BUGS, DRUGS & SMOKE

Stories from Public Health

World Health Organization

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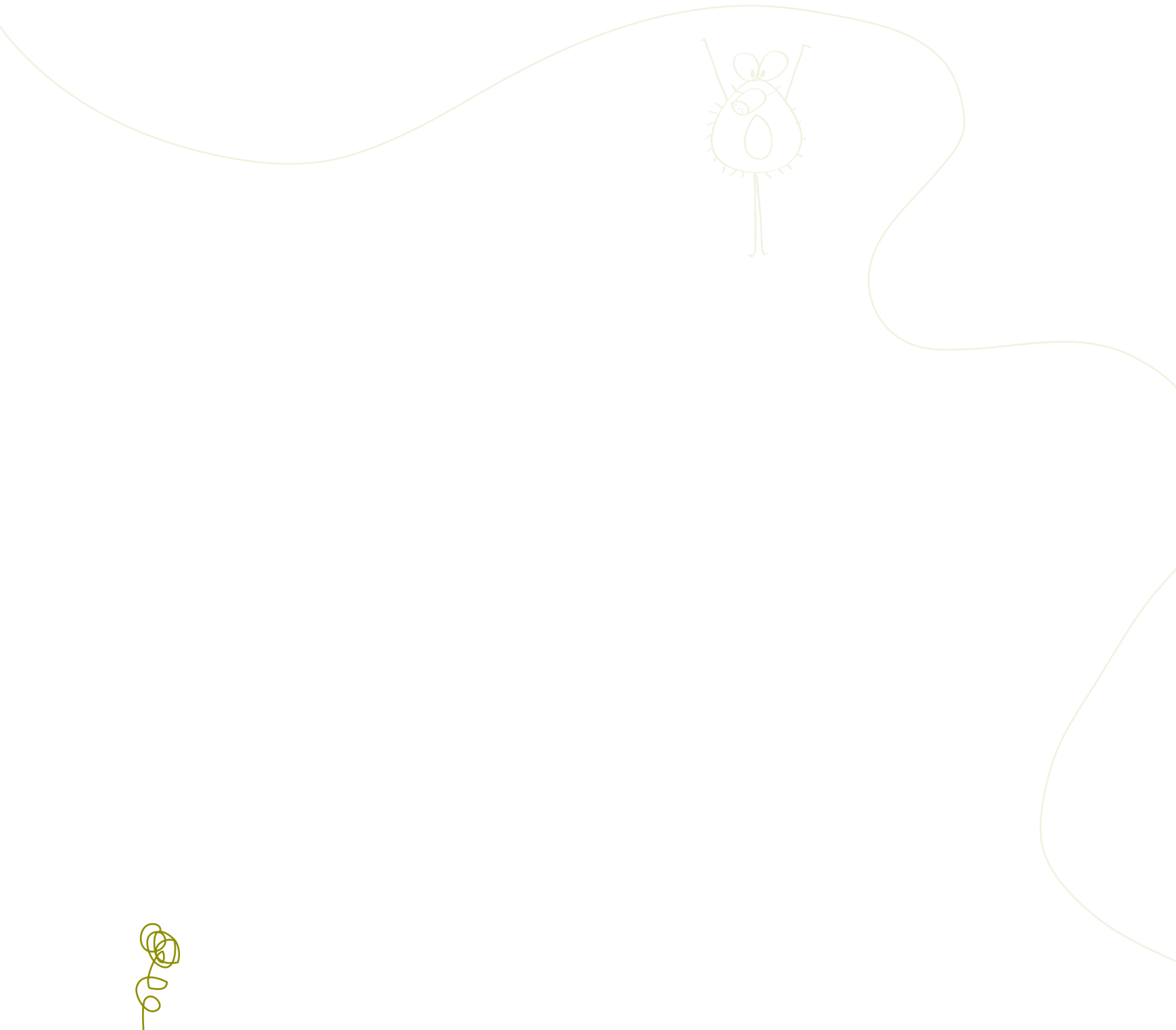
PREFACE

Since the World Health Organization (WHO) was founded in 1948, the world has changed dramatically and so too has its health. But while some scourges (e.g. smallpox and polio) have subsided, others have made a comeback (e.g. tuberculosis) and frightening new diseases (e.g. Ebola and Marburg) have appeared.

This book is primarily for young people, especially those interested in working in public health. It explains in simple, non-technical language how humankind developed techniques to protect the health of communities, drawing on first-hand interviews with leading public health figures. It covers a wide range of topics, from the control of infectious disease outbreaks to fighting the stigma attached to mental health conditions.

These narratives, told from many parts of the world, show how individuals, communities, institutions and countries can improve people's health when they work together. They show the role that WHO has played in providing countries with the technical support and coordination to make progress in health possible.

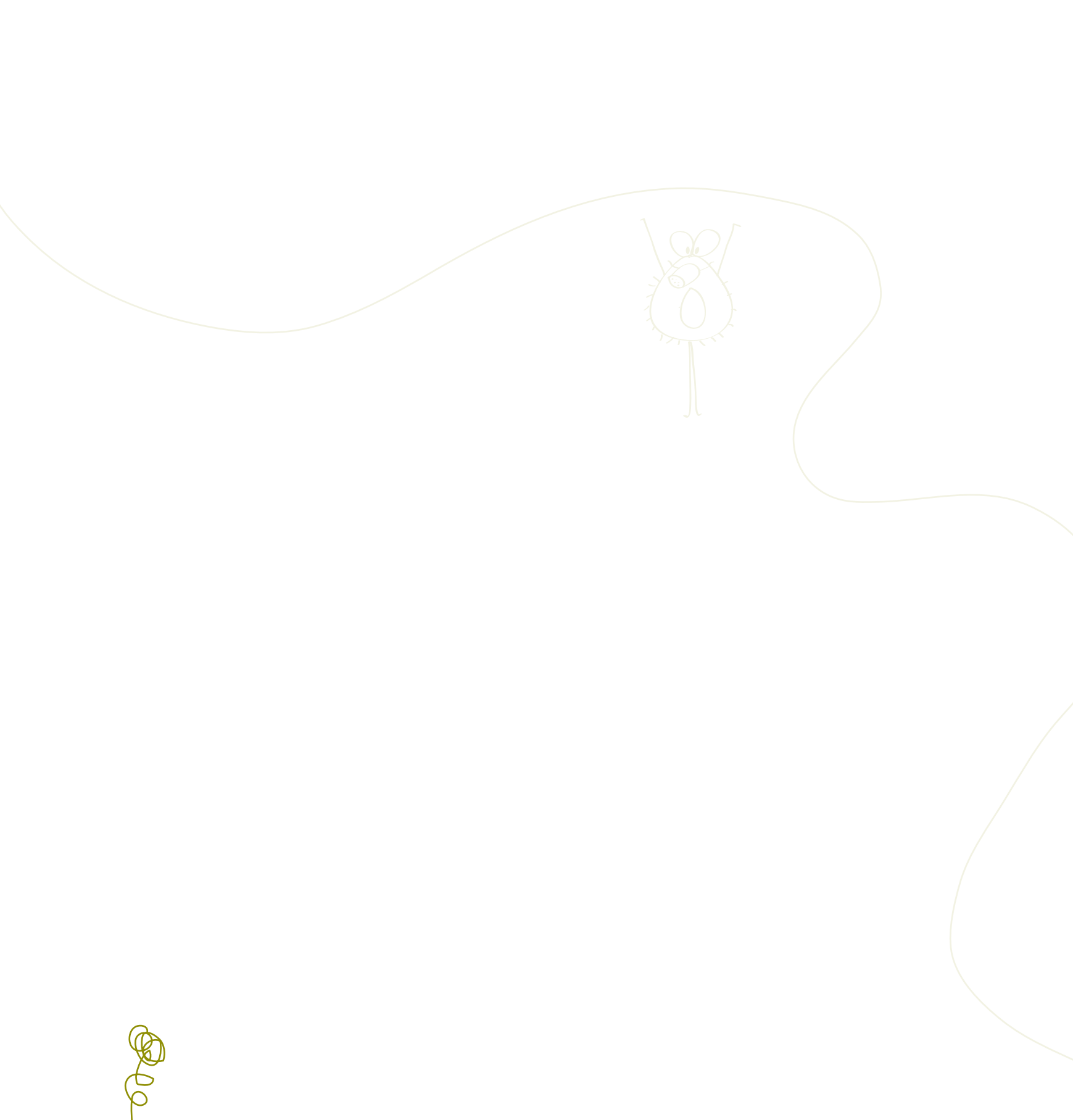
December 2011



CHAPTER 1

SMALLPOX

eradicating an ancient scourge



1

SMALLPOX

eradicating an ancient scourge

When countries gather for the World Health Assembly each year one question often comes up: whether or not to destroy the last remaining stocks of the smallpox virus. That is a choice we have thanks to the relentless pursuit of the smallpox virus by health workers across the world.

Eastern Nigeria, December 1966. The message came through on the radio – a crackly transmission carrying news of a smallpox outbreak in the bush. The missionaries had set up a ham radio network covering parts of the Ogoja region of eastern Nigeria where they were working in support of the country's national smallpox campaign. Every day at 7 pm they tuned in to share news and check that none of them had fallen ill. The report ended with a request for Dr William Foege to come out to the village and take a look. Foege had his doubts. He had been working in Nigeria as a medical missionary long enough to know that chickenpox was sometimes mistaken for the far more serious disease. However, he knew that only around 35% of the population was supposed to have been vaccinated against smallpox in that region. And an outbreak, even if only rumoured, was too important to be ignored. So Foege and his team set off that day, bumping their way over rutted roads, eventually finding the village 15 km from the highway.

Photo 1.1. Somalia, 1970s. A mother holds a child whose body is almost entirely covered with smallpox pustules

WHO/J. Breman

As always when the imposing two-metre tall Foege showed up, a crowd gathered. Foege spoke to the head of the village and was taken from hut to hut, registering the scared faces and looking for the tell-tale signs of smallpox. As with chickenpox and measles, a person with smallpox develops a rash.

Unlike the chickenpox rash which develops over a couple of days, smallpox comes up very quickly in a rash that is also more dense on the face, hands and feet. The red spots swell, filling with fluid until the pea-sized poxes become hard. As the disease progresses, the pustules continue to erupt under the skin, spreading over the face, body and hands until the victim's body is almost entirely covered (Photo 1.1).

It didn't take long for Foege to validate the report. This was indeed smallpox, and now he had a problem: fresh supplies of the vaccine and more vehicles were not due to arrive for several weeks. Whatever Foege and his team were going to do, they would have to do it quickly. That night he and his colleagues decided that the first step was to get a picture of the extent of the outbreak. They started by using a map to divide the area around the affected village into manageable sections. Then they got on the radio and called on other missionaries to send runners to the surrounding villages to find out if they had more cases.

Once they had an accurate map of the epidemic, Foege and his team went into the affected villages and, using the limited supplies, vaccinated people who hadn't yet caught the disease, ring-fencing the hot spots with a barrier of immunity. It was a good start, but on its own was not going to be sufficient to stop the disease. There were going to be travellers who had no idea they were infected and who would spread the virus around the region. Foege knew that the battle against smallpox would be won or lost depending on how well his team handled these cases.

Foege learnt that people regularly traded goods at designated locations, each market serving several villages. With this information, he mapped out local transportation and trade routes. What was left of the vaccine was committed to building rings of resistance in the areas he had mapped out that were most likely to see new cases. At the end of the first week Foege's response to the outbreak was in place. Now all he could do was watch and wait.

When WHO was founded

In 1948, when the World Health Organization (WHO) came into being, the smallpox virus was infecting about 50 million people a year – the equivalent of the population of South Africa. In many ways, it was exactly the kind of adversary that WHO was expected to take on – a global heavyweight of disease that was beyond the scope of any individual nation to combat.

Caused by the variola virus, smallpox is one of the most devastating diseases known to humankind (see Box 1.1 Fact file – smallpox). Prior to 1960, smallpox ranked with malaria and tuberculosis as the main causes of death due to infectious disease. In 1967, there were around 10–15 million cases of smallpox in the world each year, a figure which had dropped from around 50 million cases a year in the 1950s. One group of experts has estimated the global death toll from smallpox during the 20th century to have been around 300 million. This contrasts with, for example, a recent estimate by the *New York Times* that 100 million people died during the 20th century either directly or indirectly as a result of war and armed conflict.

The fear that smallpox struck in people was extraordinary. Until the vaccine was developed and widely available in the 20th century, many societies – independently of each other – developed a technique known as variolation. This involved inoculating a healthy person with the dried scabs of someone with smallpox, giving that person a mild form of smallpox. But the method was not without risk, 1–2% of those variolated in this way died, compared with up to 30% of people who died when they contracted the disease itself. Smallpox was so frightening that people were prepared to risk death to become protected.

Box 1.1. Fact file – smallpox

What is smallpox? Acute contagious disease caused by a virus.

Origin: 3000 years ago in Egypt or India.

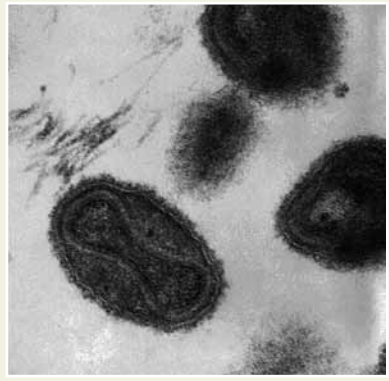
Virus family: *Poxviridae* or poxvirus.

Forms: Variola minor (killed one in 100). Variola major (killed one in three).

Transmission: Airborne droplet.

Cure: There is no cure, but vaccination can be used very effectively to prevent infection from developing if given during a period of up to four days after a person has been exposed to the virus.

Life after eradication: Virus stocks kept in high-security Russian and USA laboratories.



CDC

The smallpox virus

Photo 1.2. USA, 1960. Russian scientist Viktor Zhdanov (right)

WHO/M. Rude

Photo 1.3. India, 1962. Freeze-dried smallpox vaccine being prepared at the King Institute of Preventive Medicine in Madras (today Chennai) in the Indian state of Tamil Nadu

WHO/P.N. Sharma

Governments first seriously discussed the possibility of eradication in 1953 at the annual World Health Assembly, but there was little enthusiasm for the idea. Sceptics pointed to several failed attempts to eradicate other diseases, including hookworm at the turn of the 20th century, while efforts to stamp out yellow fever had been called off in 1932, when scientists discovered that monkeys were regularly being infected with the virus, thus putting it out of reach of an eradication campaign targeting humans. The World Health Organization's own campaign to eradicate malaria was just getting under way in the 1950s – a massive undertaking that succeeded in some countries of the Americas, Asia and Europe, but failed in Africa.

Given widespread doubt in the 1950s that any disease could be eradicated, it required someone with more than just technical knowledge of smallpox control to give WHO's programme its first real impetus. Soviet scientist, Viktor Zhdanov, was just such a man. Speaking at the World Health Assembly in 1958, Zhdanov, an epidemiologist by training and deputy health minister of the what was the Soviet Union at the time, called for the total eradication of the virus (Photo 1.2).

Inspired by Soviet success

Coming from anyone else, this might have seemed like a dream, but Zhdanov carried considerable influence. He had seen smallpox contained in the Soviet Union in the 1930s, and although the disease remained a problem in the central Asian republics where cases were coming in from Afghanistan and Iran (today the Islamic Republic of Iran), Zhdanov saw no reason why Soviet successes could not be repeated elsewhere. He proposed a four-year global vaccination campaign starting in 1959.

Apart from his own experience of running an eradication campaign, Zhdanov also brought his belief in a technique known as lyophilization or freeze-drying (Photo 1.3), which had been developed during the Second World War to meet demand for reliable stocks of dried blood plasma. Research in the 1950s had shown that several pharmaceutical products could be preserved in this way. Smallpox vaccine was one of them.

Freeze-dried vaccine is easily transported and can be reconstituted when needed, unlike polio vaccine, for example, which has to be refrigerated, greatly

complicating the task of getting it into the field. Zhdanov believed that freeze-dried vaccine would be an essential tool in WHO's smallpox eradication programme, and said his own government was ready to furnish WHO with supplies.

The Soviet Union was not the only country to have contained smallpox. Most other industrialized nations had done so by this time too, but the disease remained endemic in many developing countries (see Box 1.2 From widespread to wiped out). Zhdanov convinced WHO Member States of the merits of his plan and at the next World Health Assembly, also in 1959, they voted unanimously in favour of starting a global smallpox eradication campaign. The idea was for countries to take the lead in terms of carrying out the eradication programme with technical support from WHO. In the years that followed, many less developed countries embarked on their own mass vaccination campaigns and several, including China, eliminated the disease at home, but elsewhere it continued to take lives (see Box 1.3 A virtuoso performance). This was especially true of India, Indonesia and Pakistan and countries in sub-Saharan Africa. Meanwhile WHO's campaign was hampered by a lack of funding.

Box 1.2. From widespread to wiped out

Diseases that infect large numbers of people in a certain area and that can remain stable over a period of time are called 'endemic' diseases. A disease may have been eliminated from one country or region while remaining endemic in another. For example, China eliminated endemic smallpox by 1961, but the disease remained endemic throughout the Indian subcontinent.

So how do public health experts know when a disease has finally been destroyed for good? According to the World Health Organization, disease eradication – when a disease has been completely wiped out worldwide – means that "no further cases of a disease occur anywhere, and continued control measures are unnecessary". Smallpox was eventually eradicated in 1977 based on joint measures of disease control and surveillance.

Box 1.3. A virtuoso performance

What do Chinese opera, ice-cream coolers and chalkboards have in common? These – and other unusual devices – were deployed to tackle the last major outbreak of smallpox in China.

When the disease broke out in the county of Cang Yuan, in the province of Yunnan in 1959, one of the biggest challenges health workers faced was to reach the communities affected. Vaccinators had to cross the remote, mountainous region on horseback to get to these isolated villages because there was no public transport system.

Ministry of Health, China

China, 1961. A doctor vaccinates children in Taihu Hospital, Jiangsu Province

People living along the 4061-km border between the Chinese province and Myanmar, the Lao People's Democratic Republic and Viet Nam, were particularly affected by the killer disease. Armed with ice-cream coolers to store the vaccine, health workers set about vaccinating the entire population.

They faced many difficulties. There were not enough health workers, so they had to train locals to do the vaccinations. Some people resisted vaccination because they believed that local healers could cure smallpox by chanting – a tradition known as *koradji* – to drive out spirits. It wasn't easy to explain to the people – most of whom were illiterate – how smallpox was prevented. So to educate them, the lyrics of local songs were changed and Chinese opera performances were staged to explain how vaccination worked. Health workers also used chalkboards and posters to educate people about the disease.

Their efforts were not in vain. In March 1961, China's last case of smallpox was confirmed – a 23-year-old man, Hu Xiaofa.

Campaign gets a boost

Photo 1.4. Ethiopia, 1972. Dr Donald A. Henderson (right) examining vaccination scars on children during case-finding operations

WHO

By the end of 1966, smallpox was still circulating in 31 countries and territories. Frustrated by the lack of progress, in 1966 governments finally secured annual funding of US$ 2.4 million for what was termed an intensified global smallpox eradication effort. It wasn't a huge amount of money and governments didn't allocate the funds with any great enthusiasm. At that time, the public health community had plenty of reasons to be sceptical about stamping out diseases – the struggling malaria campaign being just one of them.

Fortunately, positive forces were at work. For one thing, the United States of America had stepped up its commitment to the programme. In 1965, President Lyndon B. Johnson announced that his country would fully support a programme to eradicate smallpox in 20 countries of west and central Africa and backed the idea of global smallpox eradication. In 1966, he sent one of the country's top epidemiologists, Dr Donald A. Henderson, to Geneva to head WHO's Smallpox Eradication unit (Photo 1.4).

Like Zhdanov, Henderson had considerable experience in the field. He had been the head of disease surveillance at the Centers for Disease Control and Prevention (CDC) in Atlanta, USA, with particular responsibility for the planning of smallpox eradication and measles control programmes to support countries in west and central Africa. A forceful man, he was just the kind of person needed to push the programme forward.

But he did not join WHO willingly. "I was reluctant to take on the job because of my commitment to the smallpox and measles eradication campaign, which had just been launched only a year before in west and central Africa, and which I was running," Henderson recalls. "Secondly, there wasn't a lot of money assigned to this – US$ 2.4 million wasn't even enough to buy the vaccine we needed. Beyond that, nearly half the delegates in the World Health Assembly were doubtful about undertaking the programme in the first place." The delegates were not alone. WHO's director-general at the time, Dr Marcolino Gomes Candau, believed that smallpox eradication was unachievable, a programme which "could serve only to undermine the organization's credibility". Candau had been informed by experts that to eradicate smallpox, at least eight in 10 people had to be vaccinated. From his

own experience in his native country, Brazil, he knew this was impossible in vast, inaccessible places, such as the Amazon region.

Despite his misgivings, Henderson went to work at WHO headquarters in Geneva where he launched the Intensified Smallpox Eradication Programme on 1 January 1967 that was to provide technical assistance to countries' smallpox eradication campaigns. From the outset, Henderson considered the accurate and timely reporting of cases to be an essential element of a successful campaign. At that time, this systematic collection and analysis of data known as surveillance was not the standard approach it is today. Surveillance and containment are in other words the identification and isolation of known cases and vaccination of their close contacts. These were the key approaches that Henderson and his team recommended in a manual they published in preparation for CDC's campaign in west and central Africa, to provide support to countries working to eradicate smallpox. In contrast, however, the WHO campaign Henderson took over was, at least to begin with, a programme committed to traditional mass vaccination of populations thought to be at risk in countries where the disease was still established.

Mass vaccination means pretty much what it says: vaccinating, as far as possible, every man, woman and child, although WHO experts at the time recommended vaccinating at least 80% of the population to achieve protection in a given population known as herd immunity. It was an approach that had proved successful in western Europe and North America, as well as in Japan and other countries. Indeed, many vaccine-preventable diseases, like smallpox, are controlled by achieving this high level of immunization known as herd immunity (see Box 1.4 Herd immunity).

For the campaign to work, WHO needed to be sure of two things: that the vaccine was of good quality, and that it was reaching all the areas where it was needed. Donations of vaccine were coming in from several

Box 1.4. Herd immunity

Vaccines have been proved to be one of the safest biological preparations. Millions of people have been vaccinated all over the world against numerous diseases with relatively few adverse reactions. However, there are some people for whom vaccination may not be safe. These include pregnant women and people with allergies, some skin conditions and diseases that weaken the immune system, such as HIV/AIDS.

That is why the concept of herd immunity is important. It means that even if a small proportion of the population is not vaccinated, by vaccinating most and reaching herd immunity, the unvaccinated people have a very low risk of becoming infected. This is because the chain of transmission of the disease has been reduced to a level that is too low to maintain.

So, for example, about 90–95% of the population has to be vaccinated to prevent measles from spreading to the remaining 5–10% who are unvaccinated. For polio, this level – known as the herd immunity threshold – is 60–97%. For smallpox, the level was about eight people in every 10.

Box 1.5. Vaccinia – the first vaccine

Smallpox is famous for being the first disease that humankind eradicated, but it will also be remembered as the first disease for which we created a vaccine.

But before we had a vaccine, a technique known as variolation had been in use for centuries. People in China, India, Turkey and other parts of the world would introduce scrapings of smallpox sores into healthy people. Most of them became immune, but between about 1% and 2% of those variolated in this way died.

WHO/S. Furnell

Switzerland, 2008: A cow

The discovery of smallpox vaccination is generally attributed to the English physician Edward Jenner, who in 1796 noticed that milkmaids never seemed to get smallpox because they had caught what he thought was cowpox. Jenner set out to prove this. He scratched the arm of an eight-year-old boy called James Phipps and deliberately infected him with cowpox pus taken from a blister on the hand of a milkmaid. A few months later, he infected the boy using pus taken from a smallpox patient. The boy didn't develop the disease. The cowpox had made him immune. It was not until 1938 that another scientist, Allan Watt Downie, realized that cowpox did not make people immune from smallpox but a related virus, called vaccinia virus.

Jenner coined the term 'vaccination' from the Latin word for cow, *vaccus*. In the 1870s, almost a century after Jenner's work, French scientist Louis Pasteur developed preparations that protected people against rabies and anthrax. He coined the term 'vaccine' for this type of preparation in honour of Jenner's accomplishments.

countries, but not all of it was usable. To boost its stocks, WHO persuaded laboratories in Canada and the Netherlands to act as quality control centres, testing samples of all vaccine for the programme. Meanwhile, designated vaccine manufacturers produced a manual that laboratories in front-line countries could use to manufacture their own vaccine. As early as 1973, more than 80% of all vaccine for the programme was coming from countries where the disease was endemic.

Of course, it was one thing to have plentiful supplies of good vaccine, quite another to make sure that the vaccine was getting to and getting *into* the people who needed it. Vaccination technique hadn't changed much since the 18th century, when the smallpox vaccine was first discovered (see Box 1.5 Vaccinia – the first vaccine).

At the beginning of WHO's smallpox eradication campaign, vaccination was a crude scratching process that sometimes caused serious wounds. Whether it worked or not depended largely on the skill of the person doing the scratching. What WHO needed was a technique that didn't require expert delivery.

Saved by a 'sewing needle'

Scientists at CDC had developed a hydraulic-powered jet injector that could do 1000 vaccinations in an hour. It was impressive in the right conditions, but had a tendency to break down. The jet injectors were used in Brazil and west and central Africa in the first year of the intensified programme, but were soon pushed aside in favour of a simpler instrument – an industrial

sewing needle that delivered the vaccine not with the point, but with the eye, which was ground down to produce a two-prong fork (Photo 1.5). This became a perfect receptacle for holding a droplet of vaccine. All the field worker had to do was dip the fork into the reconstituted vaccine then make 15 rapid jabs on the upper arm with the needle held at a right angle to introduce the vaccine underneath the skin. Village volunteers required less than an hour's training to get it right, after which they were able to vaccinate as many as 500 people per day. The bifurcated needle had the added advantage of requiring only a quarter of the vaccine that the jet injector needed to deliver immunity (Photo 1.6).

In the first year of the intensified programme, 44 countries reported 131 789 cases of smallpox. The countries where the disease was endemic were Afghanistan, Brazil, India, Indonesia, Nepal, Pakistan and most of the countries in sub-Saharan Africa. Staggeringly, it later emerged that only about 1% of all cases were being reported in 1967, suggesting that a more realistic figure for smallpox cases that year was somewhere between 10 and 15 million. But as already stated, health data were less reliable and abundant than they are today.

To say that what WHO and the endemic countries were trying to achieve was daunting would be a serious understatement. Even homing in on a single country such as India, which at the time had a population of around 600 million people, many of whom lived in rural areas, the challenge of mounting a successful mass vaccination campaign was enormous. Sceptics pointed out that even if one could vaccinate everyone in India, it was going to be impossible to cope with each year's wave of 20 million or so newborn babies, all prime candidates for infection.

Such arguments carried considerable weight until December 1966 and what happened in eastern Nigeria.

Photo 1.5. The bifurcated needle was about five centimetres long

WHO

Photo 1.6. Bangladesh, 1975. A volunteer vaccinates a small child with a bifurcated needle

CDC/WHO/S. Foster

Breakthrough in Nigeria

Foege's response to the eastern Nigeria outbreak was based on careful case reporting or surveillance and close containment, through targeted vaccination. That way, he and his colleagues managed to shut down the smallpox outbreaks in a matter of five months. Everyone located in the radius of an outbreak was vaccinated, encircling the disease to form a ring of immunity around it and to

prevent it spreading. The population of eastern Nigeria was about 12 million at that time and Foege and his colleagues stopped the outbreaks across the vast region by vaccinating only 750 000 of them. It was a remarkable achievement.

Foege was not the first to argue that eradication based on surveillance–containment could work. A similar approach had been used to control outbreaks in England in the 19th century. The approach, known as the Leicester system, relied on the same isolation or ring-fencing of known smallpox cases from the general population to break the chain of transmission.

But Foege succeeded in providing convincing evidence of how effective surveillance– containment could be in field conditions. Perhaps even more extraordinary and significant was the work of Dr A. Ramachandra Rao in the Indian state of Tamil Nadu a year later. With funds from WHO, Rao led a single team in surveillance–containment work across the state. Within six months they had halted smallpox transmission among its 41 million inhabitants. The eastern Nigeria experiment and the experience in Tamil Nadu pointed the way forward and set WHO's global eradication campaign on a new course. As Henderson puts it: "Even though we had been talking about surveillance–containment in 1966, we hadn't realized how effective it could be in the field."

Lessons were being learnt. Important information was flowing into WHO's head office in Geneva from campaigns across the globe. The increasing emphasis on surveillance containment began to bear fruit in country after country as smallpox began to recede across the world.

In Brazil, where the campaign had been run on a mass vaccination basis, people such as Dr Ciro de Quadros, who was working in Parana state in the south, started surveillance–containment campaigns that were pursued with extraordinary zeal. Almost four decades later Henderson recalls de Quadros's personal commitment with considerable warmth: "This man used to get reports from every single health unit and hospital in the state, then head out with his driver and vaccinator to do the containment vaccination." By 1971 smallpox had disappeared in Brazil.

Indonesia was also getting to grips with the problem. The government set up four 'fire-fighting teams' to tackle the disease in central Java where cases continued to arise. In a matter of months, cases dropped from several hundred a month to zero. Smallpox was also on the run in Africa, where by 1970 it had been extinguished in 20 African countries.

But as long as the disease remained at large, it could re-appear anywhere. This chilling fact was brought home in 1972 in Kosovo (when it was part of the Socialist Federal Republic of Yugoslavia). In February of that year, a 38-year-old man returned home from a pilgrimage to Iraq. He started to feel sick but was only diagnosed with smallpox after he had been in contact with his family. The result was an epidemic that infected 175 people and killed 35. The authorities launched a campaign to vaccinate the whole country – 21 million people. They worked so fast that 18 million were vaccinated in just 10 days. A combination of military roadblocks and intensive vaccination brought the outbreak to an end.

At the end of the decade, WHO was faced with a tantalizing prospect – that the surveillance–containment approach might be sufficient to stamp out the disease for good. But big doubts remained. It was one thing to contain outbreaks in sparsely populated eastern Nigeria, quite another to attempt the same thing in heavily populated India.

India – the last bastion

Foege went to India in 1970, joining Dr Nicole Grasset at WHO's South-East Asia Regional Office in New Delhi. Grasset had gained her field experience in Biafra, Nigeria, during the civil strife there (Photo 1.7). While employed at the Pasteur Institute in Paris, she organized, at the request of the International Committee of the Red Cross, three major immunization programmes for the prevention of measles, tuberculosis and smallpox. Grasset was a formidable presence, combining intelligence and drive with an absolute belief in the campaign's ultimate success. For Grasset, Henderson's and Foege's contribution was invaluable. To understand this, it is necessary to realize the extent to which experts in the early 1970s were bitterly divided over which approach to eradicating smallpox was the most effective: "One of the biggest problems we had in India," Grasset recalls, "was the view of some in the health ministry and other high-level health officials saying that what we should be doing was vaccinating in areas where the disease was not yet established," the idea being that these areas would then become bastions against the disease. But as Grasset points out, you don't fight fires by dousing the area around the burning building, you target the flames, and the hot spots where the flames are most likely to develop.

Photo 1.7. India, 1960s. Dr Nicole Grasset

WHO

Photo 1.8. India, 1963. Schoolboys take part in a national vaccination campaign

WHO/Satyan

In India, until the 1950s, more than a million people died of smallpox annually, while the disease blinded and disfigured many more, according to Dr Mahendra Dutta, who was a senior member of the health ministry's smallpox eradication department (Photo 1.8). Working with India's central and state governments, and a handful of nongovernmental organizations (NGOs), WHO provided India with technical support as it stepped up its surveillance–containment effort, and by the end of 1973 had chased the disease into four remaining states: Bihar, Uttar Pradesh, West Bengal and Madhya Pradesh. Despite progress, doubts remained about the global eradication campaign's ultimate success. "We were doing very well," recalls Henderson, "Latin America was free. Indonesia was free. It looked like Africa was pretty much free except for Ethiopia. But where we had the problem was India. So in 1973 we sat down with the Indian government and worked out a plan to visit every village in India, every house within a space of seven to 10 days. The idea was that if we could intervene early enough it would interrupt the chain of transmission."

The Intensified National Smallpox Eradication Programme was launched in India in 1973, and introduced, among other things, a set of surveillance and containment standards. They required 75% of cases to be discovered within two weeks of the first case and for containment proceedings – in other words targeted vaccination – to begin within two days of that case being identified. What this meant was that the veritable army of health workers committed to the India campaign – more than 135 000 people each week – had to work even harder.

India's health workers were supported by epidemiologists from diverse backgrounds. One was Dr Larry Brilliant, who in true 1970s style, was told by his guru that eradication of smallpox was God's gift to the world, and that he should get involved. Brilliant, who once headed the Google philanthropic foundation, was one of many WHO health-care professionals who joined the India campaign in 1972. Brilliant's co-workers searched schools and markets as well as Shitala Mata temples. People entering the temple to make an offering to Shitala Mata, the Goddess of smallpox, were followed back to their houses where his co-workers often found people with smallpox (Photo 1.9).

At times, the efforts in India looked like a military campaign. Occasionally WHO workers were called upon to use strong-arm tactics and forced vaccination, when there was resistance. But in general such methods were not

advised as they often resulted in villagers running away into the fields or fighting with vaccinators. And such incidents were rare. Moreover, Dutta recalls that rumours of resistance to vaccination were often unfounded: "Day after day in every village visited, the people were found panicky, as a number of cases, several of them fatal, had occurred, and they pleaded [with us] to provide vaccination."

The results of the intensified eradication programme were astounding. "Search teams found 10 000 cases immediately," Henderson recalls. For critics of the campaign, the sudden increase in reported cases was proof that the eradication efforts were not working, and never could work. But Henderson, Grasset and Foege knew the statistics simply reflected more accurate reporting of cases. They were convinced that by continuing to contain the outbreaks reported, better days would come, which they did.

The number of cases rose rapidly from January through May, eventually reaching the largest monthly total of cases since 1951. However, for Henderson, January and February were the turning point in the global campaign. "We had a structure and teams in place and I knew we were getting on top of it," he says. "And we knew that if we could defeat it in India, we could defeat it anywhere – in Bangladesh, in Pakistan and in Ethiopia."

And then came Bihar – a fertile state in north-eastern India. At the beginning of 1974 smallpox had burned through the north of the state, and, in the heat of the summer, a WHO team arrived in the industrial city of Jamshedpur (at that time a part of Bihar) where it was greeted with gruesome stories. In four days of intensive searching the WHO team, led by Brilliant, registered more than 2000 smallpox victims. To prevent the disease from spreading further, almost the entire city of Jamshedpur, which had a population of 600 000 at that time, was quarantined. Buses and cars were stopped at the city gates while vaccinators boarded trains leaving the city and worked through the carriages.

