

Chapter 4

The Mass Onslaught Against Disease

In its early efforts to help children in underdeveloped parts of the world, Unicef proceeded by trial and error, mixed with a spirit of adventure and a good measure of simple faith. With the help of established experts in the field of public health—Drs Parran, Lakshmanan, Eliot, Debré, Holm, Passmore, Rajchman himself and many others—it did its best to adapt its formulae for ‘material assistance’ to suit conditions in parts of the world far removed from those in Europe. Still, with the most expert advice and the greatest goodwill, the process of adaptation was initially somewhat crude. In common with similar organizations setting out on a new kind of humanitarian mission in the decolonizing world, Unicef could only do what it knew how to do, re-shaping and re-designing as it went along policies and programmes originally conceived for countries whose economic, social and cultural circumstances were very different.

From the outset, it was self-evident that certain precepts did not apply: no activity to improve child health or nutrition, whether mass feeding or something else, could be carried out in schools, clinics and day-care centres which did not exist. The poor health and poor nutrition among children in Asia, Africa and Latin America were greatly exacerbated because few such institutions were in place; yet without some organized social network, it was hard to reach either them or their mothers.

This was the conundrum of underdevelopment, what the ‘emergency’ in a country, such as India, Ethiopia or Guatemala, was all about.

Most of those who made up Unicef’s new constituency lived in rural communities where life had hardly changed for generations. Families produced, or harvested wild, most of what they needed to live on; cash only passed through their hands in tiny amounts. Their food supply was uncertain, depending on the abundance of nature, the size of their land holding, the greed of their landlord, and the weather. Their exclusive social support system for dealing with the everyday crises of living and dying was their family and their kin.

Most of the governments of the countries they lived in had very little to spend on extending their networks of health and social services to touch

such people's lives, even where the idea of so doing appealed to them. The inhabitants of far-flung villages only recognized the emissaries of 'government' in the shape of tax collectors or security forces: no other representative had yet come their way. Trying to help governments wanting to change this picture was a very daunting proposition. Even to describe the task in such terms begged all sorts of questions.

In those days, it was far from clear to Unicef or to many other external or international organizations what kind of useful role their assistance could play in such regions. Thirty-five years on, the debate is better informed and many of the issues are clearer; but there still are no definitive answers. To help some other country or government build a health and social network, even for children, has many implications: it is an act, potentially, of charitable gift or enlightened self-interest; it can promote social justice or exert invisible control. These implications are, and remain, major dilemmas of international activity in the postwar world, although they are often projected in other terms—financial and economic interests, political and strategic alliances, ideological conflict. In the early 1950s, however, theories about and models for 'development aid' were few and far between.

Unicef was not a specialized agency, whose task was to offer technical advice; nor was it a financial organization offering loans and credit, although it was called a 'fund'. These were roles belonging to other UN organizations set up to address the conundrum of 'underdevelopment', and both fitted within recognizable parameters, at least superficially. Unicef was an organization with a purely humanitarian mandate. But relief and rehabilitation—the UNRRA role—was no longer sufficient; something new had to emerge. If it did not emerge quickly and convincingly, Unicef would probably disappear, either because impecunity forced it out of business or because the temporary stay of execution won in 1950 from the General Assembly would eventually be rescinded.

In trying to arrive at an understanding of its new role towards the world's children, Unicef had what turned out to be a useful advantage. Since it was about giving 'material assistance', or supplies, and since it prided itself on making sure that its supplies reached their target, it was obliged to plunge itself up to its neck in 'underdevelopment'; to tramp around the remote corners of its vast parish and get its feet dirty—and, incidentally, its fingers burnt. During the 1950s, Unicef's staff travelling in what from this point onwards was called 'the field' learned a great deal about development aid, even though few would have attached such a label to their efforts.

The most immediately obvious problem to an organization whose mandate stated that its resources should be administered 'for child health purposes generally' was that millions of children in underdeveloped countries suffered from infectious disease; and that much of this disease could be prevented or cured with modern therapies.

The medical breakthroughs of the last half century suggested a strategy

for dealing with disease which did not depend on the spread of doctors, hospitals and health centres. For the first time in history, mass onslaughts on various age-old scourges were a practical possibility; and they were a distinct advance on the nineteenth century and early twentieth century equivalent—quarantine and the *cordon sanitaire*.

The idea of the mass-disease campaign was not a novelty; certain national or regional campaigns against typhus, malaria, yellow fever and hookworm had paved the way in the past thirty years; and smallpox and diphtheria vaccination had long been around. But the end of the second World War offered not only new challenges but also new solutions: better technologies, cheaper costs, and the communications and transport systems which made it possible to move through a population and have a measurable impact on health in a relatively short space of time. In spite of the residual scepticism about BCG, the International Tuberculosis Campaign was now the worldwide vaccination front-runner. The properties of DDT had promoted it to the pre-eminent killer of mosquitoes, lice and other disease-carrying insects, and was everywhere in hot demand. Large-scale production of penicillin, only achieved during the war, was beginning to offer miracle treatments not just to a handful of the élite, but also to the general population. Mysterious agents of diseases which invaded the body and would not go away now succumbed to the toxic powers of drugs which were otherwise obligingly benign.

The new drugs, vaccines and compounds were getting cheaper all the time; they represented the threshold of a global advance in public health. Used on a mass scale according to a systematic geographical coverage and timetable, they could be applied in such a way as to relinquish the hold of an infectious disease over a whole population. Once the caseload of the disease they carried descended below a certain level, mathematical probability reduced the life chances of certain parasites and bacteria to a point where the disease they spread would disappear for good. Therefore, over a relatively short period of years, a special investment in a disease campaign could produce permanent health dividends, even where there was no sophisticated health network to back it up. That at least was the vision of those brave and confident enough to embrace it.

One such individual was Sam Keeny, Unicef's Regional Director in Asia from 1950 to 1963. Keeny was a great believer in public health campaigns. He had been a relief worker in Siberia during the first World War and witnessed the horrors of a protracted typhus epidemic; he had served in Poland after that war, trying to prevent typhus crossing the *cordon sanitaire* from Russia into Europe. After the second World War, when he was chief of UNRRA in liberated Italy, he had asked Dr Fred Soper of the Rockefeller Foundation to mastermind a successful attempt to eradicate malaria from Sardinia.

The particular style of leadership and inspiration Keeny brought to

Unicef in Asia was specially suited to the era of the mass disease campaign. He combined acute intelligence with earthy common sense, behaving as if he was an ex-officio minister of health for millions of children in his surrogate care. He was comfortable with authority and exercised it with impunity, yet he made it his business to learn as much about his job from people in the villages of Asia as from any Minister or senior government official, and he expected others to do the same. Many of those who worked under him in the thirteen years he spent in Asia for Unicef, men and women who themselves went on to positions of leadership, thought that Keeny played a more important role than any other person in establishing Unicef's credibility and reputation in the field.

At the time Keeny arrived in Bangkok in 1950, WHO—which guided Unicef closely during these years—had already established mass-disease control as the priority for international health assistance in Asia. Lowering the huge caseload of 'killer' diseases was regarded as the first essential task; but fledgling health networks were thin on the ground, poorly equipped, understaffed and overwhelmed by the magnitude of need. Success in combating the diseases which afflicted people and children in their millions would pave the way for other things: more clinics, better midwifery, sanitation, improved nutrition and child care. Disease control en masse would also introduce the idea of health services to people who had never seen a white-coated doctor before and whose only idea of medical treatment was the local healer or herbalist. The campaigns would act as an advertisement and an advance guard.

