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An Investigation into the Insurability of Pandemic Risk

October 2020

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The Geneva Association

The Geneva Association was created in 1973 and is the only global association of insurance companies; our members are insurance and reinsurance Chief Executive Officers (CEOs). Based on rigorous research conducted in collaboration with our members, academic institutions and multilateral organisations, our mission is to identify and investigate key trends that are likely to shape or impact the insurance industry in the future, highlighting what is at stake for the industry; develop recommendations for the industry and for policymakers; provide a platform to our members, policymakers, academics, multilateral and non-governmental organisations to discuss these trends and recommendations; reach out to global opinion leaders and influential organisations to highlight the positive contributions of insurance to better understanding risks and to building resilient and prosperous economies and societies, and thus a more sustainable world.

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Foreword

We offer our deepest empathy to the countless people, communities and businesses who have been impacted by COVID-19. At the time of publication of this report, in late October 2020, there have been more than 40 million cases and 1 million deaths recorded globally. Many countries are experiencing a second or third wave of the virus.

There is a great proliferation of information and views on COVID-19, and what we read, unfortunately, is not always rooted in facts. The insurance space is no exception.

This first report in The Geneva Association's research series on pandemics and insurance sets out to explore – in objective terms – the capacities of insurers to absorb pandemic-related costs.

Encouragingly, pandemics on the scale of COVID-19 pose no fundamental insurability challenges for health and life insurers, allowing them to fully play their protection and support role to affected people and communities.

> Health and life insurers can fully play their protection and support role to people and communities affected by COVID-19.

The picture is different for property & casualty (P&C) losses. Even those who anticipated the scenario of a global pandemic did not fathom the nature and scale of government decisions taken around the world to slow infections: wide-ranging shutdown measures that brought economies to a standstill.

From an insurance perspective, this type of government response is neither predictable nor modellable. That is one of the reasons why pandemic risk was not included in most business interruption policies.

Our research findings are unambiguous: the property & casualty insurance industry, which collects USD 1.6 trillion in premiums per year for all policies – and a mere USD 30 billion for business interruption risk – is not the right vehicle for shouldering the projected global loss in GDP for 2020 of USD 4.5 trillion.

As a consequence, governments need to involve themselves in closing the pandemic protection gap in P&C. And insurers still have a role to play. Our second pandemics report will explore possible solutions: innovative, public-private efforts that recognise the enormous magnitude and unique nature of pandemic risks.

Taken together, we hope these reports will help governments and insurers think about and agree upon feasible, effective ways to work together to better protect society from extreme risks, such as pandemics, going forward.

Jad Ariss
Managing Director

1. Executive summary

COVID-19 and the draconian shutdown measures adopted by many governments to contain it have plunged the global economy into the deepest recession since the Second World War. For the global insurance industry, too, the pandemic is a severe loss event. Despite this massive strain, initially exacerbated by a steep decline in capital markets, insurers worldwide promptly paid legitimate claims in all areas where pandemic risk was intended to be covered; for example, under life, health and event cancellation policies. In addition, also during the lockdowns, insurers have continued to pay claims and benefits unrelated to the pandemic; for example, in motor, liability and annuities insurance.

At the same time, COVID-19 has exposed massive protection gaps in the area of business continuity risk. Less than 1% of the estimated USD 4.5 trillion global pandemic-induced GDP loss for 2020 (source: The World Bank) will be covered by business interruption insurance – a niche segment which generates annual premium income of about USD 30 billion (less than 2% of the world's property & casualty insurance market), with cover generally intended for and triggered by physical damage only.

The mismatch between economic losses and the risk-taking capacity of insurers who offer business interruption cover, as well as past demand for pandemic coverages, is staggering. With annual business interruption insurance premiums of about USD 30 billion, insurers would have to collect premiums for 150 years in order to absorb the estimated USD 4.5 trillion global output loss inflicted by COVID-19 and its handling in 2020. Even the size of the entire global property & casualty insurance industry (USD 1.6 trillion in premiums, according to McKinsey) is eclipsed by the economic damage from the pandemic. In order to cover the total cost, all property & casualty insurers worldwide would have to collect premiums across all lines of business for almost three years, with no money left for covering private homes and vehicles, injured workers and numerous liability exposures. Therefore, property & casualty insurers have typically applied strict exclusions on pandemic business continuity risk and never intended to cover it.

Insurers would have to collect business interruption insurance premiums for 150 years in order to absorb the estimated USD 4.5 trillion global output loss inflicted by COVID-19 and its handling in 2020.

Existing protection gaps facing individuals and households in the areas of mortality and healthcare risk have been much less highlighted by this pandemic due to relatively moderate excess mortality and slightly reduced overall healthcare expenditure.

The extent of correlation and aggregation of pandemic losses for businesses across the globe has put the insurability of pandemic risk in the spotlight. It touches upon

the pivotal question of whether pandemics are a type of risk for which the insurance industry can play any kind of role or if this is the type of risk where traditional insurance products are not the solution.

It is not difficult to intuitively understand the limits to insuring pandemic risk. The word 'pandemic' originates in the ancient Greek ('pan' means all and 'demos' means people). Pandemic-induced business continuity risk is obviously unique given its potential to impact virtually all policyholders simultaneously, over an extended period of time. Applying the two most relevant customary criteria of insurability to pandemic business interruption risk yields the following conclusions:

First, losses are neither random nor independent. Even though pandemics are naturally occurring phenomena, policy decisions to lock entire economies are deliberate and intentional. This means that expected loss amounts and risk loadings cannot be set. There are also no historical data for the policy responses witnessed during COVID-19. Furthermore, the strong correlation among individual risks renders efficient risk pooling and diversification impossible.

Second, the maximum possible loss is not manageable from the insurer's solvency point of view. The uncontrollable aggregation of losses could be ruinous to the risk pool and, ultimately, to the insurance industry as a whole. This in turn could lead to significantly further financial stability risks across the wider economy.

The uncontrollable aggregation of losses from pandemic business interruption could be ruinous to the risk pool and, ultimately, to the insurance industry as a whole.

As opposed to business continuity, pandemic life and health risks are generally non-systemic and privately insurable. Excess mortality risk is modellable based on a wealth of historical data. In addition, increased mortality risk is (partially) offset by reduced longevity. For health insurers, there is a 'natural' limit to claims given the finite capacity of healthcare systems and temporarily reduced expenditure on non-pandemic-related procedures. Hence, there are generally no exclusions for pandemics or other common causes of extreme mortality and health events. Having said this, life and health insurers' resilience could be tested by future pathogens which may be more aggressive and lethal than COVID-19.

In addition to distinguishing between uninsurable and insurable parts of pandemic risk, it is important to understand the differences between pandemic and other catastrophic risks, first and foremost, in terms of the scope for global diversification. Pandemics are, by definition, not diversifiable as they occur on a very wide or even global scale (as opposed to epidemics which are more locally concentrated). Some other risks such as terrorism or natural catastrophes are diversifiable on a global level and routinely transferred via re/insurance or Alternative Risk Transfer (ART) instruments. These disasters impact a limited number of policyholders for a limited period of time. As COVID-19 illustrates, economic losses caused by extreme pandemics and their handling by public authorities are neither locally nor globally independent. Therefore, pandemic business continuity risks are uninsurable.

Pandemics are, by definition, not diversifiable as they occur on a very wide or even global scale.

Having said this, insurers are aware of the need to address this socio-economic challenge. The industry is prepared to explore the scope for innovative solutions and public sector-led efforts which acknowledge the enormous magnitude and unique nature of this particular risk.[1]

1 To be discussed in-depth in our forthcoming publication *Public and private solutions to pandemic risk* (November 2020).

2. Quantifying the challenge: Global protection gaps in light of the pandemic

2.1. The notion of protection gaps

For re/insurers there is significant uncertainty about the ultimate claims burden from COVID-19. According to Swiss Re 2020, the mid-point of the range of current publicly available estimates is around USD 55 billion for all lines of business. In any case, the insured part will be dwarfed by the economic cost of the pandemic. For 2020, the World Bank currently expects a 5.2% contraction of the global economy (World Bank 2020), amounting to more than USD 4.5 trillion in lost output.

The share of uninsured losses in total economic losses is generally referred to as the *protection gap*. A more meaningful measure, however, is the notion of the *insurance protection gap*, defined as the difference between the amount of insurance that is economically beneficial for both insureds and insurers on the one hand and the amount of coverage actually purchased or offered, on the other. This gap is significantly smaller than the broader protection gap, for some of the following reasons:

- Certain risks simply defy insurability, with pandemic risk being a case in point (see section 3.3).
- A certain level of risk retention makes economic sense to incentivise risk prevention measures and risk-conscious behaviors.
- Insurers implement deductibles to mitigate moral hazard, i.e. a tendency on the part of the policyholder to behave more carelessly because they have insurance cover. Deductibles translate into lower sums insured.
- Institutional factors, such as extensive social security benefits or government post-disaster relief, reduce the need for individuals to take out private insurance (The Geneva Association 2018).

