News

Was 2005 the year of natural disasters?

Why do natural disasters seem to be increasingly frequent and increasingly deadly? Poor and vulnerable people are usually the worst hit.

Tsunamis, hurricanes and typhoons, earthquakes, locusts and now the threat of a flu pandemic. Will 2005 be remembered as the year of natural disasters?

The year 2005 saw the aftermath of the 26 December 2004 earthquake and tsunami waves in Asia, hurricanes in central and north America, notably Katrina, which triggered flooding in the US city of New Orleans, and the 8 October earthquake in Pakistan and India. The year also saw famine after crops were destroyed by locusts in Niger.

Virtually unnoticed by the outside world was tiny El Salvador where the country's highest volcano, Ilamatepec, erupted on 1 October, displacing more than 7500 people and killing two. A few days later Hurricane Stan swept through and killed about 70 people with floods and mudslides.

From January to October 2005, an estimated 97 490 people were killed in disasters globally and 88 117 of them in natural disasters, according to the Center for Research on the Epidemiology of Disasters (CRED), a WHO Collaborating Centre that operates a global disaster database in Belgium. According to CRED, the number of natural disasters — floods, windstorms, droughts and geological disasters — recorded since 1900 have increased and the number of people affected by such disasters has also increased since 1975.

Is this as bad as it gets, or could it get worse? Why do natural disasters appear to be increasingly frequent and increasingly deadly?

Today's disasters stem from a complex mix of factors, including routine climate change, global warming influenced by human behaviour, socioeconomic factors causing poorer people to live in risky areas, and inadequate disaster preparedness and education on the part of governments as well as the general population.

Some disasters experts reject the term "natural disasters, arguing that there is almost always a man-made element.

"I don't like to use the term 'natural disasters'," said Dr Ciro Ugarte, Regional Advisor for Emergency Preparedness and Disaster Relief with the Pan American Health Organization (PAHO) in Washington DC, explaining that natural disasters would not have such a devastating effect on people's lives if they were not exposed to such risks in the first place.

Natural phenomena do not always generate human disasters. Ugarte noted that in 2005, several earthquakes that struck in South America were of a higher magnitude than the one that devastated northern Pakistan and parts of India in October, but these hit sparsely populated areas and therefore caused less damage. The same goes for several tsunamis in 2005 which were not deemed "disasters" because they didn't endanger anyone, Ugarte said.

Natural phenomena are likely to affect more people because Earth's population has increased. According to the United Nations Population Fund, this stands at about 6.5 billion people and is projected to reach 9.1 billion people in 2050.

Marko Kokic, spokesperson for WHO's Health Action in Crisis department, said that some communities are more vulnerable to the effects of natural disasters than 100 years ago because of ecological degradation. He said that, for example, when tropical storms hit the Caribbean in September 2004, there was nothing to stop storm waters gathering and wreaking devastation in Haiti because of deforestation.

"We need to tackle the underlying issues, such as poverty and inequity," Kokic said, adding: "In many countries, people cut down trees because wood is the cheapest fuel".

Disasters are also a consequence of development and industrialization. In Europe, experts believe that countries such as France and Germany are more adversely affected by floods today because major rivers, such as the Rhine, have been straightened to ease commercial traffic.

Global warming as well as routine, cyclical climate changes are causing a higher number of strong hurricanes in the Caribbean, meteorologists say. Add to that the increasing number of people living in areas such as coastlines, in

WHO/C. Black

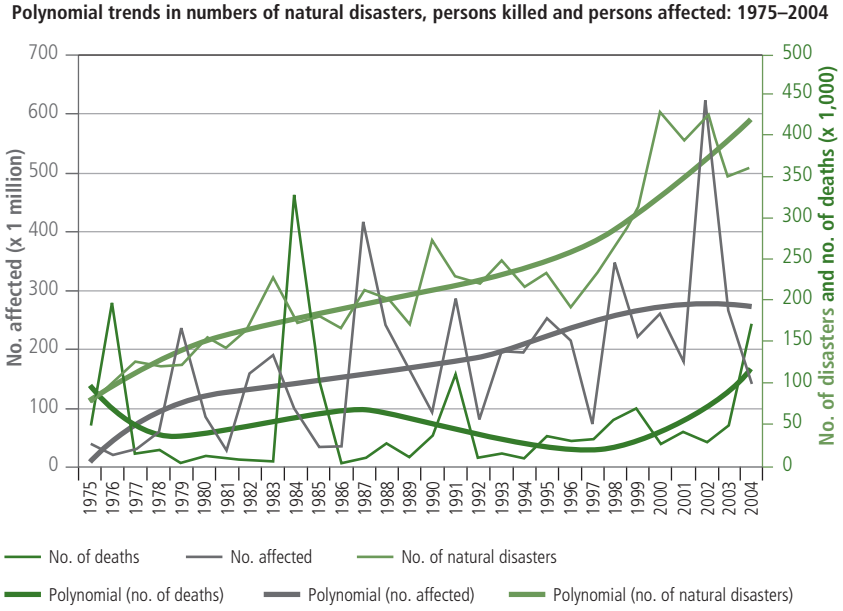
The Asian earthquake on 8 October killed 73 000 people and seriously injured 70 000 more. Three million people were left homeless and hundreds of thousands still lack the shelter they need to survive the winter.

