Chapter 4

Progress in priority-setting methodologies

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Section 1

About priority setting

1. Why priority setting?
Priority setting is as critical as conducting the research itself. Funding for research is limited and a rational priority-setting process is therefore required. This should be based on sound methods, scientific process and in-built mechanisms to facilitate subsequent utilization of findings.

2. Deficiencies in priority setting
There is no simple way to set priorities. However, failure to establish a process for priority setting has led to a situation in which only about 10% of health research funds from public and private sources are devoted to 90% of the world’s health problems (measured in DALYs).\(^1\) This extreme imbalance in research funding has a heavy economic and social cost. To make matters worse, even the 10% of funds allocated to the 90% of the world’s health problems are not used as effectively as possible, as health problems are often not prioritized using a defined methodology.

Reasons for this imbalance in health research funding include the following:

(a) In the public sector
• Over 90% of research funds are in the hands of a small number of countries (see Chapter 6) which, understandably, have given priority to their own health research needs.
• Decision-makers are often unaware of the magnitude of the problems outside their own national borders. In particular, they are unaware of the impact on their own country of the health situation in the rest of the world both directly (rapid growth in travel, re-emerging diseases, development of antimicrobial resistance) and indirectly (lower economic growth, migration).
• The decision-making process is influenced by factors including the personal preferences of influential scientists or decision-makers, competition between institutions, donor preferences, career path ambitions and tradition.
• There is insufficient understanding of the role the public sector could play in supporting the private sector in the discovery and development of drugs for ‘orphan’ diseases.

(b) In the private sector
• Decision-makers in the private sector are responsible for the survival and success of their enterprise and for the satisfaction of their shareholders.
• Their decisions are based largely on profit perspectives which inevitably limit investment in diseases prevalent in low- and middle-income countries, as market potential is often limited or underestimated.

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Section 2

Approaches to priority setting: an overview

Research into methodologies to help set priorities in health research is a recent development which can be traced back to the 1990 Commission on Health Research for Development. Since the Commission’s recommendations, there has been substantial progress in the development and testing of priority-setting methods.

It is important to differentiate between the process of priority selection and the tools used for that purpose. The process is the mechanism by which constituencies are involved and decide upon research priorities. The tools are the instruments which facilitate the collection, processing and presentation of the information needed for reaching a decision on priorities on a scientific basis. Tools can be used in a variety of circumstances to ensure that the information collected will lead to a set of priorities for the country or community in which the process took place.

Insert 4.1 summarizes the characteristics of the major priority-setting approaches for health research which have emerged since the Commission’s report. Sections 3, 4 and 5 will review in greater detail recent progress in the respective methods.

Section 3

Recent progress in Essential National Health Research

1. Principles and essentials

The collection, processing and presentation of the information needed for reaching a decision on priorities on a scientific basis. Tools can be used in a variety of circumstances to ensure that the information collected will lead to a set of priorities for the country or community in which the process took place.

Insert 4.1 summarizes the characteristics of the major priority-setting approaches for health research which have emerged since the Commission’s report. Sections 3, 4 and 5 will review in greater detail recent progress in the respective methods.

1990, the Commission on Health Research for Development proposed a set of strategies through which the potential of research could be harnessed to accelerate health improvements and to overcome health inequities throughout the world, summarized as Essential National Health Research.
(ENHR). ENHR encompasses two research approaches: (i) research on country-specific health problems and (ii) contributions to regional and global health research. The Commission recommended that each country should adopt the principles of ENHR as a strategy for planning, prioritizing and managing national health research.

The goal of ENHR is health development on the basis of social justice and equity. The content is the full range of biomedical and clinical research, as well as epidemiological, social and economic studies. The mode of operation is inclusiveness, involving all stakeholders, including research scientists, policy-makers, programme managers and representatives of civil society.

Since its creation in 1993, the Council on Health Research for Development (COHRED) has focused its efforts on facilitating the implementation of the ENHR strategy in low- and middle-income countries. In doing so, it has gained much experience and evolved within a global environment that has been, and continues to be, in a state of rapid change. Many of these changes were reflected in two major events that took place in October 2000 and were of special significance for COHRED:5

(a) The first meeting of COHRED Constituents (October 2000)
The Constituents’ meeting was attended by representatives from some 40 countries. The meeting confirmed the continuing relevance of ENHR and identified four roles for COHRED in support of the strategy:

• as advocate for the ENHR strategy
• as broker, assisting countries with links to donors, agencies, private-sector groups and global networks
• as learning community
• as “collegium”, bringing together colleagues to encourage and support each other in implementing the ENHR spirit.

(b) The International Conference on Health Research for Development (October 2000)
The International Conference, jointly organized by WHO, the World Bank, Global Forum for Health Research and COHRED, stressed the importance of building effective national health research systems, and identified the primary functions of such systems as:

• knowledge production, management and use
• stewardship
• financing
• capacity development.

In the light of these discussions, the COHRED Board confirmed, in November 2000, that the organization’s major role is to provide support to countries. In particular, while continuing to foster the promotion of ENHR as a general strategy, this support should aim at the development of effective national health research systems, with due attention to the functions specified by the International Conference.

2. Country-level support
(a) Criteria for setting priorities
The ENHR strategy seeks the inclusion of a wide range of partners to identify research priorities at the country level. In the documents reviewed and in the national ENHR priority-setting exercises undertaken in a number of countries, the following criteria appear most often for the selection of priority research areas:

• Demand-driven process by four major stakeholders at the country level: (i)

## Insert 4.1
### Comparison of various priority-setting approaches

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Essential National Health Research Approach</th>
<th>Ad Hoc Committee on Health Research Approach</th>
<th>Advisory Committee on Health Research Approach</th>
<th>Global Forum Combined Approach Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Objective of priority setting</strong></td>
<td>Promote health and development on the basis of equity. Help decision-makers make rational choices in investment decisions.</td>
<td>Help decision-makers make rational choices in investment decisions so as to have the greatest reduction in the burden of disease for a given investment (as measured by number of DALYs averted).</td>
<td>Address problems of critical significance for global health: population dynamics, urbanization, environment, shortages of food and water, new and re-emerging infectious diseases.</td>
<td>Help decision-makers make rational choices in investment decisions so as to have the greatest reduction in the burden of disease for a given investment (as measured by number of DALYs averted), on the basis of the practical framework for priority setting in health research (matrix presented in Insert 4.8).</td>
</tr>
<tr>
<td><strong>2. Focus at the global or national level?</strong></td>
<td>Focus on situation analysis at country level; residual problems to be studied at global level.</td>
<td>Focus on situation analysis at the global level; method also applicable at the country level.</td>
<td>Priority to “significant” and “global” problems, requiring “imperative” attention.</td>
<td>Method applicable at both global and national level.</td>
</tr>
<tr>
<td><strong>3. Strategies/principles</strong></td>
<td>Priorities set by all stakeholders. Process for priority setting should be iterative and transparent. Approach should be multidisciplinary.</td>
<td>Five-step process. Process should be transparent.</td>
<td>Priorities should be set by all stakeholders. Process should be transparent and comparative. Multidisciplinary approach.</td>
<td>Priorities should be set by all stakeholders. Transparent and iterative process. Approach should be multidisciplinary (biomedical sciences, public health, economics, environmental sciences, education sciences, social and behavioural sciences).</td>
</tr>
<tr>
<td><strong>4. Criteria for priority setting</strong></td>
<td>Based on an estimate of severity and prevalence of disease.</td>
<td>Measured by DALYs (number of years of healthy life lost to each disease).</td>
<td>Allocate resources to the problems deemed of “greatest global burden”.</td>
<td>Measured by DALYs (number of years of healthy life lost to each disease) or other appropriate indicators.</td>
</tr>
<tr>
<td>Burden of disease</td>
<td>Analysis of multidisciplinary determinants (biomedical, economic, social, behavioural, etc.).</td>
<td>Analysis of mostly biomedical determinants. Other determinants implicit.</td>
<td>Analysis of multidisciplinary determinants (biomedical, economic, social, behavioural, etc.).</td>
<td>Analysis of determinants at following intervention levels: - individual/family/ community - health ministry and research institutions - sectors other than health - government macro-economic policies.</td>
</tr>
<tr>
<td>Analysis of determinants of disease burden</td>
<td>Some attempts at measurement in terms of impact on severity and/or prevalence.</td>
<td>Cost-effectiveness measured in terms of DALYs saved for a given cost.</td>
<td>Implicit reference to cost-effectiveness analysis.</td>
<td>Cost-effectiveness measured in terms of DALYs saved for a given cost.</td>
</tr>
</tbody>
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### Insert 4.1

**Comparison of various priority-setting approaches** (continued)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>4. Criteria for priority setting (continued)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect on equity and social justice</td>
<td>Central criterion in ENHR approach (not directly measured).</td>
<td>Inbuilt equity orientation, based on same weights given to year of healthy life saved for poor and rich population (effect on equity not directly measured as yet).</td>
<td>A number of indicators in the VHIP draw attention to the situation of the poorer segments of the population.</td>
<td>Inbuilt equity orientation, based on same weights given to year of healthy life saved for poor and rich population (effect on equity not directly measured as yet).</td>
</tr>
<tr>
<td>Ethical, political, social, cultural acceptability</td>
<td>This criterion is present, although in varying degrees, in various approaches, either explicitly (particularly in the ENHR approach) or implicitly.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific quality of research proposed</td>
<td>Pre-condition in all approaches.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feasibility (availability of human resources, funding, facilities)</td>
<td>Specifically mentioned in the ENHR approach.</td>
<td>Implicit.</td>
<td>Implicit.</td>
<td>Feasibility is part of the list of criteria.</td>
</tr>
</tbody>
</table>
researchers, (ii) decision-makers at different levels, (iii) health service providers, (iv) communities.

- Economic impact, including both the severity of the problem (urgency, seriousness, degree of incapacitation) and the magnitude/prevalence of the problem (number of persons affected).
- Effect on equity and social justice.
- Ethical/political/social/cultural acceptability.
- Feasibility of the research: probability of finding a solution.
- Avoidance of duplication.
- Contribution to capacity strengthening.

Not all these criteria have been systematically applied in ENHR priority-setting exercises in all countries. However, basic criteria such as economic impact, the effect on equity, and acceptability are present in most cases.

