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Organizing and Managing Tropical Disease Control Programs

Lessons of Success

Bernhard H. Liese, Paramjit S. Sachdeva, and D. Glynn Cochrane

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Preface

Tropical disease remains a serious public health problem in developing countries. Despite a major expansion of primary health care in the 1980s, the burden of tropical diseases, particularly on the rural poor, is increasing. More than 500 million people are infected worldwide, and the prospects of controlling the major diseases — malaria and schistosomiasis — are worsening. Without renewed global and national efforts to control tropical diseases, many people will suffer and die needlessly.

Many tropical disease control programs suffer from financial and institutional weaknesses. A few programs, however, have been notably successful in achieving their program goals over 10 to 15 years or more. The lessons learned in these successful efforts can strengthen tropical disease control programs elsewhere.

This empirical report provides guidelines on how to improve the organization and management of tropical disease control programs. The first chapter provides an overview of tropical diseases, the second focuses on the study's scope and sample, and the third chapter outlines the issues examined and the analytical framework. Subsequent chapters review the control technology and organizations, field data and lessons of experience. The target audience is donors, health specialists, and program managers interested in improving tropical disease control programs in developing countries.

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Contents

Executive summary

Despite a major expansion of primary health care in the 1980s, the burden of tropical diseases—particularly on the rural poor — is increasing. More than 500 million people are infected worldwide, and the prospects of controlling malaria and schistosomiasis are worsening.

Most people with tropical diseases are in Africa. The continent's entire population — 500 million people — is at risk of at least one tropical disease. The most rampant diseases are malaria, schistosomiasis, river blindness, and African sleeping sickness. Eighty percent of the people — 400 million Africans — live in areas where little has been done to control malaria transmission, so the problem remains the same or is getting worse. Global and national efforts must be made to control tropical diseases or many people will suffer and die needlessly.

Relatively few internationally supported tropical disease control programs exist, despite growing recognition of the problem. This is partly because disappointment with the global program to eradicate malaria has made people reluctant to establish disease control programs to remedy particular situations. This reluctance is reinforced by the continued belief that purely community-based health services could significantly reduce tropical diseases. Few identifiable programs have targeted or plan to target specific tropical diseases.

Some tropical disease control programs, however, have been notable *successes, in the sense that they have consistently achieved their program goals over an extended period (10 to 15 years or more).* The most successful programs also demonstrate the capacity to sustain high performance despite changes in program environment. We examined seven successful programs in this empirical study. Programs in China, Brazil, Egypt, the Philippines, and Zimbabwe were covered.

Successful disease control organizations take many forms. Brazil's main organization for control of endemic tropical diseases, SUCAM, is a federal agency with 40,000 field workers and 45,000 volunteers. It is a categorical semiautonomous agency under the Ministry of Health [1989 data]. China's single-disease control organization for schistosomiasis comprises many specialized institutions for research, policy guidance, and implementation. It rests on three legs—for technical, administrative, and policy functions. Egypt's schistosomiasis control program is administratively integrated with the provincial (governorate) health service system, but remains programmatically distinct from the general health services. In the Philippines, each of the three programs studied — for schistosomiasis, malaria and tuberculosis control — was largely successful for the many years it was organized as a categorical program [up to the 1970s], but has now been integrated with primary health care, with adverse effects. Zimbabwe's malaria control program has suffered a similar fate, and both its schistosomiasis and malaria control programs are trying to establish their separate programmatic and organizational identities so as to reinvigorate their control efforts.

From an operational point of view, a key policy question for all the programs examined was how to effectively organize the delivery of technology.

For this we found James O. Wilson's recent typology of public bureaucracies — based on their task characteristics — very helpful.

Health systems tend to have five complementary components — therapeutic services, public health services, regulatory agencies, research and training institutions and financing institutions. For the purpose of the study the interrelationship between the therapeutic and public health services was of interest. The former is a network for providing curative, therapeutic services to individuals. It may involve public and private organizations, hospitals, health clinics, and local health offices, and often some form of primary health care. This network is largely demand-driven by individuals who present with self-recognized complaints.

The latter tends to be policy-driven. It caters to population-based health requirements such as epidemiological surveillance and area-wide disease control, rather than to individual needs. The public health service requires technical expertise, effective outreach to local communities, and a systematic collection of information on health.

The study shows that although the task orientation of the two components is different — which explains some of the traditional friction between them — they are both essential for effective control. Ideology-driven attempts to promote either therapeutic services at the expense of public health services or vice versa are not appropriate.

We examined the main technological, organizational, and managerial features of successful disease control programs by preparing detailed case studies based on field data and interviews (see case studies available separately). The analytical framework for the case studies was tailored to the peculiarities of tropical disease control programs. Nine major lessons were drawn from experience.

Lessons learned

(1) *Successful tropical disease control programs are technology-driven.* Providing a coherent package of control technologies — such as chemotherapy, vector control, epidemiological surveillance, and health education — requires functionally specialized programs, skills and activities. Adapting technologies to different situations requires a thorough understanding of the disease, population, and control techniques, as well as good judgement about what is achievable, given local resources and constraints. All the successful disease control programs identify an appropriate technological strategy and package, and suitably adapt it to local circumstances through operational research.

(2) *Successful programs are "campaign-oriented".* They gear every detail of organization and management to applying the technology in the field. Brazil's SUCAM, for example, has a vigorous campaign mentality that drives its programs all year round, year after year. Of course, this campaign is conducted in phases, each of which may last several months. But each phase is equally well planned and implemented, and the organization goes after its targets with the game plan, budget, manpower, technical support, and management commitment needed to win.

(3) *Successful programs rely heavily on expert staff groups that have the authority to decide on technical matters.* The influence of these groups permeates all operations. They help design program strategy, develop the technological package, prepare operational manuals, backstop the technical supervision and quality control of field operations, and help train line personnel at all levels. The need for, and use of, such expert groups is independent of the organizational structure. It is more a requirement of the technology and campaign-mentality that are essential to effective disease control.

(4) *Successful programs use both vertical and horizontal modes of operation.* A clear line of program authority facilitates hierarchical direction, and competent specialists provide technical support. The program organization is functionally specialized. External integration, especially at lower levels, is limited to what the technological tasks permit and local resources demand. There is also a great deal of collaboration between line and staff groups at all organizational levels. Even programs combined with primary health care — as in Egypt — have developed mechanisms to control the budget and specialized field personnel, thus introducing an important element of functional specialization into an administratively integrated program.

(5) *Successful control programs are largely centralized in formulating strategy and decentralized in operations (tactics).* No single structural pattern applies universally, but the tendency is toward decentralized, and categorical or partially integrated organizations. Being results-oriented, they de-

centralize authority and responsibility for programmatic rather than administrative reasons. Their main concern is to get tasks done as effectively and efficiently as possible. They formulate strategy and develop technologies centrally, but rely on field offices for program implementation and for planned adaptations to local needs.

(6) *Successful disease control programs* — mindful of the complex *technological tasks* to be performed — *fit the organization to the task, not vice versa.* The organization is suitably — but not radically — adapted to national health policy requirements and available resources. The programs' governance structure enables them to navigate the political terrain, acquire legitimacy and resources, and balance program needs with administrative considerations. *Structural differences do not — by themselves — fundamentally affect program performance.* On such aspects as program autonomy and task specialization, all successful programs are rather similar. The program-related activities of their central and field offices are also similar, despite differences in organizational configuration, size, and the nature and extent of administrative control exercised by the supervising Ministry of (Public) Health (MOH).

(7) *Successful programs have a pragmatic view of extension activities.* Field systems (for surveillance, logistics, and the delivery of drugs, for example) are reliable, efficient, and realistic about what is feasible at the periphery. Health education is important to each program, and the managers are realistic about how much they can changes people's attitudes and behavior. Program staff develop highly focused, task-related interactions with households rather than with the community at large, thereby reducing to a minimum the uncertainties of field actions.

(8) *Successful programs emphasize effective leadership and personnel management.* Central and institutional leadership, on policy as well as program issues (such as the acquisition and effective utilization of financial and human resources) is important. In addition, these programs work well because their employees at all levels are trained, motivated, and compensated to make them work. This requires suitably designed policies and procedures, including career development and job rotation policies. Even when managers have little discretion in devising personnel policies — as in China — informal as well as professional means are used to keep program staff motivated and productive.

(9) *Successful programs consciously develop a unique organizational culture* that combines standardization of technical procedures with flexibility in applying rules and regulations, uses non-monetary rewards to foster experience-based (rather than academic) application of technological packages, and encourages a strong sense of public service and an equally strong commitment to personal and professional development. The result is an organization committed to — and capable of — sustained achievement.

In short, we found that *effective management of endemic tropical diseases requires a functionally specialized organization with a technological and campaign orientation, and a flexible, adaptive approach to program implementation.*

Policy conclusions

What are the implications of these findings for policy? We have concluded that *disease control activities are more effective if programs maintain a clear focus; use functionally specialized organizational units and staff; emphasize results and clients; and maintain a technology- and people- orientation.* Some of the study findings have implications not only for disease control programs but for the health sector generally.

A program's integration with the nation's health service system must be determined on the basis of task requirements, administrative capabilities, and local resources — not ideological reasons. Even in China — which is traditionally considered the role model for primary health care — disease control is organized as a specialized activity, only partially integrated with the rest of the health service system. But not all countries (especially in Africa) are large enough (or financially able) to support many specialized staff or institutions. They must therefore fashion a locally feasible *partially-integrated* program, as Egypt has successfully done.

Similarly, *programs must be pragmatic about the nature and extent of community participation.* In successful disease control programs (as in Brazil and Egypt), community involvement is limited to *interactions* with households, and few attempts are made to involve large community groups in routine campaign operations. By keeping community interaction to the minimum needed to get the technological tasks completed, the work demands on lower-level staff remain sharply focused and manageable. Undertrained or poorly supervised field workers are not overburdened with extraneous tasks that do not bear directly on program performance.

In successful programs, the emphasis on technology and training drives the entire organization — making the programs technology-driven and, most importantly, dependent on professional staff. A premium is placed on knowledgeable staff whose professional judgement and long experience in control activities is given more weight than their administrative status or responsibilities. These technical specialists, while often performing a "staff" function, are indispensable (through learning by doing) to adaptive operational research.

A key to program success is the *balance between centralized and decentralized activities* — rather than an ideologically-driven adoption of one or the other extreme. This lesson is highly relevant for health programs in general. Central officials must provide a clear focus on goals and objectives, while local staff provide responsive, flexible program planning and implementation.

Finally, *programs must inculcate and nurture a sense of common purpose, dedication, and commitment, and a collaborative mode of behavior that reinforces professional values.* Successful control programs show that even government-run programs and institutions can produce excellent results if the right culture and values are encouraged — instead of relying on bureaucratic procedures or administrative regulations. This emphasis on the "soft" side of the organization, to supplement the "hard" (technological) focus, is unusual in public organizations. Successful disease control programs judiciously balance the needs of the organization and the needs of the individual, thus ensuring sustained productivity and high staff motivation. The relevance of this approach to other public health programs and institutions is obvious.

Organizing and managing tropical disease control programs: Lessons of success

Tropical diseases: The global toll

Almost half a billion people — one person in 10 — suffer from tropical diseases.(See Table 1 overleaf.) Most live in countries with less than US$400 per capita income a year. Often governments in these countries are so poor that they spend an average of only US$4 per person a year on health care. (See Box 1 on page 3 for an overview of the diseases).

These tropical scourges cause tremendous pain and suffering ranging from ulcers, internal damage, and disabling anemia to gross deformities of face and limb, blindness, brain damage, and death. They also have insidious effects on society: they impede national development, make fertile land inhospitable, impair intellectual and physical growth, and exact a huge cost in treatment and control programs.

Tropical diseases are not solely a result of poverty. Paradoxically, the process of development can provoke outbreaks of tropical diseases. In Brazil, for example, the attempt to develop the Amazon is creating new breeding sites for malaria-carrying mosquitos. Tropical diseases were once considered diseases of the rural poor; they still are, but now they are also associated with the need to earn income.

Most victims of tropical diseases are in Africa. Malaria, schistosomiasis, river blindness, and African sleeping sickness are rampant. The whole continent — 500 million people — is at risk of at least one tropical disease. Eighty percent of the African population — 400 million — lives in areas where little has been done to control malaria transmission and where the problem remains virtually unchanged or is worsening.

Estimates put the annual number of cases of tropical disease in Asia at more than 100 million. The most serious diseases are malaria, schistosomiasis, and filariasis. In Central and South America, more than 35 million people are infected. The most serious diseases are Chagas, schistosomiasis, and malaria.

Most tropical diseases are caused by tiny parasites that invade the body. Insects spread all the parasitic diseases except for schistosomiasis (which is spread by fresh-water snails), and leprosy (which is caused by a bacterium and probably transmitted through the nasal discharge of infected people). The parasites and the vectors that carry them are moving targets. They can adapt to changing conditions, and develop resistance to drugs and control measures. For example, the parasite that causes malaria has become resistant to chloroquine, the standard treatment for 40 years. When people move to seek work, land, and food or to flee wars or natural disasters, they may be exposed to tropical diseases to which they have no resistance. They can also carry diseases from one area to another. See Box 2 (on page 4) for problems and prospects of tropical disease control.

Despite these problems, there are some technology-related success stories. Leprosy is now declining as a result of drug therapy. River blindness is down in West Africa because of blackfly control, and should decline further because of a new drug, ivermectin. Chagas disease is being reduced in Brazil through control of car-

Table 1 The global toll

	Malaria	*Schistosomiasis*	*Lymphatic filariasis*	*Onchocerciasis*
Carrier or cause	Mosquito	Aquatic snail	Nematode worm (mosquito)	Nematode worm (blackfly)
People at risk (million)	2,100	500-600	900	90
Countries affected	103	76	76	34
People infected (million)[a]	270	200	90	17
Typical clinical symptoms	Cyclical fever, chills	Blood in stools or urine; spleen, liver enlargement	Disfiguring swelling of limbs	Intense itching, eventual blindness
Mortality per year	1-2 million	<200,000	n/a	n/a

a. Half a billion people are infected with one or more of these diseases.
Source: Tropical Diseases. 1990. WHO, Geneva.

rier insects. In Uganda, tsetse flies, the carriers of sleeping sickness, are being controlled with simple insect traps. But control of tropical diseases is far from complete.

The empirical study

Many tropical disease control programs suffer from financial and institutional weaknesses. A few programs, however, have been notably *successful in the sense that they have consistently achieved their program goals over an extended period (10 to 15 years or more).* The most successful programs also demonstrate the capacity to sustain high performance despite changes in the program environment. In other words, these programs have achieved notable reductions of disease morbidity and mortality over extended periods of time, and they have done so while adapting (or remaining responsive) to changes in the local technological, epidemiological, physical and sociopolitical conditions.

The criteria for "success" outlined above relate primarily to measures of program effectiveness, i.e., achievement of program objectives. The study did not cover issues of program efficiency and costs in depth. Nevertheless, we believe that the empirical lessons derived from the experience of these successful efforts can strengthen tropical disease control programs elsewhere.

Although the lessons draw on documented field experience, the complexity of the issues and the diversity of country and program circumstances suggest that the conclusions should be applied flexibly.

Scope of the study

The study asks the following questions: What makes tropical disease control programs successful? What organizational and management features are unique in terms of structure, processes, and mechanisms for program planning and implementation? What specifically do they do, or not do, and why? And what are the policy and programmatic implications for donors and health specialists?

The study stems from an international workshop held at the World Bank in 1986 (see Annex 1). The workshop included a background review of tropical disease control programs — especially for malaria and schistosomiasis — to identify issues of concern to program managers in the field. Strategic and organizational issues were foremost among these concerns.

Workshop discussions — especially the comments of program managers — confirmed that an institutional development focus was appropriate. Participants noted that it was important to augment the general information on disease control programs with more specific and more analytical material. They concluded that specific recommen-

Chagas disease	*Leishmaniasis*	*Leprosy*	*African trypanosomiasis*
Triatomine bug	Sand fly	Mycobacterium	Trypanosome (tsetse fly)
90	350	1,600	50
21	80	121	36
16-18	12	10-12	0.25
Swelling of lymph nodes; damage to heart, intestines	Lesions, tissue damage, malaise	Disfiguring deformities	General malaise, pain
n/a	n/a	n/a	n/a

Box 1 Tropical diseases

Malaria is the most important tropical disease. It is widespread throughout the tropics but also occurs in many temperate regions. The disease extracts a heavy toll of illness and death — especially among children in endemic areas. Epidemics are frequent in rural areas experiencing intense economic development. Treatment and control have become more difficult with the spread of drug-resistant strains of malaria, and insecticide-resistant strains of the mosquito vectors.

Schistosomiasis, or bilharzia, is widespread, especially in Sub-Saharan Africa, Brazil, China, Egypt, and the Philippines. It results in a relatively low mortality rate but very high morbidity rate — causing severe debilitating illness in millions of people. It is often associated with water development projects, such as dams and irrigation schemes, where snails, intermediate hosts of the parasite, breed in water where people swim, wash, and fish.

Filariasis affects the lives of a billion people, mainly in Africa, Asia, and to a lesser extent in Latin America. The different types of filariasis are rarely life-threatening in themselves, but cause chronic suffering and disability. Lymphatic filariasis can lead to hugely swollen limbs (a condition known as elephantiasis) while onchocerciasis can lead to blindness.

Chagas disease, also known as South American trypanosomiasis, is transmitted through large blood sucking "assassin" bugs similar to large bedbugs which live in the cracks and crevices of poor quality houses. Regrettably the disease remains incurable, although transmission can be successfully interrupted by control of the insect vectors in houses and peridomestic habitats.

Leishmaniasis is widespread in Latin America, the Middle East and Asia (but not in South East Asia). It is transmitted by sandflies; and is hosted by dogs, rodents, and other small mammals. Although generally known for causing disfiguring lesions, epidemics of visceral forms of leishmaniasis have caused thousands of deaths.

Leprosy, sometimes known as Hansens disease, is widespread throughout the tropics, although prevalence rates vary considerably by region. Because of its psychological and social effects, leprosy is referred to in many languages as "the big disease." It is believed to be transmitted mainly through nasal discharge from infected people.

African trypanosomiasis or sleeping sickness is often fatal if untreated. The disease is caused by the trypanosome parasite, transmitted by tsetse flies. It occurs throughout the Sub-Saharan tsetse belt of Africa — an area of some 10 million square kilometers, severely restricting cattle growing. Although sleeping sickness claims relatively few lives today, the risk of severe epidemics means that surveillance and active control measures must be maintained.

Source: Tropical Diseases. 1990. WHO, Geneva.

Box 2 Tropical diseases: Problems and prospects

Most tropical diseases are widespread, and several are on the rise. Malaria, which infects 270 million people in 103 countries, is increasing in the Amazon region and Asia, and is widespread in Africa. This increase is due in part to changes in land and water use, the malaria parasites' resistance to drugs, and the malaria-carrying mosquitoes' increased resistance to insecticides. The continuing spread of schistosomiasis, which is prevalent in 76 countries and infects 200 million people annually, is in part the unintended consequence of new mining, irrigation, and agricultural schemes. The spread of other tropical diseases is exacerbated by increasing colonization, urbanization, and migration, all of which aid the transmission of parasitic infections.

Shortfalls in research and program funding continue to be major constraints. Although tropical diseases cause about half the world's illness, they receive only about 3 percent of medical research funds. Multilateral and government funding of tropical disease control programs is also limited. For example, in FY89 only 25 percent of the World Bank's development assistance to the population, health, and nutrition sector ($136 million of $550 million) went to such programs, and only about 5 to 7 percent of government health sector budgets was devoted to tropical disease control. Increased funding is needed as well as attention to countering the disease-spreading consequences of economic development activities.

The technology—primarily drugs and insecticides—for treating and controlling most of the tropical diseases already exists; and can reduce the morbidity and mortality caused by disease. For example, the drug praziquantel is effective against schistosomiasis, ivermectin is effective in treating onchocerciasis (river blindness), and a multi-drug regimen of dapsone, rifampicin, and clofazimine is used to treat leprosy. Research on vaccines for malaria and leishmaniasis, and chemical insecticides against the vectors (mosquitoes, snails, flies) that carry the parasites are also making reasonable progress.

But few developing countries have effectively used the available technologies to reverse or even halt the spread of tropical diseases. A variety of factors — economic, sociopolitical, technical, and administrative — have impeded the governments' control efforts.

More has to be done; but not more of the same. If countries are to overcome the tropical diseases that cause so much misery in the third world, they have to know what measures are likely to work and under what circumstances. Once policymakers and program managers understand the factors that are important to achieve results, and learn how to manage or influence them, they will be able to design and implement tropical disease control programs more effectively.

Source: Tropical Diseases 1990. WHO, Geneva; and World Bank data.

dations on organizing and managing control programs were needed, but would require in-depth empirical studies. Participants recommended a comparative approach that looked at the country context, organizational structure, and performance of institutions. The proposal for the study was endorsed by WHO's Parasitic Diseases Programme, the Malaria Action Programme, and the Special Programme for Research and Training in Tropical Diseases.

As a follow-up the World Bank and the Clark Foundation initiated an empirical study in September 1987. The objective was to identify institutional features associated with successful programs, explain their importance, and draw out the practical lessons for disease control specialists and managers.

