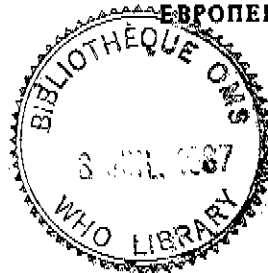




Consultation on Economic Aspects of
Prevention of Disease and Disability

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R E P O R T

Prevention of disease and disability is a large part of the European strategy for health for all. Many persons have become health conscious and there are a number of promising projects, notably integrated community-based programmes for the prevention of non-communicable diseases and the promotion of healthy lifestyles. On the whole, however, progress has been slow, in part due to the lack of convincing economic arguments in favour of prevention.

At this informal Consultation, economists, epidemiologists and other health professionals met to review methods of studying and using economic aspects in prevention and help establish principles of good practice for such studies. The meeting also examined ways to stimulate more economic analysis in this field, which was seen as an interdisciplinary task for economics, epidemiology and other sciences.

A specific purpose of the meeting was to find ways for improved collaboration between these different disciplines. The meeting was explicitly structured to force agreement and dispute over the present state of the art of economic analysis. It was also hoped that the discussions could reveal and correct misunderstandings of what constitutes the economic aspects of prevention of disease and disability.

I. Economic and epidemiological analysis of prevention

Definition of prevention

The definitions suggested in the scope and purpose of the meeting make the distinction between primary prevention, secondary prevention and tertiary prevention.

Primary prevention: prevention of disease and injury by means of reduction of health risks (for example immunization, pollution control, anti-smoking campaign).

Secondary prevention: prevention of impairment of body organs due to disease and injury, by means of early detection plus early treatment (for example cancer screening and surgery, hypertension control).

Tertiary prevention: prevention of (i) disability in carrying out physical and mental functions of daily living due to impairment and (ii) handicap in participating in social and economic life due to disability and isolation, by means of medical, economic and social rehabilitation (for example, emergency care, long-term medication and physical therapy for heart attack victims).

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While these definitions are generally accepted, both economists and epidemiologists expressed the need for further clarifications and distinctions. From the economist perspective one important aspect of prevention is the time span between costs and benefits. Using the economist terminology, prevention could be seen as an investment rather than as immediate consumption. The benefits will be distributed over a long period of time or at a distant time while costs will be immediate. Not only are costs more immediate than benefits, but they are also more certain. It is typical of investments that we do not know with certainty what the benefits will be later on. Lifestyle changes often involve continuing and certain costs to be weighed against sporadic and uncertain benefits (avoidance of future episodes of illness). Preventive measures, i.e. vaccination, may also carry risks whose bad consequences are immediate and adds to the costs. However, it was pointed out that many preventive programmes give important immediate benefits that must not be forgotten, for example education (greater understanding), reassurance, self-esteem (positive self-image) self confidence, feelings of mental and physical wellbeing, coping skills etc. It was also suggested that prevention should be seen as one among several other activities aimed at improving health.

Instead of using a classification like primary, secondary and tertiary prevention it may be more fruitful to focus directly on the specific activities of prevention. Some suggested also to focus on primary prevention in the sense of preventing or postponing the very occurrence of disease.

Prevention within and outside the health care sector

The greatest opportunities for prevention of disease and disability do not lie in health services but in the guidance of other production and consumption activities. The inter sector nature carries with it some specific problems of economic assessment. For example, it can be difficult to identify and measure all costs associated with changes in consumption patterns and production methods. It may also be difficult to provide epidemiological evidence about the health consequences of specific policy changes. Health benefits have also to be compared and weighted against foregone benefits of other types, e.g. increased travel time in the transport sector. Even simple analysis, such as the listing of the economic aspects involved and the economic interest of various parties, may already contribute to policy.

It was also pointed out that the way in which health care is financed could influence the incentives for preventive measures both within and outside the health care sector. There is a general bias due to the fact that curative activities and care generally are collectively financed through taxes and insurance premiums while preventive action is often up to the individual person, household or firm and typically has to be self financed. One obvious example is the cost of exercise, including suitable clothing, shoes, equipment and transportation. However, it is not easy to change this without creating other ethical and distributional problems.

Difficulty of obtaining hard evidence

It was argued that prevention is underprivileged in relation to curative services because it is more difficult to obtain hard data on effects. It is also more difficult to undertake trials of preventive actions than, say, of surgical and medical interventions. More scope could be given to simulations and scenario techniques as alternatives to clinical trials. The technology for evaluating community-level interventions, in particular, could be improved. It may sometimes be possible to take advantage of "natural experiments" to assess the effects of prevention. It was also said that one should not seek irrefutable proof of the health effects of prevention. Decisions will continue to be taken on best judgement.

II. Overview of economic methodology

Objectives of economics

Economic aspects of prevention are often misinterpreted. The participants deplored the tendency to interpret economic aspects as cost accounting or cost containment. Prevention of disease and disability can be a very cost-effective effort even if it does not pay for itself through reduced health care expenditures. However, where prevention can be shown to reduce overall health care expenditures, this fact constitutes a strong political argument for pursuing such activity.

Resources for prevention (labour, equipment, supplies and real estate, but including, in a wider sense, also skills, technology, time, financial liquidity, social infrastructure, social relations, time preference, prestige, health-related tastes and other relevant inputs) are scarce. Consequently, opportunity costs become important, i.e. the benefits foregone through the use of resources for prevention. Since opportunity costs are determined by the value put on outputs and outcomes of different uses of resources, economic aspects explicitly attempts to consider these values. Cost-effectiveness analysis, cost-benefit analysis and cost utility analysis address different questions. The choice of economic method depends on the problem and the questions asked.

