Decentralization of endemic disease control: an intervention model for combating bancroftian filariasis[1]

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The goal of establishing a health care model that embodies the essential principles of the Health Reform of Brazil (universal, equitable, and integral health care) obliges us to direct attention to control of endemic diseases. In accord with Brazil's current health model, until now such control efforts have been based on preventive and curative activities carried out within the framework of "vertical programs" providing individual care, together with vector control activities that are nearly always outside the endemia's spatial context.

Theoretically and conceptually, efforts to address the problem in terms of current ideas about health care models have been infrequent, even though integration of endemic disease control activities into the basic health network has been proposed for more than a decade (*1*). From then until now, very little progress has been made in defining the stages of this process. However, it is worth noting a seminar on decentralization of endemic disease control activities, sponsored in 1994 by the National Health Foundation and the Brazilian Ministry of Health, that brought together representatives of research centers, health ministries, and international organizations. This meeting defined guidelines and strategies for integrating endemic disease control into the new health care model. In so doing it stressed the technical and legal sides of decentralization, examined the steps needed to put decentralization into practice, emphasized certain subjects (characteristics of the health care model, sources of financing, social control, and interinstitutional relationships), and concluded by formulating a series of recommendations (*2*).

This background makes it appropriate to place the formulation of endemic disease control strategies within the context of a broader debate on reorientation of the health care model. At the heart of this debate is the matter of decentralizing health activities and services and also the question of the epidemiologic analysis model that should be used to guide changes aimed at attaining health care equity. The notion of decentralization was definitively incorporated into the Brazilian Constitution of 1988—which established the Single Health System, declared health to be a civic right, and asserted that health care was a duty of the State. Decentralization thus became a fundamental strategic element for implementing the new national health policy, and since then the municipalizing and "dis-

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trictizing" of health services have become processes that can be observed to a greater or lesser extent in Brazil's states and municipalities (*3*).

In practice, however, different interpretations of what decentralization should consist of have given rise to two different approaches, one stressing the importance of the process and the other emphasizing bureaucratic and topographic criteria. The former asserts that implementation of activities in the health districts should not result exclusively from a process of political and administrative decentralization, but rather should result from a social process of transformation of health practices (*3*). Health practices, in turn, should reflect the health needs of each population group—as determined by the social, economic, cultural, epidemiologic, environmental, and political processes of that group's specific space. The bureaucratic-topographic approach, on the other hand, places the emphasis on administrative regionalization but not on true decentralization of decision-making power or changes in health practices. Rather, it proposes that services be organized around a large number of medical interventions and defines health needs in accordance with technical criteria, without considering the various social processes of the population groups residing in the districts involved (*3*).

Because of these two interpretations, when one speaks of "decentralizing" endemic disease control activities, the meaning may vary considerably, and so it becomes necessary to explain what is meant. The approach presented in this text requires that a given health problem be placed within a specific spatial context. Hence, when filariasis control activities in the city of Recife, Brazil, are examined in the light of a decentralized model for controlling endemic diseases, this necessarily involves redefining the epidemiologic analysis model and converting it into an instrument appropriate for addressing the complex of distinct factors that determine the health and illness patterns of a given population.

EPIDEMIOLOGY AND THE NEW HEALTH CARE MODEL

Traditionally, explanations for variations in disease distribution are sought in terms of causal relationships between exposure to risk factors and the disease. The causality approach in modern epidemiology has the aim of estimating the effect of exposure to a given risk factor upon the likelihood of disease development, i.e., to quantify risk. This makes it possible to identify those individuals most likely to be affected by a particular problem, given their relevant personal characteristics.

There is no doubt that research studies based on the notion of causality have led to major biotechnologic advances; however, these have not been much help in formulating strategies capable of transforming the health status of the population's diverse groups. Instead, the linear concept of causality has directed health service planning toward consolidation of practices centered on medical care and on preventive activities of an individual nature.

