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# Economic Evaluation of Injury Control

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## Purposes of Economic Evaluation

As the problem of injury garners increasing attention in the public and private sectors of the economy, the amount of resources dedicated to the prevention, treatment, and rehabilitation of injuries can be expected to grow. These resources are the scarce labor and capital that could be applied to other productive uses in the economy (e.g., better housing or education) if they were not allocated to the field of injury control. Even if we restrict the allocation issue to the injury control field (e.g., prevention vs. treatment, unintentional vs. intentional injuries, injuries to adults vs. injuries to children, and technological vs. behavioral interventions), resource-allocation decisions regarding which interventions to implement still need to be made. Currently, these types of decisions are often made informally or implicitly, without analytical consideration of what would be in the best interests of society.

Effectiveness is one of the few objective criteria applied in the selection of recommended best practices (US Preventive Task Force, 1996). Efficiency, that is the relationship between the effectiveness of an intervention and the resources needed to implement it, is more rarely used as a selection criterion.

The purpose of economic evaluation is to assist decision makers in allocating resources efficiently by taking into account the costs and effects (or consequences) of an intervention compared with the status quo or the most-likely alternative to the intervention. Efficiency considerations become even more necessary as the number of effective interventions continues to grow, exceeding the resources available to implement all of them. On occasion, nonefficiency considerations, such as fairness or equity, may induce informed departures from efficient resource allocation. Thus, economic evaluation offers information, insight, and guidance; it is not an algorithm that replaces the need for human judgment and ethical considerations in resource allocation (Drummond et al., 1997).

## Types of Economic Evaluation

Economic evaluation consists of a set of three techniques (Drummond et al., 1997). The choice among them depends on the type of consequences produced by the interventions being compared (Table 19.1).

**Table 19.1** Types of economic evaluation

| *Type of analysis* | *Units used to measure cost* | *Units used to measure consequences* | *The interventions being compared produce:* |
|---|---|---|---|
| Cost minimization | Money (e.g., US dollars) | None | identical consequence(s) (in type and quantity) |
| Cost effectiveness | Money (e.g., US dollars) | Natural units (e.g., lives saved, life-years gained, number of injuries averted) | same type of consequence(s), but produced in different amount |
| | | Non-natural units[a] (e.g., quality-adjusted life years) | identical or not identical consequences |
| Cost benefit | Money (e.g., US dollars) | Money (e.g., US dollars) | identical or not identical consequences |

Note: [a]historically referred to as cost utility analysis.
Adapted from: Drummond et al., 1997.

When the interventions under comparison lead to identical consequences, both in type and in quantity, only costs deserve attention and cost-minimization techniques are used to evaluate which of the interventions is more economical. When the interventions under evaluation produce different types of outcomes and/or in different amounts, cost-minimization techniques become insufficient and the consequences need to be compared using either natural, non-natural, or monetary units.

When non-monetary outcomes are used to measure effectiveness, the techniques are either cost-effectiveness or cost-utility analysis. The result of the analysis is presented as the ratio between the net resources consumed by the intervention (expressed as costs) and the net effectiveness accrued by the intervention. This ratio indicates how many resources (e.g., dollars) are expended to gain one unit of outcome. The term cost-effectiveness analysis (CEA) has been used, historically, when the outcomes are described in one or several of the available natural units (e.g., lives saved, injuries averted, hospital days prevented, days of work saved, potential years of life saved). This diversity of effectiveness measures limits the use of this technique. It is impossible to compare cost-effectiveness ratios of alternative interventions when different units have been employed in their evaluation. In injury prevention, this becomes particularly limiting if one tries to compare the fatal and nonfatal injury prevention benefits of different interventions. For example, if the effectiveness of safety belts is measured by the number of lives saved while air bag effectiveness is measured by the number of head injuries prevented (both nonfatal and fatal), then it is not feasible to compare the cost-effectiveness of the two restraint systems.

Cost-utility is the name traditionally given to CEA in which the consequences of the intervention are described in non-natural, preference-weighted units, such as utility values. Some experts prefer these "utility-based" measures because they are based on the preferences of citizens who are at risk of injury and who might benefit from (and bear the cost of) the intervention programs. The word "utility" refers to an approach to measuring citizen well-being that was developed by decision theorists, economists, and psychologists and that is the basis for measures such as the quality-adjusted life years (QALYs) or the disability-adjusted life years (DALYs). These measures are increasingly used in decision problems involving clinical and preventive interventions where the subjective preferences of patients are critical to the choice of optimal therapy (Weinstein and Stason, 1977; Torrance, 1986; Gold et al., 1996) or to quantify the burden of disease and injury in a population (Murray and Lopez, 1996). In the field of injury control, the Functional Capacity Index (MacKenzie et al., 1996) is an example of this type of measure (see Mackenzie, this volume).