Economic evaluation

The following table, based on M. Drummond et al (1987) may serve to exemplify economic evaluation.

O P T I O N S		E V A L U A T I O N		
C O M P A R E D	Only outputs	Only inputs	Inputs and outputs	
Only one option	Output/outcome description	Cost description	Cost and outcome description	
Several options	Efficacy or Effectiveness evaluation	Cost analyses	Full Economic Evaluation	

Integration of economics and epidemiology

It is impossible to do an economic assessment of preventive activities without good epidemiological basis. Epidemiological studies are often ill suited for the analysis of economic aspects. They investigate the aetiology of specific diseases without explicitly considering the policy implications of the results. Economists seldom participate in the design of epidemiological studies but are called in for advice when the study is nearly terminated. This poses significant constraints on the possibilities for economic analysis. Very often it is possible to obtain the relevant information for studying the economic aspects at a low cost if this is done together with the epidemiological study. In some cases the design of the epidemiological study also requires adaptation to make it useful for analysing economic aspects.

There is a need for more policy relevant epidemiological studies. Ideally, these studies should be carried out by a multidisciplinary team including both epidemiologists and economists as well as scientists from other relevant disciplines.

Objectives of epidemiology

Epidemiology is generally defined as the study of distribution of disease in the populations and its determinants. Even if the general purpose of epidemiology is to make a contribution to the improvement of the health of the population, epidemiological studies rarely address policy questions directly. On the contrary, it was argued that many epidemiologists had been hesitant to become involved in the policy discussion of their findings. There may be a change in this respect. Epidemiology as a method/discipline can obviously be very useful for addressing policy questions, and the field of social epidemiology is by now well established.

Measurement of effects within and outside the health care sector

It was stated that the problems of measuring the effects of prevention were not in principle more difficult than measuring the effects of curative interventions. The problem is mainly difficulty of access to information. An increasing number of studies use output and outcome measures that make it possible to compare the cost and utility (or effectiveness) of curative and preventive interventions. This is a significant improvement compared with other output measures, e.g. number of cases found in a screening programme or number of occurrences prevented in an immunization programme. Progress in the development of health related outcome measures, e.g. quality adjusted life years, is very important for the analysis of economic aspects of prevention and comparisons of different allocation of resources to improve health.

A good example of use of comparable output measures is the survey by Weinstein and Stason (1976) of the cost-effectiveness of intervention to prevent and treat coronary heart disease. They compare the cost per quality-adjusted life year for different therapeutic and preventive interventions. Their study shows that coronary artery bypass surgery for patients with left-main disease, beta-blockage in post-myocardial infarction patients and treatment of moderate to severe hypertension appear to be the best use of scarce medical resources in chronic heart disease, while coronary artery bypass surgery for mildly symptomatic one-vessel disease, admission for patients at low risk of having sustained a myocardial infarction, treatment of mild hypertension and cholesterol-lowering drugs have the highest cost per year of quality adjusted life gained. Other interventions are intermediate in cost-effectiveness.

Only when economic efficiency is assessed, that is, programme inputs (costs), programme outputs (effectiveness, benefit, utility) as well as their relation, and only when the economic efficiency of more than one option of prevention (or health/socioeconomic action in general) is reviewed, can we speak of full economic evaluation. This does not mean that the partial evaluations are not worthwhile; indeed, most randomized controlled trials have the sole goal of establishing that one programme is more or less efficacious than others in a rigidly controlled "laboratory" environment. On the other hand, any further approximation of reality, such as the assessment of the relative effectiveness of programmes requires a professional economic input, however small, and the consideration of both inputs and outputs.

Cost-effectiveness analysis is applied when different options differ only regarding the success they have in achieving a single, already determined objective and when there are no other consequences worth mentioning. As an example, different districts may have different programmes to educate school children about the harmful effects of taking up smoking, and the programmes differ only in the percent of smokers three years later. Outputs are measured in cost-effectiveness evaluation in "natural units", e.g. life-years gained or disability-days saved. A variant of cost-effectiveness analysis is the risk benefit analysis, where probabilities of both positive and negative (health etc) effectiveness are considered.

Cost-benefit analysis evaluates health and socioeconomic effects that are not necessarily common to the options, and where one or more effects are achieved to differing degrees. Different anti-obesity campaigns, for example, may differ not only regarding their success in diminishing obesity but also regarding the restrictions they do or do not pose on individual freedom or on trade, in the social support and therefore quality of life they give to persons who wish to slim etc. In the end, outputs and outcomes are usually converted in money units, and the conclusion is often presented as a net benefit figure. While some of the conclusions could also be presented by way of multiple cost-effectiveness analyses, it is important to note that the question asked in cost benefit analysis is whether at all, and by how much, a given option is worth pursuing. The aim is to ensure that objectives and targets being pursued are likely to yield greater benefits from the resources used than would competing objectives and programmes. If one could include all inputs and outputs and all points of view and everybody's values, then the economic analysis would at the same time be a decision analysis. This is never possible, and what are usually included are potentially relevant variables that are amenable to economic analysis. Even the most sophisticated and relevant analysis can only aid, not make decisions.

The third type of analysis, namely of cost utility, is more recent and has been specially created for the health field. Utility focuses directly on health status; it is the value or worth of a specific (change in) health status to an individual, group or society at large. It therefore allows for consideration of quality of life and is typically measured in terms of healthy days or quality-adjusted life-years. It is therefore eminently suited to the collaboration between epidemiologists and economists, and both disciplines are making contributions to its further development. When applying it to the field of prevention, care has to be taken to adjust for quality not only additional life years gained, a practice that is more suited for comparing surgical interventions than, say, prevention in mental and dental health.

