).

In HIA, scientific information usually is only one component of a large decision-making process. Following in the footsteps of environmental impact assessment, research is combined with other “known” variables in a proposal (policy or project) that is the basis for consultation and debate with a wide range of stakeholders. The Gothenburg consensus paper emphasizes the central role of the values of democracy, equity, sustainability, and ethical use of evidence in HIA (1).

CRA is defined by WHO as the systematic evaluation of the changes in population health that result from modifying the population’s exposure to a risk factor or a group of risk factors (3). Risk here can be broadly understood as being the probability of a prescribed effect; it accounts explicitly for uncertainty in the actual outcomes of a decision.

Like HIA, CRA allows users to compare different sources of ill health in a population according to the research that is available (the “prescribed effect” in the definition of risk given above) or, in particularly significant cases, according to specifically commissioned research. A key difference in the

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methods of the two assessments is that CRA places different risk factors into a single measure that incorporates mortality and morbidity: disability-adjusted life years (DALYs) (4). This measure allows vastly different health risks to be compared in a relatively systematic way. In the transport context, for example, DALYs can be used to compare the health risks from traffic crashes with the risk of respiratory disease attributable to traffic-related air pollution. Such standardized measures of impact have been used in “global burden of disease” calculations, including those in *The world health report 2002* (5), and have significantly enhanced the rigour of CRA in the health area. Although the calculation of DALYs for various risk factors is a complex process that often requires significant judgement, the availability of a common basis for comparison removes much of the ambiguity inherent when trying to make decisions on the basis of the health equivalent of apples and pears that can occur in HIA. For example, is a proposal with an anticipated impact of 30% decrease in respiratory disease from air pollution and no change in traffic-related injuries “better” or “worse” than a proposal with a 15% decrease in air pollution and a 15% decrease in traffic-related injuries?

The question of how best to gather, compare, and account for different types of information is inherent in transport policy and planning decisions that seek to account for changes in population health. Such accounting is made difficult by the complex nature of the health effects of transport, combined with limited scientific research on the ways in which health risks may change under different management or decision-making regimes.

Assessing health in motorized road transport — an overview

Motorized road transport is an area in which CRA could contribute to HIA, because it is associated with a variety of health risks, as well as a number of health benefits — such as better access to health care. This complexity is, as yet, dealt with poorly in public debate and policy. For example, *The world health report 2002* highlighted the importance of analysing public health risks and interventions at global and regional levels (5), but transport-related health risks did not feature strongly, despite the fact that the report acknowledged that 2.8% of the global burden of disease and injury is due to traffic-related injuries (35 million DALYs). It further estimated that 20 million DALYs could be prevented (5); this means the number of DALYs associated with traffic-related injuries alone is similar to the number of all global DALYs from suicides, for example, and is larger than the number of DALYs associated with each of diabetes, protein-energy malnutrition, and lung cancer.

This paper largely reflects data about the experience of developed countries — an artefact of the analyses that are available and accessible. The issues in developing countries will often differ in detail (for example, whether motorcycles, cars, or buses are the main source of road injury-related health impacts or risks), but many of the larger questions addressed — who should be involved in transport and health planning? how can different sources of information be meaningfully compared? — also are relevant to developing countries. Despite the lower prevalence of motorized transport, the incidence of road crash deaths in developing countries tends to be higher than in developed countries (see Table 1).

Table 1. Incidence of road crash deaths in selected developing and developed countries

| Country | Road crash deaths per 10 000 motor vehicles | Motorization rate (motor vehicles per 1000 inhabitants) | Deaths per 100 000 inhabitants (crude rate) ^a |
|--------------------------|---|---|--|
| Republic of Korea | 11 | 263 | 28 |
| Thailand | 10 | 294 | 28 |
| Malaysia | 9 | 362 | 31 |
| United States of America | 2 | 787 | 16 |
| Germany | 1.9 | 559 | 11 |
| Japan | 1.2 | 668 | 8 |
| Sweden | 1.3 | 477 | 6 |

^a Mortality rate in the whole population unadjusted for age or sex distribution. Source: Factbook, 2003 (6).

Furthermore, as major cities in many developing regions are moving rapidly towards “western-style” transport systems, developed countries can offer important lessons to developing countries in terms of anticipating and avoiding the health impacts that have been experienced in highly motorized countries.