substandard housing and the destruction in a crisis of essential infrastructure, such as hospitals, and you have the potential for more devastating disasters than a few decades ago.

There have always been disasters. The bubonic plague wiped out more than 25 million people, or 37% of Europe's population, in the 1300s. More recently, the 1918–19 flu pandemic killed between 20 and 40 million people worldwide. One of the earliest recorded disasters, the eruption of Vesuvius in 79 AD, buried the ancient Roman city of Pompeii killing about 10 000 people. Today, two million people live within its possible range, illustrating one major difference between then and now.

About 75 disasters were reported globally in 1975, according to CRED. In 2000 the figure peaked at 525 and dropped to just under 400 in 2004. By far the highest number of fatalities — about 450 000 — occurred in 1984. In 2004 nearly 300 000 died in disasters, but the number of people affected has soared since 1975 with about 600 million people affected by disasters of all kinds in 2002 (see graph).

Fig. 1. **Trend in disaster occurence and impact 1975–2004**



Source: EM-DAT: The OFDA/CRED International Disaster Database. http://www.em-dat.net, Université Catholique de Louvain, Brussels, Belgium.

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Since 1975, the number of disasters and the number of people affected by those disasters have gone up.

So complex and intertwined are the factors behind these disasters that some experts believe the most practical approach to preparedness may be to focus on reducing the risks rather than factors behind the risks.

Dave Paul Zervaas, regional coordinator for Latin America and the Caribbean at the United Nations' International Strategy for Disaster Reduction (ISDR), argued that preparation should focus on making people less vulnerable to disasters.

"We think it's much more important now to look at vulnerabilities, because you have factors you can control," Zervaas said. "You can work to lower vulnerability [to disasters]."

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Hurricane Katrina in the United States is a good example, Zervaas said. A number of factors contributed to the damage and loss of life. The storm was huge. It struck a city whose levees had not been maintained or strengthened for years, and government agencies' response to the emergency was at first inadequate.

In Central America storms such as hurricanes Mitch and Stan have wrought damage with rain and landslides rather than wind. "The poverty issue and the social inequity situation have not become much better in most places," said Zervaas, adding that migration to cities conspires with a lack of urban planning to put people in danger.

Clearly, climate change — whether helped by human behaviour or not — is playing a role. Hurricane experts say the world is in the midst of a routine, cyclical climate change that causes the Caribbean to heat up, increasing the frequency of powerful storms. The effect of this is greater than that of global warming, according to Stanley Goldenberg, a meteorologist at the US National Oceanic and Atmospheric Administration in Miami.

While earthquakes represent some of the most devastating disasters in recent years, these are diminishing in strength compared with earlier times, Ugarte said. Nowadays an earthquake with a magnitude of 8, 9 or 10 on the Richter scale is rare, the one in south Asia in October 2005 was 7.6, Ugarte said, adding: "But yes, we are seeing a lot of damage. You will probably find more damage in the future for phenomena that are less in magnitude than in previous years."

Experts agree that the poor are disproportionately hit. "In several of these countries, the poor people are looking for spaces to build their houses or their communities [and] they find spaces that are not already used," Ugarte said. "And those spaces that are not already used are usually the spaces at higher risk for natural phenomena. There's a huge relationship between this kind of damage and poverty."

For this reason financial services play a role in both prevention, and damage limitation and recovery. A report entitled, *Climate change futures: health ecological and economic dimensions,* published in November 2005 assesses the risks generated by climate change. One of several scenarios "would involve blows to the world economy sufficiently severe to cripple the resilience that enables affluent countries to respond

to catastrophes," according to the report, which was published by the Center for Health and Global Environment at the Harvard Medical School and sponsored by reinsurance company Swiss Re and the United Nations Development Programme.

While it is important to encourage people, governments and companies to buy insurance, not everyone can afford it or see the need.

Microfinancing is another avenue, giving poor people the means to improve their economic situation so that a disaster does not hit them as hard as it would otherwise, and also by lending them money to use in recovering from it.

