

Openness is key in fight against disease outbreaks

New technology and real-time electronic media are vital to detecting outbreaks of infectious diseases globally, but more transparency is also needed. From June 2007 governments will commit themselves under the new International Health Regulations to report certain disease outbreaks and other potential global health threats.

When pneumonic plague struck Surat, Gujarat, India in 1994, thousands of people panicked and fled the city. “We were sitting in Ottawa watching CNN showing pictures of people fleeing,” said Dr Ron St John, Director-General of the Centre for Emergency Preparedness and Response at the Public Health Agency of Canada, recalling how news media were the first source of information on the outbreak for public health officials, including those at WHO.

The slow response to that outbreak and an Ebola outbreak in Kikwit in the Democratic Republic of the Congo the following year led to panic and unnecessary deaths. “We had no capacity to respond to outbreaks on our own, or even to deal with the information coming in. All we had was a fax machine. The switchboards at WHO were completely overwhelmed,” said Dr David Heymann, acting Assistant Director-General for Communicable Diseases and the WHO Director-General’s Representative for Pandemic Influenza.

New techniques were clearly needed to respond to disease threats, such as pandemic influenza, that could kill millions. In 1996, the then director-general, Dr Hiroshi Nakajima, asked Heymann to set up a new emerging infectious disease programme to deal with outbreaks.

In the age of real-time electronic media and television, journalists became a vital source of instant information that public health authorities could use to detect outbreaks, in addition to information from governments, nongovernmental organizations and health-care workers, said Dr Thomas Grein, Medical Officer, Alert and Response Operations at WHO.

The question was: how to search through the maze of thousands of reports filed by journalists every day? The answer came from Canada.

St John linked up with Dr Rudi Nowak from Health Canada, the Canadian health ministry, and they proposed the development of a computerized system that would collect raw news feeds from international news agencies such as Agence France Presse, Associated Press and Reuters, and scan these feeds automatically to find news of disease outbreaks.

Development work on the software began in 1997 funded by a Canadian government grant of 800 000 Canadian dollars (US\$ 500 000 at the time). The news filtering system St John and Nowak developed, known as the Global Public Health Intelligence Network (GPHIN, pronounced G-finn), went live in 1999 and scanned news feeds in English and French.

“We were astounded at how much information we could get,” said St John, adding that the system collects thousands of reports everyday. “But the information had to be verified, and incorrect information discarded.”

Nowak came to WHO in Geneva for two years to work with Heymann, Dr Guénaél Rodier, Special Adviser for Communicable Diseases to the Regional Director, WHO Regional Office for Europe, and Dr Mike Ryan, Director of the Department of Epidemic and Pandemic Alert and Response, in establishing

a team that would be responsible for verification.

Every weekday morning at 9am about 20 members of that team meet in the Strategic Health Operations



Morning meeting of outbreak review and risk assessment in the SHOC room.

WHO/C. Black

Centre, nicknamed “the SHOC room”, at WHO’s headquarters, to discuss outbreak reports that have come in and which ones need to be verified, by contacting WHO country offices, which, in turn, contact their host governments. The reports are also analysed by the relevant crisis centres set up at WHO’s regional offices.

Ryan and his team set up the Global Outbreak Alert and Response Network of 126 institutions across the globe. Its experts can be despatched to the field, where they work together with WHO staff from regional offices and headquarters to stem any outbreaks.

Before WHO and other subscribers receive the reports from GPHIN, these have been screened by a team of eight public health specialists in Canada.

The SHOC was opened in May 2004 with funding from the United States. After the death of WHO’s Director-General Dr LEE Jong-wook in May 2006, it was renamed the JW Lee Centre for Strategic Health Operations.

A new version, GPHIN II, which went live in 2002, scans newsfeeds in the four other official United Nations languages — Arabic, Chinese, Russian and Spanish — in addition to English and French, as well as in Farsi. A Portuguese service is in the pipeline. As well as WHO, other public health institutions and many governments subscribe to the GPHIN service.

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Dr Guénaél Rodier, Special Adviser for Communicable Diseases to the Regional Director, WHO Regional Office for Europe.

Technology plays vital role in detecting disease outbreaks

Under the revised International Health Regulations, governments have committed themselves to reporting outbreaks from the very outset and to confirming any reports of outbreaks in their country.

"An accurate diagnosis of the disease two months later doesn't help you to control the outbreak, particularly with avian influenza" said Dr Thomas Grein, Medical Officer, Alert and Response Operations.

Scientists can make diagnoses early and promptly thanks to technologies developed over the last twenty years in biological research. These tools can identify an infectious agent in as little as half an hour, and due to mass production, they have become more affordable for developing countries. For example, PCR (polymerase chain reaction), a technique that can be used to detect particular infectious agents. Technological improvements have allowed PCR machines to be made smaller and more robust.

