WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

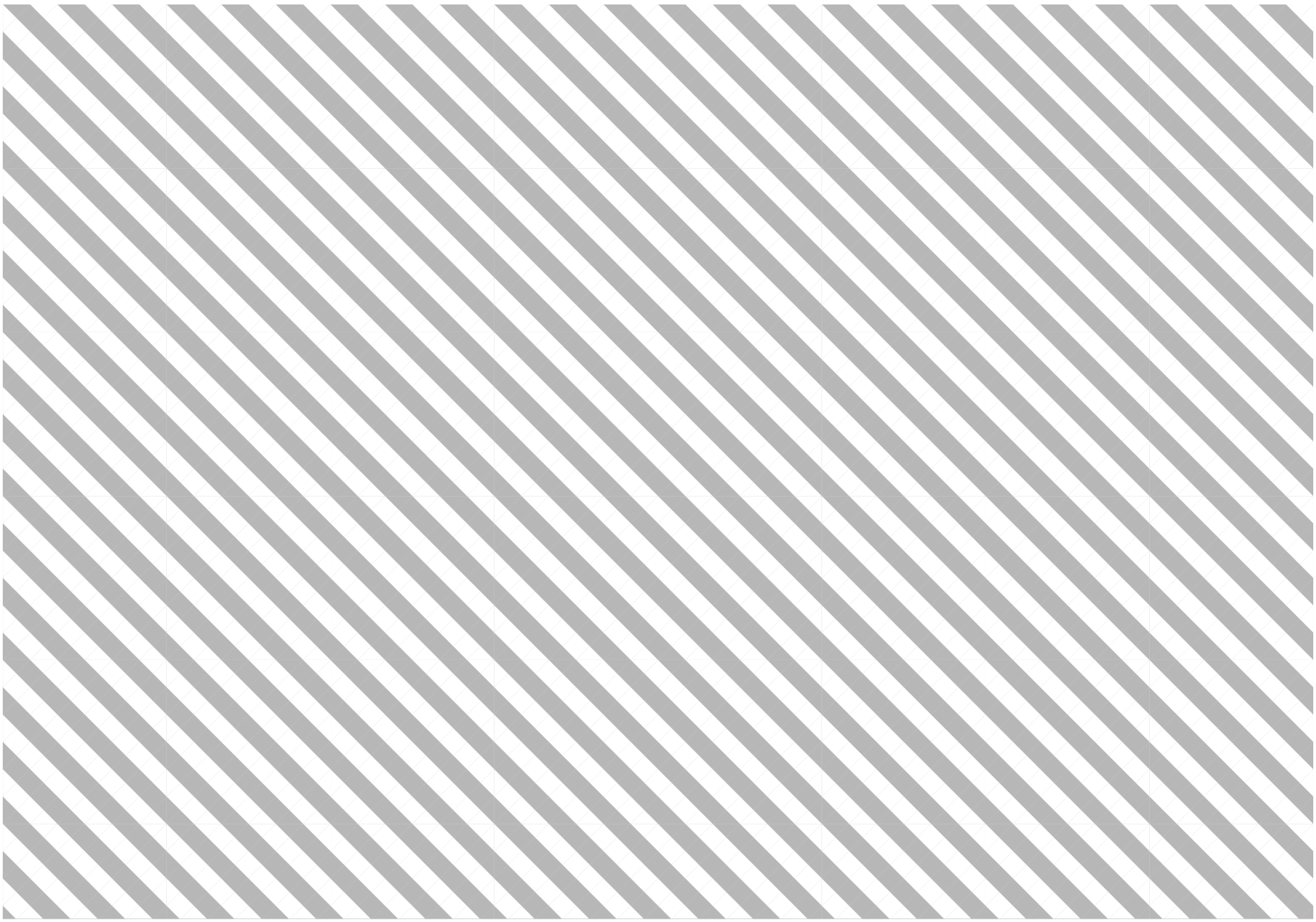
White Paper

Outbreak Readiness and Business Impact

Protecting Lives and Livelihoods across the Global Economy

In collaboration with Harvard Global Health Institute

January 2019



World Economic Forum
91-93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland
Tel.: +41 (0)22 869 1212
Fax: +41 (0)22 786 2744
Email: contact@weforum.org
www.weforum.org

Contents

Foreword

Peter Sands,
Research Fellow,
Harvard Global
Health Institute

The fable of the boiling frog provides a salutary lesson for business leaders. In this apocryphal story, a frog placed in cold water remains in the water as the temperature is gradually increased to boiling. In failing to notice the gradual but real change in its circumstances, the frog dooms itself to a catastrophic ending. Although frogs do not behave this way in real life, humans often do. Neurobiologically conditioned, as we are, to pay attention to stark contrasts and sudden changes, we often overlook slow moving changes in our environments that may herald disastrous consequences.

The evolution of infectious disease risk is one such change. As this report explains, the number and diversity of infectious disease outbreaks are gradually but inexorably increasing, as is their capacity to send shocks through our global economic systems. As we travel, trade and communicate across an increasingly hyperconnected global economy, more and more companies will find themselves exposed to the effects of outbreaks that begin thousands of miles away. One threat is the disease itself; the other is fear of the disease. In a world of always-on news and "fake news", fear spreads faster than any pathogen, sparking policy reactions, sharp changes in customer behaviour and deep anxieties among staff.

During my time as CEO of Standard Chartered, I saw first-hand how infectious disease outbreaks like SARS, MERS and Ebola could wreak havoc on business. Customers avoided public places such as restaurants, shops and cinemas. Staff struggled to get to work, fearful of public transport and needing to look after their children once schools were closed. Supply chains and basic services faltered, as pressures and blockages built up. As these crises unfolded and we raced to secure our operations and support our customers, I was acutely aware that we were making things up as we went along, without the sophisticated informational tools and well-established menu of interventions that we used to monitor, mitigate and respond to other business risks.

For individual businesses, developing a better understanding of infectious disease risks and how they can be managed has clear financial benefits. For policy-makers, the better that businesses manage such risks, the more resilient the overall economy will be. Moreover, when business leaders are more aware of what's at stake, maybe there will be a different dialogue about global health – from being a topic that rarely touches the radar screen of business leaders to being a subject worthy of attention, investment and advocacy.

For far too long, we've veered between panic and neglect in responding to the risks presented by infectious diseases, with business leaders, for the most part, bewildered bystanders. With the risks increasing, we cannot afford to continue like this. I hope you will join us in making 2019 the year we step up to the threat epidemics pose to our companies and communities. Businesses need not suffer the fate of the apocryphal frog. Instead, we can choose to shape a safer, more stable world for all.

Executive summary

On the 100th anniversary of the 1918 influenza pandemic, it is tempting to believe the world has seen the worst epidemics. However, with increasing trade, travel, population density, human displacement, migration and deforestation, as well as climate change, a new era of the risk of epidemics has begun. The number and diversity of epidemic events has been increasing over the past 30 years, a trend that is only expected to intensify.

The risk of infectious disease can no longer be thought of exclusively in terms of rare but devastating events like global influenza pandemics. Potentially catastrophic outbreaks may only occur every few decades, but highly disruptive regional and local outbreaks, such as the 2014 Ebola virus crisis in West Africa, are becoming more common and pose a major threat to lives and livelihoods. Moreover, despite considerable progress, the world remains ill-prepared to detect and respond to outbreaks and is not prepared to respond to a significant pandemic threat.

