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VECTOR CONTROL AND NATIONAL HEALTH SYSTEMS

by

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VECTOR CONTROL AND NATIONAL HEALTH SYSTEMS

1. INTRODUCTION

The purpose of this paper is briefly to discuss the rightful place of vector control in health organizations and review the related role of Ministries of Health.

In line with the concepts inherent in the Primary Health Care approach as put forward at the Alma Ata Conference*⁽¹⁾ and later embodied in the Global Strategy for Health for All by the Year 2000⁽²⁾ we have entitled this paper "Vector Control and National Health Systems". We have preferred to speak of "health systems" instead of "health services" in line with the concept that health is a responsibility of all sectors, groups and individuals contributing to the socioeconomic development of a country and that, in relation to health, action undertaken by other sectors may be as effective and, sometimes, more effective and longer lasting than action undertaken by the health sector itself. This concept applies particularly well to vector borne diseases.

* The Declaration of Alma Ata defines primary health care as "essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination. It forms an integral part both of the country's health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process". Primary health care "includes at least: education concerning prevailing health problems and the methods of preventing and controlling them; promotion of food supply and proper nutrition, an adequate supply of safe water and basic sanitation, maternal and child health care, including family planning; immunization against the major infectious diseases; prevention and control of locally endemic diseases; appropriate treatment of common diseases and injuries, and provision of essential drugs".

**A 'health system' must be seen as the coherent whole of many interrelated component parts, both sectoral and intersectoral as well as the community itself, which produce a combined effect on the health of a population. In order to achieve a combined effect, all parts have to work together and adjust to each other so as to create a 'purposeful whole' or a 'purposeful system'. This can be done through constant communication and division of labour among parts.⁽³⁾

The Primary Health Care approach can be understood as a philosophy, a strategy and a level of care.⁽⁴⁾ As a philosophy it emphasizes equity and justice in the allocation of health resources to all population groups; a broader understanding of health that can only be realized in a developmental process that gives priority to social as well as economic goals; self-reliance and self-realization, i.e. the confidence of the individual in his ability to control his own life and environment and the opportunity to do so, and finally international solidarity in health. As a strategy it emphasizes appropriate changes in the health sector, involvement of communities in decision-making and the control of resources and the development of the necessary links with overall development strategies. As a level of care it emphasizes coverage of the population by all essential service elements at the level of first contact with the health system, with appropriate extension into the community and their homes on one side and into the supporting system at intermediate and national levels on the other side.

2. THE PLACE OF VECTOR CONTROL IN NATIONAL HEALTH SYSTEMS

While a certain degree of centralization may be appropriate when national policies are being developed and strategies and broad plans formulated, health work should preferably be implemented in a decentralized fashion at various levels, depending on the size and administrative set-up of the country. The current trend is to strengthen decision making at provincial, district and local levels and a process of administrative decentralization is occurring in many countries. The need for highly specialized skills as well as the identification of appropriate low-cost technology options in vector control exist side by side. The optimal extent and level of integration of vector control with other health activities is thus an important current concern. Likewise, links are being developed among related components of the health sector and between this and other sectors in order to arrive at the most effective possible use of available resources.⁽⁵⁾ To this effect, one of the innovative and promising aspects of the health for all strategy based on primary health care is the involvement of communities in health work. Such an involvement will be briefly reviewed in the following section in relation to vector control. Thereafter we will consider sectoral and inter-sectoral integration of vector control activities in the context of national health systems development. Lastly, mention will be made of the roles and resources of Ministries of Health and of research in supporting vector control activities in countries.

3. COMMUNITY PARTICIPATION IN VECTOR CONTROL*

The scope of the PHC approach would be difficult to translate into practice without an appropriate degree of decentralized management and an adequate involvement of the community.

Generally, community involvement in health action can take place in very different ways. Essentially, three could be distinguished.

- (a) endorsement of a programme planned at a different level;
- (b) choice of the programme to be adopted from among predetermined alternatives identified and formulated without the participation of the community,
- (c) direct and true responsibility in decision making and over the use of resources.

Until recently the approach followed has been largely the one described in (a), characterized by passive community attitudes and the imposition of solutions from the national or regional level. People are now gradually moving away from this approach, but the desirable situation described in (c) is still seldom observed. Here the responsibility of the ultimate decision is shifted from the technicians to community leaders, although the burden to the community of contributing locally available resources is also increased.

