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Global health security: the wider lessons from the west African Ebola virus disease epidemic

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The Ebola virus disease outbreak in West Africa was unprecedented in both its scale and impact. Out of this human calamity has come renewed attention to global health security—its definition, meaning, and the practical implications for programmes and policy. For example, how does a government begin to strengthen its core public health capacities, as demanded by the International Health Regulations? What counts as a global health security concern? In the context of the governance of global health, including WHO reform, it will be important to distil lessons learned from the Ebola outbreak. *The Lancet* invited a group of respected global health practitioners to reflect on these lessons, to explore the idea of global health security, and to offer suggestions for next steps. Their contributions describe some of the major threats to individual and collective human health, as well as the values and recommendations that should be considered to counteract such threats in the future. Many different perspectives are proposed. Their common goal is a more sustainable and resilient society for human health and wellbeing.

Adrian Roots

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The true scope of health security

David L Heymann

Health security—essentially the protection from threats to health—is recognised as one of the most important non-traditional security issues.[1–5] As the Ebola virus crosses national borders, there is clear understanding that the outbreaks in west Africa are a threat to our health security—people with infection have travelled across borders within Africa and to Europe and to North America where they have unintentionally caused small chains of transmission far from the epicentre of the outbreak. The Ebola crisis has put the spotlight on the importance of reducing the vulnerability of societies to infectious disease threats that spread across national borders. This aspect of health security—collective health security—has been the focus of attention and the commonly understood conceptualisation of health security for centuries. The paradigm today is rapid detection of these events, and rapid response. But there is a second, equally important aspect to health security that is less appreciated that the west Africa Ebola outbreaks have also tragically highlighted: individual health security. This is security that comes from access to safe and effective health services, products, and technologies. Ebola-infected health workers from developed countries have been repatriated from west Africa for care in their own countries where there is health security for individuals—hospitals that provide safe and effective access to life-saving medicines and services. Meanwhile, Ebola-infected west Africans have had to accept that health care is not always safe, not always effective, and not always accessible—that their own health security is yet again at risk. As the Ebola epidemic has unfolded, the part that has been played by substandard infection control and inadequate access to effective health products and services has clearly demonstrated a wider scope of health security—the intertwining of collective and individual health security.

The concept of collective health security against infectious diseases was already clear in the 14th century when quarantine was first used in an attempt to prevent bubonic plague from crossing borders. As international travel and trade increased, a series of international treaties and conventions were developed to attempt to stop the cross-border spread of plague and three additional infectious diseases—cholera, smallpox, and yellow fever.[6] In 1969 the International Health Regulations set out a collaborative global framework to enhance the world's health security against these four infectious diseases with a reporting requirement and predetermined actions to be implemented at borders.[7,8]

After the outbreak of severe acute respiratory syndrome (SARS) in 2003, and the strong reminder that border controls cannot stop the international spread of disease, the International Health Regulations were broadened in scope.[9] They now require reporting of any public health emergency of international concern and real-time dialogue among affected governments and WHO to propose real-time, evidence-based actions at borders; they also require countries to strengthen eight core capacities in public health aimed at more rapid detection and response to public health events where and when they occur.[10] Although these requirements have not been met in all countries,[11,12] the regulations provide an agreed global framework for enhancement of collective health security—a framework for investment by countries and development agencies to strengthen public health so that outbreaks caused by infectious organisms such as Ebola can be rapidly detected and contained.

Although the International Health Regulations are aimed at mitigating and preventing collective health risk, they do not provide for access to goods and health services. This gap was put to the test in 2007 when the Indonesian Government stopped sharing information about avian influenza virus strains with the international community, as required under the regulations, after it

had made an unsuccessful attempt to obtain a vaccine that was based on the virus strain it had provided to the international surveillance network for influenza.[13] This action resulted in a gap in knowledge about novel influenza viruses, and a threat to collective health security.

Attention was therefore called to the need to address the health security of individuals in Indonesia and elsewhere—access to an avian influenza vaccine in case of need. This event led to the doctrine of equal benefits from equal sharing, and after several years of intergovernmental negotiation led to a pandemic influenza preparedness framework that loosely governs sharing of novel influenza viruses and access to the resulting vaccine and other products.[14,15]

Unlike the International Health Regulations, the global framework for pandemic influenza preparedness is not binding—and it has been developed in part because of the need to overcome a blockage to collective risk assessment and health security. Its primary goal for many negotiating countries was to again ensure virus sharing for collective risk assessment; for many of them, increasing access to vaccines was a secondary and spin-off benefit to developing countries.

Smallpox was regarded as a collective health security risk during the mid-20th century as the colonial period drew to a close. Eradication removed the threat to collective health security of naturally occurring smallpox; it was accomplished because national eradication programmes had provided access to a vaccine for all people at risk.

A final threat to health security is bioterrorism, shown to be a reality in 2001 in the USA where anthrax spores were distributed through the postal system to place the health security of targeted individuals, and whole populations in contact with the postal system and infected letters, at risk.[16] Foreseeing these risks in the mid-20th century, the Biological Weapons Convention was developed and came into force in 1975.[17]

Another outcome of smallpox eradication was to further enhance individual health security, through a movement to provide vaccines to children at risk of childhood communicable diseases. The Expanded Programme on Immunization (EPI), established by WHO and UNICEF in the late 1970s, was not developed to provide a vaccine as a means to protect collective health security. It was established to save the individual lives of children.[18] EPI now provides sustained vaccine supplies to countries at minimum or no cost, and prevents tetanus, pertussis, measles, diphtheria, and polio in countries where health systems successfully deliver these vaccines. One of these diseases, polio, is now scheduled for eradication. Access to polio vaccine has thus satisfied an individual health security need and at the same time led to herd immunity, which has enhanced collective health security by eliminating polio in all but three countries, and will hopefully lead to eradication.[19]

The GAVI Alliance followed the establishment of EPI and provides newer vaccines to countries. Development agencies have continued to contribute to GAVI for the health security of individuals without the need to justify vaccination as a requirement for collective health security.

At the time of revision of the International Health Regulations in 2005,[10] smallpox was thought to remain a collective health security risk because of fears by some countries that the smallpox virus could be weaponised and used to create terror. Smallpox is now included in the regulations as a specific collective health security risk to be

Key messages

- The Ebola virus disease crisis has drawn attention to the well recognised importance of reducing collective vulnerability to infectious disease threats that cross national borders, but also to a second, equally important aspect of health security that is less appreciated: individual health security. This security comes from personal access to safe and effective health services, products, and technologies.
- This conceptualisation constitutes only one of many perspectives on the scope of global health security, which constitutes only one part of a broader set of human security threats. Irrespective of the threat, what matters is the centrality of people—not borders, not economies, and not even international relations.
- The crisis revealed countries' lack of political commitment to global health security, battered WHO's credibility and highlighted non-compliance with international health law. It has nonetheless resuscitated interest in global health security, but whether the epidemic can rejuvenate global health security as a prominent world affairs issue is unclear.
- The epidemic has shown how we are only as safe as the most fragile states and is a reminder that improvement of the capacity of every country to find, stop, and prevent health threats is both in the world's self-interest, and a moral imperative. Far too many blind spots remain around the world.
- Health security applies not only to infectious diseases, but also to non-communicable diseases. The anticipated unaffordable costs of non-communicable diseases threaten individual and collective health security.
- The Ebola outbreak is only the most recent illustration of how ill suited the medical research and development model is to addressing the world's health priorities. Research and development and access to diagnostics, vaccines, and treatments are crucial to health security, and cannot be left to market forces.
- Substandard and falsified drugs pose formidable social, economic, and political challenges to health security. They greatly undermine capabilities to curb both infectious and non-communicable diseases, while eroding public confidence in governments and international institutions.
- Setting of priorities and allocation of resources to mitigate the effect of, and recovery after, conflict and natural disaster is a quintessentially political challenge, not merely a technical one. Both individual and collective health security are intimately tied up with successfully meeting this challenge.
- In safeguarding of global health security, it is important to pay attention to migration. Fuller implementation of the International Health Regulations in west Africa would have been a far more effective safeguard against migration than travel restrictions. Action can be taken to reduce the risk of, or pre-empt, unwarranted decisions to close borders and detain or deport migrants who have fled health crises.
- Collective health security is the sum of individual health security, and compels global action to provide individuals in all countries with access to essential health care. Universal health coverage—universal, equitable access to health care with financial protection—is indispensable for achievement of individual health security and, therefore, collective health and human security. In effect, the international response to the Ebola outbreak reflects this approach.

