



Institute of Actuaries of Australia

PANDEMIC

What every Actuary advising an Australian financial services organisation should know

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1. Introduction

- 1.1. This paper contains little original thought, analysis or research.
- 1.2. So, you might ask, why is it being presented, and that is a good question to ask. The fact is that there is a veritable cornucopia of material written about the current potential for Avian Flu to turn into a pandemic, and anything related to that potentiality. Even as banal an approach as typing “Pandemic” into Google, will yield about 190 million hits, and a more targeted set of searches will lead the searcher to a number of very comprehensive and effective information sources.
- 1.3. So why write a paper on this topic?
- 1.4. There were three things that caused me to produce this paper. The first is that despite the richness of information available, there is little that is effectively packaged in a form that is both relevant and accessible for a financial practitioner advising a financial services organisation. The effort in assembling the information in this paper is testament to that fact. The second is that despite the potential importance of a pandemic to at least the short term health and well-being of Australian financial services organisations, in my limited discussions with finance professionals there was good awareness of the issue but, to me, surprisingly low levels of knowledge in some quarters. Lastly, there was little applied “so what” in the available material; that is how a pandemic might specifically impact financial services organisations and what an organisation can do about it.
- 1.5. Hence this paper of little original thought, analysis or research, attempts to bring together in a fairly concise but comprehensive manner the most important things a finance professional advising an Australian financial services organisation needs to know.
- 1.6. Sections 2 to 9 aim to give the reader a broad-based fact base and context through which the more apparently relevant sections of 10 to 14 can be better interpreted.
- 1.7. I have several acknowledgments to record:
 - Simon Swanson for getting me interested in the topic in the first place;
 - Kent Hopper who did much of the original research that informed me and which led on to much of the content in this paper;
 - Eugene Cheah who helped me get my facts right for income protection, and then sense checked my workings – I retain responsibility for all the errors;
 - Eddie Jones of Munich Re and Trevor McMahon of Swiss Re for supplying me with data related to loss of human life in natural disasters;
 - Martin Stevenson of Mercer Human Resource Consulting for giving me access to a number of Mercer publications;
 - Rosemary Lown who proofed the document for me and picked up many inconsistencies – I retain responsibility for all remaining inconsistencies and errors; and
 - My peer reviewers, Dr Alan Carless, Kevin Allport and Pauline Blight, each of whom gave freely of their time and made many valuable suggestions from their varied perspectives.

2. Unknowable and out of date

- 2.1. It is very important that all readers understand with perfect clarity from the outset that there are a number of critical matters relating to a pandemic that are simply unknowable.
- 2.2. All of us would like to know when a pandemic will hit, what disease will cause it, the severity of the pandemic and the impact of the pandemic on individuals, families, society, economies and the organisations we advise. These things cannot be known until they happen.
- 2.3. In finance circles we lead a paradoxical life where we regularly chant the mantra, “the past is no guide to the future”, and at the same time we rely heavily on the experience of the past to help us plan for the future. In trying to understand a potential pandemic this paradox is magnified as we have little or no tools with which to think about the future but those we can discern from the experiences of the past, and yet we can see enough from the past to know that it has little chance of accurately predicting the future.
- 2.4. Where possible I have tried to quote hard facts and figures as at end March 2006. The simple fact is that by the time you are reading this paper, it will be out of date in some material matter, possibly many. Hopefully, the underlying points will retain some validity. A more fervent hope is that the broad pandemic situation will not have moved dramatically from the time of writing.
- 2.5. With the sobering thought of unknowability clearly in mind, let me now lead you on a journey that starts by framing the issue, explores the past and then looks at what we can infer for the future.

3. Need for a sense of urgency

“It’s obvious that a pandemic will occur, all the conditions are in place. The problem now is time.”

Dr Lee Jong-Wook, Director General, World Health Organisation (WHO)

September 21, 2005

- 3.1. But first, a quick digression to explain why there is a real need for anyone or any organisation who is “responsible” in the broadest sense to have a sense of urgency about becoming informed about a potential pandemic and thinking about what, if any, preparations are needed.
- 3.2. I have seen little published that comprehensively addresses the issue of just how quickly a pandemic **might feasibly** develop from a precursor condition.¹ And in general, knowledgeable people are reluctant to enter this fraught space.
- 3.3. However a medical colleague and friend of mine, who is far more on top of these matters than I could ever hope to be, has put forward this view of the range of potential speeds of development of a pandemic. Don’t panic about the definitions of the Pandemic alert phases, this will be explained shortly. The table shows his assessment of the probability that a later pandemic phase will emerge if an earlier stage is reached, and the time it might take for that later stage to emerge when the earlier stage is reached.

Move to Australia Phase 6 Pandemic from Pandemic alert phase						
	Optimistic		Best Guess		Pessimistic	
Actual Phase	Probability	Time	Probability	Time	Probability	Time
Overseas 4	50%	12 months	85%	6 months	95%	2 months
Overseas 5 Or Aus 4	85%	3 months	95%	1~2 months	98%	1-2 weeks
Overseas 6	100%	2 months	100%	1 month	100%	1 week

Source: Dr Alan Carless

- 3.4. The key things to note in this highly judgement based assessment are:
 - On both a pessimistic view and a best guess view, a pandemic in Australia could develop in a frighteningly short space of time after progressing beyond Phase 3 anywhere in the world. The clear implication is that if an organisation is not prepared before a pandemic starts emerging, it may well not have enough time to prepare.

¹ In several publications there are almost throw-away references to the speed of spread of a pandemic. On p29 of Revill J. Everything you need to know about Bird Flu and what you can do to prepare for it, hereafter referenced as Revill “Bird Flu” it is noted that within 1 to 2 months of Phase 5 we can progress to Phase 6, but this is unsourced. It also notes on p135 that it will take two to four weeks once at Phase 6 in a major centre such as Hong Kong to reach Phase 6 at other major centres. I found this publication a useful “packaging” of information otherwise available from multiple sources. Mercer Human Resource Consulting note that the 20th Century pandemics circled the globe in 6 to 9 months when most international travel was still by ship.

- Even on an optimistic view, the judged expectation is that once any country declares a pandemic alert Phase 4, a pandemic will probably emerge soon. The clear implication is that there should be a high priority on pandemic contingency planning before this occurs.
- 3.5. To me, the above assessment makes it abundantly clear that there is a need for urgency in getting to the point where any financial professional can answer for the organisations in their care “what does the organisation need to do prepare for and protect itself in the event of a pandemic”. In their preparations, organisations must be cognisant that a general realisation in the community that time to prepare has probably shortened will induce panic buying of increasingly scarce essentials like protective equipment. Freelance expert knowledge and competent response capability will become scarce, as will opportunities to hedge on financial markets. For what remains available to purchase, the price of everything will rise.

4. What is a Pandemic

- 4.1. So, what is a pandemic?
- 4.2. Wikipedia² defines pandemic thus: “A pandemic (from Greek pan all + demos people) is an epidemic (an outbreak of an infectious disease) that spreads worldwide, or at least across a large region”.
- 4.3. So, a pandemic is simply an outbreak of infectious disease on an international, regional or global³ scale. All countries, except those that can close borders effectively⁴, are expected to be eventually affected regardless of the standard of health care.
- 4.4. The terms “outbreak” and “epidemic” are generally interchangeable, with “epidemic” specifically denoting human disease. Epidemics run a course, with a rapid rise to a peak of new cases each week, then a decline to a tail-off phase. In contrast, cases of non-endemic diseases fluctuate in frequency of appearance around a fairly stable mean over an indefinite period.
- 4.5. The World Health Organisation (WHO) monitors diseases with potential for epidemic or pandemic through their “Epidemic and Pandemic Alert and Response” facility.⁵ This global operation currently monitors the world for evidence of outbreaks under 16 disease headings⁶, of which only influenza (also called “flu”) in general, and avian influenza in particular, appear likely to become pandemic in the near future.⁷
- 4.6. According to the World Health Organisation, a pandemic can start when three conditions have been met:
 - the emergence of a disease new to the population
 - the agent infects humans, causing serious illness
 - the agent spreads easily and sustainably among humans⁸.
- 4.7. A disease or condition is not a pandemic merely because it is widespread or kills a large number of people; it must also be infectious and spreading with little or no evidence of natural control before population resistance develops. For example cancer is responsible for a large number of deaths but is not considered a pandemic because the disease is not (generally seen to be) infectious⁹. Tuberculosis is widespread, often fatal, highly infectious in some circumstances, but outbreaks are generally unsustainable because healthy people have inherent resistance. Highly lethal virus outbreaks rapidly lose momentum when all who can get sick have died before they can carry the disease outside the locality.

² <http://en.wikipedia.org/wiki/Pandemic>.

³ In the 20th century, pandemics were indeed global. In the 21st century, this is expected to be the same as the speed and extent of human movement and movement of goods ensures rapid distribution of any easily transmitted pathogen.

⁴ There is considerable debate as to whether any country can effectively close borders. The chances of effective border closure reduces if there is a symptom free infectious period in the epidemic disease.

⁵ <http://www.who.int/csr/en/>.

⁶ <http://www.who.int/csr/disease/en/>.

⁷ My interpretation of the information presented on each disease by WHO. The other diseases are monitored because they are or are likely to become causes of widespread suffering and death, if control measures are defeated.

⁸ <http://www.who.int/csr/disease/en/>.

⁹ <http://www.who.int/csr/disease/en/>.

5. History of Pandemics

- 5.1. Needless to say, determining what pandemics have occurred in the past before modern medicine and the recognition of what causes infection and disease, and before effective written records is a matter of some conjecture.
- 5.2. What is not a matter of conjecture is that pandemics occurred with reasonable regularity and sometimes disastrous effect since recorded human history began, bearing in mind that the “pan” in pandemic was applicable to contiguous groupings of human beings, rather than global as such.
- 5.3. Thus most commentators refer to the graphic description of “plague” by Thucydides in “The History of The Peloponnesian War” as one of the first recorded instances of a pandemic, notwithstanding that the scope of spread of disease was quite localised. Around 430 BCE, during the height of the war between the Greek states of Sparta and Athens, a plague killed a quarter of the Athenian troops and a quarter of the population of Athens over four years. This disease fatally weakened the dominance of Athens, but the sheer virulence of the disease prevented its wider spread; i.e. it killed off its hosts at a rate faster than they could spread it. The exact cause of the plague was unknown for many years. In January 2006, researchers from the University of Athens analysed teeth recovered from a mass grave underneath the city, and confirmed the presence of bacteria responsible for typhoid fever¹⁰.
- 5.4. Wikipedia¹¹ lists a range of pandemics from the year 165 through to the 20th century including two bubonic plague pandemics (in 541 and the Black Death of the 1300s), Smallpox pandemics from 165, seven Cholera pandemics from 1860 to 1961 and, of course, the current HIV pandemic.
- 5.5. Of most interest at this time are influenza pandemics. Wikipedia¹² lists four influenza pandemics; Asiatic Flu 1889-1890, Spanish Flu 1918-1919, Asian Flu 1957-1958 and Hong Kong Flu 1968-1969. Another source¹³ notes that *“Influenza is an ancient disease. It is first described by Hippocrates in 412 BC, though the term “influenza” would not be coined until the 14th century. (“Influenza” is Italian for “influence,” as the prevailing idea of disease causation at that time was the influence of the stars). In 1580, a disease originating from Asia and thought to be influenza swept through Europe, Africa, and the Americas on trade routes. While these cannot be confirmed as influenza, a better handle on the symptoms of the disease makes it likely that several influenza pandemics occurred in the 1800s: in 1833, 1836, 1847 and 1889”*. Potter¹⁴ asserts there have been 10 probable and 3 possible influenza pandemics since 1590.
- 5.6. Enough! To me it is clear; the points any financial services professional should take from this brief history lesson are:

¹⁰ Scientific American January 2006. <http://www.sciam.com/article.cfm?articleID=000BF619-9B78-13D6-9B7883414B7F0135&ref=sciam&chanID=sa003>.

¹¹ <http://en.wikipedia.org/wiki/Pandemic>.

¹² <http://en.wikipedia.org/wiki/Pandemic>.

¹³ <http://aetiology.blogspot.com/2005/10/pandemic-influenza-awareness-week-day.html>. No sources were provided for the information displayed.

¹⁴ Potter, C.W. (2001). “A history of influenza”. J Appl Microbiol 91(4): 572-9 as quoted in McKibbin and Sidorenko published by the Lowy Institute and ANU titled “Global Macroeconomic Consequences of Pandemic Influenza”: McKibbin.pdf from <http://www.lowyinstitute.org/> (Lowy/ANU).