(b) Progress in the support given by COHRED to country activities are listed in Insert 4.2

3. Regional and sub-regional cooperation
Developing regional mechanisms as optimal intermediaries between the global and country level has become important for more focused country-level support. COHRED’s support for regional and subregional networks plays a crucial role as a catalyst in steering effective health research operations at country levels within regions. Selected regional Health Research Forums have been described in Chapter 3 (the planned African Health Research Forum and Asian and Pacific Health Research Forum). The following are examples of recent progress on regional consultation:

**Eastern Mediterranean/Middle East**
An informal regional consultation for the Eastern Mediterranean/Middle East region was held in Tehran, Iran, to focus on the ENHR competencies for priority setting, research into action, and capacity development. The regional network will facilitate sharing of information on various aspects of national health research systems; organize the training, planning and implementation of joint projects; convene periodic meetings of focal points; and promote the establishment of national networks.

The network meeting of francophone African ENHR
Teams from six French-speaking African countries (Benin, Burkina Faso, Cameroon, Côte d’Ivoire, Guinea and Mali) met in Ouagadougou, Burkina Faso, to discuss national developments, future plans for the implementation of the ENHR strategy and the development of health research in general. The group plans to develop a research profile which will enable the identification of gaps in research studies and available health information.

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**Insert 4.2**
**COHRED’s recent country-level support**

In 2001, COHRED recorded notable achievement in the provision of technical and financial support for the country work on priority setting, coordination networks and research capacity development. An overview of selected country examples includes the following:

**Mali: health research priority setting for development of health systems**
The first national workshop on health research priority setting in Mali was held in August 2001 and provided a unique opportunity for two major reasons: (i) the relevance of health research in the development of health systems in Mali was recognized for the first time; (ii) a consultative process involving both national and international partners set out
Insert 4.2

**COHRED’s recent country-level support** (continued)

...to define the health research priorities based on a set of basic values and principles toward long-term decisions and actions for improving the health of the Malian population.

Based on dialogue at both the regional and sub-regional level, different priorities among health problems were identified. The outcome is a list of priorities which include a wide range of options, from the control of communicable diseases to the need to make health delivery systems more effective and efficient.

**Ghana: informed decision-making – a prerequisite for health policy**

The Health Research Unit of the Ministry of Health in Ghana conducted a study to address the information and communication needs in health policy decision-making. The objectives of the study were three-fold: (i) to assess the context in which health professionals, health policy-makers and health researchers seek information; (ii) to examine the type of information sources they access; (iii) to establish the factors that influence the use of information resulting from health research. An interesting finding was the paradox between the recognition of the relevance of research information in the decision-making process and the limited or non-use of research as a basis for policy formulation. The reasons reported by different respondents include: lack of relevant research for policy-making; non-availability of research findings and difficulties in accessing data and research findings when available.

**Cameroon: the priority-setting process**

Cameroon is involved in efforts to set a national health research agenda. Based on the recommendations from a Promotion and Advocacy workshop, which was organized in Yaounde, three working groups were formed to carry out the priority-setting work. The objectives of the study have been spelt out as follows: (i) to identify country-specific health problems, to design and evaluate action programmes for dealing with them and to join international efforts to find new knowledge, methods and technologies for addressing global health problems that are high priority to the country; (ii) to channel resource allocation, as well as donor investment in health, to areas of highest priority in order to meet the needs of the most vulnerable groups of the population (women, children and the poor). Data collection will be implemented in 2002.

**Malawi: development of country-level health priorities**

Since the establishment of a research unit in the Ministry of Health and Population in Malawi, the Government of Malawi has increasingly become committed to health research. In view of the obstacles to the advancement of health research in Malawi, the research unit organized a three-day workshop aimed at developing a national health research agenda based on the ENHR strategy. Specific objectives were: (i) to identify health research priority areas; (ii) to discuss ways of promoting health research in Malawi; (iii) to build consensus among stakeholders on health research matters. Based on discussions involving a broad range of participants and the use of the priority-setting methodology developed by COHRED, the workshop drew up a provisional list of health research priorities.

**Pakistan: preparation for a health research agenda and implementation of ENHR strategy**

In 2001, the Pakistan Medical Research Council (PMRC) organized a priority-setting seminar to focus on the role of health research in development and to define the role of the Council in promoting health research for development in the country. The participants included policy- and decision-makers from the ministries of Health and Science and Technology and the Planning Division, researchers and academics and representatives from nongovernmental organizations and the private sector. An important and recurring theme throughout the discussions was the need for capacity development to improve the health research environment in Pakistan. The seminar participants concluded that the priority-setting process needs to be backed up by evidence and national data. The remaining challenge, as pointed out by participants, was the inadequacy, both in terms of the quality and quantity of such information in Pakistan.

**Chile: strategic direction towards strengthening national health research**

In 2001, the National Council of Research and the Ministry of Health in Chile organized a seminar to address the need for a national health research strategy in the country. The seminar addressed diverse issues ranging from health problems in Chile, which need technical and scientific research, the consensus-building process among different stakeholders such as the Ministry of Health, universities, the private sector and parliament. Among other topics addressed during the seminar was the discussion on available human resources for health research in terms of technical and scientific research capacity in the biomedical sector, clinical medicine, public health and social sciences. The seminar identified the following questions to be addressed in the process of establishing the national health research strategy: (i) the type of national health policy needed for the formation of human resources for health research in Chile; (ii) the kind of funding policy guidelines to be adopted for national health research; (iii) the type of health research policies needed to reduce inequity in health.
Section 4

Recent progress in the ‘five-step process for priority setting’ (the approach of the Ad Hoc Committee on Health Research)

In its 1996 report, the Ad Hoc Committee presented the five-step process (Insert 4.3), a tool to be used by policy-makers to help make more rational and transparent decisions.6

The five-step process was a response to the key issue of how to allocate limited resources efficiently and effectively between a large number of possible research projects so as to have the largest possible impact on the health of the largest possible number of people.

The objective of this section is to review the recent progress in each of the five steps advocated by the Ad Hoc Committee for priority setting.

1. Magnitude of the disease burden (Step 1): recent developments and challenges
   (a) Developments
   Disease burden is an important measure of the degree of morbidity and mortality in a given population. This measure uses evidence-based information to provide a quantitative measurement of health status and relies on information from public health branches of quantitative disciplines, including epidemiology and demography.

   Summary measures of population health are measures that combine information on mortality and non-fatal health outcomes to represent the health of a particular population as a single number. One of these types of summary measure, disability-adjusted life years (DALYs), has been used in the Global Burden of Disease Study7 and since, in a number of national burden of disease studies. The DALY is a health gap measure. One DALY can be thought of as one year of healthy life lost and the burden of disease as a measurement of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability.

   Other summary measures which have been developed to assess ways of measuring the benefits of implementing specific interventions include the QALYs (quality-adjusted life years), changes over time in HALEYs (healthy life years), DALYs as DALE (disability-adjusted life expectancy) and HALE (health-adjusted life expectancy). The QALYs differ from the DALYs in that QALY is a period of time adjusted using a quality weighting, and may be used to measure an observed stream of life years (say, in a population or after an intervention). Conversely, the DALY involves calculation of lost years of healthy life for a population measured against a normative standard for years of good health that people could expect to have in an ideal case. The health state valuations used in HALE

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The five-step process proposed by the Ad Hoc Committee on Health Research (1996)

Step 1  **Magnitude (disease burden)**  
Measure the disease burden as years of healthy life lost due to premature mortality, morbidity or disability. Summary measures, such as the DALY (disability-adjusted life year), can be used to measure the magnitude (but other methods can be used as well).

Step 2  **Determinants (risk factors)**  
Analyse the factors (determinants) responsible for the persistence of the burden, such as lack of knowledge about the condition, lack of tools, failure to use existing tools, or factors outside the health domain.

Step 3  **Knowledge**  
Assess the current knowledge base to solve the health problem and evaluate the applicability of solutions, including the cost and effectiveness of existing interventions.

Step 4  **Cost-effectiveness**  
Assess the promise of the R&D effort and examine if future research developments would reduce costs, thus allowing interventions to be applied to wider population segments.

Step 5  **Resources**  
Calculate the present level of investment into research for specific diseases and/or determinants (see Chapter 6).

Calculations represent average population assessments of the overall health levels associated with different states.

Summary measures have specific potential applications (Insert 4.4).

The World Health Organization is currently undertaking a Global Burden of Disease (GBD) project for the year 2000 (Insert 4.5). The GBD attempts to assemble a vast body of epidemiological estimates of diseases, injuries and risk factors, and uses DALYs as a summary measure. The primary objective of the GBD is the development of comparable, valid and reliable epidemiological information on a wide range of diseases, injuries and risk factors.

(b) **Challenges and further research**

(i) Contextual measurement
While there is good progress in the establishment of burden of disease measurement in countries, there has been a relative lag in evaluating how social, cultural and environmental factors affect the severity of a disease in different contexts. This failure to take account of contextual considerations has important implications, as a study funded by the Global Forum has highlighted.8 Using

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The study examined the impact of two health conditions (epilepsy and paraplegia) on people living in different contexts. The contexts were varied by country (Australia and Cameroon) and by environment (urban and rural); the effects of gender and socioeconomic status were also examined. Participants completed a variety of tests and interviews.

Both qualitative and quantitative tools revealed that people with paraplegia in Australia were substantially better off than people in Cameroon. The lack of infrastructure in Cameroon in general and in the rural areas in particular made coping with paraplegia extremely difficult. Indeed, in Cameroon paraplegia is generally regarded as a terminal condition. Facilities in Australia made it easier to cope with this condition. In addition, it was evident that participants who were financially better off could buy the equipment and services they required to improve their quality of life.

The study underlined the importance of distinguishing summary measurement of health (using measures such as DALYs which attempt to quantify average levels of health in the population) from measurement of broader quality of life or well-being. Ignoring the context in which health conditions occur may reinforce existing inequalities in health.

(ii) Co-morbidity
Co-morbidity deals with the quantification of the effect of more than one disease or condition affecting the same individual. The GBD 1990 used an additive model in which, for the same individual, the average time spent in two different health states were combined. The GBD 2000 work being undertaken at WHO is examining co-morbidity in more detail, particularly for mental disorders.

