Health security: is the world better prepared?
A disease outbreak best demonstrates the acute need for a guardian of health. Lessons learned from the West Africa Ebola outbreak in 2014 catalyzed the creation of a new Health Emergencies Programme, enabling a faster, more effective response to outbreaks and emergencies. WHO helps countries implement the International Health Regulations and guides R&D collaboration to develop new vaccines and treatments for epidemic-prone diseases. The response to subsequent outbreaks of Zika and yellow fever has improved but more work is needed to ensure that the world is better prepared to handle the next epidemic.

Managing the global regime for controlling the international spread of infectious diseases is a central and historical responsibility of WHO. The International Health Regulations, administered by WHO, provide the legal instrument for doing so. These regulations are the only internationally-agreed set of rules governing the timely and effective response to outbreaks and other health emergencies that may spread beyond the borders of an affected country. Yet fewer than a third of WHO Member States meet the minimum requirements for core capacities needed to implement the IHR. This is the situation nearly ten years after the regulations entered into force.

At the same time, the factors that govern global health security extend well beyond the mandate of WHO and its capacity to respond. Much responsibility falls to countries. In line with IHR provisions, affected countries need to report unusual disease events promptly and openly. When they do so, other countries need to stop punishing them by imposing unjustified restrictions on travel and trade. A promise of financial and technical support is a powerful incentive for early reporting, but is often impeded by an inadequate response from the international community. As abundant experience shows, prompt and transparent reporting is compromised when the certainty of economic damage outweighs the prospect of financial and technical support.

Implementation of the IHR requires that countries move out of the sanctuary of national sovereignty in the interest of the common good. For example, countries must be willing to issue visas for foreign emergency responders, let them investigate, and grant them full and unfettered access to data and records. Countries and airlines must agree to send patient samples to WHO collaborating centres with designated expertise in the handling and analysis of dangerous or

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unusual pathogens. Many WHO-led responses to outbreaks have been delayed or encumbered when countries exercise their sovereign right to refuse international collaboration, regarding it as unwelcome interference with national affairs.

Above all, to prevent another devastating event like the Ebola outbreak in West Africa, countries need resilient and inclusive health systems that extend to rural areas, a sensitive early warning system coupled with rapid response capacity, and informed and engaged communities that trust their government and the health services it provides. Countries also need access to effective and affordable vaccines, diagnostics and treatments (when these exist), outstanding laboratory and logistics capacity, and safe and abundant treatment facilities, properly staffed and equipped.

The world has a long way to go before reaching such a level of preparedness. An estimated 400 million people have no access whatsoever to even the most basic health services. WHO has identified nine severe pathogens that have epidemic potential but no or inadequate medical countermeasures – another glaring gap in the world’s collective preparedness.

Fortunately, recent G7 summits and a growing body of research see a strong mutually-reinforcing compatibility between the goals of universal health coverage and global health security. **Countries with well-functioning and inclusive health systems are more likely to catch an outbreak early when the chances of rapid containment are best.** Countries with strong health systems are better prepared to cope with the added demands on health services and staff that outbreaks and other health emergencies inevitably bring. Recent history has many examples of fragile health systems pushed to the brink of collapse, often by comparatively mild outbreaks. Finally, the commitment to fairness and protection against financial ruin, embodied in universal health coverage, can inspire the public confidence and trust that underpin compliance with recommended control measures.

**Ebola: WHO must change the way it works**

The Ebola outbreak in West Africa was the largest, most severe, and most complex in the nearly four-decade history of this disease. WHO was too slow to recognize that the first Ebola outbreak in West Africa would behave very differently than the previous 17 outbreaks that occurred in equatorial Africa since 1976. Even the largest of these outbreaks, which were mostly confined to rural areas, was contained within 5 months.

In Guinea, where the outbreak began in late 2013, the virus circulated, undetected and undeterred, for three months. By the time the causative agent was identified in March 2014, the virus had already reached hospitals in crowded urban areas. Subsequent spread to Sierra Leone and Liberia overwhelmed fragile health systems within little more than a month, especially after the virus entered the capital cities. As cases began increasing exponentially, WHO introduced rapid course corrections and dramatically scaled up its response.