Some authors (*4–7*) have looked to Bunge's theory of general determination (*8*) for a way to overcome the limitations of the risk model, as it is applied in epidemiologic analyses. This theory asserts that the notion of causality is not the only way to explain the origin of a phenomenon. Bunge (*8*) argues that there are other ties between events and processes in both nature and society, and that "determination" serves to designate these in a more general fashion. Events occur by determination (i.e., in a nonarbitrary way, subject to laws), and the processes by which all objects acquire their characteristics derive from preexisting conditions. The various forms of determination are interconnected and act hierarchically (*8*).

Building upon this notion, Castellanos (*9*) proposes an analytic model to explain the frequency of health and disease phenomena based on the degree of complexity and importance of the various levels of determination. This model must, on the one hand, overcome the linear concept of causality and, on the other, avoid establishing excessively general relationships between social, economic, and cultural processes and the development of disease. It must also explain how concrete health and disease phenomena observed on the "individual" plane are determined by "general" (universal) biological and social laws and principles through the mediation of "particular" processes of social reproduction (*9*).

Matus (*10*), in discussing situation planning, explores some very useful concepts for putting this type of approach into practice. In particular, he draws attention to the entire systemic network of factors that determine a specific problem in the light of the measures that must be taken to perpetuate or alter current reality. For Matus, this involves constructing models enriched with categories of analysis and variables representative of a given population group's social production processes. Such processes distribute goods and services, income, power, liberty, knowledge, and diseases unequally. Employing this kind of approach, the assumptions used as a basis for defining health and disease phenomena acquire decisive importance. We have arrived precisely at the point where it would be possible to add to the formulation of

Castellanos' spaces and planes (*9*) the description of "problems" as conceived by Matus, especially if we adapt this description to the subject at hand, i.e., health problems.

Taking this view, one "problem" would be the presence of an unsatisfactory and surmountable reality that could be exchanged for another, more favorable reality (*10*). Matus makes a distinction based on the complexity of the problems encountered, which he classifies as either well structured or semistructured. The complexity of a problem relates not only to the number of variables that intervene in that problem, but also to the extent those variables are known. Well-structured problems are those whose determining variables are entirely known; semistructured problems are those involving one or more groups of variables that are either unknown or not satisfactorily known. The problems generated by the processes of social production, among them health and disease phenomena, can be classified as semistructured. When faced with problems of this type, it is necessary to identify the principal processes and occurrences that may be represented by variables and indicators in the context of adequate explanatory models.

If we return, therefore, to the idea of levels of organization, as proposed by Castellanos (*9*), it is possible to state that in "singular" space (i.e., considering the individual as the unit of analysis) various degrees of health and disease are manifested in individuals by virtue of their personal attributes (including their genetic and immunologic makeup and their individual patterns of behavior) and their exposure to specific risk factors. The ability to take steps to transform the problems defined at this level is related to the degree of access to various technologic possibilities and the ability to modify harmful behavior patterns and lifestyles by means of activities aimed at educating diverse population sectors.

If the problem is defined in "particular" space (i.e., considering the group as the unit of analysis and examining the health and disease profile of a population group), the variations encountered can be explained in terms of the processes that perpetuate the living conditions of each population group. These processes act at different moments: moments of biological reproduction, of ecologic processes and relationships, of formation of awareness and behavior, and of economic relationships. Each moment is linked to others that in turn are linked to it (*9*). At this level, the variations observed in the general health and disease profile are explained in terms of factors related to patterns of collective immunity, environmental working and living conditions, environmental sanitation, education, popular mobilization, participation in the distribution and consumption of goods, and access to health services.

When the problem is defined in "general" space, the potential for explaining it is broadened. Moreover, the general level is that of health policies and plans. It is the level at which analysis of the economic model, and hence analysis of the health model, takes place.

A health problem shows up at all of the "situation" levels and in all of the action spaces. Identifying these planes and spaces makes it possible to understand the relationship between causative processes of a varied nature and to determine the prospects for intervening at different levels in order to resolve those processes. Accordingly, epidemiology and health planning can be combined to provide a deeper explanation of disease development and, in this way, can assist in modifying health practices.

