Pan American Health Organization World Health Organization

XXIX MEETING OF THE ADVISORY COMMITTEE ON HEALTH RESEARCH

Washington, D.C., 2-6 August 1993

ACHR 29/93.4
Original: English

GLOBAL ADVISORY COMMITTEE ON HEALTH RESEARCH

REPORT TO THE DIRECTOR GENERAL

on its thirty-first session
held a t WHO headquarters, Geneva
28 September - 2 October 1992

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

DISTR. : LIMITED
DISTR. : LIMITEE

ACHR31/92.22 Report

ORIGINAL: ENGLISH

ADVISORY COMMITTEE ON HEALTH RESEARCH

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CONTENTS AND AGENDA

LIST OF MEMBERS AND OTHER PARTICIPANTS

Members

Professor M. Gabr, Head, Paediatric Department, Faculty of Medicine, Cairo, Egypt (**Chairman**)

Professor T. M. Fliedner, Director, Department of Clinical Physiology and Occupational Medicine, University of Ulm, Germany (**Vice-Chairman**)

Professor A. Neri, Vice Presidente, Comision de Asistencia Social y Salud Publica, Camara de Diputados de la Nacion, Buenos Aires, Argentina (**Vice-Chairman**)

Professor P. G. Svensson, Director, Centre for Public Health Research, Karlstad, Sweden (**Rapporteur**)

Professor O. O. Akinkugbe, Department of Medicine, University of Ibadan, Ibadan, Nigeria

Professor J. M. Borgoño, Adviser to the Minister of Health, Santiago de Chile, Chile

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Professor K. Z. Hasan, Dean, Baquai Medical College, Karachi, Pakistan

Dr Bernadine P. Healy,[1] Director, National Institutes of Health, Bethesda, United States of America

Professor L. Kaptué, General Inspector of Public Health, Yaoundé, Cameroon

Professor W. A. Karczewski, Chairman, State Committee for Scientific Research, Warsaw, Poland

Professeur M. Manciaux, Ecole de Santé publique, Université de Nancy 1, Faculté de Médecine, Vandoeuvre les Nancy, France

Professor L. Malcolm, Head, Department of Community Health, Wellington School of Medicine, University of Otago, Wellington South, New Zealand

Professor B. McA. Sayers, Dean, Imperial College of Science, Technology and Medicine; Director, Centre for Cognitive Systems, William Penney Laboratory, Imperial College, London, England

Dr T. Shimao, Chairman, Board of Directors, Japan Anti-tuberculosis Association, Tokyo, Japan

Professor Charas Suwanwela, President, Chulalongkorn University, Bangkok, Thailand

Professor Zeng Yi, Head, Department of Tumor Viruses and Aids, Institute of Virology, Vice-President of Chinese Academy of Preventive Medicine, Beijing, China

Chairmen of the regional Advisory Committees on Health Research

Professor F. K. Nkrumah, Director, Noguchi Memorial Institute for Medical Research, Accra, Ghana (**Chairman, WHO African Regional Advisory Committee on Health Research**)

Dr C. Milstein, Medical Research Council, Laboratory of Molecular Biology, Cambridge, United Kingdom (**Chairman, PAHO Advisory Committee on Health Research**)

Professor (Mrs) Sneh Bhargava, New Delhi, India (**Chairman, South-East Asia Advisory Committee on Health Research**)

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[1] Unable to attend.

Professor J. Rantanen, Director-General, Institute of Occupational Health, Helsinki, Finland (**Chairman, WHO European Regional Advisory Committee on Health Research**)

Professor M. Abdussalam, Bundesgesundheitsamt, Berlin, Germany (**Chairman, WHO Eastern Mediterranean Regional Advisory Committee on Health Research**)

Dr Lee Hin Peng, Head, Department of Community, Occupational and Family Medicine, National University of Singapore, Singapore, Singapore (**Chairman, WHO Western Pacific Regional Advisory Committee on Health Research**)

Council for International Organizations of medical research (CIOMS)

Dr Y. Bankowski, Executive Secretary, CIOMS, Geneva, Switzerland

International Agency for Research on Cancer (IARC)

Dr H. Vainio, IARC, Lyon, France

United Nations Research Institute for Social Development (UNRISD)

Mr C. Richard-Proust, UNRISD, Geneva, Switzerland

Temporary advisers

Professor Natth Bhamarapravati, Professor and President Emeritus, Mahidol University, Bangkok, Thailand

Professor H. Danielsson, Department of Pharmaceutical Biochemistry, Faculty of Pharmacy, Uppsala University, Uppsala, Sweden

Professor Ju. F. Issakov, Vice-President, Russian Academy of Medical Sciences, Moscow, Russian Federation

Dr A. Kessler, London, United Kingdom

Professor J. Lederberg, The Rockefeller University, New York, United States of America

Dr K. Leppo, Director-General, Department of Social Affairs, Ministry of Social Affairs and Health, Helsinki, Finland

Professor B. O. Osuntokun, University of Ibadan, Ibadan, Nigeria

Professor F. J. Radermacher, Institut für Arbeits- und Sozialmedizin, University of Ulm, Ulm, Germany

Special invitees

Professor V. Ramalingaswami, formerly Chairman, ACHR, Special Adviser to the Director-General, WHO, Geneva, Switzerland

Dr R. Wilson, Coordinator, Task Force on Health Research for Development, UNDP, Geneva, Switzerland

Representatives from the WHO regional offices

Regional Office for Africa: Dr I. Aleta, Research Promotion and Development

Regional Office for the Americas: Dr A. Pellegrini, Chief, Research Coordination

Regional Office for South-East Asia: Dr Aung Than Batu, Director, Research and Health Manpower

Regional Office for Europe: Dr H. Vuori,[1] Regional Adviser, Health Care Policies and Research

Regional Office for the Eastern Mediterranean: Dr El-Sheikh Mahgoub Gaafar, Regional Adviser, Research Promotion and Development

Regional Office for the Western Pacific: Dr A. Shirai, Research Promotion and Development

WHO headquarters Secretariat

Dr H. Nakajima, Director-General

Mr D. G. Aitken, Assistant Director-General

Dr R. H. Henderson, Assistant Director-General

Dr Hu Ching-Li, Assistant Director-General

Dr J.-P. Jardel, Assistant Director-General

Dr N. P. Napalkov, Assistant Director-General

Dr D. B. Evans, Special Programme for Research and Training in Tropical Diseases

Dr H. R. Hapsara, Director, Programme of Epidemiological Surveillance and Health Situation and Trend Assessment

Dr D. L. Heymann, Global Programme on Aids

Dr J. Kasonde, Special Programme of Research, Development and Research Training in Human Reproduction

Dr B. Mansourian, Responsible Officer, Research Promotion and Development
(**Secretary**)

Dr Y. Nuyens, Responsible Officer, Health Systems Research and Development

Dr C. Romer, Chief, Injury Prevention Programme

Dr K. Steel, Chief, Programme on Health of the Elderly

Dr J. E. E. Stjernsward, Chief, Cancer and Palliative Care

Dr J. Szczerban, Vice-Chairman, Council for Science and Technology

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[1] Unable to attend.

CONCLUSIONS - RECOMMENDATIONS

Agenda item

6. Reports by the Chairmen of the regional ACHRs

6.1 Periodicity: it is recommended that the global as well as the regional ACHRs should meet annually.

6.2 Cross-representation: it is recommended that regional ACHRs should have improved cross-representation.

6.3 Communication between global and regional ACHRs: progress reports of ACHR task forces and subcommittees should be readily available to the Regional Office secretariat.

6.4 Reporting to global ACHR: the Office of Research Promotion and Development (RPD) should inform Regional Offices of minimum information required according to a standardized format.

7. Task Force on Health Development Research

7.1 The Task Force should review the state of health development research in cooperation with appropriate investigators within and outside of WHO, and propose ways to promote such research, including research on neglected issues such as nursing and women's health.

7.2 The Health Systems Research unit of WHO, the operational core component of health development research, should be strengthened and given enhanced resources, so that it can respond more effectively to the needs for capability strengthening in Member States and WHO's programmes.

7.3 Innovative epidemiological approaches and methods should be developed for measurement, monitoring and forecasting, in relation to health development research.

8. Task Force on Evolving Problems of Critical Significance to Health

8.1 The Task Force should continue mobilizing extrabudgetary funds as needed. Emphasis should be given to the analysis of health consequences of determinants such as population dynamics, industrialization and new economic order of global developments and the description of research deficits that need to be addressed.

8.2 It is recommended to pursue "cross-sectoral" approaches to the evolution of global health problems.

8.3 Health consequences of global developments such as cancer, injuries and environmentally caused health impairments (including physical, chemical and microbial effects) should be examined as paradigms of problems of critical significance to health development at global level.

8.4 It is recommended that the Task Force should continue its planned work.

9. Task Force on Science and Technology

9.1 The Task Force should continue its stated programme of work, with clear priorities, focusing particularly on new positive health-related indicators and new methodologies for studying intersectoral interactions and behavioural aspects of health.

9.2 The Newsletter project should be implemented taking into account the Committee's response.

10. Subcommittee on Research Capability Strengthening

10.1 Regional Offices should encourage and support national, subregional and regional workshops on research methodology and management involving countries at different levels of development, bringing together researchers and policy-makers in the comprehensive process of capability strengthening.

10.2 All WHO programmes should build up research capability and integrate this component into research activities.

10.3 The situation in central and eastern Europe, as well as that in Africa, should receive special emphasis in collaboration with regional ACHRs.

11. Report of the Subcommittee on Health and the Economy

11.1 The Committee takes note of the final report, with appreciation.

11.2 It encourages research activities on the main recommendations, and in particular to request the Task Force on Science and Technology to focus on the development of new health-related indicators and new methodologies for investigating intersectoral interactions involving health, and for understanding behavioural aspects of health.

12. Global Health Research Strategy: update and relevance to WHO's health paradigm

12.1 Progress made with the first draft strategy is noted with satisfaction.

12.2 Inputs from the regions should be sought.

12.3 The update should be completed by the ACHR secretariat with a small group comprising both the initial members and co-opted members.

13. Major research activities of WHO programmes

13.1 The Committee notes with appreciation the excellent reports given by four programmes.

13.2 Since advice must be based on appropriate information, ACHR should be continuously informed on progress made in WHO's research activities.

13.3 ACHR concludes that it must assess the implications for future strategies of all research activities within WHO's programmes.

14. Resources for supporting research infrastructures

Several possibilities should be explored to augment resources for health research at national and international levels:

14.1 by drawing a proportion (2% to 10%) of available funds for: (a) development assistance, (b) public health budgets, (c) research and development budgets, (d) institutional budgets (universities and research institutes in the North to work for the South);

14.2 by fostering new partnerships between industrialized and less developed countries (investing funds in the North for research on the problems of the South);

14.3 WHO is urged to take a lead in effecting these changes by earmarking at global, regional and national levels appropriate resources for health research. Results are to be reported to each ACHR.

15. Future directions for ACHR activities

ACHR, in accordance with its mandate from the Assembly, notes the unavoidable necessity of taking account of issues that impinge on health status, and which traditionally are not the concern of the health sector; it therefore increases the scope of its concerns and recommends:

15.1 annual meetings of the global and regional ACHRs;

15.2 action to strengthen the ACHR secretariat;

15.3 increased funding to support the work of Task Forces;

15.4 compilation by the secretariat of information on WHO research for use by ACHR;

15.5 a two-way exchange of views between the task forces and the WHO regions;

15.6 the continued investigation of WHO's advisory mechanisms in science and technology, with more detailed proposals to be scrutinized by the Standing Committee.

16. Collaborative research activities with:

(a) the Council for International Organizations of Medical Sciences

The ACHR agrees to:

- Endorse both the ethical guidelines for epidemiology and the ethical guidelines for research involving human subjects, and proposes that the Director-General make them known to all Member States;
- Recommend that WHO should support CIOMS activities, if possible from core budget;
- Support creation of an "ad hoc" group linking CIOMS to the Standing Committee;
- Recommend the investigation of ethical aspects of Health System Research;
- Recommend that medical school curriculum should include the subject of bioethics;
- Recommend that ethical issues relevant to health research be a subject for forthcoming technical discussions at the World Health Assembly.

(b) other groups and organizations

- The reports of Professor Ramalingaswami and Dr Wilson are noted with appreciation.
- Future cooperation with the nongovernmental organization to be formed shortly should be encouraged.

OPENING OF THE SESSION (Agenda item 1)

1. The Chairman, Professor M. Gabr, opened the thirty-first session of the global Advisory Committee on Health Research and welcomed members to Geneva.

ELECTION OF OFFICERS (Agenda item 2)

2. Professor A. Neri and Professor T. Fliedner were elected Vice-Chairmen, and Professor P. Svensson, Rapporteur.

ADOPTION OF THE AGENDA AND PROGRAMME OF WORK (Agenda item 3)

3. The draft agenda (document ACHR31/92.1 Rev.1) and programme of work (document ACHR31/92.2) were adopted without amendment.

INTRODUCTORY STATEMENT BY THE DIRECTOR-GENERAL (Agenda item 4)

4. The Director-General bid a special welcome to the new ACHR members: Professor Borgoño, Dr Healy, Professor Malcolm, Professor Manciaux, Professor Kaptué, Professor Karczewski, Professor Suwanwela and Professor Svensson.

5. He also welcomed the Chairmen of the regional ACHRs, Dr Abdussalam, Dr Bhargava, Dr Lee Hin Peng, Dr C. Milstein, Professor Nkrumah and Professor Rantanen. He was pleased to see that WHO's temporary advisers were participating, as were representatives of the regional research offices.

6. He referred to the concern expressed by some that biennial sessions were not enough to maintain the momentum and monitor the global orientation of health science and research in the Organization, and expressed the view that consideration could be given to revert to annual sessions, if a majority so wished.

7. He outlined for the Committee the major events which had taken place since the last session, including his report on the Role of Research to the Executive Board and to the World Health Assembly in 1992, as well as the work of ACHR's Task Forces and Subcommittees.

8. He addressed the various points on the agenda before the ACHR and looked forward to receiving the Committee's advice.

9. He stressed the essential role of research in health development, and re-emphasized that WHO should remain close to the scientific community, utilize recent advances in science and technology to promote health and maintain its leadership in research.

INTRODUCTORY STATEMENT BY THE CHAIRMAN (Agenda item 5)

10. The Chairman thanked the Director-General for his presence, congratulated new members of ACHR on their appointment, and welcomed old members of ACHR, guests and invitees.

11. He stated that the report of the Director-General on health research had been prepared and presented both at the WHO Executive Board and the World Health Assembly in 1992 and had received approval and firm support. Both the Board and the Assembly had emphasized the ethical aspects of research, and requested that measures be taken to strengthen research capabilities, especially in Africa and eastern Europe. The broad principles adopted during the meeting of ACHR in 1990 were supported. ACHR was being recognized as a body that advised the Director-General on future strategies for research in the light of evolving problems and scientific advances. ACHR also emphasized the multidisciplinary approach to health research which was consistent with the new paradigm for health.

12. He recalled that, during the past two years, the four ACHR subgroups established by the Director-General had been active, and that their reports and activities would be discussed during this meeting. New members were encouraged to join one or other of the task forces.

13. The health research Strategy which had been prepared by ACHR in 1986 was being updated.[1] Future strategy for health research would take shape after members had heard of the research activities carried out by the regional ACHRs, special programmes and other WHO programmes, and from the groups concerned with: health development research; science and technology; evolving problems; and strengthening research capabilities. He saw tremendous potential in science and technology for improving health care. Huge problems were evolving: economic adjustment, environmental factors, demographic changes, evolution of new diseases, etc. These required investigation and understanding. The world recession and the political changes in eastern Europe affected the effectiveness of many research institutes. Strengthening of these institutes, as well as more international cooperation, would be needed. There would also be a chance to discuss ethics in research as well as mechanisms of cooperation and coordination between WHO and nongovernmental organizations.

14. At the Chairman's invitation, Professor Danielsson presented a specific coordination issue: "Mechanisms for the acquisition of scientific and technological advice in WHO".

15. Professor Danielsson referred to the discussions on this issue at the previous ACHR meeting. These discussions had led to the decision to proceed with an in-depth analysis.

16. He recalled that in 1991, Professor Osuntokun had made a general review of the existing system and suggested some improvements, including closer connections between ACHR and special programmes as well as regular budget programmes. He had also proposed a change in ACHR members' term of office from four years to six years. As a follow-up, the Office of Research Promotion and Development had asked Professor Danielsson to undertake a more detailed review which was now completed.

17. Professor Danielsson had analysed the activities of 150 of the more than 1000 WHO collaborating centres and found considerable variation in performance both from quantitative and qualitative aspects. He concluded that the network of WHO collaborating centres was very valuable but that there was a need to strengthen the review process upon designation and redesignation. He proposed that ACHR should become involved in peer review of collaborating centres. In his opinion, this would lead to a necessary reduction in the number of centres - some programmes had more centres than they could cope with - as well as an improvement in overall quality.

18. With respect to expert advisory panels, Professor Danielsson stated that there were at present 54 such panels with a total membership of 2180. He had found that most of the members were rarely called upon for advice. He proposed that there should be a more stringent analysis upon appointment and reappointment - some members were no longer scientifically active - and that the total number of members should be decreased.

19. Professor Danielsson made suggestions for strengthening the interaction between ACHR and special programmes and other larger programmes.

20. Concerning the newly created Council for Science and Technology, Professor Danielsson considered the task of harmonizing scientific and technological development within WHO an important one. He also proposed that the Council should become involved in the prioritization of non-earmarked extrabudgetary funds.

21. Finally, Professor Danielsson proposed that "regular budget" programmes should be subjected to regular peer review. In his opinion, this would strengthen the programmes and contribute to a needed prioritization of programmes by the WHO Secretariat and the Executive Board. Professor Danielsson considered that many programmes did not reach the necessary critical mass.

22. After a brief discussion, ACHR decided to submit Professor Danielsson's report to the Standing Committee of ACHR and the Council for Science and Technology for further consideration.

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[1] See agenda item 12.

REPORTS BY THE CHAIRMEN OF THE REGIONAL ACHRs (Agenda 6) (see Annex 1)

TASK FORCE ON HEALTH DEVELOPMENT RESEARCH (Agenda item 7) (see Appendix 1)

23. The subject was introduced by Professor Davies. Health development research includes the concepts and contents of essential health research as well as health systems research. Thus, it comprises the whole range of research activities necessary to define health problems, to design and evaluate plans and policies to promote health and control diseases. It is therefore a multidisciplinary field, which includes social sciences.

24. The essential epidemiological capacities defined by a group of experts who reported to the Director-General of WHO in 1988 are basic to the fulfilment of health development research priorities. The Task Force on Epidemiology requested ACHR to further clarify the epidemiological activities in WHO headquarters and to support the strengthening of epidemiological capability at various levels.

25. Directions in epidemiological research must reflect countries' emerging needs and priorities in order to balance proposals of fundamental and applied research. Various applications of epidemiological methods - including models, scenarios, and projections already available - need to be adapted for the development of health services and for measuring their quality.

26. Considering the 10 directions which are proposed, all have to be included, even though some lead to conceptual research and development of tools and methods. The feasibility of some is not obvious.

27. Epidemiological research and the application of epidemiological methods and tools, including those using qualitative information, should aim to answer the question of how to achieve equity, and to demonstrate the impact of equity policies on human health. The Task Force stressed the importance of developing environmental and occupational epidemiology in order to evaluate their impact on health, and encouraged WHO to strengthen the development and use of epidemiology at all levels: peripheral, national (including medical schools and institutions) and global.

28. Dr Nuyens, Manager of the Programme on Health Systems Research and Development, presented his programme (see Appendix 2).

29. Discussing the relation between health systems research and health development research, the Advisory Committee noted a considerable overlap between these concepts. From WHO's point of view, the operationalization of health development research at country level is carried out mainly through health systems research activities.

30. In implementing these activities, a balance between excellence (scientific) and relevance (utility) is necessary, with a focus on equity in health development. The Committee confirmed that this requires partnerships in health systems research between scientists, decision-makers and managers, and the community. The Committee further noted that in developing as well as developed countries, health systems research is addressing health development issues at policy, programme and operational levels, calling for a variable combination of research skills and involvement of the above-mentioned partners. Finally, the Committee strongly recommended re-evaluation of the present structural and financial situation of the Programme on Health Systems Research and Development (HSR). There is a growing need and demand for health systems research at country level, as well as in programmes within and outside the Organization. Consequently, WHO urgently requires a stronger HSR Programme with commensurate financial and human resources, to allow it to play a more active focal-point role and to respond to the above-mentioned needs, including those of health development research.

TASK FORCE ON EVOLVING PROBLEMS OF CRITICAL SIGNIFICANCE TO HEALTH (Agenda item 8)

31. In reviewing the work of the Task Force, its Chairman, Professor Fliedner, pointed to the importance of considering ethical aspects of the North-South imbalance (Appendix 3). The imbalance is a fundamental obstacle to the reduction of prevailing inequities. WHO needs an ethical Magna Carta whereby it could create a new value system with the aim of reducing North-South inequities. The current situation can only get worse, and a mechanism is needed for sounding out the consequences of developments in both North and South so that a broad picture of risks can be achieved.

32. The Task Force has turned its attention primarily to global issues such as the likely origin of major problems of critical significance to health. It identified population dynamics, environmental degradation and North-South resource imbalances, and, having undertaken a preliminary modelling study, came to several broad conclusions as to how severe these consequences could be. In the light of this, it was felt important to collect sufficient data to allow clear demonstration of the likely scale of events if no action is taken soon. The Task Force recommended that convincing evidence on these hazards be collected, in order to exert pressure on politicians to take urgent action.

33. The Chairman introduced Professor Radermacher who presented a paper amplifying these points.

Discussion

34. Ethical concepts were seen to be important. For instance, "sharing", leading to a fairer distribution of wealth, is the concept that can lead to decreased inequities and decreased poverty. Poverty, seen as the main obstacle to equity, should be repeatedly emphasized by WHO; the positive role of education, particularly of women, also needs repeated emphasis.

35. There was much support from Committee members for the idea of exploring large-scale scenarios as a guide to the scale and nature of possible future problems. On the other hand, some members pointed out that no attention had been given to microbial threats, for instance, which are seen by many as a major hazard to which there is no present answer. Organisms long since generally thought to have been eliminated or to pose no threat had changed character. Chemotherapy that had worked in the past no longer did so, and it was by no means clear that the competition between microbes and humans will be resolved in favour of the latter. This constitutes a serious emerging problem.

36. The advantage of pursuing a global modelling study lies precisely in the evidence it offers - provided that the methodology is convincing - for persuading political action. It was regarded as important for the scientific community to act as a pressure group to create awareness, by whatever means are available, to the existence and magnitude of these evolving problems, and the subsequent threat to life and health.

37. Continuing work by the Task Force along these lines was strongly encouraged by the members of the ACHR.

38. A problem of fundamental concern was raised by Professor Lederberg concerning the permanent threat of new and mutating viruses as he perceived it from an evolutionary viewpoint. His thoughts had been expounded in a publication which he shared with the Committee (see Annex 2).

39. Two WHO programmes presented their work to illustrate the relevance of this theme to the Organization's operational concerns.

40. First, Dr Romer, Manager of the Programme on Injury Prevention reported on the programme. He stated that injury ranked high (first or second) in terms of years of life lost due to premature mortality, and the ratio disability/mortality remained high. Injury analysis needed to include both intentional and unintentional injury, since common patterns with regard to surveillance systems, categories of risk groups and risk factors such as alcohol, etc., were observed.

41. An epistemologic approach was applied to the science of accidental hazards, drawing on several biomedical, psychosocial or engineering disciplines, as a prerequisite and basis for decision making and policy formulation for safety promotion in a public health context. Methodologies for analysis of unsafe conditions and accidental hazards monitoring needed to be clearly formulated in three major areas: behavioural; psychosocial and cultural; and engineering or environmental, taking into account the many interactions which will influence the level of safety or unsafety. With regard to prevention of intentional injuries and violence, public health research should incorporate the epidemiology of violence in its scope of concern.

42. In 1993, two advisory groups were due to meet: one on safety promotion and injury control and the other on violence prevention. Their recommendations with regard to research needs and management should be brought to the attention of the ACHR.

43. Second, Dr Stjernsward, Manager of the Programme on Cancer and Palliative Care, reported on the programme. He said that cancer had to be recognized as a growing problem, since by the year 2015 it was expected to account for 54% of all deaths while tropical infections and parasitic diseases would decrease to 16% (from 35% in 1985). Projections for the next 25 years were 300 million new cases and more than 200 million deaths from cancer. Nearly two-thirds of all cancers would occur in developing countries which had only 5% of the resources for cancer control. The predicted increase during that period exceeded 100% in developing countries, whereas for the developed countries, it was approximately five times less.

44. The Committee agreed with the Programme Manager that the knowledge acquired in the area of cancer control over the last two decades should be applied to prevention measures. These could prevent a third of all cancers; curative measures could cure another third; and symptomatic measures could control pain in the remaining incurable cases. Support to countries in establishing and strengthening national cancer control programmes was crucial to the effective management of cancer control on a world scale, and it was agreed that the WHO programme deserved full support in this endeavour.

TASK FORCE ON SCIENCE AND TECHNOLOGY (Interim Report) (Agenda item 9) (see Appendix 4)

45. Professor B. McA. Sayers, Chairman of the Task Force, outlined the three aspects of its work: identifying technology that could be used or adapted to solve an existing health problem; monitoring new or emerging science and technology with potential applications to health; preparing expert papers. The Task Force also met to discuss the recommendations of the Subcommittee on Health and the Economy and produced a summary with their comments.

46. The Task Force proposed informal meetings of experts on selected health problems in need of technological solutions and experts with wide experience in science and technology. Successful outcomes could lead to pilot projects as a precursor, if warranted, of a more extensive development; for example, a pilot development for a cheap biosensor to monitor faecal contamination of water supplies.

47. The Task Force proposed that a regular newsletter be produced and circulated through the WHO distribution system to report new advances in science or technology that should be monitored for their possible later development for health purposes. Low cost and accessibility would be of immediate concern to developing countries and would justify the circulation of a newsletter. A draft first issue was tabled.

48. It also recommended that occasional papers be commissioned from acknowledged experts, and reviewed before circulation to member countries, again through the WHO system. It suggested consideration be given, for example, to the subject of implementation of information technology in developing countries, based on a recent in-depth case study.

49. Members supported the idea of a newsletter although there was some debate about target readership, and the appropriate means of dissemination. Electronic mail and satellite communication were mentioned but the consensus was to print, and perhaps to circulate a newsletter with, or as part of, a regular WHO publication. It was also recommended that scientific and professional journals, especially those in developing countries, should be placed on the mailing list. It was accepted that, normally, at least some of the short articles comprising each issue should be comprehensible to planners, whilst other articles would be more relevant to professional scientists or technologists. It was also accepted that some review mechanisms would need to be established; each article would be supplemented, if possible, by references to easily accessible journals; in any case, each article would be signed by the author whose address would be stated and who would be expected to respond appropriately to correspondents. Detailed plans to the newsletter would be reviewed in the Standing Committee of ACHR after the first issue had been finalized.

50. ACHR accepted that the Task Force should focus particularly on two priority areas, indicators and methodology, when following up research recommendations from the final report of the Subcommittee on Health and the Economy.

SUBCOMMITTEE ON RESEARCH CAPABILITY STRENGTHENING (Agenda item 10) (see Appendix 5)

51. The Subcommittee carried out three tasks:

(a) Survey of certain research institutes

52. This survey was carried out on behalf of PAHO regional research centres and national institutions in India, Indonesia, Malaysia, Pakistan and Thailand. The relevant data are included in the information documents. The following essential features were retained:

- Political commitment to health research is essential. It was the basis of the successful network of research centres in Indonesia.

- Strengthening of research capabilities should go hand in hand with strengthening of the necessary infrastructure in order to create an environment conducive to research.

- Such favourable conditions must include appropriate remuneration to young research workers and a stimulating career structure. A critical mass of professionals and technicians is required to ensure the continued success of an institution.

- Strong leadership combined with good scientific and managerial abilities is a major determinant of success. The success or failure of many PAHO centres has been directly related to the quality of leadership.

- High quality research needs sustained financial support. Successful institutions such as Mahidol University, the Institute of Medical Research, Malaysia, and others, have diversified resources. Conversely, quality of research is a prerequisite for support from national, international and bilateral sources.

- The more multidisciplinary the research institution is, the more likely it is to be sustained. Biomedical research should not be separated from health systems research. The capacity for biomedical, socio-behavioural and economic health research is central to the strengthening of health systems research.

- Health systems research, much as it is needed in developing countries, is more difficult to sustain than biomedical research. Biomedical research is more vertical with clear cut objectives and methodology, while health systems research is horizontal, cutting across many disciplines. Support for health systems research is not only necessary, it is cost effective.

- Health systems research is more successful when the institute concerned is associated with the Ministry of Health. Examples are the National Institute for Health Research and Development in Indonesia and the National Institute for Family Health in India. Close links with the community, and universities are also essential, so that priority can be given to areas of research according to need and in order to facilitate application of research results.

(b) Support to training and research

53. Limited financial support was provided to two small projects in the Eastern Mediterranean Region and the South-East Asia Region. Both regional offices also contributed to the projects. The first project was carried out in Mahidol University where small research grants were offered to primary health care personnel. Professor Natth undertook to brief ACHR about progress.

54. The other project was carried out by the Institute of Health at Alexandria, Egypt, where special courses in health systems research were convened between Ministry of Health personnel and staff of the Institute for decision-makers, middle-level managers and health personnel. The project is continuing.

(c) Ibadan University/research capabilities

55. Professor Osuntokun reported on his proposal to strengthen the research capabilities of certain departments of Ibadan University, which is at present being considered for funding by a foundation.

56. The Subcommittee is planning to pursue surveys of research centres, particularly in Africa, and central and eastern Europe, in response to concern raised at the WHO Executive Board and at the World Health

Assembly. The Subcommittee will also continue to seek funds to support the research capabilities of certain institutes.

Discussion

57. The efforts made by WHO and other agencies to strengthen research capabilities have been without sustained success in many developing countries. This has led to wastage of valuable resources. Among the many reasons the following four factors are frequently observed:

(a) lack of a comprehensive country plan for capability strengthening (for example, is it the responsibility of WHO or the government?);

(b) inadequate training, and insufficient or unsuitable learning materials;

(c) lack of career structure and of appropriate incentives for research workers;

(d) inadequate support systems such as libraries, data bases and other services.

58. The subcommittee has examined and analysed some **successful** cases of institution-strengthening and identified the factors which led to this success.

59. It is suggested that in the pursuit of its work, the subcommittee should examine cases of failure or partial success of efforts at capability strengthening and identify causes.

REPORT OF THE ACHR SUBCOMMITTEE ON HEALTH AND THE ECONOMY (Agenda item 11)

60. The final report of the Subcommittee on Health and the Economy was introduced by its Chairman, Professor B. McA Sayers, who drew attention to the Interim Report to ACHR on its session in October 1990 (agenda item 5.3). Annexed to this report was a summary of a subsequent discussion of the research recommendations by the Task Force on Science and Technology.

61. Preliminary consideration of the range of topics to be considered, particularly the importance of multisectoral actions for health, had led to recognition of a number of methodological barriers to progress and needing to be explored in detail. Accordingly, two subgroups had been formed, to focus respectively on health economics and on methodological issues; their conclusions had been combined into a single set of recommendations.

62. The interaction of the health sector with other sectors of the economy was seen as a topic of prime concern. However, study and modelling of the interaction are inhibited by severe methodological deficiencies. Many of the important variables cannot be measured directly and must be assessed by indicators - but many indicators of health-related variables are unsatisfactory. New indicators, and a methodology for their simplification and validation are needed. Furthermore, much of the information about relationships affecting health and other sectorial variables cannot be expressed in quantitative terms: it exists, actually or potentially, only in the form of "knowledge": textual statements expressing observations or beliefs, particularly those of expert observers. Methods for representing and manipulating such knowledge are needed, and these methods must allow formal analysis of the knowledge, first of its self-consistency and second, of the completeness with which it describes a given segment of the system under study.

63. The Subcommittee emphasized the importance of behavioural matters. It is therefore vital to understand how to describe and assess behaviour and how to represent behavioural information in a formal way, in order to allow systematic analysis. Research on the role of behavioural factors in health, taking account of ethical issues, is necessary and may provide the means for influencing behaviour for health-promotion purposes.

64. The Chairman pointed out that behaviour in the health context also concerned behaviour of individuals and groups as personnel within organizations. For instance, if certain technology is introduced into a health system, will health service personnel actually use it? What social and cultural factors operate? How is it possible to create a climate of acceptable organizational "behaviour" amongst personnel? Once the appropriate methodology has been developed, such questions can become the subject of research.

65. In the general area of health economics, the Subcommittee took particular note of difficulties in the management and health effects of structural adjustment policies. It proposed research on meso- and micro-economic factors, including, in particular, the problem of targeting health services to households and groups at special risk.

66. Accordingly, the Subcommittee recommended a number of areas of research that included behavioural issues in the health context, new indicators (including the design of "knowledge based" indicators) and methods for their validation, modelling of multisectoral interactions involving health, and a number of health economics issues linked to the consequences of national economic policies - especially restructuring - or concerned with problems of resource allocation and monitoring in the health care system.

67. The Subcommittee also drew attention to the need for research on these topics to be promoted as quickly as possible, and made recommendations to the ACHR concerning its possible role in this process.

Discussion

68. ACHR received the report warmly. In the ensuing discussion many members agreed on the importance of individual and collective behaviour and expressed particular support for research into behavioural factors in the context of health. It was recognized that, although much social research on behaviour had been carried out, the development of methods for formal analysis of behavioural data was still vitally important. A compilation of the actual achievements of social science in understanding behaviour might be a starting point for research, even though the proposed new methodologies were based on computational logic rather than social science. Professor Manciaux emphasized that the behavioural studies should extend to professionals engaged in the provision of health services.

69. Professor Hasan, referring to the reasons for health systems failure in developing countries, particularly in relation to the use of technology, pointed out that the major causes of failure were frequently man-made rather than due to the lack of technology. Missing or defective equipment, lack of personnel, inadequate training or insufficient supervision were often the major reasons for failure of technology in health systems. Research into the consequence of such factors, either individual or collective, should allow greater understanding of optimum resource allocation to minimize these consequences: a "behavioural" model of the use of technology in health may be useful. Dr Bankowski pointed out that human values were associated with technology, and that this should be taken into account in studying behaviour that is secondary to the socioeconomic and political environment.

70. ACHR unanimously endorsed the recommendations in the report.

GLOBAL HEALTH RESEARCH STRATEGY: UPDATE AND RELEVANCE TO WHO'S HEALTH PARADIGM (Agenda item 12) (see Appendix 6)

71. Introducing document ACHR31/92.14 the Secretary recalled the circumstances in which the original strategy document (the so-called "McKeown report") has been written and approved by ACHR. The main elements of that report were summarized, its impact on and translation in regional programmes were evoked and the need for updating was emphasized. Not only had the original authors advised periodic updating, but the World Health Assembly had requested it in resolution WHA43.19. In addition, the critical comments arising from various sources had to be taken into account. Specifically, the "disease-oriented" approach to medical research should perhaps be counter-balanced by a more positive analysis of the components of health. Relevant issues would be the socio-political and economic environment, its impact on health and human development, global problems influencing future health, science and technology policies and infrastructural capacities.

72. Dr K. Leppo stressed that key actors in health research were the Organization, Member States and the scientific community; the effort was global and long term; research capability strengthening was an essential issue and, in accordance with the WHO Secretariat's views, there was a need to develop weak areas of great potential, while maintaining strength where it existed; WHO's paradigm for health identified key issues and emerging trends which underlined the "intelligence" role which the Organization should play; the updated strategy should emphasize implementation and incorporate an action programme; the financial constraints should be overcome by making better use of the strengths of WHO, thus turning the obstacles into

opportunities; and that WHO's strength lay in its influence in the intellectual and moral domains, through expertise and shared values (constitution, adopted policies and strategies).

73. Professor B. O. Osuntokun emphasized the mandate for the strategy given by the World Health Assembly and drew particular attention to the need for acknowledging multisectoral determinants of health. While considering the McKeown report still valid, he saw the strategy as a dynamic process which could advantageously incorporate the contributions of ACHR's task forces. The criteria outlined by ACHR in 1976 for WHO's involvement in research were also valid; whereas present-day concerns, such as the large numbers of people living in transitional conditions and the special problems of vulnerable and marginalized groups, pointed to the need to prevent diseases affecting large populations (e.g. tropical diseases, HIV).

74. He supported the views on forecasting outlined in the above-mentioned document, and considered that whereas the economy drove health, it was also true that health drove the economy, and recommended that the strategy ought to define some generally achievable objectives (such as, in the McKeown report, a level of health for the South, by the year 2000, equivalent to that in the North 40 years ago).

75. Professor B. McA. Sayers said that the hope of the writers of the paper under consideration was that it would stimulate ideas. The final paper would: state and amplify the important background issues from which the conclusions would be drawn; suggest a general framework for the background issues; deduce the major research issues in a systematic way; devise an explicit strategy. A selective commentary drew particular attention to the basis of the conceptual framework for strategy formulation, emphasized the scope of economic influences on health matters, and explained the need and basis for a science and technology policy which recognized the broad range of needs for information in health research and the essential role of information technology.

Discussion

76. The Chairman pointed out that ethics as well as international collaboration should be further emphasized in the update document.

77. Other comments included the following:

(a) Strategies had to emanate from policies, which were themselves defined by the WHO governing bodies, the Health Assembly and the Executive Board; the role of ACHR was to advise the Director-General on how to translate the policy into strategic planning for health research.

(b) The dictum "The pen is mightier than the sword" was used to illustrate the need to mobilize the scientific community; science should not be guided by politics, but should assist policy-makers by providing objective knowledge: a new geographic taxonomy of development problems ought to be worked out by the task force.

(c) The strategy update should be enlarged to take into account human vulnerability to new pandemics. A background document, written by Professor J. Lederberg and circulated to the Committee, should be used for the update (Annex 2).

(d) Although there was general agreement that the McKeown report remained the cornerstone of WHO's research strategy, and that new dimensions should be added to give proper emphasis to infrastructural, economic, environmental and socio-behavioural aspects, concerns were expressed. Some members felt that the PHC approach, empowerment of people, the role of health services, and subjective rating of health status ought to be given greater prominence.

On the other hand, one member argued that the 1986 document was a remarkable one, and that its implementation should be monitored and documented, so as to identify new priorities and areas in need of strengthening and expansion.

(e) A case was made for the "correction of imbalance", not only to ensure equity, but also to establish a balance between primary, secondary and tertiary care, especially in view of the economic and technological problems created by the epidemiologic transition. Furthermore, enlightened anticipation of

problems for the next two decades should result in an action plan for "primordial restructuring". North and South should share responsibility for research activities related to these issues.

RESEARCH AND TRAINING IN TROPICAL DISEASES (Agenda item 13.1)

78. The UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases (TDR) was established with two related objectives which still apply. The first was to provide the research and development needed to obtain new and improved tools for the control of six major tropical diseases. The second was to strengthen the capacity in endemic countries to undertake such research.

79. The Social and Economic Research component (SER) was established in recognition that it is pointless to have efficacious tools if they are not used, or not used effectively. Community effectiveness (influenced by community and provider acceptance and communications strategies) as well as sustainability (influenced by affordability and cost-effectiveness) must also be considered.

80. The research sponsored by SER is guided by three principles:

- it must be applied research, directly linked to reducing the burden imposed by these diseases;
- it requires the active collaboration of social scientists and disease control experts within and outside WHO;
- it is multidisciplinary in nature.

81. Practical examples were used to illustrate the extent of this work. They are loosely grouped into research aimed at: strengthening the activities of official control programmes; providing options which can supplement official control; providing options while awaiting the introduction of official control.

82. An example of the first type was given. It concerns the effectiveness, cost and acceptability of insecticide paints and fumigant canisters compared to traditional house spraying as a means of controlling the vector responsible for transmitting Chagas' disease. This research is being conducted in five Latin American countries using a common protocol developed jointly by SER, the Chagas' Disease Steering Committee in TDR, Chagas' control experts in WHO and in the field, and field researchers. The research is being undertaken side by side with official control activities.

83. The options involved combinations of activities inside and outside houses. Early results suggest that the combination of paint/paint is more effective than traditional spraying. Projections suggest that paints could cost less than half as much as spraying, and the hypothesis is that they will be more acceptable to households. On the other hand, there have been sporadic reports that paints may be unpopular because they destroy operators' uniforms. This demonstrates the importance of provider attitudes. Such research provides a way to strengthen official control activities.

84. Other experiments have shown that rebuilding has been undertaken for many years as a means of Chagas' vector control; involving communities in the design of the house renovations, and providing them with small loans, is a feasible supplement to intervention by the control programme.

85. In the absence of a control programme, research may be directed at: ways to reduce the costs of control in the hope of encouraging its implementation; community-based control activities; persuading governments and donors that control is worthwhile. TDR has been involved in all three areas.

86. Schistosomiasis is not controlled in much of Africa partly because of the costs of identifying and treating communities affected. Social and economic research has been carried out in seven countries on the use of the school system to identify high-prevalence communities for treatment for *S. haematobium*. This study shows that a questionnaire delivered to schoolteachers, concerning the proportion of children with observable blood in their urine, is a very specific means of identifying communities (not individuals) for treatment. It is also significantly less costly than alternatives, and is well accepted by teachers and pupils. It may encourage control activities by reducing costs at no loss in effectiveness.

87. Research may also identify innovative financing mechanisms. TDR has sponsored two income-generating activities as part of disease control: making and selling mosquito nets in Papua New Guinea; and community weeding of ponds in which the vector of brugian filariases breeds in Kerala, South India (the ponds are then restocked with fish). Research on African trypanosomiasis, sponsored by the trypanosomiasis steering committee in TDR has shown that people are willing to spend the money and time to construct traps for the tsetse fly and to maintain them. With all these projects, long-term compliance could be difficult to achieve, however, and a group within TDR is currently developing a communication programme to deal with this problem.

88. None of these examples involve social scientists alone. They involve a combination of disciplines and skills aimed at solving a problem: the unacceptable burden of disease. Social science is part of applied field research. It is important in the identification of research priorities and for testing new and improved tools, as part of a coordinated problem-solving approach.

Comments on research and training in tropical diseases

89. The areas of concern highlighted in agenda item 13.1 evoked the following comments:

- Several WHO programmes could learn from TDR's practical approach.
- The role of children in an effective implementation of TDR activities should be clarified.
- What is the relation between literacy and success?
- It was thought there was too much focus on drug development.
- There is a need for teaching material on case studies that are both multisectoral and multidisciplinary in approach.

RESEARCH, DEVELOPMENT AND RESEARCH TRAINING IN HUMAN REPRODUCTION (Agenda item 13.2)

90. The Committee reviewed the report of the Special Programme of Research, Development and Research Training in Human Reproduction on exercises being organized by a few countries, with the support of the Programme, aimed at identifying needs for research in reproduction health.

91. The overall objective of each of these exercises was to bring together policy-makers, scientists and the community to jointly identify reproductive health problems and to deduce the areas requiring research. The specific objectives were: to assess the reproductive health situation based on existing data; define reproductive health problems of the country or part of the country; determine what research needs to be done; assess existing resources for research and deduce the requirements for research capability strengthening; establish or strengthen mechanisms for continuous identification and setting of research priorities at country level; and establish or strengthen strategies for carrying out the research.

92. The information required to define needs included political, social and economic factors, national health system and health status, national health research system and capacity, sources of funding and reproductive health problems. Examples of the latter were fertility, maternal and perinatal morbidity and mortality, breast-feeding, contraceptive prevalence, sexually transmitted diseases, cancer of the breast and reproductive tract, abortion, common obstetric problems, and other aspects of the health of women.

93. Several aspects of the process of needs assessment were described. The first aspect included national health authorities, and institutions, research bodies, and representatives of the community. A strategy for implementing the research was also developed.