Several factors contribute to the health effects of transport decisions (Box 1). These health issues need to be considered in relation to the different transport options available, which are illustrated as a matrix in Table 2. The matrix for each transport decision under consideration would need to be created to suit local conditions by selecting common local modes of transport, such as bicycles and rickshaws in China or “jeepneys” in the Philippines. Comprehensive health impact or CRAs would address each relevant cell in such a localized matrix to get an overall picture of the interactions between health and transport systems. Table 2 shows the complexity and diversity of health issues in relation to transport policy and planning. These issues take effect across different geographical and temporal scales, and the variables highlight the challenge for comprehensive, policy-relevant impact assessments.

Although generic scientific information is available to add to many of the cells in Table 2, the comparisons being made across those cells in both CRA and HIA must be meaningful. The risks attributable to air pollution or traffic crashes can be quantified using DALYs, but other issues — such as the effects of sleep disturbance, access to health care, or reduced neighbourhood contact through community disruption — are difficult to quantify in DALY-like terms. This limits how comprehensive CRA can be in the analysis of the health effects of transport. Furthermore, the extent of different health risks for each mode of transport in a specific location is determined by local geographical, meteorological, social, and physical planning conditions, as well as the dominant modes of transport (e.g. bicycles in China or the Netherlands). This emphasizes how important it is to base health impact and CRAs on local knowledge, as well as generic scientific evidence.

In the policy and planning decision-making context, the scientifically-defined health aspects of transport need to be

Box 1. Factors contributing to the health effects of transport decisions

- **Traffic crashes**
A major cause of death and injury that affects children and young adults more than many other public health risks (e.g. cancers and cardiovascular diseases) (4)
- **Air pollution from motor vehicles**
An important problem in urban areas both in developed and developing countries (7–9); this includes emissions that increase risk of heart attacks and asthma attacks, lung and heart diseases (9), and lung cancer (10)
- **Traffic noise disturbance (or annoyance)**
Can disturb sleep, affect school and work performance (11), and even lead to debilitating symptoms of mental and physical disease in vulnerable people (12)
- **Reduction of daily physical activity**
Increasing use of motor vehicles for daily travel is associated with increased overweight and obesity (13)
- **Other environmental factors**
Factors such as water pollution from toxic chemicals in road dust can affect ecological or food production systems
- **Community disruption**
Can result from changes in traffic conditions
- **Access to community services**
Access to, for example, shops for daily necessities, schools, health care, and other important services can be enhanced or reduced through changes made to transport systems. This can have major positive impacts on health and, for some people, such access may be best provided by private cars that otherwise can have negative health impacts

- economic
- political
- quality-of-life
- moral

Health, rather than being a separate “interest”, is embedded deeply in each of these areas. Basic health is deemed widely to be a fundamental human right — it is central to quality of life, is an important sphere of political action, and has a range of economic impacts that increasingly are being recognized and accounted for.

Whether stakeholders should have a direct say in the decision-making process — and, if so, who should be involved and how — is a key question for policy-makers who wish to account for health effects in their decision-making processes. HIA typically sees stakeholder consultation as a fundamental part of the impact assessment process and, as such, is a framework that can potentially — albeit in a relatively informal way — incorporate these qualitative aspects of health into decision-making. CRA, as a formal, quantitative approach, is limited in its ability to incorporate these factors in the comparison of risk, especially in terms of DALYs — it certainly makes little sense to attempt to translate political and moral interests into this or similar measures.

Contribution of CRA to HIA

Although CRA is a quantified system that is useful for comparing important scientific issues that need to be accounted for when assessing changes to health caused by transport decisions, it cannot take into account factors associated with more qualitative aspects of life. This is especially true when health interests are entangled with broader issues, such as economic well-being and access to political systems and socially “healthy” communities. The involvement of stakeholders through the HIA framework has the potential to bring these more nebulous aspects of health into decision-making processes. However, HIA needs decisions to be made on the basis of comparisons across different measures.

weighed against the need for efficient and effective transport systems and the broader ecological and social effects of different transport options. The complex mix of health issues that surround transport decisions also create a complex mix of stakeholders (Box 2). Even within the various groups, the stakeholders do not have a unified voice and their interests often conflict. These interests are also culturally and politically variable — and context-specific — but they can be grouped tentatively into several different categories:

Table 2. Matrix of health issues related to different modes of transport

| Transport mode | Crashes “accidents” | Air pollution | Noise | Physical activity | Other environmental factors | Community disruption | Access to community services, etc. |
|----------------|---------------------|---------------|-------|-------------------|-----------------------------|----------------------|------------------------------------|
| Walking | | | | | | | |
| Bicycles | | | | | | | |
| Rickshaws | | | | | | | |
| Motorcycles | | | | | | | |
| Private cars | | | | | | | |
| Buses | | | | | | | |
| “Jeepnies” | | | | | | | |
| Trucks | | | | | | | |
| Trains, trams | | | | | | | |
| Ferries | | | | | | | |
| Airplanes | | | | | | | |