This approach appears to be both useful and adequate for study of endemic diseases at a time when such diseases once again constitute major public health problems, particularly in the large urban centers of developing countries. Such is the case of bancroftian filariasis in Recife, where there are neighborhoods with microfilaremia prevalences exceeding 10%, i.e., rates similar to those observed by René Rachou, who conducted the first research study in that city some 40 years ago (*11*, *12*).

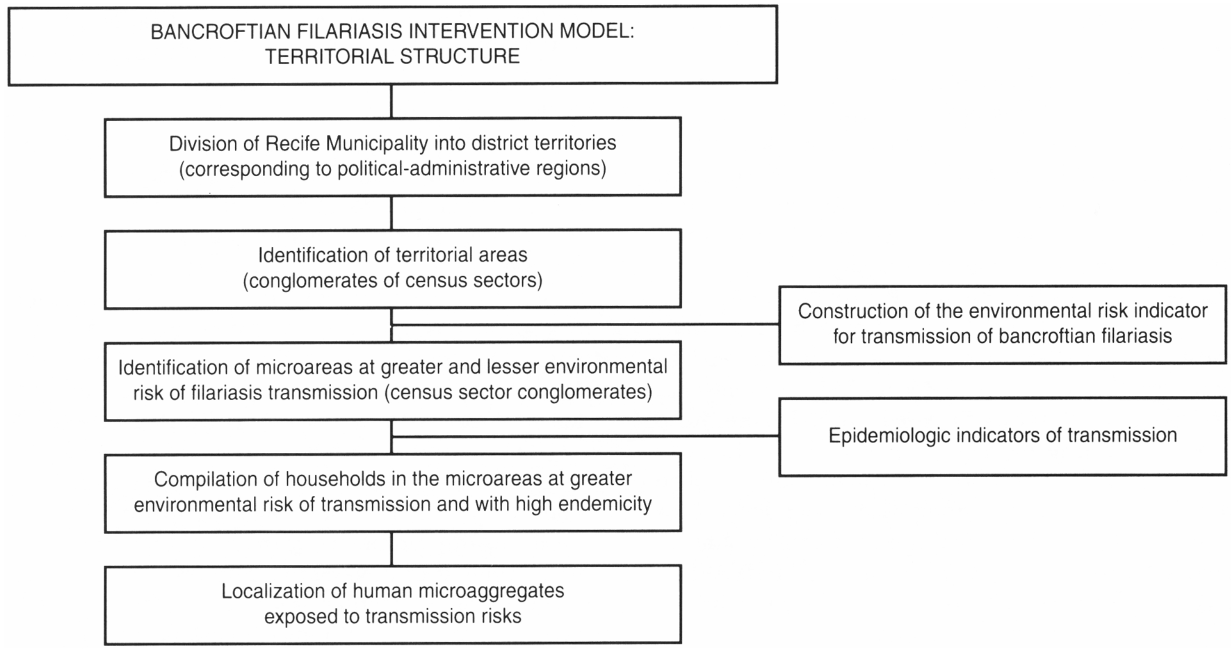
INTERVENTION MODEL FOR CONTROLLING FILARIASIS

An intervention model for controlling filariasis based on the situation approach and guided by epidemiologic analysis directed at the general, particular, and individual levels where endemic diseases are determined makes it possible to more clearly identify the necessary interventions at each level and their corresponding interrelationships.

At the "general" level of health policies and plans, it is essential that the measures taken be articulated in conjunction with other health activities within a model of decentralized and integrated health care. This is the level at which the health, housing, sanitation, and education sectors must act together to overcome the current scarcity of urban infrastructure services and the precarious nature of those that do exist—both of these being factors closely related to the population's health status.