Convinced this time that the best way to get the wheels turning in India was to go right to the top, Grasset went to see Jehangir Ratanji Dadabhoy Tata, head of Tata Industries, and explained the situation. With the go-ahead from the prime minister Indira Ghandi, Tata committed a large number of his staff to the project – from assembly-line workers to nurses and managers – to search for and isolate smallpox cases, and then vaccinate the people who had recently come into contact with them.

Photo 1.9. Shitala Mata is the Hindu Goddess of smallpox – both the disease and the cure. She rides on a donkey and carries in her four hands a broom, a fan, a small bowl and a pot of water, which she uses to cure the disease. Shitala Mata means "cooling mother" in the Hindi language

WHO/S. Khamsi

The situation was complicated by the fact that people in hundreds of villages around the city had also become infected. One of these villages, occupied by members of the Ho tribe, refused to be vaccinated on religious grounds. With the support of local police, Brilliant once recalled how sometimes he and his co-workers had to forcibly vaccinate people, occasionally having to break down doors in the middle of the night to do so.

Operation Smallpox Zero

WHO launched Operation Smallpox Zero in 1975. This tightened the noose further, and the last case of the disease was reported on 17 May that year in Bihar. There had been many critics of the campaign. One – a WHO official – had even told Henderson that if the India campaign were successful, he would "eat a tyre off a jeep". At the successful conclusion of the campaign Henderson sent that person a jeep tyre. "I don't know if he ever tried to eat it," he says.

At this point the only country in the world still seeing outbreaks of variola major – the worst type of smallpox – was Bangladesh, India's eastern neighbour. Local fighting had broken out in the newly independent, but still fragile state, and the United Nations had evacuated all of its staff apart from its smallpox eradication team. The team searched for months, but found no more cases to report. In November 1975, WHO announced at a press conference that two months had passed since the last case in Bangladesh had been reported. At that time there were no known cases anywhere in the world. The following day, however, a cable arrived from Bhola Island, off the country's southern coast, to report new cases in the village of Kuralia.

A WHO team set off on a 24-hour journey by speedboat, steamer, jeep and finally on foot to reach the village, expecting to find cases of chickenpox. It turned out that a medical officer had failed to report several smallpox outbreaks. Indeed, when the team searched they found there had been outbreaks in three other villages that had since burnt themselves out. After narrowing their search, they found a three-year-old girl named Rahima Banu, who had become ill on 16 October.

To make quite sure she was the last case in Asia, the WHO team put Rahima in quarantine, posting guards at her home 24 hours a day while food and money were supplied to the family so that they would not need to leave the house. Everyone within a mile and half – about 18 000 people – was vaccinated and

every house was searched within a five-mile radius of Rahima's house. The team found dozens of cases of measles and chickenpox, not one of smallpox. Rahima survived. No other smallpox cases were found. It seemed that little Rahima Banu was indeed the last case in Asia.

Doctors from WHO collected six of Rahima's pox scabs – the last relics of a once mighty disease, which are now kept in a laboratory in the USA (see Box 1.6 Genie in a bottle).

After Bangladesh, the only country with smallpox was Ethiopia. It was already difficult, but when the civil war broke out in 1974 the challenge for vaccinators was daunting. Some rebel forces supported the eradication campaign, providing teams with a military escort. Others attacked smallpox workers and on one occasion killed two of them.

Smallpox teams travelled by helicopter, braving grenades and bullets to reach remote areas. One team was kidnapped with their Canadian pilot. They were released four days later. Petrus Koswara, a 43-year-old doctor from Indonesia, died in the field of a heart attack attributed to the emotional and physical strain. "This was one of the most difficult countries for the smallpox eradication effort," Henderson says.

While civil war raged in Ethiopia, WHO was about to fight its last battle

Box 1.6. Genie in a bottle

The eradication of smallpox, while clearly a blessing, has left one dilemma – what to do with the remaining stocks of the virus. As far as we know, they are kept in only two places on the planet: the Russian Federation's virology institute called VECTOR outside the city of Novosibirsk in Siberia and the Centers for Disease Control and Prevention (CDC), in Atlanta, USA. In both institutions, the virus is kept frozen and stored securely. So, it is nevertheless still with us – like a bottled genie with appalling powers.

In 1979, when WHO announced that smallpox had been eradicated, it recommended that vaccination against the disease should stop. By 1986 it had ceased everywhere. Then, WHO's Expert Committee on Orthopoxvirus Infections asked whether all stocks of variola virus should be destroyed. In preparation, scientists prepared a library of cloned DNA fragments of selected strains, and fully or partially sequenced the genomes of several prototype strains.

However, several developments have made governments reluctant to deliver the virus the final blow. In particular, they fear that terrorists might obtain smallpox virus stocks illegally and build biological weapons or 'bioweapons' that are designed to spread disease deliberately to kill whole populations. As far as we know, no 'smallpox bombs' have been built successfully. Such a bomb would be devastating because most people born since 1970 have not been vaccinated against smallpox.

Since eradication, some people fear that the bodies of those who died of smallpox in the permafrost wastelands of Siberia could thaw – due to global warming – unleashing the virus on the nearby population. That could cause a local outbreak that would spread fast across the globe, given today's unprotected populations. There are also fears that a laboratory somewhere in the world may have kept smallpox virus stocks – deliberately or simply without realizing it. In this case, a laboratory accident could also unleash the virus on an unprotected world.

In 1999, WHO's expert committee decided that the virus should be destroyed. But given these and other risks, the World Health Assembly decided that the stocks should be kept for research purposes. That's why the Russian Federation kept its stocks at VECTOR and the USA kept its stocks at CDC. Just in case the genie manages to leap back out of the bottle.

WHO

Container to keep smallpox virus stocks in high-security laboratory at the Centers for Disease Control and Prevention in Atlanta, USA

WHO/S. Marennikova

Soviet Union, 1987. Smallpox virus strains are stored in a sealed refrigerator at VECTOR, the State Research Center of Virology and Biotechnology, which was in the former Soviet Union and is today located in the Russian Federation

Box 1.7. The last case

Ali Maow Maalin was working as a hospital cook in the busy port of Merca, Somalia – a town of some 30 000 people on the Indian ocean. Maalin, aged 23 at that time, had worked as a vaccinator in the smallpox eradication programme, but he himself had not been vaccinated. On 12 October 1977, two children with smallpox from a nomad encampment were sent to an isolation camp near the town. The driver stopped at the hospital to ask for directions.

Maalin offered to accompany the driver. "He asked me if I had been vaccinated," says Maalin, now working for the Polio Eradication Programme in Somalia. "I said: 'don't worry about that. Let's go.'" Maalin says he was in contact with the infected children for no more than 15 minutes. But that was enough.

WHO

Somalia, 1977. Ali Maow Maalin, the last person to have naturally occurring smallpox in the world

Nine days later Maalin started to feel sick. After developing a rash, he was diagnosed with chickenpox and sent home. But Maalin had seen enough smallpox posters to know that what he had was not chickenpox. Even so, he was too scared to check in to the isolation camp. "I thought that I would die there," he says. In the end a male nurse from the hospital reported that Maalin was sick. Maalin did not go to the hospital, but remained at home.

The hospital had stopped taking patients while everyone inside, including the staff, had been vaccinated and were in quarantine. Meanwhile, a team set about vaccinating everyone in the 50 houses surrounding Maalin's home, later expanding this to the 792 houses. In all, 54 777 people were vaccinated in the following two weeks.

Isolated, the virus was unable to leap into a new victim. The cook from Merca was the last case of smallpox – variola minor to be precise – in a small outbreak that flared up just one year past

WHO's originally projected 10-year eradication target date. Since then, as far as we know, there have been no other cases of smallpox apart from a laboratory accident in the United Kingdom that triggered a small outbreak and caused one death in 1978. Smallpox was officially declared eradicated in 1979, two years after Maalin became ill. Maalin is the last person in the world to have contracted naturally occurring smallpox.

against smallpox on the country's border with Somalia. Teams had hunted down the last cases among the dispersed groups of nomads across the Ogaden Desert. In October 1976, WHO announced that Ethiopia was free of smallpox.

Seven weeks later, however, another outbreak was reported just over the border in Somalia, possibly brought by nomads from Ethiopia, and in 1977 an epidemic took hold. The Organization mounted an intensive search and containment programme in the spring and summer of that year, finally hunting down the last case of variola minor, the less lethal form of the disease, in the port town of Merca. The person carrying the virus was a 23-year-old hospital cook by the name of Ali Maow Maalin (see Box 1.7 The last case).

For the next few years, international commissions assembled by WHO visited each of the endemic countries to confirm that eradication was a reality, and in May 1980 the World Health Assembly announced that eradication had been achieved across the globe (Photo 1.10). For the first time in history, a major disease had been completely destroyed by human endeavour. The overall cost was around US$ 300 million, of which just under one third, or US$ 98 million, represented international assistance.

Photo 1.10. Switzerland, 1979. Scroll of the Declaration of Smallpox *(overleaf)*


نحن أعضاء اللجنة العالمية للإشهاد الرسمى باستئصال
الجدرى نشهد بأنه قد تم إستئصال الجدرى من العالم.

WE, THE MEMBERS OF THE GLOBAL COMMISSION FOR THE CERTIFICATION OF SMALLPOX ERADICATION, CERTIFY THAT SMALLPOX HAS BEEN ERADICATED FROM THE WORLD.

NOUS, MEMBRES DE LA COMMISSION MONDIALE POUR LA CERTIFICATION DE L'ÉRADICATION DE LA VARIOLE, CERTIFIONS QUE L'ÉRADICATION DE LA VARIOLE A ÉTÉ RÉALISÉE DANS LE MONDE ENTIER.

我们，全球扑灭天花证实委员会委员，
证实扑灭天花已经在全世界实现。

МЫ, ЧЛЕНЫ ГЛОБАЛЬНОЙ КОМИССИИ ПО СЕРТИФИКАЦИИ ЛИКВИДАЦИИ ОСПЫ, НАСТОЯЩИМ ПОДТВЕРЖДАЕМ, ЧТО ОСПЫ В МИРЕ БОЛЬШЕ НЕТ.

NOSOTROS, MIEMBROS DE LA COMISION MUNDIAL PARA LA CERTIFICACION DE LA ERRADICACION DE LA VIRUELA, CERTIFICAMOS QUE LA VIRUELA HA SIDO ERRADICADA EN TODO EL MUNDO.

Genève, le 9 décembre 1979

The smallpox legacy

Photo 1.11. Mexico, 1987. A child wearing a brace to support her leg that has been weakened by polio

WHO/L. Solmssen

Dr Halfdan Mahler, WHO director-general at the time, later described the smallpox programme as "a triumph of management, not of medicine". But given the numerous problems that had to be overcome, including shortages of funds and vaccine, dysfunctional or non-existent national health services, infected refugees fleeing civil war and famine, traditional beliefs, and all the problems posed by climate and difficult terrain, it might be said that the programme was also an extraordinary triumph of the human will – the kind of determination that was in evidence when doctors, carrying vaccination equipment on their heads, swam across rivers, emerging on the other side "with leeches clinging to their bodies," as Grasset recalls.

The lessons learnt during the smallpox eradication campaign were put into practice by doctors working in other fields. Years later, Grasset and eye doctors in Nepal applied surveillance–containment to successfully tackle xerophthalmia, an eye condition that can lead to blindness in young children.

Dr David Heymann, who was with WHO for many years, worked on the smallpox eradication campaign in the 1970s in India. He points out that a couple of years after the world was declared free of smallpox, a new, lethal disease that weakened the body's ability to fight disease by attacking the immune system reared its head – HIV/AIDS.

"If HIV/AIDS had fully emerged to its present prevalence while smallpox was still circulating, I am not sure if we would have been able to eradicate smallpox using the smallpox vaccine," Heymann says, recalling how a US soldier in the 1980s became ill and died after being vaccinated for smallpox, because he was HIV positive. Since then, no new smallpox vaccines have been developed that are suitable for people with weak immune systems. If HIV had become widespread earlier, smallpox itself may have become lethal for people with HIV, just as tuberculosis and pneumonia are today.

The smallpox campaign was not only an achievement in itself, it also inspired other major public health successes. For example, the Expanded Programme of Immunization which covered vaccination for six major

childhood diseases – diphtheria, pertussis (whooping cough), tetanus, polio, measles and tuberculosis when it was launched in 1974 and to which many countries have recently added vaccination for hepatitis B and *Haemophilus influenzae* type b or Hib (Photo 1.11).

Of those, polio – a viral disease that can cause paralysis particularly in children – is the next major target for eradication. As Heymann points out, smallpox was easier to eradicate in many ways. "Smallpox was easy to diagnose. Once someone was infected, the symptoms appeared quickly and were clear. Polio, for example, often shows no symptoms, making it harder to track and vaccinate the people who are in contact, or at risk of contact, with those who are infected." The vaccine for smallpox was effective, protecting around 95% of the people, and easy to administer. The polio vaccine cannot be freeze-dried and reconstituted, like that for smallpox, and requires refrigeration.

Despite the difficulties, the polio campaign has gone well. In 1988, when the initiative began, there were more than 350 000 cases in 125 countries. Since then, the number of cases has fallen by more than 99%, and the polio virus continues to circulate in four countries – Afghanistan, India, Nigeria and Pakistan, which have in turn re-infected a number of other countries that had been polio free. But snuffing out the last remaining traces of the disease is proving difficult. With about 181 cases reported in the first six months of 2011, public health officials are hopeful that a final push by the remaining endemic and re-infected countries could see an end to the disease in the near future (Photo 1.12). A new vaccine targeting wild poliovirus serotypes in a single dose was launched in 2010 to tackle these last remaining strongholds.

The smallpox campaign laid the foundation – based on a mixture of surveillance and containment and mass vaccination – for controlling other vaccine–preventable diseases. "Many of those who run immunization programmes are former smallpox eradication leaders. Indeed, the emphasis given to immunization today is largely a result of the deliberate efforts made with one of the most cost-beneficial interventions available in medicine – immunization!" Heymann says, adding: "Immunization programmes have been some of the most successful and cost-effective means of fighting diseases in the last few decades."

Those programmes are ongoing. ■

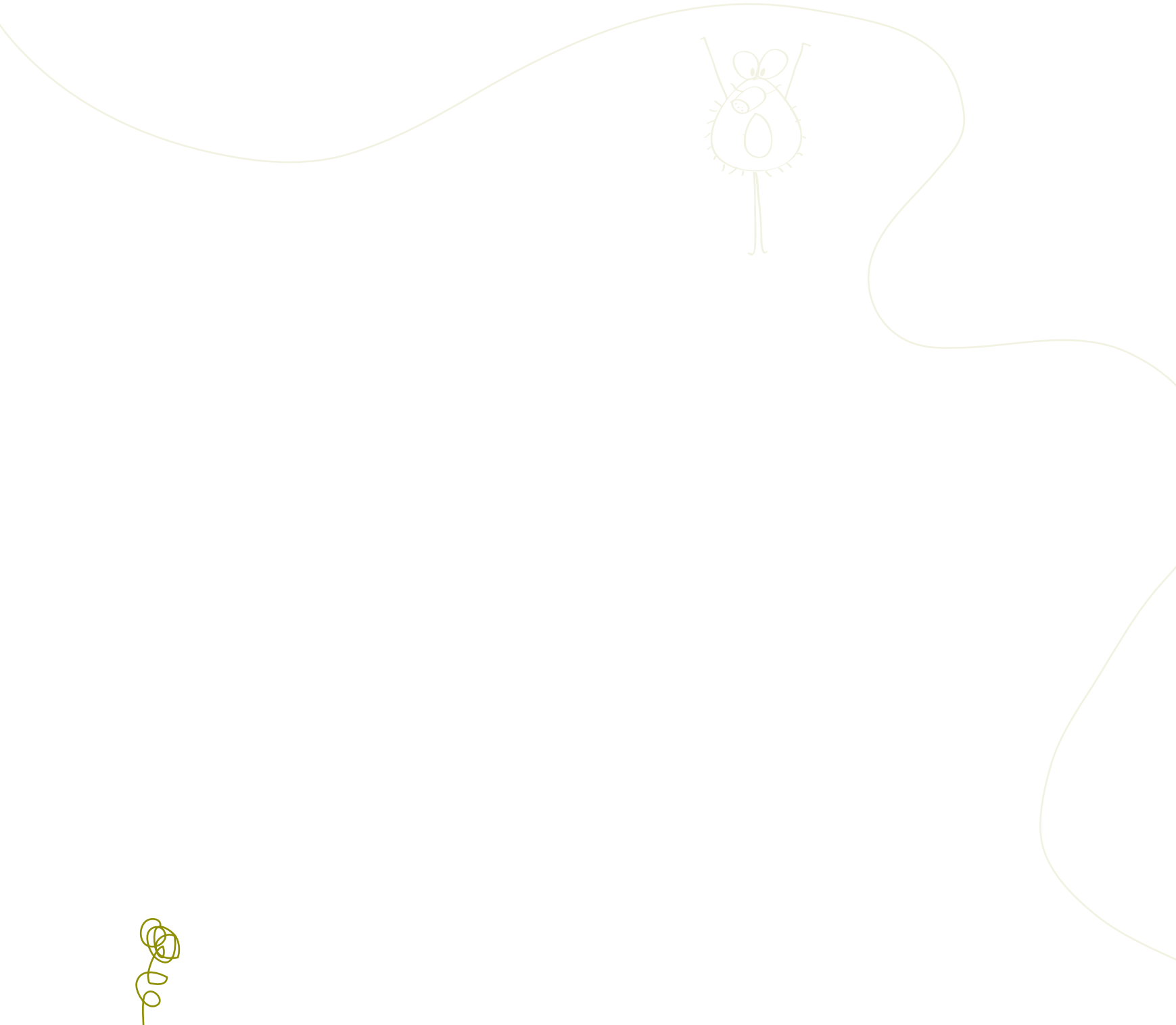
Photo 1.12. Côte d'Ivoire. Child proudly holds up her vaccination certificate

WHO

CHAPTER 2

ORAL REHYDRATION SALTS

a miracle cure



2

ORAL REHYDRATION SALTS

a miracle cure

About 50 million people owe their lives to oral rehydration salts solution, once described as 'potentially the most important medical advance' of the 20th century. Yet for years champions of the treatment at the World Health Organization and in the field were resisted by a sceptical medical establishment.

Bangaon, India, May 1971. There seemed to be no end to them. Every day, Dr Dilip Mahalanabis watched thousands of people cross the border from what was then known as East Pakistan and now is called Bangladesh. They were refugees from the war of independence from Pakistan: men, women, children; a mass of half-starved humanity shambling like sleepwalkers in the heat. By the end of May, as temperatures soared to 40 °C and humidity rose to a stifling 90%, more than nine million refugees had crossed into India. It seemed to Mahalanabis that most of them had come to Bangaon (Photo 2.1).

The sheer number of hungry mouths would already have put a strain on the limited infrastructure of this rural area. But the refugees not only brought hunger, but

Photo 2.1. India, 1971. Refugees from former East Pakistan, now Bangladesh, seeking shelter, food and medical attention at the Bangaon refugee camp, West Bengal

D. Mahalanabis

also sickness, and one in particular, a disease that thrived in the muddy, slow-draining delta of Bangladesh – cholera. In colonial times, British doctors said that cholera killed a man quicker than he could dig his own grave, and this was only a slight exaggeration. Without proper treatment, the disease can kill a person in a matter of hours, flushing the fluids out of the body in a watery stool.

The human body is mostly water and needs constant replenishment to stay alive. One of the most important ways the body absorbs and secretes water and salts is through tiny channels in the walls of the small intestine – a mechanism that allows the absorption into the bloodstream of nutrients from digested food. Mahalanabis studied cholera for several years at the Johns Hopkins International Center for Medical Research and Training in the Indian city of Kolkata, and made a close study of this process. He knew exactly how the cholera bacterium, *Vibrio cholerae,* turned off the body's water supply like a hand closing a tap (Photo 2.2).

Cholera lives in the plankton of salt and fresh water. The bacteria enter the body in contaminated food or water. Most of the bacteria are torn into pieces by the stomach's burning acids, but the few that get past enter the small intestine, grow, and swim through the pasty mucus that lines the small intestine. They then attach themselves to the wall and secrete a poison known as cholera toxin, which causes channels in the intestinal wall to open. This is where the damage is done. Salt leeching out through the channels carries with it water that causes the liquid stool known as diarrhoea. Adults have been known to produce as much as six litres of liquid a day. The loss of salts, which must be

maintained at a certain concentration for the body to function, is just as damaging for the body. The diarrhoea flushes bacteria back into the environment where the cycle begins again.

Cholera thrives where there are no proper toilets or sewers to carry away human waste and where clean drinking-water is in short supply. To a certain extent, the disease is also seasonal, taking advantage of warm, wet conditions, like during the monsoon season in Bangladesh (see Box 2.1 From Bengal to Bangladesh).

Raining sickness and fear

Watching the refugees pour into Bangaon from war-torn Bangladesh, Mahalanabis knew the monsoon was only a month away and he feared what the rains could bring. The problem was that he and his colleagues in Kolkata and Dhaka, Bangladesh, did not have an effective weapon to fight diarrhoeal disease – at least, not yet.

It was thought that a 'silver bullet' like the smallpox vaccine might be found for cholera, but vaccines against the disease had turned out to be a big disappointment. They provided only partial protection for a short period of time and caused mild reactions.

Instead, Mahalanabis and other researchers focused on the problem of rehydration – how to get fluids back into a cholera patient, and get them to stay there. The obvious solution was to force the patient to drink litres of water, but that didn't work because the fluid went through the digestive system too quickly to be absorbed by the body's tissues.

Since the beginning of the 20th century doctors had been using another method. If the cholera bug was stopping the small intestine from passing fluids into the bloodstream, why not go round the intestine by injecting salty fluids known as saline directly into the patient's veins? This approach, known as intravenous or IV therapy, had proved to be effective in hospital conditions, allowing patients to be rehydrated quickly. But outside the hospital environment it had several shortcomings.

Keeping everything sterile and getting a needle into a vein required some medical know-how. Given that most cases of diarrhoea occurred in developing countries where there was limited access to doctors and nurses, this

Photo 2.2. Burma, 1984. Dr Dilip Mahalanabis (far right) visiting a village health centre in Burma (now Myanmar) to promote oral rehydration therapy

Courtesy of Dr D. Mahalanabis

Box 2.1. From Bengal to Bangladesh

1946 The Bengal region of colonial India is partitioned into East Bengal and West Bengal.

1947 East Bengal becomes part of a new country, Pakistan.

1955 East Bengal is renamed East Pakistan, although it shares no borders with Pakistan.

1971 East Pakistan declares independence from Pakistan and forms the People's Republic of Bangladesh.

presented a big problem. Moreover, diarrhoea – whether or not it was caused by cholera – mainly affected children under the age of five. Trained paramedic or not, it was difficult to get an IV needle into an infant's tiny veins. Finally, there was the issue of cost. The fluid used had to be properly prepared in sterile conditions. All this posed logistical problems and cost money.

An alternative to IV was needed, and doctors like Mahalanabis thought they had one. It was based on a discovery that had been made several years earlier by doctors in two major research centres in the region: the Johns Hopkins Center for Medical Research and Training in Kolkata and the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B) in Dhaka. In its simplest form it involved giving the patient a mix of sugar – known in science as glucose – and salt in water. The doctors in Kolkata and Dhaka called it oral rehydration salts solution and it had only ever been used by specialists to treat adult cholera patients in hospitals. But Mahalanabis, who had worked on oral rehydration as part of his research in Kolkata in 1966, thought it might be effective in children too. Having experimented with oral rehydration and achieved a decrease in patient fatalities from 50% to zero by the late 1960s, the doctors at the International Centre were also convinced it was an effective treatment (see Box 2.2 Kolkata or Calcutta?).

The reason the solution was so effective had to do with the chemical properties of sugar and salt. As stated earlier, simply giving a cholera patient salty water by mouth has no effect because the cholera toxin prevents the intestine from absorbing it. Not only that, the presence of salt in the intestine makes the problem worse, pulling water out through the intestinal wall. But – and here is the simple miracle of it – if sugar is added to the salt solution in the right proportions, all the chemistry changes. What happens is that the sugar and salt molecules become a co-transport coupling mechanism. Even in its poisoned state, the intestine will continue to absorb sugar, and because the salt is attached to it, the intestine absorbs that too. And with the salt goes the water. The result: rehydration.

Box 2.2. Kolkata or Calcutta?

Kolkata is the Bengali name for the city Calcutta, the capital of the Indian state of West Bengal. During the late 1990s, the state government, backed by writers, poets and artists, campaigned to change the city's name to reflect the language and culture of its inhabitants. The proposed change was accepted by the Indian government and came into effect on 1 January 2001. Kolkata followed the example of other Indian cities, such as Mumbai, which changed its name from Bombay in 1995, and Chennai, formerly Madras, in 1996.

WHO/P. Almasy

India, 1960. Open drains, such as these in Calcutta (now Kolkata), may carry human waste and can therefore spread diseases like cholera

As effective as the technique appeared to be, at the beginning of the 1970s many people doubted it could work in the field without trained medical staff. Meanwhile, those who were interested in the approach, such as Dr Dhiman Barua, the World Health Organization cholera specialist, were warned by the medical community not to put oral rehydration in the hands of inexperienced staff. But Barua had seen what had happened during a cholera epidemic in 1932, in what later became Bangladesh. "I was about 11 years old at the time," he recalls. "People died like flies, whole families were just wiped out. And the problem was we didn't have the saline needed to treat them."

Barua didn't want others to experience what he had witnessed in 1932, but the situation did not look good. The seventh cholera pandemic had started in Indonesia in 1961 and, at the beginning of the 1970s, WHO was bombarded with requests for help as more and more countries became affected (see Box 2.3 Seven cholera pandemics). "I remember receiving a telegram from Africa, in which a consultant said, 'I see children swimming in the cholera stools of their parents'," Barua says. "The situation was desperate." People were asking for thousands of tons of IV saline, but the cost of providing the product to the 40 countries afflicted with cholera was more than WHO's budget could support.

Barua talked to doctors in Dhaka, Kolkata, and in the Philippines capital, Manila, to see if oral rehydration was a workable alternative. But the unanimous verdict was that this treatment should be left in the hands of experienced health workers. In the 1950s, before the technique was fully understood, early attempts to use oral rehydration in the USA had resulted in the deaths of several children from excess salt. Doctors feared that allowing unqualified people to dispense rehydration therapy could result in similar incidents.

Box 2.3. Seven cholera pandemics

Cholera-like diseases have been described in ancient Chinese, Greek and Sanskrit literature. Since the 19th century, cholera has been particularly associated with the fertile Ganges river delta, with its labyrinth of waterways and swamps. Seven cholera outbreaks have sent waves of the disease across the world. In 1817, an outbreak was reported in the Jessore district of India (now in Bangladesh). From there, it travelled along trade routes throughout Asia and to the shores of the Caspian and Mediterranean seas. By 1823, the disease had receded to the Ganges delta, where it remained endemic.

One of the worst cholera years on record was 1854 when 23 000 people died in Great Britain alone. That was also the year that English physician John Snow first demonstrated the link between contaminated water supplies and the spread of cholera. Another milestone in the fight against cholera came in 1883 when German physician Robert Koch – one of the first doctors to study bacteria – first isolated the *Vibrio cholerae* bacterium that causes cholera, while studying outbreaks in Egypt and India.

The seventh pandemic originated in Indonesia and was caused by a different strain of the bacterium, termed 'El Tor'. In 1970 it spread to Africa where it remains a problem today.

The risk of cholera outbreaks often intensifies as a result of conflicts, disasters and other crises where there is a lack of clean water and sanitation. For example in the aftermath of the Rwanda crisis in 1994, outbreaks of cholera caused at least 48 000 cases and 23 800 deaths within one month in the refugee camps in Goma, the Congo.

Photo 2.3. Aluminium foil packets of oral rehydration salts

WHO

Photo 2.4. Sudan, 1980s. A child with diarrhoeal disease in the rehydration ward at Wad Medani Hospital

WHO/D. Henrioud

The World Health Organization took the warnings seriously and responded by organizing crash courses in administering the solution, and published a document that included a chapter on oral rehydration. In Geneva, where the Organization has its headquarters, WHO also persuaded a pharmaceutical company to solve the problem of packaging the salts, which tended to form cakes inside the packages that were unusable. It was discovered that if the packs were made of aluminium foil of the right thickness, the mixture lasted for a long time and stood up to transportation (Photo 2.3). The new packets were sent out to affected countries with instructions for proper use. These were all moves in the right direction, but it wasn't until after 1971 that a global shift in attitudes took place. It wasn't until after what happened in Bangaon.

A desperate decision

The rains came in June, and the cholera came with them. The steady trickle of cases that Mahalanabis and his team treated, suddenly swelled into a full-blown outbreak as the refugees poured into the camp. By mid-June it had swollen to around 350 000 people, and was admitting 6000 new people per day.

Mahalanabis and his team set up wards in two cottages in the camp, which had 16 beds. The doctors singled out the most severe cases as they were brought in, then hooked them up to IV saline. The therapy worked wonders, but there were too many sick people, and, as always, not enough saline. Mahalanabis called for more supplies from Kolkata, which was not far away. Soon trucks arrived bringing IV saline, but in a matter of hours it had been all used up.

One in three people succumbed to the disease. The children were too weak even to cry. Some of them were only a third of their proper weight, little bundles of stick-like limbs attached to a hugely distended belly (Photo 2.4). Frantic calls for more saline brought more trucks. Soon a continuous convoy of trucks was running between Bangaon and Kolkata. But no matter how much saline the convoy brought, it was never enough.

A couple of weeks into June, it became clear to Mahalanabis that they were losing the battle. Something had to be done. The decision was taken to start administering oral rehydration salts solution on a massive scale, even though that meant handing it to people with no medical training. It was a

huge decision to make, one that went against the prevailing wisdom among the medical establishment in Dhaka and Kolkata.

But Mahalanabis saw no other choice, and he decided on a simple rehydration formula made of sugar, salt, and bicarbonate of soda, ingredients that had been found to be effective in severe cholera cases. He later wrote that he would have included potassium, a mineral that is essential to nerve and muscle function, if there had been enough of it available, but that wasn't the case.

It was essential to get the quantities of each ingredient right, particularly salt, which could kill a child if there was too much. There was no room to put together tons of oral rehydration salts solution at the refugee camp. "We converted the library at Johns Hopkins Center into a factory," Mahalanabis recalls. "We brought in drums with side-taps, filled them up and sent them to the field. We were essentially using people to experiment on. But we were pushed to the wall. We had no choice." Staff weighed the correct proportions of sugar, salt and bicarbonate of soda and put the mixture into plastic bags along with instructions on how to dissolve it in water. The bags were then sent to Bangaon.

At the camp, Mahalanabis organized the staff into two groups. One group was given the task of treating the very sick, who were given IV saline to increase their fluid levels as quickly as possible. The job of dispensing the solution was given to everyone else – paramedics, friends and relatives (Photo 2.5). The instructions were very simple: as soon as the patient was able to drink – give him or her the solution.

In a sense, Mahalanabis had set in motion a huge experiment involving thousands of critically sick people. Over the next few days he watched for the tell-tale signs of hypernatraemia, a condition caused by excess salt in the bloodstream. It went well at first, but then the high salt content of the mixture began to make people vomit. This was particularly a problem in infants and small children. Adults presented other problems. As they became more hydrated and regained their strength, they started calling for plain water. Sometimes it was necessary to force the solution into patients, even feeding it through the nose.

One of the biggest challenges was getting paramedics and family members to administer a sufficient quantity of fluid, especially in the first stages of the disease. When someone died, it usually turned out that the patient had not received the massive amount of fluid needed.

Photo 2.5. India, 1971. A relative collects oral rehydration solution to give to a patient at the Bangaon refugee camp

D. Mahalanabis

However, as the days went by fewer people died, but patients still kept pouring in. There was so little room that Mahalanabis was forced to discharge many patients after only 24 hours and supply them with packages to continue rehydration treatment at home. But the treatment had been so effective that few patients came back. Mercifully admissions began drop to below 60 per day in the latter half of July. By the end of August, Mahalanabis knew that the worst of the cholera outbreak was over.

It was a stunning victory. Mahalanabis and his team had treated more than 3700 people during the peak period, and fewer than four in every had 100 died. The staff from the Johns Hopkins Center had treated 1200 people of whom only 12 had died – a remarkable 1% death rate. If proof was needed that the approach worked, Bangaon had given it.

However, despite these exceptional results many doctors continued to be sceptical, recalling how problematic the solution had been earlier. Later, when Mahalanabis produced a paper describing the Bangaon outbreak, several medical journals refused to publish it. Fortunately, the events at Bangaon had been witnessed by someone who was not so easy to ignore.

The Organization's cholera specialist, Barua, had visited Bangaon during the crisis and what he had seen there amazed him. Here was a supposedly problematic therapy being administered by people with no training whatsoever. "They had these big five-litre packets of the salts which they mixed in drums that had a tap on the side, and then everyone just helped themselves to it with a cup," Barua remembers. It was beyond simple. It was basic – a treatment that could work anywhere in the developing world.

As a treatment for cholera, oral rehydration solution was more than promising, but for Barua it went way beyond that. After all cholera was not the only bug that caused diarrhoea (see Box 2.4 The bug brigade).

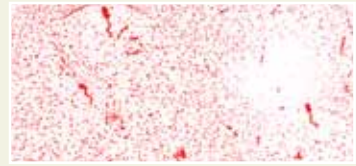
Box 2.4. The bug brigade

Bacteria, viruses and parasites – tiny agents too small to be seen with the human eye – can all cause diarrhoeal diseases as well as many other diseases. Most of these are spread by contaminated drinking-water and food due to poor hygiene and sanitation.

The bacteria that most commonly cause diarrhoea are *Campylobacter* spp. and *Salmonella* spp., which are both found in food products derived from animals, particularly poultry, and *Shigella* spp., which is transmitted through what is known as the faecal-oral route. This means that organisms excreted in human faeces contaminate people's hands and, in turn, their food.

Vibrio cholerae, the bacterium that causes cholera, is usually found in contaminated water but can be present in food too. *Escherichia coli* (better known as *E. coli*) is another significant bacterial cause of diarrhoea. The *Clostridium difficile* bacterium is the most common cause of infectious diarrhoea in hospital patients.

Several viruses are commonly associated with diarrhoea including rotavirus, norovirus, cytomegalovirus and viral hepatitis. Meanwhile, parasites such as *Giardia lamblia* and *Entamoeba histolytica* can also provoke the condition. These minute organisms enter the body through food, water or person-to-person contact, and lodge themselves in the digestive system.



CDC/ Dr William A. Clark

India, *Vibrio cholerae*. Leifson flagella stain (digitally colorized)

The condition can be provoked by several bacteria, as well as by a host of viruses and parasites. At the beginning of the 1970s, diarrhoeal diseases were the single major killer of children under five years of age worldwide. Barua believed oral rehydration had the potential to cut those figures.

To further test this hypothesis, Barua organized a clinical trial in rural centres in the Philippines where paramedics, after some training, treated children with acute watery diarrhoea with oral rehydration solution. The trial clearly demonstrated the acceptability, safety and effectiveness of this treatment and this finding provided a strong impetus to develop a global plea to promote oral rehydration solution to save lives (Photo 2.6).