Outbreaks and epidemics are also causing more economic damage when they occur. Recent work on pandemics suggests that the potential economic losses from outbreaks of infectious disease are massive and similar in magnitude to the annual impact of climate change. Framing economic losses on a global scale, however, has major drawbacks – it can make the problem seem too large to solve, and it conceals how impacts are distributed across geographic areas and economic sectors. For the future, a proposed alternative perspective provides tailored insights on the impact of outbreaks on companies and equips them to respond appropriately. Among businesses, the risk of infectious disease is rarely emphasized in their considerations of risk. If large enterprises fully appreciate the commercial threat, they will no longer be able to justify remaining on the sidelines of efforts to strengthen global health security.

While predicting where and when the next outbreak will occur is still an evolving science, it is possible to identify factors that make companies vulnerable to financial losses from infectious disease events. Factors such as the geographic location of a company's workforce, customer base and supply chain, and the nature and structure of its business, can help inform estimates of its vulnerability to disease outbreaks.

Outbreaks of infectious disease may be inevitable, but the economic damage they cause is not. Helping companies to properly understand these risks will enable them to reduce their exposure, improve their resilience and deliver on key opportunities for public-private cooperation to strengthen global health security. In doing this, companies not only act in their own commercial interests, but also help mitigate the potentially devastating impacts of infectious disease, in both human and economic terms.

Economists estimate that, in the coming decades, pandemics will cause average annual economic losses of 0.7% of global GDP – a threat similar in scale to that estimated for climate change. As this report makes clear, this is a level of risk that businesses can no longer afford to ignore.

Report findings

Infectious disease outbreaks are a global threat

Outbreaks are increasing and are more diverse than ever

On the 100th anniversary of the 1918 influenza pandemic – the deadliest infectious disease outbreak in recorded history – numerous other outbreaks of disease have forged a persistent presence among modern-day headlines. Among these are Severe Acute Respiratory Syndrome (SARS), H1N1 influenza pandemic, Middle East respiratory syndrome (MERS), Ebola, Zika, Nipah virus, cholera, yellow fever and Lassa fever.

The frequency and diversity of disease outbreaks are expected to grow steadily, as they have for the past 30 years. In fact, 12,012 outbreaks, comprising 44 million cases and affecting every country in the world, were recorded between 1980 and 2013.[1] According to the World Health Organization (WHO), 7,000 new signals of potential outbreaks occur each month, generating 300 follow-ups, 30 investigations and 10 risk assessments, distributed to inform operational partners globally.

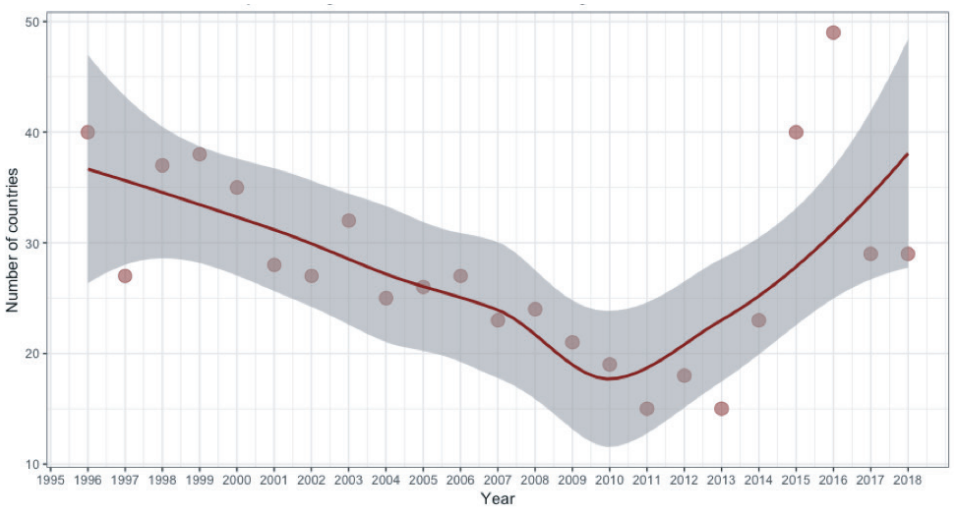
Several powerful global trends are at the basis of increased frequency of disease outbreaks. Among them is growth in travel, trade and connectivity. An outbreak can travel from a remote village to any major city in the world in less than 36 hours, and the economic or social disruption often travels faster and further. Additionally, the growth of urbanization and associated high-density living, often in unhygienic conditions, promotes the spread of infectious disease. Currently, 55% of the world's population lives in urban areas, with that proportion expected to increase to 68% by 2050.[2]

Increases in deforestation spur new outbreaks; loss of tree cover has been rising steadily over the past 17 years, and 31% of outbreaks of new and emerging diseases, such as the Nipah virus, Zika and Ebola, are linked to deforestation.[3] Growing displacement of people, driven by persecution, conflict, emergencies or civil unrest, drives large populations to new places, often in poor conditions and with increased exposure to health threats. Among refugees, infectious diseases are some of the major causes of morbidity and mortality, and measles, diarrhoeal diseases, acute respiratory infection and malaria are primary causes of death.[4] Finally, climate change is leading to changes in transmission patterns of infectious disease, potentially accelerating outbreaks of Zika, malaria and dengue fever.[5]

> "The frequency and diversity of disease outbreaks are expected to grow steadily."

Recent global trends suggest the world is entering a period of increased outbreak activity (Figure 1). June 2018 is an illustrative snapshot of the convergence of these trends. During the month, and for the first time ever, the world contended with six of the eight categories of disease highlighted in the WHO Blueprint priority diseases list, any one of which had the potential to spread, killing thousands and further disrupting the global economy.[6] This rising threat to lives and livelihoods points to the need to strengthen global public health infrastructure, as well as to develop novel strategies for monitoring and responding to emerging infectious disease crises.

Figure 1: Number of countries experiencing significant disease outbreaks, 1995-2018



Source: Harvard Global Health Institute/World Economic Forum analysis of data from WHO Disease Outbreak News (http://www.who.int/csr/don/en/)

The world is ill-prepared to detect and stop outbreaks

Although significant progress has been made since the response to Ebola in West Africa between 2014 and 2016, experts generally agree that the world remains ill-prepared to detect and respond to outbreaks and is not prepared to respond to a significant pandemic threat.

The foundation of global preparedness consists of every country's technical, financial, socio-economic and political capacity to prevent, detect and rapidly respond to threats of epidemics. Recognizing this shared responsibility and shared vulnerability, 196 countries, including all WHO Member States, have agreed to the International Health Regulations (IHR), a legally binding agreement to help the international community prevent and respond to acute public health risks that can potentially cross borders and threaten people worldwide.[7]

The regulations have two primary objectives, namely (1) to strengthen countries' preparedness and capacity to respond so they can more effectively detect, assess, report and address acute public health threats; and (2) to support international response to outbreaks that is commensurate with and restricted to public health risks, and which avoids unnecessary interference with international traffic and trade.

> "The world remains ill-prepared to detect and respond to outbreaks and is not prepared to respond to a significant pandemic threat."

Despite this commitment and the aforementioned trends, most countries have failed to meet the regulations' minimum core capacity requirements. Gaps in each country's ability to prevent, detect and respond to outbreaks are the primary source of global risk from infectious disease threats.