(iii) Measuring the impact of a health problem on third parties
A condition affecting one individual can also affect others. An example of this would be a relative or close contact of an alcoholic or a violent drug addict. While the measurement of disease burden would estimate the impact of alcohol or drugs on morbidity, disability and mortality, it would not estimate the effect...
The Global Burden of Disease 2000 Project

The World Health Organization is currently undertaking a new global burden of disease assessment for the year 2000 (the so-called GBD 2000 Project). The three goals articulated for the GBD 1990 remain central:

(i) to decouple epidemiological assessment of the magnitude of health problems from advocacy by interest groups of particular health policies or interventions
(ii) to include in international health policy debates information on non-fatal health outcomes along with information on mortality
(iii) to undertake the quantification of health problems in time-based units that can also be used in economic appraisal.

The specific objectives for GBD 2000 are similar to the original objectives:

• to develop internally consistent estimates of mortality from 135 major causes of death, disaggregated by age and sex, for the world and major geographic regions
• to develop internally consistent estimates of the incidence, prevalence, duration and case-fatality for over 500 sequelae resulting from the above causes
• to describe and value the health states associated with these sequelae of diseases and injuries
• to quantify the burden of premature mortality and disability by age, sex and region for 135 major causes or groups of causes
• to analyse the contribution to this burden of major physiological, behavioural and social risk factors by age, sex and region (see below under ‘research into determinants’)
• to develop alternative projection scenarios of mortality and non-fatal health outcomes over the next 30 years, disaggregated by cause, age, sex and region.

The GBD 2000 aims to produce the best possible evidence-based description of health, the causes of lost health and likely future trends in health. To the extent possible, the GBD 2000 aims to utilize and synthesize within a consistent and comprehensive framework all relevant epidemiological evidence on population demography and health for the various regions of the world. Where the evidence is uncertain or incomplete, the GBD 2000 attempts to make the best possible inferences based on the knowledge base that is available, and to assess the uncertainty in the resulting estimates.

On third parties through events such as stress, time investment, financial implications, violence or accidents at home.

In this case, alcohol consumption or drug abuse by others is a risk factor for disease burden and, in principle, could be taken into account in the estimation of the attributable burden for certain risks and exposures. The GBD 2000 is assessing the burden attributable to around 20 major risk factors in an attempt to deal with this problem (see point 2 below).

(c) Conclusions and future steps
Over the past decade, information on the global burden of disease has had a powerful influence on policy-makers and proved to be an effective tool for advocacy. The work has
informed a large number of national and global initiatives and the accounting of healthy life years lost as a consequence of morbidity and mortality has led to a renewed interest in a wide range of conditions.

The challenge now is to continue promoting and improving these methods as a quantitative tool, and to use the information to guide research priorities and funding allocation. Continued work is needed to improve the usefulness of these summary measures, in particular with respect to contextual measurement, co-morbidity and measuring the impact of ill health on third parties. Ignoring this context may reinforce already existing inequalities in health.

2. Research into determinants (Step 2): recent developments and challenges
Research into determinants can identify interventions to prevent disease or premature death. For example, reducing malnutrition in a given population is likely to have a large impact on a variety of diseases. In some cases, determinants may not only be relevant to prevent disease but also be part of its treatment, as is the case of reducing salt intake for high blood pressure.

(a) Comparative risk assessment
The comparative risk assessment (CRA) module of the GBD study is a systematic evaluation of the changes in population health which result from modifying the population distribution of exposure to a specific risk factor or a group of risk factors. CRA is distinct from intervention analysis which seeks to estimate the benefits of a given intervention or group of interventions in a specific population at a particular time.

(i) Objective of CRA
The aim of CRA is to produce:

- a “meta-level” analysis which demonstrates the contribution of each risk factor or group of risk factors to disease burden, relative to other risk factors;
- a mapping of alternative population health scenarios with changes in distribution of exposure to risk factors over time.

While intervention analysis is a valuable input to cost-effectiveness studies, CRA can provide guidance for research and policies designed to lower disease burden by changing population exposure to risk factors. CRA can provide information on the magnitude of the burden associated with risk factor(s), the expected magnitude of burden avoidable as a result of modifying exposure distribution, and the distribution of both exposure and burden of disease in the population, all relative to other risk factors.

(ii) Addressing some of the shortcomings of CRA
Since past exposure to determinants may lead to current burden of disease, it is not easy to estimate the temporal dimensions at a given point in time. The GBD comparative risk assessment module provides a framework to address some of these challenges as follows:

- The burden of disease and injury is converted into a summary measure of population health which allows comparison between fatal and non-fatal outcomes, also taking into account severity and duration.
- The burden due to the observed exposure distribution in a population is compared with that from a hypothetical distribution or series of distributions (rather than a single reference level such as non-exposed).
- Multiple stages in the causal web of interactions between risk factor(s) and disease outcome are considered (Insert 4.6) to enable analysis of some combinations of risk factor interactions or exposure levels for which epidemiological studies have not been conducted.
- Health loss due to risk factor(s) is calculated as a time-indexed stream of disease burden.
Insert 4.6
A causal web illustrating various levels of disease causality

Distal causes  Proximal causes  Physiological and pathophysiological causes  Outcomes

D1  P1  PA1  O1
D2  P2  PA2  O2
D3  P3  PA3

Insert 4.7
Risk factors included in the comparative risk assessment component of the Global Disease Burden 2000 Study

1. Alcohol  11. Selected occupational risks
2. Blood pressure  12. Ambient air pollution
3. Cholesterol  13. Physical inactivity
4. Climate change  14. Tobacco
5. Illicit drugs  15. Unsafe injection practices in medical settings
6. Indoor smoke from biofuels  16. Unsafe sex and unplanned pregnancies
7. Lead  17. Unsafe water, sanitation and hygiene
8. Childhood and maternal under-nutrition  18. Non-breastfeeding
9. Obesity and overweight  19. Childhood sexual abuse
10. Lack of fruit and vegetable intake  20. Distribution of risk factors by poverty.
due to a time-indexed stream of exposure. In particular, in introducing the comparative risk assessment framework, Murray and Lopez\(^\text{10}\) provide a temporal dimension for the burden of disease due to a risk factor by introducing the concepts of attributable burden (the reduction in the current or future burden of disease if the past exposure to a risk factor had been equal to some counterfactual distribution\(^\text{11}\)) and avoidable burden (the reduction in the future burden of disease if the current or future exposure to a risk factor were reduced to a counterfactual distribution).

\((b)\) Conclusions and future steps
The expansion of the focus from disease burden to risk factors (determinants) is an important step for future improvements in policies. However, this shift produces other challenges of its own, the main one being the selection of the risk factors to be studied. Insert 4.7 details the selected risk factors to be studied in the GBD 2000.

The GBD 2000 study selected risk factors (determinants) on the basis of the following criteria:

(i) among the leading causes of disease burden
(ii) neither too specific nor too broad
(iii) high likelihood of causality
(iv) reasonably complete data
(v) potentially modifiable.

These characteristics are more likely to fit proximal determinants in the causal web rather than distal determinants. Poverty is an example of a distal determinant (see Chapter 1, Section 1.2 on the vicious circle of poverty and ill-health). In the GBD 2000 the distribution of risk factors by level of poverty has been attempted and may lead to new approaches to tackle these problems. The challenge now is to expand this analysis and to obtain better estimates of the contribution of risk exposure to disease.

3. Present knowledge and cost-effectiveness analysis of health interventions (step 3): recent developments and challenges
Cost-effectiveness analysis is a useful tool to help policy-makers and programme managers decide between different ways of spending scarce resources to improve population health. It provides information on which interventions are likely to provide the greatest improvements in health for the available resources, a key input to decision-making, together with information on factors such as health inequities.

Cost-effectiveness analysis values “life years” similarly amongst individuals. As a result, a life year gained in a rich country is equivalent to a life year gained in a poor country. Cost-effectiveness analysis can identify whether a new tool or product is likely to lead to larger number of healthy life years gained for a given cost.

The challenges in the coming years are the following:

(a) Little information available from low- and middle-income countries
Cost-effectiveness analysis requires the following information:

- the extent to which current and potential interventions improve population health (i.e. effectiveness or number of healthy life-years gained)
- the resources required to implement the interventions (i.e. costs).


\(^{11}\) A counterfactual exposure distribution is an alternative distribution scenario other than the current exposure levels. It is used as a standard for comparison to estimate what disease or mortality level would be expected under this alternative scenario.
There is a dearth of information on cost-effectiveness of interventions in low- and middle-income countries. Transfer of findings from high- to low- and middle-income countries is difficult given the extensive differences in infrastructure, costs and capacity.

Economic evaluation has acquired significant prominence among decision-makers, and many ministries of health in low- and middle-income countries have expressed an interest in designing a national package of essential health services using this method. Given the high cost of many economic evaluations in low- and middle-income countries, interest has also been generated in pooling data and the results of previously published studies.

A review of published literature demonstrated that very few economic evaluations of communicable disease interventions in low- and middle-income countries were published during 1984-1997.\(^\text{12}\) While increasing over this period of time, there was concern at the lack of a universally accepted outcome measure for comparing cost-effectiveness across health interventions.

(b) Need for comparative data

Why is it necessary to compare a wide variety of health interventions? Policy-makers are concerned with two questions requiring evidence on costs and effects:

- Do the resources currently devoted to health achieve as much as they could?
  To answer this question, the costs and effects of all interventions currently employed must be compared with the costs and effects of alternatives. Reallocation of resources from inefficient to efficient interventions can increase population health with no change in costs.

- How best to use additional resources if they become available?
  This type of analysis is critical for ensuring that, as societies become wealthier, additional resources are well used. But it is pointless to ask this type of question if the current mix of interventions is inefficient. Both questions need to be asked together.

(c) Developing tools for generalized cost-effectiveness analysis

In order to tackle the difficulties stated above, WHO has initiated the WHO-CHOICE project (CHOosing Interventions that are Cost-Effective). WHO-CHOICE is an Aid to Policy which provides information on intervention costs and effects. The aim is to improve health systems performance. Health systems with very similar levels of health expenditure per capita show wide variations in population health outcomes. This is partly explained by variation in non-health system factors, such as the level of education of the population. But it is also due to the fact that some systems devote resources to expensive interventions with little impact on population health, while at the same time low-cost interventions with potentially greater benefits are not fully implemented.

WHO seeks to provide the evidence decision-makers need to set priorities and improve the performance of their health systems. WHO's Global Programme on Evidence for Health Policy has contributed to this question by:

(i) developing tools and methods for generalized cost-effectiveness analysis
(ii) assembling regional databases on the costs, impact on population health and cost-effectiveness of key health interventions.