During Michael Watt's brief Unicef tenure in the region, the first steps in Unicef's support to disease control had already been taken. DDT was being supplied to India, Pakistan and Thailand for spraying in experimental anti-malaria campaigns. BCG vaccination campaigns—in India the ITC campaign was by far the largest in the world—were also already underway. So were two national campaigns against yaws in Indonesia and Thailand. During the next few years, Keeny and his staff were to put much of their efforts into disease control, supplying campaigns with drugs and vaccines, with vehicles and equipment, with the costs of training local staff and the salaries of international experts.

Guided technically by WHO, managed and run by the national health staff of the countries concerned, these campaigns were to have many remarkable successes in saving lives and relieving human misery around the world. The most dramatic effects would be seen in Asia, where their profound demographic implications also most quickly raised concern.

Unicef was only one player in this huge and theatrical health exercise, but an important one. Its most obvious role was as a mass supplier of drugs, vaccines, compounds—the magic ingredients; but in countless other ways, especially in Asia and mostly because of the way Keeny operated and taught his staff to do likewise, Unicef did much to make the technical

promise of the campaigns a practical reality. The spectacle of millions of children cured or protected from dreadful diseases was exciting to Unicef's recipients and donors alike. As a result of its contribution to these campaigns, Unicef's credibility grew, dispelling any lingering doubt that a United Nations fund for children could not find a niche in countries whose problem was underdevelopment, rather than the damage of war.

Yaws was the disease which fell earliest and most spectacularly to the mass campaign.

A disease confined to a tropical belt within twenty degrees of the equator, yaws was mostly found in hot, humid, poor, dirty, and almost invariably remote rural areas. The saying was that yaws began where the road ended. Because it was off the beaten track, estimates about the number of cases varied widely; in the early 1950s, there were thought to be around twenty million worldwide, of which over half were in Asia. As the mass campaigns moved ahead, the figures were revised upwards. By the end of the decade, the yaws map of the world had been re-drawn: in most places, yaws had ceased to be a major public-health problem. Except for some parts of Africa, where yaws today is making a comeback, the mass campaigns had had an astonishing success.

In the great majority of cases, the victims acquired the disease in early childhood. In many tropical rural areas, small children ran about barefoot and scantily clad, scratching their legs and feet on the spiky twigs and stones found on every village path. Yaws' tiny twisted micro-organism, or *treponema*, is not transmitted venereally like its close relation, syphilis, but by contact with broken skin; it therefore spread easily from child to child, particularly where few received a regular scrub with soap. Its first manifestation was a highly infectious raspberry-coloured sore rather like a boil. After a while, the sore would come to a head, burst, and heal. But gradually others erupted all over the body, sometimes attacking the membranes of the nose and the roof of the mouth. Often they turned up in the palms of the hands or on the soles of the feet, making it impossible to work in the fields, or to walk except in an awkward crab-like gait balancing on the sides of the feet. As the child grew up, the disease became entrenched in the body and its scars destroyed the skin. Joints became locked and the body immobilized. The nose and mouth were eaten away and deformities like those in leprosy developed. What began in childhood as a painful sore could become a permanently disabling condition by adulthood.

Penicillin had transformed the prospects for sufferers of *treponemal* diseases. Until the mid-1940s, arsenicals offered the only treatment for the *treponemal* diseases: yaws, syphilis, bejel and pinta—a skin disease mostly found in tropical America. This toxic, expensive and unreliable treatment required constant repeat dosages which could never be trusted to evict

the disease entirely. Now this remedy had been outdated by modern antibiotics. The most effective treatment was a procaine penicillin in oil known as PAM, which acted slowly and stayed in the blood for several days after injection.

In the case of yaws, one shot would clear up the painful lesions within days, and only a limited number of doses were needed to rid the body of the disease for good. The experts of WHO, which had named the control of venereal and treponemal infections as among the original priority targets of the organization's activities, were careful to counsel that 'penicillin is not public health'; that supplies of the wonder drug were not the beginning and end of the story. But in the light of both its preventative and curative properties, it did in fact come close to being just that; more so than any vaccine or insecticide with only preventative properties.

The pioneering mass campaign against yaws was in Haiti. All the people living in the country's rural areas—around eighty-eight per cent of a population of three million or so in 1950—were at risk of catching yaws; more than half of them either had the raspberry insignia of the disease or scars indicating where they had been.

With help from the Pan-American Sanitary Bureau, a national effort had been underway to bring the disease under control since the early 1940s. In 1949, a new project was inaugurated with WHO advice and Unicef supplies of PAM. To begin with, mobile clinics were set up and the population invited to attend them on an appointed day. In the areas covered during the first year of the project, a little more than half the people attended. Unsatisfied with this turnout, the campaign moved into a new phase in 1951, aiming for blanket coverage. Every single rural household would be visited by teams going house-to-house; every single case would be tracked down. Each victim would receive one dose of penicillin; each contact of a victim would receive a protective shot of half the amount. Although Haiti was a small country, this still meant checking up on 2·7 million people, most of whom lived not 'at the end of the road', but nowhere near a road of any kind. The strategy adopted for reaching everyone had an important bearing on future mass campaigns.

For any mass disease campaign, the most important ingredient was competent personnel to run and manage the campaign teams in what was essentially a labour-intensive exercise. In most parts of the underdeveloped world, fully-trained professional medical personnel were as scarce as gold dust. Each campaign therefore had a serious manpower problem to resolve; and each one, in its own way, came up with the only possible solution. Auxiliary staff, or lay medical workers, were recruited and trained for the specific purpose of the campaign. In Haiti, these personnel were called 'lay inspectors'. Their wages were quite attractive: equivalent to those of a skilled labourer.

Haiti's terrain is mountainous and rugged and in the early 1950s, nothing

better than rutted tracks connected village to village and one cluster of huts to another. The most important skill needed by a lay inspector on the yaws programme therefore was the ability to drive a jeep and keep it in running order. Educational qualifications were regarded as secondary. Yaws was a singularly easy disease to diagnose: it took no particular skill to recognize the raspberry lesions. Most people could be taught to give an injection properly, and to keep the necessary records. They must, however, be healthy, vigorous and conscientious; checking out every house high in the hills often meant a hard trek on foot.

Haiti's campaign organizers were proud of their corps of jeep-driving yaws inspectors. By the summer of 1953, the entire country had been covered and 1.6 million people treated. A spot recheck in certain areas the following year produced hardly a case of the disease. Within a further period of continuous checking and treatment, yaws was fully eradicated from Haiti. This success opened up the hope of global eradication.

The next area of yaws onslaught was Asia, where the problem was on a vastly magnified scale. Both Thailand and the Philippines had black spots of yaws in their rural areas, as did India; but the main reservoir of the disease was Indonesia, where there were thought to be perhaps as many as ten million cases. Indonesia, unlike Haiti, was a huge archipelago, with some large and heavily-populated islands, and thousands of smaller ones. Its total population at independence in 1949 was seventy-five million, of which fifty-four million lived on Java. Around seventeen per cent of the Javanese people appeared to be afflicted by yaws, making Java at that time the home of the largest congregation of yaws sufferers in the world.