In reality, however, the insurance protection gap is hard to measure and highly subjective. Each insured individual or business assesses the economic benefits of insurance differently. Similarly, on the supply side, insurance companies differ in their view as to what is insurable and at what minimum price (Karten 1997). Therefore the notion of the insurance protection gap is generally replaced by the wider, easier to quantify but less meaningful overall protection gap measure which compares covered losses with total economic losses.

In the following section, we explore protection gaps for the three areas of pandemic risk discussed in this report – business interruption, health and mortality. The scope and scale of such gaps is enormous. It entails businesses (especially small vulnerable

ones) defaulting within weeks, households suffering financial stress from additional out-of-pocket healthcare expenditure or, in extremis, impoverishment if the main breadwinner dies from COVID-19.

Against this backdrop, it is important to understand the limits to insurability presented by the various forms of pandemic risk. This awareness is an indispensable foundation for subsequent discussions on pandemic risk.[2]

2.2. COVID-19: Assessing the shortfalls

In the following section we explore protection gaps in the areas of business interruption (BI), mortality and health. These risks were selected, first, because of their relevance to both insurers and customers during COVID-19 and, second, especially for mortality and health, because of the availability of meaningful data.

2.2.1. The business interruption protection gap

In the context of COVID-19, the protection gap debate focuses on the trillions of dollars of economic losses arising from the impact of government-mandated lockdown measures worldwide and the share of these losses insurers could or should absorb.

The relevant dimensions and proportions speak for themselves: P&C insurers globally generate annual premium income of about USD 1.6 trillion (McKinsey 2020). They would have to collect this amount of premiums across all lines of business for almost three years in order to cover the estimated USD 4.5 trillion global loss in GDP (see Figure 1 for an illustration).[3]

We estimate the aggregate capital base of the world's P&C insurance sector at a similar size of USD 1.6 trillion. Therefore, in a global lockdown scenario, insurers' entire surplus would be exhausted after a few months. In light of the probability of a major pandemic event (industry experts put it at 30–40 years), and given the current levels of industry capital (versus levels of exposure to pandemic risk), this risk would impose a material solvency risk on the sector and harm many other policyholders from other lines of business, as well as create a potential financial stability threat.[4]

Only a tiny fraction (an estimated USD 25–30 billion[5], or less than 2%) of the world's total P&C premium base is linked to BI coverage. The lion's share of the industry's premiums and capital backs private homes and vehicles, injured workers and numerous liability exposures unrelated to COVID-19 (Hartwig and Gordon 2020a).

Further assuming that global insured BI losses from the pandemic could ultimately amount to USD 20–40 billion for 2020,[6] insurance claims would cover less than 1% of global COVID-19-induced GDP losses, translating into a protection gap of more than 99% (based on the earlier assumption of USD 4.5 trillion BI-related economic losses).[7] In other words, the global P&C insurance industry would have to collect BI premiums for at least 150 years in order to absorb the estimated global output loss from the pandemic in 2020.

> Effective private market insurance coverage for BI losses would necessitate rates which would likely be unaffordable or unattractive for commercial buyers.

Effective private market insurance coverage for BI losses would require multiple times the current premium and capital base of the P&C insurance industry and necessitate rates which would likely be unaffordable or unattractive for commercial buyers (see section 3.3). These supply-side reasons for the private P&C insurance market's decision to limit exposure to pandemic risk are compounded by demand-side barriers such as the underestimation by

2 See section 3 of this report as well as The Geneva Association (2020).
3 Global output losses are obviously not a perfect proxy for business continuity losses. Government support measures have provided significant relief to businesses.
4 For the U.S., The American Property Casualty Insurance Association (APCIA) estimates monthly lockdown-induced BI losses for smaller, and arguably the most vulnerable, businesses with fewer than 100 employees at USD 255 billion to 431 billion (APCIA 2020). If fully insured, these businesses' losses alone would exhaust the U.S. P&C insurance industry's entire capital in 2–3 months.
5 We estimate that 20–25% of global commercial property premiums of about USD 115 billion (source: Allianz Research, 2018 figure) reflect BI risk. Note that this premium pot almost exclusively covers BI risks with an unequivocal physical damage trigger (e.g. a fire at a manufacturing plant).
6 Willis Towers Watson 2020 estimate insured BI losses (including event cancellations) in the U.S. at roughly USD 10–20 billion, including an allowance to pay claims on policies where no coverage was intended, as triggered by litigation, regulation and/or legislation. The share of the U.S. market in global commercial property premiums is about one third. Assuming a lower level of BI insurance penetration and legal uncertainty in other parts of the world, global insured BI losses could come in at the estimated range of USD 20–40 billion.
7 Again, global output losses are not a perfect proxy for business continuity losses.

businesses and households of a pandemic's probability of occurrence,[8] the speed and/or extent to which a virus spreads, the probability and/or duration of government-imposed lockdown measures, or excessive optimism about the ability of scientists to develop treatments and vaccines. Demand can be further reduced by people's expectation that, if a truly disastrous pandemic event hits, governments will be there to provide financial assistance (Hartwig et al. 2020). This analysis suggests that the overwhelming majority of pandemic BI risk will remain uninsured by private insurers given the prohibitive amount of premiums and capital required to offer credible and secure insurance coverage (OECD 2020a).

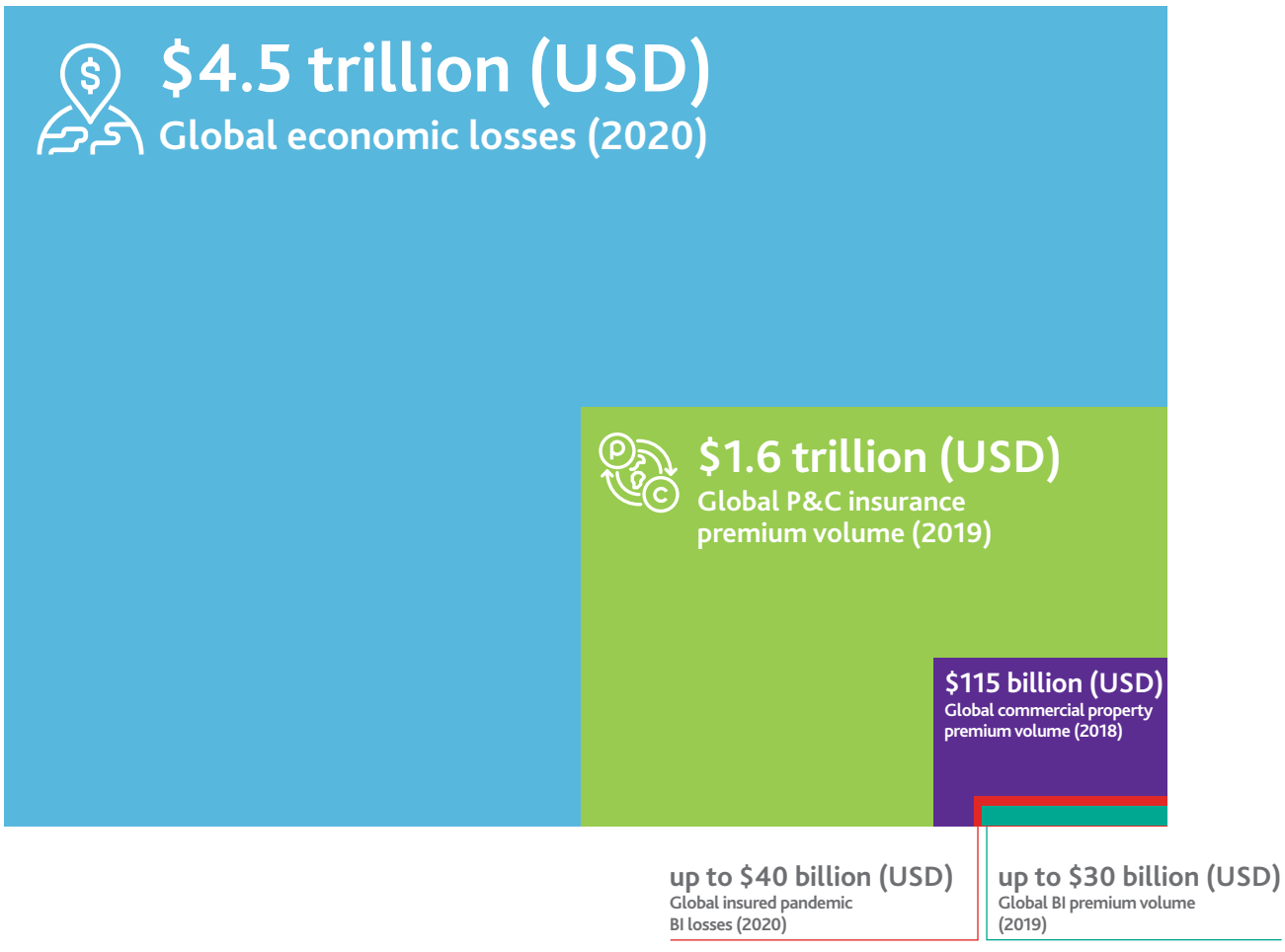
In summary, in light of these supply- and demand-side factors at work, the massive BI protection gap compares with a much smaller BI insurance protection gap as defined as the difference between the amount of insurance that is economically beneficial and feasible for both customers and insurers, on the one hand, and the amount of coverage actually purchased or offered, on the other.