Photo 2.6. Bangladesh, 1979. A father carrying his severely dehydrated daughter

ICDDR,B/A. Ansari

WHO's global campaign

First, Barua led an effort to establish a single oral rehydration salts formula to treat all episodes of acute diarrhoea among adults and children. It was an important breakthrough that greatly simplified discussions about the treatment, and enabled comparisons between countries. From that point, Barua put all his efforts into establishing a global campaign to fight diarrhoeal disease, and in 1978 WHO established the Diarrhoeal Diseases Control programme.

The main focus of the programme was children under five years. From the outset, WHO worked closely with the United Nations Children's Fund (UNICEF) to achieve its goals, as well as aid agencies of individual governments, notably that of Denmark, Sweden, the United Kingdom and the USA, along with nongovernmental organizations. Meanwhile, resistance and opposition to rehydration salts formula continued from paediatricians, child health specialists, trained in the developed world; it required years of patient persuasion to win their support.

One of the first things WHO did was to issue guidelines for the assessment and treatment of patients with diarrhoea. The diagnostic process was stripped to a few simple questions and a brief examination to identify symptoms with no medical instruments or laboratory studies needed. Three kinds of diarrhoea or 'syndromes' were recognized: acute watery diarrhoea, bloody diarrhoea (dysentery) and diarrhoea that lasted longer than 14 days (persistent diarrhoea). The Organization recommended that all three forms of the condition be treated with oral rehydration solution until the diarrhoea stopped. Importantly, WHO also recommended continued feeding of the patient, and

Photo 2.7. Burkina Faso, 2011. Breastfeeding is the best way of reducing the risk of diarrhoea in infants

WHO/F. Thompson

the limited use of antibiotics only for bloody diarrhoea or severe cholera. The guidelines were summarized on a one-page treatment chart, which later found its way onto the walls of almost every health facility across the developing world.

Countries were also helped to develop their own national diarrhoeal disease control programmes, and five years after WHO's Diarrhoeal Diseases Control programme came into being, 52 countries were launching their own plans. By 1986 that number had risen to 100 and eventually swelled to 130 countries, which were home to more than 99% of all children in the developing world.

Working together WHO and UNICEF made sure that these countries had a reliable supply of the solution, giving technical expert assistance where it was needed, helping them build factories and providing raw materials and packaging. By the end of 1985 more than 40 developing countries were manufacturing their own salts.

The development of national diarrhoea control programmes was a huge task. It required the training of hundreds of managers, tens of thousands of doctors, not to mention the veritable army of physicians' assistants and nurses needed to provide care for children with diarrhoea. The Organization developed training materials and, with its partners – particularly the International Centre for Diarrhoeal Disease Research, Bangladesh in Dhaka – supported thousands of courses. It also worked with medical and nursing schools to get the treatment guidelines into their curricula, and with publishers to include them in influential medical textbooks.

The Diarrhoeal Diseases Control programme was nothing less than an attempt to change global attitudes to an ancient problem, and to address every parent on the planet struggling to care for a child sick with diarrhoea. In some cases, this meant telling mothers how to care for their babies. For example, numerous studies have shown that one of the best ways to reduce the risk of diarrhoea in infants is breastfeeding (Photo 2.7). Studies in Brazil and Iraq show that the risk of severe diarrhoea and diarrhoea death increases 20 times for babies who are not breastfed. But breastfeeding in developing countries declined in the 1960s and 1970s, reflecting a global trend that was driven by corporations arguing for the supposed advantages of breast-milk substitutes over mother's breast milk. The decline in breastfeeding that resulted was particularly worrying in urban slums and shanty towns where diarrhoea was a major cause of death.

The campaign to change attitudes to treating diarrhoea was also difficult because mothers already used a range of treatments for diarrhoea. One of the biggest killers was the practice of starving the child to 'rest' the stomach, or to starve the microbe, worm or parasite. What parents didn't know was that, even during the worst case of diarrhoea, more than half the normal absorption of nutrients took place. Cutting off food altogether, just meant that the weakened child was suddenly deprived of its main source of recovery.

Therefore, WHO needed to make mothers understand that the main cause of death from diarrhoea was dehydration, and then convince them that oral rehydration was the best way to counter it. Perhaps not surprisingly, it turned out that one of the most effective ways of doing this was to have the mothers give it to their own child and see how rapidly the child improved.

Working closely with UNICEF, WHO used a variety of approaches to get the message across to the mothers who didn't come to the treatment centres, including teaching through the church or mosque, or by working with trusted figures in their communities. In some countries, this meant getting traditional midwives or schoolteachers to talk about oral rehydration (Photo 2.8). In other cultures, party officials or the heads of women's organizations spread the word. Where possible – in Egypt and India for example – television, radio and newspapers were also used.

Because oral rehydration treatment is so easy to administer, and based on an equally simple preparation of ingredients, it is perhaps not surprising that in many cases, public information campaigns brought about a big change in attitudes. In Bangladesh in 1984, for example, a public information campaign resulted in more than 50% of primary schoolchildren learning how to make the solution themselves, while in over 74% of homes, home-made solutions were being used to treat diarrhoea. This use of home-made solutions was a result of UNICEF's promotion of the use of household ingredients such as rice gruel, starchy soups or sugar and salt to prevent dehydration.

Photo 2.8. Bangladesh, 2006. A health worker counsels mothers on hygiene and nutrition

ICDDR,B/Bitu/Map

Continuing research

The World Health Organization also supported research into improving the oral rehydration salts formula. When new research revealed that substituting sodium citrate for sodium bicarbonate made the formula more stable – dramatically increasing its shelf life and making it cheaper to pack – WHO revised its guidelines.

Research into diarrhoeal disease control was not limited to improving the oral rehydration mix. By 1983, WHO's Diarrhoeal Diseases Control programme was backing 147 biomedical research projects, nearly half of which were based in developing countries. The development of effective and affordable vaccines against diarrhoeal disease continues to be challenging, although there have been encouraging developments to make new vaccines for rotavirus more accessible in some countries.

Meanwhile, other simpler measures have been developed that look promising. A series of studies in the 1990s and early 2000s showed that watering down the concentrations of some ingredients makes oral rehydration solution more effective. At field research centre of the International Centre for Diarrhoeal Disease Research, Bangladesh, children who had diarrhoea and were given a 10-day course of zinc tablets in addition to oral rehydration therapy had shorter episodes and 30% fewer relapses, and 20% fewer developed pneumonia, reducing non-injury death by 50%. Since 2004, these new findings have been included in the recommendations made by WHO and UNICEF for the management of diarrhoea. An programme run by the International Centre for Diarrhoeal Disease Research, Bangladesh, now aims to provide zinc tablets to every child under five in Bangladesh and many other counties are moving towards national coverage with zinc treatment of diarrhoea such as Ethiopia, India, Indonesia, Madagascar, Pakistan and the United Republic of Tanzania.

One of the biggest challenges faced by WHO's Diarrhoeal Diseases Control programme was getting a clear picture of the impact of diarrhoeal disease on the global population along with the effectiveness of oral rehydration solution. Monitoring and evaluation mechanisms were set up by WHO to find out the extent to which the solution was being made available to children under five years old, and what effect it was having on sickness and deaths due to diarrhoea.

The first reliable estimate of global mortality – i.e. the number of deaths – from diarrhoea among young children was reported by Dr John Snyder and Dr Michael Merson who showed that in 1980 diarrhoea was killing 4.6 million children annually, and was implicated in nearly a third of all deaths of children under five years of age. By the mid-1980s, surveys undertaken by 40 countries working within the Diarrhoeal Diseases Control programme showed that Barua's campaign was beginning to bear fruit.

Where only 6% of children under five had access to oral rehydration solution in 1982, around 33% were receiving it in 1985. The numbers were even more encouraging in WHO's Eastern Mediterranean and Western Pacific regions, where 40% of children were receiving the treatment, and in South-East Asia, where 66% were reported to be receiving it. All over the globe people were seeing a marked decline in deaths due to diarrhoeal disease. At the Massey Street Clinic in Lagos, Nigeria, for example, the number of child deaths due to diarrhoeal disease fell from 17% to 3% within seven months of setting up of the oral rehydration clinic there. By the mid-1980s, diarrhoea deaths were falling by between 40% and 50% in Egypt, Honduras, the Philippines and Thailand.

Snyder and Merson had shown that in 1980 an estimated 4.6 million children under five years died each year from diarrhoea, but by 2000 the number had fallen to around 1.8 million. By 2007, diarrhoea as a cause of death in young children had fallen from an estimated 33% of deaths to 18% since the 1980s. This drop is largely responsible for the decline in overall deaths among young children, from 14 million globally to just under 9 million during this 20-year period. It has been estimated that oral rehydration treatment saved 50 million lives in the past 25 years. One of the reasons the international medical journal *The Lancet* once described it as "potentially the most important medical advance of the 20th century".

Photo 2.9. Ghana, 2003. Building pit latrines helps reduce cases of diarrhoea

WHO/P. Virot

The real front line

Despite the enormous progress in saving lives, poor sanitation, unclean water (Photo 2.9) and inadequate education about hygiene in developing countries continues to be the root of the problem. Diarrhoeal diseases still kill around

Box 2.5. Necessity of a sanitary world

For people living in developed countries where proper sanitation and access to clean drinking-water are widely available, diarrhoea is little more than an occasional inconvenience. But for the 1.1 billion people who lack a regular supply of clean water and the 2.6 billion living without proper sanitation, it can be a killer disease.

Clean water comes from: public standpipes, tube wells or boreholes; protected dug-wells; springs; and rain water. Sources of water that are unsafe to drink are: unprotected dug-wells and springs; carts with a small tank; tanker trucks; and surface water, such as rivers, dams, canals and irrigation channels.

Proper sanitation decreases the chance of people coming into contact with human waste thus reducing the spread of disease. This includes toilets that flush waste into a piped sewer, septic tanks, and pit latrines that have a cover; latrines that circulate air to eliminate flies and smell; and composting toilets, which transform human waste into organic compost. But for everyone, including people with proper sanitation and clean water, one of the most effective ways of preventing disease is for people to wash their hands after visiting the toilet and before eating.

P. Virot

Malawi, 2003. Woman fetches water from a well

1.4 million children every year and children are still getting sick at roughly the same levels as they were back in 1970 – suffering on average three episodes of diarrhoea per year.

Oral rehydration treatment cannot stop children from getting sick, but it can prevent them from dying. For this reason, the front line in the war against diarrhoeal disease is not likely to be a vaccine laboratory. It will be a village well in Cambodia, or a standpipe in an Angolan shanty town (see Box 2.5 Necessity of a sanitary world).

In Ethiopia, only 40% of people have access to safe water, while less than a third has regular access to basic sanitation. For these two simple reasons, the average Ethiopian child suffers on average five to 12 episodes of diarrhoea per year, resulting in around 50 000 to 112 000 deaths every year. Real change in Ethiopia will come with programmes like the current initiative supported by nongovernmental organizations to build pit latrines.

Almost 90% of diarrhoeal diseases can be attributed to contaminated water and/or food, and inadequate sanitation and hygiene. It has been estimated that by improving the water supply it is possible to reduce death as a result of diarrhoea by up to 25%, while improving sanitation can cut diarrhoea

deaths by around a third. Hygiene education – which may be as basic as teaching people the importance of hand-washing – can reduce diarrhoea cases by around 45%.

The WHO designated the 1980s the International Drinking-water Supply and Sanitation Decade. During this period the Organization encouraged its Member States to improve water supply and sanitation, which resulted in an additional 1.6 billion people getting access to safe water. But that still left 1.2 billion people in developing countries without access to clean water.

In March 2010, a WHO/UNICEF report warned that the world was in danger of missing the Millennium Development Goal for sanitation by 2015. Given the prevailing outlook on the world's water supplies and sanitation status, oral rehydration salts solution is likely to continue to be an essential tool for saving lives (see Box 2.6 Fact file: oral rehydration salts (ORS) solution). ■

Box 2.6. Fact file: oral rehydration salts (ORS) solution

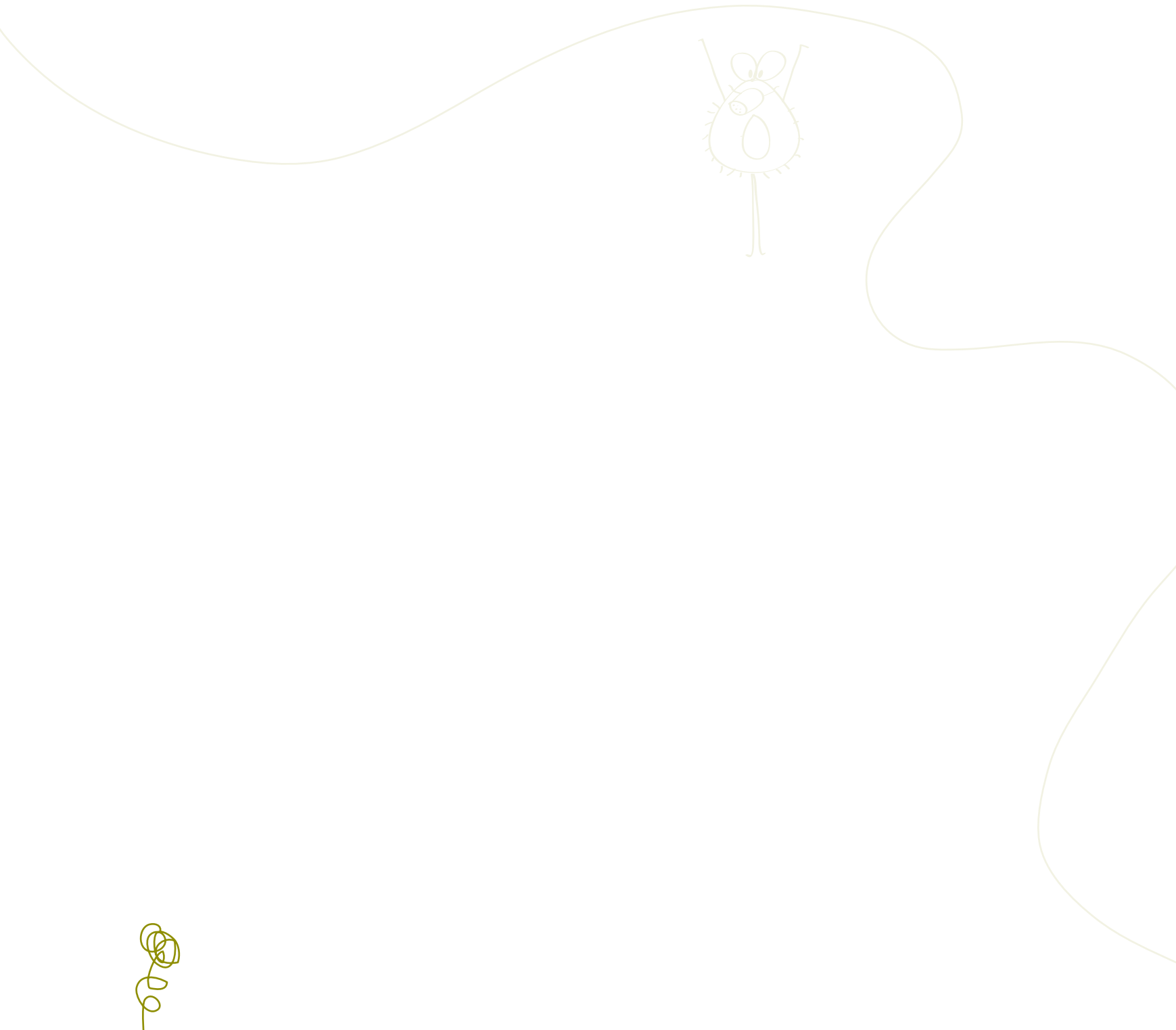
When was it first used on a large scale? In 1970, in a refugee camp along the Bangladesh border during the war of independence. In 1978, WHO issued a recommendation to use a single ORS formulation to treat clinical dehydration from acute diarrhoea of any origin and at any age, except when it is severe. In 1984, the mixture was changed (tri-sodium citrate replaced sodium bicarbonate) to make it more stable in hot and humid climates. Finally in 2004, the mixture was further modified (reduction in the concentrations of both sodium and glucose) to make it more efficacious (reduction in stool volume, vomiting and need for unscheduled intravenous drip to treat diarrhoea).

What is it made of? The solution is a glucose and salt-based formula, recommended by WHO and UNICEF for the treatment of dehydration due to acute diarrhoea irrespective of the cause or age group affected. The new ORS solution recommended since 2004 consists of a balanced combination of sugar (glucose), sodium, potassium, and tri-sodium citrate.

How does it work? Each component plays a special role that makes ORS effective. The sugar (glucose) allows the intestines to absorb the sodium, which in turn, drags the water into the intestinal cell and the body. Potassium replaces this essential ion, which is lost during diarrhoea and vomiting. Citrate is used to treat the high level of acidity that builds up in diarrhoea patients. The proportions of the different ingredients must be accurate, to ensure maximum efficacy.

How is the mixture packaged? In packets containing 20.5 g of mixture (to prepare 1 litre of ORS solution) made of aluminium foil to protect it from humidity. These packets are packed in boxes of 100 and shipped in overseas containers.

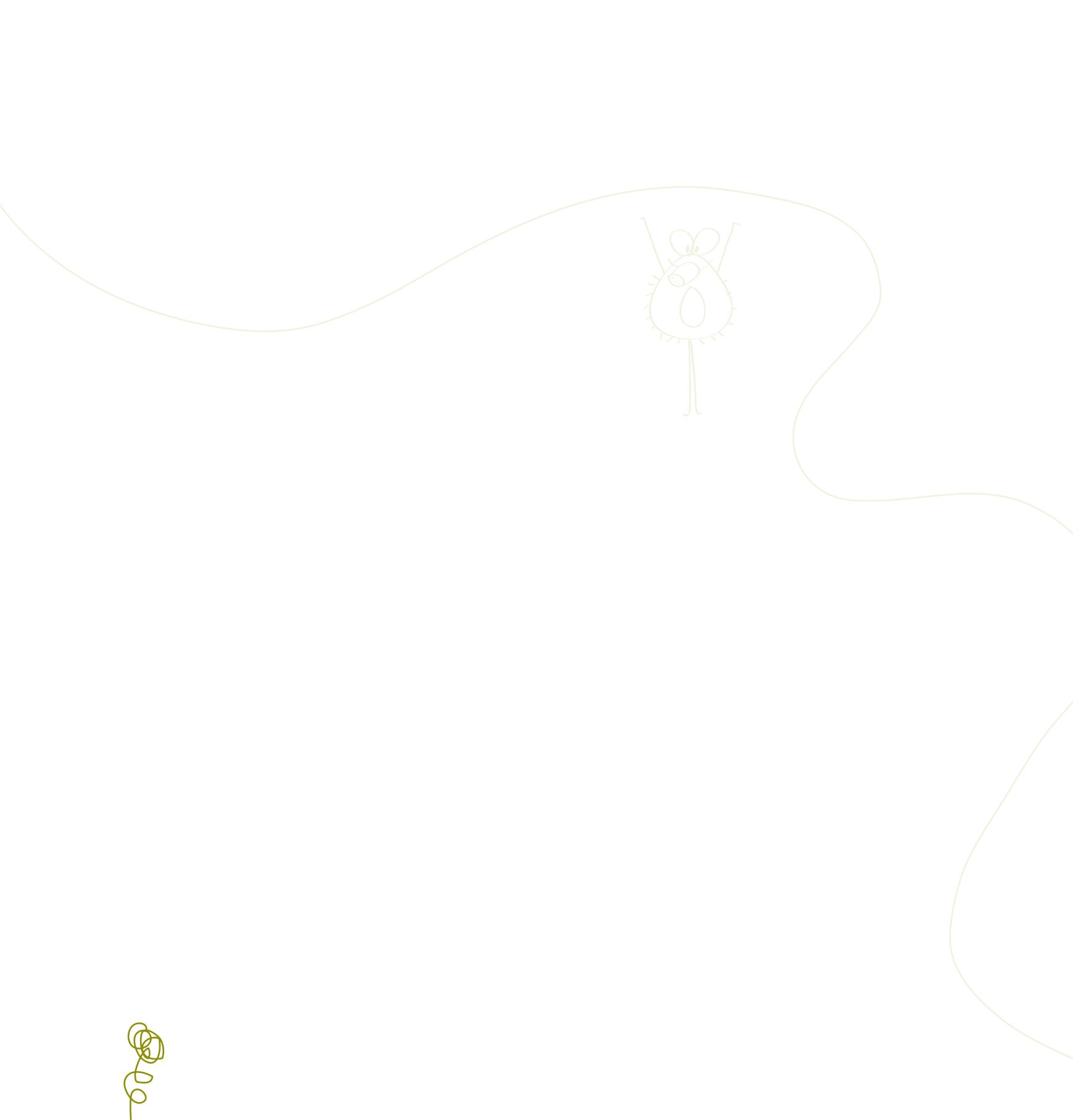
How are the ORS packets distributed? At the point of use, each packet is mixed in one litre of drinking-water. The packets can be delivered by village health-care workers and by mothers in the home, with some guidance. To prevent or to treat dehydration, ORS is used in every child with acute non-cholera diarrhoea, as well as adults and children with cholera. Along with proper feeding practices, and the administration of zinc supplements, as recommended by WHO and UNICEF since 2004, ORS treatment will lead to better weight gain, and thus reduce the adverse effects caused by diarrhoea in children.



CHAPTER 3

MENTAL HEALTH

unlocking the asylum doors



3

MENTAL HEALTH

unlocking the asylum doors

Equipped with modern health-care methods and a better understanding of mental illness, the World Health Organization and its partners are working to open the asylum doors. Much has changed in the past 30 years.

Bouaké, Côte d'Ivoire, 1982: Grégoire Ahongbonon was in a street when he had his revelation. "I was walking along and I saw a man, a mentally ill person, completely naked digging through a trash can for something to eat," he says. It was something that he had seen many times before in the streets of Bouaké and normally he would have crossed over to the other side and kept on walking. He was, by his own admission, afraid of people with mental disorders, a perspective he shared with many.

Ahongbonon is not a psychiatrist. In fact, he started out repairing tyres. "I also owned a taxi company," he says. "I was doing well. I owned my own car at age 24, but then I lost everything. I became so depressed I even considered suicide." But then the rediscovery of his religious roots turned him towards others.

Photo 3.1. Benin, 2007. Grégoire Ahongbonon (right) with a mental health patient

Fondazione Saint Camille

"I saw that it was Jesus Christ who suffered through this poor man," he says. "It forced me to question my fear." He walked up and asked if he could help. The man needed food and water. And he needed something else. After a series of similar encounters, Ahongbonon came to the realization that everyone needed the same thing. "I saw that people with mental disorders were seeking love like everyone else."

Love and respect, and clean water. Ahongbonon and his wife began to walk the streets of the city at night handing out food and drink. From there they opened a little chapel in a back room on the grounds of the general hospital in Bouaké, and began, says Ahongbonon, "to look after people". The results surprised everyone, including Côte d'Ivoire's minister of health, who agreed to expand the space and build a centre inside the hospital. This was a major breakthrough in Côte d'Ivoire where, as in many other countries, the mentally ill had for a long time been kept in institutions located at a distance from cities. "It was for me a miracle," Ahongbonon says.

From that point people came to Ahongbonon with word of sick relatives or friends and he began to see things he could barely believe. "People chained to trees and left in the forest," he says, shaking his head. "Men, women, children." And these were not acts of casual cruelty. They were attempts at a kind of treatment. "People believe that by making the person suffer, they will drive the demon from the body," Ahongbonon explains.

To banish such superstitions – that people with mental disorders are struck by witchcraft – and to integrate them back into society, Ahongbonon established the Saint Camille de Lellis Association the following year, 1983. He and his co-workers work hard to remove the stigma attached to mental illness and free those afflicted with mental disorders from chains or blocks of wood, where they have been placed by their families or village chiefs. By 2006, the association had established a network of 10 centres in Côte d'Ivoire and Benin and had treated thousands of people, 85% of whom have been reintegrated into society. "We have come to see work as essential to the recovery of people with mental disorders," says Ahongbonon, who encourages patients to engage in a range of vocational activities such as farming. "People who have been chained up for years feel enormous relief in working. We have people who have come through our programme to become lab technicians," Ahongbonon says proudly (Photo 3.1).

Such treatment of people with mental disorders is a universal phenomenon. Virtually every society has locked up their 'insane', and many continue to do so. In poor countries it may mean keeping patients in chains, while in wealthier countries patients are sedated and confined to institutions (see Box 3.1 Breaking the chains). This is one of the greatest challenges for WHO and its partners in their work to encourage a better understanding of mental illness, and promote effective and humane treatment.

Dr Itzhak Levav is also a passionate advocate of mental health care reform. In November 1990, as Regional Coordinator for Mental Health in WHO's Regional Office for the Americas, Levav organized a conference in Caracas, Venezuela, that was to become a milestone in public health.

Levav, a psychiatrist, had seen the abuses of people afflicted by mental disorders. He was determined to return their dignity and humanity. It did not mean he wanted to stop giving them treatment. It just meant that their treatment should be based on sound scientific evidence and human rights. He and his WHO colleagues proposed that conventional psychiatric care in Latin America should be decentralized. To help countries do this, WHO engaged volunteer consultants to provide technical support to the countries. The Organization maintained – and continues to do so today – that patients do better if they are not locked up

Box 3.1. Breaking the chains

Fondazione Saint Camille

Côte d'Ivoire, 1990s. Man chained to a tree

Dr Mohammad Taghi Yasamy was visiting a mental hospital in Hargeisa in northern Somalia where, to his horror, he saw patients who were chained to posts. Yasamy, a mental health specialist at WHO, asked for an explanation. "They said it was because these people were out of control," he recalls. "But when I opened the chains, I found that most of the patients were quite calm." That day – after discussions with the patients, families and health providers – an idea was born. The Chain-Free Initiative is now a WHO programme to stop restraining people with mental health conditions.

The WHO initiative has three phases: chain-free hospitals, achieved by removing chains, and reforming hospitals into patient-friendly and humane places with no restraints; chain-free homes, which involves removing the chains in homes and providing training for family members on how to help a sick relative recover; and chain-free environment, which involves removing the invisible chains of stigma and restrictions on the human rights of people with mental illness.

Through this initiative, WHO wants hospital staff to become more aware of human rights issues and to adopt more humane and scientific methods of caring for these patients. The initiative encourages the creation of associations for service users and families, and the establishment of chain-free committees to lobby for humanitarian assistance to people with mental illness.

The Chain-Free Initiative was first piloted in the Somali capital, Mogadishu, and then in Kabul, Afghanistan, in early 2007, where it became a joint project between WHO, the Ministry of Public Health and the Kabul Mental Hospital. As a result, the hospital is now well maintained and all chains have been removed. The programme is catching on in other countries.

"In Kabul, family members showed a lot of support," says Yasamy. "They were keen to help out in providing a more decent living standard for the patients." Yasamy hopes that eventually patients can live and work independently and enjoy full reintegration into society.

Photo 3.2. Trinidad and Tobago, 1977. Doctor prepares to sedate his patient

WHO/M. Beaubrun

in asylums or remote psychiatric hospitals, but integrated into the community. It is an approach based on breakthroughs in treatment made since the 1950s. That was the idea behind the Caracas conference, and it caused something of an uproar among psychiatrists.

Like a visit to the dentist

Psychiatrists in Europe and the USA came out of the 1940s armed with some very blunt instruments – crude versions of electroconvulsive therapy, where the brain is given an electrical shock for therapeutic effect, and even more brutal 'psychosurgical' procedures, such as prefrontal lobotomy. Dr Walter Freeman's refinement of this procedure involved driving a spike into the frontal lobe of the brain. Such was Freeman's enthusiasm for lobotomy and its 'calming' effects that he recommended it for patients, even those with mild symptoms, and predicted that it would become as commonplace as a visit to the dentist.

Fortunately, Freeman's 'vision' was swept aside by the first effective psychiatric medicines, which became available in the 1950s. Chlorpromazine, which became better known under the brand name Thorazine, was originally developed as an antiemetic – a drug that suppresses vomiting – but was found to have powerful antipsychotic properties. Thorazine didn't just calm people down, it also seemed to promote clarity in thinking, and revolutionized psychiatric care, making it much easier for severely ill people to return to society. Meanwhile, synthetic muscle relaxants, developed at the beginning of the 1950s, allowed for slightly safer use of electroconvulsive therapy, while antidepressants such as iproniazid offered hope to those diagnosed with mood disorders or depression. Ken Kesey's 1962 book *One Flew Over the Cuckoo's Nest*, a darkly humouristic exposé of asylum life that features a tyrannical nurse and ends in a lobotomy, was very much a book of its time.

The development of these drugs brought enormous change. In WHO's view, forcible restraint and psychosurgery had never been necessary. It had never been necessary for people with mental health disorders to be sedated and confined for many years in psychiatric hospitals (Photo 3.2). But now, with new mental care methods and new medicines, doctors finally had an alternative. Meanwhile, outside the asylum walls, society was changing. A broad social movement to shut down and reform mental hospitals was gaining momentum and Caracas was the trigger.

Major reforms started in Brazil, Chile, Italy, Spain, the United Kingdom and other countries.

But while the possibilities for treatment were improving, not everyone saw the benefits. Where money was scarce, the impetus for mental health reform was weaker. Poor countries, such as Kenya, Uganda and the United Republic of Tanzania, for example, had difficulty just maintaining the status quo, and struggled to prop up dilapidated, overcrowded asylums.

Photo 3.3. Benin, 2008. Patients participate in a training project of the Saint Camille Association

Fondazione Saint Camille

Many of the patients spent years in such places, heavily sedated, never visited by qualified psychiatrists or relatives. Institutions like the Mathari Hospital in Kenya had existed since 1910 and had served the British colonial armed forces during the two world wars as a place where they could send their 'mad' soldiers. It was run along strictly segregationist lines, the 'native lunatics' – who represented 95% of the inmates – being corralled in 'bomas', buildings traditionally used for livestock, while the wards were reserved for Europeans.

In the United Republic of Tanzania, the mental health system had been established under German colonial rule in the 1890s and was run along the same centralized lines as found elsewhere in Africa, the most famous large hospital being Muhimbili. But the system began to change in the 1960s, with the government pushing to establish more regional psychiatric units in an effort to get services closer to the people who needed them. In the late 1970s, the health ministry, working closely with WHO and the Danish development agency, started to decentralize mental health care, which was to be provided as part of the general health-care system – an integrated approach that came to typify WHO-supported models. Rehabilitation villages were also established, providing patients with training in skills, such as farming and carpentry (Photo 3.3).

Box 3.2. Schizophrenia – nature or nurture?

One misconception about mental illness is the belief that people are 'born that way' and nothing can be done to prevent it. Studies with identical twins show, however, that environmental factors play an important role in the development of mental illness too, and not least in the development of schizophrenia.

That was borne out by the experience of Dr Carolyn Spiro and her sister, Pamela Spiro Wagner. While on call at the psychiatric unit in Boston in the USA where Carolyn worked, she was stunned to hear the news – her identical twin sister had been diagnosed with schizophrenia, a severe mental disorder characterized by profound disruptions in perception and thinking, including hearing voices or experiencing delusions.

Despite being genetically identical, the sisters had taken starkly divergent paths. One had become a psychiatrist, the other – a psychiatric patient. Cases like this have prompted the question: to what extent do genes (nature) and environment (nurture) play a role in mental illness? If genes were the only determinant factor, then Carolyn would also have developed the disease just like her twin sister, Pamela, because they were genetically identical, but she didn't. The Spiro twins' story is told in a book *Divided minds: twin sisters and their journey through schizophrenia.*

Schizophrenia affects about 26 million people worldwide, and around 60% of cases are thought to involve a genetic predisposition. Twin studies show that if one identical twin develops schizophrenia, the second has a 50% chance of developing the condition too. With fraternal twins, who are genetically similar but not identical, the second twin will have a 9% chance of developing schizophrenia, which is above the 1% expected in the general population.

By the mid-1970s, the World Health Assembly had fully embraced the revolution in health care and WHO was taking steps to put mental health at the heart of its concerns. Not that it had ever been far away. Indeed, the WHO constitution defines health partly in terms of mental health, declaring health to be a state of "complete physical, mental and social well-being". The WHO Expert Committee on Mental Health of 1949, which encouraged the application of psychiatric knowledge to preventive work, and the groundbreaking International Pilot Study of Schizophrenia of 1973 (see Box 3.2 Schizophrenia – nature or nurture?) were clear evidence of the Organization's commitment.

WHO reaches out

In the mid-1970s, WHO created the Division of Mental Health, and appointed a regional adviser for mental health in each of its six regional offices, one of whom was Levav. The new division expanded its network of collaborating centres from fewer than 10 to more than 100, including some of the most prominent people working in psychiatry from 80 countries – WHO was reaching out.

And becoming frustrated. Because it seemed that no matter how much the Organization sought to make the global community aware of current thinking on psychiatry, little seemed to change. Ten years after the World Health Assembly first acknowledged the existence of effective treatments for mental illness, WHO's director-general at the time, Halfdan Mahler, expressed growing frustration with the lack of progress in a report in 1988 entitled *Prevention of mental, neurological and psychosocial disorders.*

The report concluded with a statement that verged on a rebuke, saying, "… countries were fully aware of the major public health problem that mental, neurological and psychosocial disorders represent. Countries are also aware of the existence of effective measures for their prevention, and that the wide application of these measures could diminish the devastating effects of these disorders for health and social productivity of individuals, communities and nations." The final conclusion of the report was that although some activities had been undertaken at a regional and global level, "there was a vast potential for an enhancement of WHO's role in national efforts". The director-general wanted individual nations to invite WHO in, so that together they could come to grips with the problem of mental health care and start making a tangible difference.

But beyond making statements, there was a limit to what WHO could do. Publishing the latest research showing that shutting down old asylums was a good thing and that medicines to treat psychiatric disorders should be prescribed by primary health care providers made no difference if countries didn't make mental health a priority (Photo 3.4). Brazil was a case in point. In the late 1980s and early 1990s, patients there were locked up for indefinite periods in institutions designed to keep people off the streets rather than help them get better. The situation was made worse by a health system that granted funds according to the number of beds filled, a policy that had led to Brazil maintaining 246 psychiatric hospitals, with 70 000 beds. This compared to the United Kingdom, for example, which, while it had only a third of Brazil's population, maintained only 50 such hospitals. Not only were there more mental institutions in Brazil, but the hospitals there had a financial incentive to prevent their 'inmates' from leaving.

Something needed to change. "We needed to broaden the debate," Levav says, recalling those turbulent times, and Caracas was the ideal forum. A broader debate required participants from different spheres, such as non-specialists like Ahongbonon. Levav made sure that such people were invited – as well as politicians. "The conference was very well attended at a ministerial and even senatorial level," Levav recalls. "These days we think nothing of having government people present, but back then it was not so usual."

Mental health was at the bottom of everyone's political agenda. There were no lobby groups, while the people affected – the mentally ill and their families – formed a narrow constituency that politicians had little interest in

Photo 3.4. Colombia, 1974.
Patient locked behind bars

WHO

cultivating. In so far as politicians were aware of their country's mental health arrangements at all, they were generally – and with good reason – ashamed. Levav thought this was wrong, and that politicians should be made to take responsibility for their policy, and, if they didn't like it, to change it.