At the "particular" level, changes in health policies (especially ones relating to endemic disease control) would lead to establishment of an epidemiologic filariasis surveillance system dependent on the health services structure and territorially distributed not along geographic lines but rather in accord with the concept of "space" as used in critical geography. This is a concept of socially organized space determined by a set of social factors

FIGURE 1. Territorial approach proposed for the intervention model designed to control bancroftian filariasis



and relationships and immersed in a process of ongoing construction (*13*).

Such an approach, the type most adaptable to the heterogeneous spatial distribution of the filariasis endemia in Recife, would make it possible to identify priority groups that, in accord with the criteria applicable to urban space, would benefit from collective health practices. At the "individual" level, this approach would make it possible to provide care to each individual with filariasis.

To put into practice a model based on the above concept (Figure 1), the municipality of Recife would have to be subdivided into "districts" based on political-administrative criteria. These districts should coincide with the six political-administrative regions established by the office of Recife's mayor for purposes of planning, formulating, and implementing government activities (*14*). Within each district, the area of influence of each outpatient care unit would be identified, with determinations being made of the population served and the number of professionals in the unit. The areas would consist of a cluster of census sectors[4] and would be structured in terms of their geographic accessibility, user population, and existing resources (*15*).

The spaces existing in the areas of influence of each unit of outpatient care are so heterogeneous that it is necessary to identify within them "microareas" that are reasonably homogeneous with regard to the risk of filariasis transmission. These "microareas of risk" would be identified according to the characteristics of the urban space and the population groups inhabiting them, i.e., according to criteria of social, economic, and sanitary homogeneity. They would constitute spaces where living conditions would be reasonably uniform, and so would present similar ecologic and socioeconomic environments. By having similar situations with regard to housing and urban infrastructure services, their inhabitants would be exposed to about the same risk of filariasis. The criterion for characterizing the microareas should therefore be an indicator that is sensitive enough to reflect living condition differences related to the social organization of the space and, consequently, differences in the risk of filariasis transmission.

Since in the case of endemic filariasis it has been possible to demonstrate empirically and conceptually the close relationship between the proliferation of breeding places for vectors that transmit the disease and the absence or poor quality of sewer and storm drain systems, information along these lines could provide the basis for configuring the above-mentioned indicator. These secondary data,

4 The census sector is a territorial unit established for purposes of controlling cadastral compilations. It consists of a continuous territorial zone, divided according to the number of households it contains and lines of demarcation of the territorial blocks that originate the information disseminated and that determine operational needs for survey purposes. In planning the most recent census, that of 1991, it was determined that each census sector should include between 250 and 350 households. The municipality of Recife contains 1 086 census sectors (*16*).

disaggregated by urban neighborhoods and census sectors (*16*)—they can be found in the tabulations prepared by the Brazilian Institute of Geography and Statistics Foundation (*Fundação Instituto Brasileiro de Geografia e Estatística,* FIBGE) and other institutions—would constitute essential elements in the flow of information (Figure 2) needed to properly orient the intervention model. Such data would include the following:

- the percentage of households not connected to the general sewer network (percentage of households with septic tanks, cesspools, latrines, and other disposal methods);
- the demographic density of the zone;
- the number of residents in each household.