2.2.2. The health protection gap

Even conceptually, the capture and quantification of the healthcare funding gap is a challenging endeavour. To a major extent, healthcare expenditure is discretionary and depends on the quality of healthcare services. Public healthcare services, for instance, are available in many markets at affordable prices, but accessibility, long average waiting times and quality are frequent issues. Consumers seeking state-of-the-art or timely treatment

Figure 1: An illustration of the global pandemic BI protection gap

All figures are estimates.



Source: The Geneva Association (based on The World Bank 2020, McKinsey 2020a and contributions from Allianz Research)

8 PathogenRX, a BI pandemic risk product, was not widely purchased in the years preceding COVID 19; a clear indication of the demand-side challenges highlighted above.

Box 1: Protection gaps in trade credit insurance

In 2019, credit insurers worldwide wrote around USD 15 billion in premiums (including surety). This corresponds to about 1% of the global premium pool in P&C insurance (excluding health). Despite its relatively small size, credit insurance is of significant economic importance. Its total exposure amounts to around USD 3.3 trillion. That is, approximately 15% of global merchandise trade is covered by credit insurance.

This raises two questions: How can such a small industry shoulder such a large exposure? And does the fact that about 85% of global trade is not insured suggest a huge 'protection gap'?

On the first question, credit insurance differs from most other insurance lines in one key respect: it is based on a dynamic relationship. Trade credit insurance policies are continually updated and cross-referenced over the course of the policy period. While policyholders can constantly adjust their needs for credit limits, notably when increasing business with existing clients or when approaching new prospects, the credit insurer monitors its customers' business partners throughout the year to ascertain their continued creditworthiness. In case of doubt, individual coverage limits are reduced. This flexibility allows credit insurers to keep pricing very moderate, with premiums as a percentage of total exposure standing well below 1%. This has to be seen against the backdrop of the annual global corporate default rate only having dropped below 1% in two years since the Global Financial Crisis – when it rose to over 5%.

On the second question, not every business relationship requires insurance, e.g. if the customer is a long-term trusted business partner, a government, a blue chip company or a member of the same group (about two thirds of global trade in goods are estimated to be intra-group deliveries). This also makes the real value of credit insurance clear: supporting customers in their expansion by opening up new international markets and business relationships. Ultimately, credit insurance is not only about indemnifying losses incurred from a default, but also providing businesses with the support and expertise to improve their risk management. Credit insurers offer actionable economic knowledge, making them information providers rather than pure risk carriers.

Having said this, credit insurers are not infallible. In extreme cases, individual limits may be withdrawn completely. This happened in the Global Financial Crisis, accelerating the downward spiral because, in the worst case, transactions without cover were not conducted at all. As a result of these experiences, many governments acted quickly in the COVID-19 crisis and, by means of state protection shields, enabled credit insurers to maintain their limits – for the benefit of their customers and the economy at large.

Source: Allianz Research

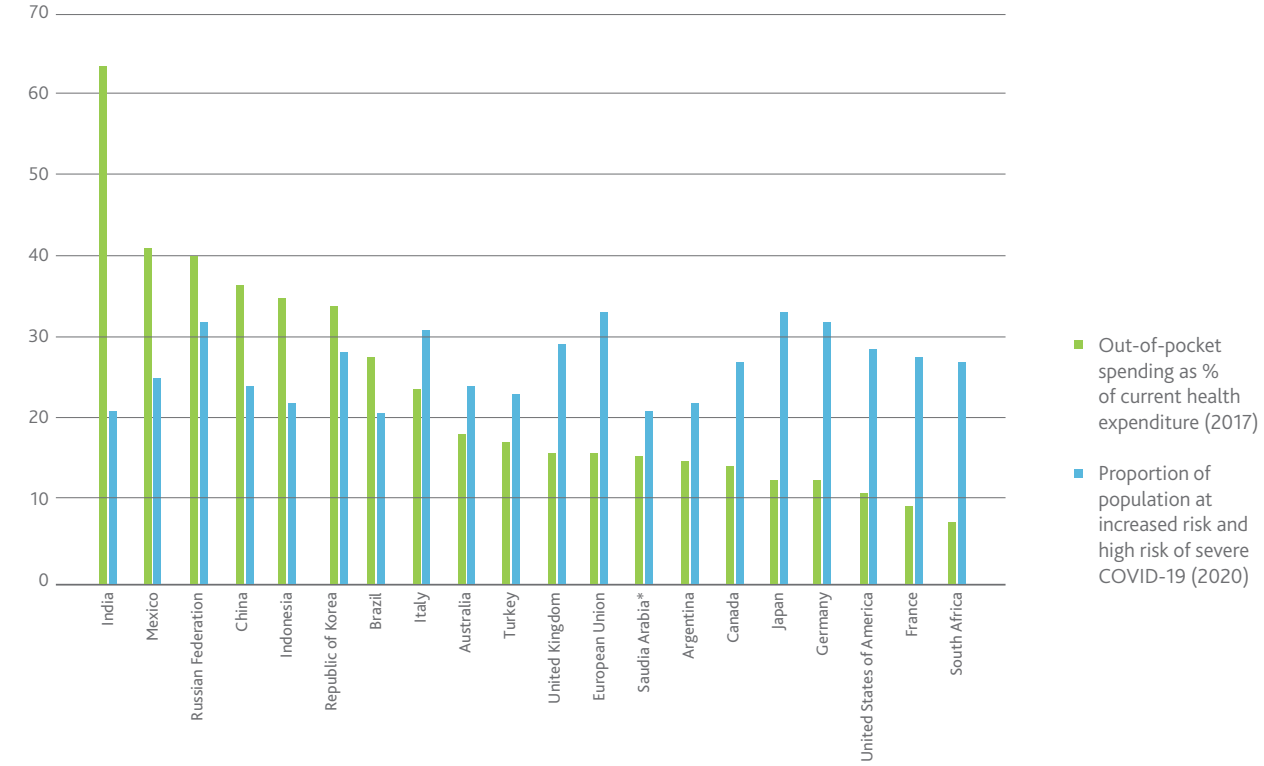
usually face significantly higher costs. In addition, the dynamics of socio-economic variables such as ageing populations, volatile and difficult to predict government policies (including subsidies and tax incentives) and cost inflation as a result of medical advancements can have a notable impact on the cost of necessary treatment (The Geneva Association 2019).

Despite these challenges, various parameters have been used to gauge the size of the health protection gap. One common proxy is out-of-pocket spending (OOPS), i.e. the part of national health expenditure that comes from household savings. The focus here is on the share of OOPS that is stressful to households – that results in the need to reduce discretionary spending on food or education in order to pay medical bills. OOPS, however, fails to take into consideration cases of non-treatment or under-treatment due to affordability and accessibility reasons.[9]

Introducing the current context of the global pandemic, Figure 2 compares the relevance of OOPS in the G20 countries with the estimated shares of the population at increased risk of severe COVID-19 due to underlying health conditions (reflecting primarily demographic and lifestyle-related peculiarities). The figure illustrates those countries' populations' vulnerability to financial stress or even catastrophe as a result of COVID-19.

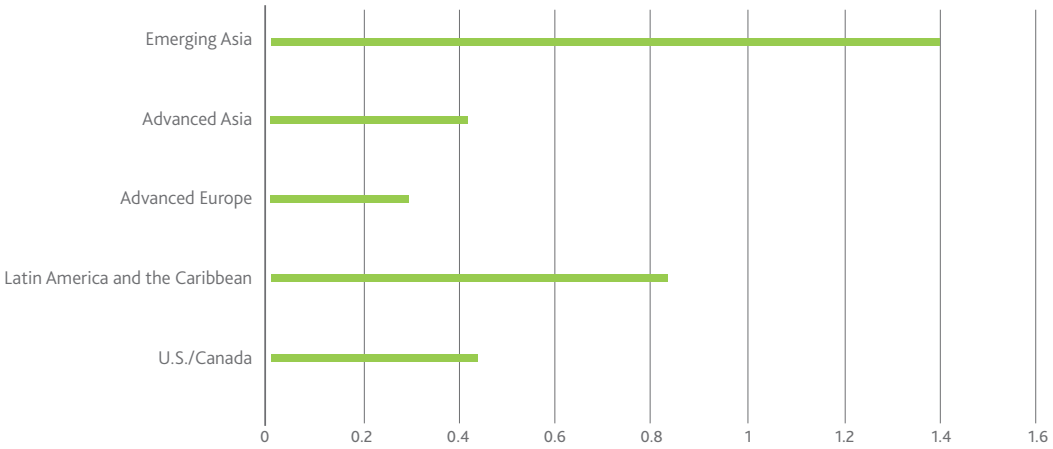
9 Other researchers have focused on catastrophic health expenditure or the risk of impoverishment from unexpectedly high medical expenses as a key determinant of the health protection gap (see, for example, Wagstaff et al. 2018). Every year, about 100 million people are still being pushed into extreme poverty (defined as living on less than USD 2per day) because they have to pay for health care. And over 900 million people, around 12% of the world's population, spend at least 10% of their household budgets on health care (WHO 2019).