The first efforts to bring the disease under control in central Java began in the 1930s. Dr Kodijat, a district health officer destined to become a national hero in the fight against yaws, found that the rural health clinics under his charge were overcrowded with yaws patients. He elaborated a systematic way of treating them with arsenicals. This was beginning to attract national and even international notice at the time when war broke out. During the war, all work in yaws control completely ceased, and the incidence of the disease rose sharply. In the late 1940s, even before the struggle between the Nationalists and the departing Dutch reached its conclusion, discussions began about a national yaws campaign.

In 1950, the Indonesian Ministry of Health launched such a programme with agreement from WHO and Unicef that they would provide international assistance. The campaign was to start in the densely populated Javanese districts of Djakarta and Jogjakarta, and gradually extend throughout other parts of Java, as well as North Sumatra, parts of Kalimantan (Borneo), and the Lesser Sunda Islands.

Kodijat was placed in charge of the yaws campaign. His headquarters was in Jogjakarta, where his handful of staff ran a serology laboratory, a small hospital for yaws patients, all the training for the campaign, and

masterminded the activities of the teams of campaign personnel. Kodijat had a reputation as the mildest and softest-mannered person; but he also had an iron will and a conviction that methods must be carefully tried and developed before being applied in the field. It took a while to persuade him of the efficacy of penicillin against yaws: only when he had tried it himself in his hospital at Jogjakarta and carefully analyzed its effects did he agree to accept it as the agent for the attack on yaws in Indonesia.

This was only the first of many issues on which Kodijat refused to be rushed by pressure from his international helpers; but as he was the longest-serving and most experienced yaws protagonist in the world, his painstaking experiments in all aspects of conducting the campaign and his immaculately-kept field data and survey maps were a model which less patient field marshals knew they ignored at their peril.

Kodijat's strategy, tried over many years and endorsed by Dr C. J. Hackett, a senior WHO expert on yaws who became an admirer and collaborator of his Indonesian colleague, involved the use of mobile teams of male nurses—*mantris*—headed in each case by a doctor. The teams of eight went out on the road and systematically covered the countryside, village by village. Their impending visit would be announced ahead of time by the village elders, who summoned the villagers at the appropriate moment. A temporary clinic was set up in the house of a headman, and a throng of mothers and children assembled. With the help of the elders, each team tried to ensure they examined as many of the village population as possible.

In most of Java, where census data were thorough, it was relatively easy to work out what proportion of people attended. In villages where the disease was very common—as many as one-third of the people might be infected—attendance was often nearly total. Each yaws sufferer was given a penicillin shot; a few days later the team would reappear and give each person a second injection.

The national campaign gradually covered more and more territory, surveying over 2.5 million people in 1952 and treating nearly 300,000 cases. Impressive though the progress was, it was not enough for Sam Keeny: at this rate, the elimination of yaws from all of Indonesia would take thirty years.

Keeny visited Kodijat at Jogjakarta at least once a year, and was an imaginative and energetic purveyor of ways to overcome the various obstacles to what he saw as the campaign's slow momentum. A major problem was the low budget for health services generally in Indonesia, a country still emerging from civil war and struggling with many other post-colonial problems besides health. Keeny was adept at juggling Unicef allocations to match the particular areas of shortfall in the national yaws campaign and other parts of the health budget, and at negotiating these solutions high up the national health command. Keeping down the costs

of any mass-disease campaign was a critical factor which rarely left the back of Keeny's mind: it had implications for every other campaign of its kind.

When Dr Soetopo, a health officer in eastern Java, came up with a solution for the campaign's most intractable problem—manpower shortage—Keeny did a great deal of juggling and manoeuvring to make it financially possible to put it quickly and widely into action.

The limitations of the use of the mobile teams of *mantris* had become obvious by early 1952. Kodijat's staff at Jogjakarta had so far trained around 150 for the campaign; even diluting the teams by replacing some by health clerks for record-keeping did not greatly increase the number of teams, and the health services could spare no more *mantris* from other tasks.

Dr Soetopo brought existing 'polyclinics' into the yaws campaign picture. These small bamboo and thatch health posts, each manned by a *mantri*, were relatively common throughout the countryside of the larger islands. In eastern Java, Soetopo assigned assistant nurses, *djurupateks*, to work under the polyclinic *mantris* specifically on yaws control. The *djurupatek* visited local communities, identified yaws cases, and arranged a day for treatment with the village leaders and the local doctor.

Initially Kodijat was reluctant to accept this method as nationally applicable; he was anxious to avoid putting too much responsibility on relatively uneducated and lowly health personnel. This was a legitimate concern, especially given his determination that, above all, Indonesia's yaws campaign must be thorough. With persuasion, however, he came round.

In late 1952, with the enthusiastic backing of Keeny and Hackett, full-scale training of *djurupateks* began. The medical part of their job was easy; although, unlike Haiti's lay inspectors, *djurupateks* were not allowed to give injections. In Indonesia, candidates were not expected to be so generally able or professionally skilled. Bright young boys with primary school certificate were given six weeks' training, a bicycle from Unicef, and paid the princely salary of twenty-five dollars a month to become yaws canvassers.

By early 1953, thirty-five 'simplified' disease campaign teams were already in the field. By the end of 1954—a year earlier than anticipated—the number of cures per year in Indonesia had reached one million; and, due also to a drop in the world price of penicillin, the cost of each cure had gone down from around three dollars in 1952 to around eighty-five cents. In the meantime, the campaign had become the world's largest of its kind, and the most famous. It seemed that a ten-year eradication target was not unrealistic, if the rate of progress could be maintained.

The other Asian country with a sufficiently-high incidence of yaws to demand a mass campaign was Thailand. The problem was not nearly so

daunting as in Indonesia: the disease was concentrated in certain particularly poor and remote rural areas. Out of the country's population of eighteen million, the total number of cases was thought to be around 1.4 million. A campaign assisted by WHO and Unicef began in April 1950; its target was to build up to the point where its mobile teams surveyed two million people a year, eventually covering all nine million in the yaws-affected areas. Hopefully, by the end of the decade the incidence of yaws would have declined to the point where existing health services could deal with the remaining cases without fear of any new major outbreak.

Thailand was not as overstretched for medical personnel as either Indonesia or Haiti. The Public Health Department was able to depute eighty-eight sanitary inspectors to undertake all the surveys and examinations, supplemented by Thailand's version of the lay health worker: high school graduates trained as 'lay injectors'.

Mass-disease campaigns have aspects in common no matter what the particular disease. These are the mass mobilization of communities; the teams of health personnel with drops or drugs or injections; the endless counting of heads and cases; the checking and rechecking and spot checking to catch those who were left out the first time round. Yet each type of campaign has particular problems associated with the particular organism causing the trouble, and the particular features of its antidote, the preventive or curative therapy. Until a certain amount of experience has accumulated and been scientifically examined, campaigns addressing an ancient problem with a new technique—as in the case of yaws and penicillin—are run along experimental guidelines which require constant revision and are the subject of endless debate and enquiry. In March 1952, WHO laid on the world's first international yaws symposium in Bangkok in a palace borrowed from the King of Thailand for the purpose.

