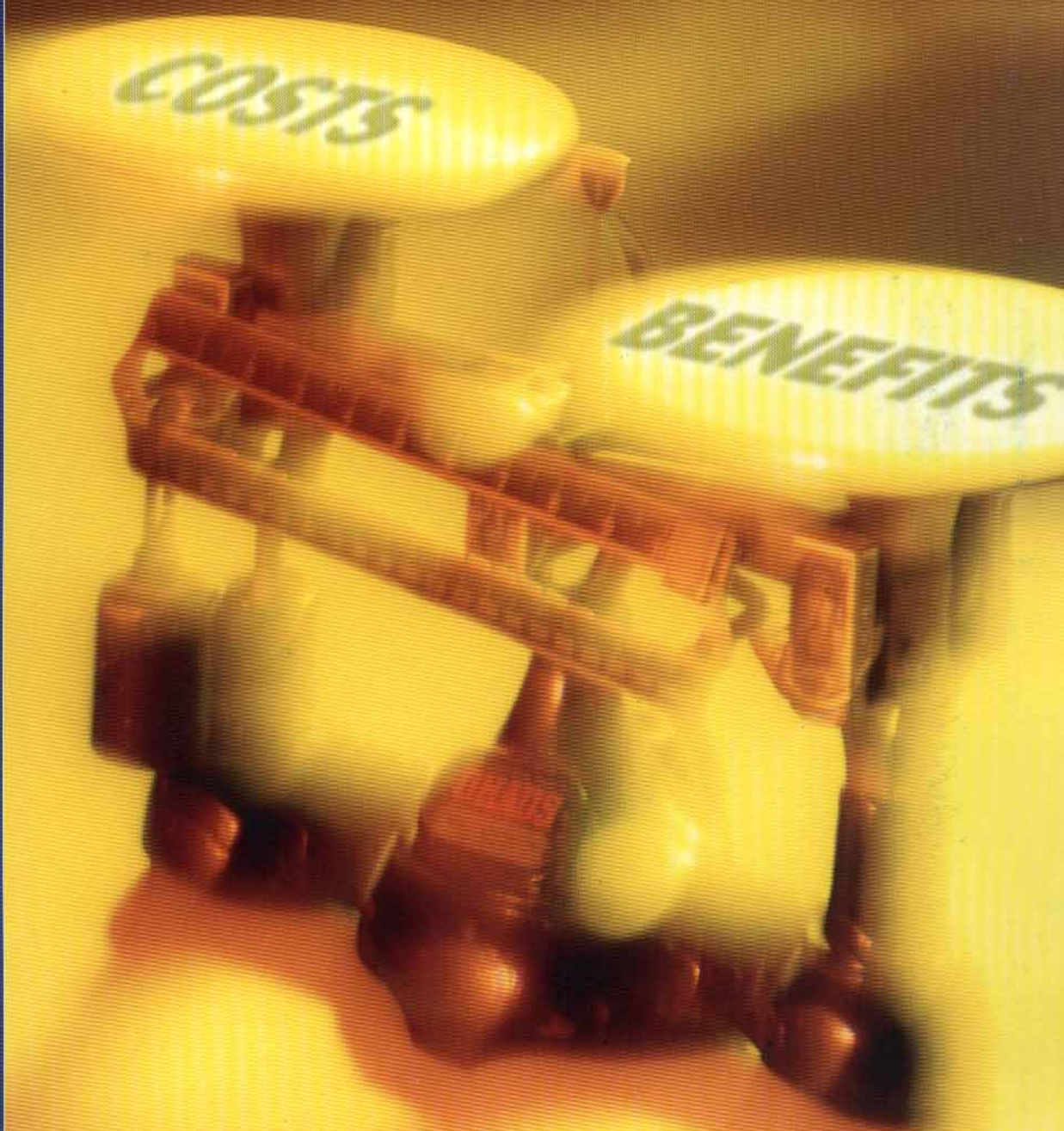
European Agency for Safety and Health at Work

magazine 1

Magazine of the European Agency for Safety and Health at Work

HEALTH AND SAFETY AT WORK

A question of costs and benefits?



COST-BENEFIT ANALYSIS IN DECISION-MAKING

COST-BENEFIT ANALYSIS IN PRACTICE

LIMITATIONS OF COST-BENEFIT ANALYSIS

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A great deal of additional information on the European Union is available on the Internet.
It can be accessed through the Europa server (http://europa.eu.int).

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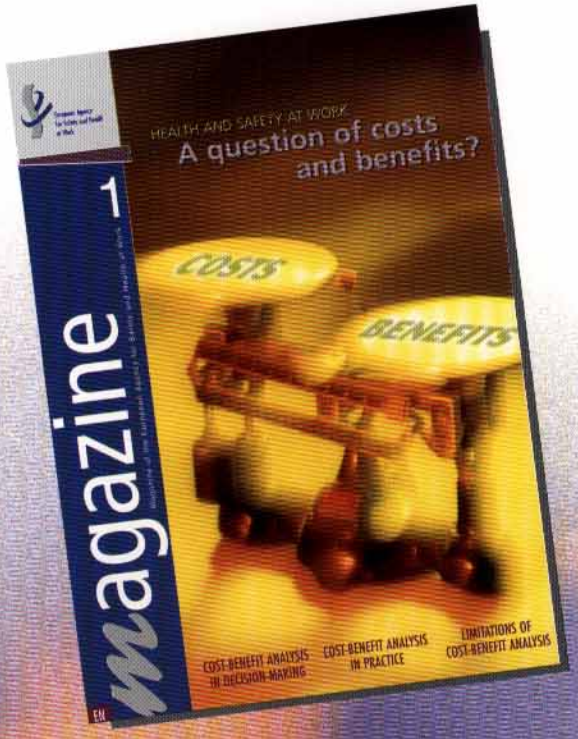
Director, European Agency for Safety and Health at Work



Editorial

Welcome to the first edition of the Agency's new ***Magazine*** – the latest in our growing series of printed and web-based publications serving the information needs of the occupational safety and health community across Europe.

The free flow of information between all those involved in safety and health issues is fundamental to achieving our overall goal of improving people's working lives. To stimulate that flow, the Agency draws on a Europe-wide network of Focal Points to help collect and disseminate technical, scientific and economic information.

Our quarterly ***News*** details latest news and developments at EU, Member State and enterprise level and keeps the OSH community abreast of our own activities. Our website at http://osha.eu.int gives instant access to an ever-increasing wealth of up-to-date European and international health and safety information on topics ranging from legislation and standards to statistics and training.

The new ***Magazine*** complements these existing media. Concentrating on a different theme each edition, it aims to present the views of all sides: workers, employers and academics, as well as national, European and international representatives and experts. In this role it will act as a new forum for discussions on issues of major importance to health and safety at work in the EU – stimulating debate and highlighting both differences and common ground.

This particular edition considers cost-benefit analysis (CBA), reflecting the fact that CBA – according to the Agency's report T***he Economic Impact of Occupational Safety and Health*** – is a subject of strong and increasing interest. The use of CBA in the field of safety and health at work raises issues that should not be left only to experts. It requires the involvement of all those who play a role in the improvement of occupational safety and health.

Even in today's rapidly changing world of electronic media, the printed word still has a major role to play in communicating ideas and information. We hope you find our ***Magazine*** of interest and value and would welcome any ideas or comments that might add greater value to this new Agency publication.

EVA BIAUDET
Minister of Health and Social Services, Finland

Foreword

Health and well-being are prime objectives of both individuals and society. Good working conditions are a key element in achieving these goals. Efforts towards the improvement of working conditions in EU Member States continue to form an essential element in all the Union's treaties and policies. It is important that these efforts continue in a determined and unprejudiced way, with a continuing search for new ways of approaching the issues involved. It is also important that the social partners are closely involved in this development work.

Improving employment is currently a primary goal both in the EU and in most Member States. Positive development in the employment situation is built on economic growth and a number of supporting measures now and in the future. The role of health and safety policy in boosting employability has recently become more pronounced, and this must be seen as a welcome development. We must develop working life in order to improve both productivity and individual well-being.

In recent decades, great improvements in working conditions have been made across the EU through better practice, better policy and by exploiting new technology. Many problems, however, still remain and their resolution now calls for more information at the workplace and a greater will to tackle the day-to-day issues involved.

Changes in working and industrial life, and in the needs of companies and their personnel, must be the starting point for further reforms. For example, excessive workloads and pressures are increasingly leading to worker 'burnout'. As the economic importance of working conditions both to society and to individual organisations is more closely examined, issues such as the mental well-being of workers are becoming ever more important.

In the past it was generally accepted that investments in improving working conditions could only be made at times of economic success or in successful companies. Occupational safety and health was seen as an issue of conflicting interests and regarded merely as a cost factor to business and to society. However, society's attitudes to health and safety at work have changed for the better, and today it is apparent that improvements in productivity and profitability greatly depend on good worker health and welfare. Today it is possible to discuss the economic aspects of safety and health more openly than before, in a positive atmosphere and with a spirit of partnership.

A good working environment can be of great financial benefit. Conversely, a better understanding of the economic factors and social costs resulting from a poor working environment can help in developing better OSH policies and safer working practices. In this context, the Agency's major survey of the economic impact of OSH measures is of great value.

Economic factors are important in all decision-making processes. But in decisions about human health and safety issues, ethical and economic requirements often seem to conflict. This is especially true where economic factors are viewed only short-term or in too constrictive a manner. In fact, sound long-term economic thinking seldom conflicts with ethical values.

> *This publication will have made an important contribution to the improvement of safety and health at work if it furthers understanding of the economic importance of safety and health*

The Agency's survey noted that cultural differences amongst Member States led to different attitudes to the use of cost-benefit analyses in drafting legislation. For this reason I think that determining what can be done at EU level in this field represents a challenge. It would not be useful to develop very detailed and widely applicable models to examine what are very complex issues. At the very least, however, we must be better able to describe the main benefits of any measures if decisions are to be made with the consequences of policies fully understood.

Studies in different EU Member States have shown that work-related diseases and accidents cause financial losses that equate to several percentage points of individual gross national products. At a workplace level, losses occur through sick leave, premature retirement and high personnel turnover, as well as through various indirect costs.

It is encouraging that today all partners at the workplace are better aware of these factors. The individual's wellbeing and health is as important to SMEs as it is to larger organisations.

Progress towards improving the mental well-being of workers can be difficult using traditional legislative and supervisory measures alone. Economic motivation may prove a more effective means. This publication will have made an important contribution to the improvement of safety and health at work if it furthers understanding of the economic importance of safety and health. Improved productivity and competitiveness usually go hand-in-hand with good working conditions and a healthy, motivated workforce.

MARTIN DEN HELD

European Agency for Safety and Health at Work

Introduction

The Agency's recent survey on the economic impact of occupational safety and health in EU Member States provided a summary of the many complex issues surrounding this important and constantly developing topic. The report included information about the use of subsidies, financial sanctions as enforcement tools and incentives in social insurance schemes. The issue that probably raised most attention, however, was that of cost-benefit analysis (CBA), its role in decision-making processes and the way the technique is applied in practice, either at national or at enterprise level.

On the issue of CBA, the survey found a great diversity of practice and opinion. It showed, for example, that most national CBA studies include only a limited number of elements on both sides of the cost-benefit equation, often excluding those elements that are difficult to monetarise. On the other hand, it also showed that in some Member States attempts are made to place monetary values on subjective costs, such as pain, grief and suffering.

Furthermore, the report noted a wide variation between Member States in the extent to which CBA is an integral part of the law-making process. Some Member States use formalised CBA procedures while others apply the technique in a far less prescribed way.

Although for a number of Member States in the report there are estimates of the total costs of occupational safety and health as a percentage of gross national product, it must be stressed strongly that these percentages should be compared with caution. They can only be seen as a rough indicator since – as mentioned above – the methods used to estimate these costs differ considerably between Member States. The report recognised this factor as the major limitation in the further development of CBA methodology.

One specific reason why the methods used differ so widely is the difficulty in estimating social costs. What should be included? Early retirement, sickness absence, medical and rehabilitation costs, or even pain and grief? To what extent can they be related to work? And to what extent can they be prevented by intervention?

All these issues are important when it comes to the question of whether the costs of investment are in balance with the reduction in social and other costs. This type of information is needed to decide upon which regulatory measures can be imposed on companies with 'reasonable costs', or whether particular investments are financially advantageous at company level. But even if the issue of social costs could be solved, there are still a number of other unresolved questions. Can we quote all this information in monetary terms? Can technical concepts such as discounting be used? Are we not grossly overestimating the precision of the tools available? And what about the potential economic benefits from technological innovation? We have to be frank and admit that there are important differences in opinions and gaps in our knowledge as to how to deal with all these issues. Cost-benefit analysts have a difficult task, and some even question whether cost-benefit analysis should be applied to occupational safety and health at all.

Because the questions raised generated much interest, the first edition of our new ***Magazine*** is dedicated to an in-depth examination of the subject. Reflecting the diversity of viewpoints and opinions, we have invited a number of authors to contribute. In doing so we have intended to cover all elements that are part of the wide debate on CBA in occupational safety and health. Contributions have been received from representatives of the trade unions, employers' associations and governmental bodies, as well as from scientific experts.

In the first section, on the role of CBA in decision-making, a number of opinions are expressed about the practical purpose of CBA and its potential impact in the decision-making process. Next are presented a number of in-depth articles on the content or practice of CBA. These contributions focus on particular aspects of the development and application of CBA instruments. In the final section several authors describe the limitations of CBA.

health and safety at work: a question of costs and benefits?

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Cost-benefit analysis is too crude a tool to apply to complex OSH issues and results can be easily manipulated to suit the needs of vested interests. Despite its shortcomings however, if systematically improved and applied in combination with professional OSH expertise, the technique could potentially become a powerful tool for improvements in the OSH decision-making process.

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Globalization and the drive towards greater flexibility in employment and production systems have been key factors in the increasing role played by economic criteria in OSH policy-making in recent years. Cost-benefit analysis and cost internalization techniques will continue to feature prominently in this seemingly relentless drive to economic efficiency in OSH, but their application may see a prolonged period of friction between safety and political protagonists.

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KURT-CHRISTIAN SCHEEL

Federation of German Industries, Cologne

An industry perspective

Industry associations and employers in Europe regard CBA as a crucial tool for the drafting of good legislation. They are prepared to take on the additional work which more widespread use of CBA will involve and to support lawmakers at the European level. At the same time, there should be no doubt that they do not see such procedures as ritual exercises, but rather as an important prerequisite for better legislation.

Cost-benefit analysis (CBA) is in fashion. Everybody is talking about it; the European Union uses it; the Member States practice it; and the United States is supposedly the best in the field. Behind this superficial excitement evident in political circles, the subject is a serious one.

If lawmakers, and that includes those in the European Union, are to make good laws, they need at their disposal the best possible information. That includes a clear picture of the social and economic consequences of any given proposal.

What are the consequences for employers and job-seekers if pre-employment medical examinations are prescribed for certain jobs? What are the economic implications if people are obliged to wear heavy respiratory equipment for work in confined places? Who profits from more stringent protective devices on electrical equipment? These are the types of questions to which there are no easy answers.

The debate on how to assess the consequences of new legislation has flared up regularly for several decades. It is evidence of a need to improve both the theory and practice of assessment techniques. In this context the issue of deregulation is an important factor. Industry's concern is that in recent years waves of European legislation have been introduced without sufficient consideration having been given to the economic consequences. Something now needs to be done.

THE CURRENT SITUATION

Industry and employers have a special interest in CBA. Only competitive companies can provide a firm foundation for social prosperity in the EU. Competitiveness requires efficient companies operating under the best possible conditions, and this is where the lawmakers have a duty to perform, and particularly European lawmakers due to the importance of the internal market.

It is now up to the Commission to put the Advisory Committee's recommendations into practice, for example by applying them to its current proposal for a directive on protection against the hazard of vibration

Statutory provisions on health and safety at work may limit entrepreneurial freedom. At the same time they form a basis for sustainable success in company management. Bad laws can result in excessive costs affecting not only industry, through implementation costs, but workers as well. If costs of compliance are excessive, competitiveness is reduced because resources are allocated inappropriately. The result is that less money is available for other, more effective health and safety measures. For example, regulations might require the introduction of expensive technical measures to reduce an exposure where simple organisational measures would in fact be sufficient to bring about the same result.

CBA is carried out too infrequently. At European level methodological discussions predominate and have often been dangerously close to the purely philosophical. On the other hand, there have been few attempts to learn from the experience of others, particularly from the USA where considerable experience exists.

Attempts made at European level have lacked the necessary pragmatism. For example, the European Commission carried out an extensive study of the consequences of the explosive atmospheres (ATEX) worker protection directive. The resulting report weighed in at several hundred pages but has had almost no impact on the legislative process. From industry's point of view, such bureaucratic perfectionism can do nothing but harm.

The fact that in 1998 the European Commission asked the Advisory Committee on Safety, Hygiene and Health Protection at Work to look at the problem is an optimistic sign. After careful evaluation of experience in Europe and the rest of the world, and intensive discussions among the interested parties, the Committee's ad hoc group submitted a draft report, which the Advisory Committee then adopted unanimously. It is now up to the Commission to put the Advisory Committee's recommendations into practice, for example by applying them to its current proposal for a directive on protection against the hazard of vibration.

WHAT NEEDS TO BE DONE?

Essentially, CBA is nothing more than a tool to make good laws. But it cannot provide irrefutable scientific arguments to support a legislative proposal and thereby substitute for political decision-making. Nor can it guarantee optimal legislation.

For example, should society require industry to invest substantial financial resources for specific measures to improve machine safety that are less than 50% likely to reduce the number of workers affected by a particular occupational disease by, say, less than 20%? Remember: the same money could be spent, to give an example, to buy new machinery which would make the relevant companies much more competitive on the world market, resulting in more than 2000 new job opportunities.

This is a question of priorities that has to be dealt with on the political level, and it is the job of politicians, not of experts performing CBA, to bear the responsibility for decisions like these. It is up to scientists and lobbyists, however, to make politicians aware of the context so that their decisions are well-founded.

From industry's point of view, this has a number of consequences for both substance and procedure. The key requirements must surely find support both outside and within industry. They are that the requisite information on the costs and benefits of a given piece of legislation should be available:

- in the appropriate quantity and quality
- at the right time
- to the right decision-maker

Each of these aspects is problematic in some way.

THE RIGHT AMOUNT OF INFORMATION

CBAs must be based on neither too much nor too little data. Equally, it must be possible to evaluate and weigh up the information correctly. Above all, in the opinion of the Advisory Committee, this means that data on the overall economic impact to the economy as a whole on one side, and on the cost for individual companies on the other side should be collected, processed and evaluated separately.

These aspects of a CBA present completely different challenges as regards the methodology of gathering and processing data. The costs of complying with a particular legal requirement (e.g. a new limit value for a dangerous substance) may be relatively easy to determine in methodological terms. However, this is not necessarily the case when the benefits for individual entrepreneurs or the consequences for society as a whole are being considered. Quantifying benefits is a much more complex process both at micro-economic level (the individual worker, the individual company) and as regards the benefits to society as a whole. From the perspective of the economy and the society, it is virtually impossible to put a monetary value on indirect benefits such as the prolongation of life spans of workers.

From the point of view of the industry associations, the collection and aggregation of data on the financial consequences of particular legislative proposals is a crucial area of activity. The associations know their companies best. They are able to analyse draft legislation in terms of its significance to companies and to gather the necessary data in an appropriate manner. The associations regard themselves as the perfect partner for the politicians in this respect.

THE RIGHT TIME

The data required must be available at the right time in the legislative process. When the stage of political compromise begins, those making the compromises must be aware of the figures involved. It is too late to carry out a CBA once a legislative proposal has been submitted to national or EU parliaments. A start must be made on the CBA as soon as a draft text has been produced. The CBA should be refined as the legislative process progresses.

In this context, the Advisory Committee has proposed a two-stage model for a 'social and economic assessment' procedure that provides for the allocation of time and expenditure on CBA according to the importance and complexity of the legislation in question. According to this procedure, the official responsible for a proposal should prepare a rough analysis at an early stage. The support of the industry associations and other affected parties would be immediately available for this preliminary assessment. Only once draft legislation has progressed and the rough analysis has shown the potential impact to be significant, should a more comprehensive assessment be conducted, based on scientifically sound data.

What is essential, above all, is that the final social and economic analysis should be discussed openly and intensively, with the involvement of representatives of the industry concerned and of workers in that sector. No legislative plans should be so urgent that there is no time for proper discussion and reflection.

AVAILABLE TO THE RIGHT PEOPLE

The data used in the legislative process must also be available to the right people. It is not decisive whether competent authorities themselves compile the necessary data, as occurs to some extent in the UK, or whether there should be a special office in Europe, comparable to the Congressional Budget Office (CBO) in the US. What is important is that officials who draft regulations on the protection of workers' health gain an understanding of the costs that they are proposing to impose on the sector concerned. At least for the rough analysis, they are most capable to collect the data needed. Here too it is important to remember that the further the legislative process progresses, the greater the need for dialogue. It cannot be stressed too strongly that the figures used in a CBA must be discussed openly with representatives of all employers, employees and national enforcement bodies concerned. This is the only way that the desired political acceptance of European occupational health and safety provisions can be ensured. This also means that the methodology used, and the data on which a CBA is based, must be presented openly and discussed where necessary. Nobody should be able to boast that they are in possession of the definitive data – the only true figures. Such an open debate also ensures that there can be no hiding of political responsibility for particular measures behind a cloak of pseudo-scientific reasoning.

CONCLUSION

Industry associations and employers in Europe regard CBA as a crucial tool for the drafting of good legislation. They are prepared to take on the additional work which more widespread use of CBA will involve and to support law-makers at the European level. At the same time, there should be no doubt that they do not see such procedures as ritual exercises, but rather as an important prerequisite for good legislation. Occupational safety and health is a perfect area in which to develop and refine the procedure.

ANGEL CÁRCOBA

Confederación Sindical de Comisiones Obreras, Madrid

Whose costs? Who benefits?

Cost-benefit analysis does not help in dealing with risks which are expensive to eliminate or mitigate. The technique can only be acceptable when minimum regulatory standards are implemented, they are enforced through a harmonised system of sanctions across the EU, and employers are penalised when accident costs are externalised.

The current interest being shown by both European governments and the EC in the costs and benefits of OSH measures reflects a number of issues. As trade unions, we fear that official EU lines of argument in this area are based on a concern more for economic costs, rather than social costs. One example is the Agency's report entitled Economic Impact of Occupational Health and Safety in the Member States of the European Union whose title and content both reflect a greater concern for economic strength than for the health of workers.

This is not an isolated example. In the early 1990s there was a strong shift in the EU towards deregulation, based on a lack of confidence in the State. Governments were held to have been responsible for most economic ills, having been assigned the task of smoothing the way towards a market economy and eliminating any 'rigidities' in the system. This was based on two fundamental premises affecting both public and private sectors:

- Health and safety standards were an increasing economic burden
- The inspection and penalty system was ineffective and costly

The conclusion was that regulatory standards should be replaced by a mechanism enabling companies to manage the costs and financial benefits of OSH matters internally.