94. Subsequent action included the preparation of research projects, raising of funds for the research and implementation. Continual reassessment of needs and strategies was part of the process.

95. By 1991 seven countries had undertaken such exercises: Cameroon, Chile, Egypt, Myanmar, Nepal, Sri Lanka and Uganda. In addition, sub-regional assessments had been carried out in French-speaking Africa, in East Africa and in Latin America; two more were planned, in the Caribbean and the Eastern Mediterranean Region.

96. Immediate positive results included the strengthening of contacts between policy-makers, scientists and the community; the setting of priorities for research of national relevance; and strong support for health systems research. The long-term outcome was expected to focus on the results of research, their dissemination and their utilization.

97. Members asked whether the communities always recognized a need for setting research priorities and whether their priorities differed from those of scientists. It was explained that the communities were always consulted, and that they had so far agreed with the need for priority setting. However, the priorities of the representatives of the community did not always accord with those of the scientists and serious discussion at the workshops led to either agreement on priorities or an appreciation by each group of why the other group considered certain issues as of priority importance.

98. Committee members asked why maternal morbidity and mortality in developing countries was not a priority for research sponsored by the Special Programme. Two reasons were given. First, the Programme in its early stages had emphasized family planning research in response to the perceived world population problems. Secondly, in 1987 the World Bank had initiated a programme on safe motherhood which addressed research in this area.

99. As to whether priorities for research were influenced by global population dynamics, it was agreed that priorities differed from country to country and reflected demographic concerns.

Comments on the report of the Special Programme of Research, Development and Research Training in Human Reproduction

100. The following questions and observations were made, after review of the report:

- What focus is put on maternal morbidity and mortality?
- What has been the influence of communities on the development of activities?
- How is priority setting made?
- From a global perspective, this programme is of extreme importance. It should become a priority and be brought to the attention of authorities at national level and at the World Health Assembly.

GLOBAL PROGRAMME ON AIDS (Agenda item 13.3)

101. The dimensions of the AIDS pandemic pose a unique challenge to health authorities worldwide. Thus far, 1.5 million adults have developed AIDS, an estimated 9-11 million more are now harbouring the human immunodeficiency virus (HIV), and one million infants have been infected. The disease is spreading very rapidly in many regions of the world, particularly sub-Saharan Africa, South and South-East Asia, and Latin America and the Caribbean. The Global Programme on AIDS (GPA) estimated an additional 20-30 million infections will occur during the 1990s, bringing the cumulative total by the year 2000 to 30-40 million men, women and children infected with HIV. In severely affected countries, the AIDS epidemic will have enormously disruptive demographic, social and economic consequences.

102. Drugs are urgently needed to treat the increasing numbers of people who develop AIDS, and vaccines to halt the expansion of the pandemic. In addition to the scientific challenge of developing these drugs and vaccines, there is the challenge of making them available and affordable to all people in need.

103. Three mechanisms have been introduced in the Office of Research of GPA designed to promote research on HIV/AIDS drugs and vaccines in developing countries: the WHO Network for HIV Isolation and

Characterization; the preparation of vaccine evaluation sites through the Vaccine Development unit (VAD); and the preparation of field sites for drug efficacy studies through the Clinical Research and Drug Development unit (CRD). Each of these activities is guided by a steering committee.

104. HIV vaccines presently being developed in industrialized countries are based on well-characterized (prototype) HIV strains. But HIV has been shown to vary antigenically from region to region, and these vaccines may not be appropriate for use in developing countries where the antigenic structure of HIV strains may be different. In addition to geographic variation, temporal variation of strains occurs within HIV-infected persons and within regions. Systematic isolation and characterization of HIV from industrialized and developing countries, at regular intervals through the WHO Network for HIV Isolation and Characterization, will ensure that representative virus strains are available for vaccine development.

105. There is broad international consensus that Phase I/II safety and immunogenicity trials of AIDS vaccines should be conducted initially in the countries where the vaccines are developed and then be repeated in developing countries. One important reason for repeating these trials is that side effects and immune response in developing countries may differ from those in industrialized countries due to factors such as nutritional status or presence of different endemic diseases. Larger-scale Phase III efficacy trials will need to be conducted in populations with a high incidence of HIV infection in both developed and developing countries. WHO is ensuring that sites in developing countries are prepared for these vaccine evaluations so that developing countries may fully participate in and benefit from the global effort of HIV vaccine development. Site monitoring is conducted by the staff and Steering Committee of the Vaccine Development unit and its independent Data Safety and Management Board for vaccine trials.

106. The Steering Committee on Vaccine Development initially recommended four countries - Brazil, Rwanda, Thailand and Uganda - as WHO-supported sites for HIV vaccine trials. National authorities and scientists in each of these countries are developing plans for strengthening field sites and undertaking HIV-vaccine related research which will provide an environment in which national and international investigators, approved by all parties, may work towards the common goal of HIV vaccine development.

107. The following are priority areas for HIV/AIDS drug research in developing countries:

- prevention of perinatal transmission of HIV;
- prevention of sexual transmission of HIV; and
- prophylaxis and treatment of common and important secondary HIV-related symptoms and diseases such as tuberculosis, candidiasis, pruritus, and diarrhoea, in paediatric and adult populations.

108. The Clinical Research and Drug Development unit is in the process of selecting developing country sites that may have, or may be brought to, the required level of competence for the evaluation of HIV/AIDS therapies. Certain sites will be strengthened to function as regional centres of reference and training, and geographic representativeness will be ensured by selecting sites in Africa, Asia, Latin America and the Caribbean.

109. Once a site has been selected, a plan will be developed for the strengthening of the existing infrastructure to meet clinical and laboratory standards required for clinical trials so that the data is of the quality required for licensing purposes.

110. Formal and informal collaboration between the Global Programme on AIDS and the pharmaceutical industry provides a constructive and productive mechanism for information exchange about such topics as current and projected needs in developing countries for drugs for HIV infection and HIV-related diseases; potential HIV vaccination strategies and vaccine needs; potential mechanisms to ensure developing country access to safe and effective drugs for HIV/AIDS; international harmonization of drug regulatory criteria; and patent and liability issues in collaborative development of drugs and vaccines. The open and frank dialogue has lead to an increased understanding of issues of concern to both WHO and industry - issues which must be resolved in order to progress towards the common goal of ensuring global availability of drugs and vaccines for HIV/AIDS - and has resulted in many concrete proposals for action.

Comments on the Global Programme on AIDS

111. The following questions and comments were made on agenda item 13.3:

- What sort of behavioural research is accorded priority?
- How accessible are drugs in developing countries?
- Is GPA collaborating with others in order to get extrabudgetary funding? If so, how?
- What sort of agreements have been worked out with the pharmaceutical industry? Are there any ethical issues to be discussed?
- There is a severe need for a cost-effective test-kit for the Third World in order to help combat the spread of the virus.
- What is the proportion of social and behavioural research in relation to biomedical?
- Are country data, e.g. from Eastern Europe, reliable?

EPIDEMIOLOGICAL SURVEILLANCE AND HEALTH SITUATION AND TREND ASSESSMENT (Agenda item 13.4)

112. The subject of futures research for health development, its current status and its potential was presented by Dr H. R. Hapsara, Director of the Division of Epidemiological Surveillance and Health Situation and Trend Assessment (HST).

113. The essence of futures research is not merely predicting the future, but the attempt to conceptualize a future which is desirable, as a means of guiding present action.

114. WHO has been involved in various futures research activities for more than two decades; a first consultation on health projections was convened in 1971. In the 1980s, a study was carried out in the European Region on the projections of the health status, health resources and of the use of health services.

115. The second evaluation of the implementation of the Health for all strategy (carried out in 1992) devotes a whole chapter to the outlook for the future. This chapter draws on the analysis of national implementation experience, identifies important trends taking place in health, and postulates how future trends may develop. It makes qualitative and quantitative statements about the future, identifies important strategy issues and five challenges for the future.

116. The relatively little use of futures research in developing countries is a most important challenge. Lack of awareness of and skills in using these techniques is one major cause of this situation. Decision-makers, health planners and persons responsible for developing strategies do not seem to be actively involved in studying future health. Another possible cause is that health status is often narrowly perceived as related to medical problems.

117. It is suggested that the role of futures research for health development be further promoted as a tool of policy-making and planning. Futures research should be based on a new paradigm, that is a framework for new public health actions. People themselves should be considered as actors in identifying and deciding on their future.

118. At present, several techniques are available for futures research in health development. The selection of a particular technique should be based on the knowledge of the phenomenon studied and on a thorough understanding of the advantages and limitations of the technique. Several techniques were mentioned: trend extrapolation, time series analysis, regression analysis, questionnaires, interviews, the Delphi method, simulation modelling, and scenario analysis.

119. WHO could cooperate with developing countries by: providing information about methods in health futures research used by other countries; providing financial support through contractual services agreements to the institutions carrying out health futures research; providing special fellowships for research workers, planners or policy analysts; and organizing postgraduate training.

120. Futures research for health development is now an expanding scientific activity and a potential tool for health policy-makers and managers. WHO therefore should intensify efforts to promote and coordinate national activities, by direct support and by exchange of experience through the identification of regional centres of excellence and strengthening global networks for futures research for health development.

121. The Division of Epidemiological Surveillance and Health Situation and Trend Assessment could play a catalytic role in promoting futures research for health development. A new unit was created in 1990 especially for the purpose of developing and strengthening the methodology for monitoring, evaluation and assessment of future trends (MEP). The Division is implementing activities which will enable WHO to have a more meaningful role in futures research for health development.

122. One of the major activities in this area is a consultation on health futures, scheduled for June 1993, with the following main objectives: to review and share major health futures studies, their findings and the methods used; to assess the usefulness and impact of these studies, and the appropriateness of the study methods for broad dissemination and use in support of new public health action; and to generate ideas on how to foster practical, useful health futures studies and research, especially in developing countries. Also, the MEP unit has created a network of researchers and decision-makers who are actively involved in monitoring, evaluation and future studies. The Network currently contains some 250 persons from 50 countries of the world. All this potential can be tapped to coordinate international efforts, create mechanisms for exchange of ideas and experience, and actively promote futures studies useful for health managers and decision-makers.

123. The discussion showed the interest of ACHR in the possibility of futures research for health development. Several salient points were emphasized, including: the necessity to integrate these activities into the total WHO programme; the role of community participation and health as an integral part of socioeconomic development; the importance of basic research together with public health research; methods and approaches to be used; and the potential value of futures research to predicting the epidemiological situation or the value of behavioural research. ACHR is expected to give advice and pragmatic and positive guidance to the Director-General of WHO on the direction of these activities.

Comments on the report on epidemiological surveillance

124. The following questions and comments were raised by participants in response to agenda item 13.4.

- What is the linkage to the "new public health"?
- Forecasting should also include medium- and long-term predictions.
- Available methods are often too crude. How are happiness, equity and satisfaction monitored?
- How are community involvement and young people's aspirations monitored?
- Which professions may contribute to future research?
- How are WHO's epidemiology surveillance activities linked to the other WHO programmes?
- Social and behavioural sciences should be more closely associated with the construction of epidemiological indicators.

RESOURCES FOR SUPPORTING RESEARCH INFRASTRUCTURES (Agenda item 14) (see Appendix 7)

125. The subject was introduced by Dr A. Kessler; he quoted Lord Rutherford, who, when speaking of research in physics, said: "We have not the money, so we have got to think". Perhaps concerning health research, and in so far as this Committee and, more broadly, WHO are concerned, the statement should be

turned around: "We have done a great deal of thinking but we have not anything like the money we need to implement all the ideas generated". The Committee was presented with some ideas on how funds could be generated for both research and research capability strengthening, which are taken together in terms of funding. Indeed, the two should be considered together. Too often in the past expensive research facilities have been set up, but have withered away because inadequate provision was made for funding research and the necessary technical support.

126. It was stated that WHO has had a good record over the past 20 years for fund-raising for research and research capability strengthening oriented to the needs of the developing countries. The rise in funding during this period from US$ 5 million a year to over US$ 100 million a year can largely be ascribed to the recognition that the problems identified were accorded high priority and that WHO had the expertise and infrastructure to ensure high quality and well managed research information systems.

127. Some examples were given of different ways in which funds had been or might be raised further to implement some of the recommendations of ACHR. These mechanisms include:

- increasing allocation from the regular budget;
- intensifying efforts to ensure WHO acts as an executing agency for programmes and projects funded by other agencies;
- generating projects in which WHO acts as facilitator and technical partner in bilateral aid programmes;
- exploring further opportunities for collaborating with nongovernmental philanthropic organizations;
- extending the WHO special programme mechanisms to other research and research capability strengthening;
- modifying the special programme mechanism to a more regional-office-oriented base. This mechanism is called an "Intensified Programme" to distinguish it from the special programme mechanism;
- approaching the pharmaceutical industry and other industries for increased contributions.

128. Dr Kessler made the following observations on the fund-raising mechanisms mentioned above.

Regular budget funding: this is the surest form of financing. Once a project is included in the budget, it is likely to be carried through for a number of years, and represents a genuine commitment to a particular field of activity. On the other hand, it usually takes a number of years to get a project into the regular budget and there is intense competition among different proposed activities.

The executing agency mechanisms: whereby WHO is asked, on the basis of its technical competence, to develop, in conjunction with a Member State and an international agency such as the World Bank, a detailed plan of action for a given research and research capability strengthening activity over a number of years. Once the plan is approved, the main responsibility will lie with the Member State and with WHO. Again, this is a reliable method of financing.

WHO as a partner in a government bilateral aid programme: this is a similar mechanism to that of executing agency except that the source of funds is governmental rather than international.

Collaboration with philanthropic organizations: some philanthropic organizations might simply be sources of funds, others, like the Regional Fund can be expected to make valuable technical as well as financial contributions to a project.

The special programme mechanism for research and research capability strengthening: this brings together all the previously mentioned sources of funds into a single mechanism, whereby regular budget, international organizations, government aid programmes, private foundations, all contribute to a large and complex research and institution strengthening programme.

The intensified programme mechanism: Dr Kessler suggested that a new health systems research programme should be funded by a modification of the special programme mechanism anchored in the regional offices rather than in headquarters.

Contributions from industry: this represents a largely unexplored yet considerable potential source of funds for research and research capability strengthening as long as the research in question is not related to the development of further drugs, devices or other products.

129. Two further suggestions were made for facilitating fund raising. The first recommends giving a higher profile to health research in science policy units. To achieve this a small investment in building up nuclei of health research oriented individuals within existing science policy units would be helpful. The second suggestion advocates better data and better analysis of funding and activity in health research and research capability strengthening. For instance estimates of expenditures on all health research and development conducted in developing countries in the mid 1980s vary by a factor of 2: from US$ 685 million to US$ 1.43 billion. Accurate documentation is required on an ongoing basis. When analysing funding figures, several points should be borne in mind.

130. It is a mistake to equate activity and funding. Different types of research involve different costs. Health systems research can be conducted much more cheaply than, say drug development. Furthermore, costs vary among countries: US$ 1 million spent in a developing country may be the equivalent of US$ 20 million spent in a developed country. Costs also vary over time owing to inflation and changing currency values. It is essential to compare like with like by using constant units of currency with a given year taken as a basis. Naive analyses, such as those which imply that virtually none of the research carried out in developed countries is of benefit to the less developed countries, should be avoided. Not only is fundamental research likely to benefit equally developed and developing countries, the rapidly increasing incidence of post-transitional diseases such as cancer and cardiovascular diseases in the least developed countries means that research carried out in developed countries on these diseases is likely to be of substantial benefit to developing countries as well.

131. The task of obtaining reliable information and interpreting it in a balanced and judicious manner is not an easy one; few bodies would seem to be better suited to it than WHO headquarters and regional ACHRs and the Office of Research Promotion and Development.

Comments on resources for supporting research infrastructures

132. It was suggested that the best way to draw increasing funds to health research and research capability strengthening was for both WHO and governments to give these activities greater visibility and greater commitment, for example: for WHO by allocating larger amounts of the regular budget to health research and research capability strengthening; various percentages earmarked for health research and research capability strengthening were suggested for country projects, for regional office funds, and for headquarters funds; for governments, by giving greater prominence in their national health plans to health research and research capability strengthening, or by earmarking 5% of funds in the frequently very large bilateral aid health programmes.

133. In addition to the seven mechanisms outlined in the background document (ACHR 31/92.19), the following mechanisms were identified for research relevant to the needs of developing countries.

(a) Encouraging research initiatives in developed countries to focus on health problems of the South. A joint USA-Japan research effort with such an orientation was given as an example.

(b) Exploring the possibility of public contributions - "voluntarism" - (in forms prevalent in many countries for research in areas such as cancer or cardiovascular diseases) for health research and research capability strengthening for developing countries.

(c) Cofinancing of health research and research capability strengthening for, or in, developing countries, between WHO programmes, or national projects with WHO acting as intermediary, with the large research institutes of developed countries. This would not only bring funds to such projects but would also stimulate or reorient research in these institutes to problems of concern to developing

countries. Such cofinancing and collaborative projects would also serve to promote research capability strengthening in developing countries.

(d) Increasing contact between WHO and the European Economic Commission which has funds that could be channelled for health research and research capability strengthening for developing countries.

(e) Changing national regulations in certain developed countries to allow investigators to use a percentage of their research funds for collaborative research with scientists and institutions in developing countries.

(f) The establishment in WHO of highly modified special programmes such as that on vaccine development which bring together staff of different existing programmes but without the infrastructure, the staffing or the managerial mechanisms of the WHO special programmes.

134. Repeated pleas were expressed for the funding of research capability strengthening in developing countries. This was the only way for assuring the sustainability of health research in these countries. The value of capability strengthening in the context of ongoing research projects was illustrated from a recent WHO project in Thailand.

135. ACHR had an important responsibility in attracting funding to newly emerging areas such as those which were the concerns of some of its task forces.

136. High priority was given to health systems research by several speakers for any additional funding that might be generated by the Organization.

137. The potential of industry as a source of funding for health research and research capability strengthening in developing countries should be explored (in so far as such research is not related to the development of drugs, devices or other products).

FUTURE DIRECTIONS FOR ACHR ACTIVITIES (Agenda item 15)

138. ACHR, in line with its mandate given by the Assembly, notes the unavoidable necessity of taking account of issues that impinge on the health status and which traditionally are not the concern of the health sector; it therefore increases the scope of its concerns and recommends:

- annual meetings of the global and regional ACHRs;
- action to strengthen the ACHR secretariat;
- increased funding to support the work of task forces;
- compilation by the secretariat of information on WHO research for use by ACHR;
- a two-way exchange of views between the task forces and the regions;
- the continued investigation of WHO's advisory mechanisms in science and technology, with more detailed proposals to be scrutinized by the Standing Committee.

COLLABORATIVE RESEARCH ACTIVITIES WITH: (Agenda item 16)

(a) the Council for International Organizations of Medical Sciences

139. Dr Z. Bankowski, Secretary-General of CIOMS, referred to the document on CIOMS activities which had been distributed to committee members and said that he would focus on ethical issues in his oral presentation.

140. At the previous ACHR meeting, the results of the conference in 1990 on Genetics, Ethics and Human Values had been reported. Dr Bankowski mentioned that the proceedings of this conference had been published.

141. In late 1990, CIOMS had arranged a conference on Ethics and Epidemiology: International Guidelines. The proceedings had been published in 1991. The result of the conference was that a set of international guidelines for ethical review of epidemiological studies had been prepared.

142. In 1982, CIOMS had prepared International Guidelines for Research involving Human Subjects. As Dr Bankowski indicated, these guidelines had won worldwide acceptance. However, the developments in biomedical research during the last 10 years required some revisions and additions to these guidelines. Consequently, CIOMS had arranged a conference on the subject in February 1992. The conference and the subsequent work by CIOMS had now resulted in revised and updated guidelines. Furthermore, work was in progress on an annotated guide on ethical review.

143. In the ensuing discussion, a number of ACHR members expressed their very high appreciation of the work of Dr Bankowski and CIOMS. CIOMS had become indispensable for WHO through its work on the ethical aspects of research and health care. ACHR decided unanimously to endorse the Guidelines and propose that the Director-General make them known to all Member States.

144. Further, ACHR decided to propose that ethical issues could be a subject for forthcoming technical discussions in connection with the World Health Assembly. It was also mentioned that the ACHR Standing Committee would keep continued contacts with CIOMS on ethical issues. Finally, ACHR expressed deep concern with the present financial difficulties of CIOMS and decided to propose to the Director-General that WHO provide a core support to the CIOMS secretariat.

(b) Other groups and organizations

145. The reports of Professor Ramalingaswami and Dr Wilson were noted with appreciation. It was recommended that future cooperation with the nongovernmental organization shortly to be formed be encouraged.

REPORT ON THE POCCHIARI FOUNDATION FELLOWSHIPS (Agenda item 17)

146. The Chairman reported that the Fellowship Committee, consisting of Professor G. Vicari, Director of the Istituto Superiore di Sanità; Professor M. Gabr, Chairman, ACHR; Professor B. McA. Sayers, Professor B. O. Osuntokun and Professor A. M. Davies, members of the ACHR, met in Geneva on 31 July 1992 and considered the 42 applications that had been submitted to WHO through the Regional Offices.

147. The Committee agreed unanimously to award the 1993 Fellowships to

- Gyula Poor, Hungary, and
- William Pomat, Papua New Guinea.

Reserve candidates,[1] in order of priority, were

- M. N. Vasilescu, Romania
- E. M. Songok, Kenya, and
- E. Ekanem, Nigeria.

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[1] The Secretariat was asked to contact the reserve candidates to request from them a statement of acceptance of the host institution(s). This is to be done after presentation of the report of the Executive Board.

148. The Chairman of the ACHR will appoint the next Nominating Committee six months before it is due to meet and determine, in consultation with members, the procedure for selecting candidates according to a points system.

149. In addition, the Committee made the following decisions concerning the criteria to be used for the next selection:

- candidates should be informed that the Nominating Committee will be applying the following guidelines:
  - normal age limit 40 years;
  - five years' experience in research;
  - at least one research publication;
  - clear statement of proposed project;
  - the institution(s) to be visited should be specified and a statement of acceptance must be included;
  - other things being equal, preference will be given to candidates who have not travelled abroad for significant periods for professional purposes;
  - applications from developing countries and eastern Europe will be considered.

OTHER BUSINESS (Agenda item 18)

150. There was no other business.

REVIEW AND ADOPTION OF THE REPORT (Agenda item 19)

151. ACHR reviewed and adopted the report of its thirty-first session, subject to its finalization by the Chairman, the Rapporteur and the Secretary.

CLOSURE OF THE SESSION (Agenda item 20)

152. Dr Hu Ching-Li, in bringing the meeting to a close promised that the report of ACHR would receive the full attention of the Director-General. He thanked the members on his behalf, reminding them that their Committee was a statutory body established through a resolution of the World Health Assembly, and that its advice was also conveyed by the Director-General to the governing bodies through periodic reports and information documents.

STATEMENTS BY THE CHAIRMEN OF THE REGIONAL ACHRs

AFRICAN REGION

Introduction

1. Within the context of the regional policy known as the African Health Development Framework (AHDF),[1] research is one of the three principal interventions aimed at improving the management of the health system focused at the community and district levels. The others are monitoring and evaluation and training. Each was the topic of three technical discussions of the WHO African Regional Committee from 1990 to 1992.

2. Since 1989, reforms have been introduced by WHO's Regional Office for Africa (AFRO) aimed at revitalizing health programmes at the regional level through appropriate operational strategies. The AACHR was integrated with the Advisory Committee on African Health Development (AACHD). This emphasizes the integral role of health research in the health development cycle. Since 1990, research has been added to the AACHD agenda.

3. During the last quarter of 1990, a 5-year Research Promotion and Development (RPD) programme plan for the Region was prepared, in line with the 5-year Implementation Plan of the AHDF (1990-1994). The principal strategy is to promote the integration of research in health programmes. The priority research areas in the African Region are: (i) improving the management of the health system; (ii) rational selection, management and transfer of appropriate technology; (iii) improving the implementation of the three priority programmes (Disease Prevention and Control, Maternal and Child Health/Family Planning and Nutrition; Community Water Supply and Sanitation); (iv) improving health care financing; and (v) overcoming the social constraints of AIDS.

Review of health research activities

4. The Community Health Research Awards (CHRA) scheme was established and the first awards were made in 1991. The scheme calls for the involvement of educational institutions of higher learning in the selection of candidates (African students enrolled in African educational institutions) and technical support for the completion of their research. Two types of CHRA awards have been established: small research grants to support selected research proposals and prizes to students whose theses are adjudged to be outstanding in the field of community health.

5. A project document was prepared during the first quarter of 1991 towards the development of a Health Research Information System For Africa (HERISA). This will involve the development and testing of HERISA by linking up health research data bases which have been established separately by several programmes in the headquarters of WHO in order to make these readily available to decision-makers and health researchers in the Region such as the Special Programme for Research and Training in Tropical Diseases; the Special Programme of Research, Development and Research Training in Human Reproduction; and the Global Programme on AIDS (TDR, HRP and GPA). The project will aim to build on these data bases and eventually add data on other researches conducted at country level.

6. A country situational analysis on health research was conducted in 1992 using questionnaires sent to ministries of health, national health research institutions and educational institutions of higher learning. It looked at basic issues on health research: policy planning and coordination, resources for health research,

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[1] Monekosso, G. L. A Health Development Framework for Policy Makers. Guidelines for Policy Makers. WHO/AFRO, November 1991.

training, incentives for health researchers, selection of research topics and dissemination of research results.[1] The study concludes that the necessary infrastructure and research coordinating and implementing mechanisms are in place in some countries and are working, albeit at a minimal level. Collaboration among national research institutions and with external bodies is needed in three areas in order to develop and revitalize research for health development: (i) further reorientation and strengthening of national health policies towards health research planning, implementation and utilization of findings; (ii) strengthening of national mechanisms for health research management and training and (iii) provision of the necessary research resources. Arising from these findings and within the context of the regional health policy (AHDF) a framework for essential health research (EHR) at the three levels of the health system was proposed and deliberated on during the 13th AACHD (1992) and RC42 technical discussion on health research (see Annex 1, Tables 1, 2 and 3).

7. An institutional situational analysis of health research in the African Region was completed during the second quarter of 1992.[2] It identified the research activities in health programmes in WHO/AFRO; the strategies for research-capability strengthening including those being promoted by HRP, TDR and HSR; and reviewed WHO/AFRO's catalytic role in providing leadership and technical guidance in health research.

8. The Joint WHO/DGIS/RTI[3] project on health system research which began operations in 1987 supported by WHO headquarters and the Dutch Government (DGIS) continued its technical and financial support to the 14 countries of Subregion III. Its second phase began in 1992 with a focus on consolidation and institutionalization. It actively contributed towards the completion of the 5-volume health systems research training series supported by the International Development Research Centre. At least six countries from Subregions I and II had participated in Subregion III health systems research training to catalyse the process in their respective countries. Prime movers are being identified to facilitate the process in these Subregions.

9. Within the health programmes, externally-funded research activities continued in: maternal health and safe motherhood, the Expanded Programme on Immunization, Control of diarrhoeal diseases; and of Acute respiratory infections and the Global Programme on AIDS. Centrally-established research protocols are generally used to conduct multi-centre studies, especially those involving biochemical and clinical research. Action-oriented research on the behavioural aspects of disease management have seldom been a feature. With the increasing number of research activities on AIDS, the headquarters Global Programme on AIDS initiated in Africa an AIDS-related Research Inventory in 1988, which was repeated two years later. In 1990-1991, 1037 researches were recorded, largely in the fields of biomedical (39%) and epidemiological (33%) research. There has been an increase (from 16% to 21%) in socio-behavioural research.[4] The long neglected tuberculosis research has recently come into the limelight in view of its association with HIV infection. Thus in 1991, 11 collaborative research projects on TB and HIV/AIDS were either approved or under way, with external funding. In parasitic diseases and vector control, the countries of the Region are continuing their participation in studies and field trials on new drugs and vaccines (e.g. against hepatitis, polio and African trypanosomiasis), and the development of simple and effective vector control tools which can be used at the community level (for malaria and African trypanosomiasis). Within the last few years, there has been a growing number of experiments and studies on health care financing.

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[1] WHO/AFRO. Situation Analysis on Health Research in the African Region. RC42TD/1/INF.Doc.4, May 1992.

[2] Aleta, I. R. Health Research in the WHO African Region. Situation Analysis and Prospects for Development. WHO/AFRO, July 1992. Unpublished.

[3] WHO/Directorate-General for International Cooperation/Royal Tropical Institute, Netherlands.

[4] Sow, A., Heymann, D. L. and Bres, P. "AIDS-related research in Africa. Lessons from the inventory." Abstract submitted to the VI International Conference on AIDS in Africa. Dakar, Senegal, 16-19 December, 1991.

Research capability strengthening

10. Most activities on RCS were also financed externally. TDR and HRP continued to be active in the Region.[1] During the 1990-1991 biennium, 34% of TDR funds were allocated to research capability strengthening (RCS) and 59% to research and development activities. The joint health systems research project has utilized consultative meetings at the policy level; provision of technical assistance to the Ministry of Health focal point or unit on health research; training of nationals on research methodology; and the provision of small research grants, as a means for stimulating institutional strengthening. Focal points have been established in all the participating countries with seven countries having transformed these into health research units. A functioning advisory committee on health systems research, with health managers and researchers is well established in three countries and is starting in three others.

Research-related meetings and consultation activities

11. A Regional Consultative Workshop to promote HSR as a management tool for decision-makers was held in Ghana in December 1990. Participants came from the ministries of health, national research institutes and educational institutions of 11 countries. At least six countries of the Region conducted consultative meetings with financial support from the Task Force on Essential Health Research. In the area of continuing education and short training of health workers, several national and intercountry workshops have been held with the aim of providing health workers with the knowledge and skills to prepare and implement research proposals. These generally aimed at training health workers either in research methodology or problem solving, for immediate application of the skills. Externally funded, they generally focused on specific health or health systems-related problems and health research methodology.

12. During the period under review, workshops were conducted on health systems research involving most southern African countries, with interdisciplinary teams of district and intermediate health workers. They resulted in the drawing up of project proposals by each working group; they were problem- or programme-oriented and implemented in the country with follow-up technical support and a small grant. To date, about 50 researches have been conducted dealing with issues of management of health services, utilization of health services, risk factors for specific health problems and behavioural studies. Workshops were also conducted to prepare proposals for food and nutrition research (funded by IDRC). The headquarters Global Programme on AIDS organized workshops on epidemiological methods and surveillance, social and behavioural research, and national research priority setting in 10 different countries.

Prospects for health research in the Region

13. There is a dearth of research activities, particularly in relation to the strengthening of the health systems. There are commendable efforts towards strengthening national health research capacities, most of which are externally-funded. This confirms observations about the very limited resources allocated nationally and globally to the least developed countries, the majority of which are in this Region. There is a great need to improve the coordination on the part of countries and of funding agencies, to enable countries to make maximum use of even the small amount of resources available for health research in the Region. Given that the budgetary allocation to health research cannot be extensively increased, there is a need to strengthen and/or establish the minimum national prerequisites that would enable countries to take advantage of research as a powerful tool in improving the management of their health systems and the limited resources available. There is an urgent need to train nationals not only on research methodology, but also on research management and coordination. WHO and other similar agencies have the responsibility to facilitate and sustain these efforts. Therefore, WHO's Regional Office for Africa has proposed a framework for promoting essential health research, within the context of existing structures, institutions and other realities in its Member States.

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[1] WHO. "Strengthening research capabilities in the least developed countries." Report of a joint HRP, TDR, GPA consultation. WHO/HRP/RfR/1991. WHO Geneva: 1991.

TABLE 1. ESSENTIAL HEALTH RESEARCH AT CENTRAL LEVEL
(Strategic support)

Structures	Functions	Institutions	EHR types
Ministry of Planning, Science and Technology National Research Coordinating Authority or Council Ministry of Health - EHR Coordinating Unit. **Membership**: * Health-related sectors * Multidisciplinary * Government and NGO institutions involved in EHR * Professional associations	**Establish**: * HR policy and plans, priorities and goals * EHR information base **Organize/sustain mechanisms to**: * Coordinate EHR * Mobilize funds * Prioritize EHR needs * Screen proposals **Evaluate** applicability, disseminate results **Promote orientation and training for EHR**: * Human resources for health * Public education	Research institutions (MOH and other sectors) Universities, educational institutions Teaching hospitals Government departments NGOs Professional health and related associations	Biomedical Clinical Complex studies: * policy * planning

TABLE 2. ESSENTIAL HEALTH SYSTEMS RESEARCH AT INTERMEDIATE LEVEL (Technical support)

Structures	Functions	Institutions	EHR types
Provincial Development Committee Provincial Health Committee (PrHC) Provincial EHR Subcommittee of PrHC **Membership**: Provincial health team + * Provincial heads of priority programmes * Representatives of research institutes in the province * Health-related sectors * District Medical Officer	**Prepare** provincial and district plans **Secure** resources **Train** district health teams **Liaise** with institutions conducting research in province **Supervise and support** district EHR **Conduct** EHR **Evaluate** applicability of findings **Promote** dissemination and use of findings	**Provincial level**: * Hospitals * Public health units * Research institutes * Training institutions * NGOs involved in EHR	**HSR issues**: * Management * Epidemiological * Clinical

TABLE 3. ESSENTIAL HEALTH SYSTEMS RESEARCH AT DISTRICT LEVEL (Operational support)

Structures	Functions	Institutions	EHR types
District Development Committee District Health Committee District EHR Subcommittee - **Membership** * District Health Management Team * Heads of health centres * Other sectors	**Identify** EHR areas (problems of PHC implementation) **Secure** resources **Liaise** with institutions conducting research at district level **Conduct** and follow up simple EHR **Promote** "participatory research" **Evaluate** applicability of findings **Disseminate and use** findings	Local or district hospitals Health centres Local training and research institutions including NGOs	Simple research on operational issues: * management * epidemiological Clinical and basic research: as **collaborators** with higher levels

REGION OF THE AMERICAS

14. This report covers the most important activities carried out by PAHO/WHO in the field of health research during the period 1991-1992. The PAHO/AMRO ACHR held its XXVIII meeting in Montevideo, Uruguay, from 20 to 23 August 1991. Several important issues related to the situation of health research in the Region, particularly in the Latin American countries, and the technical cooperation activities of PAHO/WHO in this field were addressed.

Regional research activities

15. The Committee discussed the results of five studies coordinated by PAHO/WHO and funded by its Research Grants Programme on the situation of health research in Argentina, Brazil, Cuba, Mexico and Venezuela. These countries, together with Chile, are responsible for more than 90% of the scientific papers published by the Latin American region.

16. The studies analysed the characteristics of the projects under way in the years 1987 to 1989 (including profiles of the researchers and institutions related to these projects) and the scientific production measured in terms of papers published during the 1979 to 1988 period. The papers published by Chilean authors were also included in the analysis, besides those of authors of the five countries already mentioned. Although the studies do not cover the last two years, when important changes took place, there were some very interesting results. For example, it was observed in all countries that biomedical and clinical research dominated over public health research, with only 5% of the projects in this last category. Other features common to all countries in relation to the projects under way from 1987 to 1989 were: the scant expression of development research (5-6% of the projects); the lack of a multidisciplinary approach, the medical and biological sciences accounting for more than 90% of the projects; and a small participation of social sciences and engineering. This is correlated with the profession of the researchers, who were mainly physicians or biologists. The predominance of projects with only one researcher was surprising in an era of increasingly large multidisciplinary teams. There was clear evidence of increasing female participation in scientific work (in Argentina and Venezuela more than 50% of the researchers were women).

17. With regard to the publications, 77 925 papers were published in the six countries during the 1979 to 1988 period, 60% of which were produced by researchers in Brazil and Mexico. These data show that the production is relatively small and very concentrated. In 1986 a fall in the scientific production of about 25% was observed in all the countries. This is probably related to a significant decrease in science and technology expenditure which occurred throughout the Region from 1982 to 1983.

18. ACHR acknowledged the relevance of this kind of study and recommended broad dissemination of the findings among policy-makers. A publication entitled "Health Research in Latin America", which includes the country reports of the regional project already mentioned and a comparative analysis of the results observed, is in press.

19. In relation to the general aspects of PAHO technical cooperation in health research, ACHR discussed a report made by the Secretariat, about the research-related activities (RRAs) carried out by the Organization during the period 1988-1990. The report shows that 10.1% of the funds, budgetary and extrabudgetary, during this period were programmed to support research-related activities.

20. ACHR recognized the significant amount of PAHO resources allocated to support health research, and emphasized the need for the continuous assessment of research quality. With this in mind, the Committee asked for new reports on qualitative aspects of these activities, particularly those performed by the Pan American Centres. Indeed, quality of research is a consideration of critical importance. There are a variety of examples which demonstrate that first class research in the Region is possible. However, these are the exception rather than the rule, and evaluation of quality is an issue which needs to be addressed. These issues were raised in the last meeting of ACHR and it was suggested that this should be the subject of future discussions, particularly with reference to ways in which PAHO/WHO could help to promote the practice of international peer reviews for the evaluation of the quality of research efforts.

21. PAHO's Research Grants Programme (RGP), which provides financial support with resources of the regular budget for research projects in some priority areas, has approved since 1986 around 200 projects, half of them already completed, for the total amount of US$ 3.3 million. The report for the 1990-1991 biennium was analysed by ACHR. During this period 34 projects were approved for a total amount of US$ 620 817. The approval rate during this period dropped to 31% with four countries receiving around 75% of the resources. The Committee expressed concern about the low percentage of projects approved and the trend to under-utilize available funds. Nevertheless, it pointed out the need to maintain strict criteria of scientific rigour and, if possible, to increase the efforts to promote the RGP in order to obtain more and better proposals. The Committee stressed also the need for a better coordination between the RGP and other PAHO cooperation activities in research, such as research training and institution strengthening.

22. In terms of the qualitative assessment of the contribution of approved projects, ACHR analysed the results of 11 projects approved from 1987 to 1989 which are now completed. These included research in the priority area of biotechnology.

23. After the discussion of the results achieved by these projects, the Committee stated that it was very encouraging to see such significant results in a short period of time and with such limited programme resources.

Vaccine development

24. One important initiative coordinated by PAHO is the establishment of a Regional System for Vaccine Development in Latin America and the Caribbean (SIREVA). This system covers all the stages involved in the development of vaccines, from epidemiological studies to pilot production and field tests. Based on epidemiological and present state of knowledge criteria, four vaccines were initially chosen: against *S. pneumoniae*, *N. meningitidis*, *S. typhi* and dengue. Estimated costs for the first 10 years are approximately US$ 150 million, a third of which will be allocated to strengthening the scientific and technical infrastructure of the countries, and the remainder to product development and evaluation. The project feasibility study has been concluded and its outcome presented at various international meetings, where reaction has been positive. This study and the initial experience with its implementation shows that SIREVA is politically, administratively, financially and scientifically feasible.

25. During 1992 a master plan for the development of each vaccine was elaborated and will be submitted to the steering committees established for this purpose and for the supervision of the execution of the activities included in these master plans. As a first phase in the development of a vaccine against *S. pneumoniae*, an epidemiological study on the prevalence of serotypes of this bacteria in the Region is now under way at a cost of US$ 1.2 million, financed by the Canadian International Development Agency (CIDA). Field trials of vaccines against cholera based on the SIREVA approach are also in progress. By agreement reached between the Organization and the Government of Mexico, a regional centre for the coordination of SIREVA activities was established in this country. Funds provided to the Organization by the Rockefeller Foundation will partly finance the first year of operation.

Subcommittee on Biotechnology

26. During the fourth meeting of the Subcommittee on Biotechnology held in January 1992, in addition to assessing the situation of SIREVA, other important issues related to the development of biotechnology in the Region were also discussed. The Subcommittee analysed the progress report of a collaborative project for the development of a diagnostic kit for HIV, which has been carried out by four Latin American institutions with financial support from PAHO. Other items of the agenda were the perspectives and modalities of North-South collaboration in biotechnology; aspects related to biosafety in this area; the situation of the UNDP/UNESCO/UNIDO-supported Regional Programme in Biotechnology; the situation of the International Centre for Genetic Engineering and Biotechnology of UNIDO, in Trieste, and its contribution to biotechnology applied to health in the Americas, and the possibilities of participation of Latin American institutions in the Human Genome Project.

Other activities

27. Although ACHR as a whole is not yet involved in its development, the so-called "Convergence Project" should be mentioned. This is an interagency initiative, with the participation of PAHO, Latin American Economic System (SELA), UNDP and, recently incorporated, the Economic Commission for Latin America (ECLA) and UNESCO. The objective of this project is to promote technical cooperation among developing countries (TCDC) for the development of projects and programmes in the area of science and technology in health. The project started in July 1991 and, since then, several subregional and one regional meeting have been held in order to develop and negotiate collaborative projects. At the regional meeting held in Santiago, Chile, in July 1992, eight regional projects were drafted along with several subregional projects and bilateral agreements. The five agencies established a commission to follow up and support these projects, with PAHO assuming the role of technical secretariat.

28. Recognizing its limitations, the Regional ACHR is trying to adjust some and develop other strategies and lines of action to allow the Organization to face the challenges posed to those involved in the development of science and technology in the Region.

29. The aim of this brief presentation has been to present an overall view of the very dynamic situation of the Region, mainly in Latin America, in the field of health research, with special emphasis on those aspects involving the technical cooperation of PAHO and the participation of the Regional ACHR.

SOUTH-EAST ASIA REGION

Highlights of Regional ACHR activities

30. The seventeenth and eighteenth sessions of the South-East Asia Advisory Committee on Health Research (SEA/ACHR) were held in Yangon, Myanmar, from 21 to 27 April 1991 and in the Regional Office, New Delhi, from 20 to 24 April 1992 respectively.

31. At each session the Regional ACHR reviewed the progress report on regional research promotion and development activities during the preceding year, as presented by the Secretariat, and made comments and recommendations thereon, including the need for a balanced mixture of biomedical, clinical and health systems research; better utilization of the WHO collaborating centres; and greater emphasis on socio-behavioural and socioeconomic themes.

32. It also reviewed research promotion and development activities in relation to past SEA/ACHR recommendations presented by the Secretariat. These reviews were on technology assessment, development and transfer; on information support for research regarding which it recommended strengthening of perceived weakness in national linkages in the Hellis network; and on health systems research, an area in which SEA/ACHR noted considerable progress.

Regional research activities

Review of research and development activities in the Region

Health systems research

33. In accordance with the recommendations made by the various WHO bodies concerned with research policy, including the SEA/ACHR, greater emphasis is now paid to the promotion and development of health systems research (HSR) in the South-East Asia Region. This is being done through a series of interrelated strategies such as an institutional strengthening scheme; provision of technical and consultant support; support for training and direct support for research.

34. An important event was the convening of a consultative meeting in April 1991 to develop a framework and criteria for the appraisal of health systems research projects. The appraisal considered three sets of

attributes: the scientific attributes; their utility; and the contextual attributes. The framework was used as the basis for the development of the criteria.

Follow-up action on resolution WHA43.19

35. The subject of the role of health research (resolution WHA43.19) was discussed at length at the Seventh Meeting of Directors of Medical Research Councils or Analogous Bodies (MRCs) in November 1990 and by the SEA/ACHR in April 1991 and April 1992 (at the seventeenth and eighteenth sessions respectively).

36. The MRCs meeting endorsed the call for action embodied in resolution WHA43.19 and the viewpoints embodied in the preamble. The meeting recommended that health systems research is essential for every country and that provision should be made for small grants for such research of short duration. It also called upon national MRCs and analogous bodies, health and scientific institutions and health professionals and scientists in the countries to respond effectively to the challenges contained in resolution WHA43.19 and recommended that WHO cooperate with Member States in developing national plans of action in response to the call for action embodied in the resolution.

