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Which way for malaria control and epidemiological services?

Historically epidemiological services were intimately linked with malaria control, and both were conceived as an integral part of local public health services. The strategy of malaria eradication between 1956 and 1969 moved malaria activities away from the health services and led to a weakening of epidemiological capacities. The epidemiological requirements of malaria control are now greater than ever. However, the capacity of health services to fulfil these requirements remains seriously weak. Investment in malaria control could provide an important building block for the much-needed strengthening of national public health.

Over the last two decades there has been a gradual deterioration in the effectiveness and efficiency of routine antimalaria activities. Malaria remains the single most important tropical disease, causing over a million deaths annually, mostly of children. Its control should have a sound epidemiological basis, yet current epidemiological capacity in this sphere is disquietingly weak, partly because of the following factors:

- the declining presence of epidemiology in models of health service development;
- the great handicap imposed by the malaria eradication era on epidemiological thinking and practice;
- lack of consensus concerning the development of epidemiological services within the primary health care framework.

Epidemiology in global models of health service development

Primary health care, representing the current global approach to the development of national health services, was preceded by the basic health services introduced in the 1950s. Before that, in 1937, an important statement on health services had been issued by the League of Nations; it is of particular interest in relation to malaria control.

These three landmarks in the history of health service development provide a background against which it is possible to assess the changing importance given to epidemiology or, more accurately, to functions closely associated with epidemiology: surveys, evaluation, monitoring, surveillance, information, and applied research (see boxes). From the epidemiological standpoint the evolution of concepts and functions has been somewhat disquieting. There is considerably less epidemiological presence in the primary health care model than in either of the
Landmarks in health service development: general organizational features

League of Nations

- Efforts principally directed along preventive lines.
- Curative and preventive work combined in one organization or in separate organizations.
- Medical and health services as near to the population as possible. Decentralization of activities guided and supervised by a central body in order to maintain efficiency and uniform policy.
- Rural hygiene through collaboration of representatives of public assistance, health insurance, agricultural associations, the medical profession, agriculturalists, architects, hygienists, engineers and educationalists.
- Preventive and curative work organized on a basis of accurate vital statistics.

Basic health services

- Rural health units providing or making accessible basic health services.
- The health unit an organization of health centres and subcentres closely linked with other local services, e.g., education and agriculture.
- Great stress on preventive services, but preventive and curative medicine not separable.
- Provision of statistical registration and/or analysis, central laboratory services, vector control and other services by the higher levels.
- Provision and maintenance by the higher levels of mobile field units for mass survey and treatment of endemic community diseases (with promotion of health education) and for rapid mobilization to deal with epidemics and disasters.

Primary health care

- Major health problems in community addressed through promotive, preventive, curative and rehabilitative services.
- Involvement and coordination of all related sectors and aspects of national and community development, in particular agriculture, animal husbandry, food, industry, education, housing, public works, and communications.
- Concentration by other levels of the health system on combating health risks which directly or indirectly influence poverty. Specialized curative services provided and development catalysed by support for community activities promoting health and preventing disease.
- Political, social and economic considerations. Multidisciplinary planning teams needed, especially at central level, including people with knowledge of economics, political science and other social sciences.
Landmarks in health service development: disease control and epidemiological aspects

League of Nations

- Determination by each country, with the help of personnel trained in malariology, of its most logical plan of campaign, having due regard for general principles, funds and staff available, focal distribution of disease, and opportunities for enlisting local cooperative assistance.

- First responsibility of government in a malaria campaign—the saving of life and relief of physical distress by making treatment available.

- Flexibility of rural health organization to cope with the focal nature of malaria.

- Financial feasibility of malaria control in cities, large towns, communities of government or industrial employees, military cantonments, construction projects, colonization camps, pilgrimage centres, and large-scale agricultural enterprises such as coffee estates. In such places, poor organization rather than shortage of money likely to delay control.

Basic health services

- Communicable disease control programme integrated with other programmes, such as those of maternal and child health, environmental sanitation, and medical care.

- Degree of emphasis given to communicable disease programme dependent on local circumstances. For major problems, assistance obtained from intermediate level to conduct intensive large-scale campaigns by teams of experts.

- Responsibility of local units for encouraging and facilitating notification, undertaking simple epidemiological studies of sources and channels of spread, and providing instruction for home care, isolation of patients and quarantine of contacts.