Despite the conceptual distinction between natural and non-natural (i.e., preference-based) units, any economic evaluation involving non-monetary outcomes is often termed CEA, regardless of whether natural or non-natural units have been used to describe the outcomes (Gold et al., 1996). In this chapter, we will use the term CEA in this broader sense.

CEA is particularly well designed to help identify the most efficient mix of interventions, where efficiency implies achieving the maximum amount of effectiveness with the resources available. When several cost-effectiveness ratios are presented together, this is often referred to as a "league table," because it resembles the rank ordering of sports teams by wins and losses.

Cost–benefit analysis (CBA) is the technique used when the consequences are measured in monetary terms. In CBA one subtracts the benefits that the intervention produces from the amount of resources required to implement the intervention (that is, the net cost of implementing the intervention). From the perspective of economic theory, CBA is the best-grounded technique (Pauly, 1995; Johannesson, 1996; Kenkel, 1997) and it allows for comparison of all types of interventions (e.g., within the injury field, across other health care-related fields, and across other fields such as education or housing). Despite this strength, CBA has had only limited influence in the health sector because of its requirement that an explicit monetary loss be assigned to premature death and health impairments. Many citizens, scientists, and policy makers consider this practice to be unscientific and/or unethical. For example, it has been noted that whether a health-related intervention is "worth its cost" is not an economic issue but "a moral and ethical issue" (Petitti, 1994). Consequently, CEA – in the broader definition of the term, has emerged as the dominant economic-evaluation technique in the evaluation of health-related interventions (Johannesson and Jonsson, 1991; Gold et al., 1996).

### State-of-the-art Methods

An economic evaluation is typically performed from the societal perspective, which means that all costs and benefits of an intervention are counted, regardless of who in society is affected. It is also feasible to conduct evaluations from narrower perspectives, such as the accounting perspective of a managed care organization or the budgetary perspective of the Medicare program. Analyses undertaken from these targeted perspectives can be useful to specific decision makers but will not provide the overall insight that is provided by an evaluation undertaken from the societal perspective. It is important for any economic evaluator to state explicitly the perspective that is being taken.

The problem definition in economic evaluation goes beyond the choice of perspective. It entails specification of the particular morbidity, mortality, or disability outcomes that are of concern as well as the specific target population (e.g., age, gender, and geographic location) for analysis. The same intervention (e.g., seat belts) may offer fewer benefits for some target populations (e.g., rear-seat car occupants) than others (e.g., car drivers) because the baseline levels of injury risk vary enormously by target population and/or the effectiveness of the intervention is different (e.g., seat belt effectiveness on drivers vs. children).

Comparison of decision alternatives is essential to any evaluation. The costs and benefits of a particular intervention (e.g., an automobile air bag system) are not defined unless the comparator to the chosen intervention is defined (e.g., a manual lap/shoulder belt system). The same intervention may appear attractive or unattractive depending upon the comparator that is chosen. Thus, air bags may look like a better investment when applied to a vehicle with few safety features than when applied to a vehicle that already has numerous safety features. When evaluating a new technology or program, the standard practice in economic evaluation is to select the status quo (or current technology, treatment, or program) as the comparator.

The choice of comparator is a concept closely related to that of incremental analysis. An incremental analysis of alternatives needs to be conducted any time the economic evaluation compares more than two interventions that are not mutually exclusive. Suppose three alternatives are being considered to address fire-related injuries: no action, installation of smoke detectors, and installation of sprinkler systems. It may be the case that smoke detectors and sprinkler systems are each a good economic investment compared with no action. Yet that does not mean that it makes sense to purchase both systems. An incremental analysis needs to be undertaken that quantifies the extra (or additional or incremental) net cost and net benefit of doing both systems compared with doing only one system. The technical literature in economic evaluation has devised some fairly rigorous guidelines for how such incremental comparisons should be performed in order to achieve efficient investment strategies (Weinstein, 1995). It has been shown that a decision-making algorithm based on incremental CEA can be used to achieve the maximum amount of overall effectiveness with the resources available (Sloan, 1995; Weinstein, 1995; Gold et al., 1996).