- Pandemics are nothing new – to the extent they have not been on our radar, it is our radar that has been blind rather than there is something new we need to take into account. WHO has been monitoring and planning for serious epidemics and pandemics since 1952.
 - There are epidemics, and there are pandemics. I will elaborate on this in the next two paragraphs.
 - The character of a pandemic depends to a substantial degree on our ability to respond to it. We are told, variously¹⁵ that the 430 BCE plague killed over 4 years one quarter to one third of the population of Athens – a then world power. Two and a half to three times a classical “decimation”, more with compounding!¹⁶ Today, Typhoid is generally seen to be a manageable disease in normal circumstances¹⁷. We can see that the current HIV pandemic behaves quite differently in Africa, than in Asia or Australia, due to cultural differences resulting in radically different expressions of the disease and public health care responses to it. Smallpox was once pandemic material, but is now eradicated from the wild¹⁸. And more to the point, we can see that an influenza pandemic can be mild or extreme in its effect on mortality and morbidity, though all have some effect. More on this in a later section.
- 5.7. As professionals helping our organisations prepare themselves adequately for the exigencies of a business existence, different types of pandemic present different challenges and demand different responses. Simplistic, I know, but I think of three different types of pandemic:
- Slow, creeping pandemic. Case in point being the HIV pandemic. Here urgency of response is less the issue than are the changes in consumer behaviour the pandemic causes and how our organisations should respond to those¹⁹. And as the pandemic has developed, it has become clear that governmental and public health responses are the most important determinants of the impact this type of pandemic has on our organisations.
 - Fast, devastating pandemic. This is what we really fear and what this paper is most aimed at helping finance professionals and financial services organisations to prepare for. At first glance, it may appear that there is little we and our organisations can do to mitigate and manage the outcomes of such a pandemic should experts and authorities be unable to control it. The remainder of this paper will articulate a view, shared by

¹⁵ The Wikipedia source information quoted one quarter. The Scientific American article referred to one third.

¹⁶ In the modern lexicon, “decimate” is one of the most misused phrases. See <http://en.wikipedia.org/wiki/Decimate>. As any good student of compound discounting would understand, to remove 30% of the initial quantity requires a little more than three “decimations”. Hey, and I learnt something new researching this having previously believed decimations were punishments meted out by the Roman army on recalcitrant conquered populations, not themselves. And you thought the IAAust disciplinary process was harsh!

¹⁷ Although its threat is ever present in modern day catastrophes such as earthquakes, mud slides and tsunamis, along with Cholera.

¹⁸ Smallpox was officially declared eradicated in 1979. The last known natural case was in Somalia in 1977. Since then, the only known cases were caused by a laboratory accident in 1978 in Birmingham, England, which killed one person and caused a limited outbreak. <http://www.who.int/csr/disease/smallpox/en/index.html>. It is still subject to WHO monitoring because it could be spread by terrorists.

¹⁹ In the life insurance world, think anti-selection. Any life or super actuary who lived through the early days of this pandemic in the late 80s would recall the fear that at-risk and infected people would be able to “game” the insurance pooling principle to their financial advantage and to the disadvantage of other pool participants and pool sponsors; the life companies and super funds.

WHO and most governments, that this is not so. However, as noted earlier, time is indeed “of the essence”²⁰

- All the others. For these pandemics, timely response at the business organisation level is not as critical, nor are the impacts expected to be as severe. History shows us that a resilient human population and society will bounce back as they have done from all manner of natural catastrophes since time immemorial.
- 5.8. The past is no guide to the future. Two things are clear from the history of pandemics:
- Diseases that have been devastating in the past can be contained and controlled²¹.
 - Those that have not yet been fully contained and controlled evidence very wide variation in impact. More of this later in relation to influenza.
- 5.9. Public health responses are critical. The extent and severity of pandemics are driven by a number of factors which include both the natural capabilities of the pathogen and the responses of its hosts to it. As a “host” response, public health measures have the capacity to significantly alter the course of a pandemic or even eliminate the causal virus from the wild. In history this shows up in outcomes such as the varying expressions of HIV across continents, the containment of the potentially pandemic form of pneumonia known as SARS²² and the eradication of smallpox.

²⁰ A legal phrase, widely used. Thus “time is of the essence n. a phrase often used in contracts, which, in effect says: the specified time and dates in this agreement are vital and thus, mandatory, and “we mean it.” Therefore, any delay, reasonable or not, slight or not, will be grounds for cancelling the agreement” <http://legal-dictionary.thefreedictionary.com/time+is+of+the+essence> Which is to say that unless we act now, events may well overtake us. Perhaps more eloquently put by William Shakespeare by the character Brutus in Julius Caesar: (Act IV, scene III) “There is a tide in the affairs of men, which, taken at the flood, leads on to fortune; omitted, all the voyage of their life is bound in shallows and in miseries. On such a full sea are we now afloat; and we must take the current when it serves, or lose our ventures”. As advisers we seek to ensure that none we advise lose their ventures.

²¹ With appropriate knowledge, technology and application.

²² Severe acute respiratory syndrome (SARS) is a viral respiratory illness caused by a coronavirus, called SARS-associated coronavirus (SARS-CoV). SARS was first reported in Asia in February 2003. Over the next few months, the illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained.

<http://www.cdc.gov/ncidod/sars/factsheet.htm> There were just under 800 deaths from SARS.

6. Pandemic Alert States

- 6.1. A standardised basis has been developed by world health authorities to classify incipient, emerging and actual influenza pandemics²³:

		Phase
Inter-pandemic phase New virus in animals, no human cases	Low risk of human cases	1
	Higher risk of human cases	2
Pandemic alert New virus causes human cases	Animal to human spread. Human-to-human transmission no more than rare, isolated cases	3
	Small localised clusters human-to-human transmission	4
	Large localised human-to-human transmission	5
Pandemic	Efficient and sustained human-to-human transmission	6

Source : World Health Organisation (WHO)

- 6.2. In the case of what I have called a fast, devastating pandemic, these phases are critical markers of the extent and potential time-line of an emerging pandemic. Refer back to the table in 3.3 to refresh yourself of the potential reaction time differences different phases may represent.
- 6.3. For planning and reaction purposes, it is convenient to think of these phases separately for Australia and "overseas".²⁴

²³ The Australian Management Plan for Pandemic Influenza, June 2005 (<http://www.health.gov.au/internet/wcms/publishing.nsf/Content/phd-health-emergency-threat-level.htm>) contains a more detailed classification. In particular, Phase 6, when arising in Australia, is classified into four stages a, b, c, d representing a: present but localised, b: present in multiple regions, c: subsiding and d: subsequent waves.

²⁴At the risk of stating the obvious, this is a practical division between the near-and-immediate and the less-near-and-less-immediate, particularly for an island territory. For any practitioner in another territory, the same separation in respect of their own territory is appropriate.

7. Current pandemic threats

7.1. As has been stated above, we are currently experiencing an HIV pandemic. This is not news! The HIV pandemic is not a current hot topic for financial services organisations because it is what I have called a slow, creeping pandemic:

- That has been with us for over two decades;
- For which the business implications, risk mitigation and management strategies are well established; and
- For which the public health response is well developed in Australia.

It is therefore not seen as a particular threat, but rather as “business as usual”.

7.2. What is seen as a threat is influenza in general and avian flu in particular. As was noted in the history of pandemics, influenza is believed to be an ancient disease²⁵. However it has been both one of the most devastating diseases and in modern times has been the most frequently recurring pandemic disease. Three pandemics are generally recognised in the 20th century, all arising from influenza and each having death tolls which dwarf all other natural catastrophes.²⁶

Year	Name	Global Deaths	Case Fatality Rate ²⁷
1917-18	Spanish Flu	20-40million +	2.5%
1957-58	Asian Flu	1-2 million	Approx. 0.37%
1968-69	Hong Kong Flu	1 million	Approx 0.19%

7.3. Flu pandemics arise because the flu virus mutates continually and from time to time a quite new virulent strain emerges, against which the world population has no effective immunity. Seasonal flu, by contrast, is due to a strain that is the same as or a variation on one that has been around before and, on each visit, spread is constrained by encountering people with acquired or vaccine-induced resistance. The presumed most likely source of the next influenza pandemic is avian influenza, in particular the H5N1 version of this disease. In humans, influenza is a highly contagious viral disease of the respiratory tract. When severe, all body organs may be affected. It warrants the attention it receives due to the rapidity with which epidemics evolve and spread amongst the relevant community, the associated widespread morbidity and the often fatal complications. It is spread by airborne droplet transmission and via surface contact, and contaminated materials.

²⁵ Relative to recorded human history that is. Scale is everything!

²⁶ 20th century influenza pandemic deaths sourced from <http://www.who.int/csr/disease/influenza/pandemic10things/en/index.html>. Mortality rates sourced from Revill “Bird Flu” pages 44, 49 and 50, the last two reflecting the US experience specifically. Some sources quote 50m to 100m toll for the 1918-19 pandemic but do not attribute this significantly higher toll. In “World map of Natural Hazards” published in 1998 by Munich Re, it is noted on p19 that since 1900 (ie over 98 years) natural catastrophes have taken the lives of 10 million people. In Sigma No2/2006 “Natural catastrophes and man-made disasters 2005” published by Swiss Re, figure 2 on p4 shows that over the last 35 years, natural catastrophes have caused deaths in excess of 10,000 only 4 times, and all of those were less than 500,000.

²⁷ The proportion of those contracting the disease who die on account of the disease.

- 7.4. There are three types of influenza viruses: A, B, and C. Only influenza A viruses are further classified by subtype on the basis of the two main surface glycoproteins hemagglutinin (HA, or H for short) and neuraminidase (NA, or N for short). Influenza is further classified by strains. New strains of the same A subtype or B type have mutated to develop small changes to surface glycoproteins. Humans can be infected with all three influenza types, when they encounter a strain they have not had before or been immunised against.²⁸ Influenza C is the most common and the least harmful, causing nothing more than a cold and a high temperature. Most seasonal flu is caused by Influenza B.²⁹ The apparent inability of B type strains to completely change their surface glycoproteins by the process called reassorting, as A type influenza can, explains why pandemic flu has been due to emergent A subtypes with ability to infect humans and spread among them. If both the H protein and the N protein are new to this A virus subtype it causes more severe illness than if only H or only N is new.
- 7.5. 16 forms of the H protein have been identified (H1 through H16) and 9 forms of the N (N1 through N9). As the virus mutates new subtypes emerge, designated by the H and N combination – for example H1N1, H1N2 and so on. Each combination represents a different subtype.
- 7.6. Wild birds are the natural host for all known subtypes of influenza A viruses. Typically, wild birds do not become sick when they are infected with avian influenza A viruses. However, domestic poultry, such as turkeys and chickens, can become very sick and die from avian influenza, and some avian influenza A viruses can also cause serious disease and death in wild birds. The different strains are sometimes called “low pathogenic” and “high pathogenic” strains. Low pathogenic influenza viruses have the potential to evolve into highly pathogenic viruses and this has been documented in some poultry outbreaks³⁰. The avian flu currently of concern is the highly pathogenic H5N1 subtype.³¹ The H5N1 virus has raised concerns about a potential human pandemic because:
- It is especially virulent;
 - It is being spread by migratory birds;
 - It can be transmitted from birds to mammals and in some limited circumstances to humans, and
 - Like other influenza viruses, it continues to evolve.³²
- 7.7. “Human influenza virus” usually refers to those subtypes that spread widely among humans. There are only three known Influenza A virus subtypes (H1N1, H1N2, and H3N2) currently circulating among humans. It is likely that some genetic parts of current human influenza A viruses originally came from birds. Influenza A viruses are constantly changing, and other strains might adapt over time to infect and spread among humans.³³

²⁸ Quoted from <http://www.cdc.gov/flu/avian/gen-info/flu-viruses.htm>

²⁹ Paraphrased from Revill “Bird Flu” p 28.

³⁰ <http://www.cdc.gov/flu/avian/gen-info/flu-viruses.htm> Revill “Bird Flu” on p78 & p79 notes that H5N1 has been around in poultry for a long time but that from 1977 “*there has been a plethora of new variants of H5N1*”.

³¹ Drawn largely from <http://www.pandemicflu.gov/general/#viruses>, a publication of the US Department of Health and Human Services – January 2006.

³² Drawn largely from <http://www.pandemicflu.gov/general/#viruses>.

³³ Drawn largely from <http://www.pandemicflu.gov/general/#viruses>.