- Research, whether epidemiological, clinical, sociological or administrative an essential undertaking. Much research especially on epidemiological and social matters, conducted by local health units.

Primary health care

- Prevention and control of locally endemic diseases an essential element. Education on health problems and methods of preventing and controlling them, appropriate treatment of common diseases, and provision of essential drugs.

- Incorporation of preventive measures into agricultural projects that pose particular health hazards, e.g., irrigation schemes.

- Provision of funds for continuing health service research; organization of health service research, development units and field areas; encouragement of evaluation and feedback for early identification of problems; close collaboration with educational and research institutions; encouragement of participation of field workers and community members; sustained efforts to train research workers in order to promote national self-reliance.
earlier ones. By focusing on social and political aspects of equitable development, primary health care has relegated technical, health-specific disciplines to a lower rank.

The approach to malaria control and the importance given to epidemiological functions by the League of Nations was

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reflected in specific country strategies. For example, the following appeared in a League of Nations memorandum on antimalaria measures in the Punjab (India): “What is required is that each medical officer of health should be the malaria officer for the district he controls. It may take years to collect data, but each individual observation, if accurate, is of the greatest value. The aggregate of data slowly and steadily recorded will in time form the basis on which sound economical work can be established.”

The basic health services approach to malaria control had little chance of being tested since it coincided with the decision to undertake global eradication. Experience with malaria control as part of primary health care is still in an early stage, and there are undoubtedly drawbacks caused by the lack of attention given to epidemiological services *per se*. This aspect of primary health care was only taken up in the WHO health-for-all framework in 1989, 11 years after the International Conference on Primary Health Care in Alma-Ata (1).

**Malaria eradication undermines epidemiological services**

The eradication of malaria was conceived in the mid-1950s as an activity of limited duration: a year’s preparation followed by three during which all houses in a malarial area would be sprayed with residual insecticide at appropriate intervals. The attack phase would be followed by several years of consolidation, with a view to confirming the cessation of malaria transmission and dealing with any relapsed or imported cases. If all went well, malaria eradication would be maintained by the general public health services (2). The decision taken by WHO’s governing bodies to launch a global eradication plan was based on the recognized effectiveness of DDT. Also influencing this decision were the long-term savings expected from eradication, and the risk of insecticide resistance in vectors if control activities were maintained for long periods (3).

The global eradication campaign, which lasted far beyond the limited time originally foreseen, had major repercussions on malaria epidemiology:

- a radical diminution of field (epidemiological) research relevant to the development of new approaches to control;
- the unfulfilled contribution of malaria eradication to the strengthening of national epidemiological services;
- the particular interpretation given to epidemiological surveillance, which inhibited the strengthening of chemotherapeutic services while forcing the health services to act as the guardian of eradication at high cost.

Where it was believed that eradication would be achieved, there was little reason for spending time and money on
investigations other than those related directly to improving eradication techniques. Even if confidence in eradication was less than complete, little time was available for active malariologists to engage in scientific study. Furthermore, funding for research outside the scope of eradication largely disappeared. It was commonly felt that there was little use in studying the intricacies of malaria epidemiology, given the potential of residual spraying with DDT. The overriding attention given to eradication caused malariologists and laboratory scientists to drift apart, the latter being located primarily in non-malarial developed countries. Progress was hindered by technical, operational and financial problems, and it became increasingly difficult to maintain professional competence. Epidemiological work confined itself to surveillance, which either became a routine with little epidemiological interest or was taken over by research institutions where it lent itself to outside criticism of the malaria eradication effort (4).

It was supposed that mass campaigns would lead to a strengthened epidemiological capacity in the general public health services. In some quarters the malaria programme was expected to form the backbone of an epidemiological service and a system of environmental sanitation (5). Less committed was the view that the experience of malariologists would make them as valuable as epidemiologists in other fields (6).

Experiences with the contribution of the malaria programme to national epidemiological services varied greatly. China (Province of Taiwan) was successful in its eradication efforts but did not choose to build on the epidemiological infrastructure of the malaria eradication programme, whereas Iran, whose eradication campaign was unsuccessful, adopted the opposite position.

