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Centre for Risk Studies

IS THE UK WELL PREPARED FOR A REPEAT OF THE 1918 INFLUENZA PANDEMIC?

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Pandemic Risk in UK

- Scenarios for a present-day pandemic
- Trends that are increasing pandemic risk
- Trends that are decreasing pandemic risk
- How likely is something similar to the 1918 pandemic to occur again?
- How could we be better prepared?

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A Hypothetical Pandemic Scenario

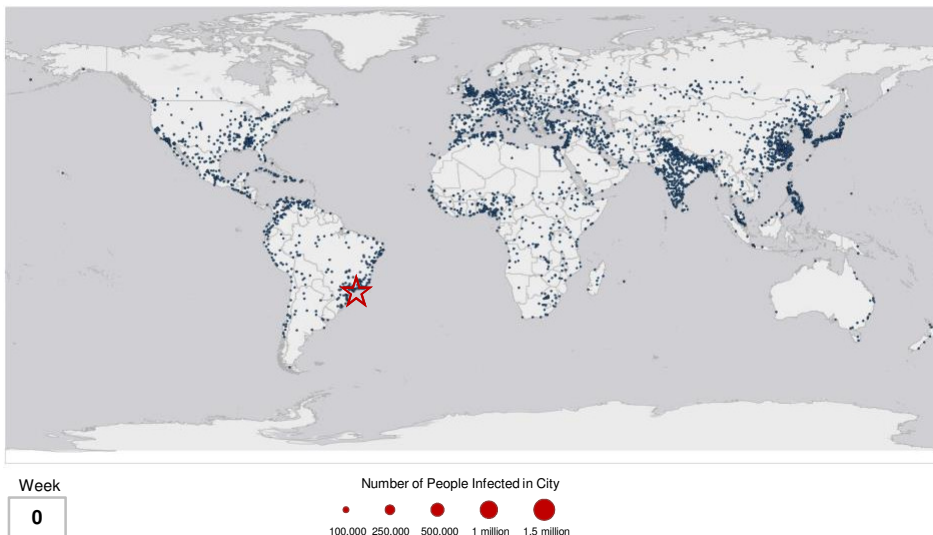
- Published by Cambridge Centre for Risk Studies
- 'Highly Infectious - Moderate Virulence' outbreak
 - 43% of the population becomes infected
- Influenza pandemic
 - Dynamic reproduction ratio, R_0 of 2.5 - 3.0
 - Case Fatality Rate of 0.7% (similar to seasonal flu)
- Origin of outbreak is in poultry farms of Brazil
- Genetic shift produces a new strain of influenza that can evade the human immune system
- No vaccine available at time of outbreak
 - Takes around five months to develop and produce vaccine



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Simulation of Spread of Hypothetical 'São Paulo' Pandemic



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Pandemic Healthcare Demand Swamps Capacity



S1 Standard Scenario Assumption		
	USA	UK
Physician Consultation Demand	PHCP Consults	GP Consults
Normal Consultations per week	19,623,240	4,672,200
Pandemic demand in peak week	15,871,380	3,778,900
Pandemic demand as % of capacity	81%	81%
Hospitalization Demand		
Total number of hospital beds	944,277	136,486
Normal Occupancy Level:	68%	86%
Pandemic hospital bed demand	1,800,000	312,000
Pandemic demand as X of spare capacity	5.9	16.3
Intensive Care Demand		
Total Intensive Care beds	67,357	3,770
Normal Occupancy Level:	80%	85%
Pandemic Intensive Care Bed Demand	350,000	58,000
Pandemic demand as X of spare capacity	25.9	102.6

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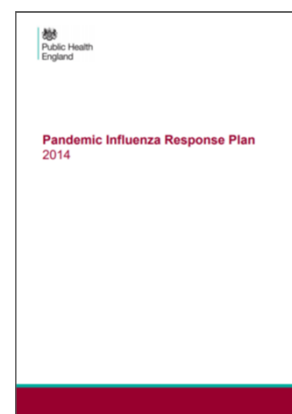
Strategies for Managing Pandemic

■ Pharmaceutical

- Vaccination program with pathogen-specific vaccine
- Antiviral treatment (e.g. Tamiflu) for infected severe cases
- Antibiotic treatment for secondary infections pleural

■ Non-Pharmaceutical

- Contact tracing and quarantine of index cases
- Closure of schools and public gathering places
- Travel restrictions and border closure
- Hospital treatment of life-threatened infecteds
- Intensive care treatment of cases with respiratory distress



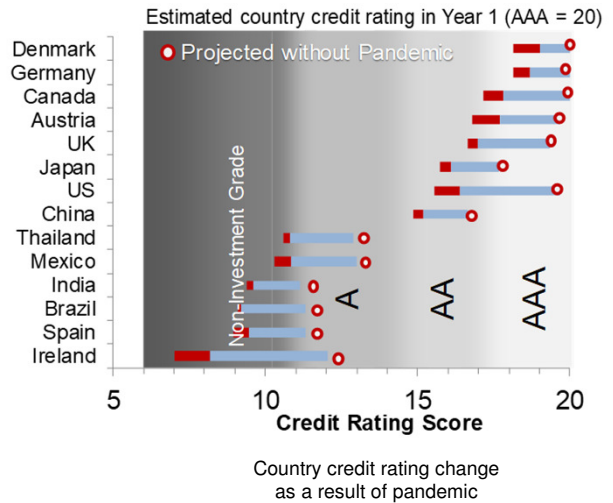
160 countries have filed their pandemic preparedness plan with World Health Organization