The CHOICE project is currently assembling regional databases on the cost and effectiveness

of approximately 500 preventive, promotive, curative and rehabilitative health interventions using a standardized methodology. Regional databases containing raw data on cost and effect are being developed for analysts from different countries to use and, if required, modify the base assumptions to make them consistent with their own settings. Completed examples of the use of CHOICE will be available from WHO in 2002.

The impact of interventions on population health is vital. But it is also important to determine the role of different interventions in contributing to other socially desirable goals, such as reducing health inequalities. This dimension can be introduced in the cost-effectiveness analysis by attaching higher weights to health benefits accruing to the poorer population of a country.

4. Cost-effectiveness of future interventions (step 4)
The same reasoning and challenges apply to the calculation of the cost-effectiveness of future interventions, although the level of complexity and uncertainty is increased by the fact that, on the cost side, one must estimate the costs of research for the discovery, development and delivery of the intervention and, on the benefit side, one must estimate the likely number of healthy life-years saved by the new intervention.

5. Analysis of resource flows for health research
Developments and challenges under this topic are presented in Chapter 6.

6. Conclusions
The importance of the five-step approach as a tool to help set priorities for health research lies in its ability to relate research on burden of disease and determinants, cost-effectiveness, and financial flows. The method is useful to improve health research financing and can help decide which projects will have the greatest impact on the health of the largest possible number of people. There has been some progress over the last two years in the development and application of the tools. This process has also thrown up new methodological challenges which need further research and the refinement of currently available tools.

Section 5

Progress in the application of the Global Forum Combined Approach Matrix

This section focuses on the Combined Approach Matrix which incorporates the criteria and principles for priority setting defined in the ENHR approach, the Visual Health Information Profile proposed by the Advisory Committee on Health Research, and the five-step process of the Ad Hoc Committee on Health Research. The five steps are linked with the four broad groups of actors and factors determining the health
status of a population to form a proposed matrix for priority setting (Insert 4.8). During 2000-2001, the Combined Approach Matrix has undergone piloting and testing. A summary of progress is presented below.

The information will inevitably be partial in the first exercises, probably even sketchy in some cases, but it will progressively improve and even limited information is sometimes sufficient to indicate promising avenues for research.

1. Overview of the Global Forum Combined Approach Matrix
The Combined Approach Matrix is useful to incorporate and summarize all information obtained through a variety of processes (ENHR, VHIP and the five-step process). Information used in priority-setting exercises conducted at country, regional and global levels can be introduced into the Combined Approach Matrix and thus contribute to priority-setting in this broader context.

A summary of how to make use of the matrix is presented in Insert 4.9. Institutions using this tool can incorporate their specific information into the matrix. The priority research agenda at the global, regional or country level will then be defined for each disease or determinant, and across them. It will comprise those research projects which have the greatest impact in lowering the burden of disease in the country. Although this is a long-term effort, the tool should demonstrate its usefulness at an early stage by highlighting the most important gaps in the information needed to make evidence-based decisions and by enabling some decisions to be made despite the limited availability of information.

Insert 4.8
The Global Forum Combined Approach Matrix to help priority setting for health research

<table>
<thead>
<tr>
<th>Five Steps in Priority Setting</th>
<th>1. Level of the individual, family and community</th>
<th>2. Level of the health ministry, health research institutions and health systems and services</th>
<th>3. Level of sectors other than health</th>
<th>4. Level of central government, macroeconomic policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. What is the burden of the disease/risk factor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Why does the burden of disease persist? What are the determinants?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. What is the present level of knowledge?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV. How cost-effective could future interventions be?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V. What are the resource flows for that disease/risk factor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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2. Experiences with the application of the ‘Global Forum Matrix’ in the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) 14

(a) Context
TDR is an international research programme co-sponsored by the United Nations Development Programme, the World Bank and the World Health Organization. It has been successfully promoting research and research capacity strengthening in low- and middle-income countries for 26 years, and currently receives financial backing from over 20 sources, including bilateral development agencies and private foundations, in addition to the co-sponsors. In 1999, a strategic review was undertaken with the aim of “developing a long-term vision and a strategic plan that would set the overall context for TDR’s priorities”15. This was in response to major changes in both the internal and external environments.

The strategy emphasizes that TDR remain focused on generation of new knowledge and development of new approaches applicable, acceptable and affordable by low- and middle-income countries to prevent, diagnose, treat and control neglected infectious diseases. The strategy broadens the concept of “products from methods and tools” to “solutions to public health problems”, thereby including research into areas such as delivery of effective services, appropriate structure of health systems and policies. The strategy proposes a completely new way of deciding on priorities and sets out to fundamentally restructure the interaction between research and disease control. It also acknowledges that significant research capacity has been developed in low- and middle-income countries over the past 26 years and concludes that the time has come to adjust TDR’s research capacity-building approach to capitalize on the research capacity that is now available.

An immediate result was to re-Emphasize the importance of the diseases within TDR’s management system by creating Disease Research Coordinators (DRCs) from among

Insert 4.9
How to use the Combined Approach Matrix to identify research projects

(i) Define the disease or determinant to be explored.
(ii) Fill in the combined matrix with all the information available and relevant to your location.
(iii) Complete the matrix with information available from other sources.
(iv) Identify research ‘boxes’ for which information is missing or insufficient.
(v) Discuss in your group which of these identified areas of research should be examined according to your possibilities and comparative advantages.
(vi) Identify research projects which can fill these gaps.

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15 TDR. Strategy 2000-2005. TDR/GEN/SP/00.1
the experts on staff or new recruitments. In an early decision, tuberculosis and dengue fever were added to the TDR disease portfolio.

As part of the focus on outputs, TDR classified its expected results into the following categories:

(i) new basic knowledge
(ii) new and improved tools
(iii) new and improved intervention methods
(iv) new and improved policies for large-scale implementation of disease control strategies
(v) partnerships and research capacity building
(vi) provision of technical information, research guidelines and advice.

The challenge then was to establish new links with the control community and to define TDR’s priorities in each disease.

(b) The tools
Brought to bear on this problem were the results of several bodies of work. First, the analyses carried out by TDR, WHO and the World Bank between 1993 and 1996 which culminated in the Ad Hoc Committee Report Investing in Health Research and Development16, which in turn owed much to the work of the Commission on Health Research for Development17. Second, the analysis of research needs carried out by the Global Tuberculosis Research Initiative of the former Global Tuberculosis Programme (GTB) of WHO18. Third was the Global Forum Combined Approach Matrix for setting priorities in health research which came into being as a result of the work carried out since the Commission report in 1990.19

(c) The approach
The first step was to ask the Disease Research Coordinators (DRCs), together with disease control experts from within WHO and country programme managers, to analyse rationally and transparently the current situation of control for each disease. They were then asked to analyse the status of research, define research needs and opportunities, apply their knowledge of TDR’s competitive advantages and make recommendations for the strategic emphases that TDR should adopt for the next six years. Insert 4.10 provides an example of lymphatic filariasis using the TDR matrix. Areas (v) and (vi) cut across the other areas and other staff were challenged to establish new mechanisms to actively support the priorities in (i) to (iv).

In order to standardize the reports of each DRC and to expand the focus of the process, they were asked to complete the Combined Approach Matrix and a matrix summarizing comparative advantages across each of TDR’s expected results areas.

(d) The results: problems and solutions
The Global Forum Combined Approach Matrix was considered ambitious in this first exercise: it not only asked technical questions about the status of the disease and research, but also demanded awareness, knowledge and analysis of the factors determining health at the various levels (from the individual and the family to global macroeconomic policies). Although this was considered a major

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**Insert 4.10 Lymphatic filariasis**

**Strategic emphasis matrix for lymphatic filariasis research (TDR)**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Answers</th>
<th>TDR comparative advantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) New basic knowledge</td>
<td>Is current knowledge sufficient to develop new tools, methods, policies, etc?</td>
<td>• Genome network Brugia</td>
</tr>
<tr>
<td>(ii) New and improved tools</td>
<td>Are existing tools sufficient?</td>
<td>• Pathogenesis research</td>
</tr>
<tr>
<td>(iii) New and improved intervention methods</td>
<td>Are methods for applying existing tools optimal?</td>
<td>• Macrofilaria experience, links with industry, main actor in drug development, link with clinical trial sites</td>
</tr>
<tr>
<td>(iv) New and improved policies</td>
<td>Are existing policies and strategies effective? And are they used in control?</td>
<td>• Extensive experience in Phase IV trials of drugs for lymphatic filariasis and onchocerciasis</td>
</tr>
<tr>
<td>(v) Partnerships and capacity building</td>
<td>Is the current number of partners sufficient? Do they have sufficient capacity to address i-iv?</td>
<td>• Network of researchers</td>
</tr>
<tr>
<td>(vi) Information, guidelines, instruments and advice</td>
<td>Are information and guidelines sufficient and accessible to support the R&amp;D agenda?</td>
<td>• WHO link / prestige</td>
</tr>
</tbody>
</table>
advantage, in that it forces the users to think broadly and inclusively, not all DRCs or disease control experts had the relevant skills or knowledge, and some responses could not be answered in a small box.

The following are problems and questions identified during this process for each of the five steps.

Step 1. What is the burden of the disease/risk factor?
To this question we needed to add the distribution and the trend of disease burden. In Chagas disease, for example, the fact that transmission had been interrupted in Uruguay in 1997, Chile in 1999 and most of Brazil by 2000, is of crucial importance to the research directions to be taken in South America. Similarly, on trends, the relative lack of impact of control measures on the disease incidence in Central America and the Andean countries was fundamental to take into account.

Step 2. Why does the burden of disease persist? What are the determinants?
For a programme like TDR, focused on reduction of disease burden, it is essential to first establish what is/are the major control strategy/ies. Only then can the issues surrounding constraints to control be addressed as determinants of the persistent burden.

Step 3. What is the present level of knowledge? What is known about existing interventions? How cost-effective are they?
This step caused the most controversy. The “present level of knowledge” is too vague and impractical a term. As is the question about existing interventions. Most DRCs and disease control experts consulted had major reservations about the primacy of cost-effectiveness as the sole criterion for judgement on a control strategy. Applicability, acceptability and affordability were all considered to be essential qualifications. The real-life effectiveness in the field is also crucially important. Management of the sick child, for example, may be potentially the most important single measure for reducing disease burden, but if drugs are consistently not delivered to health centres, or malaria treatment cannot be obtained by those children who need it, then the theoretical cost-effectiveness counts for little. Thus, the constraints to better performance in the field are an essential part of the analysis for research priorities.