More typically, Turkey's failed eradication campaign took a long time to unravel and its limited epidemiological skills were transferred to other programmes. In 1969 a WHO consultant was asked to study the possibilities of extending the duties of the personnel in the malaria eradication services and of integrating the malaria campaign with the public health services. He favoured such an extension but noted that staff in the malaria campaign were isolated from other public health workers and that the standard of education and training of its field workers was relatively low, most of them having had little more than primary schooling (7). Rather than trying to build on its malaria programme, Turkey phased out control activities while giving priority to the rural health services. Earlier in the eradication campaign there had been successful attempts at retraining malaria workers to do other simple tasks, among them those of immunization and health education, but these initiatives had been swept away as they encroached on the duties of other health departments.

This example illustrates that it was too simplistic to imagine that epidemiological surveillance in respect of malaria could form the backbone of a public health surveillance system. In fact a closer look at what surveillance meant to eradication helps to explain both past and present difficulties in the conceptualization of control strategies.

Many malaria programmes continue to make blood slides for every fever case. This is a gross misuse of resources.

Surveillance was seen as the element that distinguished eradication from control. It involved looking for cases, these being
identified by microscopic examination of blood films. The detection of a single positive case gave rise to an investigation aimed at identifying the source of transmission, delimiting the transmission focus, and intervening with spraying and presumptive treatment of the whole population. Surveillance did not come to an end when eradication had been achieved in an area, but was modified and reduced in intensity, becoming a normal activity of the public health service.

With the recognition in the late 1960s that eradication was not feasible in the foreseeable future, attention turned to control, yet special consideration was given to surveillance activities aimed at the maintenance of malaria-free areas. The role of the basic health services was thus primarily conceived as the preservation of the achievements of the eradication campaign. To fulfil this role the basic health services were expected to carry out case detection as originally intended under the eradication strategy.

It was natural that malarialogists, still largely committed to eradication, should stress the importance of preserving its achievements through surveillance. Public health generalists also accepted that it was desirable to trace parasitic infections where transmission had been significantly reduced, in the hope of maintaining eradication. Not surprisingly in these circumstances, those responsible for tackling malaria failed to come to grips with redefining surveillance in the context of control, an issue that has still not been satisfactorily resolved.

Many malaria programmes continue to make blood slides for every fever case through a system of periodic house visits and the collaboration of outpatient clinics. This is a gross misuse of resources, as outlined below.

- Slides are forwarded to a central laboratory and the results usually become available too late to help with differential diagnosis or the treatment of malaria cases (8).
- Malaria microscopists are overwhelmed with negative slides, some 150 million of which are collected each year, with an average positive result of only 3% to 5% (4).
- Data that should serve as an early warning of epidemics are not analysed in an adequate or timely fashion (8).
- The data collected do not cover the registration or reporting of severe forms of malaria or of deaths attributable to the disease (4).

Of more basic importance is that this use of laboratory resources loses sight of the clinical needs of the patient. Most malaria programmes consider that it is not part of their responsibility to provide microscopy for differential diagnosis or to monitor the treatment of severe suspected malaria cases or treatment failures in general health services (8).

Eradication programmes led to the halting of studies that were in keeping with a model of health service development compatible with primary care. They replaced a productive relationship between epidemiology and malaria control with routine practices that distorted the role of
epidemiological surveillance. They produced a situation where the therapeutic services for disease management were weak and the epidemiological services for malaria control were almost nonexistent. Primary health care has inherited this problem and the responsibility for its resolution.

**Primary health care and epidemiological services**

Skilled epidemiological direction forms the backbone of any public health activity, particularly where control involves a combination of preventive, promotive and curative methods whose precise formulation is strongly dependent on human and ecological factors that cannot be easily ascertained. An infrastructure that brings these methods together could clearly facilitate determination of the mix required in a given situation. The League of Nations could not decide on a common approach to preventive and curative work, whereas the basic health services concept envisaged an integrated service. For this purpose a minimum staffing pattern for rural health units was specified (9).

Far more practical advice concerning the building of an infrastructure is to be found in the health service models of the League of Nations and the basic health services than in that of primary health care. The primary care concept has been left open to interpretation. It is not easy to combat the threat with which selective primary care (in which priorities for health interventions are determined by institutions far removed from the local level) confronts people who are working to build an infrastructure with an adequate base of epidemiological skills. Selectivity breeds competition rather than cooperation between the elements of primary care. Independent and largely uncoordinated efforts are made to pursue various functions, which, in principle, should be integral parts of any national epidemiological service: laboratory services, survey and surveillance methods, monitoring and evaluation, the rationalization of logistical support according to local requirements, in-service staff training that matches local priorities, and so on. In most situations these independent efforts do not reinforce each other, and programmes cannot sustain operations without continuous external support.