Sample selection and methodology

For the purpose of the study, success was defined as sustained achievement of program objectives (see above). The next step was sample selection for the proposed case studies of successful programs, using such criteria as: a) documented evidence of program achievement; b) international recognition of program success; c) willingness of national policy makers in the ministry of health and managers to expose their program to external scrutiny; and d) regional representation of the sample selected.

The program reviews presented by managers at the 1986 workshop provided the first cut at the potential universe of case studies. This preliminary assessment revealed the paucity of successful tropical disease control programs in Sub-Saharan Africa, and the preponderance of successful schistosomiasis and malaria control programs in Asia and Latin America (especially during the 1960s and 70s). The latter included schistosomiasis control programs in China, Indonesia, and the Philippines, and malaria control programs in Brazil, India, Sri Lanka and Thailand. Other programs considered were in such countries as Egypt, Madagascar and Sudan, and some smaller (pilot) programs in Kenya and Zimbabwe.

Based on the selection criteria noted above — and constrained by the limited resources available for the study — we were able to examine only seven programs. The field work was mostly undertaken on a mission-basis (i.e., combined with operational work for the World Bank). The individual case studies were initially prepared by two- to three-person teams of nationals and external specialists in tropical disease control and institutional development. We then compared the seven successful control programs to identify common features and to see what lessons might be applicable to other disease control programs. The programs examined were: Brazil — endemic diseases; China — schistosomiasis; Egypt — schistosomiasis; the Philippines — malaria, schistosomiasis and tuberculosis; and Zimbabwe — schistosomiasis. See Annex 2 for an outline of the study methodology, and the list of case studies available separately.

Successful programs selected

The study examined programs that have made considerable headway in controlling disease transmission and morbidity. Some notable achievements of these programs are given below. Program outcomes are measurable in terms of reductions of morbidity and mortality (per 1,000 population at risk); and in reductions in disease transmission rates or areas infected with the disease or vector.

Brazil has a large public health program for controlling tropical diseases. The main institution for endemic disease control is the semi-autonomous Superintendency for Public Health Campaigns (SUCAM), under the Ministry of Health [1989 data]. Malaria is the most pervasive public health problem in the Amazon region and continues to infiltrate new areas. Over 280,000 cases of malaria were reported in 1983. By 1987 the number had doubled to nearly half a million, despite fairly intensive and effective control efforts. Schistosomiasis is also a major concern, although the number of schistosomiasis-related deaths has fallen sharply. Other tropical diseases, such as yellow fever, dengue, plague, and Chagas disease, require continued control efforts.

SUCAM has demonstrated its effectiveness over the years. In 1987, 88 million people were protected from tropical diseases in Brazil. This entailed some 55 million house visits and 30 million kilometers of travel by foot, bicycle, horseback, motorbike, truck, canoe, and river boat. Over 14 million blood slides were examined, including 1.5 million collected by volunteers. Control operations covered 7,700 municipalities.

China's schistosomiasis control program for *S. japonicum* is large, and was successful during the 1960s and 70s. Over the past 35 years the number of endemic counties has been reduced from 373 to 107 (a 71 percent reduction), the population at risk has been halved, from 100 million to 50 million, the number of people infected has fallen from 10 million to 1 million (a 90 percent reduction), and infected snail habitats are down from 14.5 billion square meters to 3.2 billion square meters. Despite these remarkable achievements, eight provinces remain endemic. These areas are mainly in the swamp, lake, and mountainous regions, primarily in the five provinces surrounding Poyang Lake (the largest in China), Dongting Lake, and the Yangtze River.

The schistosomiasis control program in *Egypt* is one of the largest in the world. The disease is the most important parasitic infection in the country. Snail control operations protect 18 million people in 12 provinces (governorates). Seventy-two towns and 1,800 villages are involved. The program controls *S. haematobium* in upper and middle Egypt and *S. mansoni* in middle Egypt and some areas of the Nile delta.

The program started out to control the transmission of the disease, but is now shifting toward control of morbidity. Control efforts have been successful in reducing schistosomiasis prevalence from about 29.4 percent to about 10 percent in middle Egypt — and more importantly — in reducing the intensity of infection by about 40 percent in more than 2.7 million people. In upper Egypt in 1980, 21.7 percent of the 775,000 people examined tested positive; by 1988, the number infected had dropped to 14.4 percent of more than three million people examined.

S. japonicum is endemic in many areas in the *Philippines*. In 1987 some 1,160 villages (*barangays*) in 170 municipalities of 24 provinces in central and southern Philippines were endemic for schistosomiasis. Of more than 5 million people living in the endemic municipalities, 1.54 million are at risk. With a prevalence rate of 6.6 percent for 1987, it is estimated that more than 335,000 people suffer from the disease. In the island of Leyte, the case study area, the number of deaths from schistosomiasis is estimated at 1.78 percent of positive cases. The program's performance was impressive up to the 1970s but declined in the early 1980s when the Ministry of Health was reorganized. It has since begun to improve.

Control programs for malaria and tuberculosis in the *Philippines* have been uneven since the early 1950s. Malaria fell from a leading cause of illness and death to sixth place in 1970 and remained at that level until 1984. Morbidity rates decreased from 1,000 per 100,000 in 1946 to 77.6 in 1970, even as the population doubled from 18.4 million to 36.8 million. Mortality rates fell from 91.0 to 1.8. The resurgence of malaria worldwide pushed morbidity rates up from 66.8 in 1971 to 202.1 in 1984. In 1983, the disease affected about 5.9 per 1,000 people; by 1987 it had increased to 15 per 1,000. In 1987 more than 10.5 million people were at risk from malaria. The disease is endemic in 72 of the 75 provinces of the country.

Tuberculosis is the third leading cause of death in the *Philippines*, and the fifth leading cause of illness. During 1965-85, 26,000 Filipinos on average died of tuberculosis each year. Although the mortality rate has been going down, the absolute number of deaths has not declined. In 1988 more than 387,000 Filipinos were estimated to have infectious tuberculosis. Each of these cases would probably transmit the infection to an average of 10 people a year. Ten percent of this group would eventually become tuberculous several years after primary infection, and of these about half would subsequently become infectious. The program was reasonably effective up to the early 1980s. Its performance has been erratic since then, largely due to organizational and funding constraints.

The study also examined the schistosomiasis control program in *Zimbabwe*. The Zimbabwe study differs from the others as it deals primarily with a number of successful pilot projects. These projects, however, are expected to lead to a national control program in the near future. In examining the expansion from small projects to a national program, Zimbabwe's malaria control program was also reviewed. It was largely successful up to the 1970s, but has since declined due to organizational and resource limitations.

Issues examined and analytical framework

The study addressed key institutional issues of policy and operations, including: the organizational requirements of tropical disease control programs; the managerial requirements for effective program execution; and the problems of scaling-up and program maintenance. A comprehensive analytical framework was used.

Issues in control

ORGANIZATIONAL REQUIREMENTS OF TROPICAL DISEASE CONTROL PROGRAMS. Most control programs are undergoing a gradual change in strategy. For instance, in the case of schistosomiasis—and to an extent malaria — there is growing evidence to support a control strategy emphasizing disease control using drugs, rather than vector control using insecticides. Future programs are likely to focus on "people-oriented" activities — such as case finding, treatment and follow-up; health education and demand creation; and responsiveness to individual behavioral characteristics — rather than on activities relating to epidemiological surveillance, mollusciciding and environmental management. This evolutionary shift in tasks and technology will require a corresponding shift in the way control programs are organized and managed, and in the way services, such as drugs and health education, are delivered to individuals and groups.

The study reviewed a wide spectrum of program tasks and the organizational approaches, ranging from the functionally specialized structure of a categorical program (that is, a program focused on one or a few diseases) to the more complex institutional arrangements that integrate disease control activities with the public health service delivery system, particularly for primary health care.

The study compared, for example, the categorical endemic disease control programs in Brazil with the (earlier categorical, but presently) integrated programs for malaria, schistosomiasis, and tuberculosis in the Philippines. It also examined the hybrid program organizations in China and Egypt. This review shed light on the ongoing debate over the relative pros and cons of various approaches to organizing disease control. (See Box 3 for definitions of some of the key concepts and terms.)

MANAGERIAL REQUIREMENTS OF EFFECTIVE PROGRAMS. What managerial activities are needed to undertake the program? Implementation is often the weakest link in disease control programs. There are problems in planning and implementation, monitoring and evaluation, surveillance, reporting, and logistics. Besides the difficulty of ensuring the availability of money and materials (particularly drugs, transport, equipment, and supplies), there are endemic problems of dealing with the human side of the enterprise (particularly training, incentives, supervision, and the like).

Box 3 Definitions of terms

AUTONOMY. The quality or state of being self-governing.

CATEGORICAL. A program focused on one or a few diseases.

DECENTRALIZATION. The redistribution of authority and responsibility for program activities from higher to lower levels (vertical decentralization), and/or from line managers to staff or advisory groups (horizontal decentralization).

GOVERNANCE. The process of directing, leading and controlling the formulation and implementation of policy, strategy, and plans. The underlying values guiding this process are also important.

HORIZONTAL APPROACH. Implies a decentralized, integrated organization (for example, disease control undertaken through the general public health delivery system).

INTEGRATED. A disease control program combined with the public health service delivery system, particularly for primary health care (PHC).

INTEGRATION. Bringing together independent administrative structures, functions, and practices.

LEADERSHIP. Establishing an organization's mission and goals, acquiring the needed resources, setting a realistic agenda, and influencing others to rally behind the agenda.

MANAGEMENT ACTIVITIES. These include setting goals, planning, organizing, delegating, and supporting the work of subordinates as well as problem-solving, reviewing, motivating, and communicating.

ORGANIZATIONAL CULTURE. Culture encompasses the organizations' traditions, values, beliefs, and patterns of behavior. Culture can be overt or covert, strong or weak, depending on how it affects behavior.

ORGANIZATIONAL STRUCTURE. The structure depicts formal reporting relationships among organizational units, illustrates how the organization differentiates among the tasks and activities, and shows how the activities of different units are to be integrated and coordinated. Depending on the distribution of control and influence, the organization can be centralized or decentralized.

PLANNING. The process of formulating a detailed program of action.

PROGRAM. A set of interrelated functions and activities necessary to attain defined objectives.

SUCCESS. Consistent achievement of program goals over an extended (10 to 15 year) period. The most successful programs also demonstrate the capacity to sustain high performance despite changes in program environment.

VERTICAL APPROACH. Implies a centralized, categorical organization (for example, focusing on a single purpose and disease).

Compounding the issue of implementation — and exacerbating the difficulties of the technological shift noted above — are two other evolutionary changes. First, the push toward combining two or more disease control programs or folding such programs into the general health care delivery system. And second, a push to decentralize program activities and increase the responsibility of field personnel.

In principle, each shift — toward disease control, toward integration, and toward decentralization — can take place independently. In practice, however, many control programs (such as those in the Philippines and Egypt) have attempted to move in two — if not three — directions simultaneously. They have justified this linkage by stressing the need to respond to external factors, such as a government decision to decentralize health services or an international call to integrate control activities with primary health care systems. Although this justification is understandable, the timing, speed, and extent of the changes must be managed carefully.

To resolve this issue the study looked at programs in Egypt, China, and the Philippines. These programs tried new control strategies while simultaneously adopting new organizational arrangements and implementation practices. Operational procedures were examined at national, provincial, municipal, and village levels; managerial systems for planning and resource allocation, programming, budgeting, and evaluation were reviewed.

PROBLEMS OF PROGRAM EXPANSION AND MAINTENANCE. Many disease control programs have passed through stages of birth, growth, and maturation or decline. At first a small pilot scheme is introduced to test new control technologies which, if effective, have the potential for replication or expansion. The expectation has been that once the technology is proven in a small area, it will be successful on a larger scale.

This expectation has seldom been justified. Pilot projects rely on resources — money, materials, staff, and managerial and political commitment — that cannot be replicated easily. Even when the expansion is gradual, so that fledgling systems have time to gain strength and durability, it is difficult to maintain momentum on a large scale and over long periods. As the initial commitment and enthusiasm gradually subside, the organization's performance inevitably begins to decline, even before the program matures.

Some programs, however, have successfully avoided such a fate — in Brazil, Egypt, and China, for instance. The Zimbabwe study provided a complementary perspective; the program was still in the pilot stage, but was gearing up for expansion nationwide.

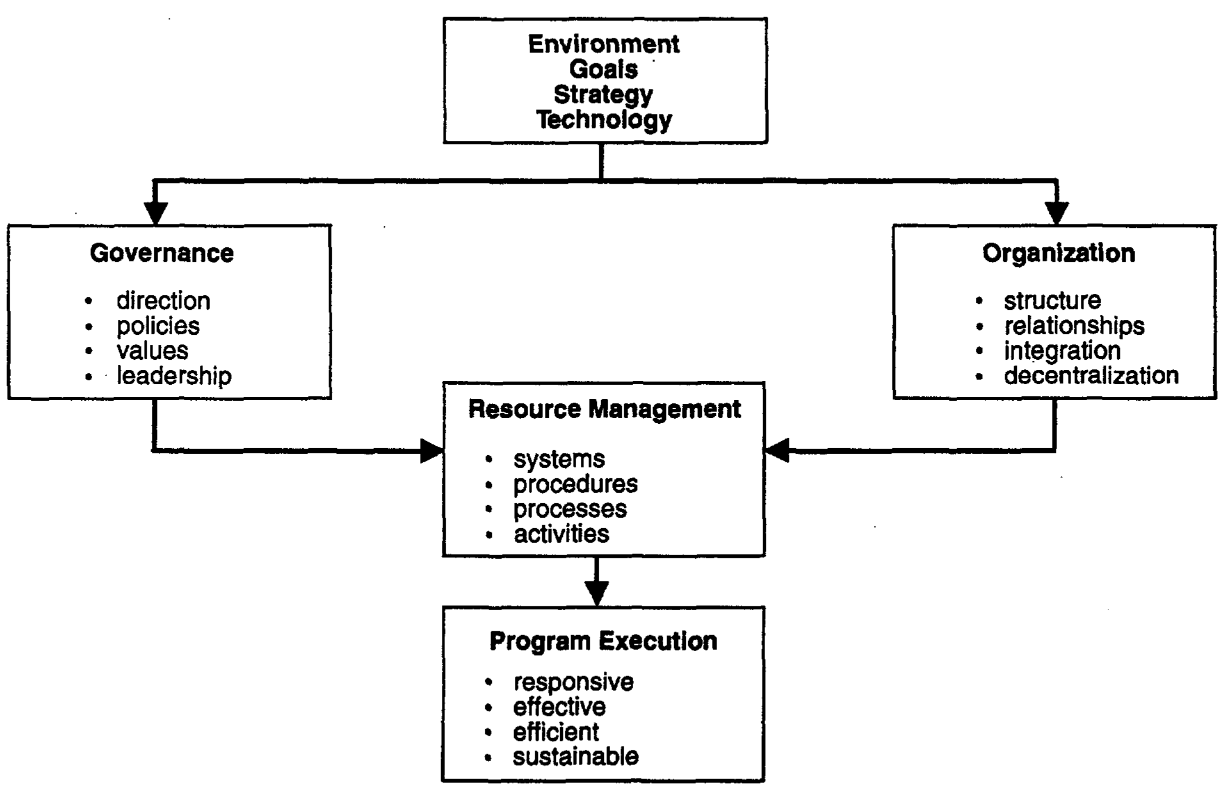
Control programs that successfully maintain high levels of performance over long periods obviously do something more than — and probably different from — organizations with less impressive track records. Based on a review of the literature, we hypothesized that the difference in performance was the result of a variety of structural and process-oriented factors. To understand the specifics, the study tapped knowledgeable insiders for an accurate picture of the values, attitudes, and beliefs that had shaped the organization.

Analytical framework

The analytical framework of the study was comprehensive. It examined the interactions within and among three sets of variables: technology; organization and management; and community interactions. The framework assumed that: (a) the disease control strategy and technology should be appropriate for the country and feasible in the local environment; (b) the organizational and managerial arrangements should fit the task requirements of the program; (c) the technology and the organizational arrangements should be acceptable to the community served; and (d) residents should participate, as needed, in disease control activities. It further assumed that success of the program would depend on interaction among the three sets of variables.

The specific variables examined are given in Figure 1. Details of the analytical framework are given in Annex 3.

Figure 1 Variables included in analytical framework



Disease control technology

This chapter gives background information on the technology for controlling the major tropical diseases and offers examples of the specialized activities of disease control organizations.

Control strategy and technology

The strategy and technology of control must achieve program goals using available resources in a cost-effective manner. Most of the programs examined have successfully initiated large-scale activities for controlling schistosomiasis and malaria. As noted, the strategy has gradually shifted from transmission (or vector) control, using insecticides, to disease control using drugs. Most tropical disease control programs, however, use a variety of control technologies, including insecticides (termed molluscicides for schistosomiasis), chemotherapy, epidemiological surveillance and health education (see Table 2).

In China, for example, based on the epidemiological pattern of schistosomiasis and the ecological distribution of vector snails, the endemic areas were divided in 1956 into three regions — the plains, the mountainous regions, and marshland and lake regions. The strategy was then tailored accordingly, with initial emphasis on transmission control through environmental modification and mollusciding as well as treatment of infected persons and animals. Efforts were also aimed at large-scale control of the disease with drugs. Subsequently, the control strategy has been modified in response to changing epidemiological and technological requirements.

In Egypt schistosomiasis control includes large-scale chemotherapy of infected patients with metrifonate or praziquantel, environmental sanitation, control of contact with water, and area-wide mollusciciding of irrigation and drainage systems. The Philippines relies on a mix of technologies for controlling schistosomiasis and malaria. The emphasis is gradually shifting from vector control to chemotherapy. (See Annex 4 for an overview of malaria, schistosomiasis, and tuberculosis).

Table 2 Control technologies used for tropical diseases

Technologies	*Malaria*	*Schistosomiasis*	*Lymphatic filariasis*	*Onchocerciasis*	*Chagas disease*	*Leishmaniasis*	*Leprosy*	*African trypanosomiasis*
Chemotherapy								
Individual	X	X	X	X	X	X	X	X
Large scale	X	X						
Mass		X						
Vector control								
Pesticides	X	X	X	X	X	X		X
Environmental modification	X	X			X			X
Agro-engineering		X						
Epidemiological surveillance								
Routine reporting	X	X	X					
Active surveillance	X	X		X		X	X	X
Survey and mapping	X	X		X				X
Case detection								
Active	X	X		X	X		X	
Passive	X	X		X	X		X	
Others								
Health education	X	f.	X	X	X	X	X	X
Water supply		X	X					
Sanitation		X						
IEC	X	X						
Housing							X	
Surgery					X			

Source: World Bank data. Compiled by the authors.

Specialized control activities

Each control technology is a discrete activity requiring a good understanding of the disease, the vector, and the interactions in the community, as well as the operational requirements of the control tool.

For example, chemotherapy is often used to treat individuals (as for malaria) and on a large scale (for example, selective or mass chemotherapy for schistosomiasis). Individual treatment requires, at a minimum, proper diagnosis by a qualified health specialist, an adequate supply of suitable drugs, and accessible and affordable treatment facilities (such as a health clinic or hospital) for severe cases. Large-scale drug treatment imposes additional requirements and requires different technical and organizational skills.

These requirements, somewhat simplified, include the following:

- Reliable population data.
- Surveys of prevalence.
  - Age-specific prevalence.
  - Intensity of infection.
  - Selection of index municipalities for program monitoring.
- Preparation of maps.
- Testing and quality control using a simple, specific diagnostic method for routine applications.
- In-service personnel training for treatment and treatment of side effects.
- Logistics of drug supply (purchase and storage).
- Information to and education of patients (via media, posters, person to person) to create compliance and cooperation.
- Monitoring of drug resistance.

Egypt's schistosomiasis control program is a good example. It concentrates on two important parameters — prevalence and intensity of infection. Baseline data on prevalence rates is obtained from four data bases:

- Annual screening in sample surveys.
- Annual follow-up of a fixed population sample of cohorts at index villages.
- Annual records of rural health units giving the numbers of persons examined and the numbers detected as infected with the parasite.
- Biannual examinations of children at the beginning of the school year in October and just before the hot-weather transmission season in March.

In Egypt, schistosomiasis is detected through laboratory examinations of urine and stools. The urine is examined by sedimentation, and the negatives are re-examined after centrifugation. Stools are examined by sedimentation for screening of *S. mansoni* and intestinal helminthic infestations. (See Box 4 for stool checks in the Philippines.).

The control plan is based on a village census. Adequate coverage of the population is assured through periodic samples of 10 percent of the households. Residents are examined at rural health centers and schools. Health workers pay special attention to occupational groups at high risk.

In Egypt, as in Brazil, very young children are seldom infected. But children five years old and older can be severely infected. Since children have high levels of schistosome egg excretion, and therefore contribute beyond their numbers to community egg production, it makes sense to concentrate on age cohorts under 14 years. If prevalence is less than 4 percent, only that group is treated; if prevalence is 4 to 20 percent, the 5 to 25-year age group is treated; if it is more than 20 percent, the whole population is treated.