An unprecedented international push in recent years has supported national implementation of the IHR, as non-compliance often results from a lack of financial, human and logistical resources, in addition to a lack of understanding and awareness.[8] Primary among these efforts is the Joint External Evaluation (JEE), an objective and internationally accepted epidemic preparedness assessment developed by WHO and other partners. More than 80% of countries that have assessed their preparedness to date, however, are not ready to find, stop or prevent an epidemic.[9]

Finally, although the IHR urge an international response that avoids unnecessary interference with international traffic and trade, governments often disregard this requirement. For example, throughout the Ebola epidemic in West Africa, WHO issued temporary recommendations advising that general travel restrictions were unnecessary. Nevertheless, WHO detected 41 instances of restrictions deemed to interfere with international travel.[10] Despite similar guidance during the H1N1 influenza pandemic, half of the 56 countries responding to a survey advised their citizens to avoid travelling to affected states, while several denied permission to at least one mode of transport to embark or disembark due to illness on board or closed their borders to citizens of affected states.[11] Disruptive measures like these accompany most major outbreaks despite their high cost and questionable effectiveness.

Every epidemic stirs calls for a vaccine or therapeutic to serve as a "silver bullet", or a medical countermeasure that ultimately mitigates the emergency's risk and impact. More often than not, these hopes are likely to be misplaced. Indeed, the game-changing impact of available, experimental Ebola vaccines and therapeutics during recent responses in the Democratic Republic of Congo illustrates the exception that proves the rule. Despite promising new efforts, such as the WHO R&D Blueprint and the new Coalition for Epidemic Preparedness Innovations, no medical countermeasures, or insufficient ones if they exist, are available for both unknown pathogens and the majority of the most concerning pathogens.

A cycle of panic and neglect is costing lives and livelihoods

World leaders are quick to discuss epidemic readiness on the heels of a major outbreak, calling for better preparation and new investments. Such was the case following the Ebola epidemic in West Africa in 2014, as well as the H1N1 and SARS outbreaks before that. While real progress often follows these calls, so does a genuine neglect of epidemic readiness.[12] A report by the World Bank International Working Group on Financing Preparedness charts this cycle of attention and neglect. Following a string of outbreaks in the 1990s, calls grew for the IHR to be revised; however, these calls went unanswered until after the SARS crisis in 2002. The resulting 2005 revisions to the IHR were largely successful, but the 2009 H1N1 outbreak once again showed shortcomings in the global public health infrastructure.[13] This cycle is also evident in national-level budgeting processes. Considering that both the Ebola epidemic outbreak in West Africa and the spread of the Zika virus across Latin America required emergency appropriations in the United States to fund the federal response, the next major outbreak will likely require such appropriations as well.

> "At the going rate, it will be a long time – if ever – before the world is "ready" to address the threat of epidemics."

Investments needed to improve pandemic preparedness are not large relative to the risk of being unprepared. After all, responding to outbreaks once they have occurred is far more expensive, in lives and money. Nevertheless, after outbreaks are no longer in the headlines, epidemic readiness is frequently displaced on budgets and high-level agendas in favour of more immediate and visible priorities. New outbreaks are certain to occur, and without sustained attention and financing, they are likely to again provoke panic

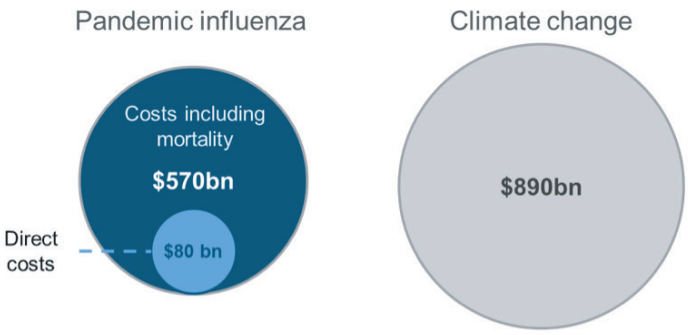
and risk global health and welfare. Simply put, at the going rate, it will be a long time – if ever – before the world is "ready" to address the threat of epidemics.

Economic sensitivity to outbreaks is on the rise

Disease outbreaks cause massive economic damage

Though rarely emphasized in business's consideration of risk, the potential economic losses from infectious disease outbreaks are massive, as suggested by recent work on pandemics. Using data from the flu pandemics of the 20th century, a report by the Commission on a Global Health Risk Framework for the Future estimated the annualized impact of flu pandemics at roughly $60 billion, more than doubling previous estimates.[14] When the statistical value of life years lost is considered, the estimates grow even larger. Work by Fan, Jamison and Summers that includes this mortality component revises the annualized figure upward to $570 billion total.[15] For context, this amount is on the same order of magnitude as the $890 billion annual impact of climate change estimated by the Intergovernmental Panel on Climate Change (Figure 2).

Figure 2: Annualized cost of flu pandemics approaching the cost of climate change



Source: Fan, Jamison and Summers, "The Inclusive Cost of Pandemic Influenza Risk", National Bureau of Economic Research Working Paper No. 22137, 2016; Intergovernmental Panel on Climate Change, *Climate Change 2014: Synthesis Report*, 2015.

> **The annualized cost of flu pandemics is approaching the cost of climate change.**

Moreover, the figures from both the National Academy of Medicine (United States) and Fan et al. are calculated using only flu pandemics which, while severe, represent a narrow subset of infectious disease activity. A fuller accounting that includes the effects of epidemics and regional outbreaks of diseases like Zika or Ebola would likely drive the figures much higher. For example, the Centers for Disease Control and Prevention provides a partial estimate of the effects of the 2014 Ebola outbreak in West Africa,[16] citing World Bank estimates that the three affected countries – Sierra Leone, Guinea and Liberia – lost $2.2 billion in gross domestic product (GDP) in 2015 alone. Including social burdens, namely immediate effects on population health and healthcare as well as wider indirect consequences such as food security and employment, the outbreak's estimated cost to the three countries is an astounding $53 billion.[17] In addition, the top three international donors contributed more than $3.6 billion to medical relief efforts.

> **Multinational corporations will increasingly rely on the often relatively weak public health and disease control infrastructure in these countries to avoid outbreak-related economic disruption.**

As dramatic as these costs are, they are perhaps most notable for what they omit. The one-year GDP loss fails to account for how these countries' economies might rebound (or fail to do so). The costs of prevention and mitigation in adjacent countries, changes in travel patterns and other economic disruptions also increase the total. While some of these costs fell directly on the budgets of nation states, many of the 2014 Ebola outbreak's effects fell instead on private enterprises, their employees and suppliers, in West Africa and beyond.

Globalization has magnified the economic effects of disease outbreaks

Globalization has driven tremendous growth in both developed and emerging markets, and the greater freedom of movement of labour and capital has created increasingly interdependent economies. While this pattern has been a boon for development, it has also increased the risks posed by infectious disease outbreaks, with ripples potentially affecting a wide range of firms.

The World Bank estimates that 2016 saw over 1.2 billion international tourist arrivals.[18] Additionally, the International Labour Organization estimated over 150 million migrant workers worldwide in a 2015 report.[19] These statistics point to an increasingly mobile global population, with parallel growth in the risk that pathogens will spread with these travellers. Additionally, globalized supply chains mean that disruptions far from a manufacturing plant could lead to critical delays for firms. These risks are compounded by growing complexity in supply chains, with visibility often limited to first-tier suppliers in a network.

Emerging markets form an increasingly important segment of the global economy in several respects. As incomes rise, consumers in these countries will make up a greater share of the revenue streams for multinational firms. Economic development along an export-driven path has also integrated more countries as important suppliers. As these trends continue, multinational corporations will increasingly rely on the often relatively weak public health and disease control infrastructure in these countries to avoid outbreak-related economic disruption.