- 7.8. The risk from avian influenza is generally low to most people, because the viruses do not usually infect humans. H5N1 is one of the few avian influenza viruses to have crossed the species barrier to infect humans, and it is the most deadly of those that have crossed the barrier. Most cases of H5N1 influenza infection in humans have resulted from contact with infected poultry (e.g., domesticated chicken, ducks, and turkeys) or surfaces contaminated with secretion/excretions from infected birds. H5N1 has also crossed the species barrier into pigs, tigers, cats and dogs. Of these, infection in pigs is possibly the most worrisome as pigs already carry the H3N2 virus and infection with another A virus may see a new subtype emerge through reassorting. This new virus could have characteristics that allow it to spread readily between humans and have at least some of the pathogenicity of avian H5N1.³⁴
- 7.9. So far, the spread of H5N1 virus from person to person has been limited and has not continued beyond one person³⁵. Spread from other mammals has not been observed. Viruses have limited potential to survive in dead flesh and are killed by cooking, so eating poultry or cooked egg dishes is not a likely source of infection.
- 7.10. As the following maps show, the world is already in the grip of an H5N1 avian flu global outbreak amongst poultry and waterfowl.

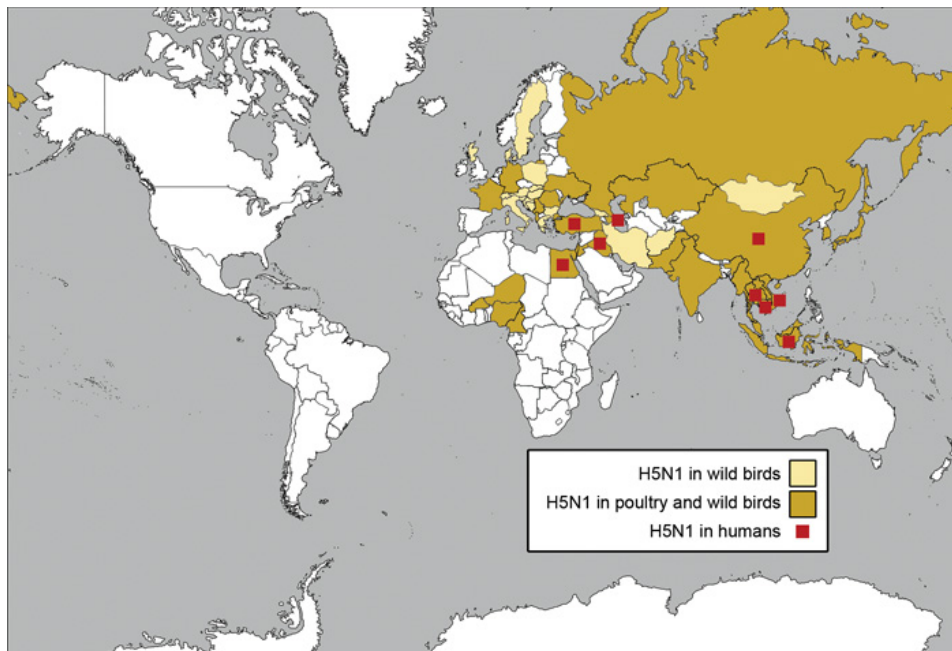


Colour coded circles for wild bird H5N1:(confirmed or suspected in confirmed location) May 2005 = Blue June = Orange July = Yellow August 15 = Green August 31 = Red September = Purple October = White November = Azure December = Gray January 2006 = Brown February = Rust³⁶

³⁴ <http://www.pandemicflu.gov/general/#viruses> and Revell "Bird Flu" pp42~43.

³⁵ This is a possibly panglossian assessment as several instances in Asia cannot have human-to-human transmission ruled out, albeit that those cases are amongst close family.

³⁶ Source: http://www.recombinomics.com/H5N1_Map_2005_QinghaiL.html



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- 7.11. The top map in particular confirms what any casual reading of the press will have shown a reader in Australia over the last few months – we are currently in the middle of a massive outbreak of H5N1 avian flu.
- 7.12. It is difficult³⁸ to predict when the next influenza pandemic will occur or how severe it will be. Health professionals are concerned that the continued spread of avian H5N1 virus across eastern Asia and other countries represents a significant threat to human health.
- 7.13. Since 2003, a growing number of human H5N1 cases have been reported in Cambodia, China, Indonesia, Iraq, Thailand, Turkey, and Vietnam. More than half of the people infected with the H5N1 virus have died. All these cases, with rare possible exceptions, were caused by exposure to infected poultry. The following table shows the cumulative number of confirmed human cases of Avian Influenza A/(H5N1) Reported to WHO³⁹

As at 13 March 2006

Country	2003		2004		2005		2006 (to 13 March)		Total	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
Cambodia	0	0	0	0	4	4	0	0	4	4
China	0	0	0	0	8	5	7	5	15	10
Indonesia	0	0	0	0	17	11	12	11	29	22
Iraq	0	0	0	0	0	0	2	2	2	2
Thailand	0	0	17	12	5	2	0	0	22	14
Turkey	0	0	0	0	0	0	12	4	12	4
Viet Nam	3	3	29	20	61	19	0	0	93	42
Total	3	3	46	32	95	41	33	22	177	98

Note, WHO only publishes independent laboratory-confirmed cases. Additional cases have been reported by these countries. An alert from WHO dated 14 March refers to 3 fatal cases in Azerbaijan and a 5th death was reported in Cambodia on 20 March.

³⁷ Source: site <http://www.pandemicflu.gov/> produced by the US Government.

³⁸ Impossible is probably a better description. See earlier comment on “unknowability”.

³⁹ http://www.who.int/csr/disease/avian_influenza/country/cases_table_2006_03_13/en/index.html.

- 7.14. It is possible the virulence of the disease in humans is overstated by these statistics because of the likelihood that less severe cases may go undetected by health authorities, or unreported to WHO.
- 7.15. At the risk of being repetitious, the need for urgency should be evident from all the preceding. As I see it:
- The avian flu pandemic is only part way through its development;
 - The number of human cases of H5N1 has been at least doubling over the last four years⁴⁰; and
 - The pace at which a human pandemic disease can spread is ably illustrated by the pace at which the avian influenza pandemic is currently spreading.
- 7.16. WHO sum up neatly 10 things you should know about influenza pandemics at <http://www.who.int/csr/disease/influenza/pandemic10things/en/index.html>. In list form they are:
- Pandemic influenza is different from avian influenza.
 - Influenza pandemics are recurring events.
 - The world may be on the brink of another pandemic.
 - All countries will be affected.
 - Widespread illness will occur.
 - Medical supplies will be inadequate.
 - Large numbers of deaths will occur.
 - Economic and social disruption will be great.
 - Every country must be prepared.
 - WHO will alert the world when the pandemic threat increases.
- 7.17. WHO have declared a Phase 3 alert in respect of H5N1 avian flu, meaning that there is a new virus causing human cases, but there is no or very little human to human transmission of the disease.

⁴⁰ On a simple extrapolation of the 33 2006 cases to 13 March, we can anticipate about 160 cases in 2006.

8. Preparedness – who is doing what

- 8.1. As you will have inferred from the readily available sources quoted here, there is much afoot.
- 8.2. WHO operates its Epidemic and Pandemic Alert Response facility, which tracks the evolving infectious disease situation, sounds the alarm when needed, shares expertise, and mounts the kind of response needed to protect populations from the consequences of epidemics, whatever and wherever might be their origin. WHO has developed a global influenza preparedness plan, which defines the responsibilities of WHO and national authorities in case of an influenza pandemic. This plan incorporates new scientific data and experience obtained during recent outbreaks that had pandemic potential. WHO also offers guidance, tools and training to assist in the development of national pandemic preparedness plans.⁴¹
- 8.3. The Australian Government has developed The Australian Management Plan for Pandemic Influenza (AMPPI)⁴², first published in June 2005. The aim of this document is to provide a detailed guide for the Australian response to a pandemic influenza threat. The plan targets the wide range of people who will be involved in planning and responding to an influenza pandemic: health planners, public and clinical health care providers, border workers, state and territory health departments, essential service providers, and those involved in the media and communications. The Government has provided \$156.8 million to ensure Australia is adequately prepared. The Government has funded measures such as the National Medicines Stockpile of antiviral drugs and protective equipment; the establishment of an independent World Health Organization Collaborating Centre on Influenza Reference and Research; and contracts with two of the largest vaccine manufacturers in the world to guarantee sufficient supplies of pandemic vaccine to protect all Australians.⁴³
- 8.4. Each of the State Governments has put in place a pandemic response plan linked to the AMPPI, and local governments are likewise developing plans linked to the AMPPI.
- 8.5. Although not widely publicised at this time, at least some large corporates are preparing detailed pandemic response strategies, often focussed on business continuity during the height of a pandemic and the health and safety of their staff. However, corporates may not yet be doing enough. Mercer Human Resource Consulting recently published a survey report on pandemic preparedness.⁴⁴ It notes that across the organisations surveyed there is a considerable gap between the organisational concern about the impact of a pandemic and their current state of either pandemic preparedness or even the current state of action being taken to become pandemic prepared. The report noted that its Australian respondents had below average levels of preparedness.

⁴¹Quoted from

http://www.who.int/csr/resources/publications/influenza/WHO_CDS_CSR_GIP_2005_5/en/ .

⁴² <http://www.health.gov.au/internet/wcms/publishing.nsf/Content/phd-pandemic-plan.htm>.

⁴³ Quoted from <http://www.health.gov.au/internet/wcms/publishing.nsf/Content/phd-pandemic-plan.htm>. Revill "Bird Flu" p 114 asserts that Australia is one of the better-prepared countries.

⁴⁴ Mercer Human Resource Consulting: Avian Flu Pandemic Preparedness Survey Report, Spring (Northern Hemisphere!) 2006.

- 8.6. Organisations serving local health care professionals are actively promoting preparation and responses that can be taken at a local level.
- 8.7. And finally, concerned individuals are taking steps to inform themselves and consider what steps they might take to protect themselves and their loved ones in the event of a severe influenza pandemic.
- 8.8. The overarching theme of all this preparation activity is that “the effects of a pandemic can be lessened if preparations are made ahead of time”.⁴⁵
- 8.9. There have been some success stories already arising from countries being prepared and able to act quickly. In 2003, a serious outbreak of H7N7 in poultry in the Netherlands which mildly infected people was stopped from developing further.⁴⁶ Similarly, Hong Kong has acted decisively as there have been successive waves of avian flu entering that territory from China mainland (1997, 2001 and 2002) culling millions of infected birds and dramatically reducing potential exposures at the time.⁴⁷ To quote, “*Hong Kong has shown us that with a very high level of surveillance and monitoring, it is possible to set up an ‘early warning system’ and detect the earliest cases of bird flu, before it has had the chance to infect many people – and particularly before the virus has had a chance to mutate further into a fully ‘humanized’ form of the disease*”.⁴⁸

⁴⁵ www.pandemicflu.gov/plan/pdf/guide.pdf.

⁴⁶ Revill “Bird Flu: p32.

⁴⁷ Revill “Bird Flu” pp39~41.

⁴⁸ Revill “Bird Flu” p51.

9. How influenza affects individuals

- 9.1. As previously noted in humans influenza is a highly contagious viral disease of the respiratory tract. When severe, all body organs may be affected.
- 9.2. Flu symptoms usually develop one to three days after exposure to the virus. Some people experience symptoms in as short a time as 18 hours after exposure. Fever, chills, headache, muscle aches, and total exhaustion can occur suddenly. Fevers associated with influenza infection generally do not exceed 104 degrees Fahrenheit (40 C), but they can rise to 106 degrees (41 C). Frequently, people experience a dry cough and a runny or congested nose as their initial symptoms begin to subside. These respiratory symptoms worsen and remain for three to four days. The cough and fatigue may persist for two weeks or more after the other symptoms of infection have disappeared.⁴⁹
 - 9.2.1. Complications: The most common complications of the flu are those that involve parts of the respiratory system - for example, pneumonia (infection of the lungs), which affects both adults and children, and croup (infection of the larynx), which affects young children. If the patient has extreme difficulty breathing, blood in the coughed-up mucus, bluish tint to the skin, or a bark-like cough, a physician should be consulted immediately. One of the life-threatening complications caused by influenza that mostly affects children and adolescents between the ages of 2 and 16 years old is Reye's syndrome. Reye's syndrome is a type of encephalitis (inflammation of the brain) that is accompanied by deterioration of the liver.⁵⁰ Reye's syndrome can be fatal.⁵¹
 - 9.2.2. Treatment: In most cases, influenza cannot be cured and is treated only with measures designed to help relieve symptoms and make the patient more comfortable. Treatment for the flu is generally the same as treatment for a bad cold or other viral fever. Physicians recommend bed rest, extra fluids, and an aspirin substitute⁵² to reduce fever and muscle aches if needed. Nasal sprays or drops (when used sparingly so that nasal tissues are not damaged) and cough medicines can help relieve cold-like symptoms. Using a vaporizer in the patient's bedroom to add moisture to the air helps relieve congestion.⁵³
- 9.3. Pandemic influenza mainly differs from "seasonal influenza" in that virtually no-one in the world has prior immunity. Like seasonal flu, pandemic flu is capable of spreading easily between people with no immunity. Mortality patterns might also differ; in the 1918-19 pandemic, Sydney adults between 25 and 40 years old comprised 27% of the population but experienced almost half of the influenza deaths.⁵⁴ As will be seen in the next few paragraphs, this outcome is believed to be a result of a particular immune response to a highly virulent pathogen.