The temporal issues that are important in an economic evaluation are the lifetime of the program or technology and the "analytic time horizon." Explicit assumptions must be made because these times typically differ. The useful life of a bicycle helmet may be 5 or 10 years. Yet an analysis of the benefits and costs of using bicycle helmets may require a much longer time horizon as, for example, the economic and quality-of-life impacts of head injuries may extend for the entire life of people who are injured in bicycle crashes.

When measuring the net cost of the intervention (the cost of the intervention minus the savings from the intervention), the governing principle will be one of opportunity cost. All resources used by the intervention (including the long run costs associated with the intervention and its effects) should be included. Resources that will be consumed regardless of adoption of the intervention should be excluded from the analysis. Market prices are (most frequently) used as they are presumed to reflect the marginal opportunity costs of labor and material resources. When market prices are neither available nor valid, shadow prices can be devised and used. Constant dollars are used when aggregating price information across time (removing any effects of general price inflation). In CEA, the net cost of the intervention becomes the numerator of the ratio; this numerator should not include productivity impacts (i.e., loss of capability of working) of the intervention to avoid double counting (Gold et al., 1996). In contrast, in CBA, productivity impacts of the intervention should be included and wages are used as a surrogate measure for the value of time for those in the labor force.

Sensitivity analyses of key inputs to the economic evaluation (e.g., the discount rate, effectiveness estimates, utility values) should be conducted to determine the degree of uncertainty in the results (i.e., uncertainty analysis). Additionally, information on any qualitative issues associated with an intervention that cannot be included in the analysis but may be of concern to policy makers (e.g., a target population with a disproportionate number of low-income or minority citizens which would bring into consideration equity arguments) should be presented. These issues are sometimes called intangible considerations (Mishan, 1994) and should be explicitly stated.

There are multiple textbooks that cover the technical aspects associated with the use of these techniques (Petitti, 1994; Johannesson, 1996; Drummond et al., 1997). Although most of these books have been written with a more generic application to health issues, there is no barrier to their application in the injury field. In 1994, the U.S. Department of Health and Human Services appointed an Expert Panel that recommended that analysts use standard practices when conducting CEA of public health and clinical interventions and proposed such standards (Gold et al., 1996). These standard practices cover how costs are defined and measured, how effectiveness is defined and quantified, why and how future costs and effectiveness are discounted to present value, and how cost-effectiveness ratios are computed and reported. (Table 19.2 summarizes these recommendations.) Adherence to these recommended practices can be expected to bring more rigor and consistency to economic evaluations. In the example that follows in this chapter, we follow fairly closely these standard practices.

## Review of Injury-control Economic Evaluations

Only in rare occasions do injury prevention interventions lead to identical consequences; thus, cost-minimization analysis is seldom used. Indeed, we are not

**Table 19.2** Summary of the steps required to perform a cost-effectiveness analysis

(1) Identify problem and promising intervention to evaluate.
(2) Identify alternative (or set of alternatives) against which to compare the intervention, including any incremental comparisons.
(3) Identify baseline data for the population of interest: mortality, morbidity, disability.
(4) Identify (incremental) effectiveness estimate(s): mortality, morbidity, disability.
(5) Identify (incremental) gross costs and savings costs.
(6) Control for inflation (if necessary) by computing constant dollars by using the Consumer Price Index.
(7) Discount future costs and savings at the same real discount rate.
(8) Compute the (incremental) number of fatalities, morbidity, and disability averted.
(9) Compute the discounted (incremental) number of years of life gained (by averting the fatalities).
(10) Compute the discounted (incremental) quality-adjusted life years gained (by averting morbidity and disability).
(11) Compute the discounted (incremental) total quality-adjusted years of life by adding the discounted (incremental) years of life gained and the discounted (incremental) quality-adjusted years gained.
(12) Compute the (incremental) costs of implementing the intervention.
(13) Compute the (incremental) savings in resource costs.
(14) Compute the net costs by subtracting the (incremental) savings in resource costs from the (incremental) costs of implementing the intervention.
(15) Compute the discounted (incremental) net costs.
(16) Compute the cost-effectiveness ratio by dividing the discounted (incremental) net cost by the discounted (incremental) total quality-adjusted years of life gained.
(17) Perform sensitivity analysis of important inputs such as effectiveness, discount rate, intervention cost, and utility values.

Adapted from: Gold et al., 1996.

aware of any peer-reviewed publication using this technique to evaluate an injury prevention intervention.