Figure 2: Out-of-pocket spending as a percentage of current health expenditure (2017) and estimated share of population at increased risk of severe COVID-19 due to underlying health conditions[10]



Source: The Geneva Association (based on WHO's health expenditure database and Clarke et al. 2020)

Figure 3: Regional health protection gaps (insurance premium equivalents as a share of GDP, in %)



Source: The Geneva Association (based on Swiss Re 2019)

10 In line with WHO standards, Clarke et al. (2020) define a severe case of COVID-19 as 'a patient with severe acute respiratory illness': 1) fever, 2) at least one sign/symptom of respiratory disease, e.g. cough, shortness of breath and 3) requiring hospitalisation. Conditions associated with increased risk of severe COVID-19 include the following 11 categories: 1) cardiovascular disease, including cardiovascular disease caused by hypertension; 2) chronic kidney disease, including chronic kidney disease caused by hypertension; 3) chronic respiratory disease; 4) chronic liver disease; 5) diabetes; 6) cancers with direct immunosuppression; 7) cancers without direct immunosuppression, but with possible immunosuppression caused by treatment; 8) HIV/AIDS; 9) tuberculosis (excluding latent infections); 10) chronic neurological disorders; and 11) sickle cell disorders.

Figure 2 reveals, for example, that Indians' massive vulnerability to health protection gaps is somewhat offset by a low level of increased risk of severe cases of COVID-19. Russians look particularly vulnerable with an OOPS share of 40% compounded by a 32% risk of severe COVID-19. It is however important to note some of the challenges inherent in analysing this type of data. While the U.S. appears to be in a relatively strong position when looking at OOPS, it is clear that other variables, such as macro-economic conditions, can quickly lead to a deterioration in healthcare (as discussed in Case Study 1).

Figure 3 offers a different perspective on the relevance of health protection gaps in a number of major regions. It is based on the premium equivalents of underlying gaps in sums assured, or protection available from public and private schemes versus protection needed, i.e. total healthcare expenditure. The figures understate the true extent of health protection gaps as they do not consider the so-called 'treatment gap' (i.e. required healthcare services not accessed because of a lack of availability or affordability). The figures also require an estimation of what level of OOPS on health is stressful for households, which depends on a country's development status. In advanced economies, for example, a larger share of OOPS is part of co-insurance and deductibles (Swiss Re 2019).

Premium-based health protection gaps as a share of GDP are, as expected, most pronounced in emerging markets, especially in Asia. In advanced Europe, the gap is smallest, at about one-fifth the level calculated for emerging Asia (Figure 3). In absolute premium equivalents, 'Emerging Asia' and the U.S./Canada exhibit the largest health protection gaps, at USD 278 billion and 95 billion, respectively (Swiss Re 2019).

In general, closing these protection gaps through private-sector insurance solutions looks much more realistic than addressing pandemic BI risk, especially as pandemic health risk is insurable, in principle (The Geneva Association 2019 and section 3.3.2 of this report).

From a macro perspective, COVID-19 is expected to further exacerbate health protection gaps across the globe. Even though healthcare spending globally is forecast to fall in 2020 (EIU 2020), [11] the hit to national incomes (as measured by Gross Domestic Product (GDP)) is almost certain to be significantly more severe. Therefore, the share of healthcare expenditure in total GDP is set to further increase in 2020. Assuming a constant relationship between total healthcare expenditure and OOPS, health protection gaps will become even more acute, especially in emerging countries like India where healthcare expenditure in 2020 is projected to increase by 5% (in local currency) but GDP is forecast to contract by at least 3% (EIU 2020).

11 COVID-19 has led to a sharp drop in spending on other conditions, with non-urgent care cancelled and patients avoiding hospitals and clinics. However, EIU 2020 expect spending on non-coronavirus care to recover in 2021, also driven by the expected availability of effective vaccines and treatments.

Case Study 1: COVID-19-induced health protection gaps in the U.S.

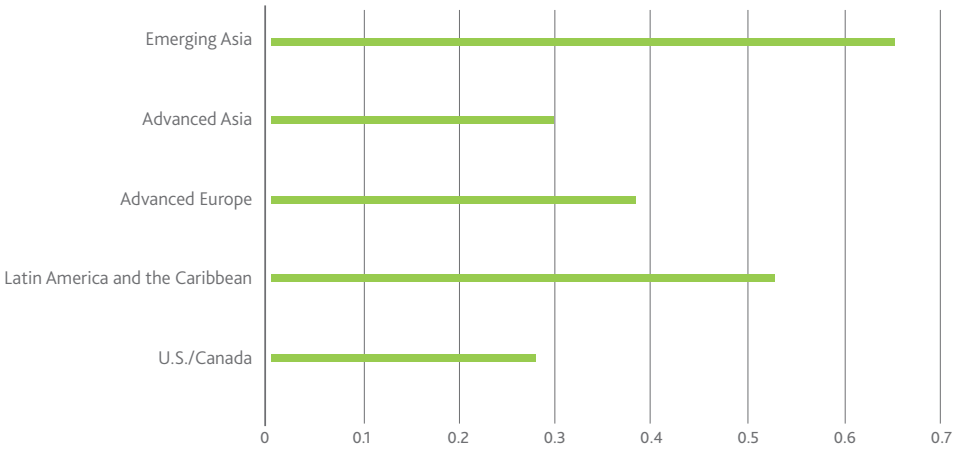
Based on past hospitalisations for pneumonia and other respiratory illnesses, tens of millions of Americans could face significant out-of-pocket medical expenses for COVID-19 hospitalisations, despite the fact that many insurers have waived cost-sharing requirements. Researchers from the Johns Hopkins Bloomberg School of Public Health analysed out-of-pocket costs for pneumonia and other respiratory illness hospitalisations from January 2016 through August 2019 as a potential indicator of likely COVID-19 costs. The study found that these out-of-pocket costs were particularly high for 'consumer-directed health plans' which account for about 60% of employer-sponsored health insurance plans in the U.S. Those plans typically feature lower premiums but higher deductibles compared to standard plans, and under their terms, insurers are not required to adhere to the cost-sharing waivers.

The study found that average OOPS for the 2016–2019 research period for these respiratory hospitalisations was about USD 2,000 for patients with consumer-directed plans (Eisenberg et al. 2020). Another study estimates average COVID-19-related OOPS across all employer-sponsored plans at more than USD 1,300 (Cox et al. 2020).

Those Americans who have lost or will lose employer-sponsored health insurance as a result of pandemic-related unemployment will suffer even more financial stress,[12] with hospitalisation costs exceeding USD 20,000 for pneumonia patients with complications and more than USD 80,000 for patients with the most serious respiratory conditions that require ventilator support (Cox et al. 2020). More than 10 million people are estimated to lose their employer-sponsored health insurance plans between April and December 2020 (Banthin et al. 2020).

This challenge comes on top of the well-documented fact that even before COVID-19, an estimated 87 million U.S. adults (aged 19–64), or 45%, were inadequately insured for health (including those 23 million not insured at all) [Collins et al. 2019].

Figure 4: Regional mortality protection gaps (insurance premium equivalents as a share of GDP)



Source: The Geneva Association (based on Swiss Re 2019)

12 In principle, while affordability could still be a challenge, a system that requires an employer to provide cover for a period after redundancy and/or allows the individual to take over the cover in some form could help mitigate this.

Having said this, there are COVID-19-related factors which could actually mitigate health protection gaps. The pandemic has catalysed the digital provision of health services which could alleviate shortfalls associated with access and affordability (APX/Porsche Consulting 2020). In addition, heightened awareness of health risks and the potential benefits of insurance could generally boost demand for health insurance (McKinsey 2020b).

The accelerated provision of digital health services catalysed by COVID-19 could actually mitigate health protection gaps by addressing obstacles to access and affordability.

