4

How to evaluate the programme

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Monitoring and evaluation of any programme or intervention is vital to determine whether it works, to help refine programme delivery, and to provide evidence for continuing support of the programme. Evaluation will not only provide feedback on the effectiveness of a programme but will also help to determine whether the programme is appropriate for the target population, whether there are any problems with its implementation and support, and whether there are any ongoing concerns that need to be resolved as the programme is implemented.

This module describes the process of developing and conducting an evaluation of a helmet programme. It is divided into three key sections:

- **4.1 Planning the evaluation**: This important initial stage involves collecting data, in a baseline study, to assess the situation before going on to develop the programme. Based on the information collected, it is then necessary to define the aims of an evaluation, and to consider the different types of evaluation methods that could be used for your evaluation.
- **4.2 Choosing the evaluation methods:** Once the type of evaluation has been determined, there are different methods that can be applied to carry out an evaluation. This section describes the different study types possible, explaining the advantages and disadvantages of each type of method. It outlines the types of performance indicators that can be used to measure the success of a programme. This section also briefly describes how to conduct an economic evaluation, and provides guidance on calculating sample size.
- **4.3 Dissemination and feedback:** This section describes how to feed the result of an evaluation back into the planning and implementation stages, as well as ways that the results of an evaluation can be shared with different interested parties.

4.1 Planning the evaluation

The process of designing and implementing a helmet programme was covered in Module 3. Work carried out prior to implementation should ensure that the programme is clearly defined and that it is implemented in a consistent and standardized way. It is far easier to evaluate the impact of a complete, well-planned and executed programme than one that is implemented in an inconsistent way.

It is essential that the evaluation framework is developed and implemented alongside the proposed programme. Thus, this work would be carried out by the working group as they develop the action plan for the programme (see Module 3). Baseline measures need to be collected *before* the intervention is put in place so that change in such measures over time may be gauged.

The type of evaluation to be conducted will depend on a number of factors. These include the aims of the evaluation itself, as well as the objectives of the programme being evaluated. The type of methodology chosen may also depend on resource constraints.

4.1.1 Aims of evaluation

Determining the aims of the evaluation will help to determine how best to carry out the evaluation. The evaluation may have one or more aims. For example, an evaluation of helmet legislation and increased enforcement programme may primarily be aimed at determining whether helmet-wearing rates have gone up as a result of the programme. However, secondary aims may include determining whether the enforcement has increased, whether training of police is effective, and whether the programme is acceptable to the stakeholders. The evaluation in this case needs to be multifaceted.

The breadth of an evaluation will always be limited by the resources available and a well designed simple evaluation can be as powerful as a more complex one.

4.1.2 Types of evaluation

Evaluation may take several forms, and one or more may be appropriate, depending on the aims of the specific programme to be evaluated.

Process evaluation

Rather than measuring change in outcomes this aspect of evaluation examines whether the programme was carried out as planned. This involves creating a list of indicators that need to be measured, depending on the aims of the programme. The results will help to identify the strengths and weaknesses of the programme, and where improvements may be made.

For example, in a media campaign designed to increase voluntary use of helmets, a process evaluation may ask these sorts of questions:

- Have the campaign products (posters, billboard, radio and television spots) been pre-tested?
- How often were the campaign advertisements run?
- How many people saw them?
- Was the target group being reached?
- Are high-quality helmets available and affordable in local shops?
- If the intervention involves enforcement of helmet legislation:
  - Is there noticeable enforcement by police?
  - Are the police supportive of the campaign?
  - Is the penalty sufficient to change behaviour?

- Are people able to circumvent the process (for example, using bribery)?

Process evaluations are what are known as "formative". That is, the enquiries carried out are designed to provide information to guide programme improvement *(1)*. For example, it may be considered important to determine whether the TV adverts shown as part of a helmet programme are appropriate – do they adequately address the issue, are the helmets advertised actually available for purchase in the region where the adverts will be seen?

Impact assessment

This will determine whether the advertisements have brought about a change. The impact, or programme effect, refers to a change in the target population that has been brought about by the programme – that is, a change that would not have occurred if the programme had not happened *(1)*. For example, if the helmet programme involved airing television advertisements on helmet use, the impact assessment might examine whether people who had seen the advertisements believe that there is a good chance that they will be fined by the police if they do not wear a helmet. Unlike a process evaluation, this would tend to take place at the end of a programme, as the focus would be on the outcome.

