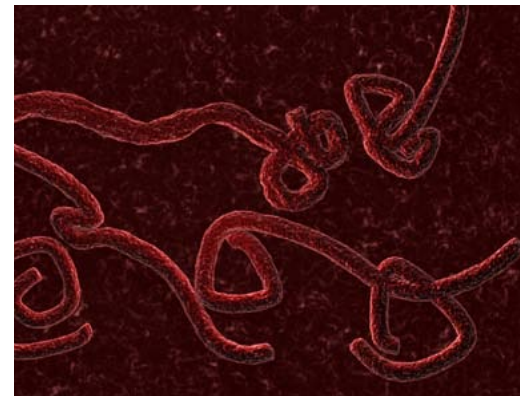


HUMANITARIAN CRISIS DRIVERS OF THE FUTURE

REVISITING PANDEMICS FROM A FUTURES PERSPECTIVE

**A SYSTEMS APPROACH TO PANDEMICS
AS BOTH CRISES AND CRISIS DRIVERS**



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Summary

Pandemics are both crises and potential crisis drivers. As drivers, they can cause compound crises. Each iterative strike of a pandemic wave has the capacity to weaken society, and reduce the resources available to fight the next pandemic or other crisis threats. Pandemics in this sense can generate crises beyond health and potentially make affected societies less resilient to the next sequence of crises. Their impacts upon health and economic systems and their effects on human security in general further explain their designation here as a crisis driver.

Today the HIV/AIDS pandemic is finally stabilising outside Africa after 25 million people have died, and 33 million are infected. However, neither the full societal impact nor its effects upon food insecurity, livelihoods and resistance to disease have been adequately calculated. As these uncertainties remain, the international community is preparing for future possible pandemics. The so-called 'swine flu', or H1N1, is the most recent in a series of possible pandemic threats manifested over the past decade, including SARS and avian influenza, H5N1. While many governments, multilateral organisations and non-governmental organisations are preparing to address these specific threats, there is little effort expended in calculating the cross-sectoral impacts of such possible events.

The standard causes of pandemics are generally understood. They are the result of disease mutation for which humans are not immunologically prepared, or of zoonotic disease in which an infectious disease is transmitted from animals to humans. Quite possibly in the future, there may also be human-engineered pandemics arising from biological warfare or terror. Most pathogenic viruses that affect humans have originated in animals and crossed to humans. These account for 60% of all infectious diseases, and 75% of all emerging infections.

There is growing acceptance that pandemics would have devastating impacts on affected societies. However, despite considerable efforts to prepare, present solutions for pandemics need strengthening. According to the 2008 joint UNSIC-World Bank global progress report, the world is only '40% prepared' for pandemics, and most of this preparation is in high-income nations. How

can this situation be improved, particularly in countries where governments have the least resources?

Even the partial existing preparation, however, belies a more worrying perspective – that pandemics continue to be viewed predominantly as a health issue. This narrow view ignores the compounding impact of pandemics, the degrading of resilience and the cascading effect that will be felt across sectors. Pandemics viewed as an engine of crises will encourage greater cross-sector engagement with a broader range of stakeholders. To mitigate the consequences of the pandemic crisis driver, it has to be slowed before it gains momentum.

First, this requires re-framing the context in which pandemics are analysed, beginning with a more cross-sectoral perspective on potential impacts. Information in this regard is central, but it is all too evident that the sources of such information – particularly at community levels – are often ignored by conventional pandemic information networks. Measures that need to be addressed in preparing for the pandemic as crisis driver include:

- adopting a systems perspective that brings inter-sectoral analysis of possible pandemic consequences to the fore
- using 'inter-pandemic' periods as a platform for pandemic preparation
- applying 21st-century technology to pandemic preparation
- incorporating pandemic preparedness into existing disaster-response planning and other infrastructure where possible to increase capacity
- improving pandemic governance by engaging the private sector.

There is useful learning from experience with the HIV/AIDS pandemic. UNAIDS highlights the relative merits of an inter-agency model of disease management, in contrast to the traditional institutional approach. An inter-agency approach allows greater flexibility and the opportunity to engage cross-sectorally with a range of governments, institutions from the private, public and third sectors, and informal knowledge networks



in fluid coalitions and alliances. HIV/AIDS has also been conceptualised in a risk-management framework, allowing resources to be targeted more effectively.

Pandemics are increasingly likely to occur in future, and to be more virulent as a result of highly likely compound crises weakening resilience over time. This tendency will be increased by a combination of other factors such as rising urbanisation and vulnerable populations living in dense environments, increased meat consumption and use of anti-virals in meat production, increased migration and air travel, and the vulnerability of just-in-time supply chains. Re-framing pandemic preparedness will help to strengthen global ability to prevent or mitigate the impact of this crisis driver.

The impact that pandemics will have over time on humanitarian implementers begins with the fundamental assumption that pandemics, as crisis drivers, will weaken the overall resilience of the societies that they affect. The pandemic paradigm proposed in this paper assumes that pandemics will leave large swathes of populations more vulnerable to a range of diseases. This has been described in related contexts as the consequence of, 'compound crises'. It is also plausible to assume that a range of hitherto unrelated factors, such as food security, disease and livelihoods will also become part of wider societal problems triggered by pandemic related decline in societal resilience. Stemming from the approach

this paper takes, it is important for those involved with pandemic preparedness to take into account the consequences of compound crises that could result from pandemics. Hence, planners in the future will have to be sure that what might be regarded as potential tertiary impacts of epidemics are incorporated in strategic planning.