Community participation involves education and organization of the community, development of mechanisms for community decisions on priority problems and the establishment of a functioning partnership between the community and general health services. Prerequisites for this partnership to be effective are the decentralization of governmental authority leading to greater community self reliance, representation of a majority of the people and not a select few by community organizations and leaders and a satisfactory degree of integration within the health system to prevent communities being overwhelmed by a variety of requests and proposals from different parts of the system.⁽⁷⁾

* Part of the content of this section has been summarized from document WHO/VBC/82.847.⁽⁶⁾

If one excludes measures, like house spraying, which are of universal application, many others can only be adopted for use depending on a variety of local and specific socio-epidemiological conditions which must be perfectly known. Here the specialist becomes an adviser to the community (rather than its leader) and has the responsibility of providing the community with factual information. For example, an explanation will have to be given as to why deforestation around villages is so effective for Anopheles balabacensis in the Far East but would actually lead to an increase of A. gambiae breeding places in Africa; or why the control of Anopheline larvae is so effective in the arid Middle East but is less important in Africa; or why control of Anopheline larvae in rice fields is effective in China but a questionable practice in Equatorial Africa, etc.

The feasibility of certain vector control measures under certain socio-economic contexts will depend upon the efforts of the health workers to make these measures acceptable to the people. Thus, the natural history of both vectors and pathogens will have to be explained, undesirable side effects like the proliferation of DDT-resistance bedbugs in malaria control campaigns will have to be obviated and practices incompatible with the culture of the people, like the spraying of "sacred woods" in Africa, will have to be avoided.

A substantial health education effort is implied in every vector control campaign. As a result of this educational process community members may themselves become the actors and work and operate, so to speak, from within the community provided that they are kept informed and are well supported by trained national or regional specialists. They could:

- continue the educational process in the community to keep awareness, interest and collaboration alive;
- facilitate in different ways the work of vector control teams coming from outside,
- acquire responsibility for the transfer to village level of vector or infection control techniques already practiced on a large scale by specialized teams (e.g. distribution of anti-malarial drugs or, in the Volta Basin, carry out black fly larvicidal treatment for the prevention of onchocerciasis on the ground, while it is generally done by helicopter,

- take responsibility for vector control activities which are more specific to their village population and environment such as the installation and maintenance of mosquito nets (plain or impregnated with insecticides), installation and maintenance, or even improvisation, of water filters to prevent dracunculosis, improvement of dwellings to eliminate hiding places for reduviid bugs in Chagas' disease areas; installation and maintenance of impregnated traps for tse-tse flies, deforestation and cleaning of undergrowth for the control of exophilic anophelines (A. balabacensis and A. nunez-tovari); elimination of urban and sub-urban breeding places of filarial vector Culex quinquefasciatus and of Aedes aegypti in dengue epidemic areas.

All these possibilities are attractive but there is only limited concrete experience available about them, there is a need for much 'learn by doing' to clarify how many of the new ideas can be successfully applied and the extent of their results.

4. INTEGRATED VECTOR CONTROL

Integrated vector control has been defined as "the selection and application of methods of control to optimize achievement of results".⁽⁷⁾

In vector control the need for integration stems from the realization that simplistic control measures of the past were inadequate to deal with most complex situations. It also relates to the observation of a variety of problems such as the scarcity of new effective chemicals, resistance to chemicals by insects, chemical residues, scarcity of resources, increasing realization of the need for cost-effectiveness, etc.

Integrated vector control has two dimensions which could exist simultaneously in the same area:

(a) Integration of methods to control specific vector borne diseases

Because of differences in effectiveness and the unpredictable occurrence of undesirable effects (resistance to pesticides, changes in vector behaviour), as far as possible several methods are used in interrelated fashion to control the responsible vectors. These may include adulticides for residual or space spraying, larvicides, biological control agents such as larvivorous fish, parasites and other pathogens, genetic control measures and various approaches

to environmental management" such as modification and manipulation of the environment (see following diagram)