The technology for vector control is also adapted to local conditions. "Blanket" mollusciciding is used for large irrigation canals. Selective mollusciciding is carried out on large bodies of water, such as the Nile, where other methods would not work. Two types of selective mollusciciding are used: radial, where waterways serving dispersed villages are dosed; and focal, where transmission centers are treated or where the molluscicide is released into waterways serving a cluster of villages. Although selective mollusciciding cannot be used as easily as blanket

Box 4 Schistosomiasis control: Stool checks

In the Philippines' schistosomiasis control program, the examination of stools is a crucial task. This requires, at a minimum, a microscope and a trained microscopist to examine the specimen. Screening is handled by the Rural Health Unit, with the assistance of its *barangay* health station, the program's front-line service center.

It is here that the public can seek assistance. To find active cases the *barangay* health workers or midwives distribute stool cups (or banana leaves) to encourage community members to submit stools for examination. Although there is no charge, collecting stool samples remains the main problem in finding new cases.

Source: World Bank data. See case study of schistosomiasis control in the Philippines.

molluscididing during the active intervention phase, it is economical in terms of application sites and personnel.

Control organizations

From the operational point of view, the problem is not simply to develop techniques for treating and controlling the disease, but how to effectively organize the delivery of technology.

Health sector organizations

Traditionally health systems have been described as having five complementary components — therapeutic services, public health services, regulatory agencies, research and training institutions and financing institutions. The first is a network providing curative, therapeutic services to individuals and includes hospitals and health clinics. It may involve public and private organizations. It often has a primary health care involvement at the community level. This network is largely demand-driven and responds to complaints from individuals.

The public health service caters to such population-based health requirements as epidemiological surveillance and area-wide disease control. The service responds to changes in policy and in epidemiological conditions by implementing control strategies with a preventive rather than purely therapeutic effect.

Public health services require high levels of technical expertise, effective outreach to local communities, and a systematic collection of information on health. Its functions are essential for effective disease control, and complement the services targeted at individuals. In the last decade, some countries have neglected the public health service and allowed it to fall into disrepair.

The third component of health systems includes the regulatory organizations, such as the policy, planning and public health departments of Ministries of Health or specialized regulatory organizations (such as "Food and Drug" departments). The fourth component includes medical and paramedical training institutions, such as medical and nursing schools and health research institutions. Finally, in more developed countries there are specialized organizations involved in financing the health system, such as sickness funds or social security administrations. For the purpose of this study, the interrelationship between the therapeutic and public health services was of interest.

Typology of organizations

Recently James O. Wilson has proposed an organizational typology of public bureaucracies. Wilson's organizational typology is based on two main dimensions: a) can the activities (*outputs*) of the employees be observed or measured; and b) can the results (*outcomes*) of these activities be observed or measured. Observing outputs and outcomes may be difficult or easy, depending on the situation. This results in a 2x2 matrix; and a typology of four organizational types. See Figure 2 overleaf.

The key features of these four types of organizations are given below:

- In production organizations, both outputs (or activities) and outcomes are observable. Disease control organizations, specialized hospitals, and surgical departments would fall in this category. Work that produces measurable outputs (e.g., area sprayed with insecticide) tends to drive out work that produces less measurable outputs (e.g., health education).
- In procedural organizations, managers can observe what their subordinates are doing but not the outcomes that result from those efforts. In these organizations it is best to rely on the professionalism of highly trained and experienced staff capable of meeting self-imposed standards of work. In the health sector, the primary health care network (especially health centers), general hospitals, and mental hospitals fall into this category. But because outcomes are not easily observable, there is a tendency to become means-oriented, i.e., to rely on standard operating procedures.
- In craft organizations, the activities of employees are difficult to observe but the outcomes of their work are relatively easy to evaluate. These organizations must often rely on goal-oriented management and a shared commitment to the overall purpose(s) of the organization. In the health field this category includes regulatory organizations, and many departments of the Ministry of Health. Because in public bureaucracies compliance and regular oversight are deemed essential, it is seldom possible to provide the high degree of individual discretion that might be expected by the employees.
- In coping organizations, neither outputs nor outcomes can be easily observed. Medical and paramedical training schools and health research institutions fall into this category.

Obviously, few real-life organizations neatly fit any one category. Most organizations are hybrids

Figure 2 Typology of organizations

	Output (activities): *Easy to observe*	Output (activities): *Difficult to observe*
Outcomes (results): Easy to observe	**1. Production organizations** Disease control Surgery departments	**3. Craft organizations** Regulatory organizations Hygiene, food inspection
Outcomes (results): Difficult to observe	**2. Procedural organizations** Health centers network General hospitals Mental hospitals	**4. Coping organizations** Medical schools Research institutions

Source: Adapted from James O. Wilson, *Bureaucracy: What Government Agencies Do and Why They Do It* (Basic Books, 1989), pp. 158-175.

— with some types of work requiring one type of (sub)organization, while other types of work require quite another organizational arrangement.

As indicated, successful disease control organizations would tend to be production organizations. Part of the organizational difficulty of integrating tropical disease control activities with PHC activities at the field level arises from the different task-orientations, incentive structures, and managerial systems required for each. In a fully integrated PHC system, it is understandably more difficult to maintain a clear results-orientation and a sharp focus on measurable disease control activities. The next section provides organizational details of the programs studied.

Disease control organizations

China. In China disease control is organized categorically and administered by specialized institutions. At the national and provincial levels, health care delivery is provided by preventive programs, clinic-based services, and family planning services. The government is responsible for much of the preventive medicine, and for controlling specific communicable diseases.

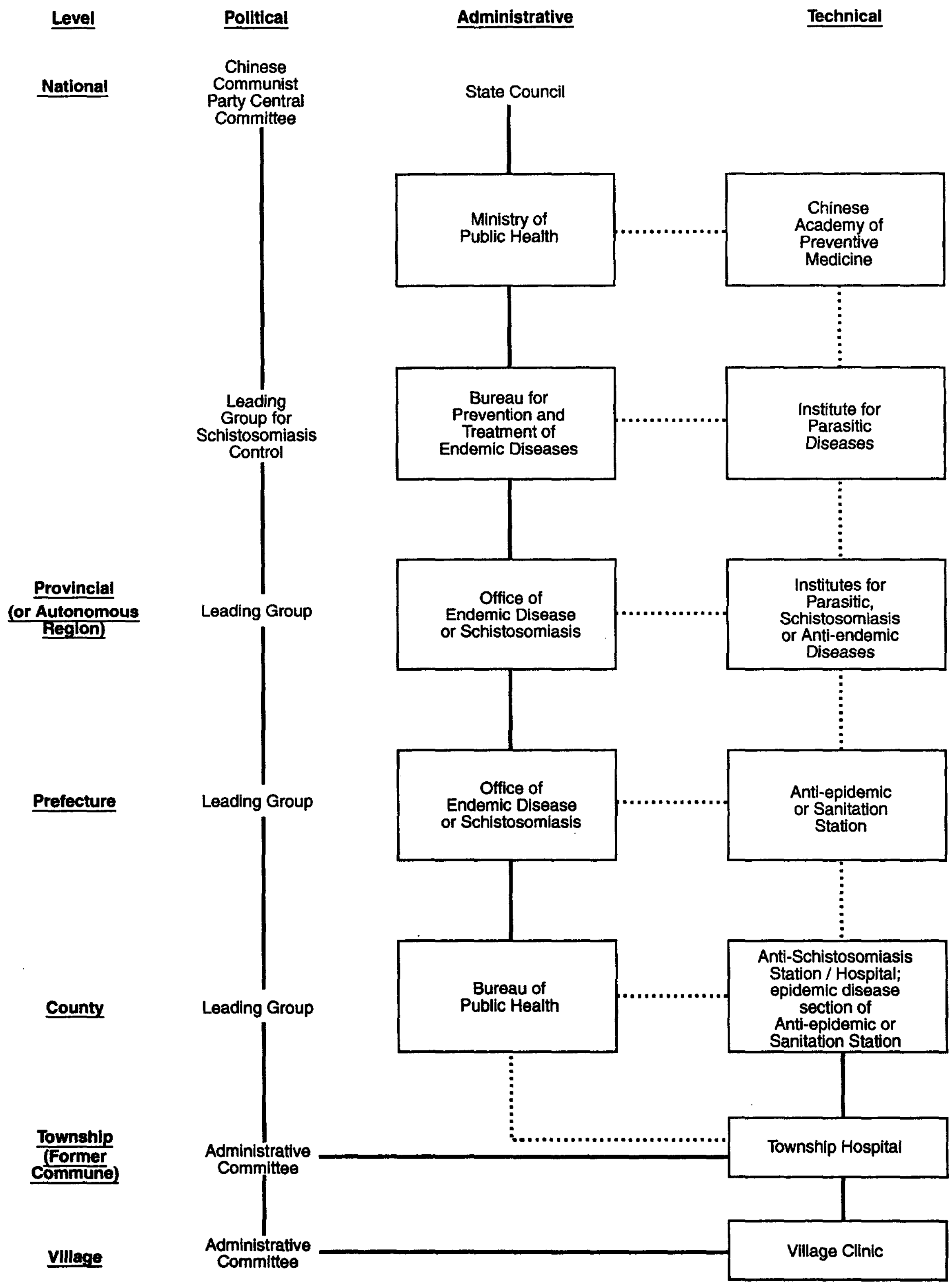
The strong emphasis on categorical programs and government-sponsored health campaigns has played an important role in dramatically reducing China's morbidity and mortality rates. This emphasis — on a multi-disease basis, except for schistosomiasis and tuberculosis in highly endemic areas — is worth noting, especially for countries seeking to learn from China's experience.

The central ministry of public health has a legislative, regulatory, and oversight function, and does not have major responsibility for executive and service delivery functions. The administrative hierarchy extends from national to county levels. The health bureau staff is small, and primarily handles planning and coordination.

The schistosomiasis control organization is structured more on the basis of professional levels than on strict administrative hierarchy. There is a functional division of labor between the provincial and county-level institutes and stations — not a bureaucratic reporting relationship. Research institutes, anti-schistosomiasis stations, and hospitals have been established at different levels. The research institutes' responsibility is to prevent and treat endemic diseases, direct lower level professional units in research practice and technique, draw up technical regulations, train professional personnel, appraise scientific achievement, and set up and collaborate in a national scientific network.

Three national research centers — for endemic diseases, leprosy, and venereal diseases are responsible for the scientific work. At the provincial level, about 60 provincial research centers under the direction of the local health department handle

Figure 3 China: Organization of schistosomiasis control



prevention and control. There are five provincial institutes for schistosomiasis, but work is also under way in specialized departments of anti-epidemic stations and of provincial institutes of parasitic diseases.

At the county level most of the affected areas have an anti-schistosomiasis station. The largest, in the Poyang Lake area, has 280 employees. In addition there are specialized anti-schistosomiasis hospitals. At the next level (township, previously commune), each affected township has an anti-schistosomiasis team operating in the local anti-epidemic station.

About 14,000 professional scientists, physicians, and public health workers are directly engaged in schistosomiasis control. Most have intermediate-level qualifications and are trained as field technicians. Although they are under the administrative control of the local health department or bureau, technical (functional) guidance and support are provided by the professional staff of the institutes, departments, or stations at the next higher level. This distinction between technical and administrative supervision reinforces the categorical features of the program.

BRAZIL. Brazil's premier endemic disease control organization [1989 data] is a semi-autonomous Superintendency for Public Health Campaigns (SUCAM). SUCAM is the largest agency of the Ministry of Health and its mandate covers planning and implementation of control programs for all endemic diseases. SUCAM directs its campaigns at homes and relies on extensive mapping (see Boxes 5 and 6).

SUCAM has administrative and financial autonomy. The agency has a department of personnel so that it can deal directly with personnel questions. Despite SUCAM's large multi-disease mandate, its institutional resources are not extensive; a staff of fewer than 40,000, few of whom are university graduates. The staff are not well paid by public sector standards, and indeed, earn less than other civil servants in the health sector. Despite this salary disparity, few public agencies approach SUCAM's reputation for expertise in the field.

SUCAM's management and execution of field activities is organized hierarchically. From the field level up it can be described as follows: teams of five guards (*guardas*) are led by a chief guard (*chefe de turma*). Five such teams are subordinated to an inspector (*inspetor de endemias*) and five inspectors to a general inspector. The latter, in groups of five, are supervised by a professional in charge of a specific endemic disease control program. The control programs are managed at the local level through local districts (the *sub-distrito*, usually located in a municipal seat). Local districts, ideally, report to subregional units called technical-administrative districts (*distritos*), which are officially the primary operational units. These, in turn, are managed by regional directorates in state or territorial capitals. Regional directorates are subordinate to the central superintendency in Brasilia.

There are nine regional directorates in Amazonia, for example, coordinating the activities of approximately 8,700 workers in 26 technical-administrative districts. In addition, SUCAM has a volunteer system of notification posts at the community level. The volunteer (*notificante*), a resident of the local community, collects blood slides from febrile patients (passive case detection) and provides treatment (chemotherapy). SUCAM has about 15,000 such volunteers in the Amazon and more than 45,000 in the country.

SUCAM's central organization comprises one planning unit and four departments (see Figure 4 on page 16). The planning unit is responsible for planning, programming, and budgeting based on proposals prepared by the 26 regional directorates and worked out with the 80 district offices. The regional directorates receive technical advice from the central Department for Eradication and Control of Endemic Diseases.

This department has separate divisions for each of the major endemic diseases. These divisions have the following technical functions:

- Identification of endemic areas and areas of residual disease.
- Advice on control technology.
- Implementation of epidemiological surveillance system.
- Technical training.
- Public awareness.
- Sponsoring and monitoring research.
- Intersectoral coordination.

In addition, a division of epidemiology is responsible for analysis of data required to support changes in strategy, such as a shift from attack to maintenance phases. The division is also responsible for transmission studies, has a prominent research role, and is responsible for monitoring and evaluating drug use in campaigns. The division's field section is responsible for developing data for training field personnel in mapping, for familiarizing them with the behavior of

Box 5 Brazil's SUCAM: Campaigns directed at households

At the beginning of a campaign, work areas are divided into zones (or *sitios* in rural areas). The size of the zone has to be such that a *guarda* (field worker) starting work on Monday morning will be able to complete his visits by Friday afternoon, thus leaving Saturday morning for any houses that have been locked during the week. The nature of house construction (whether single or two story), the spacing between houses and so on are considered in the initial demarcation of zones. Zones are adjusted after six months, and surveys are repeated at intervals of not more than a year.

Th number of houses in a zone depends on the nature of the terrain, the methods of construction, and the control work that has to be done. Urban *guardas* can map 40 houses, capture mosquitoes in 20 houses, and spray 12 houses in one day. In rural areas, the *guardas* can map 20 houses, capture mosquitoes in eight to 15 houses, and spray four to eight houses.

A *guarda*'s itinerary is defined by the inspector. Five *guardas* make up a team under a chief of guards. Five chief *guardas* are under the control of an inspector. Five inspectors are under the control of an inspector-general. The number of inspectors-general is determined by the size of the district and the campaign activity. The span of control in SUCAM field operations is seldom more than six; and five is the preferred number.

A fixed itinerary is plotted in advance for each *guarda*. The point at which the *guarda* begins work is marked with a pin on the map at district headquarters. Different colored pins are used for different modes of transportation: blue by water; red motorized; yellow on foot; green on horseback. The *guarda* has no excuse if he is not found where he is supposed to be on any given day.

The *guarda* fills out a daily form indicating houses visited, conditions found, and actions taken. Additional forms are used to notify residents of closed houses so they can leave keys with a neighbor; to request special spraying to kill mosquito larvas; or to inform absent householders that they should follow certain advice.

The inspector leaves his itinerary at district headquarters. This indicates the zones he intends to check and the approximate times of his visit. Should the technician in charge wish to visit him in the field he can find him.

The *guarda* is expected to discover places where vectors are breeding, destroy the foci found, and prevent the formation of other foci. Special teams are formed to capture mosquitoes and other vectors during the later stages of the campaigns, and to deal with really inaccessible breeding spots such as gutters and hidden water tanks. District inspectors are responsible for checking the work of zone inspectors on a regular basis. They do this by inspecting all the *guardas* on a regular basis. The chief inspector is responsible for the maintenance of personnel records of all permanent staff.

Concentration on the house for application of SUCAM technology focuses attention on the requirements in the technical manuals. Staff can concentrate on a narrow range of health behavior, and can monitor the roles and responsibilities of *guardas*, auxiliary health workers, and other SUCAM employees.

The household provides a control area for vectors; and a workplace for *guardas* and inhabitants. There is a degree of symmetry between the expectations of the householder and the *guarda*. For the householder the effort required is minimal and fairly risk free; neither literacy nor numeracy is required.

Source: World Bank data. See case study of SUCAM in Brazil.

Box 6 Brazil: Mapping houses

A SUCAM campaign begins with the mapping of localities where the campaign will be conducted. SUCAM maps are extensive; it has mapped most of the houses in Brazil at one time or another. SUCAM certainly has mapped every house in campaign areas. Maps are made by the *guardas* and are often used by other agencies because the information they contain is very accurate and up to date. As maps, they are unique: they do not use the magnetic north, but instead are oriented toward the rising sun; nor do they contain precise measurements of height or distance.

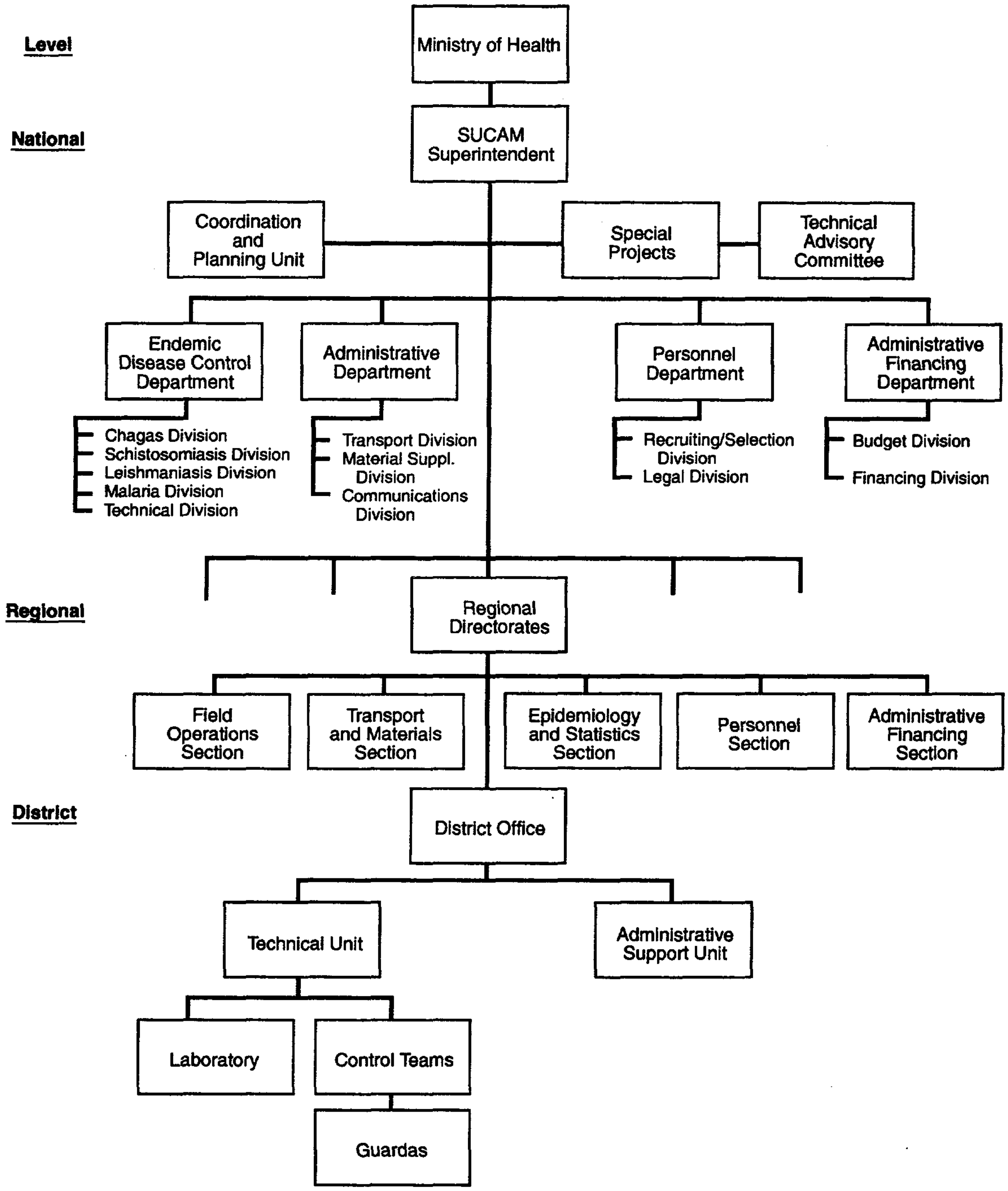
The mapping is updated each time the *guarda* visits. Should a house disappear or new houses be added, he adjusts his map by indicating additional houses to represent the changes. Precisely the same system is used in rural and urban areas, and it can deal quite easily with apartment blocks. SUCAM also puts a register in each house, usually on the back of the front door. On this the *guarda* or inspector who visits the house notes the date and time of his visit and the purpose of the visit.

Based on the mapping exercise and the results of previous campaigns, SUCAM's district technicians can focus on the physical aspects of the household, and the suitability of different types of construction for different vectors. It is the presence and behavior of the vector in relation to the household — or in close proximity to the household — that SUCAM staff seek to influence. Therefore, SUCAM technicians at the district level — and their counterparts at the regional level — target their control methods and message at the behavior of vectors in the household, and at the behavior of residents in the household.