Technology has accelerated "informational contagion" across populations

The global public health community has traditionally focused its surveillance on pathogens themselves, monitoring the spread of viruses and bacteria through human and animal populations. As modern information technology accelerates the spread of information between people, however, "informational contagion" is rapidly growing as a contributor to the economic effects of infectious disease outbreaks. One recent World Bank estimate suggests that only 39% of the economic losses from outbreaks are associated with effects on infected individuals. Rather, the bulk of the costs results from healthy people's change of behaviour as they seek to avoid infection.[20] These behavioural changes are contributing to a decoupling of the historic relationships between levels of morbidity and mortality resulting from an outbreak and the scope of economic impacts. Consider the 2015 MERS-coronavirus outbreak in South Korea: though less than 200 individuals were infected and only 38 died, nearly 17,000 people were quarantined at an estimated cost of $8.5 billion.[21] In a modern economy, relatively small numbers of infections could have massive economic effects that can extend far beyond the original outbreak's footprint.

The South Korean MERS-coronavirus outbreak is also instructive in showing that while governments have centuries-old tools for controlling the movement of people, the ability of public actors to spread accurate information – and to displace distracting or even harmful noise – is still in its infancy. Social media activity helped to thwart the concealment of which hospitals were housing MERS patients. Even if public health agencies publish accurate, timely and actionable information through official channels, many will still get their information on health issues from the media and other sources.[22] A recent article in *The Atlantic* points out that these alternatives often exert a malign influence on public understanding, with examples ranging from the constant barrage of anti-vaccine information shared on networks such as Pinterest to the rapid spread of misinformation during the 2014 Ebola crisis.[23] Understanding the behavioural effects on economies requires insights that extend beyond the biomedical sciences and draw on fields such as economics, sociology and social psychology.

Business is on the front line of an evolving microbial war

A new framework is needed to understand and communicate the effects of epidemics

Much of the work on estimating the effects of pandemics and advocating for greater preparedness has focused on global non-governmental organizations and national governments. These estimates, on the order of tens or hundreds of billions of dollars in annual losses, provide a stark picture of the potential harm caused by infectious disease outbreaks, as well as of the global trends towards human-animal co-densification, economic interdependence and other vulnerabilities. This all means that the risks are only rising.

> "In a modern economy, relatively small numbers of infections could have massive economic effects that can extend far beyond the original outbreak's footprint."

Framing the losses on a global scale, however, has a number of major drawbacks, First, the escalating estimates can induce a sense of helplessness, especially in actors smaller than countries. Viewing infectious disease outbreaks as massive, unpredictable catastrophes steers parties away from thinking of mitigation and better preparation. Relatedly, presenting global estimates aggregated across long timescales and multiple disease categories does not help firms to recognize their own exposure to parts of the larger problem. Given these considerations, an alternative perspective or framing is needed – one that provides tailored insights on the effect of outbreaks on specific firms and equips them to respond appropriately.

> "Effective readiness for outbreaks requires reliable public-private cooperation."

In fact, businesses are in many respects ideally situated to contribute to pandemic preparedness and response, potentially averting losses to their bottom lines and populations at large. Through their ability to affect their employees' behaviour, as well as through their sophisticated communications infrastructure and capacity to lobby and partner with governments, firms can be important participants in responding to an outbreak.[24] Indeed, effective readiness for outbreaks requires reliable public-private cooperation. This section lays out the potential effects of infectious disease outbreaks on economic activity and a framework for thinking more generally about those effects. The conclusion in the following section explores how firms might inform themselves about the risks posed by infectious disease, and what actions they could take to mitigate risk.

Businesses experience outbreaks through their effects on employees, suppliers and customers

As the risk of infectious disease rises globally, and economic sensitivity to events increases in parallel, all relevant actors must be provided a framework for understanding their vulnerabilities and options for mitigation. To date, extensive work has been done to show national governments the actions required to maintain a robust infectious disease surveillance and response system. Efforts such as the JEE of a country's capabilities compared to the 2005 IHR standards have provided clear guidelines. At the other extreme, public health agencies have long provided individuals with information about threats to public health. In the middle range of activity, however, businesses have so far been underequipped to deal with this important threat. The following points discuss how infectious disease

outbreaks might affect businesses' employees, suppliers and customers.

Impact on employees

The most intuitive effect of infectious disease outbreaks on corporate activity may be their potential harm to employees. Firms already have experienced seasonal variation in workplace absences – for example, with increases in influenza activity. They may even have noted the variation in intensity from year to year, such as the more severe influenza outbreak in the winter of 2017-2018. In the United States, where many companies self-insure for medical claims by employees, healthcare costs are a familiar and significant part of operating costs. Infectious disease outbreaks may also have broader implications for a firm's operations. Concerns about outbreaks far from the headquarters can limit business travel, affecting how companies interact between offices and with clients or suppliers. Concerns about spreading illnesses within a workplace can play an important role in structuring benefits with regard to paid time off, as human resource managers attempt to encourage contagious employees to stay home. Monitoring threats to employees and proactively considering benefits design, telecommuting options and other features of workplace organization can help firms mitigate these concerns.

Impact on supply chains

Additionally, infectious disease outbreaks could significantly disrupt complex international supply chains. The rise of just-in-time manufacturing has revolutionized how businesses operate, as companies can emphasize small on-site inventories and low defect rates. Yet, the resulting low inventories and high turnover makes producers highly reliant on inputs arriving quickly from suppliers, thus leaving firms potentially vulnerable to even modest disruptions in supply chains. Companies may have comprehensive knowledge of their immediate suppliers, but in moving to tier-two suppliers and beyond, the location and operation of sub- and sub-sub-contractors can be far less visible. Increasingly globalized production also means that the tracking of infectious disease outbreaks, to be most useful, must include comprehensive coverage and high geographic and time resolution to provide businesses with a tailored risk profile. Understanding current and emerging infectious disease threats and mapping their potential impact on a firm's supply chain can provide valuable insight into where losses might accrue in a crisis.

> **Outbreaks with low infection rates but widespread fear of infection could reduce customer footfall, depressing retail and entertainment spending.**

Impact on customers

Finally, firms need to understand how infectious disease outbreaks might affect their customers. In the event of a widespread outbreak, the impact on morbidity and mortality would negatively affect a company's performance; however, these effects are not limited to severe scenarios. Outbreaks with low infection rates but widespread fear of infection could reduce customer footfall, depressing retail and entertainment spending. These events could also influence consumers to change their habits and increase spending in e-commerce compared to traditional retail. Such shifts could have major distribution effects among firms, depending on how well they are positioned to respond to these changes.

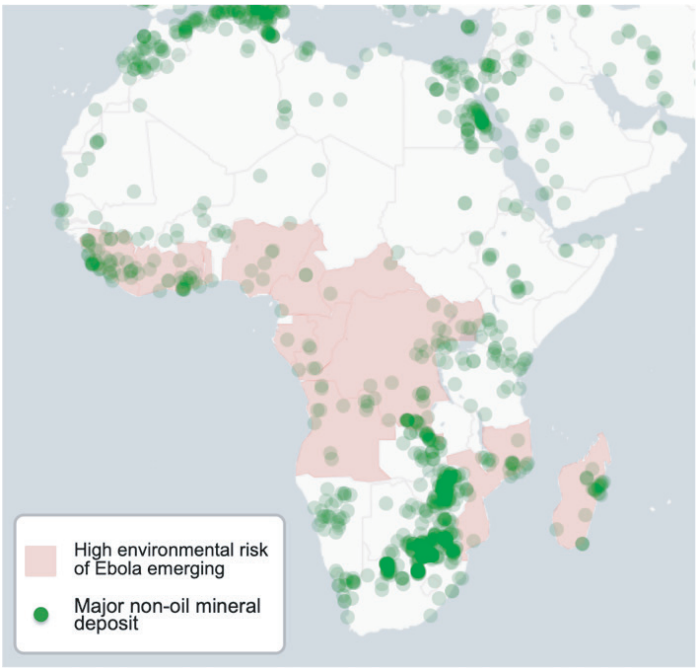
Infectious disease outbreaks can cause real damage to industries and economies

Few comprehensive studies of the effects of outbreaks on business activity globally have been carried out, but case studies of businesses operating in areas affected by outbreaks can be instructive. Even though the pathogens, locations and industries differ, the significant commercial disruption and need for better preparation shine through as shared experiences.