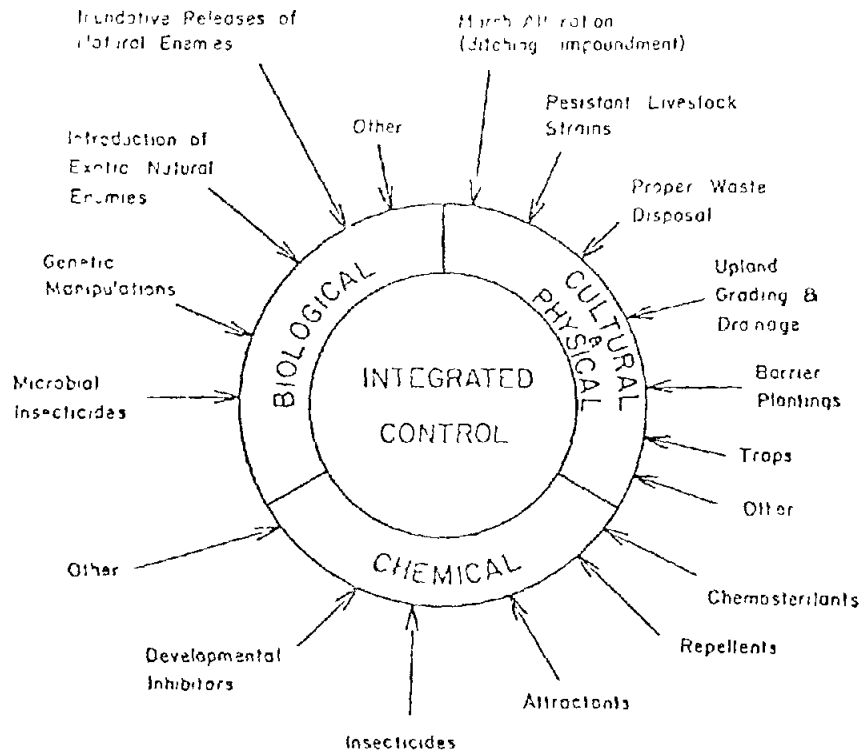


Diagram of the components (physical and cultural, chemical and biological) and some of their potential constituent techniques to be considered in an integrated control approach to mosquito integrated pest management. (From Axtell, 1979).⁽⁷⁾

Selection of methods and their time of application will depend on what is known of the biology and ecology of the vector involved, the intended results and the resources available. If a quick effect is needed preference may go to insecticides, conversely, environmental management may be slow to act but its impact will last longer and in the long run be more economical. In general, environmental measures should be preferred to the use of chemicals, biological means should be used as additional measures, the use of insecticides should be rationalized and the timing of application adjusted to the local pattern of transmission. In selecting methods for integration, consideration should be given to economic and cultural factors. Methods being considered for selection should have been analyzed for cost-effectiveness. This is defined as the ratio of effectiveness to cost of one method, a

* A Joint WHO-FAO-UNEP Panel on Environmental Management for Vector Control was created early in 1981. Its purpose is to facilitate intersectoral collaboration, communication and exchange of knowledge and to provide project support.

combination of methods or a programme as a whole over a specified period of time (the duration of the effectiveness being an important factor). Benefit-cost analysis are much more difficult to use as both benefits and costs must be calculated in monetary terms. Finally, methods should be suitable to local conditions, acceptable to people and safe for them and for the environment (i.e. they must have a positive benefit to risk ratio).⁽⁷⁾

(b) Integrated control of vectors responsible for different diseases.

As a single vector can be controlled by several methods, single methods, if properly applied, can be effective against the vectors of various diseases which appear to be prevalent in the same area. Even when this does not occur, the integrated use of resources in an attack on the vectors of different diseases may be more economical. Integration of vector control operations and programmes is therefore not only justifiable on technical grounds but, being based on the sharing of often limited resources, may be more cost-effective and therefore attractive. Experience has shown that as a result of anti-malarial activities the incidence of diseases such as leishmaniasis and others has also decreased. Minor modifications in material used or method of application may affect the vectors of several diseases.⁽⁷⁾ Although there is resistance to this approach, mostly related to the need to discontinue established structures and practices and the possible threat to vested interests, and although relevant experience is limited, there seem to be good prospects, supported by some notable examples (Adana Project in Turkey,⁽⁷⁾ the Blue Nile Health Project in the Sudan,^{(8) (9)} and the Sedawgyi Project in Burma⁽¹⁰⁾) that entomological services will orient themselves towards this type of approach more and more in the future (see also section 7).