Outcome evaluation

This is where the outcomes are measured to see if the programme was successful. Are more people now wearing helmets than before? Have head injuries been reduced? Are more children wearing helmets to school? Measuring a change in outcomes is probably the most common form of evaluation as it provides information as to whether the programme or intervention has actually made a difference.

4.2 Choosing the evaluation methods

The methods used for each type of evaluation will vary. Both qualitative and quantitative methods can be used within the design of an evaluation. Qualitative methods may be employed for the formative, and process evaluations, e.g. focus groups, short-answer or open-ended questionnaires.

Impact and outcome evaluations may be carried out using a variety of quantitative methods. Using an experimental or quasi-experimental design to demonstrate a change (or not) is the most powerful programme evaluation for detecting changes in outcome. The type of methods used will depend on the aim and the budget for the evaluation.

4.2.1 Study types for formative and process evaluations

Qualitative studies

Qualitative research tends to involve detailed, verbal descriptions of characteristics, cases, and settings to explain reasons underlying various behavioural patterns. Specific techniques include using focus groups, in-depth interviews, or surveys with short answers or open-ended questions *(2, 3)*. For example, a question in a formative evaluation of a media campaign aimed at increasing helmet use may be whether the television advertisements address the question. Focus groups may be set up to determine whether the audience believes that the message from the television advertisements is appropriate. Feedback will further enhance the development of the advertisement.

NOTE

Researchers in Ghana evaluated the effectiveness of televised road safety messages on speeding and alcohol impaired driving *(4)*. Focus groups were conducted with 50 commercial drivers and addressed coverage, clarity and appropriateness of messages, including suggestions for improvements. The advertisements reached, and were understood by most of the target audience, although some participants were unclear on the behaviour that the advertisements were telling viewers to take. Opportunities for strengthening the messages included using other media, increasing the number of languages, and stressing the change in behaviour being recommended.

4.2.2 Study types for impact and outcome evaluations

There is a well defined hierarchy of study designs for examining the effectiveness of interventions. These range from randomised control trials, which provide a high level of evidence, to uncontrolled before–after studies which provide very weak evidence about the effectiveness of an intervention.

Randomised control trial (RCT)

The gold standard of evaluation, the randomised control trial will provide the highest quality level of evidence that an intervention or programme is successful. A RCT design means that individuals or groups of individuals (e.g. a school, or village, known as a cluster randomised trial) are randomly allocated to either receive, or not receive, the programme. As participants (or groups of participants) are randomly assigned to one group or another, other factors that may influence the outcome – measured and unmeasured – are more likely to be balanced between the intervention and non-intervention group. However, although RCT designs should always be considered when evaluating effectiveness of an intervention, they do

require significant resources and may be difficult to conduct with a limited budget. There may also be ethical considerations in randomising an intervention with known benefits (that is, in denying an effective intervention to those participants who will be in the non-intervention group).

It is important to note that there is no need to conduct a randomised controlled trial on the effectiveness of helmets themselves as part of your helmet programme. There is sufficient evidence from a number of studies that clearly demonstrate that helmets are effective at reducing the head injuries and fatalities that result during motorcycle crashes (see Module 1).

NOTE

Evaluation using a randomised controlled trial

A randomized control trial was conducted in 27 schools in Western Australia to assess the effectiveness of a whole-school intervention to increase the correct wearing of bicycle helmets by primary school children *(5)*. Schools were randomly allocated to either intervention or control conditions; the main component of the programme was peer-led classroom curriculum for 10–12 year old children. Helmet use was observed at baseline, and at one and two years following the intervention. Observed wearing rates declined by 13% in the control group compared to 5% in the intervention group (p=0.185), suggesting that while school-based activities may not increase helmet use, they may arrest the rate of decline in helmet use in children.

Quasi experimental designs

These study designs, while not as rigorous as randomised trials, if well conducted, may also be used to establish the effectiveness of an intervention. That is, using the information collected on trends of the indicators measured, these studies allow conclusions to be drawn as to whether or not the intervention (the programme) is associated with change in the outcome.

Controlled before-after study

This is often the most practical design for programme evaluation. Randomisation is not always feasible, for example where some areas have already adopted an intervention. The controlled before–after study design involves observing the outcome of interest (e.g. helmet-wearing rates) before and after the programme in both the people who receive the programme, and those in a control group. The control group should be as similar as possible to the programme group and any important differences between the groups need to be take into account. Having a

control group means that trends that may have been occurring in the population aside from what was happening due to the programme are taken into account.