In speaking about outcome evaluation, it was noted that "evaluation" in the economists' and epidemiologists' sense (and in contrast to WHO's notion in the managerial process) pertained both to future and past courses of action. On the other hand, economists use the notion of "outputs" where epidemiologists would speak of "outcomes". The economic "outputs" and

"inputs" are abstract notions that are well suited for the variety of socioeconomic systems and system levels to which economics is applied. Regardless of the terms, both disciplines agree on health as the main objective of all health action, although economists would also add reassurance, certification, coping and other aspects of personal welfare, as well as social control. There is furthermore some difference of opinion about the relevance and measurement of concepts such as "need" and "demand".

Economic evaluation should satisfy the following criteria (see M. Drummond and G. Stoddart, 1985):

- clarity in posing the question for evaluation
- comprehensive description of competing options or alternatives
- establishment of a programme's effectiveness
- identification of the important and relevant costs and consequences for each alternative identified
- measurement of costs and consequences in appropriate "physical units" that are understood by non-economists
- credible valuation of costs and consequences
- adjustment of costs and benefits for differential timing
- incremental analysis of costs and consequences where scale or mix of activity is important (as is usually the case)
- sensitivity analysis where the compliance rate or other effects are uncertain (as they usually are)
- presentation and discussion of all issues of concern to users.

Other economic aspects

Analysis of costs and benefits of special measures for the implementation of preventive policies are perhaps the most important contribution of health economics but not the only one. Health economics can be useful also in:

- setting the goals of prevention and aiming at a clear and relevant statement of objectives;
- knowing the economic burden of illnesses that can be prevented, such as the economic costs of road accidents, smoking, alcohol abuse, etc.;
- judging individual behaviour in relation to prevention (one example is the study by Fuchs (1982) on time preference and health);
- strengthening economic incentives for prevention, i.e. the role of health care financing and externalities;
- contrasting economic policy and health care policy and making explicit conflicting means and ends;
- studying the distributional consequences and, therefore, social equity of preventive policies.

Heterogeneity and changes at the margin

Prevention of disease and disability includes many very different activities. It is difficult to make a general analysis of economic aspects of such heterogeneous interventions; we have to look at each activity separately. The economists did not think that it was the purpose of their analyses to provide arguments in favour of prevention in general. Economic analyses, however, would be helpful in identifying preventive actions that gave most value for money. While work of this kind is now frequently requested as a basis for policy decisions in the area of medical and surgical interventions, proponents of prevention have so far been rather hesitant to ask for the advice of economists.

In economic analyses it is important to distinguish between the total and the margin. It is important not only to find out which preventive programmes give most value for money but also to find out the cost and the benefits of different designs, scopes, and mixes of programmes. The most relevant question is often what are the economic consequences of increasing or decreasing the resources at the margin for a specific activity. For a very telling reference on the issue of 'margins' versus 'averages', taking the example of repeated blood screening for occult blood, see Neuhauser and Lewicki, 1976.

The political benefit of economic analysis for prevention

Strategic decisions about prevention as a general strategy for improving health cannot be made through formal analysis, including of cost-effectiveness and cost-benefit. Such far-reaching and long-term goals have to be assessed on grounds other than economic efficiency. For example, knowledge about the groups most likely to win and lose by change may be more important. Formal economic analysis is best restricted to specific interventions, where the technology of change is possible to identify, measure and value. Economic analysis means a critical assessment of the pros and cons of a specific use of resources. The purpose of the analysis is to improve the use of scarce resources through elimination of wasteful or inefficient activities. Economic analysis will therefore also identify preventive (and curative) measures that are not good value for money.

Different views were expressed as to how an increased use of economic analysis in the health field would affect the balance of resource allocation between preventive and curative purposes. The purpose of the analysis is to improve the use of scarce resources through elimination of wasteful or inefficient activities. Economic analysis will therefore also identify preventive (and curative) measures that are not good value for money or that have been extended too far. It was agreed that, in the long run, prevention as primary health strategy will benefit from a careful and critical economic assessment. Many policy-makers paid lip service to prevention but took no action, since they feared a steep increase in health care spending. This was thought to be as exaggerated as the claims for saving lots of money.

Incentives and assessment -

Policy implications of economic analysis of prevention

Economics is basically about values. This means that the economic analyses cannot dictate the decision but should be seen as a help to improve decision making. Even if it is important to include in the analysis as many relevant aspects as possible, there will always be room for different judgments. Therefore, it is not surprising that policy decisions sometimes differ from the result of the analyses. Another reason could be that decision-makers do not have incentives to decide according to social costs and benefits.

Economists should make clear to policy-makers why economics analysis and evaluation is important. Organized consideration of the factors involved in a decision to commit resources is important for at least three factors (see Drummond et al. 1987):

- Without systematic analysis, it is difficult to identify the relevant alternatives, for example anti-smoking campaigns instead of new diagnostic tests for lung cancer.

- A programme which looks unattractive from one viewpoint may look significantly better when other viewpoints are considered: the individual patient, the family, the specific institution or programme, the government budget, the local community, industry, the economy, society.
- Without measurement, the uncertainty of consequences and opportunities can become critical.

An important area for future investigation is how economic incentives can be used to promote prevention. In this, we can learn from the "addiction industries" that successfully use incentives for promoting more alcohol use, tobacco consumption or other bad health habits.