5. INTEGRATION OF VECTOR CONTROL INTO PRIMARY HEALTH CARE

The expression "primary health care" is used here in the sense put forward at the Alma Ata Conference⁽¹⁾ and described in the Introduction. Generally, vector control activities in the past have been part of specific disease control programmes or have been carried out by special units operating independently of the health services. More recently there has been a movement towards the gradual technical and administrative amalgamation of such vertical programmes (where they exist) into general health services or towards the development of general health services in which the control of specific vectors or diseases is an integral component.

The general principles and the basic questions relating to the integration of mass campaigns formulated several years ago⁽¹¹⁾ are still valid

The principles are those of technical effectiveness and operational efficiency.

The questions relate to (a) whether mass campaigns should be automatically run when general health services are lacking or underdeveloped; (b) the extent to which it is possible to incorporate these campaigns into the general health services from the beginning; and if this is not feasible (c) the stage at which and the manner in which general health services should be involved.⁽¹¹⁾ However, these concerns have been somewhat overshadowed by the recent commitment of most countries to the development of effective health systems based on primary health care, as well as increasing concern with the high costs of mass campaigns, which have also often failed to deliver the results foreseen by their initial promise of effectiveness (malaria being an obvious example).

The feasibility of implementing control of vector borne diseases as a fully integrated component of PHC depends on the magnitude and urgency of the health problems, the stage of the control activities, and the development of the PHC infrastructure.

This being said, it should also be clearly emphasized that the integration of a vertical control programme into primary health care is no optional matter even if, in certain cases due to local circumstances, it cannot occur from the very beginning.

However, even in such a case it is desirable to associate all those concerned in a joint planning and formulation effort and to provide them with full information. Experience has repeatedly shown that this will prevent problems in later stages of the programme.

Integration of vertical control programmes into PHC is therefore desirable, not only because PHC provides a valuable basis for the vertical programme but also because, due to the law of diminishing returns, it will allow continuation of the programmes in later stages in a cost-effective manner. Conversely, vertical programmes may, in certain situations, provide an otherwise difficult to attain basis for the development of general health services. Because of this it "must be established as early as feasible and progressively expanded. It must be regarded as a definite responsibility and not as a form of simple and perhaps somewhat casual

collaboration. It must comply with the technical and operational requirements of the campaign" (11)

6. VECTOR AND DISEASE CONTROL AND INTERSECTORAL ACTION AND COORDINATION

Health is not improved solely by the health sector. Action undertaken by other sectors can be as effective and, sometimes, more effective. The adverse effects on health of many types of human activity are also becoming more widely recognized. The effects of many types of development activities which are accompanied by temporary or permanent environmental changes - irrigation, deforestation, mining and construction projects - have considerably demonstrated potential to alter the ecology of vectors of human disease.

Thus, the primary health care focus on intersectoral action could be considered in relation to the following three areas of direct concern to vector borne disease control

- results of vector and disease control measures would be better and longer lasting if traditional measures currently used in health programmes were complemented with methods of environmental management and other types of action carried out by industry, public works, transportation, agriculture and forestry, animal husbandry, housing, education, etc. in their own areas of operation,
- development projects, especially those relating to water resources, often have important effects on the prevalence of vector borne diseases and the related vector populations; predicting and preventing undesirable side effects related to health becomes, therefore, an important aspect of planning, implementing and maintaining development projects (water improvement projects, irrigation systems, road and railway building, etc.);
- a special aspect of development project implementation is the need to maintain the people working at the site in good health, often as a sine-qua-non condition of the feasibility and success of the development projects.

In all these situations some of the measures necessary to prevent or control relevant diseases are likely to be well beyond the knowledge, capability and resources of the general health services. This will not

only necessitate mechanisms for the collaboration of other sectors as indicated above, but also requires the establishment or strengthening of national or subnational expertise, within or outside the health sector, which can be drawn on by all those concerned whenever it is required.

A recent Intersectoral Seminar on Integrated Vector Borne Disease Control⁽¹⁰⁾ made important contributions to this area. It was focused on the construction of the Sedawgyi dam near Mandalay, Burma, where it was held. The objective was to review the changes in the health and behaviour of the population and in the environment following permanent irrigation of large areas. It also discussed how to prevent or minimize adverse impacts and maximise positive effects by familiarising government departments with possible health implications, enhancing intersectoral collaboration in this (and other) development projects, promoting and coordinating related health research and encouraging active participation of communities in all aspects of the project concerned with health at all stages.