The presence of human rights activists at the Caracas meeting was vital. "With the Inter-American Commission for Human Rights of the Organization of American States there, we knew the debate would be different. We all knew there was going to be finger-pointing," Levav says.

In the end, the fingers were pointed at Mexico. "There was a lot of tension at the conference with people speaking very openly," Levav recalls. "Mexico was far from being the only country to face challenges in its mental health system, but as it turned out there was also a good deal of criticism of Mexico, and the Mexican officials went on the defensive. In the end, that was a good thing because it polarized the debate and made it easier for people to get behind a declaration calling for fundamental reforms." Later, Mexico did endorse the Caracas Declaration, as it became known.

The Caracas Declaration called for reform of mental health legislation to protect the civil rights of people with mental illness and decentralize psychiatric care in the Americas. For the first time, media and advocacy groups had been invited to join the debate. It was a watershed moment, especially for Latin America. The English-speaking Caribbean followed suit. Prior to the Declaration, psychiatric care in Latin America generally meant custodial care – incarceration – in remote asylums characterized by understaffing, and poor hygiene, food and clothing. In other words, the familiar nightmare.

In some countries change was already in the air. In parts of Argentina, Brazil, Colombia, Ecuador, Panama and Paraguay, which all enacted new constitutions in the 1980s, there were provisions allowing for more civil rights, including those of mental health patients.

After Caracas, the pressure for reform grew, and led eventually to new legislation. In Brazil, for example, laws were introduced that guaranteed the rights of people with mental illness. Senator Paulo Delgado was the author of a bill designed to phase out psychiatric hospitals in his country, regulate compulsory commitment to mental units and encourage care in the community. People with mental health disorders were in Delgado's view "the world's most oppressed people, one of the last groups still not given basic human rights".

Dissenters branded 'insane'

After the 1990 Caracas Declaration, human rights became a touchstone in discussion of mental health care reform, and this remains the case today. "People with mental disabilities must be empowered everywhere. Human rights violations of people in psychiatric institutions occur every day in countries across the world," says Dr Benedetto Saraceno, former director of WHO's Department of Substance Abuse and Mental Health.

The push to reform the system in Brazil was given extra weight by the support of writer Paolo Coelho, who wrote a letter to the Senate that, as "a victim of the violence of being committed [to a psychiatric hospital] totally unjustifiably, I see this new law not only as opportune, but absolutely necessary." Coelho, who has written several best-selling books, revealed that his family had committed him to a mental institution claiming that he suffered "psychological upsets" and was hostile to his parents.

His father even cited Coelho's political views as symptomatic of mental illness. Brazil was not the only country where political dissenters were branded 'insane'. Some countries went further and actually used psychiatry as a weapon to suppress political dissent, for example, the former Soviet Union, where some government critics were treated with psychoactive drugs and confined to asylums for years.

A year after Caracas, in 1991, Modest Kabanov, director of the Bekhterev Psychoneurological Institute in the Russian city of St Petersburg, was one of the first to officially acknowledge past abuses in Soviet psychiatry. Kabanov led an investigation by psychiatrists into the case of a former Red Army general called Pyotr Grigorenko who was committed to psychiatric hospitals twice, in the 1960s and 1970s. They rehabilitated Grigorenko by officially declaring him 'sane'. It was the first step in a programme of rehabilitation for thousands who had suffered similar treatment.

In Brazil, the reform programme rested on two pillars: the creation of decentralized units to care for people with severe psychiatric disorders and a programme that gave money to families who welcomed home relatives who had spent years confined in mental hospitals.

Since 1995, the number of psychiatric beds in mental units in Brazil has fallen by around 41%, whereas community services have increased ninefold. Reform has also increased access to essential psychotropic drugs for all citizens.

For Saraceno, Brazil's achievements in this area are remarkable. "I attended meetings in Brasilia such as I have never seen in my life, organized and funded by the government and attended by hundreds of severely mentally ill patients discussing mental health reform – a remarkable example of empowerment, democracy and consultation," he says. Similarly impressive, in Saraceno's view, is the fact that reform has taken place without huge expenditure.

The next significant step forward came in Europe, where, in 1999, WHO and the European Commission agreed to collaborate on mental health reform. In Italy, for example, some of these reforms had already started as early as 1978 and led to a network of services that allowed people with mental disorders to live in the community. For example, in Trieste, the psychiatric hospital was closed down and replaced by community-based services providing sheltered accommodation, acute care when needed, social support and help finding work.

What was happening in Europe served to draw attention to what was not being done elsewhere. Addressing the European Conference on Promotion of Mental Health and Social Inclusion held in Tampere, Finland, in October 1999, WHO director-general Dr Gro Harlem Brundtland said that while the mental health issues and problems in Europe certainly needed attention, Europe also had to consider its responsibilities regarding the rest of the world.

Studies carried out in the previous 20 years had shown that mental disorders were twice as frequent among the poor as among the rich, and by extension in developing as opposed to developed countries. Nor was it just a question of poverty. If you added to the psychological pressures brought by hunger, overcrowded living and low levels of education, the horrors of war and the psychosocial impact of natural disasters and diseases, such as HIV/AIDS, you had the basis of a global mental health crisis that could only get worse.

A mental health snapshot

Brundtland's comments in Finland anticipated one of WHO's most significant initiatives in this area to date, the publication in 2001 of the Organization's annual flagship publication the world health report, entitled *Mental health: new understanding, new hope*, a milestone in consciousness-raising that sought to give a comprehensive global picture of mental health. Dr Shekhar Saxena, Director of WHO's Department of Mental Health and Substance Dependence, says: "For the first time we had a document that enabled us to talk about the facts rather than having to base our discussions on assumptions about global mental health."

A huge undertaking, the report was a snapshot of the entire planet's mental health.

The report showed that roughly one in 10 adults – an estimated 450 million people at the time – were affected by mental disorders. It also showed that psychiatric disorders accounted for about 12.3% of the global burden of disease for the year 2000, a figure that was forecast to rise to 15% by 2020. From the point of view of disability alone, without the effects of premature death, the impact of mental illness was starker still, accounting for 31% of all years lived with disability.

For all the reasons we have seen so far, mental health disorders are often hidden from view. The report's findings were dynamite. It was the first time that the full magnitude of these disorders became evident on a global scale (see Box 3.3 How big is the problem?).

Box 3.3. How big is the problem?

One reason why mental illness tends to be neglected is the difficulty of measuring the problem. It is not difficult to count the work days lost to influenza, but much more difficult to make the same calculation for, say, depression.

That changed with the introduction of a measure known as disability-adjusted life-years (DALYs). First developed by the World Health Organization in the 1990s, DALYs measure what is known as the burden of disease – in other words the size of the health problem – by calculating the sum of years lived with disability (YLD) and the number of years lost (YLL).

In 2004, psychiatric and neurological conditions together accounted for 13% of the global burden of disease. Some of the main disorders included in this are:

- alcohol disorders 2%
- bipolar affective disorder 1%
- dementia 1%
- schizophrenia 1%
- unipolar depressive disorder 4%.

Unipolar depression ranked as the third largest contributor to the global burden of disease worldwide and the greatest contributor in middle- and high-income countries.

These metrics not only allow us to gain a better idea of the true effect of mental and psychiatric disorders, but knowing the scale of the problem also makes for more effective planning and management of public health programmes.

That year, WHO took up the cause in a big way. Director-general Brundtland not only devoted the *World health report* to the subject of mental health, she also made it the theme of World Health Day on 7 April that year and the subject of a roundtable discussion for health ministers from WHO's Member States at the annual World Health Assembly gathering in Geneva.

Perhaps the most striking finding of the 2001 report was that nearly half of all countries had no national mental health policy whatsoever. A quarter didn't even have legislation establishing the rights of people with mental disorders. Nearly a third of nations had no specified budget for mental health, while roughly one third of the global population lived in nations that invested less than 1% of their total health budget in mental health. As a general rule, the poorer the country, the less they invest in mental health.

Photo 3.5. Benin, 2006. To fight the fear and stigma of mental illness, former patients participate in vocational training to learn how to make fabrics for dresses and table cloths

Fondazione Saint Camille

But the picture was not entirely bleak. A 'Caracas effect' was taking place. Where mental health policies did exist, for example, half had been formulated during the previous 10 years – in other words after the Caracas Declaration. Significantly, nongovernmental organizations (NGOs) were active in the mental health sector in many developing countries, such as Grégoire Ahongbonon's Saint Camille Association in Côte d'Ivoire and Benin (Photo 3.5).

Four years after the *World health report*, another report, the *Mental health atlas 2005,* revealed that while there were nearly 10 psychiatrists per 100 000 people in Europe, there were only 0.04 psychiatrists for every 100 000 people in Africa. The reality then, and now, is that many people with mental illness were not receiving the treatment they needed.

As well as giving a clear picture of global mental health, the 2001 report called on countries to provide treatment at the primary care level – that is to say, where generalist doctors treat patients in the community. This would enable the largest number of people to get faster access to services and psychotropic medicines.

Today, WHO continues to recommend that people be cared for in the community, believing that this approach is more cost-effective than treating people en masse in mental hospitals and that it leads to better treatment outcomes, an improved quality of life while encouraging the respect of human rights.

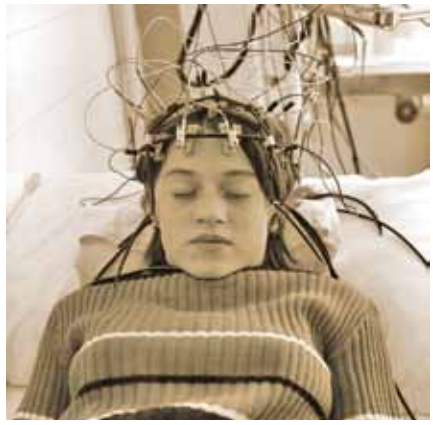
At a more macro level, WHO also continues to call for policies, programmes and legislation based on scientific evidence and human rights considerations. To achieve this, most countries would have to increase their budgets for mental health from the existing very low levels. There would also need to be improved training of the mental health professionals and also support for primary health care programmes providing mental health care. Finally, WHO recommends that countries monitor community mental health care services closely and support research that could help gain a better understanding of mental disorders and develop more effective methods of caring for and treating people with such disorders.

Little or no treatment

Recommendations and guidelines are, however, not enough and some countries need more assistance in adopting a modern approach to mental health. To help them take practical steps to achieving this, WHO launched the Mental Health Global Action Programme in 2008. More than 75% of people with mental disorders in developing countries receive no treatment or care.

The new programme aims to make politicians more aware of the problem, so that they take it more seriously and spend more money on it. In Africa alone, nine out of 10 people with epilepsy go untreated, unable to obtain simple and inexpensive anticonvulsant drugs (Photo 3.6). The extra cost to extend services for mental disorders to more people in need is not great. Provision of treatment also means training adequate numbers of specialized nurses and doctors, particularly in low- and middle-income countries, where staff shortages for mental health are often acute.

Photo 3.6. Socialist Federal Republic of Yugoslavia, 1982. Young woman receiving an electroencephalogram at the Psychiatric Institute in Belgrade. This is a method of diagnosing patients for epilepsy, by measuring the electrical activity produced by their brains



WHO/P. Almasy

Box 3.4. Alcohol and mental health

People have consumed alcohol – wine, beer and spirits – in diverse cultures around the world for thousands of years, but many of the health consequences of excessive alcohol consumption have only become clear recently.

Alcohol consumption has increased during the last few decades globally, with all or most of that increase in developing countries – many of which have little tradition of drinking alcohol or experience in prevention, control or treatment of alcohol-related health problems.

Alcohol can cause several diseases, including cancer of the oesophagus (or gullet through which food passes to the stomach) and of the liver, as well as cirrhosis of the liver. It is a risk factor for mental conditions, such as depression, bipolar disorder and anxiety as well as for domestic violence and road accidents.

Globally, alcohol causes an estimated 2.3 million deaths (3.8% of total) and 69 million (4.5% of total) of DALYs (see Box 3.3 How big is the problem).

WHO/B. Stephenson

United Kingdom, 1995. Alcohol consumption is a risk factor for depression, bipolar disorder and anxiety

A WHO study, known as the "mhGAP report, showed that, in low-income countries, extending an essential package of services to people with schizophrenia, bipolar disorder and depression and with one risk factor for mental illness – hazardous alcohol use – requires an additional investment as low as US$ 0.20 per member of the population/per person receiving treatment (see Box 3.4 Alcohol and mental health).

The new programme aims to make treatment available in developing countries for depression, schizophrenia, alcohol and drug dependence, dementia, epilepsy and suicide. A core part of this programme is to reduce the stigma attached to mental illness. The stigmatization of people with mental disorders is one of the biggest obstacles preventing people from seeking the treatment. But WHO's efforts alone cannot change attitudes to mental illness – its success will depend on the willingness of countries to change the way they deal with mental illness.

Twenty years after Caracas the signs are encouraging, as the number of governments, NGOs and individuals striving to improve mental health care has grown. As already stated, Brazil, Chile, Italy, Spain and the United Kingdom were among the first to reform their mental health care. Since Caracas, several developing countries have followed suit, including Ghana, Lesotho, Namibia and Sri Lanka. Meanwhile, reforms are under way elsewhere including in the Gambia and India.

Chile, for instance, is improving conditions for people with mental disabilities. For example, the national primary care programme in Chile includes treatment of depression for all who need it, bringing much needed care to thousands of its people.

A project in China, which integrated epilepsy control into local health systems, has achieved good results. This project showed that epilepsy could be treated there with an inexpensive anti-convulsant medicine by health professionals who had undergone basic training. That project, which started in six provinces, has now been extended to 15 provinces and tens of thousands of people have been treated.

Following a critical judgement by the African Commission on Human and People's Rights on human rights violations at the Campama psychiatric unit in 2003, the Gambia, asked WHO for assistance in drawing up a new mental health policy. In 2009, a new institution, the Tanka Tanka Psychiatric Hospital, opened to replace the Campama unit, which was closed down, while other new units were established at the country's six main general hospitals, thus integrating most mental health services into the country's primary health care system in which patients are treated on an outpatient basis.

Ghana is another African country to have called on WHO for help in drafting new legislation and starting to treat mental health disorders in the community. In 2007, an estimated 650 000 of the 21.6 million people living in Ghana were having severe mental disorders, while a further two million or so were living with moderate-to-mild forms of the disease. Treatment is available at most levels of care, but the majority is still provided through specialized psychiatric hospitals located close to the capital and therefore serving a fraction of the population. Government funding tends to go into these institutions, leaving community-based services to rely on private funding.

Through training, consultation and review of different drafts of new law using WHO materials and tools, Ghana has also developed new health legislation that shifts from institutional care to outpatient treatment in primary health care centres.

The Organization's work over the past 60 years has often influenced the debate in countries embracing reform. For example in India, where media discussion of a tragic fire which occurred at an asylum in Erwady, Tamil Nadu, in 2001 constantly referred to WHO's *World health report 2001* on mental health.

The fire prompted calls for mental health reform in India, with the Supreme Court recommending that a new policy be drawn up and that adequate and humane mental hospitals be established (Photo 3.7).

Photo 3.7. India, 2002. Women locked behind metal cage at the Institute of Human Behavior and Allied Sciences, New Delhi. India has been introducing reforms to its mental health system

WHO/P. Virot

Box 3.5. A suicide every 40 seconds

Suicide is arguably the most extreme expression of mental illness. Almost one million people die committing suicide every year, representing about 13 per 100 000, or around one death every 40 seconds.

Suicide rates have been higher among older men in the past, but today young people are most at risk in rich and poor countries alike, in particular women. For women aged between 20 and 59 years, suicide is the seventh leading cause of death worldwide.

While mental disorders, notably depression and problems associated with drug abuse, are risk factors for suicide, social and cultural factors can also play a role.

In China, suicide is the leading cause of death among adult women in rural areas and the rates of suicide among women are higher than among men.

Among the factors cited are family disputes, domestic violence, social isolation and the availability of lethal pesticides. In China and other parts of Asia, a high proportion of suicides in rural areas are by women who poison themselves with pesticides.

However, there is evidence that adequate prevention and treatment for depression, which tends to affect more women than men, as well as for other mental disorders, excessive alcohol use and substance abuse can reduce suicide rates considerably. Also, strategies to ensure that pesticides are stored properly and kept out of harm's way have been effective interventions in reducing the number of suicides in rural areas in Asia.

Bondevik's gamble

Levav, who strove so hard to get human rights onto the agenda at the Caracas conference of 1990, believes that the care of the mentally ill has come a long way. "I remember seeing naked people in a cage," he says. "A terrible thing, it is an image that has stayed with me. There were nameless people suffering terribly." He is convinced that in cases where there are such abuses, the patients would not remain nameless for long. "The pressure from the media now, coupled with the actions of advocacy groups and NGOs makes it less likely for that kind of thing to happen without it coming to the world's attention," he says.

In many countries, the asylum doors are no longer locked. But many people with mental health disorders still remain reluctant to come forward and seek help because they fear being branded a lunatic, or they fear the stigma attached to mental illness. One of the greatest challenges for all societies and for WHO is to fight that stigma.

In August 1998, Norway's prime minister Kjell Magne Bondevik, during his first term in office, announced that he was suffering from depression and was taking a break from his duties to seek treatment and recover. A few prominent Norwegians said the depression proved Bondevik was unfit to govern. But when he returned to work after three and a half weeks of rest, which included sleeping late, walking in the country and meditating, he found that his honesty and willingness to speak openly about his depression was rewarded. An opinion poll revealed that 85% of Norwegians thought their prime minister had done the right thing. The episode led to an outpouring of support from across the country that helped to break down the stigma surrounding mental illness.

Bondevik's gamble paid off, but it might just as easily have failed. As Saraceno, formerly of WHO, points out, while we consider it normal for someone to take time off work because of a physical ailment, we are less tolerant of illness that affects the mind. "If I break my leg skiing, people will say 'a physically active man, broke his leg. Of course he needs time off'. But if I say 'I cannot get out of bed in the morning because I am feeling depressed', they will say that I should pull myself together".

In South Africa, a recent public survey backed that view. It showed that most people thought mental illnesses were related to either stress or a lack of willpower rather than to medical disorders. Contrary to expectations, levels of stigma there were higher in urban areas and among people with higher levels of education.

The simple fact is that depression, schizophrenia and bipolar disorder are illnesses just as diabetes is an illness. Mental illness taken as a whole, estimated to affect 450 million people worldwide, is as much a public health issue as HIV/AIDS or any other infectious disease. The World Health Organization has long worked for a change in attitudes based on the assumption that mental illness and mental well-being are points on a sliding scale, rather than the poles of a notional 'heaven' where everyone is sane and a 'hell' where everyone is crazy.

Mental disorders are common all over the world and contribute substantially to overall disability and premature death, including by suicide (see Box 3.5 A suicide every 40 seconds). Despite this, many people with such problems receive little or no treatment or care. A WHO global review of scientific literature found that 32% of people in need of treatment for schizophrenia were not receiving it, while the number for depression was 56%, and for alcohol-related disorders was 78%.

At the launch of the Mental Health Global Action Programme in 2008, WHO Director-General Dr Margaret Chan called for more action to address "the abysmal lack of care, especially in low- and middle-income countries, for people suffering from mental, neurological, and substance use disorders". She described these as being "among the most neglected problems in public health" (see Box 3.6 Fact file: mental health).

Echoing so many before her, including her predecessor Brundtland, Chan said that the solution was not to "virtually imprison affected people in costly and largely ineffective psychiatric hospitals, where human rights abuses are often rampant".

She added: "People suffering from mental disorders face considerable stigma and discrimination. Their human rights are often violated in communities as well as in mental hospitals. This is another duty: to give these people a voice as active partners in calling for adequate and appropriate care." ■

Box 3.6. Fact file: mental health

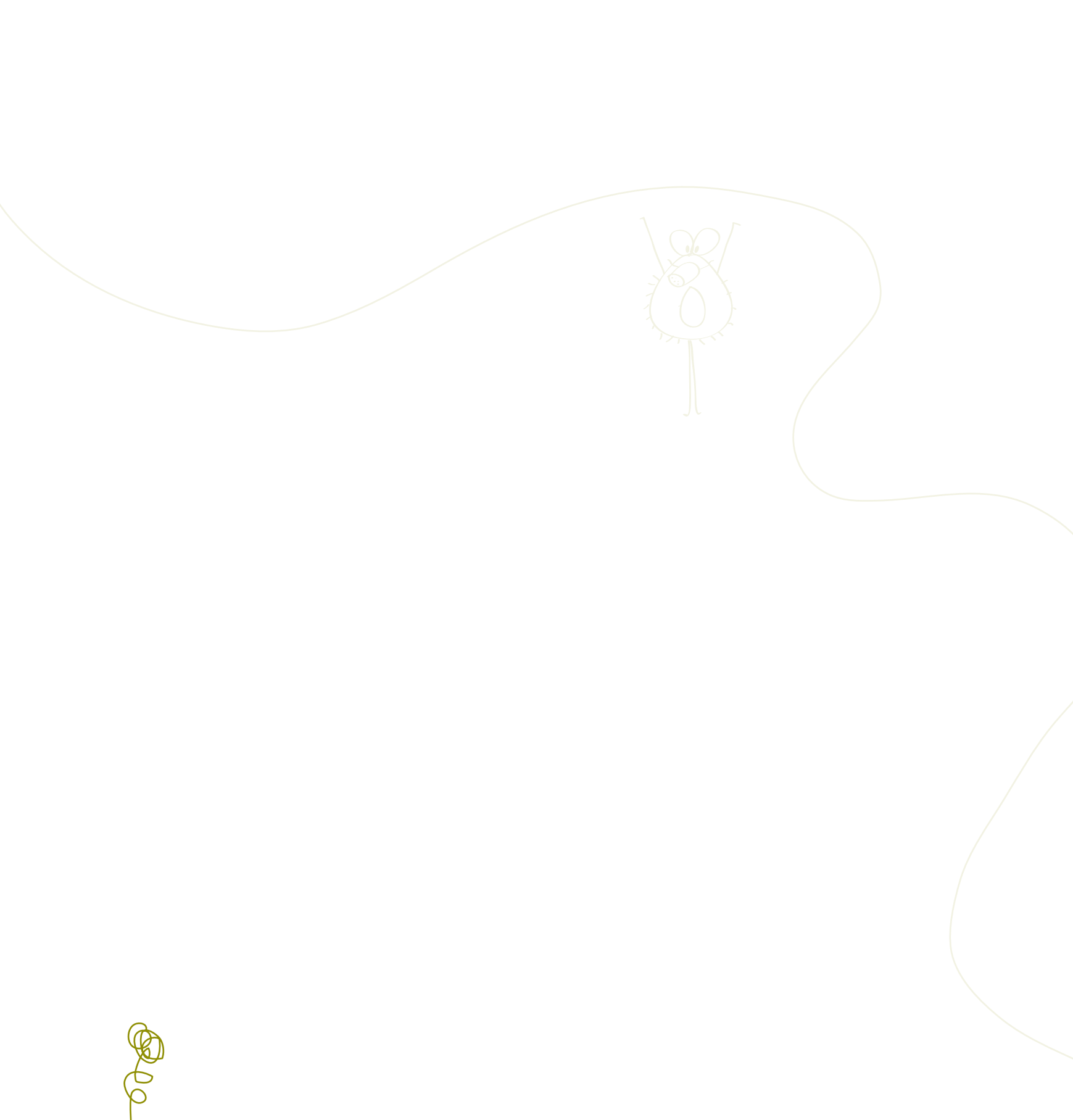
Mental health is a state of well-being in which an individual can cope with the normal stresses of life, work productively and make a contribution to society.

- More than 450 million people suffer from mental disorders around the world, about half of which begin before the age of 14.
- Depression is ranked as the leading cause of disability worldwide.
- War and other major disasters have a big impact on mental health.
- Low-income countries have 0.05 psychiatrists and 0.42 nurses per 100 000 people. The rate of psychiatrists in high-income countries is 170 times greater and for nurses is 70 times greater.
- Few countries have laws that adequately protect the rights of people with mental disorders. Stigma attached to mental disorders and discrimination against patients and families prevent people from seeking mental health care.

CHAPTER 4

THE TOBACCO TRAP

fighting back



4

THE TOBACCO TRAP

fighting back

Through sophisticated marketing and advertising, millions of young people are lured into the tobacco trap every year. The World Health Organization plays a crucial role in helping countries to fight the influence of tobacco companies.

San Francisco, USA, May 1994. The box arrived by express delivery: a plain brown carton containing a jumble of documents. It was addressed to Stanton Glantz, Professor of Medicine at the University of California. The return address said simply: 'Mr Butts'. Whoever sent it had a sense of humour.

Glantz had a sense of humour himself, and a reputation for eccentricity. A quote from political philosopher Machiavelli competed for space on his office wall with that of the popular American television puppet Kermit the Frog, and that he still wore the brightly-coloured waistcoats his mother knitted for him when he was 16. But Glantz had his serious side too – as a scientist and an anti-tobacco crusader.

At the time of the 'Mr Butts' leak, he and his university colleagues had been running a research programme for more than a decade. A programme that,

Box 4.1. Fact file: tobacco

Whether it involves smoking cigarettes or water pipes, puffing cigars, bidis or kreteks, chewing tobacco, sniffing snuff or sucking snus, tobacco use is one of the biggest public health threats the world has ever faced. Why?

- There are more than one billion smokers in the world.
- Globally, the use of tobacco products is increasing.
- Almost half of the world's children breathe air polluted by tobacco smoke.
- More than 80% of the world's smokers live in low- and middle-income countries.
- Tobacco use kills more than five million people a year.

among other things, kept a tally of the tobacco industry's financial and in-kind contributions to political campaigners, and to officials who decide on government policy. As a heart disease researcher, Glantz knew only too well the dire effect of smoking on people's health and had long campaigned to make people aware of the dangers of smoking tobacco and of breathing in the smoke that others are puffing around them (see Box 4.1 Fact file: tobacco).

"My initial reaction was I'm a second-hand smoke guy, not a litigation guy," says Glantz. At first, he was going to send the box to a lawyer he knew. "But then I started looking through it," and for someone who had devoted his career to revealing the truth about tobacco smoking "it was like an archaeologist finding a tomb filled with lost treasures".

The box was a remarkable archive – more than 4000 pages of documents from the tobacco firm Brown & Williamson Tobacco Corp. (B&W), British American Tobacco's subsidiary in the USA at the time. Each page offered new insights into B&W's inner workings – as well as those of the tobacco industry as a whole. There were handwritten notes from lawyers who had edited scientific documents to dilute unfavourable research findings; memoranda from a campaign to encourage journalists to write pro-smoking stories; a 1963 memorandum from the company's vice president and general counsel at the time, saying: "We are … in the business of selling nicotine, an addictive drug …" There was even a letter from a Hollywood star promising to use B&W tobacco products in six feature films in exchange for US$ 500 000.

The documents had originally been copied, secretly by a paralegal called Merrell Williams, who worked for a law firm hired by B&W to go through their documents and identify anything that people could use against the company in a court case. The documents were categorized using a secret code, so that if they were ever leaked, no one would understand them. The

letters DA, for example, marked a document dealing with addiction; DDA – lung cancer; DDB – throat cancer; DDC – other cancers; and DDE – permanent genetic damage.

Williams had health problems caused by smoking and was enraged by the cynical way in which the company made profits by selling a product that it knew was addictive and would eventually kill many of its customers. It was only a matter of days before Williams started smuggling the documents out of the building under his clothes. Eventually, the box of documents made its way to the mysterious "Mr Butts", who sent them on to Glantz. The cat was out of the bag.

Taking on tobacco

The cat in question wasn't just the tactics that tobacco companies had been using to protect and increase their profits. The 'Mr Butts' leak also revealed a great deal about the cat's claws, the weapons that tobacco companies were ready to use on any adversary they considered a threat.

One of those adversaries was the WHO, which had been on the watch-list of the tobacco companies since 1970, when the World Health Assembly – the annual gathering of representatives from WHO's Member States – adopted its first resolution calling on governments to take action against smoking as a preventable cause of death.

As the tobacco companies focused their attention on the markets in the developing world, WHO launched a concerted campaign to stop people from starting to smoke in the first place. The first global anti-smoking day, World No Tobacco Day, in 1988, was designed to draw the attention of individuals and governments around the world to the health risks of smoking (Photo 4.1). It is now an annual event that takes place on 31 May.

Fast forward to 1998 – a decade later – when Dr Gro Harlem Brundtland was elected WHO's director-general. Her acceptance speech to the World Health Assembly in May of that year virtually threw down the gauntlet to the tobacco companies. She made it clear that tobacco control was going to be a key issue during her term.

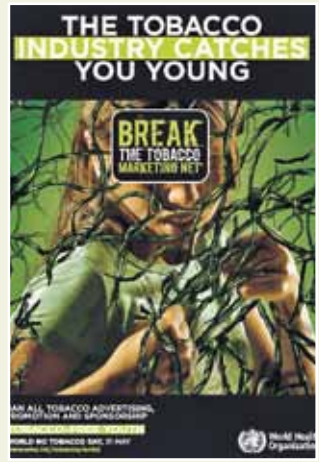
Photo 4.1. Poster for the first World No Tobacco Day in 1988

WHO

Box 4.2. Young people at risk

Social networking web sites are not just places where people can watch videos and socialize. They can be powerful marketing tools to reach young people.

Tobacco logos and images of people smoking are everywhere, especially in the places young people like the most. Many fashion accessories – hats, t-shirts and backpacks – carry tobacco logos and some tobacco companies even have fashion-wear ranges. There is a long history of smoking imagery attracting young people to tobacco. In India, home to Bollywood, the largest film industry in the world, nine in 10 films shown between 2004 and 2005 contained scenes showing people smoking. In 2009, WHO called on countries to restrict tobacco imagery in youth-rated films.



WHO

World No Tobacco Day 2008 poster

But not only in films, WHO is also campaigning to restrict tobacco marketing and sponsorship. Many music events are sponsored by tobacco companies, attracting crowds as young as 13. Tobacco adverts brim with sex appeal and adventure – glamourizing a 'rebel' life that many teens seek to emulate. It is this manipulation of young people's aspirations that WHO's World No Tobacco Day 2008 sought to expose with a new campaign calling for a ban on advertising, promotion and sponsorship of tobacco.

Most people around the world are under 18 years when they try their first cigarette and about half of the youth in the world live in countries that do no prohibit the distribution of tobacco products to them. Bans on tobacco marketing, sponsorship and advertising work. Studies show that tobacco use drops by as much as 16% after these bans are put in place.

Referring to tobacco as a "killer", she called for a "broad alliance" to combat an industry that "deliberately targeted" young people to get them hooked on cigarettes. To protect them, Brundtland said it was imperative that tobacco should not be "advertised, subsidized or glamourized" (see Box 4.2 Young people at risk). The Assembly gave her enormous support and even a standing ovation.

The momentum continued through July that year, when WHO established the Tobacco Free Initiative (TFI), a project designed to focus international attention on the global tobacco epidemic. As with many WHO programmes, the Tobacco Free Initiative sought to underline the facts and make sure everyone was aware of them. It also promoted – and continues to promote – change that governments can bring by adopting tobacco control policies that are known to be effective and by providing support to countries that want to introduce tobacco control measures.

For the Tobacco Free Initiative, a grass-roots approach to tobacco control has always been essential. Thus, it relies on advisers across WHO's six regions. The Initiative has played a central role in rallying support from countries for a key international agreement called the WHO Framework Convention on Tobacco Control. Years of work went into this agreement, and with the help of the Tobacco Free Initiative it finally came into force in 2005. Unlike many international agreements, this one is legally binding. That means that

countries that sign up to it and ratify it – usually by a vote in parliament – are required to pass tough laws, including ones that restrict tobacco marketing and advertising.

While WHO was promoting strategies to control tobacco and stop people from smoking, tobacco companies were seeing the foundations of their business erode – not least in the USA.

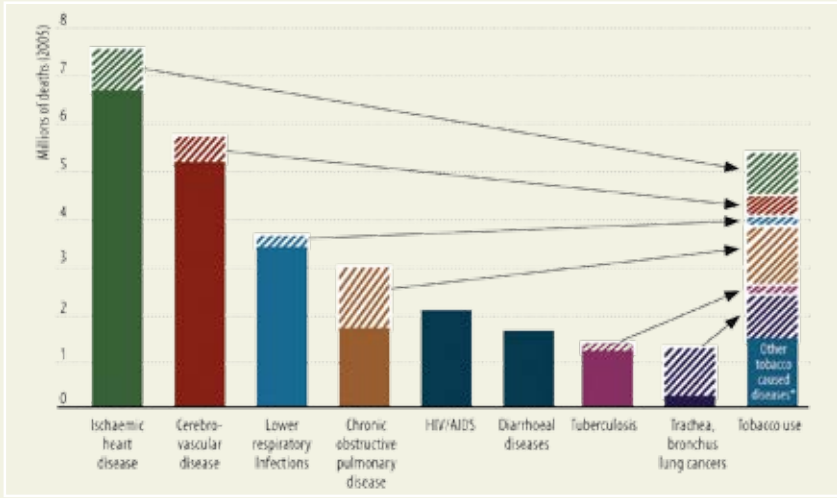
Two years after Glantz received his box of documents, Dr Jeffrey Wigand, the former chief of research at B&W, went public with the news that industry spokespeople and leaders had consistently lied about the effects of tobacco on people's health. He acknowledged that they knew full well that cigarettes – and in particular because of the nicotine they contain – were an addictive product and that they were in the business of selling "a nicotine delivery device".

None of this was great public relations for the tobacco companies, and it led inevitably to more lawsuits, brought not only by individuals, but also by many states in the USA. These states argued that the health-care costs caused by smoking-related diseases – estimated to be somewhere between 6% and 15% of total annual health-care costs – should be laid at the door of the tobacco industry.

Meanwhile, individuals argued in court that tobacco companies had misled them into thinking smoking was not harmful and that tobacco companies had been selling them an addictive drug, without warning them that smoking kills (see Box 4.3 What do smokers die of?). The companies fought back claiming that there were no links between tobacco and disease.

Box 4.3. What do smokers die of?

The tobacco industry is unique in that it sells a product that – if used by consumers as intended – will eventually kill about half of its customers. Tobacco use is a risk factor for six of the eight leading causes of death in the world



Hatched areas indicate proportions of deaths that are related to tobacco use an are coloured according to the column of the respective cause of death.
* Includes mouth and oropharyngeal cancers, oesophageal cancer, stomach cancer, liver cancer, other cancers, as well as cardiovascular diseases other than ischaemic heart disease and cerebrovascular disease.

The lawsuits filed by states culminated in what is known as the Master Settlement Agreement, the largest civil settlement in the history of the USA. It was initially signed by four of the largest tobacco companies operating in the country at the time – Philip Morris USA, R. J. Reynolds Tobacco Co., B&W, and Lorillard Tobacco Co. Later other companies joined them. Every state plus six territories signed the agreement, with the exception of four that had already reached individual legal settlements with tobacco companies.