The use of mapping for defining a specific workplace for implementation is not confined to district campaigns directed at households. SUCAM also relies on its mapping techniques for pinpointing and controlling mollusciciding work (and in its work on trachoma). Additional maps are produced on the basis of aggregated data to show how campaigns are proceeding. These maps make extensive use of color to show disease prevalence, attack stages, and so on.

Source: World Bank data. See case study of SUCAM in Brazil.

Figure 4 Brazil: SUCAM's organization chart



vectors, and for spraying. In addition it assists in operational research activities.

The division in charge of field personnel looks after new entrants to SUCAM, and conducts field training. It is also concerned with community relations, particularly the issue of how best to work with local populations within the technical parameters of the various campaigns.

The special projects division deals with cases that do not fit within the central campaign structure, such as the special requirements for controlling malaria in Amazonia. This division works especially closely with SUCAM's financial authorities because some of its work and expenditures are unforeseeable at the beginning of a financial year.

The support functions at the regional (and district) level mirror those at the national level. The operations section in the regional directorate promotes the technical norms advanced by the national level of SUCAM, and tries to improve the standards of technical knowledge of field personnel. The epidemiological section, following central advice, analyzes laboratory results and suggests changes in campaigns, if needed. The statistical section maintains the actual results of health campaigns and transmits them to the central government. Other sections deal with budgeting, finance, and personnel.

The *guardas* (SUCAM field workers) handle field operations, house visits, laboratory examinations, spraying, and investigations of the vector and intermediary host. The responsibility of *guardas* is also to recruit and train volunteers who can administer medicines and take blood slides for laboratory analysis. The *guarda* is also responsible for health education, for making and keeping a map of his or her area, for spraying and for capturing of vectors.

EGYPT. Over the past 50 years Egypt's public health system has gradually been decentralized, integrating the schistosomiasis control program with general health services, especially in the field.

During the 1940s field implementation was the responsibility of the Rural Health Services. Endemic disease control had a separate identity and was supervised in Cairo by the Endemic Diseases Control Department (EDCD). In 1959 the government decentralized health activities to the provincial (governorate) level. A Director of Health had authority over all rural, preventive, and school health activities. Although snail control activities remained organizationally separate, endemic diseases came under local control, and no longer had a separate budget.

In 1962 the authorities concluded that health services were still too remote from the village level. A health facility was planned for each village of over 4,000. In 1975 district-level councils were established. The councils provided financial contributions for the construction and maintenance of medical facilities. These contributions of money, land, or both were important in the expansion of rural health care. During the 1970s more than 400 centers were built or significantly upgraded as a result of community participation. Provision was also made for the establishment of health boards for every rural health facility. By 1975 district chiefs had the same authority over health matters as an under-secretary; the head of the local government unit had the same authority in health matters as a director.

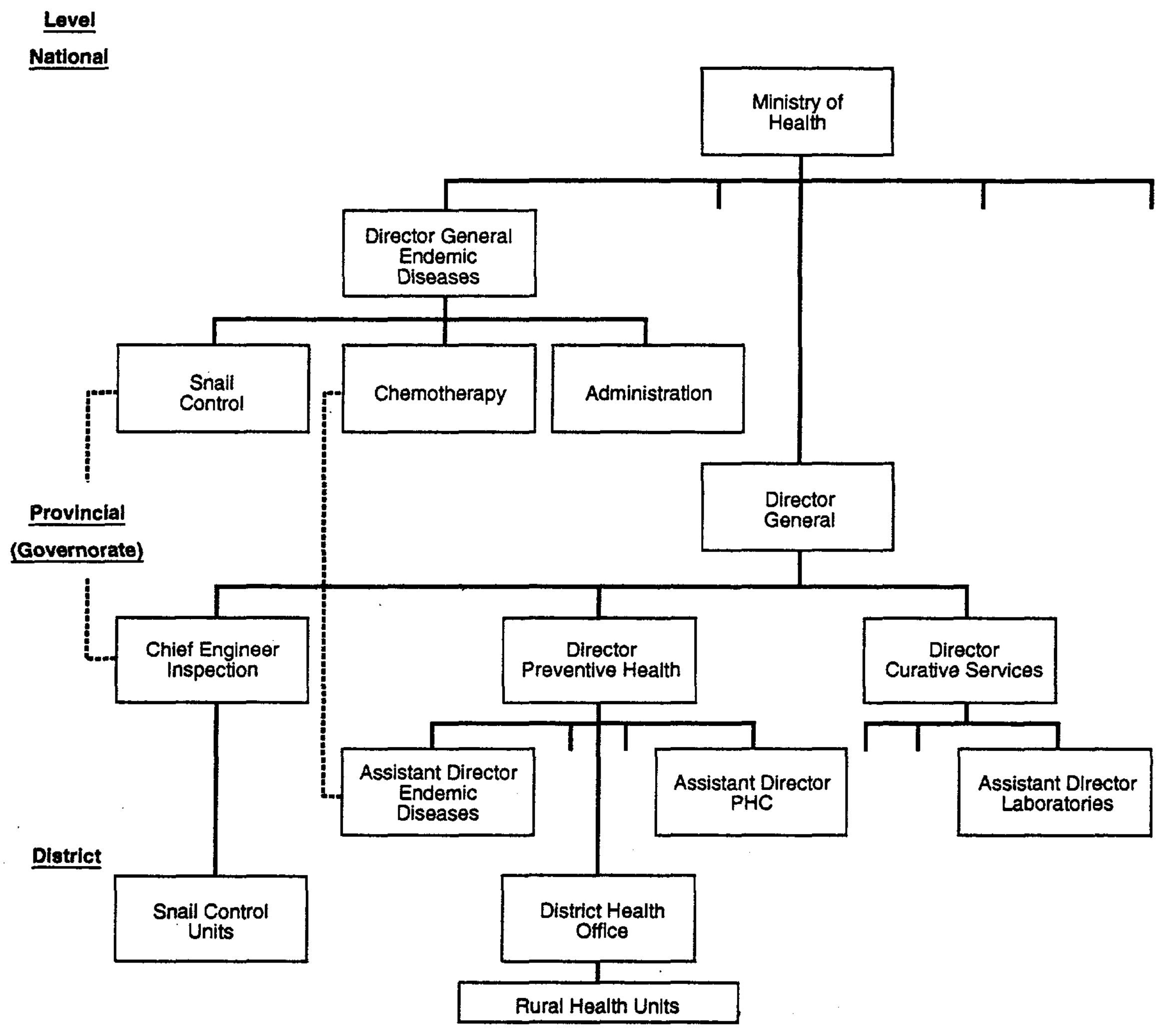
The Ministry of Health is in charge of all public health activities, and the health units in the governorates are responsible for executing orders and policies. The governorate director-general of health oversees several departments, each headed by a medical director. These departments include, among others, preventive medicine (including epidemic diseases) and primary health care (including endemic diseases). For schistosomiasis control the central EDCD retains responsibility at the national level, but operates through the governorates and lower-level staff (see Figure 5 overleaf).

EDCD's activities cover (a) diagnosis, treatment, and clinical and epidemiological work; and (b) snail control. Within the framework of the national program, the agency is responsible for planning, logistics, procurement, supervision, training, evaluation and intersectoral coordination. (Since 1974 disease control administration has been divided into schistosomiasis control and malaria and filariasis control).

Although budgets are the responsibility of the governorate, in practice the endemic diseases control budget is prepared and approved separately. While there is no legal authority in Cairo to influence governorate allocations, in practice the EDCD exerts considerable influence. The role of the director-general of EDCD, who reports to the minister, is crucial.

Executive responsibility for schistosomiasis control in the governorate rests with the director of health services. The assistant director for endemic diseases directly oversees control activities. He is assisted by trained staff — snail control engineers in the governorate's inspectorate of snail

Figure 5 Egypt: Organization of schistosomiasis control



control, and a senior laboratory technician. Field staff pay much attention to mapping waterways and snails (see Box 7).

In the field all rural health institutions deliver basic health services. Rural health units and district hospitals handle diagnosis and treatment. The EDCD, which has no direct line authority over field staff in the governorates, provides advice to the rural health units. At the rural health centers, EDCD-trained personnel (particularly microscopists) work with a number of programs. The ability to share personnel and to shift staff between programs is an important feature of the system.

The endemic disease control program is not unique in the sense that other health services, particularly preventive programs (for instance, population) are also organized on a program basis. Integration is a function of sharing common facilities and working together on community-wide health problems.

But there are important differences between the endemic disease control program and other public health programs. For example, unlike the schistosomiasis control program, the population program does not have a specialized staff or budget, nor is it regularly exposed to strong technical review and control from the center. While all health initiatives have a programmatic focus, the endemic disease control program has a clearer emphasis and is more tightly run. The schistosomiasis control program uses a variety of (sometimes informal) mechanisms for influencing administrative behavior.

The Philippines. The Department of Health (DOH) has five organizational levels: (a) the central level; (b) the regional level, with directorates and general and special hospitals; (c) the

Box 7 Egypt: Mapping waterways and snails

Mapping waterways

In Egypt's schistosomiasis control program, the first phase of a control operation involves the registration and mapping of watercourses. The 3.2 million acres of land and waterway that are covered are recorded in some 3,020 maps.

Individual maps cover about 1,050 fedans. Each is drawn by snail control personnel. They are not drawn to scale, though they do show patterns of cultivation, the length, type, and condition of waterways, the location of pumping stations, fisheries, human settlements, schools, and public facilities. All bodies of water are shown on the maps, as are roads, villages, schools, mosques, and other landmarks. The water courses are measured, listed, and numbered. A survey of watercourses is undertaken.

The maps have multiple functions: agricultural engineers are concerned about water requirements, and these can be estimated from the crops grown. Physical information about the waterways is also important for planning how much mollusciciding may be needed, how much work must be done to clear the banks and weed, or simply to test the water. Fisheries can be adversely affected by mollusciciding, and the distribution of population, combined with information on the depth and velocity of waterways is important for planning selective mollusciciding.

Snail surveys

The snail surveys use three dips of a special scoop every 20 meters to collect snails—or eggs that will mature into snails. The program records about a billion dips a year for survey purposes. Infestation is estimated as the percentage of the number and length of infested waterways. Each map covers an area a snail control unit could handle in a month. The aim is comprehensive coverage on a reliable and routine basis.

While a snail control team's work usually concentrates on dipping, it may also involve clearing undergrowth from the banks, advising people on the dangers of water contact, taking water samples, or helping with mollusciciding. When the day's work is finished, the survey team returns to the Rural Health Center to record what was done.

When snails are recovered from the net, the type of snails, the date and time, the map location, the quantity, and the water conditions are recorded. The snails are taken to the nearest center that has a laboratory technician, are crushed, and placed on slides for microscopic examination. If cercariae are found, arrangements are made for mollusciciding and for a later follow-up visit to ensure that the treatment was effective.

For control purposes, operational inputs, men, money, and materials are carefully recorded on a daily, weekly, and monthly basis. The outputs, coverage of so many kilometers of waterways, the density of snails per kilometer, the cercariae count, and any changes as a result of mollusciciding are also recorded on a daily, weekly, and monthly basis. Inspectors always know where teams are, and what they have done. They make random quality control checks on the work of snail control teams.

Source: World Bank data. See case study of schistosomiasis control in Egypt.

provincial level, with health offices and provincial and district hospitals; (d) the municipal level, with health offices; and (e) the village level, with rural health units and *barangay* (village) health stations. Under the decentralized system adopted in 1982-83, the integrated provincial health offices (IPHOs) have the primary responsibility for: (a) planning, programming, and budgeting health services activities at the provincial and lower levels; (b) integrating curative and preventive health services in the IPHO and district hospital; and (c) developing a community outreach program through the training of volunteer community health workers.

As part of the 1982-83 reorganization, the government largely dismantled the categorical disease control programs and merged them with the general health services. This integration and decentralization effort has not lived up to initial expectations, however, and the government is attempting to restore some aspects of the earlier program organization. We outline here the history of the national malaria control program as an example of the shifts undertaken in the past.

In the 1950s, the division of malaria was a semi-autonomous unit in the Department of Health (DOH). Its director had line authority over 30 field units. He managed the support and administrative services for a malaria eradication program that employed approximately 2,000 persons annually. The rationale for this highly centralized and specialized structure was the need to contain the disease before insecticide resistance set in.

In 1960 the government created 10 regional health offices within the DOH. The division of malaria became a staff bureau with advisory functions — essentially formulating plans, policies, and regulations. With assistance from the regional malariologist, the regional health officer assumed executive responsibility for the direction, administration, coordination, and supervision of the program's line operations.

The initial successes achieved by the intensive malaria control programs were reversed in the early 1960s by population migration, mosquito resistance to DDT, and the administrative dislocation caused by the untimely decentralization. The deteriorating situation prompted the government to restore the former structure in 1966. The Malaria Eradication Service (MES) was created, and all malaria eradication activities and resources, including personnel, equipment, supplies, and appropriations were placed under its control.

Until 1983 the MES operated as a categorical program. Six area field offices coordinated and supervised the activities of 36 malaria field units, the backbone of the program. Each field office had personnel to carry out health education, epidemiological and field operations, and administrative services. The malaria units were responsible for spraying every residence twice a year and for house-to-house canvassing for cases of fever.

In December 1982 in pursuit of a primary health care approach, Executive Order no. 851 mandated the integration of the promotive, preventive, curative, and rehabilitative components of health delivery. The Ministry of Health was again reorganized. This radical change was prompted by concerns that health programs should be broader than the particular needs of a specific disease control program. The MES became a staff bureau of the Ministry of Health. Field operations were to be integrated into the Provincial Health Office within two years of government approval of the reorganization. All program resources were handed over to the provinces. Field personnel who lost status and job security became severely demoralized.

By 1986 it was apparent that the consequences of the integration had not been fully anticipated. Little attention had been given to administrative adjustments that might have cushioned the impact of the sudden shift in control from the central office to the field offices at a time when their responsibility for other programs was increasing.

The latest reorganization (in 1986-87) established a "semi-categorical" organization at the provincial level (see Figure 6). Vector-control efforts, primarily spraying operations, are under the direct supervision of the provincial malaria coordinator, who directs sector chiefs, squad leaders, and sprayers. The district malaria coordinator heads up identification and treatment services, through the municipal health officers, the canvassers, and the barangay health workers. An epidemiological team assists the coordinator at the regional level.

Each of the above disease control organizations is obviously quite different. Despite these differences, however, there are common features. The next chapter further reviews these features to identify key lessons to be drawn from them.

Structuring control programs

There is no "best" way to organize disease control programs. Successful programs decentralize their operations but retain a central policymaking authority. They also limit the degree of integration with the rest of the public health system.

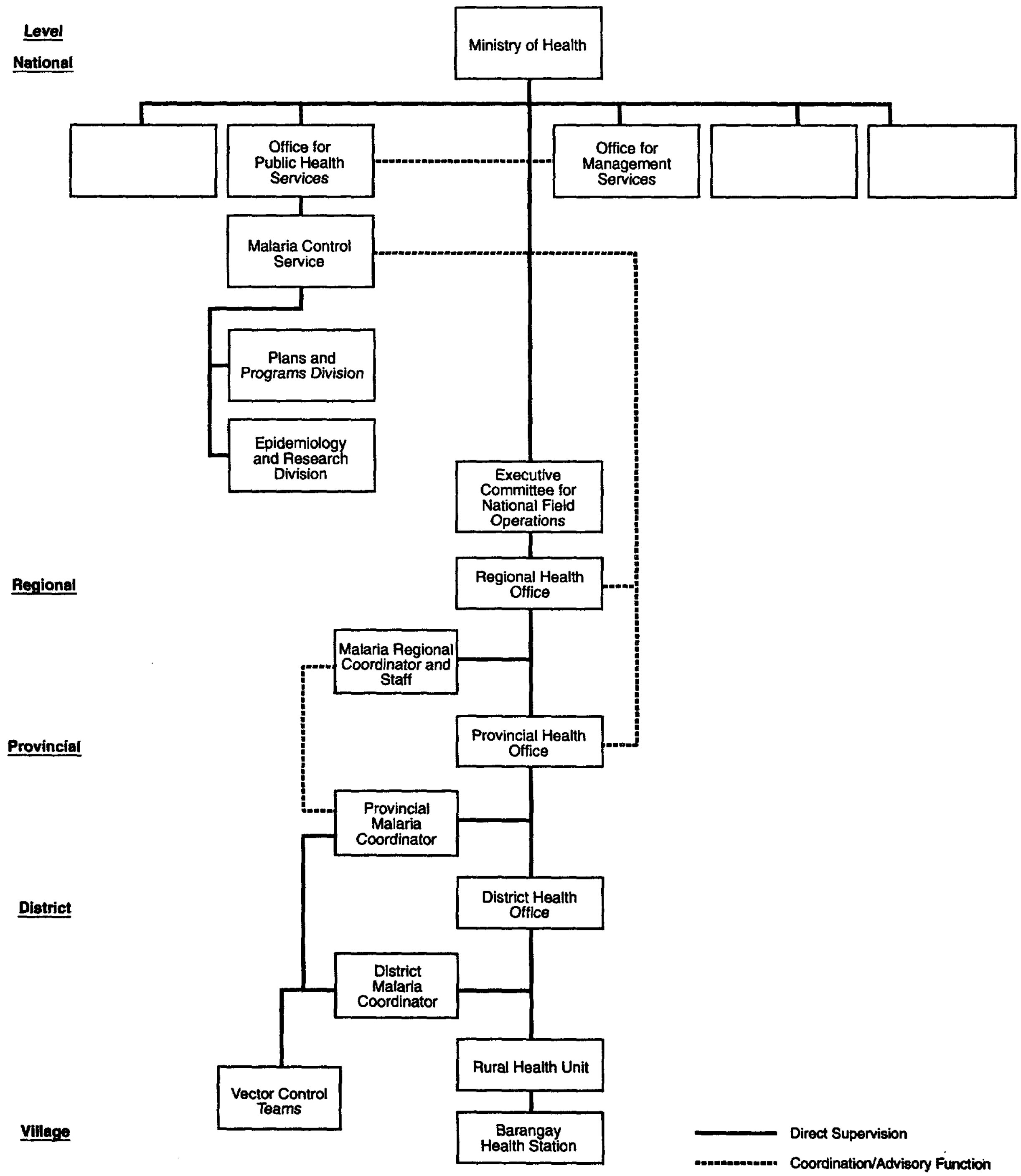
Functional similarity despite structural differences

Disease control organizations have diverse structures. As noted earlier, Brazil's organization for control of endemic diseases is a semi-autonomous entity. China's schistosomiasis control organization is comprised of many specialized institutions. Egypt's schistosomiasis control program is administratively integrated but programatically distinct from the general public health services. In the Philippines, each of the three programs studied (schistosomiasis, malaria, and tuberculosis) was organized discretely for many years. Each program was successful during this period but has been integrated with primary health care, with adverse consequences. Zimbabwe's malaria control program has suffered a similar fate, and both its schistosomiasis and malaria control programs are trying to gradually establish separate programmatic and organizational identities. Details are given in the case studies.

All the above program organizations are (or until recently were) successful. The relation between program performance and purely "structural" features — such as mechanisms for dividing and coordinating the work — is not obvious. In fact, the opposite impression — that structure does not matter — could well be gained from the above data.

A closer examination of the case studies, however, reveals a more complex picture: the structural variations are a matter of degree, and the differences are more administrative than functional. On such matters as program autonomy and task specialization, all successful programs cluster in a

Figure 6 The Philippines: Organization of malaria control



narrow range; and their programmatic functions are similar.

The central departments or service units perform similar functions as well, including:

- Establishing policies, regulations, and criteria for preventing and treating diseases.
- Directing the professional work of institutions specializing in the disease.
- Collecting and analyzing information about the endemic situation of the disease.
- Providing health education.
- Supervising the training of professional personnel in collaboration with related departments and bureaus.
- Administering research work on the diseases, and communicating research findings internationally.
- Handling miscellaneous activities associated with prevention and treatment of diseases.

The similarity of functions extends to lower levels as well. In successful programs, detailed operational planning is done by program managers and their staff at regional or provincial levels, rather than by a central planning unit. In addition, the organizational processes and mechanisms are quite similar across the case study countries.

In general terms each organizational level coordinates, executes, and controls plans financed and approved by the next higher level; and the work plans are implemented by the next lower level. This applies right down to the ground level, where the specialized field worker serves as the vital provider of services and link with the community. Control programs that have systematically developed this functional hierarchy and have a coherent system of mutually reinforcing roles and responsibilities have been successful. Those that have lost sight of this essential requirement — even temporarily (as in the Philippines) — have inevitably paid the price in performance.

Both vertical and horizontal modes

Over the past 10 years, health planners have debated the virtues of a vertical approach (a centralized, categorical organization, as for malaria control) and a horizontal approach (integrated with primary health care and decentralized). Little reliable field evidence was available to support either side. Now that some data is gradually becoming available, a more reasonable middle ground is likely to emerge.

Our field data supports this conclusion: neither extreme position — vertical or horizontal — has much to commend it. Successful disease control organizations are hybrids; they share features of both modes of operation. In other words, successful disease control programs fit the organization to the task — not vice versa. Their structure is appropriate for navigating the political terrain, obtaining the legitimacy and resources needed, and balancing program requirements with administrative considerations. Their internal organization is functionally specialized; their external integration, especially at lower levels, is limited to what the technological tasks permit and what local resources demand.