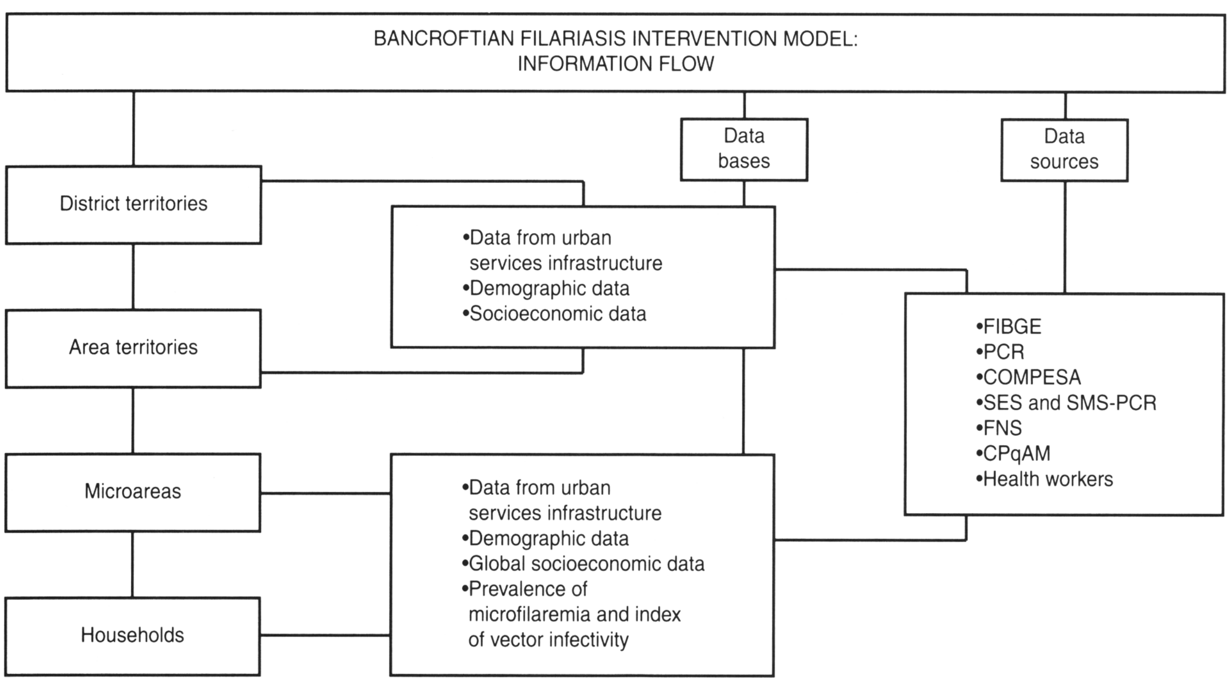
These variables could be combined using various techniques (point systems, principal component analysis, factor analysis, etc.) to construct a single indicator (*17*). Such techniques could also be tested with a view toward selecting the most appropriate one within the context of local reality.

In order to ensure that the socioeconomic data provided by the census can be used, it is essential that the territorial division of the health district be made to coincide with the municipal division adopted by the FIBGE. For that reason, the microareas of risk should be made up of clusters of census sectors that are relatively homogeneous with regard to the proposed indicator. Such microareas would be classified as being of greater or lesser environmental risk for filariasis transmission and would be treated differently in accordance with urban infrastructure criteria, as proposed above.

That differentiation would be expressed in the search for epidemiologic transmission indicators in the areas of greatest risk. These indicators, which make it possible to determine the degree of endemia in a given area because they reveal the existence and intensity of local transmission, would be the prevalence of microfilaremia or the infectivity index of the vectors. Regarding the former, WHO (*18*) classifies as slightly, moderately, or highly endemic those areas where the microfilaremia prevalence is less than 5%, at least 5% but less than 10%, and 10% or more, respectively.

Stratification of the urban space as described above makes it possible to apply knowledge of filariasis control technology to a number of differ-

FIGURE 2. Information flow pertaining to the intervention model for controlling bancroftian filariasis. FIBGE: the Brazilian Institute of Geography and Statistics Foundation; PCR: the Recife City Government; COMPESA: the Pernambuco Water Supply and Sewerage Company; SES and SMS-PCR: the State Health Secretariat and Municipal Health Secretariat of the Recife City Government; FNS: the National Health Foundation; and CPqAM: the "Aggeu Magalhães" Research Center



ent risk situations. WHO recommends mass chemotherapy in situations of high endemia (*19*), because this eliminates the need to conduct frequent parasitologic examinations and because treatment is provided to cases yielding false negative results—cases that contribute significantly to reintroduction of the mosquito-transmitted infestation (*19*). In this way, it is possible to effectively reduce the burden of microfilariae in the population. In areas of low endemia, selective treatment of individuals with microfilaremia (the method traditionally used by the Ministry of Health in the city of Recife over the past four decades) is recommended (*19*).

