

The immunization programme that saved millions of lives

What started as an ambitious effort to tackle six vaccine-preventable diseases has become one of the world's most successful public health programmes. This month the Expanded Programme on Immunization marks its 40 years. Michael Reid and Fiona Fleck report.

In the 1960s, smallpox was still circulating in Africa and Asia. Within a decade of the launch of the World Health Organization's (WHO) Intensified Smallpox Eradication Programme in 1967, the disease had been wiped out globally.

Long before the last case of smallpox was reported in 1977, the idea that a similar approach could be taken with other vaccine-preventable diseases was gaining support.

Dr Donald A Henderson, who joined WHO in 1967 to head the Intensified Smallpox Eradication Programme, was struck by how much could be achieved with modest means. "We found very quickly that in Africa the average vaccinator could reach 500 African children a day," he says. "We wondered 'why aren't we doing this with more vaccines?'"

But the idea did not take hold immediately. And even after the Expanded Programme on Immunization (EPI) was established by a World Health Assembly resolution (WHA27.57) in 1974, it "sputtered along with only one full-time medical officer and secretary, supplemented by part-timers lent from other divisions," according to the pro-

gramme's first full-time director Dr Rafe Henderson (no relation).

In 1977, when it was clear that without more resources, the programme would end, Dr Halfdan Mahler, the WHO Director-General at the time, stepped in, providing over US\$ 1 million of WHO's regular budget to support eight professional and four secretarial staff.

"That was a boost," Rafe Henderson says, "but the breakthrough that set the programme on its future course came when UNICEF was brought in, with its executive director, James Grant, providing funding for national programmes and persuading, if not scolding, national leaders to support EPI".

While other donors joined them, it was the core EPI team at WHO that established the foundation of this global initiative with its cold-chain unit, led by John Lloyd and James Cheyne, "catalyzing a revolution in improved cold-chain equipment and logistics," Rafe Henderson says.

Few countries had immunization programmes and most were just responding to outbreaks, according to Dr Ciro de Quadros, who became head of EPI in the WHO Region of the Americas in 1976. His first step was to

get countries to appoint a national immunization manager.

"We brought together the country managers and everyone else from the governments working in epidemiology, primary health care, and so on, and listed the problems – how to improve coverage, do surveillance and organize the cold chain – and analysed them. Then we worked on each problem and solution in each country," de Quadros says.

In the 1970s countries the world over were keen to launch their own EPI but lacked important elements, including sustainable funding, heat-stable vaccines (in tropical countries), suitable transportation and a system to guarantee vaccine quality.

Cheyne and Lloyd worked on vaccine logistics in collaboration with the United Nations Children's Fund (UNICEF) and its supply division, and soon UNICEF was providing newly designed refrigerators, cold boxes, syringes, needles and sterilizers and other technologies for vaccine delivery.

The first cold-chain training course was written in three weeks, tested in Nepal, revised and tested in three other countries so that within four months course materials were ready for distribution. "EPI benefited from an organizational culture that allowed projects to develop quickly based on a 'guess and test' strategy," Cheyne recalls.

Another factor for EPI's success was the sharing of country data at meetings, which, Cheyne says, put the health ministries under peer pressure to match or exceed the progress that the EPI managers saw in their neighbours' programmes.

The WHO cold-chain unit worked out many of the detailed logistical needs of national programmes and provided training for national immunization managers. In the Democratic Republic of the Congo (DRC), Dr Jean-Marie Okwo-Bele coordinated immunization in three provinces during the 1980s, before taking over as national coordinator of EPI.

"The key elements were training provincial and district managers, equipping districts with transport – cars, motorcycles and bicycles – and cold-



Community health worker prepares to vaccinate a child in Niger.

chain materials, such as freezers and refrigerators, to keep the vaccines cold,” Okwo-Bele says. “Electricity supplies were scarce, but we received funding to procure kerosene to run absorption refrigerators.”

For Okwo-Bele, reliable funding and political backing were essential for his country’s EPI, and DRC had both, thanks to the government, United Nations organizations and partners including USAID, Oxfam and Rotary International.