With these signatures, the Master Settlement Agreement was concluded in November 1998. Under the deal, plaintiffs agreed to settle in exchange for a combination of annual payments and restrictions on advertising and marketing of tobacco products. It was a significant but by no means complete victory. It cost tobacco companies US$ 246 billion over the first 25 years. It was the first time these tobacco companies had been brought even close to paying for the harm they cause.

Not all legal action against tobacco companies succeeds. Indeed, many tobacco companies still win court cases, especially outside the USA, and – despite their increased legal costs – they still make profits.

Calm before the storm

Photo 4.2. Switzerland, 1998. Dr Gro Harlem Brundtland

WHO/C. Marcel

The advent of the Tobacco Free Initiative and the Master Settlement Agreement made 1998 something of a banner year for tobacco control campaigners. But for Brundtland (Photo 4.2) it marked only a brief moment of calm before the storm that broke in 1999, when she received the news, in an internal WHO document, that tobacco companies had for many years undermined WHO's tobacco control efforts, spying on staff and infiltrating the Organization.

The revelation of spying and infiltration of the WHO had a profound effect on the director-general. "We were upset in our hearts, all of us," Brundtland recalls. "It was mind-boggling. Perhaps for the first time in its history, the Organization was confronted by a group of people, who had set themselves against it simply because it was getting in the way of business." Brundtland appointed an expert committee, to take a closer look at the industry. The Organization's anti-tobacco campaign had to begin by laying open the inner workings of the tobacco companies. The expert committee analysed the

documents and compiled a more detailed report. Its findings were shocking. Not only had tobacco companies been paying "consultants" to sabotage WHO's anti-tobacco work, while employed at WHO, but the expert committee also found that tobacco companies had joined forces to "contain" and "neutralize" WHO's tobacco control work and to "reorient" it, where possible.

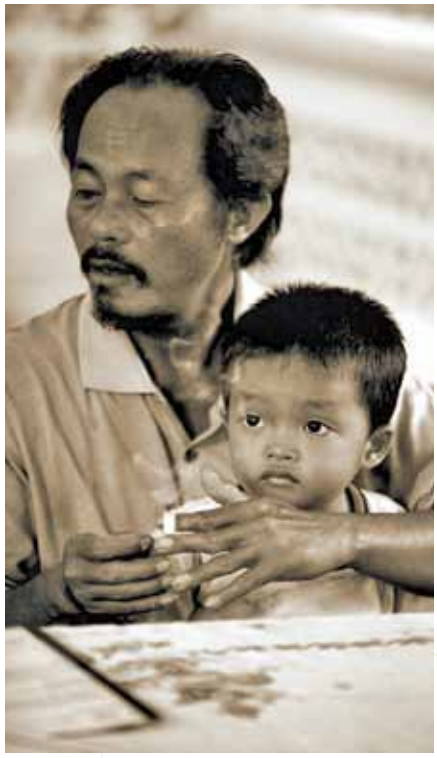
"They saw WHO as one of the greatest threats to their global expansion," says Dr Douglas Bettcher, the director of the WHO Tobacco Free Initiative. "They were studying us under a microscope in order to counteract our work." The tobacco companies had also tried to block off funding for WHO scientific and policy activities, and had tried to undermine and create confusion about the scientific basis of WHO's work.

Brundtland asked WHO's regional and country offices to take a closer look at the tobacco industry's activities and, in particular, to find out where tobacco firms were sabotaging public health initiatives and to take measures against them. Meanwhile, revelations that the tobacco industry had infiltrated WHO by paying "consultants" to join the Organization led to the introduction of screening of all employees and consultants, who are about to start working for WHO. The revelations also changed the way staff went about their daily business.

"We had to put locks on the doors of our offices," remembers Katherine Deland, a lawyer and public health specialist who has been associated with the Tobacco Free Initiative since the beginning. "WHO head office is an open-doors kind of place, so this was entirely new. We also had to check for wiretaps. It was extraordinary, like something out of a Cold-War thriller." Phone calls from unidentified "consultants" requesting information were a frequent occurrence. Bettcher even received calls at home, and eventually had his number removed from the telephone directory.

Of course, the tobacco industry had not limited itself to infiltrating WHO. Spies were everywhere. In some countries, tobacco companies co-opted prominent political figures to lobby for their cause. Tobacco firms hired scientists to discredit scientific studies showing that smoking and second-hand smoke (Photo 4.3) led to serious disease and death, and they set up ineffective programmes like 'youth smoking prevention' campaigns, at the same time heading off meaningful initiatives that might have been launched by legitimate public health agencies.

Photo 4.3. Indonesia, 2006. Cigarette smoke damages the health of everyone



WHO/J. Holmes

Box 4.4. The power of one child

Sitting in a restaurant in the bustling streets of his home town, Yuhta Ohishi was about to enjoy a meal with his family in 2003. Then 10 years old, Yuhta was unaware that the events that were about to take place would cause him to embark on a three-year campaign that would change his city forever.

WHO/WR China

Japan, 2008. Yuhta Ohishi

"The person sitting next to us was smoking," recalls Yuhta. "And, then I had a terrible asthma attack. When I got home, I started to ask why I had this asthma attack, even though it was not me who was smoking."

Filled with curiosity, Yuhta spent his summer holidays that year researching the effects of second-hand smoke. He found discovered that were very harmful indeed. Imagining a 'Smoke-free Dreamland' in his home town Shizuoka in Japan, Yuhta began writing letters to city council officials asking them to ban smoking in public places.

But Yuhta knew that his voice alone wouldn't be enough to change the law – he'd need the collective voice of the people. Yuhta asked 62 storekeepers from the central shopping district what they thought about banning people from smoking in public.

With the help of his family, friends and teachers, Yuhta collected more than 24 000 signatures for a petition against smoking in public places. His perseverance didn't stop there. Yuhta continued to research anti-smoking measures that were being taken in other parts of Japan, while keeping the mayor of Shizuoka informed about his research.

Smoking is relatively common in Japan, where 40% of men and 10% of women smoke, according to the *WHO Report on the Global Tobacco Epidemic, 2009*. Also, there are cigarette vending machines on many street corners across the country.

In 2005, Yuhta's efforts were rewarded. Shizuoka City Council introduced a by-law that banned outdoor smoking in several streets in the city. "The passing of the Road-way, Non-Smoking by-law in Shizuoka City is concrete proof indeed that your endeavours were worthwhile," wrote Dr Margaret Chan, Director-General of the World Health Organization, in a personal letter to Yuhta.

On 31 May 2008, Yuhta – then aged 15 – was granted a Director-General's Special Recognition Certificate in addition to the World No Tobacco Day Award, becoming the youngest person to receive it over the 19 years it has been running.

Scientific studies had long established that second-hand smoke damages people's health and leads to premature death. One of the first studies to show this was published in 1981 by researcher Takeshi Hirayama in Japan. It found that the wives of heavy smokers faced up to twice the risk of developing lung cancer as the wives of non-smokers, and that the risk was related to the "dose" of second-hand smoke. The Hirayama study became one of the most influential of its kind, and frequently came under attack by scientists hired by tobacco companies to undermine such findings (see Box 4.4 The power of one child).

This subtle manipulation was at times combined with more forceful tactics. In Argentina, for example, Parliament passed legislation banning tobacco advertising and restricting smoking in public places in September 1992. Weeks later, tobacco industry leaders met representatives from media groups, sports and advertising – the people who benefited financially from tobacco sponsorship and advertising – to discuss how to counter the government's move. The tobacco industry even secretly retained a physician as a consultant, while he acted as a scientific adviser to then-president Carlos Menem to lobby him. Following that meeting, the country's media became filled with pro-smoking articles and – as this media and industry pressure built up – president Menem used his power of veto to stop the tobacco control bill on 13 October 1992 from passing into law.

Opening the floodgates

In the 1980s and 1990s, more and more people were giving up smoking in wealthy, industrialized countries, particularly in North America, western Europe as well as Australia and New Zealand. While this was an achievement for tobacco control measures in those countries, scores of other countries continued to see growing numbers of smokers. And companies were still profitable.

In the 1980s, tobacco companies embarked on a major expansion of their markets, turning their sights first to Asia, notably Japan, the Republic of Korea and Thailand, each of which had at the time a closed market run by a government-owned tobacco monopoly. The tobacco companies in the USA lobbied the government to pry open these Asian markets, and by 1985 the government was actively supporting their business, threatening trade sanctions if countries refused to provide market access. Japan gave in to the pressure in 1986, and the Republic of Korea in 1988.

Traditionally, it had been unacceptable for women in Asian societies to smoke, but within a few years after the advertising campaigns arrived, millions of women started to light up and become hooked. In the Japanese capital, Tokyo, the number of female smokers more than doubled between 1986 and 1991 (Photo 4.4).

The expansion continued. After the fall of Communism in the late 1980s and early 1990s, multinational tobacco companies rolled into eastern Europe and the former Soviet Union. British American Tobacco, for example, acquired factories in the Czech Republic, Hungary, Poland, the Russian Federation, Ukraine and Uzbekistan. Many people in those countries saw the 'new' tobacco products as symbols of Western luxury and affluence. But the success of tobacco companies did not only depend on consumers with little or no experience of advertising. Tobacco companies were also in a good position to negotiate with governments and offer investment 'opportunities'.

Two decades since the collapse of the Soviet Union in 1991, the number of women who smoke in the Russian Federation, for example, has more than doubled, according to researcher Dr Anna Gilmore of Bath University, the United Kingdom. She blames this increase on the privatization of state-owned monopolies and the behaviour of multinational tobacco companies.

Photo 4.4. Japan, 2003. A woman advertises a cigarette brand by giving out free samples of cigarette packs to people leaving a railway station

WHO/J. Holmes

Boosting influence, ravaging health

Given multinational tobacco companies' successful penetration of markets in developing countries, it is not surprising that the tobacco epidemic has spread. While tobacco consumption has been declining in the majority of wealthy countries over the past 20 years, it has been rapidly increasing in the developing world.

Every year tobacco use kills an estimated five million people globally, who die from lung cancer, heart disease and other illnesses. Without preventive action, these tobacco-related deaths will increase to more than eight million a year by 2030. Around 80% of the world's smoking population is now located in the developing world and that proportion is expected to remain the same for the next three decades.

Photo 4.5. Pakistan, 2009. Tobacco farmer

WHO/Jan Brouwet

China, the largest country in the world with a population of 1.3 billion, is also the largest producer and consumer of cigarettes. Its nearly 350 million smokers represent about one third of the global smoking population, which is estimated to be more than one billion people. China's state-run tobacco industry also accounts for about a third of global sales, with 1.6 trillion cigarettes sold each year. Smoking in China is still predominantly a male addiction, with 52.9% of adult men regularly lighting up, compared with about 2.4% of women, according to the Global Adult Tobacco Survey 2010.

The effect of tobacco addiction on the poor is particularly devastating. For example, studies in China have shown that smoking is driving families into poverty as it is an expensive addiction to maintain and later can lead to expensive medical treatment. Even if people can afford or at least raise the money for costly cancer treatment, many of them will nevertheless die of the disease. Meanwhile, people with cancer who

cannot afford treatment are likely to face premature death. Not only in China, tobacco addiction makes the poor even poorer all over the world.

The leading cause of death in rich and poor countries alike is heart disease and tobacco contributes considerably to this death toll. Tobacco use is also a significant risk factor for lung cancer. For example, lung cancer is a leading cause of death among men in Bangladesh, but in a poor country like this, cancer often causes premature death, depriving families of an important breadwinner. The cost of only five cigarettes a day in a poor household in Bangladesh has been estimated to lead to a monthly dietary loss of 8000 calories, which can be fatal for malnourished children. Nor is it just children that tobacco starves. The country itself gives up 100 000 acres of land to tobacco cultivation (Photo 4.5), pushing out aman, the major rice crop, and wheat.

Governments say 'no'

In the midst of all this gloom there have been success stories offering hope that the global epidemic can be contained and possibly even reversed, when governments say 'no'. In Latin America, where, as we have seen multinational tobacco companies gained access to local markets from the early 1960s, Brazil has achieved a great deal despite being the world's second biggest tobacco producer after China. Despite the aggressive tactics of multinational tobacco companies to promote smoking there, Brazil – along with other Latin American countries Panama, Uruguay and Venezuela – has passed tough anti-tobacco laws by introducing advertising bans and mandatory warning labels on cigarette packs.

Box 4.5. The 'lights' lie

One of the tobacco companies' most cunning tactics was to launch 'light' cigarettes claiming that these have a lower tar and nicotine content and implying that they are, therefore, less harmful. The fact is that 'lights', sometimes called 'low tar' and 'mild' and similar descriptors for cigarettes were developed and marketed as less harmful to counteract a new requirement for tobacco companies to limit the measured nicotine and tar using a machine specially designed for this purpose.

By creating holes in the cigarette filters, the machine measured less nicotine and tar in each type of cigarette. But, later, studies showed that after millions of smokers had switched to 'lights', 'low tar' and 'mild' cigarettes, thinking they were safer, they were not safer at all.

The studies found that when people smoke these cigarettes, their fingers, lips or both tend to cover the specially engineered ventilation holes intended to let air inside the machine and dilute the tar and nicotine measurements. The studies also found that smokers 'compensate' for smoking these types of cigarettes by smoking more of them and inhaling more deeply. So 'lights', 'low-tar' and 'mild' cigarettes are no less harmful than ordinary cigarettes.

Brazil was the first country to ban the use of misleading descriptors such as 'light' and 'mild' from cigarette packages, back in 2001 (see Box 4.5 The 'lights' lie). That move was in line with a law passed a year earlier requiring cigarette manufacturers to include pictorial health warnings covering at least

100% of one of the two main sides of a pack. It was the second country to do so after Canada. These disturbing images often depict people in advanced stages of tobacco-related illness and the effect of years of smoking on people's health.

As a result of such initiatives, the number of smokers has come down in the past two decades from 34% of the adult population in 1989 to 15% in 2008, according to the Brazilian health ministry.

Across the Middle East, several countries have passed laws banning smoking in government buildings. In addition, the Islamic Republic of Iran and the United Arab Emirates have banned smoking in restaurants and cafes, while the Islamic Republic of Iran, Jordan and Pakistan now require pictorial health warnings on cigarette packets. In Egypt, a tobacco-free campaign was launched in the city of Alexandria in June 2010. In Pakistan, taxes were increased in the same year along with a ban on tobacco use in public places (see Box 4.6 A myth is born).

Religion plays an important role in the daily life of people in this region and can be influential in changing behaviour. In 2002, Islam's holy cities of Mecca and Medina were pronounced tobacco free by Saudi Arabia, these bans also cover the sale of tobacco products. African countries are increasingly being targeted by tobacco companies. In 2009, WHO launched a programme to help these countries resist the spread of tobacco and to stop tobacco use becoming as prevalent there as it is in other parts of the world.

While much of Asia (Photo 4.6) was being flooded with tobacco advertising and products in the 1970s and 1980s, Singapore – an island state on the southern tip of the Malay Peninsula – stood firm against the onslaught. Today, the city-state has fewer smokers than most countries in

Box 4.6. A myth is born

Ever since countries started to make workplaces, bars, cafes and other public places no smoking areas, tobacco companies have been fighting back. One of their tactics in recent years has been to create a myth – that smokeless tobacco products are harmless.

Some tobacco companies have created new ranges of smokeless products that are often packaged in the form of sweets to attract young people. These and other smokeless products are also marketed to smokers to help them bridge the time they spend in smoke-free bars and cafes. They are in fact perpetuating their nicotine addiction.

WHO/M. Seoane

Switzerland, 2006. No smoking area

Tobacco control campaigners say these 'nicotine pills' are seriously undermining efforts to protect young people's health. "Smoke-free environments and tax increases on cigarettes are supposed to help people give up smoking, but these new products give smokers an alternative to giving up," says Dr Jeffrey Wigand, a scientist, who worked for a tobacco company for many years before switching sides to become a passionate anti-tobacco campaigner.

"Smokeless products are marketed to kids. They look and taste like candies, in vanilla or spearmint flavour, and they are cheaper than cigarettes," says Wigand, who runs the USA-based charity Smoke-Free Kids, Inc. "Studies show that these smokeless products contain more nicotine for absorption than cigarettes, and the nicotine is absorbed more quickly that from cigarettes."

Asia. According to the National Health Surveillance Survey 2007, 14.5% of adults in Singapore smoke. This is due to a series of tough laws.

In the 1970s, Singapore embarked on a series of tough measures against tobacco. Its first law restricting smoking in public places came into force in 1970 and the following year, it became one of the first countries to ban tobacco advertising.

In 1986, the government of Singapore launched a campaign called Towards a Nation of Non-Smokers, while in 1989 it took further action by prohibiting tobacco companies from handing out free samples, by banning display of cigarettes in shops that sell them and by banning cigarette logos on non-tobacco products, such as fashion wear and accessories.

Despite these measures, the city-state had been operating a successful tobacco business in the 1970s and 1980s. But in 1993, an industry analyst said that this commercial success would no longer be possible, describing Singapore as "the world's most hostile environment for our industry" with "one of the world's most restricted markets" (see Box 4.7 Behind the smoke screen).

Thailand also stands out for the firm stance it has taken against tobacco. In fact, it would be hard to overstate the importance of what happened in Thailand in 1990 for global tobacco containment. In the mid-1980s, the country was awash with contraband cigarettes, including Marlboro, one of the brands produced by Philip Morris. At that time it was illegal to sell Marlboro cigarettes except in a few duty-free stores, yet Philip Morris was advertising the brand everywhere.

Although Philip Morris's company policy is to condemn contraband cigarettes, the large quantities of contraband Marlboro cigarettes combined with advertising nevertheless helped to set the stage for the brand's eventual entrance into the Thai market.

The government-run Thai Tobacco Monopoly hit back with its own advertising campaign, adding to the barrage of tobacco advertising in the country. As never before, the population of Thailand was encouraged to smoke, smoke, smoke. This situation went on until 1988, when, under pressure from the medical profession, the government ordered the monopoly to stop advertising. The monopoly complied, but Philip Morris continued, arguing that the Thai Cabinet decision was not a law. This led to a government decree banning all tobacco advertising in 1989.

Photo 4.6. Lao People's Democratic Republic, 2005. A man smoking a long wooden pipe filled with local tobacco

WHO/J. Holmes

Box 4.7. Behind the smokescreen

"Giving up is easy, I do it all the time." So goes the old joke, but behind the humour there's a sad truth: solo attempts to quit have low success rates. That's because nicotine is an addictive substance and its withdrawal symptoms – both physical and psychological – are often too much to bear. Without help from support groups or programmes, more than nine out of 10 people who try to give up start smoking again within a year.

WHO/WPRO

Singapore, 2000. A staff member from the health ministry talks of the hazards of smoking cigarettes

Some smokers know that nicotine is the addictive substance in cigarettes and that tar is the part of the cigarette that settles in their lungs and damages their health. But recent research shows that cigarettes are even more lethal than we thought because – in addition to nicotine and tar – cigarettes contain many other toxic substances, for example, cancer-causing nitrosamines – a mixture of nicotine and nitrates. That's why campaigners are calling on tobacco companies to disclose all the components of each cigarette on packs, just as food companies list ingredients and nutrition values on food packaging.

The very same year, multinational tobacco companies lobbied the government of the USA to oppose the Thai advertising ban, accusing Thailand of unfair trade practices. But despite political pressure, the Thai government refused to reverse the ban, and received support from health promotion groups in Thailand and in many other Asian countries. What came next was unprecedented: the various groups supporting the Thai position decided to argue their case on the doorstep of the tobacco companies that had tried to gain market access. Those health groups took out an advertisement explaining their position and posted it in the *Washington Times* – a daily newspaper that is particularly influential among conservative politicians, a group who tend to favour free market access and to support industry in general. The response to the advertisement was tremendous. Thailand suddenly found that it had supporters everywhere, including in the media, as well as among health and anti-smoking advocates. This gave a considerable boost to the anti-smoking cause in Thailand and led to the creation of an international network that supported the Thai government's position.

A turning point

The issue in Thailand had become a hot potato and something that needed to be resolved on an international level. So it was handed over to the regulatory body responsible for international trade, known at the time as the General Agreement on Tariffs and Trade or GATT. What followed marked a turning

point in the history of tobacco control. GATT ruled that although Thailand could not ban foreign cigarettes or tax them at a higher rate than domestic cigarettes, it was within its rights to implement anti-tobacco measures, as long as domestic and foreign manufacturers were treated equally. Thailand's advertising ban could remain in place. Philip Morris could sell cigarettes in the country, but the 'Marlboro Man' would not be riding the billboards anymore.

The tobacco companies' lobbying had backfired. Since then, Thailand has increased taxes on cigarettes, banned advertising and free samples, and imposed health warnings on cigarette packs. The country has also imposed a ban on smoking in public places, vending machines, sales to minors under 18 and candy cigarettes that lure children into smoking.

Thailand and Singapore proved that despite the immense power of tobacco companies to lobby and win over some politicians, it is possible for a government to control tobacco within its borders simply by saying 'no' (see Box 4.8 Stop tobacco, save lives).

The tough steps that these two countries took are just the kind of measures countries signed up to in the WHO Framework Convention on Tobacco Control, which came into force in 2005. Since then, it has become one of the most widely embraced treaties in the history of the United Nations. "That's a long way from the early 1990s, when the idea of a tobacco treaty was first mooted in Paris," says Bettcher. "It was shot down immediately by many critics, and the tobacco companies thought it sounded like an idea from outer space." As of January 2011, there were 172 parties to the treaty who must by law put it into force. That means taking all the tough measures, especially making public places 100% smoke free, and banning the marketing and advertising of tobacco products.

Box 4.8. Stop tobacco, save lives

There are tried-and-tested ways for governments to stop tobacco and save lives. Here are seven of them:

- protect people from second-hand smoke (passive smoking) by making public places and workplaces – including cafes, bars and casinos – smoke free;
- ban advertising, promotion and sponsorship for tobacco products;
- raise taxes to make cigarettes and other tobacco products more expensive;
- warn everyone about the dangers of tobacco, for example, by putting warnings on cigarette packets in large letters, such as 'SMOKING KILLS';
- support anti-tobacco campaigns;
- offer help to people who want to quit;
- monitor the number of people who use tobacco and promote government policies that will halt the epidemic of tobacco-related diseases.

Photo 4.7. Niger, 2000. Children marching on World No Tobacco Day

WHO/B. Chaibou

It is easy to see which way the wind is blowing. Many countries are now seeing the economic argument for controlling tobacco. China has already tightened tobacco control noticeably since 2005. Tobacco advertisements are disappearing from the streets, to be replaced by posters on the harm smoking causes. Other countries have started to do the same, but there is still a very long way to go. Brundtland must be pleased. She once said that smoking may not be a communicable disease, but it is communicated – by advertising. With the disappearance of each advertising billboard, tobacco companies lose some of their infective power (Photo 4.7). ■

CHAPTER 5

AIDS

fear, stigma and hope

5

AIDS

fear, stigma and hope

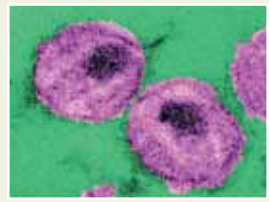
It wasn't until 1996 – 15 years after the disease was first described – that a cocktail of drugs turned AIDS from a death sentence into a chronic disease. The World Health Organization has taken a leading role in getting these medicines to people who need them.

Cape Town, South Africa, 1999. "I was 18 when I first became pregnant." Nokhwezi Hoboyi's voice quavers as she recalls events of a decade ago. She went to a doctor in the South African township where she was living. "The doctor told me that I had 'a rare illness'," she says.

She was too afraid to ask for more details, and the doctor did not elaborate. Later on, she gave birth to a boy, Bulelani. But her excitement about motherhood turned to anguish as Bulelani became sick. He died aged six months of whooping cough. Around this time Hoboyi was diagnosed with tuberculosis but, after a six-month course of treatment, she recovered. She then became pregnant again and gave birth to a girl named Nokuzola in 2002.

Box 5.1. Fact file: human immunodeficiency virus or HIV

Virus family: HIV is a lentivirus, which is a type of retrovirus. Retroviruses use RNA instead of DNA to carry their genes and have an enzyme called 'reverse transcriptase' that makes a DNA copy of the RNA genome, the DNA integrating into the genetic material of the host cell. RNA is much less stable than DNA. This means that HIV mutates very quickly, making it difficult to fight it with drugs.



CDC/Dr A. Harrison; Dr P. Feorino

HIV particles

Forms: HIV-1 is found worldwide. HIV-2, which is slightly less infectious, is found in western Africa.

How do people get infected? Through contact with bodily fluids, such as blood, breast milk, semen and vaginal fluid but not saliva, tears or sweat. This usually happens through unprotected sex, sharing contaminated needles, receiving infected blood transfusions, childbirth or breastfeeding. The virus is actually quite frail – it can only survive outside those fluids for a few minutes, unlike, for example, the flu virus, which can spread through the air.

What does the virus do? Particularly lethal, HIV infects the cells of the immune system, the body's natural defence against viruses, bacteria and other infections. That means other infections, which the body would normally fight off, can take hold and kill the patient.

The nightmare began again. Two months after her birth, Nokuzola was diagnosed with pneumonia. This time the doctors asked Hoboyi if they could test the baby for the human immunodeficiency virus (HIV) that causes acquired immune deficiency syndrome (AIDS) (see Box 5.1 Fact file: human immunodeficiency virus or HIV). It was the first time anyone had talked to Hoboyi about the disease, which she knew was a death sentence. She agreed to the test, and Nokuzola tested positive. She was given antiretroviral drugs (ARV) but did not improve.

"That was really shattering," says Hoboyi, holding back the tears. Nokuzola was so weak she had to be put on life support. After a couple of months, the doctor asked for permission to switch off the machines explaining that even if Nokuzola got better she would be brain damaged. "I was so depressed, and I was on my own at that time and I just agreed," Hoboyi says. Nokuzola died. She was four months old. By this time Hoboyi had to face the reality of her own HIV status. She went to get tested and sure enough it came back positive. "It was then that I thought about that 'rare illness' the doctor talked about," she says. She had been HIV positive for at least three years and had passed the virus to her babies without realizing it.

From mother to child

About two million children under the age of 15 were living with HIV globally in 2008, while these and many millions more were being raised in households impoverished by their parents' HIV/AIDS sickness or death. Most of these children became infected in the womb, during birth or while breastfeeding – like

Nokhwezi Hoboyi's first two babies – but the numbers of children infected in this way dropped steadily during the first decade of the 20th century with increased provision of services to prevent pregnant women and mothers from passing HIV to their babies.

When Hoboyi first became pregnant in 1999 such services were not available in her country. Yet, HIV had been present in southern Africa for about a decade and the virus had been circulating in other parts of sub-Saharan Africa for much longer (see Box 5.2 Origins of HIV). Among the first reports of the disease in the early 1980s were from Belgium, where doctors were confronted with Congolese patients arriving with symptoms that looked distinctly like a new syndrome being reported in the USA. The Centers for Disease Control and Prevention, which monitors outbreaks of infectious diseases around the world, was notified and in 1984 a team was sent to Zaire, now the Democratic Republic of the Congo, to investigate. At the Mama Yemo Hospital in the capital, Kinshasa, alone they found 38 patients with AIDS.

Similar scenarios were developing in neighbouring Rwanda, as well as in Burundi where Dr Teguest Guerma was the head of an international medical ward in the main public hospital of the capital, Bujumbura. The official response was as alarming as the disease itself. "The national authorities seemed to think that if the problem were ignored it would go away," recalls Teguest Guerma, of WHO's HIV/AIDS department in Geneva.

A wall of silence prevailed. People who tried to bring the problem to attention were punished. So great was the fear of the new disease that even people suspected of doing as much were punished. "A colleague from Antwerp was accused of telling a Newsweek magazine reporter that there was AIDS in the country," says Teguest Guerma. "Even though the man had in fact said nothing, he was removed from the country within 24 hours. Meanwhile I was caring for people who were dying of AIDS every day."

Box 5.2. Origins of HIV

Most researchers believe that the human immunodeficiency virus (HIV) was originally derived from a virus infection of chimpanzees that passed to humans in the early decades of the 20th century, somewhere in West or Central Africa. Nobody knows quite how this happened, but scientists believe that, after hunting monkeys, humans may have become infected with an ape virus when eating or butchering their catch. Once it entered humans, the virus is thought to have mutated into what we now know as HIV.

But the pandemic probably only got started once people infected with the virus migrated in adequate numbers to Africa's big urban centres. It is thought that this might have happened as far back as the 1950s; in 1998 a sample of frozen blood taken from a man who died in 1959 in Kinshasa in Zaire, now the Democratic Republic of Congo, was found to contain the virus. This is the earliest known sample of HIV.

The end-stage of infection with HIV, known as acquired immune deficiency syndrome or AIDS was not described by doctors until 1981, when they observed unusual cases of disease in homosexual men in Los Angeles, USA. A couple of years later, in 1983 and 1984, scientists at France's Pasteur Institute and the USA's National Cancer Institute identified HIV as the cause of AIDS.

As in other countries, people with HIV in Burundi were being stigmatized because of the disease, and were in many cases left to die. Part of this reaction was simply due to fear. In the early years of the epidemic, people did not know how HIV was transmitted or how infectious it was. "Even the hospital staff would not come near the AIDS patients," remembers Teguest Guerma, who was left to feed and clean patients single-handed.

While AIDS was starting to spread in Burundi, it was already a full-blown epidemic in Uganda. As early as the mid-1980s, the global focus of the pandemic was shifting to this eastern African state, where people spoke of a new disease they called 'slim'.

Box 5.3. Epidemic or pandemic?

Epidemic: rapid spread of infection in a specific population. This can be due to a change in local conditions, such as a natural disaster or displacement of large numbers of people. It can also take place when a disease hits a population with little or no immunity to that disease.

Pandemic: large-scale epidemic of a new disease to which populations have little or no immunity in several countries in more than one continent.

One person who witnessed the Ugandan epidemic firsthand was Noerine Kaleeba, a forthright woman who ran the school of physiotherapy at Mulago Hospital in Kampala. Kaleeba's husband, Christopher, became infected with HIV after receiving a blood transfusion in Uganda, but the first time he knew anything was wrong was during a stay in the United Kingdom in the summer of 1986. Kaleeba heard that Christopher had been diagnosed HIV positive and was very ill and flew there to be with him. Then when she heard that WHO had appointed someone to head up the first global programme on AIDS, she left her dying husband on a desperate impulse to go to the headquarters office in Geneva and get the cure.

Photo 5.1. USA, 1985. Dr Halfdan Mahler (right) and Dr Jonathan Mann give a press conference at the United Nations headquarters in New York City

WHO/M. Grant

Looming pandemic

In 1986, WHO took centre stage in the global battle against HIV/AIDS. At a news conference in November that year, WHO's director-general, Dr Halfdan Mahler, warned of the looming global pandemic and acknowledged that "we stand nakedly in front of a very serious pandemic as mortal as any pandemic there ever has been" (see Box 5.3 Epidemic or pandemic?).

Admitting that WHO had not taken the disease seriously enough, Mahler said the Organization was now committed to combating the epidemic – one

that was "knocking unpleasantly on the doors of Asia" and had infected nearly eight million people, although at the time it was believed to be more than 10 million. Calling for an anti-AIDS effort, at the core of which would be science-based policies and strategies for combating the disease, Mahler insisted that there be a strong emphasis on educational campaigns. The programme was to focus on creating an international network among scientists to share information, and promote research into drugs, vaccines and other therapeutic and preventive health measures.

To head the programme, Mahler appointed Dr Jonathan Mann, who had first encountered the reality of AIDS in Zaire in 1984 (Photo 5.1). Mann was given a budget of US$ 5 million a year and an office at WHO's headquarters in Geneva. It was into this cluttered office that Kaleeba walked in 1986. She was told by Mann's secretary that without an appointment she could not see him, at which Kaleeba burst into tears. It was at that moment that Mann walked in.

For the next four hours Mann talked with her. There was, he said, probably nothing he could do for her husband, but her country was a different matter. He urged her to return and fight the prejudice, the ignorance and denial that had become attached to this disease.

Kaleeba returned to Uganda in 1987 where she established the AIDS Support Organization (TASO) and found a powerful ally in the country's new president, Yoweri Museveni. Unlike many heads of state before and since, Museveni tackled AIDS head on, speaking frankly about the causes and calling for compassion. The government developed a strategy to combat AIDS — A B C or 'Abstinence, Be faithful to your partner, but if you can't manage the other two, use a Condom'. There was humour in it. There was humanity. TASO groups took the word into remote areas, even performing plays to demonstrate the importance of safe sex for people who were illiterate. Later, TASO activists were key in helping to roll-out treatment across the whole country, one of the first sub-Saharan African countries to attempt this (Photo 5.2).

Similar programmes were repeated elsewhere, notably in Thailand, where the virus had started to spread in the mid-1980s. Fuelled partly by Bangkok's sex trade, Thailand's epidemic was also fed by a large population of injecting drug users, most of them in prison. The virus spread fast in 1987 when 37 000 prisoners were granted an amnesty and released. The infection spread through sexual contact as well as exposure to blood or blood products, injecting drug-use and mother-to-child transmission.

Photo 5.2. Uganda, 2003. Activists from Uganda's AIDS Support Organization, TASO. The group provides support to people with HIV, helping them obtain antiretroviral medicines and medicines for other diseases, such as tuberculosis, to which they are susceptible. TASO activists educate people in villages – who often are illiterate – by putting on plays about HIV/AIDS and tuberculosis

WHO/ G. Hampton

Photo 5.3. Thailand, 2010. Dr Mechai Viravaidya 'Mr Condom'

WHO/ A. Treerutkuarkul

The country's prime minister in 1991, Anand Panyarachun, appointed Dr Mechai Viravaidya to tackle the epidemic. Viravaidya had been promoting the use of condoms since the 1970s for family planning purposes and had gained the nickname 'Mr Condom' for his promotional activities that included condom-blowing contests for children. Viravaidya directed radio and television networks to run a half minute of AIDS education spots for every hour of broadcast (Photo 5.3). There was also an education campaign, largely targeted at sex workers. Condoms were distributed free to every brothel in Thailand on the understanding that any brothel not using them would be shut down (Photo 5.4). The campaign produced dramatic results, reducing HIV infection among sex workers by around 90% over the following decade. Thailand proved that a targeted information campaign, backed by a supply of condoms, was a powerful weapon against HIV.

Fighting the stigma

At WHO's Geneva headquarters, Mann realized that effective treatment for HIV would only be part of the solution to the epidemic. He saw AIDS as a social issue as much as a medical one (Photo 5.5). Like no other disease, AIDS provoked the strongest reactions, and led to the worst injustices of stigmatization and exclusion. For these reasons, he put the greatest emphasis on the human rights aspects of the pandemic.

Organizing a series of meetings at WHO, Mann succeeded in creating a consensus among global AIDS experts against the compulsory testing for HIV, and above all against the exclusion of people with HIV from employment. He also lobbied for their right to be insured, and to be able to travel, bringing in human rights activists to support his cause. No one was to be excluded because – as he told the World AIDS Summit in London in 1988: "Silence, exclusion and isolation – of individuals, groups, or nations – create a danger for us all."