A few examples clarify this point. China's schistosomiasis control organization, as noted, is clearly a specialized organization. But its schistosomiasis control leading groups are integrated with local health services. In areas that are not highly endemic or that have reached the maintenance phase, the program is implemented through the general purpose preventive health system. Furthermore, even some specialized control activities are integrated. For instance, health education is complemented by national preventive health campaigns. Mobilization to improve environmental conditions is the task of village committees who use local volunteers; vector control and case treatment are the joint responsibility of specialized schistosomiasis teams and village health workers.

Even in an integrated system the same principles apply. In Egypt the schistosomiasis control program has a developed mechanisms to control the budget, and uses the governorate laboratory technicians and snail control units. It relies on governorate and district agricultural engineers to survey waterways and to conduct mollusciciding operations. But the decentralized system is strongly advised by a central Endemic Diseases Control Department.

The situation in the Philippines, as noted earlier, has been reversed several times. The latest reorganization established a semi-categorical organization at the provincial level, which has most of the operational authority and responsibility. The primary health-oriented public health system, however, is integrated.

The structure of the malaria control program in Zimbabwe (see Box 8 and Figure 7 on page 24), was also redesigned, and also reported adverse consequences. This program is now attempting to create a partially integrated organization that is

Box 8 Zimbabwe: Constraints of an integrated organization

Malaria is a major cause of morbidity and mortality in rural Zimbabwe. About 5 million people are exposed to the disease each season. Prior to independence in 1980, malaria control activities were limited. The focus was on spraying houses with DDT to suppress epidemics. From 1980-83 a full-fledged national program was administered entirely by the Blair Research Institute. Since 1983, as part of the overall restructuring and decentralization of the health services, malaria control has been an integral part of the provincial medical directorate and the district health administration.

Before 1983 all malaria control personnel (including the 650 spray technicians) were directly employed and supervised by the Blair Research Institute. Full-time field officers, supervisors and technicians of the Blair Institute provided field-level direction and supervision. Other Blair personnel undertook research and provided diagnostic services. This categorical organization was apparently quite effective in implementing the national program, primarily because it had full control over field activities and resources.

Under the present decentralized system, Ministry of Health staff at provincial and district levels are responsible for malaria control. Each provincial medical director has a separate malaria control unit, although budget allocation, especially for procuring the imported DDT, remains centralized. Actual control operations are carried out by spraymen hired on a seasonal (temporary) basis by district-level disease control officers who are also responsible for program administration, health education, equipment purchase, and maintenance.

These officers and technicians are supported at the village level by staff of the rural hospitals and health clinics who are responsible for collecting blood slides and sending them to the central diagnostic facilities of the Blair Research Laboratory in Harare. The epidemiology department of the MOH head office is responsible for data on prevalence and incidence, based on the results of surveys and submissions by district hospitals and clinics and diagnostic tests undertaken by Blair staff.

Although some progress has been made over the years in malaria control, many problems remain. First, slide submissions to the central Blair Laboratory do not provide an accurate reflection of disease distribution in the country because health center staff are hard pressed for time, and do not take blood slides of all patients diagnosed to have clinical malaria. Second, disease surveillance is not systematic or reliable enough to detect potential epidemics because diagnostic facilities are poorly equipped, are too centralized, and there are not enough microscopes in field locations. Third, the human resources available for planning, implementation, monitoring and evaluation are rather limited; and equipment shortages are endemic. Finally, the Blair Institute does not have sufficient vehicles for deploying entomologists and parasitologists in the field during the malaria season.

All these constraints — lack of reliable diagnosis and surveillance; limited funds (especially foreign exchange), transport, equipment, and manpower; limited planning, supervision, and follow-up; and the increasing problem of insecticide and drug resistance — need to be tackled if Zimbabwe is to reduce the incidence of malaria.

Source: World Bank data. See case study of schistosomiasis (and malaria) control in Zimbabwe.

compatible with the government's primary health care strategy yet is capable of performing the specialized tasks required for effective disease control.

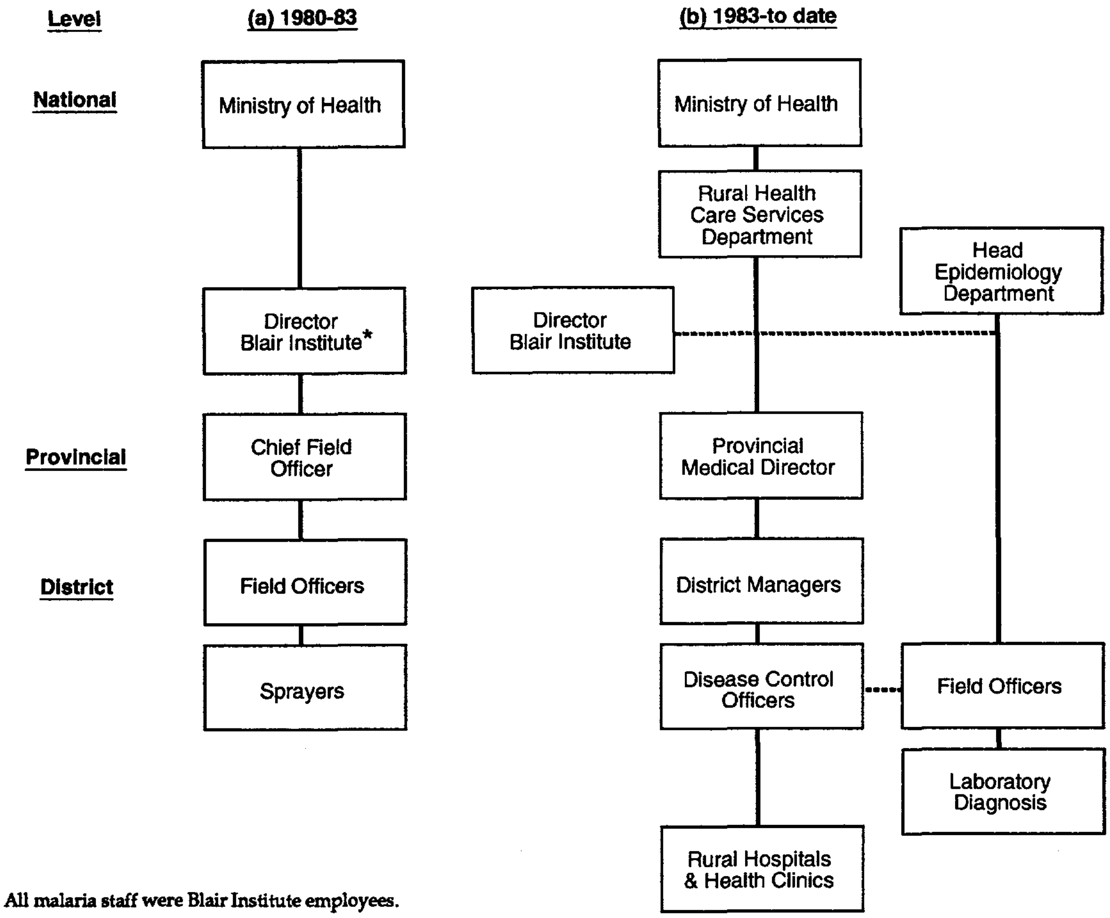
Both centralized and decentralized activities

Some of the central functions common to all successful disease control programs have been noted earlier. These cover such aspects as: formulating plans, policies, and standards for implementing the program, providing training and technical support to field personnel, initiating and coordinating research, evaluating program performance, and reporting data. In addition, some programs (for example, in Brazil, Egypt and the Philippines) provide drugs, laboratory supplies, and health education materials.

The formulation of a national disease control policy based on comprehensive and reliable epidemiological data is obviously a key function. It involves a thorough understanding of disease and population characteristics, and control technologies. Health planners need to have good judgment about what can be achieved, given resources and constraints. All the successful disease control programs reported here are knowledgeable about identifying the most appropriate technological strategy and adapting it through local research. China's research institutes, and the Philippines' schistosomiasis laboratory in Leyte are internationally recognized for their outstanding research. Even Zimbabwe's relatively small malaria and schistosomiasis control programs are based on more than 50 years of research at the Blair Research Laboratory in Harare.

Complementing this technological capacity is a well-developed central capacity to plan, organize,

Figure 7 Zimbabwe: Organization of malaria control



* All malaria staff were Blair Institute employees.

and implement the program. For example, SUCAM's global planning requires aggregating and assessing plans prepared by the various districts. This means evaluating ongoing program activities, assessing resource allocation options, keeping the superintendent informed of progress and problems, liaising with the Ministry of Health where necessary, and monitoring expenditure control through SUCAM's electronic data processing systems. In the Philippines the central Schistosomiasis Control Service (SCS) performs similar functions through three divisions: Plans and Programs Development, Research and Training, and Field Operations Support.

The SCS is seeking a delicate balance between centralization and decentralization. (As is the TB control program, see Box 9 and Figure 8 on page 26). The SCS has transferred its administrative functions to the regions and provinces and has relinquished control over the schistosomiasis hospital in Leyte. Its staff in the central office, which was 130 in 1984, was only 79 in 1988. Schistosomiasis control teams, which were formerly under the SCS, now report to the integrated provincial health offices (see Figure 9 on page 27).

The Department of Health's regional and provincial offices are now responsible for overseeing and supporting program implementation, ensuring intersectoral coordination, and guiding the schistosomiasis control coordinators at regional, provincial, and district levels. DOH staff prepare plans and supervise implementation in their respective areas, provide administrative, technical, and logistical support, deploy personnel, and coordinate with other agencies.

The front line of the program's service delivery

Box 9 The Philippines: Balancing central and field requirements

For almost 40 years, prior to 1967, the government's TB control program had a categorical structure. Field activities were carried out primarily by public dispensaries and chest clinics under the direct supervision and control of central authorities. But the personnel and facilities were insufficient to cover the country — so the program did not succeed.

In 1968 the central Division of Tuberculosis was transferred to the Bureau of Disease Control and was assigned only staff functions. Simultaneously, the TB control program was integrated into the general health service structure by making TB control part of the routine activities of the Rural Health Unit. As there were enough RHUs to serve all municipalities, the National TB Control Program had nationwide coverage.

The integrated structure of the NTP was further strengthened at the lower levels in 1982. The Ministry of Health was reorganized, integrating hospital and public health services.[1] The district hospital and the RHU were both placed under the direct supervision and control of the District Health Office, thereby making it easier for the RHU staff to refer TB cases that they could not handle to the district hospital.

At the same time the NTP structure was weakened at the central level by changing the Division of Tuberculosis into a mere section, with only four medical staff and a clerk, despite the fact that TB was still a major public health problem (the third leading killer and fifth leading cause of illness). Funds for TB control were inadequate.

The latest change occurred in 1986, when DOH was again reorganized. This time the structure at the central level was strengthened by elevating the section to a TB Control Service under the Office for Public Health Services. Its personnel complement was increased to 38, while the structural arrangements at the lower levels were maintained. And, for the first time, the program was given additional funds for drugs and laboratory supplies.

These steps have restored a better balance between central and field requirements, and between vertical and horizontal elements.

1. See Annex 1 of the case study on schistosomiasis control in the Philippines.

Source: World Bank data. See case study of tuberculosis control in the Philippines.

mechanism is the rural health unit. The *barangay* (village) health workers help with stool collection and treatment. Such decentralization of health service activities is not unique to disease control programs. It is significant, however, that successful control programs decentralize authority and responsibility for programmatic rather than purely administrative or ideological reasons. Their main concern is to get the task completed as effectively and efficiently as possible.

Conclusion

The field data show that successful disease control organizations are centralized in some respects and decentralized in others. The tendency is toward decentralized, categorical or partially integrated organizations. Organizational choice is inevitably constrained by health sector policies, strategies, and organization. It can be difficult for managers to shape the organization according to the task, so they compromise to capitalize on the best choice under the local circumstances.

The data also show that appropriate organization — though helpful — is not sufficient for program success. Good management is needed to make the structure function and to ensure that the programs deliver. In some cases, good management even compensates for bad organization — within limits, of course. The next chapter explores how the successful programs manage.

Managing control programs

Based on our field data, the most important day-to-day activities cover such mundane aspects as program management, people management, planning, budgeting, monitoring, and the logistics of field services. Good managerial practices in these areas distinguish the high performers. The best examples are the programs in Brazil, China, and Egypt.

Campaign management

Brazil's SUCAM uses a campaign approach that relies on a new kind of disease control field worker, called a *guarda* (see Box 10 on page 28). The "campaign" is the process by which management decisions on the eradication and control of endemic diseases are implemented. Campaigning falls into three well-defined phases: first, an initial clean-up, second, the discovery and elimination of hidden breeding places, and third, guarding against re-infestation.

Campaigns rely on interventions that work — and have been rigorously field-tested. SUCAM values campaign experience much more than edu-

Figure 8 The Philippines: Organization of tuberculosis control

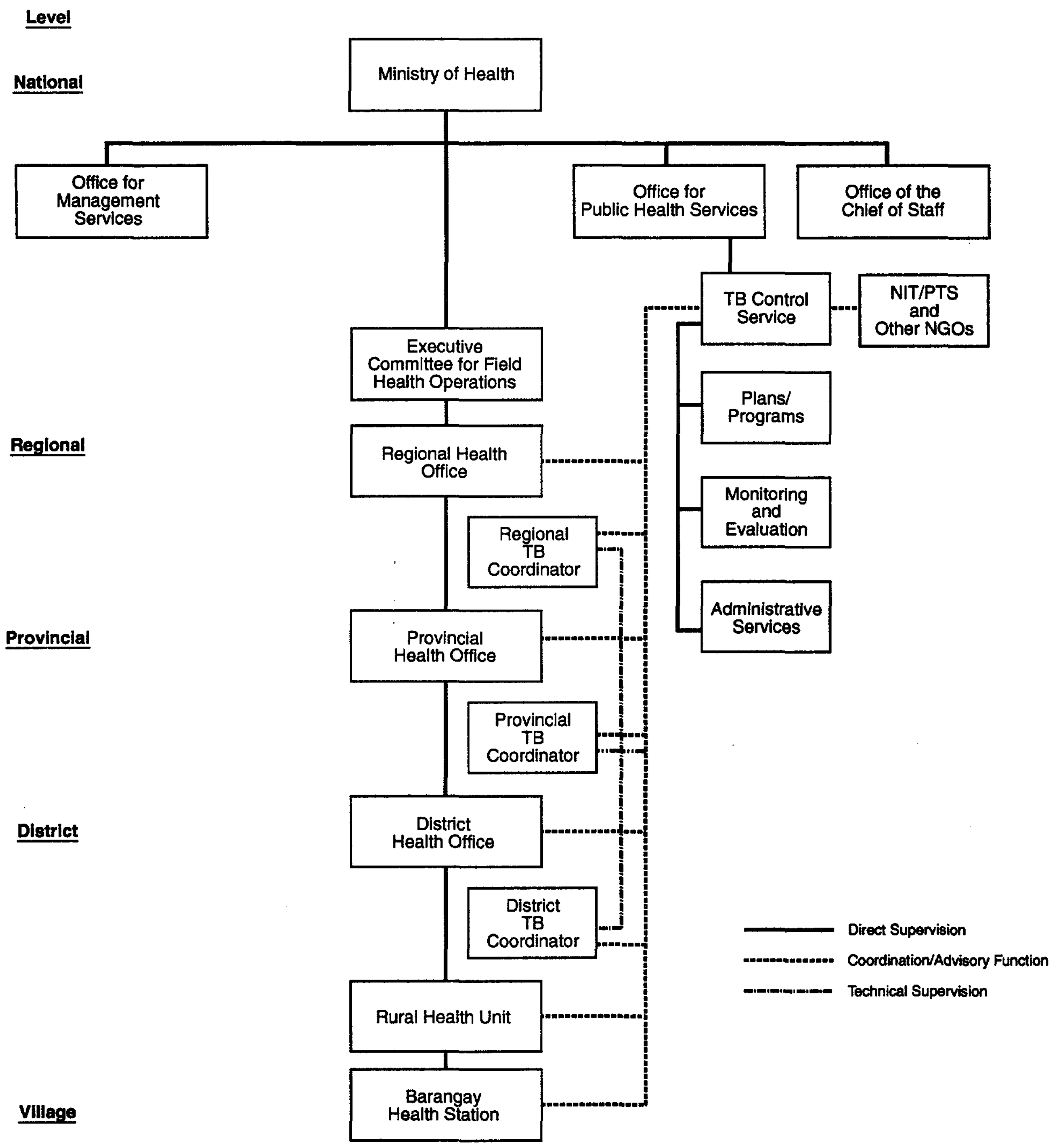
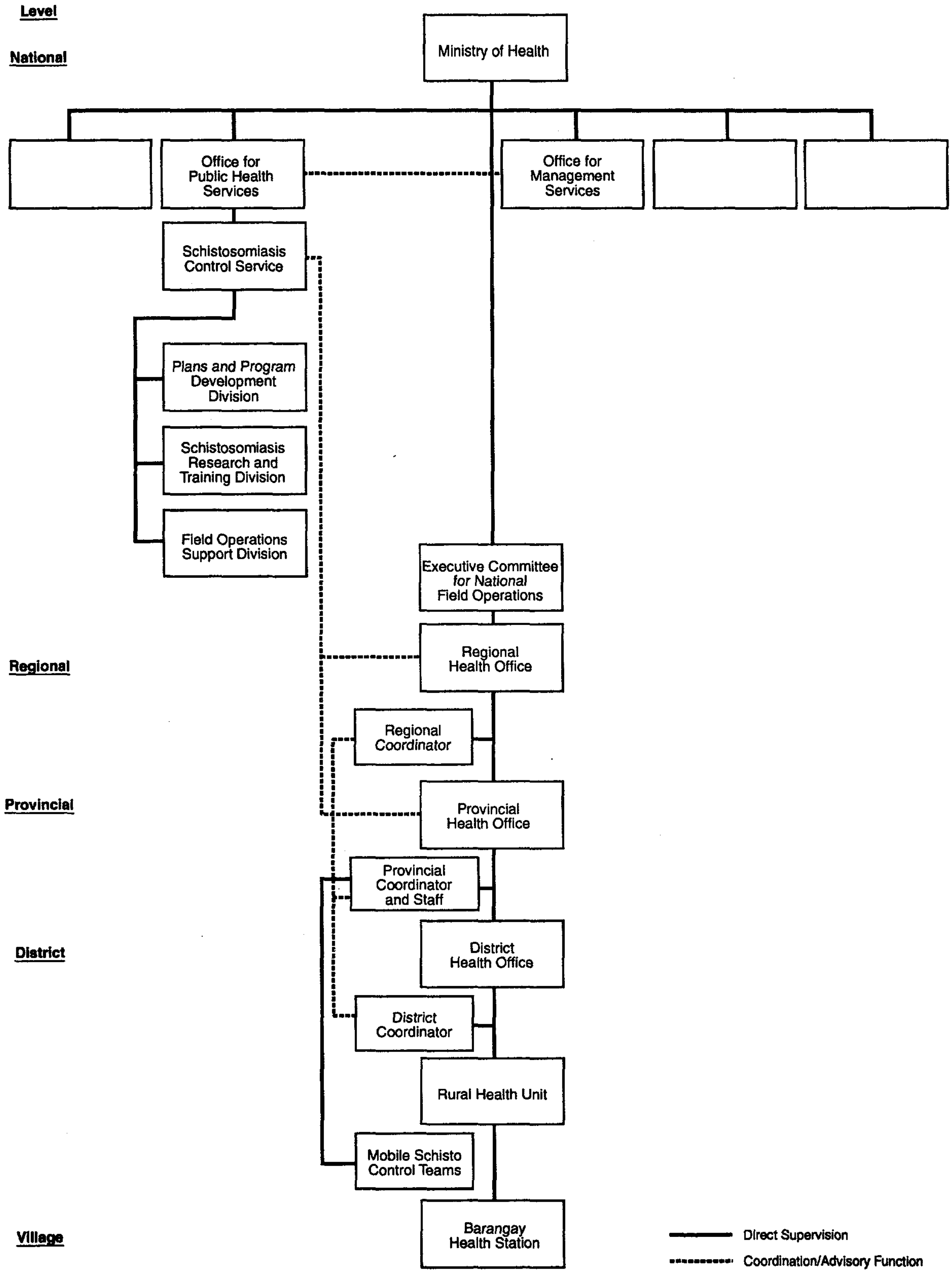


Figure 9 The Philippines: Organization of schistosomiasis control



Box 10 SUCAM's *guarda*: A new kind of professional

Campaigns require the support of the Brazilian public. For this, SUCAM created a new cadre of employees who could enter people's private homes because it was clear that they had no political or police functions, did not seek or accept tips, were not under the influence of alcohol, were above suspicion of moral misconduct, and applied the same standards to all houses in an impartial manner. It was known that they had to leave a record of their work in the houses visited, and that this work would be checked by their superiors. The local director of the District Service was always accessible to the public, and answered complaints promptly.

The *guarda* combines in one person a variety of technical, administrative and social skills. He or she has broad cartographic, epidemiological, and communications skills, and is specialized in the management and treatment of endemic diseases. *Guardas* do not take orders from technical specialists; instead, they represent several professions and disciplines and answers only to one supervisor. The *guarda* is not simply a poorly educated substitute for the doctor; young physicians in the field are taught by *guardas* and frequently acknowledge how much they have learned.