Step 4. How cost-effective could future interventions be?
While the need to estimate the likely cost-effectiveness of a future intervention before embarking on major research is not in dispute, it is fraught with difficulty. This detailed definition is part of the research process and, ideally, the components should be measured in the real world, through at least a pilot research project. Similarly, the affordability and feasibility of likely intervention methods also need to be assessed, ideally in the field.

Step 5. What are the resource flows for research into that disease/risk factor?
The need for such information is clear, although little disease-specific information exists. Collection of disease-specific data would benefit from an agreed common approach. Methods range from the very detailed approach taken by the Wellcome Trust in assessing research efforts in malaria, to the rapid method used by the WHO Global Tuberculosis Programme.

(e) Results
Each DRC completed the Combined Approach Matrix after the necessary modifications taking account of the issues described above. The resulting examples for malaria can be seen in Insert 4.11 and for onchocerciasis in Insert 4.12.

20 PRISM Unit, Wellcome Trust, 1996.
### Insert 4.11 Malaria

**Combined Approach Matrix applied by TDR to malaria**

<table>
<thead>
<tr>
<th>Actors/factors determining the health status</th>
<th>1. Level of the individual, family and community</th>
<th>2. Level of the health ministry, health research institutions and health systems and services</th>
<th>3. Level of sectors other than health</th>
<th>4. Level of central government, macroeconomic policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five steps in priority setting**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| II. Why does the burden still persist? What are the determinants? | 1. Ignorance about the nature, presentation and transmission of malaria  
1.1. insufficient personal protection against mosquito | 1. Problems of service quality (in areas where basic services exist)  
1.1. lack of supervision of programme staff | 1. Exposure of unprotected populations with little immunity in high transmission areas (high land, forest, desert-fringe areas) | 1. Lack of sustained political commitment  
2. Insufficient linkage across sectors  
2.1. lack of evidence linking health and development  
3. Lack of technical and managerial expertise | 2. Disregard for bio-environmental consequences of development projects  
3. Inappropriate housing  
4. Insufficient education  
5. Inappropriate water and drainage systems  
6. Lack of political commitment leading to absence of national malaria programmes  
7. Cross-border actions  
8. War and social unrest | 1.2. failure of early diagnosis and disease management  
1.3. failure to decentralize responsibility to districts, hospitals | 2. Lack of integrated malaria control and treatment services  
2.1. lack of treatment facilities  
2.2. lack of trained manpower  
2.3. lack of resources, including drugs  
2.4. unavailability of tools | | 3. Lack of integrated malaria information systems for control programmes  
3.1. lack of timeliness  
3.2. over-reliance on quantitative information  
3.3. failure to decentralize information systems  
3.4. failure of early detection and containment or prevention of malaria epidemics | 4. Lack of proper strategic analysis and assessment (e.g. inability to pick and choose between donors/aid) |
### 3. Progress in priority-setting

<table>
<thead>
<tr>
<th>3.1</th>
<th>inappropriate and unaffordable tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2</td>
<td>competing problems</td>
</tr>
<tr>
<td>4.</td>
<td>Poor access to health care and to skilled care providers</td>
</tr>
<tr>
<td>4.1</td>
<td>poor referral opportunities</td>
</tr>
<tr>
<td>4.2</td>
<td>delay in treatment or referral</td>
</tr>
<tr>
<td>4.3</td>
<td>no treatment for severe disease where people get sick</td>
</tr>
<tr>
<td>4.4</td>
<td>unavailability of services within reach</td>
</tr>
</tbody>
</table>

#### III. What is the present level of knowledge?

##### a) Interventions currently available

<table>
<thead>
<tr>
<th>1. Prevention of infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>1.1.1</td>
</tr>
<tr>
<td>1.1.2</td>
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<tr>
<td>1.1.3</td>
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<tr>
<td>1.1.4</td>
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<tr>
<td>1.1.5</td>
</tr>
<tr>
<td>1.2</td>
</tr>
<tr>
<td>1.3</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>2.1</td>
</tr>
<tr>
<td>2.2</td>
</tr>
</tbody>
</table>

1. Development of national antimalarial drug policies, with regard to:
   - 1.1 | geographical distribution of parasite |
   - 1.2 | parasite resistance to the drug |
   - 1.3 | characteristics of health services (quality and coverage) |
   - 1.4 | risks and benefits of different drug regimens (pre-packaging) |
   - 1.5 | costs of and compliance with drug regimens |

2. Treatment of individuals
   - 2.1 | chemotherapy |
   - 2.2 | chemoprophylaxis |
   - 2.3 | herbal remedies (this term, however, is poorly defined) |

3. Early diagnosis and disease management

1. Political commitment for the effective control of malaria
   - 1.1 | epidemiological stratification (according to vectorial transmission capacity, environmental, social, economic conditions) |
   - 1.2 | techniques to detect insecticide resistance mechanisms |

3. Appropriate housing

4. Environmental management
   - 4.1 | reduction/elimination of mosquito breeding sites |
   - 4.2 | appropriate planning of development projects |
   - 4.3 | environmental impact assessment in proposed development projects |

5. Emergency preparedness

1. Give malaria control highest priority
2. Promote awareness for problem and action
3. Arrange for appropriate funding (external & internal)
4. Subsidize treatment
**Insert 4.11 Malaria**

*Combined Approach Matrix applied by TDR to malaria* (continued)

<table>
<thead>
<tr>
<th>Actors/factors determining the health status</th>
<th>1. Level of the individual, family and community</th>
<th>2. Level of the health ministry, health research institutions and health systems and services</th>
<th>3. Level of sectors other than health</th>
<th>4. Level of central government, macroeconomic policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five steps in priority setting**</td>
<td>3. Health education</td>
<td>3.1. development of guidelines for the management of patients with fever by people at different levels of health care</td>
<td>5.1. emergency relief organizations should include malaria into their planning (e.g., malaria control among refugees and displaced populations)</td>
<td></td>
</tr>
<tr>
<td>III. What is the present level of knowledge? (continued)</td>
<td>3.1. promotion of acceptance of interventions (treatment-seeking for malaria)</td>
<td>3.2. equipment of relevant services with the means to diagnose malaria microscopically or use of rapid diagnostic tests</td>
<td>6. Health education programmes (in schools, workplace, media)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.2. teaching about the nature of malaria (risks, interventions, symptomatic identification of malaria in the home and in PHC clinics)</td>
<td>3.3. quality control of drugs, insecticides, diagnostics</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>3.4. monitoring of treatment failure to assess frequency, degree, distribution of drug resistance</td>
<td>4. Early detection, containment or prevention of malaria epidemics</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>5. Health education</td>
<td>5. Health education</td>
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<td></td>
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<tr>
<td></td>
<td>6. Provision of the community with information on the risks of malaria, its prevention, and action to be taken when it occurs</td>
<td>6. Provision of the community with information on the risks of malaria, its prevention, and action to be taken when it occurs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) How cost-effective are current interven-</td>
<td>1. Prevention of infection</td>
<td>1. Development of national antimalarial drug policies: evidence is poor. Some work on whether a switch to higher level drugs is GE.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tions? (refer to numbers under IIIa)</td>
<td>1.1. personal protection</td>
<td>1.1.1. no convincing (if any) evaluation of effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1.2. no convincing (if</td>
<td>1.1.2. no convincing (if</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>suitable)</td>
<td>suitable)</td>
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</tr>
</tbody>
</table>
any) study of impact on incidence or severity of disease.
1.1.3. no convincing (if any) study. Costs assessment might be easy.
1.1.4. C/E in all medium levels of transmission in Africa.
   No studies of impact in very intense transmission areas where mortality is apparently lower. Also question marks on long-term impact on reduction in immunity. But the general belief is that they are C/E in most areas of Africa.
1.1.5. C/E in pregnant women in many parts of Africa at least.
1.2. no evidence on effects.
1.3. by itself, this is not an intervention.

2. Prevention of development of disease in infected individual
2.1. in-depth literature search might lead to results. The emphasis should be on severe malaria, not on uncomplicated malaria.
2.2. limited evidence of low costs and effectiveness

3. Health education
3.1. no good evidence.
   Behaviour changes may/may not be linked to health outcomes
3.2. see 3.1

2. Treatment of individuals
2.1. on an individual basis, treatment is clearly very effective and cheap. However, there are no good studies at the population and system levels. What are the overall costs of current patterns of use of antimalarials, and what is prevented by this? But appropriate treatment is C/E in many settings. In areas where there is no access to treatment, it might be expensive to get treatment to the population and to ensure it was used appropriately.
2.2. C/E in pregnant women in many parts of Africa at least.
2.3. certainly very ineffective for severe malaria.

3. Early diagnosis and disease management
3.1. no really good evaluations.
3.2. Comparison of microscopes vs. dipsticks has been done. Microscopes will not be cost saving in many settings. Unclear if they will save any lives as people tend to treat all cases as malaria.
3.3. there is still a cost to someone, so no different to earlier comments on treatment.
3.4. no evidence

4. No evidence that this is measurable, let alone evidence on the impact.
5. No evidence on hard outcomes
6. No evidence on hard outcomes
### Insert 4.11 Malaria

*Combined Approach Matrix applied by TDR to malaria* (continued)

<table>
<thead>
<tr>
<th>Five steps in priority setting**</th>
<th>1. Level of the individual, family and community</th>
<th>2. Level of the health ministry, health research institutions and health systems and services</th>
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<th>4. Level of central government, macroeconomic policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) What types of interventions are under consideration?</td>
<td>2. Rectal artesunate</td>
<td>1.1. implementation</td>
<td>2. Involvement of private, industrial and other sectors in malaria control</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Drug combinations, fixed-dose combinations</td>
<td>1.2. tools</td>
<td>2. Access-related issues</td>
<td>3. Harnessing space research (satellite imagery) for predicting epidemics.</td>
</tr>
<tr>
<td></td>
<td>4. Improving access by having a more inclusive network of antimalarial treatment outlets, e.g. shopkeepers, chemical sellers, drug peddlers, community-based agents, etc.</td>
<td>2.1. cost of drugs</td>
<td>2.2. availability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Strategies for organizationally and financially sustaining use of insecticide-treated bednets (ITNs)</td>
<td>2.3. economics/health economics (to justify engagement)</td>
<td>3. Multinational research</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Working with traditional healers to improve referral for very ill children</td>
<td>3.1. new drugs</td>
<td>3.2. vaccines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Introducing malaria into school curricula</td>
<td>3.3. improved vector control (tools, methods)</td>
<td>3.4. genetic manipulation of malaria vectors</td>
<td></td>
</tr>
<tr>
<td>b. How cost-effective could future interventions be?</td>
<td>Not yet assessed</td>
<td>3.5. new and safe insecticides</td>
<td>4. Improved targeting of interventions based on risk mapping</td>
<td></td>
</tr>
</tbody>
</table>

This is available for malaria vaccines only. It could be done for drugs. The limitation is that no analysis can really take into account impact on transmission because transmission models are not well developed.
For malaria vaccine, if it had the same impact as nets on all cause mortality (i.e., at least 20% reduction), it would be very cost-effective regardless of duration of protection or how it had to be delivered. A combination of effectiveness, price, duration of protection and treatment mechanisms can be described at which it would be cost-effective.