37. At the eighteenth session, SEA/ACHR reviewed the follow-up actions that had been taken in accordance with resolution WHA43.19. SEA/ACHR, therefore, recommended that in order to meet the challenges of the emerging and future health scenario in the South-East Asia Region, and in order to respond to the request addressed to the research community and WHO in resolution WHA43.19, including the updating of the WHO health research strategy, the Regional Director should convene a consultative meeting with appropriate terms of reference.

Information support for research

38. Information support for research was currently being provided by several means:

- by the technical divisions and Special Programmes in WHO/HQ and from the technical units in WHO/SEARO, including RPD;
- the Health Literature, Library and Information Services (HELLIS) Network in the countries of the South-East Asia Region.

WHO/SEARO Library prepared and circulated to all concerned an information document entitled "Information support through HELLIS and other sources".

Research training and related institution capability strengthening

Research training

39. Several visiting scientist grants and research training grants were awarded during the period 1990 to 1992. The award of fellowships and research grants also has an indirect research capability strengthening effect.

Institution capability strengthening

40. Strengthening of research capability is now specifically targeted towards institutions capable of undertaking health systems research. This is being done through a separate budgetary provision. The scheme of institutional strengthening grants has now been implemented in Bangladesh, Democratic People's Republic of Korea, Myanmar, Nepal and Thailand. The grants provide for infrastructure development (administrative, library and data processing facilities), training and direct support to research.

41. RPD/SEARO and RPD/HQ have jointly promoted and supported capability strengthening for health development research at the ASEAN Institute for Health Development (AIHD), Mahidol University at Salaya, Thailand. It is proposed to develop this centre as a prototype for replication in other countries.

Direct support of research

42. During the period from April 1990 to March 1992, some 100 new research project proposals were received, of which about 30% were funded. As at March 1992, there were 82 ongoing research projects.

43. The ongoing projects cover a wide field including cardiovascular diseases, diarrhoeal diseases, forest-related malaria, environmental health, health of the elderly, human resources for health, mental health, nursing, nutrition, primary health care, public health administration, and rehabilitation.

44. One particular project that deserves special mention is WHO/SEARO support to the Dengue Vaccine Development Programme at Mahidol University, Thailand, which started in 1980.

45. The object of this project is to develop an immunogenic, safe, live, attenuated tetravalent vaccine (against the four strains of dengue viruses - dengue 1, 2, 3 and 4) which could be used to prevent dengue haemorrhagic fever (DHF) in the target populations living in communities where dengue and DHF are endemic.

46. Bivalent, trivalent and tetravalent combinations of the four monovalent candidate vaccines have undergone Phase-I trials in adults with satisfactory results. The tetravalent vaccine tested so far in adults is immunogenic and safe but will need further testing in children.

47. Preliminary preparations are now being made to enable the commencement of the field trials of the tetravalent vaccine in Thailand in late 1993 or early 1994.

Collaborating centres

48. As of March 1992, there were 69 WHO collaborating centres in the Region, representing a wide spectrum of specialities, thereby reflecting the increasing stature of the institutions in the Region.

Research-related meetings and other consultation type activities

49. The convening of intercountry meetings, research study group meetings, national meetings, consideration of specific topics by SEA/ACHR and the MRCs and the provision of consultant support have all been effective means of promoting research on priority topics in the countries.

50. Twenty-one research-related meetings were supported during the period under review (April 1990 to March 1992), covering fields ranging from health systems research, nutrition research, development of human resources for health, forest-related malaria, nursing research, and promotion of polymerase chain reaction in diagnosis.

51. The services of 27 consultants were provided for 38 man-months during the two-year period ending March 1992. Their research activities included health of the elderly, financing of health care, malaria control, quality assurance, and hepatitis C virus infections.

EUROPEAN REGION

52. Major economic and social changes are currently taking place in both the western part of the Region and particularly in the countries of central and eastern Europe (CCEE). These new developments have also changed the order of priorities for regional health policies and for health research policies as well.

53. The European ACHR was convened from 19 to 21 February 1991 to review the new situation. Two major activities are to be considered in the near future:

(a) the research support to the implementation of the Regional Health for All by the Year 2000 (HFA 2000) strategy, and

(b) support for the development of health research policies and strengthening of health research capacities for the CCEE countries.

54. The 41st Regional Committee Meeting in 1991 adopted the revised Regional Strategy for HFA 2000 with certain modification of the 38 targets, including a new one on ethics in health (No. 38).

55. These targets can be categorized in five different groups:

- those concerning fundamental requirements for health
- healthy lifestyle
- healthy environment
- appropriate care
- support for health development

all of these targets require research support to be implemented.

56. Target No. 32 on research encourages the Member States "to formulate strategies to stimulate investigations which improve application and expansion of knowledge needed to support their HFA developments".

57. EACHR has contributed to the production of two policy guidelines for the implementation of the target:

(a) Research Policy for Health for All

(b) Priority Research for Health for All.

58. The basic philosophy in these guidelines is that target 32 should strengthen the Region's ability to make effective use of health research results, rather than to produce new research data (which will take place in hundreds of research institutions in the Region).

59. In view of the above policies the priorities for research in the five different target areas mentioned above were chosen. Particular areas of research were recommended on health policy and organizational behaviour, research on inequities and better information on health systems.

60. Special and urgent action for strengthening research capabilities in the field of health in CCEE countries has been considered by WHO's Regional Office for Europe and the EACHR. Such actions should be based on the analysis on:

- how health research can assist and guide the health policy reforms,
- what are the priorities for health research, manpower development, development of infrastructure and logistic support, and
- what role the international scientific community, research organizations and networks, including WHO and EACHR should play in that development.

61. EACHR has decided to concentrate on the following areas:

- fact-finding missions to CCEE
- workshops on national health policies
- development of public health data base and health information systems

- upgrading of WHO collaborating centres in CCEE
- guidance for CCEE researchers in the establishment of collaborative links
- provision of access to literature, journals and computer software
- supporting and organizing training for researchers.

62. A training workshop on health research administration for CCEE Member States was organized jointly by the European Medical Research Councils and WHO/EURO in Strasbourg in 1991. Courses for training in health services research are given a high priority. The EACHR has planned to organize in the near future a preparatory meeting in Tallinn, Estonia.

63. Among the most dynamic developments have been the establishment of the European Centre of Environment and Health which has units in Bilthoven, Netherlands; Rome, Italy; and Nancy, France. The Centre is collecting information on health and the environment, and carrying out research on specific aspects of environmental health, such as the epidemiology of health effects of the Chernobyl accident. The Centre is also preparing a document "Concern of Europe Tomorrow" as a background document for the Second European Conference on Environment and Health to be held in 1994.

EASTERN MEDITERRANEAN REGION

64. The 16th Session of the EM/ACHR held in April 1991 highlighted the strategy for research promotion in the region which centred around capability strengthening in health research (HR) in general and health systems research (HSR) in particular. In this respect, a consultation was held in December 1990 to prepare a 5-year work plan for health systems research in the region. This consultation also commended collaborative research on topics common to the countries and to those oriented towards the goal of Health for All by the Year 2000.

65. Participants noted that effort is being made to disseminate information on HSR through the EMR/Health Services Journal, and other specific publications.

66. The task force (TF) mechanism for situation analysis, development of national policies and strategies continues to be a useful method for motivating research. The TF visit to Yemen at the time of unification of North and South Yemen was discussed.

67. During discussion on the ethical component of research the Committee pointed out the need for national ethical committees.

68. The EM/ACHR recommended health systems research rather than general health research; cooperation between ministries of health and universities; research leading to self reliance; and the flow of continuous information and mechanisms for its analysis.

69. The Committee discussed a follow-up report on Accident Prevention and two papers, one on Research on Environment and the other on Health Economics.[1] It also reviewed the recommendations of the thirtieth ACHR. A review of research activities in the region supported by the Special Programme for Research and Training in Tropical Diseases was presented.

70. By mid-1992 there were 39 WHO collaborating centres in the Eastern Mediterranean Region, 10 of which were new.

71. The advantages and disadvantages of annual versus biennial sessions of the EM/ACHR were discussed. Committee members favoured annual meetings.

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[1] Available from the Regional Office for the Eastern Mediterranean.

WESTERN PACIFIC REGION

Highlights of Regional ACHR activities

72. The fourteenth meeting of the WPACHR was held in Manila, Philippines, in August 1992 in a joint session with the Directors of the Health Research Councils or Analogous Bodies.

73. The subcommittee on health promotion had planned four main research strategies, these being in the areas of behavioural, biomedical, socioeconomic and environmental change. Research on urban health development, with special attention to the urban poor, was recommended as the initial priority. Other priority areas for research were the building of healthy-supportive public policy, creating supportive physical and social environments, strengthening community action, developing personnel skills and reorienting the health services. Ways of funding health promotion research needed active consideration.

74. The presentation on the status of the environmental health programme dealt with the activities of its five components. The targets for each of these were stated and progress made towards reaching the targets was summarized. One lesson learnt during implementation of the programme was that the problems are complex and interrelated. Vertical implementation of one aspect only was inappropriate, since it might solve some problems, only to create others. It had to be accepted that some environmental problems would not be fully solved even with access to necessary resources. Current strategies involve the focusing of resources into a few particular areas, with due regard to the effect on other sectors.

75. A task force had visited the WHO Regional Centre for Research and Training in Tropical Diseases and Nutrition at the Institute for Medical Research, Kuala Lumpur, Malaysia, to review its work and future action plans, with particular attention to its role in collaborative research. It noted that most of the short- and medium-term goals had been reached and long-term objectives were now being actively pursued. The original objectives for the Centre remained appropriate, with the addition of the two new concerns: noncommunicable diseases and nutrition. The task force recommended that emphases in the future should include clinical epidemiology; clinical nutrition; molecular biology and biotechnology; behavioural sciences; clinical research; occupational medicine; environmental health; and noncommunicable diseases. The report by the task force confirmed the high regard in which the Regional Centre was held by the WPACHR.

76. A study was undertaken to assess the status of nursing research throughout the Region. It was concluded that there already was a critical mass of nurse researchers in the Region, with a wide range of research interests. The use of research findings outside the nursing profession was, however, low. Both funds and time were needed to encourage more research by nurses. It was recommended that all nursing curricula should include some basic training in research methodology and that advanced training should also be available to selected individuals.

77. Attention was given to the subject of research in oral health. It was noted that while clinical treatment of oral diseases would continue to be needed for the foreseeable future, emphasis on disease prevention and health promotion would be of greater long-term importance, and this should be the aim of public health dentistry and dental training. Further research was recommended in the areas of oral health epidemiology, edentulousness, dental caries, periodontal disease, oral cancer, and strengthening of human resources. Because of the great intercountry variation, the most important general need was for regular surveillance, to detect trends and plan appropriate interventions.

78. A paper presented on human resources in health research focused on how human resources might best be expanded in order to meet new demands for health research to support the priorities of WHO. It was accepted that most research was likely to be carried out on a part-time basis by staff whose main responsibility lay in other areas, particularly by primary health care health workers. The contributions of health workers to essential national health research would therefore remain indispensable but would be unreliable until such workers received some training in research methodology as part of their basic training programmes. The situation is different in industrialized countries, where research programmes are often conducted by full-time staff, who are trained in research methodology.

79. The multidisciplinary nature of health research, especially in the field of health promotion, needed to be taken into account in the training of research workers. Expertise already existed in areas which were now needed in health promotion research and experts from the political, economic, social and behavioural sciences should be co-opted for this purpose. It was not enough for research to be multidisciplinary if its component disciplines worked in isolation: a more synergistic approach was advocated. Countries should be encouraged to build up self-reliance in health research.

80. The report on the activities of the health biomedical information programme showed that a majority of Member countries have identified a focal point for the programme; focal-point representatives have since made significant contributions to policy development, implementation and assessment. Most countries now have access to international databases. China has developed a separate "China Medline" for cataloguing and disseminating literature in the Chinese language. It was pointed out that the financial problems facing most developing countries would increase rather the need for biomedical/health information, since resource allocation must be based on the best information available. This principle applied at all levels, from strategic planning and decision-making to the implementation of public health programmes and to student teaching.

81. A meeting on health research management in the South Pacific was held in Fiji in July 1991. It was attended by members of WPACHR and the directors of health research councils and analogous bodies. Subjects discussed included special problems for research in the Pacific area; the work programme of the South Pacific Commission; the functions of a national health research council; the setting of research priorities; networking and information exchange; development of human resources for research; and technology transfer relevant to Pacific countries.

82. A number of impediments to research in Pacific countries were recognized: "helicopter research" (research conducted by outsiders, without benefit to the country) posed a problem; research planners did not always ask the right questions; local interest was sometimes lacking, due to inappropriate training programmes or work overload; research results were not always implemented; and communication and dissemination of research information was often poor. Countries were encouraged to establish national research policies and to confirm a national focal point for health research.

83. Eight country reports on national research management mechanisms and activities were presented. It was noted that a national health research council was a useful mechanism. However, a formal structure of this kind might be beyond the needs of some smaller countries, which could perhaps join together to form subregional groups, with or without links to an established health research council or analogous body. The presence of academic institutions, especially medical schools, encouraged the development of good research management structures. However, the view was expressed that administrative structure should respond to a need, not create one, and that over-management of research should be avoided. The provision of information, coordination and support for research was more important than management, although an important function of the health research councils or analogous bodies was to ensure both quality and accountability in health research.

84. Health research in the Region was seen to be facing many challenges, some of which were the result of wide differences between countries in levels of socioeconomic development and rates of movement towards urbanization and industrialization. Others were presented by the geographic isolation of a number of Member countries. However, these differences offered unique opportunities for effective partnerships between developed and developing countries, provided the problem of isolation could be overcome by improved communication and information networking. "Twinning" of research institutes should be encouraged. Regional experts should be available more freely in areas of need. Greater use should be made of existing centres of excellence, including WHO collaborating centres. The administrative infrastructure for research programmes at national level should be further improved in a number of countries, since this would benefit research programmes through improved availability of relevant scientific information and better mechanisms for quality control and accountability in research and for external research collaboration.

85. Recurring themes during these general discussions were those of coordination, strategic planning and training for research. An ever-present concern was the lack of sufficient funds for health research; careful and effective use of such resources as were available was essential. Effective collaboration between countries

should allow more effective utilization of funds. The principal need was for more effective communication and networking between countries and there were already encouraging signs that this was taking place, aided by new communications technology. In some countries, research progress would be accelerated by a greater emphasis on training, including further workshops in research design and methodology and effective follow-up of trainees from such programmes. There was also a need for training of the users of health research information, in both developed and developing countries.

Regional research activities

Research training and related institution capability strengthening

86. Ten research training grants, totalling US$ 59 415, were awarded during the period 1990 to 1991.

87. National workshops on research design and methodology in health research were held in China (1990) and Fiji (1991). These were, respectively, the thirteenth and the fourteenth workshops held since 1981.

88. The manual on "Health research methodology: a guide for training in research methods" has recently been published.

89. During the period 1990 to 1991, 48 research contracts were awarded for a total of US$ 522 274.

Research-related meetings and other consultation-type activities

90. Eighteen research-related meetings and activities were held during this period.

Annex 2

Medical Science, Infectious Disease, and the Unity of Humankind

The ravaging epidemic of acquired immunodeficiency syndrome has shocked the world. It is still not comprehended widely that it is a natural, almost predictable, phenomenon. We will face similar catastrophes again, and will be ever more confounded in dealing with them, if we do not come to grips with the realities of the place of our species in nature. A large measure of humanistic progress is dedicated to the subordination of human nature to our ideals of individual perfectability and autonomy. Human intelligence, culture, and technology have left all other plant and animal species out of the competition. We also may legislate human behavior. But we have too many illusions that we can, by writ, govern the remaining vital kingdoms, the microbes, that remain our competitors of last resort for dominion of the planet. The bacteria and viruses know nothing of national sovereignties. In that natural evolutionary competition, there is no guarantee that we will find ourselves the survivor.

Some of the great successes of medical science, including the "miracle drugs," the antibiotics of the 1940s, have inculcated premature complacency on the part of the broader culture. Most people today are grossly overoptimistic with respect to the means we have available to forfend global epidemics comparable with the Black Death of the 14th century (or on a lesser scale the influenza of 1918), which took a toll of millions of lives.

Visualize human life on this planet as mirrored in the microcosm of a culture of bacteria; a laboratory test tube can hold ten billion cells, twice the human population of the globe. More than 70 years ago, Frederick William Twort and Felix d'Herelle discovered that bacteria have their own virus parasites, the bacteriophages. It is not unusual to observe a thriving bacterial population of a billion cells undergo a dramatic wipeout, a massive lysis, a sudden clearing of the broth following a spontaneous mutation that extends the host range of a single virus particle. A hundred billion virus particles will succeed the bacteria; but their own fate now is problematic, as they will have exhausted their prey (within that test tube). Perhaps there are a few bacterial survivors: mutant bacteria that now resist the mutant virus. If so, these can repopulate the test tube until perhaps a second round, a mutant-mutant virus, appears.

Such processes are not unique to the test tube. The time scale, the numerical odds, will be different. The fundamental biologic principles are the same.

Humans are more dispersed over the planetary surface than are the "bugs" in a glass tube; there are more diverse sanctuaries, and we have somewhat fewer opportunities to infect one another. The culture medium in the test tube is more hospitable to virus transmission than is the space between people (with the exceptions of sexual contact and transfusion). The ozone shield still lets through enough solar ultraviolet light to hinder aerosol transmission, and most viruses are fairly vulnerable to desiccation in dry air. The unbroken skin is an excellent barrier to infection; the mucous membranes of the respiratory tract are much less so. Our immune defenses are a wonderfully intricate legacy of our own evolutionary history. This enables machinery for producing an indefinite panoply of antibodies, some one of which is (we may hope) a specific match to the antigenic challenge of a particular invading parasite.[1] In the normal, immune-competent individual, each incipient infection is a mortal race between the penetration and proliferation of the virus within the body and the evolution and expansion of antibodies that may be specific for that infection. Previous vaccination or infection with a related virus will facilitate an early immune response. This in turn provides selective pressure on the virus populations, encouraging the emergence of antigenic variants. We see this most dramatically in the influenza pandemics, and every few years we need to disseminate fresh vaccines to cope with the current generation of the flu virus.

Many defense mechanisms, inherent in our evolved biologic capabilities, thus mitigate the pandemic viral threat. Mitigation also is built into the evolution of the virus: it is a Pyrrhic victory for a virus to eradicate its host! This may have happened historically, but then both the vanquished host and the victorious parasite will have disappeared. Even the death of the single infected individual is relatively disadvantageous, in the long run, to the virus compared with a sustained infection that leaves a carrier free to spread the virus to as many contacts as possible. From the perspective of the virus, the ideal would be a nearly symptomless infection in which the

From the Office of the President, The Rockefeller University, New York. Dr Lederberg won the Nobel prize in physiology and medicine in 1958. This article was adapted from a presentation at a conference of Nobel laureates sponsored by François Mitterand and Elie Wiesel, Paris, January 1988.

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Reprinted from JAMA The Journal of the American Medical Association
August 5, 1988, Volume 260

host is oblivious of providing shelter and nourishment for the indefinite propagation of the virus' genes.[2] Our own genome carries hundreds or thousands of such stowaways. The boundary between them and the "normal genome" is quite blurred.[4] Not much more than 1% of our DNA can be assigned specific physiological functions; most of it is assumed to be a "fossil" legacy of our prior evolutionary history, DNA that is today parasitic on the cell.[5,6] Further, we know that many viruses can acquire genetic information from their hosts, which from time to time they may transfer to new ones. Hence, intrinsic to our own ancestry and nature are not only Adam and Eve, but any number of invisible germs that have crept into our chromosomes. Some confer incidental and mutual benefit. Others of these symbiotic viruses or "plasmids" have reemerged as oncogenes, with the potential to mutate to a state that we recognize as the dysregulated cell growth of a cancer. This is a form of Darwinian evolution that momentarily enhances the fitness of a cell clone at the expense of the entire organism. Still other segments of "nonfunctional" DNA are available as reserves of genetic potential for further evolution, in a sense more constructive for the individual and the species.

At evolutionary equilibrium we would continue to share the planet with our internal and external parasites, paying some tribute, perhaps sometimes deriving from them some protection against more violent aggression. The terms of that equilibrium are unwelcome: present knowledge does not offer much hope that we can eradicate the competition. Meanwhile, our parasites and ourselves must share in the dues, payable in a currency of discomfort and precariousness of life. No theory lets us calculate the details; we can hardly be sure that such an equilibrium for earth even includes the human species even as we contrive to eliminate some of the others. Our propensity for technological sophistication harnessed to intraspecies competition adds a further dimension of hazard.

In fact, innumerable perturbations remind us that complex systems often fluctuate far from equilibrium—each individual death of an infected person is a counterexample. Our defense mechanisms do not always work. Viruses are not always as benign as they would be if each particle had the intelligence and altruism to serve the long-term advantage of the group.

Fears of new epidemics as virulent as those of the past have been mollified by the expectation that modern hygiene and medicine would contain any such outbreaks. There is, of course, much merit in those expectations. Influenza in 1918 was undoubtedly complicated by bacterial infections that now can be treated with antibiotics[7]; vaccines, if we can mobilize them in time, can help prevent the global spread of a new flu.

owever, the impact of technology is not all on the human side of the struggle. Monoculture of plants and animals has made them more exposed to devastation. The increasing density of human habitations as well as inventions such as the subway and the jet airplane that mix populations all add to the risks of spread of infection. Paradoxically, improvements in sanitation and vaccination sometimes make us the more vulnerable because they leave the larger human herd more innocent of microbial experience.

The opening of wild lands to human occupation also has exposed people to unaccustomed animal viruses, to zoonoses. Yellow fever has sustained reservoirs in jungle primates, and the same source is the probable origin of the human immunodeficieny virus in Africa. It is mystifying that yellow fever has not become endemic in India, where competent mosquitoes and susceptible people abound. We will almost certainly be having like experiences from the "opening" of the Amazon basin.

Our preoccupation with acquired immunodeficieny syndrome should not obscure the multiplicity of infectious diseases that threaten our future. It is none too soon to start a systematic watch for new viruses before they become so irrevocably lodged. The fundamental bases of virus research can hardly be given too much encouragement. Recombinant DNA, still a scare word in some quarters, is our most potent means of analyzing viruses and developing vaccines.[8] Such research should be done on a broad international scale to both share the progress made in advanced countries and amplify the opportunities for field work at the earliest appearance of outbreaks in the most afflicted areas.

The basic principles of vaccination were established long ago, but practical means of production of vaccines for viral afflictions like polio had to await the cell and tissue culture advances of the 1950s. The most celebrated example, smallpox, also has the oldest historical roots. That success has encouraged other proposals for the eradication of other infectious agents. Rarely do we have the understanding of its natural history needed to calibrate the feasibility of the goal. This will strain our basic knowledge of the genetics and evolution of the etiologic agents.

For example, our stratagems on malaria, gonococcus, and human immunodeficiency virus are all confounded by the poorly understood capacity of the viruses to undergo further antigenic evolution. We know a bit more about influenza, but not enough to give us more than a few weeks or months of lead time merely to respond to its perennial variations.

As one species, we share a common vulnerability to these scourges. No matter how selfish our motives, we can no longer be indifferent to the suffering of others. The microbe that felled one child in a distant continent yesterday can reach yours today and seed a global pandemic tomorrow. "Never send to know for whom the bell tolls; it tolls for thee."

Joshua Lederberg, PhD

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Printed and Published in the United States of America

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

DISTR. : RESTRICTED
DISTR. : RESTREINTE

ACHR31/92.5b

ORIGINAL: ENGLISH

ADVISORY COMMITTEE ON HEALTH RESEARCH

Thirty-first session

Geneva, 28 September - 2 October 1992

Agenda item 7

Appendix 1

TASK FORCE ON HEALTH DEVELOPMENT RESEARCH [1]

Epidemiology, Research and WHO

[1] Prepared by Professor A. M. Davies

Epidemiology, research and WHO.
Memo to the ACHR Standing Committee, 6 February 1992

A. Michael Davies

Epidemiology, the basic science of public health, is of course an applied science and is concerned with

- the measurements and inter-relationships of parameters of health and disease in populations,
- the biological, social, economic, cultural, political and other factors which affect them, and
- the effectiveness and efficiency of interventions to change health status including health services.

Epidemiology, in addition to its own body of knowledge, also incorporates knowledge and methods from many scientific disciplines, among them, environmental, biomedical, sociological and political, integrates them and applies them to health problems. In particular epidemiology depends on appropriate statistical methodology.

There is a need for the development of new knowledge, particularly "friendly" methods for assessment of the various factors affecting health problems,

- for monitoring measures of health and the effects of different interventions
- for forecasting future trends and modelling scenarios both on a community and regional basis as well as on a global basis
- for developing capacity to obtain and process such data and to make it available for decision making.

The institutionalization of epidemiology

Epidemiological methods have always been used by the various units of WHO in the fight against specific diseases and in appraisals of health situations. The seminal resolutions of WHA 30.43 (1977) and of Alma Ata (1978) however required the development of plans of action for national and international health policies and underlined the need for accurate information on demography, health status, services and health expenditure by member states. As national plans and policies were formulated, and monitored by WHO, it became clear that most countries made far-reaching decisions on their health without benefit of adequate data.

In October 1987, Professor W.W. Holland, the newly elected president of the International Epidemiological Associaton (IEA), and Professor T. Abelin, a member of its council, met with the Director General, Dr H. Mahler and epidemiologists in WHO. It was agreed that there was an urgent need to expand epidemological expertise in member states as well as the capacity of WHO to assist in this effort, if the goals of HFA were to be met. Professors Leon Gordis and Norman Noah conducted a survey on behalf of the IEA in January 1988 and proposed a plan of action (report 11 May 1988). In its resolution 41.27, the World Health

8. Improved methods of ecological risk assessment, for quantification of long term effects of low dose pollutants, radiation, electrical fields and so on, in various combinations, on large populations with possible increases in disease incidence.

9. Ways to combine different sources of information and measures into composite indicators for modelling. Decisions are needed on standard relevant data sets for this and future generations including better indicators of the world health situation.

10. Improvement of methods of modelling and scenario building with health impact to incorporate demographic, behavioural and social changes, as well as environmental impacts.

Comment

This first list of research needs should be discussed and elaborated by the ACHR and other experts. I suggest that the item be placed on the agenda of the ACHR at its next meeting and that representatives of WHO/HST and the Task Force, among others, be invited to submit background papers and to attend.

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ACHR31/92.6

ORIGINAL: ENGLISH

ADVISORY COMMITTEE ON HEALTH RESEARCH

Thirty-first session

Geneva, 28 September - 2 October 1992

Agenda item 7

Appendix 2

HEALTH SYSTEMS RESEARCH [1]

[1] Prepared by Dr Y. Nuyens

HEALTH SYSTEMS RESEARCH

1. MANDATE OF HEALTH SYSTEMS RESEARCH

Although research for the development of national health systems has been part of WHO's programme since the creation of the Organization (1948), it was recognized in 1976 as an explicit component of the Organization's support to research to which priority should be given. The mandate to develop health systems research stemmed from various resolutions formulated by the World Health Assembly in recent years, as well as from recommendations and decisions of the Executive Board, the regional committees and the global and regional advisory committees on medical/health research.

Within the Eighth General Programme of Work covering the period 1990-1995, the Programme on Health Systems Research and Development has been given the following target : "By 1995, 70% of countries will be carrying out health systems research as part of their managerial process for health development, and will be using the findings both in policy-making and in the development, organization and functioning of the health system".

2. HEALTH SYSTEMS RESEARCH WITHIN AN EVOLVING CONTEXT

The ACMR Subcommittee on Health Services Research, which was in operation between 1978 and 1980, defined health services research as "the systematic study of the means by which basic medical and other relevant knowledge is brought to bear on the health of individuals and communities under a given set of existing conditions". At its final session in Addis Ababa (1980), the Subcommittee addressed a series of recommendations to the Director-General, including :

"1. The immediate strengthening of the WHO Secretariat to enable it to manage adequately the health services research component of each programme, and to perform the health services research tasks that are common to all programmes.

2. The allocation of substantial budgetary and/or extrabudgetary funds to carry out health services research in designated priority areas...

3. The formation of a Scientific Steering Committee on Health Services Research as soon as possible...

4. The establishment of the necessary close liaison between WHO and other United Nations and bilateral agencies to coordinate efforts in providing a basis for technical cooperation among countries in health services research...

5. The focusing of WHO efforts on raising motivation towards health services research and awareness of its potential for improving primary health care...

6. The placing of sufficient emphasis on health services research as a means of solving health problems of mothers and children as part of the strategy for health for all...

7. The promotion of the establishment in each country of a national health services research coordinating body to properly emphasize health services research as an essential part of primary health care..."

Ten years later, in the introduction to the HSR Publication "From Research to Decision-Making" (WHO/SHS/HSR 91.2), Dr A.M. Davies answers the question - What is health systems research? - in the following way :

> "Practitioners of health systems research are particularly concerned with providing information which can be used to make rational decisions in health planning and management at different levels of the health system. They are thus involved in the development of rational systems of information on health and disease of populations, with examinations of the structure and functions of health care, with issues of management and costs, and with questions of effectiveness and efficiency".

At the policy level, the Consultative Group on The Role of Health Systems Research in Primary Health Care Development (Geneva, 1991) made a series of recommendations to the Director-General in the following major areas:

- Priority research issues in PHC, including community participation, district health systems, financing, management, system balance and sustainability;

- Priority research issues in HSR, including the measurement of health needs, evaluation of programmes, health care resource allocation, effectiveness and outcomes;

- Consensus building to strengthen the demand for HSR

- The development and use of a framework for capacity building in HSR at national level;

- Consolidation of HSR activities in support of PHC

- Networking and donor coordination.

The above examples not only suggest a growing momentum for health systems research over the last ten years, but also some important changes at the conceptual as well as the policy level.

3. CHANGES AND DEVELOPMENTS IN HEALTH SYSTEMS RESEARCH

3.1 From health services research to health systems research

Problems of poverty, nutrition, housing, transport, pollution and life-style factors are now major determinants of health, which means that the forces affecting health and health care go well beyond the health sector. If health systems research were to confine itself to issues conventionally labelled health services, it would fall far short of applying existing science and technologies to understanding the origins of health and disease, the factors promoting or hindering prevention, treatment and care, or the discovery of effective and efficient means of optimizing health.

3.2 From health systems research to health systems research and development

Health systems research is action-oriented, and is expected to develop solutions for specific problems, to provide immediate support for managerial decision-making in order to improve the impact of the use of available resources, manpower and technology, on the health of the community. Much traditional bio-medical and clinical research is also intended for action, but the difference, apart from subject matter, lies in its time-scale and its immediacy.

3.3 Health systems research at different levels of health development

Health systems research has been shown to be applicable and useful in countries at different levels of development and in different cultural contexts. For example, a recent publication by the (American) Foundation for Health Services Research (Health Services Research: Key to Health Policy, 1991) reviews the contributions made by health services research over the last decade in the U.S. and one unequivocal conclusion emerges from this summary: "...health services research has demonstrated its capacity to make important and continuing contributions to the improved understanding of how our health care system operates and how it can be made to perform more effectively and efficiently for the benefit of the American people...". On the other hand, the Joint WHO/DGIS/RTI Project on health systems research has, over the past four years, completed in countries of the Southern African Region some 50 research projects, dealing with issues of management of health services, utilization of health services, risk factors for specific health problems and behavioural studies (Annex 1).

3.4 Health systems research at different levels of the management hierarchy

Health systems research is being used at the different levels in the management hierarchy, i.e. policy and planning, programming and operational levels. The complexities of the problems dealt with at the respective levels range from highly complex at the policy level, to fairly simple at the operational level. Accordingly, the type of research that is needed for decision-making also varies in complexity and scope. Some examples:

- policy makers may want to know what the implications are of alternative models for health care financing;

- managers at provincial level may raise the question why neonatal mortality is much higher in certain districts than in other districts;

- hospital directors may ask if the routine procedures and policies in the different units are appropriate? comprehensive? efficient?

- managers at village level may want to know why village health posts are underutilized;

- community leaders may be interested to know what the effects will be of a cost-recovery programme on drug costs and availability of drugs.

3.5 Health systems research as a horizontal programme

Health systems research is attracting the interest, support and collaboration of a growing number of programmes within and outside the Organization. Two examples from within the Organization:

- at the first meeting of the Task Force on HSR in Leprosy (1992), it was recognized that although much progress had been achieved in the control of leprosy through the introduction of MDT, the degree of success had been varied largely due to managerial weaknesses, particularly at the operational level. Therefore the strengthening of managerial capability is a priority concern in leprosy control and the use of health systems research to provide information for managerial decision-making was identified as a strategic approach, to be developed in close collaboration with the HQ programme on HSR;

- since the success of introducing contraceptive methods depends on understanding the service environment through which contraceptive methods are delivered, the Task Force on the Introduction and Transfer of Technologies for Fertility Regulation of the HRP Programme has initiated recently collaborative efforts with the HSR programme in strengthening institutional capabilities in HSR and in implementing research projects addressing these service issues.

- A series of international agencies and health research networks, such as the Network of Community Oriented Educational Institutions for Health, the International Health Policy Programme, the International Clinical Epidemiology Network, the International Forum for Social Sciences in Health, have taken health systems research on their training and research agenda, most of the time in close collaboration with the HSR programme.

3.6 From HSR pilot projects to the development of a national HSR process

In the seventies, HSR established visibility and credibility through some prospective, so-called pilot projects, like the DANFA project in Ghana, the Narangwal project in India and the Lampang project in Thailand. Pilot projects are generally popular with donor agencies, since they have high potentials of quick results which can be presented to their governing boards. Governments in developing countries usually accept them because of the funds attached rather than conviction of their relevance to national health needs. The stated objective of pilot projects is to test new knowledge under optimal conditions, but pilot projects have turned out to

be show pieces, white elephants, hardly testing any new concept.

Over the past decade there has been a gradual shift in concern from specific, ad-hoc, pilot-type research projects to the development of an adequate infrastructure and appropriate institutional arrangements, including research agenda and priority setting for improving health and health systems. Country initiatives such as the establishment of focal points within the ministries of health, coordinating mechanisms between government, university and community, integration of health systems research into major health programmes, realignment of funding and inclusion of health systems research in curricula for training of doctors, nurses and other health workers illustrate an increasing concern for the development of a sustainable process for health systems research.

4. CONTRIBUTIONS OF HEALTH SYSTEMS RESEARCH TO HEALTH DEVELOPMENT

The changes and developments reviewed above indicate the major lines along which health systems research is contributing to health development.

4.1 The focus of health systems research is on the health system.

Although the health system may differ from society to society, it usually covers four components: the individual, family and community, which assume a vital responsibility for health promotion as well as for the curative care of its members; health care services, including the public sector as well as the private sector; health related sectors like agriculture, education, water and transport; and the international sector, including bilateral and multilateral donors supporting health as well as development activities. In view of this broad scope, the contribution of health systems research to health development is not restricted to the improvement (efficiency and effectiveness) of health services and includes also any health related sector which affects the health status of the population.

4.2 Problem-solving, action-oriented and participatory.

Health systems research is aimed at developing solutions for problems in health development. An essential characteristic of health systems research is that consideration for the subsequent use of the research findings is integrated into the research process. Therefore, those who will eventually use the research findings (policy-makers, health managers, community members) are actively involved with researchers in identifying the problems for research and in supporting the research process. This helps the research to focus on priority and relevant problems and encourages the subsequent use of research findings.

4.3 Development of new knowledge and fostering innovation

At present most health systems research is country-specific, meaning that the problems being addressed and the answers are only applicable to the country. Health systems research identifies national priority problems, designs and evaluates policies and programmes that will bring the largest health benefits, utilizing existing knowledge and available resources. However, in view of the fact that health systems research is being practised in developing as well as in industrialized countries gives

a unique opportunity for collaborative mechanisms linking together researchers with similar interests from countries at different levels of (health) development to promote quality research on issues and problems where answers may be applicable to several countries. The results of such "fundamental" health systems research are usually cumulative and transferable, and can lead to major technological breakthroughs and innovative approaches to solve problems in health development.

4.4 Information needed for various types of decision-making

Adoption of health development strategies requires countries to reorient existing health systems so as to achieve equitable re-allocation of resources for health in order to achieve total coverage, increase accessibility, provide effective referral and to develop appropriate mechanisms for community participation. To effect such changes, managers at all levels need detailed and accurate information on a large variety of issues such as priority health needs, availability of resources, technologies and strategies and their respective effectiveness, cost and acceptability. Since health systems research is dealing with policy decisions at macro level as well as with operational decisions at meso/micro level, it has multiple entry and intervention points in health development processes: individual, family, community, health care services, health care and health-related programmes, health policy and health planning.

4.5 The participatory nature of health systems research

The participatory nature of health systems research guarantees its contribution to health development in three different ways: first of all, by involving everyone directly concerned with a particular health or health-care problem in the research project, it ensures that the research is relevant and appropriate and increases the chances for implementation of the results; secondly, by offering technical programme managers a tool to substitute assumptions and unjustified opinions by an objective knowledge base, fundamental for priority setting and equitable allocation of scarce resources; and finally by orienting other health research programmes to more problem solving approaches in dealing with research issues in health development.

4.6 Health systems research as a sustainable input into health development

The shift from pilot projects towards integrating health systems research into the managerial and decision-making processes to support health development, means that objective and relevant information on key issues in health development will be available in a more systematic, ongoing and comprehensive way, thus leading to more informed decision-making.

5. SOME CHALLENGES FOR THE NINETIES

5.1 Growing consensus versus increasing diversification

5.2 Country-specific agendas versus donor-driven strategies

5.3 Creating the demand versus allocation of resources

5.4 Continuity versus re-inventing the wheel.

ANNEX 1

HSR TRAINING COURSES AND COMPLETED RESEARCH PROJECTS

1. **MALAWI (April 1988 - October 1988)**

Organizer: Professor P.R. Khonje, Chief Research Officer, Ministry of Health

a. A study of factors contributing to low utilization of child-spacing services in the Northern Region of Malawi with emphasis on male participation.
Principal investigator: Dr J. Masanjika

b. Oral health knowledge, attitudes, practices and oral health status in Mchinji District, Malawi.
Principal investigator: Dr W. Mukiwa

c. A study of factors that influence nursing care at Queen Elizabeth Central Hospital, Blantyre, Malawi.
Principal investigator: Dr F. Sungani

d. Factors contributing to high neonatal mortality rate in Lilongwe District.
Principal investigator: Dr W. Chiomba

2. **SEYCHELLES (May 1988 - November 1988)**

Organizer: Dr A. Kitua, Epidemiologist, Ministry of Health & Social Services

a. Study of factors influencing the low recruitment of student nurses in Seychelles.
Principal investigator: Mrs M. Servina

b. Study of factors contributing to a high attrition rate in the nursing profession in Seychelles.
Principal investigator: Mrs E. Savy

c. Study of factors leading to the incidence of gonorrhoea in Seychelles.
Principal investigator: P. Vidot

d. Study on factors influencing low compliance to diet of diabetic patients referred to Dietetic Clinics in Mauritius.
Principal investigator: Ms U. Haw Tai Wah

3. **ZIMBABWE (January 1989 - July 1989)**

Organizer: Dr Shiva Muragasampillay, Epidemiologist, Ministry of Health

a. Study of reasons for defaulting from out-patient treatment among tuberculosis patients in Masvingo Province.
Principal investigator: Mr D. Proudfoot

b. A study on the maintenance of district council clinics in Midlands Province.
Principal investigator: Dr D. Dhlakama

c. An investigation into the reasons for the failure of the Beitbridge sanitation project to reach its target.
Principal investigator: Mrs S. Mutambiranwa

d. Investigation into factors affecting staffing levels of health institutions in Matabeleland North Province.
Principal investigator: Mrs I. Moyo

4. **TANZANIA (March 1989 - March 1990)**

Organizer: Dr S. Ndeki, Director, CEDHA, Arusha

a. Protein Energy Malnutrition in Sengerema District - Prevalence and risk factors.
Principal investigator: Dr P. Mtey

b. A study on high perinatal mortality in Shinyanga Urban and Rural district, Tanzania.
Principal investigator: Dr N. Katole

c. Utilization of maternal services in Musoma District.
Principal investigator: Dr E. Massesa

d. Associated factors hindering supervision to rural health units in Same District.
Principal investigator: Dr R. Momburi

5. **MAURITIUS (September 1989 - April 1990)**

Organizer: Dr O. Awotar, Director National Programmes of Research and Training, Mauritius Institute of Health

a. An evaluation of the supply, distribution and utilization of antibiotics, anti-diabetic and anti-hypertensive drugs at primary health care level in Mauritius in order to optimize their use.
Principal investigator: Mr S. Ramphul

b. A study of referral procedures from district to regional hospitals in Mauritius.
Principal investigator: Mr M. Abdoolakhan

c. A study of factors contributing to high infant mortality in the district of Black River, Mauritius.
Principal investigator: Dr S. Auckloo

d. A study of factors influencing the use of treatment services of health centres in Mauritius.
Principal investigator: Dr H. Hung Yeung San

6. **MALAWI II (November 1989 - September 1990)**

Organizer: Professor P.R. Khonje, Chief Research Officer, Ministry of Health

a. A study of knowledge, attitudes and practices of school teenagers in Mzimba District about HIV infection/AIDS.
Principal investigator: Mr B. Tembo

b. Service related factors contributing to maternal death in health facilities in Malawi - a prospective study.
Principal investigator: Mrs A. Phoya

c. Factors contributing to shortage of essential drugs in health centres of the Southern Region, Malawi.
Principal investigator: Mr G. Vinkhumbo

d. Malaria management in the Central Region of Malawi - a community based study.
Principal investigator: Mr J. Nkhoma

7. **SWAZILAND (February 1990 - August 1990)**

Organizer: Mr M. Hlophe, Health Planner/Health Research Coordinator, Ministry of Health

a. Knowledge, attitudes and practices of primary school children, parents and teachers on schistosomiasis in Mayiwane Nkundla, Hhohho Region, Swaziland.
Principal investigator: Ms S. Mthupha

b. Study of factors contributing to high defaulting rate among tuberculosis patients in Swaziland.
Principal investigator: Dr C. Mabuza

c. Study of the factors contributing to late reporting and late diagnosis among pulmonary TB patients in Lesotho.
Principal investigator: Ms E. Mosala

d. Appropriateness of community-based drug outlets for dispensing essential drugs in the Dangbe West District of Ghana.
Principal investigator: Dr E. Amuah

e. Study of factors contributing to the under-utilization of community health posts in the South-West Province of Cameroon.
Principal investigator: Dr E. Ngapana

8. **ZAMBIA** (May 1990 - January 1991)

Organizer: Dr R. Chimba, CDD/ARI/HSR Manager, Ministry of Health

a. A study of factors influencing the low number of ordinary and ventilated improved pit latrines constructed in Kabwe Rural District, Central Province, Zambia.
Principal investigator: Mr D. Phiri

b. Primary Health Care Posts in Siavonga Sub-district: "Why are some functioning and others not?"
Principal investigator: Mr M. Chamvu

c. Factors contributing to the high rate of malnutrition in the age group of 6 to 23 months in Mwinilunga District of North-Western Province.
Principal investigator: Dr K. Habanyama

d. Low utilization of trained traditional birth attendants for deliveries in rural Lusaka Province.
Principal investigator: Dr V. Nyirenda

9. **ZIMBABWE II** (May 1990 - November 1990)

Organizer: Dr S.K. Chandiwana, Director, Blair Research Institute

a. Reasons for low utilization of delivery services in Guruve District, Mashonaland Central Province.
Principal investigator: Ms C.S. Zvavamwe

b. Underutilization of growth monitoring services at health facilities in Seke and Marondera Districts, Mashonaland East Province.
Principal investigator: Mr G. Marimbe

c. Pattern of workshop attendance by health workers of Mashonaland West Province.
Principal investigator: Mrs R. Mhango

d. Utilization of data in planning and management of health services in Buhera District, Manicaland Province.
Principal investigator: Ms A. Chideme

e. Evaluation of the CARD sanitation programme in Gutu District.
Principal investigator: Mr S. Mharakurwa

10. **MOZAMBIQUE** (September 1990 - May 1991)

Organizer: Dr A.R. Noormahomed, National Director of Planning, Ministry of Health

a. Estudo dos factores que contribuem para a baixa cobranca de receitas no hospital central de Nampula.
Principal investigator: Dr A. Ndeve

b. Estudo das causas da diminuicao da cobertura de partos institucionais nas maternidades perifericas da cidade de Maputo.
Principal investigator: Dr J. Leopoldo da Costa

c. Mortalidade em criancas menores de 2 anos em algumas cidades capitais (Nampula, Tete e Inhambane).
Principal investigator: Mr J.G. Tembe

d. Estudo para identificacao das principais causas de baixa cobertura vaccinal da cidade da Beira.
Principal investigator: Mr R. Guilande

11. **TANZANIA II (October 1990 - August 1991)**

Organizers: Mr P. Ilomo and Mr M. Mapunda, HSR Unit, Planning Department, Ministry of Health

a. Factors influencing high maternal deaths in Songea District, Ruvuma Region.
Principal investigator: Dr P. Raphael

b. A study on factors associated with low coverage of pit latrines in Sumbawanga District, Rukwa Region.
Principal investigator: Mr C. Shayo

c. Factors contributing to low condom use in relation to Aids control programme among adults in Mbozi District, Mbeya Region.
Principal investigator: Dr Y. Hemed

d. A study on poor performance of village health committees in relation to PHC activities in Iringa Rural District.
Principal investigator: Dr M. Mwakajila

e. A study on factors influencing the performance of village health committees in enhancing community involvement in health activities in Ejisu District, Ghana.
Principal investigator: Dr G. Amofah

12. **ZIMBABWE III (May 1991 - February 1992)**

Organizer: Dr S.K. Chandiwana, Director, Blair Research Institute

a. Reasons which contribute to delay in serving out-patients at United Bulawayo Hospitals.
Principal investigator: Mr L. Zindove

b. Reasons which contribute to delay in serving out-patients at Harare Central Hospital.
Principal investigator: Mr J.J. Munodawafa

c. An investigation of factors leading to the increase in number of TB cases in Chitungwiza.
Principal investigator: Mrs E.E. Tsopotsa

d. Factors leading to non-functioning of medical equipment in relation to provision of health care at Parirenyatwa Group of Hospitals.
Principal investigator: Mr A.F. Zingoni

e. Factors that contribute to the community's low perception of health services provided at Mpilo Central Hospital.
Principal investigator: Mr M. Nkomo

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WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

DISTR. : RESTRICTED
DISTR. : RESTREINTE
ACHR31/92.8

ORIGINAL: ENGLISH

ADVISORY COMMITTEE ON HEALTH RESEARCH

Thirty-first session

Geneva, 28 September-2 October 1992

Agenda item 8

Appendix 3

TASK FORCE ON

EVOLVING PROBLEMS OF CRITICAL SIGNIFICANCE TO HEALTH [1]

[1] Prepared by Professor T. M. Fliedner

Prof. Dr. Dr.h.c. Theodor M. Fliedner
Member WHO-Advisory Committee
for Health Research

Evolving Problems of Critical Significance to Global Health*

Interim Report of a Task Force of the Global Advisory Committee for Health Research**

1. Introductory Remarks

The WHO Resolution 43.19 of May, 1990 requested "interalia" the Director General, under point 5 (2) to investigate "Evolving problems of critical significance to health". In response to this resolution, the WHO-ACHR established a task force with a mandate to examine the relevant issues and to prepare a report outlining also areas for research and new approaches for study.