⁴⁹ Quoted from <http://health.howstuffworks.com/define-influenza.htm>.

⁵⁰ The cause of Reye's syndrome remains a mystery. However studies have shown that using aspirin or salicylate-containing medications to treat viral illnesses increases the risk of developing Reye's syndrome. Source: Dr Alan Carless.

⁵¹ This paragraph mostly quoted from <http://health.howstuffworks.com/define-influenza.htm>.

⁵² For example paracetamol. See footnote on Reye's syndrome for the reason for not using aspirin.

⁵³ Quoted from <http://health.howstuffworks.com/define-influenza.htm>.

⁵⁴ Max J Rudolph "Influenza Pandemics: are we ready for the next one? What Actuaries can learn from 1918" Risk Management July 2004, notes on p28 a similar proportion in a similar age range in the USA, noting that this age range only had 10% of deaths in other flu outbreaks.

- 9.4. When influenza causes death it is typically due to a secondary bacterial pneumonia.⁵⁵ Bacteria are able to take advantage of the host's compromised immune status and damaged lung cells, establishing a potentially deadly infection. However, during the 1918 pandemic, a greater percentage of the deaths in the 20-45 age group were due to primary pneumonia: pneumonia caused by a combination of the influenza virus and the host response, with no bacterial invaders involved. In some patients, this occurred within a matter of hours from the first symptoms. A Pennsylvania medical student documented the phenomenon:

As their lungs filled, the patients became short of breath and increasingly cyanotic⁵⁶. After gasping for several hours, they became delirious and incontinent, and many died struggling to clear their airways of a blood-tinged froth that sometimes gushed from their nose and mouth. It was a dreadful business.⁵⁷

- 9.5. There is a reasonable body of thought that the condition described above is the result of a "cytokine storm", a potentially fatal immune reaction consisting of a positive feedback loop between cytokines and immune cells. When the immune system is fighting pathogens, cytokines signal immune cells such as T-cells and macrophages to travel to the site of infection. In addition, cytokines activate those cells, stimulating them to produce more cytokines. Normally this feedback loop is kept in check by the body. However, in some instances, the reaction becomes uncontrolled, and too many immune cells are activated in a single place. The precise reason for this is not entirely understood. Cytokine storms have potential to do damage to body tissues and organs. If a cytokine storm occurs in the lungs, for example, fluids and immune cells such as macrophages may accumulate and eventually block off the air passageways.⁵⁸
- 9.6. Cytokine storms tend to be a phenomenon of the young and healthy who have the best immune systems.
- 9.7. Some human deaths from H5N1 avian influenza appear to have involved a cytokine storm⁵⁹. The reported symptoms of avian influenza in humans have ranged from typical influenza-like symptoms (e.g., fever, cough, sore throat, and muscle aches) to eye infections (conjunctivitis), pneumonia, acute respiratory distress, viral pneumonia, and other severe and life-threatening complications⁶⁰. So far, people who die from bird flu tend to be young or in the prime of life, mostly aged between 10 and 22 years; they die from a combination of respiratory failure, circulatory collapse and renal failure in the second to fourth week of the disease, sometimes despite full treatment with anti-viral drugs.⁶¹

⁵⁵ Revill "Bird Flu" p12.

⁵⁶ Cyanotic: Showing cyanosis (bluish discoloration of the skin and mucous membranes due to not enough oxygen in the blood). Quoted from <http://www.medterms.com>.

⁵⁷ Quoted from <http://aetiology.blogspot.com/2005/10/pandemic-influenza-awareness-week-day.html>.

⁵⁸ Quoted from http://en.wikipedia.org/wiki/Cytokine_storm.

⁵⁹ From Revill "Bird Flu" p 108 quoting Professor Colin Blakemore of the UK's Medical Research Council "What we've seen in the people who are infected is that they die really quickly. They get a raging pneumonia that just dissolves the lungs, and then it can affect the kidneys and the brain." This feature of the disease is referred to again on p153.

⁶⁰ <http://www.cdc.gov/flu/avian/gen-info/avian-flu-humans.htm>.

⁶¹ Revill "Bird Flu". p12.

- 9.8. Thus in the face of pandemic influenza, the old, the very young and the weak are at risk, as they are in seasonal epidemics, but young and healthy adults, who generally cope well with seasonal flu, may be at relatively much greater risk.

10. Mortality and Morbidity

- 10.1. The past is no guide to the future. It is impossible to predict the future mortality and morbidity impacts of a potential influenza pandemic. However, we can use the experience of the past to understand the character of the impacts of a flu pandemic on mortality and morbidity, and possibly even infer some potential ranges for the outcome of a flu pandemic. Sources describing the economic impact of a pandemic (we will explore this in the next section) generally break the human toll into an attack rate or transmission rate (ie the rate of infection) and a case fatality rate (the rate at which the infected die from the disease). The former is potentially relevant to both mortality and morbidity. The latter is mostly relevant to mortality as those who survive the disease often make a good recovery in a relatively short time. The distribution of recovery times will be relevant for life and health insurers.⁶²
- 10.2. Experts generally agree that the three past outbreaks of pandemic influenza during the 20th century did not differ markedly with respect to their attack rates and that those rates ranged from 25 percent to 30 percent.⁶³ Various other publications and analyses quote attack rates in the range 15% to 35%. Critically for anyone considering a pandemic response, key populations [health care workers are cited, but it is conceivable that front line service workers would experience somewhat elevated attack rates] have experienced attack rates as high as 59%⁶⁴
- 10.3. By contrast, the case fatality rates of the three 20th century pandemics showed significant variation as follows:

Pandemic	Case Fatality Rates in USA⁶⁵
Spanish Flu 1918-19	2.5%
Asian Flu 1957-58	0.37%
Hong Kong Flu 1968-69	0.19%

- 10.4. The very high 1918-19 case fatality rates might beg the question whether the various effects of World War I exacerbated what would otherwise have been a more mild pandemic. The strong consensus is that the conditions at that time accelerated the speed at which the disease spread, but did not increase the overall attack rates outside what appears to be influenza's normal range. Similarly, the case fatalities were mostly a result of the virulence of the

⁶² Multiple sources note that those who were infected in an earlier wave are immune in a subsequent wave.

⁶³ Quoted from "A potential Influenza Pandemic: Possible Macroeconomic Effects and Policy Issues". US Congressional Budget Office (CBO). December 2005.
<http://www.cbo.gov/ftpdocs/69xx/doc6946/12-08-BirdFlu.pdf>.

⁶⁴ From Lowy/ANU: Salgado, C.D., B.M. Farr, K.K. Hall and F.G. Hayden (2002). "Influenza in the acute hospital setting. (vol 2, pg 145, 2002)." The Lancet Infectious Diseases 2 (6):383.

⁶⁵ Quoted from CBO which references the following work for more detail on attack rates and case fatality rates. Martin Meltzer, Nancy Cox and Keiji Fukuda, "The Economic Impact of Pandemic Influenza in the United States: Priorities for Intervention", Emerging Infectious Diseases, vol. 5, no. 5 (September-October 1999). This reference was vague in regard to the difference between the 1957 and 1968 flus. Revill "Bird Flu" has been used instead.

disease rather than a reduced ability of the population to combat the disease.⁶⁶

- 10.5. For anyone approaching forecasting of mortality and morbidity effects (or for that matter their derivatives, economic effects) it seems to me the central question they have to address is “What do you have to believe to believe that past attack rates and past case fatality rates are relevant markers for the future”?⁶⁷ And, as in all our more difficult problems, the issue is asymmetric. It is of no great consequence to the organisations we advise if attack rates are trivially low. It is potentially devastating to human society if both attack rates and case fatality rates are significantly higher than we have had to deal with in the past.^{68 69}
- 10.6. So what have the experts settled on? The US Congressional Budget Office (CBO) have gone with 25% attack rates and two case fatalities scenarios, a low of “just over” 0.1% and a high of 2.5%. CBO were focused on the USA only. Lowy/ANU have tried to deal with the much wider global canvas. They have chosen four scenarios modelled on the pandemics of 1968, 1957 and 1918 plus an extreme version of 1918 where elderly survival rates were lower than the surprisingly high 1918 survival rates. To apply these, they have generated geographical differences (mainly hemispheric) and health policy differences. The resulting mortality rates are highly variable and highly leveraged to the severity of the scenario. Readers of this paper are very strongly encouraged to read the Lowy/ANU paper. The following table attempts to capture the essence of their mortality rate “results” (expressed per mille):

Additional Pandemic Mortality Rates per Mille

Mild (1968)	Moderate (1957)	Severe (1918)	Ultra
0.07 ~ 0.6	0.8 ~ 5.0	3.5 ~ 27	7 ~ 54

The USA is seen to have to the lowest pandemic mortality, driven by health care resources. Australia has one of the lowest due to both health care resources and a southern hemisphere location. Current Australian expectation of life from age zero is approximately equal to a constant 8 per mille (female) and 9 per mille (male) mortality rate. So, it can be seen, that the various

⁶⁶My interpretation of a range of sources discussing the 1918-19 pandemic. Undoubtedly there will be some element of the 1918-19 outcome that resulted from the hardships of the time, but it appears this is a small element in a disease that would have been devastating at any time.

⁶⁷If I can wax lyrical for a moment, it occurs to me [or more correctly occurred to me while writing this paper] that one of the “defining” qualities of a modern actuarial approach [and I think the qualifier “modern” is real and important, because in the past, non-transparency was one of the less pleasant defining actuarial qualities] is the thrust to make transparent the things which together go to make up the exposition of the problem/solution/model; coupled with the need to be able to articulate the “what do you have to believe”, which is to say how do you root this set of assumptions in a real-world experience (past, present or future; actualised or incipient). To continue the rant a little longer, in my experience, it has been the ability of an individual to make their advice “real” to its recipient that distinguishes the good adviser from a technocrat. I’ve found the “what do you have to believe” test to be a high-value tool in this regard.

⁶⁸Whilst not recommending the film as such, “28 Days Later” is an interesting portrayal of 100% case “fatality” rates in a disease.

⁶⁹To the point that there are pandemics and pandemics, Kilbourne [Kilbourne E.D. (2004). “Influenza pandemics: can we prepare for the unpredictable?” *Viral Immunol* 17(3): 350-7] quoted in Lowy/ANU points out that Influenza is not the deadliest disease based on case fatality alone [Influenza ~2%, Smallpox 20~25%, Rabies ~ 100%]. What makes influenza pandemics deadly is the high attack rate.

Lowy/ANU scenarios represent at the low end of their range approximately a 1%, 10%, 50% and 100% increase in a year's mortality⁷⁰ for an occurrence of a pandemic. In the territories that the Lowy/ANU model see as having more extreme outcomes, the picture is probably more like 5%, 50%, 225%, 450%⁷¹

- 10.7. I have not attempted to make any serious morbidity assessments for two reasons. First, morbidity outcomes seem to me to be the result of three primary variables, for each of which each practitioner is adequately placed to form their own view: Attack rates (how many people are going to fall sick), Illness duration⁷² and "care rate" (the multiplier to be applied to the product of attack rates and duration to allow for the fact that the ill will need home nursing). Second, the economic modelling discussed in the next section has done much of the work (if one can "believe" the assumptions used).
- 10.8. At the risk of appearing to "tease" the reader along, the "so what" of mortality and morbidity is dealt with in a later section.

⁷⁰Low end ratios calculated on a 9 per mille average mortality. For example a 0.07 additional mortality on a 9 per mille base is an approximately 1% increase and a 7 per mille additional mortality is an approximately 100% increase.

⁷¹High end ratios calculated on 12 per mille average mortality. For example 54 per mille additional mortality on a 12 per mille base is an approximately 450% increase. Anyone needing to understand this in more detail is encouraged to research appropriate average mortality rates and do the calculations themselves. My results were intended to be "order of magnitude" correct only.