Later, when he led the Polio Eradication Initiative in Africa from 1993 to 2002, the number of endemic countries fell from 34 to just two – an achievement that would not have been possible without the African Union’s Yaounde Declaration by heads of state and government in 1996 supporting polio eradication.

“Nelson Mandela’s personal support for the ‘Kick Polio Out of Africa’ campaign, with his personality and charisma, was hugely influential,” says Okwo-Bele, who has been the director of the WHO Department of Immunization, Vaccines and Biologicals since 2004.

For Dr Thomas Cherian, who coordinated WHO’s EPI from 2006 to 2012, the programme’s achievements far exceed the expectations raised by the 1974 resolution. “Virtually all countries have immunization programmes and most of them have dedicated budgets and effective surveillance systems, which are vital for detecting new cases and monitoring the extent to which a population is protected,” he says.

Since the 1980s, the quality of vaccines has been assured, through the

prequalification system managed by WHO, so that these vaccines can be recommended for bulk purchase by UNICEF, the GAVI Alliance (formerly known as the Global Alliance for Vaccines and Immunization) and other funding agencies. Thanks to prequalification and other regulatory systems, more than 90% of vaccines used in national immunization programmes are of an assured quality.

Immunization in countries is no longer limited to the six classic vaccines for children: diphtheria, pertussis, tetanus, measles, poliomyelitis and tuberculosis.

Infants are vaccinated routinely against rubella, hepatitis B, *Haemophilus influenzae* type b (a leading cause of bacterial meningitis and pneumonia), rotavirus (a major cause of diarrhoea) and *Streptococcus pneumoniae* bacteria (a major cause of pneumonia). In some countries human papillomavirus vaccine is included for girls between nine and 12 years of age and routine immunization against regionally important diseases such as epidemic meningococcal meningitis, yellow fever and dengue is also offered.

Given the number of deaths prevented – estimated to be in the millions – and the increased potential for delivering new vaccines in future, EPI is considered to be one of the most successful public health programmes to date.

Six years into the programme in 1980, global immunization coverage for the first dose of diphtheria-tetanus-pertussis vaccine was 30% and 20% for the third dose (DTP3). By 1990, global coverage for these two vaccinations had reached 88% and 76% respectively, and by 2012, it had reached 91% and 83%.

Immunization received a massive boost in 2000 with the launch of the GAVI Alliance, bringing together governments, international agencies, the private sector and philanthropic foundations.

Established with a WHA resolution (WHA53.12) in 1999, the GAVI Alliance has made a major contribution to improving access to sustainable immunization services in countries that are eligible for its funding.

Still, many countries are falling short of the ambitious goals set out in the 2020 Global Vaccine Action Plan (GVAP) that countries adopted at the World Health Assembly in 2012.

Global vaccination coverage was about 5% in 1974, but the goal now is to reach at least 90% of the population nationally, and at least 80% in every district. In 2012, 59 countries had achieved this target including several low- and middle-income countries. “It is a mark of the success of EPI that it is setting new, ambitious targets, although some countries may be falling short,” says Cherian, who leads WHO’s work on implementing the GVAP in countries.

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Thomas Cherian

While poor countries may receive funding for immunization programmes from the GAVI Alliance and other donors, middle-income countries cannot afford expensive new vaccines and additional cold storage requirements.

“We are seeing much more vaccine production in the developing world. China, India and Indonesia are all supplying vaccines that are of an assured quality and are pre-qualified by WHO,” Cherian says, giving hope that more affordable vaccines will become available and all countries will be able to attain universal coverage of immunization services.

Strengthening public health systems is seen as vital to sustaining EPI’s success well into the 21st century. “Increasing the number of vaccines you administer means you are adding to the strain on the overall health system, so you need to strengthen that, for example, by improving health worker training, supply chains and monitoring systems,” says Cherian.

An estimated one in five children still do not receive the basic EPI vaccines. “If there is the political will, the initiative in the countries and the required investment, then these ambitious targets can be achieved, as has been demonstrated in many low- and middle-income countries,” Cherian says. ■



WHO/Umit Kartoglu

The vaccine vial monitor – the image on labels of a square inside a circle – contains heat-sensitive material that registers cumulative heat exposure over time