

Perspectives

Mini-pandemics – more worrying than you think

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This year marks the 100th anniversary of the Spanish Flu pandemic, which broke out in 1918 and ended up killing an estimated 50 million people. In this article, we look at pandemics in modern times, exploring our view that insurers currently only consider complete melt-down pandemic situations (which they then ignore as being unlikely), when they should also be worried about ‘mini-pandemics’.

Pandemics and mini-pandemics: past, present, future

The World Health Organization defines a pandemic as an epidemic disease that has spread across populations over vast areas¹. In Greek, “pan” means “all” and “demos” means people – a pandemic then can be said to impact “all people”.

Over the course of human history, the largest pandemic is still the Black Death (or Bubonic Plague) of the 14th century². The highest death toll of any epidemic ever recorded, it reduced the world’s population by 100 million – over one-fifth of the estimated 450 million alive at that time. More recently, Spanish flu spread across the world in 1918 and exacted a death toll of between 20 to 50 million, while AIDS claimed the lives of over 30 million people between 2005 and 2012³. This is not to say that other pandemics in human history have been less deserving of attention, just less well documented (see *Figure 1*).

These include localised or less fatal epidemics, such as the outbreaks of cholera or dengue fever that have become commonplace in the 21st century. Cholera infects an estimated 3 million people annually but, thanks to improvements in early treatment, now

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kills only about 100,000³. Similarly, an estimated 390 million people are infected by dengue fever each year and, of these, 500,000 cases develop into dengue haemorrhagic fever – a more severe form of the disease that results in up to 25,000 deaths annually worldwide⁴.

Figure 1: Rank of Global Pandemic Death Tolls²

Rank	Pandemic	Year	Death Toll (approx.)
1	The Black Death	1346 - 1353	75 – 200 million
2	“Spanish Flu” Pandemic	1918	20 – 50 million
3	HIV/AIDS	2005 - 2012	36 million
4	The Plague of Justinian	541 - 542	25 million
5	Antonine Plague	165 AD	5 million
6	Asian Flu	1956 - 1958	2 million
7	Flu Pandemic	1968	1 million
8	Flu Pandemic	1889 - 1890	1 million
9	3rd Cholera Pandemic	1852 - 1860	1 million
10	6th Cholera Pandemic	1910 - 1911	1 million

¹ http://www.who.int/csr/disease/swineflu/frequently_asked_questions/pandemic/en/

² <https://www.mphonline.org/worst-pandemics-in-history>

³ <http://www.who.int/bulletin/volumes/90/3/11-093427/en/>

⁴ <http://www.eliminatedengue.com/our-research/dengue-fever>

How do pandemics impact insurers?

If you were to ask most insurers today what they think, or do, about pandemic risk, they might respond in one of the following ways:

- What's the point worrying about a 1-in-1,000 year event?
- If we go bankrupt, our competitors will too.
- We hold the pandemic risk capital required by the regulator and that's enough. It is only calculated assuming a mortality spike due to something like a massive flu epidemic, and it isn't very onerous.

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To begin with, wider global trends are significantly impacting the frequency and scale of such pandemics. These trends include climate change, global travel patterns, technology advances, and the rise of multidrug resistance.

It has long been known that the incidence of epidemics is correlated with weather events, for example

El Nino with increased malaria, diarrhea and hantavirus infections, and La Nina with chikungunya virus, West Nile virus and Japanese encephalitis outbreaks⁵. With the rapid acceleration of international air travel – over 2 billion air passengers recorded per annum in the first decade of this century (compared with only 70 million in the 1950s) - we see increased speeds of transmission of disease-carrying pathogens across continents. Increased drug resistance is also becoming a real problem, as overuse of antibiotics, pesticides and vaccines renders them ineffective at preventing and treating infectious diseases.

A bright spot on the horizon at least is that technological innovations, such as mobile apps and telemedicine and mobile prescriptions, are making it easier to identify, report and widely communicate in the early days of an epidemic, and to administer early-stage consultations and treatment to contain the spread of disease.