Box 2. Stakeholders affected by transport decisions

- Local residents with enhanced or reduced access to essential services
- Local residents who may be affected by air or noise pollution
- Local residents who lose opportunities for physical activity if open spaces or recreational areas are converted to traffic corridors
- Transport users and pedestrians who are affected by traffic crashes
- Politicians responsible for transport and health care provision
- Government agencies or commercial entities responsible for transport and health care provision
- Transport users who are either encouraged or discouraged to “active” transport (transport that involves more physical exercise beneficial to health than driving a car — for example, walking, cycling, using public transport)
- Health care services that respond to traffic crashes and treat injuries

These problems might be addressed by the use of CRA as a part of the HIA of transport policies. Although in some cases comparison between apples and pears may be necessary — such as to compare informal, qualitative data from stakeholder consultations with scientifically-derived quantitative data — other comparisons may be usefully systematized with a CRA method within a broader HIA framework. This possibility is explored below with respect to a number of “snapshots” of different assessments used to inform transport policies.

Snapshots of existing health impact and CRAs in policy development

Road projects in Australia and Sweden

An example of HIA in transport was undertaken in Melbourne in 1995 for a proposed motorway bypass (14). The study included injuries from road crashes, diseases associated with air pollution from traffic, and noise effects. It was “a projection of future health status based on traffic flow estimations and other local conditions that would exist if the motorway were or were not constructed”. The data necessary for this projection were only available for assessing injury, however — not for the other two factors. The study authors used proxy measures, although these suffered limitations in terms of applicability to the specific proposal at hand.

This HIA project described community input as “integral” (15). Community groups were represented on the overseeing committee, and public meetings were held at which issues of concern to the local communities could be raised. These issues were incorporated into the models that were being used and influenced the analytical approach used for traffic projections. The assessment concluded that the motorway would have an overall benefit for health, with reductions in injuries from traffic crashes and noise pollution (on existing roads) outweighing the risks of any increase in air pollution. The latter increase was not quantified, however, and the tendency for motorways to increase traffic may have negated any estimated benefits.

A formal comparative approach in this instance would have led to a more systematic analysis of the health issues, but no data were available to support a more comprehensive assessment. HIA, although less rigorous in the comparative sense, is also more flexible in accommodating the data that are available.

The downside of this flexibility is reflected in an analysis of the extent to which health aspects had been incorporated into environmental impact assessments for 28 road projects in Sweden in the 1990s (15). Of these, only five had involved any

health expertise, and although 21 mentioned traffic crash injury as important, only 14 estimated the potential changes in incidence of crash injuries after implementation of the project. Other issues that were raised commonly were noise, the dangers of transporting hazardous goods on the new road, and the potential health impacts of air pollution — but no attempts were made to quantify these health impacts. The analysis concluded that HIA of road projects in Sweden was poorly developed.

Lack of quantification, or partial quantification, of health factors is a weakness in HIA, as the tendency is often to assume that the factor that has been measured (in these cases, traffic crash injury) is the most important. Use of a CRA would ameliorate this weakness but, as noted earlier, would not be able to support all health-related issues or concerns. This may simply shift the imbalance, so that the quantified factors are considered, but qualitative factors are not.

Transport planning in Asia

Transport and health are key issues in many cities of Asia, where vehicle numbers are growing rapidly. Numerous studies and analyses of the health impacts of transport-related injuries and air pollution effects have been produced in individual countries, but formal CRAs or HIAs are published seldom. Assessments within the Urban Air Quality Management Strategy (URBAIR) programme supported by the World Bank have been published (e.g. 16). Although technically a cost-benefit analysis, this report is interesting to include here, because it effectively combined the assessment of health impacts (not risks) within a comparative framework — the common measure being monetary costs.

The URBAIR report for Manila (17) contains a detailed assessment of the health effects of air pollution, including those attributable to transport. The number of people affected was calculated and, based on a population of 9 million, the estimates included: 1300 deaths, 45 000 emergency room visits, 11 million “restricted activity days”, 35 million respiratory symptom days, and a cost of over 5 billion pesos. This type of assessment has been instrumental in policy development on air quality in Manila, including efforts to phase out seriously polluting “jeepney” vehicles, restrictions on “smoke-belching” vehicles, improved public transport, and more intensive monitoring of air quality.