⁷²To be fair, there is some uncertainty around this. For instance Lowy/ANU use 10 working days in their modelling, while Reville "Bird Flu" notes that human deaths from H5N1 have been occurring in the second to fourth week of the disease.

11. Economic Impacts

- 11.1. There are a number of respectable publications exploring the economic impact of a pandemic. The most complete of these is the February 2006 Lowy/ANU report.⁷³ Other modelling, including that by the USA Congressional Budget Office “A Potential Influenza Pandemic: Possible Macro Economic Effects and Policy Issues” seems to be broadly consistent with this report.^{74 75}
- 11.2. The report explores four scenarios:
- A mild pandemic similar to the Hong Kong flu of 1968-69 causing in Australia approximately 1 death per 10,000.
 - A moderate pandemic similar to the Asian flu of 1957 causing in Australia approximately 15 deaths per 10,000.
 - A severe pandemic similar to the Spanish flu of 1918-19 causing in Australia approximately 60 deaths per 10,000.
 - An “ultra” pandemic similar to the Spanish flu of 1918-19 but without “the anomalously high elderly survival rates” causing in Australia approximately 110 deaths per 10,000 (or 1.1% of the population).
- 11.3. Their economic modelling used 20 “countries” to in effect cover the whole world. Australia and New Zealand are two of the countries. The economic effects were modelled in four parts: labour force losses; input cost increases, demand reductions and country risk premium increases.
- 11.4. For Australia, the mild pandemic causes a 0.8% reduction in GDP in the year of the pandemic, ie a slowdown in growth without a recession. This is comprised 75% of labour force losses and 25% of input cost increases. The moderate pandemic causes a 2.5% reduction in GDP, ie also a slowdown in growth without a recession, comprised 30% labour force losses, 65% input cost increases and 5% demand reductions. The severe pandemic causes a 5.6% reduction in GDP in the year of the pandemic, ie a severe recession, comprised of 15% labour force losses, 80% input cost increases and 5% demand reduction. The ultra scenario is about twice as severe economically, with a similar pattern of sources of loss. Country risk premium increases do not feature as an expected issue for Australia.
- 11.5. There appears to be consensus that economies will bounce back relatively quickly, as was the case in the 1918 pandemic and most recently with SARS. If the death toll in working age people is very high, growth may be muted for a number of years, however evidence for this in past pandemics and economic models is ambiguous. Otherwise, in general, the pandemic effect is expected to be a short term shock. Lowy/ANU notes that there is almost no long term effect in the mild and moderate scenarios.
- 11.6. In general, opinion is that stock markets will overreact and then correct. Lowy/ANU model a 1% reduction in equity prices in Australia in the severe scenario and 1.5% in the ultra scenario. They comment that “*markets may over-react and force down prices initially but then recover over the year*”.

⁷³ by McKibbin and Sidorenko published by the Lowy Institute and ANU titled “Global Macroeconomic Consequences of Pandemic Influenza” (Lowy/ANU).

⁷⁴ The remainder of this section quotes from and/or paraphrases the Lowy/ANU paper of February 2006 by McKibbin and Sidorenko.

⁷⁵ The following sections are borrowed with thanks from some work I did for my former employer.

They contemplate the possibility that the equity risk premium rises sharply and there is a rout on the equity markets, but are sanguine, noting that “*the money flowing around globally must go somewhere and because the shocks are temporary and known to be so, the long term outlook for equities is not undermined very much except [in the year of the pandemic]*”.

- 11.7. The ability of governments to provide information that does not leave the public uncertain and hence likely to panic and overreact is seen to be key to reducing the extent of any unnecessary shock (ie over and above that of real sickness, death and caring) to economies. The experience with SARS in Hong Kong and Toronto, Canada, is seen as a model for experience in a moderate or severe pandemic because governments were not able to remove uncertainty and the resultant shock is seen to be comparable to what can be expected in a real pandemic.
- 11.8. Or to sum it all up – don’t panic! A pandemic will produce noticeable economic effects during the pandemic and immediately after but is unlikely to destroy world economies, but expect a short bout of wholly irrational market behaviour.⁷⁶

⁷⁶ My interpretation of the information studied.

12. Impact on Financial Services Organisations⁷⁷

- 12.1. Now we can get some rubber hitting the road!
- 12.2. One scheme describes five different potential risks for a financial services organisation:
- Credit Risk;
 - Insurance Risk;
 - Market Risk;
 - Operational Risk; and
 - Strategic Business Risk.
- 12.3. Each financial services organisation has a different mix of these risks, with broad patterns of weight of risks across broad classes of financial services organisations. For instance, an Authorised Deposit-Taking Institution (ADI) with significant lending is dominated by credit risk with operational risk the next largest risk class, while a general insurer is dominated by insurance risk, with operational risk or market risk the next largest risk class.
- 12.4. Each of these risks is potentially affected by a pandemic.
- 12.5. Credit risk:
- 12.5.1. In the event of severe pandemic, the combination of mortality and morbidity has the potential to significantly disrupt family income leading to financial stress. Consequently issues with the servicing of loans are likely to arise, potentially leading to foreclosures. As can be imagined, at the time of a pandemic and possibly for some time after, the residential property market, if not actually depressed is hardly likely to be vibrant leading to poor potential recoveries on any security for the loans. As with all credit risk, the issue here will be the degree of cover the security offers, and this will very much depend on how recently the loans were drawn down and the initial equity, ie the Loan to Valuation Ratio (LVR)⁷⁸
- 12.5.2. As we saw in the mortality section, the Lowy/ANU modelling suggests that in a severe pandemic additional mortality of 50% to 100% of a normal years' mortality overall might be expected. As noted from the 1918-19 pandemic, this potentially could fall unevenly on the population affecting those most with most actual credit risk (eg young couples with little equity in their home). Currently banks' bad debt provisioning is of the order of 0.5%⁷⁹, but this is heavily skewed away from secured residential lending. With unexpected deaths of the order of 0.4% to 0.8%, it can be inferred that there

⁷⁷ This section is my own work. While a limited effort was made to source / validate the content of this section, there was little that was found which appeared relevant to the topic. This does not pretend to be "scholarly". Rather it tries to apply some simple general reasoning to arrive at a set of high level conclusions that are not unreasonable.

⁷⁸ A simple measure of the proportion of debt the lender is supplying (or its complement, the equity the borrower has). Thus if a property is valued at \$500,000 and \$400,000 is lent against it, the LVR is 80%. APRA's capital requirements for lending are sensitive to the LVR ratio, especially for high LVRs, unless lenders mortgage insurance is taken, whereupon the LMI insurer's capital is sensitive to the LVR!

⁷⁹ June 2005 APRA statistics

<http://www.apra.gov.au/Statistics/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=10047> show charges for bad and doubtful debts running at just under 0.3% in the 12 months to June 2005 for the major banks.

would be a noticeable increase in lending bad debts, but that this is well below the level that would threaten any major lender.

- 12.5.3. The same thinking can be applied to Small to Medium Enterprises (SMEs)⁸⁰ in respect of mortality, on the presumption that the proprietor's survival is critical to the business. In addition, for SMEs it is necessary to factor in morbidity, mainly because the viability of SMEs and their ability to sustain their business and thus service their lending is often dependent on the personal exertion of the proprietor.
- 12.5.4. The Lowy/ANU paper built up their economic effects from a number of components including the impact on the labour force of both mortality and morbidity. They used a 30% attack rate and 10 days illness on each person attacked to model a 1.15% labour force loss. They also added a "carers" component to allow for female workers taking time off to care for sick or quarantined children. For Australia they used a total of about 1.32% and used the same amount of absenteeism across all four scenarios⁸¹
- 12.5.5. To my mind, this is a quite optimistic view of this effect for three reasons:
 - The base 1.15% makes no assumption of malingering nor the potential complications of influenza, some of which can be long lasting.
 - In a severe pandemic, with health facilities overloaded, it is highly likely that more than just females will need⁸² to undertake a caring role
 - The caring role may well be more than just one-off as there is a higher likelihood of cross infection in an infected household, and the nature of the disease means that this will roll progressively through the household.
- 12.5.6. For this exercise, I would choose a factor in the range 2% to 3%, using the more extreme factor in a more extreme pandemic.
- 12.5.7. One further factor affecting SME credit is that the demand side of the business will be affected. Lowy/ANU modelled demand separately for services/all other industries, combining the two for an aggregate outcome for each modelled economy.⁸³ CBO modelled demand declines for around 20 different industries.⁸⁴ All of which is to say that the demand effects could differ by line of business of the SME.
- 12.5.8. The final critical element for SME credit risk is the ability of the SME to withstand a shock. On this subject, I have no experience or information.
- 12.5.9. At the end, the complexity of trying to build a bottom-up view of SME credit risk impacts perhaps suggests a top down approach is better. Both the Lowy/ANU modelling and the CBO modelling suggest a severe pandemic will have a 1 year effect equivalent to a severe recession. The Lowy/ANU modelling suggests an "ultra" pandemic will be twice as bad. It is probably reasonable to use the credit experience of SMEs in severe recessions to infer the likely impact of a pandemic on SME credit risk. Again, this is not an area with which I am familiar, but I understand there is an element of

⁸⁰ For this exercise I have divided the exposure in to three simple categories: home lending, SMEs and larger corporates.

⁸¹ Lowy/ANU, bottom of p15 and p16.

⁸² People will quite likely and often enough correctly assume they are dealing with a life and death situation.

⁸³ Lowy/ANU p16.

⁸⁴ CBO p44.

“leverage” of economic activity on SMEs, ie the SMEs will be harder hit than business as a whole.

- 12.5.10. For large corporates, it is probably sensible to tag outcomes to the overall economic prognosis with the following caveats:
 - The economic prognosis varies significantly by industry; and
 - The credit risk of any individual corporate will involve a range of other factors besides the business performance.
- 12.5.11. Thus the message for credit risk on a large corporate book is that a more individualised review of the prognosis, possibly down to the level of each credit, is possibly warranted.
- 12.5.12. In the case of institutional investors holding corporate bonds, the issue is the extent to which a company’s profitability and balance sheet and hence its credit standing will be damaged by a pandemic. We have seen from the economic modelling that there is a likelihood of a one period severe recession level reduction in GDP but that following the pandemic, economic fundamentals may not be greatly changed. However, we have also seen that the pandemic will affect different industries to a greater and lesser degree. Further, it will be seen in the coming section on operational risk that there is potential for the way a company plans for and responds to a severe pandemic to affect their corporate health following the pandemic. Thus while the overall impact on corporate bond credit risk might be anticipated to be modest only, it is probably necessary for the assessment to be looked at by industry sectors and the potential for poor planning and execution during a severe pandemic to adversely affect a specific credit assessed.
- 12.5.13. Overall then, it appears a severe pandemic is likely to cause commercial lenders a significant increase in credit losses, broadly in line with the equivalent impact of the recessionary effect of a pandemic. As with a recession, it may take some time for all the losses to emerge. As with a recession, there will be an impact on all credits, but the impact is less for well secured personal credits than for SME credits. For institutional investors in corporate bonds, there may be a modest increase in overall credit losses, but it is necessary to consider this possibility issuer by issuer with regard to industry specific pandemic impacts and the potential for poor pandemic planning to affect an individual issuer.
- 12.6. Insurance risk:
 - 12.6.1. Critical for life insurance risk is the nexus between mortality and morbidity increases and insurance coverage.
 - 12.6.2. As we saw in the mortality section, the Lowy/ANU modelling suggests that in a severe pandemic additional mortality of 50% to 100% a normal years’ mortality overall might be expected. As noted from the 1918-19 pandemic, this potentially could fall unevenly on the population.
 - 12.6.3. At first glance, it may appear that for organisations carrying life insurance risk, the financial impact will be muted compared to the overall mortality and morbidity outcome because:
 - Some portion of the mortality and morbidity will fall on the very young and the elderly who will have low levels of insurance: and

- In the case of a 1918-19 style experience where the strong young adults are hard hit, this group is probably relatively underinsured.
- 12.6.4. Two things need to temper this first glance. First, for superannuation funds and the insurance attached to those, it is probably the very at-risk healthy young adults that are their biggest exposure. Second, for personally applied for insurance (such as a life company's retail book) it is not the experience of the uninsured that is critical but rather the relative experience of the insured.
- 12.6.5. I think of the mortality impact for retail lump sum covers as follows: Risk premiums are something in the order of 50% of gross premiums and profit margins before tax something in the order of 20%⁸⁵. In a severe pandemic the relevant Australian mortality shock appears to be of the order of 50%~100% of the expected risk cost. Consequently, a pandemic has the potential to cost the equivalent of one to two years profits on a representative retail risk book but is very unlikely to threaten the solvency of a robust retail book⁸⁶. Because the pandemic impact is "once off" there should be no need to revise the actuary's mortality assumptions for the future⁸⁷.
- 12.6.6. For retail income protection the relatively short duration of a likely illness, the likelihood that under most contracts only self-disability is covered and typical waiting periods mitigate the potential insurance risk cost. The inception rates for illness will however be very high. Income protection has highly risk factor specific inception rates. For this exercise, I've used 6% as indicative for a 14 day wait and 2% as indicative for a 30 day wait. It appears influenza inception rates for a zero day wait will be around 25% but the typical duration appears to be around 2 weeks⁸⁸. It therefore seems quite likely that significant numbers of short term claims could arise under 14 day wait policies. If 25% of illnesses run for 3 weeks or more, then claim inception rates could double. This effect would be much more noticeable for white collar occupations where the indicative inception rate is only 3%. For a 30 day wait, there still could be significant increases in the overall inception rates. If 10% of illnesses run for 5 weeks or more, 30 day wait inception rates will, across a population-representative book, double. The same adverse relative skew to better occupations will occur.⁸⁹
- 12.6.7. Of course, claims costs are not likely to be as deeply affected as the inception rates. Indicative 1-month terminations are around 30% to 40% for all risk factors. For influenza claims, the 1-month terminations are expected to be near to 100%⁹⁰. For this ball park exercise, I'll use 80%, with 100% termination in the second month. Thus with some simple assumptions as to

⁸⁵ These parameters vary from provider to provider. Each provider can "tune" the approach to their own pricing. It goes without saying that more profitable lines are better able to withstand a pandemic mortality shock.