Many countries are working to improve their disaster preparedness, but more needs to be done, Ugarte said.

"Countries are now better prepared in comparison to 1970," he said. "But now the level of preparation and risk reduction that you need is huge in comparison to that year."

The Michoacan earthquake in Mexico in 1985 showed that being well prepared was not enough because hospitals in the disaster zone were destroyed. Likewise, in Grenada Hurricane Ivan damaged and disrupted much of the Caribbean island's health system, making it difficult for health workers to respond to the needs generated by the hurricane.

PAHO has expanded its programmes to focus not only on preparedness but also on mitigation. This involves reducing secondary deaths and destruction that can occur in the aftermath of a disaster, and implementing building codes that require hospitals, schools, military bases other vital structures to be built to withstand such disasters.

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Many countries say they can't afford more preparation, but some measures are simple and can be inexpensive, such as a tsunami warning system, Ugarte said. "But from there to Banda Aceh, that is another step," Ugarte said, referring to the capital of the Indonesian province that was worst hit by the earthquake and tsunami of December 2004. "And from Banda Aceh to all the little communities on the coast, that's another issue. That last link of the chain is not in place. And that is the system that we need to build."

Disaster experts say early warning systems and education are essential to prevent and mitigate against the effects of natural disasters. In its *World disasters report 2005*, the International Federation of Red Cross and Red Crescent Societies notes that a simple phone call saved thousands of lives when the giant tsunami waves hit India in 2004. A fisherman's son named Vijayakumar Gunasekaran, who lives in Singapore, heard about the tsunami early on the radio and phoned relatives living on the east coast of India. Following his warning, all 3630 residents evacuated their village there before the waves arrived. ■

Theresa Braine, *Mexico City*

New type of R&D cooperation spawns malaria drugs

Artemisinin-based combination therapy drugs (ACTs) are the most effective malaria medicines to date, but many of the world's poorest countries can not afford them. Two ACTs that are due to go on the market this year may help to fill the gap.

Artemisinin-based combination therapy drugs (ACTs) drugs are seen as a new way forward to treat malaria. But combining these medicines into a single tablet is often a challenge, and like most innovations is rarely tackled by scientists in developing countries.

Recently, however, a team from Brazil's Farmanguinhos, an institute of the Oswaldo Cruz Foundation (FIOCRUZ), solved the scientific puzzle of how to combine two antimalarials, artesunate and mefloquine, into one tablet.

"Artesunate is a very tricky substance to work with," said Solange Wardell, coordinator of the Brazilian team, adding: "a slight increase in humidity could make artesunate decompose, thereby ceasing to be active."

Wardell said it was essential that the combined drug be stable in tropical,

Farmanguinhos

Members of the Brazilian team at Farmanguinhos.

humid climates where malaria is prevalent. It took a year of experiments to achieve that stability.

Brazil is one of several countries involved in a project run by a non-profit group Drugs for Neglected Diseases Initiative (DNDi) to develop fixed-dose artesunate-based combination medicines. Brazil's state-owned laboratory Farmanguinhos is perhaps best known for manufacturing generic versions of antiretroviral drugs that have helped to cut treatment costs for AIDS in developing countries.

As striking as Brazil's role was the participation of other unusual players in the project. Traditionally, research and development (R&D) in the pharmaceutical sector is done in developed countries; little innovation comes out of developing countries due to lack of funds, know-how and research-based pharmaceutical industries. This project based mainly on cooperation between developing countries marks a change. In addition to Brazil, Burkina Faso, Malaysia and Thailand were key players.

When Jean-René Kiechel, who held senior R&D management positions in the pharmaceutical industry, left the industry after three decades, he certainly broke the mould. "I heard about DNDi and was interested in the fact that it was trying to develop new drugs for neglected diseases. I felt I could contribute," said Kiechel, who subsequently became the project manager for the malaria medicines initiative.

Drug resistance is a major problem for treating malaria. In many parts of Africa single treatments for malaria, such as chloroquine, have lost their effectiveness because malaria parasites in humans' blood have become resistant to drugs designed to kill them. As a result, there is a huge demand for ACTs, drugs based on derivatives of artemisinin, a potent extract of the *Artemesia annua* plant.

No resistance to ACTs has been reported to date, but there is currently only one fixed-dose ACT combination on the market, Coartem, produced by Novartis. This product is on the WHO prequalification list of products recommended for purchase by UN and other agencies. WHO and UNICEF are making it available at US$ 2.4 per adult course of treatment, but for some countries even this is too expensive.