There is a burgeoning literature on economic evaluation (usually CEA) of interventions aimed at preventing or treating chronic and infectious diseases (Elixhauser, 1993). Yet, the literature on injury prevention is quite limited and is restricted primarily to the regulatory impact analyses of proposed rules issued by U.S. federal agencies such as the National Highway Traffic Safety Administration, Federal Aviation Administration, Consumer Product Safety Commission, and the Occupational Safety and Health Administration, and that are required by the Office of Management and Budget (OMB).

In a systematic review by Segui-Gomez et al. (in press) 54 studies were identified that reported information on the cost and effectiveness of 128 injury control interventions. Besides the fact that the use of the terminology (CEA, CBA) was very frequently inconsistent and/or inappropriate, the survey uncovered a similar problem that has emerged in the reviews of other economic evaluations of public health and medicine: inconsistent and poor analytical practices. In one-third of the reviewed papers, it was impossible to know what the viewpoint of the analysis was (i.e., whether societal, governmental, or other). Many different types and

Table 19.3 A league table of selected injury control interventions (1995 US$)

| *Intervention evaluated* | *Comparator* | *Target population* | *$ per LY* | *$ per QALY* |
|---|---|---|---|---|
| Lap/shoulder belt (50% use) | No restraint | Drivers or front-right occupants (passenger vehicles) | < 0 | < 0 |
| Compulsory helmet use | Voluntary helmet use | Motorcyclist | < 0 | < 0 |
| Daytime running lights | Nighttime lights only | All motorvehicle occupants | < 0 | < 0 |
| Frontal air bags | Manual lap/shoulder belt (50% use) | Drivers (passenger cars) | 24,000 | 96,000 |
| Strengthened side door beams | Status quo | All occupants (light trucks) | 53,000 | 160,000 |
| Frontal air bags | Manual lap/shoulder belt (50% use) | Front-right occupant (passenger cars) | 61,000 | 213,000 |
| 55 m.p.h speed limit | 65 m.p.h. speed limit | Rural interstate travelers | 82,000 | 220,000 |
| Lap-only belts (9% use) | No restraint | Rear-center seat occupants | 830,000 | 1,300,000 |
| Lap/shoulder belts (9% use) | No restraint | Rear-center seat occupants | 2,400,000 | 6,000,000 |

LY, Life-Year saved; QALY, Quality-Adjusted Life-Year saved.
Adapted from: Graham et al., 1998.

combinations of monetary cost savings and gross costs were identified, making any rigorous comparison of interventions impossible. The analytic treatment of the morbidity-reduction effects of the interventions was not comprehensive, and was far less detailed than the treatment of mortality-reduction effects, which emphasizes the need for valid outcome measures that encompass mortality and morbidity effects. There was substantial variation in discounting practices. Uncertainties (e.g., about effectiveness or costs) were either not quantified, or were addressed in a rudimentary manner (with sensitivity analysis of one or two parameters at a time), or were not addressed at all. Despite all these limitations, some of these analyses are particularly insightful illustrations of economic evaluation (Muler, 1980; Arnould and Gabrowski, 1981; Loeb and Gilad, 1982; Petak and Atkisson, 1982; Rodgers, 1985; Eastern Research Group, 1987). Other examples of more recent economic evaluations are Levy and Miller (1995) and Miller and Lestina (1997).

The first peer-reviewed CEA published using the Expert Panel recommendation was an evaluation of the incremental costs and benefits of driver- and passenger-side air bags compared to safety belts (Graham et al., 1997). The cost per year of life saved (LY) and quality-adjusted life years (QALY) saved from this evaluation are summarized in a league table (Table 19.3) together with other selected motor vehicle-related injury prevention interventions re-evaluated using the panel's recommendations (Graham et al., 1998).

The limited number of economic evaluations of injury prevention interventions reflects a variety of factors such as a lack of definitive information on the effectiveness of interventions and a lack of information on the costs of treating injuries—costs that might be averted if effective interventions were implemented. Furthermore, there has been a lack of methodology to combine mortality and nonfatal impairment information into a unified effectiveness scale. The cost-effectiveness evaluations reviewed reflect the lack of common methodology that would allow for comparison of their results.