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Impact of Pandemic on the Global Economy

- Global GDP loss \$7 to 23 Trillion
- Stock market indices (S&P, FTSE) down 17 to 36 pts
- Inflation increase up to 2.7 percentage points
- Devaluation of most investment portfolios, threatening savings and pension schemes
- House prices and asset values heavily depreciated



Consequences of the Hypothetical Pandemic Scenario

	Scenario	Poor Response	Vaccine Delay	Response & Vaccine Delay
Global Death Toll	19 million	22 million	24 million	25 million
Global Loss of GDP	\$7 trillion	\$10 trillion	\$14 trillion	\$23 trillion
% of world annual GDP	12%	18%	25%	40%
Duration of global recession	6 months	9 months	9 months	12-24 months
Life Insurance payouts	\$99 billion	\$113 billion	\$119 billion	\$121 billion
Healthcare insurance payouts	\$93 billion	\$122 billion	\$128 billion	\$144 billion

Trends That are **Increasing** Pandemic Risk

The likelihood and potential severity of future pandemics is being increased by:

- Gain-of-Function scientific research
- Increasing prevalence of Anti-Microbial Resistance in bacteria strains
- Growing populations of livestock (zoonotic reservoirs) in emerging economies
- Reducing surge capacity in healthcare for efficiency
- Pharmaceutical companies reducing vaccine research investment
- Increasing levels of international travel

Estimated Impact of AMR on Future Pandemic Scenario

Total Death Toll	Median Estimate	Death Toll with AMR*
Worldwide	19 million	
United States	425,000	616,000
United Kingdom	70,000	101,000

* 'with AMR'

assumes that for the three strains of bacteria causing secondary infections of pneumonia, 80% are resistant strains, occurring through healthcare-associated pneumonia (HAP)

- Staphylococcus aureus
- Streptococcus pneumoniae
- Klebsiella pneumoniae

Trends That are **Decreasing** Pandemic Risk

The likelihood and potential severity of future pandemics is being decreased by:

■ Influenza

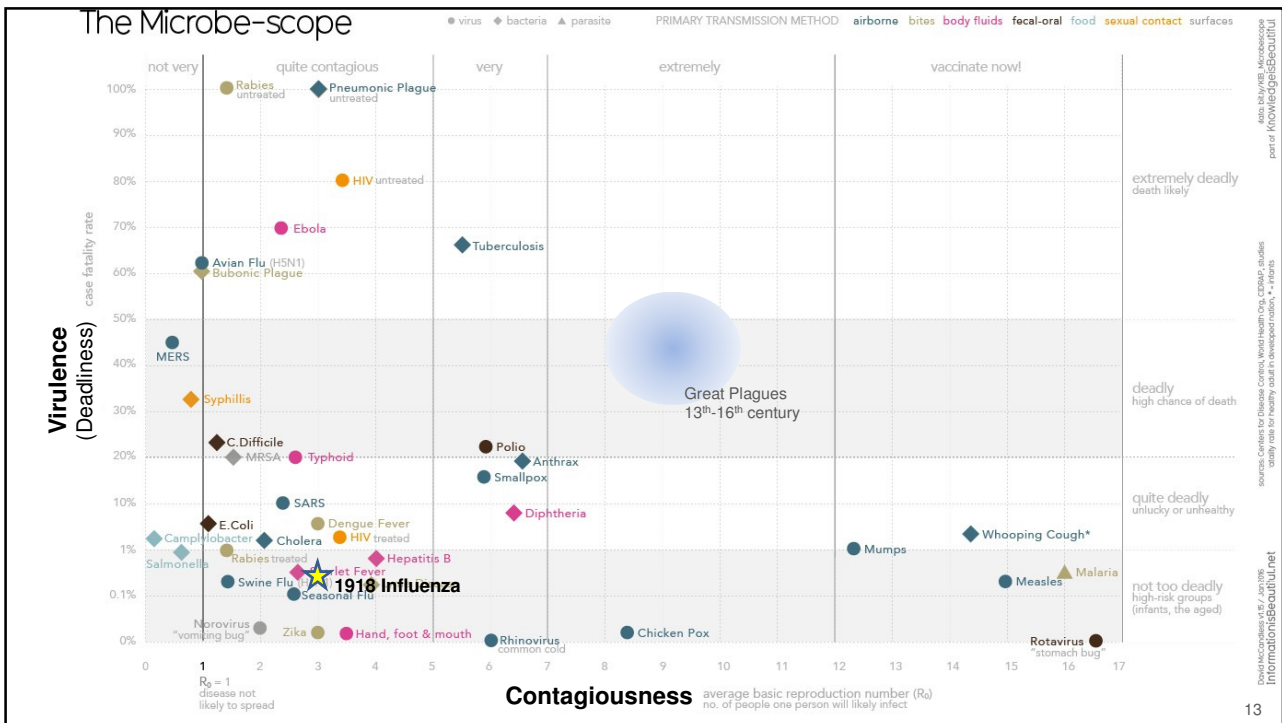
- Future potential for cell-culture vaccine manufacturing techniques
- Future potential for universal influenza vaccine
- Increasing healthcare expenditure and capacity in emerging economies

■ Emerging Infectious Diseases

- Vaccine development for the worst haemorrhagic fever viruses
- Improved disease surveillance in emerging economies
- International rapid response initiatives

How Likely Are We to See Something Like 1918 Again?