It was against this background that the Molitor Group was created with a view to adapting Community law to the needs of competitiveness and employment. The Treaties of Maastricht and Amsterdam later upheld the principle that the legitimacy of legal provisions should first and foremost lie in their economic efficiency. Any provisions should therefore be subject to a cost-benefit analysis demonstrating their positive impact on the development of the economy.

To quote from the literature:

"If it were to be accepted that economic expediency should take precedence over standards, the right to work would become meaningless and lose its raison d'être". (Vogel, Sanchez Pego).

This situation leaves a number of questions unanswered. For example, if a company can show that a set of health and safety standards has a negative impact on competitiveness and employment, would failure to comply with these standards then be justified, even if this were to result in illness and death?

CONCEPTUAL PROBLEMS

CBAs are based on a series of conceptual principles calling for a minimum level of consensus. In discussing costs and benefits, the question must be asked who pays the costs and who obtains the benefits? The same is true for acceptable risks. Acceptable to whom? The degree to which risks are acceptable will not be the same for the manager of a company handling carcinogenic substances as for a worker exposed to such substances.

If CBAs are to be implemented effectively, a minimum degree of consensus must be reached on a host of concepts relating to health, risk, accident, illness, cost, benefit, assessment, planning, prevention management, training and information, worker consultation and participation, etc. In addition to the problems of definition and conceptual principles, there is also the question of methodological limitations and the reliability of preventive management indicators.

SOME LIMITATIONS OF CBAs

Quantifying economic costs would not seem to be the most direct route to prevention. Although investment in prevention is a legally and socially-acceptable alternative, it is not the only option available to managers.

For companies that do not comply with the statutory minimum requirements, the prime motivation for prevention must not be the cost of accidents. Failure to comply with minimum standards could, for example, lead to the closure of a company where the cost of any damages would be higher than the benefits to the company. This poses the problem of establishing a ceiling. How many work-related deaths or illnesses would there have to be before a company is closed down? No purpose can be served by CBAs without compliance with the standards.

Secondly, CBAs take no account of social factors, which are difficult to quantify but of key importance in work-related accidents and illness. Sufficient proof exists to establish a relationship between work-related accidents or illness and such factors as seniority, age, sex, the type of contract being worked or whether subcontracting or outsourcing is involved. For example, how can CBAs be applied to a company with a permanent staff of a few hundred workers, but with

perhaps thousands more contracted, subcontracted, with temporary employment contracts or with contracts for specific tasks? Almost all accidents and illnesses involve workers under such contracts.

This brings us to the problem of externalisation of risks, and therefore of costs. Companies pass on to society the costs of any accidents and illness involving workers with atypical contracts, in most cases without paying compensation. In the case of the self-employed and home workers for example, these costs are often passed on to the grey economy. Employers also avoid providing compensation for intangible costs, such as suffering, chronic pain, disability and decline in life expectancy.

Given this background, one of the prerequisites for any CBA system should be the internalisation of costs through the introduction of penalties or compensation for any externalised costs, based on the principle that those responsible for the risks should be liable for the consequential costs. The penalty would equate with the social cost incurred.

The methodological limitations of CBAs have been analysed extensively. Suffice to say effective preventative management is impossible using existing health and safety indicators. It is impossible to estimate the costs and benefits of something that is unknown. We are currently acting without 'officially' knowing what leads to the illness and death of European workers.

SOCIAL COSTS

It is generally acknowledged that health, welfare and quality of working life are all social assets and from a trade union viewpoint it is unacceptable that they are not accounted for in CBAs. Whilst there are methods which attempt to quantify costs in terms of human life, costing something as intangible as suffering, illness and death is an imprecise science.

Would it be acceptable in today's society for the death of a business executive, an artist, a footballer or a banker to be a daily occurrence?

It is difficult to put a figure on the suffering of victims of occupational accidents and illness, and of their families. Neither can intangible damage be measured – loss of career prospects, falling behind at school, poor diet, changes in emotional and sexual life, the feeling of insecurity within the sectors most at risk, etc. One model that may assist in understanding these social dimensions is based on the analysis of potential years of life lost (PYLL).

All these factors serve to reinforce social inequality. This begs the question: Would it be acceptable, in today's society, for the death of a business executive, an artist, a footballer or a banker to be a daily occurrence? In considering the question of acceptable risk, the fundamental questions remains: to whom is this risk acceptable?

CONCLUSION

There is incontrovertible proof that occupational accidents and illness give rise to a number of 'hidden' economic costs, both for companies and for public funds. This is not a matter of indifference to trade unions who advocate an in-depth examination of these issues. However, the importance of the social impact of the 6,000 or more deaths and several hundred thousand illnesses per year in the EU resulting from poor working conditions must be put on the same footing as economic costs. It seems clear to us that companies need to introduce targeted cost-benefit management systems. Of even more importance is management aimed at improving working conditions with quality criteria compatible with the need for competitiveness.

Clearly CBAs cannot substitute for company health and safety programmes. In cases where preventive systems fall down, i.e. where a company has failed to comply with existing standards, the penalty system should come into operation. This is where Community institutions and EU governments have failed to listen. Standards as regards prosecution and penalties for OSH offences must be harmonised at EU level. Increasing demands for civil and criminal liability to be incurred by individual companies will be an important factor in internalising costs within those companies, thereby reducing the social costs.

Trade unions must now take up the challenge and participate fully in the debate on CBAs, adopting a clear stance in favour of better prevention rather than increasing penalties.

Prevention of accidents and illness would not only prevent enormous suffering by workers and their families, thereby removing one cause of social inequality, but would also genuinely uphold the rights of individuals within companies.

Any CBA techniques however are no substitute for a combined approach to OSH issues involving corporate liability, statutory instruments, worker consultation, monitoring and penalties. This serves to underline the vital roles to be played by both public and private sectors in improving working conditions across Europe.

WILLIAM HUNTER
European Commission

towards better OSH legislation

It is clear that preventive activity in the workplace can pay real dividends. Total direct costs of work accidents and diseases in Europe in 1991 (i.e. compensated injuries) were around 26 billion Euros. Danish and UK national studies that also took account of indirect costs (such as the cost of sickness absence to employers) were consistent with this figure (representing 1-3% of GNP). There are further negative effects on productivity etc, which are difficult to measure.

Economic and social progress are indissolubly linked. The single market is the backbone of economic integration within the Union. It was created to bring about the benefit of a large market to European companies, thereby increasing European economic growth, improving overall competitiveness and raising standards of living. Without economic growth we will not achieve improved living standards and consequently our health and social policies must contribute to and complement that objective. But if economic growth is to achieve its ultimate purpose and increase human well-being, it must also take into account social and environmental concerns.

High social standards are far from being a burden; they are a productive factor, a key element in the competitive formula. For instance, if we examine occupational health and safety we can see that it has an important contribution to make to economic performance on a number of levels, irrespective of humanitarian arguments.

There are firstly the direct and indirect financial costs, at societal and enterprise level, which result from not managing health and safety; costs we cannot afford. There are the positive benefits that well-managed health and safety bring to enterprises – promoting efficiency and effectiveness, enhancing quality and reliability programmes, improving public image, promoting productivity and innovation.

Equally important for us is to view health and safety in the context of the internal market. The provision at European level of minimum health and safety standards ensures that low standards cannot be used to gain unfair competitive advantage. They create a level playing field for competition, increase the transparency of the market and contribute to avoiding distortions in competition.

Looking first at the cost of ill-health and accidents, the money paid out each year as a direct consequence of work accidents and occupational diseases throughout the Union was estimated in 1991 at ECU 26,000 million. This does not include indirect costs but is the amount paid out in compensation for the 7,600 deaths due to occupational accidents and the nearly 10 million workers otherwise affected by accidents or diseases at work.

This is a somewhat crude estimate and grossly underestimates the true costs, both because of underestimation of occupational disease figures and because it relates only to direct compensation. It nevertheless gives an indication of the kind of figures we are talking about.

To reach a better understanding of the full financial implications of occupational ill-health, we have to turn to studies carried out at the national level. Studies in Finland, Netherlands, Germany, Denmark, UK and Sweden have examined the extent of work-related injuries and estimated their costs. The results fully support our belief in the importance of health and safety. Some details from a 1996 report on 'The costs of work-related diseases and work accidents in Denmark' illustrate this. The results are consistent with other studies.

The authors of the Danish study calculated that poor work environments account for about 20% of sickness absence; and that approximately 7,500 persons are forced to retire from the labour market every year because of work-related ill-health. Such figures should be of major concern. Europe cannot afford to lose so many people from the labour market. We are dependent on their skills and financial contributions to the economy. The socio-economic costs of work-related illness in Denmark were estimated to be 3 billion Euros, that is 2.7% of GNP. The results compare with a recent UK study which estimated the economic resource costs of preventable accidents and work-related ill-health at 1-2% of national output.

What is evident from these figures is that the consequences of accidents and work-related ill-health, when expressed in broad socio-economic terms (rather than in terms of official accidents and disease statistics) are so significant that workplace preventive measures can be expected to pay real dividends.

For instance, when the economic costs attributable to different categories of work-related ill-health are compared, musculo-skeletal disorders are seen to be the most significant OSH problem, accounting for over 30% of total costs of occupational accidents and work-related ill-health. One fourth of total costs relate to psychological disorders and cardiovascular diseases (estimated conservatively from epidemiological studies). Only 13% result from work accidents. This information is vitally important if we are to be confident of targetting efforts where most needed. It shows that whilst traditional health and safety issues still require attention, if we are to successfully improve health and safety we must also focus on issues such as manual handling, repetitive strain injury, stress at work.

In addition to these 'macro' studies at national level, a number of studies have been carried out at enterprise level. One interesting UK

study examined five organisations employing between 80 and 700 people, with average or better-than-average health and safety performance in their industries. Over a period of 13 weeks all accidents were examined, including non-injury incidents which lead to damage or loss of property, plant or material, environmental damage, or a loss of a business opportunity.

Accident costs accounted for 14% of potential output on an oil platform, 8.5% of the tender price on a construction site, and 1-5% of operation costs in the other organisations. Opportunity costs made up two-thirds of the costs of injury accidents, and one third of non-injury accidents. Non-injury costs amounted to between three and ten times the cost of accidents with injuries.

The conclusions that can be drawn from all these studies are:

- that the costs borne by society as a whole arising from accidents and ill-health at the workplace justify public regulation for workplace health and safety
- that poor health and safety performance has a detrimental effect on the economy, and on individual enterprises
- that our recent efforts to focus attention on issues such as stress and musculo-skeletal injury are entirely justified.

These studies were only concerned with assessing the direct economic costs of accidents and ill-health. They did not attempt to estimate other consequences of poor and unsafe work environments. Yet the consequences of poor product and service quality, low productivity and poor industrial relations, and the benefits of their avoidance, are likely to be of great economic importance. These components can only be quantified in case studies in individual enterprises, few of which have been carried out.

Effects on productivity and performance are difficult to measure. It is easier to measure the cost of accidents and ill-health than the benefits of their prevention. But it is in these areas that the Commission is funding major research. 'Organisational health' extends beyond a simple analysis of the profit and loss account. Profitability is an indicator of the success and financial health of an organisation at a specific, and hence in accounting terms, historical point in time. However, it is not necessarily a good predictor of future performance if account is not taken of the ability of the organisation and its workforce to sustain performance. We anticipate that the Commission's future programme of work will contribute to the development of research methodologies and improved understanding of this area.

NEW EMPHASIS IN COMMISSION'S PROGRAMME

The need for public regulation of health and safety was clearly recognised in 1987 with the adoption of the Single European Act (SEA) when Article 118A was added to the Treaty. This Article requires Member States to pay particular attention to encouraging improvements as regards health and safety of workers and sets them the objective of harmonisation of conditions in this area. The objective was to be assisted by means of directives setting minimum requirements.

This resulted in a major review of existing European legislation and a simplification, consolidation and integration of the provisions of those texts into the more rational structure and general prevention philosophy of the newly adopted legislation based on Article 118A of the Treaty. Article 118A states that the measures adopted should avoid imposing administrative, financial and legal constraints that hold back the creation and development of small and medium-sized undertakings. As a consequence, every proposal put forward by the Commission is accompanied by an economic impact study. The Commission has thus tried to ensure that its legislation does not impose unnecessary burdens on industry. That is why we are currently engaged in work to improve the quality of these studies: to develop an agreed, precise methodology that can be applied in all Member States and that will consider both the costs and benefits which may accrue from new legislation. However, I must emphasise that the Commission considers such analyses to be an aid to decision-making, not a substitute for it.

Another aspect of the legislative process under the SEA is its consultative nature. A tripartite body has been formally established, with representatives of government agencies, employers and employees from each Member State, which considers new proposals at an early stage and advises the Commission. This is invaluable for ensuring a balanced approach. Other provisions ensure that EU legislation is balanced and equitable: directives are adapted to technical progress and there are regular reports by Member States on their practical implementation, including the views of both sides of industry.

The essential principles of health and safety at the workplace having been established by the framework directive adopted by the Council in 1989 and the subsequent directives, there has been a shift in emphasis in the Community's OSH programme for 1996 to 2000 away from the previously legislation-driven approach. A major focus of the current programme is the consolidation and implementation of existing legislation. Legislation has to be enforced effectively and impartially in all Member States and to this end the Commission is evaluating the implementation of directives and in selected cases their socio-economic impact on the different Member States. The Commission has established a Committee of Senior Labour Inspectors to improve mutual understanding of the different national systems and practices, to exchange information and enforcement experiences and to develop training modules for inspectors.

The Commission is giving greater priority to information education and training and giving particular attention to small and medium-sized businesses. In this context the European Agency will be a significant source and provider of information at the European level, giving the Commission an improved basis for its activities.

Our intention in Europe in the next few years is to ensure that occupational health and safety remains as important an issue in the next century as it has been in this. The Commission will work together with Member States and the social partners to identify the priority issues for the forthcoming years and to develop the strategies to tackle them. Concentrating our resources and efforts on specific themes will, we believe, generate a clearly visible, added European value to our work.

CONCLUSION

The European Commission is encouraging the development of research methodologies to improve understanding of social and economic considerations in the development of health and safety legislation. Drafting EU occupational safety and health legislation remains an important activity, but the Commission's resources are being concentrated on specific themes which will generate a clearly-visible, added European value to our work and ensure that EU legislation does not impose unnecessary burdens on industry.

NICK HALLETT
Health and Safety Executive, London

The UK experience

A look at the role of cost-benefit analysis in the decision-making processes of the UK health and safety agency. Even though the idea of placing monetary value on human life may appear morally unacceptable, this is done implicitly whenever resources are allocated to reduce the risk of fatal accidents. Final judgements about expenditure to reduce specific risks are in many cases unavoidably political, with CBA informing but not determining decisions.

The methods of cost-benefit analysis (CBA), and the different scope of the application of these techniques at company and national level have been discussed in earlier articles, as have a range of critical observations. This article will not repeat the detailed discussion of how CBAs are carried out, but describe the role of the technique within the decision-making processes of the UK's Health and Safety Commission and Executive (HSC/E).

In the summer of 1998, the UK Government published new guidance on the form of assessment that must be carried out for all regulatory proposals that lead to new legislation. The Prime Minister's Foreword to this document[1] sets out the key requirements of such Regulatory Impact Assessments (RIAs):

"The Assessment should include a clear statement of the objectives of the regulatory proposal and its likely effects. It should demonstrate that the proposal is the most effective means of meeting the stated objectives, set out the costs and benefits of the proposal, and identify who will be affected."

Risk assessment is a fundamental part of this process, identifying the scale of the problem being addressed and the likely benefits of the proposal. It must also be demonstrated that the best of a range of options is being proposed. Costs and benefits should be clearly identified, as should the distribution of the effects of the policy within society. Environmental impacts must be taken fully into account. The approaches adopted by the Health and Safety Executive (HSE) for assessing, managing and regulating risks are described in a recent Discussion Document.[2]

RIAs thus provide a CBA of proposals, as well as the detailed background to them. The format and technical requirements for CBAs are set out in HM Treasury's ***Green Book***[3] which ensures a consistent approach across Government Departments to definitions of costs and benefits, and to the weighting of current and future effects through discounting.

EVALUATION OF HEALTH AND SAFETY BENEFITS

The HSC/E has undertaken CBAs of regulatory proposals since 1982. There has been a belief within UK Government Departments that explicit monetary valuation of the reduction in the risk of death, injury and illness, which are the ultimate objectives of health and safety measures, should be developed to compare with the costs of implementing such measures. A variety of methods has been used to estimate values for the willingness of individuals to trade off increased wealth against reductions in the risk of particular outcomes.

CBA is an effective tool to inform policy decisions, but we should not pretend to a greater precision than the available information allows

It is a widely held view amongst economists that the monetary values apportioned to health and safety factors used in economic analyses should reflect the attitudes of those affected by the risk reduction measures under consideration. HSC/E has used the Department of the Environment, Transport and the Regions' figure for the 'value of a fatality prevented' (VFP) as a basis in such analyses. Adjustments are made as necessary where people may be more averse to particular types of risk. The same approach can be used in dealing with non-fatal injuries and ill-health. Valuation of these effects can take account of health economics research into the effects on individual well-being of differing severity of injury or health impairment.

To many, the idea of placing a monetary value on human life and health seems morally unacceptable. Clearly no sum of money could fully compensate for tragedies affecting one's own family. In considering any new safety measure however, the ensuing benefit represents a small and marginal reduction in the risk of death, injury or illness to a group of people, rather than to the lives of identified individuals. It is therefore more appropriate to use the term 'value of a fatality prevented' rather than 'value of a life', which is particularly misleading in this context.

Individuals frequently make trade-offs between risks and benefits in terms of time, convenience and money. Such choices are also inevitable in society as a whole, and when political decisions are made it is impossible to avoid valuation. Any decision in the health

and safety field to introduce a policy that reduces risks of fatalities at a particular cost has an implicit VFP, which represents the views of the decision-maker. The decision to reject an alternative policy indicates that the implicit VFP in this instance must be lower than the cost per fatality avoided.

The use of explicit monetary valuations helps:

- make the decision-making process transparent
- base decisions on individual preferences about risk, and
- achieve consistency in decisions over time and between different types of workplace.

The costs of inconsistency are not merely theoretical. If scarce resources are allocated to areas where risks are low and where the effectiveness of funds spent is limited, lives may be unnecessarily lost and individuals' health damaged.

FORECASTING COSTS

Regulators often face what is sometimes referred to as 'informational asymmetry' in dealing with those they regulate. For example, in discussions about proposed health and safety measures, companies will have much information about industry requirements in order to comply with particular proposals. Information on the costs of compliance is available from the industries affected, via trade associations and through individual businesses.

These data must be critically assessed by the HSE, drawing on the expertise of its inspectors and other relevant technical disciplines. Full consideration needs to be given, for example, to issues of the indirect benefits of any improved technology, or cost reductions perhaps arising through increased production of safety equipment. External consultants are often engaged to study particular areas in estimating the likely true cost impact of proposals.

Information about the accuracy of a CBA, and the validity of the approaches taken, is assessed through subsequent evaluation. For regulations expected to produce significant costs and benefits, HSE (or its external consultants) usually carries out an evaluation to assess whether the new proposal is effective in meeting its objectives, and whether the cost and benefit estimates are in fact realised.

THE IMPORTANCE OF CONSULTING STAKEHOLDERS

The most important check on information and analysis contained in an RIA is the process of consultation in which HSC/E engages during the development of health and safety proposals. The UK system is based on the view that effective regulation of health and safety must be based on the full participation of employers, people at work and their trades unions, local authorities and other interest groups.

These stakeholders are involved at the early stages of policy development and in the formulation of any RIA. Drafts will typically be circulated to interested parties before the formal period of consultation begins, and significant changes may be made at all stages as a result of comments received.

The aim is a shared process of clarifying options and agreeing the likely impacts of these options on both the cost and benefit sides. If this process is successful, the outcome is a shared and agreed assessment, not an imposed and 'technocratic' judgement.

THE ROLE OF CBA IN DECISION-MAKING

The RIA system is a fundamental part of the decision-making process in the UK. The Government Minister responsible for a proposal signs a declaration that, having considered the RIA, "I am satisfied that the balance between cost and benefit is the right one in the circumstances"[1].

The CBA informs, but does not of course determine the decision in any inflexible way. A particular numerical relationship between the quantified elements of the analysis is only one part of the picture. Important aspects that cannot meaningfully be quantified must also be considered. There may be key issues of fairness related to the distribution within society of the costs and benefits of individual proposals. The social and political consequences of decisions with low probability outcomes but with extreme repercussions may be critical in some areas. Where baseline levels of risk are extremely high, close to levels which society would regard as intolerable, disproportionate costs may be viewed as acceptable to achieve reductions in risks to individuals affected. Such judgements are unavoidably political.

CONCLUSIONS

CBA is an effective tool to inform policy decisions, but we should not pretend to a greater precision than the available information allows. There may be honest disagreement about how, or even whether, to value human effects where no direct valuations are available for observable monetary costs. It is essential that the process of producing an RIA should be open and transparent and that the information and assumptions used in any CBA should be available to anyone who wishes to replicate the results or to change any assumption. Inevitable uncertainties should be recognised and carried through to the results, which should give ranges of outcomes rather than point estimates. Perhaps most importantly, these techniques should be applied early in the process of policy development so that where there is a range of feasible options, all are considered. The CBA approach should facilitate rational choice, it should not function as an ex-post justification for a decision reached on less defensible grounds.

The RIA system, and the process of CBA which is a vital part of it, does allow a more transparent and consistent approach to decision-making, with clarity as to the value judgements and assumptions used. There are still difficult technical and indeed ethical questions that arise in the application of CBA techniques in the health and safety area. The techniques, however, do provide a framework and an approach within which meaningful discussions about objectives, options and constraints can be pursued. Problems remain, and improvements still need to be made, but these techniques can provide a systematic and open assessment of costs and benefits without which the quality of decision-making must inevitably suffer.

REFERENCES:

1 *"The Better Regulation Guide and Regulatory Impact Assessment"*. Cabinet Office Regulatory Impact Unit; 1998.

2 *"Reducing Risks, Protecting People"*. HSE Books; 1999. Available on the Internet at: http://www.open.gov.uk/hse/condocs/dde11.htm

3 *"Appraisal and Evaluation in Central Government"*. Treasury Guidance, The Stationery Office; 1997

JANET ASHERSON
Confederation of British Industry, London

a two-step approach

The role of cost-benefit analysis and other economic assessment tools as an aid to better regulation is now generally accepted. A two-stage social and economic assessment process for EU-level regulations is proposed, whose application would improve upon the performance of limited economic impact assessments carried out on draft EU legislation in the past.

Since the end of the Second World War, regulatory intervention in the affairs of private citizens and business has increased dramatically at both Member State and European level. While in practice the costs to companies and individuals of complying with new regulations have been substantial, their drafting has taken no account of their own impact on competitiveness. In today's global business arena, excessive or poor quality regulation can undermine business competitiveness, which ultimately lowers living standards and employment prospects. It is thus essential that any regulatory framework is robust, targeted and relevant.

All levels of government need to manage the regulatory process more effectively to balance enhanced social protection and sustainable economic development with improving living standards and increasing employment.