With this recommendation in mind, one nevertheless has to acknowledge the experience of UNSIC as well as WHO for the ways that they have singly and collaboratively enhanced pandemic planning. There is no doubt that in very practical senses they have influenced a number of governments to think more systematically about ways to identify potential pandemic threats and to address their consequences more coherently. Both UNSIC and WHO have also set out practical guidelines for ways to lessen their more immediate impacts. All these, however, have been done from the perspective of the immediate threat, and not from the perspective of the longer term consequences and compounding nature of pandemics. This is the gap that must be filled for societies over time.

Introduction: a systems view

Pandemics drive crises because their demographic impact on society means they can change the nature of society itself. Pandemics are compound crises: each iterative strike of a pandemic wave weakens society, reduces the resources available to fight the next pandemic, and reduces resilience to the next crisis. There are perhaps a million viruses yet to be discovered;¹ if any of these viruses was to mutate and become transmissible between humans, a pandemic could occur. Pandemics can be crises in themselves if they are sufficiently virulent in terms of causing illness and death. But what makes them crisis drivers is their ability to disjoint health, disrupt the economy and affect human security. The impact of pandemics can be defined in terms of their geographical spread, but their impact also occurs over time. Indeed, the full impact of a pandemic may not be realised until centuries later. According to historians, the bubonic plague of 14th-century Europe was partially responsible for the Industrial Revolution in the 18th and 19th centuries.

Revisiting Pandemics from a Futures Perspective is one of three studies within the **Humanitarian Crisis Drivers of the Future** project, funded largely by USAID/OFDA. This project aims to demonstrate the types, dimensions and dynamics of future crises for which humanitarian organisations will have to prepare. Understanding crisis drivers means appreciating how complex systems, such as the global system of nation states, respond to internal and external forces. The intensity of the challenges varies from country to country but any challenge will impose some degree of stress on the system both nationally and internationally. The effects are determined by the level of stress, and also by the degree of resilience and adaptability in system states. Different levels of stress combine with different levels of resilience and adaptability to create a range of possible outcomes on a spectrum from collapse, through decline, equilibrium and enhancement, to transformation. Sometimes, national systems in decline and even close to collapse can rise again in what is sometimes called the ‘phoenix cycle’. In other cases, improved or even transformed systems can prove to have unexpected weaknesses and vulnerabilities that move them into decline.²

To appreciate the impact of pandemics, it is first necessary to understand what they are and how they are defined. This is summarised below in **Section 1, Pandemics past and future**, which also outlines the history, present status and likely future of pandemics worldwide. **Section 2, Trends increasing likelihood and virulence**, identifies six key trends likely to increase the occurrence and severity of pandemics in future, and **Section 3, Why pandemics are crisis drivers**, looks at the wider impacts of pandemics on the global health system, the economy and human security. **Section 4, Current responses to the pandemic crisis driver**, looks at the limited way in which pandemics are currently perceived and managed, but also identifies some useful approaches for further development. In **Section 5, Future solutions**, selected key ideas and practices are highlighted as steps towards an integrated systems approach to preparing for future pandemics.

I Pandemics past and future

The current definition of a pandemic, as used by the World Health Organisation (WHO), is spatial. In its broadest sense, a pandemic, as defined by WHO, occurs when there is 'a worldwide epidemic of a disease.'³ An epidemic is usually defined in both spatial and temporal terms as a disease affecting many people in a particular community or area at the same time. Under the WHO system a pandemic is declared when a disease is transmitted from one WHO world region to another, for example from the Eastern Mediterranean Region to the South-East Asia Region. The virulence of a disease, in terms its severity in causing mortality or morbidity, is not used to define pandemics.

Pandemics have recurred throughout history, with over 30 pandemics in the last four centuries.⁴ Pandemics are crisis drivers because their demographic impact can be great enough to change the nature of society itself. The bubonic plague, or Black Death, was a medieval pandemic that killed between 30 and 40 million people in Europe.⁵ The sudden demographic shock from this had a profound impact upon European society, which may not have been fully appreciated until the 20th century. Economic historians now argue that the bubonic plague contributed to ending feudalism, as surviving agricultural labourers became more valuable and could negotiate better conditions.⁵ Property law developed to handle the property disputes arising from so many sudden deaths. Moreover, technology evolved to compensate for labour shortages, increasing productivity and net output which in turn contributed to the Industrial Revolution.

Today, pandemics continue to have major impacts. The HIV/AIDS pandemic is finally stabilising outside Africa after 25 million people have died, and 33 million are infected.⁷ The world is upgrading its response to the current pandemic of Mexican swine flu H1N1, which has so far killed around four thousand people.⁸ The next potential pandemic, H5N1 avian influenza, is related to the Spanish flu that killed between 25 million and 40 million people in 18 months some ninety years ago.⁹

There are three main ways in which a pandemic can arise.

- 1 A well-known disease can mutate, becoming a new disease for which humans are not immunologically prepared.
- 2 A zoonotic disease is an infectious disease transmitted from animals (and by a vector in some instances) to humans. Again, humans are not immunologically prepared for this. Severe Acute Respiratory Syndrome (SARS) is an example, believed to have been transmitted from bats to civet cats to humans.
- 3 A human-engineered pandemic could possibly arise from biological warfare, where the release of virulent bacteria, such as anthrax, causes widespread death in the general population. Biological terror is an increasing possibility because of increasing computer power and the relatively low cost of materials to manipulate viruses.¹⁰

Most pathogenic viruses that affect humans have originated in animals and crossed to humans. These account for 60% of all infectious diseases, and 75% of all emerging infections.¹¹ Of the influenza pandemics, avian influenza has captured the attention of public health officials and has framed public health planning for viruses. In part, this is because H5N1 is considered epizootic, having suddenly affected a large number of animals in a short time, and has killed 450 people over the last six years.¹² If the most virulent strain of avian influenza, H5N1, can cross from the bird population and then sustain human-to-human transmission, the world could be facing an estimated 180–360 million deaths, many times the cumulative number of documented AIDS deaths.