* Sections on a blue background are areas in which TDR has particular comparative advantages. Sections with text written in blue are areas in which TDR has a specific interest.

** Disease burden (Step D) and resource flows (Step V) are not included in the table. Malaria disease burden was estimated in the year 2000 to account for 2.7% of the global burden of disease, or 40.2 million DALYs (World Health Report 2001). There is little information on resource flows for malaria research (see Chapters 5 and 6).
## Insert 4.12 Onchocerciasis

*Combined Approach Matrix applied by TDR to onchocerciasis*

<table>
<thead>
<tr>
<th>Factors determining impact of interventions on control</th>
<th>1. Level of the individual, family and community</th>
<th>2. Level of the health ministry, health research institutions and health systems and services</th>
<th>3. Level of sectors other than health</th>
<th>4. Level of central government, macroeconomic policies</th>
</tr>
</thead>
</table>
| **I. What is the burden of disease? How is it distributed? What are the trends?** | 18 million infected, 99% in Africa. Disease patterns vary with parasite strain. DALYS: 1083 (40% blindness/visual impairment, 60% severe itching). Extreme blindness rates led to collapse of communities in savanna. Important psychosocial and economic impact of skin disease and itching. Estimates of disease burden are outdated. Onchocerciasis is eliminated as a public health problem in the countries covered by the Onchocerciasis Control Programme (OCP) and infection virtually eliminated from central OCP area. Burden in the countries covered by the African Onchocerciasis Control Programme (APOC) may be already reduced by 25%-30%. | Health care seeking tended to be limited to traditional medicine and drug sellers for skin disease (cases spend US$20 a year) and the public health care system was not much involved. This changed with the start of the control programmes which resulted in an increasing demand on the public health care system for support to ComDT and surveillance in OCP countries, and to ensure sustained control and maintenance of achievements. | Depopulation of fertile river valleys had negative impact on rural development and agriculture. Education: school drop-out rates twice as high in households with onchocercal skin disease. | Impact on development:  
- Depopulation of relatively fertile river valleys in Sahel  
- Negative impact on food production in these countries  
- Reduced productivity and diminished income-generation activities |
| **II. What are the major control strategies?** | 1. Large-scale treatment with ivermectin  
Africa: once-yearly Community Directed Treatment (ComDT) to eliminate the disease as a public health problem. Americas: six-monthly to eliminate morbidity/transmission | 1. Large-scale treatment with ivermectin  
Africa: ComDT (annual) to eliminate PHI problem. Americas: six-monthly to eliminate morbidity/transmission  
2. Vector control to interrupt transmission  
Aerial (OCP) or ground larviciding (isolated foci in APOC) | ComDT: Community development and support/ involvement of community-based organizations (CBOs)  
Monitoring of the environmental impact of vector control in the OCP | Inter-country collaboration and coordination of oncho control  
Political commitment to OCP, APOC |
### III. Why does the burden persist?

#### a. What are the major problems and challenges with the current control strategies?

| 3. Combination vector control and ComDT: extension areas of OCP |
| 4. Surveillance + recrudescence control (with ivermectin); post-vector control in OCP area |

- Sustained community involvement in ComDT
- Overloading of ComDT with other interventions, community incentives, impact of cost recovery
- ComDT in conflict areas
- Parasite susceptibility to ivermectin

| Extension ComDT to all APOC areas (including conflict zones) |
| Integration of ComDT in health system and sustained support to CDTI |
| Cost-effective strategy for Loa loa areas |
| Effective implementation of onchocerciasis surveillance after cessation of OCP |

| Rural development/overpopulation in liberated river valleys in OCP countries |
| Integration of community development/CBOs in ComDT |

| Political support and priority for oncho control and surveillance during the post-OCP/ APOC period |

#### b. How applicable, acceptable, affordable are current strategies?

- Community Directed Treatment Initiative (CDTI) highly applicable, acceptable and affordable
- Issue of incentives
- Severe adverse reactions in Loa loa areas

| CDTI is an effective strategy but needs support |
| Vector control only applicable to savanna and isolated foci |

| Fits well in community development strategies, Support to ComDT (e.g. CBOs etc) |

| OK but need for political support |
| Vector control not affordable by countries |

#### c. How cost effective are current strategies?

Both OCP and APOC have a high Economic Rate of Return (ERR). For OCP the ERR > 11% (not including impact on skin disease). For APOC the ERR > 17% (includes only control of ocular disease and severe itching) assuming that ComDT can be sustained. These ERRs are as high as those of the better development projects in energy/agriculture/telecommunications.

#### d. What significant determinants are there?

| Community involvement in planning and decision-making |
| Social stability |
| Experience with other health programmes |
| Interaction with health system |

| Level of development, coverage and effectiveness of the health services |
| Priority and resources for support to ComDT |
| Effect of long-term treatment on transmission and parasite reservoir |

| Human migration and environmental changes affecting geographic distribution of onchocerciasis |

| Political commitment to ComDT and to sustaining control/surveillance efforts after the cessation of OCP/APOC/OEPA |
## Insert 4.12 Onchocerciasis

*Combined Approach Matrix applied by TDR to onchocerciasis (continued)*

<table>
<thead>
<tr>
<th>Factors determining impact of interventions on control</th>
<th>1. Level of the individual, family and community</th>
<th>2. Level of the health ministry, health research institutions and health systems and services</th>
<th>3. Level of sectors other than health</th>
<th>4. Level of central government, macroeconomic policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>iv. How effective would approaches* under investigation be?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. What types approaches* are under consideration?</td>
<td>• Macrofilaricide</td>
<td>• Resistance detection test</td>
<td>• Communication/advocacy strategy</td>
<td>• Advocacy strategy</td>
</tr>
<tr>
<td></td>
<td>• Multi-disease ComDT</td>
<td>• Advocacy strategy</td>
<td>• Integration of ComDT with other community development activities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Community self-monitoring</td>
<td>• Multi-disease and integrated approaches to ComDT</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enhancements of ComDT to improve sustainability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rapid assessment method for Loa loa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. How cost-effective could these future approaches* be?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Macrofilaricide would shorten duration of control and thus reduce costs</td>
<td>• Advocacy would enhance sustainability but costs and who would cover them not yet defined</td>
<td>• Advocacy would enhance sustainability but costs and who would cover them not yet defined</td>
<td>• Advocacy would enhance sustainability but costs and who would cover them not yet defined</td>
</tr>
<tr>
<td></td>
<td>• Cost of ComDT enhancements probably not very different from current costs which then would enhance sustainability</td>
<td>• Multi-disease ComDT would presumably improve cost-effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• RAP would be cost-effective compared to costs of monitoring requirements in areas potentially endemic for Loa loa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v. What extra knowledge is needed to develop new approaches* to effective control?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Multi-disease applications of ComDT</td>
<td>• Alternative models for health-sector development that would lead to improved outreach capability</td>
<td>• Community development and health care</td>
<td>• Political commitment to low priority or controlled diseases</td>
</tr>
<tr>
<td></td>
<td>• Onchocerca genome</td>
<td>• Impact of cost-recovery</td>
<td></td>
<td>• Costs of support to ComDT and surveillance</td>
</tr>
<tr>
<td></td>
<td>• Reasons for differences in compatibility between vector and parasite species</td>
<td>• Multi-disease, community-based interventions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VI. What are the research resource flows?

- TDR funds R&D on macrofilaricide, ivermectin resistance detection, and diagnostics, implementation research on drug delivery and ComDT, focusing on integration and sustainability, rapid assessment of Loa loa, and support to Onchocerca genome research.
- The Edna McConnell Clark Foundation has stopped funding onchocerciasis vaccine research.
- NIH and EC provide some funding on immunology.
- Additional funding on operational research from APOC (use of remote sensing for mapping Loa loa, country-level operational research), OCP (Onchosim, diagnostics, larvicide screening, environmental monitoring, etc.) and OIEPA (evaluation of impact on transmission)

* Approaches = tools, methods, strategies and policies, as defined in the new TDR Strategy.
Insert 4.13
TDR checklist for strategic analysis of health research needs (adapted from Global Forum Combined Approach Matrix)

1. **What is the size and nature of the disease burden?**
   - What are the epidemiological trends?
   - What are the current or likely future factors that impact on burden at the following levels, and in what way:
     - individual, community and household
     - health sector (health ministry, systems and service delivery)
     - non-health sectors
     - government and international?

2. **What is the control strategy?**
   - Is there an effective package of control methods assembled into a “control strategy” for most epidemiological settings?
   - What are its current components (stratify by geographical areas if necessary)?
   - If such a control strategy exists, how effective is it (based on observation), or could it be (based on epidemiological modelling) at:
     - reducing morbidity
     - preventing mortality
     - reducing transmission
     - reducing burden?
   - What is known of the cost-effectiveness, affordability, feasibility and sustainability of the control strategy?

3. **Why does the disease burden persist?**
   - What are the constraints to better control at the following levels:
     - individual, community and household (e.g. male dominance, poverty, access to services)
     - health sector (e.g. political commitment to control, inadequate human resources, poor management and organization of service delivery, poor financing or drug supply systems, lack of knowledge of how to control the disease, lack of effective tools, or lack of resources to implement effective tools and strategies)
     - non-health sectors (e.g. negative or positive impact on disease of social and agricultural policies, etc.)
     - government and international (e.g. impact of structural adjustment programmes, poverty alleviation strategies, macroeconomic policies)?