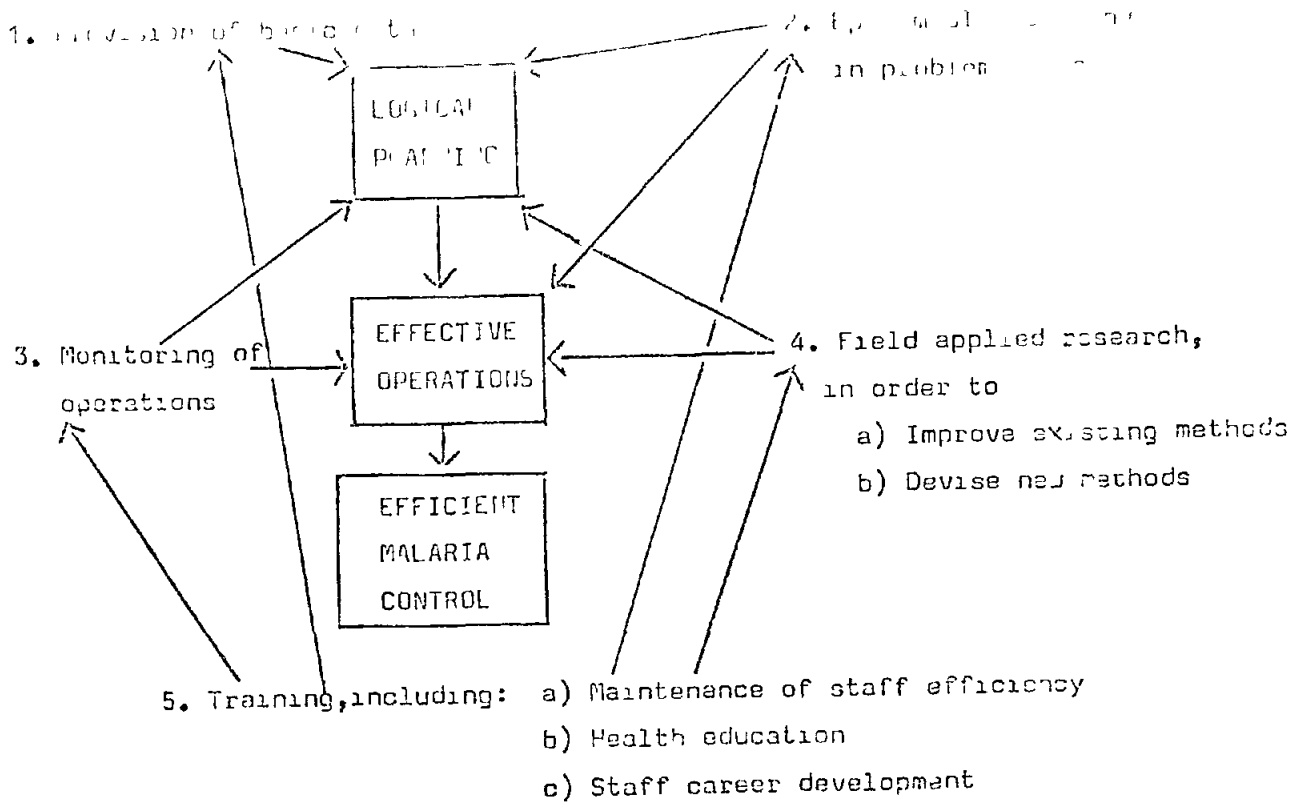
The seminar emphasized that in such development projects the primary concern should be for the well being of the people and that, therefore, everything possible should be done to preserve and improve the health of both the project workers and the community at large while avoiding disruption in their cultural patterns. Accordingly, the health implications should be clear, and preventive action, including appropriate environmental management measures, should be built into the development project. Likewise, socio-cultural and economic implications for the people should be understood and negative effects prevented. The Vector Borne Disease Control (VBDC) programme in the Burmese Ministry of Health is the body which bears most responsibility for health matters related to this project. The VBDC and the Burmese situation in general illustrates well many of the desirable developments and types of integration advocated in the preceding pages.

7. THE ROLE OF MINISTRIES OF HEALTH IN VECTOR CONTROL

(a) Functions

Indications of the role to be played by Ministries of Health in vector control comes from what has been discussed in the preceding pages.