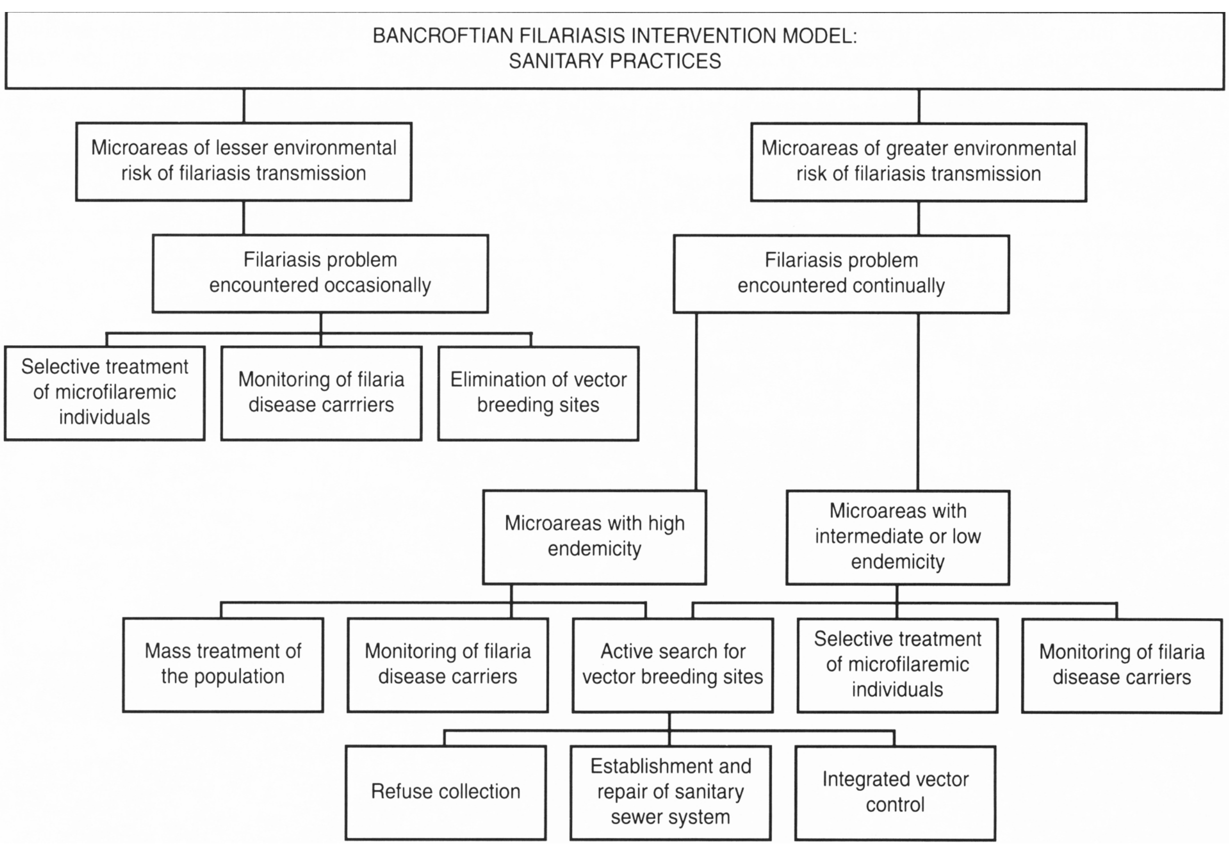
More generally, the need to institute a combination of vector control measures in Recife has been recognized and discussed for some time. A study of long-term results in treated populations has shown that when no anti-vector measures have been applied, interruption of mass treatment (even following prolonged and effective administration) has led to reemergence of transmission in some endemic areas (*20*). In addition, the presence of vector mosquitos is of considerable concern to the population, which has repeatedly called for their extermination (*21*).