The members of the Task Group met during a consultation in July 1991 at the International Institute for Scientific Cooperation, Schloß Reisensburg, to consider reports and studies prepared by members of Ulm University and by scientists from a number of scientific institutions from different parts of the world.

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* Report for the Meeting of the Global Advisory Committee for Health Research of WHO Geneva September 28 to October 1, 1992

** Supported - in part - by the Dr. Hans A. Merckle Foundation and by the WHO Collaborating Center on "Global Modeling of Health Perspectives" at the International Institute for Scientific Cooperation, Schloß Reisensburg, Günzburg, Germany

Highlights of this consultation will be published separately. The central issues raised, however, form the core of this interim report. In due course, it will be complemented to consider and propose areas of further studies to be carried out under the auspices of the World Health Organization and with the support of sponsoring agencies.

2. Problems of Critical Significance to Human Health

The key problem areas that can be identified in relation to future developments of human health are summarized in one graph (fig. 1). From the viewpoint of a physician - as an advocat for health of the individual or of mankind in general - the human being and his health should and must be in the centre of our consideration. As human beings, we are part of "ecological systems" locally, in our continents, or globally. These ecosystems can be characterized by their living elements, plants, animals. But, if one wants to characterize "evolving problems of critical significance to health" at a global level and to use this analysis as an input for possible actions of the scientific community, it is necessary to consider the elements that influence the balance of different problem areas essential for health of ecosystems including that of man. Determinants of importance are among others: Population development dynamics and population migration, nutritional resources, including water, industrialization, environmental changes (for instance as a consequence of waste disposal) and energy resources.

In addition, these determinants are influenced, by two further forces. These are the dynamics of nature and the human value dynamics. Earthquakes , the development of solar forces, floods, heat waves, cold spells, etc. need not to be forgotten. For the development of our planet of even greater importance are human values: is it possible to find a common ethical basis for global developments and decision making? Is human life really the one value common to every citizen of this world or will every ethnic group determine its own value system which then can easily be in conflict with other systems?

The history of mankind until this day shows that so far the "global village" does not accept only one human value system, but is using several conflicting systems which - in addition - seem to be modifiable by political will any time. However, for survival of man it will be crucial to adopt a "magna charta of ethics for global developments" that is adhered to and that can be enforced.

This report is meant to consider several points:

- Human Ecology: a multidisciplinary challenge
- Determinants of Global (Health) Development
- Value System Dynamics
- Global Systems Research: a new challenge

In due course and after further discussion, additional developmental determinants may have to be considered and other research priorities identified.

3. Human Ecology: a multidisciplinary challenge

At any one moment, the life and health of a human being is determined by at least 4 factors (see fig. 2): external factors (e.g. where he lives), internal factors (e.g. age), genetic factors (e.g. his disposition) and his past health history (which may well have left "scares" of non-repaired functions). We accept health as the capability of the human organism to be able, at any one minute, to communicate and interact actively, constructively as well as creatively with his physical but also his social environment. The diseased state of an individual may be characterized by the complete or partial inability to interact with his environment. Such a state means to live at the limits of adaptive potentialities to environmental stress. In dying, the human being crosses the border of adaptation and communication. It is a daily miracle, that human beings exist and live in spite of the environmental conditions that are characteristic of his habitat. This environmental conditions are in part "pysiological" and in part "pathological". There is the physical environment, characterized for instance by gravity, by nonionizing and ionizing radiation and by electromagnetic fields, by heat and cold etc.. The chemical and the atmospheric environment provides the organism with physiological chemicals, trace elements and the variety of nutrients including water as well as air. The function of the organisms cannot be separated from such an environment. The chemical compounds in this environment are essential, as long as they remain at a physiological level: iron is essential; but the accumulation of iron for instance in hemoglobinopathias can be harmfull to the metabolism. The microbial environment, again, is normally in a physiological equilibrium with the organism. A normal "microbial flora" is essential for the function of the organisms although gnotobiotic research indicates, that a "germfree life" is possible as long as the necessary vitamins and other essential compounds are administered parenterally.

However, we also know of pathological situations: if the defence mechamisms of the organism are impaired or if pathgenic microorganisms enter the body, then a diseased state may result until the balance between the evironmental microorganism and the organism is regained. The social environment (not considered in fig. 2) is also of great importance for the health of the individual. Mental and social health again require an equilibrium and balance between stress and strain. Health is closely associated with the ability of man to communicate verbally or non-verbally with each other. However, there are limits and too much stress (time pressure at work, family and partnership problems, social presure in political parties or in social gatherings) may impair the balance and may result in diseased states.

Therefore, the possibilities and limitations of the human organisms to cope with environmental stress is in the center of the field of science that could be called "human ecology".

It is really of great interest to study the mechanisms that enable the organism to survive in a healthy state in an environment of increasing natural or man made hostility. In this context it may be of importance to remember, that the life expectancy in industrialized countries continously increased, even doubled, in spite of the environmental pollution that accompanied that industrialization.

In the forefront of this adaptive potentialities are the cell renewal systems. The actively turning over systems - such as skin, mucous membranes and the blood forming systems - form a vital, dynamic barrier between the "milieu intérieur" (as Claude Bernard called it) and the more or less hostile environment. The turnover of these systems is enormous. Day by day, billions of cells are lost and quantitatively replaced by new cells to keep the integrity of one organism intact*. The survival of an organism in adverse environmental condition is determined by the possibilities and limitations of the cell systems to cope with cell losses in excess of normal and by the question whether altered cell clones develop (such as malignant clones).

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* It is worth to remember that in the skin 0.7 x 10^9 cells, in the mucous membranes 56 x 10^9 cells, and in the hematopoietic organs more than 490 x 10^9 cells are lost day by day and quantitatively replaced by newly formed cells to maintain a homeostatic equilibrium.

The area of science dealing with the physiology and pathophysiology of the vital barrier for the integrity of the human organism extends the concept of cellular pathology initiated by R. Virchow. To-day, it is realized that survival of man in normal or abnormal physical, chemical and microbial environments depends - to a large extend - on the function, regulation and structure of cell renewal systems and their homeostatic mechanisms.

Of course, the integrity and functional ability of the mammalian organism in normal and adverse environmmental conditions is also dependent on the function of the central nervous system or - rather - the "central complex". (fig. 3) The capability to recognize signals in the sense organs (skin, eye, ear, tongue, nose (smell)), to evaluate them, to store them, to retrieve them, to use them as an input for action (leave or stay, talk, respond, act) is again bound to feedback regulated nerve based systems. And all functions necessary to metabolize and use nutrients, functions to supply the CNS with oxygen have to rely on the proper function of regulated systems such as respiratory system, cardiovascular system, metabolic systems, hematopietic system etc.

Thus, it can be stated, that the health of an individual in a "physiological" or "pathological environment" is related to coping mechanisms which in themselves are anchored in a hierarchy of regulated systems at different levels of biological organisation from the macro level to the molecular and atomic level. More research is needed to understand these "coping mechanisms". The recognition of limitations and potentials of repair mechanisms at those various levels is of paramount importance for establishing "threshold limit values" for multifactorial "stress" in the human habitat.

In summary then, a new scientific area has evolved that may be called "human ecology". It is a typical interdisciplinary field that requires in the future the development of a novel "human model" recognizing the human being as a complex of interacting and well structured feed-back regulated systems all geared to maintain the integrity and functional capacity of human - and mammalian - organism in environmental conditions characterized by a variety of physiological and pathlogical stresses and to assure that the injuries inflicted remain within the limits of biological tolerance at the different levels of biological organisation.

4. Determinants of Global (Health) Developments

What are then the determinants of global (health) developments? What are the major factors that endanger the health of human beings as individuals, families, groups, nations, world citizens? It is interesting, alarming and consolidating that to-day the human race is not so much endangered by natural disasters as they were priority determinants in the past centuries. In those years, the misery of man was often caused by catastrophic events. Storms (hurricanes), floods, infectious diseases of global significance, heat waves, extreme colds without heating devices, earth quakes etc. were the constant companions of human development until the industrialization initiated 100 - 150 years ago changed the situation drastically. The preindustrial time was characterized in all peoples by the belief, that such natural disasters were fate. We recognize to-day, that it is not inevitable "fate" that governs the evolution of man. It is the human being himself that has the power of self-destruction or survival. If this is so, it should be possible to persuade and convince the peoples in this world that their survival depends on their own potentialities to cope with problems at home and to support - at the level of a global community - the others, the neighbours to attain a healthy state of living.

What problems are evident? Four major areas of concern will be briefly discussed: population dynamics and population migration, nutrition, industrialization and environment. Other areas will be considered in due course.

4.1. Population dynamics

There is a well known population development that is now characterized as an "explosion". In 1800 one estimated one billion people. In 1900 there were 1.5 billion, in 1950 2.5 billion. The world population in 1990 was 5.3. billion and it is expected to exceed to 7.0 billion by the year 2010 and 8.5 billion by the year 2020 and further enormous increases. Different areas of the world have experienced different rates of increase. These differences will result in the consequence that by the year 2020 80% of the world population will come from developing countries. Because of these differences, the proportion of the worlds population in Northern America and Europe has been shrinking while that in other parts of the world has been expanding or falling (fig. 4).

What will happen after 2020? The UN-population fund revised earlier population growth estimates and is now of the opinion, that the world population will not stabilize at 10 billion 100 years from now. (fig. 5) It is now estimated that there will be in 2150 11.6 billion people. This prediciton is optimistic, because it assumes that the developing nations can reduce their birthrates from 3.8 children per mother to 3.3 by the year 2000. If that reduced birthrate is not reached by 2010, the population will hit 12.5 billion by the middle of the next century unless mass starvation, diseases such as AIDS or war curbs the numbers. Pessimistic estimates reveal a world population in 2070 of even 38 billion. The problem does not lie only in the numerical value. The problem is, that 36 of 38 billion would be children and grandchildren of those who are now the poorest. The developed countries would then contain - rather than about 1/3 of the world population (as today) only 1/20 of it. It is obvious that such proportion may lead to enormous social conflicts of international dimension. This population growth is, of course, the net result taking into consideration birth rates, longevity, disease pattern and death but it would go too far to mention these factors in detail at this point.

4.2. Population migration

Another determinant of global health is derived from population dynamics. Two types should be distinguished: rural-tourban migration and international migration (due to economic, to political or to ideological conditions).

During the last few decades one can register a massive migration from the rural areas to cities. In the developed countries, the proportion of people living in urban cities increased from 54 to 73% (beween 1950 and 1990), in the developing world the numbers were 17% to 37%. As far as numbers is concerned, the size of the urban population will double in the developed countries by a factor of 2, in the developing world, it will have tripled between 1950 and 1990. There is no doubt, that it is the hope of migrating people to come into a prosperous and productive economy. However, it is also clear, that this type of often uncontrolled urbanization brings substantial health and environmental problems. The growth of "mega-cities" is alarming. (fig. 6) In addition, the reports about the health problems that arise out of such a development point to limits of such a development.

However, the problems lie not only in the rural-to-urbanmigration. There is evidence, that the world is at the beginning of a massive population migration for mainly economical reasons. (fig. 7) In the last century, the development of North America, of South America and Australia depended on immigration. Europe, once a source of emigrants is now a major immigration area. In the 12 member states of the European Community, with a total of 325 million people there are at present 13.3 million migrants. These people seek to attain better working and living conditions compared to home. There is ample evidence, that this population migrations will attain global dimensions and will be the source of unrest and social problems.

In addition, there is the problem of refugees. It is also of considerable importance. Only between 1970 and 1990 the total number has increased from 2.5. million to 17.2. million, a 7-fold increase and no end in sight considering the political instabilities in many parts of the world.

4.3. Nutrition

Another major concern is, whether the world is capable to feed all the people that are being and will be born. So far, agricultural development has permitted world fo d production to grow faster than population. The land and water ecosystems on which human food supplies depend have the potential to produce an adequate supply of safe, nutritious food for the world population now and up to the year 2010. Much of this potential lies in developing countries where food production increases could be achieved through increases in the yield, in arable land and in cropping intensity. However, a growing proportion of landbased productive and protective ecosystem are being irreversibly degraded and lost as a result of human activities.Many countries are facing an expanding demand for food, fuel and other primary commodities and at the same time a growing loss of farmland and diminishing water resources and biological diversity. The key words are overuse and misuse. Soil degradation from erosion, salinization, waterlogging and pollution are among the factors that undermine soil fertility. It is of interest to note, that 1/3 of the worlds population today is undernourished and this is the population, in which one can notice - as a health indicator - very low birthweights (fig. 8, 9).

Another problem is for example the pressure on production capacity of livestock feed owing to the increasing demand by higher-income groups for meat products. Meat consumption per person in developing countries with annual per capita incomes above US Dollar 1250 is almost 10 times more than in countries with income below US-Dollar 250. If incomes rise, so will the demand for feed grain. The projection is that it will account for about 25% of all cereals consumed in the developing world by the year 2000 as compared with 16% in 1980.

In summary, the central issue is at the present time not the worlds capacity to produce food but rather its ability to ensure a more equitable distribution of it so that everyone can obtain the food needed for a healthy life without detriment to the integrity of the ecosystem. However, it may well be necessary to determine under which circumstances the world population in 100 or 200 years will be able to be adequately nourished considering the basic requirements and other crucial elements of ecosystem developments.

4.4. Industrialization

It is obvious that industrialization in any country has to be considered from 2 sides. On the one side, there is no doubt whatever, that industrialization has increased the prosperity of people and their health. In addition, it has been an old dream of human being to decrease the burden of heavy working conditions. The deveopment of machines and most recently of robots has significantly decreased in the developed world the muscular strain. There has been a tremendous shift from "blue colar" to "white colar" workers. At the same time, the number of jobs decreased and the unemployment rate increases. Many people are overburdened by the psychomental strain of the modern "post-industrialization" society characterized by speed and potential of communication and an information flux sometimes exeeding the potentialities of the brain resulting in exhaustion and fatigue as a civilization disease. But the industrialization has had and still has an unbelievable impact on the global ecological developent. In the OECD countries, the pollution emissions or resource requirements indicated, that the industry was responsible for 15% of water consumption, 35% of final energy use, 50% of contribution to the Greenhouse effect, 75% of non-inert-waste and 90% of the toxic discharges into water. These countries seem to have their "population explosion" behind them, but there is an industrial boom exemplified in the increase in cars and in CO^2-emissions as compared to population growth (fig. 10, 11, 12, 13).

In terms of gross national productivity, it is obvious, that the northern regions outweigh the rest of the world. There is no doubt, that the developing world is trying to attain a similar standard of living as we are used to. Worldwide television services deliver the vision of a "dolce vita" into any village far removed from civilization. Consider the perspective, that every citizen in developing countries who rides a bicycle today wants to have a motorcycle in 10 years and a car in 20. Consider that all families in the world want a television set and the comforts of every day life. Consider that the African, South Asian or South American countries will certainly attempt to expand its industrial production. This will most likely result globally in an environmental disaster if it cannot be controlled and if it is not done in an ecologically compatible way. The way to this goal appears very long, may be too long. Although many poor countries utilized per capita relatively little energy, this energy is often inefficiently used. The countries of the former Eastern block require for their ambitious industrial programmes much more coal, oil and gas in order to produce a unit of its GNP than the western countries. The poorest countries cannot afford even the industrial technology of the past. In general, the energy consumption can be expected to increase substantially by the year 2020, while the energy intensity per GNP will be reduced in the OECD countries but not - for some years to come - in the former Eastern block countries. The imbalance in energy consumption of the "northern belt countries" is remarkable as compared to the "southern belt countries". It can be expected, that this imbalance will be reduced not so much by less energy consumption in the north but by an increase in the south as their industrial plans materialize. It goes without saying, that this industrialization in the developing world will most likely pass through similar phases as far as health effects is concerned as experienced in western Europe in the past. There will be an increase in industrial and environmental diseases as the industrialization proceeds until the industrial hygiene has developed to such an extend, that it does not cause any longer suspicious health effects, such as asbestos, lead poisoning but also decreased weight at birth, increase in the frequency of congenital malformation and abortion, increase in certain forms of cancer. The entire process will also be influenced by the economic problems that the world is facing to-day in terms of economic and financial issues characterized by aid to developing countries and by financial fluxes to the north.

4.5. Man-made and natural environments

There does not seem much doubt, that carbon dioxide plays a major role in global warming. This effect will increase in coming years due to the fact that developing countries will increase their industrial production using as an energy source low-grade coal which is most readily available but contributes considerable to the greenhouse effect. In addition, there will be a further decrease on the ozon layer and thus, a change in temperature. The health effects might be considerable. Food supplies could be threatened by shifts in climatic zones and by changes in crop, livestock and fishfarming productivity, reduced availability of water for irrigation etc. This change in temperature may also affect the communicable diseases since the microbial organisms responsible may migrate to areas in which certain diseases (such as malaria) were virtually unknown. In addition, the large and the mega-cities, for instance will provide environmental conditions that are detrimental to human health as seen in Mexico and in many other cities (smog). Any removal of forests will of course be contra-productive as far as Co^2 in the environment is concerned (fig. 13, 14).

The environmental changes to be expected will also come about by industrial waste disposal. The OECD nations - 15% of the world population - produce 77% of all hazardous waste. Per capita municipal waste generation, at the end of the 1980, were 826 kg in North America, 394 kg in Japan and 336 kg in the European countries, compared to less than 50kg in the developing world. It is evident that this waste results in enormous contaminations of soil, air and water. Thus, heavy metal, high concentration of mercury, copper and cadmium have found their way through fishes into the human body. Again, it can be expected that this type of environmental pollution will increase substantially as industrial zones develop in the developing countries and will add to the health problems of man.

This report cannot consider in detail the evidence for every statement made. There are numerous reports available on the various aspects considered. But it will have become obvious that human beings as part of the ecosystem are exposed to environmental hazards that can be expected to increase and not to decrease. It may also be said, that the development of the human race is endangered not from external, natural forces or disasters but by man-made actions - population dynamics, industrialization, environmental damages of soil, air, water due to waste disposal, exploitation of nonrenewable energy resources and - in consequence - endangerment of human health in quantitative and qualitative terms.

5. Value system dynamics: the need for development and control

Therefore, it is of importance to discuss a determinant of development of the world that is of a completely different dimension: The value systems that will govern inevitably global decision making. (fig. 1) The countries represented in the United Nations General Assembly represent a wide spectrum of political, social, cultural, ideological and religious systems. In many parts of the world, the political systems are unstable as we experience now in Eastern Europe. We experience the fact, that this representation of all peoples of the world is as yet unable to face global realities as they evolve. Too different are the value systems in each country.

However, it appears to be an absolute necessity, to try to attain a minimum of consensus of the values that should govern the future of man.

In Germany, Hans Küng has engaged himself in a study called "Project World Ethos". He points out that it becomes a pure necessity to try to establish a solid foundation for a consensus of all peoples of this world to actually subscribe to a minimum of ethical standards: Inner peace: the consensus that one will solve societal conflicts without force. Economic and legal regulations: A consensus that one is actually prepared to adhere to specific regulations and laws at a local and global level. It is also necessary to have a consensus that one needs institutions, that are enpowered to inact these rules and regulations at a global basis (such as UN-police forces and global courts).

Hans Küng goes a step further. He suggests the following maximes: 1. Instead of an ethic of success (economics) or of ethics of values (justice, love, truth) there should be the development of an ethics of responsibility (postulated by Max Weber in 1918) and in modern times by Hans Jonas, the German-American philosopher. Such an ethics is not free of values but considers the cosequences of our actions and accepts the responsibilities. 2. It appears essential to demand for the new century an ethic of responsibility of the world society for its own future. This requires responsibility for the eco-systems and environments but also for the succeeding generations. This ethics includes the will to create a "sustainable" development which may be interpreted to mean the global decision to not exploit the global or - for that matter - national wealth but rather to live on its "interests" and to make sure that - whatever might be consumed - is replaced by elements of equal value so that future generations can rely on the availability of resources necessary for their healthy survival.

This can only be achieved by those who carry political responsibility in the regions of the world. It is necessary that the world religions and the world ideologies are prepared to leave their restricted scope of thinking and learn to think and act global at a global level and keeping in mind global responsibilities. It is here, that the "northern belt regions" carry a special responsibility for the "southern" regions of the world.

It is also necessary to consider the human being as the target for action to act responsibly within their society as part of the global society. Along this line it becomes essential to develop a new type of global ethics. This cannot be a private affair. It must be a public challenge of highest importance. Ethical codes need to be developed further in many public areas: not only biomedicine but also technology, economy and environmental conduct.

The new world that has to evolve if one wants to avoid our self-destruction requires common denominators in goals to be reached, values to be adhered to, ideals and visions for the young generation.

Hans Küng comes to the conclusion that it will be necessary to establish a new global dialogue between the large religious forces of this world and he has developed initiatives to make his visions a reality.

Along this line of thinking, one meets now in Germany young philosophers - such as Kesselring or Hösle - who consider the risk of self destruction of the world population in their philosophical and ethical way. It becomes clear from their work, that it will be only possible to cope with the developmental dilema of our world, if there is a new dialogue between North and South. The rich countries demand the poor countries to reduce their population increase to zero. This will remain one-sided as long as the rich countries do not reduce just as quickly and rigerously their consumption of raw material and energy as well as emission of greenhouse gases or of chemical waste. This is - according to Kesselring - a necessary condition not only for the world sustainable development but also for the credibility of the North. Without being credible, without acting in global responsibility on the basis of an ethical consensus, it will not be surprising if all appeals remain unheard by those who suffer from the hardships of being poor.

6. Global Systems Research: Challenges for the Scientific Community

Under these circumstances one needs to address the question whether or not the scientific community has a role to play in this global evolution. The signs and symtpoms of global developmental perspectives are alarming as well as depressing. All reports of national and international agencies seem to ring the alarm bells: the politicians - as they assembled in Rio - do not seem to be much bothered. For them, to think in 4 year terms is more meaningful than to think in long range perspectives.

It is here that one can envisage a crucial role for the scientific community as located in universities, academies of sciences, national or international research centers. The scientific community is composed out of a large number of "invisible colleges" that are concerned to broaden and deepen knowledge, to educate and to advise. This scientific community does not think in election periods and is permitted to think without national borders. Science is only science if it is committed to truth and to the spreading of knowledge.

It will be an enormous challenge for the peoples of this world to maintain health until 2012 or to restore it wherever it is lost (fig. 15). We realize that the determinants of this health are in part economical. In addition, there needs to be a healthy environment and a sustainable development of the resources necessary to support human life. There needs to be an improvement of physical, mental as well as social health. We need a stability in legal health and in a healthy political culture. We all know very well, that a large amount of knowledge is available that is necessary to cope with the enormous problems on hand. But we know how difficult it will be to implement this knowledge through the available political pathways.

Where are the challenges for the scientific commmunity? No one can relief this community from the task to identify the deficits in knowledge that prevent us from having a "healthy" world today. This deficit analyses will show, that all scientific disciplines need to be involved, a "university" is required which allows disciplinary and multidisciplinary studies and actions. The contributions of natural sciences and medicine, of engineering and computer science are needed as much as sociology, economy, law, theology and philosophy. As a matter of fact, it appears as if a new branch of science is necessary that is capable of integrating the disciplinary approaches into "global systems science".

In this sense, it is the role of the scientific community to increase the knowledge of critical significance to global development, to examine barriers for not using available knowledge and to test means and ways to overcome them, to develop new methods and technologies for coping with problems on hand, to establish new approaches to communicate the results of such global science to responsible politicians or community leaders in spite of their "short term perspectives" and - most importantly - to train scientific people capable for quality work and for transdisciplinary thinking in all parts of the world as community teachers.

It is evident, that 80% of the intellectual and scientific brainpower is in the "northern belt countries". In these countries scientists are more or less forced by our politicians to use the scientific potentialities to increase the economic competitiveness between the northern belt regions - North America, Western Europe, Japan. The scientific community is not encouraged and supported to use our skills and brains to address global issues. The scientific commmunity in the "northern belt regions" does have a responsiblity to think and act globaly in spite of the political shortcomings. What is needed in the third world is education: of man and especially of women, vocational training of young people, selection of brain-power in order to educate recipients of innovative ideas. It is surprising for instance, that the United Nations have only very limited programmes for linkages between universitites and research institutes in different parts of the world which should be the backbone of increasing the scientific work force necessary to cope with global problems on hand.

The scientific community should join forces to develop education at a global level and should try to develop a global "sputnik effect" based on the alarming projections described in this interim report. The scientific community should transmit research results to the public leaders based on global studies that utilized standardized methods and modern technologies that match the size of the problems on hand.

Can we do something right now that would pave the way into this global health future?

May be one could actually establish an "invisible scientific college on global systems research" that would have the task of conceptualize a new "world development model" that encompasses the decisive determinants that are of critical significance to global health in its broad sense. One needs to know the interplays and interdependancies of the variables, one needs to consider gaps in knowledge and one needs well thought through szenarios that enable the scientific community to suggest interventions in the frame of global responsibility.

This "invisible college" is also required to develop transdisciplinary methodology and indicators for studying the dynamics and the interaction of essential determinants and their evolution to widen and deepen the knowledge to understand the global systems dynamics. And finally, it is mandatory to establish global networks for collaborating institutions for mutual leadership training and methodological development and communication of results to the public.

In the WHO report "Our planet, our earth" (1992), a significant number of recommendations are given for research issues of fundamental importance.

All these proposals chould be considered seriously and taken up by the "invisible college on global systems research".

However, at this point, global system models might be of considerable help to try to understand better the complex interactions of the determinants of human and of ecological health. The comprehension of this complexity is necessary in order to determine which programmes of research and development might be of priority importance for short-, medium- and long term returns. It is suggested to start with "robust models" since the dynamics of interacting variables are far from being understood easily. At the University of Ulm, a research group has initiated attempts along this line of thinking.

7. Conclusions

At this point, the task force on "Evolving problems of critical significance to global health" has identified at least 6 problem areas that continously interact and are of critical significance to health of the ecological system to which human beings belong as key partners.

Population dynamics and global population migration appears to be the key issues of the future. They determine the need for a rapid and continuous development of nutritional resources, including clean water. This inevitable evolution will result in a further global industrialization with its own impact on the ecological systems and human health by increasing physical, chemical, as well as psychomental stress. This development will modify and exploit the natural as well as man-made energy resources. Thus, environmental changes are inevitable that in turn will modify the ecosystems and the habitat of man.

It appears necessary to mobilize the scientific community to adress the complexity of interacting determinants of global health development by a new phase of global systems research and by helping in the educational and scientific activities worldwide based on a system logic and encompassed by a new ethic of responsibility.

The goal is to regain the potentialities of man to live not only a quantitatively but also qualitatively healthy life. This appears possible only if human beings learn to use the interest of national wealth or global wealth rather than to exploit the limited resources available until human life will become impossible to continue.

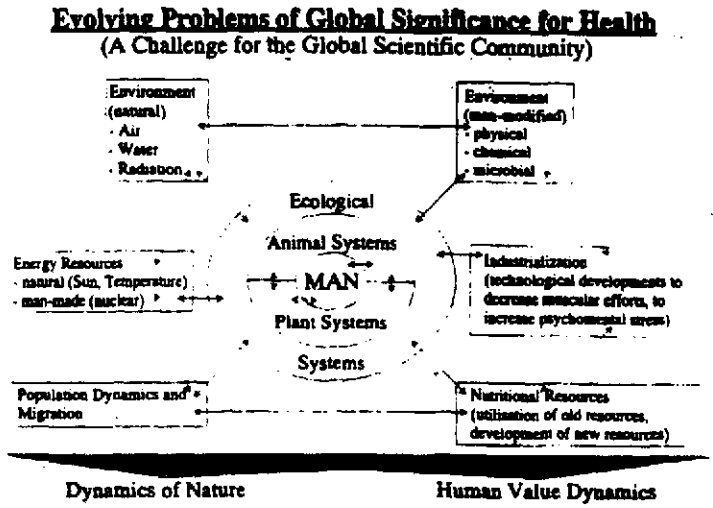
Evolving Problems of Global Significance for Health
(A Challenge for the Global Scientific Community)
Environment (natural)
· Air
· Water
· Radiation
Environment (man-modified)
· physical
· chemical
· microbial
Ecological
Animal Systems
MAN
Plant Systems
Systems
Energy Resources
· natural (Sun, Temperature)
· man-made (nuclear)
Industrialization (technological developments to decrease muscular efforts, to increase psychosomatic stress)
Population Dynamics and Migration
Nutritional Resources (utilization of old resources, development of new resources)
Dynamics of Nature
Human Value Dynamics

Fig. 1

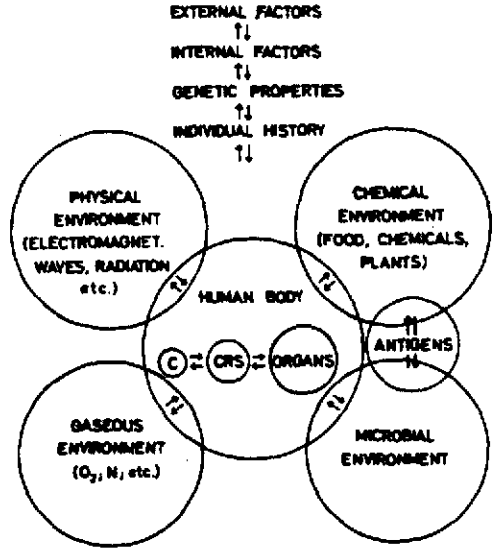
EXTERNAL FACTORS
INTERNAL FACTORS
GENETIC PROPERTIES
INDIVIDUAL HISTORY
PHYSICAL ENVIRONMENT (ELECTROMAGNET. WAVES, RADIATION etc.)
CHEMICAL ENVIRONMENT (FOOD, CHEMICALS, PLANTS)
HUMAN BODY
C
CRS
ORGANS
ANTIGENS
GASEOUS ENVIRONMENT (O_2, N, etc.)
MICROBIAL ENVIRONMENT

Fig. 2

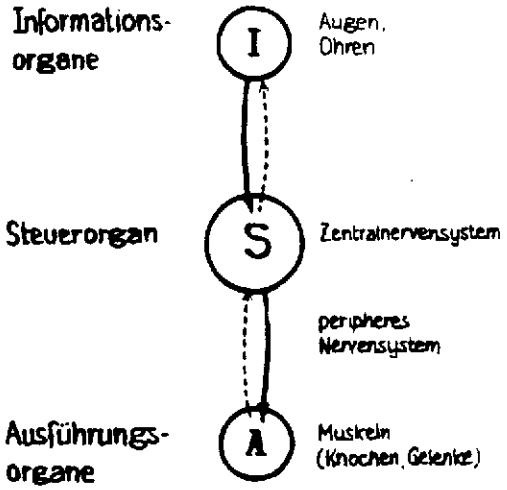

Fig. 3a Central-complex of human health: Organs of signal intake, regulation systems, executive functions

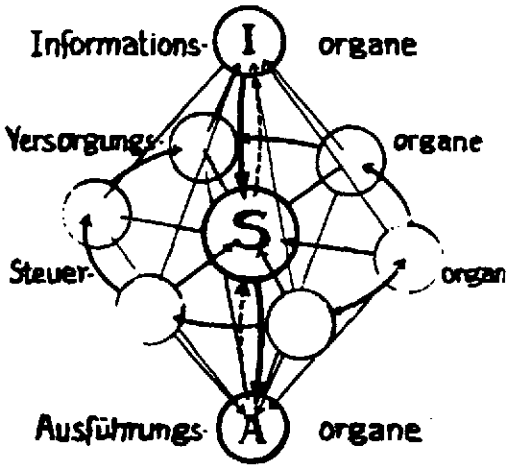

Fig. 3b Secondary organs to support the central-complex (cardiovascular, hemopoietic, metabolic, endocrine organs)

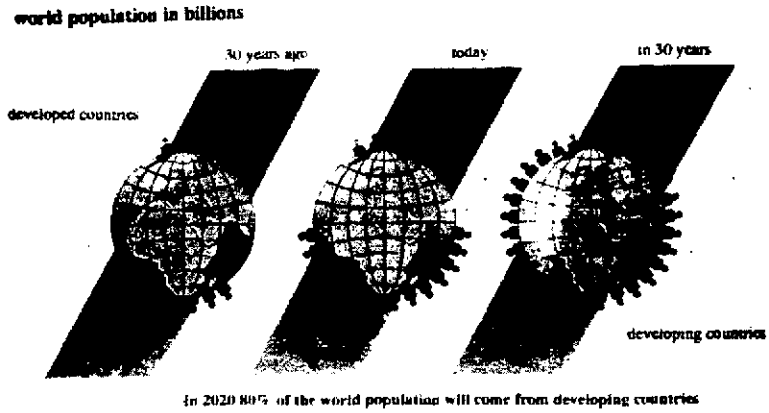
world population in billions
30 years ago
today
in 30 years
developed countries
developing countries
In 2020 80% of the world population will come from developing countries

Fig. 4

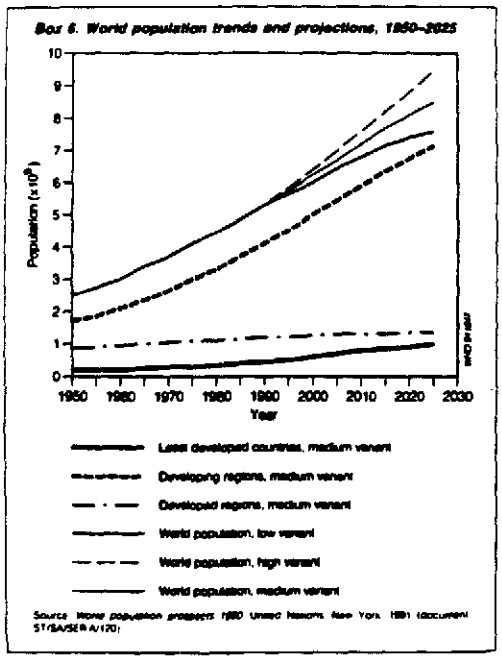
Box 6. World population trends and projections, 1950–2025
Population (x10⁹)
Year
1950
1960
1970
1980
1990
2000
2010
2020
2030
Less developed countries, medium variant
Developing regions, medium variant
Developed regions, medium variant
World population, low variant
World population, high variant
World population, medium variant

Fig. 5


London
Lagos
Rhein-Ruhr
Moskau
Teheran
Karatschi
Bombay
Tokyo
Mexico City
New York
São Paulo
Kalkutta
Jakarta
Mio.
22
16
14
1950
Megastädte
wachsen wie
Geschwüre

Fig. 6

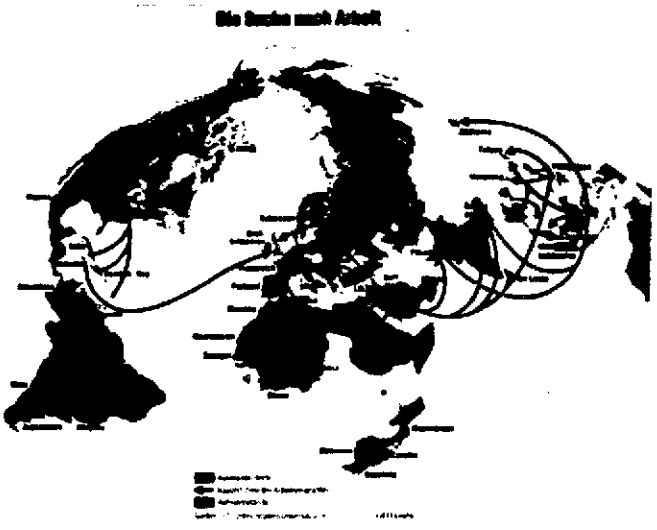

Fig. 7

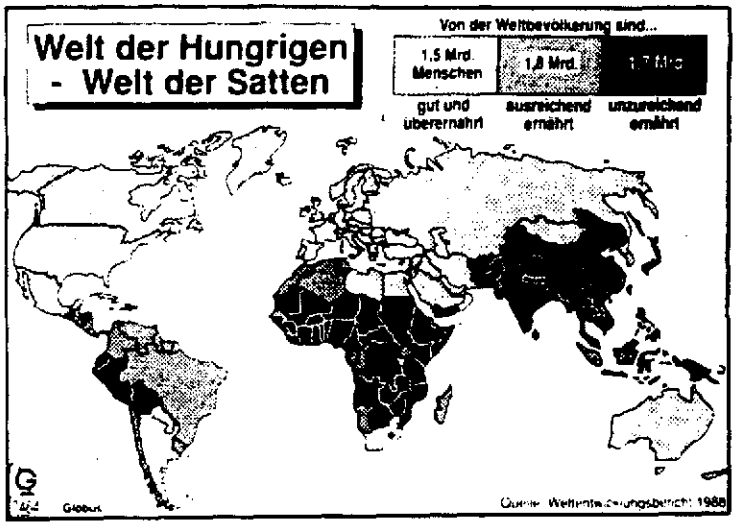

Fig. 8

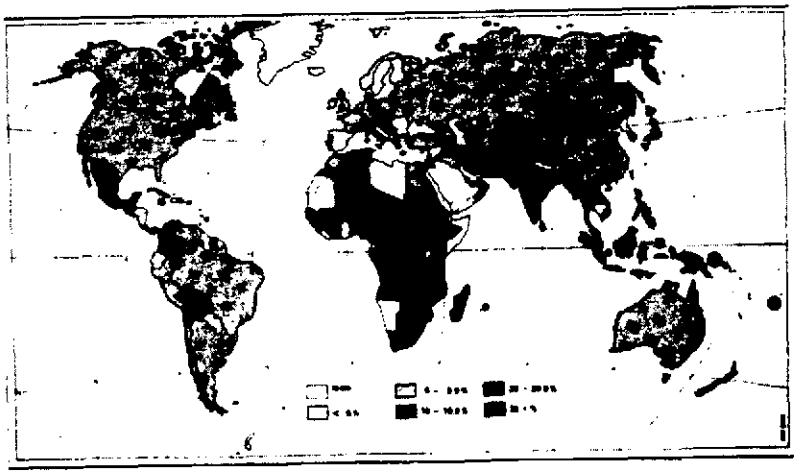

Fig. 9 Incidence of low birthweight by country (1982)

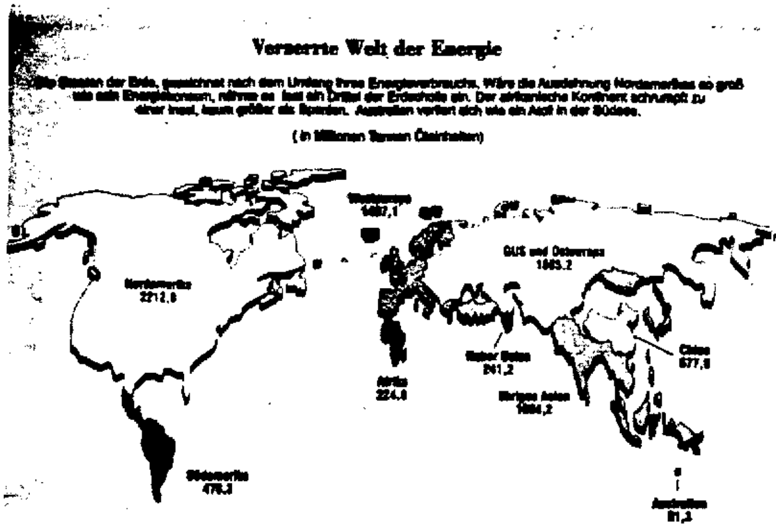

Fig. 10

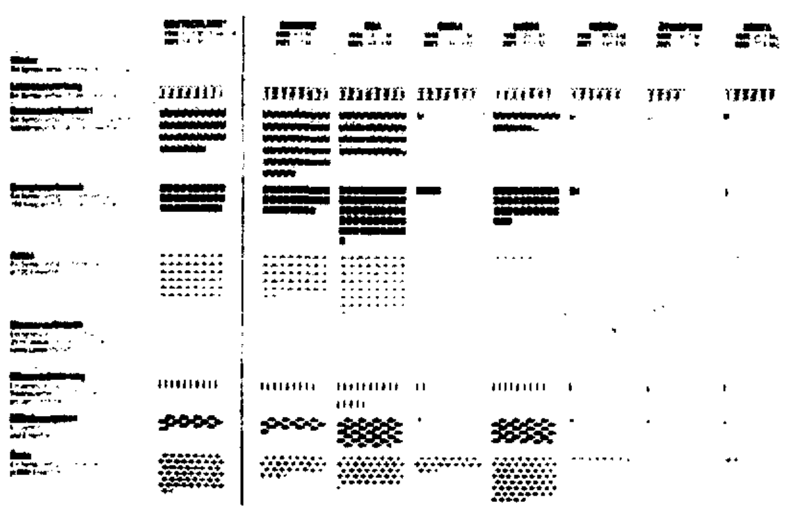

Fig. 11

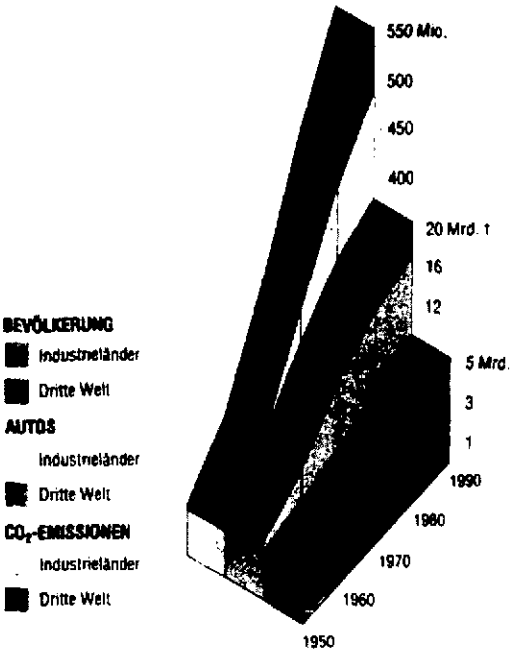
550 Mio.
500
450
400
20 Mrd. t
16
12
5 Mrd.
3
1
1990
1980
1970
1960
1950
BEVÖLKERUNG
Industrieländer
Dritte Welt
AUTOS
Industrieländer
Dritte Welt
CO_2-EMISSIONEN
Industrieländer
Dritte Welt

Fig. 12

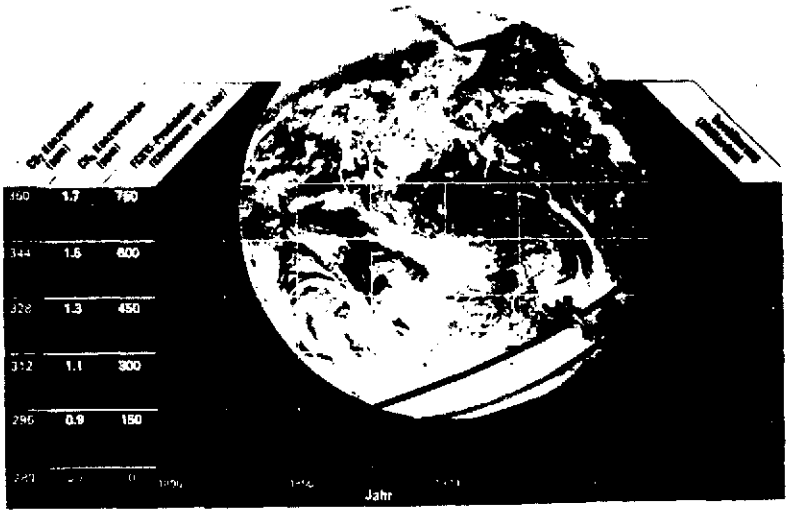
1.7
1.6
1.3
1.1
0.9
Jahr

Fig. 13

VARIATIONS IN YEARLY MEAN TEMPERATURES
AT THE EARTH'S SURFACE SINCE 1861

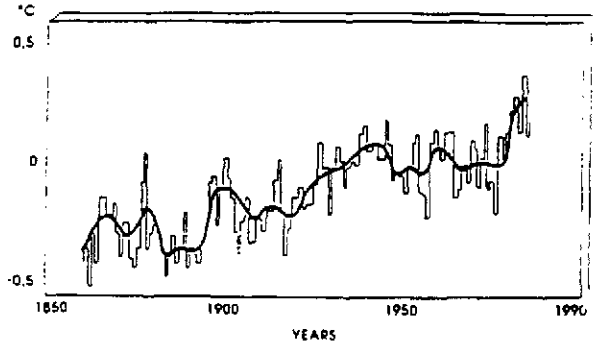

Fig. 14

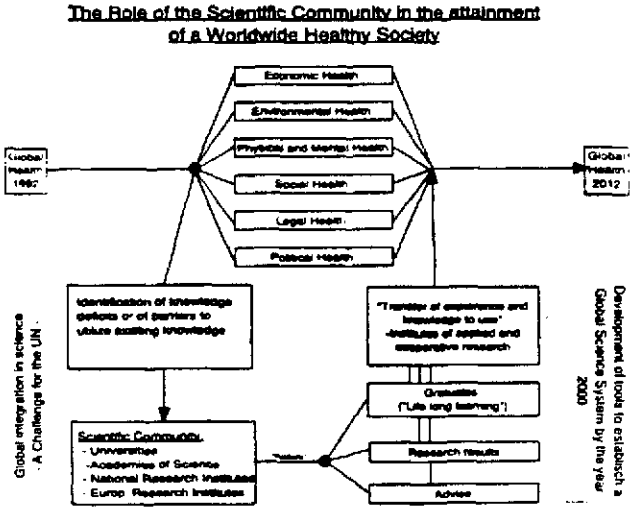

Fig. 15

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

DISTR. : RESTRICTED
DISTR. : RESTREINTE

ACHR31/92.11

ORIGINAL: ENGLISH

ADVISORY COMMITTEE ON HEALTH RESEARCH

Thirty-first session

Geneva, 28 September-2 October 1992

Agenda item 9

Appendix 4

TASK FORCE ON SCIENCE AND TECHNOLOGY [1]

[1] Prepared by Professor B. McA . Sayers

ACHR Task Force on Science and Technology

B.McA. Sayers

1. TASK FORCE RECOMMENDATIONS ABOUT FUTURE STRATEGY

1.1 Monitoring available Science & Technology

The preferred mechanism is to arrange meetings to bring together those who understand the priority health care problems of developing countries and those having expertise in science or technology - both those familiar with technologies that are known in principle to be applicable or those who have such a wide breadth of experience that they could identify science or technology potentially adaptable to provide possible solutions. Two types of meetings are envisaged:

a. On selected needs for which well-defined technologies are already known or in course of development; targets for meetings would be: acquiring, evaluating and preparing information for dissemination; planning pilot projects. Experts on the problem meet with experts on the technology; meeting reviews competitive options and, where appropriate, establishes network of centres in the North with interested centres in developing countries to initiate and support pilot projects. (This kind of network would be defined as a community of experts and users who have a single issue as their main priority.) Might be sponsored by industry.