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For the **Global Health Security infographic page** see http://www.thelancet.com/infographics/global-health-security

assessed and responded to immediately if reported, as are other infectious organisms that are thought to have bioterrorism potential. Fear for collective health security has resulted in vaccines, medicines, and other materials for smallpox and other infections being stockpiled in some countries, and in an ongoing debate among health ministers at the World Health Assembly over whether and when the samples of smallpox virus being held at secure laboratories in Russia and the USA should be destroyed.

Research and development programmes for medicines, vaccines, and treatments against these feared infectious organisms are also underway. It is thus that candidate vaccines, drugs, and monoclonal antibody preparations have been developed for Ebola. Access to those that are effective will be a major challenge to ensure health security for individuals living in regions vulnerable to Ebola outbreaks, and those involved in outbreak containment.

It has not been quite so straightforward to address access to medicines for diseases that have no preventive vaccines, even though there are life-sustaining or curative drugs. Donation of drugs by the companies that produced them has ensured access for those at risk of low-prevalence diseases such as onchocerciasis and leprosy and resulted in reduced prevalence,[20] but such donations were not forthcoming for high-prevalence infections such as tuberculosis and HIV, nor for malaria.

At the UN General Assembly Special Session on HIV and AIDS in 2001 it was thought that AIDS "may pose a risk to stability and security if left unchecked".[21] This, the concurrent political movement to place health at the centre of economic development, and evidence provided by the Macroeconomics Commission on Health,[22] all led to improved understanding of the need to provide medicines to mitigate these threats to economic growth. The Global Drug Facility, the Global Fund to Fight AIDS, Tuberculosis and Malaria, and UNITAID were subsequently created to provide medicines to low-income countries at no cost. Even though the need to advance economic development and traditional security, rather than the need to improve individual health security, have been used to justify action in this area, these initiatives nonetheless provide access to medical goods and health systems for improved health security of individuals.

Lack of reliable access to health-related products and services is not the only factor that threatens individual health security. The access must be to safe and effective products and services. Threats to this include fake, substandard, or counterfeit medicines, and the growing problem of antimicrobial resistance. These issues need sustained solutions, and every year without them leads us to increased collective and individual health security risk.

Infectious organisms are not the only disease threats that cross national borders and affect collective health security, although they have been the ones on which the international health security architecture has concentrated in the past; the risk factors that are determinants of non-communicable diseases, facilitated by globalisation and associated trade,[23,24] are also a threat to health security. For instance, rates of heart disease, diabetes, obesity, hypertension, and other non-communicable diseases have increased as countries have shifted from traditional lifestyles, in a world of cross-border trade and communications that influence personal choices that range from smoking to consumption of energy-dense processed foods.[25,26] Recently there has been effective national and global action to combat some of these threats. The Framework Convention on Tobacco Control, which came into force in 2005, has resulted in increased taxation on cigarettes as a means of decreasing the risk that tobacco causes to the health,[27] and the health security, of individuals. Similarly, there are increasing calls to protect individuals from what has been termed the obesogenic environment through measures such as regulation and legislation.[28–30]

Finally, other less understood but important risks to health security include chemical and nuclear weapons—and these are likewise being addressed through mechanisms such as the Chemical Weapons Convention,[31] which came into force in 1997.

In summary, health security from infectious organisms, from the risk factors of non-communicable diseases, and from chemical and nuclear hazards has two intertwined components—collective and individual. In some instances addressing individual health security—ensuring access to vaccines or medicines for example, or decreasing the risk of beginning to smoke cigarettes—leads to collective health security. Vaccinations increase collective health security through herd immunity and decreased risk of infection, and the Framework Convention on Tobacco Control, which aims at increasing the number of people who do not smoke, helps to protect population groups from the detrimental health effects of passive smoking. Other treaties protect individuals and societies from deliberate threats to health security from chemicals and nuclear fallout.

A final challenge is ensuring the health security of refugees and those living in conflict and post-conflict situations, who often face these same health security risks, as well as other risks associated with interruption of access to health services or violence. This challenge needs additional study and resolution. Existing international regulations, treaties, conventions, and other means of ensuring stronger health security must be sustained, and new ones developed to address their specific needs. The International Health Regulations put in place a framework under which the world can work together to better ensure collective security and develop and strengthen core capacity in public health through development assistance and national funding; treaties such as the conventions on tobacco control and biological and chemical weapons are in place that protect individual health security and provide sustainable models for the future. Donations and global funds that increase access to vaccines, medicines, and health services might be less sustainable as conceived, and longer-term solutions must be sought that include

affordable goods and a will of countries to budget for and sustain their own procurement and health systems. This aim needs national skills and economic development; and technology transfer, price negotiation, intellectual property considerations, and continued innovation and ingenuity at the global level. There is a long way to go to ensure both individual and collective health security.

Ebola: lessons in human security

Lincoln Chen, Keizo Takemi

What is the true scope of global health security? David Heymann makes the distinction between collective health security and individual health security. Health security of populations has deep historical roots traced back to quarantine against plague in the 14th century to the more recent revisions of the International Health Regulations[10] that promote core capabilities for rapid detection and timely response. Individual health security, according to Heymann, surfaced with the 2007 Indonesian withholding of avian influenza strains, insisting that poor countries be able to share in the benefits of the vaccines developed for rich markets. He argues that individual health security is dependent on access to vaccines, drugs, and health services. The Ebola crisis illuminates these two intertwined aspects of health security—individual security sums up to collective security, and collective security means enhanced individual security.

This bifurcated approach to health security constitutes only one of many perspectives on the scope of global health security. Health security itself constitutes only one part of a broader set of human security concerns. What can we learn about Ebola and health security from a broader and more comprehensive understanding of human security?

Useful insights can be gained from the UN Commission on Human Security, co-chaired by Sadako Ogata and Amartya Sen, that issued its report *Human Security Now* in 2003.[32] The Commission adopted a comprehensive approach to human security, including but not only confined to health. Several core features of the Commission's findings and recommendations are worth revisiting in light of the Ebola crisis.

First, the Commission underscored that human security, including health security, is people centred. People-centeredness is important because, irrespective of the threat, what matters is people—not borders, not international relations, not even money and economics. A people-centred approach might seem obvious today, but Cold War preoccupation with nuclear conflict had transformed the concept of security overwhelmingly into military defence of national borders. Yet, as underscored by the Commission, there are many threats to human security such as extreme poverty and deprivation that threaten human survival and wellbeing.

Second, the Commission recognised that multi-dimensional security threats are interactive. Threats to security were broadly categorised as infectious epidemics, poverty and inequality, and violence-conflict-humanitarian crises-weak governance. As Ebola has vividly demonstrated, the economic and political effect of an infectious outbreak can be catastrophic.[33] Other insecurities such as conflict and poverty can heighten vulnerability to infectious epidemics. A mutually reinforcing vicious cycle of insecurities could greatly magnify the net damage. The interactive nature of multiple threats challenges the breadth and duration of responsive actions, beyond simply containing an infectious agent.

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Third, the Commission concluded that human security needs not only protection against downward risk, but also the sharing of upward gains. This in essence was the source of the Indonesian refusal to share influenza samples unless there would be some sharing of benefits of new vaccines. Ebola illuminates not only the importance of protecting people's lives through disease control but also of the essentiality of a strong health-care system embedded in a prosperous economy and a peaceful society. Even as current control efforts attempt to reach zero cases, there is the reminder that our failure to share the benefits of global economic growth leaves many societies without a health-care system, thus vulnerable to the devastating effect of Ebola and yet another epidemic. The Ebola crisis exposed inequity in global development that ultimately shapes societal vulnerability and empowers communities and organisations to respond effectively.