THE ROLE OF CBA

Economic appraisal techniques such as CBA have a fundamental role to play here. In the context of public administration, CBA is one of many management tools used by governments to improve the quality of legislative and regulatory decision-making. It is an empirical approach that systematically examines selected potential impacts of government action, and communicates its findings to decision-makers. It takes many forms: some countries assess administrative and paperwork burdens, while others look at wider business impacts or use techniques based on social welfare theories.

In all cases, CBA provides a framework for identifying and quantifying in common monetary terms all the desirable and undesirable consequences of a given activity from the viewpoint of society as a whole. However, since the costs and benefits of any action generally fall upon different parties, with compensation arrangements at best imperfect, there are important distributional questions involving judgements that cannot be decided by economic criteria alone. For these reasons, and because the calculations are subject to substantial margins of uncertainty and error, CBA results can form only one input into the decision-making process.

CBA is an adjunct to good decision-making. Used effectively to assess the impact of any state activity it can:

- create awareness
- widen the range of factors considered
- ensure a rational and empirical approach
- clarify assumptions
- create transparency
- enhance consultation and participation.

The application of CBA presents many technical challenges, since calculating and estimating the distribution of costs and benefits across business is fraught with difficulties. For example in specific areas, such as the opportunity costs of regulation (e.g. the cost of loss of competitiveness), benefits are difficult to value. However, this should not be an obstacle to the general introduction of rigorous methods of analysis. If CBA is going to help decision-making, the impact of regulations on competitiveness must be fully understood and the consultation process must be effective and transparent.

There are three key ways that CBA might be used to ensure a better regulatory framework:

- retrospective application to existing legislation, which could help refine methodology by identifying any flaws in initial assumptions
- application to decision-making for existing legislation, which could influence the attitude of enforcement authorities
- assessment of future legislation, which could be used to help justify European-level interventions.

RECOMMENDATIONS FOR ACTION

The need for the systematic application of CBA to European Commission proposals for EU legislation has been recognised by European institutions, advisory groups, trade associations and Member States. Much work has been carried out at both European and national levels on ways to ensure the fitness for purpose of new legislation. However, it is recognised that a single methodology is unlikely to cover all cases, unless defined in terms of very general principles.

There is much to learn in this area where currently differing experiences at both national and issue levels do not give a consistent or complete picture. It is therefore important that a unit is established at European level to appraise all legislation competently, transparently and in consultation with appropriate interests, so that stakeholders are aware of the basis on which decisions are made.

Consideration has already been given at European level to the development of social and economic appraisals (SEAs) to examine the impacts of health and safety legislation. These appraisals are forms of CBA which attempt to take account of subjective and societal factors. They are broader in their approach than the simpler economic impact assessments used in the past for proposed directives and found unsatisfactory by employers, workers and governments alike.

Different legislative and political traditions have led to differences in approaches to SEAs, and individual national experiences need to be studied closely. Reliable sources of data, and their scrutiny by the social partners, are vital to the acceptability of the process. It is essential to consider all effects of proposed legislation, to perform a thorough technical and legal analysis and to examine proposals in the context of other regulatory, voluntary or economic incentives.

It is important that a unit is established at European level to appraise all legislation competently and transparently, and in consultation with appropriate interests

The aim of transparency is best served if each new proposal is analysed at as early a stage as possible. The costs and benefits to businesses, to individuals and to society should be treated separately to re-cognise their individual methodological needs. The choice of a baseline (from which additional costs can be measured) and of any assumptions made should be transparent, and their relevance to the results made clear. This will permit a 'learning by doing' approach and will also encourage consistency. Different pieces of legislation will require different factors to be taken into account, particularly in accommodating individual national legislation and social traditions. A balance has to be struck on a case-by-case basis between comparability of national assessments and flexibility to take account of these national particularities. In most cases, however, a harmonised set of assumptions, together with a common methodology, might be necessary.

It is suggested that SEAs should be prepared in a two-stage process. The first should provide rule-makers with a rough guide to the associated costs and benefits. This should be prepared by the Commission service responsible for drafting the legislation, in consultation with the relevant national authorities, as soon as a proposal is adequately defined. The proposal and its analysis should then be evaluated in consultation with the social partners, who should advise the Commission whether a second-stage analysis need be made before the proposal is taken further.

The Commission should move to a second-stage analysis only if the first-stage showed major cost effects or high levels of uncertainty about the possible benefits. For the second stage, more data from companies would be gathered and a more thorough analysis of possible benefits made. This should include consultation with national authorities and social partners on possible interpretation of the text being analysed. External consultancies could be involved to gather national data and assure its quality and comparability. The detailed methodology could be developed on a case-by-case basis. Qualitative descriptions might be sufficiently precise to inform the debate in some cases. Important uncertainties recognised in the first stage could be the subject of sensitivity analyses in the second.

CONCLUSION

Reform of the regulatory process is necessary. Mechanisms by which regulatory decisions are taken must be made more cohesive and supportive, while delivering consistency at the various legislative levels. CBA techniques, such as the social and economic assessment concept discussed above, can play a useful role in structuring effective and targeted health and safety legislation. They can inform the European political debate on the costs, which most often accrue to enterprises, as well as on the benefits for society. They create transparency without substituting political responsibility and they can help ensure that intervention is justified, that the resulting benefits exceed costs and that the quality of regulation is optimised.

SEA: first-stage of analysis* should cover:

- The aim of the proposal and possible compliance measures
- The expected benefits in terms of :
  1. Shorter term: lives saved and injuries or accidents avoided (micro-level)
  2. Longer-term: ill-health risk reduction (macro-level)

  Quantitative data should be given where possible. Monetarisation of all benefits is unnecessary
- The expected additional costs in terms of:
  1. Necessary investments
  2. Administrative costs

  Data should be quantified and based on the professional judgement of the official responsible for carrying out the evaluation
- A limited and probably qualitative sensitivity analysis of all data, including any indications of unintended effects on risks at work

* This first stage analysis should normally not exceed five pages

SEA: second-stage analysis should cover:

- A detailed description of the measures to be taken, including specification of the baseline for the analysis
- A detailed interpretation of what is required from the proposal
- Descriptions of different national situations in some countries with typical relevant structural features
- A description of technical, organisational or other measures required to be taken by employers
- Any identifiable employability effects
- A detailed, and if possible quantified, analysis of the benefits in terms of:
  (a) employee: the health and wealth of individuals
  (b) employer: productivity gain, damage avoidance, loss of production
  (c) society: reduction of ill health, avoidance of health care costs
- A detailed survey of costs to the employer: direct, indirect and administrative costs; current and capital expenditure on short and long-term compliance

PER LUNDE-JENSEN

Danish Working Environment Authority, Copenhagen

The case of the chemical agents proposal

Those aspects of legislative proposals that are most amenable to intra-EU comparisons may not be the ones that have the greater economic or social impact. The case of the economic impact assessment on the 1992 EU proposal for a worker protection directive on chemical agents is quoted as an example. Only a few meaningful inter-State comparisons could be made, and then only on a qualitative basis.

The impression is often given that economic analysis of the impact of OSH legislation is only concerned with prices, statistics and mathematical models. My own practical experience of such analyses at national and EU level, however, has indicated that the most important task is to define the problem correctly. To achieve this requires a thorough examination of the legislation involved, and though the quantification of costs is important, it is by no means essential to the success of any such analyses. Neither the analyst nor the Member State can be expected to reach a definitive conclusion on the economic impact of each and every article in a proposal.

Any such analysis of health and safety directives is a comparison of at least two different positions. The first maintains existing legislation and the workplace practises that are in compliance with it. It is the baseline where enterprises are burdened with certain specific OSH-related costs, e.g. re-investment in equipment and various recurring costs. The second position accounts for the consequences of any new proposal and reflects additional costs to the baseline level. Only additional costs to that level should be considered as consequences of the proposal.

The baseline is defined by a combination of:

- legal text analysis, at both EU and national level, and
- current work practice data, collected from individual Member States.

EU-LEVEL LEGAL ANALYSIS

The process of defining the baseline starts with a legal analysis to identify the key provisions in any new proposal, compliance with which would extend the OSH requirements of business. Such provisions may arise from reformulated articles in existing legislation, amendments to lists of equipment and agents covered or extensions of target groups.

The process was applied to proposals for the 1992 EU directive on the protection of workers from the risks related to chemical agents at work. These included new or extended requirements for business and suggested:

- workplace assessments on chemicals should be carried out by competent persons
- such assessments should also be carried out by the self-employed
- inventories should be kept of all chemicals in use (i.e. not only dangerous chemicals)
- other general preventive and protective provisions be introduced
- mandatory health surveillance be carried out of all those working with all carcinogens and other specified chemical agents
- written instructions be available for workers, for individual chemicals.

Similar or identical articles could be found in existing EC directives: the Framework directive 89/391, the Carcinogens directive 90/394 and the Data Sheet directive 91/155. A legal comparison of target groups, agents covered and other provisions revealed that OSH requirements for business under the new proposals would be extended. Their impact would be limited if written instructions were only required for agents covered by the Data Sheet directive. However, extending the requirement to, for example, low volume chemicals and cosmetics (exempted from the Data Sheet directive) would have considerably greater impact, as both the number of agents and the cost per agent would increase.

Certain articles in the proposals ('written instructions' and 'workplace assessments') were subject to varying interpretations as to their impact when compared to existing directives. Consideration of these cases was included in the subsequent data collection process, to allow Member States to comment on individual issues.

NATIONAL-LEVEL LEGAL ANALYSIS

Though most proposals for new directives have already been discussed with national authorities before their own economic analyses, systematic documentation on the level of regulation in individual Member States is unavailable in most cases. National health and safety authorities were therefore asked around 20 additional questions on the coverage of their existing national legislation. The purpose was to establish national baselines and add some national perspectives on the administration of individual provisions, which are often linked to individual national regulatory practises.

At the time of the 1992 proposals, the body of EU safety Directives was being extended rapidly and some Member States had not fully implemented the Framework and Carcinogens Directives. For this reason, national baselines could not be defined precisely. Deciding on an implementation strategy for the new provisions probably also

requires more time than was allowed by the questionnaire procedure. Thus the provisions on 'competent persons', 'written instructions' and the general preventive principles could not be specified sufficiently to allow for economic analysis. This seems to be a general experience.

The legislative data collected was presented in a table summarising each Member States' legislative profile. However, in answer to the questions 'Covered by existing provisions: yes/partly/no?' the significance of a 'no' entry would be different in individual Member States, depending on the interaction of existing national rules with the new provisions. For example, in dealing with 'Mandatory health surveillance of workers working with carcinogens', most countries apply the classification from the relevant EC directive. However Italy, the Netherlands, the UK and Denmark include, to varying degrees, agents classified by IARC and thus the impact of the proposal would be greater in these Member States.

NATIONAL WORKPLACE DATA

This part of the process should provide reliable data on:

- present levels of protection
- realistic solutions
- associated costs, e.g. prices of additional equipment or services.

Cost information without data from the first two is generally unreliable, and always assumes that each responding company interprets both the existing and the proposed legislation correctly and consistently.

Workplace data can be obtained from national surveys carried out for other purposes, or can be collected through specific case studies or industry surveys. Up till now, OSH impact analyses made for the Commission have used company data from case studies in individual Member States only, or national-level surveys covering just a few countries. It is almost impossible to aggregate the former data to cover other Member States, while the latter can be quantified and aggregated, but cannot cover all provisions.

> *Whether putting monetary values on them strengthens the arguments for or against a proposal is open to debate*

In the case of the chemicals proposal, one provision ('mandatory health surveillance') could be treated with a simple 'yes/no' approach (i.e. workers covered or not covered) and it was only necessary to collect data on the number of persons working with each of the listed chemicals. Five Member States provided figures on the number of workers exposed, though all figures were partial (industries and agents excluded) and to some extent were based on general knowledge of work practises rather than on actual exposure.

For the remaining new provisions, further analysis would have required additional data collection in Member States whose OSH legislation was not in accordance with the proposals. In some cases, such a process would have been very burdensome. Each of the activities involved may be carried out to a relatively limited extent in most enterprises, but to get a reasonably valid picture of the impact of the proposals, a large number of enterprises must be considered. It is impossible to identify a 'typical' firm when considering a large number of companies ranging from advanced laboratories, where book-keeping of all chemicals would be a considerable burden, to innumerable small garages and cleaning firms.

SYNTHESIS OF RESULTS ON THE COST SIDE

The experience of the author is that only the simplest (and probably the least interesting) proposals can be described by one figure, calculated across Member States. In the case described above, only one provision, 'mandatory health surveillance', could be assessed in monetary values. Even this assessment was only of partial value as several Member States indicated that additional costs would apply, but were unable to supply data on the number of exposed persons. A minimum cost figure could be calculated based on data from one third of the Community workforce.

The economic impact figures were generally unsuitable for advanced secondary analysis, e.g. for calculation of employment effects, impact on growth, etc. One could also question whether the items that were actually costed would have had the most profound impacts on industry at all. Both the provisions on 'inventories' and 'written instructions' would have had a partial impact, whereas 'extension of the range of agents covered' would have impacted in every Member State.

Results from the legal analyses in individual Member States were summarised in schematic form, indicating whether national legislation complied with the proposals, and whether costs would be imposed on industry. In this case, as in several other EU impact analyses, these 'schematic' results were probably just as important as the monetary calculations. The national responses were also summarised for each country, offering a more comprehensive description of individual national situations.

POSSIBLE HEALTH BENEFITS OF INTERVENTION

There is little experience linked to the implementation of EU directives which is of value in calculating quantitative estimates of the benefits of intervention, and we must therefore look to other transnational studies for guidance.

Both national and EU legislative initiatives have their roots in information on specific health problems, eg accident statistics or other data on levels of work-related sickness. This is the baseline level of health data, indicating the consequences of current exposure levels. While such data (e.g. the rate of accidents involving falls from heights) are often part of the motivation for proposed new directives (e.g. on work equipment for temporary work at heights), they are not directly relevant to the measurement of the possible effects.

For this we need a measure of what level of reduction can be achieved by compliance with the new provisions, compared to the present level of protection. We need some 'dose-response' or 'exposure-effect' relationships, quantifying the excess risk of those exposed compared to those not exposed or those exposed at lower levels. We must then relate the changes in exposure levels to those new provisions that are more stringent than current ones.

These measurements are often available where limit values for chemicals are discussed. The values are suggested from the levels at which medical evidence is found. The association between noise levels, periods of exposure and health effects has also long been established, and similar associations even exist for certain organisational hazards, e.g. between cardiovascular disease and night work or job stress. Similar data sets, from existing epidemiological studies, can supply most of the data needed. Using the latter as an example, the frequency of cardiovascular disease occurs approximately twice as often among persons exposed to high job stress (as defined by the Karasek-Theorell model) compared to those exposed to lower levels or not at all (Olsen/Kristensen 1991).

European Working Environment Surveys point to the simultaneous presence during most of the working day of tight deadlines, high working speeds and short, repetitive tasks as the main causes of job stress in the EU workforce. Some 9% to 11% of the workforce (males and females) work under these conditions according to a report from the European Foundation (Levi/Lunde-Jensen 1996). Applying established epidemiological techniques, 8% to 9% of total cardiovascular morbidity among the work active age groups can be explained by job stress. If we could remove that exposure completely, the number of cardiovascular victims would be 8-9% lower after some years. A more realistic ambition, for example to reduce job strain by 1 percentage point across EU, would lead to a subsequent reduction of a little less than one percent of the total.

Given this model example, it is clear that the near absence of any estimates of benefits in EU impact assessments is not caused by lack of effort. The standard excuse – 'data are not available' – covers a range of problems and lack of statistics is probably not the main issue. Experience indicates that the most fundamental obstacles are found in the nature of the individual provisions. Provisions may be either too broad and general (like most provisions in the Framework directive 89/391) or too narrow to allow quantification of the potential reduction in workplace exposure or risks.

Returning to the Chemicals directive above, most of the new requirements (health surveillance, written instructions or workplace assessments) do not directly change preventive levels at the workplace. They merely supply information that can be used to change behaviour. Only subsequent intervention can, in a strict sense, be identified as 'a cause' of health improvements.

SUMMARISING RESULTS ON BENEFITS

So far we have discussed 'health effects' rather than 'reduced costs'. There already exists substantial literature on economic methods, including reports made for various EU institutions. Some workplace health and safety authorities in Member States have experience in the economic valuation of health, but consensus seems to cover only the sickness occurrence indicators which should be included (e.g. levels of sick leave, years lost by early retirement or fatality, hospitalisation, etc), not the economic principles.

Whether CBA should stop at considering the level of sickness occurrence, or whether the arguments for and against a proposal are strengthened by putting monetary values on them, seems to be open to debate in the sense that it is impossible to find one method that will communicate the same message to all Member States. In this case, any approaches involving monetary valuations should be supplemented by a clear, transparent summary of the 'pure' health consequences, enabling a wider audience to take part in the debate.

LITERATURE:

1 European Foundation for the Improvement of Living and Working Conditions (1992): *First European survey of the working environment 1991-92*. Luxembourg, EF/92/11/EN.

2 HSE/DWES (1995): *The economic appraisal of European Union health and safety at work legislation*. Health and Safety Executive/Danish Working Environment Service, December 1995. Report to the European Commission, DG V.

3 Levi, L/Lunde-Jensen, P (1997): *A model for assessing the costs of stressors at national level – socio-economic costs of work stress in two EU Member States*. Luxembourg: European Foundation

4 Olsen, Kristensen (1991): Impact of work environment on cardiovascular diseases in Denmark. *J. of Epidemiology and Community Health*. 45:4-10.

JOS MOSSINK

TNO Work and Employment, Hoofddorp

The true costs of ill-health

The health data collected for economic assessments by individual Member States varies in consistency and reliability, making interpretation and international comparisons extremely complex. In examining cross-national comparisons of methods and results, the author advocates development of a common European methodology and data strategies which cover the whole range of worker health and welfare.

Growing EU interest in the economic aspects of OSH have led to several studies to assess the true costs of ill-health resulting from adverse working conditions, and the costs and benefits of interventions. These have generated much discussion between social partners. In general, employers argue for deregulation and an assessment of the economic impact of new regulation. Ex-ante assessments (economic forecasts) should ensure that new regulations do not adversely affect competitiveness.

In contrast, the trade unions claim that current practice in economic appraisal gives a one-sided view, highlighting costs to employers and largely ignoring human costs. In practice they feel that because costs to employees are generally hard to quantify, there is a tendency to leave these out of any assessment. The danger is that these costs (and other related social costs) receive insufficient attention.

A third view is that economic and social issues should not be mixed and that economic impact assessments are inappropriate in dealing with social issues such as the improvement of health at work. The view is that a number of human and social values, such as health, welfare and the avoidance of pain and suffering, should not be measured in financial terms and clear distinction should be made between financial costs and human and social costs.

It is clear however that some form of assessment or quantification may be needed to justify OSH expenditure or to help choose between different policies when financial resources are limited. From the arguments used in these debates it can be concluded that economic impact analysis is not just a technical exercise, but is part of a social debate. In this light it is clear that any suggested methodology or template for economic impact assessment sometimes has to deal with conflicting interests. Deficiencies in both the methodology and the data used tend to be exploited in discussions between social partners and authorities. As a consequence, any methodology applied, aside from its scientific basis, is the result of a trade-off between the results required, the availability of relevant data and its acceptance by stakeholders.

THE PURPOSE OF ECONOMIC ASSESSMENTS AT NATIONAL LEVEL

In the process of developing national regulations, CBA may have a role to play. Current views in the EU Member States have been summarised by Mossink et al. (1998) and EASHW (1999).

At national level, two broad categories of economic assessment can be distinguished:

- Assessments of socio-economic costs aimed at summarising the total financial burden of OSH to an individual country. The general objective is to establish for society an order of cost magnitude for occupational accidents and diseases and work-related illnesses
- Assessments of the economic effects of new policies or regulations (CBAs). These are generally performed ex-ante (ex-post evaluations have occasionally been performed but mainly for learning purposes). In addition to cost-of-illness studies, the costs of interventions and the effect of the intervention on health and safety have to be estimated. Much experience of economic impact assessments already exists in the UK, the USA and Denmark, where such assessments have been mandatory for some time.

Different types of economic analysis are available for specific purposes, such as cost-effectiveness studies. In both categories listed above, economic analysis has a clear function: to structure arguments and to assign monetary values in the process of developing new policies and regulation. Economic assessments have a supporting and decisive role in any policy development process.

GENERAL APPROACH TO ECONOMIC APPRAISAL AT THE NATIONAL LEVEL

Most economic assessments made in the EU take the same general approach (Mossink et al., 1998). Figure 1 shows the basic steps in performing a typical economic assessment:

- Evaluation of data sources
- Construction of economically-relevant quantitative indicators that reflect the effects of occupational accidents and work-related diseases
- Pricing – putting value to the indicators.

International comparison shows that these steps can be identified in all such studies. The actual way in which the steps are performed varies across the EU Member States (see Table 1). Each of the steps influences both the accuracy and the scope of the assessment, and every step poses a number of fundamental and practical issues. Several of these are examined in the following sections.

Figure 1: General approach to cost estimations of the effects of occupational diseases and accidents. Examples of cost components are given. Individual studies may use other variables.

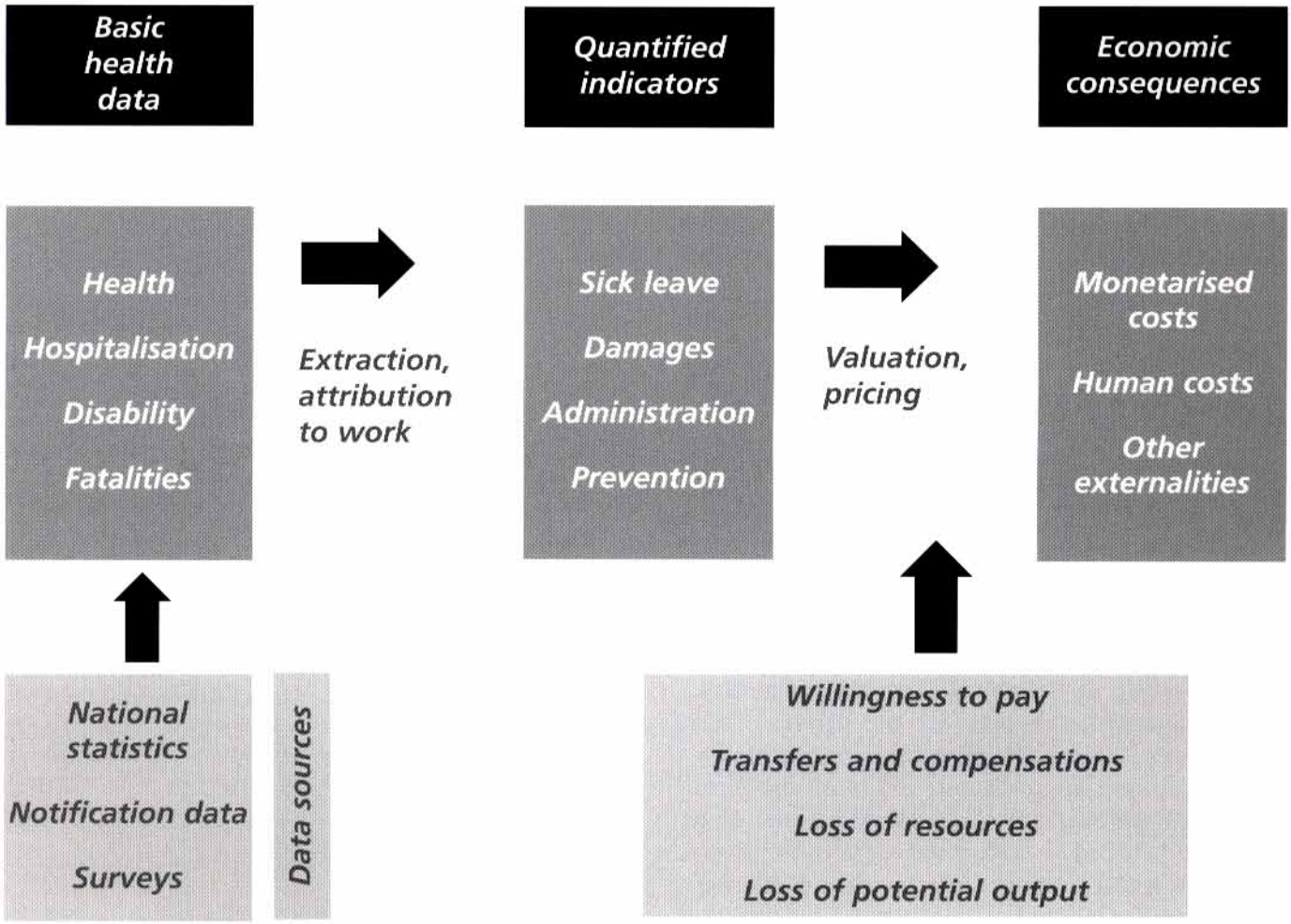


Table 1: Overview of some national economic assessments, data stratetgies, indicators and pricing principles applied (Adapted from Mossink et al., 1998).