In spite of the increasing evidence that yaws had become an almost miraculously easy disease to conquer from a technical point of view, there were a number of problems still to solve. One was dosage: in Haiti, a much smaller dosage was being given, in one shot only, than in Indonesia and Thailand. The amount of penicillin, and the number of times the team had to visit a given community or household had an important bearing on the cost and speed of a campaign. Then there was the question of contacts: WHO's experts were more and more convinced that it was important to give all family members of yaws patients a half-dosage as a protection. The other critical question was that of survey coverage of the target population. WHO insisted that ninety per cent of the community must be reached in order to be certain of catching enough cases to prevent transmission. Only by going house-to-house could a team manage to reach this proportion, and in some areas where homes were scattered and hard to reach, this was extremely difficult. As the Indonesian campaign moved out of Java towards smaller and more inaccessible islands, this became more problematic, and

costs and time involved correspondingly higher.

A successful mass-disease campaign, against yaws or any other disease, had to balance on a knife edge between the thoroughness required to hunt down almost all the victims and carriers in a given community, and the speed required to reach all the problem communities before the still-infected could re-infect the cured. Judging this knife-edge balance from region to region and country to country was critical to the long-term outcome of any campaign, particularly where the vital ingredients—manpower resources, transport and fuel, fresh supplies of drug, vaccine, or chemical compound, and their costs—were thinly stretched by the nature of the underdeveloped part of the world in which it was occurring. Making the calculations come out right, not only on the back of an envelope or in a vehicle log or on a survey map or against a local census, but also in the villages where the current and future cases among children and adults were to be found, was what mass-disease campaign management was all about.

The campaign was an intensive effort designed to deal a short sharp blow; its absolute expense, as well as its temporarily disproportionate consumption of a large part of a national or district health budget, were only justified if the blow was decisive. The campaign could not go on for a much longer period than foreseen without putting at risk other important health priorities which it had temporarily crowded out.

Even in attacking a relatively simple disease such as yaws, different campaign managers computed these equations in different ways depending on the circumstances in which they were operating. At the end of 1952, following many of the recommendations emerging from the Bangkok symposium, the Thai authorities made various changes in their approach, many of which had the effect of slowing down the campaign but of guaranteeing better results over the long term. Kodijat, who always scrupulously consolidated the Indonesian efforts, was reluctant to do anything to speed up his campaign or cut any corners on cost if, in his opinion, such a step might jeopardize its ultimate success. Slowly each campaign evolved, according to its own findings, similar in many characteristics, differing in others.

In 1955, the second international conference on yaws took place in Nigeria. By this time, it was becoming evident that a far higher number of cases existed in Africa than had been previously thought: between twenty and twenty-five million. Campaigns along the familiar WHO- and Unicef-assisted pattern had begun in many west African countries during the previous two years and were just getting into their stride. Meanwhile, tremendous and striking results could be reported from Asia, particularly from Indonesia where the teams of *mantris* and *djurupateks* were managing to treat over 100,000 yaws cases a month. In Thailand, even though the numbers of examinations thought to be necessary had been revised upwards by a large margin, the campaign was ahead of schedule. Nearly one million

cases had been cured, and the mass campaign was expected to end by mid-1959. Other campaigns in the Philippines and India had begun; full eradication in Asia was becoming an increasingly hopeful prospect. Meanwhile, the almost miraculous nature of the cure had made the campaigns so popular with yaws victims that they had acted as a 'spearhead' for other public-health programmes, conferring an aura on doctors, nurses, injectors, Unicef, WHO and everyone in any way associated.

Amidst the general rejoicing, however, a report prepared in 1954 by the WHO expert committee on the control of treponemal diseases for the WHO/Unicef joint health policy committee sounded a more cautious note. Essentially, it repeated the warning that penicillin was not public health.

The primary aim of the control programme was to interfere with the spread of the disease; dramatic scores of treatments given and cases cured was not the same thing as killing off enough yaws treponemae within a population to ensure that their hold was destroyed for good. Although the widespread use of penicillin had dramatically reduced yaws in a number of areas, no definitive means had yet been established for consolidating these gains. In Thailand, the plan was to hand over the task to the stationary rural-health services once the mass campaign phase was over. In some of the other campaign areas—yaws was after all a disease 'at the end of the road'—there were no rural polyclinics or their equivalent. Who was to check and recheck the villages to make sure that no children with lesions were running along the paths; or treat the few leftover cases that had hidden or been dormant when the teams came through? Without ninety per cent coverage in the mass-campaign phase, some odd cases were bound to persist; a few odd cases could quickly become an outbreak, an outbreak an epidemic, and the phenomenon of mass childhood infection appear all over again. This problem of the take-up of the residual prevention and treatment of a disease in an underdeveloped area once a mass campaign was over was to preoccupy many public-health experts for years to come.

Whatever the fears of the mid-1950s, yaws campaigns continued to make dramatic progress throughout the decade. Few diseases have ever given in to such an onslaught in such a short period. By the end of 1958, less than ten years after the first mass campaign began, thirty million cases of yaws had been cured worldwide. Of the 200 million people in the tropical areas thought to be at risk, seventy million in Africa, the Americas, South-East Asia and the western Pacific had been checked on the first surveys of mass campaigns assisted by WHO and Unicef—and ninety million had been checked on resurveys. Campaign techniques had been refined and improved; WHO now recommended that where five per cent of a community was infected, every single child under the age of puberty should be given a protective penicillin shot. In all campaigns, the preventive properties of penicillin were now given as much weight as the curative. The results everywhere were a cause of much satisfaction.

In South-East Asia, the grip of yaws was effectively broken by the end of the 1950s. In Thailand and the Philippines, the campaigns had covered all the yaws-affected areas and examined almost everyone at least once. The 'lay injectors' of Thailand had become 'yaws supervisors', joined the staff of the health centres and now carried out yaws surveillance work alongside sanitarians and school-health visitors. In three other countries with fewer victims—Malaya, India and Cambodia—yaws teams were operating. Six islands in the Pacific had successfully eradicated yaws. Only in Indonesia, where the scale of the problem had always been of another order altogether, did relatively large numbers linger on.

On Java, the huge yaws *treponema* congregation had been decimated. Here, by 1957, Kodijat had scored a triumph, and had been nationally honoured for his work. So difficult was it to find a raspberry sore that his training programme in Jogjakarta could scarcely carry on for want of being able to teach *djurupateks* to identify the disease. One thousand of the risk areas plotted on his maps had been declared virtually yaws free. His efforts to consolidate gains in existing campaign areas were as thorough as ever. But his efforts to extend the campaign to the outer islands of the archipelago were frustrated.

Kodijat was defeated by circumstances outside his control, the worst enemy of public health: political disturbance and military disruption. There were serious revolts against the government of President Sukarno in Sumatra and the eastern islands. The breakdown of security effectively stopped the yaws campaigns, like everything else, in their tracks. Staff were summoned away to military service; salaries went unpaid; ships with penicillin supplies were unable to dock or unload; transport was unavailable. By the end of 1958, insurgencies had grounded the campaign entirely.

Kodijat did not give up his dream of eradicating yaws from Indonesia. In 1963, still campaigning at the age of seventy-two, he requested help from Unicef to continue the campaign, and received it. By this stage, there was no further need for a mass campaign in Java and the other large islands of Indonesia; the few remaining cases could be treated in rural clinics, and public understanding about the disease had advanced to the point where sufferers freely sought out treatment.

Campaigns against yaws were still going on in parts of Africa. But the era of the mass onslaught against its painful lesions had passed its peak and begun to recede into history.