A technically complex task, this study highlights the effectiveness of comparative assessment, especially at this large scale. Particularly interesting to note is that the study led to policies to mitigate the problems at the “macro” level — for instance, in the area of transport demand management (17).

Assessment of air pollution in Europe and New Zealand

Künzli et al. (18, 19) conducted a HIA of transport-related air pollution by using data from Austria, France, and Switzerland. An assessment of exposure to air pollution was based on emission inventories, atmospheric dispersion modelling, monitoring data, and geographic information system techniques. Dose-response relations from two long-term studies in the United States of America (20, 21) were applied to data on population exposure to calculate the number of deaths due to traffic-related air pollution. The results for the three countries are summarized in Table 3; the calculations for New Zealand used similar methods (22).

Table 3. Analysis of total mortality due to road toll and air pollution

| Country | Population in 1996 (millions) | Traffic accident deaths | Mortality due to traffic-related air pollution | Ratio |
|-------------|-------------------------------|-------------------------|--|-------|
| France | 58.3 | 8919 | 17 629 | 1:2.0 |
| Austria | 8.1 | 963 | 2411 | 1:2.5 |
| Switzerland | 7.1 | 597 | 1762 | 1:3.0 |
| New Zealand | 3.7 | 502 | 399 | 1:0.8 |

Sources: Künzli et al., 2000 (19) and Fisher et al., 2002 (22).

These calculations had a major influence on the interpretation of air pollution issues and led to initiatives to develop improved CRA for different European countries, Australia, and New Zealand. Investments in further air pollution reduction, including public transport expansion, cleaner diesel fuels, stricter vehicle emission controls, etc. are already implemented or under consideration.

Assessment of a safety intervention

An example of a recent risk assessment of a road safety strategy, “daytime running lights”, shows how detailed technical analysis can highlight the preventive value of a policy that is not intuitively of benefit for protecting health. Failure to see another road user is a contributory factor in 50% of all daytime crashes and in 80% of crashes at road junctions (23). Early evaluations indicated that when vehicle headlights were lit during daylight hours, the numbers of two-vehicle collisions decreased. A meta-analysis of 24 evaluations showed that the preventive effect of daytime running lights was greater at higher latitudes (in the northern countries of Europe), but that a preventive effect was seen in all countries examined.

It was estimated that if daytime running lights were made mandatory in all countries of the European Union, 5500 fatalities and 150 000 injuries would be avoided — giving a total net saving of € 2100 million (equivalent to the economic value of the health damage avoided). The authors recommended that the European Union should make daytime running lights mandatory, with technical changes made to new vehicles to ensure that lights are turned on whenever the engine is running.

Although this is a good example of the link between single-issue risk assessment, cost-benefit analysis, and health policy advice in the transport field, it did not examine any other potential health risks posed by the strategy. A CRA might have considered whether drivers of older vehicles that did not have daytime running lights would be placed at greater risk of crashes or the effects of reduced fuel efficiency. A complete HIA could have raised other issues of concern, such as the eventual health impact of climate change due to the additional greenhouse gas emissions caused by daytime running lights.

Comparisons of interventions

Other notable innovations have been developed by researchers to help decision-makers make other appropriate comparisons, for example between interventions of different types. Risk of exposure to injury can be expressed as a “proximal” variable, e.g. numbers of children travelling without child safety restraints in cars or the total person-kilometres of such travel, or as a “distal” variable (distal from the person at risk), e.g. whether or not legislation for mandatory child restraint use is in force. A

systematic analysis of such variables is supported by the Driving forces; Pressures; State; Exposure; Effect; Actions (DPSEEA) “multi-layer” framework for different degrees of proximal/distal risk factor exposure (24). This framework identifies the most proximal “exposures” as being dependent on the “state of the environment”, which in turn depends on the “pressures” and the underlying distal “driving forces” (policies, regulations, etc.). An application of the framework to identify risk variables of importance to transport is illustrated schematically in Fig. 1.

Although attribution of behavioural factors — such as personal use of crash helmets by motorcyclists, use of daytime running lights while driving, or commuting by public transport — in such frameworks can be difficult, Fig. 1 illustrates how different pieces of scientific information can be placed within a larger scheme. HIA of a particular policy or action may be carried out at any of the levels in Fig. 1; inclusion of a systematic CRA would be sure to account for all of the health issues shown.