4. **What is needed to address these constraints effectively?**
   - Which of these constraints could be addressed by research?
   - Which of the research-addressable constraints, if addressed, could:
     - improve the control/service delivery system
     - ultimately, lead to a reduction in disease burden
     - be addressed by affordable research
     - be completed within 5 years?
   - What are the potential pitfalls or risks of such research?

5. **What can be learnt from past/current research?**
   - From current/past research – both TDR-supported and outside TDR.
   - What is known about existing research resource flows?

6. **What are the opportunities for research?**
   - What is the state-of-the-art science (basic and operational) for this disease and what opportunities does it offer?
   - What is the current status of institutions and human resources available to address the disease?

7. **What are the gaps between current research and potential research issues which could make a difference, are affordable and could be carried out in a) 5 years or b) in the longer term?**

8. **For which of these gaps are there opportunities for research?**
   - Which issues can only be realistically addressed with increased financial support or investment in human and institutional capacity?
   - Which issues are best suited to the comparative advantage of TDR?
The application of the Combined Approach Matrix to all TDR diseases met with varying levels of success, due both to the shortcomings of the method and to the technical training and experience of the DRCs. After much discussion, the revisions of the disease-specific research analyses will be undertaken using the checklist (Insert 4.13) with the aim of preparing a four to five page analysis of each disease which is highly comparable. The resulting framework is a modification of the Global Forum Combined Approach Matrix adapted to the needs of TDR.

(f) Lessons learned
The contribution of the Combined Approach Matrix was to:

• bring home to researchers the need to select priorities on a rational basis
• highlight to those involved in the process that this selection must incorporate the impacts on health and health interventions of the social, economic and political context (i.e. the information placed in columns 1, 3 and 4 of the Combined Approach Matrix)
• standardize the reporting of research priorities by each DRC.

Disease research strategies need to be revised and updated as new results become available. This will be almost continuous in a disease such as malaria for which research is ongoing. The priority-setting process is therefore iterative and should not be set in stone. The TDR analysis will now be revised annually and a scientific working group meeting will be held for each disease every five to six years to carry out a thorough review of global research priorities.

The priority-setting process should ideally engage a variety of actors. Researchers need to recognize that they are not the sole voice in defining research policies. Global and national level policy-makers must have a key voice, together with disease control experts in the field, epidemiologists, sociologists/anthropologists, economists and surveillance experts.

In summary, while the Combined Approach Matrix was a helpful tool for TDR, it required adaptation to the particular needs of the programme. This adaptation needs to be continuous as the debate on priorities proceeds.

3. Application of the Combined Approach Matrix to identify priorities for research on risk factors (determinants)
To explore its effectiveness in assessing the impact of determinants of disease (Step 2), the framework was applied to the problem of indoor air pollution (IAP). While the effects of IAP manifest themselves on health outcomes, the interventions to deal with it are rooted in sectors other than health. This observation led to the application of the Global Forum Combined Approach Matrix to identify gaps in research.

A paper presented at Forum 521 represents the first attempt to formally apply the combined framework to a risk factor rather than a disease condition. The objectives were to summarize the research priorities identified through this approach and to identify the strengths and weaknesses of its use.

IAP, which derives mainly from the use of simple biomass fuels (wood, dung and crop wastes) by the poor, is a major public health problem – accounting for about 4% of the total global disease burden. It is therefore an important risk factor requiring priority research.

(a) Disease burden (Step 1)
There is consistent evidence to show that

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exposure to biomass smoke increases the risk of a range of common and serious diseases of both children and adults, in particular related to lung health (Insert 4.14).

Reviewing the published literature and using various methods to produce estimates, IAP in low- and middle-income countries may account for about 53 million DALYs (amounts to approximately 4% of the global total for low- and middle-income countries). There is marked variation when comparing continents.

(b) Determinant/risk factor (Step 2)
Around three billion people and up to 80% of homes in low- and middle-income countries are still dependent on biofuels for household energy needs. Often used indoors on simple stoves with inadequate ventilation, the practice leads to high levels of indoor exposure, especially for women and young children. Current trends in fuel use and poverty indicate that this problem will persist unless more effective action is urgently undertaken.

Health and development issues associated with the use of household energy and IAP in low- and middle-income countries include gender issues, poverty, the environment and quality of life. With development, there is generally a transition up the so-called ‘energy ladder’ to fuels which are progressively more efficient, cleaner, convenient and more expensive. Households typically use a combination of fuels, for example wood for cooking and heating, some kerosene for lighting and perhaps charcoal for making hot drinks.

(c) Application of the Combined Approach Matrix to indoor air pollution
The Global Forum Combined Approach Matrix was applied to identify research gaps in Indoor Air Pollution research.

(d) Conclusions of this first attempt
• This exercise has shown that it is possible to apply the matrix to determinants of health, such as indoor air pollution.
• Even when first attempts serve more to identify gaps in knowledge than to help set priorities, identification of these gaps is crucial for setting priorities in health research.
• The combined framework is valuable in that it encourages assessment of the actions, roles and needs of the different sectors. This helps to emphasize the role of all non-health sectors listed.
• Whereas costs and benefits are often difficult to define, cost-effectiveness needs to be addressed.

An important aspect in future work will be to obtain locally relevant information and views on the issues discussed in this section.

(e) Research recommendations
The application of the Combined Approach Matrix in the field of indoor air pollution identified a need for a broad range of multidisciplinary research. This in turn requires coordination and the development of better intersectoral collaboration in research, policy development and implementation; and well developed mechanisms to ensure the dissemination and application of new research knowledge.

The following research priorities were identified:

(i) Research to strengthen evidence on population exposure, health effects and potential for risk reduction
• Develop community assessment methods for assessing risk (fuel use, pollution, exposure, household energy systems, etc.), and options for change.
• Develop and test instruments to provide practical and well-standardized measures of exposure, health- and development-related outcomes.
• Evaluate direct effects arising from the use
### Evidence of health effects of IAP exposure in low- and middle-income countries

<table>
<thead>
<tr>
<th>Condition</th>
<th>Nature and extent of evidence</th>
</tr>
</thead>
</table>
| • Acute lower respiratory infections (ALRI) in young children  
• Chronic bronchitis and chronic obstructive pulmonary disease (COPD) in adults  
• Lung cancer (coal-related only) | About 20 studies; fairly consistent across studies; supported by studies of ambient air pollution and to some extent by animal studies. |
| • Cancer of nasopharynx and larynx  
• Cataract  
• TB | Few (2-3) studies; consistent across studies; supported by evidence from smoking and animal studies. |
| • Low birth weight  
• Perinatal mortality | One study for each condition from a low-income country; supported by studies of smoking and outdoor pollution. |
| • Acute otitis media  
• Cardiovascular disease | No studies, but an association may be expected from studies of ambient air pollution and/or studies of wood smoke in high-income countries. |
| • Asthma | Several studies, but results inconsistent. Support from studies of ambient air pollution. |

of household energy, not resulting from indoor air pollution, including burns, scalds, kerosene poisoning, fires, etc.  
• Evaluate less direct health consequences including opportunity costs of women's time.  
• Research to help understand and estimate secondary impacts of interventions on cooking time, fuel gathering and crop production.  
• Obtain new evidence on health risks of indoor air pollution to demonstrate the effect of a measured reduction in exposure on the most important health outcomes.  
• Exposure-response relationship of indoor air pollution for key outcomes such as ALRI in young children.  

(ii) Research on interventions  
• Distil and disseminate experience of interventions from existing household energy implementation efforts.  
• Conduct economic assessment of specific interventions.  
• Evaluate new interventions and policy developments on health benefits.  
• Evaluate a range of criteria reflecting the context and impacts of household energy, including sustainability.  
• Identify effective models of collaboration (case studies) in field of household energy.  
• Develop and assess methods which allow locally specific arrangements for collaboration.
## Insert 4.15 Indoor air pollution

**Global Forum Combined Approach Matrix applied to indoor air pollution**

<table>
<thead>
<tr>
<th>Actors/factors determining the health status</th>
<th>Individual, family and community</th>
<th>Health ministry, health research institutions, health systems and delivery</th>
<th>Sectors other than health</th>
<th>Central government, macroeconomic policies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Five steps in priority setting</strong></td>
<td>Poverty: Individuals, including gender-related; family; population (including effects of drought, war, debt, etc.).</td>
<td>Ministry: Lack of awareness, hence weak health policy response; inadequate collaboration with other sectors.</td>
<td>Development/Civil Society Organizations (CSOs): Focus has been on technology for energy conservation and cost saving.</td>
<td>Awareness: Lack of awareness of health impacts of indoor air pollution specifically and more generally of interrelationships between household energy, gender, health and development.</td>
</tr>
<tr>
<td></td>
<td>Awareness: Lack of awareness of health risks and/or options for change.</td>
<td>Research institutions: Relatively low priority as health research issue; limited funding; lack of population surveys of exposure (health risks); exposure assessment difficult in settings where problem worst (cost, technical expertise required).</td>
<td>Non-health ministries: Environment, housing, etc., tended to operate in own fields without collaboration with health CSOs.</td>
<td>Policy: Lack of policy and strategy to address household energy and poverty, consequently minimal capacity.</td>
</tr>
<tr>
<td></td>
<td>Culture: Preferences, e.g., for taste of food cooked on biofuel stove; uses of smoke, e.g., food preservation; spiritual issues relating to health.</td>
<td>Health systems: Focus on case finding and treatment; uncertain about role in reducing environmental exposure; lack of mechanisms and experience for collaboration with other sectors.</td>
<td>Donors: Projects often driven and funded by donors, rather than being participatory and market-led.</td>
<td>Economic: Distortions in energy sector; fuel subsidy policy not benefiting the poor.</td>
</tr>
<tr>
<td></td>
<td>Access: Limited access to cleaner fuels and appliances due to poverty, and inadequate or unreliable supply.</td>
<td></td>
<td>Finance: Lack of suitable local micro-credit or other ways to assist with costs of appliances.</td>
<td>Collaboration: Inadequate support/facilitation of inter-sectoral collaboration at national and other levels.</td>
</tr>
<tr>
<td></td>
<td>Participation: Lack of opportunities for participation in change.</td>
<td></td>
<td>Evidence: History of poor projects, together with lack of evidence of successful initiatives, has reduced interest.</td>
<td></td>
</tr>
<tr>
<td><strong>II Interventions currently available</strong></td>
<td>Community development: Allows participation in needs assessment and planning interventions.</td>
<td>Role: Health sector tends to view role as limited, so this needs to be clarified. Role includes: - collection and provision of data on health and exposures - raising awareness of health effects and need for prevention</td>
<td>Many options currently exist for these sectors, but implementation is mostly patchy and uncoordinated.</td>
<td>National policy: Integrated national policies on household energy, health and development are required, but mostly lacking.</td>
</tr>
<tr>
<td></td>
<td>Poverty reduction: Opportunities for income generation, uptake of credit where available. Note that</td>
<td></td>
<td>Energy supply: Distribution of cleaner fuels (e.g., oil sector); other clean fuels (biogas, gfe fuels)</td>
<td></td>
</tr>
</tbody>
</table>
adoption of interventions (below) includes ability to pay.