Mann went on to create the WHO Global Programme on AIDS, which became one of the largest programmes in the Organization's history. "He was so charismatic and inspiring that people who listened to him were easily persuaded to follow his ideas," remembers Teguest Guerma. Within four years of Mann entering that narrow cluttered office at WHO's Geneva headquarters, the Global Programme employed 280 people, and commanded an annual budget of US$ 109 million. In WHO terms, it was very big. But then so was the challenge.

Indeed, 1987 ended with the pandemic being debated on the floor of the United Nations General Assembly, where it devoted a whole session to the disease. As a result, the General Assembly committed to mobilizing resources worldwide in the struggle that was to be led by WHO.

The pandemic had been doubling each year since the beginning of the decade, and by the end of 1987 was already affecting between five and 10 million people. The decade closed with reports of the first home-grown HIV cases in China.

It was at this crucial juncture that WHO faltered. In 1990, Mann resigned. Some saw his resignation as a protest against the failure of the United Nations and governments worldwide to respond adequately to the pandemic, others cited personal reasons. Mann's departure marked the beginning of the end for the Global Programme on AIDS. But even without his departure, WHO's response to the challenge posed by HIV needed to be examined. "Despite the success of the Global Programme on AIDS, there were some criticisms," says Dr Kevin De Cock, former director of WHO's Department of HIV/AIDS. "Some felt, for example, that coordination with other United Nations agencies, who all had their role to play, was less than ideal."

The reality was that after almost a decade of coping with the pandemic, the needs of affected countries had become greater than any one agency could handle. "There were other agencies within the United Nations who had

Photo 5.4. Cambodia, 2000. Sex workers

UNAIDS/S. Noorani

Photo 5.5. The United Republic of Tanzania, 1990. Children mourn the death of their father of AIDS

WHO/L. Gubb

developed or were developing programmes relating to their particular mandates," says Dr Andrew Ball, WHO senior strategy and operations adviser with the HIV/AIDS Department. "This was notably the case with the United Nations Development Programme (UNDP), which had a clear development agenda, along with the United Nations Children's Fund (UNICEF) with its commitment to children and maternal issues. "AIDS needed a response that went beyond the challenges faced by the health sector," says De Cock. "In some places it was a development issue, an issue of poverty. There was a lot of pressure to develop a multi-sectoral response."

That pressure culminated in the establishment of the Joint United Nations Programme on HIV/AIDS (UNAIDS) in 1996. Headed by Dr Peter Piot – who had studied some of the first AIDS cases in central Africa when he was working in Belgium in the early 1980s – UNAIDS yoked together six agencies belonging to or affiliated with the United Nations system. Its mandate was to coordinate all of the AIDS efforts.

With UNAIDS now in the driving seat, WHO's role in AIDS control became less clear. Geneva-based staff who had worked in the WHO Global Programme on AIDS under Mann were either released or reassigned to UNAIDS. "It took several years for governments to sort all that out," recalls Ball, who joined WHO in 1991. "We really had very little presence for a time." De Cock puts it more bluntly, "It does seem that when UNAIDS was established WHO got out of the (AIDS) business. "

Meanwhile, the global picture of the pandemic was darkening. In 1998, at the International AIDS Conference in Geneva, UNAIDS presented the first set of authoritative surveillance numbers for the pandemic that showed that over the previous three years, while the scientific community had been congratulating itself on the advances WHO made in HIV

Box 5.4. Elusive vaccine

Health workers draw a lot of hope and inspiration from the fact that, using an effective vaccine, humanity was able to completely wipe out the devastating disease of smallpox. But smallpox is still the only disease that has ever been eradicated by human efforts and finding a vaccine against HIV is a major challenge.

Why? Vaccines often work by showing the body's immune system a part of the virus or a weakened version of it, so that the next time the body encounters it, it can react straight away. Unfortunately, two forms of HIV exist: HIV-1, which is derived from a chimpanzee virus and HIV-2, which originates from another monkey virus, that of the sooty mangabey. HIV-1 – the cause of most of the world's HIV infections – alone has 10 different subtypes. HIV is extremely adept at rapid mutation.

An effective vaccine would, therefore, need to protect humans against a rapidly evolving and changing virus. Making a vaccine is extremely challenging when the body does not already mount an effective protective response itself to natural infection, as is the case with HIV infection, which persists for the rest of an infected person's life. An important vaccine trial was abandoned in 2008 because it appeared to actually increase the likelihood of infection with HIV. For now, an AIDS vaccine remains a hope for the future.

treatment, HIV infection rates had doubled in 27 countries. Globally, people were becoming infected at a rate of 9000 per day.

Piot sought to engage governments worldwide, underlining the gravity of the situation and bringing economic and security considerations into discussion of the pandemic. People listened. The worsening situation in South Africa alone was sufficient to get people's attention.

A cocktail of drugs

Meanwhile, scientists had also been working on ways to fight the virus, and by the mid-1980s the first ARV drugs had become available. In September of 1986, pharmaceutical company Burroughs Wellcome & Co. announced the results of tests which had demonstrated that Zidovudine, a drug originally developed to treat cancer, slowed the progression of the AIDS virus. For five years a diagnosis of AIDS had been a virtual death sentence. Now, finally, it could be treated (see Box 5.4 Elusive vaccine). The bad news was the price – annually around US$ 10 000 per person. Under pressure from activists, the company eventually cut the price by 20%, but it was still out of reach for people in poor countries. It later emerged that the drug caused major side-effects and the virus was developing resistance to it. However, there was a solution.

In the mid-1990s triple drug 'cocktails', combining different drugs including Zidovudine, emerged as a highly effective treatment. Again, the price soon put a dampener on the celebrations. The cocktail was going to cost each patient US$ 20 000 per year. But whatever the problems associated with the triple cocktail, it marked a turning point in the fight against HIV. Not only was it possible to limit new infections through educational campaigns that focused on the use of condoms (Photo 5.6), it was also possible to lengthen lives through treatment (see Box 5.5 Incurable but treatable). AIDS was now a chronic disease that could be managed with the right medication.

In some ways, South Africa was a special case. The epidemic's explosion coincided with the transition from apartheid to a democratic system. When Nelson Mandela was released from prison in 1990 – four years before he became president – around 1% of South African adults were HIV positive, but by 2005, the epidemic peaked with an estimated 18% of people aged 15–49 years infected. Infection rates across southern Africa reached similar

Photo 5.6. Mexico, 1999. An AIDS educator explains how to use a female condom to a group of schoolchildren in Oaxaca

UNAIDS/K. Kobre

Box 5.5. Incurable but treatable

Once someone has been infected with HIV, they will carry the virus for the rest of their life. But although it is an incurable condition, it can be treated with antiretroviral or ARV medicines, giving patients extra years or decades of life, provided they take their ARV medicines as prescribed and drug resistance does not develop.

One of the most common definitions of AIDS – acquired immune deficiency syndrome, the disease caused by HIV – is that it occurs when someone's CD4 count (short for cluster of differentiation) falls below 200 per microlitre of blood. CD4 cells are a part of the immune system, which the virus infects and kills. When these cells drop below that critical level, the body is almost completely unable to defend itself against other diseases.

© UNICEF/NYHQ2005–0864/Noorani

Haiti, 2005

Although the virus cannot be removed from the body, ARVs work by slowing down the replication of HIV and reducing the detectable level of HIV in the blood. That keeps the CD4 count higher for longer and thus the patient's immune defences are stronger. That, in turn, means that the patient's body is better able to defend itself from what are known as 'opportunistic infections', ones that take advantage of the HIV-positive person's weakened immune system and ones that often contribute to his or her death. Among the most common opportunistic infections are bacterial pneumonia and tuberculosis.

levels. Moreover, it did not help that Mandela's successor president Thabo Mbeki, cast doubt on whether AIDS was caused by HIV.

In 1999, based on the advice of people who questioned whether the virus caused AIDS – known as HIV denialists – Mbeki refused to support the procurement and provision of ARV drugs in government hospitals, even though there had long been sound scientific evidence to show that these medicines could block the majority of cases of mother-to-child transmission and could lengthen the lives of people with HIV.

At the 13th International AIDS Conference in the South African city of Durban in July 2000, Mbeki publically questioned whether AIDS was actually caused by HIV. The response from the delegates was stunned silence and, later on, a statement called the Durban Declaration – signed by 5000 physicians and scientists at the conference – affirming that HIV was indeed the cause of AIDS.

It was also in Durban that the idea of a global fund for AIDS was first mooted by Kofi Annan, who was United Nations secretary-general at the time, and others. As Annan saw it, even with pharmaceutical companies lowering prices, ARV drugs were always going to be too expensive for the poorest nations. He proposed that a global fund be established that would buy the drugs at cost and make them available free to nations most in need.

At the African Summit on HIV/AIDS, Tuberculosis and Other Infectious Diseases in Nigeria a year later, Annan called for spending on AIDS to be increased tenfold in developing countries. He also proposed setting up "a war chest" of US$ 7 to 10 billion. That same year, global leaders came together at the United Nations General Assembly's first-ever special session on HIV/

AIDS. Once again the pandemic provoked an extraordinary response. The delegates committed to raising the funds Annan called for by 2005. In the end, they managed to raise US$ 8.3 billion. It was an enormous jump in funds committed to the one disease. A year later, the Global Fund to Fight AIDS, Tuberculosis and Malaria was established to provide funds to poor countries for the treatment of people with those diseases. Since then, it has attracted at least US$ 20 billion in pledges, a large part of which are for HIV/AIDS. Never has so much money been pledged in such a short space of time for one disease.

WHO's grand plan

WHO was once again able to bring its expertise to bear on the problem of HIV/AIDS. "What really brought WHO back into a prominent position was the issue of treatment," says De Cock. Getting essential medicines to people in remote areas was something WHO knew a lot about. Since the groundbreaking smallpox eradication campaign in the late 1950s, WHO had developed strategies to achieve precisely this kind of objective, and so drew up a plan called the '3 by 5' initiative. At the time of its launch in December 2003, around 400 000 people were receiving ARV medicines in low- and middle-income countries. The Organization pledged to bring ARV drugs to three million people by the end of 2005, by advising governments of poor countries which drugs to buy and how to distribute them, training health-care workers and advising clinics on the treatment of HIV.

Critics initially lashed out saying that by concentrating on treatment, WHO was no longer interested in prevention. But WHO maintained that prevention and control went hand in hand. By the end of 2005, the programme had reached about 1.3 million people while it took two more years to reach the three million originally targeted. "If every target we set was met just two years late, the world would be a better place," says De Cock. Meanwhile, WHO Director-General Dr Margaret Chan called it, "a remarkable achievement for public health" that proved that "with commitment and determination" people living in poor countries could be "brought back to economically and socially productive lives".

With an unprecedented level of funding and increased commitment on the part of governments to control the pandemic, providing treatment to

people who needed it became a key focus. A response that was ultimately to benefit people like Nokhwezi Hoboyi. Antiretroviral drugs given to a woman during pregnancy and delivery, and administered to her baby following birth, can reduce the rate of mother-to-child transmission of HIV by two thirds in non-breastfeeding populations. Breastfeeding complicates the picture, with the risk of the virus being passed on in the mother's milk. Until recently mothers with HIV infection faced a stark choice – whether to breastfeed their baby and risk infection with HIV, or avoid breastfeeding altogether and risk death from malnutrition and diarrhoeal diseases. Since 2009 WHO has recommended exclusive breastfeeding in the first six months unless safe replacement feeding was available (see Box 5.6 The HIV breastfeeding dilemma), but research published in 2009 has led to new recommendations on breastfeeding if the mother or the baby takes antiretroviral drugs to reduce the risks.

Antiretroviral drugs for pregnant women who are HIV positive have been used in some wealthy countries since the early-1990s, but it took until the end of the decade for the medicines to start to be distributed in the poorer parts of the world. Now, with help from WHO and its partners UNAIDS, UNICEF and the United States President's Emergency Plan for AIDS Relief (PEPFAR), many countries have pledged to deliver ARV drugs to prevent transmission to at least eight in 10 pregnant women with HIV by 2010. Since its launch in 2003, PEPFAR has provided funding to buy ARV drugs that have prevented transmission of HIV from mothers to 340 000 babies. Through PEPFAR, the USA government has pledged a whacking US$ 32 billion for HIV from 2004 to 2011. The other major funder of HIV programmes is the Global Fund.

Box 5.6. The HIV breastfeeding dilemma

For many years WHO advised HIV-positive mothers to avoid breastfeeding if they were able to afford, prepare and store formula milk safely.

This created a dilemma for the HIV-positive mother in parts of the world where people have little or no access to clean water. Should she run the increased risk of infecting her baby with HIV by breastfeeding it for a period of at least six months? Or should she use a breast milk substitute thereby increasing the risk of her baby dying of diarrhoea or other illnesses against which breast milk can be protective?

Recent research from Burkina Faso, Kenya and South Africa, however, has perhaps resolved the dilemma. It has shown that a combination of exclusive breastfeeding – that means no use of formula milk – and antiretroviral drugs can significantly reduce the risk of a mother transmitting HIV to babies through breastfeeding.

Based on this new evidence, WHO released new recommendations in November 2009 on infant feeding by HIV-positive mothers. For the first time, WHO recommended that HIV-positive mothers or their infants take antiretroviral drugs throughout the period of breastfeeding and up to 12 months. This means that the child can benefit from breastfeeding with very little risk of becoming infected with HIV.

Sudan, 2006

Progress has been made, particularly in southern and eastern African countries, which is where most newly-infected HIV-positive children live. In this area, the supply of ARVs to pregnant women to prevent them infecting their babies has increased more than fourfold, from one in 10 in 2004, to 4.5 in 10 by 2008.

So far, Botswana is the African country providing pregnant HIV-positive women with the best access to ARV treatment. Before its government began providing these drugs, almost four in every 10 babies exposed to HIV became infected. Now the figure is below one in 10. Rwanda, Thailand and Zambia have all had similar successes, and these countries are inspiring efforts globally since a rallying call to action by UNICEF. In 2008, more than 628 000 pregnant HIV-positive women living in low- and middle-income countries received ARV drugs to prevent them infecting their babies – a 17.5% increase on the previous year.

The picture changes

In 2004, only 9% of HIV-infected pregnant women received ARV treatment to prevent transmitting the virus to their babies. In 2008, the figure was 45%. The increase in provision of treatment to pregnant women mirrors the steady increase to more and more people with HIV who need the medicines – spurred by WHO's 3 by 5 campaign and the contribution of partners, such as PEPFAR and the Global Fund. While the overall picture may be encouraging, there is still a great deal to be done.

Governments, NGOs and faith-based organizations say they are expanding such services, but they still only reach a limited number of women and their infants. And for the many children who do become infected with HIV, medicines are not always available and, when they are, they are rarely those designed for children. More mothers are receiving treatment to prevent HIV transmission to their babies, but the world is far short of reaching the eight mothers in every 10 'coverage target' set for 2010. "Wider coverage has been hampered by the inaccessibility of some areas, a problem which is aggravated by weak health systems," explains Teguest Guerma.

In recent years, the HIV/AIDS pandemic has not been as big as some thought it would be. In 2007, UNAIDS and WHO, estimated that 33 million

people were living with HIV – fewer than the previous estimate for 2006 of 40 million. The sharp downward revision was due to better methods of gathering figures. Those revised figures confirmed what many experts already thought: the pandemic had peaked in the late 1990s, when more than three million people were becoming infected every year.

In 2008, there were an estimated 2.7 million new infections, representing an average of 7400 new infections per day. Meanwhile, deaths from AIDS-related illnesses are declining because of ARV treatment. Meanwhile, the overall number of people living with HIV is increasing not only because of continuing new infections, but also because people with HIV are living longer (see Box 5.7 How big is the AIDS pandemic?).

Both UNAIDS and WHO believe that the number of new infections is decreasing. In 2004, AIDS was the sixth biggest killer in the world. In 2030, WHO projects that it will be in tenth place. The fact that the pandemic appears to be losing some of its momentum does not mean that the disease is about to go away. More people with HIV have the treatment they need to make this fatal, incurable disease a chronic condition for which they must take medicines every day – as people with diabetes or high blood pressure do. Meanwhile, campaigners continue to fight the stigma and discrimination that resulted in a reluctance to speak about AIDS openly, or at all particularly at the beginning.

Box 5.7. How big is the AIDS pandemic?

Since it first appeared AIDS has killed more than 25 million people and continues to kill around two million people a year. As of 2008, an estimated 33 million adults and children were infected worldwide – a number that is still growing.

These and many other statistics on the AIDS pandemic are estimated by WHO and UNAIDS every year. These figures are used by public health professionals and policy-makers to work out how well – or badly, as the case may be – they are responding to the disease.

Falling numbers of people living with HIV could mean two things: that more people are dying or that fewer people are becoming infected with HIV. Higher numbers of people with HIV might mean that the number of new HIV infections has increased and/or that the people who are already infected are receiving antiretroviral therapy and are living longer. However, it's worth bearing in mind that only detailed analysis of data provided by HIV surveillance systems and programme data will bring any clarity to these issues.

Data on the number of people living with HIV are usually expressed in terms of 'incidence' and 'prevalence'. Incidence is the number of people who have become newly infected by unit of time, usually expressed by year. For example, in 2008 an estimated 2.7 million people became newly infected with HIV around the world.

Prevalence reflects the number of people in a population with a disease in a given time frame, including those who already had the disease and those newly diagnosed. For example, in 2007, there were an estimated 30.8 million adults aged 15–49 years living with HIV at the global level, while in sub-Saharan Africa the number of adults aged 15–49 years infected were estimated at 20.3 million.

Healing power

It was that same silence that kept Nokhwezi Hoboyi in the dark about her HIV status. But even if she had known that the 'mystery illness' her doctor spoke of in 1999 was HIV, it is unlikely that she would have had access to treatment. In 1999, only some private hospitals and mining health facilities in South Africa provided ARV medicines to people with HIV and few, if any, provided these to pregnant mothers with HIV. If she had been living in a wealthy country, the preventive treatment for pregnant mothers may well have been available to her.

For Hoboyi the healing began when she was referred to the Treatment Action Campaign (TAC), a South African NGO, which was founded by AIDS activist Zackie Achmat in 1998. Achmat made headlines around the world, when, in protest at government policy on ARV drugs, he refused to take the life-saving medicines for months until in 2003 the government promised to provide ARVs to all South Africans in need.

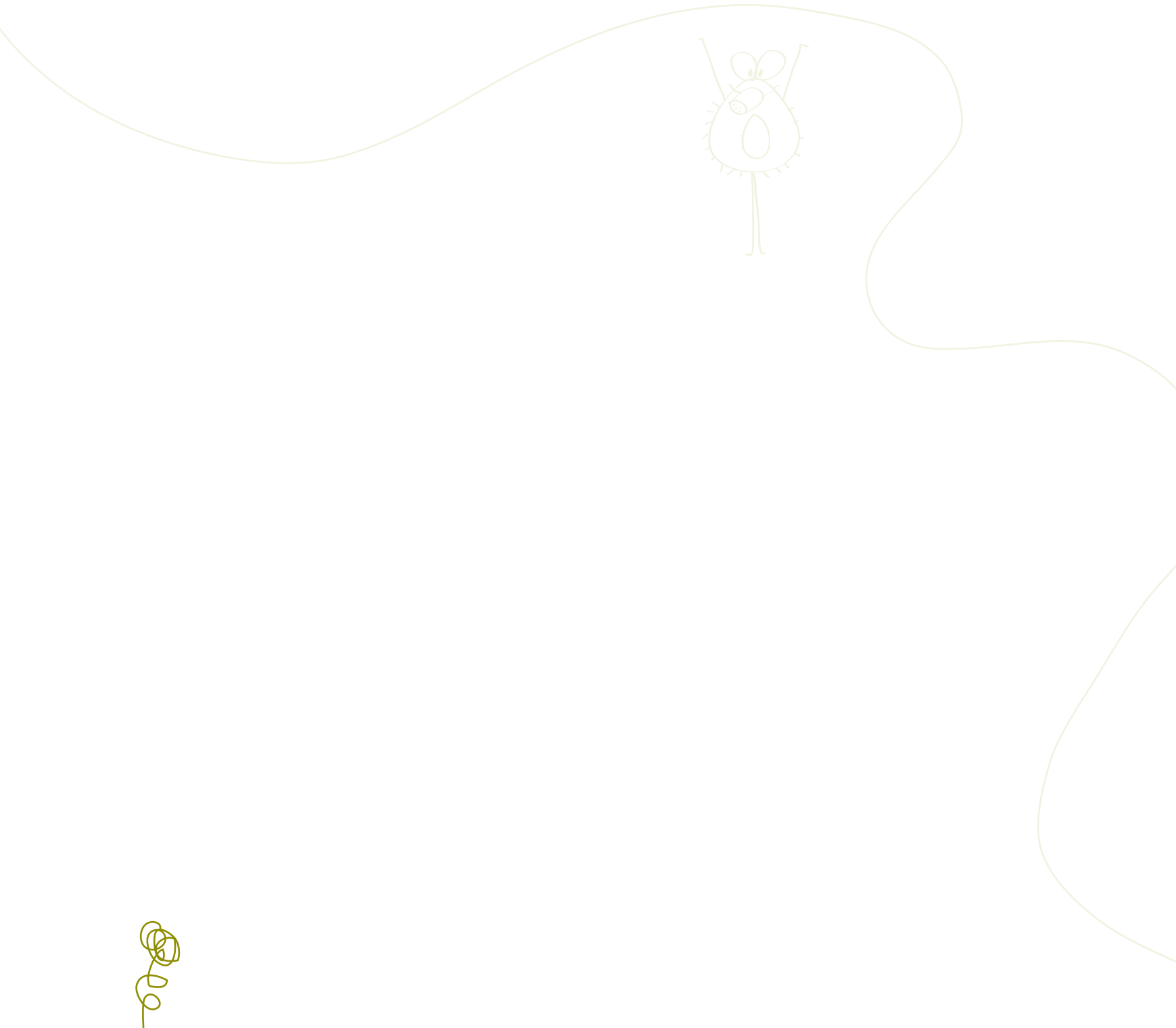
"At TAC, I saw that I was not alone, and I met people who told me that they had been living with the virus for years," Hoboyi says. Given new hope, Hoboyi became interested in learning more about the disease and became an AIDS activist. In 2007, she became pregnant again. This time she was able to take ARV medication and gave birth to a son by Caesarean section, whom she named Qhayiya. He was tested for HIV at six weeks.

Hoboyi wept the day the results came back. Qhayiya tested HIV negative. ■

CHAPTER 6

TUBERCULOSIS

complacency kills



6

TUBERCULOSIS

complacency kills

In the era of antibiotics, tuberculosis seemed to be a thing of the past but this ancient scourge has made a comeback in new, more dangerous forms. The World Health Organization's efforts to fight tuberculosis show how coordinated action can save lives.

Edinburgh, United Kingdom, 1950s. A young British doctor by the name of John Crofton watched as some of the patients died in his tuberculosis (TB) ward in Edinburgh, Scotland, puzzled as to why the drugs they were given did not cure them. "We found that some patients had already been infected primarily by tubercle bacilli that were resistant to one of the drugs," said Crofton, who later became 'Sir John'. "Isoniazid had just been discovered, a drug which did not destroy the bacilli, but which interfered with their reproductive mechanisms, and so we decided to add it to the drugs being administered."

It worked. "To our astonishment we found that we were curing everyone – all the new cases," Crofton recalled. It worked so well that some doctors questioned his findings. But what was happening had to do with simple probability. The chances of

any one organism – in this case a TB bacillus – mutating to resist three drugs at the same time were lower than for one or two drugs. His work showed that by treating patients with three drugs simultaneously and monitoring their progress, it was possible to achieve a 100% cure rate. This approach became known as 'the Edinburgh method' of treatment. It was a breakthrough.

Medicine miracle was short-lived

Tuberculosis has been with us for thousands of years. Evidence of TB damage has been found in human remains dating back 6000 years and in the spines of 3000-year-old Egyptian mummies. The ancient Greek physician Hippocrates observed it to be the most widespread disease of his time. The bacillus that causes tuberculosis was first identified in 1882 by Robert Koch (see Box 6.1 A discovery that paved the way).

Fast forward to the 21st century and TB is still a global menace. Roughly one third of the world's population – a staggering two billion people – are estimated to be infected with TB. These people are not yet sick and cannot infect others, but they are at risk of developing what is known as 'active TB'.

Back in 1948, the year the WHO came into being, TB was considered one of the major public health challenges. This highly contagious disease is believed to have accounted for more deaths over the millennia than wars and famines combined. And then, in the middle of the 20th century, scientists put an end to the hopelessness surrounding TB when they discovered an antibiotic called streptomycin. It was the first medicine that could cure TB, and it was heralded as a miracle drug that seemed to promise a new TB-free age.

But then TB started fighting back.

Like any other living organism, the tubercle bacillus evolves. From generation to generation its DNA

Box 6.1. A discovery that paved the way

It was the German physician Robert Koch who first identified the TB bacillus under a microscope in 1882, using a special technique to stain the sputum (matter coughed up from the lungs). The tuberculin skin test is something else we owe to Koch. Initially, he developed this extract of killed bacteria as a remedy for tuberculosis. But it was not suited for that purpose and actually infected some people he tested with tuberculosis. Later, the Austrian scientist Clemens von Pirquet realized that this extract could be used to detect the presence of an allergic reaction to tuberculin – an indication of whether a person is infected or had been infected in the past. This diagnostic test is sometimes used today, but it is not reliable except to detect latent infections (see Box 6.5 Latent or active?). Koch's discovery of the TB bacillus was important because it paved the way for the development of TB diagnostics, drugs and vaccines. In 1905, Koch was awarded the Nobel prize for medicine.

CDC/Janice Carr

Mycobacterium tuberculosis

adapts to its environment. Within someone who is infected with TB, each new generation of bacilli produces a few that are resistant or partly resistant to a given antibiotic. In cases where the antibiotic is weak or not administered properly, or where treatment is interrupted, resistant organisms are left alive. These re-populate the space left by the bacteria wiped out by the drugs. At this point infected people are worse off than before and when they cough they are spreading the new drug-resistant bacilli.

To counter the problem of drug resistance, doctors started combining streptomycin with another antibiotic called para-aminosalicylic acid or PAS, giving TB patients the two drugs instead of just one. This worked for a while, but as time went on it worked less. Then the breakthrough came in the 1950s with Sir John Crofton's triple combination therapy. His approach was a success in Europe. In the Netherlands, for example, the proportion of people, who were sick and infectious (those with active TB) had been falling by 5% every year between 1910 and 1940, as living standards improved. But with the introduction of streptomycin, that annual drop was 13%. And this success was similar across the developed world. However, in China, India and many countries in Africa, the number of active TB cases was barely coming down, despite WHO initiatives (Photo 6.1).

The problem was that WHO-supported TB programmes in Europe relied on specialized staff to diagnose the disease. But when WHO and its partners encouraged India and other developing countries to adopt similar TB programmes, they struggled because of their weak infrastructure, poorly trained staff and cash-strapped institutions.

What was needed was a workable and affordable way to deliver TB diagnostics and treatment to the urban and rural masses in poor countries, countries that in some cases spent no more than a US$ 1 per person per year on health care.

The beginnings of a solution came with a series of trials conducted by the United Kingdom's Medical Research Council in East Africa, Hong Kong and India in the 1960s and 1970s that proved that new treatment using three drugs: streptomycin, isoniazid and thiacetazone (which replaced PAS) was safe and worked. The great advantage of this new treatment combination was that it took 12 rather than 18 months saving money and making patients more likely to complete their treatment.

Photo 6.1. Africa, 1964. Villagers surveyed to find which population groups have with the highest rates of tuberculosis

WHO/D. Henrioud

Photo 6.2. India, 1960s. Two boys have been tested for TB after they received the bacille Calmette–Guérin vaccine as part of a national campaign to test one million children and vaccinate about 350 000

WHO

When tackling TB, one of the biggest problems health workers face is identifying the people who are sick and infectious early enough to prevent them from spreading the disease. But it is hard to detect TB because people who are sick, do not always go to a doctor or hospital and, when they do, clinics may be ill-equipped and staff do not always identify them. Ideally, clinics should provide rapid testing and put patients on treatment when necessary. But that doesn't always happen.

People spread TB through coughing and sneezing. The person next to you could have it and you would not know. Those who live or work close to someone who is ill with TB and coughing for days are most at risk. As Dr Mario Raviglione, Director of the Stop TB Department at WHO, puts it: "Infectious people are not walking around with the word 'tuberculosis' written on their foreheads." In other words, if they have active disease – which means they are sick and infectious – they are not always easy to identify because the symptoms can be mistaken for those of another disease.

In Europe in the 1950s brochures and posters were distributed to make the public more aware of TB, and mobile X-ray units and specialized drop-in clinics were provided to meet any demand for TB testing. As the number of cases dropped, these units were scaled back. But in India – as in many other developing countries – it was different: a handful of specialized clinics were overwhelmed by a sea of active TB cases. For example, in 1946 India had only 6000 sanatorium beds and an estimated two and a half million active cases, according to the Indian Tuberculosis Control Programme (Photo 6.2).

Groundbreaking studies in India

One advantage India did have was a public health system. While far from optimal, this system, which included general hospitals for anyone who could walk or be carried in, became the basis of India's revised TB screening programme. A study conducted in the Indian city of Bangalore by WHO and the British Medical Research Council in the 1950s revealed that most active TB cases could be identified simply by taking a closer look at patients coming into these hospitals and clinics who showed typical TB symptoms. All that was required to diagnose TB in them was the relatively low-tech method of sputum microscopy, which

dispensed with the need for expensive X-ray machines and specialized staff. The problem with this approach, however, was that it did nothing to prevent cases occurring in the first place.

After Crofton's Edinburgh method and the Bangalore study in which TB cases were identified by hospital staff, a third advance came in 1956, when a study conducted in the Indian city of Madras showed that TB patients could be treated as successfully at home as in sanatoria. This was the first of a series of studies conducted by the Madras Tuberculosis Chemotherapy Centre that had been established by the Indian Council of Medical Research, the Madras state government, WHO and the United Kingdom's Medical Research Council.

The 1956 Madras study had a tremendous impact worldwide, and not only in developing countries; developed countries too began closing their sanatoria. The feeling was that if out-patient treatment for TB could work in Madras where living conditions at the time were appalling, it could work anywhere. Indeed according to Dr Wallace Fox, of the United Kingdom's Medical Research Council, one of the key researchers in the Madras studies, the city was chosen because "everything was unfavourable" for TB treatment.

The 1956 Madras study not only showed that hospital beds were no longer necessary to cure the disease, it also highlighted the importance of Fox's concept of "entirely supervised administration of medicines" – an echo of Crofton's Edinburgh method.

On the basis of the studies in Bangalore and Madras, WHO's expert committee on tuberculosis revised its treatment guidelines in 1964 – that is, its recommendations to countries on how to treat TB – and for the next 10 years many countries started to rely on general health services rather than specialized TB clinics. But in the two-steps-forward-one-step-back manner of many public health advances, the results were disappointing.

While many countries were happy to dismantle expensive specialized TB services, they were less willing to invest extra money in TB diagnosis and treatment provided by general health services. And there were other problems with the outpatient approach to TB care. Doctors' interest in patients with TB often started with diagnosis and ended with prescription of drugs. Once the patients were out the door, they were left to their own devices. This would have been unhelpful with any disease, but it was problematic with TB because patients need to complete treatment without interruption to be cured and to prevent the spread of drug-resistant forms of TB (Photo 6.3).

Photo 6.3. India, 1967. The chief of a mobile health team inspects 'badges of health' on childrens' arms – indelible ink marks indicating that they have been tested for tuberculosis

WHO

New approach is needed

A system was needed to make sure that TB patients completed their full course of treatment and that doctors had some way of knowing whether their efforts to detect and treat TB were working in the long term. In the late 1970s, a system emerged, when, with the support of the International Union against Tuberculosis and Lung Disease (IUATLD), Dr Karel Styblo worked with United Republic of Tanzania's health ministry to develop a structured programme to support TB services in the general health system. Styblo, who was born in 1921 in Czechoslovakia, had an intimate knowledge of the disease, having grown up surrounded by what was termed 'galloping consumption', and having contracted TB as an inmate of a Nazi concentration camp during the Second World War. These experiences led him to become a doctor, eventually working under Crofton in Edinburgh.

Styblo also worked hard to find out why some European countries were more successful in fighting TB than others, working closely with Czechoslovakia and the Netherlands. Meanwhile, a major turning point at the time was the discovery of rifampicin, a TB drug developed in the 1960s and introduced into use in the early 1970s. Wallace Fox from the Tuberculosis Research Unit of the United Kingdom's Medical Research Council, found that by combining rifampicin with other drugs, patients would recover after six to eight months of uninterrupted treatment – a major improvement over 12 to 18 months. It was this breakthrough that heralded a new approach to TB. Styblo tested the new treatment approach in the field in the late 1970s, initially in the United Republic of Tanzania. This work proved that short-course chemotherapy could be used in the poorest settings.

"He was a quiet man", Crofton recalled, "but wonderfully persistent and a tremendous worker". Styblo also had what Crofton termed "a particular genius for persuading governments that TB was a major economic problem". To convince them, WHO commissioned studies to find out whether TB programmes based on the new approach in Malawi, Mozambique and the United Republic of Tanzania and elsewhere were better value for money than previous TB efforts. The findings were clear: the new approach was cost effective compared with earlier TB programmes and also other health programmes.

The Tanzanian TB programme, launched in 1978, was based on case-finding among patients who showed symptoms, the same approach that had worked in Bangalore. It also relied on district-based government hospitals and clinics to provide treatment. Styblo's approach used hospitalization or ambulatory supervision (when patients stay at home and visit the doctor for treatment) during the first two months, to make sure the patient took every dose. He created registers and treatment cards that doctors and nurses could use to see that patients continued their treatment and also – a crucial element that was new – to record the details of the patients who were cured. By recording the success rate of TB programmes, public health authorities could show health workers where TB services were working well and where they could be improved. First recommended by the WHO expert committee in the 70s, it was this crucial addition of what came to be known as 'monitoring and evaluation' that distinguished these new TB programmes from their predecessors and paved the way for today's approach.

In 1991, WHO, working with Styblo, adopted the model as the basis for the DOTS approach that it recommends to government, an all-encompassing public health approach with five key elements: government commitment to a sustained national programme; diagnosis using microscopy to look for bacilli in the sputum; standard supervised treatment and support for patients; a regular drug supply system; and monitoring and evaluation.

The DOTS acronym originally stood for 'Directly Observed Treatment – Short Course' referring to the central role in the strategy of direct observation of patients to make sure they took their medicine until they were cured. This approach formed the basis for WHO standard recommended treatment and has been taken up by virtually all national TB programmes. Under today's TB programmes, patients are able to live at home and take their medicine at home or as close as possible to home with the help of a health worker or a friend or relative, who has been trained.