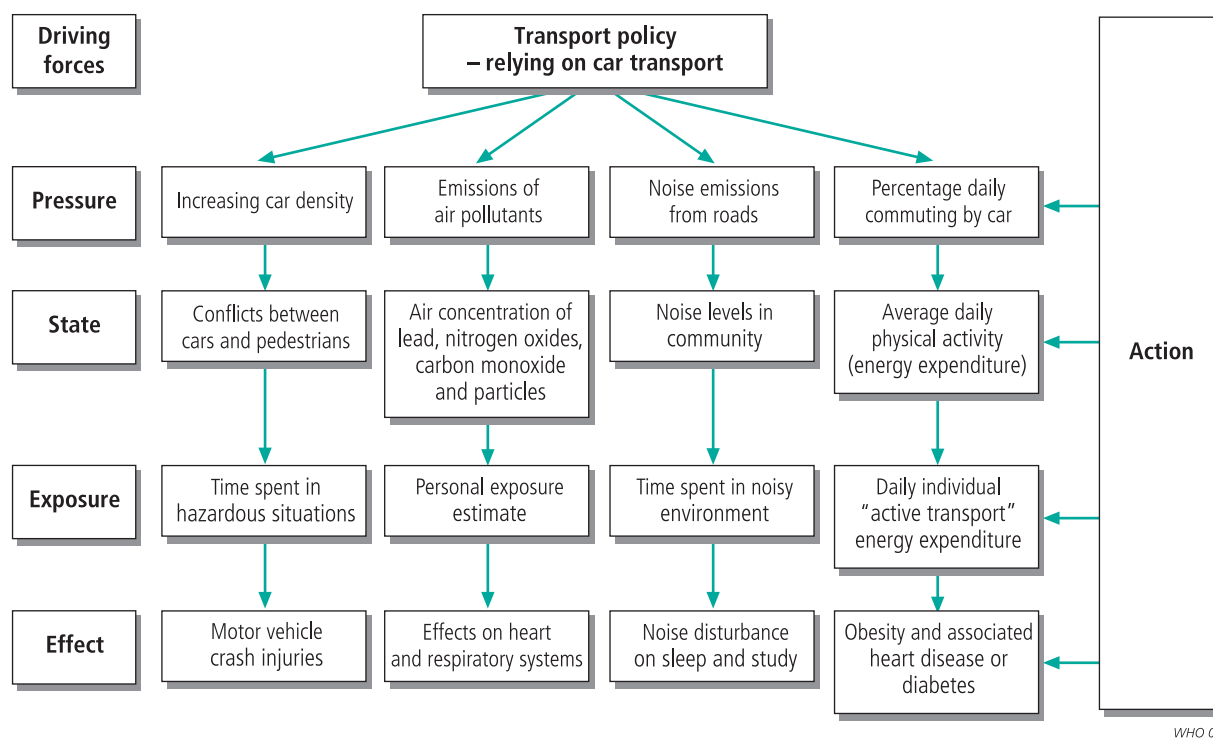
Discussion

The assessment of health impacts or health risks in transport systems is still in the early stages of development. Many issues, such as the meaningful application of complex scientific data in decision-making and stakeholder involvement in policy and planning processes, are bound up in these assessments, and no easy, “tried-and-true” formulae can be applied to work through this complexity. HIA offers substantial steps forward by providing a structure that encourages stakeholder participation and by potentially generating more “socially robust” policy decisions. CRA offers strengths in the comprehensive and systematic use of scientific information to yield more “scientifically robust” outcomes. Application of CRAs within a more flexible HIA framework has the potential to enhance decision-making along both social and scientific dimensions.

At the moment, however, this is a highly ambitious goal. The transport cases presented show how difficult and complex such work can be — even when a relatively simple method is used. A lack of relevant data hampers efforts to conduct both health impact and CRAs, including comprehensive quantitative data in terms of DALYs or similar common measures. More research with field data and forecasts from developing countries, and assessments of interventions at proximal or distal levels (as in Fig. 1), is essential to prevent a build-up of risk caused by poor application of preventive policies and actions already used in developed countries.

Published research on stakeholder involvement is also lacking. Identification of relevant stakeholder groups and “best practices” for incorporating stakeholders’ concerns would be helpful. The importance of social, cultural, and economic factors, such as the role of pressure groups, and of marketing,

Fig. 1. The DPSEEA framework applied to transport policy and health



such as the speed and thrill focus of much car advertising, in counteracting the risk reduction policies and actions also needs to be researched.