Extractive industries: Mining in West Africa

The impact of the 2014 Ebola crisis in West Africa, through the outbreak and fear of its future spread, exerted a major influence on industry. In the wake of this devastating outbreak, a report by the Brookings Institution documented massive effects on extractive industries in the affected region. The report highlighted the closures of major mines, with local employees laid off and international workers sent home. Moreover, the region experienced noteworthy reductions in foreign investment in the extractive industry.[25] The density of mineral deposits in the affected countries, and in West Africa more broadly, points to significant potential disruption should Ebola return to the region (Figure 3).

Figure 3: Africa – major mineral deposits in areas at risk of Ebola outbreaks



Source: Pigott, D. et al., "Updates to the zoonotic niche map of Ebola virus disease in Africa", *eLife* 2016;5:e16412, https://elifesciences.org/articles/16412; US Geological Survey, "Major mineral deposits of the world", https://mrdata.usgs.gov/major-deposits/

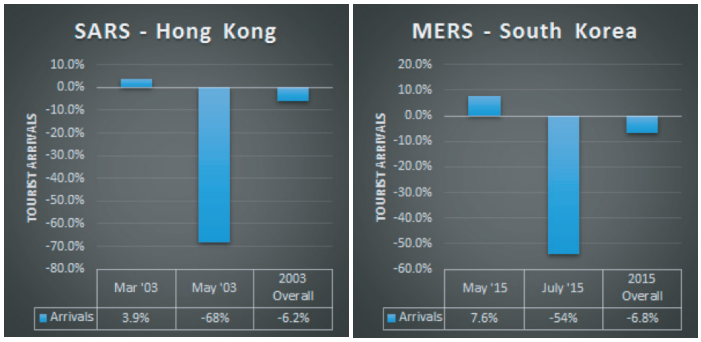
During an outbreak, loss of access to a major mineral deposit (or in other contexts to production facilities, among others) through border closures, quarantines or worker illness represents a significant threat to firms. Additionally, such events have major implications for the development of the emerging economy. Extensive layoffs can have far-reaching effects, including reductions and disruptions in investment in human capital, leading to concerns for broader investment and development goals for the affected regions.[26]

Travel and tourism: SARS/MERS and Zika

The travel and tourism industry is one area where the effects of infectious disease outbreaks on commercial activity is most evident. The number of tourist arrivals plummet during and immediately following a regional outbreak, leaving airlines, hotels and others severely affected.

Hong Kong's experience during the SARS outbreak of 2002-2004, as well as South Korea's during the 2015 MERS crisis, illustrates these effects (Figure 4). In the immediate aftermath (indicated by May 2003 for Hong Kong and July 2015 for South Korea), tourist arrivals plunged; in fact, these short-term impacts were so severe that annual totals were substantially reduced.

Figure 4: Change in tourist arrivals in SARS/MERS-affected regions



Source: Fazeli, S. et al., "Zika may increase economic risks, industrial costs", *Bloomberg Professional Services*, 31 May 2016, https://www.bloomberg.com/professional/blog/zika-may-increase-economic-risks-industrial-costs/

These episodes demonstrate important aspects of the potential impact of infectious disease events. For the travel and tourism industry, protecting employees' health is a major concern for humanitarian and operational reasons. Consumers' perception of the risk attached to travel, however, goes beyond their contact with airline and hotel employees. Moreover, these events can have an impact on an entire asset class or industry, regardless of whether a firm's geographic footprint is directly affected by illness.

Businesses should act to mitigate the rising threat of infectious disease outbreaks

Infectious disease outbreaks may be inevitable, but the economic damage they cause is not. The better informed and better prepared companies can minimize disruption to their businesses, protect their assets and gain advantage over less well-prepared competitors. They are also better positioned to partner with governments and industry groups to help protect the communities they serve. To do this, however, business leaders must first recognize the opportunity and the responsibility of better managing infectious disease risk. (See Figure 6 for a classification of corporate responses to infectious disease threats.)

Many businesses do little to prepare for the rising threat of disruptions caused by infectious diseases. In fact, many companies have no mitigation plans or rely on a wait-and-see strategy when responding to outbreaks. A great number of businesses assume that operational continuity insurance will compensate them for any losses arising from outbreaks, yet they may be unaware that many business continuity insurance policies exclude infectious disease outbreaks as a contingent event. This leaves businesses vulnerable to avoidable losses when disease outbreaks disrupt their commercial networks.

> "Infectious disease outbreaks may be inevitable, but the economic damage they cause is not."

A new risk paradigm requires a new leadership mindset

Infectious disease risk can no longer be thought of exclusively as the threat of low-probability, high-impact events. While a global influenza pandemic may only occur every few decades, highly disruptive regional and local outbreaks are becoming more common and are causing more economic damage. As supply chains, operations and customers become more geographically dispersed, businesses must be ready to manage the effects of outbreaks wherever they occur.

Despite these trends, many business leaders underestimate the threat posed to their companies. Only 37% of executives surveyed in 2015 by the United Nations Conference on Trade and Development identified infectious disease outbreaks as a factor likely to reduce global investment activity, despite evidence of repeated economic effects of such events.[27] Business leaders who are aware of the changing nature of commercial infectious disease threats are better able to position their organizations to avoid exposure, respond effectively and support global health security for the good of communities.

Companies must take a holistic approach to managing infectious disease risk

Companies need to recognize that a holistic approach to reducing infectious disease risk is required. Many of them only focus on employee wellness and healthcare interventions, such as providing vaccinations or antiviral medication. While these are important responses to outbreaks, effective risk management must extend beyond medical responses alone. Securing operations, supply and

distribution channels, and managing relations with employees, customers and investors, are critical steps, as is advanced logistical planning that can help minimize disruptions to production capacity and supply chains. In addition, plans for pre-emptive communication to employees, business partners, customers and investors can help reduce the risk of harmful overreaction that drives most of the economic losses arising from disease outbreaks. Most companies should at least engage in public-private information sharing and trust-building networks in relevant locations and at relevant levels across their operations.

Action taken to reduce exposure to infectious disease threats and protect companies from the impact of diseases need not be expensive or disruptive to running businesses effectively. To be most effective, such actions should be incorporated into routine risk management practices.

> **Infectious disease risk can no longer be thought of exclusively as the threat of low-probability, high-impact events.**

Practical action is needed to protect employees, assets and revenue

Executives and boards can take several steps to reduce corporate and community exposure to infectious disease risk:

Clarify the scale and nature of the disease threats to the company

- Monitor emerging threats actively through an appropriate risk surveillance platform.
- Incorporate data from such sources into company risk management and operational decision-making to ensure adaptive management of infectious disease risk.
- Understand how outbreak risks are tied to geography, and how those location-based risks intersect with critical business dependencies. These crucial overlaps can occur in operations and human resources, supply chains and sources of revenue. For example, are production facilities or an important natural resource concentrated in vulnerable regions?
- Consider a comprehensive audit of exposure and vulnerability to infectious disease threats throughout business functions. This audit should cover not only exposure to potential infectious disease disruptions, but also a review of likely commercial and economic effects of disruptions should they occur.