Evaluation using a controlled before-after study

A controlled before-and-after study was used to evaluate a subsidy programme to increase bicycle helmet use by children of low-income families *(6)*. The population included were bicycling children 5 to 14 years of age from areas of low average family income in a defined geographic community within a large urban Canadian city. Students in three schools located in the area of lowest average family income were offered helmets at $10 each, and were provided with an educational programme; three other low-income areas served as control areas. Helmet use was measured by direct observation of more than 1800 bicycling children. Results from the study showed that although 910 helmets were sold to a school population of 1415 (64%), and reported helmet ownership increased from 10% to 47%, observed helmet use in the low-income intervention area was no different from the rate in the three low-income control areas (18% versus 19%). The authors concluded that the results do not support the efficacy of a helmet subsidy programme in increasing helmet use in children residing in areas of low average family income and that developing other strategies to increase helmet use in children of low average family income should be a priority.

Interrupted time series design

It is possible to assess the effect of a programme by using multiple measures of the outcome of interest before and after the programme. There are a number of different variations on this design, some involving control groups. Studies that have used these designs generally use routinely collected measures such as death rates, as multiple measures are required for appropriate analysis. This study design is, however, subject to time related challenges to its validity: the possibility that other factors occurring simultaneously to the programme actually led to the observed effect. However, statistical analysis of such data can take into account any such secular trends, meaning that it is possible to establish whether the intervention or programme was responsible for the change in outcome.

Before–after study (no control group)

The before–after study without a control group is often used to evaluate the impact of a programme, but provides the weakest evidence for the effectiveness of a programme. This design involves measuring the outcome of interest before and after the programme has been run. This study design is simple, and may be

conducted relatively cheaply as all that is needed is a sampling frame and research assistants to conduct observations at various sites. However, without a control group, the scientific merit of these study types is relatively limited as it is often difficult to attribute with any certainty the change in outcome to the introduction of the programme.

NOTE

Evaluating a poster and TV helmet campaign in Cambodia

In 2004 Handicap International launched a series of helmet-use awareness campaigns, in collaboration with the Cambodian Ministry of Health, the World Health Organization, UNICEF, UNESCO and the Belgian Cooperation. The main campaign featured international film star Jackie Chan. The campaign targeted young people, who represent 50% of road traffic casualties in the country's capital, Phnom Penh, and used television spots and posters to illustrate Chan's use of a motorcycle helmet. Several helmet-wearing surveys conducted before and after the campaign allowed the organisers to evaluate the campaign's success. Prior to the campaign, the average helmet wearing rate, assessed at 20 locations over a 4-day period in the city, was 8%. Following the campaign's implementation, a year and a half later, this level had risen to 14.7%.

Jackie Chan, goodwill ambassador for UNICEF, promotes helmet use in Cambodia.

Source: 7

Table 4.1 Study types and their advantages and disadvantages*

	Formative and process evaluation	Impact and outcome evaluation	Pros and cons
QUALITATIVE			
Focus groups/in-depth interviews	✓ – formative – process	✓ – outcome	– Can provide information on why intervention may or may not have worked – Cheap – Sample (participants) are not random sample – Results are not generalisable
QUANTITATIVE			
Randomised controlled trials		✓ – impact ✓ – outcome	– Most rigorous evidence – Expensive – Randomisation not always feasible
Controlled before–after study		✓ – impact ✓ – outcome	– Most practical design – Must have comparable control group
Interrupted time series design		✓ – impact ✓ – outcome	– Practical design if sufficient numbers of events and accurate surveillance systems in place
Before–after study (no control group)		✓ – impact ✓ – outcome	– Cheap – Low level of evidence

* Further detail about study types is available in references 8 and 9. There is also a useful online glossary of epidemiological terms at www.cochrane.org/resources/glossary.htm

4.2.3 Choosing the performance indicators

Performance indicators (or outcome measures) are a measure of how successful the programme has been. Choice of performance indicators will be determined by the aims of the evaluation, the study type used, the resources available and, to a certain extent, the requirements of the funding agency. For instance, government funding agencies may require certain information to ensure support for increased enforcement or for further roll-out of a programme.

Injury and death outcomes

The effectiveness of both motorcycle and bicycle helmets in reducing crash-related head injury and death has been well documented in many studies including two Cochrane systematic reviews (see Module 1) *(10,11)* and there may be no need to replicate these findings in a large scale (and possibly expensive) piece of experimental research. However, much of this effectiveness research has been conducted in high-income countries (predominantly the USA) where high-quality helmets are

common. There is very little published research examining the effectiveness of light weight or locally developed helmets in reducing injury and death in low- and middle-income countries, particularly with regard to motorcycle helmets. Further research in this area is important as use of such helmets is increasing.