Finally, the Commission proposed a dual strategy of bottom-up empowerment balanced with top-down policies. Ebola demonstrates vividly that community perceptions, human behaviour, willingness to report, and compliance with control measures are all key parameters in effective disease control. Local cultural practices such as burials, church groups, and community-based organisations are part of the building of trust essential to combat an epidemic.[34] Empowered communities—with education, good health, adequate income, and health knowledge—are better able to diagnose and respond to their own crises. Equally important are effective top-down actions. Like a fire brigade, the top-down global responses to Ebola must link effectively to local action. Yet, the plethora of global responses have been found wanting. The sentinel warnings of non-governmental organisations and the heroism of international volunteers have been heart-warming, but criticisms of inadequate and delayed action by international agencies, especially WHO, have been wake-up calls. Yet, WHO is an under-resourced and undermandated intergovernmental organisation where member states insist on preserving their absolute sovereignty in a world where viruses do not respect political borders or authority.

Ebola will not be the last new and lethal pathogen to emerge. In today's globalising world, we have new contexts for infectious pandemics—larger human

populations, unprecedented volume of transnational movement, rapid travel, and growing global inequalities in economics and health. What makes Ebola different from the many other epidemics is the fear of contagion that the lethal disease has precipitated among the public, especially in rich countries. When the rich and powerful feel threatened, global political priorities are accordingly redirected.

The global health community should address future threats to health security comprehensively based on deeper understanding of prevention and remediation of human security. Simply taking the International Health Regulations to a next step would be too weak and too narrow an adjustment. We live in a globalising world where health interdependence is greater than ever. There is still a window of opportunity to respond more effectively and comprehensively to the wake-up calls. Ultimately, in a genuinely egalitarian world, health security for all must be based on global equity, solidarity, and social justice.


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The Ebola outbreak and the future of global health security

David P Fidler

A seminal change in global health during the past 20 years involved the framing of specific health problems as security threats and development of a strategy to achieve global health security. This strategy connected global health with core political interests of states, transformed the responsibilities of WHO, and produced the revised International Health Regulations.[10] However, the outbreak of Ebola virus disease in west Africa damaged the strategy's political, institutional, and legal pillars. It revealed countries' lack of political commitment, battered WHO's credibility, and weakened the International Health Regulations. Resurrection of global health security will need restoration of each pillar. Unfortunately, the damage exposes challenges that states previously have failed to handle, including sustaining global health as a political priority, reforming WHO, and improving compliance with international health law. In view of the difficulty of what is needed, whether the Ebola outbreak can rejuvenate global health security is far from clear.

How Ebola went from "an exotic tropical disease to a priority for global health security"[35] involves a backstory in which WHO and its member states built and then undermined the strategy for global health security. Starting in the mid-1990s, WHO crafted new approaches to dangerous disease events, such as the Global Outbreak Alert and Response Network (GOARN)[36] and the revised International Health Regulations. Outbreaks, including SARS and pandemic influenza H1N1, tested these innovations. In 2010–11, the International Health Regulations Review Committee analysed the H1N1 pandemic, acknowledged positive features of the response, and identified problems with the regulations and WHO's ability to address health emergencies. Warning "the world is ill-prepared" to handle any "sustained and threatening public-health emergency", the Committee recommended improving compliance with the regulations and WHO's capacities to manage dangerous disease events.[12]

WHO did not adopt these recommendations. Concerns about global health security informed WHO's reform process, which started in 2010, but the process failed to support the Review Committee's recommendations or strengthen WHO's responsibilities in this area. The 2012 deadline for meeting obligations on surveillance and response capacities in the International Health Regulations passed with most countries not in compliance.[37] The Review Committee also flagged this issue,[12] but WHO's reform process did nothing about it. When fiscal difficulties forced decisions about priorities, WHO cut funding and staffing for its surveillance and response activities,[38] rejecting Review Committee proposals for strengthening them.[12] The cuts reflected WHO's strategic choice to de-emphasise global health security and increase attention on problems outside the global health security realm, including non-communicable diseases. The reform process also failed to tackle long recognised problems with WHO's regional and country offices that undermine the organisation's effectiveness.

This backstory reveals the rise and fall of global health security before the Ebola outbreak. Once catalytic in making global health more prominent in world affairs, the global health security strategy suffered political neglect by countries, downgrading within WHO, and legal non-compliance—before a single Ebola case appeared in west Africa. Although countries responded when the Ebola crisis teetered on catastrophe, the scale of the tragedy and the needed response highlighted the lack of political commitment seen before this outbreak.

For WHO, leadership failures, problems with regional and country offices in Africa, weak surveillance and response capacities, and incompetent staff made the Ebola outbreak a debacle.[39] The UN stripped WHO of leadership in creating the UN Mission for Ebola Emergency Response, which implemented an approach unsustainable for long-term global health security. WHO's mistakes during the outbreak were bad enough, but, combined with its pre-outbreak actions, the disaster for WHO as the institutional pillar for global health security is much worse.

The Ebola crisis also hammered the International Health Regulations. The lack of health capacities in Guinea, Liberia, and Sierra Leone highlighted the dismal compliance with the regulations' surveillance and response obligations and the absence of any multilateral strategy or funding to address this problem in low-income countries. Many countries imposed trade and travel measures that lacked scientific and public health justifications, and few bothered to explain their actions.[40] This behaviour violated the regulations, producing a different epidemic of legal non-compliance.

Despite the damage, the Ebola outbreak has resuscitated interest in global health security. The WHO

Executive Board now supports proposals that the Review Committee made years ago.[41] However, the rise, fall, and Ebola-related bruising of global health security mean that a renaissance needs deeper political commitment by states, extensive reform of WHO, and significantly improved compliance with the International Health Regulations. Achievement of such commitment, reform, and compliance constitutes a formidable challenge for global health policy.

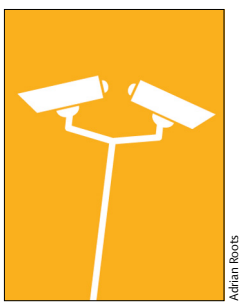
From a position before the Ebola outbreak of downgrading the priority of global health security, WHO members must suddenly move in the opposite direction of trying to strengthen it. The outbreak revealed how inadequately countries supported the global health security strategy before this crisis. Transformation of national interests will prove difficult. Epidemics exhibit political elasticity—they increase global health's political importance, but this effect fades as crises pass. As noted above, marginalisation of global health security accelerated after the H1N1 pandemic, and influenza pandemics are the most feared threat to global health security. How an Ebola outbreak in post-conflict societies in west Africa can embed global health security more firmly in national interests than previous, and more dangerous, disease crises did is not self-evident.

Ebola-generated proposals also envision a daunting institutional and legal reform agenda, which includes the emergency reserve force and contingency fund ideas, reconfiguring WHO's governance architecture, and giving the International Health Regulations "more teeth".[42] This agenda asks states to accomplish things they have failed historically to do: seriously reform WHO, sufficiently fund WHO's expanding responsibilities, provide sustained assistance to help low-income countries to build public health capacities, and accept enforceable rules of international health law. Why the Ebola outbreak will cause countries to reform WHO, fund global health priorities adequately, and enforce international health law has not been explained in the clamour for change.

Once upon a time, global health security was an innovative idea that produced a strategy resulting in historic changes in global health politics, governance, and law. After the Ebola outbreak, the novelty is gone, WHO is discredited, the changes have proved inadequate, and the strategy is in shambles. Repair of the political, institutional, and legal pillars of the global health security strategy has to involve institutional, financial, and legal actions that countries have been unwilling to take in the past, no matter what disease crisis recently happened. For global health to escape this pattern of behaviour after Ebola would need a transformation in global health politics beyond what made global health security a seminal change years ago. In view of the nadir global health security has reached, such a transformation is a very tall order. The future of global health security has never been more uncertain.

Global health security agenda: building resilient public health systems to stop infectious disease threats

Jordan W Tappero, Mathew J Thomas, Thomas A Kenyon, Thomas R Frieden



Adrian Roots

Infectious diseases have threatened health security since the beginning of civilisation. As exploration, trade, and warfare spread, so did disease. Geographical dissemination of disease became much more pronounced as the sailing vessel gave way to steamship and the oceans were no longer the barriers they had once been. As cultural and ecological frontiers were crossed, populations were exposed to unfamiliar infections from foreign lands. Within 50 years of the Spanish conquest, an estimated 90% of the central Mexican population died from smallpox.[43] There are also examples of the deliberate use of pathogens as weapons and as agents of bioterrorism, including the use of smallpox by British forces against Native Americans during the American colonial conflict,[44] and use of anthrax spores targeting members of the US Congress and media in 2001.[16] Today's mobility and commercial air travel has accelerated the shared global risk, and consequent fear, of the rapid, inadvertent, or intentional introduction of an emerging pathogen or biological agent.