Other countries in West Africa, namely Nigeria, Mali and Senegal, fared much better. As their surveillance systems were on high alert and response capacity was in place, they were able to hold their outbreaks to just a single or a handful of cases. Likewise, during the simultaneous
but unrelated outbreak in the Democratic Republic of Congo, caused by the same Zaire virus, health officials, facing their seventh Ebola outbreak, were able to contain the disease within less than two months.

The unprecedented scale and duration of the West African outbreak prompted a large number of critical assessments, largely focused on the role of WHO and shortcomings in the Organization’s performance. All assessments made specific recommendations for WHO reform, often calling for similar changes. These recommendations shaped the design of a new health emergencies programme, which extended WHO functions from largely normative and standard-setting work to an operational role within countries experiencing an emergency.

First tests for early reforms

Many early reforms were put to the test in 2015, when Zika made its first appearance in the Americas and raised the alarming possibility that a mosquito bite during pregnancy could cause severe neurological abnormalities in newborns. Innovations, such as the introduction of an event management system and a clear pathway for command-and-control, coupled with the early declaration of a public health emergency of international concern, supported a level of WHO performance that has been generally praised for its speed and strategic focus.

2016 saw a second major test, when Angola and the Democratic Republic of Congo confirmed outbreaks of yellow fever in their capital cities, marking the largest and most ominous African outbreaks of this disease experienced in four decades. Travellers and foreign workers carried the virus to Kenya and China, despite requirements for yellow fever vaccination certificates for travellers set out in the IHR. A market in fake vaccination certificates quickly sprang up.

Those outbreaks demonstrated what can happen when migrants from rural areas and workers from mining and construction sites carry the virus into urban areas with powder-keg conditions: dense populations of non-immune people, heavy infestations with mosquitoes exquisitely adapted to urban life, and the flimsy infrastructures that make mosquito control nearly impossible.

The world has had a safe, low-cost vaccine that confers life-long protection against yellow fever since 1937. Despite this advantage, the response faced a crippling initial shortage of vaccines, which WHO and the experts that advise the agency were eventually able to address. The result was the largest emergency vaccination campaign against yellow fever ever undertaken in sub-Saharan Africa. A crisis was averted. The resurgence of the yellow fever threat and the inadequacy of the vaccine supply were again illustrated in March 2017, when WHO despatched 3.5 million doses from its emergency stockpile to support Brazil’s response to its expanding of yellow fever outbreak.
A new emergencies programme is launched

The WHO emergencies programme, launched in August 2016, is playing a central role in coordinating a number of activities with partners. **Early warning and rapid detection systems are being strengthened in vulnerable countries**, and procedures are in place to activate established mechanisms for coordinating the emergency response to outbreaks of infectious diseases and humanitarian crises.

A formal process of quality control for the training and verification of emergency medical teams is strengthening the global health emergency workforce, offering vetted surge capacity during outbreaks and bringing order to a situation historically prone to chaos. The teams verified and registered by WHO are qualified and fully self-sufficient, responsible for bringing their own equipment and supplies – another requirement that relieves the pressure on local health systems and officials.

Member States, at all levels of economic development, are prioritizing peer-reviewed assessments of their core capacities to implement the IHR. A major concern is the lack of assured financial and technical assistance to fill the gaps identified during these assessments.

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### Graded Countries and Protracted Emergencies (April 2017)

[Map showing graded countries and protracted emergencies]

Source: WHO
New models and tools

The January 2017 Executive Board confirmed that the Pandemic Influenza Preparedness Framework, set up in 2011 after years of negotiations, works as a bold and innovative preparedness tool that puts virus sharing and benefit sharing on the same footing. At that time, the Framework had secured guaranteed access to around 350 million doses of influenza vaccines as they roll off the production line during the next pandemic. Partnership contributions from industry, amounting to more than $110 million, have been largely invested to build surveillance, laboratory, regulatory and other capacities in developing countries.

This is one successful model for better – and fair – preparedness, and there are other encouraging signs. The WHO R&D Blueprint, developed in response to lessons learned during the Ebola outbreak, has been immediately applied to expedite the development of new medical products for Zika virus disease. It aims to cut the time needed to develop and manufacture candidate products from years to months. In December 2016, WHO published final clinical trial results demonstrating that the new Ebola vaccine confers nearly 100% protection.