2.2.3. The mortality protection gap[13]

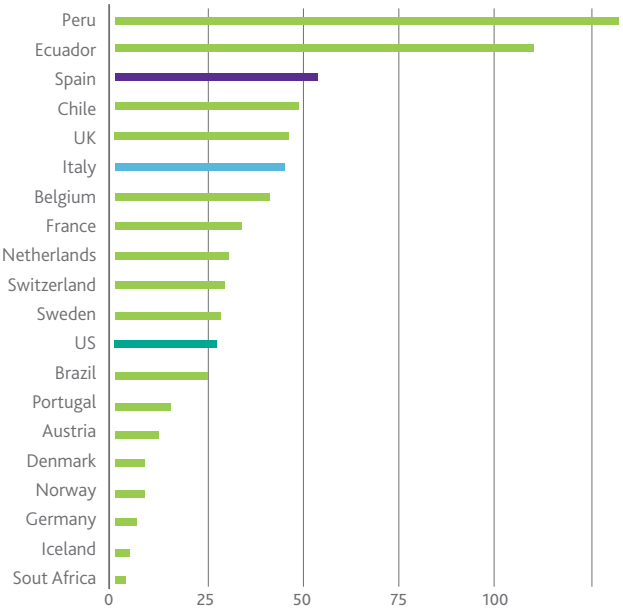
The mortality protection gap can be defined as the difference between the amount needed to substitute a household's future income in the event of the main breadwinner's death, and the existing resources available to repay outstanding debts and maintain the living standards of surviving household members. Resources available include the household's existing financial assets, benefits from life insurance policies and social security payments. The mortality protection gap describes the portion of the deceased's regular income that cannot be replaced by these existing resources (Swiss Re 2020b).

The pandemic is likely to have widened these gaps. Sharply rising unemployment and eroding asset valuations reduce available household resources, exacerbating the shortfalls. Also, given the fiscal emergency in most countries, the availability of social security payments is likely to decrease.

Figure 4 offers an illustration of various regions' vulnerability to the mortality protection gap, which is measured in life insurance premium equivalents (Swiss Re 2019) as a share of GDP. It is most relevant in emerging Asia, followed by Latin America and the Caribbean. It is lowest in the U.S. and Canada.[14] For all regions, mortality protection gaps are smaller than the respective shortfalls in healthcare (see Figure 3).[15]

As argued in section 3.3.2 of this report, COVID-19 pandemic mortality risk is insurable. Therefore, private-sector insurance capital and expertise seem to be well equipped to narrow such protection gaps.

Figure 5: Excess mortality in % (March to mid-July 2020)



Source: FT 2020

Establishing the link to COVID-19, Figure 5 shows the level of excess mortality for a number of countries, capturing the period from March to mid-July 2020. Excess mortality indicates the number of people who die from any cause in a given region and period compared with the recent historical average. Many Western countries, and a handful of other nations and regions, publish such data regularly (see FT 2020).

Figures 4 and 5 suggest that especially for Latin America, massive regional mortality protection shortfalls are significantly compounded by COVID-19 induced excess deaths.[16]

13 In addition to the heightened risk of premature death, life and health insurers are likely to be affected by longer-term changes to morbidity patterns as a result of COVID-19.

14 Note, however, that the notional mortality protection gap in the U.S. amounts to a staggering USD 25 trillion, defined in absolute terms as the difference between the amount needed to substitute a household's future income in the event of the main breadwinner's death and the existing resources available to repay outstanding debts and maintain the living standards of surviving household members (Swiss Re 2018).

15 In absolute premium equivalents, mortality protection gaps amount to USD 129, 78 and 58 billion for Emerging Asia, Advanced Europe and the U.S./Canada, respectively (Swiss Re 2019).

16 There are no recent comprehensive data capturing mortality protection gaps by country. Based on Swiss Re 2013, Peru's mortality protection gap (as defined above, i.e. in terms of the absolute notional shortfall) exceeds the country's GDP by a factor of 2.3. The respective multiple for Indonesia is 1.8. (Swiss Re 2020).

3. Getting the basics right: The insurability of pandemic risk

A pandemic creates mortality and morbidity risks that affect individuals. What affects businesses and companies is primarily the handling of the pandemic by governments. To prevent propagation, public authorities implement measures, such as lockdown and stay-at-home orders, that restrict freedom of movement and the ability to work. Such measures have major economic repercussions, simultaneously reducing supply and contracting demand on a global scale and across a wide range of economic sectors. This risk is the focus of the following sections.

For insurers to underwrite all of the economic losses resulting from pandemic risk would impose a material solvency risk on the industry and create a potential threat to broader financial stability.

There is a broad consensus, including among governments and regulators, that it would be ruinous for insurers to underwrite all of the economic losses resulting from pandemic risk. As discussed in section 2.2.1., the mismatch between the insurance sector's current levels of capital, on the one hand, and the probability and exposure levels of pandemic risk, on the other, would impose a material solvency risk on the industry, as well as create a potential financial stability threat.

3.1. The concept of insurability

The insurability debate gained traction in the 1980s, based on this observation: 'The insurance industry as a whole is increasingly confronted with risks where for reasons of principle and capacity doubts arise as to whether they can and should be covered. This increase of risks at the limits of insurability is due to growing social and accumulation problems, advancing technology and concentration of values, increased complexity and exposure of numerous risks'. (Berliner 1985). These observations have to be seen in the context of the liability crisis in the U.S. when, in response to the excesses of the U.S. tort system, some re/insurers stopped insuring liability risks and the cost of cover in the U.S. increased dramatically across all sectors as a result (Gollier 1997).[17]

17 In March 1986, the front page of *Time Magazine* read, 'Sorry, America. Your Insurance Has Been Canceled'.

In general, insurance markets tend to respond adversely to major catastrophe events. Insurers may reevaluate their estimates of the probability and severity of loss, restrict the supply of capacity and raise the price of the (limited) coverage they are willing to offer (Cummings 2006). Such responses have been observed, for example, after Hurricane Andrew in 1992, the Northridge Earthquake in 1994 and the World Trade Center terrorist attack.[18]

Risks that can be insured need not be 'legislated'; uninsurable risks, however, have to be dealt with by nation states (Stahel 2003).

After massive loss events in particular, uninsurability implies that a prospective policyholder cannot buy the coverage one reasonably needs to manage the adverse consequences of damage resulting from an uncertain occurrence. Specifically, this could mean three things. First, the insurance product is not available. Second, the insurance product is available, but the coverage offered is insufficient. Third, the insurance product is not affordable to certain groups because of its price (Holsboer 1995).

Against this backdrop, the concept of insurability pivots on 'the 'natural borderline' between the market economy and nation states: risks that can be insured need not be 'legislated'; uninsurable risks, however, have to be dealt with by nation states' (Stahel 2003). This borderline ultimately defines 'the division of labour' (Giarini 1995) in risk taking between the private insurance sector and the public sector.

3.2. The criteria of insurability

The insurability of risks is not an exact science. There are no objective attributes which unambiguously define a certain risk as 'insurable' or not. 'Limits to insurability cannot be defined, but only analysed' (Berliner 1985). As a matter of fact, risks are insurable if an insurer and an insurance buyer reach an agreement about a specific insurance coverage and its price, including a common understanding of what is insured and what not. From the insurer's perspective, any decision to offer coverage also depends on (partially) subjective elements such as the company's strategic objectives, risk assessment, risk aversion and risk-taking capacity (determined by available equity and reinsurance capacity) (Karten 1997).

From a more theoretical perspective, Berliner 1982, in a seminal publication, introduced a simple, yet rigorous and comprehensive set of criteria of insurability. This approach still shapes the academic discourse on insurability and continues to be frequently used by practitioners to analyse insurance markets and products. For example, Berliner's set of criteria has been widely applied to climate insurance, cyber insurance and microinsurance (Biener and Eling 2012; Biener et al. 2015; Charpentier 2018; Kunreuther and Michel-Kerjan 2004). Ultimately, these criteria 'can (…) be interpreted as dimensions of insurability which have to be gone through by the professional risk carrier individually like a checklist when assessing the insurability of a risk' (Berliner 1985). A risk is uninsurable for a professional carrier if at least one criterion is not satisfied.

Berliner's framework is three-pronged, consisting of actuarial, market and societal conditions for insurability. The first actuarial condition requires that risks are random and independent (i.e. accidental and unintentional in nature) so that loss probabilities are reliably estimable within reasonable confidence limits. Events that are highly correlated expose insurers to systemic risk which cannot be diversified away through risk selection and portfolio building. Second, maximum possible losses per event must be manageable from the insurer's solvency point of view, i.e. they must not be financially ruinous. Third, average loss amounts per event must be moderate and, with a growing number of mutually independent risks in the insurance pool, converge towards expected losses, allowing for acceptable and decreasing safety loadings.[19] Fourth, actuarial insurability necessitates a sufficiently large number of independent exposure units (policyholders) and loss events per annum. The size of the risk pools has to be adequate so that insurers can calculate loss probabilities. Fifth, insurability from an actuarial perspective requires the absence of severe information asymmetries (i.e. moral hazard and adverse selection), or, at least, the possibility to mitigate them through contract design and underwriting, for example.[20]

18 Given the vital role in the economy, major post-disaster fluctuations in the availability and price of coverage generally lead to pressure for government intervention in insurance markets. This will be discussed in The Geneva Association (2020).

19 This is known as the 'law of large numbers', i.e. the larger the number of mutually independent risks in a risk pool, the lower the variance of losses per risk (Bernstein 1996).