Unlike geographically and temporally bounded disasters, a pandemic will spread across the globe over the course of months or a year, possibly in waves, and will affect communities of all sizes and compositions. In terms of its scope, the impact of a severe pandemic may be more comparable to that of war or a widespread economic crisis. But how likely is a modern pandemic that would be severe enough to drive a series of international crises? Presently, there is a broad range of perspectives on the likely severity of pandemic consequences.

In an article entitled 'Pandemic Influenza: Time for a reality check', the global re-insurer, Swiss Re, argues that, based on their modelling parameters, a Spanish flu pandemic has a 1-in-500 year likelihood or an annual likelihood of 0.02%.¹³ An MIT researcher, Peter Doshi, analysed influenza data from more than a century, and determined that the peak monthly death rates in

the 1957/8 Asian Flu and 1968/9 Hong Kong flu pandemic seasons were no higher than, and sometimes less than, those for severe non-pandemic seasons.¹⁴ Doshi notes, 'Should the trends observed over the 20th century continue to hold in the 21st, the next influenza pandemic may be far from a catastrophic event.' He considers the 'pandemic-equals-extreme-mortality concept' to be derived solely from the 1918 flu season, when 'doctors lacked intensive-care units, respirators, antiviral agents and antibiotics.' He argues that, 'had no other aspect of modern medicine but antibiotics been available in 1918, there seems good reason to believe that the severity of this pandemic would have been far reduced.' Given improvements in living conditions, nutrition and public health, influenza death rates substantially declined throughout the 20th century. Doshi calculates an 18-fold decrease in influenza deaths between the 1940s and 1990s, a trend that began far before the introduction of widespread vaccination.

Laurie Garrett, of the Global Health Program of the US Council on Foreign Relations, on the other hand,

considers that, 'Science does not know the answer.'¹⁵ There are any number of animal diseases which are currently small-scale but which could mutate to allow human transmission, and there is a reservoir of possibly close to a million uncertain, interminable potential mutations. Some authorities consider this cause for a sense of not only uncertainty but also urgency. Indeed, the Global Early Warning and Response System for Major Animal Diseases, including Zoonoses (GLEWS) has listed 25 zoonotic and non-zoonotic diseases to be of early-warning interest.¹⁶ The outbreak of Severe Acute Respiratory Syndrome (SARS) in 2002/3 was a near-virulent pandemic. If the outbreak had occurred in a country with less rigorous reporting and control mechanisms than China, the impact could have been much greater. The coronavirus pathogen (SARS-CoV) is virulent, and led to 774 deaths and 8000 cases during the initial outbreak, with a case-fatality rate (CFR) of nearly 10%. (The CFR of Spanish flu was around 2%.) The threat from other zoonotic diseases such as West Nile fever remains unknown.¹⁷

2 Trends increasing likelihood and virulence

This report argues that the world's ecological and socio-economic systems are becoming increasingly vulnerable to pandemics. There are several key factors contributing to the likely increase in the frequency and virulence of pandemics. These include urbanisation and the associated overcrowded and impoverished living conditions for many people, greater affluence for some people and the associated increase in meat consumption, the effects of deforestation, growing numbers of people with weakened immune systems, increasing mass movement and air travel, and 'just-in-time' delivery systems.

With growing urbanisation, the population density of large cities is also increasing. By 2025 the largest cities in the world are projected to be Tokyo (36 million inhabitants), Mumbai (26 million), Dhaka (22 million), Sao Paulo (22 million) and Lagos (15 million).¹⁸ Some 59% of the world's population will live in urban environments.¹⁹ The rapidity of urbanisation has meant that informal, often illegal, settlements are 'emerging human settlements of the 21st century'.²⁰ 'By 2025 around 1.7 billion people will live in slums in sub-Saharan Africa, Western Asia, and Southern Asia. Today, 43% of the developing world live in slums. There are around 200,000 slums in the world, 15,000 of them in five cities of South Asia – Karachi, Mumbai, Delhi, Kolkata and Dhaka'.²¹ Slum housing makes residents more vulnerable to pandemics because of inadequate shelter, limited access to water and sanitation, lack of property rights, overcrowding and, in many instances, high levels of violence.²²

However, amidst the poverty of urban environments, there will be pockets of affluence. In relatively low-income countries, people in households with incomes above US\$16,000 per year will rise from 352 million in 2000 to nearly 2 billion in 2025.²³ This affluence is reflected in changing diets and greater meat consumption. The meat industry is driven by cost competitiveness and this requires greater economies of scale. In 1968 China had 5 million pigs, rising to over 500 million by 2005.²⁴ China today houses nearly half the world's pigs, increasing the contact between human beings and pigs, particularly as the majority of China's pork farms are in four provinces. 'In parts of Southeast Asia, humans and chickens – and pigs – live so close together, exchanging viruses, it looks almost like a science experiment.'²⁵ Some 70% of meat production

occurs in low- and middle-income countries, due to low production costs, market size and climate. However, these regions have limited resources for pandemic preparation.

To satisfy the projected global demand for meat, production of the cheapest meat, poultry, is expected to double by 2025. China already has 10 billion broilers and there are additional concerns that meat producers in China are over-liberal in their application of anti-virals to protect their livestock. In the US there is a similar problem with anti-virals and antibiotics, with 69% of antibiotics distributed to livestock being fed to hogs, 19% to broiler chickens and 12% to beef cattle.²⁶ This may hasten resistant variants of viruses or bacteria.