Yaws was the early success story among the many great disease campaigns of the second half of the century. Others achieved even more remarkable gains measured in terms of the absolute numbers of people they saved from illness or death; and in terms of the far more difficult obstacles placed in their path by more wily and elusive adversaries.

Throughout most of the 1950s, until the malaria extravaganza edged it from the limelight, the largest and most complicated international health campaign continued to be that against tuberculosis. Every month, WHO and Unicef published the figures of children and teenagers tested by tuberculin and vaccinated with BCG; by 1960, the tallies had reached the respective totals of 265·4 million and 105·7 million, and campaigns had been completed or were being carried out in sixty-four countries and territories.

The peak of this vast numbers game—in which Sam Keeny was one of the most prolific players—came between 1956 and 1959, when around 3·5 million children were tested each month, and around one million vaccinated. Over four-fifths of these were in Asia; within Asia, more than two-thirds were in India.

When in 1948 Unicef's Board stipulated that half the \$4 million for the ITC must be spent in countries outside Europe, they did so mainly because of the rise in tuberculosis in all 'countries victims of aggression'. But in the underdeveloped countries, the aftermath of war had far less to do with the spread of tuberculosis than did the more remorseless process of social and economic change.

Tuberculosis began to strike such countries just at the time that its importance in the west declined. In Europe, the disease reached its peak in the nineteenth century. Although genteelly associated with consumptive pallor and early death among literary and artistic figures, tuberculosis was chiefly a disease of the slums and workshops of the Industrial Revolution. Densely-packed housing and urban squalor provided the bacillus with a perfect breeding-ground. In most parts of Asia, Africa and Latin America, tuberculosis was almost unknown until mines and factories spawned their surrounding shanty towns; then it took off on a virulent rampage.

There was no treatment for the victims, no sanatoria where they could be kept from infecting anyone else, nor any systematic improvement of housing or sanitation—the factors that had gradually cut down the tubercular toll in the West. In Europe, the war had temporarily reversed a positive trend of tuberculosis decline; elsewhere it boosted a negative one. Only one of its characteristics seemed to give the disease an edge over certain others as a reachable and conquerable scourge. Instead of being 'a disease at the end of the road', it was thought to be confined to the crowded areas; this proved sufficiently faulty to throw off some planners' calculations.

For an attack on tuberculosis in parts of the world where the average patient's chances of bed rest, fresh mountain air, and treatment in isolation from possible contacts were absolutely nil, there was no alternative to a mass campaign with BCG. Diagnosis by lung X-ray for suspected pulmonary cases was complicated and expensive enough in countries with the most minimal health facilities; but, as the authorities had pointed out to Drs Parran and Lakshmanan, treatment remotely akin to the standards of

Western care was way beyond the bounds of economic possibility.

At that time certain drugs had been developed which might prove to have the same miracle properties against tuberculosis as penicillin had against treponemal disease; but none had yet demonstrated an ability to destroy the tubercle bacillus with such killing effect. In the absence of a means of mass treatment, protection against those most at risk of the bacillus' invasion—children and young people—was the only option, whatever its shortcomings and imponderables. When questioned by Unicef in 1948 how he would conduct a BCG campaign in a non-European country, Johannes Holm had replied pragmatically that he would use the same techniques as were then in use in Scandinavia, and make the necessary adaptations as he went along. 'Adaptations' turned out to be something of an understatement.

When WHO took over the technical direction of the ITC in 1951, and Unicef retreated to its by-now established partnership role as principal international financier and supplier, there were still lingering doubts within the medical profession both about the efficacy of BCG vaccine and its suitability for widescale public-health campaigns. Even those confident in the vaccine's protective properties had to admit that the credentials of the tuberculin test were looking increasingly shaky. In 1949, WHO had set up a Tuberculosis Research Office in Copenhagen. As the international tuberculosis effort grew and spread, the TRO became responsible for the scientific investigation needed to re-design key technical elements of the campaigns. The data they used was collected by special WHO assessment teams based in different parts of the world and paid for by Unicef.

Operational problems were expected. The numbers of those the teams must reach were enormous: in India alone, the target was to reach 180 million children and adolescents—half the country's population. No serious doubts could any longer be entertained about using lay health workers to help staff the mobile teams; without large commitments of national medical personnel, professional, auxiliary and lay, the prospects of running any campaign on this scale were non-existent.

The other operational problem was that of reaching all the BCG candidates twice, once with the test, once for the results and, if applicable, the vaccine. In Europe, most children were captive. Babies could be reached conveniently in a maternity ward or a health clinic; older children could be found sitting behind a desk at school. In few areas of the under-developed world did any but a small proportion of better-off families use such amenities.

All campaigns in such areas, therefore, had to take place in a non-institutional setting, and people had to make the effort to bring their children. In many cases, a fifth of those who received the test never came back for the results . . . all the more reason to ensure that those who did take the time and trouble to attend received a technically-immaculate

product. If the children later developed tuberculosis, their parents would distrust not only this health campaign but others.

The first discovery to shake the medical foundation of the campaign was that the tuberculin test used in Europe did not divide people everywhere else in the world into neat categories of 'positive'—and therefore not to be vaccinated—and 'negative'—in need of protection from BCG. The pattern of reaction to it was turning out to be very different among different populations, and its results were open to all sorts of different interpretations.

How some people came to be slightly insensitive to tuberculin was a mystery; it did not seem as though they could be suffering from the disease and would therefore be at risk from a BCG vaccination, but nothing could be taken on trust. What to do about cases of 'low sensitivity' or 'non-specific sensitivity' preoccupied the researchers at the Tuberculosis Centre in Copenhagen for many years until they settled on the precise degree of sensitivity below which they felt a BCG vaccination was not only safe but highly desirable. Meanwhile, because of the cost and complication of case-finding and sure diagnosis, the results of applying the tuberculin test were often used to gauge the prevalence of tuberculosis in a population. The uncertainties surrounding its results obviously threw out such calculations. WHO began to insist that a proper tuberculosis survey was essential before any campaign was mounted.

Even more threatening to the reputation of the international campaign was the discovery that the vaccine was not potent enough.

A second round of tuberculin testing after BCG vaccination in some north African and Asian countries revealed that it had 'taken' in no more than fifty or sixty per cent of cases. This compared with ninety or even ninety-five per cent of the children vaccinated in the European campaigns.

Dismayed, the ITC mentors—Holm, Debré and others in WHO and Unicef—considered all possible causes. The immediate deduction was that BCG vaccine was sensitive to a tropical climate. This realization inspired the invention of the 'cold chain': a system whereby vaccine and tuberculin could be kept at a low temperature from the moment they left the State Serum Institute in Copenhagen and other WHO-approved manufacturers until the moment when they entered the body of the child.

At the production centre, the vaccine was packed into insulated boxes before it was taken by airplane to its destination. Upon arrival at the airport, the insulated boxes were installed in jeeps; later they were strapped to the back of health workers and vaccinators. Unless the vaccine could be kept cool until it entered the syringe and passed through the needle, the whole operation was pointless.

Within a few years, techniques for freeze-drying vaccines were developed. This cut down the number of links in the cold chain; but, beyond the laboratory where the bulk supply was reconstituted into liquid form, the

vaccine still needed to be transported in ice and stored in a refrigerator. These items added to the costs of the campaigns; and they became, and remain, standard parts of the equipment supplied for vaccination programmes by Unicef.