As announced in January 2017, a $500 million Coalition for Epidemic Preparedness Innovations, which draws on the R&D Blueprint and the WHO list of nine priority pathogens, holds great promise for developing vaccines ahead of epidemics. Initially focused on Lassa fever, Nipah virus and the MERS coronavirus, the Coalition will need far more funds to develop vaccines for the remaining high-risk pathogens with epidemic potential.

Four famines: the worst crisis since 1945

WHO has also become more directly operational during humanitarian crises. Working through ministries of health, WHO coordinates the work of partners and conducts rapid assessments of needs, delivers large quantities of medical supplies, and operates mobile laboratories and clinics.

The scale of needs is unprecedented. On 11 March 2017, the UN humanitarian coordinator informed the Security Council that more than 20 million people were at risk of starvation and famine across four countries in Africa and the Middle East: north-eastern Nigeria, Somalia, South Sudan and Yemen. The situation was described as the world’s worst humanitarian crisis since 1945.

In all four countries, already fragile hand-to-mouth survival has been crushed by the deadly combination of drought and fierce fighting. Drought caused farmers to abandon their fields and families to flee as livestock died off and water supplies dried up. The threat from fighting keeps people displaced by drought constantly on the move. Between starvation and death nearly always lies disease. Severe undernutrition compromises immune functions. Diseases that a well-nourished body can ward off turn fatal. Displaced people living in crowded unsanitary camps are vulnerable to outbreak of multiple diseases.
In South Sudan, where nearly three years of conflict have left the health system in tatters, life expectancy has dropped to 55 years and health needs have risen exponentially. In February 2017, the UN declared a famine in parts of the country and warned that almost half of the total population was in need of urgent food assistance. Given the strict criteria used, the declaration of a famine means that people are already dying from starvation. Together with the Ministry of Health, WHO coordinates the work of 35 partners, sounding alerts to hot spots and investigating dozens of disease outbreaks, including a cholera outbreak confirmed in July 2016. In 2016, three million children were vaccinated against polio and more than 200,000 against measles. A nation-wide vaccination campaign against cholera began in April 2017.

In Somalia, the greatest concern is the ongoing cholera outbreak fuelled by a severe drought that has, as elsewhere, forced people to consume contaminated water. Since the start of 2017, 22,000 cholera cases have been reported, representing a nearly five-fold increase over the previous year. To contain the rapidly spreading outbreak, Gavi, the Vaccine Alliance, delivered nearly a million doses of oral cholera vaccine; 450,000 people received their first dose in mid-March 2017. The vaccines are being administered by the government with support from WHO and UNICEF. A recent investigation of 12 cholera treatment centres and units found that none had adequate water and sanitation facilities. While WHO has delivered badly needed emergency medical supplies and equipment to the hardest-hit areas, more will be needed if the number of cases continues to rise.

The eight-year conflict in north-eastern Nigeria led to a deepening humanitarian crisis, displacing farmers from their land and leaving a massive food shortage in its wake. Despite the challenging security situation, WHO and its partners have targeted 8.2 million people across the region, including nearly six million in north-eastern Nigeria, for emergency health assistance. Borno is the most severely affected state, with 35% of health facilities destroyed and another 30% damaged. Childhood mortality is off the charts. WHO has deployed 35 mobile teams to the most remote and insecure parts of the state, where travel on poor roads requires a military escort. Apart from offering general health care, these teams have provided treatment for malaria, the biggest killer in the severely undernourished population. Given the precarious immunization status resulting in the emergence of new polio cases, WHO supported vaccination campaigns which protected nearly three million children from measles and more than 1.8 million from polio. In March 2017, Borno State reported its first Lassa fever outbreak since the disease was first detected 48 years ago, again illustrating the vulnerability created when health systems collapse.