The Ebola epidemic has shown how connected we are as a global community; we are only as safe as the most fragile states. Ebola will not be the last infectious disease threat that we face—other recent examples include HIV, Middle East respiratory syndrome coronavirus, H1N1 influenza, and SARS. Population growth, encroachment on previously sparsely populated areas in Africa, Asia, and elsewhere, civil unrest and conflict, natural disasters, and the increasing density of urban areas in the developing world are being amplified in many of the most vulnerable corners of the world; the frequency of outbreaks and epidemics might well increase.[45,46] Thus, we can expect infectious diseases to continue to emerge and re-emerge unpredictably in places where we are not looking—or simply cannot see because of lack of adequate, resilient public health surveillance systems and infrastructure.

In 2005, WHO revised its International Health Regulations to better address emerging epidemic threats such as the 2003 international outbreak of SARS.[10,47] However, by the self-imposed deadline of June, 2012, fewer than one in five member states had even self-reported full compliance with the regulations.[48] On Feb 13, 2014, the USA along with 28 partnering nations, WHO, the Food and Agricultural Organization of the UN (FAO), and the World Organization for Animal Health (OIE) launched the Global Health Security Agenda (GHSA).[49] GHSA was developed to advance International Health Regulation implementation through focused activities to strengthen core capacities, and to ensure "a world safe and secure from global health threats posed by infectious diseases—where we can prevent or mitigate the

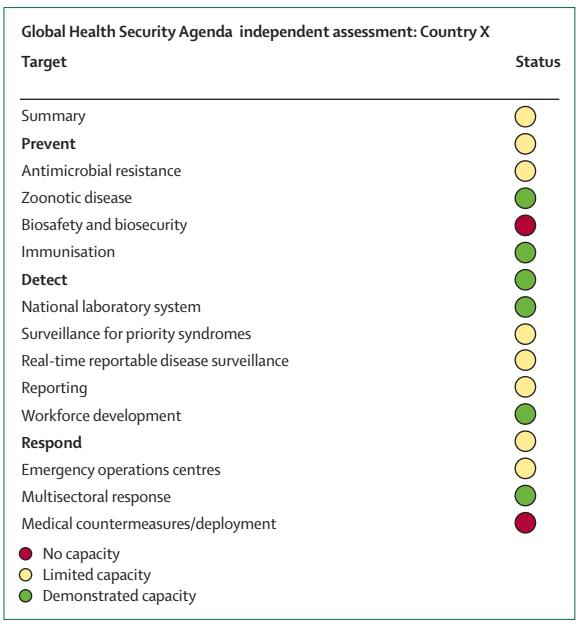


Figure: **Mock country dashboard for periodic independent assessments of progress made towards Global Health Security Agenda targets**

impact of naturally occurring outbreaks and intentional or accidental releases of dangerous pathogens".[50] More than three dozen countries have made firm commitments to working collectively across 12 GHSA technical targets.

The GHSA provides a framework and path with clear targets and milestones to accelerate progress in strengthening of public health systems needed to protect global health security. A resilient health system to stop naturally occurring outbreaks of infectious disease has the same attributes needed to prevent, detect, and respond to the deliberate use of a biological agent. These include a national biosecurity system that ensures that especially dangerous pathogens are secured with biosafety and biosecurity best practices in place, a nationwide laboratory network with a specimen referral system reaching at least 80% of its population and with effective modern diagnostics in place to detect epidemic-prone diseases, a timely biosurveillance electronic reporting system meeting WHO, OIE, and FAO requirements, a dedicated workforce of medical and public health professionals including at least one trained field epidemiologist per 200 000 population, and a public health emergency operations centre with the capacity to coordinate an effective emergency response within 120 min.[50] If there is one thing we have learned about preparedness, it is that the most effective systems are those that are in use every day and can be scaled up in an emergency.

The GHSA targets are crucially important. The west African Ebola epidemic has not been limited to Guinea, Liberia, and Sierra Leone. There have been inadvertent introductions from the affected countries to Nigeria, Senegal, Mali, Spain, and the USA.[51–55] These importation events were quickly controlled and these countries remain Ebola free. Had systems been in place in the west African countries, the past year would have looked very different. Although the threat of Ebola importation contributed to preparation of an effective response, the other countries already had components of the GHSA in place, and although not fully developed it showed that even nascent capacity was crucial in facilitation of a timely response. In Nigeria, a dedicated public health emergency operations centre for polio eradication and a cadre of Field Epidemiology Training Program-trained[56] epidemiologists facilitated the multisectoral coordination and extensive contact tracing efforts needed to control the outbreak once it spread as it spread within Lagos, and from Lagos to a second city.[51] A common theme in quelling the Ebola importation events has been the ready availability of trained ministry of health staff who used existing surveillance systems, laboratories, and public health emergency operations capabilities to quickly control Ebola. Unfortunately, there remain far too many blind spots around the globe where public health systems lack trained disease detectives, functional laboratories, and quality surveillance data to make timely decisions about the use of resources to prevent, detect, and respond to infectious disease threats within their borders.

Attaining GHSA targets and achieving compliance with International Health Regulations is the foundation for making the world safer from infectious disease threats, but we must also strengthen our global infrastructure to respond to acute events that exceed national capacities. GOARN contributes to global health security by identifying, preparing and training, and rapidly providing international multidisciplinary experts to support the national response when assistance is requested.[36] The network plays an important part in coordinating the work of international partners with national health authorities. In the response to Ebola in west Africa, specialists from GOARN partner institutions have taken part in more than 1250 deployments to Guinea, Liberia, and Sierra Leone since March, 2014. GOARN clearly needs to become much stronger, faster, and better organised and have a broader set of skills. GOARN is planning enhancements that include an expanded network of partners, field leadership training for rostered participants, streamlined deployment processes, and field tools for outbreak response.

The moment for global public health systems development is now. GHSA is the opportunity to make rapid progress strengthening our collective health security through country and intercountry capacities to prevent, detect, and respond to infectious disease threats, both naturally occurring and intentionally released. One crucial activity is independent evaluation of progress at the country level (figure). Evaluation must be objective, transparent, simple, and meaningful, and findings must be used to mobilise human and financial resources to improve systems. Independent evaluation will be crucial to accelerate progress where it is needed most, and will

facilitate global and country accountability for our shared health security fate.

The west African Ebola epidemic is a telling reminder that improvement of the capacity of every country to find, stop, and prevent health threats is both in the world's self-interest,[57] and a moral imperative.[58]

The effect of non-communicable diseases and population ageing on health security

Derek Yach, Sania Nishtar, Alex Kalache

Non-communicable diseases and mental health are major causes of death and disease in almost every country worldwide.[59,60] Of the 38 million deaths attributable to non-communicable diseases in 2012, more than 40% occurred among people younger than 70 years.[61] Despite the size of the problem, the current framing of health security focuses almost entirely on infectious diseases.[62] Ebola reminds us of the effect of global interconnectivity on the spread of deadly diseases. Fear and dread about the short-term consequences of Ebola have stimulated a global response based on traditional public health measures.

We need to broaden the framing of health security to include non-communicable diseases. Prevalence of these diseases—with its high-cost implications—will undermine the ability of governments to implement universal health coverage. By contrast with most infectious diseases, and similar to HIV/AIDS, non-communicable diseases are rarely cured. They need lifelong management. Imaging, expensive diagnostic tests, and costly treatments are needed for decades, not weeks or months. The cumulative costs are set to soar in all countries as risk levels remain high and access to care increases.[63] These unaffordable costs threaten individual and collective health security.

Incidence of non-communicable diseases, which is partly driven by globalisation of unhealthy consumption and lifestyles, explains the rapid rise in prevalence of many major non-communicable diseases. Five risk factors are common to several diseases: tobacco use, excess alcohol intake, unhealthful and high-calorie diets, physical inactivity, and unavailability of or non-adherence to medications to treat non-communicable diseases.