Example subjects: limb (especially, lower limb) prostheses; technology for spectacle manufacture using cheap cast-plastic lenses; reduced cost imaging technology

b. Exploratory brain-storming meeting on specific health care problem(s); is there any existing technology that can be developed or modified to solve an existing problem? The nature scale and ramifications of the problem would be explained by experts (mainly from developing countries), to experts having wide general experience in science & technology, who may be able to point to a possible approaches to a solution or know someone who might.

Example subjects: diagnostics at primary health care level (esp. cheap field diagnostics); simple devices for some ophthalmic problems; support devices for the elderly; a new look at the malaria problem.

1.2 Expert papers on new developments or new applications

The concept of a series of occasional Expert Papers was accepted as an important element in the process of disseminating information about usable science and technology. Topics would range widely, as recommended and selected by the Task Force panel, from basic information on establishing some technical facility - say, an information technology system - to the scope of major important branches of technology - say, food technology and biotechnology - on to innovative techniques suited for developing country use - say, in physiotherapy apparatus - and to reviewing significant matters in advanced science - say, biomaterials, imaging technology or monoclonals. Degree of novelty in use or innovation in design, unfamiliarity, and potential relevance to developing countries would normally be taken into account in the choice of material. The papers would

be specially commissioned, refereed as appropriate and published in a clearly identified series: an Expert Report Series of the ACHR (possibly printed as Supplements to the Bulletin). The Task Force would be responsible for selecting topics and taking soundings to identify suitable experts who could be approached to write papers.

Other possible types of topic are illustrated by the following suggestions: cheap biosensors; design of manually-driven dental drills; laundering in PHC; field diagnostic methods using 'expert system' software in hand held devices; software for organisation and utilisation of field data; PCs in mass screening surveys; standardisation in IT; protection of electronic apparatus against power line surges and failures; protection against 'software viruses'; what is available on CD ROM bibliographic data relevant to health; setting up a microcomputer/lap-top and modem to allow telephone access to bibliographic material; using text scanners; fibre optic applications; what is available in educational material on specific fields; immunological developments; robotic technology; receptor physiology and the impact of toxic agents.

1.3 **Reporting emerging science and technology: a Newsletter**

We propose that a regular (initially 2 per year) newsletter be produced, to report on emerging science and technology and on other aspects of science and technology that would be useful to strengthen health care and its delivery in developing countries. It would be intended that a network of 30-40 "corresponding editors" be established, covering a wide range of countries and science/technology disciplines. The full Task Force would be used to advise on the selection. The meeting considered problems and mechanisms in the implementation of this scheme: the needs for information in member countries and what kind of information is most needed and for what target readership, how to collect and validate, how to communicate, and what advice to provide about utilisation.

It was agreed that the publication should be under the direct aegis of the ACHR but it was suggested that other sponsors might offer support; these could perhaps include regional RPD offices. Financial support from industry might also be found, although it was felt that the funding needed should be included within the extrabudgetary requirements of the various initiatives of the Task Force. A linkage could also be envisaged with other agencies and institutions such as NIH, NASA, and Medical Research Councils.

The proposed contents would be:

- short reports on new developments of potential interest drawing attention to horizon technology in the life sciences, physical sciences and technology including biomedical and clinical engineering, biotechnology, molecular biology and genetics;

- brief mention of outstanding research results (e.g., the role of toxic aminoacids in neurobiological disorders);

- highlights of recent reports of general importance (e.g., the recent Lancet Report on the role of folic acid in the genesis of CNS malformations);

- brief accounts of new technological innovations (e.g., safe,

manually operated crop sprayer to protect operators from pesticide toxicity);

- announcements of relevant events;

- summaries or announcements of expert papers prepared for, and to be published by, the ACHR.

1.4 Pilot projects

In some cases it would be appropriate to initiate one or more pilot projects arising out of meetings (1. a or b above); the work would be guided and followed up by (for instance) the members of the network set up to consider the basic problem, a steering group which would therefore be kept in being for a period for the purpose.

An illustrative topic is: locomotor disability - later perhaps generalised to include sensory or mental disability. The precise topic might be the lower limb prosthesis, innovating the combination of new materials technology (especially composites), new understanding of biomechanical dynamics of movement, and computer-aided mechanical design. The pilot project would require commitment of a centre in a developing country and one or more centres of technical expertise in developed countries, advised where necessary by the steering group.

1.5 Research projects

The Task Force recommends that several research projects suggested by the ACHR Sub-Committee on Health and the Economy were of such general importance that they should be brought into the ambit of the Task Force. This would provide a buffer mechanism between the ACHR and the researchers concerned and with the funding agencies which, it is hoped, will fund the work. The Task Force would take responsibility for establishing a steering group, identifying a potentially suitable network of laboratories to carry out the work, conduct the peer review operations required at various stages, integrate and publicise the results and as far as possible see to their proper utilisation.

2. REVIEW OF THE RESEARCH PROPOSALS

The meeting discussed the research proposals outlined in the draft final report of the Sub-Committee on Health and the Economy. A wide-ranging exploration of underlying factors identified many detailed aspects of necessary research and led to a broad consensus about the important issues. The main points are summarised below.

2.1 Describing and influencing behaviour in the context of health

The meeting concurred with the views expressed by the Sub-Committee on Health and the Economy: behavioural issues are seen as crucial in the context of health, and a greatly improved understanding of their nature and impact is perhaps one of the urgent requirements on the scientific scene at present. The term: behaviour: should be constrained to mean behaviour in a specific sectoral context - here, in the context of health. Nevertheless, the scope of proper interest includes the behaviour of individuals, families, communities and organisations (whether the organisation is

administrative, a service providing health care, a regulating agency, or a company), including the behaviour of individuals within and as a part of a family, community or organisation.

The research community should seek to increase knowledge about behaviour and about the motivations and constraints that affect behaviour. It should also acquire a better understanding of the available mechanisms and potential for, and risks of, influencing behaviour - to reduce health damaging behaviour and to encourage health promoting behaviour in the individual or group (whether the 'health' is that of an individual, family or community, or the 'health', i.e., effectiveness or efficiency, of an organisation).

Understanding behaviour generally starts from direct observation instead of quantitative measurement and much possibly useful knowledge comes from subjective impressions. There seems to be no common perception that a fully 'scientific' approach is feasible. But if objectivity of observation can be achieved, the techniques of 'knowledge representation' and computational logic might then be applicable: to record 'knowledge' that can only be expressed semantically, and to organise and generalise from the knowledge obtained. The technical methodology needs development but may offer a way forward. Correspondingly it has been suggested that the techniques of economics might be transposed into the field of health behavioural problems. (Interesting ideas flow from transposition of economic concepts into the health context - 'health' replacing 'money' or 'goods', and concepts like 'discounting' in money terms suggesting the concept of 'discounting of health risk', for instance.)

The need to understand individual behavioural choices in the context of health raises many questions to which answers are required but cannot yet be given. For instance, how far do social-environmental factors, economic circumstances and cultural values play a part in behavioural choices; what interactions exist between individuals and communities, and how do these exert an influence; what is the role of an individual's internally perceived 'quality of life' in relation to particular behavioural choices; what features contribute to an individual's perception of this 'quality of life'; what is the relation between 'stress' and behaviour; how does perceived risk enter behavioural choice; and so on ? More generally, it will be necessary to understand the influence of various institutions on individual behaviour: administrations, community, social pressures, organs of the media.

In the study of behaviour-affecting measures, it is necessary to identify educational actions that act at the cultural level, especially in synergism with other measures. One might also ask what leads some societies to initiate community-wide action to improve health, e.g., by environmental action? The identification of motivating factors underlying successful manipulation of group behaviour (e.g., fashion, modes of life style) may be instructive. Indeed, case studies will evidently be a fruitful source of information about behaviour.

Research into the behavioural context of health is thus seen as of vital importance and, summarising the consensus, five conclusions were agreed, it being assumed that the research would focus first on the needs of developing countries, and take account of their specific health priorities.

First, while much of the information about behaviour is descriptive, it is believed that the techniques of knowledge engineering may render the systematisation of such information more rigorous and more subject to possible generalisation. Methodology along these lines is expected to be fundamental to many of the following researches and so methodological development is an early priority in this proposed programme.

Second, the behaviour of individuals needs to be studied at four levels: as individuals, as members of a family group, as members of a community, and within organisations for delivery of health care services (focussing on the impact of individual behaviour patterns on the effectiveness and efficiency of the organisation and considering the role of incentives in performance).

Third, the behavioural patterns of and within organisations for health care delivery warrant investigation; attention is drawn particularly to the task of decision-making and resource allocation, both within the organisation - in supporting its infrastructure - and in carrying out its function. The structure of the organisation, internally and externally, may be relevant to its behaviour patterns, those of its personnel, and its efficacy; a taxonomy of organisations according to their structure and how they conceive their role, might be a useful starting point. (It is recognised, incidentally, that the transformation of health delivery organisations in the former centrally planned economies, according to one or other model of a hybrid private/public system, will generate great difficulties; the utilisation of insight into organisational behaviour should assist the process.)

Fourth, studying the behaviour of community units that are, or are not, successful in influencing the health of their citizens, through detailed case studies, could lead to the identification of relevant factors.

Fifth, it is recommended that a literature search should be undertaken as a first step, to lay a foundation for research programmes, by clarifying what insights are already available on these matters, in the context of health, and to confirm what work needs to be done.

2.2 Estimating health status

Health as a concept will always be subjective; it cannot generally be measured in any direct way. Health and health status of an individual or of a community can only be evaluated by using measures that 'indicate' the variable, attribute or concept that cannot itself be accessed. A critical review of indicators raises many issues: acceptability, validation, availability, utility (explanatory and predictive capability) - and the need to discard those that are redundant, unverifiable, unstable or ineffective.

'Acceptability' of an indicator is linked to several factors. For instance, the choice of indicator must be *prima facie* reasonable: the implied relation between the indicator and what it purports to indicate must seem likely. The meaning of 'validity' needs definition. If an indicator is well correlated with another, say economic, variable its validity is enhanced correspondingly; but it is also then redundant. So one seeks, rather, a good correlation between observed and predicted values

of a variable that can be 'forecast' by the indicator. But translating this into a practical procedure may be difficult. 'Availability' takes into account the practicality of measuring what the indicator requires; but the costs of measuring and sustaining the use of the indicator and its associated information systems must be considered. 'Utility' of an indicator expresses its capability to explain and predict: its 'power' in these functions; it is noticeable that few indicators are provided with objective justification of their claimed capabilities and properties - this justification would seem to be desirable.

In the natural course of development, a new indicator giving positive results will usually need to be transformed into a robust, cheap technique. Success at this stage will determine utility of the indicator, but it is difficult to envisage any general methodology for this step. However, any new programme of development of indicators should certainly be carried through in collaboration with other UN agencies, particularly UNRISD, which should be a source of valuable experience.

Various topics involving indicators were discussed:
What kind of new indicators are necessary? How can they be validated?

'Quality of life' indicators; their 'content' and role precursor events or circumstances indicating probable later ill-health
life histories constitute a kind of indicator of health status
measures of fitness (isolated, point measures) should not be taken as indicators of health:
for instance, infants born HIV positive may be fit at the time, remain asymptomatic for years and so, fit, but are inherently unhealthy
indicators may be multi-valent: e.g., representing the degree of ill-health, and the consequences of ill-health such as disability
indicators may be multi-dimensional, including a static measurement (assessing the current value of some variable), a dynamic component (describing the evolving pattern with the passage of time) and a latent component (indicating the consequences of the occurrence of some event, say)
new indicators are probably necessary in studies of multisectoral interactions involving health
new knowledge based indicators are needed, because certain significant pointers to health status or other health-related features (which are indicators also) may only be expressed semantically rather than quantitatively; a design methodology for knowledge based indicators would be applicable to many of the research issues proposed by the Sub-Committee on Health and the Economy.

2.3 Dynamic modelling, especially of multisectoral interactions with health

Determinants of health need not only originate in the health sector; there are numerous multisectoral contributions. For instance, economic factors affect health through social provision, housing, availability of suitable food, quality of nutrition and so on; manufacturing industry influences health through the availability and nature of employment, environmental effects, consumption or creation of foreign currency for health or nutrition related purposes and perhaps through the provision of

health related products. Conversely, health affects other sectors. Superficially even, health is a factor in the phy al and mental quality of manpower, in the sickness-absence record in emp yment, as well as in the consumption of resources that could otherwise be used for economic or social development, and so on. So the interactions should be investigated, in order to provide a rational basis for forecasting, planning and resource allocation at the national level, amongst the sectors, including health.

Interventions and disturbances in large scale economic and societal systems generally produce consequences that take time to evolve; this means that the bulk of any responses may be delayed in onset and drawn-out in effect. Successful interventions to reduce infant mortality, for example, will create an increasing need for other services - education, health care, housing, food - as the infants grow; the consequences of the intervention are both delayed and evolve with the passage of time. So, in this sense, the system is dynamic.

Modelling is undertaken in order to provide a mechanism by which a planner can attempt to understand the system with which he is concerned, and that would allow him to try out specific planned interventions in advance, to see what is likely to happen. The planner might also wish to determine the consequences of spontaneous events of various types that are outside the control of the planner but that nevertheless could occur.

In broad terms, the aim is to develop a generic model; this may then be adapted to the variables and pathways appropriate to an individual country and its particular health-related purposes. The purpose of the model is to allow the test of strategies devised by planners to achieve defined goals; trying out the strategies on the model allows the planner to identify the costs and consequences, inside and outside the health sector, of individual strategies.

There are two major problems to be faced: first, complexity and second, character. Complexity brings its own problems of practicality - identifying all the pathways comprehensively, determining the nature of the causal effects along each pathway, implementing in a computer model that can be shown to be correct and requiring, of course, sufficient computer power and speed. Without doubt, a full description of any system relevant to health will indeed be highly complex and elaborate. Is a full system possible feasible? Probably not. So, is a partial system model feasible and, more important, valid? Consequently, significant questions for investigation are: can simplified system models be developed and if so, are likely to be valid - and on what basis they could be justified?

Turning to the matter of system character, an interesting issue emerges. When contemplating dynamic system models, it is natural to think of a quantitative mathematical description of each pathway involved. But in the socio-economic context, at least some important relationships, causal or not, cannot be expressed in this way or, if they can, only at the cost of great complexity. However such relationships can always be expressed semantically, i.e., in terms of verbal statements. These statements constitute knowledge about the system that is equally as valid as quantitative mathematical statements and equations. But does this help?

Information in the form of semantic 'knowledge' can be handled formally (stored in a computer, tested for logical consistency, linked

inductively with other knowledge) using the methodology of computational logic. Furthermore, it is known that the techniques of logic programming can be utilised in system modelling. In principle, one could envisage integrating such a 'knowledge-based' model representing appropriate parts of a system with a more conventional quantitative model representing other parts, thus achieving more comprehensive representation of the overall system. Additionally, a qualitative model, supplied with sufficient pieces of knowledge, can approximate a fully quantitative model of the same system. The methodology needs and warrants further research.

Turning to the matter of intersectoral interactions, one of the first questions on which evidence is needed is: does better health lead to a stronger economy? Negatively presented, this leads to: does poor health affect the economy? Such questions might be answered in broad terms by studies that take no account of the structure of the interactions through which their effects are created, but give no indications about possible interventions that might be considered. That requires detailed insight, and detailed insight originates, in practice, through the study of models of the interactive system.

Modelling intersectoral interactions requires measurement or other representation of the variables involved. Some of these variables will inevitably take the form of indicators, and knowledge engineering indicators may become relevant. If so, the approach of defining the indicator as a 'high level concept' may be useful because this leads to the use of a 'knowledge map' as a tool for its assessment. For instance, the high level concept: 'health': would be broken down into its contributing components (treated as 'intermediate level' concepts) such as "stress" which in turn would be resolved into its contributory components expressed in knowledge enginnering terms. Similarly, the natural history of positive and negative health events could form another part of the knowledge map. Generalising, it is suggested that this approach helps to organise the task of taking into account the influence of other sectors and so defining important pathways; also, a model based on knowledge representation and logic programming is likely to be much easier to implement than a fully quantitative model.

In formulating the elements of a model of interaction between health and other sectors, it is useful to distinguish the sectors: health; the productive economy directly linked to health (e.g., the pharmaceutical industry); other sectors with inputs to the economy having health effects (e.g., education); rest of the economy. The tactic would be to start with simple interactions including their forward and feedback pathways, from which sub-models can be devised and build up an increasingly more complex picture. In accordance with the purpose of modelling, it is necessary to build-in the capability to introduce external disturbances to the system; such disturbances as wars, refugees, rural impoverishment (for instance, due to climatic effects) must be regarded as typical in various developing countries. An understanding of the way the consequences of such 'shocks' spread through the various sectors in the country would be useful in planning responses and limiting damage.

2.4 Problems of funding health care in the national context

The impact of national policies on health is a central issue; it is particularly significant where adjustment policies have been put into

effect. Adjustment is not totally an economic matter; it has a major social impact. This underlines the point that, when undertaking financial planning for re-organisation, experience in the developed world should not be transposed to the developing world. The World Bank and the IMF do now appear to be more conscious of the need for considering this issue, but there is considerable scope for improved co-ordination between the UN and other international agencies in recognising that interventions can have significant impact on, for instance, levels of health care provision, through direct or indirect influence. Both short-term and long-term effects must be recognised. The short term psychological effect of the constraints imposed by adjustment may be substantial and the likely consequences for health of the measures proposed need careful advance explanation to the public. Indeed it should perhaps be mandatory for UN/IMF missions to have a health expert as part of its team - or at least be advised of the likely health effects of what is intended - and for a health expert to be included in the negotiating team from the developing country.

When policies of adjustment take effect, three types of consequence may follow in the health sector: a direct effect on health (e.g., a shift from foodcrops to export products impacts negatively on nutrition); an imposed deterioration of health services because of reduced availability of resources; an impact on personnel in the health sector because, for instance, they are deprived of full facilities and unable to make full use of their training and professional skills, leading to a cycle of deterioration of morale and subsequently, standards.

Turning to the matter of researchable issues, it was recognised that much more needs to be known about the effects of adjustment, attitudes of populations to the effects, means for ameliorating the consequences for the most needy, and the design of administrative structures to implement the tasks involved. What distinguishes countries that have coped successfully with the consequences of adjustment and those that have not? It is recognised that personnel problems are acute in these areas: top-quality managerial structures and practices are vital and research on managerial issues at all level is needed; and if it is, as a result of policy, it may be no longer possible to employ all graduates in the health services - in which case it must be decided how the stock is to be used and how quality and effectiveness is to be maintained.

Indeed, designing a proper mix of personnel to meet a country's health care service needs, and the manpower development involved, requires expert advice. It would start with a redefinition of the tasks required at various levels in relation to overall health needs, and assembling these tasks into jobs of specific types; the associated administrative and career structures would be included. This would need to be based on a methodology for 'task analysis' leading to 'task specification' and thence to the redesign of training at at all levels, a methodology which apparently has not yet been developed or its requirements explored. It may be desirable to develop an 'expert system' to make such advice readily accessible to member countries. (A previous recommendation along these lines was made by the ACHR Sub-Committee on "The Transfer of Technology to Developing Countries, with special reference to Health".)

There are other aspects also, as the following example shows. A cadre of village health workers was established in certain countries as aides to

medical personnel. After a short period of training, they were deployed to villages to work under the control of Government officials. However, the monitoring failed and in the absence of adequate financial support, they became self-financing, mainly through selling drugs. These health workers thus became entrepreneurs rather than aides to the medical personnel. They are in private practice and there is no control on or monitoring of what they are doing, for example in the sale of dangerous drugs. Control is needed, with suitable monitoring to achieve adequate quality assurance. But what standards for primary, secondary or tertiary health care should be set? Quality assurance must be introduced into these activities, as in any other components of the service and this will generate consequences that will influence job specification, the pre-requisite abilities of personnel and training given.

Furthermore, health needs and circumstances alter dynamically. Accordingly, the demands to be placed on health care service will also alter dynamically and the methodology of task analysis, job specification and training schemes should take this into account.

It is clear that a significant problem area is the design and management of change in the structure of a health service (or other administrative) system. Various models of structures are in existence, but the unthinking adoption of any specific system, regardless of the virtues of parts of the system previously existing in the country may be wasteful and unwise. (Eastern Europe offers a potentially rich source of research data in this area, and it is known that some experts are worried about bringing East Germany into the West German system without regard for the value and utility of components now to be abandoned.) It might be valuable to investigate the reasons why different health service systems developed in the way they have.

2.5 Health and national development

Determinants of demand for health care services are influenced by social and cultural factors. Since the absence of health services in rural areas tends to drive people to urban areas, provision of rural health care may be important in national policy.

Targets for meeting health needs, in the light of costs, specify priorities. Selecting what to tackle, and distributing the resources required is unavoidable. So, the basic process is to translate health needs into costs via priorities, leading to targets, a managerial plan for implementation, and monitoring. As national circumstances alter, the process must be iterated and is as dynamic as the system driving it. A taxonomy of needs must therefore be established and the consequences of intervention in the health sector also needs to be appreciated. This is the reason why modelling, in providing a means for testing for the consequences of any intervention, is so important.

It is also clear that, in the national context, the distribution of resources, functions and activities between public and private sectors, and related options, are matters of some consequence to both developed and developing countries; for instance, the place of insurance schemes needs consideration. Research is needed to gain sufficient insight into the key factors to offer an objective basis for good choices in specific circumstances.

ANNEX A

List of attendants at a meeting of the Task Force on Science and Technology, Salisbury, UK, October 1-3, 1991.

Professor B. McA. Sayers, (Chairman), ACHR and Imperial College.

Dr G. Bloom*, Institute of Development Studies, at the University of Sussex.

Dr M. Eden, Chief, Instrumentation Branch, National Institute of Health, Bethesda, MD, USA.

Dr C. Henshall*, Research and Development Division, Department of Health, London.

Professor B. Z. Nizetic, School of Public Health, Free University of Brussels (also representing Professor T. M. Fliedner, ACHR and Rector, University of Ulm).

Professor B. O. Osuntokun, ACHR and University of Ibadan, Nigeria (on leave at the Department of Medicine, University of Cambridge).

Professor H. Singer*, Institute of Development Studies, at the University of Sussex.

Dr J. Szczerban*, ACHR and Office of Research Promotion and Development, WHO, Geneva.

Professor Dorothy Wedderburn*, School of Management, Imperial College (formerly Principal, Royal Holloway and Bedford New College, University of London).

* present for part of the meeting.

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SCIENCE AND TECHNOLOGY FOR HEALTH
A NEWSLETTER

Reporting selected new developments with future potential for improved health care delivery

August 1992, No 1

Appendix 4 (b)

Editorial

This is the first issue of a Newsletter on New and Emerging Aspects of Science and Technology having potential relevance for health care and its delivery, especially in developing countries. Its primary purpose is to draw attention to developments that warrant the attention of scientists, technologists or planners. The Newsletter is an initiative of the Global Advisory Committee for Health Research, and particularly, its Task Force on Monitoring Science and Technology; the initiative arises from a recommendation adopted by the World Health Assembly in May 1990, following its Technical Discussions on Health Research. (The Proceedings of the Technical Discussions have been recently published[1]). The Newsletter will appear from time to time, at the rate of several issues per year; it will be distributed through the W.H.O. system.

It is our present intention that items will be brief, deal with topics that are likely to be significant in the medium- or long-term, and be written by authoritative authors as signed contributions so that, if adequate references cannot be included in the article, readers can contact the author directly. Occasional status reports of ongoing research will appear, at the discretion of the editors. Some brief explanatory information items will also be included to serve as a starting point for those who may need to follow them up. For instance, it is expected to publish shortly a summary of some of the main databases on medical information - especially concerning science or technology - and information about accessing these with, at a later stage, information about technical factors (such as the desirable equipment facilities).

Under advice from the Executive Committee of the Global ACHR, certain of its activities will be mentioned, such as the impending publication of commissioned expert papers and relevant reports.

The Task Force is at present in course of establishing a network of Corresponding Editors who will scan the field within their own specialties, identify topics (subject to review) for inclusion, and arrange for brief reports to be prepared.

B. McA. Sayers

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In this issue:

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NEW TECHNIQUES TO PREPARE ANTIBODIES

One of the great breakthroughs in biomedical research during the last 15 years was the discovery of the hybridoma technique for obtaining monoclonal antibodies. The most commonly used animal species in the procedure has been the mouse. Since the discovery of the technique, great efforts have been made to prepare human monoclonal antibodies.

However, these efforts have not been very successful. Recent work by two research groups in Cambridge, UK, and in La Jolla, US, has changed the situation radically. The two groups have devised techniques to prepare human antibodies that bypass immunization and the hybridoma technique 1,2,3,4. The definitive proofs of the validity of the technique can be considered to be found in the publication from the Cambridge group3.

The technique uses human peripheral blood lymphocytes. Immunoglobulin heavy and light chain variable genes are amplified by the polymerase chain reaction (PCR). The genes are combined at random using PCR. The material is inserted into a large number of bacteriophages. The bacteriophages are allowed to infect E.coli bacteria which express the antibody genes. The resulting library is tested for content of a specific antibody by letting it react with an antigen on a filter. The gene in the bacteriophage that codes for the specific antibody can then be isolated and amplified by PCR.

The technique opens up great possibilities for preparing different human antibodies. In the future, it could also be possible to modify antibody genes to make them more effective. Applications can be foreseen in treatment of infectious diseases, auto-immune diseases, cancer and in the production of vaccines.

H. Danielsson

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STEROIDS IN THE TREATMENT OF ACUTE SPINAL CORD INJURY

Acute spinal cord injury, though twenty times less common than acute head injury, is a devastating event. Until recently there was little evidence to support any specific treatment, apart from general supportive care and prevention of worsening of the spinal cord injury by stabilisation of the associated vertebral injury. The recent evidence for the use of high dose steroid as specific therapy had come from a randomized controlled trial of methylprednisolone, naloxone and placebo by the National Acute Spinal Cord Injury Study in USA (NASCIS II)1. In fact the results were impressive enough to justify its announcement by the USA's National Institute of Neurological Disorders and Stroke, before they were published by a scientific journal, on the basis that pre-publication announcement could be beneficial to many patients.

In spinal cord injury2 as in brain injury, initially there is an increase in extracellar potassium, decrease in sodium-potassium ATP-ase, indicating membrane dysfunction, and failure of pump mechanism: the axoplasm fragments and the blood/spinal cord barrier begins to leak. Secondarily there are ischaemia with impairment of autoregulation of blood flow, lipid peroxidation in cell membrane produced by free oxygen radicals during activation of arachidonic acid, and explosive release of neurotransmitters which trigger calcium to enter into cells through ligand gated channels to cause delayed and spreading cellular necrosis in the spinal cord. To interrupt this sequence of events, nalexone, nimedipine, thyrotropin releasing hormone, glucocorticoids and others had been tried. Glucocorticoids have received most attention. Glucocorticoids are effective in reducing peritumoural oedema in the brain and in limiting oedema formation in experimental spinal cord contusion.

The recent or second American trial (NASCIS II) of high dose steroids after spinal cord injuries followed a first study of the American National Acute

Spinal Cord Injury (NASCIS I). In NASCIS I, infusion of 1000mg of methyl-prednisolone sodium succinate was compared with a 100mg dose given as a bolus and daily thereafter. There was no significant difference in motor or sensory function or outcome between the two treatments3.

In the second multicentre trial, NASCIS II, which was based on the experimental evidence that the doses of glucocorticoids used in the earlier trials were too low, treatment with high dose methyl-prednisolone, naloxone and placebo were compared in patients with acute spinal cord injury. Methylprednisolone was given to 162 patients as a bolus of 30mg per kg body weight, followed by infusion at 5.4mg per kg body weight per hour for 23 hours. Naloxone was given to 154 patients as a bolus of 5.4mg/kg body weight, followed by infusion at 4.0mg/kg body weight per hour for 23 hours. Placebos were given to 171 patients by bolus and infusion. Motor and sensory function were assessed by systematic neurologic examination on admission, six weeks and six months after injury. Patients who started treatment with methyl-prednisolone within 8 hours of injury showed significant improvement in motor functions, sensation to pin prick and touch at 6 months. Such improvements were seen in patients whose injuries were initially evaluated as neurologically complete and in those with incomplete lesions. The patients treated with naloxone or with methyl-prednisolone more than eight hours after their injury did not differ in their neurological outcomes from those given placebo.

Both in the developed and developing world, the results of the above study have important implications for the management of acute central nervous injury. Head injuries with brain damage and spinal cord injuries are common in all parts of the world and are particularly common in some parts of the developing world for example, West and East African countries (mainly due to automobile accidents). Whether early very high dose steroid regimen is equally as beneficial in head injuries is the subject of some ongoing research.

B. O. Osuntokun

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THE USE OF ARTIFICIAL WHOLE BLOOD SUBSTITUTES

The need for blood transfusion during surgery or following severe trauma or childbirth is extremely common throughout the world. However, the processes of taking blood from donors, then storing and distributing it as required, as well as ensuring that recipients receive a compatible type, are complex and costly. Screening for blood-born pathogens such as hepatitis and HIV adds significantly to these costs. The reason for giving a person whole blood is to try to maintain the oxygen carrying capacity of the circulation and keep the tissues at near to normal oxygen levels; this is the function carried out by the haemoglobin molecules contained within red cells. If a reliable alternative to human whole blood could be found at a reasonable cost, it would have wide potential use.

The concentrated packaging of haemoglobin within red cells has many biological advantages. The high concentration favours the formation of quatrameric polymers in which the molecules interact to give the most beneficial physiological loading and unloading of oxygen; fine tuning and control of this process is aided by phosphate and other ions contained in the cells. The bulk viscosity of the cellular suspension is lower than that of an equivalent cell-free solution. Furthermore, the relatively large red cells are not filtered across the glomerular membranes of the kidney, thus preventing uncontrolled loss of haemoglobin.

The search for a reliable and simple gas carrying replacement began many years ago and focussed first on the use of haemoglobin solutions from which the pathogen carrying plasma and antigenic cell membranes were removed. Then in the early 1960's viable techniques of encapsulating haemoglobin within artificial cell membranes were first demonstrated. More recently, the exciting possibility of using inert perfluorocarbon emulsions, or PFCs, was recognised because these liquids can dissolve considerably greater amounts of gas than can water or plasma. Today both forms of blood substitute are being actively investigated. Research focuses on developing PFC emulsions of

improved performance and on producing polymerised and artificial haemoglobins. Whilst, there is apparent rivalry between the proponents of each of the principal forms of substitute regarding relative merits, all will surely find important roles in future medical practice.

Early haemoglobin solutions gave disappointing results. Oxygen was loaded readily but released reluctantly and at low partial pressure. The haemoglobin was rapidly lost through the kidneys, sometimes leading to renal failure. There were also unacceptable immune reactions - largely resulting from insufficient purification of the haemoglobin solution. To overcome this, improved methods of separating cell membrane and stroma from both animal and human haemoglobins have been developed. Recently human haemoglobin has been genetically engineered, both in animals and in a yeast host, and ultimately this method may provide all commercial requirements. Super-normal haemoglobin molecules, capable of releasing oxygen at higher partial pressures have also been produced chemically. Chemical polymerisation of haemoglobin, after pyridoxylation, either with itself or other macromolecules is likely to provide the first commercially successful haemoglobin substitute. The intention is to produce polymerised aggregates that are acceptable to the immune system and are large enough not to need encapsulation to prevent loss through the kidneys.

Artificial membranes to envelop haemoglobin are being explored; they can be derived from a range of polymers including proteins and phospholipids. However, if stable, uniformly polymerised haemoglobin molecules can be manufactured, the need for encapsulation will be diminished. Artificial membranes are however also being developed for many other uses and it is to be expected that they will find their most significant applications encapsulating drugs, enzymes, antibodies and even foreign cells.

PFCs are inert dense compounds consisting of fully fluorinated carbon skeletons. They are however immiscible with water and can only be used as emulsions; the most stable emulsions have a small mean particle size of approximately 0.2 μm and are stabilised with suitable non-toxic surfactants. The goal for PFC based substitutes is a non-toxic, stable and concentrated emulsion that can be stored at room temperature, and, whilst not cleared from the circulation too quickly, does not remain in the body indefinitely. Toxic reactions seen in early emulsion preparations have been isolated to impurities in components, particularly the surfactants, and essentially have been overcome. Recently, stable emulsion formulations as high as 40%, by volume have been prepared. These can carry as much as 16 vol% of oxygen in a 100% oxygen environment.

Research into the use of PFCs has already demonstrated an exciting range of potential applications which, for convenience, may be described under three broad categories. Firstly, there are those requiring the use of large quantities to act as a whole body source of oxygen. Secondly, applications are being found that utilise a small volume of emulsion targeted at a particular site in the body for diagnostic or therapeutic purposes. A third unique area of use of these emulsions involves their non-gas transporting characteristics, either alone or in combination with their ability to carry oxygen. The most revolutionary applications are likely to be associated with the second and third categories.

It is possible that ultimately the largest use of PFCs will be for bulk blood substitution. This would be in circumstances such as surgery for replacing lost blood or for priming by-pass machines or following major trauma; the battlefield and major natural disasters such as earthquakes are other obvious candidates for their widespread use. However, initially PFCs will be used in commercial quantities for specialist, small volume purposes; indeed permission has already been granted for their use in balloon angioplasty.

Balloon angioplasty, rather than major surgery, is being increasingly used in the treatment of coronary arteriosclerosis. However the efficacy of the procedure is limited by the period of total vascular occlusion that can be allowed. The injection of PFCs, by catheter, beyond the site of occlusion can overcome the problem by maintaining oxygenation of the myocardium downstream and preventing reperfusion damage, thus enabling the surgeon to extend the time of occlusion.

There are many examples of tissue ischaemic hypoxia, such as myocardial infarction and cerebral ischaemia and incipient gangrene resulting from peripheral vascular disease in which the administration of PFCs may be beneficial. The small particles, unlike red cells, may be able to traverse the constricted vessels providing oxygen to the downstream tissues and lessening necrosis. They can also help to prevent reperfusion injury of such tissues by inhibiting chemotaxis and superoxide radical release, if introduced before normal blood flow is reinstated.

Another novel use of PFCs is likely to be in the treatment of tumours, particularly solid ones.

The small droplets can pass through the compressed blood vessels or narrow newly endothelialised paths and thus improve local oxygenation. This, in turn, improves the sensitivity of hypoxic tumours to radiotherapy. It may also facilitate the penetration and potency of cytotoxic drugs; indeed it may prove possible to design drugs that can be transported by the PFC droplets themselves.

The use of PFCs has also been proposed in the treatment of sickle cell crises; emulsion droplets can easily flow through the lung, become oxygenated and then transfer oxygen directly to sickled cells, recovering their flexibility and consequently improving the circulation. PFCs could be given to people who will not accept a blood transfusion on religious or moral grounds.

A major difficulty in keeping very premature babies alive results from the problem of ventilating stiff lungs because of the lack of surfactant lining the alveolar air-liquid interface. It has been shown that filling the lungs with PFCs overcomes this and enables adequate oxygenation of the baby's blood. This idea of liquid breathing has even been mooted for deep-sea divers! Introduction of PFCs into the blood stream of divers suffering from the "bends" has also been proposed as a method to remove the excess nitrogen that causes the condition; its use is also being investigated for treating submariners experiencing the "bends" as a result of escaping from abandoned craft.

PFCs have been used successfully to maintain tissue viability of transplant organs during storage and transport.

In addition to their gas transport characteristics, PFCs are likely to find use improving imaging procedures because of their unusual physical properties. Their ability to penetrate beyond the formed elements in blood means that, potentially, they can enhance regions of tissue such as tumours and ischaemic areas which are conventionally hard to visualise. They have provided good radiographic images of ischaemic heart muscle during balloon angioplasty and are being tested successfully in a number of other conventional radiography situations as well as computerised tomography. Excellent pictures of tumours have been obtained by magnetic resonance imaging using PFCs cross-linked with a carcinoembryonic antigen. They have also been employed to enhance ultrasound images.

R. C. Schroter and T. Sopwith

TESTING FOR CONTAMINATION OF WATER: OPPORTUNITIES FOR BIOSENSORS

Introduction

Typical water and sanitation projects in the Third World (supported by non-Governmental organisations; such as Water Aid, a British Organisation) include spring protection, gravity water supplies and hand-drilled tube-wells. In all these projects the practice is to use protected sources wherever possible; visual inspection is the normal means of assessing whether or not a source is likely to be polluted. However, it is frequently found that users of a scheme unknowingly pollute the water which they have collected, through poor hygiene practices; hence there is a need for health education in each project.

For both reasons, testing of the water quality for contamination by faecal bacteria is desirable, first to confirm that the water source is unpolluted and second to confirm the effectiveness of the health education. It is also desirable in order to check the performance of the finished scheme.

Unfortunately testing is not carried out as often as it should be. Field testing equipment is available but it is relatively expensive (roughly the cost of five protected springs or the cost of one and a half tube-wells fitted with hand-pumps). It requires skilled operators, a power source and does not produce immediate results. Hence biosensors would be an attractive option.

Biosensors developed to indicate the presence of E. coli should be accurate and sensitive enough for monitoring drinking waters. They would enable relatively unskilled field staff to assess potential sources with greater confidence; to assess the quality of water in completed schemes; and enable health educators to assess the effectiveness of their work: all with much more rapid feed-back than is possible at the moment.

Nick King

Some Biosensor applications

Biosensors are analytical devices which have particular advantages for water monitoring. Such a device can comprise an inexpensive, battery operated, portable meter with low cost disposable or reusable test strips. The test can be sensitive and simple to perform, and the result can be obtained within seconds. The result could be presented in

the form of a simple colour indicator (e.g. green/amber/red), or a precise reading such as a digital display.

