Assessing Global Risks
Pandemics and Cyber Risks

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Begin with a story

Most human infections have their origins in livestock, including cattle, chickens, pigs, goats, sheep and/or camels. This is why agriculture-control is so important and why governments monitor any infectious disease in livestock so carefully - at least in the more developed countries. In poor countries, more than 25 percent of livestock show signs of current or past infection with bacterial foodborne diseases (also named zoonotic gastrointestinal disease) causing food contamination. Other deadly diseases from livestock which can severely harm humans include leptospirosis; cysticercosis; zoonotic tuberculosis (TB); rabies; leishmaniasis (caused by a bite from certain sand-flies); brucellosis (a bacterial disease that mainly infects livestock); echinococcosis; toxoplasmosis; Q-fever; zoonotic trypanosomiasis (sleeping sickness), hepatitis E; and anthrax.

In case of severe damage to existing infrastructure and/or controlled environment due to e.g. natural disaster or cyber-attacks, bacterial infections can develop and hit both animals and humans. The infection can potentially even jump from one to others. The example of leptospirosis which occurred 2017 after the hit of hurricane Maria, demonstrates the seriousness of humans and animals if the environment in which we live is stuck be natural catastrophes.

Link to epidemic risks in an unbroken environment

When mitigating risks, we need to understand what has happened in the past to attempt to predict future risks. We need to understand the risk of disease as well as cultural and demographic factors associated with transmission, vulnerability and/or insufficient preparedness.

While epidemics in humans and livestock may appear inherently stochastic, they actually demonstrate distinct patterns, just as other natural catastrophes do. This means that their risks can be quantified and analysed, with the results used to insure against their impact, despite their substantial diversity.

Since the majority of poor people in rural areas live in close proximity to livestock, sometimes without a safe water supply and usually dependent on livestock for food and milk, the risk of a pandemic spreading from poor regions is greater than many realize. Bird flu and tuberculosis are examples of diseases which can be transmitted between animals and humans. 13 different animal-to-human diseases were already observed, killing more than 2 million people, according to a study from Dreamstime.

Another way to introduce such diseases has been observed in countries such as Georgia, Ukraine and Poland, where most cooking and food production is done in private homes. Viruses have been spread by students returning home during their holiday period and throwing remainders of their fast-food packages into the woods (so called 'Christmas Sandwiches'). Ducks, pigs, frogs and other animals have been infected and have carried diseases to livestock. African Swine Fever and Avian Flu have now entered those countries and will remain there as a threat to humans.

The pandemic and epidemic risks are part of today's reality; whether it's Zika, a vector borne disease (spread through mosquitos), SARS, MERS or other airborne, waterborne of foodborne diseases. What makes vector borne disease very much unpredictable is the fact that mosquitos carrying Zika can also carry diseases such as Dengue Virus, West Nile Fever. And they can carry these diseases throughout the globe.

Information about economic losses of a disease: from foodborne, Ebola, Sars, Mers, etc.

The cost of birds lost to avian influenza can be very large, according to economist Thomas Elam of the Indiana-based consulting group FarmEcon. The direct costs associated to the avian influenza in 2015 in central United States were 1.57 billion US dollars. The additional costs associated with businesses that support farms (i.e. egg and poultry wholesalers, food service firms) pushed the total loss to 3.3 billion US dollars. In addition, the US Department of Agriculture committed 500 million US dollars to emergency efforts to block the disease, and paid out 190 million US dollars to farmers whose birds were destroyed.

Costs linked to foodborne diseases can vary from a relatively modest 450 million US dollars (due to the 2013 Enterovirus 71 outbreak in China) adding up to of 77 billion US dollars, which is due to a large 2012 case of food-borne illness in the USA.

Not only the direct impact of diseases can be a disaster but also the costs related to hospitalizations, treatments, and recovery. Any outbreaks in an economically well-developed country is more costly than an event in a poor country. However, the risk of a spread is higher in a poor country due to the density of living and the lack of preparedness, healthcare and even awareness of the risks.

The number of casualties (deaths or sickness) in outbreaks is not always a good predictor of the extent of the associated economic damages. Other factors also play a significant role. As another example, the costs of the outbreak of Ebola between 2014 and 2016 in Guinea, Sierra Leone and Liberia were - in fact - relatively modest at 2.8 billion US dollars. This is due to the fact, in which the victims of epidemics in those regions either die or recover quickly. On the other hand, as seen in the UK, the persistent foot-and-mouth epidemic in 2001 resulted in damages of 11.7 billion US dollars, after 10 million cows and sheep needed to be killed to prevent the highly contagious disease from spreading.