These risk factors are seen by many as freely adopted and an inevitable consequence of development. Non-communicable diseases are seen as age-related. That partly explains the paltry response to the overwhelming need. In reality, corporate interests related to tobacco, food, and alcohol hamper development of public health strategies. This effect has been best documented in respect to tobacco.[64] Massive demands for urban infrastructure limit the ability of health experts to have their voices heard as new and expanding cities in Asia and Africa reduce levels of physical activity. Agricultural interests favour cash crops irrespective of their consequences for non-communicable diseases, food insecurity, or the environment.[65]

Taken together, forces outside the direct control of health professionals are driving major demographic and epidemiological changes with substantial effects on health-care costs, public pensions, and social protection and security systems. Public health is ill-equipped to address such forces even as they threaten personal and collective health security.

Adrian Roots

Government leaders point to data that show life expectancy increasing in most countries. Age-specific declines in incidence of and mortality from non-communicable diseases in many countries indicate that all countries do better. Further, decades of trend data provide evidence that lives lived in good health lag behind improvements in life expectancy.[66] This gap leads to increasing disability and severity of diseases as populations age, with profound implications for productivity, continued economic growth, and, indirectly, serious political implications. In recent months, the costs of unhealthy ageing and how to address the consequences has emerged in macroeconomic debates in Greece, Singapore, Japan, and the USA. In all cases the options are becoming core to political debates.

Two highly age-dependent disease categories, musculoskeletal disease and dementia, are set to impose massive financial and human burdens on society at a time when evidence of effective prevention or care remains scant.[67] In 2013, dementia affected an estimated 44·4 million people worldwide, and the prevalence is expected to almost triple by 2050 to 135·5 million.[68] The cost of dementia-related care is more than US$600 billion—equivalent to the 18th largest economy in the world today.

Life expectancy gains have been achieved through building of economies and businesses that led to unprecedented improvements in the quality and quantity of life, but these economies are based on the extensive use of non-renewable resources that have pushed us beyond many environmental limitations.[69] Continued improvement in longevity therefore cannot be taken for granted, nor can we assume that massive gaps in health outcomes can be closed through "more of the same" policies that worked to propel 33 countries to now have life expectancies greater than 80 years at birth.[70]

Just as we now have serious debates about the need to change our consumption patterns in advanced industrialised countries to become healthier and more sustainable, these very lifestyles are promoted as desirable and aspirational in low-income and middle-income countries. This lifestyle, first popularised in tobacco advertisements of the 1950s in the USA and Europe, places ubiquitous use of tobacco, alcohol, and fast food at the core. Globalising dietary patterns that favour meat and calorie-rich nutrient-poor diets at the cost of healthier ones; or favour driving over walking, cycling, and public transport; or fail to clamp down on tobacco use and excess alcohol intake, are already eroding the global health gains achieved by dramatic declines in infectious diseases and undernutrition. They are also

translating to significant threats to personal, family, and national health security.

Change will not be easy, particularly because low-income and middle-income countries aspire to the consumption patterns that have enhanced life's prospects and now threaten their health. Public health leaders have more to learn from the current global debate about climate change, which at its centre faces the same resistance to change, than from those addressing infectious disease control. That debate needs deeper insights into the real politic of change possible within government (as opposed to the health department); substantially more sophisticated approaches to interaction with markets and corporations with a view to finding ways to make markets work for prevention and control of non-communicable diseases; and the establishment by leading non-governmental organisations of mutual accountability systems supported by global investors in ways that the Carbon Disclosure Project (CDP) has achieved. CDP investor initiatives—backed in 2015 by more than 822 institutional investors representing an excess of US$95 trillion in assets[71]—give investors access to a global source of year-on-year information to support long-term objective analysis. This information includes evidence and insight into companies' greenhouse gas emissions, water use, and strategies for managing climate change, water, and deforestation risks.

It is time we had an equivalent initiative to drive better health within corporations. Relying on governments alone to transform major corporations to address health has not proven useful to date except with respect to some aspects of tobacco control.[72]

Incidence and severity of non-communicable diseases is a function of personal, corporate, and government behaviour over our lifespan. When incentives and actions for each are aligned and explicitly addressed, progress could be fast. Achievement needs partnerships that extend well beyond those that are effective for Ebola and a clearer vision of the goal: longevity with a high quality of life for all.

Adrian Roots

Health security and rights in times of emerging health threats: towards a new way of doing essential health research and development

Piero L Olliaro, Peter Horby, Els Torreele

Faced with a public health emergency such as Ebola, timely and affordable access to effective diagnostics, medicines, and vaccines is crucial to provide an adequate response to this individual and collective health security issue, and is central to the realisation of the right to health.

The scarcity of health tools to respond to Ebola has attracted widespread attention now, but this is just the most recent illustration of the failing research and development model. Infectious diseases in general are marginalised; not only the aptly named neglected tropical diseases, but also antimicrobial resistance at large: from artemisinin-resistant malaria to multidrug-resistant tuberculosis and other resistant bacterial infections, including the so-called superbugs haunting even the best equipped hospitals.[73] Various non-communicable diseases that are not deemed profitable enough also fall in the same category.

But why do we not have adequate health tools for Ebola and other epidemic and emerging diseases, or a pipeline of drug candidates to combat the continuous threat of antimicrobial resistance? The most common answer is: it is a market failure. However, this explanation is too simplistic, and masks the real underlying cause: our current medical research and development system, which relies largely on pharmaceutical companies that respond to profit prospects rather than health needs, is de facto ill suited to address the world's health priorities, unless these coincide with major market opportunities. Which in the 21st century turns out rather the exception than the rule.

Without a health rights frame and public health leadership to guide research and development priorities to address people's health needs, our current model prioritises the development of blockbuster products that can be marketed to generate maximum sales, even if marginal or superfluous from a medical perspective. The current pharmaceutical research and development system produces much more me-too products than it delivers genuine medical innovation: 75% of new medicines reaching the market provide no added therapeutic value.[74] Ironically, when they do, new drugs tend to be unaffordable, priced well beyond the capacity of people and health systems to pay, even in wealthy countries. A case in point is a recent hepatitis C drug priced at $84 000 in the USA for 12 weeks of treatment, which has provoked both private insurers and government programmes to ration the treatment,[75] while remaining totally out of reach for millions of people living with hepatitis C worldwide. This example illustrates how health security and the right to health are not only issues of concern for developing countries.

Too often, promising leads that would address public health priorities are not pursued. For instance, some candidate products for Ebola have been known for some time.[76] The fact that they got even this far is because they have been largely supported by public funds, primarily from defence budgets during a time that Ebola was regarded as a potential bioweapon.[77]

More generally, billions of public money are invested in biological and medical research and more spent on buying the products of this research, thus financing both ends of our pharmaceutical innovation system. However this does not translate into health security because there is no governance to ensure that our biomedical research and development system responds to priority health needs and delivers affordable products. The profit-seeking rewards and incentives system that has permeated private and public biomedical research alike creates a culture of secrecy and competition for knowledge access that is detrimental to scientific progress and results in

inefficient use of resources, unnecessary fragmentation, duplication, and delays. It also biases choices towards developing health products that represent the best commercial market opportunities.

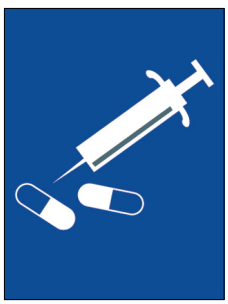
Obviously, products destined for epidemic and emerging diseases and antimicrobial resistance do not fall in this category, and the chronic crisis we are facing shows why we need alternative ways to conduct and finance research and development that prioritise public health needs and where the primary payback is improved global health security and the fulfilment of the individual right to health. This scenario means shifting from a system in which essential health products are regarded as profitable commodities and it is left to the private sector to decide which ones to develop, to a system where medicines are deemed public goods, and where it is incumbent on the public sector to define the public health priorities, and to create a conducive environment for product research and development, approval, and rational use. A governance system is needed to prioritise product development according to unmet health needs, and mechanisms that will allow diagnostics, drugs, and vaccines to be developed without an immediate financial reward, but, as conditions might warrant, left on the shelves until the next outbreak occurs, or kept in reserve until bacteria become resistant to first-line therapies. This arrangement is by sharp contrast with the current motive of maximising sales, which leads to massive overuse of some drugs, and necessitates regulation of the way drugs are deployed, prescribed, and used for instance to minimise the misuse of crucial antibiotics and prolong their lifespan.[78]

The Ebola crisis offered an opportunity to pilot a different paradigm of health-needs-driven research and development,[79] as a collective action under public leadership and primarily financed with public funds, allowing open access to data, resources, and research aids, building a shared evidence base of so far fragmented knowledge, mobilising the research community to contribute to problem solving through crowdsourcing, and managing creatively intellectual property for products to be available as public goods. Sadly, so far this has not happened; our current research and development ecosystem lacks the needed leadership and governance to prioritise research, resulting in fragmentation, diverging priorities, controversies over study design,[80] and now competition for access to study sites and patients.[81]

Despite best intentions, we were unprepared this time again to overcome the systemic deficiencies of our research and development model. Research and development and access to diagnostics, vaccines, and treatments are crucial to achievement of health security, and cannot be left to market forces. Public leadership, direction, and accountability are needed for creative rethinking of a research and development system that urgently needs to be fixed.