Country	Data strategy applied	Main indicators	Pricing principles
Austria (1993)	Notification data	Accidents (occupational and commuting)	Lost production, output losses
Denmark (1991)	Percentage of sickness occurrence (related to total)	Total work-related illness	Financial transfers from public sector
Denmark (1996)	Epidemiological approach (exposure risk) surveys	Accidents, work-related diseases	Lost resources, financial costs
Germany (1993)	Notification data	Accidents (occupational and commuting)	Lost production,
Finland (1994)	Notification data, estimations	Selected work-related illnesses	Lost production
Italy (1986, 1992)	Notification data	Accidents and occupational diseases	Financial costs, lost production
Netherlands (1997)	Survey, notification, percentage of sickness	Accidents, work-related illness	Financial costs, lost production, resource costs
United Kingdom (1994)	Survey, case study aggregation	Accidents, work-related illness	Financial costs, lost production, resource costs, willingness to pay

DATA STRATEGIES AND SOURCES

Availability of relevant and accurate data is the major problem in every assessment. Data sets on occupational diseases appear to have different bases because definitions of occupational disease vary between countries. Estimates and approximations made to overcome this often lead to methodological problems or results that are difficult to interpret by non-specialists. There is a lack of reliable data sets in almost every EU country. Many sets suffer from under-reporting and their coverage is often limited to those that are relevant to the individual country's social security system.

Three areas have been used in Europe to collect the required health data: social security (notification data); workforce surveys; and epidemiological studies.

Use of notification data

Cases notified to social security (or social insurance) institutions are particularly useful in financial calculations relating to workers' compensation. Figures for 'total costs of accidents', based on insurance costs, can be calculated in many countries (Austria, Belgium, Italy, Germany, Ireland, Portugal and Sweden). Depending on national compensation rules, an individual's loss of income may also be calculated from this data.

> *Liabilities only act as an incentive when employers cannot be insured against claims*

All notification systems are heavily influenced by the incentives to notify (for instance by the chance of receiving compensation) and by the level of attention to paid workplace exposure or workplace risks in the health system. Both factors lead to bias against 'new' work-related diseases and diseases that have multiple causes.

General health and workforce surveys

Workforce surveys have been used as a primary data source in a number of EU countries (Finland, Denmark, Netherlands, Sweden, and the UK). This data is easy to aggregate at national level. In particular, such surveys can be used to calculate total costs of work-related diseases (or the percentage of sickness occurrence with a disease which can be related to work). Use of such surveys overcomes the problem of 'notification incentives', but because their work-relatedness is based either on self-reporting or on the judgement of professionals (such as occupational physicians), the problems of 'knowledge and recognition' and of determining causal factors in individual patients remain. Little empirical data on the links between illnesses and workplace risks or exposure at the workplace has been reported so far. As a consequence, the concept of 'work-relatedness' is imprecisely defined and leaves room for debate.

Epidemiological studies

Epidemiological studies try to establish causal associations between exposure and a specific health outcome, comparing the risk of an exposed person with that of the general population. Quantification of data based on workplace exposure and the excess risk associated with this exposure has been applied to specific work-related illnesses only, e.g. cardiovascular disease (Levi & Lunde-Jensen 1996), cancer (Arbejdstilsynet 1996, Hansen 1993, Fahs et al. 1989) and noise (Weinberger 1992).

Measuring the number of exposed people through workforce surveys, which look at specific health outcomes, must be considered far more precise than measurements involving an individual's judgement on the work-relatedness of specific symptoms or diagnoses.

Knowledge of the level of sickness occurrence that would not have occurred if the risk factor had not been present is closer to the ideal requirements of CBA than are either current notification data or other direct measures of sickness behaviour. The main limitation of this data strategy is that the economically relevant health outcomes (sickness absence, early retirement) are also influenced by behavioural and legal factors. Also, epidemiological studies have stringent methodological requirements which cannot always be easily met.

SOCIAL SECURITY SYSTEMS AND EFFECTS OF NATIONAL CULTURE

The influences of national administrative and legal systems are manifested in a number of ways. One relates to the data used (in both socio-economic and financial cost estimates) which reflect the national perception of work injuries and work-related disease and the relative importance assigned to them. Also, definitions of occupational diseases are formalised in the context of the individual national social security system. For instance, most countries apply a list of their own recognised occupational diseases, while in Austria and Germany alone commuting accidents are covered by social security. Furthermore, the social security system has an impact on what is seen as a cost for individual parties. Estimates of socio-economic costs can be severely limited by strict and narrow definitions of occupational diseases. It should be recognised that new attitudes and opinions on work-related illnesses (stress for instance) are not readily accepted in social insurance or social security circles. In general, recognition of new occupational diseases is a long process involving conflicting interests.

Another way national systems influence the picture is the extent to which the costs to companies and individuals are covered by insurance. At national level, this may result in low estimates, as parts of external costs are not registered. A number of options is regularly used in several countries to partly internalise to companies the costs of occupational accidents and diseases. Some examples are:

- Differentiation of premiums by safety and health risks or by number of previous accidents and occurrence of diseases, or based on present risks. Premium differentiation and 'no-claims bonus' systems as an incentive for occupational safety and health and corporate health promotion measures are already in use (European Foundation, 1995)
- Liabilities – the right and ability of workers to claim the costs of occupational accidents and diseases from their former employer
- Changes in social insurance systems, such as the limiting possibility of insuring the costs of sick leave
- Full cost pricing (Dorman, 1998; Den Butter, 1998) where all employers should be forced to sell products at prices that include costs for OSH investments and damages due to work-related illnesses.

The more costs are internalised, the more economic effects become visible and the better the insight into the true costs of adverse working conditions. Cultural differences can also lead to a different

Table 2: Cost components included in national studies of costs of occupational accidents and work-related illnesses (Mossink, 1999, adapted from Beatson & Coleman, 1998).

Cost component	United Kingdom	Nordic countries	Australia	Denmark	Finland	Netherlands
Medical costs • hospitalisation • first aid, ambulances • non-hospital treatment	partly	yes	yes	yes	yes	partly
Lost production • lost output • potential future loss • non-market production	yes	yes	unknown	yes	yes	yes
Other costs • legal costs • lost time and production for others	yes	no	partly	no	no	partly
Human costs • decreased healthy life expectancy • grief and suffering	yes	no	yes	no	no	No
Societal costs • police, fire brigade • inspection, administration	yes	no	unknown	no	no	partly
Material damages • lost equipment and premises	yes	no	unknown	no	no	yes
Expenditures for prevention	no	no	no	no	no	yes

approach to certain cost components. In the UK, the US and Ireland, workers are able to claim work-related health damages from their former employers, possibly including some compensation for grief and suffering. In other countries, no such practice exists (or would even be acceptable). In these cases the corresponding cost components are not covered in the national estimates of socio-economic costs.

WORK-RELATEDNESS OF DISEASES AND ACCIDENTS

As stated above, current methods for the economic appraisal of OSH issues focus strongly on the costs of accidents and formally recognised occupational diseases. This focus is due to the availability of social insurance data. However, this narrow approach has some serious shortcomings:

1. there is a limited number of outcomes, as some adverse effects on health are omitted
2. no direct link is made between health at work, productivity and quality
3. future opportunities in terms of technological and organisational developments are not addressed

The limitation of such a narrow focus becomes clearer when considering the importance of the health effects of work-related stress and musculo-skeletal injuries (Levi & Lunde Jensen, 1996; Koningsveld & Mossink, 1997; Bjurström, 1998). A study in Holland has shown that the costs of mental illnesses and musculo-skeletal diseases represent about 80% of the total costs of work-related accidents and illnesses. By comparison, the contribution of traditional occupational diseases (e.g. occupational cancers and skin diseases) and respiratory diseases is fairly small. Notification systems rely on the proposition that the work-relatedness of each individual case can be demonstrated, which is not often the case (e.g. lung cancers or cardiovascular diseases).

INDICATORS AND COST COMPONENTS

The assessment of socio-economic costs is a one-off exercise for most countries. The characteristics of these assessments, and the approaches adopted, have been evaluated by Davies et al. (1995) and by Beatson and Coleman (1998). The latter conclude that none of the national studies include all relevant cost components (see Table 2). Studies inside and outside the EU primarily focus on health-related costs. Also, data sets used for economic assessments in most countries have the same focus. Sick leave, priced in terms of lost production, is commonly used as the most important variable (see Table 2), while hospitalisation, material damages and lost household production are cost components in other studies. Prevention costs have been included in cost estimates in only a few countries (Holland, Italy).

Regardless of the strategy adopted, there are many problems relating to national data sets gathered to calculate the costs and benefits of actions to reduce occupational accidents and diseases. As a result, the number of indicators or cost components is limited, making it difficult to generate useful calculations within many countries.

Among the major problems with these data sets are:

- In some countries little data is collected and there are few sets collected which are common across all countries

- There are relatively few data sets concerned with occupational diseases or work-related illnesses. Those available appear to under-represent the true situation. Data reliability is also a problem with regard to notified accidents.

Indirect effects on national economies are seldom evaluated. For example, how will consumer expenditures and purchases be affected and what is the effect on national competitiveness?

The importance of health at work on productivity, innovative power and competitiveness has been indicated by several authors (Dhondt, 1998; Thiehoff, 1998; Johanson, 1998; Kuusela, 1998), but until now reliable data has been missing and so these factors are not included in national cost estimates.

MEASUREMENT OF ECONOMIC EFFECTS

At national level, several methods of measuring economic effects are available besides monetised costs. Examples are national welfare, employment levels and healthy life expectancy. However, in practice these measures are not often used. In the studies performed in the EU so far, various pricing principles, or a mix of them, have been applied (see Table 3).

Material damage and losses
In considering material damage and losses, the common method is to take the replacement or repair costs as the monetary value, possibly adjusted for depreciation of the damaged equipment or materials. This method is useful for assessing the value of damage to property, products, premises and the like.

Health effects
For estimating the value of health-related variables, a distinction must be made between reversible, temporary health damage and permanent health damage (generally defined as damage whose effects remain after one year).

For the temporary effects, summing the costs (or market prices) of medical consumption and treatment is the most common pricing principle. There is no generally accepted method for calculating a monetary value for permanent health effects such as pain and suffering, reduced quality of life and healthy life expectancy. Methods such as 'willingness to pay' (WTP) or 'willingness to accept' (WTA) are used to make estimates, but the outcomes are often criticised as different techniques yield different results. Both WTP and WTA estimates are ex-ante (before-the-injury) willingness to accept (or to pay to avoid) the risk of injury. They are indiscriminately equated to the value of a human life saved or value of an injury avoided. These latter values are described as ex-post valuations. Thus, the WTP and WTA estimates are criticised not only because different studies yield different results, but also because they pretend to measure what they cannot measure. The value of a human life saved, or injury avoided, inferred from ex-ante valuations is almost always much smaller than ex-post valuations. Herein lies the main objection to their use for decision-making purposes. Other methods are based on financial compensations, which may vary from jurisdiction to jurisdiction.

Lost production
The most common and simplest method of assigning a monetary value to lost productive labour hours is to take wages as the opportunity cost of time. This method is valid on the assumption that wages adequately reflect the value of production.

For permanent disability, application of the human capital method (with prevalence data) implies that estimations have to be made of future wages. Similar adjustments have to be made for persons who stopped working a long time ago. This estimation can be problematic.

If incidence data is used, an estimate of all possible or likely production (or wages) has to be made from the time of occurrence of disability until the moment of regular retirement or death. In this case also the estimation of potential future production is problematic. This method is criticised because full employment (which is assumed in the human capital method) is extremely rare and absent workers are usually replaced after some friction period (Koopmanschap, 1994). Costs are usually only incurred for the period during this friction period (which may be some months). An estimate of the costs of permanent disability at national level would give cost estimates that are only a fraction of those made using the human capital method.

Human costs
There is no generally accepted method for calculating a monetary value for permanent health effects, pain and suffering, the quality of life and (healthy) life expectancy. Clearly no market prices exist for these commodities. Methods like WTP or WTA are used to make estimates, but the outcomes are often criticised as different techniques yield different results. Socio-economic evaluations should also reflect social values, but until now only a very limited number of studies include effects on employment. Measures that quantify national welfare, health or quality of life are not used, though these are available to some extent (e.g. life expectancy, QALY's and the like).

Table 3: Applicable pricing principles for some variables (economic and human costs)

Variable	Unit of measurement	Applicable pricing principles
Sick leave	Lost production time	Lost output: full wages, opportunity costs of labour
Healthcare costs, medical rehabilitation	Number of cases, duration	Market price (costs of healthcare)
Disability, early retirement	Age of victim	Lost output: future wages of non-working life-years Willingness to pay, willingness to accept
Fatalities	Age of victim	Lost future output of lost life-years Willingness to pay

TIME

Time is an important issue in economic assessments of OSH issues for several reasons. Firstly, corrections have to be made for the changing value of money over time (discounting). Discount rates for public projects (in real terms, without inflation or risk correction) are 4 - 6% (Davies et al., 1995; Polanen Petel et al., 1996). Using a positive discount rate has the effect of reducing the value of costs and benefits that occur in the future. However, in the case of benefits that are not realised until some time in the future (and they include acute events avoided, such as accidents, as well as chronic disease), the value of benefits is reduced much more than costs. This biases prevention initiatives towards the more immediately avoidable events, and disadvantages long-term investments to reduce occupational injury and disease.

Time is also an important element for diseases that take considerable time to develop. Up to 20 years or more may pass between exposure and the first symptoms of some diseases. Similarly it may take considerable time before the effects of an intervention become apparent. CBA requires discounting over considerable periods of time, e.g. 10 years (Davies et al., 1995) or 15 years (Polanen, Petel, 1996). These long periods pose specific problems. The most important is that in order to make practical calculations, one has to assume that all circumstances remain unchanged and prices develop at the same rate as inflation. Davies et al. (1995) observe that the value of life is likely to rise over time. Ashford (1998) indicates that technological and organisational innovations caused by changes in regulation have a large impact on the costs to comply with that regulation.

The importance of technological development has been discussed by Ashford (1998). His analysis of past US regulation on occupational health indicates that new regulation serves as a stimulus to the development of new technology, which enables companies to comply at lower cost. Economic appraisals that neglect the effects of new technology are likely to overestimate the costs to companies of new regulation.

SPECIFIC ISSUES WITH REGARD TO CBA

Estimates of national costs and CBA differ on a few essential points. A crucial one is that it is not easy to precisely attribute the cost savings of preventive policies and measures to specific health and safety effects (Krüger, 1997; Lehmann & Thiehoff, 1998). All manner of unmanageable external and spill-over effects can occur inside and outside an organisation. From the company perspective, money goes out to insurance and tax systems, workers and their families, other companies, subcontractors, clients, etc. OSH investment by any organisation always has beneficial effects on these external parties, though the costs of the investments do not automatically flow back to the purse of the investor. Problems intensify when prevention is aimed not only at accidents, but also at work-related diseases where most positive effects are external. Even if positive effects of work-related diseases are internal, they usually only become noticeable in the long term.

In this context, it is obvious that the extent of cost internalisation has a major impact on the outcome of economic appraisal at company level. The more costs that can be passed on to others (externalised), the less likely it is that prevention will give financial benefits. As a consequence, the possibility of exporting the burden of ill-health outside the company can hamper application of health, safety and environment management within the company. Externalising costs to society, to individual workers or to other companies may offer economic advantage, as the damage (e.g. in the form of ill-health) is not paid for by the company itself. As a result there is no direct incentive to take action.

For a number of reasons it is doubtful whether full cost internalisation can be attained. Extensive dependence on employer liability is criticised because employees often have difficulties in claiming their rights. Procedures can be long and costly, employees may lack relevant knowledge and this kind of procedure could affect their relationship with their employer.

Furthermore, liabilities only act as an incentive when employers cannot insure against claims. Lehmann and Thiehoff (1998) ob-serve that new concepts of economic incentives (tax abatements or subsidies) offer fascinating inter-nalising possibilities but pose many questions on closer inspection. Dorman (1998) points out that technical problems are a serious impediment to internalisation.

Particularly problematic is the issue of attribution of illness to work and the reliability and acceptance of an economic appraisal of health effects to individual workers and their families. Hopkins (1995) questions whether economic self-interest gives sufficient drive for action. Morality and irrational behaviour are of key importance in decision-making. The implication for economic impact assessments at national level would be that the methodology applied should be capable of making various externalities visible, even though these may not reflect any costs within the existing social security system or liability practices. Widening the scope of assessments would give a clear view on the economic effects of internalisation.

CONCLUSIONS

It is clear from the above that economic studies can have many imperfections that makes interpretation difficult and give room for much further discussion. Also, international comparisons are enormously complicated.

Countries differ in the type of data collected, the purposes for which it is collected, the definitions used, the social security system in place and the policy objectives and approaches taken in dealing with occupational accidents and diseases. Moreover, there are apparently universal problems in the reliability, coverage and validity of some of the data sets collected. Nevertheless, it would be very useful to improve upon the methodology involved and to develop a common European framework. Based on current knowledge of economic appraisal at national level, such a framework might involve:

- taking a broader definition of health and well-being, in which health should not be defined merely as the absence of illnesses
- not being limited to accidents and illnesses that can be proven to be fully caused by working conditions and practices, nor by definitions that stem from the existing social security system; economic appraisal should be as independent from the social security systems as possible
- only including real costs or expenditures to individuals, companies and society
- taking full account of national systems and infrastructure with regard to safety and health.

Future methods should involve all forms of output of human work and value the contribution of labour to the company's goals and to

its competitiveness. This could include increases in tacit knowledge and skills and the contribution to a positive company image. The current state-of-the-art of economic appraisal of OSH issues would not see these kinds of benefits being supported in the near future.

LITERATURE:

1 Arbejdstilsynet, *The costs of work-related diseases and work accidents in Denmark*, Danish Working Environment Service, Copenhagen, AT-Report 9,1996

2 Ashford, N., *The importance of taking technological innovation into account in estimating the costs and benefits of worker health regulation*. In: Mossink J.C.M., Licher F (eds.), Costs and Benefits of Occupational Safety and Health, Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health, 1997, Hoofddorp, NIA TNO, 1998, p. 69-78

3 Beatson, M., Coleman, M., *International comparison of the economic costs of work accidents and work-related ill-health*. In: Mossink JCM, Licher F (eds.) Costs and Benefits of Occupational Safety and Health. Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health, 1997, Hoofddorp, NIA TNO, 1998, p. 143-146

4 Bjurstrom L.M, *The economic aspect of working conditions changes policy and practice*. In: Mossink, J.C.M., Licher, F., (eds.), Costs and Benefits of Occupational Safety and Health, Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health, 1997, Hoofddorp, NIA TNO, 1998, p. 36-46

5 Butter, F.A.G., den, *Prospects for Research on the Costs And Benefits of Occupational Safety and Health, A* ***Macroeconomic Perspective***. In: Mossink J.C.M., Licher, F. (eds.), Costs and Benefits of Occupational Safety and Health, Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health, 1997, Hoofddorp, NIA TNO, 1998, p. 386-388

6 Davis, N.V., Teasdale, P., *The costs to the British Economy of work accidents and work-related ill-health*, Health and Safety Executive, HSE Books, London, 1994

7 Davies, N.V., Marshall, N., Mc Crea, P., Beatson, M., Lunde-Jensen, P., *The Economic Appraisal of European Union Health and Safety at Work Legislation*, Health and Safety Executive, Danish Work Environment Service, London, Copenhagen, 1995

8 Dorman, P., *Internalizing the Costs of Occupational Injuries and Illnesses,* ***Challenge or Chimera?*** In: Mossink, J.C.M., Licher, F. (eds.), Costs and Benefits of Occupational Safety and Health, Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health, 1997, Hoofddorp, NIA TNO, 1998, p. 13-35

9 European Agency for Safety and Health at Work. *Economic Impact of Occupational Safety and Health in the Member States of the European Union*. Bilbao, European Agency for Safety and Health at Work, 1999.

10 Fahs, M., et al, *Health Costs of occupational disease in New York State*, American Journal of Industrial Medicine, vol 16, 1989, p. 437-449

11 Hansen, S.M., *Arbejdsmiljø og samfundsøkonomi - en metode til konsekvens--bereg-ning, NORD, 1993, 22, Arbejdsmiljø og samfundsøkonomi - regneark og datagrund-lag*, AT-rapport 1993, 556 (with P. Lunde-Jensen), English summary of results: Lunde-Jensen, 1994, The costs of occupational accidents and work-related diseases in the Nordic countries, JANUS No. 18-IV-1994, Covers Sweden (Norway, Denmark and Finland)

12 Hopkins, A., *Making Safety Work*, St Leonards (NSW), Allen & Unwin, 1995

13 Koningsveld, E.A.P., Mossink, J.C.M., *Kerncijfers maarschappelijke kosten arbeidsomstandig-heden*, (Socio-economic costs of working conditions), VUGA, Den Haag, 1997

14 Koopmanschap, M.A. *Macro- en micro-economische gevolgen van ziekteverzuim*. (Macro- and micro-economic consequences of absenteeism). In: Proceedings 7de symposium gezondheid en economie, Antwerpen, Werkgroep gezondheid en economie, Vereniging voor gezondheidseconomie, 1994.

15 Koopmanschap M.A., Rutten F.F.H., Ineveld B.M. van, Roijen L. van. *The friction cost method for measuring indirect costs of disease*. Journal of Health Economics, 14, 1995, p.171-189.