> **Effective risk management must extend beyond medical responses alone.**

Outbreak Readiness and Business Impact Tool: Dashboards for epidemic risk

Efforts to better quantify and present the emergence of new infectious disease threats and the impact of existing outbreaks have steadily advanced in recent years. Indeed, documenting outbreaks and communicating their impact on a global level remains an important task. As this report proposes, however, this information is made most effective by tailoring it to specific audiences and translating effects into the most relevant terms for a given user. In other words, global estimates of disease burden are only so useful to a country attempting to budget for the care of its own citizens, or to a single firm assessing the resilience of its supply chain.

To that end, a prototype of the Outbreak Readiness and Business Impact Tool was developed that aims to provide tailored data on the infectious disease landscape. This example (Figure 5) shows the geographic footprint of production sites for a hypothetical garment manufacturer, overlaid with current reported disease activity. In addition, the figure shows how country-by-country data on the risk of future, economically significant outbreaks – through the different shades of red – could be communicated. The goal of this effort is to move away from the assumption that a firm's leadership has comprehensive knowledge of its assets and their potential exposure to outbreaks, and towards an approach of simplifying and summarizing the risks it faces.

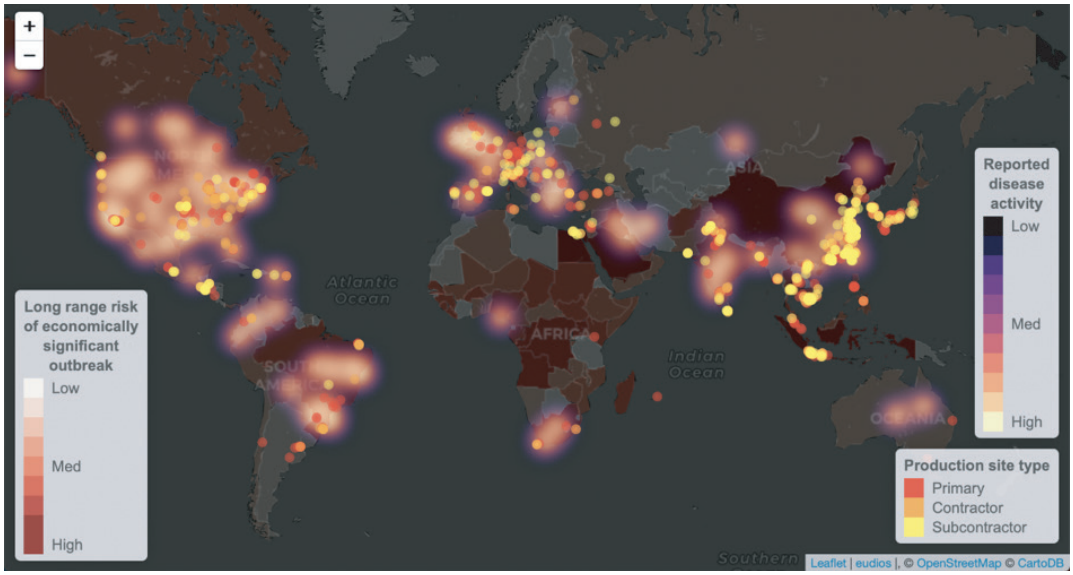
Reduce corporate exposure to critical outbreak risks

- Address critical vulnerabilities and reduce risk exposure by actively monitoring threats, managing the supply chain and planning outbreak mitigation. Where appropriate, offload risk through appropriate insurance and by outsourcing to specialized risk management firms.
- Include a review of disruption from outbreaks as a business risk when procuring goods and services, and when developing strategic investments and partnerships.

Improve internal response capabilities

- Develop and test pre-event response plans rigorously and systematically to minimize losses from a disruptive event.
- Develop appropriate employee sickness and remote working policies to protect the company's workforce and productivity. Involve human resource, enterprise risk and corporate communications teams to develop and communicate clear plans for minimizing employee exposures to possible infection during outbreaks and for communicating these plans to employees. Plans should include consideration of medical interventions to protect employees, such as vaccinations, medications and hygienic practices. They should also cover policies that can reduce the spread of a disease through the workforce. Maintaining employee trust through competent, proactive risk management can help minimize inappropriate absenteeism, while also reducing the risk of contagion within companies.

Figure 5: Tailored data – overlaying company presence with disease landscape and risk



Source: Authors

– Prepare robust production and supply chain continuity plans that include first- and second-tier suppliers who may account for the company's greatest commercial vulnerabilities. Engaging suppliers in frank but supportive discussions about their exposure to infectious disease risk can help foster relationships that improve business resilience to outbreaks.

– Develop pre-emptive contracting and capacity management plans for operational and logistic activities at high risk of disruption from an outbreak. Operational managers should be supported to help them understand their locale-specific outbreak risk and tasked to work with enterprise risk management teams to implement appropriate monitoring and mitigation activities.

– Identify key external dependencies important to the continued running of the business but that may be disrupted by an outbreak. Externally provided functions, such as public transport, childcare or food supply, may be unavailable during a severe outbreak. Developing plans for providing such functions during external failures can help companies avoid subsequent losses in productivity. Plans may benefit from a collaborative, pre-emptive agreement between businesses located in an at-risk area for procuring and providing essential external services. Participating in private-sector and industry-based groups can help with sharing best practice, developing collaborative response plans and providing a forum for collective engagement with governments to improve health security.

Communicate proactively to reduce the risk of overreaction

– Most economic losses caused by infectious disease outbreaks result from the actions of uninfected individuals. They may take drastic action to protect themselves and their families when faced with fear, uncertainty and misinformation. To avoid contagion, customers, employees and partners may stay away from places of business. Such social avoidance, however, can significantly affect employee absence rates, operational productivity and demand. Transparent and timely communication regarding the nature of an outbreak, its effect on business functioning, and preparedness and response activities can help reduce the likelihood of panicked market responses. The development of such plans should be coordinated with public health and safety agencies wherever they are present and effective. In some localities, however, the private sector may need to lead on informing communities, including their own employees, on the nature of the outbreak threat and how to best ensure public safety.

Promote preparation through leadership and governance

– Company boards can help managers stay ahead of infectious disease threats by raising awareness of the risk and reviewing corporate plans for risk mitigation and management. Helping businesses to focus on the changing nature of the infectious disease threat can protect shareholder value and promote social responsibility.