It is possible to use routinely collected data to calculate head injury and death rates. However, the efficiency with which such rates can be calculated depends on the accuracy of local surveillance. If there is a uniform capture, coding and reporting system already set up in hospitals and/or health departments there may be aggregated data available on head injury, serious head injury or motorcycle crash-related head injury. Otherwise this may need to be abstracted from local data sources. Similarly, motorcycle crash and/or death data may be routinely collected from police or transport authorities.

As quality may be variable, completeness and accuracy of these data sources should be carefully checked before use.

Helmet-wearing rates

Another appropriate performance indicator is the proportion of riders wearing helmets. Observations of riders may be made at a number of sites before and after a programme to document whether helmet-wearing rates have changed.

Calculating rates

Comparing changes in absolute numbers in injury and death outcomes, or in riders wearing helmets, before and after a programme is not useful, as absolute numbers may change due to an increase or decrease in the numbers of riders, registered or otherwise. It is therefore important that rates be calculated. Denominators may include number of riders, registered bikes, or kilometres travelled. For example, for injury outcomes a rate may be number of injuries per licensed riders, or number of injuries per 100 000 km ridden. For helmet use, the appropriate rate would be the proportion of helmeted riders over total riders observed. Note that it is preferable to use a population denominator (e.g. per 100 000 population), rather than the number of motorcycles as a denominator. This is because the rapidly increasing use of motorcycles in many countries may distort the results of an evaluation, if this latter measure is used.

Module 2 includes a detailed section on how to measure helmet-wearing rates.

4.2.4 Conducting an economic evaluation of a programme

It may also be necessary to conduct an economic evaluation to demonstrate 'value for money' and possible cost savings for government by investing in prevention. Economic evaluation addresses the question of whether one intervention represents a better use of resources than another. In other words, does spending $x on programme A represent a better investment than $y on programme B? To address this sort of

question, it is apparent therefore that a comparison of two or more options is needed (sometimes this comparison is with a 'do nothing' or 'status quo' alternative).

Economic evaluation is based on the comparison of alternatives in terms of their costs and consequences *(12)*. The term 'consequences' is used here to represent an outcome of value. There are various forms of economic evaluation that can be conducted – each differing in terms of scope, i.e. the range of variables included in the analysis. Importantly, each form of economic evaluation typically entails a set of starting assumptions; recognition of these is necessary for the policy-maker to make appropriate use of the evidence from such studies.

A common element across all forms of economic evaluation is that they involve measuring costs. Costs usually comprise, at least in part, the direct programme costs – the resources that are used to run the programme (e.g. equipment, staff, consumables). However, in principle, other costs may also be relevant such as those incurred by patients, carers and the wider community. Furthermore, there are 'downstream' costs and cost savings that may enter into consideration e.g. a programme may result in reduced hospitalisations and these savings in resources may be deemed relevant. The type of costs selected generally depends on the perspective taken in the evaluation and the nature of the resource allocation problem being addressed.

Methods used in economic evaluation

The most common form of economic evaluation is **cost effectiveness analysis** (CEA). This entails the total cost of programmes alongside a defined outcome to produce a 'cost-effectiveness ratio' (e.g. cost per life saved, cost per life year saved or cost per case prevented). The assumption in CEA is that the objectives of interventions being compared are adequately captured in the measure of outcome used *(13)*. One modification to conventional cost effectiveness analysis is cost-utility analysis which is based on an outcome measure, Quality Adjusted Life Year (QALY), that incorporates change in survival and quality of life and thereby enables a wider set of interventions to be legitimately compared than would be possible with CEA.

Another form of economic evaluation is **cost-benefit analysis** (CBA) which seeks to evaluate interventions in terms of total costs and total benefits – both dimensions being valued in monetary terms (e.g. dollars). Therefore if benefits are greater than costs, the decision would be to fund the programme. Valuation of health benefits in this way can be challenging, but one approach would be to elicit from beneficiaries of programs their maximum willingness to pay for these benefits (i.e. if they had to pay for it in a hypothetical market place). The idea behind this approach is to derive a valuation for an intervention akin to the way in which consumers value goods and services in markets.

Choosing the appropriate type of economic analysis for the needs of the particular programme will depend on resources available (both economic and human resources), and the aims of the evaluation. Taking quality of life into account is a powerful

measure for evaluations of motorcycle crashes where lifelong disability resulting from serious head injury is an outcome.