16 Krüger, W., *Ökonomische Anreize - Möglichkeiten ind Probleme eines modernen Arbeitsschutz-systems*, In: Neue Ansätze zur Kosten-Nutzen-Analyse des Arbeits- und Gesundheitsschutzes, Bundesanstalt für Atbeitsschutz und Arbeitsmedizin, Dortmund, 1997, p. 26-37

17 Lehmann, E., Thiehoff, R., *What answers do we have? A presentation of cost/benefit studies*, In: Mossink, J.C.M., Licher, F., (eds.), Costs and Benefits of Occupational Safety and Health, Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health, 1997, Hoofddorp, NIA TNO, 1998, p. 36-46

18 Levi, L., Lunde-Jensen, P., *A model for assessing the costs of stressors at national level -* ***socio-economic costs of work stress in two EU Member State***s, European Foundation, (costs of job strain in Sweden, Denmark), Luxembourg, 1996

19 Mossink, J.C.M., Licher, F., *Costs and Benefits of Occupational Safety and Health*, Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health 1997, Hoofddorp, NIA TNO, 1998

20 Mossink J, Smulders P, Lunde-Jensen P, Vassie L, Wynne R, O'Brien E-J, Klein Hesselink J. *Costs and Benefits of Occupational Safety and Health in the European Union*. Hoofddorp, TNO Work and Employment, 1998.

21 Polanen, Petel, V., van, Voogd, J., de, Bokhoven, E.F., van, Gravesteijn-Ligthelm, J.H., Donker van Heel, P.A., *Kosten en Baten van Tilmaatregelen voor Bedrijven*, (Costs and Benefits of measures for manual lifting to companies), VUGA, Den Haag, 1996

22 Weinberger, *Gesamtwirschaftlische kosten des Lärms in der Bundesrepublik Deutschland*, Zeitschrift für Larmbekämpfung 39, 1992. p. 91-99

VINCENT VAN POLANEN PETEL

Netherlands Economic Institute, Rotterdam

Manual lifting in the Netherlands

A Dutch study of estimated costs associated with proposed manual handling weight limits found wide variations in impact according to sector. Overall, estimated costs associated with the proposals exceeded expected benefits from them and no national regulations were introduced. Subsequently, collective agreements in different sectors were agreed to mitigate the hazards of manual lifting.

The Dutch government's Physical Stress Decree issued in 1993 implemented the EU directive for manual handling of loads. Government guidelines on manual lifting were prepared for the labour inspectorate and at the time there were heated discussions between employers' and employees' organisations on the specific regulations for manual lifting. The trade unions were (and are) in favour of a strict standard based on the Recommend Weight Limit from the so-called NIOSH equation for manual lifting, developed by the US National Institute of Occupational Safety and Health (NIOSH). The Dutch employers' organisations were in favour of voluntary arrangements.

Needing sound research on which to base their decisions, the Dutch Ministry of Social Affairs and Employment asked the Health Council of the Netherlands for a risk assessment of manual lifting and their report was published in March 1995. In November 1994 the Ministry also requested the Netherlands Economic Institute (NEI) to estimate the costs and benefits of several standards for manual lifting at work. For this, NEI worked with many expert organisations, including TNO-Prevention and Health and Statistics Netherlands (CBS).

Several research questions were posed:
(1) Which definition of hazardous manual lifting should be used?
(2) What is the prevalence of hazardous manual lifting? For a full picture this question had to be answered for each individual category of work in each sector of industry.
(3) What are the costs of investments to prevent or to reduce the level of manual lifting activities?
(4) What is the relationship between manual lifting at work and medical complaints or bodily injury?
(5) What are the (current) costs of sick leave and disability for work?

To answer the first question several standards were used: initially the Recommended Weight Limit (RWL) of the NIOSH equation, but subsequently 1.5 and 2 times the RWL, and then simply 25 kg and 40 kg.

Several restrictions applied to the research. Firstly, it did not involve a social CBA, though a very rough estimate of the costs of healthcare was made and the employment effects analysed in a follow-up study. Secondly, the investments considered were those that could be achieved by individual enterprises, not by whole industries. Thirdly, from all the possible diseases and injuries, only those related to low back pain were considered relevant. Fourthly, the study was explorative as at the time there was no generally accepted framework for a cost-benefit analysis of OSH regulations. Finally, the research investigated the impact on salaried employees only.

CONCEPTS

The costs in the cost-benefit analysis are termed 'prevention costs' and result from measures and investments to improve working conditions. Specific OSH investments are an obvious example, as are training and education and occupational healthcare.

In the analysis, the benefits to be gained are the 'opportunity costs'; in the context of working conditions these are called 'correction (or curative) costs'. They comprise all costs necessary to correct (or cure) negative health effects of working conditions. Costs of sick leave and worker compensation claims also fall into this category. Many other costs, including healthcare, are not borne by the individual enterprise involved but are externalised. In practice, governments can try to internalise these external costs but in this case the policies considered on manual lifting were not based on such internalisation. The research thus mainly looked into the direct costs borne by the enterprise.

OSH regulations aim to change the flows of prevention and correction costs. In this case the approach taken was to treat new regulation as an investment project, and calculate the investment needs of the project and the cash flows during its lifetime.

To arrive at costs and benefits for all enterprises, it was necessary to calculate the investments and operational outlays not on a per enterprise basis, but per worker with hazardous manual lifting tasks. This combined very well with other parts of the research work and helped aggregate costs over industries and over the national economy as a whole.

EMPLOYEE SURVEY

The first task was to estimate the number of workers with hazardous lifting tasks. It was decided that the best option was to collect data that could be related to a reliable source, in this case the CBS Labour Force Survey. CBS approached around 7,500 people with a question about manual lifting: Do you have to lift manually loads of more than 3 kg several times a day? In a subsequent telephone survey among those that answered the question positively, around 1,800 people were approached with a questionnaire, of which almost 1,500 responded. One of the greatest benefits of using the CBS figures was

that their surveys provided information on many other interesting aspects of the workforce, including the industries in which respondents were working and their occupation.

The main purpose of the telephone survey was to arrive at an estimate of the Recommended Weight Limit for each lifting situation according to the NIOSH equation. The questionnaire used was tested and validated by TNO-Prevention and Health. The main finding of the validation was that employees overestimate the loads they lift by 33%. This led to the use of a correction factor in the work described.

RESULTS OF THE SURVEY

At first sight, one of the most striking findings of the survey was that one quarter of the salaried labour force regularly have manual lifting tasks involving weights above the Recommended Weight Limit from the NIOSH equation. In the Netherlands, this represents about 1.3 million workers. Differences between industries are large: whereas in government, defence and education only 7% of employees have hazardous manual lifting tasks, in agriculture and fishing the figure is 59%. There are also large differences between job categories and levels of education. Not surprisingly among jobs requiring a high level of education, only 7% have regularly hazardous manual lifting tasks. In the case of low-grade hospital workers, 88% regularly perform hazardous manual lifting tasks. The differences between large, medium and small-sized enterprises are not very large, although companies with 100 employees or more do have a smaller percentage (19%) of their workforce with hazardous manual lifting tasks than do smaller companies (25%).

Table 1: Employees with lifting activities above different thresholds (1995)

Threshold factor times the Recommended Weight Limit (RWL) of the NIOSH equation, or in kg	Employees (x 1,000)	Percent of total employees
1 x RWL NIOSH	1,338	25%
1.5 x RWL NIOSH	838	15%
2 x RWL NIOSH	539	10%
25 kg	622	11%
40 kg	266	5%

Source: NEI/CBS/TNO-PG

The results of the survey were used as the basis for estimating prevention and correction costs.

ESTIMATING PREVENTION COSTS

Prevention costs are, broadly speaking, the costs of investments. For this work, 14 safety and health experts were asked to suggest solutions for different cases of lifting of loads above the Recommended Weight Limit of the NIOSH equation. Each expert was sent around 6 cases and was asked to provide 3 different solutions per case, as well as a cost estimate. This was a difficult task since the cases were anonymous and not all required information was available. The experts were also asked to specify how many workers each of their solutions applied to. Where they could not give a figure, an estimate was made based on the proposed solution (e.g. was it activity-bound or company-wide), the duration of the lifting activities and the size of the company. The solutions were classified as follows:

- organisational
- requiring use of lifting devices
- requiring modification to the working place
- requiring modification to the load
- requiring instruction and training.

About half of the experts' solutions were presented to and discussed with 26 industry experts to gain a second opinion, and this finally resulted in a total of 227 solutions for 67 cases. These results were linked with those from the employee survey to give an overall picture at industry and macro level.

Of the costs to implement the solutions for manual lifting activities, only the additional costs of investments were included. Moreover, in the study this applied only to workplace modifications that could be expected to be carried out within a larger investment plan. Costs were further divided between operational and investment costs, the latter all being outlays at the beginning of the project and the former all outlays during the life of the project. A timespan of 15 years was applied.

The average lifetime of the investments in the study worked out at around 10 years, which meant calculating a replacement investment after that period and a residual value of the equipment at the end of the 15 years (see Figure 1).

RESULTS FOR PREVENTION COSTS

Without discounting, cost estimates of regular manual lifting activities that cross the threshold of the Recommended Weight Limit worked out at 310 Euros per employee. The costs depended on the type of industry, the size of enterprise and the type of solution. The mining, oil and chemical industries turned out to be quite expensive as regards solutions, as did wholesale trade and agriculture.

Solutions for the construction industry were not so expensive, mainly because they could be applied to several employees with the same lifting activities. The costs differed markedly between different size of enterprise. Costs per employee in small companies (less than 10 employees) can easily be twice or three times as large as for companies with 100 employees or more. Finally, costs for organisational solutions were the highest, primarily because these involve the use of more labour.

ESTIMATING CORRECTION COSTS

Three types of correction costs (benefits) were identified:
(1) reduction in sick leave
(2) reduction in disability due to occupational injuries and diseases
(3) productivity gains from investments.

Values for item 3 relied on literature. It was assumed that productivity gains approximated to 25% of the amount invested through, for example, reduced levels of rejected products as a result of better quality.

In order to estimate the correction costs for 1 and 2, links between manual lifting, sick leave and disability for work had to be established. Firstly, the relationship between manual lifting and bodily injury had to be assessed. In order to arrive at quantifiable figures, the

definition of bodily injury was confined to low back pain (LBP), which is in line with the recommendations of the Health Council of the Netherlands. In its risk assessment however, the Council stipulates that it is not possible to quantify lifting-related injury. Since it was necessary to have this relation quantified, an estimate was made based on literature. However, only one source was found to answer the question: What percentage of problems (complaints, sick leave, medical costs) relating to low back pain can be attributed to manual lifting at work? It was quoted at 14%. All other sources, such as injury and social security statistics, employee surveys and epidemiological studies, give no direct answers.

In order to use the literature the question was split to find:
(1) the relationship between manual lifting and low back pain, and
(2) the relationship between low back pain and work.

For the first part, a wide range of values (from 14% to 78%) was quoted, with 33% as the best representation from the available data. For the second part, it is common knowledge that part of low back pain related problems are not work-related. Estimates vary greatly between one third and two thirds. Most sources estimate at one third, which was the value used in the study.

A conservative estimate of the percentage of low back pain complaints resulting from manual lifting at work is thus 10%. The literature showed an average 16%. In the study 15% was used as the central assumption, with 10% and 20% as alternatives.

The next step was to establish the precise share of low back pain in overall sick leave and disability for work. Administrative and statistical databases of social security organisations indicate that on average, 11% of sick leave and 20% of disability benefit were related to low back pain.

All this work resulted in establishing the number of cases, days of sick leave and disability due to manual lifting at work. The type of costs involved then had to be identified. This was achieved using two studies: one included a model for calculation of costs for individual companies, the other provided estimates for a range of industries based on a survey among individual enterprises. Costs typically included: wage costs, administrative costs, support, management, inspection, replacement and production losses (resulting from absence and from lower productivity after return to work). Data used came from CBS and social security organisations.

RESULTS FOR CORRECTION COSTS

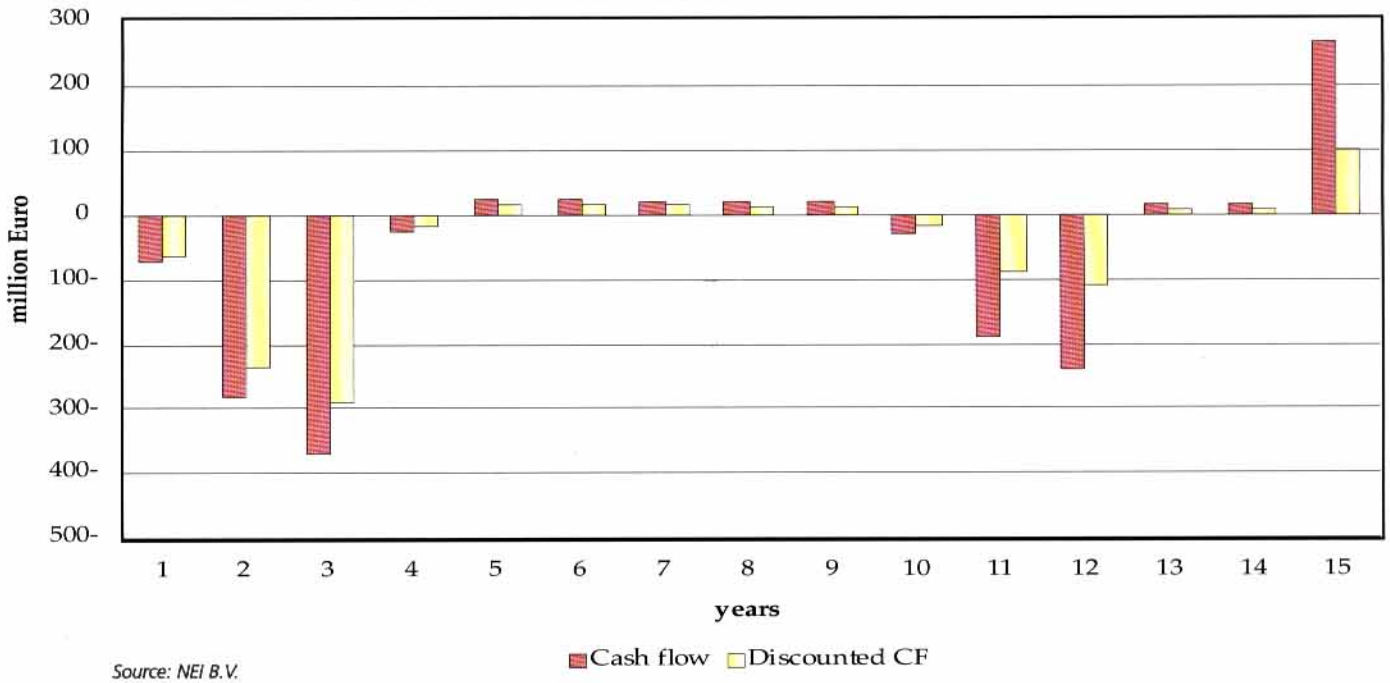
The average benefits accruing from reduction in sick leave and disability was estimated at a maximum of 490 Euros per worker regularly involved in manual lifting activities that cross the threshold of the Recommended Weight Limit.

It remains to be seen however how many low back pain problems can be prevented by implementing the solutions. In other words, how effective are the investments? One of the other findings of the employee questionnaire was that more than 50% of the employees with regular lifting activities were also involved in other heavy physical activities, which is inconsistent with one of the conditions of the NIOSH equation. Given the scarce literature on the subject of the effectiveness of lifting solutions, a level of 33% was used. When the lifting standard is relaxed (from NIOSH to 25 kg for example) it was assumed that the effectiveness was lowered. Thus the benefit per employee involved in hazardous manual lifting tasks was estimated at 175 Euros.

OVERALL RESULTS

Figure 1 shows the cash flow for Dutch companies after introduction of the NIOSH standard for manual lifting. It is assumed that in the first three years all enterprises will make investments, hence the large negative cash flows. The benefits accrue each year, but are relatively small. After 10 years, re-investment needs to take place. The cash flows are analysed for 15 years. In order to take account of the

Figure 1: Cash flow and discounted cash flow for NIOSH standards.



Source: NEI B.V.

remaining value of the investments, a positive cash flow appears at the end. On a yearly basis the (discounted) benefits amount to 366 million Euros. The costs however amount to 445 million Euros.

On balance, costs outweigh benefits by 79 million Euros per year. Expressed as a ratio, (the benefit/cost ratio) 82% of costs are recovered. Understandably, given the results of the employee survey on manual lifting activities, individual industry figures vary greatly. Some industries have more positive results. For example, transport and communication, government, defence and education, and banking and insurance show larger benefits than costs. Benefits and costs in the metal and equipment, food, drink and tobacco industries are roughly equal. All others have larger costs than benefits, with the mining and chemical industries at the lower end.

SENSITIVITY ANALYSIS

Depending on the nature of the assumptions made, the outcome of the cost-benefit analysis can vary greatly, between minus 489 million to plus 231 million Euros per year. The first figure results from combining the double figure for cost estimates per 'lifting solution' or investment, and a low effectiveness of the measures in practice; the higher figure results from converse assumptions. These are however not the only relevant assumptions that can be varied. For instance, the assumed share of sick leave related to low back pain that can be attributed to manual lifting at work is 15%. Varying this from 5% to 50% results in a range of benefit-cost ratios of 0.37 to 1.72. Of course, one of the most interesting assumptions is the standard used, the Recommended Weight Limit from the NIOSH equation. In relaxing this assumption, the difference between costs and benefits narrows, but never turns into a net benefit.

Table 2: Costs and benefits per year at different standards (annuities, million Euros)

	Costs	Benefits	Balance	Benefit/ cost ratio
1 x RWL NIOSH	445	366	-79	82%
1.5 x RWL NIOSH	232	212	-20	91%
2 x RWL NIOSH	162	152	-10	93%
25 kg	165	153	-12	93%
40 kg	62	62	0	100%

Source: NEI B.V.

EXTERNAL EFFECTS

Besides the financial consequences for enterprises, several other effects can be important: costs of healthcare, employment effects, international competitiveness, demand effects of investments and impact on the individual worker.

The costs of healthcare might be reduced by at most 57 million Euros per year, though this is a rough estimate based on several assumptions. The employment effects have been examined more thoroughly as direct, indirect and spillover effects. Direct effects bring about a change in employment through change in wage and capital costs; indirect effects work through the induced price changes of products and services; and spillover effects result in changes in production brought about by changes in sales. All in all the employment effects are small: around 3,000 less people employed. Finally, the estimated effect on the international competitiveness of Dutch enterprises was also small, though this was measured using only one indicator (exports versus exports of competitive countries).

CURRENT SITUATION

The above research into costs, benefits and employment effects, as well as the findings of the National Health Council, were used in Holland as a foundation for a discussion in the Social Economic Council. This is the organisation in which employees, employers and independent members take part and that gives advice to the government. Its advice on the regulation of manual lifting, however, was divided.

At present, the government has decided not to use specific standards for manual lifting. The main instruments for OSH policy today are OSH-covenants between employers and employees. Since these are new, only one (for homecare) has currently been agreed between employers' and employees' organisations and the government. In relation to manual lifting however, trade unions are still seeking a strict and specific standard, while employers' organisations object to this approach due to associated costs and the impact on competitiveness. OSH-covenants do, however, at least deal with one of the findings of the research: the large differences between industries.

LITERATURE:

1 Health Council of The Netherlands: Committee on *Risk Assessment Manual Lifting*, Risk assessment of manual lifting, Health Council of The Netherlands, publication no. 1995/02 (The Hague, 1995).

2 Polanen Petel, V.C.A. van, J. de Voogd, E.F. van Bokhoven, J.H. Gravesteijn-Ligthelm, P.A. Donker van Heel., *Kosten en baten van tilmaatregelen voor bedrijven* (Costs and benefits of lifting measures by enterprises), Ministry of Social Affairs and Employment : VUGA (The Hague, 1996).

3 Polanen Petel, V.C.A. van, "Costs and benefits of Occupational Safety and Health regulation, the Dutch case of manual lifting", in: J. Mossink and F. Licher (eds.), *Costs and Benefits of Occupational Safety and Health. Proceedings of the European Conference on Costs and Benefits of Occupational Safety and Health 1997, The Hague, 28-30 May 1997*, NIA TNO (Amsterdam, 1998) 110-117.

4 Polanen Petel, V.C.A. van, *Effecten van beleid voor handmatig tillen bij twee beleidsopties* (Effects of policy for manual lifting with two policy options), NEI (Rotterdam, 1998).

5 Zandvliet, C.Th, V.C.A. van Polanen Petel, N.B.J.G. 't Hoen, I. van der Weijde, *Bedrijfseffectentoets invoering tilnorm: concurrentie en werkgelegenheid* (Enterprise impact test introduction lifting standard: competition and employment), NEI (Rotterdam, 1996).

6 Walsh, K., N. Varnes, C. Osmond et al., "Occupational causes of low-back pain", *Scandinavian Journal of Work, Environment and Health* no. 15 (1989) 54-59.

7 Waters, Th.R., V. Putz-Anderson, A. Garg, L.J. Fine, "Revised NIOSH equation for the design and evaluation of manual lifting tasks", *Ergonomics* 36 no. 7 (1993) 749-776.

NICHOLAS ASHFORD

Massachusetts Institute of Technology, Cambridge, Massachusetts

Compliance costs: the neglected issue

Research in the USA over the last 20 years suggests there is strong evidence that the major benefits of technological innovation implemented in response to stringent health and safety standards are usually neglected in cost-benefit calculations.

Regulation of worker health and safety is acknowledged to result in health benefits to workers and economic costs to employers. The latter are sometimes shared by workers and consumers in the form of lower wages or salary increases and higher prices. However, the history of OSH regulation in the United States over the last twenty years reveals that this simplified view of regulation neglects the important role that technological innovation plays in:

- reducing the actual costs of compliance with a new regulation to a fraction of pre-promulgation estimates
- yielding a benefit in terms of savings in material, water and energy costs, and
- changing the nature of process and product technology, resulting in reduced environmental damage and its associated costs and compliance burden.

The US Office of Technology Assessment (OTA) investigated the technology-forcing aspects of standards promulgated by the US Occupational Safety and Health Administration (OSHA) over the last twenty years and found that:

- technological innovation usually resulted from stringent regulation, and
- traditional CBA performed prior to a standard's implementation failed to anticipate significant economic benefits accruing to the innovating industrial firm.

CHANGING ECONOMIC THEORIES

The reductionist version of neoclassical economic theory predicts that since health, safety and environmental regulations impose non-productive investment by industry on pollution control, regulation can only be a burden on innovation, and hence on economic growth, because of the diversion of resources away from R&D. A more modern view is the so-called Porter Hypothesis proposed in 1991, which argues that regulations may actually stimulate growth and competitiveness [1]. In fact that suggestion, and the empirical evidence that supports the hypothesis, goes back to a series of publications from researchers at MIT beginning twelve years earlier [2,3,4,5] although Porter does not seem to be conscious of it [6].