Significant progress has also been made, however: in terms of research, many studies of the relations between proximal transport risk factors and health effects in developed countries are available. They provide a generic evidence base for both types of assessment. The increasing use of HIA worldwide, as well as the number of major international CRA studies currently being carried out, indicates a groundswell of support for more systematic and comprehensive approaches to public decision-making in health-related areas.

As road transport systems are associated with different types of health effects, the full picture of how policies influence total health impacts can be produced only by an integrated analysis. Although HIA and CRA provide frameworks within which such an integrated assessment can be conducted, they can be strengthened by consideration of the “non-health”

effects as well — for example, whether a decision will reduce greenhouse gas emissions and future climate change. Such added benefits can be labeled “collateral externality gains” of actions aimed at reducing air pollution (25). A comprehensive integrated health risk or impact assessment would take these collateral externality gains into account and would provide the best basis for decision-making about the public health impact of road transport. The potential for using CRA to contribute to HIA and to account for the wide range of issues inherent in transport decision-making is significant, but the scientific and consultative resources needed to do this effectively should not be underestimated. ■

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Résumé

Comment l'évaluation comparative des risques liés aux transports peut-elle faciliter l'évaluation de l'impact des politiques des transports sur la santé

L'évaluation de l'impact sur la santé et l'évaluation comparative des risques sont très utiles aux gouvernements et aux communautés pour comparer différentes sources d'informations sur divers impacts sanitaires et les intégrer en un cadre unique à l'intention des décideurs et des planificateurs. Ensemble, ces deux instruments offrent des atouts qui peuvent servir à évaluer toutes les répercussions des décisions prises à propos de questions de santé complexes telles que les risques sanitaires liés aux politiques des

transports et aux activités de planification et les impacts de ces politiques et activités sur la santé. Or, à ce jour, l'évaluation de l'impact sur la santé et l'évaluation comparative des risques ont été modérément appliquées au domaine des transports. Ainsi, à partir des rares exemples d'application de ces instruments aux transports routiers, nous étudions comment l'évaluation comparative des risques liés aux transports peut faciliter l'évaluation de l'impact des politiques des transports sur la santé.

Resumen

Evaluación comparativa de los riesgos del transporte: cómo puede contribuir a la evaluación del impacto sanitario de las políticas de transporte

La evaluación del impacto sanitario y la evaluación comparativa de riesgos son instrumentos importantes con los que los gobiernos y las comunidades pueden comparar e integrar diferentes fuentes de información sobre distintas repercusiones sanitarias en un único marco para uso de las instancias normativas y los planificadores. Ambos instrumentos tienen puntos fuertes que se pueden combinar de forma útil al realizar evaluaciones integrales de las decisiones relacionadas con problemas de salud complejos, como los riesgos y repercusiones

sanitarias de las políticas de transporte y de las actividades de planificación. Sin embargo, hasta la fecha, la evaluación del impacto sanitario y la evaluación comparativa de riesgos no se han aplicado ampliamente en el campo del transporte. En este estudio hacemos uso de la escasa experiencia en la aplicación de estos instrumentos en el contexto del transporte por carretera para explorar cómo puede contribuir la evaluación comparativa de los riesgos del transporte a la evaluación del impacto sanitario de las políticas de transporte.

ملخص

التقييم المقارن لأخطار النقل - كيف يمكن لهذا التقييم أن يساهم في تقييم التأثير الصحي لسياسات النقل

التي تؤثر في القضايا الصحية المعقدة مثل الأخطار الصحية والتأثيرات الصحية التي تنجم عن أنشطة النقل وعن السياسات المتبعة في النقل. وإلى يومنا هذا لم يُطبَّق بعد تقييم التأثير الصحي والتقييم المقارن للأخطار على نطاق واسع في مجالات النقل البري لاستكشاف كيف يمكن للتقييم المقارن لأخطار النقل أن تساهم في تقييم التأثير الصحي لسياسات النقل.

يُعدُّ كلٌّ من تقييم التأثير الصحي والتقييم المقارن للأخطار من الأدوات الهامة التي يمكن للحكومات وللمجتمعات أن تستخدمها في مقارنة المصادر المختلفة للمعلومات حول مختلف التأثيرات الصحية وإدماجها في شبكة واحدة تضم أصحاب القرار السياسي والمسؤولين عن التخطيط. ولكلا الأداةين نقاط قوة يمكن ضمها إلى بعضها للاستفادة منها عند تنفيذ التقييمات الشاملة للقرارات

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Commentary

Complexity and rigour in assessing the health dimensions of sectoral policies and programmes

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The preceding paper by Kjellstrom et al. uses transportation as an example to consider the performance of two approaches (referred to as comparative risk assessment (CRA) and health impact assessment (HIA) in previous applications) in quantifying the health effects of sectoral policies and programmes. CRA, which was used in *The world health report 2002* (1), has gained attention for its attempts to unify the methods and assumptions used for the diverse risk factors that have traditionally been assessed in individual scientific and social science disciplines. Health impact assessment is a broad and generic framework that brings the health dimension into evaluations of policies and programmes across sectors. Comparison of the two approaches raises a number of important issues that should be considered when evaluating the health implications of sectoral policies and programmes, such as those in agriculture, energy, and transportation.