4.2.5 Determining sample size

For all quantitative study types it is important to have sufficiently large numbers in the study to be sure that if an effect exists it is detectable. The rarer the event, the greater the sample size needs to be in order to detect a difference. Serious injuries from motorcycle crashes are relatively rare events and a study using serious injury or death as an outcome would involve a large sample size. Measuring helmet-wearing rates requires a smaller number of participants.

Factors that must be taken into consideration in determining the sample size are the expected size of the effect to be detected, variability in the measures, and the prevalence of the variable of interest. For a cluster randomised trial, sample size calculations will also take the size of the cluster and correlation within clusters into account. For further information on sample size calculations for cluster randomised trials see reference 14.

Sample size calculators are freely available on the internet*, but it is wise to consult a statistician regarding such estimates, particularly where cluster randomised trials or random and/or stratified samples are necessary.

Economic evaluation

A study was carried out to compare cost effectiveness for three different programmes aimed at increasing bicycle helmet use in children between the ages of 5 and 16 (a legislative programme, a community-based programme and a school-based programme). Over a four-year period, it took account of the direct costs of the programme (costs of helmets and other programmatic costs) and the savings in health care expenditures due to prevention of bicycle-related head injury. The outcomes were head injuries prevented, deaths averted and years of life saved and were modelled on the basis of avoided cases, expected cases, increased risk of bicycle-related head injury from not wearing a bicycle helmet during a crash, and the pre- and post-intervention prevalence of not wearing a helmet. Overall, the legislative programme appeared to be the most cost effective, followed by the community-based programme and then the school-based programme *(15)*.

* Links to online sample size calculators may be found at http://calculators.stat.ucla.edu/sampsize/php or alternatively the statistical package Epi Info™ may be downloaded at http://www.cdc.gov/epiinfo/
A sample size calculator for cluster randomised trials may be found at www.abdn.ac.uk/hsru/epp/cluster.shtml

Statistical Analysis

For quantitative study designs data will require statistical analysis. For more advice on how to go about this refer to reference 8, or see the relevant lectures in the basic methods and injury sections at www.pitt.edu/~super1.

4.3 Dissemination and feedback

Once an evaluation is complete it is important to provide feedback to the stakeholders involved in the programme. Dissemination of the results will help to garner further support for the programme if it is successful, and help others gain support for the introduction of similar programmes. Publicity from dissemination activities may also increase the impact of the programme. If the programme has not been successful it is important to share this with others so that weaknesses or relevant issues are considered in other similar interventions, including whether or not to introduce such interventions.

Dissemination may involve presenting the results at public meetings, using the media to publicise the outcomes of the programme, or publishing reports and papers in the scientific literature.

Checklist

- ☐ Start evaluation process at the beginning of programme implementation.
- ☐ Determine aim of evaluation and develop evaluation framework.
- ☐ Clearly define target population, place and time.
- ☐ Develop and test instruments for data collection, ensuring consistency in training and measurement.
- ☐ Collect and analyse data.
- ☐ Write and disseminate evaluation report, feeding back into various aspects of programme.

Using evaluation results to feed back into new planning cycle

Consider whether the evaluation demonstrated any tangible benefits – should the programme be continued, or does it require disbanding or modification? Can the existing programme be improved on the basis of the evaluation? Have there been any unexpected side effects of the programme?

The results of the evaluation should be fed back into the planning cycle and the appropriate modifications to the programme made before it is further expanded (Box 4.1).

BOX 4.1: **Increasing bicycle helmet use in schools in Malaysia**

Bicycle fatalities constitute about 4% of all road traffic fatalities in Malaysia. The majority of these deaths result from head injuries and tend to occur in rural areas. Until the 1990s, the use of bicycle helmets was rare in Malaysia. The first bicycle helmet programme was launched in 1995 by the Malaysian Helmet Initiative, a consortium of university, governmental and nongovernmental organizations that promotes the use of motorcycle and bicycle helmets. With support from corporate funders, the programme is a model of how different sectors can work together to prevent head injuries.

Students are shown how to fit their bicycle helmets as part of this broad campaign to increase helmet use in Malaysian schools.

The bicycle helmet programme was a multisectoral initiative carried out by the country's Road Safety Council at both state and district levels, and targeting rural children through local schools. Children who cycled to school were trained in the proper use of helmets, which were provided free to those in the programme. With their parents also consenting, the children promised to use their helmets at all times when cycling. Their compliance in helmet use was assessed by the students themselves, through questionnaires on the use of the helmets, and through their reports on any crashes they were involved in while cycling. Compliance was also confirmed by the school authorities and by the programme organizers, who made unannounced monthly "spot checks" on children cycling to or from school.