III. Economic aspects of different prevention areas

The epidemiological evidence and the scope and findings of economic evaluation were reviewed in four different sectors (areas) of prevention: immunization and other medical primary prevention; promotion of healthy lifestyles and environment and other non-medical primary prevention; disease screening and other medical secondary prevention; long-term therapy, emergency care, active rehabilitation and other medical tertiary prevention.

The review was made, using the following checklist:

- Objectives/output of the sector;
- Evidence of effectiveness;
- Problems of output measurement;
- Problems in measuring costs/valuing benefits;
- The quantity of economic evaluation studies;
- The quality of these studies;
- Evidence from these studies;
- The impact of these studies on policy;
- Constraints on economic analyses and their policy impact.

The results of this review are presented briefly, and it will be evident that there is much need for further work.

Immunization and other medical primary prevention

Outputs and objectives: Reduce incidence of disease (sometimes eradication). Externality makes it a public health issue. No significant equity problems, mainly due to the fact that vaccination programmes generally are inexpensive.

Evidence of effectiveness: Good knowledge of effectiveness at least for the older vaccination programmes. Regarding new vaccines for hepatitis B, pneumonia and influenza, efficacy is well established but effectiveness can vary with use in different risk groups.

Output measurement: It is easy to measure the number of vaccinations but mortality and especially morbidity data are generally lacking or under reported. It was pointed out that there is a difference between developed and

developing countries. There is a lack of measurement of morbidity consequences and health care utilization. In general, however, the knowledge about effectiveness is better for infectious than chronic diseases. The number of deaths averted is inappropriate as an output or outcome measure; life years gained would be better.

Valuation of costs and benefits: Benefits of vaccination programmes are usually defined as savings of cost of treatment and improved productivity. Using the human capital approach for valuing benefits leads to an under-evaluation of benefits. Estimation of programme costs is rather straightforward but evaluation of time costs poses a special problem.

Range of economic studies: Studies have been done on many vaccines to determine their benefits, risks, and costs. Most studies have been of the cost-benefit type comparing the cost of the vaccination programme with benefits in terms of reduced medical expenditure and improved productivity. There are also examples of cost-effectiveness studies, e.g. of pneumococcal and influenza vaccines that estimates the cost per case of disease or death averted or the cost per quality-adjusted life year gained through vaccination. Benefit-risk studies compare vaccination with no vaccination in terms of absolute numbers on rate of morbidity and mortality for both disease and vaccination. This data type of study had been used in assessing smallpox vaccination.

Quality of studies: The quality of economic studies is generally good, but there is a need for better epidemiological models where the effects of vaccinations can be simulated. Intangible costs and benefits are rarely considered in economic analysis, such as costs in grief and suffering that would result from disease or an adverse vaccination reaction, or intangible costs that would be prevented by vaccination. Some studies ignore discounting of costs and benefits.

Evidence from the studies: Studies generally show that benefits are greater than costs. Vaccines against polio, pertussis, measles, mumps and rubella have provided a net saving to society. However, vaccination rarely reduces total medical expenditure. Vaccines for influenza and pneumococcal disease have been shown to be cost-effective relative to other health expenditures. Some studies, e.g. on hepatitis B, investigate the costs and benefits of vaccination in different risk groups and estimate threshold values. For excellent surveys, see Weisbrod (1971) and Russel (1986).

The results of a cost-benefit or cost-effectiveness analysis on a vaccine can assist in justifying large investments in basic research (poliomyelitis), in disseminating a vaccination programme more widely (measles), in changing health policy (smallpox), or in planning the use of a vaccine (hepatitis B).

Policy impact of studies: The effect on policy varies between different studies. Studies on polio vaccination were done after the vaccination programme was implemented and therefore had no effect on policy. Measles vaccination has been shown to give benefit in excess of costs but despite this there has been a slow introduction of this vaccination in many countries. In the USA, the cost-effectiveness study by the Office of Technology Assessment (1979) of vaccination against pneumococcal pneumonia influenced the government to give reimbursement for this type of vaccination. This is a clear effect of the study on policy. In Sweden a cost-benefit study on water fluoridization showed important savings but then there was a decision not to start water fluoridization, due to environmental concerns and thus conflicting health values. This is an example of an economic study that provides important evidence as a background for decision, but in the decision several other

factors were taken into account. This explains the difference between the result of the study and the decision taken. Risk-benefit studies had a significant impact on the decision that routine smallpox vaccinations should be discontinued in many countries. Studies on vaccination against hepatitis B have influenced policy.

Constraints: One reason why policy does not implement research findings could be that the party who takes the decision does not have incentives to take into account social costs and benefits. It is therefore important to investigate the costs and benefits for different parties involved. There is a need to make economic studies more generally available and the possibilities to produce an annotated bibliography and a manual of good practice was discussed.

Promotion of healthy lifestyles and environment

This sector covers very broad areas. It is more heterogeneous than primary medical prevention.

Outputs and objectives: The objective is to encourage positive health behaviour. This is not the final objective in itself, but a means to better health. Another important objective is to make the individual better able to cope with stressing life events. A third goal is to inform the population of health risks so that they can make informed decisions. A fourth goal could be to eliminate certain health-damaging behaviour, e.g. smoking. The multiple objectives in this area pose a problem for economic analysis, since an analysis pertaining to all would require a most complex consideration of multiple costs, risks, benefits and utilities.

A more modest objective is to eliminate a specific undesirable behaviour, such as smoking. The cost-effectiveness analysis would then calculate the cost of different ways to reach the goal. There are many ways to reach the goal and the different ways are seldom very well spelled out. This makes economic analysis difficult, but also particularly useful in designing the best strategy.