Increased population and deforestation arising from farming and illegal logging are impinging upon rainforests and jungles and possibly exposing human beings to new pathogens. A study in South America found that 75% of forest disruption occurred within 12 miles of a road. Roads in the deforested area promoted malaria and vectors for other prospective diseases. The study showed that the biting rate of the Amazon's main malaria-spreading mosquito was nearly 300 times greater in cleared areas than in forested ones, meaning an increased likelihood of being infected by a vector of infectious disease.²⁷

In Africa, there is a growing trade in wild or 'bush' meat, particularly in West and Central Africa. Each year, between 1 million and 3.4 million tonnes of bush meat, including about 28 million bay duikers (small mammals) and more than 7 million red colobus monkeys, is taken from the Congo Basin.²⁸ One of the many concerns about this trade is that bush-meat goods transported may potentially carry pathogens.

From a demographic perspective, an increasing number of people worldwide are likely to be living with weakened immunity due to underlying health conditions such as malaria, tuberculosis, HIV/AIDS, and the diseases of affluence such as obesity and cardiovascular conditions, as well as the effects of urban pollution. The world's population is increasing and ageing. There is the possibility that immunity declines as a result of aging, or that underlying health conditions weaken immunity. Weakened immunity could increase the virulence of

pandemics. One study of 77 patients who died of the current H1N1 virus found that 29% had 'bacterial co-infections', according to the US Centers for Disease Control and Prevention.²⁹

Future decades are very likely to see increased movement of people travelling by air, and of migration, both legal and illegal, in general. For 2011, the International Air Transport Association (IATA) predicts 2.7 billion passengers, up from 2.1 billion in 2006, and with the increase expected to come largely from India and China. Air travel speeds the geographical spread of pandemics, and the 'hub and spoke' design of airports increases the likelihood of human-to-human contact with a pathogen that one human may have no resistance to. CARE has estimated that 200 million people will be displaced by climate change.³⁰ People moving on such a large scale may have weakened immunities, making them especially vulnerable to communicable disease.

Most societies cannot be sustained without continuous deliveries of food, energy and other resources. Business supply chains are designed to be 'just-in-time' to avoid inventory management costs such as warehousing. Supply chains are often re-stocked on a continuous basis, as determined by demand, and have very little resilience to stress, such as during a pandemic. In high-income countries, food production and distribution relies on low levels of inventory, particularly to avoid wastes of perishable products on store shelves. In low- and middle-income countries, food-supply chains are generally much shorter, making them more vulnerable to food shortages. Utilities and energy supply are critical to the functioning of modern economies. For example, around 40% of the world's supply of electricity is generated by burning coal. Coal power plants maintain about 30 days of coal supplies, and rely on a constant supply from major coal-mining regions around the globe. The situation is the same with medical supplies. Hospitals keep limited inventory and will have little surge capacity to manage increased demand for medicines.³¹

3 Why pandemics are crisis drivers

Pandemics should be perceived as crisis drivers, because of their potential for profound and widespread impacts on health and health services, economies and human security.

The health system

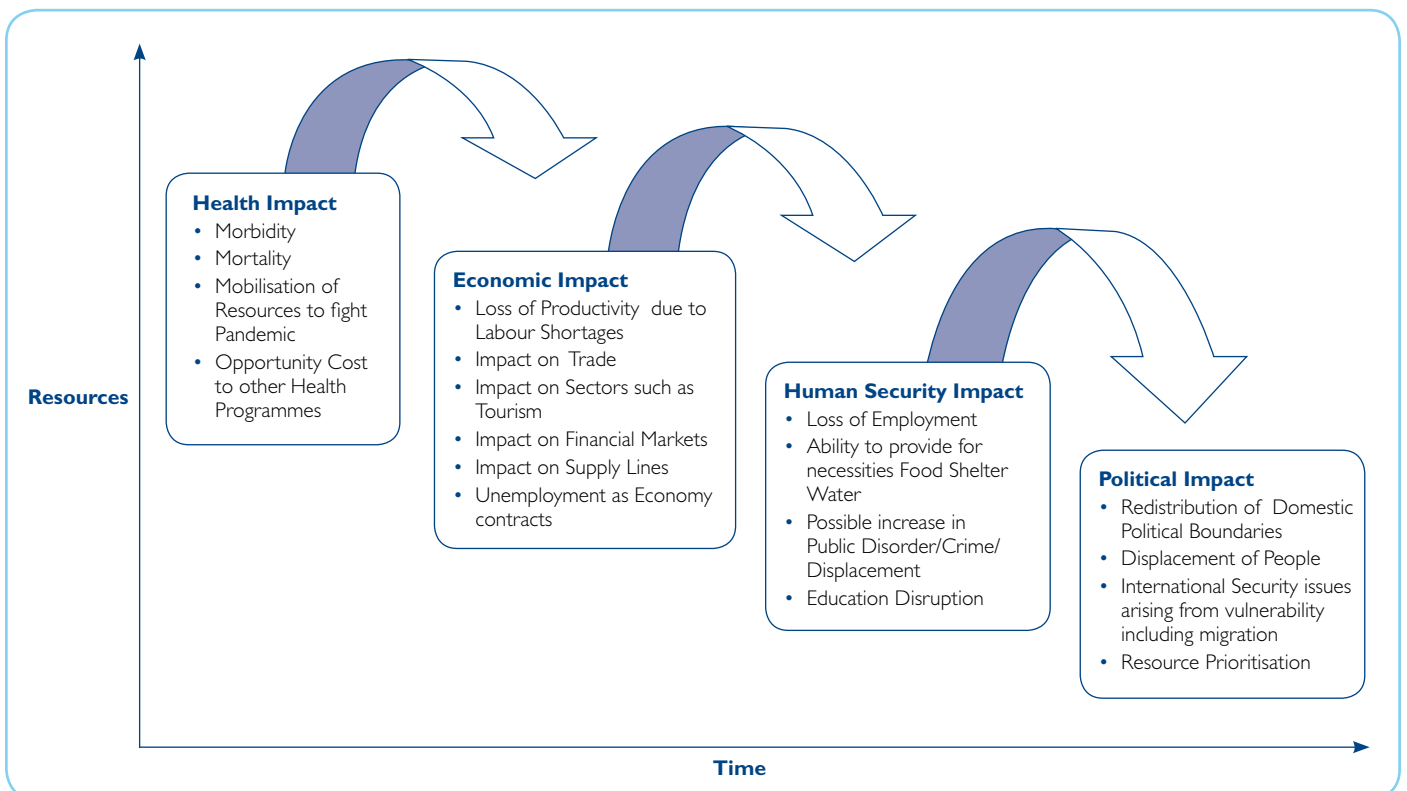
Ideally, the world health system would have sufficient monitoring and surveillance capacity to prevent an epidemic from becoming a pandemic, and the epidemic would be contained in one WHO region. The next-best case would be that, upon declaration of the pandemic, the global health system would be able to contain it, and/or have an effective vaccine which would be efficiently shipped to pandemic regions and distributed to the affected population. There may be some stress on the logistics system but overall the health system would be strongly resilient.