Porter bases his hypothesis on the notion that firms that first address environmental problems by developing technological responses to control pollution gain a market advantage by doing so – the so-called 'first mover' advantage [7]. One could describe the Porter Hypothesis as having a weak and a strong form. Porter himself actually discusses only the weak form which says that regulation, properly designed, can cause the (regulated) firm to undertake innovations that not only reduce pollution – which is a hallmark of production inefficiency – but also save on materials, water, and energy costs. This can occur because the firm, at any point in time, is suboptimal. If the firm is first to move by complying in a clever way, other firms will later have to rush to comply – and do so in a less thoughtful and more expensive way. Thus, there are 'learning curve' advantages to being first and early. What is missing from Porter's analysis are details about the process of innovation, how change actually occurs in industrial firms, what kinds of firms are likely to come up with what kinds of technical responses, and how very stringent regulation can confer competitive advantage beyond what he calls 'innovation offsets'. While Porter stresses the importance of going beyond the 'static model' of compliance responses, he is in fact talking mostly about modest or incremental innovation in reducing pollution.

> *Traditional methods over-estimate the costs of protecting workers and under-estimate the health and safety benefits achievable by adopting superior technologies*

The strong form of the Porter Hypothesis was first proposed by Ashford and his colleagues at MIT after years of cross-country and US-based studies that showed that stringent regulation could cause dramatic changes in technology, often by new firms or entrants displacing the dominant technologies. These changes go beyond traditional end-of-pipe pollution control, and result in more fundamental changes in the production process encompassing pollution prevention/cleaner production. The former results in modest reduction of pollution; the latter often brings about more significant, even radical, technological change, which is often accompanied by savings in energy, water and material resources, as well as reducing pollution at source.

The replacement of dominant technologies by new entrants, rather than incremental change by existing technology providers, has been the source of the most important radical innovations over this century. It stands to reason that any strong change in market conditions – be it sudden factor cost changes, new opportunities from new consumer or societal demands, an energy crisis, or demanding regulation – could stimulate significant innovation. Porter did not actually discuss the strong form of the hypothesis, which is by far the more important and interesting effect. Paradoxically, pollution prevention/cleaner production initiatives that do not also include concerns for worker health and safety can result in either media-shifting from environment to workplace, or problem-shifting from gradual expected pollution to sudden and accidental releases of chemicals, sometimes resulting in catastrophic accidents[8].

In contrast to the situation in the US, regulation-induced radical technological change in the environmental area has not been observed as much in Europe [9] where a more cooperative style of government-industry interaction often prevails. This cooperative style has tended to reduce the stringency of European regulations [10]. In the US, there is ample evidence that regulation – if properly designed and implemented – can prompt the kind of fundamental technological change that can significantly reduce human and environmental exposure to toxic substances in the workplace, in the environment and in consumer products [11]. Prior work at the Massachusetts Institute of Technology developed models to explain the effects of regulation on fundamental technological change, based on empirical evidence over two decades [2,3,4,5]. The particulars of this model – the nature of the regulatory stimulus, the characteristics of the responding industrial sectors, and the resulting implications of the model for explaining technological responses to regulation and for designing innovative regulatory strategies – are discussed elsewhere[12].

COST-BENEFIT ANALYSIS EXAMINED

During the past two decades, cost-benefit has become the dominant method used by many policy-makers to evaluate government intervention in the areas of health, safety and environment. As conceived in theory, cost-benefit analysis:

- enumerates all possible consequences, both positive and negative, that might arise in response to the implementation of a candidate government policy
- estimates the probability of each consequence occurring
- estimates the benefit or loss to society should each occur, expressed in monetary terms
- computes the expected social benefit or loss from each possible consequence by multiplying the amount of the associated benefit or loss by its probability of occurrence; and
- computes the net expected social benefit or loss associated with the government policy by summing over the various possible consequences. The reference point for these calculations is the state of the economy in the absence of government policy, termed the 'baseline'.

The mechanics of constructing a cost-benefit analysis can be seen with reference to Table 1, which presents a relatively disaggregated matrix of the various positive and negative consequences of a government policy – such as regulation – for a variety of actors. The consequences are separated into economic, health and safety, and environmental effects, and those affected are organized into policy-relevant groups of actors, such as firms, workers, consumers and 'others'. Initially, the consequences are represented in their natural units:

- economic effects are expressed in monetary units
- health and safety effects are expressed in mortality and morbidity terms; and
- environmental effects are expressed in damage to ecosystems, etc.

All of the consequences of a candidate policy (or regulation) are described fully in terms of the times during which they occur. What traditional CBA does is translate all of these consequences into 'equivalent' monetary units (since a dollar in an earlier time period could be invested to earn interest over time) by discounting each to present value and aggregating them into a single dollar value intended to express the net social effect of the government policy.

Table 1: Matrix of policy consequences for different actors

Group	Economic effects	Health/safety effects	Environmental effects
Producers	C_1		
Workers	C_1	$B_{H/S}$	
Consumers	C_1	$B_{H/S}$	
Others	C_1	$B_{H/S}$	$B_{Environment}$

The cost-benefit calculation can be expressed in simple mathematical terms by the following equation:

$$V = \sum_{i=1}^{n} \sum_{j=1}^{m} \frac{(B_{ij} - C_{ij})}{(1 + r)^i}$$

where B_{ij} and C_{ij} are the j^{th} type of policy benefit and cost, respectively, in the i^{th} year after the policy is introduced, and B and C are expressed in monetary units; r is the appropriate discount rate; and V is the (discounted) present value of the policy.

Elsewhere the author has argued that health, safety and environmental benefits should be treated differently to costs in computing their present value [13]. One approach would allow for discounting of non-monetisable benefits, but at a lower discount rate. This approach can be defended in terms of a belief that certain amenities, such as health, become more valuable relative to other goods in this society as time passes and the standard of living improves. The following relationship would separate the factors affecting the present value of health impairment prevented in year n:

$$B_n = \frac{B(1 + \text{Œ})^n}{(1 + r)^n}$$

where:
B = metric, expressed in person-years of health impairment prevented in any one year,
Œ = the subsequent annual fractional increase in societal value of health impairment prevented
and r = annual discount rate.

For small values of r and Œ this is equivalent to:

$$\frac{B}{(1 + r - Œ)^n}$$

Thus the 'effective discount rate' (r - Œ), or time rate of preference, will be less than the discount rate used for monetary benefit or cost calculations. Note that, in principle, if the society's valuation of health benefits increases rapidly over time, the effective discount rate for benefits could even be negative! Thus, instead of the traditional cost-benefit approach which is biased against interventions requiring cost expenditures early and yielding benefits later (such as is the case with chronic disease), this treatment makes long-term investments in health much more attractive.

The increasing concern with global environmental effects that occur far into the future, such as climate change, are a striking example of a societal judgement that the future may count more than the present. Here, the application of traditional positive discount rates are not likely to justify precautionary actions needed to prevent future catastrophic or otherwise irreversible harm[14].

When there is only one policy option, cost-benefit analysis dictates that option should be implemented only if its anticipated net social effect is positive. In general, however, numerous policies or sets of policies are possible. Each policy can be differentiated according to the various features that it comprises – type of policy instrument, policy level or stringency, firms covered, etc. In this situation, according to the cost-benefit criterion, the policy with the largest expected net social benefit, when compared to the baseline, should be implemented.

As a decision-making tool, CBA offers several compelling advantages:

- First, it clarifies choices among alternatives by evaluating consequences in a systematic and rational manner
- Second, it professes to foster an open and fair policy-making process by making explicit the estimates of costs and benefits and the assumptions on which those estimates are based
- Third, by expressing all of the gains and losses in monetary terms, discounted to their present value, it permits the total impact of a policy to be summarised using a common metric and represented by a single dollar amount.

As a practical matter, however, CBA possesses several serious limitations. The ensuing dissection of CBA is not intended to suggest a wholesale rejection of the technique, but to caution against the uncritical application of an imperfect methodology and the unqualified acceptance of its results[15].

PROBLEMS IN ESTIMATING PUBLIC POLICY BENEFITS

The benefits of a specific government policy concerning occupational health and safety are generally the reduced social costs associated with a decrease in the number (or severity) of job-related injuries and illnesses, where the decrease is brought about by the policy in question. Prominent examples of policy benefits include reductions in medical expenses, productivity losses, physical disability, pain and suffering, and loss of life. Estimation of the policy benefits in CBA is a formidable task because it is difficult to predict the reduced risk of injury and disease and to monetise the associated benefits.

There are many problems in trying to determine the effects of a government policy on the incidence of job-related injuries and disease. The baseline occupational risks may not be scientifically established. In most cases, the precise relationship between exposure and disease is simply not known. Estimating the effects of the policy on worker exposure levels may also be rather uncertain, depending as it does on assumptions about company and worker behaviour, as well as on technical production relationships.

Additionally, many of the benefits of government policy, such as reductions in physical disability, pain and suffering and loss of life, have no clearly defined economic value (as compared to the market prices established for labour and medical services). The traditional methods of monetising these benefits – surveys and market studies – have to a large extent been unsuccessful. Interviews and questionnaires asking individuals what they would be willing to pay for a stated reduction in risk have inherent limitations, since answers to hypothetical questions have been shown to be poor indicators of a person's behavior. Imputing the value of risk reduction from an individual's market behavior is also a seriously flawed approach[16]. Individual actions are normally undertaken for a variety of reasons, and it is difficult to isolate what portion is motivated by a desire to reduce the risk of bodily impairment, pain and suffering, or a premature death. Furthermore, consumers are rarely well informed about the risks confronting them and have a well-documented history of being unable to process the risk information at their disposal in an expected manner[17,18,19]. As a result, the assumption of economic efficiency underlying attempts to value risks from consumer market decisions is untenable in practice.

The job market itself is the place where policy analysts have most frequently turned to derive the value of a reduction in risk. Recall that, according to economic theory, the risk-compensating wage premium (hazard pay) represents the workers' valuation of job risk. However, the same job market imperfections that produce a socially-excessive level of workplace risk and create a need for government intervention also undermine the usefulness of the risk premium as a measure of the worker's risk valuation. For example, job-related diseases that the worker does not know about will not be reflected in the wage premium for risk. Moreover, workers may have difficulty in understanding risk information. In theory, they are just as likely to over-react as under-react to hazard information. In practice, worker risk perception appears to be dominated by an "it-can't-happen-to-me" attitude[20]. This results in known risks being understated and therefore undervalued. Another job market defect, externalities, causes the observed wage premium for risk to measure only the ***worker's*** valuation of an incremental risk, but not the value family members, friends and other interested parties attach to the risk. Furthermore, models of the risk-compensating wage differential assume a perfectly-competitive job market; violation of this assumption means that the resulting estimates will 'misinterpret' the true wage premium for risk. This is a particularly serious problem since there may be no way to adjust the estimates to correct for the mis-specification.

PROBLEMS IN ESTIMATING PUBLIC POLICY (INTERVENTION) COSTS

Although the costs imposed by a government policy seem rather easy to identify and to express in economic terms, they are usually no more certain or reliable than the benefits. One reason is that policy analysts rarely have access to detailed, independent information about actual, and potential, production relationships and associated costs in an

industry. Instead, they must depend to a large extent on industry-provided data to develop estimates of the costs to industry of complying with the public policy. Since higher compliance costs make a policy less attractive, industries adversely affected by the policy may choose to inflate their reported compliance costs.

In addition, compliance cost estimates often fail to take three significant factors into account:

- economies of scale, which reflect the fact that an increase in the production of compliance technology often reduces unit costs
- the ability of industry to learn over time to comply more cost-effectively, i.e. what management scientists refer to as the learning curve, and
- compliance costs based on present technological capabilities ignore the role played by technological innovation in reducing those costs[21].

The last factor is particularly crucial. A recent retrospective analysis of eight OSHA regulations issued between 1974 and 1989 by the OTA concluded that the agency's estimates of economic impacts systematically and significantly over-estimated compliance costs by ignoring the innovative response of industry to the enacted standards[22]. Five of these regulations addressed toxic substances and are discussed in detail below.

THE OTA STUDY

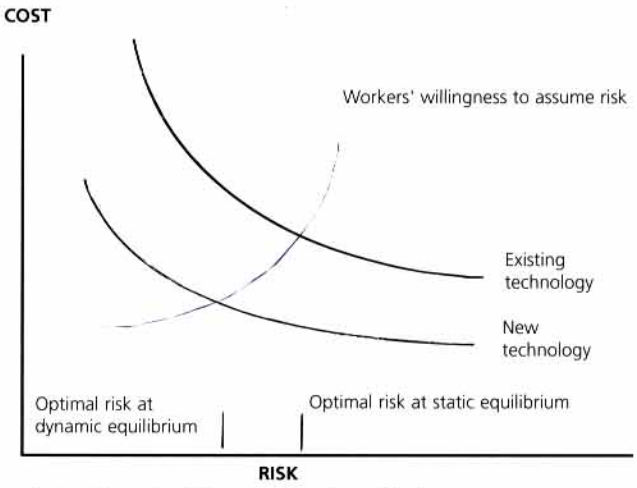
The results of the OTA study are summarized in Table 2 for the five health standards that were investigated. The study concluded that:

"OSHA's current economic and technological feasibility analyses devote little attention to the potential of advanced or emerging technologies to yield technically and economically superior methods for achieving reductions in workplace hazards... Opportunities are missed to harness leading-edge or innovative production technologies (including input substitution, process redesign, or product reformulation) to society's collective advantage, and to achieve greater worker protection with technologically and economically superior means.

"Intelligently-directed effort can yield hazard control options – attributes that would, no doubt, enhance (for regulated industries and their workforces) the 'win-win' character of OSHA's compliance requirements in many cases and support the achievement of greater hazard reduction."

There is thus overwhelming and convincing evidence that failure to include technological innovation in assessing the costs and benefits of workplace regulation renders cost-benefit analysis of minimum use in efforts to protect workers from occupational health hazards. Estimates using traditional approaches over-estimate the costs of protecting workers and under-estimate the health benefits achievable by developing or adopting superior technologies.

Thus, reliance on traditional cost-benefit analysis leads to a suboptimal level of regulation and hence a suboptimal level of occupational health and safety[23]. This of course, is one reason for the enthusiasm in some quarters for using CBA to determine the acceptability of health and safety regulation.



Optimal risks at static and dynamic equilibrium.

Table 2: OTA case histories

- **Vinyl chloride**
  (1) significant process (polymerization) innovation
  (2) final compliance costs were one quarter of pre-promulgation best estimates
- **Cotton dust**
  (1) aggressive re-tooling of entire production process yielding significant productivity improvements
  (2) final compliance costs were one third of pre-promulgation best estimates
- **Lead (secondary smelters)**
  (1) lack of enforcement, plus exercise of the option of paid medical removal of workers, yielded a small fraction of predicted compliance costs
- **Ethylene oxide**
  (1) because of fear of legal liability, the hospital industry chose to replace existing sterilisation equipment with innovative technology, thereby reducing the ambient level well below the required standard
  (2) engineering costs were, however, about the same as predicted, although new technology was adopted
- **Formaldehyde (metal foundries)**
  (1) significant innovation by formaldehyde resin suppliers
  (2) costs were a half of pre-promulgation best estimates

Source: *Gauging Control Technology and Regulatory Impacts in Occupational Safety and Health: An Appraisal of OSHA's Analytic Approach*. Washington, DC: U.S. Congress, Office of Technology Assessment (OTA-ENV-635); September 1995.

REFERENCES:

1 Porter, Michael E., "America's Green Strategy," *Scientific American*, April 1991, p 168.

2 Ashford, N. A., Heaton, G. R., and Priest, W. C., "Environmental, Health and Safety Regulations and Technological Innovation," in *Technological Innovation for a Dynamic Economy*, C. T. Hill and J. M. Utterback (eds.), Pergamon Press, Inc., NY, 1979, pp. 161-221.

3 Ashford, N.A. and Heaton, G. R., "Regulation and Technological Innovation in the Chemical Industry," *Law and Contemporary Problems*, Duke University School of Law, Volume 46, Number 3, Summer 1983, pp. 109-157.

4 Ashford, N. A., Ayers, C., and Stone, R. F., "Using Regulation to Change the Market for Innovation," *Harvard Environmental Law Review*, Volume 9, Number 2, Summer 1985, pp. 419-466.

5 Ashford, N. A. "Understanding Technological Responses of Industrial Firms to Environmental Problems: Implications for Government Policy," in *Environmental Strategies for Industry: International Perspectives on Research Needs and Policy Implications*, K. Fischer and J. Schot (eds.), Island Press, Washington, DC, 1993, pp 277-307.

6 Jaffe, A., Peterson, S., Portney, P., and Stavins, R., "Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?" *Journal of Economic Literature*, Vol. 33, March 1995, 132-163 (page 154).

7 Nehrt, Chad, "Maintainability of First Mover Advantages When Environmental Regulations Differ Between Countries" in *Academy of Management Review*, 1998, 23(1):77-97.

8 Ashford, N.A., "Industrial Safety: The Neglected Issue in Industrial Ecology" in the Special Issue on Industrial Ecology, Ashford, N. A. and Côté, R. P. (Eds), *Journal of Cleaner Production*, 1997. 5(_), pp 115-121.

9 Kemp, René "Environmental Regulation and Innovation: Key Issues and Questions for Research" in *The Impact of EU Regulation on Innovation of European Industry*, Hemmelskamp, J. and Leone, F. (Eds.), Joint Research Center, the European Union, Seville, 1998, pp 12 et seq.

10 Gouldson, Andrew and Murphy, Joseph, *Regulatory Realities: The Implementation and Impact of Industrial Environmental Regulation*, Earthscan Publications, London 1998.

11 Strasser, Kurt, "Cleaner Technology, Pollution Prevention, and Environmental Regulation" in *Fordham Environmental Law Journal* 1997, 9(1).

12 See notes 3-5. See also Ashford, N. A. "An Innovation-Based Strategy for the Environment," in *Worst Things First? The Debate Over Risk-based National Environmental Priorities*, A. M. Finkel and D. Golding (eds.), Resources for the Future, Washington, DC, 1994, pp. 275-314.

13 Ashford, N. A. "Alternatives to Cost-Benefit Analysis in Regulatory Decisions," *Annals of the New York Academy of Sciences*, Volume 363, April 30, 1981, pp. 129-137. See also Ashford, N. A. and Caldart, C. C. "Economic Issues in Occupational Health and Safety", Chapter 5 in Technology, Law and the Working Environment, Revised Edition, Island Press, 1996, 641 pages.

14 Ashford , N. A. , "A Conceptual Framework For The Use of the Precautionary Principle in Environmental Law," in Raffensperger, C. and Tickner, J. (Eds.) *Protecting Public Health and the Environment: Implementing the Precautionary Principle*, Island Press, 1999.

15 An alternative approach to cost-benefit analysis, trade-off analysis, has been suggested. In this approach, like cost-benefit analysis, the matrix depicted in Table 1 is a starting point for the analysis. However, in trade-off analysis, the matrix elements are expressed in their natural units, such as monetary costs, mortality and morbidity statistics, etc. No attempt is made to place a monetary value on health, safety and environmental effects. The time period in which each effect is experienced is fully described, but the health, safety, and environmental effects are not necessarily discounted. Trade-offs between worker health and costs to producers, consumers and others are made in a transparent manner by the politically-accountable decision-maker. Thus *accountability*, rather than accounting, is fostered. See Ashford, N. A. and Caldart, C. C. "Economic Issues in Occupational Health and Safety", Chapter 5 in *Technology, Law and the Working Environment*, Revised Edition, Island Press, 1996, 641 pages.

16 Fischer, G. W., "Willingness to pay for probabilistic improvements in functional health status: A psychological perspective." In: Mushkin, S. J and Dunlop, D. W., eds. *Health: What Is It Worth? Measures of Health Benefits*. New York: Pergamon Press; 1979.

17 Tversky, A. and Kahneman, D., "Judgment under uncertainty: Heuristics and biases." *Science*. 1974;185:458-468.

18 Fischhoff, B. "Cost benefit analysis and the art of motorcycle maintenance". *Policy Sciences*. 1977;8:177-202.

19 Machina, M. J., "Choice under uncertainty: Problems solved and unsolved." *Journal of Economic Perspectives*. Summer 1987;1:121-154.

20 Ashford, N. A., *Crisis in the Workplace: Occupational Disease and Injury*. Cambridge, Massachusetts: MIT Press; 1976, 579 pages.

21 See note 4.

22 *Gauging Control Technology and Regulatory Impacts in Occupational Safety and Health An Appraisal of OSHA's Analytic Approach*. Washington, DC: U.S. Congress, Office of Technology Assessment (OTA-ENV-635); September 1995.

23 Full application of cost-benefit analysis dictates that solutions to worker health and safety problems be "economically efficient", i.e., that intervention is justified until the marginal benefits of further protection no longer equal marginal costs. A slightly less stringent condition – often expressed in guidelines from the US Office of Management and Budget – is that the total benefits of regulation at least exceed the costs. Using the costs of *existing* technology in this calculus leads to static efficiency. Instead, if the costs of *new* technology were factored into the calculus, a different, *dynamic* efficiency would be achieved, with a greater level of worker protection at lower cost, leading to a "win-win" situation (see Ashford and Caldart, note 15). See Figure 1 for a graphical representation of dynamic versus static efficiency.

OWEN TUDOR
Trades Union Congress, London

Strengths and weaknesses

It is important to distinguish between the scientific approach involved in CBA and the moral and political baggage that comes with it. How far is it technically and philosophically possible to produce accurate CBAs, and is it right to draw policy conclusions from them?

According to Einstein, "God does not play dice with the universe." But of all the sciences, this is least true of economics. Indeed, if economists were better at predicting the future movements of the economy, they would soon be able to leave the field and retire on the profits of their stock market predictions!

TECHNICAL PROBLEMS

The lack of precision in CBAs can produce remarkably inexact findings, with margins of error in some elements of the calculation greatly exceeding total costs in other elements. There are several reasons why it is difficult to come up with precise estimates for the costs or benefits of any particular measure, but I would identify in particular five key reasons:

- the ease of focusing on the most obvious costs
- the range of potential beneficiaries
- inadequate forecasting
- overstatement by suppliers of information
- commercial confidentiality

Most CBAs are more specific about costs than about benefits, partly because of the indeterminacy of health benefits, as noted below. In most cases, this is simply because it is much easier to be precise about the likely cost of a particular preventive step, such as purchasing a new piece of equipment. Because health and safety regulation is usually framed in terms of action by the duty-holder (normally an employer), that action is easier to cost than is the result, which may or may not be certain.

In addition, the benefits are likely to accrue to a wider range of stakeholders than bear the costs. The employers/enterprises on whom the duties fall are likely to be the only group on whom the costs of a health and safety measure will directly fall. But the benefits may also be felt by:

- other employers/enterprises – for example, a reduced accident rate in a construction company is likely to benefit its clients as well
- the workers and their families who suffer fewer injuries
- the state and society who have to pay less for health and social security and pay less in taxation etc.

These stakeholders receive benefits which may or may not overlap (transfer payments are a particular issue here). The positive effects of a health and safety measure may ripple out through several layers of beneficiaries in a way that is difficult to follow.

Forecasting those ripples is even more difficult than following them. We can be reasonably certain of the costs of undertaking a certain course of preventive action, but it is difficult to be certain what impact that action will have on injury and illness rates. This is especially true in cases of long-latency diseases, such as cancers, but it is also true of any disease or injury which cannot be predicted with certainty. Some people will develop back strains in circumstances where others would not – so how can we be certain that a preventive measure will prevent the strain? And how can we tell how long it will take for the measures required to have an effect?