In view of the above, measures for controlling the mosquitos, which constitute a health problem for some people and whose control the population considers necessary, would be elevated to the level of government policy decisions, thereby promoting adoption of a large group of measures aimed at the critical knot of problems giving rise to unhealthy environmental conditions.

Once spatial stratification has been linked to accumulated chemotherapy and vector control knowledge, the procedure indicated below (shown schematically in Figure 3) is recommended:

1) In microareas where the environmental risk of filaria transmission is high, and where the disease endemicity is also high, filariasis should be deemed a health problem requiring continual attention, in the form of ongoing surveillance activities and preventive health practices. Chemotherapeutic control should consist of mass treatment with diethylcarbamazine, using a scheme the health services can implement that incorporates effective participation by community agents, as has been done

FIGURE 3. Health practices pertaining to the intervention model for controlling bancroftian filariasis



with good results in some endemic regions (*22, 23*). The health services would be responsible for providing followup of disease carriers and for satisfying the requests of people wishing to be tested for microfilariae.

Regarding vector control, a number of measures currently exist for reducing mosquito density, human contact with the vector, or both. Collectively, these measures (including activities in the areas of environmental hygiene, personal protection, and chemical, biological, or mechanical control) can be made to constitute an integrated vector control strategy.

In particular, mechanical control measures (including such things as sanitary sewer system rehabilitation and application of layers of polystyrene beads to the liquid surfaces of septic tanks and latrines not connected to the sewer system) have turned out to be tenable, relatively inexpensive, and applicable by the community (*24, 25*). Combined with measures aimed at enhancing personal protection, they constitute a decisively important strategy for combating mosquitoes in microareas of high environmental risk. This is especially so because biological control with entomopathogenic bacteria, which produced good results when tested in an urban area of Recife (*24*), cannot be applied on a large scale without first improving the prospects for local production and marketing.

Activities for educating the public about factors promoting the endemia (that is, about relationships between the environment, the vectors, microfilaremia, and filariasis) need to be carried out in health services, schools, churches, neighborhood organizations, and other social institutions. It is important that such activities be integrated with other sectors of public administration and that support from the population itself be forthcoming, in order that vector breeding sites be identified and eliminated.

Using the proposed territorial basis for filariasis control measures requires that the microareas of high transmission risk and high endemia be broken down into individual households and that attention be given, to the extent possible, to the problem of inequality. This is necessary in order that the flow of information about people's treatment and followup and also about the identification of vector breeding sites in households and household surroundings can be controlled.

In the microareas of high environmental risk but of moderate or low endemia (see Figure 3), chemotherapy should be administered to individuals with microfilariasis identified through testing as well as to those cases seen spontaneously in the health services. In addition, in all microareas of high environmental risk, vector control should be treated consistently as if it required continuous attention in terms of mechanical control, personal protection, and biological control measures.

2) In microareas at low environmental risk for transmission (see Figure 3), filariasis would be classified as a problem requiring occasional effort. Accordingly, appropriate activities would be directed at satisfying public health needs (by testing for the presence of microfilariae, selective treatment of patients with microfilaremia, and treatment and followup of those with filariasis). In these zones, vector breeding site surveillance activities would be carried out sporadically.

FINAL CONSIDERATIONS

Endemic disease control activities in Brazil, the evolution of which has tended to be "vertical" and dependent on the implementation of campaigns, have permitted a number of important achievements, particularly in the first five or six decades of this century (*26*). However, the country's current socioeconomic and health circumstances, as reflected in marked deterioration of most of the population's health status and the reappearance of certain endemic diseases, demand revision of the traditional approach. This does not imply a need to change the vertical approach to a horizontal one (that is, to transfer programs from one government stratum to another). Rather, circumstances have demonstrated that good control of endemic diseases depends on social transformations which, by impacting on the living conditions of the population, ensure the access of the latter to available control technologies.