"We can diagnose influenza and dengue fever using PCR. The tests are cheap, each one costs as little as US\$ 0.95," said Professor Leonard Peruski, Jr., from the US Centers for Disease Control and Prevention, based in Thailand.

But while the technology is good, Peruski said there is a shortage of skilled staff to do these tests in isolated and rural parts of developing countries, and re-training and quality control are often inadequate.

The toughest test for WHO's outbreak response was the emergence of a new disease, severe acute respiratory syndrome (SARS), in 2003. "WHO was able to mount an international response despite a very low budget and a small team," said Heymann.

Although WHO is widely credited with its role in coordinating global containment, Grein said the response was not easy as WHO was overstretched due to the global scale of the problem. At the time, email was the main means of communication between country offices and headquarters. "SARS was a nightmare," said Grein, recalling how thousands of emails flew around the world in an uncoordinated way.

Then, as now, WHO relies on Member States to confirm reports from GPHIN and other sources on disease outbreaks. But at the time of the SARS outbreak, Member States were only required to notify WHO of yellow fever, cholera and plague outbreaks under the International Health Regulations (IHR).

After SARS, it was clear to governments that the rules needed to be updated, something WHO Member States had already agreed to do in the mid-1990s. A revised version was developed and in May 2005 approved by the World Health Assembly.

The revised IHR (2005) require governments to report public health threats, in particular disease outbreaks and natural disasters, that could have an international dimension known as public health emergencies of international concern or PHEIC pronounced "phake". Health threats can also include chemical and nuclear accidents, laboratory accidents and bioterrorism.

Before IHR (2005), compliance was voluntary. Once the regulations come into force in June 2007, they will be legally binding. WHO's primary role is to support countries and maintain global health security through its global surveillance and response activities.

WHO is also charged with monitoring compliance of Member States. While there is no enforcement mechanism, there are strong incentives to comply.

"WHO cannot be both physician and police force. If we are perceived as the policeman, doors will be closed," said Rodier. "Countries will comply because of a sense of global solidarity in the face of a common threat, but also

they will comply because they prefer to maintain a good image and look responsible".

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Dr Ron St John, Director-General of the Centre for Emergency Preparedness and Response at the Public Health Agency of Canada.



WHO/G. Smyth

Two outbreak response workers from WHO gathering information in Angola in May 2005 about the Marburg outbreak.

WHO is producing a new version of its global event management system to improve internal communications. This system would store the reports from GPHIN and other sources in a globally accessible database, and streamline internal WHO communications.

To tackle a major outbreak, such as an influenza pandemic, everyone at WHO headquarters, the regional and country offices will need to work together. "We are certainly not a military institution, but we need to learn from the military about operations, logistics and — to some extent — discipline. We must act as one," Rodier said. ■

William Burns, Geneva

Treating malaria at home in Uganda

A novel approach — home-based care — provided by an army of volunteers could be key to beating malaria in developing countries. Uganda is one of nine countries where studies are under way to test the approach, but there are concerns about drug resistance.

Elsie Nakiryia, 66, heard her granddaughter Paula Nakafu, 6, moan uncharacteristically in her sleep. A quick check with her palm on the child's forehead "confirmed" a high temperature.

"I sponged her off until morning, then went to a drug store and bought chloroquine syrup and a tablet of Fansidar [sulphadoxine-pyrimethamine (SP)]," said Nakiryia, a resident of Makerere West, a suburb of Kampala.

Two days later, in spite of treating her with chloroquine and SP, Paula did not recover. Instead she developed a rash and that was when the grandmother who lives with three of her grandchildren, visited the doctor who confirmed Paula had measles.

It's hard enough for a doctor to diagnose malaria without a laboratory, but for families with limited access to health care it's even more difficult because the early symptoms are similar to those of other diseases.

While measles is relatively rare in Uganda and most cases of fever in children aged under-five can be attributed to malaria rather than other diseases, Paula's example underlines the problem of getting an accurate diagnosis. Delays in getting appropriate treatment for malaria in sub-Saharan Africa and inadequate access to that treatment can be fatal.

Paula's grandmother not only misdiagnosed her, but also treated her for the wrong disease. Yet for people with limited access to health workers and health-care facilities, this hit-and-miss approach remains the only option in Uganda and elsewhere in Africa.

One study showed that in places, such as these, where health care is not always available, home-based treatment of fever with antimalarial drugs still has the potential to dramatically reduce the

number of child deaths from malaria.