Source: World Bank data. See case study of SUCAM in Brazil.

cational qualifications. (For example, in annual evaluations, long service has the greatest weight). In a campaign, house-by-house coverage of a community is a useful though novel way of dealing with communities. The use of the house concentrates attention on household behavior. Program focus is not lost. Residents establish personal relationships with the guarda and the supervisors.

Campaigns not only have a technical significance but also a social significance. A campaign is not "SUCAM's" campaign; it is a popular social campaign. At the beginning of the campaign — particularly in a new area — SUCAM identifies the participants. Each house is marked, and the inhabitants see their houses on SUCAM's maps. "Their" guarda draws the map; and leaves a record of campaign work on each visit, reflecting the householder's own contribution. The community will thus remain involved in the process until the end of the campaign.

The partnership between SUCAM personnel and the household residents is reinforced with intensive supervision. Where health education is important, house visits provide the messages in a relevant and understandable manner. The *guarda* invests his or her personal reputation, and is aware that the work will be checked. The work is non-intrusive in a cultural sense — it does not affect existing relationships of power or status, nor does it run counter to important religious or ideological beliefs or values. Furthermore, SUCAM personnel are not in a position of authority over the residents; they must work with the residents and be judged by them and by SUCAM inspectors.

Community links are also strengthened by the recruitment, training, and maintenance of a force of volunteers who are invaluable in a campaign. Volunteers at the district level are important in endemic disease control in Brazil, and SUCAM devotes great efforts to such support. Each campaign recruits and manages its own community volunteers.

Each year volunteers are responsible for 1.5 million blood slides for malaria, over half a million microscopic exams for schistosomiasis, and medicines for more than a million patients. Volunteers provide more than half of all the malaria treatments, and notify SUCAM of the vectors of Chagas disease (bugs) in areas under surveillance. They are not paid; often the only recognition they receive is a calendar!

Campaign control is rigorous and systematic; field operations rely on personal accountability based on written instructions that can only be amended in writing. SUCAM believes that work worth doing is worth reporting (see Box 11). The methods used for recording the day-to-day work allow supervisors to monitor performance. During the yellow fever campaign in the 1930s, more than 30 percent of the budget was spent checking the work of employees. Senior SUCAM personnel estimate that the ratio is still the same.

Egypt's meticulous and thorough approach in schistosomiasis control is similar, although the mapping effort is directed at waterways and snails. Because the program is partially integrated with the health ministry's public health system, and because large-scale chemotherapy for schistosomiasis control requires the close cooperation of individuals and communities, the program has devoted much more attention to health education (see Box 12). The program's IEC activities have been particularly effective, especially its television spots. The communication efforts of the

Box 11 Brazil: Precise and meticulous reporting

SUCAM depends on precise and meticulous reporting. Twelve forms are required for schistosomiasis control. There are also detailed records for auxiliary workers. It is possible to determine where any worker was a year or six months ago, what he/or she was doing, and what the outcome was. It is possible not only to assess the volume of work, and to relate that to particular areas, but also to make judgments about the quality of the work. Comparisons of output can be made between areas with similar campaigns, similar houses, and similar settlement patterns.

The paper work also serves as a reminder of work that remains to be done. It indicates what has to be done, where, and who is expected to do the work. It also makes it possible to assess the supervision provided.

It is impossible for the inspector to cover up the work of an ineffective *guarda* because the inspector's work and reputation are also checked on a regular basis. Inspectors make two types of visits to *guardas* — the check visit and the revision visit. In the latter, the inspector observes the guarda's technique to improve his performance. These training visits are especially useful for new employees. The check visit assesses the accuracy of the *guardas'* work.

SUCAM's paper work expresses and reinforces the organization's belief in meticulous execution of control measures, and strict adherence to work schedules. It demonstrates and asserts the importance of discipline. It emphasizes the need for the steady unspectacular application of the tried and tested.

Source: World Bank data. See case study of SUCAM in Brazil.

Box 12 Egypt: Pragmatic health education

Egypt's schistosomiasis control program has adopted a very pragmatic but effective approach in the field.

The central Endemic Disease Control Department (EDCD) emphasizes small feasible gains rather than big leaps. For example, when health messages received a negative response because villagers were told to "avoid water" — an impossibility for farmers — this message was changed to "do not pollute water."

It tries to reach children in schools. The highest prevalence and intensity of schistosomiasis occurs in school children, and they are a major source of water pollution. Teachers and children can provide a channel for educating parents and the community.

The EDCD believes that while media contact is useful, face-to-face contact with villagers is essential. This is done not only by physicians, nurses, and laboratory assistants but also by school teachers and children. Lectures, posters, and films are used.

Both prevention and treatment are emphasized. Television films cover the disease transmission cycle and the dangers of urination and defecation in waterways. They urge those suspecting infection to get a check-up. They make the point that if the tests are positive, effective treatment can be obtained at no cost.

Twelve video-films have been designed for particular target groups, with specific preventive health messages, and are shown regularly on the nationwide television network.

The television spots have been a powerful morale booster for EDCD personnel. More importantly, there has been a steep rise in the number of people going to health centers and demanding treatment. The EDCD ensured that there were sufficient drugs on hand before airing the television spots. Continuous evaluation of the reaction has enabled EDCD to fill any communication gaps noticed, and to provide additional explanations.

Source: World Bank data. See case study of schistosomiasis control in Egypt.

program are backed by an equally strong delivery capacity in such activities as mollusciciding, chemotherapy, surveillance, and the like.

China's field program was also well-managed up to the 1970s. The approach was pragmatic. It was carefully tailored to local circumstances, and was implemented by teams of schistosomiasis workers, technicians, professionals, administrators, and village leaders. The strong local commitment to program goals reflected not only political and administrative pressures from the top but also village-level participation in decisionmaking and implementation. There was a sense of grassroots pride in accomplishment. In China, national achievements up to the 1970s clearly rested on effective local program management.

Field data from the Philippines and Zimbabwe is not as positive but supports the flip side of the same conclusion. In both countries, once the specialized disease control programs were integrated with the general health services, their field-management capacity virtually disintegrated. Program "managers" in the Philippines — who are merely part-time coordinators that have been given this additional responsibility — are unable to provide the required technical support. Nor do they have the administrative authority to marshall the logistical resources needed to do a satisfactory job. As a result, all three programs (schistosomiasis, malaria, and tuberculosis) are facing problems in the field. Central planning and technical support are quite useless if implementation is weak.

The relation between program tasks, organizational structure, managerial requirements, and performance is thus undeniable. Zimbabwe's pilot project for schistosomiasis control demonstrates the difficulty of a community-based approach, even when staff and financial resources are adequate. The most supervision-intensive activities are those that require community participation and intersectoral collaboration. Expanding from pilot projects to national programs compounds the problems (see Box 13). An under developed implementation framework cannot mount enough resources to deal with such complex tasks.

Leadership and personnel management

Brazil's SUCAM has 40,000 employees; China's schistosomiasis control program has 14,000 professional and technical staff members. Most of these employees have devoted their entire careers to disease control — conducting epidemiological surveys, spreading insecticides and pesticides, collecting blood, stools and snails, peering through microscopes, and dispensing drugs. Their task is not easy, especially in remote rural areas with few modern conveniences. Despite these adverse circumstances, the staff is committed, motivated, and productive.

Over the years, effective program leadership has obviously been a major contributing factor. In China, political and policy leadership at the highest central government level was the key up to the 1970s. In Brazil, Egypt and the Philippines, program leadership at the central and institutional level has made a noticeable difference. Leaders of successful programs excel in marshalling the needed resources (including substantial financial resources from government as well as external sources). However, although adequate funding is important, the top leaders and managers consider people their most precious resource — even more precious than scarce funds and imported drugs and pesticides. Their organizations groom and train, and punish and reward until staff members gain the necessary skills and become highly productive.

Box 13 Zimbabwe: Scaling up to a national program

In 1985-86 Zimbabwe's Ministry of Health adopted a PHC-based strategy for schistosomiasis control. The program calls for snail control, safe water supplies, adequate sanitation, health education, and chemotherapy, with all components except chemotherapy embodied in the primary health care (PHC) program.

At first glance the strategy appears to be endorsed by the results of the pilot projects — especially the water and sanitation-oriented pilot project in Mushandike and the community-based project in Madziwa. But several organizational and managerial issues that might enable the country to expand from a pilot project to a national program remain unresolved, including:

- The technology.
- The administration.
- Community participation.
- The feasibility of water supply and sanitation components.
- Integration with PHC.
- Financial issues.

In the pilot projects the construction of wells, pumps, washing slabs, and latrines was heavily subsidized by MOH and by a donor; and it remains unclear if these subsidies will be affordable under a national program.

Technical and administrative support by project staff was available, as was constant supervision, monitoring and follow-up. Blair Institute staff were able to provide this support and supervision, but might be unable to do so in a national program implemented through the decentralized health care delivery system.

Because the Madziwa project could not adequately simulate the administrative conditions of the proposed national program, the question of whether the administrative intensity of the pilot project(s) would be replicable in the national program remains.

An assessment of the strengths and weaknesses of the public health delivery system at the district and village levels is needed. In addition, the experience gained in the water and sanitation program is relevant. This program relies on community participation, supplemented by government support, and hence a realistic assessment of its present and potential achievements would be useful. Such an assessment is planned.

Source: World Bank data. See case study of schistosomiasis control in Zimbabwe.

GROOMING AND TRAINING. SUCAM prefers a lean organization. Only 600 (2 percent) of SUCAM employees are university educated; 2,700 (7 percent) are field supervisors with a secondary education. The remaining 75 percent are less educated field workers. The administrative and support staff account for only 14 percent (5,800) of the work force.

In 1979 SUCAM created a new category — the full-time public health professional — to meet its special disease control needs. These employees are drawn from a variety of fields — medical, social science, and so on. In return for giving up private practice, these people were given a 70 percent increase in salary — an important consideration in Brazil where holding two jobs is common.

A similar approach has been adopted in Egypt. The central Endemic Diseases Control Department (EDCD) has also produced its own cadre of disease control specialists. In the early days of the program, planners found that newly qualified physicians had too clinical an orientation. EDCD thus gives physicians (and engineers), who enter the service as specialists specific training for disease control. Over several years these men and women are groomed for responsibility and are exposed to disease control areas beyond their own specialty.

When the program was started, new physicians were given two months pre-entry training in the examination of urine, stools, and blood. They were also taught how to give the necessary treatment. The training included mapping and registration of waterways, survey methods and techniques, application of molluscicides, and examination of snails.

Programs were also developed to train laboratory assistants and snail control teams. Much of this training was undertaken in a center affiliated with the Research Institute for Tropical Diseases. In the 1970s, additional training centers were developed in the governorates to train laboratory assistants. EDCD's role then changed as it began to train trainers and concern itself with the quality of training in rural areas.

Other successful programs have also emphasized training that responds to operational needs and is based on local research. China's central and provincial institutes of parasitic or endemic diseases provide training on a regular basis; as do the central staff units for schistosomiasis, malaria, and tuberculosis control in the Philippines. In Zimbabwe, even the Blair Research Institute, which is relatively small and underfunded, trains public health employees for work in disease control.

SUCAM is the best example of formal and informal training. The central office organizes seminars, panel discussions, meetings and other training activities in collaboration with research and teaching institutions. Employees at higher levels are trained first, and are expected to pass on the training to lower levels. In addition, annual in-service training courses are conducted to maintain and sharpen skills. District staff are trained by technical specialists from Brasilia.

Training is a cooperative venture between superiors and subordinates. Senior technical staff travel regularly to the field to provide on-the-job training, concentrating on district level inspectors. These inspectors train the chiefs of various teams of guardas, who in turn train the guardas.

Training has a high status within SUCAM. All employees take training courses on a regular basis, both as participants and as trainers. Field personnel working on campaigns are trained. Headquarters staff regularly spend time in universities and research institutes. In addition the agency encourages overseas training. Often the best people go abroad to train.

REWARDS AND SANCTIONS. Despite their excellent qualifications and training, disease control personnel, like other public health employees, are paid low salaries. The successful programs, however, have found ways to compensate for civil service pay scales. Most programs use a combination of monetary and nonmonetary incentives.

SUCAM is not able to offer competitive salaries to personnel that it wishes to attract or retain. In the health sector, foundations have the most competitive terms and conditions of service. Next come the special campaigns, such as AIDS and tuberculosis. Third are Ministry of Health personnel with comparable jobs, and finally, at the bottom, is SUCAM. SUCAM managers are aware of this situation and an adjustment would be welcome.

It is important, however, to take into account the travel and subsistence allowance that is paid for each day away from the home workstation. This allowance is tax free, and in some cases doubles employee take-home pay. It encourages all levels of the organization to participate in field service. Some mid- and senior-level employees also receive allowances for shouldering special responsibilities or because of merit. For many SUCAM employees these allowances amount to 50 to 60 percent of base salary.

Complementing this salary scheme are sanctions imposed when there is a shortfall in delivery. Even permanent staff are not spared the severest penalties, and cannot assume guaranteed employment. In 1987, for instance, 781 permanent employees and 779 temporary employees were dismissed for a variety of reasons.

In contrast, in China, program managers have little discretion. Salaries, grades, benefits, and incentives are standard throughout the public health service, with marginal differences among provinces. Thus, monetary considerations do not appear to constitute major irritants or incentives.

In any case the government is the major employer of medical graduates and technicians in China, and there is little possibility of getting a better remuneration package (with state enterprises or collectives, for instance). Job security is highly valued, and turnover — both voluntary and involuntary — is low. The result is a rather stable work force that expects to serve long years under normal conditions of government employment. Despite this guarantee, the schistosomiasis control program has managed to keep its staff highly motivated and productive (see Box 14).

BECOMING PROFESSIONALS. Salaries are low in Egypt, and over-manning is common. (The government's policy is one of guaranteed public employment of all university and secondary technical school graduates.) Despite this drawback, problems of recruiting snail control workers at low salaries on a seasonal basis have been imaginatively solved by using former military personnel. These recruits are more than happy to put on the uniforms and knapsacks of the snail control teams; the system is similar to the methods of operation associated with the military service.

At higher professional levels more subtle and systematic socialization processes are used. Professional norms and standards are high, and everyone works hard to ensure that they are institutionalized. The program relies particularly on the broadly trained staff people specialized in disease control and especially groomed for advisory positions over 10 to 15 years.

The staff organization emphasizes collegiality. The numbers are small, and people get to know each other's work. There is constant discussion of good work — what it is, and what it means. Professional personnel publish in scientific journals and attend conferences. High job satisfaction compensates for the low salaries. The EDCD

Box 14 China: High employee productivity despite civil service regulations

In terms of formal procedures for recruitment, promotion, salary, and incentives, the 14,000 employees of the schistosomiasis control program are subject to the same regulations as the public health service.

Although the government's civil service regulations do not provide great latitude for innovative personnel management, managers and staff of the schistosomiasis control program have shown a remarkable dedication to the program. Several factors help to generate and sustain this commitment.

Government priority. Since 1956 the government has consistently accorded high priority to controlling schistosomiasis, and has used its political and administrative powers to support program activities and to mobilize program staff and the public.

Urgency. In the early 1950s there was no question that the program was urgently needed to alleviate suffering. The technical staff accepted the challenge of making a significant contribution to an important area of public health.

Results orientation. Program results are measurable in quantitative terms, the criteria for success are well established, and the performance data reported by counties and provinces to higher authorities. The high achievers get personal satisfaction as well as public recognition for a job well done. The performance planning and monitoring system is thorough and results-oriented, ensuring functional accountability.

Professional culture. The professional staff has considerable flexibility in designing and implementing the program. The internal organizational culture encourages mutual support and collegiality. All the senior professional staff has been together for 20 to 30 years, and share a practical approach to solving problems.

Commitment to public service. Although schistosomiasis control does not carry a high status, the senior staff has set an example of commitment to public service. Several provinces publicly recognize the contribution of experienced employees by giving awards for 30 years' service, and by establishing a photographic record of accomplishments.

Emphasis on training. Many technical training courses are organized at provincial and national research institutes. Workshops involve senior managers and professional staff from around the country, and are led by recognized national experts, with specialists from international agencies such as WHO.

Source: World Bank data. See case study of schistosomiasis control in China.

professionals are proud of belonging to an elite group. A similar phenomenon is at work in SUCAM, driven by the processes used for staff socialization and development (see Box 15).

In sum, good management involves attention to both organizational and individual needs. Managers rely on a complex array of mechanisms and incentives, including hiring and firing, incentives, training, delegation, and an organizational culture that emphasizes public service and personal commitment. It is not easy but it can be done.

Planning, budgeting, and monitoring

In the successful programs, strategic long-term planning is a central responsibility, but every manager plans and monitors operations. The budgeting process connects planning with implementation. Both good planning and realistic budgeting are important. Although the planning and budgeting systems are formalized, flexibility is the key to success.

PLANNING. In China the national Leading Group for Schistosomiasis Control and the central Bureau for Prevention and Treatment of Endemic Diseases, under the Ministry of Public Health, are responsible for national disease control policy and strategy. As in other countries (where boards, councils or commissions perform these functions), intersectoral consulting and technical vetting are facilitated by the composition and mode of operation of the leading group.

This policymaking body also undertakes strategic management. The term means that the program's environment, strategy, structure, and processes fit together, even though circumstances and needs change. Because of the program's technological specificity, and the relative certainty of the means suitable for reaching program goals, frequent changes are not needed. Provincial and district officers handle long- and medium-term planning.

For example, in China the central bureau allows local authorities to determine the program's tar-

Box 15 Brazil: Developing a professional organization

Brazil's SUCAM has a systematic and multi-faceted approach.

Socialization. SUCAM carefully socializes new entrants. They are taught to accept discipline and the importance of teamwork. The imposition — and acceptance — of a rigid standard of discipline is unusual.

SUCAM pays new physicians a special allowance to compensate for leaving private practice. With time, this allowance no longer compensates for the loss of private income, but the turnover is low. This is a striking example of the subordination of professional norms to organizational requirements.

Staff specialists. SUCAM considers medical graduates too narrowly trained in clinical medicine. SUCAM often spends 10 to 15 years grooming these young men and women.

Young professionals serve in a variety of field and headquarters positions to gain the necessary experience. Those unable to accept the challenge of moving from staff to line positions and from field to central assignments (and vice-versa) are encouraged to leave.

SUCAM's technical professionals are broad-gauged public health specialists. Implementation is their top priority, and their contribution must, above all, improve operations.

Professionalism. While pursuing operational relevance, technical excellence is not sacrificed. To stay on the cutting edge of disease control, SUCAM participates in professional meetings, attends international conferences, and publishes in professional journals. The atmosphere is that of a good university department.

Management has fostered a sense of intellectual curiosity. It has opened a small museum to highlight the history of Brazil's disease control. This focuses attention on the organization's achievements and status. It produces and sustains a sense of elitism, of being a member of a special body of men and women.

Service. There is great regard for long service. Experienced professionals can see how the whole disease control operation fits together. Headquarters personnel travel frequently to the regions, keep abreast of developments, and are able to make informed decisions in Brasilia.

This cadre of experts helps shape the campaigns, both by advising the superintendent and by talking to colleagues. The frequent travel helps ensure a common understanding and approach.

Collegiality. While SUCAM demands obedience, it also expects individual initiative and creativity. SUCAM managers delegate authority to the lowest level feasible, given the program's requirements.

The process of giving directions emphasizes objectives to which all are committed. A collegial approach is possible because of well-developed interpersonal skills, and because both superior and subordinate have a clear idea of the task.

SUCAM realizes that, in the heat of a campaign, success depends on the decisions of local campaign managers. Hence the training of professionals emphasizes confidence in their own decisionmaking ability. The organizational culture is conducive to generating and sustaining high productivity, based on processes that emphasize technical excellence and a results-driven approach.

Source: World Bank data. See case study of SUCAM in Brazil.

gets and objectives. In developing the control program, the responsible provincial officers set up objectives county by county after discussion with local officials.

This cooperation is emphasized because the health sector cannot reach its control targets without support from other sectors and agencies. This coordination is easier for powerful provincial officials — governors or their deputies; the director of a health bureau does not have the authority. In Egypt and the Philippines as well, the central offices guide the national programs; but because implementation is subject to the local authorities, the responsibilities of specialized control personnel are different from those in China.

In the programs examined, the planning process is affected by the organizational structure. The malaria control program in the Philippines illustrates this. The central Malaria Control Service, a staff bureau in the Department of Health, has two divisions: Plans and Programs, and Epidemiology and Research. The former division is expected to formulate, develop, and update plans and programs, vector control strategies, and educational materials. It is expected to establish the program's logistical and budgetary requirements. It allocates insecticides, chemicals, reagents, drugs, spray cans, and spare parts. It is also expected to provide training, consulting and advisory services to field staff. So it is not surprising that expectations and results do not match.

The situation is quite different in Brazil where there is a clear distinction between formulating policies and implementing them. SUCAM headquarters is responsible for translating government policy into strategy. District staff members are concerned with implementation. They plan the campaign, staff the operation, and schedule the activities. District directors are concerned with basic administrative procedures, their flexible application, and allocations of financial and human resources.