The implementation of this entire process, the purpose of which is to combat filariasis in Recife, will naturally be contingent on the presence of political will, dialogue, and negotiation at the various management levels of the local health system. The integration of control activities into the basic health services network must be progressive and must be based primarily on an intervention model adapted to the heterogeneous distribution of the endemia in Recife. To ensure the equity of control measures, it will be necessary to abandon the conventional epidemiologic approach (which defines at-risk individuals in terms of their individual characteristics) and to reorient public health practices toward high-risk situations. To this end, it will be necessary to use socioeconomic indicators reflecting the presence of different environments with regard to filariasis transmission.

The spatial orientation of this approach makes it possible to achieve precise objectives because it converts priority groups—those at greatest risk of contracting filariasis—into population groups that fall physically within the scope of the activities conducted by the health services. From the standpoint of decentralization, the greatest difficulty lies in incorporating vector control measures into the basic network of services. Despite the practical and financial difficulties involved, the stratification of risk situations would make it easier to measure the human and material resources needed. Moreover, in principle it is easier to motivate the community to combat a concrete local health problem when that problem constitutes part of the community's daily life.

We feel that these initial reflections, intended to provide the problem with a program orientation within the health service network, go part of the way toward filling an important vacuum. What is proposed here, based on a schematic model, is a series of standardized provisional measures. Of course, these measures have yet to be evaluated and are subject to the fluctuations of a changing reality. Therefore, our model should be regarded as flexible and open to the influence of new ideas.

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Important progress in the control of Chagas' disease in South America

According to information from the Brazilian national control program, the transmission of Chagas' disease has been virtually eliminated in that country. It is expected that certification of the interruption of vectorial and transfusional transmission will be carried out by an independent commission in 1998. Brazil is the largest endemic country for Chagas' disease, which exists only in the Americas.

In 1970, the originally endemic area in Brazil covered over 36% of the country and encompassed a total population of 49 million. In 1983, 711 municipalities were infested with *Triatoma infestans*, the main vector of the disease, but by 1993 only 83 municipalities were infested—a reduction of 89%. In 10 of the 11 endemic states, a reduction of house infestation rates ranging from 100% in Mato Grosso to 5% in Bahia was observed during the same period. For the country as a whole, the reduction of in-house infestation averaged 71%.

In 1995 only 1 800 of the vectors were captured by national control program field personnel in 709 012 homes surveyed, for an average of 2.5 insects per 1 000 houses. The rate of infestation is far below the minimum threshold necessary to ensure transmission of the parasite to residents.

Chagas' disease is a chronic and incurable parasitic disease which can cause disability and even death. The risk of infection is directly related to socioeconomic factors: the parasite (*Trypanosoma cruzi*) is transmitted by the blood-sucking triatomine bug, which finds a favorable habitat in crevices in the walls of poor-quality houses. An estimated 16 to 18 million Latin Americans have been infected. The incurable lesions of Chagas' disease develop some 10 to 20 years after the initial acute phase in one-third of those infected. They include chronic cardiopathy as well as chronic digestive lesions and neurologic disorders.

In 1991 the Ministers of Health of Argentina, Bolivia, Brazil, Chile, Paraguay, and Uruguay launched the Southern Cone Initiative for the Elimination of Transmission of Chagas' Disease. Current data on control activities indicate that certification of the interruption of transmission will be achieved in Chile in 1997, in Brazil in 1998, and in Argentina in 1999. Transmission was interrupted in Uruguay in 1996. Control activities are progressing in Bolivia and Paraguay, but at this time it is not possible to estimate the date when transmission will be interrupted in those two countries.

Aside from the success achieved in the Southern Cone, the disease continues to exist elsewhere in the Americas, with serious consequences. For example, a recent study in Honduras found that as many as 300 000 persons in that country were infected. Health officials estimate that about 20% of those people may die of the effects of the disease.

Source: World Health Organization. Press Release WHO/4. Geneva: WHO; 16 January 1997.