In its 2017 response plan for Yemen, WHO and its partners will be providing targeted assistance to 10.4 million people living in the country’s most vulnerable districts. The focus is on the health needs of young children, pregnant and lactating women, people injured in the conflict, and patients with chronic diseases. In 2016, WHO and its partners received financial support to sustain the functionality of more than 400 health facilities in 145 districts. Essential medicines and supplies, also for surgery and acute care, were delivered to support the health needs of more than 3 million people. WHO also established 26 centres for cholera treatment and expanded an electronic early warning system for outbreaks from 440 sites in 2015 to nearly 2000 sites the following year. As further operational support, WHO delivered more than two million litres of fuel to keep hospital generators and ambulances running. In April 2017, WHO announced that nearly five million children in the war-torn country had been vaccinated against measles and polio in a nation-wide campaign that took two months and required more than 5,000 rented vehicles.
On the frontlines: a unique chain of care

The WHO response to health needs in the embattled city of Mosul, Iraq, which began in November 2016, has provided the most dramatic demonstration of the impact of reforms on WHO performance in emergencies. WHO country staff watched the situation closely and spotted the biggest health needs immediately: injuries from bullets, shrapnel, suicide bombings and shelling. Civilians were caught up in the brutal fighting, stepping on landmines, fleeing frontlines and being crushed in buildings booby-trapped with explosives. Civilians were also being deliberately shot by snipers as they sought safety.

Staff decided that a chain of trauma care was urgently needed to save lives. Three key things needed to be put in place quickly. Stabilization points no further than 10 minutes from the frontline would get patients stable enough to travel, and code them by critical level from red to green. Field hospitals a few minutes away would perform emergency surgical interventions, then prepare patients for another ambulance ride. Finally, a set of well-equipped tertiary facilities – ideally all in the same province to keep transport times short – would provide the necessary care.

At the urgent request of the Ministry of Health, WHO rapidly set up two field hospitals, with a third expected to open in the spring of 2017 and a fourth one planned. In addition, WHO helped rebuild and reopen two general hospitals in the vicinity that had been partially destroyed during the fighting. WHO also supported the laboratory screening of blood supplies for transfusions, airlifted 47 ambulances, stocked facilities with essential surgical and other supplies, paid some doctors when government funds ran low, and equipped one hospital to respond to potential further emergencies caused by the use of chemical weapons. In this way, a well-functioning chain of care encircled the fighting, with patients moving along the chain from the frontlines to tertiary hospitals within 60 minutes – the so-called “golden hour” when critical trauma care saves lives.

As a first-time innovation, the chain of care is all the more remarkable as it unfolded amid some of the most intense fighting Iraq has experienced in several years. As the humanitarian coordinator for the UN mission in Iraq told Devex, the media platform for the global development community, “It’s been exceptional leadership from WHO.” As the Devex report further noted, the Iraqi work makes a strong case for a frontline role for WHO in emergencies. Interviews with aid groups, donors, doctors and patients in Mosul confirmed that the chain of referral is working well. In Mosul, WHO’s new leadership role as an innovator and implementing agency benefited from generous funding from the European Commission and the UN Central Emergency Response Fund.

The worst-case scenario: coming soon?

The Ebola outbreak in West Africa was a large, long, deadly and frightening human tragedy. But Ebola, which requires close physical contact to spread, causes severe and highly visible
illness when patients are most contagious, and does not spread easily via international air travel, is not a worst-case scenario.

Adequate global health security means being prepared for a severe disease that spreads via the airborne route, or can be transmitted during the incubation period when infected people look and feel well enough to travel.

Constant mutation and adaptation are the survival mechanisms of the microbial world. There will always be surprises. The outbreaks of Ebola, Zika and urban yellow fever show how changes in the way humanity inhabits the planet have given the volatile microbial world multiple new opportunities to exploit.

These are opportunities created by rapid unplanned urbanization that leaves people crowded together in slums and shantytowns poorly served by water supplies and sanitation, people living in close proximity to animals (including camels, birds and pigs), incursions (for adventure, economic gain or food) into previously uninhabited jungles and rainforests, the industrialization of food production, the overuse of antimicrobials and phenomenal increases in international travel and trade. None of these trends can be easily reversed.

In addition, the climate is changing. Unusual weather patterns are reflected in unusual patterns in the distribution of wild animals and disease vectors. Dengue has exploited these opportunities to become the most important mosquito-borne viral disease in the world.

The three outbreaks also show how older diseases can behave in dangerously unfamiliar ways when they invade new territory or enter an urban environment with poor infrastructure. Weak public health systems, especially for the early detection of unusual pathogens, the concentration of most health resources in cities and the demise of programmes for mosquito control leave the world highly vulnerable to the next microbial surprise.

The world is better prepared, but not at all well enough.