**Improved stoves:** Adoption of stoves which reduce emissions, save fuel, vent pollution to exterior.

**Cleaner fuels:** Use of kerosene, gas, electricity where available.

**Housing:** Improvements to ventilation, insulation (cold areas).

**Behaviour:** Action to reduce fuel use, reduce exposure of family members.

- provision of education at points of contact with the health system (in clinical or community settings).
- collaboration with other sectors.

**Research:** Tools and methods for obtaining valid information on: exposure and health outcomes, effectiveness of education via health sector; role in collaborative initiatives with other sectors.

**Local commercial sector:** Artisans (e.g., stoves); distributors and suppliers of fuels and appliances.

**Education:** School and adult education on health risks, role of community, options for change.

**Housing:** Integrate environmental health into design and building.

**Finance:** Targeted subsidies for development, local micro-credit.

**Forestry, environment:** Renewable wood fuel resources and protection of the local environment.

**Specific programmes:** Some examples of national initiatives, including China (rural stove programme), India (improved stove programme), and Brazil (promotion of gas). In general, few strategic national examples.

**Poverty reduction:** Rural and urban poverty reduction can be expected to have significant impact on fuel-use patterns.

---

### III Cost-effectiveness of current interventions

<table>
<thead>
<tr>
<th>Who pays?</th>
<th>Costs are incurred by households through market mechanisms, as well as through investment by utilities (e.g., electricity) and government (targeted subsidies and credit support, if available).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual cost</td>
<td>Costs to households made up of capital costs (appliances, etc.) and running costs (fuels, maintenance). Wide range of costs from US$5-7 (ceramic stove) to US$150+ for biogas or electric appliances.</td>
</tr>
<tr>
<td>Community perspectives</td>
<td>There is a need for more information on how communities and households view costs and benefits, both are locally specific and tend to be complex – in part due to the multiple impacts/uses of household energy.</td>
</tr>
<tr>
<td>Sectoral issues</td>
<td>Although there are potentially large health gains from household energy interventions, most of the costs of interventions are not borne by the health sector.</td>
</tr>
<tr>
<td>Cost-benefit</td>
<td>Estimates based on stoves in Guatemala, Kenya, suggest benefits substantially outweigh costs for overall mortality and ARI morbidity.</td>
</tr>
<tr>
<td>Cost effectiveness</td>
<td>Estimates for stoves in India indicate $50-100 per DALY saved.</td>
</tr>
<tr>
<td>Research</td>
<td>Strengthen evidence and precision of health risk estimates for IAP (including ARI, COPD, TB, low birth weight, cancer, eye disease); evidence on wider health impacts of household energy; collaboration on systematic monitoring and evaluation.</td>
</tr>
</tbody>
</table>

**Sectoral issues:** In contrast to the health sector, it is the non-health sector (mainly) that provides the interventions. The issue of cost is complex, however, as interventions mostly need to be taken up through market mechanisms if widespread uptake and sustainability are to be achieved. A range of benefits should accrue to the non-health sector, including economic development, employment, environmental protection, etc. These are also benefits for the health sector.

**Research:** Assessment of the costs and benefits of household energy development for the poor, across sectors, is a complex field requiring development.

**Integrated policy:** Not aware of any assessment of contribution to national economies, or reductions in national socioeconomic and health differentials, of integrated policies and investment in household energy for the poor.

**Specific programmes:** Chinese rural stove programme implemented in more than 170 million homes, but evaluation so far limited. Indian stove programme has been problematic. South African electrification extensive, but substitution of polluting fuels limited in poor areas. In Brazil, gas is used extensively in rural areas.
### Insert 4.15 Indoor air pollution

**Global Forum Combined Approach Matrix applied to indoor air pollution (continued)**

<table>
<thead>
<tr>
<th>Five steps in priority setting*</th>
<th>Actors/factors determining the health status</th>
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<th>Sectors other than health</th>
<th>Central government, macroeconomic policies</th>
</tr>
</thead>
</table>
| III                            | Cost-effectiveness of current interventions (cont.) | Requires combination of (a) new technologies and other approaches to interventions, as well as (b) more effective implementation of existing interventions. New ideas include:  
• uptake of improved fuels, e.g. ethanol gel fuels, solar PV  
• innovative methods of raising awareness at community level, e.g. drama, community video, etc.  
• exploring opportunities for behavioural interventions, e.g. keeping child away from smoke  
• adopt new stove designs, e.g. the insulated ‘Ecostove’ in Nicaragua  
• integrating house design with energy needs, e.g. better insulation.  
**Community participation in planning and evaluation is required.** | Awareness: More needs to be done to raise awareness at all levels of the health sector about the health impacts of IAP on ‘headline’ diseases such as ARI, as well as the overall impact of household energy on health, and of links between environment, health and development in general.  
**Define role:** If this sector is to be able to respond effectively, better methods are needed to define the role it can play at all levels (ministry, district, clinic, community) in any given setting.  
**Research:** Stronger evidence on varied impacts of household energy on health; methods for developing health sector role, with case studies.  
**Combined approach:** As with the community level, requires new approaches as well as more effective implementation. To include:  
• development and supply of cleaner fuels and appliances, as well as new fuels (e.g. gel fuel)  
• strategic development of fuelwood sector, where appropriate  
• development of micro-credit, which may require more evidence on cost-effectiveness to make case for loans and initial donor support.  
**Collaboration:** More effective mechanisms for inter-sectoral collaboration at various levels.  
**Research:** Development of new technologies and approaches to implementation, marketing, etc.  
**Integrated policy:** Increased awareness at national level needs to lead to integrated policy, linked in to poverty-reduction efforts. Specific measures to include:  
• national capacity building  
• targeted financial support  
• energy policy which facilitates access of the poor to cleaner fuels  
• measures to assist the development of micro-credit for household energy  
• resources for carrying out prioritized research.  
**Research:** Systematic reviews of experience to date with components of the above to guide more integrated policy. |  |  |  | Financial policy: Evidence that fuel subsidies do not generally benefit the poor. |
| IV                             | What types of intervention are under consideration? | Action at community level has a great deal of potential. Participatory development, particularly involving women, can be very effective in | Some initial estimates of potential reductions in mortality and incidence of specific diseases such as ARI from lowering IAP are becoming |  |  |
| How cost effective could future interventions be? |  |  | There is potential for cost-effective gains for a range of sectors, including environment, forestry, housing, education and employment. Some studies have |  |  |
|  |  |  | Integrated policy on household energy and the poor has the potential to contribute to national socioeconomic |  |  |
promoting change. Some specific new interventions, such as the Escoove (Nicaragua) and gel fuel (Africa) look promising. But there remains a pressing need for studies that assess the overall effectiveness and sustainability of interventions, covering a range of urban and rural settings. Also needed are impact assessment methods that can be applied more routinely and that are sufficiently flexible to allow for the very variable levels of capacity and information.

available. These are still based on imprecise estimates of risk, and as yet do not:
- integrate wider health impacts of household energy on health, nor
- consider the potential of interventions and (crucially) approaches to more effective and sustainable implementation outlined here.

Research: The health sector should take a lead in ensuring that the evidence for making these assessments is both available and clearly presented.

shown the combination of near-term (health) and longer-term (global environment) gains that may accrue from a range of different stove/fuel options in India – see text for examples. The inter-dependence of the costs and benefits for the many sectors involved makes any comprehensive economic evaluation very challenging, as there is only limited value in looking at the cost-effectiveness for one (sectoral) outcome at any one time.

development, particularly if the above measures can contribute to reducing inequalities in health and development in society. This is an important area for further study.

* Disease burden (step D) and Resource flows (step 5) are not included in the table. IAP is estimated to account for about 4% of the burden of disease. There is little information on resource flows for research in IAP.
Three important changes have been observed in health research management over the past 12 years:

- There is a better understanding that health research can play a crucial role in policy decisions.
- There is a better recognition of the need for a sound scientific basis for selecting the topics to be researched.
- The lack of methodologies to select and recommend research priorities have stimulated the pace of development of these tools and processes.

In summarizing recent developments, the present chapter underlines the importance of combining a disease-based approach and a determinant-based approach when setting priorities for research. It also highlights the importance of using a participatory process to obtain the information needed to set priorities. The method for setting priorities for health research needs to be separated from political and commercial pressures. The aim of priority setting is to improve health through focusing health research on the most effective interventions for decreasing the diseases burden.

The reduction of disease burden requires not only biomedical interventions but also behavioural, social and political interventions implemented by sectors other than health.

The Global Forum Combined Approach Matrix was developed as a tool to help set priorities based on earlier tools developed since 1990. It can be implemented at any level. The aim is to use priority-setting techniques to gain as many years of healthy life as possible for a given investment in health research, whether the gain in healthy life years is to be made through a reduction in communicable diseases, noncommunicable diseases or violence and injuries. A greater weight can be attached to healthy life years gained for the poor population to encourage the implementation of interventions benefiting the poor.

(iii) Research on the development and implementation of policy
- Conduct economic studies on implemented policies.
- Assess the potential for policy on household energy to address inequalities in health.
- Develop and test standard indicators for routine application in countries.
- National consequences of policy options relating to the supply and uptake of cleaner household energy for the poor.
- Research to understand household benefits of risk reduction using cost-of-illness and willingness-to-pay valuations.

Section 6

Conclusions