Unfortunately, this scenario is extremely unlikely, because public health officials do not have perfect knowledge. A pandemic has so many unknown variables, such as those concerning the outbreak and response

to it. When will it occur? Where will it occur? What will be the response by governments? How effective will pandemic planning prove? How will the general population respond? Will there be effective leadership? Will medical supplies be available? Will logistics systems work with high absenteeism?

Then there are the unknowns pertaining to the pandemic itself: the nature of a future virus or bacterium, the virus antigenic type, its speed of mutation, speed of transmission; susceptibility, resistance and reaction rates to anti-virals; age-groups most affected; clinical attack rates, pathogenicity (case-fatality rates) and 'severity or morbidity' of the pandemic; precise parameters needed for modelling and forecasting, and precise clinical-case definition. Other variables are the duration, shape, number and speed of the waves of infection, complicating conditions (super-infections), and impact on the provision of health services. Concerning vaccinations, variables include decisions on who will receive a medical response, and the risks entailed in mass vaccinations including the quality assurance of the vaccine.³²

Figure 1: Compounding & Cascading Impact of Pandemics on Society



The economic system

Initially, a pandemic is likely to have a demographic impact in terms of illness and deaths. After impacts in the health sector, there will be further effects in the broader economy. Warwick McKibbin, an economist at Australian National University, has measured the impact a pandemic could have if it cascaded onto the global economy. He estimated that a mild pandemic like that of 1957/8 could reduce global GDP by 0.8%. A severe pandemic on the scale of the 1918 Spanish flu could reduce global GDP by around 10%, or US\$4.4 trillion.³³ For comparison, the current global economic downturn has led to a contraction of global GDP by 1%.

The severity of a pandemic would be reflected in global stock markets and the destruction of asset values. Should a pandemic be virulent, there could be a violent shock to the market like the fall of the market following the collapse of Lehman Brothers in September 2008. If a pandemic is milder, there could be a gradual erosion of financial confidence as the crisis compounds. The global interconnectedness of finance markets would result in effects worldwide, although there may be a delay between the impact on finance markets and the transmission of this shock to the real economy. As confidence erodes there is a likelihood of a flight to government securities and companies that might benefit from a pandemic, such as video conferencing firms. Moreover, assets would shift from the newer economies to traditional 'safe' locations in the West, with a negative impact on development prospects for new economies.

Most industries will be affected by a pandemic, typically adversely. Those industries requiring a significant amount of face-to-face interaction are expected to be the most affected initially. These include travel companies, airlines, restaurants/bars, hotels and the entertainment industry. The impact on local communities will depend on the mix of business activity. During the SARS outbreak, there was a 66% reduction in travel arrivals to Hong Kong and it is estimated that the Asia Pacific region lost some US\$40 billion.

Human security

As a pandemic unfolds, local people would move quickly from worrying about their health to a wider range of needs such as employment to cover their basic needs and whether they had an adequate supply line for food. If employment opportunities become limited as a result of economic uncertainty then, from a systems perspective, there is a cascade of the pandemic from the economic sector into the social sector as communities begin to focus on survival and food security. At this stage the resilience of the social system is being challenged. How the crisis unfolds will determine the extent of decline. UNAIDS monitoring of the HIV/AIDS pandemic provides insights into human-security issues arising from pandemics. One recent study in Botswana and Swaziland found that women who lack sufficient food are 70% less likely to perceive personal control in sexual relationships, 50% more likely to engage in intergenerational sex, and 80% more likely to engage in survival sex.³⁴

Urban governance is likely to become increasingly problematic during a pandemic, particularly if the informal economy in slums in large cities begins to break down. This could lead to looting and gang violence as local informal governance structures fight over scarce resources. If this downward spiral cannot be controlled, there is the possibility of urban flight as communities feel that they can find greater security away from urban environments. Urban flight is of special concern in pandemics, as they are managed by containment and quarantine. Will this have political implications, as the state becomes involved to curtail or at least manage flight? Will it lead to state-sanctioned violence to manage the crisis to prevent the state losing control? Some of the answers to these questions will depend on the nature of the countries affected.