The results showed that compliance among the students involved ranged from 31% to 98% across the various schools. The commitment of school authorities to the programme was considered a vital ingredient for sustaining the commitment of the children involved. When asked why they didn't use helmets, children reported pressure not to do so from their peers, a lack of storage space at school for the helmets, and their unappealing colour.

The lessons learnt from these early programmes were incorporated into subsequent ones. Children were charged a small fee for their helmets (rather than receiving them free of charge), there was an expanded choice of colour and design of the helmets, and suitable storage places for helmets were arranged in schools. Community partners have been brought into the programmes and strenuous efforts made to ensure that the school authorities sustain their commitment to the initiative.

Since the initial programme was launched in 1995, many of the schools involved have expanded their programmes, and at least one bicycle helmet programme is now running in each state of Malaysia. In total, about 4000 students in 50 schools and about 200 teachers have been involved in these efforts aimed at reducing head injuries among children using bicycles.

Summary

- Evaluation should be seen as an integral component of any helmet programme. An evaluation needs to be determined at the beginning of a programme development, such that the plan for data collection for this purpose is built into project implementation. As well as providing information on the effectiveness of a programme, evaluation will help identify if there are any problems in running a programme.
- Determining the aims of the evaluation will help to decide how best to carry out the evaluation. There are a number of different methods that can be used to evaluate a helmet programme. Each method has various advantages and disadvantages, and the choice of which to use will depend on the aims of the helmet programme, and the resources available.
- It is important that the results of the evaluation are shared with the appropriate parties, and that they are used in planning of the programme.

References

1. Rossi PH et al. Evaluation: a systematic approach. California, Sage Publications, 2004.
2. Britten N. Qualitative research: Qualitative interviews in medical research. *British Medical Journal,* 1995, 311:251–253.
3. Kitzinger J. Qualitative research: Introducing focus groups. *British Medical Journal,* 1995, 311:299–302.
4. Blantari J et al. An evaluation of the effectiveness of televised road safety messages in Ghana. *International Journal of Injury Control & Safety Promotion*, 2005, 12:23–29.
5. Hall M et al. Evaluation of a school-based peer leader bicycle helmet intervention. *Injury Control and Safety Promotion*, 2004, 11:165–174.
6. Parkin PC et al. Evaluation of a subsidy programme to increase bicycle helmet use by children of low-income families. *Pediatrics,* 1995, 96(2 Pt 1):283–287.
7. Jackie Chan promotes helmet use in Cambodia (Press release, Phnom Penh, 25 April 2005). (www.handicapinternational.be/downloads/Jackie_Chan_promotes_helmet_use.pdf).
8. Woodward M. *Epidemiology: study design and data analysis.* 2nd edition. Chapman and Hall CRC, Boca Raton, 2005.
9. Rothman, KJ, Greenland S. *Modern Epidemiology.* 2nd ed. Hagerstown Maryland, Lippincott-Raven, 1998.
10. Thompson DC, Rivara FP, Thompson R. Helmets for preventing head and facial injuries in bicyclists. *The Cochrane Database of Systematic Reviews,* 2005 (4).
11. Liu B et al. Helmets for preventing injury in motorcycle riders. *The Cochrane Database of Systematic Reviews,* 2005 (4).
12. Drummond MF et al. *Methods for the economic evaluation of health care programmes,* Oxford, Oxford University Press, 1997.

13. Tan-Torres T et al, eds. *WHO guide to cost-effectiveness analysis.* Geneva, World Health Organization, 2003.

14. Kerry SM, Bland JM. Statistics notes: Sample size in cluster randomisation. *British Medical Journal,* 1998, 316:549.

15. Hatziandreu EI et al. The cost effectiveness of three programs to increase the use of bicycle helmets among children. *Public Health Reports*, 1995, 110:251–259.

Glossary of terms

Acceleration–deceleration injuries: injuries that occur when a person's head is moving, and then hits an object, such as the ground, as in a motorcycle crash. The head's forward motion is stopped, but the brain, having its own mass, continues to move forward until it strikes the inside of the skull. It then rebounds striking the opposite side of the skull.

Bicycle helmet: A bicycle helmet is specifically designed to provide head protection for cyclists when the cyclist falls off the bike and hits the ground. They are not designed to provide adequate protection for a collision involving another moving vehicle (e.g. a car) or a collision at high speed, although they do provide some protection. A cycle helmet should not be too heavy and should provide adequate ventilation, because cycling can be an intense aerobic form of exercise which significantly raises body temperature. Thus, most helmets are constructed from lightweight materials pierced by strategically placed ventilation holes.