One issue over which trade unions have been particularly critical of the CBA process is the weight attached to employer estimates of the costs they will need to bear. Though economists have become far more cautious about blindly accepting levels of costs quoted by those most likely to incur them, there is still virtually no other way of identifying items on that side of the CBA equation. Attempts to revisit CBAs, however, often demonstrate that the expected costs were much lower than predicted, for fairly obvious reasons.

Faced with an actual duty rather than a theoretical one, employers have an incentive to minimise the costs. But during the regulatory process they have an incentive to inflate them, not necessarily to oppose or water down the regulation (although this happens), but just to ensure that they build into their own budgets sufficient flexibility to deal with the worst case scenario.

Even where employers are not following this logic, those drawing up CBAs for the regulatory process are likely to be hindered by commercial confidentiality. This will prevent them from being fully critical about some of the cost claims. Practices concerning commercial confidentiality vary between enterprises, but there are few that will nowadays be entirely open with regulatory agencies (or indeed even within their own enterprise).

Most of these problems apply specifically to CBAs drawn up about regulatory proposals. They do not all apply, or apply to the same extent, to internal enterprise CBAs. This is one reason why the latter are often more concrete, and also why, in my view, they are often more positive about the benefits compared to the costs. This is in part, of course, a self-selecting truth. Enterprises conducting CBAs of their planned health and safety activities have access to much more and better data about their own operations than regulators have

about an entire class of enterprises (many of which would themselves be incapable of an internal CBA). But it is all also likely to be true regardless of the data issue, because of the narrower focus of individual internal CBAs. Both 'internal' and 'regulatory' CBAs, however, are likely to face problems in terms of other theoretical aspects, in particular the choice of baseline and the assumptions made about the future.

The question of which baseline to adopt depends on whether to assume that everyone is already complying with existing laws, and merely examine what would be needed to improve that compliance to the next regulatory level, or to operate on the basis of what is known about existing levels of compliance, and assume the costs of a measure include the catch-up costs of reaching the existing standards. In the latter case, the level of knowledge about existing compliance is likely to be patchy. But if it is assumed that everyone is already complying with the law, then how is it possible to distinguish the benefits of the additional regulation?

> *Attempts to revisit CBAs, however, often demonstrate that the expected costs were much lower than predicted, for fairly obvious reasons*

Assumptions about the future do not refer to the forecasting problems referred to above, but to the varying assessments made about how much expenditure made or benefits achieved in ten years' time should be discounted to equate to current prices. The different elements of the CBA equation – capital investment, running costs, the value of human health (see below) – are all likely to change in relative value over the next ten years.

This is rarely taken into account, despite the marked differences in the rate of change between, say, capital costs (especially new technologies which come down in price very swiftly) and human health (the value of which can change according to political and moral developments that are even more difficult to predict than economics).

PHILOSOPHICAL PROBLEMS

Compared to the philosophical problems of the CBA process, the economic problems are, indeed, technical difficulties – some of them soluble. There are, I think, three main philosophical problems with CBAs:

- the inappropriate use of financial valuations of human health effects
- the inadequate justification for valuing human health effects resulting from health and safety actions on the basis of willingness-to-pay research
- the indeterminacy of the value of human life.

Firstly, the predominant system for valuing human health effects is the Quality Assessment of Life Years System (QALYS), a tool derived primarily for making decisions about the allocation of healthcare. The problem with applying systems derived from QALYS to health and safety is the problem of comparing apples with pears. Under the QALYS approach to healthcare, more or less scarce health resources need to be allocated to one group of people or another (or in particularly brutal cases, one person or another). It may well be appropriate to compare two people's lives and ask: "Will the impact of treatment A on person B be better or worse than the impact of treatment Y (or indeed A) on person Z?" QALYS provides a way of comparing the health effect on one individual with that on another. The financial cost of the two treatments can then be compared against that comparison.

But in the CBA system, a completely different comparison is going on. It assumes the QALYS system is producing an objective test of the value of a health effect – something it is simply not qualified to do. QALYS, in its pure health form, merely compares two subjective assessments carried out on (hopefully) identical bases. When the human health effect of a health and safety measure is compared with its costs, we may in fact merely be compounding whatever errors have crept into the QALYS system, rather than producing a meaningful result. Change the assumptions about human health valuation for a CBA, and the entire CBA comes out differently, so that a measure may not be taken at all.

Change the assumptions about human health valuation for a decision about health intervention, and the only change is that a different action results. This might not matter much if the valuation of human health effects was watertight. In fact, it is based on guesswork and very shaky logic.

The second problem is that most systems of valuing human health effects in CBAs are based on 'willingness-to-pay' research. At best, this means that large numbers of people were asked what they would be willing to pay to prevent some health effect – classically, how much would they pay for a seatbelt to be put into their car to prevent them dying in a car crash. Allowances can even be made for people's mis-perceptions of the likely effect of the expenditure.

But this research is based on using a hypothetical case to predict what will happen in a real case. It is based on assuming that a decision, which is in fact made for many different reasons, is made only on the basis of a comparison of financial and health effects. Most importantly of all in terms of health and safety, most of this research asks people how much they would pay to avoid a risk over which they had at least some control. In terms of health and safety regulation, however, the issue is about how much workers think employers should pay to prevent something which those employers are in the best position to control.

The third philosophical problem, however, is the most intractable and very controversial. I will state it briefly. The 'willingness-to-pay' argument is based on the suggestion that we can quantify the financial value of a human life on the basis of people's willingness to pay to avoid harm. If that were so, the life of a poor person would be worth less than that of a rich one, because the rich one would have more disposable funds with which to avoid harm. This conclusion is, of course, morally repugnant (though our ancestors may have found it less so).

Undoubtedly people do make decisions about other people's lives on these morally dubious grounds. It would therefore be difficult to argue the morally pure line that it is impossible to put a value on human life, or that such a value should be infinite. But it is also clearly the case that perceptions of the value of human life can vary for all sorts of reasons. It is therefore more true to say (as Nicholas Ashford has done) that the value of a human life is indeterminate.

IS IT RIGHT TO DRAW POLICY CONCLUSIONS?

The above points, notwithstanding the advocacy of 'internal' CBAs, suggest that CBAs are of no use or dangerous in the regulatory process. This may be going too far. Clearly it is right to be sceptical about the accuracy of CBAs, and important to keep in mind the uncertainties, no matter how concrete the final financial figures appear. This is particularly important politically, as modern politics emphasise the need for certainty and modern politicians often forget to read the small print that explains the complexity of what they are being told! But it is also right that safety sledgehammers should not be used to crack risk management problems. We do need a way of identifying which safety measures might act as 'sledgehammers'.

One way to do this that is gaining support, is to abandon the attempt to attribute financial values to human health effects. Politics is about priorities, especially economic ones, and therefore it is always in practice going to be the case that health and safety regulations depend on being relatively cost-effective. CBAs can provide a better guide to policy-making if they do not hide behind an artificial screen of precision.

Instead, CBAs should identify the net financial costs of health and safety measures, and should then set that information against the human health effects, stated without translation. This would at least enable a proper public debate about whether a measure was worth taking or not.

CONCLUSION

Despite the critical approach to using CBA as a regulatory tool, I strongly believe that the technique can make a valuable contribution to health and safety at individual enterprise level.

Cost-benefit assessment was at its least appealing in the now fairly well known case of the Ford Pinto. This car appeared to have a nasty tendency to explode if rammed from behind (partly due to the location of the petrol engine) and a number of compensation cases were pursued by victims against the car company. The game was up when it was revealed that the company had considered the costs of settling such cases, and the costs of recalling the car, and decided that, on balance, it would be cheaper to continue to allow the immolation of some of its customers and pay off the victims or their surviving relatives. Since then, the practice of CBA has of course changed and become more sophisticated. Whether the morality has is questionable.

The key political issue is how much weight should CBA have in the policy-making process? The tripartite ad hoc group of the Advisory Committee on Safety, Hygiene and Health at Work was unanimous that CBAs should inform policy-making, but should not determine it.

That is in tune with the political mood of Europe. In both the EU as a whole and in Britain in particular, where CBAs have been used to inform health and safety regulatory decisions for more than fifteen years, their influence is, in practice, waning. The Labour Government in Britain replaced the Deregulation Unit with a Better Regulation Unit, and has produced guidance on 'Regulatory Impact Assessments' rather than CBAs. This meets some of the criticisms mentioned above by indicating that some outcomes cannot be measured in financial terms (health and safety gets a specific mention in that part of the guidance).

In Europe, the SHAPE project (designed to look at how European regulation of health and safety could be subjected to a CBA process) was wound up half way through its life. Cost-benefit assessment can be tremendously useful inside an individual enterprise. But it is less useful as a regulatory tool.

K A J F R I C K

National Institute for Working Life, Solna

Uses and abuses

Cost-benefit analysis is too crude a tool to apply to complex OSH issues and results can be easily manipulated to suit the needs of vested interests. Despite its shortcomings however, if systematically improved and applied in combination with professional OSH expertise, the technique could potentially become a powerful tool for improvements in the OSH decision-making process.

Why have CBAs become so popular in the debate on occupational safety and health (OSH)? Their possible advantages are that they may help to better allocate resources in two ways (see e.g. Ashford 1976: 328-33):

- Deciding how to use limited resources more efficiently – i.e. getting more OSH for your money
- Encouraging more resources to improve OSH. For example at national level by revealing the extent to which employers offload costs of work injuries to society, and at company level by demonstrating the costs of not improving OSH – i.e. getting more money for your OSH.

However, CBAs must also be recognised as products, marketed by economists and other producers. They are one of a range of models which different professional groups have long used to try to monopolise our understanding of OSH issues. Yet these models must be seen for what they are – theoretical exercises which may help solve real problems, but which in fact can only cover some of the factors relevant to decision-making.

In their competition for 'customers', many professionals promoting individual models have become consultants rather than researchers. Economic and intellectual incentives often persuade them to emphasise what they do know at the expense of what they don't, and both their models and their applications suffer accordingly. A well-known example is the often refuted but still popular 'human error theory' of accidents, which disregards problems of work-place safety and how conditions shape behaviour (Perrow 1984: 244-50; Wyatt 1995; Fahlbruch & Wilpert 1999).

INCLUDE ONLY WHAT YOU CAN MEASURE

Closely tied in to the production process, OSH is shaped by the interactions of management, organisation, technology, markets, regulation and industrial relations. The economics of OSH are therefore complex but only some CBAs attempt to tackle the methodological challenges of assessing OSH issues, e.g. at the national level Ruttenberg (1983 and 1994), and at the company level Sandkull, Gille et al. (1988), Söderqvist & Persson (1988), Krüger & Meis (1991) and Berger (1995). However, these few do not alter the overall picture of CBA models as offering little relevance to real situations and poor quality of analysis. CBAs usually ignore the problems but still claim to produce exact figures. They may list the variables used, but contain neither critical analyses of their assumptions and levels of uncertainty, nor comparisons with other similar models available.

> *The current naive belief in CBAs of OSH issues – as if they were even close to offering rational grounds for decision-making – is dangerous*

CBAs of proposed regulations rarely include productivity gains of improved OSH. Their economic evaluations of human life and health have also been severely criticised (e.g. by Ruttenberg 1981; MacCarthy 1981: 792-800; McGarity & Shapiro 1993: chap. 18-19; Dorman 1996: chapter 3), as have their costs estimations (see below).

Most CBAs account only for the benefits of reducing costs in poor OSH situations, mainly in relation to accidents and worker turnover or absenteeism (Frick 1997a; and Orkan 1974; Andreoni, 1986; Goodman & Atkin 1984). The models only include variables for which quantitative input values can be estimated. At company level, these are mainly personnel costs, such as sick pay and the cost of recruitment, or reduced productivity during worker replacements (e.g. HSE 1997; Liukkonen 1989). At national level, they include expenditures for prevention, detection, treatment, rehabilitation and lost work-hours (e.g. Walsh 1991).

Such CBAs exclude qualitative aspects of work and use costs that represent just a small part of the full OSH economic picture. Only when working conditions become so poor that individuals cannot or do not want to work do they manifest themselves in terms of increased absenteeism, registered injuries or personnel turnover. Beneath floats an 'iceberg' of continuous economic interaction between the conditions and the results of work. An exception to this approach is Sandkull, Gille et al. (op. cit.) who estimated the economic implications of two similar factories operating with large differences in their OSH conditions. They tried to develop a model relating OSH conditions to overall economic performance, instead of

merely adding up the economic effects of a few, measurable OSH variables. Frick (1994: 137) also estimated the revenues lost in a particular factory (mainly due to poor working conditions) to between 0,5 and 1 billion SEK, while a CBA had indicated extra personnel costs of just 80 million SEK. But such evaluations of CBA models, comparing calculated results with 'real' total costs, are rare. "Most economists acknowledge the existence of soft variables, then strain to find some rationale for ignoring them". (McGarity & Shapiro op. cit.: 277, partly quoting Tribe).

Fresh examples are continually reported of how OSH improvements may increase productivity. For example, reductions in levels of noise, heavy lifting and polluted air may cut expenses for heating, material handling and waste (Magnusson 1987). Accident prevention can also avoid damage to material, machinery and products (Andreoni op. cit.: 9 and 30), and help prevent incidents in hazardous production (Kjellén 1990: 238; Dawson 1991: 13-5).

More importantly, poor OSH reduces the quality and quantity of work output. Ergonomic problems led to a tripling of quality-related faults and reduced motivation among assembly workers (Eklund 1992: 2 and 11). In a steel mill, a new ergonomic service platform reduced personnel costs in terms of labour turnover and absenteeism.

Improved quality and faster uninterrupted production flow added further to profitability (Abrahamsson & Olsson 1993; cf. Oxenburgh 1991; Goldmann & Lindbergson 1991: 78; McLeod 1995; for similar examples). Such productivity effects are important, but rarely included in calculations of company or of national aggregated costs of poor OSH conditions.

GROSSLY EXAGGERATED COSTS OF IMPROVEMENTS

CBAs not only under-estimate the benefits of OSH improvements – they also exaggerate the costs. They tacitly sustain the popular belief that OSH improvements are expensive. This is openly claimed in CBAs on OSH regulations where employers' figures are used for costs of applying additional OSH measures to existing production.

However, modern quality theory suggests that if the system is right from the beginning, maintaining quality is free, or at least very much cheaper than correcting mistakes afterwards (Hedborg 1993). Ahlman (1985), Malmholt (1984) and Kiil & Heide (1986) demonstrated that this also applies to OSH issues. Even in existing production, many hazards can be greatly reduced through relatively simple and inexpensive measures, (Arbetarskyddsfonden 1977; Magnusson op. cit.; Oxenburgh op. cit.: chapter 8).

From the beginning, OHS regulations have also reduced costs by encouraging the use of more efficient technologies (e.g. Marx 1974: 215; Ruttenberg 1983 and 1994). After the cancer scare of the 1970s, US vinyl chloride producers first claimed that a drastically lowered HTV was technically impossible to comply with, and then that it was not financially viable. In the end, it stimulated the development of a more profitable industry (OTA 1985: 332; Corn 1991: 26). Olsen (1992) compared compliance costs in six European countries and found that a strict regulation, properly enforced, was much cheaper than a weak one, haphazardly enforced. The latter encouraged more costly ad hoc solutions while the strict, clear regulation promoted technological and structural innovations. Many similar cases indicate that OSH 'regulation is [often] the mother of invention' (Ruttenberg 1995; Ashford & Caldart 1997: chapter 10).

BOTTOM LINES ARE AT BEST 'GUESSTIMATES'

In CBA calculations, estimating input values is as difficult as selecting variables. It is thus no surprise that the calculated benefits (and costs) can vary greatly for the same OSH situations. For example:

- In the vinyl chloride case, compliance costs were afterwards estimated to have been only fractions of one percent of those claimed by the industry (Wilson 1985: 16).
- CBAs of personnel costs also vary and contradict each other. RRV (1980: 69-56) found absenteeism among assembly-line workers to cost twice that of process workers. Without reference to the earlier study, Liukkonen (op. cit.: 23) used a different CBA model and claimed the opposite to be true.
- Du Pont maintained that the cost for each lost-day accident was some $30,000 (at the 1993 price level; Webber 1973) while the British Health and Safety Executive (HSE op. cit.: 10) claimed it to be $125 per accident.

CBAs on OSH are thus at best informed 'guesstimates' – at worst they are complete shams. With this arbitrariness, the results depend largely on the influence of the actors involved. The US House of Representatives' Oversight and Investigations Subcommittee therefore concluded: "The most important thing in evaluating a cost-benefit study is the name of the sponsor" (Wilson op. cit.: 16).

ORGANISATIONAL REALITIES OBSTRUCT ANY WIDE IMPACT

With all these shortcomings, what hope is there of using CBAs to expand OSH resources and to use them more efficiently? Detailed evaluation is impossible, as CBAs form just one part of the complex OSH decision-making process. However, experience indicates that while the presentation of 'exact' figures for the costs of poor OSH may promote improvements, they will probably mainly occur at workplaces already actively involved in OSH issues. Most reported calculations of the benefits of reducing accidents, turnover or absenteeism were not done primarily to guide decisions, but were either carried out after the decisions were taken or to provide general overviews. Those who already tried to improve OSH conditions counted the costs of not improving them, and this may have motivated them to further OSH investments.

However, the efforts to improve OHS through the spread of CBA results seem to have had a limited overall impact. Increasingly, studies in all areas of production reveal lost, low-cost opportunities to improve both OSH and productivity. Yet there is little evidence that calculations such as those above have greatly affected the decisions of managers who are passive in their attitudes to OSH. Those approaching OSH issues through 'hard nose economics', or with little interest at all, seem rarely to have been convinced of the benefits of investing in improvements.

This lack of impact of CBA to market preventive OSH management techniques can be explained by the many obstacles facing it in organisational reality (see Frick 1997b):

- Evidence: As quality is usually poor, those who don't want to believe the calculations don't have to.
- Information: New knowledge, especially concerning seemingly peripheral issues connecting OSH and profits, can be slow to penetrate some areas of management.

- Structure: Operating procedures, notably accounting systems, are essential to co-ordinate organisations but also obstruct the recognition of new phenomena, in this case the profitability of OSH issues.
- Culture: The need to impose a common view on the varying individual perceptions of any organisation, may conserve a narrow view of the relation between productivity and OSH.
- Individual interests: Managers may have less interest than employers in OSH issues that may enhance the position of workers.

ZERO-SUM GAMES AND CHECKS ON REGULATORY OVERKILL

Through their irrelevance and poor quality, many CBAs have positively obstructed OSH improvements. Reports which are limited to the costs of poor OSH are not openly biased, but they neglect both the productive aspects of good OSH and the opportunities of cheap improvements. They portray OSH merely as a zero-sum power game between labour and capital. Their 'tip-of-the-iceberg' costs accounted for depend on much more than just OSH issues.

A worker's decision to take a job, to report an injury or to attend work when feeling slightly ill is also affected by other factors such as the labour market, the level of sick-pay, attendance pressures etc. Personnel costs can therefore be affected by these factors. For example, when Swedish unemployment rose to 'normal' European levels in the 1990s, labour turnover became a minor problem. After the sick pay was cut and workers with poor health were laid off (CBAs on the costs of absenteeism may have advised managers in that selection), absenteeism also dropped sharply.

Employers often prefer political means to circumscribe labour's alternatives instead of investing in 'expensive OSH improvements', i.e. with this limited perspective of only reducing personnel costs, OHS is converted into a zero-sum game. To make it a win-win game, CBAs must start to include both the productive aspects of OSH and the dynamics of costs. Only then can CBAs help us realise the wide opportunities for OSH and profits to join interests in developing a healthy and at the same time productive work environment.

At the national level, calculations (with the narrow perspective discussed above) of societal costs of poor OSH have sometimes been presented as motivation for political interventions (e.g. Socialstyrelsen 1987; Davies & Teasdale 1994; Industry Commission 1995: 309-22). However, there is no evidence that this has resulted in ***any major*** policy changes.

With their exaggeration of costs and depreciation of benefits, the genuine CBAs have been heavily biased against OSH regulations. On this basis, economists have concluded that society would be better off with fewer regulations. Those who wanted to ward off 'regulatory overkill' introduced CBAs in the US, where they have been most commonly used (Hilgartner 1985: 37-39; MacCarthy op. cit.). The application of CBAs in the regulatory process has also delayed or completely obstructed several OSH proposals in the US (McGarity & Shapiro op. cit.: chapter 18-19).

WEAPONS IN AN INTELLECTUAL ARMS RACE

The current naive belief in CBAs of OSH issues – as if they were even close to offering rational grounds for decision-making – is dangerous. They are open to manipulation, especially by those who develop them, by those who have production knowledge (but rarely knowledge of its interaction with OSH matters), or by those who have reasons for obstructing OSH improvements.

However, economics cannot and should not be banned from the OSH debate. Poor CBAs, biased against OSH, will continue to appear and will have to be refuted. Improved and used in a proper context, however, CBAs can help in the OSH decision-making process.

CBA is too crude a tool when applied to OSH issues to produce credible results. Both the models and their applications are too arbitrary for resulting figures to be useful in guiding decisions. The real use of such CBAs is instead twofold. On the one hand they are tools of power, where the figures are often used as weapons in conflicts of interests. On the other, CBAs may also be tools for an intellectual analysis, where the process of constructing and applying a CBA may increase the understanding of OSH economics, which in turn may improve OSH decisions.

DEVELOPING CBAS INTO ANALYTICAL TOOLS

The process of constructing and applying CBAs to analyse costs and benefits may improve the understanding of the interaction between OSH and production. However this requires that the CBAs combine a benefit perspective, which includes the qualitative interaction between the environment and the productivity of work, with a dynamic perspective on the possibilities to reduce improvement costs.

Such a methodological development requires critical discussions on the selection of variables used, on their interrelationships and on input estimations. We must also learn from all the previous CBAs, through comparison between theoretical analysis and empirical evaluations of models as applied to similar OSH situations.

That these basic scientific techniques are rare in current CBAs may be due to:

- A lack of time and interest by CBA consultants, who are usually not paid for and gain little by self-critical comparisons. They must instead emphasise the unique quality of their products and ignore competing models.
- A lack of competence. Few economists know enough about OSH to understand how it can support productivity. In economic theory rational managers will instead 'automatically' invest in all profitable OSH measures. Further OSH investments and regulation are therefore by definition seen to be unprofitable.

CBAs are thus important weapons in the intellectual arms race to win public opinion and make favourable political decisions. Their scientific basis and seemingly precise findings make them influential in defining social problems and solutions in the field of OSH (Berger & Luckmann 1967).

This impact is also growing in the European political OSH debate. OSH activists – researchers, trade unionists, administrators and others – are generally still inexperienced and unskilled in this power game. However, if they combine the economic knowledge with their OSH competence before decisions are made, they can in the future turn CBAs into a weapon to improve OSH decisions.

PETER DORMAN

The Evergreen State College, Olympia, Washington

Health, safety and global economics

Globalization and the drive towards greater flexibility in employment and production systems have been key factors in the increasing role played by economic criteria in OSH policy-making in recent years. CBA and cost internalization techniques will continue to feature prominently in this seemingly relentless drive to economic efficiency in OSH, but their application may see a prolonged period of friction between safety and political protagonists.