It took more than 30 years after the 'miracle TB drugs' first appeared to develop an approach to diagnosis and treatment that worked on a large scale in low- and middle-income countries. During that time, the number of TB cases in wealthy, developed countries fell back dramatically, leading to a false sense of security and a perception that TB was a disease of the past all over the world. This complacency led to a decline in spending on TB. In the USA,

for example, funding for TB research and treatment dropped from US$ 40 million a year in the late 1960s to only US$ 283 000 in 1980, while in 1989 the US Department of Health and Human Services was so confident TB was finally on the run that it predicted TB would be more or less eradicated from the country by 2010.

The USA was not alone. "There was neglect on the part of WHO, for sure," says WHO's Raviglione. "It got to the point in 1989 when the Director-General (Dr Hiroshi Nakajima) decided to do something about TB. At that time, WHO had only one epidemiologist and one secretary working on it." The Organization's monthly peer-review journal the *Bulletin* had ceased to produce special issues on the disease, while after 1978 the International Tuberculosis Conference, which had been held every two years, was scaled back to being held once every four years.

A sinister comeback

Photo 6.4. China, 2004. Studying the lungs of a tuberculosis patient

WHO/P. Virot

Tuberculosis had gone out of fashion, or so it seemed. But the shadow of the disease was still lurking, as it continued to tighten its grip silently and steadily across the world. This was so in Africa, where an increase in TB was linked to the growing HIV epidemic. People with HIV, a virus that weakens the body's ability to fight disease, can catch TB more easily than people who are not HIV positive. That is partly why the incidence of TB in Africa has tripled or quadrupled since the early 1980s, while in some countries as many as 70–80% of TB patients are also HIV positive.

Africa does not face the new TB epidemics alone. Countries of the former Soviet Union also saw a surge in TB after the end of communism in the 1990s, driven by disintegrating health-care systems, falling living standards and the rapid switch to a market economy. China and India too faced major TB epidemics. In China, migrant workers who left their homes in rural areas to work in the cities were the group most affected. This migration started in 1992. Lodged in unhygienic and cramped living conditions, they were more exposed to TB. At the same time their health care was tied to their place of birth and so when they became ill, they could not get treatment. These two factors became an important driving force behind China's TB epidemic, estimated by WHO to be running at 1.3 million new cases per year (Photo 6.4).

Affluent countries also saw a surge in TB. In the USA from 1985 to 1992 the average number of TB cases leapt by 20% from 22 201 to 26 673. In New York City alone, TB cases tripled. In contrast to developing countries, the trend in the USA was driven by drug abuse, homelessness and poverty. Moreover, many cases were among recent immigrants from developing countries, which goes to show that that TB has no borders and must be tackled globally.

Tuberculosis was coming back – in new drug-resistant forms. In the USA, for example, Raviglione recalls the first time he realized that drug-resistant TB was a serious problem in New York while he was working at the Cabrini Medical Center between 1984 and 1990. "The question of multidrug-resistant TB came up at a morning report," he says, referring to 30 or so junior doctors who met every day to discuss admissions from the night before (see Box 6.2 Drug-resistant tuberculosis). "This was in 1987," Raviglione says. "Someone with TB had come in, and one of the doctors said, 'Oh yeah, he is homeless so we have to give him three drugs'. I asked why, given that standard practice at that time was to prescribe two drugs, so the doctor said it was because he was likely to have resistance."

The problem, according to the doctor, was that homeless people stayed in hospital for a few weeks only, started the prescribed course of drugs, started to feel better and then disappeared. Then, some time later, they showed up at another hospital and the whole cycle would start again. Raviglione and a young doctor from Mexico, Ariel Pablos-Mendez, decided to look into the issue. "We went back through the records starting in 1981," says Raviglione. "And what we discovered was that more than half the cases of resistant TB were among homeless people." Feeling that the situation should be brought to the attention of the medical community, they wrote a study and submitted it to the *Annals of Internal Medicine*, a leading medical journal in the USA.

Box 6.2. Drug-resistant tuberculosis

WHO/D. Chavez

Philippines, 2009. Patient receives daily injection of capreomycin at the International Center for Tuberculosis in Manila

Multidrug-resistant tuberculosis (MDR–TB) is defined as TB that is resistant to the two most powerful first-line TB drugs, isoniazid and rifampicin. First-line treatment is the initial or first treatment offered to patients, it is usually the standard treatment for any given disease or condition. Extensively drug-resistant tuberculosis (XDR–TB) is defined as MDR–TB plus resistance to the most powerful second-line TB drugs, that is to any fluoroquinolone and any of the three injectable drugs: amikacin, capreomycin and kanamycin. A country with what is known as 'a high burden' of MDR–TB is defined as one where there are 4000 or more new cases of drug-resistant tuberculosis per year, or where 10% of new TB cases are drug resistant. In 2009, there were 27 such countries: Armenia, Azerbaijan, Bangladesh, Belarus, Bulgaria, China, the Democratic Republic of the Congo, Estonia, Ethiopia, Georgia, India, Indonesia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, the Republic of Moldova, Myanmar, Nigeria, the Philippines, the Russian Federation, Pakistan, South Africa, Tajikistan, Ukraine, Uzbekistan and Viet Nam.

Months later the journal rejected the piece because of its "incomplete" statistical analysis. Raviglione and his colleagues were dumbfounded. So much time had slipped away, when something could have been done about the problem of drug-resistant TB. A few months later, the editor of another journal, the *New York State Journal of Medicine*, called Raviglione, expressing interest in the piece. He published it 12 months later in 1990. Raviglione's bleak summary of the episode: "We lost a couple of years."

It wasn't until a year later that the media finally gave the problem the attention it deserved. In 1991, news of an outbreak of drug-resistant TB in New York prisons that had killed several inmates, both in the city and upstate, was splashed on the front page of the *New York Times*, which reported that officials were calling it "the most alarming medical development in the state prisons since AIDS was discovered a decade ago".

Indeed, from 1978 to 1992 the number of patients with tuberculosis in New York City had nearly tripled, while the proportion of these patients with drug-resistant forms of TB had more than doubled. This was the grim finding of one study, but it also gave hope. It found that efforts to make sure patients completed their treatment without interruption and to improve detection of TB in hospitals, shelters for the homeless and prisons between 1992 and 1994, had reduced the number of TB cases by 21%.

What had been happening in New York was mirrored elsewhere. In 1993, based on findings that showed a substantial increase in the number of cases worldwide, WHO declared TB to be a "global emergency" and proposed DOTS as the best and most cost-effective approach to combating TB and worked hard to persuade countries to adopt it, as this old enemy re-emerged in many countries across the world. WHO was raising the alarm. "Complacency towards tuberculosis in the last three decades led control programmes to be run down in many countries," said the *World health report1998*. "The result has been a powerful resurgence of the disease."

For WHO, DOTS was the next key step to tackling the TB emergency. It was around the time that TB made its comeback that WHO, in 1991, started implementing its WHO strategy for global TB control based on the Styblo model. Also, in 1991 the World Health Assembly adopted its first ambitious international targets: to detect at least 70% of active TB cases and to cure 85% of patients by the year 2000. But huge challenges lay ahead, not least the lack of funding and the need to roll out DOTS on a massive scale in countries that were most affected by TB.

China and India gear up

China had made great progress in fighting TB in the 1960s and 1970s, when Chairman Mao Zedong's government sent an army of barefoot doctors into the villages to provide basic health care, while health workers in hospitals were also trained to treat TB. During the late 1980s, standards of health care started to improve and, with the opening of the economy, hospitals and dispensaries started charging fees for their services. Many people who needed it could not afford to be diagnosed and treated for TB. That began to change in the early 1990s, when China became one of the first countries to adopt the WHO-recommended TB control approach, with the help of WHO, the World Bank and others, and to offer these services free of charge for infectious patients (Photo 6.5).

China trained thousands of health workers to deliver specialized detection, diagnosis and treatment services. It set up a better drug supply system and started to keep records of progress made while treating patients for TB. Half of China's provinces benefited from this project. The results have been proclaimed a major public health success. As the Washington-based Center for Global Development put it: "China has averted hundreds of thousands of deaths and paved the way for future wins in the battle against TB." Ten years into the project, a national TB survey in 2000 suggested that the number of people with active TB had dropped by one third in those provinces. Since then, the programme has been rolled out across most of this vast country.

In April 2009, Chen Zhu, China's minister of health, declared the TB programme a major public health success. He said that between 2001 and 2008, 6.42 million pulmonary tuberculosis cases had been detected and treated in his country.

Chen said that China was providing the DOTS approach, as recommended by WHO, across the whole country. By the end of 2008, the TB programme had detected 78% of people diagnosed with active TB and had cured 93% of those treated. "China has achieved, as scheduled, the phase targets of TB control that its government promised to the international community," Chen said.

Meanwhile, in the world's second biggest country by population after China, India, another massive DOTS programme got under way in 1997 with support from WHO, donors and other partners. At the time, India's National TB Programme was not achieving enough.

Photo 6.5. China, 1960s. Three barefoot doctors belonging to a production brigade near Shanghai

WHO/N. Grats

As other developing countries began to adopt DOTS, challenges remained. Not all governments were committed to providing DOTS and the funding needed to step up their TB efforts. Another problem was ensuring an adequate supply of medicines. Poor countries could often only afford irregular supplies of medicines of unproven quality, which undermined the whole basis of the WHO-recommended DOTS approach.

In March 1998, a WHO committee of TB experts met in London to discuss these challenges. Its conclusion was bleak. Since the beginning of the decade, the percentage of infectious cases that had been detected, treated and reported under DOTS had increased from almost nothing to 23%. But this was far from WHO's goal of detecting 70% of TB cases and curing 85% of cases by the year 2000. Many countries had adopted DOTS, but few had really made it work. The TB experts called for a sea change, urging political leaders to join forces to fight TB together and solve the problems with drug supply.

To give new impetus to TB control efforts, WHO launched the Stop TB Initiative in 1998. "It was a low-profile launch, compared to other priorities of the time," Raviglione recalls. Stop TB's goal was to make countries more aware of the growing TB problem and promote the DOTS strategy as the best approach to fighting it.

In 2000, health ministers from across the globe gathered in Amsterdam, some faced rampant TB epidemics at home others were there to donate funds. Rich and poor countries joined forces pledging to act together against TB. In 2001, the initiative expanded and, always hosted by WHO, became the Stop TB Partnership that brought together many other organizations engaged in the fight against TB and they launched the first Global Plan to Stop TB, 2001–2005. Great importance was placed on encouraging research for new drugs, diagnostics and vaccines as well as on TB care and control. Instead of seeing TB as a problem of individual countries it was seen as a disease that knew no borders and thus costs were calculated to find out how much money was needed to tackle the TB epidemic on a global scale. By 2005, nearly all the goals of that first plan had been achieved. A further plan for 2006–2015 was developed. To date, the Partnership has been commended in two external evaluations.

In order to address the bottleneck in TB drug supplies, the Partnership established the Global Drug Facility in 2001. This provides countries with high-quality drugs free of charge or helps countries in procuring drugs at low cost, and supports national programmes to manage TB drug supplies and

ensure that these drugs are properly administered. The Partnership also helps countries apply for donors funding to purchase these drugs.

Between 2001 and 2009 the Global Drug Facility organized the delivery of 13.9 million treatments to 110 countries. Managers of DOTS programmes in poor countries no longer need worry about where they will get their next TB drugs, allowing them to concentrate on improving patient care.

A major concern for some DOTS programmes, however, was that some patients were not recovering from the prescribed 'cocktail' of medicines, raising fears that drug-resistance was to blame. Many DOTS programmes developed after previous years of poor drug supply and as a result drug resistance had already started to emerge. DOTS aims to minimize the emergence of drug resistance by supporting improved adherence. But where drug resistance is already a problem, DOTS alone is insufficient to contain it. Many programmes were unable to test for drug-resistant TB and often lacked the reserve drugs needed to treat this type of TB. In some places, the numbers were fortunately small; in other places, 10% or more of patients were not being cured due to multidrug-resistant TB (Photo 6.6).

Starting in 1999, WHO and its partners tested a new TB management strategy called DOTS-Plus in pilot projects. This was built on the basic DOTS foundation and aimed to make expensive 'reserve' second-line TB drugs more accessible to those who needed them. Access to these powerful medicines was provided by the Green Light Committee of WHO made up of experts from institutions such as CDC, Harvard University and the nongovernmental organization, Médecins Sans Frontières (Doctors Without Borders). As a result of the initiative and negotiations with the drug producers, some countries saved up to 94% of money they would have spent on multidrug-resistant TB drugs while ensuring that treatment was sound and the drugs they received were of good quality.

Following the establishment of the WHO Global TB Monitoring and Surveillance Project in the mid-1990s, the number of TB cases detected has shot up from 11% to 62%, while the level of successful treatment has climbed from 77% to 86% in 2007. This was achieved against a major increase in cases detected. It has also put the world within reach of achieving the Millennium Development Goal 6 to fight major infectious diseases, including TB, by 2015 (see Box 6.3 Fact file: tuberculosis).

Photo 6.6. Kazakhstan, 2009. TB patient walks home in Dalgar after receiving his medicine at a nearby hospital for multidrug-resistant TB

WHO/D. Chavez

Box 6.3. Fact file: tuberculosis

What is tuberculosis? Infectious disease caused by the tubercle bacillus**.** It can kill up to two-thirds of infected people over a period of five years if left untreated.

What does TB stand for? Tuberculosis.

Origin: Found in human remains dating back 6000 years, but is probably older.

Bacteria family: Mycobacteriaceae.

Main form: 75% affect the lungs (pulmonary), but practically all organs can be affected.

Transmission: Coughing, through airborne droplets containing tuberculosis bacilli.

Symptoms include: Cough, coughing up blood, fever, night sweats and weight loss.

Diagnostic tests include: Microscopy, culture, new molecular methods, chest X-ray, etc.

What is tuberculin? A mixture of proteins found in the tuberculosis bacterium, used to test whether a person has a latent infection (see Box 6.5 Latent or active?)

Treatment: Combination of four drugs taken under direct supervision. Standard treatment duration is six months. Resistant strains take up to two years of treatment to cure and require a cocktail of different 'reserve' or second-line drugs.

Vaccine: Bacillus Calmette-Guérin vaccine, better known as BCG.

Photo 6.7. The Russian Federation, 2007. TB patients at Orel dispensary

WHO. E. Zolotova

Russians face new TB epidemic

Resistant forms of TB have also emerged in the Russian Federation. According to Grigory Volchenkov, chief doctor at Vladimir Region Tuberculosis Dispensary, it is a problem that goes back well before the collapse of the Soviet Union in 1991. "The growth of drug resistance is first of all a result of irregular taking of drugs and TB drugs of poor quality," he says, adding that even in earlier decades medical staff did not always ensure that patients were completing their full course of treatment: "Between 1970 and 1999 we did not have adequate protocols of treatment." A study by a group of Russian scientists published in 2000 in Russian tuberculosis journal *Problemy Tuberkuleza* traced evidence of drug-resistance back to 1979 and found a steady increase in the problem up to 1998.

By the end of the 1990s, the tuberculosis epidemic had reached alarming proportions across the Russian Federation, amid a failing economy, falling living standards and a crumbling health system, the supply chain for TB medicines broke down, greatly affecting treatment success. Orel province, in the south-western part of the country, was no exception. "The TB situation in the region was very bad, especially from 1999 to 2000," says Dr Boris Kazyenny, chief doctor at Orel Province Tuberculosis Dispensary in the regional capital (Photo 6.7).

Kazyenny recalls how the supply chains of essential medicines for tuberculosis broke down and, with that, the quality of treatment. "We didn't have enough essential drugs so we had to prescribe an incomplete course of chemotherapy and many patients did not adhere to the treatment regimen," he says.

"That's why after the beginning of the 1990s many of our patients did not make a full recovery and continued to transmit bacteria." Since introducing the WHO-recommended DOTS strategy in 2001, the TB epidemic has stabilized in Orel and control efforts have made progress across the country (see Box 6.4 Evolution of a global strategy to 'Stop TB').

Box 6.4. Evolution of a global strategy to 'Stop TB'

In 2006, WHO launched the Stop TB Strategy. It underpins the Stop TB Partnership's Global Plan to Stop TB, 2006–2015 that sets global targets for TB control for 2015, including those for Millennium Development Goal 6. The six components of the Stop TB Strategy are:

- Pursue high-quality DOTS expansion and enhancement;
- Address TB/HIV, MDR–TB, and the needs of poor and vulnerable populations;
- Contribute to health system strengthening based on primary health care;
- Engage all care providers;
- Empower people with TB and communities through partnership; and
- Enable and promote research.

Just like in China, India and the USA, poor living conditions were a driving factor behind the TB epidemic in the former Soviet Union. Victor Punga, a researcher at the Central Research Tuberculosis Institute in Moscow, notes that TB rates took off during industrialization of the 1930s. Punga says: "We always had a lot of TB, before the (1917) revolution. At that time, they tried to explain the high level of the disease as a legacy of capitalism. But it wasn't so. The situation was determined by social problems. Even if we have high-tech treatment, when people have no food and no place to live, the level of TB increases…. When industrialization began, people lived in very bad conditions and were underfed. This is the best soil for TB to grow."

While it is too early to talk about winning the war against TB, after more than a decade of rising rates of TB, the numbers are stabilizing. Still, daunting challenges remain, notably with regard to the ever-changing microbe itself and its potential to spread fast in a world without borders, in an age of frequent jet travel and mass population movement.

Multidrug-resistant TB

The World Health Organization estimates that there were 440 000 new multidrug-resistant TB cases in 2008. Meanwhile, cases of extensively drug-resistant TB – which was first identified by WHO and CDC in March 2006 – are also on the rise. Extensively drug-resistant TB cannot be treated with first or most of the reserve second-line drugs, and has so far been found in

nearly 60 countries. Extensively drug-resistant TB can sometimes be successfully treated, when the necessary drugs are available, but it is a death sentence for most people who become sick with it. In August 2006, 52 out of 53 people infected with extensively drug-resistant TB died during an outbreak in Kwa–Zulu Natal, South Africa. Most of the dead were also HIV positive.

One of the places where the threat of multidrug-resistant TB and extensively drug-resistant TB is most apparent is the former Soviet Union. For example, official figures show that in 2008 nearly 1 in 4 of new TB cases in some parts of the north-western part of the Russian Federation were multidrug-resistant TB. In other newly independent states, such as Azerbaijan, the Republic of Moldova and Ukraine up to 1 of every 5 TB cases has multidrug-resistant TB, posing a serious threat to TB control. WHO is working with partners in those countries and internationally to control multidrug-resistant TB.

Tuberculosis rates in the Russian Federation are generally falling now and there are some successes in fighting drug-resistant forms of TB – not least in the province of Vladimir, home to over one and a half million people.

Since 2002, WHO has worked with the Provincial TB Dispensary in Vladimir, the country's Central TB Research Institute, CDC and USAID (the USA's government development agency) to implement an intensified programme for infection control aimed at preventing transmission of multidrug-resistant TB between TB patients, as well as reducing the risk of health-care personnel becoming infected. This helped to cut the number of cases among health workers of the Provincial TB Dispensary from 1080 per 100 000 personnel (1993–2002) to 160 (2005–2007) per 100 000 personnel. The Vladimir Provincial TB Dispensary also runs an Excellence Training Centre for health workers from across the country.

But, as we have seen in the past, such successes can always be overshadowed. In one of the last interviews before he died in 2009, Sir John Crofton said he considered the emergence of extensively drug-resistant TB a matter of grave concern and that it posed a similar challenge to the one he faced in Scotland 60 years earlier. He was nevertheless hopeful that several new drug candidates could still have an impact on it, but feared a period of time when many patients' lives will be lost because of drug resistance.

For WHO's Raviglione, while the emergence of highly drug-resistant strains is a serious concern, it is important not to lose sight of the TB problem as a whole. "All TB cases have to be treated properly or we will get more multidrug resistant cases," Raviglione says, underlining the fact that to treat TB properly it is imperative that health ministers around the world realize the enormity of the problem. "They need to put more money into this and where they cannot, they need to apply for grants from the Global Fund (to fight AIDS, Tuberculosis and Malaria) or other international sources of aid."

Raviglione wants to see more laboratories upgraded with new diagnostics technology. "We also need drugs of proper quality and trained physicians. Countries should not be afraid to call for outside experts to come in and teach them how to deal with this problem," he says.

There are signs of political resolve at a global level, for example in 2009, at a meeting on drug-resistant TB organized by WHO in Beijing, China, in cooperation with the Chinese health ministry and the Bill & Melinda Gates Foundation. The meeting was attended by health ministers from the 27 countries carrying the greatest burden of drug-resistant TB, including four – China, India, the Russian Federation and South Africa – that account for an estimated 60% of multidrug-resistant TB cases worldwide.

Box 6.5. Latent or active?

The TB bacillus lodges itself in tiny air sacs in the lungs, known as alveoli. And as soon as it takes up residence, the immune system of a healthy person – the mechanism by which the body fights infections – sends macrophages, which are a type of white blood cell, to attack the TB bacteria that are protected by a tough waxy shell.

The macrophages gobble up the bacteria but then start to clump together, attracting other white blood cells that attach themselves to the clumps. Within a few weeks of infection, the clumps form small hard "tubercles" in which lung cells begin to die, breaking down into a cheese-like substance. For many people, the TB bacteria remain trapped inside the tubercles and this is as far as the disease goes. This state – when the infected person shows no symptoms and is not infectious – is known as latent or dormant TB. More than 90% of people in this state do not develop active disease or any symptoms, which means they do not develop 'active TB'. An estimated two billion people – about one third of the world's population – are latently infected today.

But if the immune system of someone with latent TB is weakened, for example by HIV infection, the bacteria break out of the tubercles, attracting more macrophages and creating more tubercles. Left unchecked, tubercles continue to grow, destroying lung tissue and replacing it with more of the cheese-like substance, which eventually liquefies and is carried up the airways, leaving behind cavities and scar tissue. The build-up of mucus that results from the liquefaction of dead cell tissue causes persistent coughing, one of the main early warning symptoms of TB.

At first, TB can be mistaken for a bad cold or bronchitis. The patient experiences extreme fatigue and a cough that just won't go away. But as the TB bacteria keep killing cells and destroying lung tissue, blood vessels are affected, and blood appears in the sputum or matter from the lungs that is coughed up. And as the tubercles make holes in the lungs, breathing becomes more difficult. The patient loses weight, and often becomes pale and lethargic. It is this characteristic weight loss that inspired the term 'consumption', and the pallor that inspired one of the many nicknames for the disease: the 'white plague'. In the famous poem, *Ode to a nightingale*, poet John Keats, who died of tuberculosis in 1821, wrote of a condition "…where youth grows pale, and spectre-thin, and dies", alluding to TB's relentless deterioration of the body.

Participants pledged US$ 15 billion to finance the TB response particularly to drug-resistant strains and set a deadline of 2015 to do so. They also called for increased investment in research and development of new TB diagnostics, drugs and vaccines, and called upon WHO and the Stop TB Partnership to provide technical support to help them implement plans to respond to drug-resistance. The Organization believes that only 3% of the half million multi-drug-resistant TB cases estimated to occur each year worldwide are receiving adequate treatment from public services. Although it is unclear how many more are receiving care from the private sector, it is still a small number. That means that there are people with multidrug-resistant TB who may not be aware they have it and who can spread potentially untreatable pathogens to people around them (see Box 6.5 Latent or active?).

You don't have to be rich

Despite the enormity of the challenge, Raviglione is optimistic about the future: "I know that when people have the will, they get things done… And I've seen that with my own eyes." Raviglione cites Estonia and Latvia, which were once part of the former Soviet Union and where 9% of TB cases were already multidrug-resistant 10 years ago. "They decided to request external aid. They got technical help. They created hospitals where they could isolate cases. They got the drugs, and they got the laboratories."

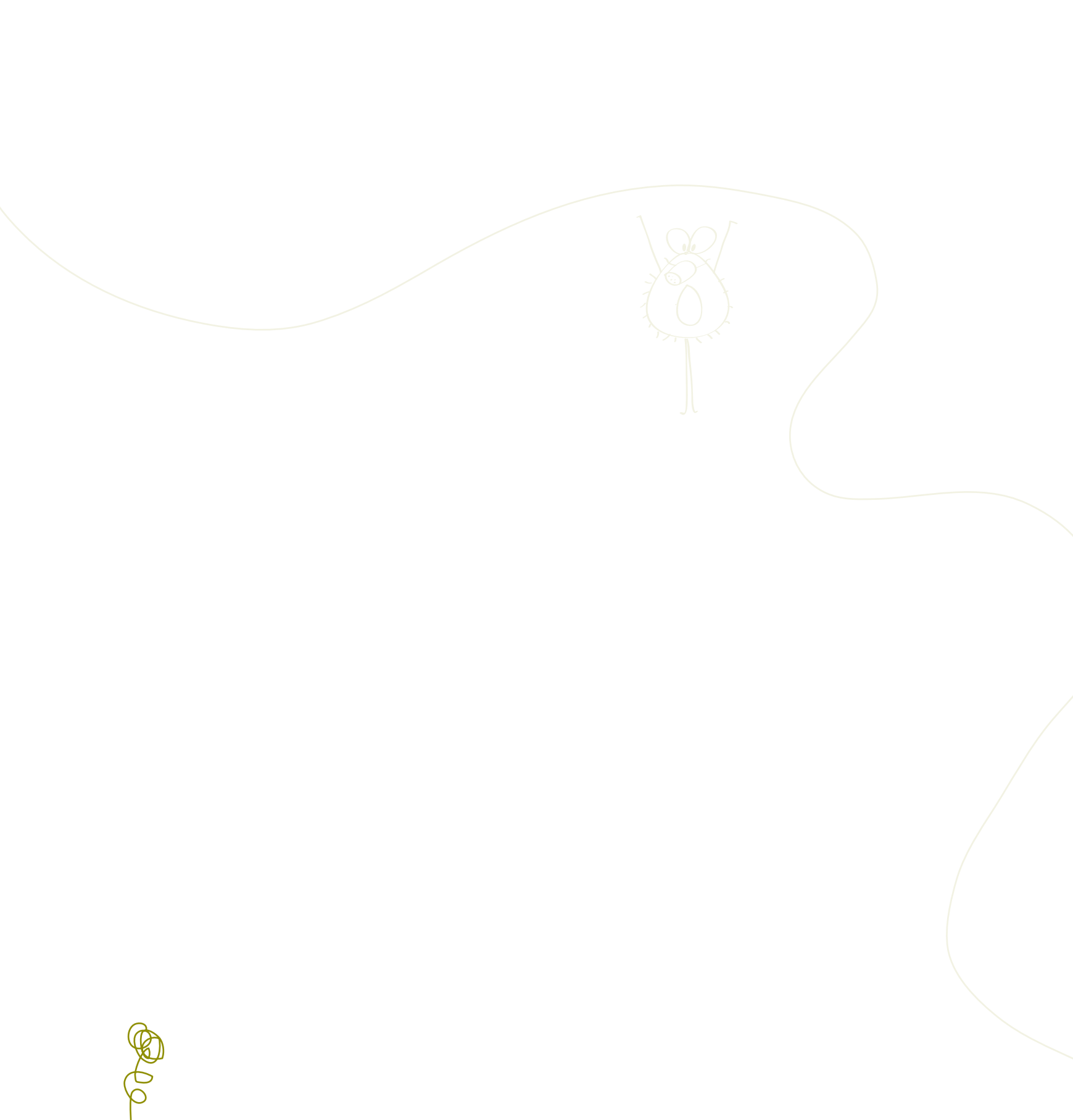
Swaziland is another country that has asked for external funding and technical support. As in other parts of sub-Saharan Africa, TB is closely associated with the HIV/AIDS epidemic there – an association that invites a combined response. In fact, Swaziland has the highest per capita rates in the world for both TB and HIV/AIDS. This fact was brought home to Raviglione in

2008 when he travelled to Swaziland, a country sandwiched between Mozambique and South Africa. There he helped the health ministry convene a meeting with nongovernmental and faith-based organizations working on the frontline of the AIDS epidemic to persuade them to put TB on their agenda. As a result Swaziland received a grant from the Global Fund To Fight AIDS, Tuberculosis and Malaria to tackle the double scourge. "We helped to create a national partnership between government and local and international nongovernmental organizations, so that access and delivery of services can be much more effective," Raviglione says.

Another case in point is Lesotho, a small country surrounded by South Africa that also sought external funding to tackle its TB epidemic in 2006, an epidemic that Raviglione described as "disastrous". "So the decision was made by the Minister of Health to invest in labs to do diagnostic tests", he says, "and within a year I was there to inaugurate the lab in the capital city (Maseru], which was able to use the most advanced liquid culture media equipment that produces a result within a week rather than three months. Now they have introduced a new molecular method that can diagnose multidrug-resistant TB in a day – a method that is not even widely used in the rich world yet. So where there is a political will, there is a way" (Photo 6.8). ■

Photo 6.8. Lesotho, 2009. Community nurse on her way home to her mountain village

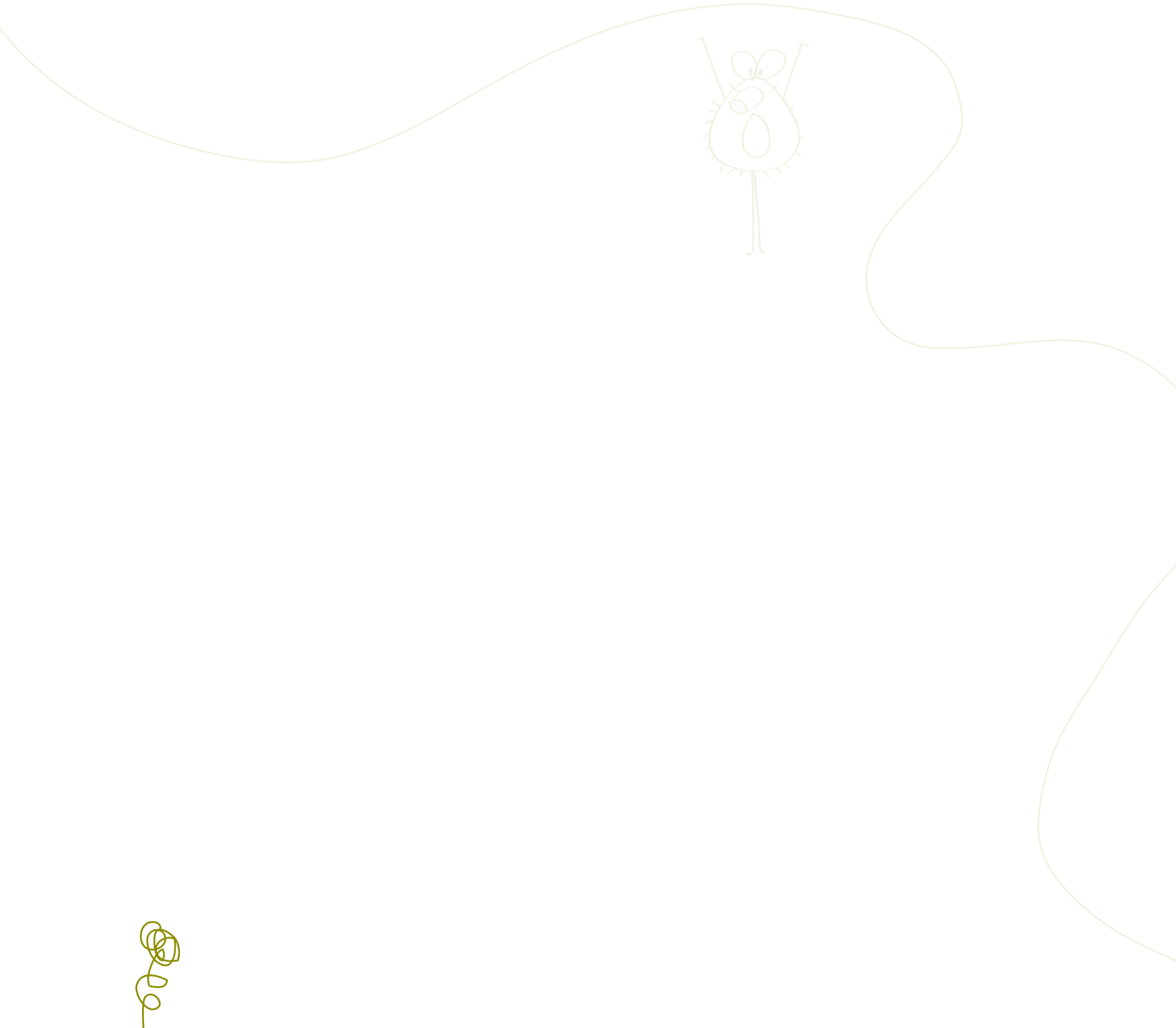
WHO/D. Chavez



CHAPTER 7

OUTBREAK

the world's emergency room



7

OUTBREAK

the world's emergency room

As the first flu pandemic of the 21st century has shown, it only takes a few hours for a disease to wing its way around the world courtesy of air travel. Now armed with sophisticated reporting systems, the World Health Organization and its partners are ready to help countries respond to any outbreak when public health is threatened.

Sudan and Zaire, 1976. At first, the illness looked like malaria or flu. The symptoms came on suddenly – a high fever accompanied by muscle pain. The sick took to their beds complaining of sore throats, nausea, dizziness, abdominal pain and diarrhoea. Then they began to develop a rash that spread all over their bodies. By the beginning of the second week it was clear it was not malaria. As the victims started to bleed from nose, mouth and ears, and pass blood, the doctors and nurses caring for them started to suspect that what they were looking at was something far more serious.

Ebola first appeared in 1976 in simultaneous outbreaks. One in a village called Yambuku near the Ebola River in Zaire, now the Democratic Republic of the Congo.

The other in Nzara in Sudan, now South Sudan. It just seemed to come out of the jungle one day, killing 151 of 284 people with the disease in Nzara and 280 of 318 people infected in Yambuku before returning to the leafy gloom. It re-emerged the following year in Zaire, killing one person.

In 1995, it returned with the ferocity of the first outbreak, this time in Kikwit, a town of around a half million people, 550 kilometres east of the capital, Kinshasa. A laboratory technician at Kikwit General Hospital had come down with fever and bloody diarrhoea a few days after he drew blood from a patient with similar symptoms. Misreading the diagnosis as a perforated bowel, doctors operated, exposing themselves to blood humming with virus.

Four days later, other medical staff at the hospital began to come down with fever, some of them bleeding profusely. But instead of being isolated straight away a few infected people left the town and journalists descended on Kikwit to report the story. A frightening new outbreak had been unleashed.

The World Health Organization first received notice of what was happening on 7 May from its office for the African Region in the Republic of the Congo. Ebola was confirmed on 9 May at which point the outbreak was at least a month old. It raised the prospect of a terrifying scenario: that of one of the world's most lethal diseases – for which there was no cure – had emerged from a rainforest not far from a city of five million people, a city with an international airport that was one connecting flight away from anywhere in the world (see Box 7.1 Fact file: Ebola and Marburg).

Box 7.1. Fact file: Ebola and Marburg

CDC/ Frederick Murphy

Ebola virus

Virus family: Filoviridae derived from *filum* meaning thread in Latin, characterized by long filaments.

Description: Severe acute viral illness often with loss of blood.