Because of this distinction between strategy and tactics, people at headquarters do not try to manage district activities. The objective is more to arrive at an agreement rather than to issue a command. Furthermore, this policy making works because it is not isolated from operations. The planning process is cyclical and iterative; there is consultation and feedback from bottom to top. Policy is not something the minister or the superintendent initiate; they rely on staff contributions, based on operational experience and judgment.

BUDGETING. In the successful agencies, budgeting is program-based and pragmatic. In Egypt and in Brazil's SUCAM, budgeting is on an output (not input) basis. That is, it is concerned with how much can be accomplished by specific expenditures. The budget is adjusted to the program format. Where legal authority is vested in the local government, these employees handle the recurrent budget for salaries, allowances, and maintenance. The national office handles procurement of drugs and supplies.

The budget is based on detailed campaign requirements. When decisions are made to launch a campaign or to move from one phase to another, administrators know how many people must be protected, what the terrain is, and what the costs are likely to be. Resource transfers to regional offices are based on monthly reports. Standard measures of output are used to check the efficiency and effectiveness of expenditures.

But budgeting is becoming more difficult with the change in strategy from vector control to chemotherapy. The demand for drugs is more difficult to estimate than vector control costs. Even in vector control these costs are uncertain because of increased use of focal mollusciciding for which pesticide requirements are difficult to estimate.

Cost savings have been important in Egypt's program. For example, the range of molluscicides has been extended. In 1968 it was thought that the carrying distance was 12.5 kilometers; experience has shown that a carrying distance of 110 kilometers is possible. In 1968 expensive vehicles and machinery were used to dispense molluscicide; now these functions are performed by snail control teams using cheaper hand pumps.

In Brazil too, cost is a major consideration. During an emergency funds are relatively easy to obtain because public attention is focused on results rather than cost. But most campaigns have to be funded out of the annual budget. SUCAM faces difficulties because its operations depend on imported equipment, drugs, and supplies, which require hard currency. SUCAM therefore remains extremely conscious of costs and budgets (see Box 16).

MONITORING. Planning and budgeting are thus complementary aspects of the program management system, which also includes systematic monitoring and efficient logistics. In Egypt, for instance, routine monitoring is based on standard analytical procedures and guidelines that ensure uniform practices in all endemic areas. Annual epidemiological surveys, biannual examinations of schoolchildren, and seasonal snail surveys provide performance data that feeds back into the planning and budgeting processes, thereby providing a mechanism for adjusting to changing needs.

The control teams also have their own logistical support system, so they are not dependent on public health services. A similar arrangement works well in Brazil and China. It helps to tie together the management of all program resources. Without such a tight linkage, effective program management would be difficult indeed, especially in the field.

SUCAM's programmatic division of work makes strict monitoring and accountability possible. Each disease control program has its own manager who controls all the resources, including budget and personnel. Each manager at each level is accountable for results. The budgetary system reinforces assigned responsibilities. Furthermore, management has all the information it needs to monitor and evaluate each program. Monitoring (especially of financial disbursements) is undertaken on a monthly or quarterly basis, as needed.

Most campaign programs have three levels of management accountability, with matching levels of budgets and expected performance. The budget at the national level is for technical research and supervision, field-related training, and extension work. The inputs for this work are specified in terms of staff time, university and other contracts, and so on. The activities and their outcomes can also be specified and observed. Usually there are technical manuals dealing with the campaign subject matter, field administration manuals dealing with what workers must do to effectively combat the disease, and training courses for field workers.

The region is the second level of program budgeting. The regional director is personally accountable for specific results. Both the activities (say, the number of slides examined) and the costs are quantified and monitored. The third level is the district. The director controls the funds and is accountable for execution of the campaign. In terms of the SUCAM budget process, it is the district level budget whose size and shape determine the budgetary requirements of the support and technical functions at higher levels. Program monitoring is thus firmly grounded on field data.

Box 16 Brazil: Realistic and responsive budgeting

Annual campaigns, whose size and shape are determined by district operations, drive SUCAM's annual programming and budget process. Although a medium-term plan (for three to five years), and a long-term plan (for 10 to 15 years) are prepared, annual campaign activities are emphasized.

The campaigns lend an element of stability to budgeting. By shifting funds between the various phases of a campaign as well as among campaigns for the different diseases, a roughly stable aggregate budget is possible from year to year. Nevertheless, SUCAM officials have learned that while funds are not difficult to secure when an epidemic is on, expenditures must be significantly reduced during the maintenance phase.

SUCAM's experienced line management is skilled in managing the budget process. Although resources are tight, they manage to husband a little extra here and a little there to reward outstanding achievements. The budgeting is not incremental — good performance is rewarded; and resources are increased in areas where the campaign is weak.

The superintendent's office evaluates the districts' annual bids. The Brasilia office constructs two scenarios for each district — an ideal projection of what should happen based on technical requirements, and a probable scenario based on operational realities. Technical requirements are then matched with operational requirements, and compared with bids. (In most years the bids from the districts seem to be inflated by about 30 percent.) Negotiations then take place with the Ministry of Health for two separate authorizations — for money, and for additional staff (if needed).

Programming for most campaigns is on a 12 month basis. Control activities for malaria, Chagas, leishmaniasis, schistosomiasis, goiter, and filariasis continue throughout the year. Trachoma control activity is concentrated in the dry season; plague becomes important at the end of the dry and rainy seasons in affected areas.

Changes are made in June if needed. These adjustments do not require formal approval from the Ministry of Health. If disease conditions change during the year, the superintendent can also draw on SUCAM's special fund, with the approval of the Ministry of Health.

In recent years inflation has made it more difficult to manage financial resources. In previous years expenditures were reported on a monthly basis. It is now weekly. Instead of an annual budget with a mid year correction, there are now, in effect, 12 mini-budgets.

Source: World Bank data. See case study of SUCAM in Brazil.

Conclusion

Control programs must not only get the big picture (policies, strategy, organization) right, but the small pieces (systems, procedures, processes) must also be properly managed. There is no single template that fits all programs, but certain basic themes are common. These cover program (campaign) and personnel management, planning, budgeting, monitoring, and logistics.

A complex mixture of managerial practices and activities underpins the success of disease control programs. No single factor is sufficient for success. Each of the many requirements discussed plays its part. The next section reviews these findings and lessons of experience.

Lessons and conclusions

Experience can be valuable if properly distilled and applied. Each case study reviewed here examines those factors that sustain the high performance of the particular program. In addition a cross-country assessment yields lessons that have even wider application.

Lessons of success

Successful disease control organizations tend to be decentralized, and categorical or partially integrated. Several organizational and managerial features stand out. Successful programs: (a) adapt technology through local operational research; (b) use staff groups to support line management at all levels; (c) centralize operations such as control strategy and technology while decentralizing field operations; (d) manage resources effectively; and (e) manage field logistics efficiently.

Underlying these common organizational features are fundamental similarities of approach and orientation. The successful organizations are technology-driven and campaign-oriented. Field data show that every aspect of organization and management conforms to the requirements of applying technology in the field. Despite the structural differences, successful programs use highly technical, functionally specialized organizations.

In pursuing this approach, these programs are anything but rigid. In contrast with the average government bureaucracy, the organizations are flexible and responsive. They use whatever it takes — organizational and program autonomy, expert staff groups, delegation of authority, and client participation — to ensure program quality and relevance.

Holding these features together is a unique organizational culture that masterfully combines potentially divergent requirements, blending technical standardization with administrative flexibility; organizational conformity with individual creativity; procedural routines with scientific experimentation; and personal development with public service. The result is an organization committed to — and capable of — sustained achievement and continuous learning.

Details of the data and findings have been given in previous chapters. The main conclusions are that the effectiveness of disease control activities could be improved by: maintaining a clear program focus, using functionally specialized organizational units and staff, emphasizing results and clients, and maintaining a technological- and people- orientation. These are further discussed below.

TECHNOLOGY-DRIVEN. SUCAM and the schistosomiasis control programs in China, Egypt, and the Philippines have an international reputation for practical operational research, based on a sound knowledge of the disease, its epidemiology, and the various available technologies. The fundamental requirements of morbidity and transmission control — epidemiological surveillance, mapping, case finding and treatment, laboratory examination and reporting — are given the importance they deserve.

This emphasis on technology, and on high standards of technical proficiency — in terms of accuracy, precision, and reliability — can be seen in countless ways. Among them are: the superb technical manuals that give detailed guidance to operational staff; the frequent and extensive training provided to field personnel; the thorough checks on quality of work; the supervision of field activities for monitoring compliance with prescribed technical procedures; the timely reporting of field data to staff groups; and the adjustments to the technical package. The conclusion is inescapable: success is anchored in technology.

CAMPAIGNING. Having determined precisely what technology is to be used, the entire organization and management effort is geared to making sure that the technology actually gets implemented. SUCAM wages a constant war on disease — not because it mounts a sporadic campaign, but because a vigorous campaign mentality drives its programs all year, year after year. This continuous campaign is, of course, sequential. The organization almost resembles a paramilitary operation — it goes after its targets with the gameplan, budget, manpower, technical support, and management commitment needed to win.

This does not mean that programs are rigid or autocratically managed. On the contrary annual work programs, though detailed and definite, are flexibly carried out by small, semi-autonomous teams or units. Once the broad goals of the campaign have been agreed on, they are passed on to lower levels for modification and implementation. Regional managers and supervisors have the freedom to interpret and adapt the central strategy as needed, and to devise tactics locally, almost like a well-trained guerilla unit.

Even when the program management structure is not clear — as in Egypt — the control program has its own budget, personnel, and technical advisory group so that effective implementation is still possible. An element of functional specialization is introduced into the otherwise integrated structure by emphasizing technical competence, training, and administrative control so that a distinct organizational identity can emerge.

STAFF GROUPS. One of the important findings is that a strong cadre of experienced technical personnel underpin the successful implementation of technology. The influence of this group permeates all operations: it helps design program strategy; develops the technological package and prepares operational manuals; backstops technical supervision and quality control of field operations; and helps train line personnel at all levels. Even though technical personnel give no direct orders for implementation, and thus resemble staff officers in the government or military, they are absolutely critical for establishing and maintaining a sound disease control program.

The need for such an expert group is independent of the organizational structure. Both SUCAM's categorical organization and Egypt's integrated structure rely on a technical group. In the Philippines, prior to the 1982-83 reorganization, the specialized schistosomiasis control program utilized such a group, with similar success. The present dilution of this staff function in the Philippines program at the crucial regional and provincial levels, and the resultant loss of special emphasis on schistosomiasis control, is further evidence of the key role played by well-qualified and experienced personnel in staff assignments.

Health planners in the Brazil, China, and Egypt programs spend a great deal of time training and grooming technical personnel for eventual staff positions. SUCAM rotates newly recruited professionals through a variety of line and technical positions in the field and in headquarters. As they broaden their experience, they also gain authority and status in the organization. After this long apprenticeship, these employees have a remarkable blend of technical expertise and operational experience, and have been molded into broad-based specialists especially suited for SUCAM's technocratic requirements. They are then capable of giving sound advice — and the organization is receptive to using it.

BOTH VERTICAL AND HORIZONTAL MODES. Data from Brazil, China, Egypt, and the Philippines show that programs must make use of both vertical and horizontal modes of operation. In most large programs there are only a few highly trained specialists. To ensure that field work is done properly, a certain amount of hierarchical direction and technical supervision is essential. If there is a clear line of program authority, and competent staff at the district, provincial, and national levels, supervision is easier. However, even within SUCAM's categorical structure, there is a great deal of horizontal collaboration and coordination between line and staff groups at all organizational levels. This interaction is what makes SUCAM work.

In Egypt's equally successful program, the structure is reversed. Disease control is integrated with primary health care in the general health service, and there is a fair amount of horizontal collaboration. But the schistosomiasis control program is functionally distinct. The program has its own budget and its own apparatus for data reporting and technical analysis. It has some indirect authority over laboratories, and specialized field personnel. In terms of work procedures and supervision, especially for logistics and surveillance, these organizational mechanisms have introduced an important element of functional specialization into what would otherwise be an integrated program.

The same need for both specialized and integrated activities applies to the post-1983 reorganization experience in the Philippines. The integration of schistosomiasis control activities with the general health service has provided strong horizontal links, but it has simultaneously weakened the specialized elements of the program. The virtual elimination of the functional structure for schistosomiasis control has deprived the program of the technical guidance and the resources needed for effective implementation.

To rebuild the system it will be necessary to restore the balance between the integrated and the specialized activities. A similar effort to fine-tune the organization is under way in the malaria and tuberculosis control programs in the Philippines as well as in Zimbabwe's malaria and schistosomiasis control programs.

BOTH CENTRALIZED AND DECENTRALIZED ACTIVITIES. No large organization can function effectively without a strong central policymaking body, and an equally strong field structure. Once the program strategy is established, successful disease control programs delegate the authority for decision making to the lowest possible level in the chain of command, commensurate with the skills of the operational staff. This strategy is useful for devising field tactics for rapidly changing environments. Local workers are thus authorized to adapt operations, and can be held accountable for the results. In Brazil's SUCAM, contrary to assumptions about over-regimentation, there is freedom in day-to-day activities.

China, Egypt, and the Philippines also use decentralized systems, for programmatic reasons. In China decentralization is necessary to manage the large national network. In Egypt decentralization has a long history on which the schistosomiasis control program can capitalize. In the Philippines decentralization in 1982-83 was linked to a push toward integration with primary health services. These changes have adversely affected implementation capacity. It is likely that organizational changes will have to accompany a gradual program build up in the newly decentralized and integrated structure.

PRAGMATIC APPROACH TO EXTENSION. The successful programs have developed extraordinarily reliable logistical systems. Despite the huge staff involved in field operations over great distances, disease and vector control operations run with predictable precision and mechanical regularity. Large quantities of drugs and supplies are purchased, stored, and delivered. Equipment is well maintained. Field results are reported accurately and with clockwork regularity.

This efficiency reflects a pragmatic view of what one can expect from employees and from community members. Although health education is an important part of each program, the planners are realistic about expecting changes in people's attitudes and behavior. In Brazil for example, program staff develop relationships with households — not communities — and deal with the target population according to precise, prescribed procedures. The uncertainty of what is to be done, by whom, when, and so on is thereby reduced to the minimum so that the program can operate efficiently.

EFFECTIVE LEADERSHIP AND PERSONNEL MANAGEMENT. This approach works because personnel at all levels are effectively led, trained, motivated, and compensated to make it work. National and program leadership is of a high caliber. SUCAM field workers have specialized training and tasks, and are organized in disciplined, semi-autonomous teams. Even though team workers do not have much education, they consider themselves specialized — as distinct from "ordinary" health workers. The situation is similar in Egypt and China. The significance of these arrangements is that the staff knows that the technology it provides is needed and useful. When combined with strict supervision — including swift disciplinary measures when needed — and public acknowledgment of individual competence, the incentives are sufficient for generating high levels of effort and achievement.

There is great emphasis on doing a job well and on pride in the organization's contribution to the community. Because voluntary turnover is low, the benefits of extensive training and experience can be fully realized through systematic career development, job-rotation, and promotion.

ORGANIZATIONAL CULTURE. The glue that really holds these diverse aspects together is an organizational culture that values experience and accomplishment more than technical or academic brilliance. This conclusion does not negate the importance of technology — it simply means that the technology must be practical. There are no arm chair generals in SUCAM or the Egyptian or Chinese control programs — only battle-hardened field commanders. Their policies, strategies, and procedures are all geared toward immediate targets and long-term goals. This concern for results — measurable, visible, substantive results — is what really drives the whole organization. It explains in large measure why the control programs reviewed here have a well-earned reputation for success.

Successful programs emphasize task requirements. Appropriate organization and systematic management are also important. The organization is suitably adapted to the task rather than vice versa. Roles and responsibilities at all levels of the hierarchy are tightly linked. The approach is somewhat different from the usual public health system. Hence successful disease control programs try hard to maintain a distinct program focus and identity.

Although these conclusions are drawn from a limited set of successful control programs, they are general enough to adapt to specific circumstances. Each program must balance environmental, technological, organizational, and managerial considerations. To the extent that these vary from country to country, so must the program response. The lessons of success highlighted here are offered as general guidelines, not prescriptive solutions. To the extent that they seem obvious, they can be easily understood and accepted. Applications, however, must rely on informed judgment of local considerations and circumstances. Maintaining responsiveness to changing conditions can require a different mix of factors or emphasis in different programs (or over time in the same program). Sustained high performance depends on continuous learning-by-doing.

What are the implications of these findings for policy? We have concluded that disease control activities are more effective if programs maintain a clear focus; use functionally specialized organizational units and staff; emphasize results and clients; and maintain a technology- and people-orientation. Some of the study findings have implications not only for disease control programs but for the health sector generally. These implications are outlined below.

First, a program's integration with the nation's health service system must be determined on the basis of task requirements, administrative capabilities, and local resources — not ideological reasons. Even in China — which is traditionally considered the role model for primary health care — disease control is organized as a specialized activity, only partially integrated with the rest of the health service system. But not all countries (especially in Africa) are large enough (or financially able) to support many specialized staff or institutions. They must therefore fashion a locally feasible partially-integrated program, as Egypt has successfully done.

Second, programs must be pragmatic about the nature and extent of community participation. In successful disease control programs (as in Brazil and Egypt), community involvement is limited to interactions with households, and few attempts are made to involve large community groups in routine campaign operations. By keeping community interaction to the minimum needed to get the technological tasks completed, the work demands on lower-level staff remain sharply focused and manageable. Undertrained or poorly supervised field workers are not overburdened with extraneous tasks that do not bear directly on program performance.

Third, in successful programs, the emphasis on technology and training drives the entire organization—making the programs technology-driven and, most importantly, dependent on professional staff. A premium is placed on knowledgeable staff whose professional judgement and long experience in control activities is given more weight than their administrative status or responsibilities. These technical specialists, while often performing a "staff" function, are indispensable (through learning by doing) to adaptive operational research.

Fourth, a key to program success is the balance between centralized and decentralized activities — rather than an ideologically-driven adoption of one or the other extreme. This lesson is highly relevant for health programs in general. Central officials must provide a clear focus on goals and objectives, while local staff provide responsive, flexible program planning and implementation.

And finally, programs must inculcate and nurture a sense of common purpose, dedication, and commitment, and a collaborative mode of behavior that reinforces professional values. Successful control programs show that even government-run programs and institutions can produce excellent results if the right culture and values are encouraged — instead of relying on bureaucratic procedures or administrative regulations. This emphasis on the "soft" side of the organization, to supplement the "hard" (technological) focus, is unusual in public organizations. Successful disease control programs judiciously balance the needs of the organization and the needs of the individual, thus ensuring sustained productivity and high staff motivation. The relevance of this approach to other public health programs and institutions is obvious.

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Annexes

Annex 1 Genesis of the study[1]

The two main factors determining the effectiveness of tropical disease control programs are: (a) the suitability of the control technology in relation to the epidemiological characteristics of the disease; and (b) the program's organizational and managerial performance at national, provincial and local levels. While considerable effort has been devoted in the past to developing better control technologies (particularly through the UNDP/World Bank/WHO Programme of Research and Training in Tropical Diseases (TDR)), much less attention has been given to institutional considerations in implementing these technologies.

To address the latter organizational dimensions, an international workshop, jointly sponsored by the World Bank, the WHO and the Edna McConnell Clark Foundation was organized in Washington, D.C., in June 1986. Program managers from Brazil, Egypt, Ghana, Morocco, the Philippines, Sudan and Thailand prepared brief assessments of their respective program, and presented these at the workshop. In addition, overview papers were prepared by WHO (both for schistosomiasis and malaria), the GTZ (German Technical Cooperation), the Medical Research Council (of the U.K.), and the World Bank. These were supplemented by lessons learned from development programs in other social sectors.

The three-day workshop was attended by 32 participants and covered a broad range of topics. Technical requirements of schistosomiasis and malaria control provided the context for an extensive discussion of organizational and management issues. To take advantage of the diversity of backgrounds and experience of the participants, and in view of the complexity of issues examined, discussions took place in plenary as well as small working groups. The major topics covered were: organizational implications of changes in control strategy and operational tasks; appropriateness of organizational alternatives, including integration with primary health care (PHC); steps needed for demand mobilization and community involvement; scaling-up from pilot to large-scale programs; capacity building for operational research and service delivery; and the sustainability of program performance over the long term.

In general, workshop participants concluded that the presumed "shift" in program strategy was in fact a gradual evolutionary change in emphasis; issues of operational management cut across all organizational levels, from central headquarters to field workers; operational research is essential for adapting and continuously improving control techniques and their organizational delivery mechanisms; scaling-up from pilot projects is invariably problematic, and should be undertaken in phases; management at the periphery is often the weakest link in disease control programs; and as priorities shift from transmission control to morbidity control, demand mobiliza-

1. Based on Summary Report of the International Workshop on Organization and Management of Tropical Disease Control Programs, October 1986, by B. Liese and P. Sachdeva.

tion and community involvement will become increasingly important for program success.

Participants also felt strongly that much of the current material on control programs (including their own reports) was very descriptive and general — not analytic and specific. They concluded that specific recommendations for improved organization and management of control operations could only emerge from an in-depth review of major control programs and from a comparative assessment of their environmental context, organizational structure, processes and performance. This conclusion provided the primary impetus for undertaking the inter-country comparative study reported here.