Further research revealed that the intense light of the tropical sun caused at least as much damage to the potency of the vaccine as did the heat. Halfdan Mahler, the senior WHO medical officer for the Indian BCG campaign between 1951 and 1961, was among the first to realize that at all times the vaccine had to be shielded from strong light; and that, if light was so destructive to the vaccine, it must also destroy the live bacillus expectorated by a patient.

Since the tubercular cough of the patient was the main means of passing on the disease, Mahler concluded that he or she only threatened other family members and workmates during the hours of darkness. If tuberculosis victims could be persuaded always to cough into a handkerchief and not to sleep in the confined space of the typical one-room house shared with all the members of the family, there was no reason, Mahler believed, that public health would be endangered by their continuing to lead a normal life during the daytime. These ideas were a breakthrough, since they offered at least some kind of alternative strategy to the impracticability and cost of hospital care in isolation.

In 1957, the WHO expert committee on tuberculosis examined at length the technical and operational experience of the many campaigns WHO and Unicef were assisting and assessed their overall results. Their recommendations marked a turning point in the way mass BCG campaigns were conducted. From its inception, the ITC had been very popular with governments and its assistance much sought after. Whatever the setbacks it had encountered, very real gains for public health had been made. The vaccine as a means of mass protection had now definitively proved itself, and health authorities and BCG campaign personnel had shown that even in the most adverse circumstances and the most difficult terrain, it was possible to take a vial of fresh vaccine across thousands of miles, and do whatever was necessary to put it to work in the bodies of children. BCG was doing much to popularize international health assistance. But the total process of solving the riddle of tuberculosis control, and the role of the mass campaign within it, was still evolving subject to scientific trial and error.

Some campaigns, on close examination, were going all out to chalk up the maximum numbers of tests and vaccinations without paying enough attention to the proportion of children they were reaching. The results of the numbers game were impressive; but they were masking the fact that the coverage in many places was not all that it ought to be.

Setting targets for each team, jeep and vaccinator to reach every month, and reckoning progress by their success or failure to do so was good to a

point; it provided a built-in check on all the elements which could delay things, from punctures to religious feast days to personnel shortages. But it could also have the effect of discouraging teams to hunt down all the children whose houses it took time to reach, or whose mothers were busy the day they called, in favour of going on to an easier location.

Even the best-operated campaigns had not managed to reach more than half the children under the age of seven. Many children about seven years old were in school and the proportion was higher: around two-thirds. But the younger ones were the most important: the earlier a child was reached, the less chance there was that the tubercle bacillus would get there first. If the campaign had to slow down to reach more of the younger children, then it should do so. Here again was the knotty balancing act between speed and thoroughness, both of which were vital.

Much more careful attention had to go into selecting the places where the campaign teams should go. When international help with BCG vaccination was first offered to countries outside Europe, there had been a tendency to accept requests from every government which asked. Assumptions were made that tuberculosis was prevalent throughout their countries without carrying out a survey. The upshot was that precious resources had been wasted carrying out BCG vaccination in areas where the chances of contracting the disease were very low. Repeat campaigns in places where the risk was high were more useful than deploying teams in far-flung areas where the chances of contagion were very remote. In many high-tech areas, the coverage was not what it might have been. In all such areas, the report recommended, campaigns should be held every three years to vaccinate the children who had been born since the last time around or had then been left out. Some voices were already suggesting that BCG vaccination should be incorporated into the regular health services and the mass campaigns phased out. Not yet, declared the WHO experts. Teams which went out to obtain mass coverage with BCG were still an essential part of the armoury against tuberculosis.

Although this was true in 1957, the days of the mobile BCG teams were already numbered. Tuberculosis control was already moving into a new phase. The diagnosis of suspects by radiography and the complications of treating confirmed cases had made the curative part of the attack slow, difficult and expensive. Now the moment had come when a simple means of mass treatment could meet both the need of the patient for a cure, and the need of the community that the patient present no risk to others. In 1951, a drug had been discovered which was effective, cheap, could be taken orally and caused few complications.

Isoniazid appeared to be the breakthrough that everyone had been waiting for, but it took time and careful testing to prove it. Although isoniazid sent the disease into recession, it did not kill off all the infective bacilli. Not only could these take hold again if the patient stopped treatment,

but also they seemed to develop isoniazid resistance, threatening to become a master race of infectious tubercle bacilli. Until it could be shown that the cough of a patient taking the new drug was not more hazardous to others than before, isoniazid had to be used only with great care in controlled circumstances and not given out in the community at large. By the end of the decade, the drug was conclusively shown not to offer a public health risk, and could then come into wider public use. The ground in tuberculosis control had shifted.

In 1964, WHO declared a new era in the continuing effort to defeat the disease worldwide. BCG vaccination of all young children was still one of the two main weapons, but it was now no longer regarded as necessary to administer a tuberculin test in advance. This dramatically reduced costs and logistical complications. The other weapon was home treatment of patients with an improved version of isoniazid. The best way to advance this strategy was no longer to build clinics, sanatoria, send out mobile X-ray units and BCG vaccination teams, but to incorporate prevention, diagnosis, and cure within the general health services. Although some countries at first proved reluctant to accept that this was the way WHO and Unicef now saw things, the days of international support for the mass tuberculosis campaign were over.

Another disease on the original WHO and Unicef campaign lists was trachoma, a painful and disabling eye complaint.

The trachoma virus flourished in dirty and poverty-stricken surroundings, and attacked young children mainly in the hot season when dust was permanently in the air. If left untreated, inflammation on the undersides of the eyelid became progressively more acute, which could in time damage the cornea and cause the eye to retract into the socket. In poor societies, the human consequence of blindness is often to be found on the corner of the street holding a begging bowl; sightlessness has denied him or her any useful role in family or community.

In the early 1950s, trachoma was regarded as another disease which need no longer be taken for granted as part of the general tapestry of ill-health. Rising living standards and improved hygiene had expelled the disease from Europe and north America; but with the degree of variation common to all calculations concerning diseases of poverty, it was thought that there were 100 to 400 million cases in the world. Now modern drugs had transformed the prospects of destroying the virus.

Two antibiotic eye ointments—*aureomycin* and *terramycin*—had come on the market at a price which made large-scale campaigns against trachoma affordable. In 1952, WHO established an expert advisory panel on trachoma, and the international attack began.

The first country to receive Unicef support for a trachoma campaign

was Morocco. The Director-General of Health in what was then a protectorate of France was Dr Georges Sicault, a bold and successful adventurer in public health. Sicault had been in Morocco for many years and was responsible for campaigns against smallpox, malaria and typhus— from which he once himself came so close to death that his life was given up as lost.

Sicault was always in the vanguard of new disease control drives and had been the first senior public health official in north Africa to start mass BCG vaccination, with the help of the ITC. In 1952, Unicef provided the Moroccan health services with supplies of antibiotic ointment for an experimental four-year attack on trachoma.

Sicault's strategy was to cover the affected population systematically by sending mobile medical teams to each village at the beginning and end of the hot epidemic season. The teams applied ointment to the eyes of every person, gave out tubes free of charge and instructions for its use. From year to year, free ointment was gradually phased out in the belief that once they had understood its value, people would buy it; tobacco sellers and tea shops were encouraged to carry stocks. Both trachoma and conjunctivitis, its advance guard, gradually declined each season. But self-treatment did not work as well as expected.