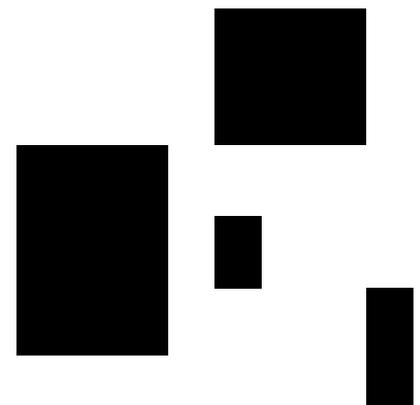
The effect of some of these factors is, as we have already seen, that small-scale, fairly contained epidemics, can cause severe financial stress. Middle Eastern Respiratory Syndrome (MERS) caused USD 10 billion of financial losses in South Korea⁶ within three months of the first Korean diagnosis. When South Asian Respiratory Syndrome (SARS) broke out in 2003, the MSCI Pacific ex-Japan Index fell by 12.8% in two months⁷, while Asia-Pacific airlines saw revenues fall by USD 6 billion⁸. Tourism to Singapore fell 70% and Singapore's GDP reduced by USD 400 million that year⁶. The World Bank estimated China's SARS-related losses at USD 15 billion, and global losses at up to USD 40 billion⁵.

In the US, where the 2017-2018 flu season has been one of the worst in recent history, influenza hospitalisation

at one point this year was the highest the Centers for Disease Control and Prevention (CDC) has ever recorded. In a mild year, flu kills about 12,000 people; in a bad year, it kills up to 56,000⁹. No longer can we think of any flu or other infectious disease as being too far away to affect us. In a globally connected world, an epidemic spreading to nine countries could cost the US between USD 8 to 41 billion³.

Mitigating the impact from pandemics and mini-pandemics

For insurers, sound Enterprise Risk Management (ERM) can play a significant part in mitigating evolving pandemic risks. One of the foundation stones of an ERM strategy is a holistic framework that encourages insurers to identify all possible risks that could impact their business and to understand their interconnectedness. *Figure 2* outlines a six-step approach which can then be applied to mini-pandemic risks.



⁵ <https://www.sciencedirect.com/science/article/pii/S0160412015300489?via%3Dihub>

⁶ <http://www3.asiainsurancereview.com/News/View-NewsLetter-Article/id/41519/Type/ARM/New-global-pandemics-feared-experts/1/sid/197957>

⁷ <http://www-stat.wharton.upenn.edu/~steele/Pandemic/Resources/FidelityPandemic.pdf>

⁸ <https://www.reuters.com/article/us-reutersmagazine-davos-flu-economy/flu-economics-the-next-pandemic-could-trigger-global-recession-idUSBRE90K0F820130121>

⁹ <https://www.nytimes.com/2018/01/18/health/flu-season-facts.html>

Figure 2: Six-step enterprise risk management approach



- The first step, risk appetite would require articulation of the insurer's tolerance for such risks. For example, would insurers want to hold capital just adequate to support a 1-in-50 mini-pandemic event? Or, would their tolerance be closer to 1-in-200? What would be the impact of a mini-pandemic to the insurer's balance sheet or profit and loss statement (P&L) – and which is more relevant?
- Next, how would the insurer identify and assess mini-pandemic risks? What definitions are currently employed by the insurer to define mortality or morbidity risk and what benchmarks is the insurer already using to measure their own experience?
- Moving on to risk measurement, the insurer would want to assess how they should model such risks – would a standard industry formula be sufficient or would they want to develop an internal model given the materiality and specificity of their own portfolio? How should the insurer choose to monitor and report emerging and developing risks?
- To initiate the remaining steps, the insurer should then link the answers to these questions back to their business strategy, in order to determine the type and level of stress and scenario testing that they might perform. Most importantly, the insurer's actions to identify and manage mini-pandemic risk should be communicated to its stakeholders, ranging from shareholders to customers.

Reinsurance solutions

Understanding and quantifying the risk of mini-pandemics and pandemics is an essential first step. However, this is not just about nasty flu strains, but includes many other infectious conditions. Insurers also need to make a decision about retaining the risk of mini-pandemics on their P&L, or pandemics on their balance sheet, or whether they want to transfer the risks to a reinsurer, or even the capital markets.