20 Moral hazard occurs when individuals or businesses have an incentive to increase their exposure to risk because they do not have to bear the full costs of that behaviour, e.g. as a result of taking out insurance. Adverse selection describes a mechanism by which individuals or businesses choose whether or not to buy insurance based on information not available to their insurer. See the seminal work by Arrow (1963).

Conditions for insurability include that maximum possible losses per event must be manageable from the insurer's solvency point of view. They must not be financially ruinous.

In addition to the actuarial dimension, Berliner (1982) establishes two market-related insurability criteria. First, insurance premiums need to cover the insurer's cost (e.g. claims and operating expenses, cost of capital, etc.) and, at the same time, must be affordable to the insured.[21][22] Second, cover limits imposed by the insurer must be acceptable to the insured, i.e. not defeat the purpose of buying insurance.

The third dimension of insurability is the societal one and proposes two further criteria. First, coverage must be in accordance with public policy and societal values (e.g. not promote criminal behaviours) and, second, comply with the legal and regulatory restrictions governing the operation of insurance companies and the offering of coverage.

Figure 6: The fundamental criteria of insurability

Source: The Geneva Association (based on Berliner 1982)

When exploring insurability, it is important to note that the limits derived from Berliner's criteria are not set in stone. Progress in risk modelling driven by digital technology, advanced analytics and the increased availability of large amounts of data is a key to expanding the boundaries of insurability. It enables insurers 'to more accurately quantify probabilities and underwrite previously difficult-to-insure risks' (Swiss Re 2017). This will be further explored in The Geneva Association (2020).

3.3. Limits to insuring pandemic risk – A comparative and holistic view

It is not difficult to intuitively understand the limits to managing pandemic risk. The word 'pandemic' originates in the ancient Greek ('pan' means all and 'demos' means people). A pandemic outbreak spreads worldwide, or at least across large regions. As witnessed during the COVID-19 lockdown periods, pandemics have the potential to paralyse entire countries and economies, causing significant and simultaneous damage to virtually all individuals and businesses. This enormous correlation and aggregation of risks further highlights the enormous challenges of insuring these.

3.3.1. Pandemic BI risk

Due to its systemic characteristics, the pandemics insurability discussion pivots around commercial P&C business and BI in particular. Pandemic-induced property and business continuity risk is unique given its potential to impact virtually all policyholders simultaneously, over an extended period of time (OECD 2020a). The fundamental mechanism of risk pooling and redistribution – spreading the losses of the few among the many unaffected by disaster – no longer works in the presence of systemic risk where the destabilising effects of a pandemic ripple through the entire economy. The simultaneous 'losses of the many' cannot be diversified and mutualised across risk pools (Van Hulle 2020; Hartwig and Gordon 2020a; Richter and Wilson 2020).

21 If policyholders are risk averse, the pooling of risk makes them better off if transaction costs are low and the risks are not (fully) stochastically dependent (Mossin 1968). In the case of stochastically dependent risks (such as pandemics) the benefits of pooling the small diversifiable risk part may be offset by transaction costs associated with special pandemic risk schemes. This will be further explored in The Geneva Association (2020).

22 The risk loadings for pandemics are expected to be massive because of the large loss variance associated with individual events, the positive correlation of the individual risk units in the pool and the negative correlation between pandemic risk and the insurer's investment portfolio. These factors are likely to translate into insurance rates where even very risk-averse policyholders would prefer to be not insured (Gründl and Schmeiser 2002). The cost of capital associated with pandemic risk will be further discussed in The Geneva Association (2020).

The fundamental mechanism of risk pooling and redistribution – spreading the losses of the few among the many unaffected by disaster – does not work with a systemic risk like a pandemic, where the destabilising effects ripple through the entire economy.

A second peculiar feature is the endogenous and political nature of the risk which is almost entirely driven by governments' decisions taken before, during and after the pandemic. Its economic severity may vary greatly depending on:[23]

- Level of preparedness of the country when the pandemic occurs, notably in terms of availability of masks and medical equipment (e.g. hand sanitiser, ventilators etc.): The higher the level of preparedness, the lower the need for implementing long lockdown and stay-at-home orders across the board that are the costliest in economic terms.
- Timing in terms of adopting and implementing measures to contain the pandemic: The higher the level of 'denial' from public authorities regarding the actual risk posed by the pandemic at the onset, the higher the ultimate economic cost to handle it.
- Decisions as to which businesses/sectors can continue to operate, fully or partly, and which businesses/sectors must be fully shut down.
- Timing in terms of relaxing lockdown measures: This is to some extent a political decision; even more since there is no clear, predictable time limit on a pandemic.
- Economic and fiscal measures adopted by governments to dampen the economic impact of the crisis on companies (e.g. furloughs, short-term hours, reductions in social charges, etc.).[24]

Hence there is a myriad of parameters that are driven, or that can be changed or influenced, by governments' actions and that will determine to a large extent the magnitude of the economic burden of a pandemic crisis. Covering this risk through private insurance would create obvious moral hazard issues. Public authorities, which decide the ways and means to handle the pandemic and are accountable for the management of the crisis, would ultimately not bear the full economic costs of the decisions they take and could succumb to the temptation to misuse private-sector capital.

A third distinguishing feature of pandemic risk is the fact that it is very difficult to model and measure the economic losses that are specifically linked to the handling of a pandemic by public authorities.

Covering pandemic risk through private insurance would create moral hazard issues for public authorities, who would ultimately not bear the full economic costs of the decisions they take.

Table 1 comprehensively explores the insurability of pandemic business continuity risk on the basis of Berliner's previously introduced criteria (see Figure 6).

23 Special thanks to Guillaume Ominetti (SCOR SE) for contributing this thought.
24 If governments learn from this crisis and develop a 'play book' of responses for future pandemics, the scale of the economic loss could be significantly reduced.

Table 1: Criteria of insurability of pandemic business continuity risk

	Insurability criteria	Comments	Assessment
1	Randomness and independence of loss occurrence	Losses are neither random nor independent • Policy decisions to lock entire economies are deliberate and intentional. This means that loss amounts and risk loadings cannot be set • There are no historical data for the policy responses witnessed during COVID-19 • The strong interrelations among individual risks render efficient risk pooling impossible	
2	Maximum possible loss	The maximum possible loss is not manageable for the insurer • The uncontrollable aggregation of losses could be ruinous to the risk pool	
3	Average loss per event (severity)	It is very difficult to keep the average loss amount per event at a moderate level • The average loss for pandemic risk needs to be managed to an accepted level by cover limits and exclusions, as adopted after previous pandemics • In light of current political discussions and stakeholder expectations, the broader acceptability of cover limits post COVID-19 is questionable	
4	Exposure units	The number of independently exposed policyholders (exposure units) is too small • As the economy as a whole is affected simultaneously by a pandemic, insurers cannot build risk pools that are large enough and that diversify the losses. The law of large numbers does not work	
5	Information asymmetries	Information asymmetries limit insurability • Insurers are likely to face higher demand from exposed sectors (adverse selection) and have to expect less risk-conscious behaviours (moral hazard) • The mitigation potential (e.g. through contract wordings) is limited	
6	Insurance premiums	Insurance premiums are not economically viable • As pandemics threaten most, if not all, members of the risk pool at the same time, the probability of loss (in addition to severity) is very high	
7	Cover limits	Cover limits present challenges of complexity • Non-physical trigger definitions create complexity (compared with clearly describable property damage events) which can be problematic for both the insurer and the insured	
8	Public policy	Pandemic risk coverage should be in the public interest • Issues could arise from certain government interventions (e.g. compulsory insurance requirements)	
9	Legal restrictions	Pandemic risk coverage should be compliant with existing legal and regulatory restrictions • There might be a 'risk of change'[25] or a 'warlike' scenario of the public sector 'taking over' and rewriting the rules that underpinned pricing and risk assessment during 'peace times'	

- *Highly problematic*
- *Problematic*
- *Less problematic*

Source: The Geneva Association and University of St. Gallen, Institute of Insurance Economics

25 For example, changes in legislation which were unknown at the time of risk assessment and pricing or broader changes to the economic and social environment such as the systematic increase in life expectancies.

Box 2: Analogies between pandemics and wars

Politicians all over the world have compared COVID-19 to a warlike challenge. From an insurance perspective, too, there are analogies between wars and pandemics. Both represent fundamentally cataclysmic, correlated and incalculable risks which insurance as a risk transfer mechanism was never intended to cover. Both also come with harsh restrictions and strong measures that are outside the scope of ordinary law and taken for national security matters due to force majeure circumstances. These features, which explain why most insurance policies have a war exclusion clause specifically excluding coverage for acts of war, would also justify that insurance contracts do not cover economic losses arising from measures taken by public authorities to handle a pandemic.

Pandemics, like wars, represent cataclysmic, correlated and incalculable risks which insurance contracts were not meant to cover; not least because the insurance premiums would be unattractive or even unaffordable for customers.