⁸⁶ Rudolph "Learn from 1918" notes that in 1918-19, about three quarters of US life companies paid no or a reduced dividend (cash dividends are the normal form of participation in US life policies). I infer from this that profitability was hit but companies remained solvent.

⁸⁷ These assumptions for prudential reserving ought to already allow for extreme risks such as pandemic.

⁸⁸ But note conflicting information on this quoted earlier.

⁸⁹ I am not advocating these particular illness duration proportions. Rather, they are being used to build some high level numbers from which an "I believe" can be conducted.

⁹⁰ As noted earlier, there can be genuine long term complications of influenza. Rudolph "Learn from 1918" notes on p27 cardiac and neurological impacts including paralysis and mental illness. It must also be anticipated that there will be some extension of potential claims through the need to care for a household member or simple malingering. In the conditions of an over-worked claims department, it may be that more of these will be paid for longer than they should.

weeks on claim in each month, these termination rates suggest a cost once on claim of maybe 20% of the standard table claims cost.⁹¹

- 12.6.8. Putting the two together suggests it is conceivable that over a population-representative portfolio, there could be a 20% increase in claims costs for both 14 day and 30 day wait benefits. This is unlikely to be solvency threatening as such, but given the generally poor profitability of retail income protection policies, this probably represents burning up to 5 years profits.
- 12.6.9. It is clear however, that the proportionate damage will be much larger on the white collar and professional classes because the risk shock is “classless” and therefore represents a much higher relative shock to preferred risks. I have no figures, but understand that the Australian retail income protection book is broadly population-representative with a potential skew to the white collar and professional occupations. Financial services organisations with such books therefore need to consider the white-collar / blue-collar mix of their book and anticipate an outcome twice as bad as noted above for the white-collar portfolio.
- 12.6.10. A final word of warning on this high level assessment. It is not an estimate but rather a guesstimate / planning scenario. To undertake an estimate, better understanding than I possess of the distribution of duration of illness would be required and the numbering would always need to be put in the context of the actual terms and conditions of the policies under consideration.
- 12.6.11. A similar logic can be used for wholesale risk lump sum benefits as for retail risk. Here the equation is far more severe as the risk premiums are something of the order of 85% and the profit margins something of the order of 5%. The increased Australian mortality shock is still 50% to 100%, and given the insured demographic, possibly worse in a severe pandemic due to the risk of cytokine storms in robustly healthy young workers. Put these together and there is the potential for a pandemic to burn the equivalent of 8 to 20 year’s profits. That is enough to potentially burn through the available capital base allocated to wholesale lump sum risk business.
- 12.6.12. This is a potentially real issue for superannuation trustees, whether insured or self-insured as a severe pandemic has the potential to significantly change the financial status of their fund or place them in a state of very high reliance on an insurer’s claims paying ability.
- 12.6.13. At the high level, it seems likely that the issues with wholesale lump sum risk will also apply for wholesale income protection, although at a less severe level. For many funds, there may be a relative benefit compared to a retail book in that they are nearer to population-representative. This is however dwarfed by the simple fact that there are very skinny margins in this business and any material increase in claims costs will burn through several years profits. My view is that it will be nigh impossible to recoup these losses through future re-rating as trustees and “newco”⁹² tenderers will focus on expected future claims costs.

⁹¹ I’m too embarrassed to reveal how I did this numbering. For the good of your soul, try something yourself!

⁹² A classic pricing situation where a new entrant without the burden of a past loss or legacy terms and conditions will have competitive advantage. It was exactly this type of competitive situation that drove aggregate term insurance pricing out of the market in favour of non-smoker pricing.

- 12.6.14. For completeness, this section needs to consider medical health insurance. Some broad general reasoning can define the scale of the issue as follows:
- GP visits will skyrocket during a pandemic, and probably be elevated before an overseas pandemic has actually made its way to Australia, and be elevated for some months after as a nervous population settles back to its former health services usage pattern⁹³. Much of this cost will fall to the state and federal governments⁹⁴, but there may be some leakage into the more generous health fund benefit scales.
 - Hospitalisations will increase significantly. For simplicity, there will be three groups from the 25% attack rate victims. Those who die⁹⁵ can be assumed to be hospitalised under the most expensive treatment⁹⁶. Those who become life-threateningly ill can also be assumed to be hospitalised, possibly at slightly less expense in terms of both duration of stay and intensity of nursing. The remainder may have comparatively little additional cost other than medications and additional GP visits. I have seen no cogent discussion⁹⁷ of the split of the last two groups. In the absence of better information I would use a simple exponential rule to generate the proportions. For a 2.5% case fatality rate, this suggests a further 14.5% need hospitalisation and the remaining 83% only require home nursing.
 - For all infected people and some proportion of their households and carers potentially insured medications will be required.

12.6.15. Unfortunately, I have little or no knowledge of this area of insurance risk⁹⁸ and so no attempt is made here to convert this into excess insurance losses. It is probably worth commenting however that this is likely to be very significant. Given the broadly mutual nature of Australian health funds and the particularities of how health fund premiums are set, it appears to this lay observer that a severe pandemic would be a devastating financial event for Australian health funds, quite possibly requiring government intervention.

12.6.16. There do not appear to be any significant direct linkages between a pandemic outbreak and insurable losses for general insurance risks. Indeed, some risks may well be reduced temporarily on account of a pandemic⁹⁹.

12.6.17. In summary then, for human life and well being insurance, there will almost certainly be significant short term increased costs. The impact of the increased costs is highly dependent on the insured demographic, the typical margins in the current pricing and benefit design. For “typical” expressions of these insurances, the impact on retail books can be expected to be strong but not solvency threatening. In wholesale books, the impact is expected to

⁹³ An article by Hugh Powell “Pandemic The cost of Avian Influenza” in the American Academy of Actuaries September October 2005 “Contingencies” quoted certain statistics from a “*CDC commissioned study of a pandemic influenza model*”. I was unable to source the statistics from CDC itself. The quoted statistics noted a 42% “Outpatient” rate for infected individuals. This may refer to the equivalent of our GP and hospital outpatient treatments.

⁹⁴ Medicare is a federal government issue, but the state based hospital system may well pick up some part of this through emergency departments.

⁹⁵ 2.5% in a severe pandemic. See discussion of mortality.

⁹⁶ If it can be obtained.

⁹⁷ The AAA “Contingencies” article by Pugh quotes the CDC model with 7.3% hospitalisations amongst the infected. The veracity of these statistics is clouded by their quoting a death rate of 0.2% in both a low and a high scenario but describing the death rate as being based on the 1957 death rate (0.37%) at the low end and “a multiple” at the high end.

⁹⁸ Other than as a user, and a heavy one at that. I am convinced my health fund hates me.

⁹⁹ For example, motor insurance claims may fall due to lower traffic volumes. Household burglaries may also fall although post a pandemic, crime could potentially increase due to economic hardship.

be proportionally much higher, potentially creating capitalisation issues for any organisation without reinsurance that will withstand a severe pandemic and a high proportion of wholesale exposures. For health insurance books, it is possible the impacts will create widespread capitalisation issues and or compromise claims paying ability without specific government intervention in this price-controlled market.

12.7. Market risk:

12.7.1. Market risk takes many forms across financial services organisations. These include:

- Traded risk such as arises from taking positions from a trading desk.
- Mismatch between the liability characteristics and the characteristics of the assets backing liabilities.
- Principal positions, ie choosing to hold capital in forms exposed to market risk as part of a deliberate risk / reward investment strategy.

12.7.2. It should be taken as a given that a financial services organisation understands its market risk position and is comfortable with that position ahead of any possible risk impact of a pandemic.

12.7.3. The conclusion from economic modelling appears to be¹⁰⁰ that in the event of a severe pandemic, there will be a GDP reduction equivalent to a severe recession in the year of the pandemic but that economic fundamentals post a pandemic will probably be unaltered. The implication of this is that there is no need to revise longer term market risk settings on account of an impending, current or recently passed severe pandemic.

12.7.4. There is however a short term issue certain financial services organisations need to consider very seriously. The issue arises from the likelihood that financial markets will seriously over-react to a severe pandemic taking markets much lower than the actual economic fundamentals justify¹⁰¹.

12.7.5. One of the lessons of risk-based failures is that it is not a single adverse outcome that kills the company, but the conjunction of a number of adverse outcomes.¹⁰² A severe pandemic represents a classic conjunction for any organisation holding significant pandemic-affected insurance risk as that risk will be generating losses at exactly the same time that market risk may be generating short term losses that may be significant. That is, claims may have to be paid at precisely the time when reserves for normal levels of claims and capital to cover adverse levels of claims are both depressed in value.

12.7.6. There are three possible responses to this situation, and which an organisation chooses will depend on its risk appetite and “beliefs” about pandemics. The role of financial professionals here is to make sure the organisations are informed enough to understand the responses they are actually making:

¹⁰⁰ See section 11.

¹⁰¹ See section 11.6 in particular. My own view is very strongly that markets will behave irrationally at the onset of a pandemic, creating an interesting set of risks and opportunities for any investors bold enough to step away from generally accepted benchmarks.

¹⁰² A lesson I learnt at the knee of a number of risk managers, but in particular Jim Evans of Lend Lease and CBA who has wide experience in these matters.

- Do nothing and tough it out. That is make no changes to risk settings. The rationale for this probably rests most strongly on a view that getting the timing right is not possible and that being de-risked before there is a need to be is as damaging as being fully-risked at the time of a pandemic.
- De-risk now in anticipation of a pandemic. The rationale for this probably rests on the view that the organisation must survive the adverse situation at all costs and hence any lost opportunity ahead of a pandemic is a necessary cost of being a robust organisation. This in turn probably requires the “beliefs” to be that a pandemic will happen, will happen in a relatively short time (say within 3 years) and will be severe.
- Plan to de-risk “at an appropriate” time. The rationale for this is that the conditions which will spark an irrational market response are knowable and can be perceived in advance. This potentially allows an organisation to enjoy the benefit of its current risk settings for longer, but then gain the benefit of lower risk settings when that is the better position. Critics will call this “market timing” and are probably right to do so. I have a reasonably strong preference for this approach¹⁰³ rooted in the belief that the market’s irrationality will be predictable and slightly reactive. Thus for my own “opportunistic” money I plan to de-risk a little if a Phase 4 alert is issued and de-risk seriously when a Phase 5 alert is issued¹⁰⁴. For any organisation, the dangers of such an approach lie in the possibility that a pandemic will move with extreme rapidity between phases, or even jump phases, and that the market will elect to panic early.

12.7.7. There is one last aspect of market risk that should be considered.

Organisations such as super funds, unit trust managers and life companies with unit linked funds are managing other people’s money. The risk belongs to the customer, but the organisation probably has a duty to inform the customer about the nature of the risks they are facing and, to an extent, help protect the customer from themselves. It can be expected that during a pandemic induced market panic, many fund members and customers may think to change their investments away from equities and growth assets to defensive assets. Given the long term prognosis, this may well be against their best interests. Financial services organisations with this type of business need to seriously consider what, how and when they are going to communicate with their members and customers about this issue.