There are many options here, and it is more than a checklist exercise to decide on the right solution for each case. The available options include:

- Traditional reinsurance which would transfer risk proportionally (however pandemic events would only be reinsured in the same proportion).
- Standard Personal Accident (PA) Catastrophe (Cat) covers can be extended to include infectious disease outbreaks as an 'event' (defined over a certain number of weeks, rather than a certain number of hours like other Cat events) – the cost of this extension is quite low, but so is the extent of the protection.
- Extreme mortality reinsurance represents another option, which operates as a portfolio-wide stop loss. The reinsurer would take on all excess mortality beyond, say, 110% of expected.
- When insurers would rather not take on the credit risk of the reinsurer making payments under the above treaty structure (since the Cat would be impacting the reinsurer's own balance sheet), and especially for large portfolios, companies might choose to issue a Cat bond to the capital markets. This would largely operate as a portfolio stop loss, but as a bond, not reinsurance.

Many more options exist, and the ideal solution depends on the size of the portfolio and the company's risk appetite targets and tolerances.

Dengue Fever: a more enlightened view of the risks

Dengue fever is an excellent example of a mini-pandemic. We have not yet seen anyone predicting that the insurance industry will be brought to its knees due to dengue fever, but if we focus on what a 1-in-50 year scenario might look like, there are some interesting points worth noting about this mosquito-borne disease.

- Although outbreaks have been relatively benign so far, statistics¹⁰ suggest insurers' health insurance claim ratios have increased by 5% in years with relatively more severe dengue fever outbreaks.
- The incidence of dengue fever has increased globally by 30-fold in the last 50 years¹¹, driven by trends in globalisation, travel and global warming. As these trends continue, we will see the incidence of dengue fever increase even in regions such as North America and Europe where it is rarely reported.
- If an individual infected with dengue fever is subsequently infected with a different variant or serotype (there are four known variants), the second infection is much more severe and potentially fatal. Different serotypes can be prevalent at different times and in different regions.
- Dengue fever impacts insurance companies, not just through claim costs of treatment, hospitalisation, and even deaths, but also operational costs.

Dengue fever outbreaks tend to follow a cyclical pattern – with particularly severe outbreaks occurring every five years. Due to the complex interplay of factors affecting the incidence and severity of dengue fever infections, we see dengue fever as a potential mini-pandemic just waiting to happen.

What can insurers do about dengue fever? Using the ERM approach, insurers could start with appropriate quantification of dengue fever risk in their books. Several versions of dengue fever epidemiological models already exist and are well documented in academic literature. These include variants of the S-E-I-R (Susceptible – Exposed – Infected – Recovered) model, which Willis Towers Watson has adopted.

Don't just think big

For now, most insurance companies still tend to think about pandemics in terms of 1-in-200 meltdown scenarios, and they can be somewhat fatalistic about such events, thus doing nothing. However, long before extreme events hit, there are less severe events which can still significantly impact a company's financial metrics.

We believe insurers are missing a large risk measure if they overlook all mini-pandemics that are less than “total death and devastation” scenarios.

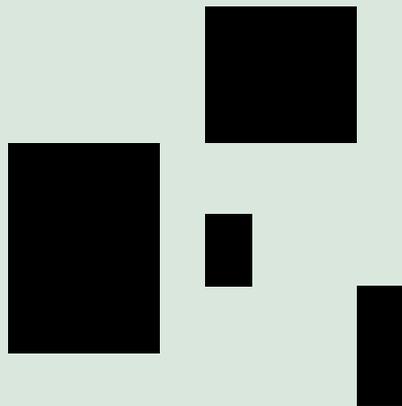
The good news is there are multiple possible solutions available to insurers to mitigate these risks, starting with effective risk management, and including reinsurance solutions ranging from run-of-the-mill non-proportional solutions to more exotic Cat bonds.

How can Willis Towers Watson help?

Willis Towers Watson has actuarial health consulting teams, reinsurance broking specialists, generalised mortality and specialised pandemic models, and the Global Captives Practice – who are available to work with you to identify, quantify, constrain or mitigate clients' risks.

¹⁰ Willis Re

¹¹ Kristie L.Ebia, Joshua Nealon. <https://doi.org/10.1016/j.envres.2016.07.026> Dengue in a changing climate;



About Willis Towers Watson

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