The five main functions of a Ministry of Health in vector control, as suggested by D A Muir in a recent paper⁽¹²⁾ are illustrated in the following diagram.



(Reproduced with the kind permission of the author)

(b) Structure and manpower

In line with the needs described in section 4 when dealing with integration, the logical evolutionary trend seems to be the establishment of a vector borne disease control service dealing comprehensively with all vector borne diseases prevailing in the country. This would allow: "(1) economical use of highly trained staff; (ii) coordination in control of insect vectors; (iii) economical use of supportive facilities and (iv) attracting and retaining qualified staff".⁽¹²⁾ At the peripheral level the minimum basic entomological units would include one fully trained entomologist, two high grade technicians, four entomological aides and auxiliary personnel (e.g. collectors) recruited locally as required. For every four or five basic field units there would be supervisory teams at a higher echelon which would perform under a Vector Borne Disease Directorate at central level. The second level team would be responsible for the provision of essential information for stratification of epidemiological areas and planning, for field applied research, basic and continuous training of field staff and their supportive supervision.

One manpower requirement of increasing importance is the formation of vector control specialists to be trained and seconded to the primary health care team by the vector borne diseases control units which would continue providing all the required technical support.

(c) Supporting facilities

Supporting facilities at appropriate levels would also be required including (i) clerical and statistical support for analysis and tabulation of data, (ii) administrative and logistic support; (iii) transport facilities and (iv) working, storage and laboratory facilities including insectary. (12)

(d) Coordination with other sectors

Following on what has been discussed, especially in section 5, the Ministry of Health will have the responsibility of promoting and arriving at the necessary coordination with ministries and institutions in other sectors and of seeing that appropriate mechanisms are set up for this purpose. Such mechanisms could take the form of health councils established at national or sub-national level, interministerial committees or institutional networks. (13)(14) The first of these should enlist the participation of all relevant sectors and would ensure the formulation of appropriate policies, legislation and plans. The last one would be more concerned with the integrated implementation of action programmes, the generation of needed information and the carrying out of research, and would allow the creation of the multidisciplinary basis required in most development projects. Nuclei would have to be identified and located as appropriate to local situations and, in Ministries of Health, a special office may have to be established to deal with intersectoral coordination in health matters.

8. APPLIED RESEARCH

Several of the approaches mentioned in the preceding pages, although logical, attractive and justifiable on the basis of limited available experience, have not been submitted either to rigorous field testing or to more widespread application sufficiently long to prove their effectiveness and worth. A continuing effort in applied research is therefore needed along the following two main lines: (a) development and evaluation of technology, particularly low cost and less sophisticated methods which can

be applied by unskilled workers, (b) study of the organizational, managerial and resource requirements with which the technology can be successfully used under the prevailing conditions. The latter is what currently goes under the name of health systems research. Both types of research are needed and since one is dealing with very dynamic situations, the research effort must be a continuous one. The basic difference between these two lines of applied research is that while the first provides results which to a great extent can be extrapolated to situations other than the one under which the research was carried out, the second is culture bound and the transferability of its results is low.

The importance of the latter must be emphasized: the analysis of the operational and epidemiological data pertaining to malaria control and eradication programmes, for example, clearly indicated that in many countries the operational application of pesticides and antimalarial drugs has been organized according to their theoretical effectiveness rather than to the specific epidemiological, ecological and socio-cultural characteristics of different areas.⁽⁷⁾ This might have been due also to an insufficient knowledge of these characteristics.

Thus, health services in all countries where vector transmitted diseases are a problem must feel the responsibility to undertake this kind of research and develop the capability for it.

Special attention should be paid to collaboration with universities. In this relationship not only would the universities contribute to the alleviation of the manpower shortage and to the generation of new knowledge through research, but would in turn benefit from exposure to concrete field situations and problems, thus increasing the social relevance of their educational and research work.

9. CONCLUSIONS

Primary health care broadens the scope for looking at vector control in a socio-economic perspective.

The development of vector control activities within a health system context and the involvement of communities present many opportunities which should be more vigorously explored to extend activities and increase cost-effectiveness.

There continues to be a need for specialised skills for planning, monitoring and research in vector control, within and outside Ministries of Health, and for well integrated linkages with both vector control service institutions and other sectors. The range of structure options within health systems based on primary health care needs furthe exploration and more research to answer these and other questions.

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