Questions boards should ask

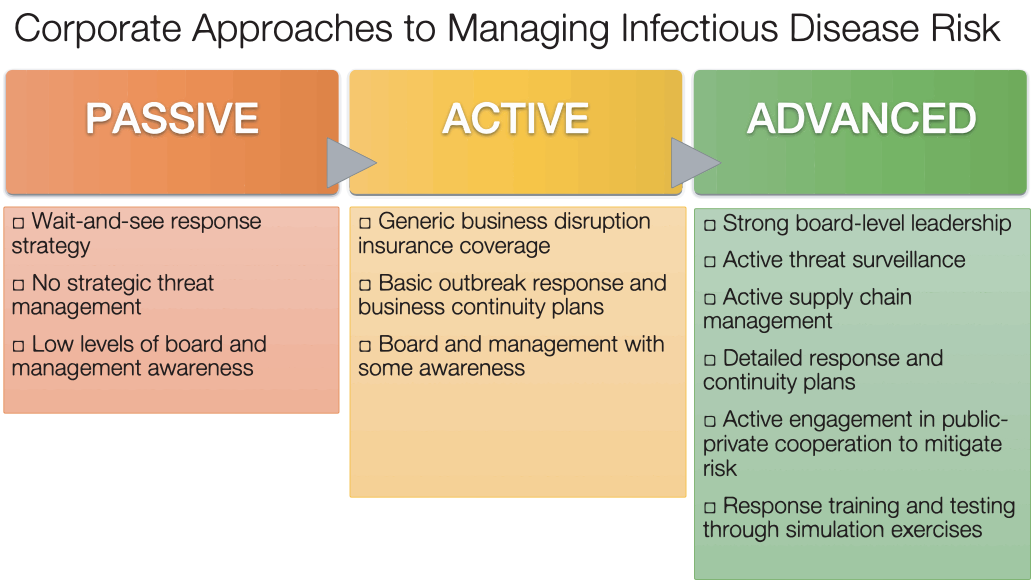
– Has our business been disrupted by infectious disease outbreaks? How big was the impact? What did we learn? What have we done since to reduce our risk?

– What tools and information are we using to monitor vulnerabilities to infectious disease outbreaks?

– What are our current critical disease threats? How does our exposure compare with that of others in our industry?

– Are we actively tracking risks to our business? What are we doing to reduce our exposure and prepare for future events?

Figure 6: Classification of corporate responses to infectious disease threats



Source: Authors

- How can we better communicate with employees and other critical stakeholders about our level of preparedness?
- Are we engaging in public-private cooperation to mitigate risk?

> **Most economic losses caused by infectious disease outbreaks result from the actions of uninfected individuals.**

Public-private cooperation: An essential mechanism for protecting corporate and community value

Effective corporate leaders know the importance of collaborating for the common good. They also know that disease outbreaks have no sectoral or geographic boundaries. The societal threat posed by epidemics provides a compelling platform for engagement across the public and private sectors; in fact, during a major outbreak, public or government leaders often compel large organizations to act. Moreover, relationships developed during peacetime increase the likelihood of effective cooperation once outbreaks occur. Businesses should be willing to take the lead to foster such efforts, especially in locations where government capacities are constrained. By looking for opportunities to create shared value with government and civil society organizations, businesses can support better global and local capacity to manage the risk and impact of outbreaks.

Responses to past outbreaks have featured a range of innovative partnerships among businesses and civil society to complement the official response. Many instructive success stories exist related to public-private cooperation to support outbreak response, although efforts have typically been ad hoc, limited to traditional partners and largely initiated only after the outbreak has substantially evolved. Uncertainty relating to communication and coordination has generally challenged efforts at cooperation, and sometimes to the detriment of the overall response. Accordingly, past experience points to interesting opportunities to optimize response before the next outbreak, especially when public-private cooperation is essential to an effective global response.

Epidemics Readiness Accelerator

The World Economic Forum Epidemics Readiness Accelerator provides a platform for the public and private sectors as well as civil society to work collaboratively to address significant roadblocks in the global outbreak response architecture. Recent work streams have addressed issues in travel and tourism, supply chain and logistics, data innovations, legal and regulatory challenges, and communications.

EPIDEMICS READINESS ACCELERATOR

Global Health Security Agenda: Private Sector Roundtable

The Private Sector Roundtable is an industry coalition that mobilizes corporations to help countries prevent, detect and respond to global health threats. It engages companies across a broad array of sectors, such as healthcare, communications, energy and extraction, finance, technology, and logistics to address the complex challenges of global health security and health systems strengthening.

Conclusion

Improving corporate resilience and responsiveness to emerging threats of infectious disease is a huge concern for the global economy and public safety. Billions of dollars and millions of lives and livelihoods depend on the business community's collective response to the changing threat of epidemics. Better corporate citizenship towards such threats enables companies to deliver substantial shareholder and social value at the same time.

Moreover, the ability to do this has never been greater. Advances in data, communications and corporate governance allow companies to be better prepared than ever before to face the rising threat of disruption from infectious disease outbreaks. Companies that protect their assets, employees and communities will be rewarded with increased economic resilience, competitive market advantages and greater social relevance. As expectations of corporate stewardship of natural and human resources continue to align with drivers of economic value, companies that respond slowly will find themselves increasingly at odds with customers, investors and workers. The business community must step up now and play its full part in protecting societies from the rising threat of infectious diseases.

Appendix

Planning Scenarios

To demonstrate how readily a disease outbreak can affect businesses, operations and profitability, the effect of two currently active pathogens on two hypothetical companies is considered.

Scenario 1: MERS+ and consumer electronics manufacturing

To illustrate the commercial impact of infectious diseases, consider how a new outbreak of Middle East respiratory syndrome (MERS) might affect a large consumer electronics firm. MERS is a highly pathogenic airborne virus that originated in camels. The first prominent outbreak of the virus was in Saudi Arabia (2012); a subsequent outbreak occurred in South Korea (2015), and 27 other countries have reported outbreaks since 2012. While relatively few people were infected in the South Korean outbreak, its high case-fatality rate (above 30%) resulted in widespread public concern. Nearly 17,000 people were quarantined to control its spread and $8 billion in economic damage was attributed to the outbreak. In September 2018, South Korea reported its first new case of MERS since 2015.

The hypothetical electronics giant is a premium brand, manufacturing and retailing computers, phones and wearables. With annual revenues of $215 billion, 500 retail stores and over 110,000 direct employees in 20 countries, this fictional firm has a large and complex disseminated supply chain, with 13,000 suppliers employing nearly 1 million people. Its state-of-the-art production facilities are distributed across 10 countries, relying on just-in-time supply chain management with a five-day inventory turnover. Final assembly of its flagship smartphone product occurs in Taipei, Taiwan, China. The retail schedule for this flagship phone is particularly important to the company's bottom line, with the launch of a new version planned for the end-of-year holiday season. Pre-order sales are being closely watched by investment analysts around the globe, and holiday sales will be important to market assessment of the company's success.

Consider now the effect of a hypothetical, more transmissible version of the MERS virus ("MERS+"), centred on the Philippines and spreading regionally to Taiwan, China; Hong Kong SAR; mainland China; Singapore; and Viet Nam. This spread has particular potential to disrupt shipping activity due to quarantining and port closures, especially as the Philippines supplies a large proportion of the global shipping workforce. The region's interconnected manufacturing and logistics networks also make it likely that disruptions to facilities or transportation in one country will have knock-on effects on components and product assembly in others. This new outbreak has arrived eight weeks before the global launch of the new flagship phone and threatens to delay the product launch ahead of the holiday sales season. If this occurs, the competitive opportunity costs and effects on earnings may adversely affect the company's valuation and future operational plans.

Scenario 2: Seasonal influenza and consumer retail

As a second example of the burden infectious disease events can impose on businesses, consider how a particularly severe seasonal influenza outbreak might impact a large consumer goods store chain with a sizeable e-commerce presence. The 2017-2018 influenza season was among the most severe in the Northern Hemisphere in over a decade. The H3N2 strain predominated and available vaccines were less effective than usual against this strain. In response to increased absences due to sickness and the impact on productivity last season, the chain is looking at how year-to-year variation in flu intensity might affect its operations.