Every year Africa accounts for more than 60% of an estimated 350–500 million clinical cases of malaria globally, while children in Africa account for 80% of nearly one million malaria-related deaths worldwide according to WHO's Rollback Malaria department.

Many African countries have changed their national malaria treatment policy, switching from single to combination treatment. But the problem is that countries can not afford the new combination drugs, which are much more expensive than the old medicines.

Another problem is the laborious way medicines must be taken to treat malaria. Failure to stick to the exact dosages, taking one drug without the other or, as, often happens, not completing the course can reduce the effectiveness of the treatment.

Seeing the urgent need to develop a more effective and more affordable form of malaria treatment, Geneva-based DNDi sought to develop two fixed-dose combinations each containing two d rugs in one tablet. "The idea was that instead of having to take a different number of drugs each day you would take one or two fixed-dose combination tablets once a day for three days," Kiechel said.

While the Brazilian team combined artesunate and mefloquine into a medicine known as AS/MQ, a team at the University of Bordeaux 2, France, combined artesunate and amodiaquine to produce a second antimalarial, AS/AQ.

The UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical

WHO/Stephenie Hollyman

Malaria kills more children aged under five years old in sub-Saharan Africa than any other infection.

Diseases (TDR) provided scientific advice for the project, and helped coordinate clinical trials. Funding came from different sources. DNDi provided US$ 4.4 million for both the clinical research and registration application scheduled for this year; INCODEV, a European Union programme that promotes cooperation between developing countries provided US$ 1.39 million; Farmanguinhos contributed US$ 614 000. In addition, TDR provided US$ 538 000 and Médecins Sans Frontières (MSF) provided US$ 180 000.

In parallel with the Brazilians, the French team was coordinated by Pascal Millet of the Bordeaux University 2 School of Medicine. He set up a public–private partnership with the university's laboratories and French start-up, Ellipse Pharmaceuticals, to develop AS/AQ. Like the Brazilians, this team also succeeded in developing a stable combination.

The next step was the clinical trials. The Sains University in Malaysia did some of the studies, including Phase 1 trials of AS/AQ in healthy human volunteers, prepared technical reports for the drug registration files for both projects, and provided analytical support for other studies required for registration. Dr Visweswaran Navaratnam, Professor of Tropical Clinical Pharmacology at Sains, was the Scientific Programme Leader supervising this part of the project.

The team from Burkina Faso's Centre National de Recherche et de Formation sur le Paludisme did the safety and efficacy field trial of AS/AQ. Their contribution was also crucial, explained Kiechel, because they conducted trials among small children there. Children aged under one year are one of the most vulnerable groups to malaria.

The third phase of clinical trials of AS/MQ were done by a team from Mahidol University in Thailand, further testimony to the project's cooperation between developing countries.

WHO/Stephenie Hollyman

Malaria causes untold human misery as well as economic and social devastation in much of Africa. Children in Africa account for 80% of nearly one million malaria-related deaths worldwide.

Sornchai Looareesuwan, Director of Emerging and Re-emerging Diseases Research Programme and his team did studies to compare the efficacy and tolerability of the combined AS/MQ drug with that of the two component drugs taken separately.

DNDi has a contract with French pharmaceutical group, Sanofi-Aventis, to manufacture AS/AQ. The first marketing authorization applications were expected to have been submitted at the end of 2005. The French group has indicated that it will make AS/AQ available at cost price to the national health services of countries that have registered it, as well as to NGOs and international organizations, according to Clive Ondari, Coordinator at WHO's department of Medicines Policy and Standards. Farmanguinhos is in discussions with possible partners in Asia to manufacture AS/MQ.

Once AS/AQ and AS/AM are approved by regulators and prequalified by WHO, developing countries will be eligible for grants from the Global Fund to fight HIV/AIDS, Tuberculosis and Malaria to purchase the new products.

"The biggest challenge for us will be to obtain all the requirements needed for exporting the drug," said Wardell, explaining that registering AS/MQ in Brazil and other countries was a new activity for Farmanguinhos. To help them, DNDi has provided a consultant.

Like the Brazilians, other teams from developing countries involved in the project took on unfamiliar tasks. Navaratnam said the need to supplement and integrate varying levels of knowledge and skills between partners in developed and developing countries had been a challenge. "Additional time was needed to ensure new methodologies transferred were properly adapted and realized," he said.

The challenge, from Millet's point of view, was uniting scientists and private entities towards the same goal of providing a stable pharmaceutical product that was transferable to an industrial partner. Nevertheless Millet, like other players, echoed how pleased he was to "work on an international project with so many different and complementary people at the international level". ■

Clare Davidson, *Sao Paulo*