Substandard and falsified drugs: a threat to human and global security

Lawrence O Gostin, Margareth Ndomondo-Sigonda, Daniel Carpenter



Adrian Roots

In a world shaped ever more powerfully by transnational currents of disease, of treatments, and of trust and distrust, substandard and falsified drugs should be understood as a threat to human and global health security. That security is at the centre of the problem should not be in doubt, once we understand that everyone is at risk. Like infectious diseases themselves, substandard and falsified drugs transcend national boundaries. The fear of ineffective and unsafe treatments can spread contagiously, engendering distrust in the health system. From heparin in the USA to treatments for malaria, tuberculosis, and Ebola in Africa, substandard and falsified drugs pose formidable social, economic, and political challenges to health security.

Epidemic disease is now viewed through the lens of security ranging from the US GHSA to WHO's International Health Regulations. The unprecedented UN Security Council resolution declaring Ebola a threat to international peace and security demonstrates the political instability wrought by fast moving epidemics.[82] Substandard and falsified drugs greatly undermine national and global capabilities to curb epidemic and endemic infectious diseases, as well as non-communicable diseases. Populations will always face health security risks, but the crucial point is that institutions must have the ability to regulate and bound those risks. The ubiquitous and highly profitable nature of the global trade in substandard and falsified drugs poses grave dangers, while eroding public confidence in governments and international institutions.

Emerging states and civil society often object to the broad descriptor "counterfeit" for all low quality drugs. Counterfeits are a narrow class of drugs that infringe on a registered trademark, which is a proprietary interest protected under intellectual property law. A preferred common language frames the challenge purely in public health terms: "falsified" drugs misrepresent a product's identity or source, or both; and "substandard" drugs fail to meet national specifications in accepted pharmacopoeia or the manufacturer's dossier.[83]

There is a dearth of high quality, comprehensive data for the prevalence of substandard and falsified medicines not only because of the underground, often criminal nature of this problem, but also due to inadequate national drug surveillance systems. WHO estimates that substandard and falsified medicines make up 10% of the global pharmaceutical trade, rising to 25% in low-income countries.[84] In Africa alone, they kill 100 000 patients annually,[85] with poor-quality malaria and tuberculosis drugs being of greatest concern.[86] The disproportionate burden in low-income countries is attributable, in part, to ineffective regulatory and criminal justice systems.[84] The poor also cannot afford branded or even generic drugs, so they purchase medicines in market stalls and in unscrupulous pharmacies, including on the internet.

Falsified medicines pose three overlapping risks that undermine human and global health security. First, they can contain hazardous ingredients, causing poisoning or overdoses. For example, in September, 2008, 84 Nigerian children died from acute kidney failure caused by industrial solvent diethylene glycol in teething syrup.[87] Second, low-quality drugs are ineffective, so diseases progress, sometimes causing death. Believing they are being treated, patients can delay or forego medical attention. Third, drugs that contain subtherapeutic concentrations of active pharmaceutical ingredient breed antimicrobial resistance. The loss of an entire class of medicines (eg, antibiotics) threatens populations today and for future generations.

Beyond the human toll, substandard and falsified medicines pose substantial costs to national health systems. They strain regulatory and law enforcement agencies, undermining the rule of law itself. The sheer scale of low-quality drugs can stunt social and economic development, with the diminution of worker productivity, corruption of public officials, and foregone tax revenues as criminal cartels divert products from the legitimate drug supply.

Curtailing a problem of such global breadth needs mechanisms of action that span national boundaries, but remain largely within the regulatory powers of states. The drivers of substandard drugs include failure to meet good manufacturing practices (GMP). Although large pharmaceutical companies have the funding and incentives to meet GMP, small market companies often do not. They need training and equipment to meet international standards, and governments need regulatory structures to assess and assure quality. Although states must invest in safe and effective drugs, many need international assistance to close glaring gaps in manufacturing and regulatory capacities.

Empowered regulatory agencies can act against known manufacturers, but if products are falsely represented, the primary responsibility falls to customs and law enforcement. At present, falsified products are highly lucrative, with weak detection, enforcement, and criminal penalties. Sophisticated transnational criminal networks can produce illicit products that are very hard to differentiate from genuine products. They are highly skilled at manufacturing, packaging, distributing, and selling unlawful products—while avoiding regulatory oversight or police detection.


Adrian Roots

Even if national regulation and enforcement were adequate, states face a global enterprise beyond their reach. Yet, international criminal justice (UN Office on Drugs and Crime and International Criminal Police Organization), customs (World Customs Organization), and health (WHO) agencies have few tools and resources to stem the transnational trafficking in falsified drugs. There are no robust international agreements or transnational agencies to oversee drug quality, detect fraud, and apprehend bad actors.

Weak drug regulation and law enforcement at the national level combined with ineffective legal instruments and organisations at the international level enable traders in falsified drugs to prosper. When traffic in falsified drugs eludes the technologies and networks of regulatory detection, as in many developing countries, the problem is likely to grow and become more intransigent.

Enhanced pharmacovigilance and quality assurance compose two broad policy responses that are essential to coordinate across governments. WHO has developed a global monitoring system to define the magnitude of substandard and falsified products at the country, regional, and global level. The organisation is initiating a global network of focal points from national regulatory authorities and partnered civil society organisations to report suspected incidents.

Just as the International Health Regulations have identified core capacities, regulatory and enforcement capacities are vital to prevent, detect, and prosecute traders in substandard and falsified medical products. When criminals evade detection through porous borders, law enforcement cannot apprehend unlawful actors, and criminal justice meets out inconsequential penalties, then incentives for trade in falsified medicines will grow. Strengthening of inspection and enforcement capacities that interface among regulatory agencies and jurisdictions—customs, police, and courts on the one hand, and distribution networks, supply chains, clinics, and pharmacies on the other—is crucial.

The global stakes in substandard and falsified drugs are as high as they are because the very legitimacy of national health systems and international organisations is at stake. Substandard and falsified drugs have the potential to destabilise governments, affecting their functioning and credibility. This spiral of distrust manifests itself in the criminal networks and undermining of regulatory and criminal law, another driver of state failure. Substandard and falsified drugs pose a public health crisis not merely when epidemic disease spreads unabated or when treatment fails biologically, but also (and more enduringly) when the public and civil society lose confidence in national and global governance—a spiral of distrust caused by the failure to ensure a safe, effective supply of essential drugs and vaccines.

Conflict, disaster, and health security

Simon Rushton, Louis Lillywhite, Bhimsen Devkota

Violent conflict and natural disasters pose threats to individual and population health.[88] They damage and disrupt health systems, reduce treatment capacity and access, damage infrastructure, and preclude appropriate responses to acute health crises. The resultant health threats sometimes extend beyond the borders of the directly affected country. Promotion of health security therefore entails ensuring that effective health systems exist before a crisis, are sustained during and after conflict and disaster, and are at all times accessible to the

population. The challenges facing health systems differ greatly between contexts, but always raise similar questions over how best to contribute to, or facilitate, efforts to provide safe and effective health services.