Transmission: Contact with contaminated blood, fluids or tissues.

Treatment: Intensive nursing care.

Reservoir: In Africa, the first cases of Ebola in outbreaks, known as index cases, are believed to been infected through contact with dead gorillas, chimpanzees, monkeys, fruit bats and duikers (a type of antelope). Index cases of Marburg are believed to have been infected by Egyptian fruit bats in caves or mines.

Ebola

First identified: 1976, simultaneous outbreaks, one near the Ebola River in Zaire (today's Democratic Republic of the Congo) and the other in Nzara in Sudan (today's South Sudan).

Outbreaks: Côte d'Ivoire, Democratic Republic of the Congo, Gabon, South Sudan and Uganda.

Incubation period: Two to 21 days.

Case–fatality ratio: 50–90% of the people who became infected in these outbreaks died.

Marburg

First identified: 1967 in Marburg, Germany, following importation of infected green monkeys from Uganda.

Outbreaks: Angola, the Democratic Republic of the Congo, Germany, Kenya, South Africa, Uganda and (the Socialist Federal Republic of) Yugoslavia.

Incubation period: Two to 21 days.

Case–fatality ratio: 25–80% of the people who became infected died during these outbreaks.

Deadly hitch-hikers

Since its inception in 1948 one of WHO's key roles has been to respond to outbreaks of dangerous diseases, such as cholera and typhus, by assessing their scale and nature, and by bringing together the international expertise and resources to stamp them out.

Two late 20th century developments – jet travel and mobile populations – make it easier for a disease to spread around the globe within hours. "A typhus louse or a plague flea brushed off the rags of a beggar in an eastern bazaar can be in Tokyo or Oslo, New York, Moscow or Sydney within a few hours." That sounds like a very 21st century observation, but it was in fact made in 1958 by Dr Brock Chisholm, the first director-general of WHO (Photo 7.1). He was talking about the speed with which diseases could travel and he was referring to the first public emergency that WHO faced as it came into being – the cholera outbreak of 1947 in Egypt.

The outbreak started in El Korein, a village on the eastern edge of the Nile Delta where merchants gathered every autumn for a date fair. Nearby, an army of 6000 workers were working on an airbase. A few fell sick and, before any kind of quarantine could be set up, word got out. Panic ensued and people fled the area desperate to escape what was seen as a death sentence.

Three days after the outbreak was declared cases were reported in Cairo. A few weeks later the whole country was engulfed, with run-down hospitals trying to cope with some 33 000 infections. There was mass panic. The last time cholera had swept through Egypt in 1902 it had killed 35 000 people. The government came down hard. The sick were crammed into makeshift isolation wards. Cairo's streets reeked after houses were sprayed with disinfectant. Markets were closed. Even praying outdoors along the banks of the Nile was prohibited and movements of pilgrims from Egypt to Mecca and other Muslim holy places were banned.

Egypt's neighbours looked on with a growing sense of alarm. As Chisholm put it in 1958 when reflecting back on the event 10 years later, "the powerful sanitary barrier of the Red Sea and Suez Canal" had been breached "and, in epidemic proportions, was again threatening the world".

The crisis blew up in the year before WHO's 1948 inception. At that time, the Interim Commission (Photo 7.2), the United Nations body whose job it

Photo 7.1. Switzerland, 1946. Brock Chisholm (left) in Geneva

WHO

Photo 7.2. Switzerland, 1946. Members of the Interim Commission gather in Geneva

WHO

was to look after essential international public health activities until WHO was set up, responded to Egypt's calls for help. Within a few hours telegrams went out to the Pasteur Institute in Paris, the Lister Institute in London and the Haffkine Institute in Bombay, now Mumbai, asking how much vaccine they had available, how quickly they could make more and how soon they could get it to Cairo. Eventually 20 million doses of cholera vaccine were delivered, enough to vaccinate every child, woman and man in Egypt.

With the first response to the crisis under way, the Interim Commission brought together a team of cholera experts in Geneva. One of the central concerns of this group was that there should not be an overreaction to the outbreak. There was good reason for this view.

Ever since the city of Venice in Italy had turned away ships coming from areas infected with plague in 1348, public health officials have argued the merits of quarantine – the isolation of people for a period of time to ensure that they do not carry an infectious disease. But the use of quarantine also had the capacity to produce its own humanitarian crises, sometimes with grave economic consequences. A chilling example occurred in 1848, when the captain of the Matteo Bruzzo, a ship out of the Italian port of Genoa carrying 200 passengers, had declared that there was cholera on board and was kept on the high seas for four months because countries on both sides of the Atlantic refused to let the ship dock.

Such incidents sent a signal to every ship's captain to keep quiet the next time a passenger came down with cholera. And what was true of ships was true of 'ships of state'. Over-strict quarantine, the closing of borders – all such actions had the potential to discourage the disclosure of outbreaks, thereby encouraging the spread of disease.

These concerns prompted the first International Sanitary Conference of 1851, where 12 states debated but failed to agree on the quarantining of patients with diseases, such as cholera, plague and yellow fever. Finally in 1892 countries agreed on the first International Sanitary Convention on quarantine measures, and, by the time of the Egyptian outbreak of 1947, it was generally accepted that the only effective way of dealing with such outbreaks was through international cooperation. Indeed the fact that cholera forced the world's nations to focus their attention on these issues led some to call the disease "the founder of the public health services".

Photo 7.3. Sudan, 2007. This girl survived the cholera outbreak. Most of the people who die are the young children and the elderly

WHO/O. Maher

In the end, the Egyptian cholera epidemic of 1947 was brought under control in three and a half months, from confirming the outbreak to reporting the last case. During that time, 10 277 people lost their lives out of 20 804 confirmed cases – a fatality rate of around 50%. A mass vaccination campaign was launched, followed up with a second round in 1948, and drinking-water supplies and sanitation were improved. That year only 10 cases were reported. In 1949 there were none.

The cholera epidemic demonstrated the importance of having an international body to step in at times of crisis, when relations between individual nations are strained. The response of the Interim Commission to that outbreak became a model for WHO's future work. Far from being a debating society, as some critics suggested it would be, WHO went on to show that it was capable of drawing together the nations of the world in coordinated and rapid action to respond to a common threat.

Swifter reporting

Other lessons were learned in Egypt. If the El Korein outbreak had been reported and investigated immediately and the first patients treated promptly, cholera might never have reached Cairo (Photo 7.3). What was needed was a system that would cut the delay in reporting from days to hours.

The World Health Organization began working on such a system in 1948 using the most up-to-date telecommunications technology of the time – radio. It expanded its Geneva-based radio network and started broadcasting daily bulletins of disease information worldwide, using sources such as centralized public authorities, but port and airport medical services also contributed, as did ships at sea. It was the beginning of a global surveillance system for monitoring the outbreak of disease, but coverage was by no means complete. Many countries did not have effective systems to monitor and report disease outbreaks, while others feared the consequences – economic or otherwise – of reporting potentially lethal outbreaks. Indeed, openness and transparency on the part of countries is just as relevant today as it was back then (Photo 7.4).

Photo 7.4. Switzerland, 1950s. A map showing the location of the wireless stations transmitting epidemiological bulletins to the International Quarantine Service of the World Health Organization, Geneva. This intelligence network received reports about outbreaks of cholera, smallpox, plague and other diseases and kept health authorities informed about them

WHO/J. Mohr

Photo 7.5. Radio was one of the first technologies used to inform the public about disease outbreaks

WHO

While WHO worked to improve the flow and transparency of information, it was also developing the capacity to analyse the data. By the time the Asian flu pandemic of 1957 struck, WHO was able to draw on its global network of laboratories to analyse the virus and declare it to be a new subtype in a matter of days. Samples of the new virus were sent to vaccine manufacturers, while WHO, using radio and telegraph dispatches, got on with the job of alerting the world (Photo 7.5) (see Box 7.2 Three major pandemics in the 20th century).

These were promising beginnings, but they were not followed up. By the end of the 1950s, interest and investment in disease surveillance – including the identification of known cases and tracing of their close contacts – had not yet come into its own. There was a growing sense, particularly in the wealthy countries, that the threat of infectious diseases had gone away. After the Second World War, there was a common perception that antibiotics could kill any microbe and cure any bacterial disease. For many bacteria, initially, that was true. But over the years, microbes developed resistance to antibiotics so that new ones had to be developed. That race against time continues to this day (Photo 7.6).

Yet the stunning advances in the production of vaccines and antibiotics, along with steady progress in the eradication of smallpox combined to create a false sense of security. Reflecting the spirit of the time, the World Health Assembly turned its attention elsewhere, and WHO put some infectious diseases projects on a back burner.

Box 7.2. Three major pandemics in the 20th century

Influenza or 'flu' pandemics are recurring events and have been documented since the 16th century. Since then, each century has experienced, on average, three pandemics.

In the 20th century, the most serious one took place in 1918–1919. Sometimes called the Spanish flu, it is believed to have killed 20–40 million people, most of them young adults. A second pandemic in 1957, known as the Asian flu, killed more than two million people and a third in 1968, known as the Hong Kong flu, killed about one million.

In 1997, 18 people in China, Hong Kong Special Administrative Region, became infected with a type of flu that normally infects birds. Six of them died and it was named A (H5N1) avian influenza. The virus, which is sometimes called 'bird flu', has since infected many people around the world. In more than half of the cases that could be confirmed by laboratory tests, it has proved fatal.

Every new pandemic has the potential to kill millions of people and have a devastating effect on the economies of the countries affected, given today's world of rapid, jet travel and mobile populations. That is why many countries have drawn up plans outlining what they would do if such a pandemic strain were to emerge and that is why the World Health Organization is working to keep governments and the public informed about the safe handling of animals, including birds, so that they know what to do when humans become infected with avian influenza.

Panic in Surat

Brock Chisholm's generation would have loved the Internet for its potential for real-time, global disease surveillance. But he and his fellow public health specialists might have been surprised to see how new problems have emerged as a result of the technological advances in media and communications. One of these

problems was in plain view in India in 1994 during an outbreak of pneumonic plague in the city of Surat. Pneumonic plague is the rarest and most contagious form of the disease with a high death rate (see Box 7.3 From animal to man). It attacks the lungs and spreads when people cough or sneeze, but people can wear a face mask to protect themselves and it can be treated with antibiotics.

However, such considerations tend to be forgotten when a city of two million people hears through a mix of official announcement and rumour that 100 people have died of the disease, that it is carried by the wind and that a sick person can die without treatment in the first 24 hours. In such situations people flee and that is what happened in Surat.

In the days after the media reported the news, as many as 500 000 people fled Surat and the surrounding area. Panic buying of drugs took supplies out of circulation. Further media reports that the central government was sending eight million doses of antibiotics to the city did nothing to quell people's fears.

Once people were on the move, there were serious concerns about the disease spreading to nearby Mumbai with its population of 11 million people.

Almost 40 years had passed since Egypt's cholera epidemic, and yet it seemed that little had been learned. Within a week of the first media reports of the 'outbreak of plague' circling the world with lightning speed, countries throughout Asia and the Middle East had stopped flights to and from India. Meanwhile, Bangladesh, Oman, Qatar and the United Arab Emirates all stopped importing India's foodstuffs, and many other countries followed suit. These measures were taken despite WHO recommendations that no travel or trade restrictions be imposed.

And none of it need ever have happened. The facts of the outbreak, as they later emerged, were that on 20 September 1994, Surat Civil Hospital admitted seven patients with pneumonia-like symptoms. Despite penicillin treatment, two died within a day; meanwhile other hospitals nearby were admitting similar cases. Examination of patient sputum revealed the presence of rod-shaped bacilli similar to the plague bacteria.

India's health ministry was notified and at that point government officials had the choice of declaring an outbreak of plague or waiting a week for laboratory confirmation of what the doctors in Surat thought they had seen. The government decided to go public. Three days later reports of the 'outbreak of plague' flashed around the world.

Photo 7.6. World Health Day 2011 poster

WHO

A subsequent investigation revealed that due to a lack of adequate equipment doctors had relied on clinical diagnosis instead of confirming the presence of plague bacilli through laboratory tests; this had led to the over-reporting of cases. In the end, it turned out that 52 people had died. A later report from the All India Institute of Hygiene and Public Health indicated that not a single case of plague had been confirmed by laboratory tests.

India's trade deficit doubled that year as a result of lost business. Other countries, having observed the price India had paid, would clearly be more reluctant to report similar outbreaks. It was a disaster for global disease surveillance. WHO's director-general at the time, Hiroshi Nakajima, even flew out to Surat – an indication of the depth of the political crisis provoked by the event. Surat showed that while openness and transparency are essential to mount an effective defence against a disease outbreak, rushing to report a suspected outbreak before cases can be laboratory confirmed can result in social upheaval, economic losses and damaged public confidence.

But there were other lessons too, not least the need for better diagnostic services and know-how in the country as well as the need to avoid inaccurate and sensationalist media reports by providing more complete information to journalists. People around the world read reports of a mass exodus from the city of Surat, but were not told that the risk of catching the disease was in fact low and that the spread of the disease was limited.

Box 7.3. From animal to man

More than 30 human infectious diseases, including viruses, have emerged over the past three decades. The emergence of these diseases is due to a number of factors, including urban expansion, population growth and agricultural practices, while their spread has been encouraged by international travel and migration.

Diseases originating in animals, known as zoonoses, account for about three-quarters of the new diseases that have affected humans over the last 30 years. These new infectious diseases do not necessarily affect large numbers of people, but they often trigger fear and panic among members of the public, health workers and governments because they are caused by pathogens that are initially unknown. Also, since they start out as new diseases – 'new' in the sense of being new to humans – no one knows how people become infected and die. This was the case with variant Creutzfeldt-Jakob disease (vCJD), also known as mad-cow disease, and with the Nipah virus, discovered in 1999, which scientists traced to fruit bats but that was originally transmitted to humans via pigs.

Humans can become infected with zoonotic diseases through contact with a wide range of animals and insects. To date, over 200 zoonoses have been identified. Some have caused devastating but isolated outbreaks. Others have threatened human health across the globe. For instance, plague is a bacterial infection carried by rats, mice, squirrels and cats that can be fatal in humans if left untreated. Rabies is a viral infection that can be transmitted to humans by wild and domestic animals.

With new zoonotic diseases appearing every year, we are not only dealing with pathogens spreading across countries and regions, but also diseases that cross the borders between humans, domestic animals and wildlife. That is why the World Health Organization is collaborating with the Food and Agriculture Organization and the World Organisation for Animal Health, as well as NGOs working on issues related to wildlife and agriculture.

Then came Ebola

A year after Surat came the Ebola outbreak at Kikwit, in Zaire. Here the information problem was the opposite – a case of 'too little, too late' (Photo 7.7). A WHO team reached Kikwit on 10 May 1995, less than three days after the government reported the outbreak and obtained a blood specimen for laboratory tests. The government report, however, came four months after the first victim died. The first Ebola death, on 6 January of the same year, was never reported because health workers had no idea why the patient had died. It was only subsequent detective work carried out in the field by WHO experts that traced the chain of transmission back to him.

The WHO team, led by Dr David Heymann, were the first experts to arrive at the site of the outbreak. They were later joined by experts from the Centers for Disease Control in Atlanta, USA, the Pasteur Institute in Paris, France, the National Institute for Virology in Sandringham, South Africa, the NGO Médecins Sans Frontières and other partners.

Soon health workers were driving up and down the broken streets telling people to report family members who showed signs of the disease. People were also asked not to use traditional methods of preparing bodies for burial, as many people had become infected in this way in past Ebola epidemics. People were subdued, scared. Many thought the disease was some sort of curse.

Heymann's experience in outbreak response went back to the 1970s, when he had been recruited into WHO's smallpox eradication programme straight from the London School of Hygiene and Tropical Medicine. After that he'd worked for CDC where his first assignment had been to investigate the outbreak of a puzzling pneumonia-like disease in Philadelphia, Pennsylvania – a disease that came to be known as *legionella* or Legionnaire's disease. That same year, 1976, he had been sent out to the first Ebola outbreak in Zaire.

The outbreak in Kikwit was 20 years later. Heymann knew Africa, and he knew Ebola. Even so, the scenes he saw at Kikwit General Hospital came as a shock. Lacking running water, Kikwit General was like an abattoir. There was virus-infected blood everywhere – on the mattresses, the floors and the walls. The wards themselves were crammed with frightened people – either dying or watching others die. The hospital had no fresh linen to change beds and few sterile syringes. Wearing protective vinyl suits, the WHO team members

Photo 7.7. Zaire, 1995. Sanitary procedures during the Ebola outbreak in Kikwit

CDC/ Ethleen Lloyd

Box 7.4. Marburg virus mystery solved

WHO/C. Black

Bats hanging from the ceiling of the cave

WHO/C. Black

Dissecting bats through the night

The news reached Dr Sam Okware of the Ugandan health ministry by text message on his mobile phone. "Marburg virus isolation confirmed by CDC lab in Atlanta. More later …" This confirmation in July 2007 from the US Centers for Disease Control and Prevention in Atlanta was the trigger for a hunt for the virus's natural reservoir – the animal or other living organism that hosts the virus.

Humans need to know where such a dangerous pathogen is housed so that they can protect themselves against infection. That is why the natural reservoir is an important piece in the outbreak jigsaw puzzle. Another important piece of the puzzle is the 'index case' – the first person to become infected in an outbreak. In the Ugandan outbreak, this was a 21-year-old gold miner who came down with a fever and bleeding, and later died in hospital.

The health ministry began investigating and WHO sent in a team of international experts to work with them. The investigation focused on a cave in Uganda's Kikasi Forest Reserve, where the miner had been working with two others who also became infected with the virus. Only one of the three survived and no further cases were found. But important questions remained: in particular how the miners got infected.

Bats had been found carrying Marburg virus in Gabon, but apparently they had not infected any humans there. The Ugandan cave was home to about 100 000 bats. "These bats sleep during the day and come out of the cave at night," says WHO expert Dr Pierre Formenty. "Every night we set up nets in the entrance of the cave and caught 100 to 200 bats."

To enter the cave, Formenty and the other team members had to wear several layers of protective clothing, covering every inch of their bodies. Outside the cave, the temperature was 27 degrees centigrade, but inside it was a sweltering 32 degrees centigrade.

They brought the bats back to a make-shift laboratory set up in a local hospital, put them to sleep and spent the whole night dissecting them to provide samples. "We were wearing full protective suits and masks that completely cover the face. We breathed through a respirator. It wasn't easy to do the autopsies with scalpels while wearing two pairs of gloves, but we had to," Formenty says.

They sent samples from 611 bats to CDC and tests showed that 5% of them were infected with the Marburg virus.

"It's the first time we could actually link the natural host and carrier of the Marburg virus – in this case the bats – to an outbreak among humans," Formenty says. "The miners were wearing gloves but no face masks. The bats spread the disease by droplets of blood or through urine and faeces in the air, which the miners breathed in. That's how they got infected."

and their partners set up a strict isolation ward, and went about showing the local health workers sterilization techniques and the use of protective clothing so that they could safely treat the sick without becoming infected themselves.

By 14 May, the outbreak had killed 64 people. The government set up roadblocks around the capital, Kinshasa, while WHO sought to calm people by announcing that the outbreak could be contained, even if it reached the city. By 17 May, the investigation had identified 93 suspected cases, 86 of whom had died.

The Organization and its partners moved on to actively look for other cases by tracking down people who had been in contact with the sick. They went house by house through Kikwit and the surrounding area, trying to unravel the tangled chains of transmission and trace the source of the outbreak in order to contain it (see Box 7.4 Marburg virus mystery solved).

Special teams of experts toured the region, some slogging along the muddy roads on foot. Everywhere they stopped to ask questions and take notes. It was in this way that they traced the likely first case of the outbreak – the 'index case' – to a charcoal maker who had died on 6 January in Kikwit General Hospital.

By late May the outbreak was under control. The Organization and its partners helped establish a regional surveillance system that would report any new outbreaks of the disease. In September of that year, having allowed two incubation periods of 21 days to elapse without any repeated cases, WHO announced that the outbreak was over. This time the death toll was 244 of the 315 people who had been infected – a mortality rate of 77%. Yet again, if only the first case had been properly diagnosed before passing on the virus to family members; if only someone had notified the authorities; and if only the authorities had notified WHO, the outcome would have been very different.

Heymann and the WHO team returned to the WHO headquarters in Geneva with one question on their minds: how to improve the sequence of diagnosis, notification and response. One of the team members, Dr Guénaël Rodier, had also studied tropical medicine in London before joining the US Navy laboratories to work on infectious diseases. Like Heymann, he was also committed to developing WHO's disease surveillance and outbreak response. In fact, in the autumn of 1995, it seemed that everyone was pre-occupied with this.

Change in awareness

The re-appearance of Ebola in 1995, coming on the heels of the plague outbreak in Surat, which itself had followed news of a cholera outbreak in Peru, and an alarming outbreak of multi-drug resistant tuberculosis in New York, had contributed to a sea-change in the general public's awareness of the threat from the world's lurking pathogens.

This change was reflected in a World Health Assembly resolution that year urging countries to step up their surveillance of infectious diseases so that they could spot any re-emerging varieties and identify new ones. In October 1995, in response to the resolution, WHO announced that it was setting up a new division devoted to the surveillance and control of communicable diseases, especially new diseases or old ones that had made a comeback, such as tuberculosis. The division would include a rapid response unit whose staff could be mobilized and sent to an outbreak within 24 hours.

It was a promising development, but as Heymann said at the time, its success depended on "the ability to obtain information about infectious diseases and a willingness to communicate this information nationally and internationally".

Finding a way to encourage nations to be more open was the big challenge. One way was to use the International Health Regulations, which were first introduced in 1969 to protect countries from six diseases – cholera, smallpox, yellow fever, plague, relapsing fever and typhus – while minimizing disruption to global trade and travel. In 1995, these rules were revised to require governments to report public health threats within 24 hours, notably disease outbreaks and natural disasters, but the definition also included threats from chemical, biological or radiological materials.

The regulations were revised again in 2005 and came into force in June 2007. This time they were legally binding. The onus is now on countries to implement the regulations, which means they must build their own capacity – that is establish systems and employ technical staff – to notify and report public health events with potential to affect other countries. This could be a disease outbreak, a chemical spill or a bio-terror attack. Countries are also required to report all cases of four diseases: smallpox (which was eradicated in the 1970s, in case of a comeback), poliomyelitus due to wild type polio, severe acute respiratory syndrome (SARS) and cases of human influenza caused by a new subtype (to monitor for a potential new pandemic flu).

However, no enforcement mechanism exists, that is a means to compel countries to report such events. Rodier, the WHO official who was for many years in charge of implementing these rules, said the idea was that countries comply with the rules rather than risking international disapproval and distrust. "A country that knows something but does not report it may make a short-term economic gain, but will incur long-term losses when it gains a reputation as being unreliable as a country and as a business partner," he said. Beyond that, states are likely to be mindful of the fact that today it is simply not possible to keep such incidents secret. In a world of real-time reporting, blogs and Internet chat rooms, the truth will eventually come out.

But if official sources can't always be relied upon for accurate reports of disease outbreaks, and news media have to be treated with caution because of their tendency to sensationalize, where does WHO go to get its information? The answer is everywhere. Almost.

The Organization receives 'formal reports' of suspected outbreaks. These are supplied by ministries of health and national institutes of public health; WHO's regional and country offices; WHO collaborating centres, such as the CDC, also provide information as do civilian and military laboratories, academic institutes, and NGOs.

It also searches for 'informal reports' of outbreaks by trawling the Internet using a powerful search tool called the Global Public Health Intelligence Network, or GPHIN. This web crawler acts as an early-warning system, often picking up reports in many languages about possible outbreaks before they hit the headlines. Up to 60% of initial outbreak reports come from these informal or unofficial sources.

One of the biggest challenges is to verify the information – whether from formal sources, such as governments or informal sources, such as the Internet. In 2004, the team working on verifying these reports moved into a new room specially equipped with the most up-to-date communication technologies for that very purpose at WHO headquarters in Geneva, known as the Strategic Health Operations Centre or 'SHOC room' for short (Photo 7.8). Experts regularly meet to review outbreak reports that have come in. When there's a doubt, WHO contacts governments to verify the reports.

Photo 7.8. Switzerland, 2008. The Strategic Health Operations Centre (SHOC) room in Geneva

WHO/C. Black

Ready to go

The World Health Organization's work often relies on external experts, and its work in helping countries to contain outbreaks is no exception. In the 1990s, WHO realized that to be really effective in this field, it would need to draw on a wide range of external experts. In 2000, it established the Global Outbreak Alert and Response Network (GOARN) for this purpose.

"The Kikwit experience was very clearly a warning that we needed to do something and needed to be better prepared for such incidents," says Rodier. The "capacity to respond was only one element, and we also needed not just experts in whatever pathogen happened to have come to light, but experts in the local language, and familiar with the local terrain".

The GOARN is a diverse network made up dozens of scientific institutes, laboratories and NGOs with a wide range of expertise in infectious diseases. It has the capacity to dispatch these external experts at very short notice into the field, where they work alongside WHO staff to contain outbreaks. Many of these experts keep a packed suitcase at home with them and are ready to fly out at any time of the night or day at short notice, when their expertise is required somewhere in the world.

Dr Mike Ryan joined Heymann and Rodier at WHO in 1996, and is referred to by his peers as "the father of GOARN", remembers the chaos of the pre-GOARN days with typical good humour. He compares outbreak response to a game of football: "WHO, and the other agencies were always meeting in the field and trying to work it out like a soccer team with players coming from all over the place and arriving on the day of the game and deciding what jersey to wear and who's going to be in goals, who's going to play striker and all this without a manager."

To develop the capacity for a uniform response, Ryan and his colleagues invited 50 agencies to meet in Geneva, put a proposal on the table and asked for suggestions. In the end all of them agreed to establish a network of external experts run by WHO staff.

Since 2000, GOARN has honed its ability to respond, learning how to deal with political realities on the ground and about the importance of listening to local communities. Managing an outbreak is not about parachuting in to stricken communities wearing white suits and masks. It's about engaging with local people, who are affected, to explain to them in their own language what they can do to protect themselves and halt the outbreak. This is particularly difficult when it comes to preparing the dead for burial – as some traditional methods have led to further spread of Ebola and Marburg in African countries – and need to be adapted to protect relatives (Photo 7.9).

Photo 7.9. Uganda, 2008. Testing for Ebola

WHO/P. Formenty

The SARS test

On 21 February 2003, a 64-year-old medical doctor from China's Guangdong Province, flew to the Hong Kong Special Administrative Region (Hong Kong SAR) of China, and booked into a hotel room in the city. That night would change the world as he unwittingly transmitted a new, mysterious respiratory disease to at least 16 other guests. Those people travelled on to Canada and Viet Nam setting off a scenario that infectious disease experts had long predicted, courtesy of jet travel and mobile populations. Crowds of people going about their everyday business in the streets of Hong Kong SAR all wearing face masks was one of the defining images of the outbreak that flashed over television screens across the world. By July 2003, when the outbreak had been contained, there had been 8422 cases of people with SARS in more then 30 countries and areas, of which 916 had died.

But for WHO, this new and highly contagious disease that spread by droplets in the air or by touching contaminated objects provided a major test for its surveillance and reporting mechanisms. In November 2002, WHO received reports of a severe flu outbreak in Beijing and Guangzhou in China.

In December of the same year, WHO asked the Chinese government if it could confirm the outbreak. A week later China sent WHO a report confirming the presence of a type B flu strain. It was an outbreak of seasonal flu, nothing

Photo 7.10. China, 2004. Health worker (right) talks to people who may be infected with SARS in Beijing

WHO/P. Virot

more. But later it turned out that there had in fact been two respiratory disease outbreaks in Guangdong Province in mid-November of 2002. One was caused by the flu virus and the other by an unknown pathogen that was causing a new kind of pneumonia infecting a large number of health workers. This first wave of what later turned out to be SARS rolled through December 2002 and January 2003, until a second wave broke during the first 10 days of February 2003. This time even more health workers were getting sick (Photo 7.10).

On 10 February, the WHO office in Beijing received an official e-mail describing an infectious disease in Guangdong Province that had killed more than 100 people. The next day, the Chinese health ministry reported to WHO that there were 300 cases and five deaths in an outbreak of what they were calling "acute respiratory syndrome". The following day, the health ministry said the outbreak dated back to 16 November 2002, that the flu virus had yet to be identified and that the outbreak was being contained.

A week later, a Chinese-American businessman flying from Hong Kong SAR to Singapore came down with pneumonia-like symptoms so severe that the plane had to be diverted to Hanoi in Viet Nam. The businessman had been staying at the same hotel in Hong Kong SAR as the doctor from Guangdong. After his condition worsened, Dr Carlo Urbani, a WHO medical officer, was asked to examine him. Urbani took specimens and sent them to laboratories of the WHO Global Influenza Surveillance Network for analysis.

Several of the health workers who treated the businessman began to develop the same symptoms – a dry cough, fever and difficulty breathing – despite having followed hospital procedures. Urbani told the hospital to isolate patients and staff, and the hospital was closed to the public. He reported these new cases to WHO and the Viet Nam government on 10 March. The severity of the symptoms and the fact that hospital staff there had also been infected prompted WHO to issue a global alert warning governments and the public about a new highly infectious disease of unknown origin in Viet Nam and Hong Kong SAR. The Organization issued the alert on 15 March, when more than 150 suspected new cases had been reported from several parts of the world, including Canada, Hong Kong SAR, Singapore and Viet Nam.

The ultimate price

With that alert, WHO provided a case definition that also named the syndrome as 'severe acute respiratory syndrome' or SARS, beginning a coordinated global outbreak response. Across the world authorities scrambled to prevent and contain SARS outbreaks. Thanks to Urbani and his colleagues in Viet Nam, WHO was able to act with decisive speed, alerting the world to a new global public health threat. But Urbani paid the ultimate price for his professionalism. After the two weeks he spent caring for SARS patients, he caught the disease himself and died on 29 March aged 46.

Following outbreaks in Canada, Hong Kong SAR, Singapore and Viet Nam, China permitted WHO epidemiologists to enter Guangdong Province to verify that the disease there was in fact SARS, a coronavirus related to the viruses that cause the common cold.

By then, WHO teams were working at every SARS outbreak site in Asia. The GOARN network had been able to bring together some of the world's top laboratory scientists, clinicians and epidemiologists in virtual networks, enabling them to quickly arrive at an understanding of the virus and how it was transmitted (see Box 7.5 SARS and the Internet). The Organization then provided that information to health workers with advice on the clinical management of SARS and the protective measures needed to prevent further spread.

Many lessons were learned during the 2002–2003 SARS outbreak – above all that infectious diseases know no borders and are everyone's problem. As Heymann puts it: "The SARS outbreak made one thing very clear – inadequate surveillance and response capacity in a single country can endanger national

Box 7.5. SARS and the Internet

When an outbreak of a highly fatal respiratory disease occurred in late 2002 and early 2003 in China, doctors thought it was a new type of flu. But as cases were admitted to hospitals in Canada, Hong Kong SAR and Singapore, it seemed that the outbreak was crossing borders and spreading fast. When scientists took samples of the 'diseases' and analysed them, they soon realized clear that they were dealing with one and the same disease – not flu, but a new respiratory condition.

The World Health Organization gathered the scientists who were based in the places where cases had been admitted to hospital and invited them to share their findings in telephone conferences. By working together and pooling their knowledge online about the new health threat, they knew that they could quickly identify the new disease. Once identified, experts could then find the best ways to contain the disease and save as many lives as possible. That is exactly what happened, thanks to their joint efforts and the Internet.

To enable the scientists to share their findings, WHO set up a password protected web site. Often scientists prefer to work in isolation and to be the first to make a scientific breakthrough. But this time, they shared their information by telephone and online, and within about a month the scientists had identified and genetically sequenced the new virus. They found out that it was a coronavirus, and gave the disease a neutral name – severe acute respiratory syndrome – because they felt it would be unfair to associate it any geographical place unlike Marburg, which was named after a German city, and Ebola, named after a river in the Democratic Republic of the Congo. Today, the new disease is best known by its acronym, SARS, and – as far as we know – has not made a comeback.

populations and the public health security of the entire world." In other words, if one country fails to keep an eye on disease outbreaks and does not report promptly an outbreak that has the potential to spread fast, that country and the rest of the world will pay the price later.

At the beginning of the 21st century countries faced a test of their ability to do just that. It came in the form of a new flu virus that became known as A (H1N1) 2009 influenza that was first identified in spring 2009 and that by July of the same year, had spread to more than 100 countries, prompting WHO to announce the first flu pandemic of the 21st century (see Box 7.6 The first flu pandemic of the 21st century).

This time it seemed that some lessons from history had at last been learned. Many countries that were affected – in particular Canada, Mexico and the United States where the new virus seems to have struck first – were praised for their willingness to share information and join forces with other countries to combat the new global health threat.

"Mexico gave the world an early warning and it also gave the world a model of rapid and transparent reporting, aggressive control measures and generous collaboration as their own outbreaks began to spread," said WHO Director-General Dr Margaret Chan. Referring also to the contribution of Canada and the USA, she said on a visit to Mexico in July 2009: "WHO and the international community have much to thank these three countries for setting a precedent that, up to now, nearly every country has followed." ■

Box 7.6. The first flu pandemic of the 21st century

Though often confused with the common cold, influenza – the real 'flu' – can be lethal. Influenza viruses are particularly difficult to fight because they are constantly changing. These viruses are new and therefore not recognized quickly by our immune system and that is why new vaccines are developed every year to protect us from them. A new influenza virus crosses from animal species into the human population every decade or two infecting people with no immunity and leading to an influenza pandemic.

WHO/H. Ruiz

Measures taken during the influenza A (H1N1) outbreak in Mexico in 2009

That is precisely what happened in 2009. In March of that year, WHO received reports from Mexico and the USA of an unusually high number of flu cases for early spring in the northern hemisphere. It turned out to be a new influenza virus, named pandemic A (H1N1) 2009 to which the vast majority of people around the world at the time had no immunity, but to which some people aged over 65 years had succumbed.

After early outbreaks in North America in April 2009, the new virus spread rapidly around the world. By the time WHO declared a pandemic in June 2009, a total of 74 countries had reported laboratory confirmed infections. As of February 2011 most countries in the world have had confirmed infections with the new virus.

The Organization has been working closely with governments to slow the spread of the pandemic influenza virus A (H1N1) 2009 and to encourage rapid vaccine production and distribution, including vaccine donations to poor countries.

Since previous flu pandemics (see Box 7.2 Three major pandemics in the 20th century), new antiviral medicines have been developed to provide treatment especially for the people who develop more severe illness or who are at higher risk of complications. In addition to vaccines and antiviral medicines, WHO and governments have distributed information on how individuals can protect themselves and others from getting infected in the first place, through simple hygiene measures, such as hand washing.

Unlike typical seasonal flu (which is mainly deadly for the elderly and for people with chronic medical conditions) pandemic A (H1N1) 2009 virus has led to unusual patterns of illness and death, particularly among younger people who were otherwise healthy. Still, two years into the first flu pandemic of the 21st century, most people who caught the new virus have experienced only a mild illness and recovered without treatment.

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