Some of the objectives in this sector also involve fundamental changes in society, including significant changes in the relative prices and values. The economic evaluation based on partial analysis, such as all methods mentioned thus far, may not be powerful enough, if indeed the desired fundamental changes and adjustments in society and the economy were to be realized fully according to the wishes of the "green movement". Malaria eradication with its population impact and the sad famine epidemic in parts of Africa are instances, where partial analysis is not enough and where the economy as a whole and its welfare implications have to be modelled directly.

Evidence of effectiveness: Evidence on effectiveness is good in some areas, bad in others. Changes in lifestyles and nutrition give health effect in the very long run and the effects are therefore difficult to detect. Immediate gratification is also difficult to measure. Effectiveness of accident prevention can be more easily studied, e.g. changes in speed limit. There is generally more knowledge about the effect of lifestyle on health, e.g. the relation between smoking and cancer, than between specific health promotion interventions and their effect on lifestyles and behaviour. Epidemiological studies have mainly been undertaken for the first question and only to a more limited extent to the other.

There are few statistics that link occupational exposure information to health, morbidity and mortality. This lack of information systems relating to chronic diseases is a significant drawback for economic analysis, and in the area of addiction at least it has been the economists who conducted significant epidemiological studies (Maynard & Kennan 1981). Since socioeconomic factors are important in this area of prevention, one can expect greater involvement of economists and other social scientists.

Output measurement: The most common output measure is mortality rates for specific diseases, such as heart disease. It would be an improvement to measure total mortality, since changes in lifestyle can affect many different causes of mortality. In general, a comprehensive measure of health effect, including both mortality and morbidity is needed. In this respect, the efforts to measure utilities of health status variations (see Torrance 1986) is a step forward.

The effects of physical fitness are sometimes measured as increase of maximum oxygen transport, a decrease of body fat, a strengthening of muscles, tendons and bones, an improvement of body liquid profile, and a better balance between oxygen demand and supply in the myocardium. However, as important these measures are in epidemiological and clinical studies, they are seldom relevant for economic studies. More relevant are measures like perceived health effects and impact on productivity, consumption and social equity.

Valuation of costs and benefits: There is a problem in valuing intangible benefits like greater understanding, reassurance, self-esteem, self-confidence, self-efficacy, personal attractiveness, feelings of mental and physical wellbeing and coping skills. Cost utility studies are better able to cope with subjective perceptions than are the more traditional cost-effectiveness and cost-benefit studies.

One resource that is of great importance in preventive programmes aimed at changing lifestyles is time. For example, a person who spends three hours a week on exercise, works 156 hours on exercise in the course of a year. The valuation of this resource use may have a significant impact on the result of a cost benefit or cost-effectiveness analysis.

An important question in nutrition policy is the cost of changing the content of fat in food intake in different countries. There is a need for estimates of the costs for defined nutritional goals. It was pointed out that economic analysis can also be helpful in studying marginal changes and in assisting to set goals. It would be useful to investigate the cost and benefit of reducing the fat content a little more or a little less than the nutritional target or standard.

Range of economic studies: There are few analyses of change in lifestyle, and fewer still that meet the standards attained by the best studies of immunization. One reason is that good cost-benefit or cost-effectiveness analysis requires good scientific evidence about effects. The evidence in areas like diet and exercise is just reaching the point where it can support such studies, see Russel (1986). A significant number of studies on the economics of smoking have been published, but these studies seldom address questions of cost-benefit or cost-effectiveness.

Quality of studies: Occupational health, air pollution and road safety are areas where some good studies can be found. It is more difficult to identify good studies of health promotion. Regarding the distributional questions of smoking, see Leu (1984).

Evidence from the studies: Shephard (1978) reports a reduction in health care expenditure and absenteeism and increased productivity following the introduction of a large-scale employee fitness programme. However, no formal cost-benefit analysis was undertaken.

Studies of the economics of smoking have shown that elimination of smoking behaviour will not reduce health care expenditure (Leu 1983) and that health care expenditures for smokers only amount to a fraction of taxes on tobacco (Stoddart 1986).

Policy impact of studies: Since so few studies have been undertaken in this field and the available studies have revealed shortcomings, especially in the availability of relevant empirical data, there have been no policy implications. The major changes in living habits during the last two decades, including regular exercise, low fat diets, an emphasis on fruits and vegetables, and reduction in smoking, is mainly the result of individual choice and informal cost-benefit calculations as part of a general cultural change in society. The health sector can claim little benefit, if any.

Constraints: The way objectives are set, for example, in the nutrition or the environment field where nutritionists or engineers agree on the "right" norms, standards and targets, discourages economic studies. This "technocratic" approach, which leaves little room for economics and social science is similar to the claims physicians make as regards medical care. They are also an abuse of epidemiology. Or are the standards really equally applicable for old and young, rich and poor, educated and illiterate, the north and the south of Europe, a declining and a growing economy? A clearer statement of higher level objectives and consideration of competing options (rather than coming up a priori with "the" right answer) will stimulate economists to undertake studies, where they are ideally involved already in the process of setting objectives.

Disease screening and other medical secondary prevention

This sector includes early detection of disease and prevention of secondary occurrence of disease, e.g., a second myocardial infarction.

Outputs and objectives: The objectives of screening are to find cases early enough for treatment to be effective, thereby reducing mortality and morbidity, reassure the patient that disease is not present and in some cases reduce the spread of contagious diseases, e.g. AIDS. A further objective is to reduce screening errors, namely the false positives and false negatives, and their consequences. Using output measures like quality-adjusted life-years makes it possible to integrate this negative health effect with the positive health effect of screening, see studies on the screening of antenatal screening, especially for spina bifida and Downs syndrome.