Most contemporary conflicts occur in countries with weak health services,[89] where infrastructure deficiencies are often compounded by ineffective governance and chronic shortages in finance and human resources. Low-income and lower-middle income countries are also disproportionately affected by natural disasters, comprising seven of the top ten countries in terms of disaster mortality incidence.[90]

The direct health effects of conflict and disaster on individuals (such as physical injury, mental trauma, or infectious disease) as well as the indirect effects (from displacement, famine, and other causes of insecurity) can be severe,[91] often falling most heavily on women, children, and displaced and marginalised groups.[92] They are highly destructive of health systems, via multiple mechanisms, including targeting of health facilities, loss of health professionals to death, injury, or emigration, disruption of governance structures and supply lines, and interruption of health campaigns, in addition to increased demands for care. In recent years conflict-affected countries have confronted serious infectious disease outbreaks including Marburg haemorrhagic fever in Angola in 2005[93] and a cholera epidemic in the Democratic Republic of the Congo in the aftermath of the 1994 Rwanda crisis.[94] Thus, some of the world's weakest health systems find themselves facing some of the world's toughest health challenges. Ensuring that populations have access to effective, safe, and properly resourced health services—even during a conflict or disaster—is (or at least should be) a shared priority. Achievement of this aim is a complex task needing sustained domestic efforts and much international assistance.

Although many recent disasters have seen a high-profile humanitarian response, increasingly efforts are directed to preparation for, and reduction of the effect of, disasters. Resilience and risk reduction are evident in various current strategies including those of the UN[95] and the UK Department for International Development.[96] At the third UN World Conference on Disaster Risk Reduction in Sendai, Japan, in March, 2015, a new Framework for Disaster Risk Reduction 2015–2030 was adopted, which for the first time includes specific targets; however, whether or not these will attract international funding will have to await an international development financing summit in Ethiopia in July.[97] Resilience is about much more than the health sector (for example, flood protection measures), but much can be done to ensure the continued functioning of health systems post disaster (eg, ensuring that hospitals are constructed to resist earthquakes).[98]

Nevertheless, disasters will on occasions necessitate regional and international assistance, but to be effective previous political and financial investment is needed to ensure that personnel and resources are available and able to be rapidly deployed. The Euro-Atlantic Disaster Response Coordination Centre, which operates 24 h per day, 7 days per week, and covers 50 countries, has responded to 60 requests for assistance since the late 1990s.[99] Globally, however, disaster response capacities are patchy. During the Ebola epidemic in west Africa several proposals have been made for the creation of a so-called rapid reaction body, although questions remain over whether WHO, the Office for the Coordination of Humanitarian Affairs, or some other agency should take primary responsibility.[100] Whoever leads, it is essential that steps are taken to ensure that well intentioned international aid does not create additional problems. The response to the Haiti earthquake, for example, drew health workers away from the public health system, caused patients to preferentially use the facilities provided by aid organisations, and introduced cholera into the country.[101] Finding ways to anticipate and mitigate these negative effects should be a priority for donors and agencies.

Armed conflicts raise additional challenges. The International Committee of the Red Cross is currently campaigning against the deliberate destruction of health facilities and services.[102] Under international humanitarian law there is an expectation that health resources will be protected. In practice, they are often damaged. Investing in more training in these laws for all armed groups (state and non-state) might help to reduce both deliberate and non-deliberate damage to health systems, but we also need to understand why belligerents target health systems in some cases and not others and why health indicators during some conflicts, such as Nepal,[103] continue to improve while in other cases they fall.

The use of health services by belligerents to win hearts and minds can improve health coverage, but raises issues around the politicisation of health care and can increase inequalities in access or exacerbate intercommunity tensions.[104] Dilemmas also arise in relation to non-state armed groups who might be the primary providers of health services in some areas.[105] State and donor governments are often reluctant, or refuse, to work with those they characterise as terrorists. Humanitarian aid agencies, keen to maintain impartiality, have their own reasons for being concerned about engaging with belligerents. Yet there is a pragmatic argument for working with both the state and non-state armed groups who are engaged in health service delivery and, perhaps, for prioritising impartiality over neutrality and independence. This suggestion might seem far-fetched, but so initially did the proposals in the late 19th century that led to the Geneva Conventions that require impartial health care during international conflicts.

The end of conflict usually involves a formal peace process and here again attention needs to be given to health systems. Whereas political and security

considerations often dominate (eg, arranging elections and demobilising combatants), more attention needs to be given to the negative effects on health and health services that continue after the fighting stops.[106] Dealing with the direct individual health effects (such as physical disability or post-traumatic stress disorders) and the process of (re)constructing a health system are by their nature long-term endeavours. All parties to a peace process need to be engaged from an early stage in discussions on the post-conflict health system, including how health workers trained by the combatants in support of the conflict can be used post conflict. The failure to invest in the post-conflict health systems in west Africa has been identified as contributing to the size and effect of the current Ebola outbreak.[107–109]

These cases highlight several strategic challenges, including a smooth transition from short-term humanitarian relief to longer-term development-oriented programmes; the need to effectively coordinate the activities of many domestic and international actors; and the fact that health system rebuilding is inextricably linked to broader issues of national capacity and good governance.

Setting of priorities and allocation of resources to mitigate the effect of, and recover after, conflict and natural disaster is a quintessentially political challenge, not merely a technical one. Both individual and collective health security are intimately tied up with successfully meeting this challenge. The health community can advocate, advise, and contribute to these efforts, but an effective response needs high-level political commitment. It is to be hoped that the landmark UN agreements to be reached in 2015 (not least the post-2015 Sustainable Development Goals and climate change agreements) lead to substantial improvements in current capacities to deliver health services and products in conflict and disaster-affected environments. It is equally to be hoped that WHO is prepared to articulate the case for health system strengthening, to invest in identifying what works and what does not in cases of conflict and disaster, and to provide the health community with the leadership necessary for successful implementation.

Adrian Roots

International migration and global health security: five lessons from the Ebola crisis

Khalid Koser

There are many links between international migration and global health security, ranging from health-care disparities as a cause of migration, through the risk of a so-called brain drain of qualified health workers with implications for health-care provision in their origin countries, to heightened rates of mortality in refugee camps[110] and restricted access to health care for unauthorised migrants,[111] to the role of migrant remittances and diaspora doctors and nurses in responding to emergencies and contributing to the development of health-care systems at home.[112] In safeguarding of global health security, it is therefore important to pay attention to migration.

In the context of the recent Ebola crisis, the main migration-related concern was that the crisis might trigger large scale migration, which in turn would become a vector for spreading the virus. In response most neighbouring countries tried to close their borders, industrialised countries such as Australia imposed temporary visa restrictions on all immigrants from these countries, and several airlines stopped flying to the affected countries. Yet evidence from previous health crises demonstrates that they rarely result in large scale international migration, that where they do travel bans do not always work, and that the unintended consequences of travel bans might be more harmful than the problem they are intended to address.[113]

There are five wider lessons to learn from these migration responses to Ebola, and their overall lack of effectiveness, for understanding the relation between international migration and global health security, and generating positive feedback loops. First, the Ebola crisis has reinforced that more research is needed on the effect of health crises on international migration, to inform more effective policy making. An historical review of health crises has indicated that they rarely result in large scale migration.[114] When it has occurred, as for example from Beijing during the 2003 SARS outbreak, migration tends to be internal, temporary, and early on in the health crisis. It has been difficult to discern disease from other underlying factors such as poverty and persecution where international migration has occurred during health crises, for example during the cholera outbreak in Zimbabwe in 2009.[115] Overall the evidence is scarce, anecdotal, and hard to verify. Empirical challenges involve identification of and access to affected populations; conceptual challenges include attribution and distinguishing of health from other motivations to migrate.

Second, increased efforts are needed to encourage states to abide by the International Health Regulations, and for organisations that work with migration and migrating populations to fully understand their potential to prevent migration related to health crises. The implementation of International Health Regulations, which takes a preventive approach to the international spread of disease, focusing less on control measures at borders than detection and response at source and on enabling global communication channels, appears to be one reason why health crises in recent years have not triggered mass migration. Fuller implementation of International Health Regulations in west Africa would have been a far more effective safeguard against migration than travel restrictions.