### *An Illustrative Example*

Imagine a society that is considering whether to mandate driver-side air bags in all new motor vehicles produced in the near future (10 million per year). If air bags are not mandated, it is assumed that the driver's fatality rate will be 125 cases per million vehicles per year. For each fatality, additional 15 severe, yet nonfatal, and 150 minor injuries are expected in the absence of air bags. We assume that this baseline rate of fatality and injury is spread evenly over a 10-year vehicle life (i.e., we follow 10 million vehicles for 10 years). We will use a 3% annual discount rate. We assume further that each fatality is associated with a loss of 23 discounted life years of full quality and that each significant and minor injury are associated with the loss of five and 0.01 discounted QALYs, respectively. In our example, these air bag systems are 10% effective in preventing fatal and significant nonfatal injuries, but increase the rate of minor nonfatal injuries by 50%.

We assume also that the driver air bag system costs $250 per vehicle and that the total lifetime injury-related treatment costs, discounted to present value, are $10,000 per fatality, $60,000 per significant injury, and $5000 per minor injury. The question then is, will there be any net resource savings to society due to the installation of these air bags? (The numbers presented next are rounded for simplicity purposes.)

The total gross discounted savings will equal $11 million for the fatality prevention ($\$10,000 \times 125 \times 0.10 \times 10$ years)—(with discounting) plus $990 million for the significant injury prevention ($\$60,000 \times 1875 \times 0.10 \times 10$ years), or a total gross savings of $1001 million. Yet the driver air bag will cause numerous minor injuries (9375 per year for 10 years) that will cost a total of $412 million to treat. Overall, the net costs of mandating the air bags will be $2.5 billion ($250 per air bag system $\times$ 10 million vehicles) minus the net savings in treatment costs ($589 million), or about $1.91 billion.

Although the driver air bag will not produce a net savings in resources in the economy (i.e., it is not a "cost saving" intervention), it may still be a reasonable investment in length and quality of life (Russell, 1986). The annual number of discounted life years saved will be 2875 ($125 \times 23$), or a total of 24,848 for the 10 years of protection after discounting (i.e., 2875 + (2875 × 0.97) + (2875 × 0.94) + ··· + (2875 × 0.77)). The impact on nonfatal injuries includes a reduction in significant nonfatal injuries (1250 × 15 × 0.10 × 5), or 9375 QALYs saved per year of air bag protection, or a total of 82,406 QALYs saved over 10 years. A deduction must be made for the QALYs lost from minor injuries (1250 × 150 × 0.5× 0.01 = 938 per year), which amount to a total loss of 8241 QALYs from air bag-induced minor injuries over 10 years. Overall, the total effectiveness of the driver air bag is 99,013 QALYs saved. It is worth noting here the distinction between the discounted life-years gained by preventing a fatality and the discounted QALYs lived after preventing the long-term consequences of a nonfatal injury.

The net cost-effectiveness ratio for the driver air bag (compared with the safety forecast with no air bag) is equal to the net resource costs ($1.91 billion) divided by the net number of QALYs saved (99,013), or about $19,290 per QALY saved ($19,000 when rounded). Interestingly, this hypothetical calculation is a close approximation to the finding of the recent cost-effectiveness evaluation of driver air bag systems in the United States referred to before (Graham et al., 1997).

Is $19,000 per QALY saved a large or small ratio? There is no correct answer to this question. One can only compare the ratio with the ratios for other interventions. For example, many well-accepted procedures in the prevention and treatment of heart disease and cancer have cost-effectiveness ratios in the range from $50,000 to $150,000 per QALY saved (calculated using the same procedures) (Table 19.3) (Tengs et al., 1995; Graham et al., 1998). Some economists, based on surveys and studies of the implicit preferences of consumers and workers, have estimated that the implicit value of a QALY saved is as high as $400,000 (Viscusi, 1993). Yet it may be preferable to treat a cost-effectiveness ratio as information that decision makers should consider in conjunction with other legal, political, and ethical information about the proposed air bag mandate.

## Challenges Ahead

An economic evaluation is only as good as the input values that one uses for the analysis. Fortunately, scientific progress in recent years has made it possible to apply economic evaluation techniques to a variety of injury control interventions. Despite this encouraging progress, much work is needed in (1) better defining the effectiveness of interventions; (2) characterizing the costs of injuries; (3) describing alternative and more comprehensive outcome measures; (4) promoting standardization of the methodology; and (5) encouraging the training of researchers in this area.