Evidence of effectiveness: There is generally good information in terms of the coverage rate of the screening programmes and the number of cases found. There is less evidence about the effects on mortality and morbidity from early treatment and still less when it comes to reassurance.

Output measurement: Where one output or outcome, such as lifesaving, is clearly the dominant one, the result of an evaluation can usefully be stated in terms of cost per life saved, or per year of life. Screening programmes for coronary heart disease and cancer focus on mortality, but other aspects, such as side effects of treatment, are also important. It is therefore important to use a composite measure of health. The index used most often is

the quality-adjusted life-year. This approach makes a year of life in good health the standard unit and assigns it the value 1.0. A year of life with some illness or disability is valued at a fraction of a healthy year and assigned a number between zero and 1.0. It is difficult to measure the degree of reassurance and anxiety produced by screening programmes.

Valuation of costs and benefits: The valuation of reassurance and anxiety creates specific problems. Again, the cost utility approach has an advantage over more traditional forms of economic evaluation.

Range of economic studies: A large number of studies have been undertaken, especially outside Europe. Weinstein and Stason (1976) estimated the cost of screening and treating all adults with moderate or severe hypertension at \$7000 per health year compared with \$4,850 for treatment alone. Eddy (1981) has studied the cost-effectiveness of screening strategies for cancer of the breast, colon, lung, cervix, endometrium and oral cavity. These studies highlight the importance of focusing on marginal, rather than average, costs and benefits: the main choice is usually not whether to screen at all but the right strategy (frequency, population etc.) for screening.

Quality of studies: Studies in these areas are generally on cost-benefit where the cost of the screening programme plus early treatment are compared with the additional costs of later treatment, often focusing narrowly on medical expenditure and productivity. Time costs are rarely taken into account. A study by Kristein (1980) on the economics of screening for colo-rectal cancer can illustrate some quality problems. In this study of occult blood screening versus (implicitly) no screening, cost of screening procedures and tests were quoted, without stating how they were calculated or what they included. Estimates of "value of life" were adopted from other studies, and make the benefit evaluation suspect.

Evidence from the studies: Economic analysis of screening programmes has seldom shown such programmes to be cost-effective. Examples of this are studies of cancer screening programmes for breast cancer, cervix cancer and colon cancer, although technology and values change. Neither have studies of general health examinations screening for hypertension found them to be efficient economically. Some specific screening programmes that were seen to be efficient include screening for phenylketonuria and some antenatal screening.

Policy impact of studies: It was noted that this area had been attracting a lot of attention for economic analysis. An explanation of this could be that it is a very well defined technology that needs a specific funding decision to be implemented. It is also possible to compare the cost of the screening programme with reductions in the costs of treatment of disease avoided. Several examples of the influence of policy were quoted. Eddy's studies on cancer screening (1981) had an influence on the decision to recommend a longer interval between pap smear tests. A cost-benefit study by Pole (1971) of tuberculosis mass screening in the United Kingdom had an effect on the decision to stop that programme. A WHO-assisted evaluation of a pilot programme in Bulgaria changed policy from annual mass screening to the strengthening of primary health care and health promotion.

Constraints: There was general agreement that there were good opportunities for economic analysis in this area. Treatment with beta blockers after myocardial infarction, provides an example of how economic analysis could be done.

Long-term therapy, emergency care, active rehabilitation and other medical tertiary prevention

This sector is the most heterogeneous, making a comprehensive review very difficult.

Outputs and objectives: The aim is to improve quality of life for persons with disabilities and impairments. This can be done either through changes in the environment or through changes in health status or both. Equity aspects can be very important.

Evidence of effectiveness: The level of knowledge of effectiveness is generally very low.

Output measurement: Need for improvements in the measurement of quality of life or quality of service.

Valuation of costs and benefits: Need for longitudinal epidemiological studies looking at total resource costs and quality of life for different patterns of care.

Range, quality, evidence, policy impact and constraints: One of the major questions discussed was the cost-effectiveness of home care versus institutional care for the elderly. This debate can illustrate some of the issues in economic analysis of tertiary prevention. It is well known that many earlier studies had severe methodological shortcomings. In a recent survey, Hedrick and Inui (1986) included only studies that fulfilled six basic criteria. One of their criteria that there be a randomized controlled design was seen as being too restrictive.

The result of the 12 reviewed studies of programmes targeted at chronically ill populations, home-care services appeared to have no impact on mortality, patient functioning, or nursing home replacements. Across studies, these services either had no effect on hospitalization or tended to increase the number of hospital days. The cost of care was either not effected or increased.

Several methodological weaknesses were found despite the careful selection of studies including subject selection, patient assessment and the reporting of methods, analyses and results. A special problem concerned the misuse of statistical methods of inference.

The measurement of outcomes of care also has to be improved.

IV. Economics of large-scale community programmes to change risk factors

A subgroup of the participants considered how to strengthen economic analysis in programmes such as "CINDI" and "healthy city". They felt that insufficient attention is being given to the economic evaluation of these community initiatives as against per se epidemiological and social sciences evaluation. One of the reasons for this is that experience in this field is extremely limited and that practical guidance on ways to proceed is extremely limited. A criticism of previous projects such as North Karelia has been the lack of an economic assessment as against a mere costing exercise. It would be a pity if we missed the opportunity of including an economic perspective of these new programmes.