Brain contusion: damage to the nerves or blood vessels of the brain.

Closed head injury: injury where there is no open wound to the brain, often resulting from am impact which jars the brain in the skull. The movement of the brain within the skull may result in bruising, swelling, tearing of the brain tissues, nerves or blood vessels.

Cost: Use of resources that have alternative uses. Costs are generally measured in monetary terms, but the concept of cost includes any use of resources, not just direct out-of-pocket expenses *(1)*.

Cost-benefit analysis: A formal analysis of costs and benefits of a programme, in which all relevant impacts are converted to monetary terms *(1)*.

Cycle: A road vehicle which has two or more wheels and is propelled solely by the muscular energy of the persons on that vehicle, in particular by means of a pedal system, lever or handle (e.g. bicycles, tricycles, quadricycles and invalid carriages) *(2)*.

Concussion: a head-trauma-induced alteration in mental status that may or may not involve loss of consciousness.

Diffuse axonal injury: injury to the axons in the brain that can have serious long term consequences.

Disability: any restriction or lack of ability (resulting from an impairment) to perform an activity in the manner or within the range considered normal for a human being.

Emergency medical services (EMS): the services provided by trained personnel using adequate equipment soon after an emergency. EMS services for injuries aim to reduce the rates of death from potentially life-threatening injuries. These services include the care provided before the person reaches the hospital (prehospital EMS, such care delivered in the field and transport to a fixed site of definitive care), and the medical care provided in a hospital-based setting.

Evaluation: an on-going process to assess the effectiveness of a programme in achieving its objectives. Evaluation also aims to identify problems that may arise with the implementation of a programme, so that concerns are fed back into the planning process and modifications can be carried out during the implementation. An evaluation is usually designed to try to distinguish the effect of a programme from those of other factors.

First aid: emergency treatment administered to an injured person at or near the injury site, prior to receiving professional medical care.

Head injury: injury to the head that may damage the scalp, skull or brain. Head injury may occur either as a closed head injury (e.g. the head hitting a car's windshield) or as a penetrating head injury (e.g. when a bullet pierces the skull).

High-income country: For the purpose of this document the World Bank classification has been used to classify countries, based on Gross National Income (GNI) per capita. A high-income county is one whose GNI is US$ 9076 or more *(3)*.

Intracranial haemorrhages: internal bleeding, which can occur in different areas of the head or brain.

Legislation: Acts or provisions that have the force of law, i.e. that give the police the right to enforce and courts of law the right to impose penalties *(1)*.

Low-income country: For the purpose of this document the World Bank classification has been used to classify countries, based on Gross National Income (GNI) per capita. A low-income county is one whose GNI is US$ 735 or less *(3)*.

Middle-income country: For the purpose of this document the World Bank classification has been used to classify countries, based on Gross National Income (GNI) per capita. A middle-income county is one whose GNI is between US$ 736 and US$9075 *(3)*.

Motorcycle helmet: A motorcycle helmet is a type of protective headgear used by motorcycle riders. Helmets are usually made of a hard substance (usually a type of plastic) that will afford protection from high speed collisions and falling objects. The primary goal of a motorcycle helmet is to protect the rider's head during impact, although many helmets provide additional conveniences, such as face shields, ear protection. Motorcycle helmets are generally designed to break in a crash (thus expending the energy otherwise destined for the wearer's skull), so they provide little or no protection after their first impact

Motorized two-wheelers: a two-wheeled vehicle powered by a motor engine – such as a motorcycle or moped.

Open head injury: injury which involves a fracture or penetration of the skull. May result in brain injuries.

Prehospital care: The care provided to reduce the effects of trauma or injury before the injured person reaches a hospital-based setting (see EMS). This includes the formal response provided by trained and equipped personnel, as well as the bystanders' response provided by lay people.

Risk: The possibility of an unwanted event occurring.

Risk factor: A factor which affects the probability of a crash or collision occurring or influences the severity of the consequences which arise as a result of the event.

Road traffic accident: a collision involving at least one vehicle in motion on a public or private road, that results in at least one person being injured or killed *(2)*.

Road traffic crash or collision: an incident, involving at least one moving vehicle, that may or may not lead to injury, which occurs on a public road.

Road traffic fatality: a death occurring within 30 days of the road traffic crash *(2)*.

Road traffic injuries: fatal or non-fatal injuries incurred as a result of a road traffic crash.