In 2000, Gebreyesus Kidane and Richard Morrow reported in the *Lancet* a 40% reduction in under-five child mortality after mothers in Ethiopia were given simple training in recognizing fever and supplies of chloroquine for treatment at home.

Catching the malaria early with prompt treatment can stop it from progressing to a more severe and often fatal form.

In 2002, the Ugandan government formalized the already common practice of treating fevers without visiting the doctor by introducing the home-based management of fever strategy. That strategy involved teaching mothers to recognize malaria symptoms at an early stage in their children. Sick children

were then taken to see a community volunteer, known as a community medicine distributor.

“Early data using the newer ACTs in home management of malaria suggests community members can be trained to administer these medications properly and avoid drug resistance.”

Dr Franco Pagnoni, a research manager from TDR in Geneva.



Paula Nakafu, 6, (left) with her grandmother Elsie Nakiryia, 66, and her younger cousin Kirabo Hilda, 3, (right) after her recovery.

Carolyne Nakazibwe

this particular two-in-one combination drug can replace the combination of chloroquine and SP in Uganda and eight other African countries in the home-based management of fever programme.

“The objective of the research is to find out if using artemether–lumefantrine in the home-based management of malaria in Uganda is feasible, acceptable, safe and effective,” said Dr Franco Pagnoni, a research manager from TDR in Geneva.

The Uganda research team aims to find out if artemether–lumefantrine can be used for home-based treatment of malaria in two districts in eastern Uganda where malaria is a major problem, Iganga and Bugiri.

The principal investigator in the study is Fred Bateganya from Makerere University's Faculty of Sociology. His team has been working with 118 community medicine distributors since June 2006, who have been trained for two days at the sub-county health facility. They are given artemether–lumefantrine to distribute to children with symptoms of fever in 56 villages. The team assesses the effect of unsupervised treatment with ACTs on the health of patients, as well as how storage of the drug affects its efficacy.

According to WHO estimates, between 70 000 and 100 000 children aged under five years die in Uganda annually of malaria. On average, a child in Uganda has four malaria episodes a year, and any of them could be fatal.

“We will get samples of the medicine randomly from community medicine distributors and test it in the National Drug Authority laboratories in September,” Bateganya said, referring to the volunteers who store the artemether–lumefantrine on behalf of the community. A mid-term evaluation report on the Iganga–Bugiri research will be ready by January 2007, Bateganya said.

Everyone acknowledges the risk that malaria parasites could develop resistance to antimalarials if they are given out in an uncontrolled way.

“There are no data available on the effects of ACT when it is given by mothers to their children without proper diagnosis. It should reduce mortality, but we simply don't know if it does,” D'Alessandro said. He also questions the general applicability of the findings of the Ethiopian study, published in 2000, given that this study was done with chloroquine rather than ACT.

The treatment regimen is slightly more complicated for artemether–lumefantrine than for chloroquine and SP, requiring patients to take two tablets per day preferably with a fatty meal, for three days. Patients needed to take chloroquine and SP over three days to be cured. Unless patients take the full course of artemether–lumefantrine, the malaria may rebound, but there is also the chance that the parasites causing the disease could develop resistance to the drug.

Pagnoni said that TDR is addressing this concern in Uganda by checking that mothers comply with the treatment regimen. He cites a study he co-authored and published in *Tropical Medicine and International Health* in July 2006, which showed that about 90% of caregivers in Ghana gave the correct artemether–lumefantrine dose. Similar studies are underway in Benin, Burkina Faso, Cameroon, Ethiopia, Malawi, Nigeria and the United Republic of Tanzania.

“Early data using the newer ACTs in home management of malaria suggests community members can be trained to administer these medications properly and avoid drug resistance,” Pagnoni said. ■

Carolyne Nakazibwe, *Kampala*

Street food boom in Ghana spurs calls for better hygiene

Street food vendors provide cheap meals for thousands of Accra's citizens but concerns over foodborne diseases have led to efforts by the Ghanaian authorities to improve food safety and encourage vendors to adopt more hygienic practices.

Gloria Tawiah's ready-made meals of fufu, banku and rice sell for as little US\$ 0.02. For many of the city's poorest people she and other vendors offer the only chance of a square meal. And when customers are short of cash, vendors offer meals on credit.

Tawiah is one of thousands of street food vendors in the Ghanaian capital who help to feed travellers, commuters, workers and school children.

But despite the importance of Tawiah's role in the local economy and the fact that she has been selling food for 12 years, she attended a workshop on food safety for the first time this year.

“They taught us how to handle and cover food, what type of food

items to buy,” said Tawiah, who now has a licence from the Accra Metropolitan Assembly to sell food and who belongs to the Ghana Traditional Caterers Association. “It was very useful”.