During the last two decades there has been increasing pressure on national occupational safety and health systems to adhere to the precepts of 'economic efficiency'. No longer is it regarded as sufficient that working conditions be made safe. They must, we are told, be competitive in an unforgiving global economy. To achieve this end, practitioners are being asked to translate policy outcomes into monetary terms and to rely on the techniques of cost-benefit analysis and cost internalization (incentive-based policies). This represents a major departure from traditional practice.

Over the course of the previous century, two principles have guided public policy in OSH that have little to do with efficiency, public health and social justice. The public health view seeks to counteract threats to the health of the population. If the goal of firms is to maximize profits, the goal of the public health community is to minimize morbidity and mortality. The absolutist character of this mission, so alien to the economic mindset, draws on the tradition of medicine. Doctors, after all, do not ask whether the patient's health is worth the cost. If there is a remedy it must be taken. Health, from this perspective, is not a commodity to be traded off against other goods in the marketplace. Its value is thought to be incommensurable – a precondition for the enjoyment of any other value.

The second source of public activism in OSH draws on the workers' demand for justice and fairness on the job. Justice, in this context, means something very specific: no one should derive personal benefit by imposing hardships on others. Those who share in the profits of a firm, whether as owners or highly paid managers, should not do so at the expense of preventable risks to the workforce. This precept seems to have animated labor movements in every industrialized or industrializing country. There seems to be something 'natural' and universal about it, even if philosophers can see problems with it. In particular, it is much more widely shared than the competing perspective of utilitarianism – that A should not impose hardships on B unless the benefits to A exceed the costs to B. The prevalence of 'Kantian' ethics within the labor movement has led, however, to a pattern of worker protest that has been deplored by both the efficiency and public health perspectives. Workers and the general public, it is argued, focus on hazards that trigger claims of injustice, rather than those with the greatest health consequences or the highest benefit-to-cost ratios of abatement[1]. Nevertheless, the Kantian perspective continues to win the most votes, and its effects can be found in every national OSH system[1].

> *Taken together, globalization and the new cult of flexibility have enormous implications for OSH policy*

It is important to remember, however, that public health and social justice concerns were never pursued without any concern for economics. The costs of programs (both for the government and private employers) and their expected effectiveness were always important considerations. What is new about the current push for 'efficiency', however, is that, by quantifying and monetizing all aspects of policy analysis, only economic considerations are given weight. Health and justice objectives that cannot survive this translation must be dropped altogether. This is a difficult step for most practitioners to accept – and rightly so.

Given that fundamental changes in our approach to OSH policy are being sought, and that these changes would revise long-standing practices in the field, it is reasonable to ask two questions:

- why have these pressures appeared now?
- what would be the practical consequences of trying to implement a predominantly economic approach to OSH?

Demands for radical change in OSH policy cannot be attributed to a sudden recent failure of national OSH systems. The evidence simply does not support this notion. The record of safety improvement during the past 20 years, at least insofar as it is measured by official statistics, does not look different from that of previous periods. National OSH systems may have plenty of room for improvement, but they are not performing more poorly than before.

In my opinion, there are two profound economic developments that underlie the ostensible 'crisis' in OSH policy – the process of globalization and the shift toward flexibility. Each of these requires some explanation.

THE GLOBALIZATION PROCESS

Globalization has become one of the most widely used, and one of the most useless, terms in popular discourse. Like 'industrialization', 'development' and other portentously vague signifiers, its universal applicability implies a uniformity and inevitability to economic processes that is unwarranted by the facts. It is certainly true that the world has become a smaller and more tightly integrated place. Trade as a percentage of global product rises year after year. Investment is generating worldwide production networks, and international treaties are providing the legal underpinnings for a unified economic space. This process is what is generally meant by the term 'globalization', yet the description as it stands is incomplete. What we have experienced is not globalization in general, but a specific trajectory of globalization marked by these elements:

- *Technical convergence*. Until recently different regions of the world had different technical systems. Engineers were trained differently, textbooks and journals were different, and skills were not easily transferable. All of this has changed. A company from country A can go to country B, hire local expertise and implement a system designed in country C. A, B, and C encompass all of the developed countries, the developing portions of the developing world, and an increasing share of the formerly communist world. One consequence of this convergence is that national approaches to adapting technical systems are less viable.

- *The collapse of national Keynesianism and other closed economy models*. In most countries, the political left governed, when it did, under the banner of economic development through bolstering effective demand or through the erection of particular national economic institutions. As economies integrated, these programs became less viable, although the fault lines have differed from one country to the next. The important point for our purposes is that the leading edge of social regulation was tied to this coalition and has shared its fate. All OECD governments are now in the hands of the Right, or of the Left mimicking the Right, and no signs of change are on the horizon. This has fundamentally altered the political climate for OSH policy.

- *New trade imperatives*. It is not merely the volume of trade that has changed; the purpose of trade has changed as well. In the aftermath of the debt crisis of the 1980s, the developing countries came under the direction of the international financial institutions. These countries were required to adopt a strategy of export promotion based on the attraction of foreign capital, and the consequences for all of us have been profound. The developing world still hemorrhages capital due to its indebtedness and must generate trade surpluses with the OECD countries. The developed countries in turn struggle to obtain offsetting trade surpluses with one another, a game that, in the aggregate, can't be won. But the constant pressure to improve trade performance has become a dominant feature of every national economy.

Globalization might have taken a different path, but it took this path, with the resulting effects on health and safety policy. It makes little sense, then, to rail against globalization as such. We might envision other forms of economic integration that are more consistent with public health objectives — but that is a task for another day.

THE SHIFT TO FLEXIBILITY

The second fundamental transformation of the last twenty years is summed up in the term 'flexibility', but here as well it is important to be precise. Flexibility can take on many meanings. As a normative value it appears unexceptionable, since who would prefer to be rigid? Yet there are many ways in which economic institutions can become more flexible, and some are in conflict with others. For instance, it is commonplace in industrial relations to note that greater flexibility on the shop floor is purchased at the expense of less flexibility in employment levels. Moreover, there are values in the workplace about which it is not always too wise to be flexible; health is certainly one of these.

The drive for greater flexibility in employment and production systems has several sources:

(1) New technology permits greater reliance on ad hoc management methods and less on formal rules and hierarchy. Elements of the work process can be spun off, recombined and coordinated at a distance, all the while remaining within the firm's infomatic penumbra.

(2) The attractiveness of outsourcing in a near-frictionless international economy has reduced the incentive to maintain internal labor markets, training systems and other quasi-permanent labor arrangements. The era of downsizing is fundamentally about reducing the core workforce, not about reducing the size of firms in general. On the contrary, the concentration of the world's production in a small number of firms continues unabated, even as fewer workers are securely 'inside' these firms (Harrison, 1994; Standing, 1997; Storper and Scott, 1990).

(3) Management theories based on just-in-time resources (including workers), niche production and marketing, quick strikes and nimble withdrawals from shifting markets, etc. are currently popular. These may reflect the changing incentives outlined above, or they may be due to the fashions of the moment. Nevertheless, business organization and strategy have changed fundamentally. To put the issue bluntly, a managerial ethos predicated on hierarchy and centralized control has been replaced by market-oriented values and methods inside the organization.

Taken together, globalization and the new cult of flexibility have enormous implications for OSH policy. Regions are pitted against one another as locations for investment, and policies that interfere with competitiveness are seen as unsustainable. It is important to consider exactly what competitiveness means with respect to safety and health. In 1993 two fires in toy factories, one in Thailand, the other in China, claimed between them 275 lives. Similar disasters, with smaller death totals, have occurred in China, Vietnam and other east Asian exporting countries (Hong Kong Christian Industrial Committee, 1996). According to the ILO, child labor is rampant throughout the developing world and many of these children work under dangerous and unhealthy conditions (Capdevila, 1997). The transition to market economy now taking place in eastern Europe and the former Soviet Union opens new opportunities for unsafe labor. Official statistics in Hungary, for instance, show a deterioration in working conditions even as that country is being eyed as an export platform for the EU market (Jancso, 1996). To recount these and other horror stories is not to reject the right of developing countries

to develop, nor is it to endorse the fear that standards will be forced down to a corresponding level in the industrialized world. It simply means that employers, when estimating the burden imposed by OSH regulations, now have a lower baseline against which to compare. This can hardly fail to have political as well as economic consequences. (This may take the form of an argument to the effect that we have already achieved our legitimate goals in safety and health – see how far advanced we are over the third world exporters! – and that enough is enough.) Of course, it is because of international technical convergence that the possibility of relocation exists, not only for entire operations, but also, and especially, for fragments of them[iii].

The pressures for competitiveness and the political collapse of the left also color the interpretation given to the need for flexibility. In its most primitive form, this is equated with the desire of business to escape regulation altogether. In more sophisticated versions, the flexible production and organization strategies of business are contrasted with rigid, rule-bound regulatory mechanisms. In this context, traditional regulation appears, and is, anachronistic. Consider:

- Traditional regulation assumes hierarchical management and clear chains of accountability. Flexible organization stresses flat, 'recombinant' management and semi-autonomous work teams.
- Traditional regulation assumes a direct relationship between worker and employer. Flexible work systems frequently utilize leased, contract and other forms of labor under which workers are only indirectly related to the firms at which they work. (Cohany, 1996; Polivka, 1996; Segal and Sullivan, 1997).
- Traditional regulation assumes stable employment patterns, through which mandated training, safety and health committees, and other personnel practices can operate. Under flexible employment many workers have only a tenuous relationship to the firm. Neither they nor their employers can be expected to make the relationship-specific investments envisioned by policy.
- Traditional regulation assumes stable work practices that can be monitored periodically by third parties. Flexible production is fluid and uses changing technologies which are often poorly addressed by regulations drawn up years, or even months, ago.

We are now in a position to see the real 'crisis' is OSH policy: the existing system of regulation is incompatible with the demands of competitiveness, flexibility and the new political order. The problem is not that existing regulatory institutions no longer promote the public values of health and justice (although they could and should do this better); it is that the costs of regulation are seen to be more burdensome, less sustainable and less legitimate. Professionals in the field of industrial safety and health cannot ignore these concerns: they will be pressed upon them whether they agree with them or not.

Both cost-benefit analysis and cost internalization draw on the logic of market relations. Both are responses to market failure and implementations of market rationality. Clearly they are responses to market failure in the sense that, if no such failure were recognized, there would be no call to any form of action, including these. At the same time, however, both are based on the economic logic of comparing costs and benefits. In the case of CBA this is transparent. In the case of cost internalization the comparison is undertaken by private parties after the incentives have been adjusted, so that the 'right' prices have been assigned to health or other outcomes. Both depend on the piecemeal decision process characteristic of markets. Where benefits exceed costs to all parties, transactions take place, and as more such transactions occur, the world moves ever closer to its optimal state. Unions and public health officials, among others, have long been skeptical about the appropriateness and feasibility of chopping OSH objectives up into little pieces and leaving each to the test of quantifiable benefits and costs. Are they justified?

The central technical problem that would have to be overcome is that of measurement: how can we calculate the cost of occupational injuries and illnesses? This in turn raises three component issues: identification, attribution and valuation.

The existing system of regulation is incompatible with the demands of competitiveness, flexibility and the new political order

First, is it possible to identify all, or even most, cases of injury, illness, or death? No country can claim to do a satisfactory job at present, and if the full weight of OSH policy is to be placed on ex post health consequences rather than ex ante safety conditions, monitoring will have to be improved. This is only partly a matter of greater expenditure of resources. The incentive of firms to dissemble must be counteracted, and accurate diagnoses must be made[v].

Second, there must be some way to determine what role occupational safety conditions played in the etiology of illnesses. Many health conditions have multiple causes and are stochastically, rather than deterministically, related to any specific causal factor. Thus apportioning the share of costs to be borne by the employer is a tricky business.

Finally, there remains the problem of assigning monetary values to the subjective costs experienced by disabled workers, not to mention the subjective costs of fatalities – whatever this might mean. Elsewhere I have surveyed the techniques that have been used to estimate these values[vi]. Without a detailed analysis however, it is still possible to draw up a collective balance sheet reflecting the strengths and weaknesses of these techniques. The primary insights that animate modern valuation methods are that:

(1) the ex ante anticipation of injury or death rather that the ex post loss is the proper vantage point, and

(2) the subjective valuation of risk – in the language of economics the willingness to pay to avoid risk or be paid to incur it – is the proper basis, rather than lost income, inability to perform specific tasks or other supposedly objective criteria.

For this reason survey techniques ('contingent valuation') appear to offer the most promising approach[vii]. On the negative side, all monetization exercises face several intractable problems:

(1) They assume that states of disability and premature death are essentially homogeneous (a lost digit is a lost digit), whereas in real life people make distinctions based on cause and circumstance.

(2) They assume that individuals possess a utilitarian calculus capable of measuring the disutility of death and disease against the utility afforded by consumable goods. This is contradicted by actual behavior.

(3) They ratify the ex ante judgments of individuals regarding future health states, despite the fact that these judgments are, by definition, fundamentally under-informed. It is difficult to see how these problems can be overcome.

In the absence of a feasible strategy to attach monetary values to OSH outcomes, it is simply not possible to either conduct a proper CBA or calibrate an 'optimal' market incentive. In my opinion, this is devastating for the 'strong' program of OSH policymaking according to the criteria of economic efficiency. But it is important to bear in mind that this conclusion has no particular significance for the practical environment that OSH practitioners find themselves in. Due to the pressures for international competitiveness and increased flexibility, CBA and cost internalization will continue to be put forward as the models that all must follow.

CONCLUSION

The result can only be a long period of tension between the OSH community and its political overseers. I expected to see parallel policy apparatuses. One branch would draw on employer associations and enjoy official government support, conducting fully monetized studies of dubious accuracy. The other, rooted in the unions and health professions, would use messy but more reliable hybrid systems incorporating qualitative health outcomes, worker participation and economic cost estimates. In the long run, the creation of a coherent policy environment will depend on a much larger-scale reform of the international institutions of production, investment, and trade – the ultimate source of the competitiveness and flexibility imperatives.

NOTES:

i For a critique of environmental and OSH regulation that draws on both economic and public health arguments, see Breyer (1993). Breyer is now an Associate Justice of the U.S. Supreme Court and may have the opportunity to implement some of his suggestions for greater regulatory scrutiny. A more balanced approach can be found in the debate documented in Finkel and Golding (1994).

ii In Dorman (1996) I argue that a Kantian stance may be rational in a context in which repeated conflict occurs over working conditions. By focusing on risks that benefit the employer and which are clearly discretionary, workers can more readily influence the severity of future risks. The costs of this stance in forgone attention to "non-Kantian" risks – which often have greater health and safety consequences – remain, however.

iii No studies have been performed on the effect of OSH costs on patterns of industrial location. There is a large parallel literature on the effects of environmental regulation on trade; Goodstein (1994) summarizes it by concluding that the tradeoff between environmental standards and international competitiveness is a "myth". While I am less convinced by the weight of evidence concerning environmental protection — it is subject to problems of excessive aggregation and omitted variables — I think the primary cause for concern with respect to OSH is that worker protection generally assumes a larger share of total cost. Whatever the impact of environmental regulation on trade, the impact of OSH regulation should be greater.

iv As the costs to the firm of reported accidents increases, so does the incentive to disguise them. The Japanese experience documented in Wokutch (1992) is instructive in this regard.

v This monetization problem is a central theme of Dorman (1996). For an update of the statistic analysis, see Dorman and Hagstrom, 1998.

vi Wage-risk studies, referenced previously, purport to measure the same thing, but are vitiated by the "impurities" of the labor markets they analyze.

LITERATURE:

1 Breyer, Stephen G. 1993. *Breaking the Vicious Circle: Toward Effective Risk Regulation*. Cambridge: Harvard University Press.

2 Capdevila, Gustavo. 1997. ILO Shapes Up For The Challenges Of Globalisation. InterPress Service, April 1.

3 Cohany, Sharon R. 1996. Workers in Alternative Employment Arrangements. *Monthly Labor Review*. October: 31-45.

4 Dorman, Peter. 1996. Markets and Mortality: Economics, Dangerous Work, and the Value of Human Life. Cambridge: Cambridge University Press.
– and Paul Hagstrom, 1998. "Wage Compensation for Dangerous Work Revisited. *Industrial and Labor Relations Review*. 52(1): 116–35.

5 Finkel, Adam M. and Dominic Golding. 1994. *Worst Things First? The Debate over Risk-Based National Environmental Priorities*. Washington: Resources for the Future.

6 Goodstein, Eban. 1994. Jobs and the Environment: The Myth of a National Trade-off. Washington: Economic Policy Institute.

7 Harrison, Bennett. 1994. The Dark Side of Flexible Production. In *Lean and Mean: The Changing Landscape of Corporate Power in the Age of Flexibility*. New York: BasicBooks.

8 Hong Kong Christian Industrial Committee for the Coalition for the Charter of Safe Production of Toys. 1996. Press release, September 12.

9 Jancso, Anna. 1996. Hungary: Safety At Work Takes Second Place To Keeping A Job. InterPress Service, August 19.

10 Polivka, Anne. E. 1996. A Profile of Contingent Workers. *Monthly Labor Review*. October: 10-21.

11 Segal, Lewis M. and Daniel G. Sullivan. 1997. The Growth of Temporary Services Work. *Journal of Economic Perspectives*. 11(2): 117-36.

12 Standing, Guy. 1997. Globalization, Labour Flexibility and Insecurity: The Era of Market Regulation. *European Journal of Industrial Relations*. 3(1): 7-37.

13 Storper, Michael and Allen Scott. 1990. Work Organization and Local Labor Markets in an Era of Flexible Production. *International Labour Review*. 129: 573-91.

14 Wokutch, Richard E. 1992. *Worker Protection, Japanese Style: Occupational Safety and Health in the Auto Industry*. Ithaca (NY): ILR Press.

JUAN CHOZAS PEDRERO

Secretary General for Employment, Spain

Achieving the right balance

Two stakeholders respond to common questions concerning the general application and relevance of cost-benefit analysis techniques to OSH issues, with particular reference to SMEs.

Q ***Should cost-benefit analysis be used as a tool for guiding regulation in the area of occupational safety and health at EU and/or national level? Why?***

A It should be one of the factors taken into consideration, since the advantages and disadvantages at both social and economic level should be assessed before any regulations are adopted.

A regulation will impact on a number of areas, often making it more difficult to achieve equilibrium. In the case of health and safety, a balance must be achieved between general interest needs, for example health protection, employment, corporate competitiveness, etc. It is the duty of the public authorities firstly to ensure that any regulation satisfies the objective sought, and secondly, that the regulation does not lead to unjustified disadvantages or costs.

Q ***Is it acceptable to issue occupational safety and health legislation if it cannot be justified on cost-benefit grounds?***

A Cost-benefit analysis is a necessary but not limiting factor in the approval of a regulation. Given that the purpose in this context is to ensure the safety of persons and human life, it is essential that consideration be given to other factors that may be of major importance for the achievement of this objective. Nevertheless, the involvement of the social partners and the parliamentary process facilitates a balance being achieved, making it very difficult, if not impossible, for a provision to be adopted without the social and economic advantages and disadvantages involved having been assessed.

Q ***Is it realistic to motivate small businesses to improve occupational safety and health standards using cost-benefit arguments rather than requiring them to comply with mandatory regulations?***

A Both approaches must be combined. Any legislation drawn up must take into account the specific problems encountered by businesses – but once promulgated it should be mandatory.

It must not be forgotten that prevention is the best form of investment in this field. This is something of which the public must be made aware.

Q ***Do you have any other comments about the cost-benefit issue in relation to safety and health at work?***

A The importance of involving all those concerned in this field should be emphasised. This will ensure that a balance is achieved.

Notwithstanding the fact that that the prime objective is the protection of human life, if an effective outcome is to be achieved, the financial aspect must also be seen as fundamental. In this context, socio-economic analysis should be undertaken by examining separately the advantages and disadvantages that regulations may generate for companies, workers and society.

> *Notwithstanding the fact that that the prime objective is the protection of human life, if an effective outcome is to be achieved, the financial aspect must also be seen as fundamental*

Thereafter, significant efforts should be made to ensure effective implementation of any regulations approved, communicating the message that prevention is cost-effective, and reinforcing it by other means.

MARC SAPIR
European Trade Union Technical Bureau for Health and Safety

Limitations of CBA

Q ***Should cost-benefit analysis be used as a tool for guiding regulation in the area of occupational health and safety at EU and/or national level? Why?***

A Priority must be given in all companies to the recognition of both the rights of workers and their representatives to information, consultation and participation, and also to the application and improvement of existing European legislation regarding new risks and the increasing casualisation of the labour market. CBA as a tool for guiding the work of regulatory institutions is of limited use in the realisation of these objectives.

The methodological limitations of CBA also need to be taken into account. These include the lack of precise information on benefits and costs and the fact that this information is currently based on a wide variety of assumptions. As a trade union we reject any method which estimates the benefits of legislation on the basis of a financial estimation of life.

The results of CBA could be considered as an information tool in the regulatory process once it is possible to collect precise information on an existing situation and the potential benefits and costs of any new proposal. There is no neutral calculation method. CBA results cannot replace ethical values, political debate or labour action.

Q ***Is it acceptable to pass occupational health and safety legislation if it cannot be justified on cost-benefit grounds?***

A Is it acceptable to whom? Legislation is needed in the field of health and safety because a large number of workers are in no position to influence their working conditions.

When data and complaints show that workers are at risk, then all the necessary preventive measures should be taken. We live in very rich societies that can fully assume all the costs of prevention.

Q ***Is it realistic to motivate small businesses to improve occupational health and safety standards using cost-benefit arguments rather than requiring them to comply with mandatory regulations?***

A risk level is higher in SMEs because working conditions are worse (longer working hours, lower salaries, greater job insecurity).

Recent studies have shown that no more than one third of European SMEs have performed risk assessments and the majority of respondents are of the opinion that the framework directive is not applicable to them.

These situations are related to the frequent lack of worker representation and trade union action, and the inadequacies of existing systems of prevention and enforcement.

Any watering-down of mandatory regulation would further jeopardise the health and safety of workers in these companies.

The results of CBA could be considered as an information tool in the regulatory process once it is possible to collect precise information on an existing situation and the potential benefits and costs of any new proposal

Q ***Do you have any other comments about the cost-benefit issue in relation to health and safety at work?***

A cost-benefit assessment could have a negative impact on certain categories of workers, especially women and casual workers, for two reasons.

Firstly, the value of work is determined by complex social mechanisms. There is no justification for considering work of less financial value to be less important from the point of view of human life and health.

Secondly, there is a pervasive invisibility of many work-related injuries and their costs (for the individuals, for society and for the public health system). Ranking priorities by cost-benefit techniques would give rise to more inequalities in the field of occupational health.

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"In order to encourage improvements, especially in the working environment, as regards the protection of the safety and health of workers as provided for in the Treaty and successive action programmes concerning health and safety at the workplace, the aim of the Agency shall be to provide the Community bodies, the Member States and those involved in the field with the technical, scientific and economic information of use in the field of safety and health at work".

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