- 1918 was the worst pandemic in the past 400 years
 - The 1761 pandemic may have been almost as bad
- Many of the estimated 20-50 million deaths were from secondary bacterial infections that would be treatable with antibiotics today
- Each pandemic has its own characteristics
 - Permutations of infectiousness and virulence are the key issues



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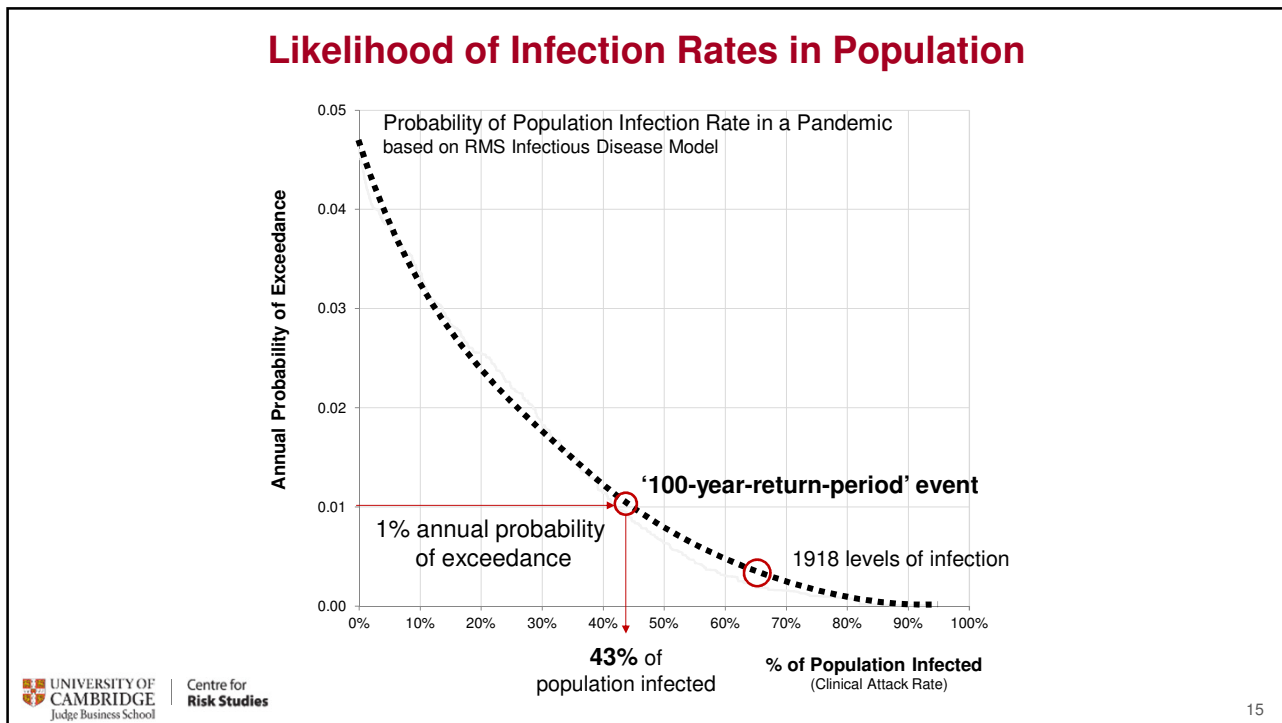
What are the Chances?

- Each year there's a 1-in-13 chance of a significant public health pandemic
- Around two-thirds of future pandemics will be influenza
- Epidemics and pandemics pose a major health burden, particularly on the aged
- Threats currently on the PPP watchlist:
 - MERS (Middle East respiratory syndrome)
 - H5N1 (avian flu)
 - Gain of Function research
 - H7N9 (new variant avian flu)
 - Haemorrhagic viruses (like Ebola)

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How Could UK be Better Prepared for Future Pandemics?

- It is not the UK's problem alone
 - Pandemic is a global threat, requiring much better international institutional infrastructure and funding to tackle it holistically
- We need to invest in hospital and healthcare surge capacity
 - Stockpiles of drugs are important but have to be specific for a known threat
- Vaccine development is too important to be left to the business model of pharmaceutical companies to provide
 - Provide radically different incentivization structures for vaccine development
- It is not sufficient to prepare for a single 'reasonable worst case' scenario
 - Potential pandemics span a wide range of severity and characteristics with different likelihoods
- Development of new classes of antibiotic to respond to AMR is a pandemic concern as well as a primary public health issue

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