4 Current responses to the pandemic crisis driver

What is the best way to respond to these drivers? How can they be addressed with the limited resources available? The best protective strategy may be to create shock-absorbers or dampeners to slow the flow of a crisis from one component of the system to another. However, the present approaches in response to pandemics are generally not systems-oriented. The one exception to this is UN System Influenza Coordination (UNSIC), which aims to improve synchronisation of UN-system response. Most other planned responses are health-focused, with strong emphasis on trying to prevent, or contain, only one possible type of pandemic – influenza pandemics. The approach taken by UNAIDS, focusing on risks, prevention and on social and economic impacts, is instructive in terms of improving future responses.

There is an institutional framework coordinated by WHO, the Food and Agriculture Organisation (FAO) and the World Organisation for Animal Health (OIE) for managing an influenza pandemic. This is based on three areas of activity

- 1 preventing the next human influenza pandemic by controlling the H5N1 virus and improving surveillance.
- 2 containing a human influenza pandemic through rapid detection and care of human cases, and preventing human-to-human transmission of the pathogen.
- 3 preparing to react effectively when an influenza pandemic is suspected, to mitigate its potential social, economic, and health impacts.

In the context of influenza, current understanding of pandemics is relatively strong. There is a considerable amount of experience with flu pandemics, and of the early-warning signs to look for. Mindful of the 1918 influenza pandemic, WHO established the Global Influenza Surveillance Network in 1952 of National Influenza Centres which have 130 laboratories in 100 countries.³⁵ The international influenza reporting system is strong, and is a good model. Worldwide, the ability to define and type the molecular structure of an influenza virus is impressive.

Yet despite the relatively advanced preparation for an influenza pandemic, the 2008 joint UNSIC–World Bank

global progress report declared a world only about ‘40% ready’ for a pandemic. Some 30–40 countries were considered relatively fully prepared; many countries, including those in Africa, had critical problems with the preparedness plans.³⁶ The London School of Hygiene and Tropical Medicine reviewed African plans and found them adequate in addressing detection and containment of influenza in animals, but that strategic preparedness to respond to pandemic human influenza was weak. Operational planning was almost entirely absent from countries’ plans for pandemic influenza.³⁷ A query arises from this: is pandemic planning a tool to create an illusion of control, so as to engender public confidence and mask genuine fears arising from pandemics? Or will the existing plans be seen as a baseline from which pandemic resilience will be built? The answer at this stage is not clear.

The other present solution is vaccines. Scientists have made tremendous strides in understanding the science of the H5N1 virus. It is now clear, according to Dr Robert Webster (a Director of a WHO collaborating centre on the Ecology of Influenza Viruses in Lower Animals and Birds),³⁸ how to formulate a new vaccine from a new viral strain in 15 days. But developing the capacity to manufacture massive amounts of vaccine at short notice remains a political, legal, ethical and distributional challenge. The leading pharmaceutical companies have managed to increase their worldwide vaccine-manufacturing capacity to 900 million doses, from 400 million.³⁹ The capacity is located in nine high-income countries, so there is still the challenge of distributing the vaccines in a crisis; there is no guarantee that vaccines developed before a new pandemic outbreak would be effective, as the vaccine needs to match the pandemic strain.

Several industrialised nations are stockpiling vaccines against both swine flu and avian influenza that might be used for pre-pandemic vaccination, but ‘both pandemic and prepandemic vaccines would not be available in developing countries unless an international mechanism exists to share such vaccine with them at low cost’.⁴⁰ Even if limited supplies of vaccines could be produced for low- and middle-income countries, the question of who will pay for them remains unanswered. Who will receive the vaccines? Will companies share intellectual property in a crisis?

One solution may be to stockpile vaccines but this raises other questions. How can stock qualities be monitored? How should the distribution of stockpiles be managed? Who will be accountable for the stockpiles? One of the limitations of stockpiling vaccines is that this solution conceptualises health as a matter of individual response. This is in contrast to an approach to fighting pandemics based on 'social relations of well being', which is evolving from years of combating HIV/AIDS.⁴¹

HIV/AIDS forced a re-framing of the approach to fighting disease in three key ways.

- 1 At the institutional level, with the creation of UNAIDS as an inter-agency body, working through flexible transnational cooperation. UNAIDS works cross-sectorally with a host of institutions, the third sector, governments, multilateral institutions, the private and public sectors, and informal knowledge networks in fluid coalitions and alliances.
- 2 UNAIDS focuses on the economic costs of the crisis at the local level, so that private companies can see the possible impact on their business. This has resulted in partnerships with business.
- 3 UNAIDS has focused on response to the HIV/AIDS pandemic in terms of risk and the likelihood of becoming infected. This has meant that greater resources were targeted at those most likely to get the disease.⁴²

5 Future solutions

There are several key ways to improve future responses, not least by re-framing the prevailing view of pandemics. If they can be seen as crisis drivers, rather than only as crises, and if the crucial role of information can be understood, pandemics could be prevented or least better managed. Using the time between pandemics for preparation, and making the most of modern communications technology could also help. Incorporating pandemic preparedness into existing disaster-response planning and other infrastructure could increase response capacity, and the private sector could contribute to pandemic governance. These ideas are discussed further in this section.