There had been some misgivings within WHO and Unicef about trachoma campaigns from the beginning. No-one doubted the technical efficacy of the remedy. But up to this time, antibiotic ointments had mainly been used in the clinic, not as an instrument of public health. Far from providing a one-shot remedy, the ointment had to be applied three or four times daily over the course of months. This demanded of parents and children a great deal more than that they should present themselves once or twice for a test or an injection. Theoretically, any mother could learn how to put ointment on her child's eyes. In practice, clumsy fingers might squeeze too much from the tube at a time and quickly exhaust its contents; or the top might be lost or the goat eat it and the ointment dry up. Applying it regularly anyway seemed a curious routine to an unlettered mother in a dusty back street to whom modern medicine was a totally alien idea. Without someone to encourage, help and admonish her, she would not easily become its practitioner on behalf of her children.

This kind of observation was little more than common sense; it did not require an anthropologist to work it out. But it eluded those campaign experts whose own world was very remote from the one in which their carefully-planned operations were supposed to take place, and who did not think that their time should be spent bumping around in jeeps and sitting for hours in dusty village compounds chatting with the great unwashed. Yet for any campaign which demanded people's co-operation such factors as the vagaries of human behaviour could make the difference between success and failure.

The pioneer trachoma programme in Asia, which WHO, Unicef and especially Keeny, saw as the guinea-pig for others, took place in Taiwan. Two million people were thought to be infected. It began in the schools. Doctors and nurses from all health centres were taught how to identify the disease. School superintendents organized the schedule of doctors' visits, and the teachers were taught how to apply the ointment. They had a classroom drill with basin and soap for hand-washing, marked tubes of ointment, squares of tissue paper for each child to press over the eyelids and fix the ointment in the sockets. In eighteen months beginning in 1954, 1.3 million children were tested, of whom about half had trachoma, and another quarter conjunctivitis. Among a captive and disciplined child population, the campaign was a success.

In 1956, the campaign began to embrace children outside the schoolroom. Taiwan had a higher proportion of children in school than in most other Asian countries; nonetheless, trachoma was a disease of poverty and a campaign to get rid of it had to reach deeper into the community. The schools invited people to come for eye examinations and issued tubes of ointment for use at home. The teachers and students kept records and visited in the community to see that the ointment was correctly applied. But for all its precise organization, the trachoma campaign in Taiwan was a disappointment. Although the incidence of the disease had dropped, it did not decline nearly so far as had been expected.

By the end of the decade 6.5 million Asian children had been treated. Worldwide, millions of children's eyesight had been protected, but new trachoma cases continued to appear at the same pace.

Both the behaviour of people and the behaviour of the virus were responsible. The virus had proved a more changeable adversary than anyone had expected. Without a careful study of the way it behaved in each different environment, no single version of antibiotic treatment could be guaranteed as effective. There was no one drug, applied in a set pattern of doses, which could be recommended as the standard global cure. In Taiwan, a variety of treatment schedules, continuous and interrupted, were tried in what was a more organized society than many, but still the rate of relapse was high. The Taiwanese campaign, a model by comparison with some others, was a poor proposition by normal cost-benefit standards. Assistance to this and other campaigns was wound down while more comprehensive research was undertaken. Trachoma was not after all a suitable case for the mass campaign.

If, at one level, the technical problem had proved more complex than had been expected, at another it was so simple that it ought to be possible to banish trachoma without recourse to such complex and expensive manoeuvres. The virus—like so many other unpleasant organisms—flourished in conditions of poverty and squalor. Quite simple measures of cleanliness would keep almost all of them at bay. Yaws and trachoma were

diseases unlikely to strike those who frequently came into contact with a bar of soap, a basin of water, and a clean set of clothes. In the case of yaws, it had been possible to substitute an antibiotic therapy because it offered a prompt and final solution. In the case of trachoma, it did not.

Unfortunately, most of the people of rural Asia, Africa and Latin America did not regard dirt as an enemy. On the contrary, most thought of 'dirt', indistinguishable from 'earth', as a close friend. The earth grew their food; earth, packed together, made floors, walls, houses, even furniture; people worshipped the earth as life itself. They knew nothing about the microscopic germs and parasites it harboured, organisms which swam in their drinking water, inhabited their homes, attached themselves to their skin, and wafted in the air they breathed. For perhaps more than half the world's people, disease came from somewhere else altogether. Its laws were mysterious, even mystical, immutable as the rising and setting of the sun. Sickness was to do with the Spirits or the wrath of the gods.

A clinical concept of health was often greeted with scepticism. It was hard to convince mothers that barefoot toddlers playing in muddy yards were leading a hazardous life. Or that eating rice with fingers that had just tended the buffalo was a dangerous practice. Even where people were persuaded that dirt was not on their side, that cleanliness was next to healthiness, they could not easily separate themselves from its invasion. Water was far from the house and had to be carried. Soap was expensive. But if only people could be persuaded to understand their significance, the expense and organizational complications of the mass campaign as a method of disease control would be bypassed. In the end the success of disease control depended as much on people's behaviour as it did on all the drugs and vaccines.

This elementary truth took some time to sink in. Most of the mass campaigns did not require much active co-operation from their targets, who simply had to line up—or be lined up—to receive their preventive or curative treatment. It was not easy to be certain that everyone who should be was in the line. But once in it, they became the passive recipients of what the health team delivered. The trachoma campaigns—except when the teacher was in control—were different. A tube of ointment was not an injection. People had to want to use it enough to spend time, effort, and sometimes their own money to buy it. That meant they had to make a judgement about its value against other priorities in their lives.

In every campaign, people—parents, teachers, children, adolescents—had to be willing participants to some degree or other. The greater the degree of independent action that had to be taken by people with little previous contact with the goods, services, and ideas of the modern world, the more unpredictable the outcome became. They often responded in ways which confused the health authorities, or the situation led to the kind of arbitrary action that more appropriately belonged to the days of

quarantine and the *cordon sanitaire*. Disease control posed questions about individual freedom and governmental action. In time, health propaganda and education programmes were developed to try and bridge the gap. But in the era of the mass campaign, they were still a weapon of the future.

In 1952, when at Unicef's request, WHO first tendered an opinion on what kind of assistance might be offered to countries trying to control or cure leprosy, the verdict was discouraging. Leprosy, the disease which had inspired the world's earliest and most notorious *cordon sanitaire*—the leper colony—was another disease of poverty and poor standards of hygiene. It, too, had been driven out of Europe as standards of living improved. Unlike so many others, in 1952 there was still no drug or vaccine which WHO could recommend for the mass treatment of this particularly-detested disease.

The leprosy bacillus invaded the nerves through the membranes of the skin, producing patches of completely insensitive light-coloured skin. The infection could be fast and virulent, or very slow-acting, lying dormant in the body for years. Its most conspicuous effect was that since it destroyed the feelings of pain which protect the body, injuries and burns easily occurred and deformity was progressive. The great ugliness of the disease, the lack of any treatment, and the belief that it was highly infectious meant that, down the centuries, the community continued to insist on the outcast status of the leper, and on his or her segregation with other similarly-cursed individuals.