Similar to a nation-wide economic lockdown due to pandemic risk, there is no identifiable maximum possible loss in a war scenario. It could cause a catastrophic amount of damage that would be likely to wipe out any insurance company liable to cover such damages (Fitzsimmons 2004). Another parallel is that exposures depend on mandatory government actions which are impossible to model and to predict. As a result, insurers are unable to calculate premiums for both risks.

In summary, similar to pandemic business continuity risk, war risk defies the criteria of insurability introduced before. Losses are neither random nor independent. A maximum possible loss is impossible to establish. The average loss per event is very difficult to contain through cover limits and exclusions. The law of large numbers does not work in the absence of a sufficient number of independent exposure units. Insurance premiums covering the insurer's cost of capital would be unattractive or even unaffordable to customers.

3.3.2. Pandemic life and health risk

This paper so far pivoted around P&C exposures and business interruption in particular. Prior to the unprecedented experience of wide-ranging lockdown measures, the most obvious and probable source of major insured pandemic losses was (term) life insurance (individual and group policies) (CRO Forum 2007). In contrast with P&C policies, there are generally no exclusions for pandemics or other common causes for extreme mortality events such as terrorist attacks or natural disasters (NAIC 2020; Kraut and Richter 2015).

Unlike the P&C exposures of pandemic risk, such as business interruption, life exposures, including excess mortality, can be modelled. There are therefore generally no policy exclusions for pandemics and other extreme mortality events.

The two main reasons behind the different treatment of P&C and (term) life exposures by insurers is data availability and the ability to model exposures.[26] For life insurers, excess mortality (mortality above what would normally be expected over a specific span of time) associated with diseases is well-documented and

26 The reasoning for permanent life insurance which offers both death benefits and a savings portion is slightly more nuanced. It offers guaranteed, not contingent, benefits, and as such the timing element to loss is more relevant than the contingency of loss. Considering the key issue is when the loss will occur, not if it will occur, life insurers price in some level of volatility in the mortality and may also hold some extra capital for pandemic stress scenarios.

researched by epidemiologists around the world (CRO Forum 2007).[27] For P&C insurers, however, modeling pandemic risk is virtually impossible as it is driven as much by subjective decisions of countless government officials on national, regional or local levels as by epidemiology (Hartwig and Gordon 2020b). In addition, average mortality rates among life policyholders are usually significantly lower than in the population as a whole, mainly on the back of medical underwriting in individual life insurance business (CRO Forum 2007). Also, due to higher than expected mortality rates, annuities may offer a natural hedge to the mortality shock caused by a pandemic (Cox and Lin 2007; GCAE 2006), especially as many life insurers focus on annuities rather than pure risk (term life) products and, as such, tend to be more concerned about life expectancy increases than sudden jumps in mortality.[28] [29]

The underwriting losses of life insurers from COVID-19, while significant, are expected to remain manageable.

Against this backdrop, the underwriting losses of life insurers from COVID-19, while significant, are expected to remain manageable. It is too early to estimate ultimate losses but the standard pandemic scenario typically used by insurers, regulators and industry observers may provide an indication. Based on an excess death ratio of 1.5 per 1,000, in the U.S., this would imply about 500,000 deaths (larger than current official estimates of the potential death toll). In such a scenario, underwriting losses would be about USD 15 billion, or about 3% of pre-shock industry capital (Kirti and Mu 2020). Having said this, life insurers' exposure could be significantly more severe in the case of a pandemic involving a more lethal virus (see Box 3).

Box 3: An extreme pandemic scenario on the scale of the Spanish flu

The Spanish influenza pandemic of 1918–19 is the most virulent on record, with an estimated global death toll of 25–50 million people, or 2–4% of the world's population at that time (CRO Forum 2007). In the U.S., 675,000 excess deaths from the flu were recorded between September 1918 and April 1919, corresponding to an excess mortality of 6.5‰ (Toole 2007).

Toole 2007 also analyzes the impact of a severe pandemic on the scale of the Spanish flu on today's U.S. life insurance industry. The scenario is based on 1.9 million excess deaths or an excess mortality of 6.5‰ for the general population and 5‰ for the insured population.[30] It disregards, however, the potential mitigating impact of medical and other interventions that were unavailable a hundred years ago. Under such an extreme scenario, the U.S. life insurance industry would lose about 25% of its surplus.[31] Despite this massive hit, only a very small number of U.S. life insurers would face an increased risk of insolvency. The industry as a whole could weather even a severe pandemic similar to the Spanish flu (Toole 2007).[32]

A wide range of circumstances must be taken into account when estimating the consequences of a disease outbreak like the Spanish flu for today's world: Medical care and technology have progressed dramatically, with the availability of antibiotics, vaccines and anti-viral drugs. In addition, global surveillance and early-warning systems (e.g. by the WHO) have been established. Furthermore, the socio-economic environment is markedly different from a hundred years ago, with much improved hygiene conditions, nutrition and health status.

Risk factors to watch, however, include potential shortages in drugs, delays in data exchange among public authorities, the increased prevalence of chronic diseases and the particular vulnerability of developing countries. Also, today's degree of urbanisation and global connectivity need to be taken into consideration (CRO Forum 2007).

27 The effects on group life business might be different as, in general, less underwriting has taken place and the state of health of the individuals in the portfolio is less well known.

28 The full impact on life insurers may take time to develop. For example, increases in suicides tend to be correlated with extended higher levels of unemployment.

29 It is important to emphasise that pandemic risk can be covered by life insurers offering broad, needs-based cover against hospitalisation costs or death as the uncertainty in the pandemic element is small relative to the total coverage. However, this does not mean that they could necessarily offer specific pandemic cover which might cause a number of elements in Table 2 to move from amber to red.

30 The impact of the Spanish flu on the insurance sector was limited due to the demographics of infections and deaths (Richter and Wilson 2020).

31 A 50% drop in surplus – presumably an existential threat to the industry – and maintaining all other assumptions of the severe pandemic scenario would require a general population excess mortality of 13% or 4.3 million excess deaths (based on a U.S. population of 330 million in 2019). The excess death toll from COVID-19 in the U.S. passed the threshold of 200,000 in September 2020.

32 Stracke and Heinen (2006) come to similar conclusions for the German insurance market.

For health insurers, too, pandemic risk poses no fundamental insurability challenges. Some saturation effects can be expected in the event of a large-scale pandemic as healthcare provision capacities are limited, e.g. a hospital bed can only be allocated once at any given time (CRO Forum 2007; GCAE 2006). However, a virus could cause more people to become chronically ill, with negative consequences for health, long-term care and occupational disability insurance.

Pandemic risk poses no fundamental insurability challenges for health insurers.

So far, the impact of the COVID-19 pandemic on private health insurance has been relatively modest. In many countries, for health insurance companies, the decline in medical care for non-COVID conditions and routine or elective procedures has more than offset the impact from COVID-19 claims. However, as for life insurers, a more severe pandemic could result in major insured losses, with one estimate putting potential U.S. health insurance losses at more than USD 30 billion (Dunks 2006).

In summary, pandemic life and health risks are privately insurable in the context of COVID-19. Excess mortality risk is modellable based on a wealth of historical data. In addition, increased mortality risk is (partially) offset by reduced longevity. For health insurers, there is a 'natural' limit to claims given the finite capacity of healthcare systems and temporarily reduced expenditure for non-pandemic-related procedures.

Based on the previous sections Table 2 offers a comparative and illustrative summary assessment of barriers to insurability of pandemic BI, mortality and health risks.

As for pandemic BI risks, six of the nine insurability criteria proposed by Berliner are deemed to present insurmountable barriers to insurability and, as mentioned before, a risk is uninsurable for professional risk carriers if at least one criterion is not satisfied (Berliner 1985). Most importantly, the almost perfect correlation and uncontrollable accumulation of losses make the risk uninsurable.

Barriers to insuring pandemic mortality risk, however, are generally manageable and of relatively minor relevance, such as the average loss size per event, the acceptability and complexity of cover limits, the alignment with public policy objectives and the compliance with existing legal frameworks. For health insurers, too, barriers to insurability appear to be surmountable, with no real identifiable 'game stopper'.

3.3.3. Pandemic risk compared to other catastrophic risks

Table 3 compares the insurability of pandemics, wars, nuclear accidents, cyber events, terrorist attacks and natural catastrophes, outlining parallels and differences for these types of low-frequency/high-severity risks.