First, the assessment illustrates the importance of the “baseline” used for health effect assessments. One of the important features of CRA has been its focus on distributions of exposure to risks, and the fact that it compares them with alternative — or counterfactual — exposure distributions that are defined consistently across risk factors (2, 3). The counterfactual exposure distributions used in risk assessment can be extremely ambitious and include distributions that would remove or minimize the hazards associated with risk factor exposure, such as populations in which every person is physically active or reductions in concentrations of urban particulate matter to ambient levels expected from dusts only. Estimates from comparative risk assessments thus provide alternative visions of population health associated with changes in risk factor exposure — regardless of the source of change — that then can guide preventative policies and intervention research.

Removal of all associated health effects is not an option when assessing the health dimensions of sectoral policies and programmes, such as those in transportation. The mere existence of such sectors results in health effects in the form of both benefits and hazards. For example, transportation policies and programmes may change the level or distribution of disease and injuries due to air pollution, road traffic accidents, and physical (in)activity. At the same time, they may provide health benefits via increased access to employment, better quality nutrition, and better access to education and health care delivery systems. Therefore, although the **total** number of road traffic accidents and deaths provides an illustration of their public health importance — and should motivate the instigation of interventions to address them — it is less meaningful when assessing specific sectoral policies and programmes. Rather, in such circumstances, the baselines

and counterfactuals should include alternative, operationalizable policy/programme options (including the status quo) (4).

Second, the example of transportation should show that the health implications of sectoral policies are heterogeneous across settings. For example, the effects of fuel taxes on the number of miles driven or on air pollution may depend on the public transportation infrastructure; similarly, reductions in numbers of road traffic accidents that result from lowering speed limits may be influenced by road conditions as well as patterns of binge consumption of alcohol. This contrasts with factors such as specific carcinogens or high blood pressure, for which quantitative hazard estimates may be transferred from one population to another with a relatively high degree of validity. As a result, assessments of the health effects of sectoral policies often should take place on the small scale and should account for the crucial role of co-factors.

Third, the discussion of the two approaches should emphasize the fact that disease and health determinants occur along a continuum of complex and multi-factorial layers of causality (2, 5). Distal transportation policies can be assessed based on the specific technologies and methods that they induce (e.g. demand for public transportation or for diesel versus natural-gas engines, speed limits, etc.) or on more proximal health determinants (e.g. ambient concentration of respirable particles). The relation between the more proximal factors (e.g. ambient concentration of lead or respirable particles) and health outcomes may be extrapolated more easily from one population to another. The mediated effects also mean that the broad, distal, sectoral determinants of health can be divided into a number of more specific, proximal, risk-factor based effects, each assessed relative to a different counterfactual distribution, based on existing data from other populations.

Fourth, the paper raises the important issue of the scope of analysis. Sectoral policies and programmes always are coupled with broader goals of social and economic development. Furthermore, their health effects would vary across different population subgroups based on factors such as age, sex, socioeconomic status, and geographical location (6). Although the results of risk and other forms of HIA at times are reported in aggregate form, analysis can, and should, be conducted on population subgroups to illustrate the equity implications of exposures and policies. The inclusion of the broader social consequences of sectoral policies and programmes has parallels in the centuries’ old debate on the divisions between health and welfare. No single analytical tool can resolve this debate. We can, however, attempt to describe the health and welfare effects of policies and programmes by using multiple systematic quantitative and qualitative methods

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— as has been done in the case of lead exposure (7). Risk assessment is one such tool.

Societies benefit in numerous ways from new infrastructure and technological innovations in sectors such as agriculture, energy, and transportation. Systematic assessment of the magnitude and distribution of the health effects of sectoral policies and programmes provides a powerful tool for increasing their contributions to health and welfare of societies. Attention to mediated causal relations and multi-causality not

only results in more rigorous health effect assessment, but also would generate a larger menu of interventions across layers of causality. With increased awareness of the role of health in inducing economic and social development (8), a window of opportunity exists to make such assessments a visible and permanent part of policy analysis and programme design. This can be successful only if our methods and tools are chosen based not on their titles, but on their suitability for the analytical problems that we face. ■

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Commentary

What can health impact assessment add to comparative risk assessment in decision-making?