Road user: a person using any part of the road system as a non-motorized or motorized transport user.

Surveillance: systematic ongoing collection, collation, and analysis of data and the timely dissemination of information to those who need to know so that action can be taken.

Traumatic brain injury: any injury to the brain resulting from the application of external forces to the skull. Traumatic brain injury can lead to a spectrum of problems including concussion, contusion (haemorrhage within the brain), or diffuse injuries that cause more severe neurological damage.

Vulnerable road users: road users most at risk in traffic – such as pedestrians, cyclists and public transport passengers. Children, older people and disabled people may also be included in this category.

References

1. Elvik R, Vaa T. *The handbook of road safety measures*. Amsterdam, The Netherlands, Elsevier, 2004.
2. Economic Commission for Europe Intersecretariat Working Group on Transport Statistics. *Glossary of transport statistics. Third edition*. New York, NY, United Nations Economic and Social Council, 2003 (TRANS/WP.6/2003/6), (www.unece.org/trans/main/wp6/pdfdocs/glossen3.pdf, accessed 23 May 2006).
3. *Country classification: classification of economies.* Washington DC, The World Bank Group, 2002 (www.worldbank.org/data/countryclass/countryclass.html, accessed 23 May 2006).

Partner organizations in the development of the manual

World Health Organization (WHO)

As the United Nations specialized agency for health, the World Health Organization aims to integrate road safety into public health programmes around the world in order to reduce the unacceptably high levels of road traffic injuries. A public health approach is used, combining epidemiology, prevention and advocacy. Special emphasis is given to low- and middle-income countries where most road traffic crashes occur. In recent years WHO has focused its efforts on the implementation of the recommendations contained in the *World report of road traffic injury prevention*, which it co-produced with the World Bank, and in particular on addressing the main risk factors for road traffic injuries. Following a United Nation's General Assembly resolution on road safety, adopted in 2004, WHO acts as a coordinator for road safety initiatives within the United Nations system, and to this end has facilitated the development of the United Nations Road Safety Collaboration – a group of over international road safety organizations, including many United Nations agencies. This coordinating role was further endorsed by a fourth UN General Assembly resolution, adopted in 2005.

Address: World Health Organization, 20 Avenue Appia, CH-1211 Geneva 27, Switzerland

URL: www.who.int/violence_injury_prevention/en/

Contact person: Margie Peden, Coordinator, Unintentional Injury Prevention, Department of Injuries and Violence Prevention

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World Bank

The World Bank promotes the improvement of road safety outcomes in low- and middle-income countries as a global development priority. It provides financial and technical support to countries, working through government agencies, nongovernmental organizations, and the private sector to formulate strategies to improve road safety. The World Bank's mission is to assist countries accelerate their implementation of the recommendations of the *World report on road traffic injury prevention* which it developed jointly with the World Health Organization in 2004. To achieve

this, it emphasizes country capacity-building, and the development of global partnerships, with a focus on the achievement of measurable road safety results.

Address: World Bank, 1818 H Street, NW, Washington DC 20433, USA

URL: www.worldbank.org/transport/roads/safety.htm

Contact person: Anthony Bliss, Lead Road Safety Specialist, Transport and Urban Development Department.

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Global Road Safety Partnership (GRSP)

The Global Road Safety Partnership is a partnership between business, civil society and government dedicated to the sustainable reduction of death and injury on the roads in developing and transition countries. By creating and strengthening links between partners, GRSP aims to increase awareness of road safety as an issue affecting all sectors of society. GRSP seeks to establish sustainable partnerships and to deliver road safety interventions through increased resources, better coordination, management, greater innovation, and knowledge sharing both globally and locally.

GRSP is a hosted programme of the International Federation of Red Cross and Red Crescent Societies.

Address: Global Road Safety Partnership, c/o International Federation of Red Cross and Red Crescent Societies, P. O. Box 372, 17 chemin des Crêts, CH-1211 Genève 19, Switzerland

URL: www.grsproadsafety.org/

Contact person: David Silcock, Chief Executive

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FIA Foundation for the Automobile and Society

The FIA Foundation for the Automobile and Society is a registered UK charity with the objectives of promoting public safety and public health, the protection and preservation of human life, and the conservation, protection and improvement of the physical and natural environment. Since its establishment in 2001, the FIA Foundation has become a prominent player in promoting road safety around the world. It conducts advocacy to raise awareness about the growing epidemic of road traffic injuries and place road safety on the international political agenda. It promotes research

and the dissemination of results to encourage best practice in road safety policy, and offers financial support to third party projects through a grants programme.

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