List of case studies

1. *Brazil: Endemic Disease Control,* by D. Glynn Cochrane and Bernhard H. Liese.
2. *China: Schistosomiasis Control,* by Paramjit S. Sachdeva and Bernhard H. Liese.
3. *Egypt: Schistosomiasis Control,* by D. Glynn Cochrane and Bernhard H. Liese.
4. *The Philippines: Malaria Control,* by Ma. Concepcion P. Alfiler, assisted by Rosa R. Cordero and Ma. Teresa T. Parroco.
5. *The Philippines: Schistosomiasis Control,* by Ma. Concepcion P. Alfiler, assisted by Rosa R. Cordero and Ma. Teresa T. Parroco.
6. *The Philippines: Tuberculosis Control,* by Ma. Concepcion P. Alfiler, assisted by Rosa R. Cordero and Ma. Teresa T. Parroco.[1]
7. *Zimbabwe: Schistosomiasis Control,* by Paramjit S. Sachdeva.

1. Tuberculosis, though not confined to the tropics, is an endemic disease like malaria and schistosomiasis.

Note: The detailed case studies are available separately. Revised versions of the Brazil, Egypt and the Philippines case studies were prepared by Paramjit S. Sachdeva.

Annex 2 Study methodology

The study methodology was tailored to its specific objectives and the issues proposed to be examined. An inter-country, comparative case-study approach was used. The country case studies captured the unique features of a disease control program's context, organization, management, and community interactions; and the comparative analysis revealed similarities and differences from which broader lessons of experiences could be synthesized.

For each case study, a desk review of available data, reports, evaluations, etc. preceded the on-site assessment. In almost all cases, the field work was done jointly by members of the study team and local program officials. Structured interviews, informal open-ended conversations, and direct observations were used for data collection. These methods are well suited for understanding the historical context and local circumstances within which control activities are undertaken, and for examining the complexities of program design and implementation. The study's analytical framework and general questions (see Annex 3) guided the field work; but the specific issues examined and the detailed questions asked were tailored to the peculiarities of each country and program.

A purposeful sample of informants — primarily program managers and staff, technical specialists, clients, and knowledgeable insiders — provided much of the field data. This information was supplemented with the prior country knowledge and experience of the study team. Except in the Philippines, where the field work was done by a team of local researchers, the case studies were the joint product of the Washington-based study team and country officials.

In doing the field work, it was found that Ministries of Health were more reticent to discuss their institutional practices than we expected. Obtaining the collaboration of local staff in case study preparation, and their adequate backstopping by the study team in Washington, therefore took more time and effort than originally anticipated.

In four of the five countries, the field work was conducted on a mission basis. Program staff — at the national, regional and local levels - were closely involved. The intention was to see things from the perspective of key actors responsible for program performance and to have their substantive input into the case analysis and recommendations. Because these officials are normally very busy, the study aimed to fit in with their existing work programs rather than initiating any time-consuming independent series of actions. This flexibility of approach proved very useful in securing the needed access to local expertise and information.

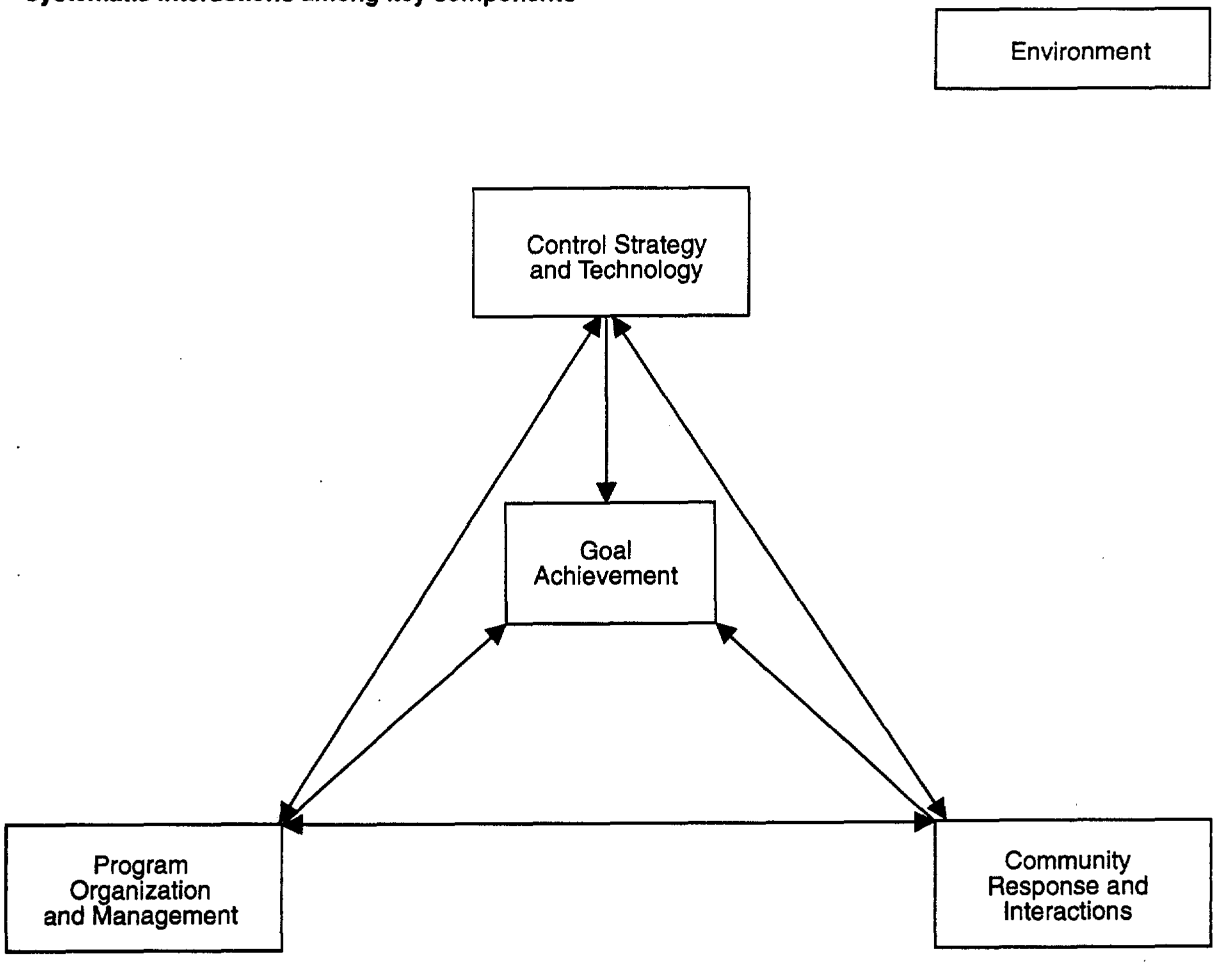
While all the empirical case studies addressed the same set of basic issues — using a common analytical framework — they were not required to conform to a pre-determined prototype. To do justice to the uniqueness of each case, the subsequent comparative analysis also emphasized a holistic approach. Each country program was understood in its own social, cultural, and administrative context before any attempt was made to draw conclusions at a more general level. The individual case studies are available separately.

Annex 3 Analytical framework

Components and interactions

In simple terms, the study's analytical framework considers a control program *"successful" if it consistently achieves its program goals over an extended period of time within a country's (changing) environment.* For doing this: (a) an appropriate control strategy and technological package has to be implemented through a suitable organizational and management system; (b) program activities have to be adaptively undertaken so that they remain responsive to the changing epidemiological characteristics of the disease; (c) both the control strategy and the organizational arrangements have to be acceptable to the targeted community and individuals, so that they willingly participate, as needed, in helping control the disease; and (d) these three sets of variables — technology, organization and management, and community interactions — have to fit well with one another in a tightly-linked system, as shown in the figure below.

Systematic interactions among key components



Systemic interactions among key components

The planning and implementation phases of a program overlap, and are iterative over time. Similarly, continual mutual adjustment (or iteration) is required among the major design variables included in the framework. However, the following logical connection among the programmatic, organizational, and managerial considerations is presumed:

- Senior officials establish the program's goals and strategy, keeping in mind the country's resources, the general features of the national public health system, and the characteristics of the disease(s) in the endemic area.
- Organizational design follows strategy formulation. Senior officials choose one of several possible arrangements (such as categorical, integrated, or decentralized organization), based on such considerations as political and social acceptability, administrative feasibility, and fit with the environment — primarily the larger system of public and private health care in the country.
- The managerial infrastructure — i.e. systems and procedures for managing resources and for undertaking such functions as planning, budgeting, implementing, monitoring, etc.—are adapted to suit the program strategy and organization, to the extent government regulations permit such flexibility.
- Throughout, the intended beneficiaries' needs and interests are carefully factored into the content and process of decisionmaking. Changes in the program context (in terms of funding, political commitment, technological innovations, etc.) are similarly monitored and considered. This improves the program's responsiveness, and its ultimate effectiveness and impact.
- As the program evolves (through such phases as scaling-up, expansion, maintenance, or possibly decline), its organization and management are suitably modified in terms of decentralization, service delivery mechanism, supervision, training, logistics, integration with the general health services, etc. The purpose is to maintain a good fit between program requirements and the other variables.

Variables examined

The above relationships are schematically represented in Figure 1 (page 8). Environmental variables (or external enabling conditions such as political and financial commitment) provide the context within which program goals are set, strategies are formulated, and technological tasks are undertaken. Senior program managers devise suitable internal enabling conditions that facilitate planning, implementation, and monitoring of program activities. Two categories of internal variables — labelled "governance" and "organization" — are important.

The variables included under the category labelled "governance" are the mechanisms and processes for setting strategy, establishing policies, nurturing values, and providing leadership. The category labelled "organization" is similarly broad. It encompasses such variables as: (a) the organizational structure i.e. the internal configuration of tasks and coordination mechanisms; (b) the relationships among jobs and categories (such as line and staff); (c) the distribution of control and influence (resulting in degrees of horizontal and vertical decentralization); and (d) the extent and nature of external linkages (resulting in degrees of integration with the general public health services provided by the Ministry of Health).

These organizational features provide the internal context within which managerial systems, procedures and processes operate. This managerial infrastructure is utilized by program personnel at national, provincial, and local levels to manage financial, human, physical and informational resources. The intended result — a disease control program that is responsive, effective, efficient, and sustainable — is the joint product of all these variables acting in concert, in common pursuit of the program's objectives, as shown in Figure 1.

Although the study examines such variables as external contingencies, program strategy, and community interactions, it focuses on various aspects of organization and management. Besides issues of organizational structure and process, it emphasizes the managerial approaches and systems that facilitate performance. It examines how successful programs ensure the appropriateness of organizational arrangements despite changes in control technology and in the socioeconomic characteristics of the target population. In doing this, it gives particular attention to such aspects as governance and leadership, mechanisms for planning and implementation, organizational autonomy and decentralization, internal culture and values, and effectiveness and efficiency of resource management.

Underlying logic

The underlying logic of this conceptual framework is consistent with established organizational principles. The framework recognizes that:

- Within limits, the same organizational structure (i.e. configuration of positions and tasks) can be made to function in different ways, depending on the "management infrastructure" used and the distribution of power and resources. A "good" structure fits the local needs and contingencies; so each program must determine its own appropriate structure and continually adapt it as circumstances change.
- Whether a particular organization and management system will actually produce the desired outputs depends additionally on the context, strategy, technology, and community response. Overemphasis on structural issues — as sometimes happens when governments repeatedly reorganize programs — can be counterproductive, because managerial systems and practices are unable to keep pace or stabilize.
- Good organization and management are necessary but not sufficient for producing results; many other variables are also important. Therefore, the independent effect of any single factor on program performance is difficult to gauge. Assessments of appropriateness of organization and management must therefore rely on informed judgement to determine the significance and contribution of particular variables.
- Sustainability of effective performance depends on adaptation to changing internal and external conditions. This, in turn, depends on such factors as leadership, incentives, client-orientation, learning, and organizational culture.

The above principles and analytical framework explain what variables were included in the study, and why. The framework guided the organizational assessments undertaken in different countries. The field work was based on a comprehensive list of general questions (see below) that helped examine how — and how well — the different variables fit together in a mutually consistent manner in a given country or program over an extended period of time, often 10 to 15 years or more.

Analytical questions guiding case studies

ENVIRONMENT

- What are the trends in government policies, commitment, and support for disease control programs?
- What is the geographic, social, economic, political, and cultural setting for program activities?
- What are the basic features of the national public health system which provide the immediate organizational context for disease control programs?

GOALS

- How are goals formulated, revised and disseminated across administrative levels?
- What inputs are sought from external organizations and sectors, and from the affected communities?
- Are program goals, targets and outputs clearly stated and are they understood by all program staff?
- Have these goals been adjusted in response to changes in technological content and geographical scope of the control program?

STRATEGY

- What is the control strategy used, and is it appropriate and feasible, given the program's environment and goals?
- Does the strategy give a clear sense of priorities, and is it used for allocating resources among program components?

TECHNOLOGY

- What technical activities are undertaken?
- Is the technological package appropriate and feasible, given the financial, administrative, and human resources available?
- Are there any detailed manuals and procedures for guiding and training staff?
- Have there been any "shifts" in technology, and how have these shifts affected task requirements and program performance?
- Are any further shifts expected in the future?

GOVERNANCE

- What is the program structure at the top, and how effectively does it give direction to lower levels?
- Are program and organizational policies clearly stated?

• What values and attitudes underpin program execution?

• How effective are the leadership and oversight of program activities, given the program's technological and organizational complexity?

Organizational structure

• What is the program's organizational structure at different administrative levels?

• What organizational arrangements are used for collaborating with other sectors, institutions, and the community?

• How integrated is the program organization with the general health services, including PHC, and how effective is this integration?

• What has been the program's experience with horizontal and vertical structures?

• How decentralized is the organization; and is the distribution of power, responsibility, autonomy, and accountability appropriate?

Organizational processes

• What are the relationships between various task units, and how is work coordinated?

• How effectively do personnel in staff positions relate to line managers and operational employees?

• How adaptive is the structure to changing external contingencies and program needs?

• How effective are the information management processes and team work?

Resource management

• What management systems and procedures are used for resource planning and allocation, programming and budgeting, and monitoring and control?

• How effective are the administrative support systems for logistics, procurement, transportation, reporting, maintenance, and personnel management?

• Are the human, financial, and physical resources adequate, and how well are they managed?

• Are staff trained, motivated, and adequately compensated; and how effective is the supervision and guidance provided to them?

Community interactions

• Is disease control a high priority among the affected population?

• How are the clients' knowledge, attitudes and practices monitored; and how is client involvement in program activities obtained?

• What measures are used to increase client responsiveness to the program?

Program implementation

• How are program outputs and outcomes measured and evaluated?

• How is performance feedback used for planning future activities?

• What measures ensure responsiveness to evolving needs of the target area and population?

• What operational research is carried out, and how are its lessons used?

• How effectively has the program been expanded or replicated, and how well has it achieved the maintenance and sustainability phase?

Annex 4 Tropical diseases covered

Malaria [2]

Malaria is caused by microscopic parasites transmitted by the bite of an infected female mosquito. Its wide-ranging symptoms generally develop within eight to 30 days after an infective bite. Typically, these include headache, muscular pain, nausea and dizziness, followed by shivering, rigor and fever. In its most dangerous form (falciparum), malaria can cause liver and kidney failure and brain and lung complications which can quickly result in coma and death.

The challenge and complexity of malaria as a disease is inextricably bound with the interaction among three biological actors: mosquito, parasite, and man. On the basis of the current state of knowledge or the epidemiology of the disease, five basic approaches to the control of malaria have been identified: a) attack the parasites in the human host (through drugs and hopefully, in the near future, a vaccine); b) reduce contact between humans and mosquitoes (by screening of houses, use of bed nets, and more recently the use of impregnated bed nets and clothing); c) reduce mosquito breeding sites (by filling or draining of collections of water, straightening and cleaning of streams and rivers to eliminate vegetation); d) attack the larval stages of the mosquito (through use of anti-larval chemicals and biological methods of larval control which includes the use of larvivorous fish, among others); and e) attack the adult mosquito (with pesticides such as DDT and dieldrin).

2. Excerpted from *Tropical Diseases*, 1990 (WHO, TDR-CTD/HH 90.1); and *WHO Features* No. 139, March 1990.

Prevention and treatment requires the following: (a) avoiding bites of infected mosquitoes by wearing clothing that limits the amount of exposed skin, and through the use of repellents, mosquito nets, fumigant coils or insecticidal sprays; (b) when exposure is inevitable, using prophylactic drugs such as chloroquine, mefloquine or doxycycline; and (c) treating suspected or confirmed infections promptly. Quick treatment is of utmost importance because life threatening disease can develop within hours.

In endemic areas, malaria control relies on diagnosis and prompt treatment of infected people, plus measures to reduce mosquito transmission of infections. Depending on local conditions, this may include spraying houses with residual insecticides, and modifying aquatic breeding sites to make them unsuitable for development of anopheline mosquito larvae.

Schistosomiasis [3]

Schistosomiasis is caused by water borne parasites passed from humans via their excrements (stools and urine) to fresh water snails and back again. The disease is caused by the body's reactions to schistosome eggs lodged in tissues of internal organs.

In urinary schistosomiasis (due to *S.haematobium*), urination becomes painful and there is progressive damage to the bladder, ureters, and kidneys. The outward symptom is blood in the urine; and bladder cancer is quite common in advanced cases. Intestinal schistosomiasis (due to *S.mansoni, S.japonicum* or *S.mekongi*) is slower to develop. There is progressive enlargement of the liver and spleen as well as damage to the intestine. Repeated bleeding from abdominal blood vessels leads to blood in the stools, and can be fatal.

The best preventive measure is to avoid contact with streams and ponds where infected snails live. If people avoid defecation or urination in or near open waters, the snails have less chance of becoming infected. Three drugs are presently in use for treating schistosomiasis: (a) metrifonate, which is cheap, but requires three spaced doses, and is only effective against *S.haematobium*; (b) oxamniquine, which requires a single dose, but is only effective against *S.mansoni*; and (c) praziquantel, which is effective in a single dose against all species of schistosome.

Control efforts have previously emphasized snail control using chemical insecticides (molluscicides) and altering of snail habitats (environmental modification), so as to achieve transmission control. With the advent of new drugs (chemotherapy), attention has gradually shifted to such people-oriented activities as surveillance, drug distribution, water supply and sanitation, and health education, all of which seek to achieve morbidity control instead of transmission control or disease eradication.

Tuberculosis [4]

Tuberculosis is caused by two types of bacteria (a) the *mycobacterium bovis* which is transmitted to man when he drinks infected cow's milk; and (b) the *mycobacterium tuberculosis* or the acid fast bacillus (AFB) which has no other host than man and is transmitted only by persons suffering from severe or active pulmonary tuberculosis (PTB) when they cough, sneeze or spit out sputum laden with the bacillus.

The basic tools for controlling TB in both developed and developing countries are BCG vaccination, case-finding, and chemotherapy. The WHO and UNICEF urge developing countries to give greater emphasis to mass BCG vaccination than to case-finding and chemotherapy, because of its much lower cost and ease of application and because it directly improves the health of children. Vaccination, however, remains a controversial preventative measure despite 50 years of use, because its protective efficacy ranges from 0 to 80 percent. Besides, it does not break the chain of logarithmic transmission of the disease among adults. Nonetheless, this approach prevents serious forms of TB among children, if given before the child is exposed to sources of infection.

There are three methods of identifying TB cases (a) sputum microscopy; (b) sputum smear culture; and (c) chest X-ray. Sputum microscopy is the cheapest and most appropriate case-finding method in rural areas as it can be performed even without electricity. However, it only identifies TB patients whose sputum is already heavily laden with AFB and not those who are suffering from either less severe or early stages of PTB. Sputum smear culture can detect the less severe type of

3. Excerpted from *Tropical Diseases, 1990* (WHO, TDR-CTD/HH 90.1; and *WHO Features* No. 139, March 1990.

4. Based on the detailed case study of tuberculosis control in the Philippines.

PTB or those who have very few bacteria in the sputum, but is seldom used in developing countries because of its high cost and the expertise required. Chest X-ray can detect most stages of PTB cases; but cannot be performed in areas without electricity, is more expensive than sputum microscopy (but cheaper than sputum smear culture), and does not allow distinction between the sputum-positive and the two other types of TB.

One of the major developments in the non-pharmacologic treatment and care of TB patients is the shift from the institutional (confinement in hospital) to the domiciliary/ambulatory approach (out-patient TB service and self administration of drugs). Hospitalization is now limited to serious or complicated TB cases. The even more recent trend, however, is towards community-based approaches wherein community health workers assume a significant role in case-finding, in ensuring that patients are religiously taking their drugs, and in educating families on what the disease is and how the community can help in controlling it.

Effective treatment of TB involves a combination of two or more drugs. The Standard Regimen (SR) is composed of isoniazid (INH) and either streptomycin, ethambutol or PAS, while the Short Course Chemotherapy (SCC) is composed of INH, pyrazinamide and rifampicin. SR is cheaper than SCC, but its treatment period is twice as long. This factor adversely impacts the effectiveness of treatment programs in developing countries where SR is the main regimen used due to its lower cost.

INH can protect household contacts of TB cases from developing the disease, but a country with very limited resources has to think twice before using this drug for chemoprophylaxis. The more appropriate preventive measures, apart from mass BCG vaccination in developing countries, are proper nutrition, hygiene, and ventilation which can be effected through intensified information campaigns and, more importantly, through improvement of the socioeconomic conditions of families below the poverty line.

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