Table 2: An illustrative summary assessment of obstacles to insuring pandemic risk

	Business interruption	Mortality	Health
Randomness/independence of loss occurrence	●	▲	▲
Maximum possible loss	●	▲	▲
Average loss per event	●	■	▲
Number of exposure units	●	▲	▲
Information asymmetries	▲	▲	▲
Insurance premiums	●	▲	▲
Cover limits	●	■	▲
Public policy	■	■	■
Legal restrictions	■	■	■

● *Prohibitively high barrier to insurability* ▲ *Manageable barrier to insurability* ■ *Insignificant barrier to insurability*

Source: The Geneva Association

Table 3: A comparison of various types of extreme events

Type	Pandemic	War	Nuclear	Cyber[33]	Terror	NatCat
Examples (loss amount)	COVID 19 (Economic loss might be > 5% of global GDP)	World War I and II (Economic loss > 15% of global GDP	Fukushima (USD 214 billion economic loss, USD 36 billion insured loss)	WannaCry (USD 8 billion economic loss, insured loss insignificant)	9/11 (economic loss USD 80 billion, USD 40 billion insured loss)	Katrina (USD 164 billion economic loss, USD 76 billion insured loss)
Time horizon	Months (potentially longer)	Years	Weeks (potentially longer)	Days/weeks	Days	Days
Risk origin	Natural (with exceptions, e.g. bio-logical weapons)[34]	Man-made	Man-made	Man-made (with exceptions, e.g. solar storm)	Man-made	Natural
Frequency[35]	Extremely rare (SARS, COVID)	Small wars common; significant events (world wars) extremely rare	Extremely rare (Chernobyl, Fukushima)	Small losses are of high frequency (e.g. data breaches); Blackout scenarios are extremely rare	Low/rare, but not extremely rare	Low, with upwards trend (climate change); extreme events rather rare
Severity	Extremely high (particularly for business interruption losses)	Extremely high	High	Small losses common (hacker attacks, data breaches); blackout scenario high severity	High	High, with upwards trend (climate change)
Measurability of risks	Difficult, especially when driven by government decisions, but possible to some extent (life & health)	Difficult, but possible to some extent	Difficult, but possible to some extent	Small losses measurable (hacker attacks, data breaches); Blackout scenario not measurable (only in the context of scenarios)	Daily terror measurable, e.g. political risk indices; extreme events difficult to measure (e.g. 9/11)	Yes, but only for the more regular disaster scenarios; little historical data on most extreme events
Independence vs. dependence of risks	Independence not given for global scenarios	Independence not given for global events	Local dependence	Small losses rather independent; blackout scenario might lead to closely correlated losses	Can exhibit dependencies, but not as extreme as pandemic	Regional dependencies; very few events with global dependence (e.g. sun flares and mass ejections)
Standardisation of risk	Definition: yes; coverage: no	Definition: yes; coverage: no	Definition: yes; coverage limited (nuclear pools)	Definition: no; coverage: no	Definition: yes; coverage limited (terror pools)	Definition: yes; coverage relatively standardised (e.g. CAT bonds)

Source: University of St. Gallen, Institute of Insurance Economics

33 Projected economic losses from conceivable cyber viruses can be as massive as from natural viruses such COVID-19. In fact, while the economic damage from lockdown measures was somewhat mitigated by digitally-enabled remote working, there would be no 'safety net' to fall back on in the event of a wide-ranging IT outage.

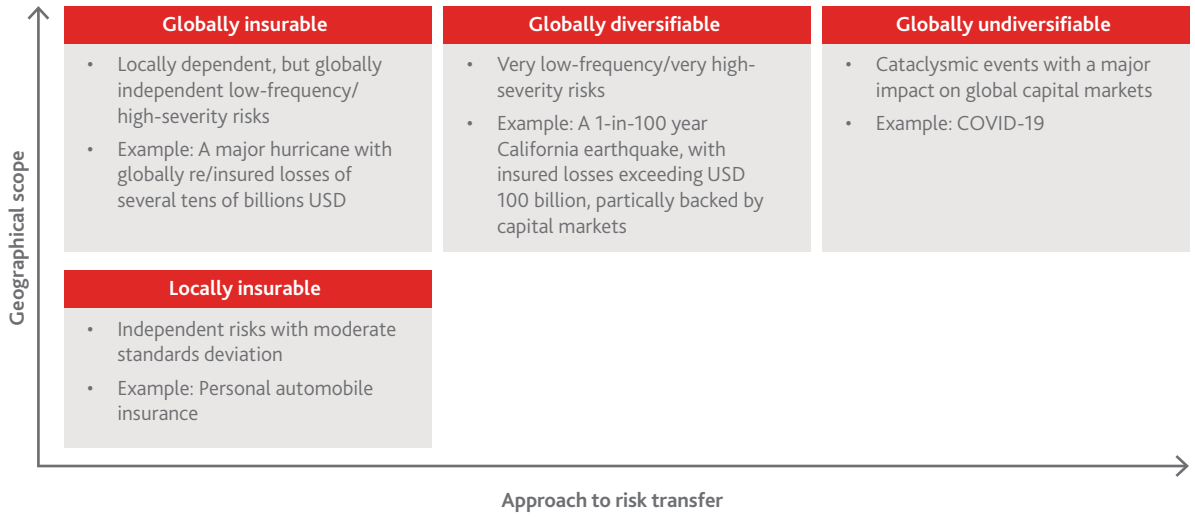
34 One can argue that different forms of the handling of pandemic risk by public authorities introduce a 'man-made' component.

35 There are no fixed definitions of 'extremely rare' or 'extremely severe' events. Any assessment should reflect the relevant context. For the sake of this paper, we consider an event as extremely rare if the return period is more than 25 years. We consider severity as extreme if the economic loss is larger than 1% of GDP.

The main difference between these catastrophic risks is the scope for global diversification. Pandemics are, by definition, not diversifiable as they occur on a very wide or even global scale (as opposed to epidemics which are more locally concentrated). Some other risks, such as terrorism or natural catastrophes, are diversifiable on a global level and routinely transferred via re/insurance or Alternative Risk Transfer (ART) instruments. These disasters impact a limited number of policyholders for a limited period of time. Using BI as an example, physical losses associated with a hurricane are largely a coastal phenomenon which typically dissipate over a span of hours. In contrast, pandemic-induced BI losses can impact virtually all policyholders, irrespective of location and nearly simultaneously, with losses continuing over months or even years (Hartwig et al. 2020).

In order to further illustrate the unique nature of pandemic BI risk, we refer to the classification of catastrophic risks introduced by Cummins (2006) (see Figure 7). As COVID-19 has shown, business continuity losses caused by extreme pandemics are neither locally nor globally independent. Therefore, they are uninsurable.[36]

Figure 7: A classification of catastrophic risks



Source: The Geneva Association (based on Cummins 2006)

36 In principle, such losses may, at least partially, be globally diversifiable through the capital markets. However, COVID-19 has cast doubt on this hypothesis given its clear correlation with the capital markets.

4. Conclusions

The uncontrollable aggregation and correlation elements of pandemic risk defy insurability in the commercial insurance space.

1. Pandemic risk is a multi-faceted phenomenon. In the commercial insurance arena, it exhibits systemic elements of uncontrollable aggregation and correlation which defy insurability. On the other hand, it has non-systemic characteristics for which private-sector life and health insurance solutions and the necessary risk appetite and absorption capacity could exist.

2. Based on a thorough analysis of existing research and a review of available premium and loss data and estimates, we have shown that pandemic BI risk associated with nationwide government-mandated lockdowns is uninsurable for the private P&C insurance industry. It violates all essential criteria of insurability; first and foremost, the criterion of manageable correlation and loss magnitude. The latter exceeds the risk-taking capacity of global BI insurers by a factor of more than 100. The amount of capital needed to offer meaningful and secure insurance coverage would be prohibitively high given the endemic lack of historical data for this unique combination of (random) viral and (non-random) political risks (i.e. decisions taken by public authorities), thwarting the ability of insurers to model the frequency and severity of losses and calculate

premiums. Therefore, pandemic risks should be excluded from commercial P&C insurance policies.

3. In contrast, life- and health-related pandemic risks are generally non-systemic in nature and covered by most mortality- and morbidity-based policies, at affordable prices and with wide availability. Life and health insurers are able to model pandemic risk and price it accordingly. Even though existing protection gaps may have been exacerbated by the pandemic, they seem to be addressable based on the risk appetite, capacity and expertise of the private-sector. With COVID-19, life and health insurers underwent their 'pandemic baptism of fire'. Having said this, future pandemics could turn out to be more aggressive and lethal than COVID-19.

4. Our analysis suggests that public and private-sector decision-makers should resist the temptation to measure pandemic risk by a single yardstick. It rather requires a clear differentiation between uninsurable and insurable variations as well as a careful distinction from other catastrophic risks such as natural disasters, cyber and terrorism, with different local and global insurability and diversifiability characteristics. Systemic pandemic economic and business continuity risk cannot be treated in the same way as other (catastrophic) risks. Government and society must accept this distinction when setting their expectations for the role of the insurance industry in addressing this issue in future.[37]

Public and private-sector decision-makers should resist the temptation to measure pandemic risk by a single yardstick.

37 To be further explored in The Geneva Association (2020).

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This first report in The Geneva Association's research series on pandemics and insurance explores, in number terms, the capacities of insurers to absorb pandemic-related costs. Encouragingly, research findings indicate that pandemics on the scale of, and similarly lethal to, COVID-19 pose no fundamental insurability challenges for health and life insurers. In the commercial insurance arena, however, the uncontrollable aggregation and correlation elements of pandemic risk defy insurability.

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