In making plans it is necessary to take account not only of the potential benefits of various actions but also their costs. As had been mentioned, costs in this context means the benefits foregone in using the resources in one way and thereby giving up the opportunity to use them in some other way which might also provide desirable benefits. If we succeed to maximize the overall benefits from the resources available, then resources are used efficiently - if not, then inefficiency is present and we are failing to provide as much health as we might. Clearly, if community prevention programmes are to be policy relevant to health policy-makers, planners and funding agencies, it is important to demonstrate the relationship between costs and benefits.

The directors of community programmes said that their most urgent lack was an operational manual of what economic data to collect, at what time, by which method, using what skills and by whom, and how to link these data to other programme information. The economists agreed and offered the following scope and purpose for economic work.

Because of the size of the community projects and the opportunity they afford to reinforce awareness of the interrelationships between health and other sectors, the following economic aspects are especially relevant:

1. the cost effectiveness of the programme approach itself;
2. the establishment of a framework for monitoring the economic impact of changes in morbidity, mortality and quality of life that are wholly or partially attributable to health promotion and disease prevention in countries;
3. the economic evaluation of specific programme actions and interventions in the field.

Cost-effectiveness of the community approach: This issue is important because the external perception of the disease prevention and health promotion field is that too little attention has been paid to economic aspects. Or else the economic strategy has been ideological, e.g. to close, privatize or nationalize this or that industry as a matter of principle, or amateurish, e.g., if people only know what is good for them then they will change their evil ways. Health for all presumably does not mean health at all costs. It will become increasingly important for advocates of any health policy to be able to provide at least some estimate of the order of magnitude of economic implications. Furthermore, the field of broad spectrum programmes involves the reduction of many, often competing risks simultaneously, and it should be the value of that approach - contrasted to a set of more vertically oriented promotion and prevention projects - that should be evaluated also regarding

its economic worth. Economic and epidemiological evaluations have in the past undervalued the long term benefit of disease prevention and health promotion activities because they have focused upon specific, usually single clinical outcomes. The community programmes afford an opportunity to stimulate broader thinking.

Monitoring the economic impact of prevention and promotion: The second type of economic analysis also results from the broad community approach, where it is difficult to attribute all benefits and costs to individual vertical actions. Some consideration should be given to include some simple data necessary for economic evaluation in the basic data set compiled for participating countries and cities. One candidate is a series of indicators on health service utilization (preferably in real terms, such as number of patient days per capita or number of visits to health professionals). Another candidate are age-sex earnings profiles. Although there will be difficulties with any indicators of economic activity or health service utilization, both will presumably be affected by successful health promotion and disease prevention. Some attempt should be made to monitor them, even if only to generate more specific hypotheses about their interaction with prevention and promotion that could be tested with less aggregate data or by specific sub-studies.

Consideration should also be given to the feasibility of gathering additional measurements and information on individual subjects in population surveys. Again, some measures of individual economic activity and health care use might be worth obtaining and would entail little extra cost. More important, this would appear to be an excellent opportunity to obtain measurements on changes in the quality of life. Advances in methodology in the area of preference measurement and assessment of quality of life are progressing rapidly, and it would be possible to ask a few experts to design a measurement instrument. It should also be possible to prepare a design for gauging the economic impact of changes in morbidity and mortality that may be in whole or in part attributable to disease prevention or promotion, in order to raise the visibility of the programme and to mobilize and maintain the support of senior policy-makers.

Economic evaluation of specific projects in the programme: Not all objectives may turn out to be capable of being achieved, because of resource constraints, which, in turn, may jeopardize the whole programme. The present priority setting in the programmes is too much based on the overall size of common risk factors or health promotion needs. More important is the capability of different measures to reduce health problems/promote health. In other words, top priority should be given to projects that return the greatest health benefit for a given budget or investment.

A mix of different types of economic evaluation techniques would be appropriate. To give three examples, cost-effectiveness analysis could be used to determine, how, at least cost, different prevention and promotion activities could reduce lung cancer deaths by 20% (measuring cost per death averted); cost-benefit analysis could address how much promotion versus prevention to pursue (measuring health and socioeconomic benefits in terms of resource use); and cost utility analysis could be used to compare a prevention/promotion programme (e.g., health education to prevent children smoking) and a curative programme (e.g., chemotherapy treatment for lung cancer).

Many specific interventions in this field are expected to be carried out in other sectors, be they private, cooperative or public. Much thought has therefore also to be given to the incentives which the health sector can apply to these other sectors and to the arguments the health sector can make. One strong argument is, of course, that the health sector brings its own house in order, that prevention and promotion is done by and for the health workers themselves. The choice of most other arguments and incentives will depend to a large degree on the understanding of what constitute costs and benefits in the eyes of these other sectors and what would be the degree of persuasion of different initiatives by the health sector. Economics thus has an enormous role to play in these inter sector concerns. Too often it is uncritically assumed that joint committees, laws or other formal mechanisms or else mere propaganda will bring about the desired health action (Cohen & Henderson 1984).

Conclusions

1. Preventive programmes are quite amenable to economic analysis. Indeed, policy-makers will increasingly demand evidence also of their economic worth. Prevention "pays" if it maintains health at less expense, improves health without adding to cost or justifies additional cost by commensurate improvements in health and the quality of life.
2. It cannot be assumed that most prevention programmes will cut health costs. Cutting costs is legitimate only when the effectiveness, benefit or utility of programmes does not suffer. Economically worthwhile prevention projects may well increase costs if they are justified by more than proportional improvements in health and the quality of life.
3. Economic efficiency is more than the description of programme costs; it links costs (inputs) to consequences (outputs) and reviews more than one option.
4. There are a number of well established techniques for carrying out economic evaluation and relating cost to effectiveness, benefit and utility. These differ in the complexity of the issues they tackle and, therefore, also in their difficulty of application and requirement of expertise. Good analysis also reviews the equity of distribution of costs and outputs, investigates economic impact, such as on employment and the quality of life, and looks into incentives for efficiency.
5. Economic and epidemiological analyses are hampered when prevention programmes lack clear objectives and when analysis is not part of a programme from the beginning. Objectives should be clearly stated. What should be done for whom, where, how often and over what length of time? What resources should be used? What results are expected and when should they appear? When analysis is brought in early, there is a good chance that feasible objectives are set and that economic aspects are built into the project.