A biosensor is a type of chemical sensor which uses a biological component such as an enzyme to determine the quantity of a particular chemical present in a specimen. They usually work by producing an electronic signal which is proportional to the quantity of the chemical. They can be designed to detect a single chemical, general microbial contamination, or a type of microorganism. For example, a pen-sized biosensor, the ExacTech, is commercially available and is widely used by diabetic patients to monitor their blood glucose concentration. The device consists of a small meter costing approximately US$100, into which disposable test strips each costing approximately US$0.5 are inserted. A drop of blood is placed onto the test strip, inserted into the device and the result of the test is displayed by the meter after 20 seconds. The diabetic patient can then decide whether an insulin injection is necessary. The test strips incorporate an enzyme and an electron transfer chemical in a carbon electrode matrix, covered by an absorbent membrane. The strips are cheaply mass-produced using screen-printing technology, and they are individually foil-wrapped for protection. A more recent method which has been employed to deposit biological reagents cheaply and accurately at high speed uses ink-jet printing technology.

Biosensors have also been developed to measure many other analytes, e.g. pesticides, cholesterol, alcohol, urea, and chemical pollutants. A portable biosensor device has been developed to measure total microbial contamination in particular applications, e.g. milk, and it will soon become commercially available. A biosensor to detect the presence of E.Coli in water is now feasible.

Biosensors for faecal contamination of drinking water

The primary source of the organism Escherichia coli is the human or animal intestine. Some strains of E.coli cause illness at a minimum infective dose of 107-1010 organisms. However, the main purpose of detecting this organism in water supplies is as an indicator of faecal pollution. A water supply contaminated by E.coli is likely to contain other organisms which can cause serious enteric diseases in man (e.g. typhoid, dysentery). Monitoring of the contamination of water by E.coli therefore permits assessment of the probable microbiological safety of drinking supplies.

It now seems possible that a small and inexpensive biosensor instrument could be developed to detect E.coli or coliforms in water supplies. The display of the results could be for example green=safe, amber=caution (boil for babies, sick and elderly people; retest advised after 12 hours), red=unsafe (boil if no alternative supply is available). The instrument could be simple to use, requiring only the insertion of a test strip and the addition of a drop of water. Such a device could detect gross contamination levels of 103-104 organisms/ml. The biosensor test could be very fast and require little power. For a meter used once or twice daily, the battery would be unlikely to need replacement for at least two years. The only training necessary would be to avoid manual contamination of the sample and of the sensitive area of the test strip. Depending on the technology used, it may be necessary to include a simple filtration step to concentrate the organisms, or to store the strips at temperatures below approximately 250C. The disposable test strips could conceivably be manufactured in an industrialised developing country for a cost of less than US$0.5.

For lower levels of contamination, a more sensitive biosensor device could be developed to monitor E.coli or coliforms at levels as low as 102 organisms/ml. This biosensor would probably involve an initial immunological recognition step. The operation would be simple, requiring the addition of a water sample to a vial which would then be placed into a portable meter for automatic processing. The result could be displayed after a few minutes as either a colour indication or as a precise digital reading. The cost of this meter would be somewhat higher than the test strip meter. This type of biosensor would have significant advantages over the current methods used to test water, e.g. rapid results, simplicity of operation and lower cost. For very low concentrations of bacteria the biosensor could be combined with a simplified culture technique to provide more rapid measurement down to the lowest levels required, i.e. one organism per ml.

In summary, a biosensor to detect E.coli could enable relatively unskilled field staff to assess water quality in less than one minute. This capability would be useful worldwide, and it would have a considerable beneficial effect on the health of the population in developing countries; its development depends upon the emergence of sufficient level of interest.

Susan Alcock
Anthony Turner

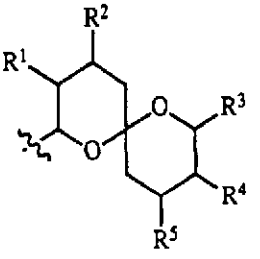
MICROPOROUS SOLIDS IN THE SYNTHESIS OF MACRO-MOLECULES

Zeolites are microporous crystalline alumino-silicates. The micropores can vary in size from 0.3 to 1 nanometer and the porosity can be 50% of the total volume of the crystal, so achieving an extremely large sorption capacity. A large number of zeolites and other microporous materials are now readily available. Some are stable to acid attack, while others are not. Zeolites and other microporous solids are being found to have apparent potential in two new areas: improved methods of synthesis of biologically active agents with complex molecular structures, in controlled drug release in the body, supported by research on drug transport through microporous materials. Desirably simple methods of synthesis of complex macro-molecules often cannot be used in practice because they produce a low-energy isomer rather than the higher-energy isomer which is frequently the biologically active form. However, the use of zeolites as catalytic agents seems likely to allow the desired isomer to be obtained with a significant saving in the current complexity of synthesis - and hence in cost of manufacture.

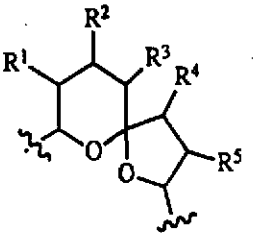
In a further innovative development, it is believed that microporous solids may be applicable to achieve slow release of various pharmaceutical agents within the body. A wide range of sizes of pores, cavities and channels are available for choice, to trap drug molecules, and by ion exchange it is possible to ensure that important cations are present in the solid which could also be released into the body. Tailoring the solid could result in controlling the rate of release of the drug molecules or cations; accordingly, the transport of molecules through microporous solids is currently being studied. (It is perhaps worth adding that a frequency response method is very suitable for studying such drug transport and release processes, and a convenient pseudo-random binary methodology has been encapsulated into a well developed suite of computer programs which may have wider use.)

The fundamentals of Stereoelectronic Control

Within the area of natural product chemistry, a vast array of substances possess one specific fundamental building block: the acetal unit; most notably as spiroacetal units, e.g. [Scheme 1] (1) and (2) and as an all pervasive feature throughout carbohydrate chemistry (e.g. 3). Typical examples of (1) and (2) include complex antibiotics of the oligomycin, rutamycin and cytovaricin types, and pest control substances (insect antifeedants) of the milbemycin and avermectin class. Oligosaccharides, glycopeptides, and aminoglycoside antibiotics are representative classes of important substances in sugar chemistry.



(1)



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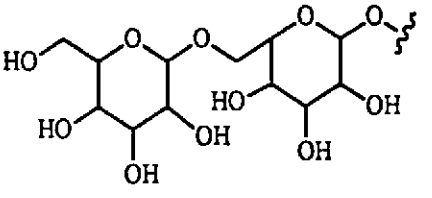
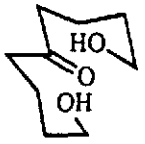


(3)

Scheme 1

While simply represented in two dimensions, the necessity to control stereochemistry, both in the relative and absolute sense, takes on a much more challenging aspect in three dimensions. Thus [Scheme 2] the simple 6,6 system represented by (1) R1 Æ R5 = H may exist in three distinct isolable forms (4), (5) and (6) when substituents are present.

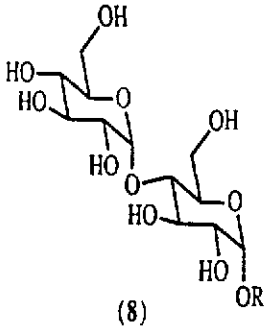
(4) (5) (6)



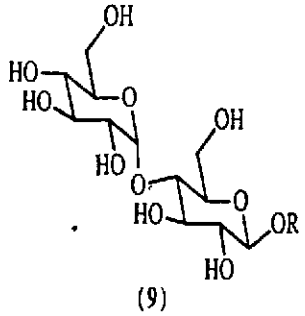
(7)

Scheme 2

Although each of these forms can in principle be derived by dehydration of a keto diol such as (7), in practice, a thermodynamic situation exists and only the doubly anomeric form (4) would be formed. Consequently, formation of structures (5) and (6) is more elusive. In synthetic terms, however, structural manipulation around the periphery of types (5) and (6), followed by rearrangement to type (4), would represent a novel and attractive alternative to existing methods.



(8)



(9)

Scheme 3

A similar argument applies in carbohydrate chemistry where the a glycosides (e.g. 8) are thermodynamically favoured by the anomeric effect but the b-glycosides (e.g. 9) are often the biologically active substances [Scheme 3].

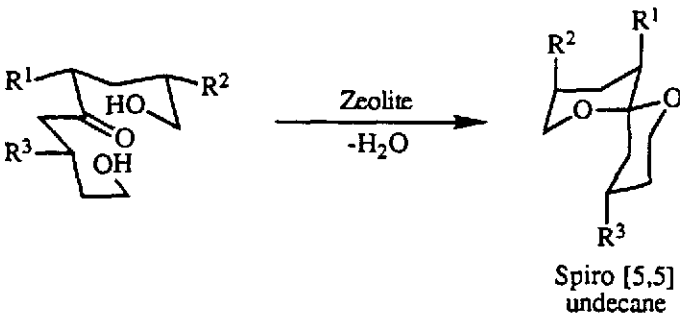
Curent research aims to manipulate and control the formation of the higher energy non-thermodynamic isomers within these classes through the use of zeolite (and other microporous materials) mediated cyclisation reactions. (A short preliminary study in the production of Jaegers ketal, an important perfumery ingredient, has indicated the validity of this approach.)

Initial studies are focussing on spiroacetol formation of simple substituted derivatives (e.g. 10) which may be derived from a variety of readily assembled precursors and involve either dehydrative or non-dehydrative approaches [Scheme 4].

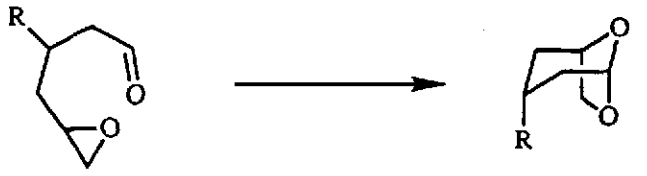
These studies will be carried out using a wide range of zeolites and other microporous solids and will also employ transition metal doped species which can coordinate to the oxygen atoms. In a similar fashion, novel approaches to the formation of b-glycosidic linkages can be considered [Scheme 5]. This formation of an oxonium ion on the zeolite surface could be followed by stereospecific attack of a second monosaccharide as in (A). Alternatively hydride delivery to an oxonium ion of a disaccharide formed from an orthoester derivative could be used as in (B).

The traditional catalytic chemistry of zeolites is considered to be small molecule hydrocarbon cracking. However the application of such catalysts to much more sensitive biologically important macro-molecules is an exciting and potentially new fruitful area; wherein opportunities for stereocontrol which circumvent laborious stepwise organic synthesis provide opportunities for practical commercial application.

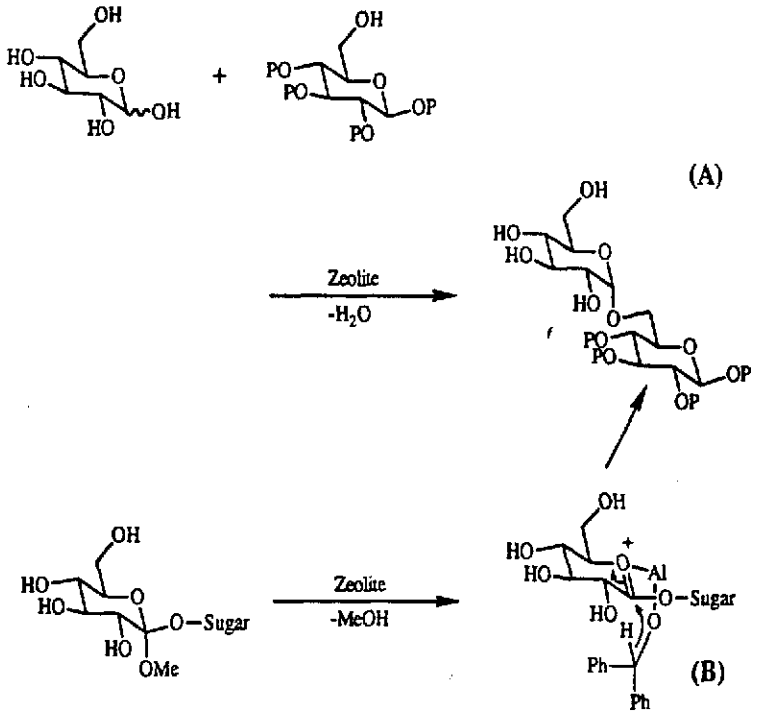
L.V.C. Rees



Spiro [5,5] undecane



Scheme 4



Scheme 5

HEALTH AND THE ECONOMY: A GLOBAL ACHR SUB-COMMITTEE REPORT

Summary

Following discussion of papers presented by Professor Thorbeke (Cornell University) and Professor E.O. Attinger (University of West Virginia) the ACHR set up a Sub-Committee to identify research issues concerning the inter-relation between health and economic factors which are likely to become important to WHO and its member countries, but which are not currently receiving sufficient attention; and advise the ACHR on further action. The ACHR was particularly concerned with possible interactions between health and economic factors outside the health sector: how economic factors affected health, and to what extent health affects economic development. The Sub-Committee (several ACHR members together with other co-opted experts, under the chairmanship of Professor B.McA. Sayers) has now produced a report; this report was considered by the ACHR Task Force on Science and Technology and the summary of that discussion supplements the main report. The Report, with the meeting summary appended, will be available through WHO channels later in the year; a summary follows.

The following Terms of Reference were adopted.

To consider:

- the utilization of economic

principles in the cost-effective promotion of health;

- the principles by which socio-economic and health policies can be designed to protect and promote health, in favourable or unfavourable economic circumstances;

- the nature of the inter-sectoral factors affecting, and affected by, health, and the implications for health of policies originating outside the health sector;

- the possible organization of financing and of health delivery structures;

- how health policies can be more effectively integrated into national decision-making;

and advise the ACHR.

The Sub-Committee divided into two groups: one concerned primarily with health economics, the other primarily with methodological issues. Both groups saw a vital role for a convincing model of the multisectoral interactions involving health, in order to clarify the impact of economic policies on health and the extent and manner in which health affects national economic development. Both groups also recognised the need for major methodological developments: notably in the generation and validation of new health-related and socio-economic indicators and in making full use of information about the operation and management of health systems that cannot be represented numerically - but only as 'knowledge'. Scope is thought to exist for 'knowledge-based' indicators. Additionally, more reliable and better understood information about health and health care delivery in the community is needed.

At macro-economic level, the health impacts and optimum management of structural adjustment policies are seen as important problems. At the sectoral level, the major issues include: identifying specific influences on health from outside the health sector; using this information to design integrated policies that target the most effective services to those most in need, by the most appropriate allocations of expenditures both within and outside the health sector; and the impact of environmental policies on health. Further research is also needed to support the efficient operation of health services. At the micro- or household-level, two main topics are of particular concern: the origin, extent and consequences of intra-household differences in nutrition and health, especially considering vulnerable groups such as women; and the targeting of health services to households and groups at risk.

Behavioural factors in relation to health are seen as a significant area for research, not least in understanding health-damaging behaviour or determining how to encourage health-promoting patterns. Methodological developments are necessary in order to speed progress in these areas because much of the information that can be acquired about behaviour is achieved by observation rather than measurement and so comes in the form of textual 'knowledge' rather than quantitative data. Formal and objective ways of handling and structuring 'knowledge' about particular problems is an urgent requirement; successful development would influence much other research. The Report sees potential for progress in these directions.

These topics form up into three main progressive lines of research: on the design of new indicators; on the investigation of behavioural factors; and on the more sensitive characterisation of quantitative health and health-related variables. They would lay the foundation for a new study of the multisectoral interactions involving health.

B. McA. Sayers

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ACHR31/92.12

ORIGINAL: ENGLISH

ADVISORY COMMITTEE ON HEALTH RESEARCH

Thirty-first session

Geneva, 28 September-2 October 1992

Agenda item 10

Appendix 5

RESEARCH CAPABILITY STRENGTHENING: ESSENTIAL FEATURES[1]

[1] Prepared by Dr Lim Teong Wah, Regional Adviser, SEARO

RESEARCH CAPABILITY STRENGTHENING: ESSENTIAL FEATURES [1]

The promotion of research capability strengthening (RCS) in developing countries is a long term task. Past experience has shown that it takes on average a minimum of 5 to 10 years before its impact can be appreciated in terms of scientific productivity. The Special Programmes' (TDR/HRP/GPA) involvement in RCS have indicated that a series of actions and steps are required in the approach to RCS beginning from creating an awareness among decision makers of the value of research in health development, leading to understanding of the priorities and fundamental research issues for improving health care delivery, to the appropriate development of human resources for health research, to research aimed at improving health services, in devising disease control strategies and to research training in the countries (or similar) own environment. Further it is important that donor agencies appreciate that it will need a long term commitment for funding support which should have appropriate flexibility to meet rapidly changing situations. The essential requirement, however, is the creation of a "critical mass" of relevant human skills for research which can also contribute to health development.

The ACHR Subcommittee on research capability strengthening thought it desirable to make a brief survey of selected research institutes with an established reputation in order to define the critical determinants of success. These small case studies were carried out in: the University of Ibadan, Nigeria, a group of institutions in Pakistan, the High Institute of Public Health, Alexandria, Egypt, Mahidol University, Bangkok, the All India Institute of Medical Sciences, New Delhi, the National Institute of Health and Family Welfare, New Delhi, the National Institute of Health, Research and Development, Jakarta, the Institute of Medical Research, Kuala Lumpur, and the Network of PAHO centres.

It appeared from the study that the main features, which determine the success and sustainability of a research institution, can be grouped at different levels i.e. institutional, national and international.

Institutional level

1. A history of consistently strong leadership and its commitment to quality with constant improvement. The key to success is that there should be no compromise with mediocrity.

2. A tradition of scientific enquiry coupled with a sense of discipline and rigour of research management including mechanisms for regular monitoring and advice. At the same time, an Institution should be assured about long-term security.

3. A critical mass in professional, technical and financial terms enabling the institution to maintain its drive and momentum in a sustained way. This can only be ensured if it is self renewed through the graduate programme with the understanding and backing of budgetary authorities.

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[1] Prepared by Dr Lim Teong Wah, Regional Adviser, SEARO

4. A systematic documentation of professional and research activities including publications. This will enable monitoring of scientific productivity, which is one of the indicators used for the assessment of performance.

5. An environment conducive to research, one of the main conditions for motivating young scientists. This would also include naturally an appropriate infrastructure such as technical and bibliographic facilities.

National level

6. A recognition of research as a tool for decision-making and a firm commitment to such research is essential. This commitment, both political, including administration, and scientific, should generate appropriate support. A close relationship with policy planners and decision makers will ensure the stability of such support at government level, particularly the Ministry of Health. The importance of the national role is emphasised, since without it the research effort would not be sustained. The NIHRD Indonesia and the NIHFW India, both function with the Ministry of Health.

International

7. It is important to promote external cooperation and networking to attract further technical support and funding from international sources. As an extension of the "twinning concept", international participation in networking arrangements with other similar institutes for training and collaboration in priority research areas should be of mutual benefit. The success in obtaining outside grants is considered to be a good indicator for assessing performance. Beyond core funding of the institution, a substantial proportion of research funds may come from outside funding agencies who use strict quality standards in awarding grants: the ability to compete and succeed in this competitive environment is a measure of success for the institution.

Past experience

In view of the wide spectrum of possible research and the marked variation in the availability of research infrastructures in the developing countries, the needs and priorities for research capability strengthening will vary considerably from country to country and from time to time. Research capability strengthening, would be needed for a variety of research activities and for this reason a number of mechanisms may be used appropriately. What is required is a flexible and selective approach to research capability strengthening. In this context, perhaps the experience of the Special Programmes can be examined to see how it can be applied in the case of developing countries. The research capacity in developing countries can be categorised generally into three levels. There are those with limited potential and weak base, those with high potential and weak base and those with high potential and strong base, but all still in need of research capability strengthening. A differentiated approach to research capability strengthening would be required for the different levels of development i.e. least developed countries, intermediate and advanced developing countries. For example in the least developed countries with limited potential and weak research infrastructure, investment should be made in individual training and in identifying and strengthening potential research groups. They should focus on the development of human resources through short term, skill-oriented training initially; developing capacity for operational and health services

research; linking with other strong research groups for training and visiting experts; and creating research infrastructures that can be sustained by national resources.

The advanced developing countries, should direct their strong research groups to participate as partners in networks to participate in collaborative multicentric research or for product development. These "prototype" institutional arrangements could offer on a regional or subregional basis, a comprehensive package of facilities in training, research, services, and expert advice. In this network arrangement also, groups from the least developed countries could be linked. To quote: the diversity of health situations and research potential in different countries highlight the need for differentiated approaches that can be adapted to individual countries and specific circumstances.

Scale of support

The scale of support required if the differentiated approach is used, would depend upon the above classification. However even for the least developed countries when the support is modest, it would have to be sustained for a period, of at least three to five years. For these countries too, emphasis should initially be on the "trans disease" disciplines of epidemiology, the social sciences, and economics which may have been neglected previously but are now increasingly gaining in importance in the control of disease and in health development. Ultimately it is the economic and political environment of the country which is the determining factor as to whether all these efforts will be successful or otherwise. If the economic and political environment deteriorates then the research capacity in the country will also deteriorate and this will lead to brain drain. The scale of support (in terms of duration and money) required for "broad spectrum strengthening" (e.g. public health sciences) in a WHO region or subregion (say, in Africa) is not known, since the experience acquired so far is not sufficient to draw a conclusion.

The "differentiated" approach

It is recognised that there are different levels of development in relation to research capacity in the developing countries, and it is suggested that a differentiated approach (as stated above) could be applied. As a start, a few developing countries can be selected. The health profiles of these countries can then be prepared, a health research needs assessment can be carried out (through a national workshop), a modest research agenda formulated, a national coordinating committee constituted, key individuals and institutions identified for early training and strengthening and a few priority health research projects (as in the research agenda) selected for implementation . It is further suggested that WHO should play a leading role in this process, especially the regional offices. The WHO regional offices are ideally situated to select countries in their regions to participate in carrying out research needs assessment, to formulate a research agenda and to select individuals and institutions for training and strengthening. Through WHO mechanisms and resources, seed money can be provided to initiate these new arrangements; and through its good offices arrange for other funding agencies to be involved. Similarly using these same mechanisms within WHO, these projects in the countries can be independently monitored, evaluated and when appropriate, suitably advised. Greater co-ordination would be required within the WHO system and between WHO and donor agencies. Funding arrangements should be varied and flexible in order to meet the different levels of requirements of the developing countries. For example, joint

funding can be initiated between Regional Offices and the Special Programmes to provide small grants to promising young scientists. This will serve to promote research and in capacity building through the undertaking of well-planned, time limited research projects on topics of concern to national disease control programmes. What is important is that in such a small grants scheme, the scientists are encouraged to formulate their own research proposals which can then be developed in a training workshop for submission for funding support. This research training component is vital for the successful outcome of the project. The gathering of young scientists in such a workshop for research protocol development will further enhance the strengthening of linkages between researchers and institutions within developing countries, as well as with those in developed countries. The ultimate aim of providing research capability strengthening to developing countries is to generate in these countries self reliance to conduct "essential health research" which will contribute significantly to the solution of some of the critical health problems affecting these countries.

The impact of such efforts could not be overestimated in so far as their effects should be felt not only at the level of scientific productivity but also at the operational level: creation of a critical mass of competent professionals, improving health care delivery, and ultimately achieving success in disease control programs.

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ACHR31/INF.DOC./92.18

ENGLISH ONLY

ADVISORY COMMITTEE ON HEALTH RESEARCH

Thirty-first session

Geneva, 28 September-2 October 1992

Agenda item 12

Appendix 6

RESEARCH STRATEGY UPDATE

(1)

(1) Prepared by the Secretary, jointly with Dr K. Leppo, Professor B. O. Osuntokun, Professor B.McA. Sayers (on the basis of progress reports of ACHR Task Forces and Subcommittees)

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RESEARCH STRATEGY UPDATE

1. Conceptual framework

1.1 Restatement of the current strategy

A document entitled "Health Research Strategy for HFA/2000" was presented for information to the Executive Board in January 1986. The main conclusions of the strategy report were the following:

"Disease is not an inescapable attribute of the human condition; except when determined at or soon after fertilization, it results essentially from unhealthy ways of life and can be prevented if those ways can be changed.

For almost the whole of his existence man, like other living things, was unable effectively to control his environment or limit his reproduction, and the chief causes of sickness and death were deficiencies of basic resources or hazards arising from competition for them. These are still the predominant causes of disease in developing countries.

In developed countries during the last few centuries it has been possible to exercise a considerable degree of control of the environment - in relation to health, particularly by increasing food supplies and improving hygiene - and, for the first time in human experience, the advances were not lost because of rising numbers. These advances have led to the decline of diseases (chiefly the infections) due to deficiencies and hazards; but, ironically, they have resulted in a new pattern of noncommunicable diseases attributable to profound changes in the environment and in behaviour.

The research strategy of WHO should be devised primarily in the light of the commitment to substantial progress in health by the year 2000, particularly in countries where the need is greatest. Against the background of the preceding analysis the following are the steps which are likely to lead to rapid advance:

(a) Control of diseases associated with poverty. The research needed is essentially of the health systems type, as the effective measures are well known: provision of sufficient and safe food; clean water; adequate sanitary facilities; fertility regulation; immunization and treatment of common infections. Individuals and communities have important roles to play in relation to their own health behaviour and to ensure implementation of the required measures. The aim of research should be to assist administrations and communities to achieve these advances as directly and quickly as possible.

(b) Control of diseases, both infectious and noncommunicable, specific to the tropics. These diseases do not respond adequately to the relief of poverty and the measures referred to under (a) and they should be attacked with all the resources - laboratory, clinical, epidemiological and socioeconomic - that can be brought to bear on them.

(c) Control of diseases associated with affluence. This requires investigation of the environmental and behavioural influences which have led to the noncommunicable diseases now predominant in developed countries and beginning to appear in the developing world. In some, the major influences (tobacco, alcohol, occupational hazards, etc.) are already known, and the research required is predominantly concerned with behaviour; in others the influences are unknown and research, particularly epidemiological, is needed into disease origins.

(d) Treatment and care of the sick. Even on the most optimistic assumptions about disease prevention, it will be necessary to make extensive provision for the treatment and care of the sick. For this we must rely mainly on biomedical research (which also, of course, contributes powerfully to the preventive measures). WHO's contribution, although modest financially, will continue to be important. It contributes to the success of biomedical research in many ways, particularly by ensuring that new knowledge which becomes available is widely known and quickly applied.

(e) Delivery of health services. The critical determinants of health should be addressed through health services that are relevant to local needs and cultures and aim to cover entire populations, particularly the most vulnerable groups. To join with policy-makers and communities in assessing needs, planning, financing and implementing programmes and evaluating them in terms of coverage, efficiency and effectiveness is the challenge for WHO in health systems research.

The application of these principles will inevitably differ between regions and between countries within the same region, according to many variables: the nature of the predominant health problems; the present level of health; economic resources; cultural, political and religious traditions. However, the aim should be common to all: to focus research where it will result in rapid advance to the health for all goal of improved health.

Without neglecting the care of the sick, the strategy places the emphasis on achievement of health through prevention of disease. This approach in the short- and medium-term does not overlook the long-term objectives which WHO has always set for itself, based on recognition of health as a state of complete physical, mental and social well-being. The achievement of these objectives does of course depend on advances in society, many of which are not within the responsibilities of health administrations: particularly elimination of poverty; universal education; full and rewarding employment; and most important of all, avoidance of war in all its forms".

1.2 Reconsidering the dimensions of health

Various formal definitions have been proposed for "health". But "health" is a complex concept having multiple dimensions; accordingly, a comprehensive strategy of research in health should take account of this complexity. Amongst the major dimensions are the following:

perceived individual quality of life
quality of life as directly related to health
reserve against biological or other health-damaging assaults
intensity and nature of risks to health
existing health defects
existing health-relevant deficits.

Examination of these dimensions shows that these too are concepts assembled from a variety of non-exclusive elements, such as:

1.2.1 **perceived individual quality of life:**
adequate food
accessibility and quality of water
housing
employment and earning: income
other income
social environment
psychological environment and satisfaction level
degree of personal development
climatic factors

1.2.2 **Specific quality of life as directly related to health:**
access to health care - availability of services
access to safe water and sanitation
literacy and general education level
intellectual: capability for education
mental: capability for employment
physical capability for employment
access to gainful employment
stress factors
anxieties about health and about access tohealth car

1.2.3 **Reserve against biological and other health-damaging aspects:**
physiological history
pathological history
natural immunity
acquired immunity : natural or by immunisation
body weight at birth
metabolic maturation
nutritional history
health-promoting behaviour patterns

1.2.4 **Intensity and nature of risks to health:**
environmental hazards: physical, climatic, biological, social
health damaging behaviour (smoking, substance abuse)

1.2.5 **Existing health defects:**
physical disability of the individual
precursors of later morbidity
existence of incipient progressive disease
known genetic factors
low expectation of life figures for the cohort/family/district
morbidity rates for the cohort/family/district

1.2.6 **Existing health-relevant deficits:**
nutritional deficits
contaminated water
uncertainty of income
poor quality/non-permanent housing

Some of the elements listed are observable or measurable (at least in principle), like "access to safe water and sanitation" or "income", whether assessed at individual or community level. Other elements may be assessable only by expert judgment, or resolved further into directly observable facts or measurable variables. The entire picture constitutes a "knowledge map" showing how our common understanding of the high level concept "health" is assembled from many interacting inputs arising from a considerable variety of fundamental observables or variables in various "domains".

Rigorous analysis along these lines and close examination of the "knowledge map" offers clear indications of the scope of the "health" concept. At the lowest level, the observable facts and the measurable variables group into "domains", overlapping and non-exclusive. A typical choice of grouping could include: physical, environmental, household, community, psychological, medical, nutritional, occupational, economic, societal and cultural domains. The hierarchy of the "knowledge map", that links the observations and variables at low level in the various domains through intermediate concepts to the high-level concept of "health" is indicated largely in terms of textually-described linkages and dependencies. The linkages, dependencies and interactions within and across domains are represented by available "knowledge", acquired from expert observers and analysis. (Such "knowledge" itself also usually needs to be expressed textually, as statements of fact or belief about the relationship concerned.)

Even superficially, it is evident that there are "domains" to which little attention has been given in identifying significant sources of damage to health or likely means to enhance health status, in considering priorities for research and in formulating health or health research strategies. This certainly applies, for instance, to economic and psycho-social domains; but more generally, defining these various contributing domains can serve to focus attention on potentially important factors and issues. Within each domain, one can ask: is intervention likely to be needed, and if so where? Tactically, matching needs against existing knowledge and against current practice will then help to identify areas within such domains in which there is scope - and a need - for research to uncover, or devise, adequate solutions to existing problems.

There is a further generic issue. Whenever a research solution leads on to an intervention in order to influence the quality or impact of available health care, consequences beyond those immediately targeted will inevitably follow. These need to be understood, preferably prior to any actual intervention. This is because, at least in some cases, interventions lead to very complex consequences: across domains and also across sectors. The search for understanding would be assisted greatly if the 'system' could be realistically modelled, since the consequences of the proposed intervention could then be determined on the model itself. However, the present technology of modelling is wholly inadequate for the kind of socioeconomic system that health planners have to handle. On the other hand when, in addition to the quantitative data and relationships that econometric-type analysis requires, observational and factual "knowledge" about the system can be incorporated, a substantial advance in capability and potential of modelling can be expected. The technology for representing "knowledge" by computer is well established, and so is the means for making logical inferences using textual information. But without

further investigation and development, it is impossible to forecast if such a model will yet be sufficiently realistic to be useful. Nevertheless, what is certain is that modelling based upon a substantial component of qualitative, textually expressed "knowledge" will have three clear advantages. First, it should be much more understandable than a complicated mathematical model. Second, the assumptions operating in each part of the model should be readily identifiable. Third, the inherent validity and completeness of the logic built into the various segments of the model can be validated; the techniques of computational logic should be applicable. At a less elaborate level though, simply having a validated "knowledge map" may be an effective basis for alerting planners to the possible consequential results of a health intervention. "Knowledge" as well as "numbers", in brief, should become an important component of health research and of its strategy.

Turning to the health delivery system, from the socio-economic system within which it must work, a further issue needs attention. Systems created to achieve health delivery are staffed by individuals of varying abilities, training and motivations. Their performance is, to some degree, a behavioural matter; motivation at all levels is relevant to the quality of system outputs, and "knowledge" about the determinants of organisational behaviour is a vital necessity.

Pursuing these lines of thought, and examining the interim recommendations of the various GACHR Sub-Committees and Task Forces in the light of the strategic framework outlined above, it is possible to identify an immediately important series of practical issues that need to be emphasised or perhaps taken fully into account for the first time. They bear significantly on the strategy for health research by topic, by emphasis, by scope and by tactical approach.

i. In the 1990's it is inconceivable that health issues can be isolated from economic imperatives, causes and consequences - and indeed, social consequences. What are the implications of the economic context in which health is influenced, and is open to improvement?

ii. The inter-relation between health development and national development needs to be understood.

iii. Determinants of health are partly inter-sectoral. The pathways and mechanisms need to be identified because interventions to influence health may have inter-sectoral consequences and the the likely consequences of interventions should be questioned in advance.

iv. Interventions at primary health care level are likely to result in increased demand for secondary and tertiary health care, but after a temporal delay. More generally, the fact that some effects will be delayed must be taken into account in planning interventions, and its consequences understood.

v. The corollary of the call to understand the relation between health and its intersectoral determinants, and to understand the detailed consequences - as time passes - of interventions, is the development of better models of the relevant system. Much effort has been invested in many countries on socio-economic representations by mathematical modelling and computer simulation. It has not been notably helpful. One reason is

that many facts and relationships that are certainly significant, if not critical, to the behaviour of socio-economic systems, cannot be represented mathematically at all. Nevertheless, non-quantitative "knowledge" can and should be incorporated in some way, because the alternative: omitting these elements altogether: is known often to lead to wholly unrealistic conclusions.

Furthermore, where measurement is impossible, using "knowkedge based" information supports and makes feasible a systematic approach aiming at the comprehensive, informed understanding of system behaviour.

vi. A systematic approach to understanding system behaviour as a basis for the exploratory trial of possible actions, raises other essential issues concerning the behaviour of dynamic systems. The entire structure of systems can change when specific thresholds of activity level are exceeded. It may be true, to take a simple example, that investing resources in improved nutrition of the population from which a work force is derived may aid economic development through the supply of effective labour for new industry. On the other hand, when the nutrition level is below one threshold, or above another, utilising available resources for investment in industry might be a more productive and sustainable way of ensuring adequate health levels than investment in nutrition. In the first case, economic growth is essential to sustain investment in nutrition: in the second case, further increase in calorie intake is, on the contrary, likely to lead to obesity and the typical sequelae of over-nutrition.

vii. Behaviour patterns may be significant determinants of health. In particular, it is possible that health damaging behaviour patterns are strongly linked to individuals' "perceived quality of life".

viii. Behaviour is also relevant to system performance. How well a health system delivers its intended outputs is undoubtedly linked to many factors; but a major role must be attached to behavioural characteristics of the personnel involved in the system: their motivations, the extent to which they are willing to maintain effective interpersonal relationships required by the structure of the organisation, and ramifications of these factors. A "behavioural model" of a health delivery system may be a desirable basis for understanding the weaknesses of the system and the necessary remedial steps. Such a model would, again, necessarily be a "knowledge based".

ix. Major methodological research is needed to provide the tools to investigate the development of behaviour patterns, the intersectoral determinants of health and, those generally, such issues as the linkage between health and the economy.

x. Effective delivery of health care requires appropriate technique; the development and design of appropriate technique is the subject matter of technology. A policy for technology, drawing upon the necessary basic science, and effectively implemented, would make WHO ready to advise member countries as their priorities on health care delivery focus on different problems in turn. It would attend to problems likely to become high priority in the future, reviewing the options that could be offered using existing technology, if it does exist, and considering how to develop the required technology if it does not currently exist. It is a corollary that the newest scientific and technological developments should be monitored to

identify long term potential to support health care in developing countries.

xi. The most valuable technology cannot, however, be effective unless it is absorbed and implemented by willing, informed and motivation personnel. While it is certainly feasible to identify and motivate the expert personnel needed to understand the technology and modify it for their own country purposes, it is less easy to solve the potential behavioural problems that would attend the decision to acquire the technology and put it into use. These aspects of the acquisition and use of new technology need to be further understood.

xii. The basic raw material for deciding action is information. The technology for capturing, organising, storing, retrieving and displaying information is no longer a remote luxury for member countries - it is rapidly becoming the crucial tool which, properly used, ensures that scarce resources can be used most effectively.

xiii. Evolving problems in health, such as the demand for specialised care needed by the growing proportion of the elderly, can sometimes be recognised from well-behaved trends. The application of well-chosen methods, applied to sensitively-chosen variables, should become routine for such purposes, provided that the properties of the variables are sufficiently well understood. However, not all health or socio-economic variables are free from unpredictable events (the emergence of new viruses, for example) and change of character (demographic changes due to urbanisation, drought, or to civil war for instance, create new patterns of morbidity.) Nevertheless, study in morbidity for instance could, in the right circumstances, offer early indications of the need for action. More generally, however, there is a case for an internationally-focussed health "alert" system which would sensitively monitor the emergence of special problems. While it cannot forecast the unpredictable (Chernobyl, the Toxic Oil Syndrome in Spain, for instance) it could be charged with the responsibility of recognising associated signs from different countries for instance, that ultimately assemble into the picture of a developing problem, and monitor the trend of its development through to the point at which a health "alert" should be issued. (Reference, 1974 Report).

xiv. The quality of epidemiological data used for planning must be satisfactory and known to be so. If quality cannot be assured, new indicators or new methods of data collection must be designed.

xv. Certain new problems are now being recognised; for instance, those associated with vulnerable groups, which have their own special needs.

These new or newly-emphasised issues are not merely items selected *ad hoc*; they constitute substantive and timely issues identified within a conceptual framework that can be used as a guide to updating the health research strategy.

Whilst current strategy identifies problem domains by classes of origin and precursor of disease, this update recognises that there are other more general ways of establishing a framework within which to define strategies for research. For instance, as discussed above, it is feasible to focus on factors that explicitly contribute, positively or negatively, to health; this opens up wider issues than if attention is dominantly directed to disease and to issues of prevention and treatment. Widening

the focus in this way clarifies the available routes for action and identifies where research effort should be invested.

2. Assessing needs and setting research priorities

2.1 Whose needs and whose priorities?

2.1.1 The research needs and priorities of WHO will inevitably differ between regions and between countries within the same region according to a number of variables: the nature of the predominant health problems; the present level and changing pattern of health; the available economic resources and the appropriate human development policies; and the cultures, political and religious traditions. As pointed out by Global ACHR (1986), one objective should be common to all - to do the kinds of research which will make it possible to advance rapidly to the goal of Health for All, and achievement of acceptable human development (including living a long and healthy creative life, and access to resources needed by a decent standard of living - UNDP: Human Development Report; New York, Oxford University Press, 1990, p. 1). It is probable however that regional needs and priorities will be based on the synthesis of country ones, and the global emphasis will in turn reflect a distillate of regional and country requirement.

2.2 Country needs and priorities

2.2.1 A health research strategy must be based on the well established concept that the determinants of health are of multisectoral nature and that there should be an appropriate balance between preventive and therapeutic measures and between basic and applied research. Furthermore, what is referred to as essential national health research should cover a broad spectrum of activities ranging from elementary fact finding and situation analysis to the fostering of innovation and experimentation. (Commission on Health Research. Health Research essential link to equity in Development, Oxford, Oxford University Press, 1990; WHA 43.19; African ENHR Conference, 13-16 April 1992, Kampala, Uganda.)

2.2.2 Research on country-specific problems must extend beyond the narrow confines of the health sector, and should address health needs, disease profiles, resource allocation, programme evaluation, health financing and other issues concerning the objectives and operation of a country's health system. (Task Force on Health Research for Development. Essential National Health Research: A strategy for Action in Health and Human Development, Geneva, 1991).

2.2.3 Determination of national research priorities and implementation of national health research policies constitute a sine qua non to meaningful health care development. In order to be relevant, national health policy must be based on valid data derived from scientific research.

2.3 Global WHO's Research Strategy

2.3.1 In articulating a Global Health Research Strategy, the following considerations have to be taken into account.

i) Human genetic constitution is much the same today as it was a thousand years ago, before the advent of any form of pastoral or agricultural

activity. We now face vastly changed conditions of life with the genetic equipment of hunter-gatherers.

ii) In developed countries the modern transformation of health and the associated increase of populations began more than a century before medical intervention was possible and must therefore be attributed largely to improvements in living conditions.

iii) The possibility of the control of infectious diseases by environmental measures and immunization has been a major factor in promoting public health.

iv) The recognition in the last few decades that most non-communicable diseases are also preventable by changes in living conditions and behaviour. Perhaps the most striking evidence is the recent decline of coronary deaths and the findings that most cancers are potentially preventable.

v) The greatest challenge in health care delivery is that if we were able to apply efficiently and effectively what is known from basic research in biological and physical sciences to the relevant problems, considerable progress could be made in health development and in improvement of community health.

vi) Most research and development is taking place in the developed countries. Indeed, more than 80% of the world's GNP is provided by a dozen developed countries which contain fewer than a quarter of the world's population and which spend more than 30 billion dollars annually on health research. On the other hand, developing countries spend less than 30 cents per capita on health research or 100 times less per capita than the developed countries. Yet it is in the developing countries that most problems exist in relation to the basic determinants of health, such as favourable socio-economic milieu, good nutrition, population control, literacy, environmental and food sanitation, employment and equity of access to health care.

vii) Any meaningful health research strategy must give special emphasis to prevention of certain diseases which afflict large populations (e.g. tropical diseases, AIDS, diseases of poverty especially due to deficiencies and hazards), to epidemiological transition including rapid aging of population: to the needs of the vulnerable and socially and economically marginalized groups, to forecasting trends in changes in health and disease, and to improvement in treatment and care of the sick. Diseases associated with poverty can be controlled through well known effective measures. The research needed here is of the applied type. Tropical diseases are identified by certain characteristics: their geographical distribution; their importance as causes of sickness and death; their relative neglect, at least in the recent past, and their intractability - their failure to respond adequately to general improvements in conditions of life.

viii) The Health Research Strategy of the WHO must take into account WHO's limited resources. For example, the resources of WHO, including voluntary funds available for promotion of research, are minuscule, representing less than 0.5% of the worldwide health research effort. They are, however, not negligible in comparison to the health research

expenditure of the developing countries. It would be unrealistic to expect WHO to fund on a large, general or non-specific scale fundamental or basic research, against the backdrop of the enormous resources available from other sources for this type of research. On the other hand, through its catalytic efforts, and through information exchange, WHO can contribute to investigations aimed at promoting applied research. WHO's commitment to health equity means that its research efforts should focus preferentially on ways and means to reduce disparities between the haves and the have-nots in health.

ix) In formulating a Health Research Strategy, one important issue is in determining priorities. To what should most of the effort be directed and what kinds of problems are likely to be successfully solved or tackled? In this regard, classification of diseases has been based on disease origins rather than on disease mechanisms in order to provide insight into the means and feasibility of disease control.

x) The Global Health Research Strategy of the WHO must be able to accommodate geographic, regional and country differences in approach, in priorities and in implementation. Of special concern must be the development and/or strengthening of research capabilities in developing countries, so that these countries can meaningfully participate in the utilisation of health research to improve the health of their people.

xi) The Global Health Research Strategy must emphasize investment in people as both the ends and means of development, for although improved health-nutrition and education are ends in themselves, healthy and educated human beings are also the principal means of achieving human development and economic growth. The capacity to develop is dependent on health. Health is an essential objective of development (World Bank, 1990 "Sub-Saharan Africa: From Crisis to Sustainable Growth"). Investment in human capital including importantly basic health care and primary education for children is one of the most effective means of stimulating long-term economic growth and improving general welfare (UNICEF, State of the World's Children, 1992, p. 27). Research to demonstrate further the effects of improved health on other sectors would attract further support and resources for health care development.

xii) It is important that a research strategy must be dynamic. For example WHO as of now is laying emphasis in its programmes on five main areas: - (i) health of man in a changing environment (ii) food and nutrition for a healthy life (iii) integrated disease control (iv) information needs for advocacy, educational, managerial and scientific purposes (v) intensified health development action in, and support to developing countries, especially those most in need. There is also the basic and fundamental thrust of WHO's programmes on protecting and promoting health, ensuring access to health care, mobilising resources for health, monitoring and evaluation of public health action, evolution of new mechanisms and new avenues of effective action to meet the increasing health demands in circumstances of economic uncertainty, and to reach the objectives of the World Summit for Children in the 1990's (The Work of the WHO: 1990-1991, Biennial Report of the Director-General, 1992; A paradigm for health: EB89/11; 9 December, 1991). Immediate future research strategies

would also relate inter alia to application of emerging areas of science and technology, evolving problems of critical significance to health, as well as new and better indicators of health development.