The bacillus had first been identified in the laboratory in 1874, but its elusive behaviour in the human body and its refusal to be cultured in the Petri dish had slowed the pace at which it yielded its secrets to medical enquiry. The stigma which since time immemorial had attached to leprosy's victims seemed to invade even the scientific laboratory. By the early 1950s, it was known that most patients contracted leprosy only after a long and close association of the kind that a mother has with a child. But the exact circumstances of transmission were still not understood, nor how long or in which stages of the disease a patient was infectious. In the absence of such knowledge, it was still thought that segregation was inevitable in leprosy treatment. The children of a mother with leprosy, in keeping with a more primitive era of public health, were quarantined neither with their mother nor with healthy children and were therefore deprived of both normal family and school life. In Asia and Africa, most known patients were confined to leprosaria which, apart from the more humanitarian principles by which in the twentieth century they were run, did not mark a significant advance on medieval times.

Fortunately, the picture was rapidly changing. In 1953, soon after Unicef

had agreed to provide its first assistance to a leprosy project in Nigeria, WHO came up with some encouraging findings. A new drug—diammo diaphenyl sulphone—looked promising. Therapy took time; marked improvement took several months, and reducing the chances of infection to a negligible point might take years. The drug was, however, cheap and easily administered. If a patient received treatment every week or every month, over time the patches of leprous skin, the sources of infection, would disappear. Meanwhile family members, specially children, could be kept under observation and themselves be treated for any symptoms. With a cure, even one whose time span was so protracted, the prospects for leprosy control were transformed. No longer need a victim hide suspected lesions, fearing banishment once they were discovered. Health authorities could go out and look for cases with some hope that they would identify themselves.

Once leprosy became a prospect for the special campaign, many requests for WHO and Unicef assistance came forward. By 1955, Unicef was assisting eight programmes of which four were in Africa, the largest leprosy reservoir. Estimates of the number of sufferers, now that people were asking for treatment, were revised upwards from two million worldwide to ten or twelve million. The new therapy, on the other hand, meant that the costs of tending leprosy had dropped even more dramatically: treatment for 20,000 leprosy outpatients in Africa now cost the same as setting up a segregated farming colony for 2000. Most programmes depended on medical auxiliaries, the foot soldiers of disease campaigns, to travel a weekly or monthly circuit, hand out sulphone tablets at appointed places, and make regular reports on patients' progress.

By the end of the 1950s, trends in leprosy treatment had crystallized. Taking sulphone tablets over a long period had not proved toxic, as had been feared. Since there was no further need for the compulsory segregation of patients, the leprosarium could be relegated to the pages of history, and pressure was put on countries to repeal the relevant legislation. WHO and Unicef were no longer willing to provide help for segregated treatment. Medical opinion now even held that infectious mothers should keep their babies, who thus received a prophylactic dose of sulphone with their mothers' milk. A few settlements for those too elderly, and no longer able or willing to manage on their own, lingered on; nowadays, they have all but disappeared. Some facilities were converted into hospitals for surgical cases or rehabilitation of the disabled.

Alongside these encouraging developments, efforts were needed to keep up the momentum of the new kind of control programme. The three years it took to cure a patient—and sometimes it took twice as long—proved a stumbling block. During the first six months, patients rapidly improved. Once they felt better, it was difficult to persuade them to go on collecting and consuming pills for years on end. If they were in close touch with a

health centre, they could be easily given their regular dose of drugs and persuasion. But if, as was common in Africa, patients had to travel many miles on foot to pick up their supply, the effort was arduous and interfered with urgent farming and domestic tasks. Yet, without treatment, the disease would continue indefinitely on its slow and destructive course.

By 1960, it was thought that one-third of the leprosy patients in the world were undergoing treatment. The question then became how to ensure that patients not only started treatment, but went on until they were fully cured. Leprosy victims, as well as all those who came in contact with them, have been candidates for the public-health propaganda campaign. Although there is still no vaccine or quick-acting cure, what has been achieved in the generation since is truly remarkable. The stigma of leprosy, physically and socially, has all but disappeared.

By the end of the 1950s, almost half of Unicef's aid—\$12·2 million out of a total of \$25 million a year—was committed to mass campaigns against the insects, parasites, viruses and bacteria responsible for so much ill-health in so many poor communities and among so many children around the world. The campaigns made headlines; they were popular; they raised funds. But, as the experts were increasingly coming to realize, not everything about the mass campaigns was quite so perfect as their public relations image. After a decade of intense activity on many technical and geographical fronts, important lessons had been learned, some of whose implications had yet to sink in.

A lesson that had been fully absorbed was that rushing in with an expensive and difficult operation in a part of the world where there was still little in the way of organized institutional development could be wasteful and unwise. It was very difficult to make campaigns work in places where administration was weak or almost non-existent, where communications were poor and transport frequently broke down, where the number of trained professional staff was always fewer than it needed to be. Before any campaign was launched in such an environment, a survey must be carried out in advance to establish the pattern and amount of the disease in the specific place it was thought to be a problem; then the campaign must start on a small, experimental scale until procedures which would work among the whole population—or at least had a reasonable chance of doing so—were operational.

Another important lesson was one that everyone had always paid lip service to, but which now began to come home with fuller force. Mass campaigns against disease were conceived as interim solutions for reducing huge caseloads of infectious disease until such time as regular health services could be set up throughout the community. They were supposed to provide a short cut, a means of lifting the stranglehold of ill-health on

families and children, and on fragile networks of health centres and medical personnel shouldering too many overpowering burdens at once. The problem was that the mass campaign, in the way typical of short cuts, had other in-built hazards which threatened to turn it into a long cut after all. If the sharp and decisive stroke the mass-disease campaign was meant to deliver became long, repetitive and inconclusive, then its justification was more difficult.

In many countries of the underdeveloped world, the mass campaigns were achieving remarkable successes in their early stages. But they were not able to sustain them to the point where the threat posed by parasite, vector, virus or bacillus was insignificant.

As the decade progressed, there was more and more talk about 'consolidation': to the need to incorporate disease control into basic health services so that the cases which had been dormant, the survey candidates who had been away, the infants who had not yet been born at the moment when the teams came round, could still be looked after. Until this point was reached, it was argued, the mobile teams would have to go on plying their rounds.

Here was a serious contradiction. While disease campaigns absorbed heavy proportions of a country's health budget, not just for a short period but for many years, there were fewer resources for building health services. Yet no campaign manager wished to withdraw his troops from the field if to do so might mean a resurgence of the disease they had spent many years trying to roll back.

Another important lesson from efforts which were in many cases the first, vital point of contact between a government's health services and far-flung communities was the response of the people themselves.

Where they found painful sores disappearing as if by magic, they would celebrate and invite their saviours to join them. But cause and effect was not always so clear-cut. Every programme which sets out to alter people's behaviour, even if the benefits are apparently self-evident, runs into resistance. Among communities in traditional societies, the resistance is greater because over the years people whose margins for error are very narrow have devised solutions to life-threatening problems which they depend on and are most unwilling to give up.

They have no guarantee that 'help' from outside will not dry up as quickly as it appeared—if it was useful in the first place. The teams arriving in the jeep may understand neither the nature of their true problems, nor the new problems their apparently foolproof solutions will create. Only the mutual understanding which develops when there is some kind of permanent medical presence in the community can allow the health service to interact properly with the ill-health it is trying to combat. In the end, not just for first aid and for the general care of the mother and child, but also for preventing and treating cases of communicable disease, services in the

community were to prove more important than flying visits from mobile teams.

The days of the mass application of the mass campaign were drawing to an end. But there was one campaign, the largest of them all, which did not learn the lessons soon enough: the campaign against the malarial mosquito.

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