6. A number of economic studies have influenced policy on immunization and screening. Economic studies of changes in lifestyle and environment are less frequent and generally of inferior quality. The lack of studies on the prevention of disabilities and handicaps is surprising in view of the health for all definition of people "participating in economic and social life".
7. In the area of healthy lifestyles and rehabilitation, both investment and consumption aspects of prevention are important. One has to look, therefore, at a mixture of both immediate and delayed benefits and costs of programmes to the individuals concerned as well as their families, work places and the local economy.
8. The evaluation of multi-factorial community-wide intervention requires innovation and experimentation. Their very nature requires a long time frame of evaluation and the capture of effects outside narrow disease boundaries. Controlled randomization may not always be the best method when a project wishes to demonstrate the feasibility of achieving popular support and changing behaviour.
9. There is a general lack of data about the effects of prevention. This can be achieved through improvements in routine statistics and research, as well as the linkage of data on preventive action with information on curative health services and with information on the living and livelihood of high risk populations.
10. Measurement of results of preventive programmes is in principle not more difficult than measuring the effects of other health programmes. Nor can one say that costs are always more easily established than results, since the very notion of "opportunity costs" is "benefits foregone". The measurement of programme utility is an approach where collaboration of epidemiologists and economists is especially fruitful.

Recommendations

1. More economic analyses of prevention should be made to supplement work done in epidemiology and other quantitative and social sciences.

This means that:

epidemiologists should

- contact an economist at an early stage of planning studies that may be of interest for economic evaluation;
- direct greater resources and effort to produce policy oriented studies;
- learn more health economics;

economists should

- stimulate more work on economic aspects of prevention;
- improve their knowledge about the objectives and the field of prevention in order to make economic analysis more relevant;
- explain better how economics can be useful in the area of prevention;

both should

- take steps to report their collaboration in scientific journals;
- ensure that their disciplines recruit more experts, especially in southern and eastern Europe;
- ensure that their technical terms do not hinder collaboration;
- associate other quantitative and social disciplines.

2. Agencies funding research should request that an economist is included in the evaluation of prevention programmes and should devote sufficient resources to the study of the economic aspects of such programmes.

3. Governments and communities should invite economists to advise on policy and action in large-scale community-based health promotion and lifestyle programmes.

4. WHO should support the above-mentioned actions by:

- making an assessment of the economic aspects of all prevention projects, especially the countrywide integrated noncommunicable disease intervention (CINDI) programme and the Healthy Cities Project, and related projects in rehabilitation, nursing, environment, social equity and nutrition;
- establishing a working group of economists (including also some epidemiologists and social scientists) in order to develop a manual for economic evaluation within community-based programmes.

5. In addition, WHO was asked to:

- invite economists to undertake an assessment of the economic aspects of the European targets for health for all;
- ensure that staff are familiar with the essentials of health economics;
- continue to stimulate the training of health economists and health workers in Member States.

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PROVISIONAL LIST OF PARTICIPANTS

TEMPORARY ADVISERS

Dr Kurt Beiersdoerfer
Robert Bosch Stiftung GmbH
Postfach 152
Heidehofstrasse 31
D-7000 Stuttgart 1
Federal Republic of Germany

Professor John C. Catford
Heartbeat Wales
Ty George Thomas
24 Park Place
Cardiff, CF1 3BA
United Kingdom

Professor Janusz Indulski
Director
Institute of Occupational Health
8 Teresy Street
P.O. Box 199
PL-90950 Lodz
Poland

Professor Bengt Jönsson
Department of Health and Society
Linköping University
S-581 83 Linköping
Sweden

Professor Gavin Mooney
Institute of Social Medicine
The Panum Institute
Blegdamsvej 3
DK-2200 Copenhagen N
Denmark

Dr G. Lamm
Klinikum der Universität Heidelberg
Klinische Sozialmedizin am Zentrum
für Innere Medizin
Bergheimer Strasse 58
D-6900 Heidelberg 1
Federal Republic of Germany

Professor Greg Stoddart
Department of Clinical Epidemiology
and Biostatistics
McMaster University
1200 Main Street West
Hamilton, Ontario L8N 3Z5
Canada

Ms A. Triomphe
Directeur de Recherche
INSERM
Université de Paris I
90, rue de Tolbiac
F-75634 Paris Cédex 13
France

Dr M.M. Verentsov
Chief of Department
Russian Federation Information
and Computer Centre
Ministry of Health of the USSR
Rahmanovskij pereulok 3
101431 GSP Moscow K-51
USSR

WORLD HEALTH ORGANIZATION

Regional Office for Europe

Technical staff

Dr Hana M. Hermanova
Regional Officer
Elderly, Disability and Rehabilitation

Dr Evgueni Leparski
Director, Disease Prevention and Control

Mr Steven Wayling, Intern, Social Equity and Health
(University of North Carolina at Chapel Hill,
North Carolina, USA)

Dr Herbert Zöllner (Secretary)
Regional Officer for Health Economics

Support staff

Gurli Vestergaard
Health Economics Unit