2.3.2 In 1976, the Global ACHR suggested criteria for selecting priority areas for WHO research efforts and these criteria are still valid today. They are:

i) The magnitude of the problem, especially in the developing countries.
ii) The suitability of the problem for international collaborative research efforts coordinated by WHO.
iii) The priority of the problem as perceived by individual countries themselves.
iv) The relevance of the problem to the socio-economic development of Member States.
v) The probability of finding solutions (or important clarifications) and the feasibility of applying them nationally, including the time and costs required.
vi) The availability of manpower, facilities and funds to carry out the research to ensure as far as possible the achievement of significant results.
vii) The involvement of the countries themselves, especially their scientific communities and facilities, in the research efforts to be undertaken preferably where the problem exists, so as to upgrade national research capabilities.
viii) The level of ongoing research efforts, both nationally and internationally, to solve the problem.
ix) The benefits which would accrue from the application of the results of successful research efforts, especially in the developing countries.
x) The potential usefulness of the results of the research in the solution of other problems.

2.3.3 The recommendations of WHO's Global ACHR (1986) are also valid in respect of its Global Research Strategy with special emphasis on the following areas.

- The first priority should be to encourage and assist research which will raise the standard of health in developing countries and in certain deprived sub-groups of developed countries. The steps needed are well-known provisions of sufficient food, clean water, sanitary facilities, limitation of fertility, and immunization against some of the common infections. The research required is essentially of the health systems type. It is probably true to say that if these basic steps were implemented throughout the world by the year 2000, one of the most important aspects of health for all would be achieved even if nothing else were done; if these measures are not implemented HFA will not be achieved whatever else is done. The effectiveness of these measures is already evident from the rapid progress recently made in some developing countries.

- Improvement in the health of developing countries also requires advance in knowledge of diseases characteristic of the tropics. They differ from the conditions referred to above in that they do not respond adequately to a rising standard of living, and basic knowledge required for their control is still lacking. They therefore need to

be tackled with all the research resources that can be brought to bear on their prevention and treatment.

- Second only to the primary goal (discussed above) should be promotion of research on the non-communicable diseases, predominant in developed countries and now threatening to advance in developing countries which are at risk of having the worst of both worlds. In some, the influences, such as smoking and alcohol, are well known, and the research needed is largely of an applied kind. But in many diseases the hazards have not yet been identified, and the research required is essentially epidemiologic, to unravel the disease origins. In these diseases the predominant influences are behavioural.

- Even if progress in prevention is as rapid as we would like it to be, the treatment and care of the sick will continue to be of the highest importance. On the most optimistic assumptions it will still be necessary to care for patients and disabling and life-threatening illnesses, as well as with the many kinds of morbidity which diminish the quality of life from day to day.

- A further requirement is for research on health services that address the critical determinants of health (health systems research). The precepts of HFA imply that such services cover entire populations, particularly the most vulnerable individuals and groups. The research questions are formidable: how to join with policy makers and communities in assessing needs, planning, financing and implementing programmes, and evaluating them in terms of coverage, efficiency and effectiveness. Health services, to a substantial extent, are specific to local circumstances - traditions, resources, politics, culture - and it is necessary, therefore, that there be local capability for this kind of research. This calls attention to the need for development, organization and support of research on the delivery of health services, which requires, in turn, national, regional and international collaboration.

3. Strategy update

3.1 The relevance of the economic environment to health

Affordable health care is dictated by economic factors everywhere - at the macro-level with the allocation and distribution of national resources; at the meso-level with the utilisation of these resources; at the micro-level with the impact of family budgets on health care. National policy, often driven by international forces, dictates the resource allocation for health in the light of national economic needs, but it is recognised that the state of health of the population may influence the nature and pace of economic development. Limiting resources into the health care delivery system not only increases the problems of managing the health system itself, but demotivates the personnel who are require to operate the system, with almost inevitable consequences. Structural adjustments have their damaging effects on health, perhaps dominantly, at the household level, on those least able to face them.

Isolating these examples illustrates that a wide range of issues need to be faced in taking full account of the economic dimension in health.

Research is needed on many fronts. Drawing upon the work of the Sub-Committee on Health and the Economy and on the review of its recommendations carried out by the Task Force, a strategy for research can be set out. This specifies both substantive tasks and the methodological research that will be needed to carry out many of them. Four main areas are identified: Health care in the national context; Health and national development including multisectoral effects involving health; New indicators; Behavioural factors in the context of health.

3.1.1 Problems of funding health care in the national context

The impact of national policies on health is a central issue; it is particularly significant where adjustment policies have been put into effect. Adjustment is not totally an economic matter; it has a major social impact, including on health.

When policies of adjustment take effect, three types of consequence may follow in the health sector: a direct effect on health (e.g., a shift from foodcrops to export products impacts negatively on nutrition); an imposed deterioration of health services because of reduced availability of resources; an impact on personnel in the health sector because, for instance, they are deprived of full facilities and unable to make full use of their training and professional skills, leading to a cycle of deterioration of morale and subsequently, standards.

Accordingly, much more needs to be known about the effects of adjustment, attitudes of populations to the effects, means for ameliorating the consequences for the most needy, and the design of administrative structures to implement the tasks involved. What distinguishes countries that have coped successfully with the consequences of adjustment and those that have not? It is recognised that personnel problems are acute in these areas: top-quality managerial structures and practices are vital and research on managerial issues at all level is needed; loss of resources may make retrenchment unavoidable, and if it is, as a result of policy, it may be no longer possible to employ all graduates in the health services - in which case it must be decided how the stock is to be used and how quality and effectiveness is to be maintained.

One such need has arisen because national and international environmental policies impact on health. If it became possible to identify most of the significant influences on health from outside the health sector, this information could be used for designing integrated policies that target the most effective services to those most in need, by the most appropriate allocation of expenditures both within and outside the health sector. More generally, support for the development of operationally efficient health services is needed and this may need to draw upon knowledge about the determinants of organisational behaviour because an unfavourable behavioural environment in key sites and managerial levels may largely nullify the most careful planning and facilities. External social and cultural factors should not be overlooked, because these may be determinants of demand for health care services. For instance, since the absence of health services in rural areas may be one factor that tends to drive people to urban areas, provision of rural health care may be important in national policy.

Recent political changes make it clear that a significant problem area

for a number of countries is the design and management of change in the structure of a health service (or other administrative) system. Various models of structures are in existence, but the unthinking adoption of any specific system, regardless of the virtues of parts of the system previously existing in the country, may be wasteful and unwise. But even where great structural changes are not envisaged, monitoring the performance of the existing system is an important task. Centralised planning of system structure does not always lead to the implementation in practice that planners would wish. A scheme for effective monitoring is needed.

3.1.2 Health and national development

Targets for meeting health needs, in the light of costs, specify priorities. Selecting what to tackle, and distributing the resources provided is unavoidable. So, the basic process is to translate health needs into costs via priorities, leading to targets, a managerial plan for implementation, and monitoring. Health needs and circumstances alter dynamically and so do the demands to be placed on the health care service; as national circumstances alter, the process must be iterated and is as dynamic as the system driving it. A taxonomy of needs must therefore be established and the consequences of intervention in the health sector also needs to be appreciated. This is the reason why modelling, in providing a means for testing for the consequences of any intervention, is so important.

Many research priorities exist at the meso-economic (sectoral) level. For instance, there is a widespread feeling that primary health care and related expenditures should be emphasised more strongly as compared to say, hospitals, but there is little empirical data or research to support this. The relative efficiency of different kinds of health sector expenditure for the production of health does need to be measured, but the methodology is not available. It is clear that, in the national context, the distribution of resources, functions and activities between public and private sectors, and related options, are matters of some consequence to both developed and developing countries; for instance, the place of insurance schemes needs consideration. Other related questions arise: how can health expenditures be lightened by shifts to low-cost activities, or by the introduction of user fees (in which case, how can the poor be protected)? Research is needed to gain sufficient insight into the key factors to offer an objective basis for good choices in specific circumstances.

There is another dimension to health in the context of national development. Determinants of health need not only originate in the health sector; there are numerous multisectoral contributions. For instance, economic factors affect health through social provision, housing, availability of suitable food, quality of nutrition and so on; manufacturing industry influences health through the availability and nature of employment, environmental effects, consumption or creation of foreign currency for health or nutrition related purposes and perhaps through the provision of health related products. Conversely, health affects other sectors. Superficially even, health is a factor in the physical and mental quality of manpower, in the sickness-absence record in employment, as well as in the consumption of resources that could otherwise be used for economic or social development, and so on. So the interactions should be investigated, in order to provide a rational basis for

forecasting, planning and resource allocation at the national level, amongst the sectors, including health.

Interventions and disturbances in large scale economic and societal systems generally produce consequences that take time to evolve; this means that the bulk of any responses may be delayed in onset and drawn-out in effect. Successful interventions to reduce infant mortality, for example, will create an increasing need for other services - education, health care, housing, food - as the infants grow; the consequences of the intervention are both delayed and evolve with the passage of time. So, in this sense, the system is dynamic.

Modelling is undertaken in order to provide a mechanism by which a planner can attempt to understand the system with which he is concerned, and that would allow him to try out specific planned interventions in advance, to see what is likely to happen. The planner might also wish to determine the consequences of spontaneous events of various types that are outside the control of the planner but that nevertheless could occur. In broad terms, the aim is to develop a generic model; this may then be adapted to the variables and pathways appropriate to an individual country and its particular health-related purposes.

Turning to the specific matter of intersectoral interactions, one of the first questions on which evidence is needed is: does better health lead to a stronger economy? Negatively presented, this leads to: does poor health affect the economy? Such questions might be answered in broad terms by studies that take no account of the structure of the interactions through which their effects are created, but give no indications about possible interventions that might be considered. That requires detailed insight, and detailed insight originates, in practice, through the study of models of the interactive system.

There are two major problems to be faced with models: first, complexity and second, character. Complexity brings its own problems of practicality - identifying all the pathways comprehensively, determining the nature of the causal effects along each pathway, implementing in a computer model that can be shown to be correct and requiring, of course, sufficient computer power and speed. Without doubt, a full description of any system relevant to health will indeed be highly complex and elaborate. Is a full system possible feasible? Probably not. So, is a partial system model feasible and, more important, valid? Consequently, significant questions for investigation are: can simplified system models be developed and if so, are likely to be valid - and on what basis they could be justified?

On the matter of system character, an interesting issue emerges. When contemplating dynamic system models, economists naturally think of a quantitative mathematical description of each pathway involved. But in the socio-economic context, at least some important relationships, causal or not, cannot be expressed in this way or, if they can, only at the cost of great complexity. However such relationships can always be expressed semantically, i.e., in terms of verbal statements. These statements constitute knowledge about the system that is equally as valid as quantitative mathematical statements and equations. This recognition helps because information in the form of semantic 'knowledge' can be handled formally (stored in a computer, tested for logical consistency,

linked inductively with other knowledge) using the methodology of computational logic. In principle, one could envisage integrating such a 'knowledge-based' model representing appropriate parts of a system with a more conventional quantitative model representing other parts, thus achieving more comprehensive representation of the overall system. The methodology needs and warrants further research.

3.1.3 Indicators

Whether studying health-related phenomena, or trying to unravel the complex pathway of causes and effects that link health with events and variables in other sectors, better indicators are needed not only of health and health-related factors but of many socio-economic factors generally. With health itself, the indicators commonly used express something about 'ill-health' or the 'lack of health'; what is needed is the kind of indicator that would express positive factors like, for instance, 'perceived quality of life', 'health reserve', 'well being' and so on. A similar complaint could be levelled at other types of indicator. The reason for the difficulty is that it is usually regarded as essential to identify something 'measurable', whereas most of the entities being examined are not quantifiable, at least in any simple way. A further problem exists with validation, which is not often attempted. However, a wider critical review of indicators raises other issues: acceptability, availability, utility (explanatory and predictive capability) - and the need to discard those that are redundant, unverifiable, unstable or ineffective.

'Acceptability' of an indicator is linked to several factors. For instance, the choice of indicator must be *prima facie* reasonable: the implied relation between the indicator and what it purports to indicate must seem likely. The meaning of 'validity' needs definition. If an indicator is well correlated with another, say economic, variable its validity is enhanced correspondingly; but it is also then redundant. So one seeks, rather, a good correlation between observed and predicted values of a variable that can be 'forecast' by the indicator. But translating this into a practical procedure may be difficult. 'Availability' takes into account the practicality of measuring what the indicator requires; but the costs of measuring and sustaining the use of the indicator and its associated information systems must be considered. 'Utility' of an indicator expresses its capability to explain and predict: its 'power' in these functions; it is noticeable that few indicators are provided with objective justification of their claimed capabilities and properties - this justification would seem to be desirable. New indicators with suitable properties are needed, and so is a methodology for designing them.

Health as a concept will always be subjective; it cannot generally be measured in any direct way. Health and health status of an individual or of a community can only be evaluated by using measures that 'indicate' the variable, attribute or concept that cannot itself be accessed. But disaggregating the concept into its contributory components (some being lower level concepts themselves) using cognitive analysis, it is feasible to iterate the process down until a set of observable or measurable elements can be recognised. The process would have to be guided by a 'knowledge map' and this takes account of the fact that much of the contributory information would have to be in the form of 'knowledge' rather than data. Such indicators are referred to as "knowledge-based"

indicators, and they seem to offer potential for wide ranging applications. Their properties would seem to make them suitable, in particular, for contributing to research on multi-sectoral interactions with health and to the research on behavioural issues mentioned below.

In the natural course of development, a new indicator giving positive results will usually need to be transformed into a robust, cheap technique. Success at this stage will determine utility of the indicator, but it is difficult to envisage any general methodology for this step. However, any new programme of development of indicators should certainly be carried through in collaboration with other UN agencies, particularly UNRISD, which should be a source of valuable experience.

3.1.4 Behavioural factors

Behavioural issues are seen as crucial in the context of health, not least in order to understand the origins of health-damaging behaviour and to identify the approach and design the means by which health-promoting behaviour may be encouraged. The term: behaviour: in the context of health includes the behaviour of individuals, families, communities and organisations (whether the organisation is administrative, a service providing health care, a regulating agency, or a company), including the behaviour of individuals within and as a part of a family, community or organisation.

Research should seek to increase knowledge about behaviour and about the motivations and constraints that affect behaviour. It should also acquire a better understanding of, not only the available mechanisms and potential for, but the risks of, influencing behaviour - to reduce health damaging behaviour and to encourage health promoting behaviour in the individual or group (whether the 'health' is that of an individual, family or community, or the 'health', i.e., effectiveness or efficiency, of an organisation).

Understanding behaviour generally starts from direct observation instead of quantitative measurement and much possibly useful knowledge comes from subjective impressions. There seems to be no common perception that a fully 'scientific' approach is feasible. But if objectivity of observation can be achieved, the techniques of 'knowledge representation' may then be applicable: to record 'knowledge' that can only be expressed semantically, and to organise and generalise from the knowledge obtained. Correspondingly it has been suggested that the techniques of economics might be transposed into the field of health behavioural problems. (Interesting ideas flow from transposing economic concepts into the health context - 'health' replacing 'money' or 'goods', and concepts like 'discounting' in money terms suggesting the concept of 'discounting of health risk', for instance.)

The need to understand individual behavioural choices in the context of health raises many questions to which answers are required but cannot yet be given. For instance, how far do social-environmental factors, economic circumstances and cultural values play a part in behavioural choices; what interactions exist between individuals and communities, and how do these exert an influence; what is the role of an individual's internally perceived 'quality of life' in relation to particular behavioural choices; what features contribute to an individual's perception

3.3 The role of institutional infrastructures for the promotion of health science and research

3.3.1. The basic requirements for the conduct of nearly all research are manpower, resources and infrastructures: the most important of the three is manpower or people which constitute the knowledge and skill base and the power of the society. Without national research capability and researchers, research cannot be done. Research capability, particularly in the developing countries was one of the four themes of the Technical Discussions at the 1990 WHA.

Following the adoption of Resolution WHA 43.19, in 1990, which inter alia urged member states

> "to build and strengthen national research capabilities by investing resources in national institutions, by providing appropriate career opportunities, to attract and retain the involvement of their own scientists and by creating environments that will foster scholarship and creativity",

the Global ACHR in 1990 set up a Standing Committee on Research Capability Strengthening to consider innovation in buiding up national research capacity. It should be pointed out that discussion of means and ways of developing national research capacity had gone on at various levels within the WHO for the past two decades.

3.3.2 The ACHR subcommittee in considering innovation in RCS observed that institutional arrangements and stability depend naturally on political will and it is of paramount importance to obtain national commitment at the highest level to promote and provide the support to build and sustain research capability. Sometimes regional agreements enhance national motivation to join in a common enterprise as demonstrated by the network of PAHO centres. At the global level, expenditures of the order of several hundred million dollars have been made by WHO over the past 15 years on research capability strengthening. These sums mainly supported R & D efforts in the special programmes.

The scale of support (in terms of duration and money) required for "broad spectrum strengthening" (e.g. public health sciences) in a whole region of subregion (say, in Africa) is not known, since the experience acquired so far is not sufficient to draw a conclusion.

There is no experience either on the feasibility of "prototype institutions" which could offer, on a regional or subregional basis, a comprehensive package of facilities in training, research, services and expert advice, for example in epidemiology and informatics.

Before pursuing any schemes involving alternative institutional arrangements, the ACHR subcommittee on research capability strengthening thought it desirable to make a rapid survey of selected research institutes with an established reputation in order to define the critical determinants of success. The following were studied: the University of Ibadan, Nigeria, a group of institutions in Pakistan, the High Institute of Public Health, Alexandria, Egypt, Mahidol University, Bangkok, the All India Institute of Medical Sciences, New Delhi, the National Institute of Health and Family Welfare, New Delhi, the National Institute of Health, Research

and Development, Jakarta, the Institute of Medical Research, Kuala Lumpur, and the network of PAHO centres.

It appeared from the study that the main features which determine the success and sustainability of a research institution are:

- a history of consistently strong leadership, dedicated to quality work and constant improvement;
- a tradition of scientific inquiry coupled with a sense of discipline and rigour in research management;
- a systematic documentation of professional and research activities, including publications;
- a critical mass, in professional, technical and financial terms, to guarantee momentum;
- an environment conducive to research, which is one of the main conditions for motivating young scientists. This includes naturally an appropriate infrastructure, such as technical and bibliographic facilities;
- a close relationship with policy planners and decision-makers, to ensure the stability of support at government level, particularly the ministry of health, which can chart the course of health systems research; and
- external cooperation and networking to attract further technical support and funding from international sources.

3.3.3 The International Health Policy Program (IHPP) supports health policy research and training in the countries of Africa and Asia. Based in Washington DC, this supported by the Pew Charitable Trust and the Carnegie Corporation of New York and is administered in cooperation with World Bank and the WHO. IHPP has recently carried out a feasibility study on the need to establish "International Health Policy Research and Training Centres". Country studies were done in Botswana, Kenya, Nigeria and Tanzania (in Africa), India, Indonesia, Pakistan, the Philippines and Thailand (in Asia). The report published in 1990 (Health Policy Training and Research Centers: Capacity Building in Africa and Asia: A proposal to the International Health Policy Program) favoured the establishment of such centers for:

- synthesising policy-relevant research;
- training researchers and policy-makers in relevant skills, disciplines and issues;
- developing and enhancing the utilisation of health policy research and analysis;
- creating a resource base to which health policy analysts and policy-makers can refer;
- serving as a repository of policy-relevant information and retrievable data for health policy problem-solving; and
- providing a meeting house for researchers and policy-makers to exchange experiences and findings.

There was a consensus that such centres should be built upon existing institutions, start modest programs, solicit government support, focus on capacity-building and on clients, have a core staff, using other institution's staff as resources, collaborate with other training and research institutions in the country, establish South-to-South and North-South institutional links, hence fellowships for staff development, conduct

training, research and consultancy and emphasize policy analysis rather than policy advocacy.

The WHO and ACHR are currently exploring means and ways of assisting a number of institutions to build on existing facilities enhanced research capability for essential health research to serve national and if possible regional needs as well.

3.3.4 Resources

The total resources available for global and interregional research-related activities out of the regular budget are less than US$ 5 million per year, whereas the research funding from extrabudgetary sources amounts to some US$ 100 million annually.

In view of the enormous operational responsibilities of the Organization, especially at regional level, there is very little leeway to augment research resources from the regular budget. It could be argued, however, that if only 1% of extrabudgetary funds were dedicated to "horizontal" research capability strengthening (say, in epidemiology), this would amount to a substantial contribution (equivalent to 20% of regular budget funds for global research activities). It should be feasible to commit a sizeable percentage (e.g. 20%) of the 7% of (1991) WHO's regular budget devoted to fellowships. to training of researchers in developing countries. It would also be worth while to approach industrial and pharmaceutical organizations to subscribe to a special fund administered by WHO to support research capability strengthening in developing countries. The summary of discussions and recommendations arising from the Technical Discussions at WHA43 are appended (annex 2).

3.4 Health Research and Development

Health has been viewed, by some, in terms of survival rates. The appearance of a population explosion in the 19th century was characterized by low survival rates and a logical goal would be that when the population stabilizes, by the 21st century, there should be high survival rates at all ages, with minimal disability.

But as asserted in Section 1.2, health is multidimensional and may also be expressed in a different way. Walsh Mc Dermott stated that "health like happiness, cannot be defined in exact measurable terms because its presence is so largely a matter of subjective judgement... Definitions that embrace the concept of the "absence of disease" in reality are misleading. For all living things are diseased... As a concept, therefore, a disease-free society would be biologically unreal, and hence something hardly to be set as a goal. But what is a realizable goal is to modify significantly the pattern of disease within a society; and certain disease patterns are clearly preferable to certain others. For disease is measurable, and to a surprising extent in any society the particular disease pattern that is present is a reflection of the overalll forces we set up or tolerate".

But what are these forces which determine disease patterns?

It is now generally accepted that disease patterns and health levels are not only determined by the genetic make-up, but are also closely related to the socioeconomic environment. Thus Mc Keown distinguishes

prenatal diseases determined at or after fertilization and postnatal diseases due either to deficiencies and hazards or to maladaptation. The latter are due essentially to recent changes in conditions of life, particularly behavioural, often encouraged by the affluence which resulted from industrialization: smoking; sedentary living; use of drug; excessive or ill-balanced diet.

The demographic transition (Fig. 2) illustrates some of these relationships: prior to such a transition the population health level is quite low and characterized by high mortalities and birth rates. The population growth rate is low, the population size is relatively stable and the economic level is generally poor. There is no change in that situation as long as the mortality rate does not improve as a result of new influences.

The transition occurs when mortality decreases sharply. As the birth rate continues initially to be high, the population increases rapidly. If this stage coincides with a period of economic growth, the birthrate declines, the population growth is reduced and the population stabilizes. This pattern is consistent with Mc Keown's argument that the major advances in the health levels of the Western Countries have occurred as a developmental process following the industrial revolution. Whereas most developing countries are lagging, the industrialized nations are well beyond the transition stage, their disease patterns having changed from diseases due to deficiencies and hazards to diseases due to maladaptation.

Focusing on the situation in which there is no strong economic growth, it can be seen that the population explosion accounts largely for the poor state of health of developing countries. During the last quarter of the twentieth century, many of these countries have seen a near doubling (or more, in Africa) of their population (Fig. 3). Although Asia and Oceania will, by the end of the century, constitute nearly 60% of the world population, they have succeeded in slowing down their growth rate and the positive effects on health have already started to appear.

The morbidity pattern in the third world is characterized by the predominance of infectious diseases, and their severity is such that they largely determine the mortality profile. Available data may be considered indicative (Fig. 4) and it may b assumed that under-reporting prevails to a large extent.

A classical indicator of health is infant mortality rate, a good proxy measure of under-development. Projections for the year 2000 indicate that many countries in Africa and South Asia are at a serious disadvantage to the rest of the world. Examples of differentials involved between specific countries are illustrated in figure 5. Thus a baby born in Sierra Leone is twenty five times more likely to die within the first year of life than one born in a Scandinavian country.

Infant mortality rate is also closely related to female's literacy, and it has been demonstrated that for specific income groups, countries with a higher proportion of literate women have an infant mortality rate considerably lower than countries with a low level of female literacy (Fig. 6). For example, in countries within the same income group, say higher middle, those with a better than 90% proportion of literate women have an infant mortality rate of 31 per 1000 on average, more than three

times better than those with a less than 35% proportion of literate women (107 per 1000). Comparable gradients apply for countries within other income groups.

Despite such discrete gaps, overall literacy, a critical determinant of health globally, continues to increase in the South, as can be measured by the "Gross Number of Literate Persons". Moreover, figures for primary, secondary and tertiary enrolment in the South in 1985 are comparable to enrolment figures for the North in 1950 (Fig. 7) Thus, the educational lag between North and South is of the order of one generation (whereas the industrial lag has been about 100 years).

As regard the physical environment, water supply and sanitation are key factors influencing health development, and much remains to be done, particularly in the rural areas of Africa, South Asia and Latin America (Fig. 8). The costs involved are in the order of hundreds of billion dollars, the countries concerned are competing for very limited resources, and it is difficult to assess effective coverage because of maintenance problems. Thus geographic distribution of services within a country is bound to be uneven.

Another critical determinant of health for which distribution data would be helpful, is nutrition. Whereas in the industrialized countries malnutrition is related to affluence, in the developing countries malnutrition is often the consequence of maldistribution and hunger (Fig. 9). Although, on average, the world has a growth rate of agricultural production which can easily feed its entire population, famine is still widespread in large parts of the African continent.

To feed people, jobs must be provided. Estimates of the labour force arriving on the market have been made, and the numbers are staggering (Fig. 10), particularly in the (former) "centrally planned economies" and in the developing countries, which together contribute only a small fraction of the world's GNP. Indeed, the ratio of total GNP between North and South is roughly 4 to 1. Expressed per capita, it would be of the order of 20 : 1. This imbalance is closely parallelled by the distribution of R & D resources and the number of scientists and engineers (see table below).

	North	South
GNP	80%	20%
R & D	95%	5%
Scientists & Engineers	90%	10%
Population	20%	80%

Distribution of population and resources between North and South (approximations)

What conclusions should be drawn from these observations? First, that there are obviously close linkages between health, science and technology, and the overall process of development. Second, that it might not be very effective to subordinate the promotion of health to economic development, since the latter progresses slowly and unevenly. Third, that the minimal resources available for research in the South should be used selectively to maximize their impact on health. It would be of the essence to foster

reliable partnerships with the North, to strengthen the overall infrastructure in science and technology, and to equip the decision making apparatus with appropriate capabilities in policy planning and research.

3.5 Science and Technology Policies

Policy is required in order to ensure that an adequate response is made to demands, needs and opportunities in relation to the use of S&T for purposes of improving health, individually and nationally. This is achieved first by establishing mechanisms for recognising and assessing needs and opportunities and second by specifying guidelines for deciding the choice, or balance, between different options that arise. Additionally, help may be needed by planners in making good use of decision-support procedures by which to decide priorities of concern and the allocation of resources within the national context. Furthermore, it is essential to establish an effective dialogue between those who are informed professionals in science or technology and planners who are not.

The key options at the national level are:

- effort given to nutrition, education, prevention, treatment and rehabilitation;
- endogenous research, development and, where appropriate, manufacture of health care materials, as distinct from relying on external sources;
- public interest versus private interests in implementing and supporting science and technology, especially when imported from abroad;
- science-led research and problem-led research and, in respect of the latter, between strategic and tactical research.

From the viewpoint of the World Health Organisation, two particular factors operate. As an international advisory agency, WHO needs to have in-house expertise on a variety of technologies, and have access to technical advice on many others. It is also uniquely placed to recognise early signs of emerging threats to health by using its position to compile and evaluate data across national and continental boundaries.

Demand for health care services has its own imperatives and volatility often driven by the media of international communication which make obvious the great disparities in living conditions as between countries. Recognising all significant needs - as distinct from demands - at the national level is not necessarily trivially simple; it is however a matter for the individual country. Nevertheless, assistance with the methodologies of trend detection and forecasting could properly be offered to member countries. At global level too, there is a role for forecasting. The matter is discussed below.

Recognising opportunities is perhaps more difficult, but two mechanisms are appropriate. First it is vital to ensure that the potential of existing technology is fully considered, by matching existing needs and existing technologies (although these may need adaptation or development). This could be achieved by a group of experts on health problems in developing countries, working together with a group of experts having wide knowledge of existing technologies, given a brief to take a critical look at existing problems in the light of known technologies. Second, in order to minimise the future risk of repeating the mistakes of the past -

notably, wasting existing knowledge, and wasting effort in redeveloping what may be already known - there needs to be continuous monitoring of new developments in science and technology for those that may have the required potential, as and when these are first reported. A pilot scheme is in operation but needs sustained support and effort.

Arranging to implement solutions based on science and technology is an important component of professional work and the initiative must lie with those who understand the technology concerned. But they have to ensure that planners are fully conversant with the potential and cost of any new technological applications, which means that an effective dialogue between planners and informed professionals must exist, that there must be a way to evaluate the resource implications and if so decided, to handle the allocation problem; furthermore, past experience confirms that there should be a mechanism to monitor the process of implementation. These operations can, to a degree, be assisted by existing techniques of decision-support, project planning and project management. These software "tools" should be transposed for use by planners in developing countries. But these planning and management tools need information - a matter discussed below.

Project implementation and management are equally important. Training of personnel will certainly be necessary. It may also be vital to ensure that the practices and culture of the personnel are not inimical to the technology or, in practice, its use. Incentives may be needed to ensure that the technological equipment is properly installed where ever it is planned to operate, and that the operating personnel can be relied upon to ensure its maintenance and continued quality of performance. Even the possibility that the technology might not be used as and when it should be, must be considered. Accordingly, performance monitoring in all these aspects may be desirable. Matters such as these involve behavioural issues and cultural overtones may also exist; due attention must be given to their impact. In fact, these are all researchable issues.

3.5.1 A policy for essential information

Planning needs information; so does research. The services and the resource allocations to provide national health care can only be rationally planned on the basis of knowledge about the needs in the light of all relevant factors. But what knowledge is needed? An "essential information list" for planning purposes could be a valuable guide for member countries. It would specify the minimum data set that will permit effective planning and support policy analysis.

Once national policy needs have been identified, it would be feasible to deduce the informational needs. Once the informational needs have been met, by adequate data collection, it would be possible to demonstrate how these lead to the development of policy. Once policy has been developed, its performance in different circumstances can be analysed. Policy analysis is required because it needs to be understood how policies would operate under the effect of constant changes in national circumstances caused by development, alterations in economic circumstances, the impact of adjustment policies, demographic shifts, the movement of refugees, and such-like factors - whether predictable or not. Understanding is the foundation on which good policies can be constructed, but policies cannot be designed in a vacuum; the "essential information", to which policies must respond, has to be made available.

It is also possible to identify another list of "essential information": this would specify the minimum data set that, in sufficiently reliable form, needs to be collected in order to undertake basic socio-economic research in relation to health.

Some components of either essential information list would be readily specified and easily measured as explicit variables. Other information can only be obtained indirectly, as indicators and it is recognised that various new indicators may need to be developed and validated; it is recognised, equally, that these must be inexpensive and robust. Not all information exists in the form of numerical data. Some can only be expressed qualitatively. Some important information exists in the form of expert observations and if this can be converted from anecdotal indications into systematic, logically-consistent knowledge, it is a valuable source of inexpensive information. As mentioned elsewhere in this document, indicators based on this approach, using the methodology of computational logic and logical inference, are now possible. But objective methods of validating new or existing indicators are a priority requirement.

Research is therefore needed to specify what information is needed, bearing in mind the need for quality testing and assurance, how it should be expressed, and how it should be stored to form a sensible and potentially informative "knowledge base". Furthermore, the insights and expertise acquired by, for instance, planners, epidemiologists, and external consultants should be regarded as an important part of a country's "knowledge base"; it should be captured in a form that makes it readily accessible to later successors, and not merely dissipated with the departure of the experts concerned. The techniques of artificial intelligence have much to offer here, and the development of a suitable expert system would be timely.

3.5.2 Emerging problems and forecasting

Forecasting, prediction and trend analysis are terms that are often lumped together without regard for the multiplicity of ideas, purposes and methods involved, or for the different kinds of raw material to which they are directed. The common factor is change, particularly systematic change, whether with reference to a variable or an indicator, to social change, to technological developments or to emerging health problems. For present purposes, we define forecasting in its simplest form as the estimation of future magnitudes of a variable or a quantitative indicator on the basis of its recent past history. Prediction, on the other hand, we regard as the attempt to guess new developments that flow from what already exists, taking account of the momentum of existing patterns of change, or new events that could occur. Forecasting depends on trend detection, modelling and extrapolation. One must specify the kind of change to be monitored, select the indicator to be used, establish if the change is systematic, identify the pattern of longitudinal change in the past, isolate any underlying trend, extrapolate and, where appropriate, set the confidence band. Each of these steps requires a careful methodological choice. Prediction calls for insight, for sensitivity to what is possible and perhaps, to a degree of lateral thinking. For instance, it is not difficult to sense the existence of new viruses "waiting in the wings"; some may be of immunodeficiency type but it is only possible to make even such an uninformative statement as this because we already have models to

guide thought. Insight into viral structure is needed to expand the prediction.

A trend is a systematic change in the size of a variable, or in its spatial distribution or in some other pattern feature; but the concept is also used in relation to more elaborate phenomena such as social change or technological development. The chance of recognising and extrapolating trends of the former kind depends on the existence of systematic behaviour that exhibits a reasonably simple form. Where there is a need to 'guess' at the emergence of new issues based on recent developments and changes, the task is quite different, and much more complicated; social and technological forecasting, for instance, has been notoriously unsuccessful in predicting major new developments.

Nevertheless, emerging health sector issues that are likely to achieve the status of emerging problems can often be recognised as due to the operation of an underlying process that does operate systematically, generating a consistent trend in some monitoring variable. Of course, not all variables behave this way; unpredictable events that cannot be forecast occur in some variables - although if the possibility that they might occur is recognised, the chance of their occurrence can sometimes be calculated empirically. One cannot make much other progress with the latter category of events; but in principle, the former might be amenable to systematic analysis. However, experience suggests that severe practical problems can be faced in trend detection and extrapolation, and a careful review of possibilities is usually wise. In practice, this means that the technical properties and features exhibited by the monitored variable need to be understood - particularly to determine if they show consistency or, for instance, if their origin is, in the technical sense, chaotic.

It is sometimes useful to distinguish different types of trend. Trends may be temporal: a progressive change with the passage of time; spatial, showing an altered geographical distribution with time; or spatiotemporal, involving trends in both. For instance, the progress of morbidity or mortality figures due to traffic accidents as urbanisation develops, may be adequately represented as a numerical time-series, altering systematically by year; case occurrences of a communicable disease may alter with time in a way that is fully represented by the progressive appearance of the disease in geographically contiguous villages - the trend occurs by "spatial translation"; but if, at the same time, the total case occurrence numbers increase in the various centres of outbreaks as well, the trend should be treated as fully spatio-temporal.

But the fact that many health and health related variables exhibit special features cannot be overlooked, because this must influence the procedures for trend detection and other processes for recognising changes. Numerous socio-economic variables that are linked to health - for instance, prices achieved on world markets for agricultural commodities - exhibit long-term trends that are greatly obscured by irregular movements of the short-term baseline. These fluctuations can sometimes be ascribed to two or three independent and highly variable components, the short-term statistics of which can be used to help set bounds on the estimates of the underlying trend, even if they cannot easily be removed by objective numerical analysis techniques. (But if the variable is dominated by fluctuations that are 'chaotic' in the technical sense, forecasting may be virtually impossible.) These points demonstrate two requirements: that

great care is needed in choosing the technical methods employed for forecasting in this field; and that the 'signal' statistical properties of the variables examined need to be understood in detail.

There is scope for a wider understanding and use of forecasting methodology. Research into the choice of approach, together with indications of the risks likely to be encountered, is desirable. At WHO level, reconsideration should be given to the need for a world health alert system, along the lines of the Report from an *ad hoc* group of experts convened in 1974 and presented to the Director General ("Technological considerations in the development of a WHO Health Alert System", OST, 12 August 1974).

4. Concluding Remarks

4.1 Translating strategy into action

The application of scientific and/or organized knowledge to practical tasks is the domain of Technology (Galbraith).

The picture of inequality in Health Technology is dominated by the tragic burden of morbidity and mortality in the Third World. Whereas some kind of industrial parity can be quickly achieved between a wealthy region of the globe and a poor one, perhaps by transferring turnkey operations, it cannot be so in the health sector.

The toll of disease and poverty in the South is the result of fundamental societal and economic processes, of an evolutionary nature, which are not amenable to "quick-fix" methods.

The fact that more than four fifths of the world's output is produced by the North, and that the South cannot spend more than 0.2% of its GNP on Research and Development has been abundantly documented. Of particular relevance is that disparities between North and South, "per capita", could range between a hundred and a thousand times, depending on the particular geographic region or population subgroup.

In scientific and technological terms, the spectacular pace of advance in post-industrial societies underlines the fact that the Third World cannot afford to reshape the frontiers of knowledge. Yet, the "cliche" about a widening gap has to be qualified: for example, production rates of scientists and engineers are converging rapidly between North and South.

Programmes for Development have been prescribed in many "fora", including WHO. Most people will agree that the following outline is based on reasonable principles: firstly, that political will should be fostered and express itself by the establishment of appropriate coordinative and promotional mechanisms.

Secondly, that national health technology policies should be formulated with clear priorities, and with specific targeting of technologies towards the solution of health problems of the majority.

Thirdly, that an appropriate infrastructure should be developed and maintained. The concept subsumes the national ability to identify, evaluate, adapt, and absorb technologies to be transferred.

Fourthly, that adequate manpower should be trained, in terms of scientists, engineers and managerial staff. Twinning and networking arrangements have been wisely proposed and explored.

Fifthly, that equipment-related requirements should be carefully assessed and managed. Of particular concern, here, are not only problems of maintenance, but also the capacity to adapt, modify and produce equipment under economically viable conditions.

Methodological research is needed as a component of decision-support technology. The search for new methods of resource allocation, of determining and ranking priorities constitutes research of a strategic nature. Strategic decisions are those which derive from a global understanding of a given situation; yet they take judicious advantage of specific temporal and spatial features to achieve a high-level objective. Thus, a state wishing to expand its internal revenue base will decide to give a 10 year tax break to new specific industries in a particular region. Far from being paradoxical, the decision, if properly followed through, may lead to industrial prosperity and subsequent tax revenues from large segments of the population. A similar line of thought can be pursued in the field of health.

If interventions x and y are major determinants of health, if there is a latent period of "n" years before the health effects of x can be perceived, and if the efficacy of y depends on x, then it would be a mistake not to wait "n" years before intervening with y. On many occasions, costly interventions are being dropped as failures, because this cardinal strategic principle is being violated. The problem, of course, is that many of the "if-then" relationships have not been elucidated: a clear case for pursuing methodological research of a strategic nature.

For example, primary health care has been accepted by WHO Member Countries as the way to achieve health for all. Its very success is likely to require an increased need for secondary and tertiary care, because of improved survival and its consequential morbidity burden. What methods do we have to advise various countries, various regions, about the redeployment of their technological resources within specific time-frames, say, 10, 20, 40 years ?

If the incidence of diarrhoeal disease and acute respiratory infection drops by 50 %, then infant mortality rate will drop by a related amount. If so, then the likely occurrence of conditions x, y, z will rise according to spatio-temporal scenarios yet to be determined and evaluated. The necessary technological resources to cope with such conditions, their probable costs over time, and the methodology to obtain such information on a large scale are all issues that belong to virgin territory.

This raises the question of WHO's role in technology and research.

If, in many instances WHO is able to fulfill the role of clearing house for information, a function recognized and appreciated by many, it is often true that we suffer from important gaps in our knowledge. These gaps relate to our frequent inability to rank priorities on a rational bases, or even to comprehend the hierarchical relationship between various health problems and between these and other socioeconomic problems. For example,

which is a priority in terms of resource allocation, to treat infectious diseases or to prevent them ? The decision is often facilitated by the fact that certain technologies are reasonably cheap and permit both approaches (for example immunization, oral rehydration). But it is often true that infrastructural technologies which would prevent a disease or a group of diseases (say, waterborne parasitic infectations) are very expensive. The result is a chronic financial drain on health services for therapeutic care, which might contain, but not solve the particular health problem. Naturally, alternatives have been proposed, in terms of changing the behaviour and life style of populations at risk. But if this is to be successful, it needs to be based on scientific grounds, and would also require research and technological contributions. Furthermore, what may be esoteric technology today, could become ubiquitous tomorrow.

The intricate nature of all these problems is illustrated by the complex linkates between the environment (both physical and socio-cultural), economics (in terms of policies and determinants) and individual human beings. It is what makes rational health policies a major difficulty. It is for this reason that policies may frequently appear subjective, arbitrary, or at least ill conceived. There is a clear case for coing more policy-oriented research, to help decision makers in their difficult task. No efforts should be spared to seek new methods to this end, for example in the field of information technology. In other words, problem assessment is a problem in itself for which rigorous scientific methodology is required and where the research establishment must play a key role. Needless to say that WHO must help, and promote the development of such methodologies.

Technology has been referred to above as the application of scientific knowledge to practical tasks. If one considers planning as one of the major tasks of health policy makers, it would be legitimate to enquire which are the technologies available to them... Computers are no more than instruments. Charting techniques are no more than recipes and productivity tools. The real technologies should enable a health planner to implement his programmes with a high degree of predictability. They constitute, naturally, a whole complex of skills and human knowledge. Hence the need for human resource development, the need for imagination and innovation. Here, as elsewhere, the R & D effort is inseparable from technological development.

Beyond the traditional roles of WHO, it may be opportune to consider new perspectives for international collaboration. It is undisputable that Science and Technology are moving fast and that despite the variety of disciplines and programmes represented in WHO, the Organization may not always be in an optimal position to capture the benefits of science for solving world health problems.

Firstly, there is a need not only for analysis, but also for synthesis. The greater specialization and verticalization which characterizes contemporary science should not lead the Organization into tubular vision and fragmentation. So there is scope for broadening the spectrum of scientific advice which is provided to WHO.

Secondly, there is a need for strengthening the relationship between WHO and scientific institutions, worldwide. In addition to the existing formal and informal programme-related networks, problem-related issues

ought to be addressed, with due attention to training and to methodological research. This required a medium to long-term approach and high institutional stability. Perhaps the types of institutional arrangements set up by other UN bodies could be adapted for WHO purpose. Two specific situations must be distinguished here: the regionally based institutions whose task would be to upgrade technological capacity in geographically defined areas in the South; and the internationally established institutions whose role would be perform advanced studies for solving major health problems afflicting the developing countries.