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Kjellstrom et al. make a very valid point by advising that comparative risk assessment (CRA) should be used to describe different health risks according to their common source (or driving source). This new use of CRA would inform about the health impacts of existing policies, such as transport policies, and about important health risks that may be overlooked by these policies.

The authors' recommendation that CRA should be combined with health impact assessment (HIA) outlines the benefits of CRA, but says relatively little about what HIA (HIA) can add to the combination (apart from engaging with stakeholders). This information is relevant for those who may consider using the combination of the two methods and is the focus of this commentary.

HIA is a systematic methodology used to inform about the health relevance of policy decisions. Quantitative assessments of risks, such as CRAs, are used in one of the stages of HIA.

HIA begins by clarifying which policy options are to be compared with respect to their expected health impacts. Those policies are screened to identify whether a need for a health assessment exists. When a health assessment is required, the range of health concerns and issues raised by those policies is identified (scoping), with consideration given to the current scientific knowledge and the concerns and expectations of stakeholders about how the policies may affect their health. These steps allow relevant questions to be identified, and these are then addressed in a stage that involves appraisal of the health impacts. A brief or more detailed appraisal can use a CRA to compare existing quantitative information on health risks. Formal reporting of the results follows, and at this stage, stakeholders again have the opportunity to debate the findings and their implications for decisions on policy options, including mitigation measures. Monitoring of health impacts follows the policy implementation, so that the effectiveness of the process can be assessed and any unexpected results identified.

HIA has parallels with and draws on the experiences of environment and social impact assessments. The procedure involved in a HIA follows the same steps as those in environmental impact assessment and strategic environmental assessment. This process facilitates comparisons with the assessment of other (non-health) impacts of policies. It therefore is suitable for use as one of the safeguards when introducing new policies — for example, as used by development banks in attempts to avoid unwanted effects of investment decisions. It is also a tangible and practical way to pursue healthy public policies (as began in the European Union, see article by Hübel & Hedin in this issue of the *Bulletin*).

What can HIA (a policy-driven process) contribute in addition to CRA (a science-driven process) when bringing

evidence to decision-making? HIA helps to frame and formulate the relevant health questions by examining the situation from a wider base than science alone. It brings transparency to the use of evidence in decision-making, as policy options are clarified and the procedures followed in each step of the assessment can be checked. It facilitates stakeholder debate and participation when the questions to be considered are identified and when the policy options are discussed in view of the results of the health appraisal. The required monitoring allows decision-makers to learn about the implications of using evidence for decision-making.

The real test of the value of using a combination of HIA and CRA in decision-making has to come from evaluation of actual practice. The descriptions provided by Kjellstrom et al. and those in this commentary are about the potential benefits of a good practice combination of CRA and HIA. Whether such a combination actually delivers an improvement in the use of evidence for policy-making, beyond rhetoric, needs to be tested in practice. This is an area that needs research.

Readers are advised to look further for examples of HIAs of transport policies, such as those used to assess transport alternatives in Edinburgh and London or and for the extension of airports in Manchester and Finningley (see http://www.hia-gateway.org.uk/Resources/completed_hia_database/completedhialist.asp) or elsewhere (1). Kjellstrom et al. give only one example of a HIA of roads in Australia, and that failed to include air pollution (i.e. bad practice). Their second case is an example of the failure to incorporate health aspects in environmental impact assessments — that is, it is a limitation of environment impact assessments not of HIAs. Their third and fourth cases are good examples of health risk assessments of air pollution attributed to transport; they are not HIAs, however, because they did not relate to policy options, did not address other risks from transport, did not include the required stages of HIA (screening, scoping, etc.), and did not involve stakeholders when the questions were framed or the policy options discussed. These analyses pointed out the importance of air pollution as a risk factor to health and estimated the proportion of health impacts from air pollution attributed to transport, but they did not make connections with specific policy decisions. One of these analyses by Künzli et al. (2) was commissioned as part of a larger effort on transport environment and health that did make those wider connections (3).

Kjellstrom et al. raise some key issues in HIA and CRA that may need further clarification. These issues are well worth debate, in view of the relevance of both methods in bringing evidence into policy-making. ■

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