Workshops teach vendors to wash their hands before cooking and to disinfect vegetables grown in fields irrigated with dirty water and fertilized with animal faeces.

Most of the food served on the streets of Accra is safe. Traditional preparation methods, such as a long cooking time, which sterilizes the food, and lactic acid fermentation, which kills some food spoilage bacteria, already provide protection.

But research published in the *Bulletin* in July 2002 showed that salads,



Antie Ama, a street food vendor in Accra, roasting plantain.

Mavis Atele

re-heated soups and sauces, and dishes served with bare hands contained high levels of potentially dangerous enteric bacteria.

Street vendors like Tawiah in Accra say they were unaware of the dangers until they attended the workshops and could unintentionally have been poisoning some of their customers.

“Vendors were horrified when we told them that their food was potentially hazardous,” said Keith Tomlins, a food safety and quality scientist at

the Natural Resources Institute at the University of Greenwich in the United Kingdom.

Since 1999, Tomlins has been involved in three food safety studies in Ghana funded by the Crop Post-Harvest Research Programme of the United Kingdom's Department for International Development (DFID).

Initially, the work set out to describe the various contaminants found in street food, but the investigation expanded its brief.

"As our study progressed, we realized that producing a report was not enough and that we also had to engage with stakeholders at all levels to push home our recommendations.

Previous studies had little effect because no one heard about them outside the scientific community," Tomlins told the *Bulletin*.

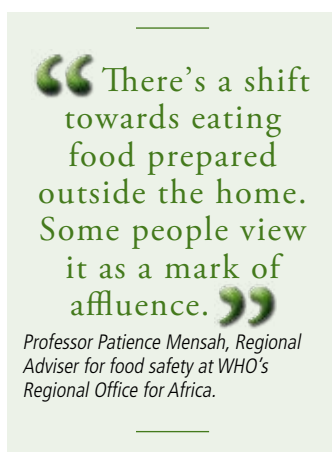
In the first project, Tomlins and his colleagues estimated that there were 60 000 street food vendors in Accra with a combined annual turnover of US\$ 100 million.

The other two projects have aimed to forge better cooperation between government, regulators and the street vendors themselves: for example, by providing workshops on food safety, personal hygiene and sanitation.

Street foods are of growing importance in developing countries across the world. "There's a shift towards eating food prepared outside the home. Some people view it as a mark of affluence," said Professor Patience Mensah, Regional Adviser for food safety at WHO's Regional Office for Africa, who has studied Accra's street foods.

"Although street foods could be a source of foodborne pathogens, they assure the food security of the poor, provide employment and service the tourist trade by providing traditional foods," Mensah said.

"Street food vendors are considered a useful segment of the economy, but there is a big problem about consumer awareness. People are not well educated about safety," said Dr



Poster in Accra sponsored by the United Nations Industrial Development Organization and the Ghanaian Food and Drugs Board urging people to avoid eating food prepared in unhygienic conditions.

Dr Paa-Nii Johnson, Food Research Institute, Accra, Ghana

Paa-Nii Johnson of the Food Research Institute in Accra, who was involved in the DFID projects.

In an effort to address this problem, the United Nations Industrial Development Organization (UNIDO) sponsored a series of giant posters on billboards in Accra with graphic illustrations of the potential dangers of eating street food.

Johnson noted that vendors had minimal or no formal education, many — unlike Tawiah — were unlicensed and untrained in food hygiene or sanitation and worked under insanitary conditions.

Mark Anthony Adotey, Chief Environmental Health Officer of the Accra Metropolitan Assembly, agreed: "We have to regulate street food vendors to ensure that food consumption is safe."

At the moment, the city authorities grant permits and health certificates to vendors after medical screening of vendors and testing of their knowledge about food hygiene.

Environmental health officers also inspect the sites and monitor conditions, and close down unhygienic

places or send offenders to court.

Adotey suggests that the central government should designate areas for street food vendors providing running water and electricity. This would create a more hygienic environment and supervision of the trade could also be better.

The government could also improve the working conditions of environmental health inspectors and encourage them to carry out more rigorous inspections, Adotey said.

Government or banks could loan funds to street food vendors. There is also a project to improve the standards of hygiene and quality of food in Ghana's popular eating places known as "chop bars".

But Johnson said that the government and city authorities have failed to address fully the needs of the sector, for example, by providing hygienic places for street vendors to ply their trade and credit facilities to finance improvements in the conditions under which food is prepared and sold.

Tawiah, the street food vendor, now knows how to prepare and sell food in a more hygienic way, but she still has to cook dishes in the open at a lorry park, which is unpaved and dusty, and where she must buy clean water from a nearby standpipe. ■

Mawusi Afele, Accra