Thirdly, every WHO programme should have the capacity to anticipate if not to forecast the type of technological developments which are likely to be relevant. The time-horizon should be 10, 20 even 40 years. (After all, 40 years have already elapsed since the creation of WHO.) This capacity could only strengthen the technical advice and information which countries expect from WHO. It could equally strengthen the nationals' own capacity in setting up appropriate groups for technology assessment and technology adaptation.

4.2 WHO Programme and Paradigm

To implement its health research strategy, WHO has to use an appropriate armamentarium. WHO has access to tens of thousands of scientists in several thousand institutions collaborating with WHO worldwide. They work as project investigators, staff, in expert committees, scientific groups, seminars and workshops, thus keeping WHO constantly abreast of new developments. The world audience is reached through massive streams of publications which ensures the diffusion of scientific knowledge and related information. As part of a wide scientific network, WHO Collaborating Centres provide research and training facilities, consultative and bibliographic services, as well as biological reference and standards functions.

In the great race for social and technological development, WHO would need to play the role, not of a passive adviser, but of an active partner.

Several needs can be readily identified:

- At the policy level, WHO must help countries to develop their own national research and technological policies.
- At the operational level, WHO should help countries to develop their own capabilities in technology assessment so as to enable them to select relevant technologies in a competent way.
- At the information level, a more active role should be taken to develop effective methodologies for the acquisition and analysis of indicators, without which progress cannot be measured reliably. In addition, training efforts should be expanded.

It is crucial to strengthen the scientific and technological coherence of the Organization. This has to be done in several ways:

i) In existing programmes, the scientific rationale for their structure and functions should be improved and their interrelationships explicitly and objectively clarified. An appropriate example would be the study of epidemiological patterns and trends.
ii) New programmes will have to be developed and promoted, for instance,

health care technology and health economics. The boundaries, substance, and relevance of such programmes to others and to the Organization's programme in general is to be continually assessed and reviewed.

iii) The role of new and emerging areas in Science and Technology should be constantly monitored. Many such developments are likely to have a major impact on health and health care. It is the duty of WHO to be on the alert in order to exploit them whenever appropriate.

iv) There are new and evolving problems that require special attention. A recent explosive example has been provided by the AIDS pandemic. Yet there are other less spectacular problems which are nevertheless of great magnitude and receiving insufficient attention; examples are liver diseases, the changing age structure in developing countries, and various ethical problems arising out of the use of new technologies and changes in the environment.

v) The inner consistency and balance between various components of WHO's programme should be closely monitored. The programmatic and resource structure of WHO's activities should reflect not only a keen concern for practical implementation, but also adequate respect for scientific validity.

vi) A strong and coherent scientific framework for WHO's programme should facilitate interaction with other UN Organizations such as FAO, UNESCO, ILO, UNIDO, etc. It should eventually lead to a better harmonization of the science and research policies within the system, as requested by the UN.

vii) The notion of critical mass should be kept at the forefront of all scientific and research endeavour at national and regional levels. It may often be more cost-effective to set up institutional arrangements for a whole region rather than to replicate smaller, less effective projects in several countries. The creation of major research and training centres in epidemiology, ecology, informatics, etc. would be a case in point.

A battle has never been won without a strategy. The battle for health and against disease, a battle without armistice, could never be won without the help of a good, relevant and appropriate health research strategy.

Figure 1

TECHNICAL DISCUSSIONS
MAY 1990

DISCUSSIONS TECHNIQUES
MAI 1990

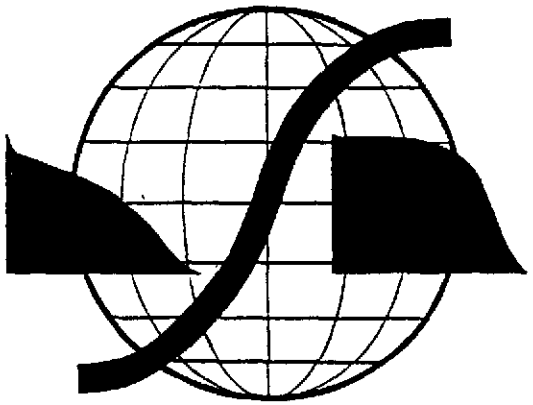


Figure 2

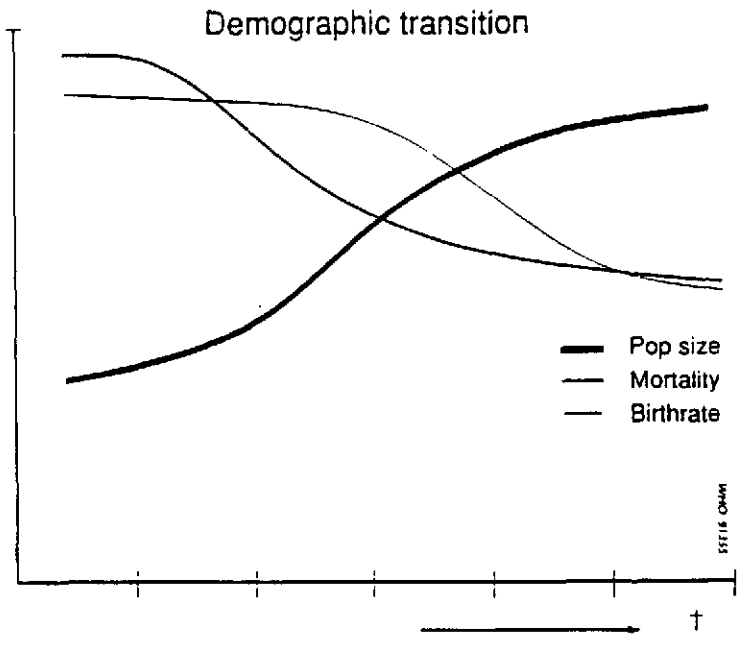
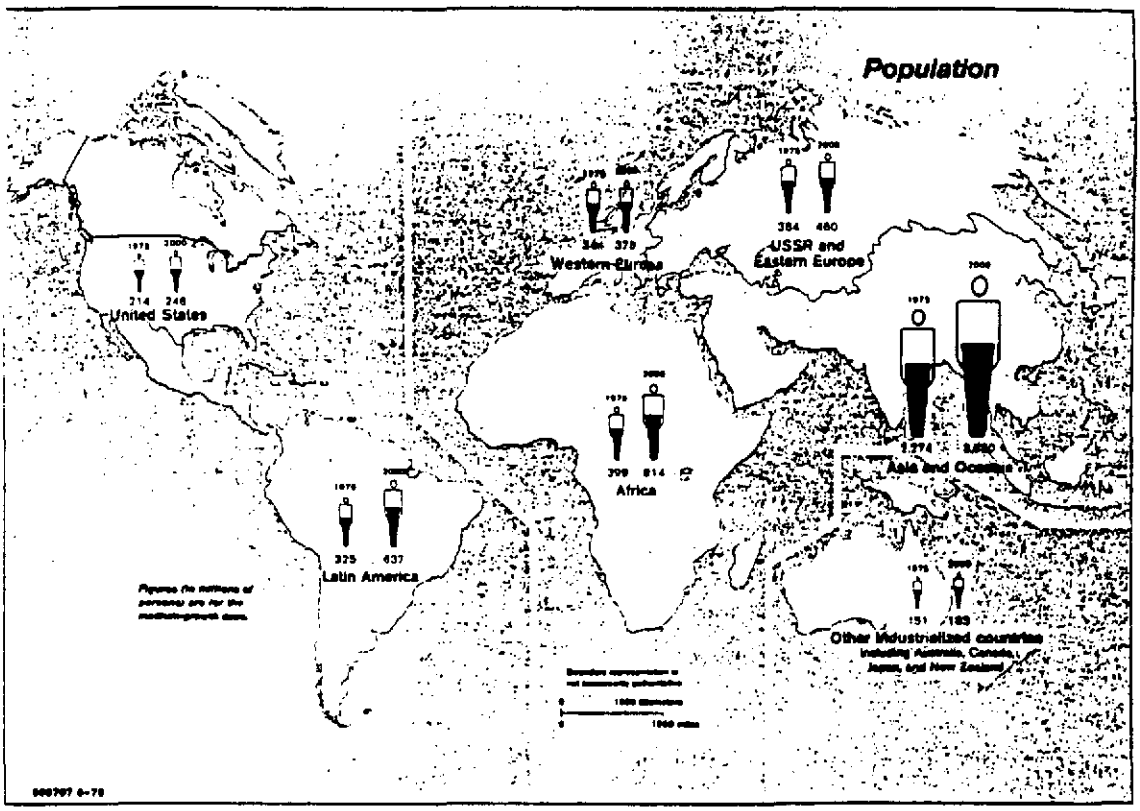


Figure 3



Source: The Global 2000 Report to the President

Figure 4

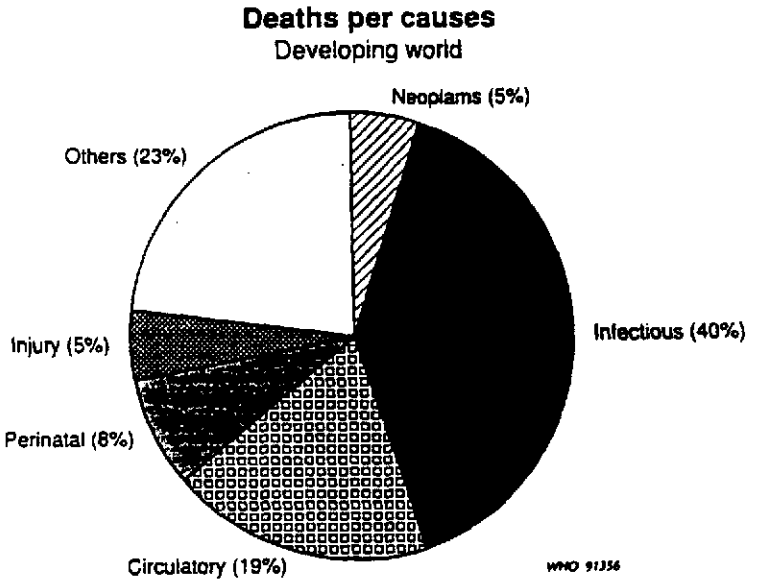
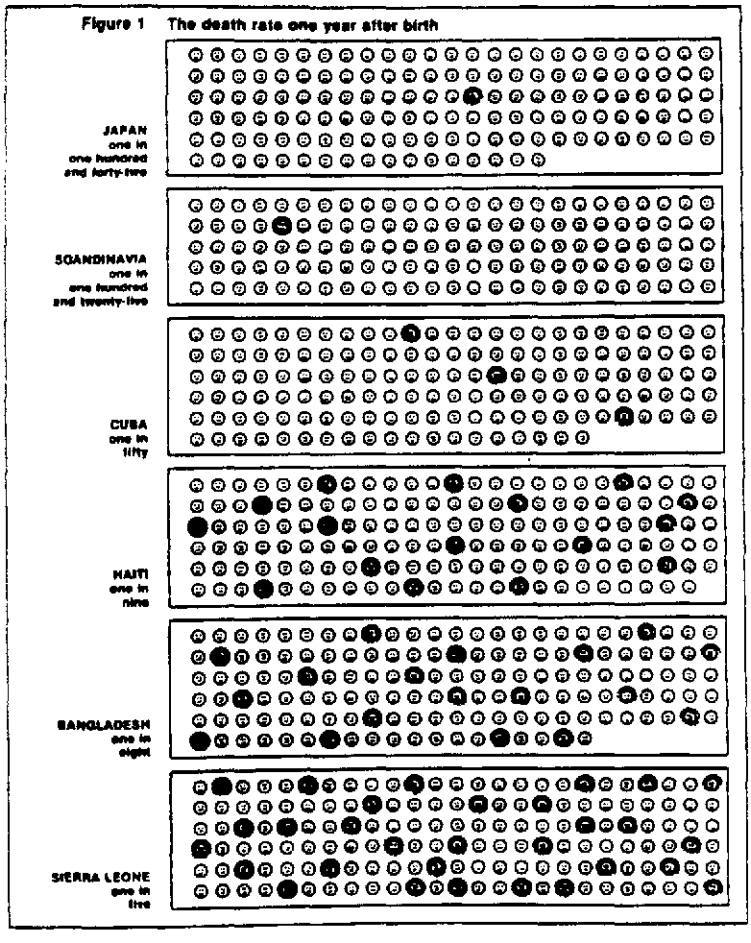

Deaths per causes
Developing world
Neoplams (5%)
Others (23%)
Injury (5%)
Infectious (40%)
Perinatal (8%)
Circulatory (19%)
WHO 91356

Figure 5

Equity and Health



Source: A39/Technical Discussions/1

Figure 6

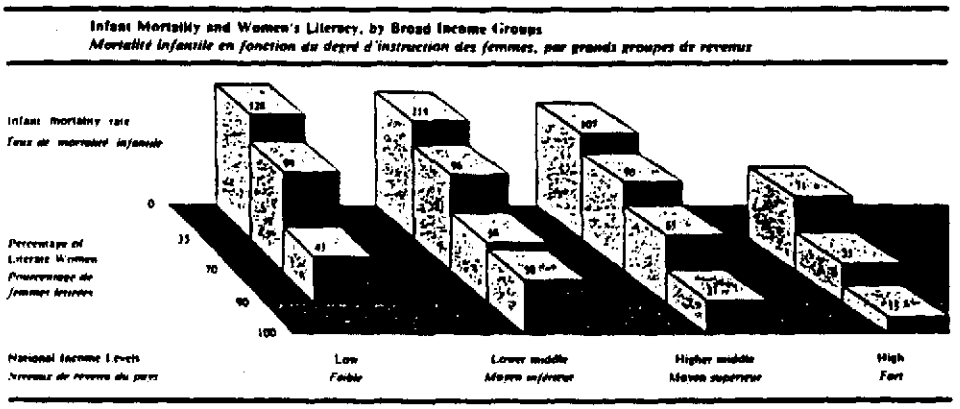


Figure 6: Infant Mortality and Women's Literacy, by Broad Income Groups (Source: WHO Stat. Ann. 1985)

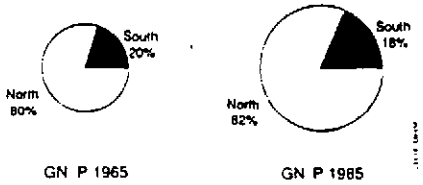
Figure 7

Gross Number of Literate Persons (GNLP)
World Literate Persons 1960 & 1985

GN P 1960 GN P 1985

Source: UNESCO Yearbooks

Gross World Economic Output (GNP)
North and South in 1965 & 1985



GN P 1965 GN P 1985

Figure 8

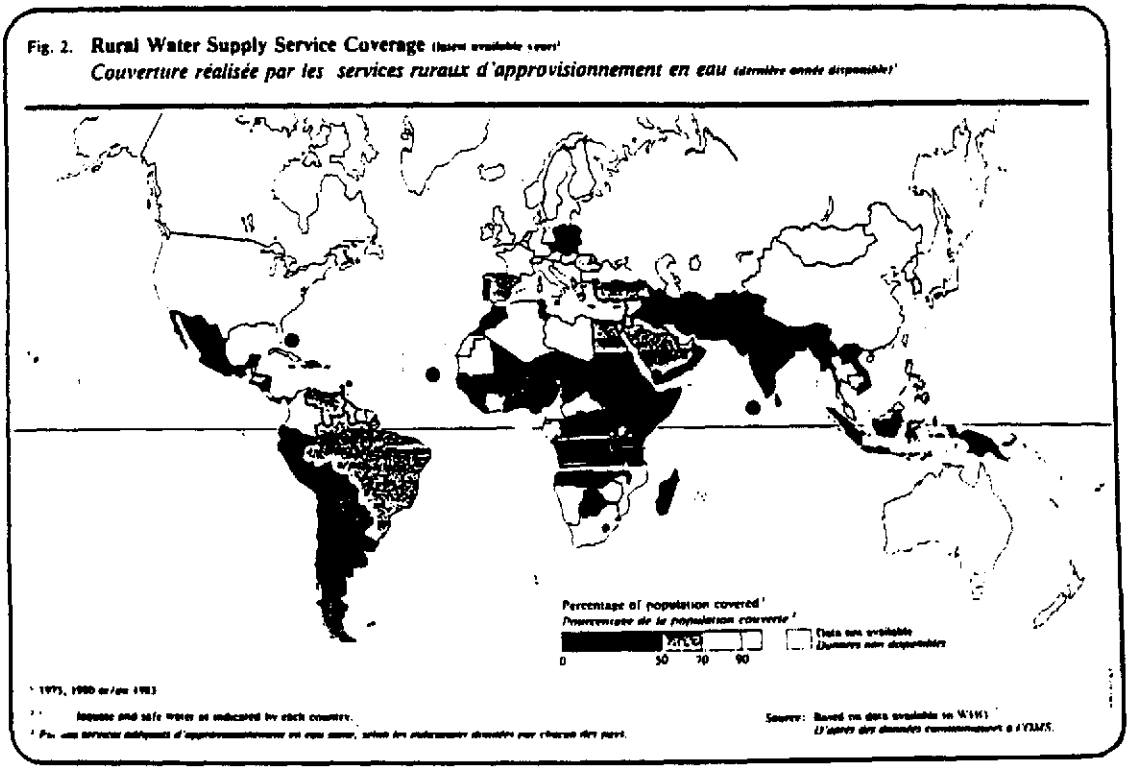
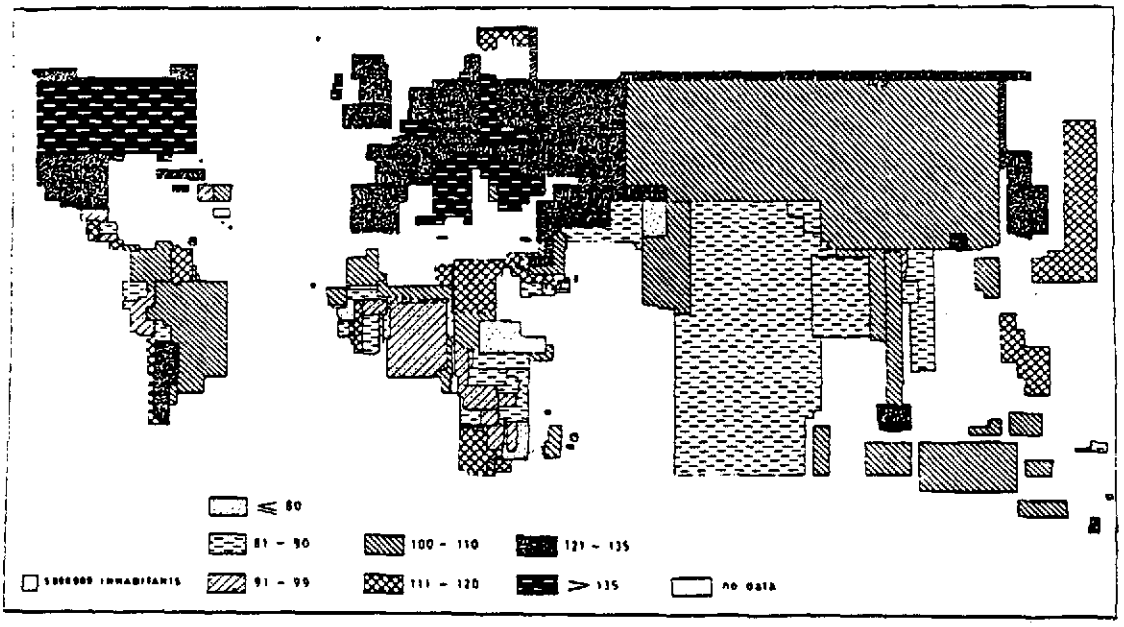


Fig. 2. Rural Water Supply Service Coverage
Couverture réalisée par les services ruraux d'approvisionnement en eau
Percentage of population covered
0
50
70
90
Data not available

Figure 9

7. PERCENTAGE OF REQUIRED CALORIES

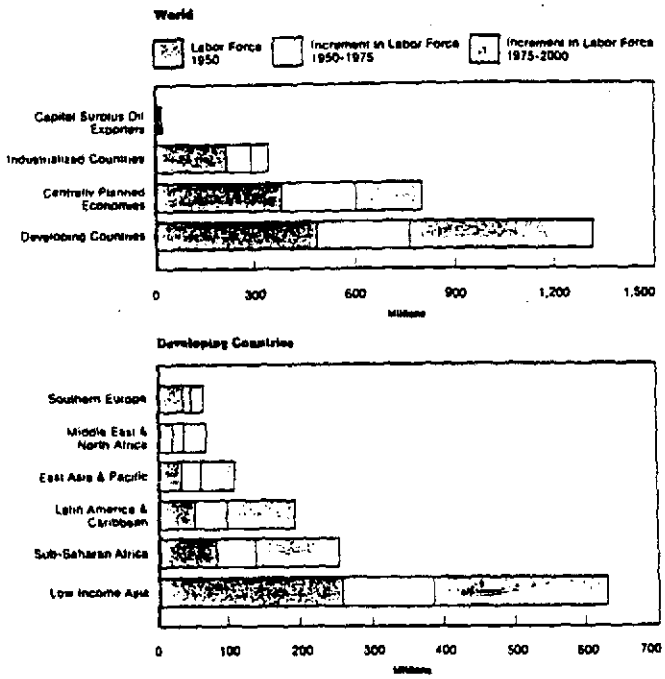


Source: Verhasselt & Truytschaever Mapping Health Indicators, 1987

Figure 10

Figure 7

Labor Force Estimates and Projections, 1950-2000



modify the relationship somewhat, labor force growth is determined mainly by past population growth with a lag of about 15 years. Consequently, the high, and in some countries increasing, rates of population growth of the late 1960s and 1970s will not be reflected in labor force growth rates until the 1980s and 1990s. Although already high by historical standards, the recent annual rates of labor force growth reported for Latin America and the Caribbean, Sub-Saharan Africa, the Middle East and North Africa, and Low Income Asia will be surpassed in the future (Table 27).

The immensity of future expansion in the labor force is illustrated in Figure 7. In Low Income Asia, the labor force increased by about 125 million people between 1950 and 1975; between 1975 and 2000, despite a projected slight decline in the participation rate, it is expected to increase by almost 250 million to approxi-

Source: World Development Report, 1979

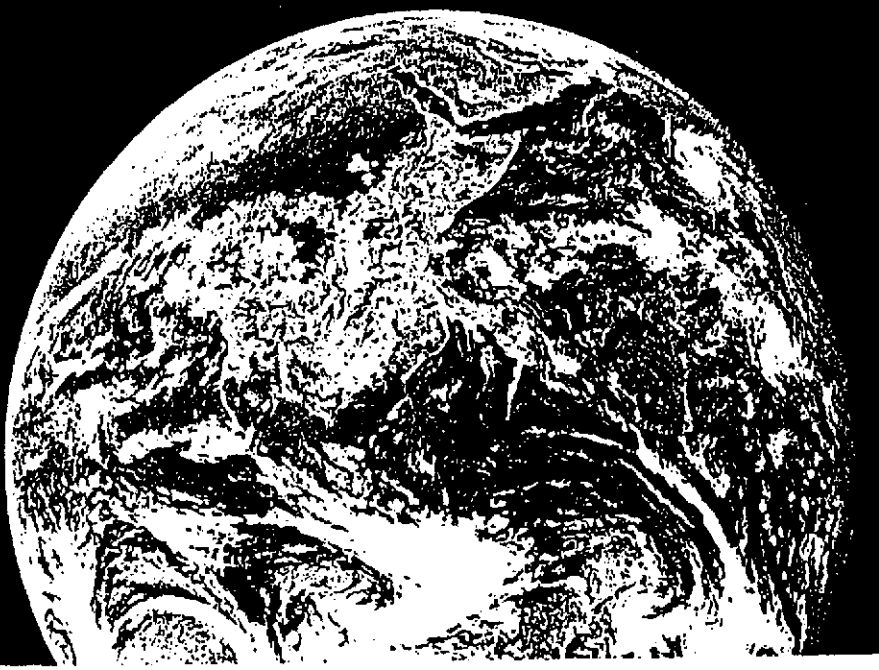
Annex 1

WHO/EHE/92.1
ORIGINAL: ENGLISH
DISTR.: GENERAL

REPORT OF THE WHO COMMISSION ON HEALTH AND ENVIRONMENT

Summary

World Health Organization



4. Research capability strengthening (RCS)

Health research capacities will continue to vary from country to country. However, national health systems will not develop without a national capacity to carry out health research. The determination of the scope and size of its research establishment is a national responsibility.

National commitment for RCS

It was agreed that RCS, particularly in developing countries, is critical for the training of researchers and the building up of research institutions. The evolution of research capability is an important and integral part of health development. As such it is of paramount importance to obtain national commitment, at the highest level, to promote and provide the support required to build and sustain RCS.

Ministries of health play a pivotal role in obtaining this national commitment. However, in view of the multisectoral scope of health research, a number of ministries should collaborate to mobilize support from other sectors such as education, science and technology and planning. External support for health research and/or RCS should be seen as complementary to that provided from national resources for this purpose.

Priorities for RCS

The priorities for RCS should flow directly from national health and research priorities. Here too the ministries of health, being the health providers, should have a key role. They are in the best position to enunciate balanced priorities for RCS.

Given the wide spectrum of social and economic conditions prevailing in the developing countries and the marked variation in the availability of research infrastructure, the needs and priorities for RCS would vary considerably.

However, the focus of RCS should initially be on what has come to be known as "essential national health research". This enables Member States to investigate their health problems, using scientific methods, provides rationale for informed decision-making and leads to improved management of health services. Several developing countries with contributions from bilateral and multilateral agencies have already initiated efforts in this direction, and there is a great need to sustain and augment these fragile national efforts.

Foremost amongst the various disciplines in which skills are needed for carrying out essential national health research are epidemiology, supported by essential laboratory research, policy analysis research, information and social sciences. The level and duration of training in these disciplines should be carefully worked out, keeping each country's unique situation in mind.

The RCS process for essential national health research should ensure utilization of research results (in order to demonstrate its usefulness, necessary for obtaining resources) and lead to linkages between scientists in universities, health services and research institutions.

To start with, every effort should be made to use existing facilities and personnel. Very few developing countries can afford to build and maintain institutions solely for health research. In this connection the universities and academic institutions have a special role. They should become more involved in essential national health research and encourage their staff to be involved in such research even for purposes of promotion and career advancement.

Approaches for RCS

Considerable experience has been gained internationally in RCS. Approaches commonly used include support for the training of researchers, for institutional facilities such as equipment, supplies and for the creation of new staff positions. Important aspects of RCS often neglected are the provision of scientific information, and the establishment of linkages amongst scientists within the country and with those from other countries.

Experience in several developing countries has also shown that while qualified physicians or science graduates can be trained to carry

out essential national health research, every type of health worker even at the most peripheral level can learn scientific approaches which would enable them to analyse health problems in a systematic manner and take steps for dealing with them. Problem solving and a spirit of enquiry should be developed as essential components of formative education.

The main thing is to adopt a flexible approach best suited to meet the country needs. The RCS process is long and drawn out and the approaches adopted should be flexible so that they can be modified with time and experience.

Research manpower

In order to develop future generations of researchers, problem-solving attitudes and a spirit of inquiry should be encouraged as essential components of formative education. Similarly medical and science students, during their training, should be encouraged to take part in on-going research projects in their institutions or even carry out a time-limited project.

A broad approach should be adopted for training researchers ranging from the training of health workers in scientific methods for collecting and analysing data to training science, medical, nursing, and social science graduates in more advanced and sophisticated techniques and skills.

It was appreciated that it may not be possible to employ researchers on a full-time basis in the majority of developing countries. A system of incentives should be available, if required, to attract and retain potential research workers. Similarly appropriate incentives should be made available to well-trained scientists from developing countries who are working in developed countries to come back.

Role of international agencies

Many bilateral and multilateral agencies have provided resources to developing countries for health research projects and to a lesser extent for RCS. It was agreed that in some instances external assistance has played a catalytic role in mobilizing national support, while in other instances, external support was short lived and not associated with any meaningful, endogenous RCS. Such collaboration should be sustained partnership on an equal basis, and provide an opportunity for both technology generation and adaptation for use in the field. Research projects undertaken within these collaborative ventures are a fruitful ground for training young researchers.

WHO should coordinate the RCS activities of its special programmes for research and training, and other programmes with a research component to effectively meet the RCS needs of developing countries.

Recommendations

1. Research capability strengthening should be viewed as an important and integral component of national health development. Appreciating that it is a long-term process, Member States should commit themselves to providing sustained financial support for RCS.
2. Priority should be given to strengthen research capacities and training, for example in epidemiology, for undertaking essential national (country-specific) health research and RCS should be considered important at every level of health care.
3. Donors and international programmes should develop explicit strategies for long-term support for RCS and allocate increased resources for this purpose in developing countries, and promote collaboration amongst scientists, both within developing countries (south-south) and with those in developed countries (north-south).
4. Member States should attract and retain talented health research workers through provision of an attractive remuneration and career structure, together with adequate facilities for research.

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

DISTR. : RESTRICTED
DISTR. : RESTREINTE

ACHR31/92.19

ORIGINAL: ENGLISH

Appendix 7

ADVISORY COMMITTEE ON HEALTH RESEARCH

Thirty-first session

Geneva, 28 September - 2 October 1992

Agenda item 14

RESOURCES FOR HEALTH RESEARCH [1]

[1] Prepared by Dr A. Kessler

ACHR 31
Agenda item 14

9 July 1992

RESOURCES FOR HEALTH RESEARCH

by Alexander Kessler M.D., Ph.D.*

CONTENTS

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* Temporary Adviser, formerly Director, WHO Special Programme of Research, Development and Research Training in Human Reproduction.

1. Introduction

"Resources for Health Research" comprise a wide spectrum of subjects that include manpower, equipment, facilities, scientific tradition and funding. This paper only addresses the last of these issues: funding for research and for research capability strengthening (RCS). It suggests a few approaches within the context of WHO to generating additional funds for the implementation of some of the recommendations of the World Health Assembly and the Global and Regional Advisory Committees on Health Research.

WHO has a good track record for fund-raising for research and RCS : In the past 20 years its budget for these activities has risen from $5 million to over $100 million per annum. The greater part of the increase has come from Government aid agencies and international organizations. They responded because they considered that:

- the problems identified for an increased research and RCS effort were of high priority;
- WHO, as the international agency for health, provided a key platform for Member States to make their wishes known;
- the Organization had the structure at national, regional and inter-regional levels for ensuring that the research and RCS conducted conform to high technical and ethical standards, and that there be close interaction between research and operational activities.

The continued and increasing support by those providing funds over the past 20 years reflects:

- satisfaction with the quality of the collaborative research conducted;
- progress made in institution-strengthening for research in developing countries;
- and the cost-effective management of the activities themselves.

It also recognizes that the monies channelled through WHO generate at least an equal amount, if not a greater one, in funds contributed on a counterpart basis by the governments of developing countries to these research and RCS activities.

It makes good sense, at a time of worldwide recession, when seeking additional funds may be difficult, to capitalize on this experience and these achievements. Different scenarios for fund-raising may be envisaged, depending on the different aspects of research and RCS that the ACHRs have addressed: clearly one would not approach funding for health systems research in the same way as one would seek support for health futures research.

What follows below are simply examples of possible ways of increasing funding to certain areas. The areas selected are illustrative and the tactics proposed are not necessarily topic-specific; they might be used for research or RCS endeavours not referred to

below.

2. Increasing funding to health systems research (HSR) and to RCS for HSR

HSR is the topic that is most frequently given highest priority in recommendations on research that requires expansion in developing countries. It is considered to be "one of the keys to getting greater value from the scarce resources that are available for health. It is also an important mechanism to identify unmet health needs and to guide policies for helping to overcome the inequities in health status. Health systems research which monitors the effectiveness of health services programmes and informs judgments on policies and management decisions is therefore central to the concept of health."[1]

Very briefly funds are principally needed for:

- increasing awareness among policy makers, health managers and community leaders of the usefulness and scope of HSR, e.g. through workshops;
- ensuring an adequate number of research workers, through training courses and fellowships etc;
- building up a network of institutions equipped for research, data-processing and training;
- the actual conduct of research, and for the much-needed development of better methodology for HSR;
- dissemination of information, e.g. through publications, meeting, travel;
- managing the HSR programmes e.g. supporting mechanisms for project review, evaluation, accounting, fund-raising.

2.1 Existing mechanisms

a) WHO Regular Budget

The first and most obvious way of increasing funding to HSR and HSR/RCS is for more funds to be allocated to this area in WHO country, regional and inter-regional budgets. There already exist a considerable number of discrete HSR projects, and HSR features as an important component of other WHO Regular Budget programmes in such areas as primary health care, environmental health, maternal and child health, and mental health. The commitment to increasing these activities is reflected in the Organization's Programme and

1. Evans, J.R. (1992), Summary of the discussions on health systems research, 43rd World Health Assembly Technical Discussions. In: Davies, A.M. & Mansourian, B. (eds.) Research Strategies for Health, Hogrefe & Huber, Lewiston N.Y. p. 76.

Budget.[1] Whether countries should be encouraged to devote a fixed percentage of the WHO Regular Budget funds to HSR and HSR/RCS is open to debate.

In any case, more funds than are likely to be available from the WHO Regular Budget will probably be needed for HSR and HSR/RCS, and thus other mechanisms for fund-raising will have to be explored.

b) WHO as Executing Agency for HSR in projects funded by other Agencies

WHO has for many years acted as Executing Agency for various aspects of health care and health research in activities funded by other international agencies such as the United Nations Children's Fund, the World Bank, the UN Development Programme and the UN Fund for Population. These are often large and fairly long-term multi-sectoral projects in which the health component is one of several inputs aiming at strengthening national infrastructure for development. By their multi-sectoral nature, and the occasion thus provided for conducting HSR in conjunction with other activities, these projects would seem to lend themselves particularly well to an infusion of HSR. WHO might intensify its efforts to identify opportunities for including HSR and HSR/RCS in such projects, and to act as Executing Agency for that component of the projects.

c) WHO as a partner in government aid programmes

Other potential sources of funds for HSR and HSR/RCS are bilateral programmes, or similar programmes involving one donor and several developing countries; WHO would act as facilitator and technical partner.

The Joint WHO/Netherlands Ministry for International Cooperation/Royal Tropical Institute (Amsterdam) project in the African Region is an example of what can be achieved in promoting HSR and building up research capability for it in several countries, using the WHO Regional Office infrastructure and support from WHO Headquarters.

Some governments, that may be reluctant to contribute to a general fund for HSR, may prefer a bilateral approach: it allows them to assist countries in which they have a special interest. Many recipients of bilateral aid may favour WHO acting as an intermediary in such arrangements, not only because of the technical inputs WHO would make, but for political reasons, because of WHO's neutrality. HSR can be a sensitive area of research, often uncovering deficiencies in national provision of health care. WHO is seen as the "honest broker" in these activities.

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1. World Health Organization, Proposed Programme Budget for the Financial Period 1992-1993, Geneva 1990.

d) WHO collaboration with philanthropic organizations

There is a long tradition of collaboration between WHO and philanthropic organizations with an interest in research. Up till now most of these collaborative efforts have been in biomedical research. At present, for example, the Rockefeller Foundation provides funds to SEARO's development of a vaccine against dengue haemorrhagic fever and is collaborating in WHO's overall programme of vaccine development.

Such sources might be further explored for support to HSR and HSR/RCS. The Rockefeller Foundation already has ongoing training programmes in epidemiology, biostatistics, social sciences, health economics and health policy; the Ford Foundation provides training in epidemiology and health management. A joint programme to use these resources to train personnel for WHO HSR activities would greatly increase the research capability strengthening capacity.

2.2 A new mechanism: an intensified Programme of HSR and HSR/RCS

Over and above these different approaches and better still running concurrently with them, an intensified WHO Programme on HSR and HSR/RCS, anchored in the Regional Offices, might be another mechanism for increasing funding.

Funds would be sought from a consortium of donors (international agencies such as the World Bank, government aid programmes and philanthropic organizations) as has been done for Special Programmes such as those on human reproduction (HRP) and tropical diseases research (TDR). As HSR however, tends to be country-specific, there would seem to be little need for the inter-regional managerial structures adopted by the Special Programmes. Technical expertise and administrative management in the Intensified Programme of HSR and HSR/RCS would be principally located in each of the Regional Offices. A start might be made, for instance, with a nucleus in each Office of 4 or 5 professional staff from the disciplines involved in HSR.

The Intensified Programme would increase the capacity of the Regional Offices to:

- promote the concept of HSR;
- collaborate with countries in formulating country and inter-country projects for HSR and HSR/RCS to be funded by the Intensified Programme or from mechanisms already mentioned above such as the WHO Regular Budget, the Executive Agency approach, or bilateral aid;
- provide technical inputs into these projects as required;
- make funds available in a rapid and flexible way for projects directly supported by the Intensified Programme projects;
- prepare reports and proposals for the consortium and for other donors.

The development of appropriate methodologies for HSR would continue to be, as it

is at present, the responsibility of HQ.

A mechanism would have to be developed to prepare and present to potential donors a consolidated proposal from the six Regions and HQ, and to convene the periodic meetings of the consortium to review programmes, evaluate progress, discuss management and proposals for the future. These meetings might be held annually and in each of the Regional Offices in turn.

There are many reasons why such an Intensified Programme should appeal to development agencies and other donors:

- there is universal agreement on the importance of HSR and HSR/RCS to developing countries;
- almost all the funds (which is not the case in most biomedical research programmes) would be disbursed in developing countries;
- HSR and HSR/RCS are both considerably less costly then biomedical research or institution-strengthening for biomedical research;
- much of HSR is relatively short-term research (again as compared to most biomedical research) and results should be available rapidly, thus facilitating evaluation of the Programme;
- similarly, strengthening institutions for HSR is a less lengthy procedure than for biomedical research;
- the Intensified Programme would provide a focus for coordinating at country level the HSR and HSR/RCS activities of different WHO programmes;
- it might be envisaged as a time-limited activity. Ten years might be sufficient to give the needed booster effect to HSR and HSR/RCS.

3. The Special Programme mechanism extended to other programmes

The Special Programme mechanism for promoting research and institution-strengthening for research, as exemplified in HRP and TDR, has shown its viability in raising funds. There is every reason to believe that it would work equally well for other priority areas identified by the WHA and the ACHR, such as research in nutrition, mental health, cardiovascular diseases and maternal and child health. Each of these programmes has an established track record in research and RCS in developing countries, as well as already formulated proposals for expansion. This is the case with other equally important programmes.

4. Industry as a source of funding

4.1 The pharmaceutical industry

WHO has a long history of collaboration with industry in the R & D of drugs

and therapeutic devices. It has at the same time always sought to maintain impartiality and to avoid use of its name for the commercial promotion of a product.

It would not appear to breach this principle to suggest that the major pharmaceutical firms might be approached to contribute funds for health research unconnected to drugs or devices. Although industry is often thought to care for little but profit, many firms have interests well beyond this. For example Roy Vagelos, the President of Merck, one of the top pharmaceutical firms in terms of R & D expenditure, is reported as being "passionate about his commitment to corporate social responsibility".[1] Why not capitalize on these sentiments?

At present, according to company accounts published up to 31 May 1992, the top 10 pharmaceutical firms in the world (ranked according to R & D expenditure) are spending about $10 billion a year on R & D.[2] They might be encouraged to form a consortium in which they and other firms would contribute to WHO research activities a given percentage of their R & D expenditure. If this were only 0.01% – one hundredth of a per cent – it would still bring in at least $10 million a year.

One would have to explore what use for these funds might most appeal to these firms. It might suit their policies to be completely altruistic and see the monies disbursed for the promotion of HSR and HSR/RCS in developing countries, for instance through the Intensified Programme suggested above. Or they might prefer that some funds at least go to research from which they might derive benefit. The research proposed by the ACHR on "Evolving problems of critical significance to health", and in particular the major topic of "new and evolving diseases and vectors" could provide useful guidance for these firms' R & D strategies and might be of considerable appeal to them.

4.2 Other industry

Non-pharmaceutical firms with a large market in developing countries, or which rely heavily on raw materials produced by developing countries, might be prevailed upon in the spirit of social equity to sponsor various health research activities unrelated to promotion of their products. For example, they might be persuaded to endow health research-oriented professorships or fellowships in developing country institutions. The name of the firm might be attached to the position, for instance a Peugeot Chair of Health Economics or Cadbury Fellowships in the Behavioural Sciences.

The ACHR has stressed the importance of developing better health, and related social and economic, indicators. It may be necessary to distinguish these new indicators

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1. Medawar C. (1992) Pharmaceutical Feuds, Nature, 357, 651.

2. The Independent, London, 9 June 1992.

from those in previous use. An inducement for firms to contribute to the research needed for the development of these indicators might be for the firm's name to be linked to a particular model or indicator, for example the Sony indicators of health care delivery.

5. Facilitating fund-raising

5.1 Giving a higher profile to health research in science policy

It is an interesting paradox that, when the public is polled on which is the most important area of research and which should be given priority for funding, health research is invariably ranked top. Actual expenditures, however, place it fairly low, in developed and developing countries alike, usually obtaining 5 to 10% of government R & D funding.

One of the ways in which this percentage might be increased is for science policy experts to take a greater interest in health research. In going through the extensive science policy literature of the past 45 years one is struck by how little of it is addressed to research in the health field. Indeed, of the 1,117 science policy units located in 84 Member States in the UNESCO inventory of 1981, essentially none had a major interest in this subject.[1]

Health research faces competition for funds at two levels. Within the overall government R & D budget it competes with defence, agriculture etc; within the overall health budget, it vies for funds with health care. A small investment in building up nuclei of health-directed individuals within existing science policy units to formulate vigorous strategies and marshall arguments for increasing funding to health research should result in obtaining a bigger slice of both these pies. Funds for this relatively inexpensive activity might be generated through collaboration with Medical Research Councils and similar bodies since they, in both developed and developing countries, face this same challenge with regard to funding, and/or from philanthropic sources.

5.2 Funding figures

In making a case for increased funding to health research, whether for an overall increase or to a particular area, one of the first steps is to determine current levels of funding and activity. Obtaining meaningful figures is, however, no easy task. First what is comprised in "health research" needs to be defined. At one end of the spectrum it merges with the basic sciences, at the other with the social sciences, and it interacts increasingly with engineering and electronics. It is also often difficult to disentangle research from teaching and health care. Moreover funding for health research is channelled

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1. UNESCO (1981) World directory of research projects, studies and courses in science and technology policy, Science policy studies and documents No. 49, Paris, UNESCO.

through many government sectors : health, education, labour, agriculture, defence etc, and by the private sector, mainly the pharmaceutical and medical equipment industry, and philanthropic organizations.

Measuring activity solely in terms of expenditures can be misleading unless certain points are kept in mind. Some types of research, such as HSR, can be conducted with a much smaller investment than others, such as research on anti-tumour drugs. Also the cost of research varies greatly among countries. To compare expenditures in different countries requires using purchasing power parities (ppps) to smooth out the effect of variation in purchasing power. Strict definition would moreover be needed of what to include under research costs: in some countries up to 100% is added to the cost of a research project for general administrative expenses (e.g. running the hospital) unrelated to the research project itself. Another point to keep in mind is that, in showing trends over time in expenditure, particularly at an international level, a constant unit of currency must be adopted, in which a given year is taken as a basis.

A further consideration is that, in comparing developed and developing country health research expenditures in terms of the populations that will ultimately benefit from the research, patterns of morbidity and mortality are changing. Research in developed countries on cancer, cardiovascular diseases, diabetes and other "post-transition" diseases will also benefit developing countries where these conditions are on the increase.

There is clearly a need for more thoughtful and accurate documentation of the actual funding situation for health research, and for this exercise to be carried out on an ongoing basis. Availability of this information should greatly increase the confidence of potential donors. HQ and Regional ACHRs and RPDs would appear to be admirably suited to carry out this task.

I should like to thank RPD/HQ for the stimulating discussions that provided background to this paper. In the brief time allotted for its writing it was not possible to consult the many WHO programmes mentioned. Clearly, if the ACHR thought it worthwhile to pursue any of the ideas suggested, these programmes would have to be involved in their elaboration.

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