Globally, there have been over 400 high priority human disease outbreaks over the past 10 years. These have caused significant economic losses, the bulk of which has been uninsured. The World Bank estimates that infections from the Zika virus cost the world nearly 3.5 billion US dollars in 2016. While regional losses due to the 2015 Ebola outbreak were moderate, global losses exceeded 32 billion US dollars. The MERS 2008 loss in South Korea cost approximately 8.2 billion US dollars.

Such economic losses will continue to escalate, due to the fact that the underlying factors driving the emergence of infectious disease are individually and collectively increasing. Keep in mind that the Spanish flu of 1918, who originated in a US soldiers camp in Kansas, killed between 50 and 100 million people, more than the total number of deaths in the First World War. One billion people were infected by the Spanish flu worldwide.

Tell why epidemic risks can follow other events: NatCat, Cyber-attacks, etc.

The late event of Hurricane Maria hitting Puerto Rico in September 2017 demonstrated the vulnerability of bacterial outbreaks after natural catastrophic events. Relying on our environmental infrastructure makes us more vulnerable than we are aware of. Even one month after the event, still 25% of its 3.4 million citizens are without clean water and 80% have no electricity. It will be several months to continue with a normal life in Puerto Rico. The reported cases of the bacterial infection leptospirosis in the region have increased during this period, increasing the possibility of a bacterial outbreak.

In 2010, the earthquake in Haiti demonstrated that epidemics following a natural catastrophe can significantly increase the number of casualties due to the natural catastrophe. The earthquake resulted in more than 230’000 people being killed and 1.5 million people without a shelter. However, the breakout of the cholera killed more than 4’500 people with 300’000 sicknesses. This can be viewed as tragic, but it is not unexpected. Prevention and monitoring of potential epidemic risks in aftermath natural catastrophes can reduce the additional casualties after an event.

Power grid and clean water can be damaged by cyber-attacks, war and/or terrorism. If not available, these infrastructure may impact our living environments. As described in the first chapter, bacterial diseases can spread if the environment in which we are living is stuck due to external factors. The damage and loss of power grid up to a blackout of several days, weeks or months, can damage our environment and our business. The impact of a loss in power grid is underestimated with a huge risk to pandemic and epidemic disease. We all rely on electricity in our daily life from financial transactions, communication up to access to food supply. Losses in power grid can follow a natural catastrophe, an outage or being the result of a cyber-attack either on purpose or by human failure.

What can Cyber Risk learn from Pandemic risk models?

Cyber Risk is a global risk, which can hurt people, industries and infrastructure. The globalization, in particular with respect to power grid and communication, of many countries and regions have a much higher impact to our risk in life than any other business. An attack to any infrastructure can be done on purpose or for harm and in most cases it has the purpose to gain illegal resources and capital. With these thoughts in mind, it makes cyber much more dangerous as pandemic risks. The start of a virus in a system can occur from many locations which are invisible for the attacked infrastructure. Pandemic risks are a failure in the nature of the health system from zoonotic to human diseases. Cyber risks can be also be seen as a failure in the IT systems and communication platforms. Man-made attacks to this system for espionage, sabotage and/or extortion lead to loss or exploitation of relevant information.

The different stages from Cybercrime to Cyberwar can be compared to the impact of a pandemic disease outbreak. Cyber-crime has the goal to potentially gain illegal capital or – in a lighter way – develop addiction or satisfy curiosity. Cyber-attack includes the purpose to do harm. Cyber-terrorism have the motivation to damage the enemy, to create fear and panic and chaos. Cyber-war can be compared to pandemic risks with bio-purposes by using poisoning gas on people or chemical plants. This is – in both cases – very critical as attacks do not depend on the size of the countries and do not have the purpose to gain territories. Acts of Cyber-war or Cyber-terrorism are often part of a “silent” trigger, which distinguish them from Cyber-crime.

Past epidemic and pandemic events are not only acquainted, also the costs and the damage of an outcome of the outbreak are known. Forecasts can be calculated and modelled both for zoonotic and human infectious diseases. In case of the various cyber risks, forecasting the costs is much more difficult to achieve if we think of a borader impact than just damaging medium-sized businesses. Modeling the potential costs of a cyber-attack is beyond mathematical standards because cyber exposures are not proceeding. This is partly due to the frequency and return periods of cyber accumulation events.

The existence of the three layers of Web's enhance that complexity. From the Surface-web, to the Deep-web and the Dark-web, the crime and attacks become less and less visible, but the process to prevent, to respond and to detect a potential crime is similar of the process to prevent, to respond and to detect a potential outbreak of a new pandemic disease.

Conclusion

Although, modelling of cyber risks is by far a more challenging than pandemic risks, they both require data of past attacks, understanding of the costs of the damage and strong actuarial models. There are more and will be more questions than answers from various anchors such as the insurance industry, technology and security firms. Who should lead such developments? Cyber or Pandemic specialists? Or Cyber-Pandemic specialists…