First, more rigorous research needs to be conducted to evaluate the effectiveness of injury prevention interventions. Although relatively few injury control interventions have been evaluated through randomized clinical trials (for both ethical and practical reasons), a number of other methods (e.g., case–control, case cross-over, time-series studies) can be (and are being) properly used in effectiveness research. Several chapters of this book contain references to this issue (see chapters 7–13, and 15).

Second, although a variety of investigators have made important contributions to our understanding of the costs of injuries, both the costs of treating injuries (from the emergency department to long-term care) and the productivity losses, consensus on the methods used to compute these costs needs to be achieved. To date, most of the research on the cost of injuries has been done in the context of motor vehicle injuries. Faigin (1975) produced the first major categories and estimates of motor vehicle-related injury costs. These costs have been updated regularly by the National Highway Traffic Safety Administration (Blincoe and Luchter, 1983; Blincoe and Faigin, 1992; Blincoe, 1996) and refined including long-term consequences and separating types and severity of injury (Smart and Sanders, 1976; Hartunian et al., 1981; MacKenzie et al., 1988a, b).

Rice and MacKenzie (1989) published the first comprehensive cost-of-injury study, including costs of injuries by age and sex, with breakdowns into six major cause categories: motor vehicle crashes, falls, firearms, fires/burns, poisonings, and near drowning. More recently, Miller (1993; Miller et al., 1995) provided the first U.S. cost information for nonfatal injury by body region, body part, and nature of injury (e.g., fracture, laceration). There is also a growing literature on the "pain and suffering" costs of injuries based on the willingness-to-pay method (Jones-Lee, 1985, 1995; Viscusi, 1993). These costs, while relevant to CBA, are not relevant to CEA (Gold et al., 1996), where the effectiveness measure (if a utility-based type of measure) is adjusted for impacts on personal well-being, such as pain and suffering.

Third, various utility-based scales and elicitation procedures have been developed that can be employed to combine information on mortality, morbidity, and sequelae into a single numerical index (Kaplan et al., 1976; Kaplan, 1982; Kind et al., 1982; Torrance, 1986). For example, using the time-tradeoff technique (one of the elicitation methods available), one might ask a citizen to decide how many years of life with good health are equivalent in value to 30 years confined to a wheelchair. If the citizen responded 15, then each year in a wheelchair would be assigned a utility value of 0.5 on a scale from 0 to 1.0, where 0 represents death (or the worst health state) and 1.0 represents good health. Thus, if all citizens in a community shared this opinion, a community intervention that saved 1000 life years and averted 500 wheelchair years would, using the utility scale, be said to save a total of 1250 (undiscounted) QALYs. These utility-based scales, while inherently subjective and a source of some controversy, are now frequently used in CEA of public health and medicine (Neumann et al., 1997)

The effort to combine information on mortality, morbidity and impairment due to injuries was initiated by Hirsch et al. (1983), while Carston and O'Day (1986) laid the groundwork for linking the Abbreviated Injury Scale (AAAM, 1990) values and measures of impairment (disutility). Luchter (1987), Miller et al. (1989), and Guria (1993) stimulated interest in the development of utility-based approaches to the valuation of nonfatal traffic injuries. Miller et al. (1995) published the first set of estimates of utility losses attributable to nonfatal injuries, taking into account previous research on limitations in physical capability due to injury, functional capacity losses (impairment), and disability at work and at home.

MacKenzie et al. (1996) through the development of the Functional Capacity Index (FCI) has advanced this work.

The FCI was conceptualized for application to patients of all ages but the initial application was only performed on middle-aged adults living in the United States who sustained only one injury and whose functional limitations lasted at least 1 year. Several projects are now underway to clinically validate the scale, refine the utility values, expand the scale to include pediatric and geriatric injuries, integrate multiple injuries, and encompass injuries with consequences that last less than 1 year. Future work should also explore the applicability of these U.S.-based utility values to other societies. Although more work on FCI is certainly appropriate, it is apparent that, compared with other utility-based scores used in the literature, the FCI is a relatively sophisticated and well-developed measure (Neumann et al., 1997).

Finally, methodologic consensus in the application of economic evaluation techniques is being widely promoted and encouraged (Gold et al., 1996; Drummond et al., 1997).

Given these recent scientific developments, the next years are an appropriate time for more researchers to seek proper training in the basic tenets of decision theory and economic evaluation, and to conduct economic evaluations of injury prevention interventions using comparable methods, good quality data, and valid assumptions. Without good-quality information on effectiveness and costs, it is difficult to make a convincing economic case in favor (or in opposition) to any specific injury prevention intervention.

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