12.7.8. In summary then, over the longer term, there is probably no need to review market risk settings on account of a severe pandemic, but for organisations facing a conjunction of losses such as increased insurance pay-outs or increased secured bad debts during a severe pandemic, serious consideration needs to be given to how their short term position will be affected and how tenable / desirable that position will be. In addition, organisations managing other people’s money, need to plan in advance how they will assist their members and customers make their decisions in the face of pandemic induced market upheaval.

12.8. Operational risk:

12.8.1. It should be clear from the attack rates noted earlier that in a severe pandemic around 25% of all people will be stricken over the 3 month period expected

¹⁰³ Much to the disgust of some former colleagues.

¹⁰⁴ It is a “courageous” risk manager who embarks on this approach planning to de-risk at Phase 6!

for the first wave of pandemic¹⁰⁵. Workers amongst these people will be sick and away from work for 1 to 2 weeks, possibly more¹⁰⁶. In addition there will be a need for carers. Somewhere around 90% of the ill will require only home nursing¹⁰⁷ however it can be assumed that this will need to be quite intensive¹⁰⁸ and that combined ill and carer absenteeism will be around 8% on top of whatever base level of absenteeism exists. This is just an average. As the workplace may be a major source of infection, the actual impact in one workplace could be much higher as individuals fall sick, and cross infect their families, at about the same time, albeit having this higher level of absenteeism for a shorter period within the 3 months.

- 12.8.2. Further, some proportion of workers will seek to minimise their chance of exposure by taking leave, working from home or simply not coming to work during the height of the pandemic.¹⁰⁹
- 12.8.3. In addition, the effects of government policy or the pandemic itself may raise additional barriers to workers attending their workplace, eg schools being shut or public transportation being closed or curtailed.
- 12.8.4. The general view is that it is prudent to contingency plan on 40% to 60% of workers being unavailable at the work place during the height of a severe pandemic.¹¹⁰
- 12.8.5. For some parts of the business of financial services organisations it may be feasible to simply run at the capacity available. There will be other parts however where there is a need to run at or near to full or mildly reduced capacity so as to preserve profitability or to maintain customer confidence and protect the organisation's brand.
- 12.8.6. For specific essential functions within organisations, the planning may be complicated by small team sizes and lack of substitutable skills such that the peak absence rate will be higher than the average the organisation is planning around.
- 12.8.7. In summary then, the direct (illness and caring), indirect (school closures and transport reduction) and protective (avoiding exposure to infection) impacts of a severe pandemic could result in very high levels of absenteeism that would disrupt all the organisation's functions, including those considered essential to the daily operation of the organisation.

12.9. Strategic business risk:

¹⁰⁵ Revill "Bird Flu" p138 (3 to 4 months) and p145 (3 months). Rudolph "Learn from 1918" notes that in 1918 waves of the flu in a given city took 6 to 8 weeks to arrive, flourish and go.

¹⁰⁶ Revill "Bird Flu" p145 (UK government predicts ... workers will be absent for 5 to 8 days, but this could be a huge under estimate), p171 (up to a week for children), p180 (may feel very tired for several weeks after recovery [possibly not functioning at full productivity]).

¹⁰⁷ Revill "Bird Flu" p140 (complication rate could be as high as 10%). p132 (roughly 7% of cases will require a ventilator).

¹⁰⁸ See Revill "Bird Flu" p179 for a description of the care of flu patients. Because of the need to monitor for laboured breathing or the start of cyanosis (eg blue lips) and the need for rapid action if this starts, it is unlikely flu patients will be left unattended at home.

¹⁰⁹ People are likely to be infectious 1 to 2 days before symptoms show, and children possibly longer. Revill "Bird Flu" p196.

¹¹⁰ Known planning criteria of certain companies, Revill "Bird Flu" p145 and the high end of Mercer ."The Emerging Global Pandemic – Human Resource Implications".

- 12.9.1. This risk can be thought of as either the residual of total risk after credit, market, insurance and operational risk, or perhaps more helpfully as the risk that changes in the operating environment (economic, regulatory and competitive) could cause loss of profits or future earnings potential to an organisation.
- 12.9.2. With one exception that has probably already come to pass, it is my view that there are no particular aspects of a severe pandemic that would adversely affect the strategic business risk of financial services organisations over all. In fact for those organisations who currently derive profit from life and health insurance or have the potential to do so in the future, a severe pandemic could possibly expand their overall market.¹¹¹
- 12.9.3. The exception is regulatory risk where APRA’s requirements may well change following the experience of a severe pandemic. See the next section for detail on why this may already have happened.
- 12.10. Overall Summary:
- 12.11. In general, it appears that the universal and for many the most serious risk exposure for financial services organisations is operational risk. However, each organisation needs to look at the specific risks to which is it exposed and its current management of each risk as credit risk, insurance risk and market risk all have some pandemic driven outcomes and the mix of risks varies across organisations

¹¹¹ Whether life and health insurance are “bought not sold” or otherwise, there is a strong possibility that potential insureds will be more receptive to purchase having just looked mortality and morbidity square in the eye.

13. APRA

- 13.1. APRA “*expect our institutions to conduct regular and thorough risk assessments which analyse the impacts that plausible disruption scenarios would have on their critical business functions, resources and infrastructure*”. “*It is important that an institution’s documented BCP is regularly reviewed to ensure that internal changes to business activities, processes and systems and changes to the external environment are reflected*”¹¹².
- 13.2. On 18 April 2005 APRA issued prudential standards on business continuity management for ADIs and general insurers¹¹³ aimed at ensuring they implement a “whole of business” approach to business continuity management. Key requirements are that organisations:
- Board and senior management consider business continuity risks and controls as part of the overall risk management frame work.
 - Identify critical business functions, resources and infrastructure which if disrupted would have a material impact on the operations, reputation or profitability.
 - Assess the impact of plausible disruption scenarios on these critical functions, resources and infrastructure.
 - Develop, implement and maintain a Business Continuity Plan that ... enables the company to respond to disruptions and recover critical business functions.¹¹⁴
- 13.3. A draft in similar terms has also been issued for Life Insurers in July 2004¹¹⁵. It is noted in the regulation impact statement put out with this draft that APRA has no power to determine prudential standards for superannuation funds but that operational risk issues including BCP have been addressed as part of new APRA licensing and registration requirements.¹¹⁶ SGN 120.1 requires a superannuation licensee to have a risk management plan identifying at least risks to the investment strategy, financial position and from outsourcing; and when these risks should be audited. A draft has not yet been issued for Friendly Societies but I understand is in the pipeline.
- 13.4. I understand that APRA is of the view that the existing requirements cover pandemics in a generic sense and that APRA is currently considering what if anything else they may need to publish in regard to pandemics.
- 13.5. APRA is meeting with the larger institutions to discuss their pandemic planning efforts and is actively engaging with relevant industry associations. APRA is advising the government on financial sector pandemic planning issues.¹¹⁷

¹¹² Both quoted from John F Laker, Chairman APRA, “Operational Risk Management: A Prudential Perspective” 25 August 2005. P6.

<http://www.apra.gov.au/Speeches/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=9488>.

¹¹³ APS 232 and GPS 222.

¹¹⁴ paraphrased from the APRA medial release of 18 April 2005. See <http://www.apra.gov.au>.

¹¹⁵ http://www.apra.gov.au/Media-Releases/04_24.cfm.

¹¹⁶ <http://www.apra.gov.au/ADI/loader.cfm?url=/commonspot/security/getfile.cfm&PageID=7439>

footnote 1.

¹¹⁷ Thanks to Heidi Richards of APRA for this information.

14. Risk mitigation and management strategies

- 14.1. This section is in two main parts, with a personally much-loved pandemic catch phrase at the end. The first part relates to individuals and the second to organisations.
- 14.2. “Why?” you might ask, does a paper relating to advice to financial services organisations look at risk mitigation and management for individuals. As you will see when we get into the organisations part of this section, the degrees of freedom for mitigation and management are quite low. Perhaps the largest and most challenging risk mitigation strategy organisations have is to help their staff, and where relevant their members and customers, to avoid becoming infected and then manage themselves and their loved ones if they do become infected, particularly if the illness leads to complications.
- 14.3. A number of publications make a very simple point: Through prior planning and gaining appropriate knowledge, it is possible for individuals and organisations to reduce the rate of infection and perhaps the severity of the disease once infected.¹¹⁸
- 14.4. Individuals:
- 14.4.1. First some context that is relevant:
- It is clear there will not be enough vaccine ready to protect people in time for a pandemic, unless the disease spreads more slowly than is being predicted¹¹⁹.
 - Oseltamivir (Tamiflu) has been shown to give some protection against bird flu, by reducing its severity.¹²⁰ For normal flu it reduces the time off work by one day.¹²¹ Another drug, Relenza may have similar effects but is less well documented in this context. Tamiflu and Relenza are prescription drugs in Australia. It is likely that the supply of Tamiflu and Relenza will be tight and subject to government controls during a pandemic.
 - Influenza virus can survive on hard surfaces for up to 48 hours, and 8 hours on soft surfaces.¹²² Heat and light kill the virus.¹²³
 - Individuals may be infectious for several days before symptoms show and will remain infectious for the duration of the illness and for some time after.¹²⁴

¹¹⁸ Revill “Bird Flu” p152 and Pandemic Influenza Planning: A guide for Individuals and Families published by the US Department of Health and Human Services January 2006
<http://www.pandemicflu.gov/plan/pdf/guide.pdf>.

¹¹⁹ Revill “Bird Flu” p101.

¹²⁰ Revill “Bird Flu” p88.

¹²¹ Revill “Bird Flu” p89,90.

¹²² Quoted in many publications.

¹²³ Revill “Bird Flu” p 198. Proper cooking will destroy the virus in infected meat or eggs, but care is needed in handling potentially infected food stuffs before cooking. The reference to light was not elaborated. I found a number of references to sunlight (in some cases specifically UV-B) killing the virus, but it was hard to classify these as authoritative. Dr Alan Carless noted that viruses do not multiply or survive long away from living cells. Unlike bacteria, yeasts and moulds they have no cell wall and cannot form spores. They do not divide like bacteria and cannot multiply in dead tissues. Faeces, urine, meat and possibly eggs with embryos could harbour viruses for days, but not forever. No special food safety techniques apply in pandemics but the importance of not transmitting lethal viruses by neglecting food hygiene deserves stress. See also
<http://www.eggsafety.org/Information%20on%20Avian%20Influenza%20from%20the%20Egg%20Safety%20Center.pdf> and http://www.who.int/csr/disease/avian_influenza/avian_faqs/en/#poultry.

- Soap and water, alcohol wipes and normal household disinfectant are all effective at killing the virus outside the body.
- The demand on critical illness care facilities such as ventilators could rise over 230% during the pandemic period.¹²⁵
- Humanized bird flu is expected to have a reproductive number of around 2 (ie each infected person will on average infect two others).¹²⁶ Any steps taken by the population to reduce this number through personal hygiene and infection control significantly reduces the pace and possibly the extent of spread of the disease.¹²⁷
- However, the vast majority of infected people will suffer nothing more than a nasty bout of the flu.¹²⁸

14.4.2. It is expected that once human transmissible, the virus will spread through exhaled droplets, notably from coughing and sneezing, and by physical contact with contaminated surfaces. Consequently, personal hygiene measures aimed at limiting transmission are the most important risk mitigation strategy¹²⁹:

- Ill people should cough and sneeze into a fresh tissue and immediately dispose of it in an appropriate container, which should then be regarded as contaminated.
- Ill people should consider wearing a mask over the mouth and nose to prevent exhaled droplets. It is critical that a used mask be treated as highly contaminated and handled and disposed of appropriately.
- Ill people should wash their hands often. Alcohol hand wipes may be the most practical means.
- Hard surfaces that may be contaminated, particularly high traffic surfaces such as door knobs and workplace toilet facilities should be cleaned frequently with disinfectant material.
- Well people should wash their hands regularly¹³⁰ and avoid physical contact with potentially contaminated sources such as other people (eg by hand-shaking) or surfaces (such as washroom doors).
- Well people should avoid touching their mouth, nose, eyes or ears as these are entry points for disease.¹³¹ The efficacy of mask wearing for the healthy is not clear. It would be dangerous if wearing a mask led a healthy person to conclude they should reduce other control measures. As for an ill person, a used mask should be regarded as contaminated once used and should be handled and disposed of properly. Masks

¹²⁴ The actual infectious period is not well documented. Until further evidence is available, WHO recommends that infection control precautions for adult H5N1 patients remain in place for 7 days after resolution of fever. Previous human influenza studies have indicated that children younger than 12 years can shed virus for 21 days after the onset of illness. Therefore, infection control measures for children should ideally remain in place for this period where feasible. Families should be educated on personal hygiene and infection control measures (e.g. hand-washing and use of a paper or surgical mask by a child who is still coughing). Children should not attend school during this period.
http://www.who.int/csr/disease/avian_influenza/guidelines/en/Guidelines_Clinical%20Management_H5N1.pdf

¹²⁵ Revill "Bird Flu" p132, sourced to a UK study by the Intensive Care Society.