Developing responses appropriate for a crisis driver

Pandemic planning needs to conceptualise pandemics as a crisis driver, not just a crisis. Pandemics are not static nor confined to the health sector, because the outcome of a pandemic is the possibility of illness and death of significant numbers of the world's population. Viewing pandemics in this context alone creates disjointed thinking and ignores the compounding impact of pandemics (the degrading of resilience) and the cascading effect that will be felt not just in the health sector, but in the economic sector, the political sector and in terms of human security as the crises builds momentum. Conceptualising pandemics as an engine of crises will encourage greater cross-sector engagement with a broader range of stakeholders who have a greater appreciation of the impact a pandemic will have on them. To mitigate the consequences of the driver, it has to be slowed before it gains momentum. Perceiving the fluidity of pandemic crises means reconceptualising the view of responses from structures to the dynamics of organisation.

A health problem or an information problem?

Analyses of pandemics often note that 'interconnectedness' is a weakness, as secondary effects could shut down the world economy because of the fragility of 'just-in-time' supply lines.⁴³ Moreover, social distancing is seen as a means of containing the crisis. Global interconnectedness is seen in this context as problem, but what if interconnectedness is perceived as strength? Is it feasible

to create a global knowledge network using the glue of interconnectedness to build resilience to pandemics?

One of the biggest impediments to managing the pandemics crisis driver is 'uncertainty.' Uncertainty results from the lack of knowledge derived from information and data. This is acknowledged by WHO: 'Misinformation or lack of information at global or country level will inevitably result in delays in response, spread of damaging rumours, inadequate resource allocation, misdirected efforts, and ultimately, unnecessary loss of life.'⁴⁴ Pandemics need to be re-framed as not only a health issue but also a 'fight for information'. Gavin has suggested that each of the pandemics of 1918, 1957 and 1968 appears to share the same pattern, with different genetic components existing in humans for a few years before a pandemic strain is detected.⁴⁵ By capturing this knowledge earlier, it would be possible to start developing resilience plans targeted at a particular pathogen.

Further, human beings over the past thirty years have been very successful in building global information infrastructure, and this gives us a sense of hope in planning for the future. The WHO Global Network on Influenza is a good start but would need to be substantially upgraded to incorporate new technology and informal networks of information gathering (communities of practice). This should include community health workers from all over the world.

The inter-pandemic period as a platform for preparation

A time interval between pandemics is called the 'inter-pandemic period' by WHO (Phases 1 and 2 of the WHO threat level). This is clearly the best time to engage in prevention and plan for disaster preparedness. However, this 'non-disaster' time is not conducive to securing donor funding or media attention. Again in terms of re-framing thinking, how can this time be repositioned as a phase of action for energetic pandemic preparedness and a platform for pandemic proofing. Pandemic preparation has to be placed in the context of scarcity of resources and prioritisation of needs. With competing demands for resources, governments are highly likely to under-spend on pandemic preparedness in inter-pandemic years. How to overcome this tendency? Here are three suggestions as components of an integrated approach.

First, capacity can be developed using limited resources by shifting the emphasis of pandemic preparedness from a centralised system that creates an illusion of control to one engaging global networks and partnerships to leverage further capacity.

National pandemic plans are useful in developing a minimum standard but are also limited as pandemics, and networks, transcend national boundaries. An emphasis on use of networks also breaks down the institutional approach to solving problems, and shifts it to organisation dynamics which are better adapted to fluidity of movement.

Existing pandemic plans focus on civil society and government institutions, leading to atrophied links with the private sector: 'Eighty-five percent of critical infrastructure resources reside in the private sector, which generally lacks individual and system-wide business continuity plans specifically for catastrophic health emergencies such as pandemic influenza.'⁴⁶ Private companies can become strategic partners in pandemic response, bringing additional resources, expertise and stakeholders. Examples of steps in this direction include the contributions of Vodafone and the UN Foundation in the mobile-phone initiative 'mHealth',⁴⁷ and Colgate Palmolive who serve on the Global Public Private Partnership to Promote Handwashing with Soap which has projects in Peru, Thailand and Ethiopia.⁴⁸ Multinational companies could employ their global capacity to help extend such programmes worldwide.

Second, the inter-pandemic period can be used to harness network infrastructure to capture information, centralise databases, decentralise analysis and disseminate information globally. Ian Lipkin, professor of epidemiology, neurology and pathology at Columbia University, has called for the internet to be harnessed for this purpose as the:

*"quantity of data needs to process is already overwhelming. It is growing exponentially as new sites and projects come on line. If two heads are better than one, a billion would be better yet. We need to find ways to increase capacity by decentralizing data analysis. We also need more efficient methods for streaming data and facilitating communication to and from the developing world."*⁴⁹

Third, as epidemics are early-warning indicators for pandemics, the focus should be on preventing diseases becoming pandemic by monitoring epidemics with this potential. This involves tracking epidemics at a local level, and determining what constitutes an epidemic with pandemic potential by using a range of indicators. FAO, WHO and collaborators have this in mind with their 'One World, One Health' programme, which they hope to develop.⁵⁰ But an estimated \$10–16 billion is needed to implement this programme, which includes a comprehensive disease early-warning system, so it seems unlikely to happen in the short term.

Applying 21st-century technology to pandemic preparation

Local-level engagement is needed to acquire knowledge for planning. Therefore, those with deep local knowledge, such as local community officers or community health workers, need to be engaged in pandemic preparation. Modern communications technology could be used to harness this knowledge. Networked global surveillance using SMS technology for example, could build on the prototype work developing health campaigns undertaking disease tracking of avian influenza in Africa and coordinating health workers in Malawi.⁵¹

In India, the state government of Andhra Pradesh has pilot-tested an Acute Encephalitis Syndrome Surveillance Information Management System (AESSIMS),⁵² in which local health workers used mobile phones (or web-based technologies) to report incidences of the disease. Decision-makers then analysed this data in real time using a variety of tools, including maps based on a GIS (geographic information system). SMS monitoring can also be supported by satellite imagery. Satellites are well positioned to identify roads into jungles for logging or bush-meat trade, for example, that might highlight areas of potential zoonotic disease.