Even a typical flu season can massively impact businesses, resulting in over 100 million lost work days in the United States.[28] These effects can spread beyond infected individuals, as school closures or illness among dependent family members can take parents and carers temporarily out of the workforce. To address these impacts, the chain is considering communication and human resource policies, though they each have their concerns:

– A push to encourage vaccinations among employees has been planned, but the chain is unsure how to communicate the risks and benefits, especially given the low vaccine effectiveness of the previous season.

– An expanded telecommuting policy has also been considered to reduce the risk of the flu spreading and of illness-related absences; however, the trade-offs between illness-related costs and lost productivity have been difficult to weigh.

Additionally, while brick-and-mortar retail is the chain's primary focus, it has a burgeoning e-commerce presence and recently made the National Retail Federation's list of the top 50 firms. However, this rapid expansion has come with growing pains, and the web and mobile platforms have experienced problems under high user loads. A severe flu season could push consumers away from crowded retail environments and towards e-commerce platforms, thus making a stable platform a necessity for capturing some of this mode-switching. At the same time, how to balance this against operations at the chain's more than 1,600 stores remains a puzzle.

Given these two scenarios, what information would be useful to these firms and to their competitors? Could business interruption insurance provide an adequate response, or would further mitigation efforts be necessary to prevent these firms from facing serious losses?

Acknowledgements

Contributors

Peter Sands, Research Fellow, Harvard Global Health Institute; Research Fellow, Mossavar-Rahmani Center of Business and Government, Harvard Kennedy School
Anas El-Turabi, Frank Knox Memorial Fellow, Harvard University
Phil Saynisch, Doctoral Candidate in Health Policy, Harvard University
Ryan Morhard, Project Lead, Global Health Security, World Economic Forum

Working Group Members

Alan Tennenberg, Chief Medical Officer, Global Public Health, Johnson & Johnson
Margaret Farley, Vice-President, Global Crisis and Risk, Edelman
Eduardo Martinez, President, UPS Foundation
Tobias Larsson, Vice President | Head of Resilience360, DHL Customer Solutions & Innovation

World Economic Forum Project Team

Vanessa Candeias, Head of Global Health and Healthcare System Initiative
Rihana Diabo, Project Specialist, Global Health and Healthcare System Initiative
Wolfgang Lehmacher, Head of Supply Chain and Transport Industry

Endnotes

1. Smith, K.F. et al., “Global rise in human infectious disease outbreaks”, *Journal of the Royal Society Interface*, Vol. 11(101), December 2014, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4223919/.
2. Population Division of the United Nations Department of Economic and Social Affairs (UN DESA), *2018 Revision of World Urbanization Prospects*, 2018.
3. Kessler, R., “What Exactly Is Deforestation Doing to Our Planet?”, *EcoHealth Alliance*, 2017, https://www.ecohealthalliance.org/2017/11/deforestation-impact-planet.
4. World Health Organization, “Migration and health: key issues”, October 2018, http://www.euro.who.int/en/health-topics/health-determinants/migration-and-health/migrant-health-in-the-european-region/migration-and-health-key-issues#292115.
5. World Health Organization, “Climate change and human health”, October 2018, http://www.who.int/globalchange/climate/summary/en/index5.html.
6. Weber, L., “More Dangerous Outbreaks Are Happening. Why Aren’t We Worried About The Next Epidemic?”, HuffPost, 18 July 2018, https://www.huffingtonpost.com/entry/outbreaks-epidemic-preparedness_us_5b4f85fbe4b0de86f4892daa.
7. World Health Organization, *International Health Regulations (2005), Third edition*, 2005.
8. World Health Assembly Resolution A69/21 of 13 May 2016.
9. Prevent Epidemics, “About PreventEpidemics.org: Bringing Attention to Epidemic Preparedness”, https://preventepidemics.org/about/.
10. World Health Assembly Resolution A69/21 of 13 May 2016.
11. World Health Organization, *Implementation of the International Health Regulations (2005): Report of the Review Committee on the Functioning of the International Health Regulations (2005) in relation to Pandemic (H1N1) 2009*, 5 May 2011, http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_10-en.pdf.
12. Sands, P. and Chawla, M., “Comment: Financing preparedness at a national level”, *The Lancet*, Vol. 389(10084), 27 May 2017: 2086-2087.
13. International Working Group on Financing Preparedness, *From Panic and Neglect to Investing in Health Security: Financing Pandemic Preparedness at a National Level*, The World Bank, December 2017.
14. The Commission on a Global Health Risk Framework for the Future (National Academy of Medicine, Secretariat), *The Neglected Dimension of Global Security: A Framework to Counter Infectious Disease Crises*, May 2016.
15. Fan, V., Jamison, D. and Summers, L., “The Inclusive Cost of Pandemic Influenza Risk”, National Bureau of Economic Research Working Paper No. 22137, March 2016.
16. Centers for Disease Control and Prevention, “Cost of the Ebola Epidemic”, August 2016, https://www.cdc.gov/vhf/ebola/history/2014-2016-outbreak/cost-of-ebola.html.
17. Huber, C., Finelli, L. and Stevens, W., “The Economic and Social Burden of the 2014 Ebola Outbreak in West Africa”, *The Journal of Infectious Diseases*, jiy213, 13 October 2018, https://academic.oup.com/jid/advance-article-abstract/doi/10.1093/infdis/jiy213/5129071?redirectedFrom=fulltext.
18. The World Bank, “Data: International tourism, number of arrivals”, October 2018, https://data.worldbank.org/indicator/ST.INT.ARVL.
19. International Labour Organization, *ILO global estimates on migrant workers: Results and methodology*, 2015.
20. Jonas, Olga B., *Pandemic Risk*, World Bank, 2013, https://openknowledge.worldbank.org/handle/10986/16343.

21. Oh, Myoung-don et al., “Middle East respiratory syndrome: what we learned from the 2015 outbreak in the Republic of Korea”, *Korean Journal of Internal Medicine*, Vol. 33(2):233-246, 2018.

22. Ophir, Y., “How the media falls short in reporting epidemics”, *The Conversation*, 14 August 2018, https://theconversation.com/how-the-media-falls-short-in-reporting-epidemics-101216.

23. Gyenes, N. and Mina, A. X., “How Misinfodemics Spread Disease”, *The Atlantic*, 30 August 2018, https://www.theatlantic.com/technology/archive/2018/08/how-misinfodemics-spread-disease/568921/.

24. World Economic Forum, *Managing the Risk and Impact of Future Epidemics: Options for Public-Private Cooperation*, 2015.

25. Sy, A. and Copley, A., “Understanding the Economic Effects of the 2014 Ebola Outbreak in West Africa”, *Africa in Focus* blog, Brookings, 1 October 2014, https://www.brookings.edu/blog/africa-in-focus/2014/10/01/understanding-the-economic-effects-of-the-2014-ebola-outbreak-in-west-africa/.

26. World Bank, *The economic impact of the 2014 Ebola epidemic: short and medium term estimates for West Africa*, 2014, http://documents.worldbank.org/curated/en/524521468141287875/The-economic-impact-of-the-2014-Ebola-epidemic-short-and-medium-term-estimates-for-West-Africa.

27. United Nations Conference on Trade and Development, *World Investment Report 2015*, 2015.

28. “Financial impact of the flu: how it pays to be proactive”, *MedExpress*, 10 September 2018, https://www.medexpress.com/blog/workplace-wellness/financial-impact-of-the-flu.html.

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation.

The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.

World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744

contact@weforum.org
www.weforum.org