Third, more work is needed at national and global levels to ensure that populations are empowered to protect themselves from diseases, and to ensure that the mass media have the knowledge and understanding to

contribute to health protection and understanding of risks and their management. In the review on health crises and international migration,[112] collective actions were also found to reduce the risk of disease and offer an alternative to fleeing. During the 2009 influenza H1N1 pandemic, for example, school closures, work pattern adjustment, self-isolation of symptomatic individuals and advice to their caregivers, and cancellation of mass gatherings helped to mitigate the pandemic.[116] The gradual improvement of the understanding of infectious diseases, their causative agents, modes of transmission, and evidence-based ways to control their spread have also empowered individuals to adopt preventive behaviour, in many cases pre-empting migration.

Fourth, increased coherence is needed between the International Health Regulations and migration policies and practices at the national and international levels to inform government responses during health crises that help populations to avoid migration, and potentially pre-empting unwarranted decisions to close borders and to detain or deport migrants who have fled health crises. For example, where there are migrants either arriving from or faced with the prospect of returning to areas affected by health crises, national migration policies should allow for their specific assistance and protection, including the suspension of deportation orders until the health crisis has subsided. Respecting the rights of migrants and refugees also applies to their countries of origin: in 2014, Côte D'Ivoire contravened international law by blocking the return of 400 refugees from Liberia, on the grounds that they might import the Ebola virus into the country.[117] At the national level, increased coordination is needed between government agencies separately tasked with migration and health mandates.

One of the unintended consequences of travel restrictions in west Africa during the Ebola outbreak was to reduce the flow of health workers there, as well as the provision of medical supplies and humanitarian assistance. It was only once these restrictions were lifted, for example, that a team of 165 medical professionals from Cuba were able to enter Sierra Leone to help to step up the response to Ebola there.[118] Finally, therefore, besides at times being a potential cause and consequence of global health insecurity, it is important to recognise that mobility can also be part of the solution.

Universal health coverage and global health security

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The Ebola epidemic, termed "a threat to international peace and security" by the UN Security Council in September, 2014,[82] has once again put the issue of health security at the top of the global agenda. Although traditionally conceptualised as protection from the pandemic spread of infectious diseases, health security, as David Heymann argues, does indeed need broader collective action to ensure that all people have "access to safe and effective health services, products, and technologies" they need to ensure their own individual health security. This expanded definition recognises that collective health security is also the sum of individual health security, and compels global action to provide individuals in all countries with access to essential health care.

A much deeper connection between individual health security and collective human security, not only collective health security, has been understood at least since the 1880s. It was then that Chancellor Otto von Bismarck linked Germany's national security to collective, state action to ensure the health and social security of individual workers.[119] This linkage was asserted more generally in the 20th century, by the two architects of today's global security framework—Winston Churchill and Franklin Roosevelt—who both accepted, as political liberals, the importance of building their own nations' security on a strong foundation of shared social solidarity and emphasised the importance to global security of ensuring that all people in all nations should live in freedom from fear and want.[120]

Individual health security cannot be separated from this broader concept of human security that is concerned with all threats to human wellbeing. The availability of essential services, technologies, and medicines is not possible if financial and other barriers prevent individuals from accessing them when they are needed and health care is not made available in a socially equitable manner. Further, freedom from fear and want—the essence of human security—also means ensuring that all individuals have adequate protection against the financial risks of medical care, which in many countries remains a leading cause of poverty and threat to individual wellbeing.[121]

Universal health coverage is fundamentally about meeting these needs—universal, equitable access to health care with financial protection—and is indispensable for achievement of individual health security and, therefore, collective health and human security. Universal health coverage can only be achieved through collective action led by governments, both within their own borders and across borders when international cooperation is needed. A wider concept of health and human security in keeping with the original vision that created the UN Security Council is needed that acknowledges that global security is more easily achieved when, in all countries, all people can "obtain the health services they need without suffering financial hardship when paying for them".[122] This is the goal of universal health coverage.

Universal health coverage requires the adequate delivery of effective health services and for all people to have access to these services. Tackling of demand-side constraints is an essential part of universal health coverage and, in particular, entails ensuring that financial cost is not a barrier to access that, if not overcome, can result in the underconsumption of services.

This requirement has profound implications for global health policy and, in particular, for how countries finance their health systems. Specifically, the financial protection

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objective embedded within universal health coverage implies that the burden of financing health care be distributed fairly across everyone in a society according to ability to pay, while protecting the sick. This scenario necessitates wealthier members of society contributing more than the poor. Global experience shows that maintenance of such an equitable system requires the state to play a major part in setting and enforcing laws compelling the healthy and wealthy members of society to subsidise services for the sick and the poor. As a result, universal health coverage can only be achieved with a heavy reliance on public financing mechanisms—in particular through general taxation and compulsory progressive social insurance systems. This reliance was one of the major findings of the recent *Lancet* Commission on investing in health, which advocated for increasing public financing to reach universal health coverage through "progressive universalism".[123]

In effect, the international response to the recent threat to global health security posed by the Ebola virus reflects this approach. In the absence of adequate public financing, the affected countries were not able to provide effective health coverage and were left extremely vulnerable to the shock caused by Ebola. The ensuing epidemic has severely compromised individual, national, and global health security. As the President of the World Bank has argued, this crisis would probably not have occurred in those African countries with demonstrably higher levels of effective health coverage.[124]

To counteract this threat to global health security, public financing from wealthy donor nations has financed universal coverage of Ebola-related services for individuals in these countries, for whom these services would have been totally unaffordable had they been available. One could argue that, in addition to efforts for smallpox, and then polio eradication, this response represents a rare example where the world has shown a real commitment to achievement of true universal coverage, such that everybody receives the services they need with the costs fully subsidised by globally pooled resources.

So why does universal health coverage matter to the wider goals of global health and human security and might it also have other benefits for development? First, if we consider the emergence of some infectious diseases of global concern (for example, artemisinin-resistant malaria, SARS, and Ebola), they occurred in settings without universal health coverage where health systems were unable to perform effective public health functions and deliver essential medical services, including hospital care for the grievously ill. In the current Ebola crisis, the longstanding lack of access to basic primary care, laboratories with insufficient capacity, and shortage of existing hospital infrastructure to isolate and treat infected people left communities with little trust in the health system, families with no help to tend for their seriously ill members, and fuelled the spread of the epidemic and its resulting death toll.

In an interconnected world, the availability of accessible and universal health-care services in all countries is the crucial first line of defence for all against such threats to health. Instilling trust in communities needs access to health systems that provide a comprehensive breadth of essential health care. Communities do not compartmentalise their health issues into vertical pillars. If they cannot access quality maternal health or diabetes care, it erodes their faith in the same systems later pursuing them to manage Ebola and other infectious threats. Additionally, the health security threat of non-communicable diseases cannot be mitigated without provision of horizontally integrated primary care that can prevent, diagnose, and manage a wide range of illnesses. Unless all countries have effective universal health coverage, populations will also be inclined to travel across borders to seek care, increasing the potential for infection to spread and posing social and economic burdens and possible threats to law and order in other nations. Indeed, Ebola has been seeded and reseeded in the three countries most affected by the current epidemic as people moved across borders in search of social support and health care.[125]

Second, universal health coverage can substantially improve human security by providing financial security against impoverishing medical costs. In Thailand, for example, extension of health coverage to the entire population reduced annual impoverishment from medical costs from 2·71% of the population to 0·49% in 10 years.[126] Achievement of the financial protection goal enshrined in universal health coverage can therefore be an effective strategy to reduce poverty and ensure human security.

Third, universal health coverage can strengthen national security by improving the social solidarity of the population. Fear and uncertainty concerning the financial consequences of ill health and inequitable access represent large welfare losses to populations.[127] Concern about falling financial access to health services has sometimes resulted in political demonstrations and violent unrest.[128] In responding to these pressures, some governments have launched socialised health financing reforms primarily to reduce political tensions and improve national security. This has been the case in China, where the architect of their recent health reforms suggested that his government's main motivation in achieving universal health coverage had been to bring about "a more harmonious society".[129]

Therefore, as well as being a means to deliver improved health security, universal health coverage can also improve economic security for households, strengthen social solidarity systems resulting in improved national security, and has even been used to facilitate unpopular climate change policies.[130] Advancement of the goal of universal health coverage can therefore simultaneously address several key development priorities, in addition to strengthening global health security. In view of these substantial economic, welfare, and political benefits, there is a strong case that universal health coverage should be regarded as a development goal in its own right.

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