Complementing the information gathering should be communities of practice in which local health workers could exchange their views on findings and other local health issues with specialists in public health. Cultivating communities of practice is increasingly recognised as the most effective way for organisations to address the knowledge challenges they face.⁵³

Modern technology can also be used to develop culturally sensitive communications messages, perhaps through translation applications to avoid misunderstandings, and such facilities could be used in the field by aid workers. Reducing negative consequences would encourage cooperation and strengthen networks. Communications technology could also be used to update risk information, and dispel rumours. One of the strengths would be the possibility of bottom-up communications responsive to local psychological, social, cultural, health and socioeconomic factors, which would be likely to enhance local resilience.

Lipkin has called for greater application of very rapid diagnostic technologies (such as MassTag PCR, GreeneChips and High Throughput Sequencing). The aim is to use powerful small platforms to diagnose new viruses quickly, and to reduce reliance on large organisations.⁵⁴

Incorporating pandemic preparedness into existing plans

The world is confronting a cluster of crises and potential disasters, including terrorism and natural or climate-change exacerbated events such as earthquakes, tsunamis, drought and floods. Given the enormity of these crises in terms of preparation and planning, most institutions will have to operate degraded-response planning and will continue to do so in the short and medium terms. How can capacity be increased, at least to raise resilience to a higher level? How can duplication of effort be avoided, resources used most efficiently, and bureaucracy minimised?

In order to build capacity to manage these possible future disasters effectively, governments, civil society and the private sector need to examine how existing resources and capacity can best absorb the demand of pandemic planning. This also requires systems design. For example, at airports national border authorities could screen for pandemic symptoms rather than creating a separate screening body.

If companies are lacking in business continuity plans (BCPs) for pandemics, can they adapt existing BCPs or contingency plans drafted in preparation for possible terrorist attacks? How can these existing resources be modified to incorporate pandemics? How can existing networks be used to capture knowledge and disseminate information? How can the infrastructure of UNAIDS be exploited to help prepare for pandemics? Could the global network of International Committee of the Red Cross (ICRC) missions (as distinct from the International Federation of Red Cross and Red Crescent Societies, which possess strong dissemination capacity) be engaged in pandemic planning? ICRC missions operate in regions of the world, such as the Democratic Republic of the Congo, where monitoring may be difficult due to conflict. Can UNHCR primary health care programmes in refugee camps incorporate some form of pandemic screening?

Improving pandemic governance by engaging the private sector

There are a number of institutions involved in pandemic governance. International Health Regulations (2005), WHO and the World Organisation for Animal Health (OIE) are mandated to coordinate responses to a pandemic. In addition, the United Nations established UNSIC to help make the UN system work to its best effect in support of national, regional and global efforts to address the threats posed by avian and human influenza. The World Bank has a mandate for developing a framework for financing pandemic initiatives. In the context of pandemics, both the private sector and civil society could also be engaged to enhance governance.

In particular, those industry bodies possessing sectoral expertise could be engaged. One example is International Air Transport Association (IATA) which represents some 230 airlines accounting for 93% of scheduled international air traffic.⁵⁵ IATA routinely works with governments on passenger and crew health issues in coordination with WHO and the International Civil Aviation Organization (ICAO) and Airport Council International (ACI). By shifting governance of pandemics in the airline context to IATA, capacity and resources are released from non-specialist pandemic institutions, allowing them to focus their resources on crucial inter-pandemic planning. IATA could regulate the industry players, as airlines are conscious that their lack of planning and preparation during the SARS outbreak led to a dramatic fall in passenger numbers.

The other big challenge is developing the framework for the non-health sector and the private sector to ensure that business continuity plans and pandemic preparedness plans are operational. Perhaps this is a responsibility that the World Business Council for Sustainable Development could be mandated to undertake, as it already has a mandate in the international community to represent business in climate-change talks.

Conclusion

Pandemics driving a series of crises show how potential and real crises confronting the world are interlinked: pandemics, food insecurity, reduced biodiversity and population growth. There is a serious prospect of a convergence of multiple strains and stresses that could create a powerful negative synergy. A crisis in one system can spill over into another system, revealing interdependencies that are not always obvious. For example, the demographic shock of a pandemic in terms of morbidity and mortality will spread from the health sector into the economy and aspects of human security, with political repercussions.

Given that pandemics are much more than just health issues, it is appropriate to re-frame perceptions of them, and future preparations, by:

- shaping responses appropriate for a crisis driver
- seeing pandemics as not only a health problem but a fight for information
- using the 'inter-pandemic' period as a platform for pandemic preparation
- applying 21st-century technology to pandemic preparation
- incorporating pandemic preparedness into existing disaster-response planning and other infrastructure where possible to increase capacity
- improving pandemic governance by engaging the private sector.

There is useful learning for future pandemics from experience with the HIV/AIDS pandemic. UNAIDS highlights the relative merits of an inter-agency model to disease, as opposed to an institutional approach. An inter-agency approach allows greater flexibility and the opportunity to engage cross-sectorally with a range of institutions, the third sector, governments, multilateral institutions, the private and public sectors, and informal knowledge networks in fluid coalitions and alliances.

HIV/AIDS was conceptualised in a risk-management framework, allowing resources to be targeted more effectively. Enhancing the ability to prioritise resources using risk-management tools for future pandemics will be useful, as pandemic preparedness also has to be viewed in the context of a cluster of global crises. These include climate change, water scarcity, food security, energy shortages, biodiversity and terrorism, and all demand resources and require prioritisation.

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