Primary health care also suffers from various problems of definition which are exacerbated by competing approaches that promote similar principles and values under different headings. One model has been termed “the new public health” (10). In recognizing that health derives mostly from living standards and conditions that fall outside the traditional interests of the health sector, the advocates of this approach promote policies and new intersectoral and participative mechanisms intended to produce improved standards and conditions favouring health. Such mechanisms are, in principle, what primary health care calls for.

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It is understandable, however, that reference to health care in the developed world may give the false impression that the already excessively dominant position of curative services is being actively promoted by primary care.
A no less important threat to the public health role of primary health care is presented by the attention given to the place of personal behaviour (life-style) in the control of disease. The definition of health promotion as "changing life-styles for disease prevention" \( (11) \) represents a shift away from prevention in favour of promotion. Furthermore, the placing of emphasis on the importance of changes in life-styles can threaten preventive medicine in other ways. For example, "the strangling of preventive medicine in medical schools is fostered by the doctrine that prevention is everybody's business. It should be, but the danger is that what is everybody's business becomes nobody's business" \( (12) \).

Perhaps of greatest immediate importance among the many problems confronting the public health side of primary care are the economic pressures faced by developing countries, particularly in respect of cost-effective disease prevention programmes affected by the reinforcing of the curative arm of the health services. Cost containment rarely increases investment in prevention, which would reduce the need for the more costly curative services. Instead, the focus is on how to cut costs or increase the share of them borne by the consumer.

Other factors constraining the strengthening of epidemiological services are:

- the lack of an adequate career structure for health personnel responsible for epidemiological work;
- the political sensitivity of epidemiological work;
- the move from field to laboratory.

In 1963 it was noted that one of the most intractable problems associated with the building of public health services was that of the adequate payment of health officer epidemiologists \( (13) \). The supplementation of incomes through private practice and in other ways severely curtails travel, survey work, dialogues with communities, supervisory visits, and so on.

It seems likely that epidemiology is seen with fear in many regions because it can show the social roots of most health problems, and epidemiological work is not encouraged for this reason \( (12) \). Malaria is intimately associated with poverty. Any serious study of malaria should touch on the root causes of illness and death, while documenting the reality that malaria mostly strikes those people who can least afford protection or treatment and who are in no position to demand that governments provide preventive services. Poverty forces people to take risks, for example by working in or moving to highly malarial areas.

Epidemiologists may uncover not only problems but also health activities with little, if any, relevance to the problems. It may emerge that the people at greatest risk are those who benefit least from the services that exist. Malaria programmes may be shown to misuse resources, where, for example, large quantities of insecticide are used incorrectly or where they are not needed at all, or where vector control measures are used in the developed section of urban areas even though the real threat lies in the camps of migrant workers living.
on the outskirts of towns. Antimalaria resources may be concentrated in better-developed but comparatively low-risk areas, while people living in very high-risk areas are provided with little care and are required to rely on their own resources for personal protection and treatment.

Concerning the imbalance in activities, dissatisfaction has long been expressed about the tendency to neglect the microorganism as it exists in the field and to concentrate on microbes that can be conveniently handled in the laboratory (14).

Technological advances and the declining incidence of infectious diseases have no doubt contributed to the diminished role of epidemiology over the last forty years. Yet it is arguable that epidemiology should be ranked in importance with cellular and molecular biology, immunology, and the social and systems sciences, as all are essential if the vast array of diseases and disorders in both the developed and developing worlds are to be effectively tackled.

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Malaria control presents a microcosm of the problems and possibilities for action encountered in curative, promotive and preventive services. As yet there is no clear picture of its role in the evolution of modern public health services in which the developmental philosophy of primary health care is merged with the epidemiologically-driven rationality of targeted public health action. There is no inherent reason why malariology should not again play an important part in such development. The recent resurgence of interest in malaria control may provide the political and financial stimulus for restoring malaria epidemiology to the centre of national and international developments in public health.

References