¹²⁶ Revill "Bird Flu: p120.

¹²⁷ Rudolph "Learn from 1918" discusses modelling done on disease spread that arrives at this conclusion.

¹²⁸ Revill "Bird Flu" p175.

¹²⁹ This is an amalgam from a range of sources previously quoted.

¹³⁰ There is a well established routine for properly washing hands when potentially contaminated, eg http://www.health.gov.au/influenza/FS_washing.pdf.

¹³¹ Revill "Bird Flu" p167 notes that unconscious touching of this sort occurs 1 to 3 times every 5 minutes.

should be changed regularly. Moist masks can be a health hazard in themselves. The US CDC suggests masks should be considered when in public places where close contact with other people may occur.^{132 133}

- Wash potentially infected clothing and bedding often.

14.4.3. Maintaining personal health is important going into a pandemic:

- Eat appropriately.
- Don't smoke. Influenza is a respiratory disease and medical opinion is that smokers are likely to be worst affected.¹³⁴
- Consider taking an Omega-3 supplement. These essential fatty acids make prostaglandins which have an anti-inflammatory activity so they may help immune functions and are one dietary element that is most likely to be deficient.¹³⁵
- Have the usual seasonal flu shot. There is some evidence that the current vaccines have some efficacy with H5N1, and otherwise it may help in the identification of newly emerging viruses.

14.4.4. Prepare your household for the worst of a pandemic¹³⁶: Some commentators note that power and water may be affected and therefore it is sensible to have a small contingency against this event. It is noted that households do not need supplies to wait out the 30 years war, nor even a full pandemic period. Enough for 1 to 2 weeks will give the flexibility to be able to choose when additional supplies need to be obtained; and to avoid panic buying:

- Bottled water and juices. Fluids with electrolytes for the sick.
- Ready to eat foods (canned meat, vegetables, fruit, soup), dried foods not requiring water. Pet food if you have a pet. Manual can opener. No good looking at a tin of beans if the power is off!
- Anti-fever medicines such as paracetamol. Aspirin is not recommended for influenza.
- Anti-diarrheal medication.
- Any required prescription medications for pre-existing conditions.
- Cleaning materials eg soap, alcohol wipes, disinfectant.
- Disposal materials eg garbage bags.
- Tissues and toilet paper. The sick may need large amounts of both. Disposable nappies for babies and very young children.
- Candles, flashlights, batteries, portable radio.

14.4.5. Carefully nurse the ill. Good care and some strategies may reduce the duration and severity of the illness. For those who develop complications¹³⁷ early identification and rapid application of more intensive nursing may be the difference between life and death.¹³⁸

- Take anti-virals (Tamiflu or Relenza) if available. These are expected to reduce the duration and severity of the disease. They are prescription medicines at this time. Carers should also seek to take vaccines if they

¹³² Revill "Bird Flu" p165.

¹³³ Revill "Bird Flu" p207 states that gloves are a waste of time as hand washing is just as effective and that protective clothing is only required for health care workers in a contaminated environment.

¹³⁴ Revill "Bird Flu" p154.

¹³⁵ Revill "Bird Flu" p154.

¹³⁶ This list is mainly drawn from Pandemic Influenza Planning: A guide for Individuals and Families published by the US Department of Health and Human Services January 2006:

<http://www.pandemicflu.gov/plan/pdf/guide.pdf> and is supplemented with other material noted along the way.

¹³⁷ Up to 10% as previously quoted.

¹³⁸ Drawn mainly from Revill "Bird Flu" p187, 179, 194, 195.

are available or anti-virals as prescribed by a medical practitioner for prophylaxis.

- Offer lots of hot and cold drinks.
- Offer pain killers.
- Monitor for dehydration. Offer anti-diarrheal medication as needed.
- Record temperature at the outset and monitor it regularly.
- Use a room humidifier. Moisture appears to not favour the virus.
- Monitor for deterioration of condition. Laboured breathing (ie patient unable to get enough air) or blue tinge around the lips are danger signs that require immediate medical consultation. Any blood in phlegm or large amounts of yellow or green (ie bacterial infection of) phlegm require urgent medical assistance. In the cases of human contracted H5N1 to date, laboured breathing has become a symptom within three days.¹³⁹
- Write down symptoms as they emerge. This information could prove critical if the disease becomes severe in the patient.

14.5. Financial services organisations:

14.5.1. As has been noted, operational risk is the universal impact of a pandemic. Much of the pandemic operational risk comes from business continuity risks of staff absenteeism. As has also been noted, APRA is expecting regulated entities to have built pandemic type scenarios into their business continuity planning. There are a range of mitigation and management strategies that can be taken in regard to this risk:

- Identify functions that are critical to maintaining the business and develop contingency plans for these. This could include cross training.
- Identify key staff and develop contingency plans specifically for them. This could involve priority health treatment, prophylaxis or isolation.
- Identify the communications needs of stakeholders. Will cover staff and markets. It may extend to customers, members, insureds etc. Being clear about the messages that need to be communicated, the timing and medium are all important elements.
- Deal with the occupational health and safety of staff. This will include education about infection, infection control and personal hygiene, provision of appropriate materials such as cleaning materials but may extend to more extensive measures such as barrier materials (masks, gloves etc.) and anti-virals or vaccines.
- Where possible develop work at home or work remote capabilities and / or cross train staff so as to build resilience in staffing options during a pandemic.

14.5.2. In preparing a plan to manage operational risk it is sensible to consider not only the direct risk, such as ill or absent staff, but also the indirect risks. These could be many and will vary across the types of financial services organisations. They will include things such as the different patterns of consumer use of services (eg reduction in face to face transacting and increase in phone and internet transacting) and a range of “flow-on” impacts of the disruption to other businesses which form part of the organisation’s supply or fulfilment chain. For life and health insurers, this could be particularly important as a possibly stressed health care system and health care workers are unable to, or treat as lower priority, providing the

¹³⁹ Revill “Bird Flu” p194.

information needed to underwrite, assess or manage risks. For some types of insurance, the health care system stress may even lead to increased claims costs due to slower or less effective treatment. Clearly the ability to mitigate and manage these indirect risks is lower than for risks directly in the organisation's control. Strategies are likely to include understanding the pandemic plans of key suppliers and making contingency plans in the event of operational failure or shortcomings of suppliers.

14.5.3. Credit risk strategies really fall into two groups – those for individuals and SMEs and those for corporates and for institutional investments in corporate bonds:

14.5.3.1. There are limited avenues to mitigate and manage the additional credit risk a severe pandemic may bring for individuals and SMEs:

- Credit providers could ration their lending, however as this is core business it goes against the purpose of being in business. Further, it is too late to ration business already taken on but for which this exposure exists.
- Various risk sharing / risk transfer mechanisms exist and can be used or extended. These include LMI insurance for a direct writer, reinsurance for an LMI insurer, securitisation of the credit book or some credit risk related financing from capital markets. Organisations with credit risk should be reviewing their risk settings in the light of potential pandemic risks and re-casting their utilisation of these mechanisms if appropriate.
- To a limited degree, pricing could be used to either better price for those credits with greater pandemic risk, or to using pricing signals to “cherry pick” the preferred risks. Again this mechanism is only useful for yet to be written credits.
- It may also be possible to use pricing, post a pandemic emerging to help claw back potential losses across the whole book. Such a move could aggravate the extent of the losses.
- If some infection avoidance and self-protection strategy for debtors is considered appropriate, it is possible to target this at the credits that are most at risk, thereby reducing the cost of this strategy and possibly improving the efficacy of any campaign.
- Finally the risk could be (partially) mitigated by encouraging the exposed to take out life insurance, thereby shifting some of the risk from a credit risk into an insurance risk.

14.5.3.2. Similarly there are limited avenues to mitigate and manage the additional credit risk a severe pandemic may bring for corporates:

- Credit limits could be reviewed by industry and tightened for the most exposed industry segments.
- For new major exposures, it is feasible to write pandemic preparedness into the credit assessment process. For existing major exposures, the corporate can be asked to disclose their degree of pandemic preparedness, and on-going assessments can be based on this. It may be possible to exert some influence on credits whose preparation is seen to be below par.

14.5.4. For insurance risk, as for credit risk on individuals, the mitigation and management avenues are constrained. Insurance risk will often be core to the business of the organisation and the options in respect of risks already underwritten are much narrower than for risks yet to be written.

14.5.4.1. Clearly if insurance risk is non-core then steps can be taken to outsource it. Some diligence is needed to ensure that in the event of a severe pandemic the residual risk does not fall back on the organisation.

14.5.4.2. Where it is core:

- Various risk sharing / risk transfer mechanisms exist and can be used or extended. These include current reinsurance programs, stop loss reinsurance programs¹⁴⁰, and alternative risk transfer mechanisms such as so-called Catastrophe Bonds¹⁴¹. Organisations with insurance risk should be reviewing their risk settings in the light of potential pandemic risks and re-casting their utilisation of these mechanisms if appropriate.
- To a limited degree, pricing could be used to better price for pandemic risk, however this is difficult to achieve in a competitive market ahead of actual insurance losses.
- Following pandemic losses pricing across the book could be used to try and claw back some losses. Again, competitive forces may constrain this opportunity.
- There are a range of acceptance and limitation mechanisms that could be used. These are all quite limited because they will apply principally to new applications, not existing covers. They are perhaps most useful in limiting the scope for anti-selection to damage the organisation during a pandemic.
- For claims generally and income protection claims in particular, the approach to claims admittance can be tweaked to optimise the outcome. There are two aspects to this. The first is ensuring that anti-selective and illegitimate claims are not allowed to sneak through under cover of a pandemic. The second is being potentially rigorous with claims handling without straying into the brand-damaging territory of declining legitimate claims.
- Finally, and possibly the most effective mitigation strategy, is an infection avoidance and self-protection strategy for the insureds themselves, thereby helping them to avoid the need to claim. Based on what I have seen leading up to and during the writing of this paper, I am of the view that there is scope for holders of insurance risk to enhance their insureds' ability to protect themselves through simple and practical infection control advice. This appears to have potential for all classes of life, health and income protection insurance.

14.5.5. While the inherent market risk is beyond the control of financial services organisations, for much of their exposure it is their own policy setting that defines how much of this risk is taken on. Organisations have the ability to dial up or down their market risk to a fair degree. This can be done through both direct positions taken, and also through using hedging techniques to counter direct positions taken. In market risk, there clearly is no “free lunch” so de-risking implies moving lower on the risk/reward curve or efficient frontier, however it is achieved. Perhaps what is most critical in regard to managing market risk to make sure that there are appropriate charges being made for any guarantees being given¹⁴² and that there are appropriate capital

¹⁴⁰ Which may prove to have relatively low capacity and to be relatively expensive at this time.

¹⁴¹ Swiss Re recently announced to the Australian market that they had written one of these to protect their own book. Mechanisms such as this tap a different and wider potential source of funding large losses.

¹⁴² Bearing in mind that allowing for pandemic risk might change the assessed cost of a guarantee and that historically financial services organisations have undercharged for guarantees. In recent times Australian financial services organisations have been better at this pricing than most of their overseas

reserves backing the risk so as to avoid placing the organisation under financial duress in a severe pandemic situation.

14.5.6. Section 12 noted my view that severe pandemic created little significant strategic business risk exposure for financial services organisations but did offer up some potential opportunities. Whether an organisation shares this view or takes the opposite view, it is appropriate to use the opportunity of planning for a severe pandemic to explore the strategic business threats and opportunities that may arise out of it and to create a plan to address these.

14.6. And finally remember above all, “don’t kiss the chickens”.¹⁴³

equivalents, but there is still a tendency to underestimate these costs. Potential extreme events such as a severe pandemic create a reason to attempt an objective review.

¹⁴³ To quote from Revill “Bird Flu” p144 “The Hong Kong government has ... advised the public not to kiss their pets”

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