

Pandemic Mortality

An Update on Current Experience, Practice and Responses

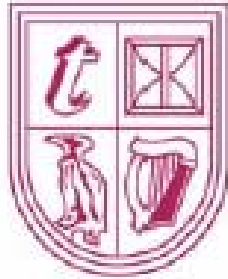
Presentation to Society of Actuaries in Ireland
Date 30 April 2008

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Part 1

Avian Flu Update

Pandemic Influenza

Review of Industry and Professional Analyses



Avian Flu – Avian Update

Colin's Patient - 2006



Doing Nicely in 2008

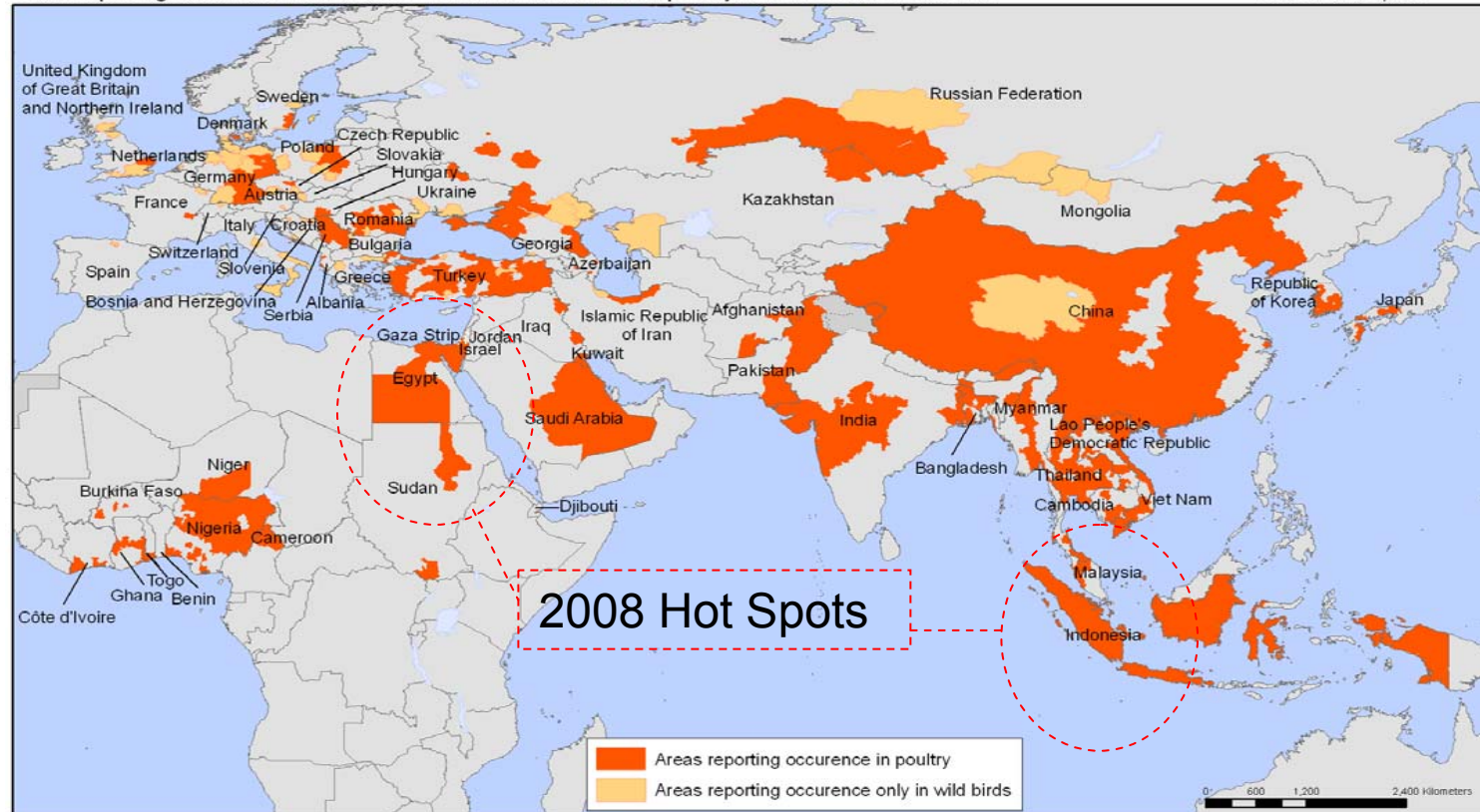




Avian Flu – Avian Update

Areas reporting confirmed occurrence of H5N1 avian influenza in poultry and wild birds since 2003

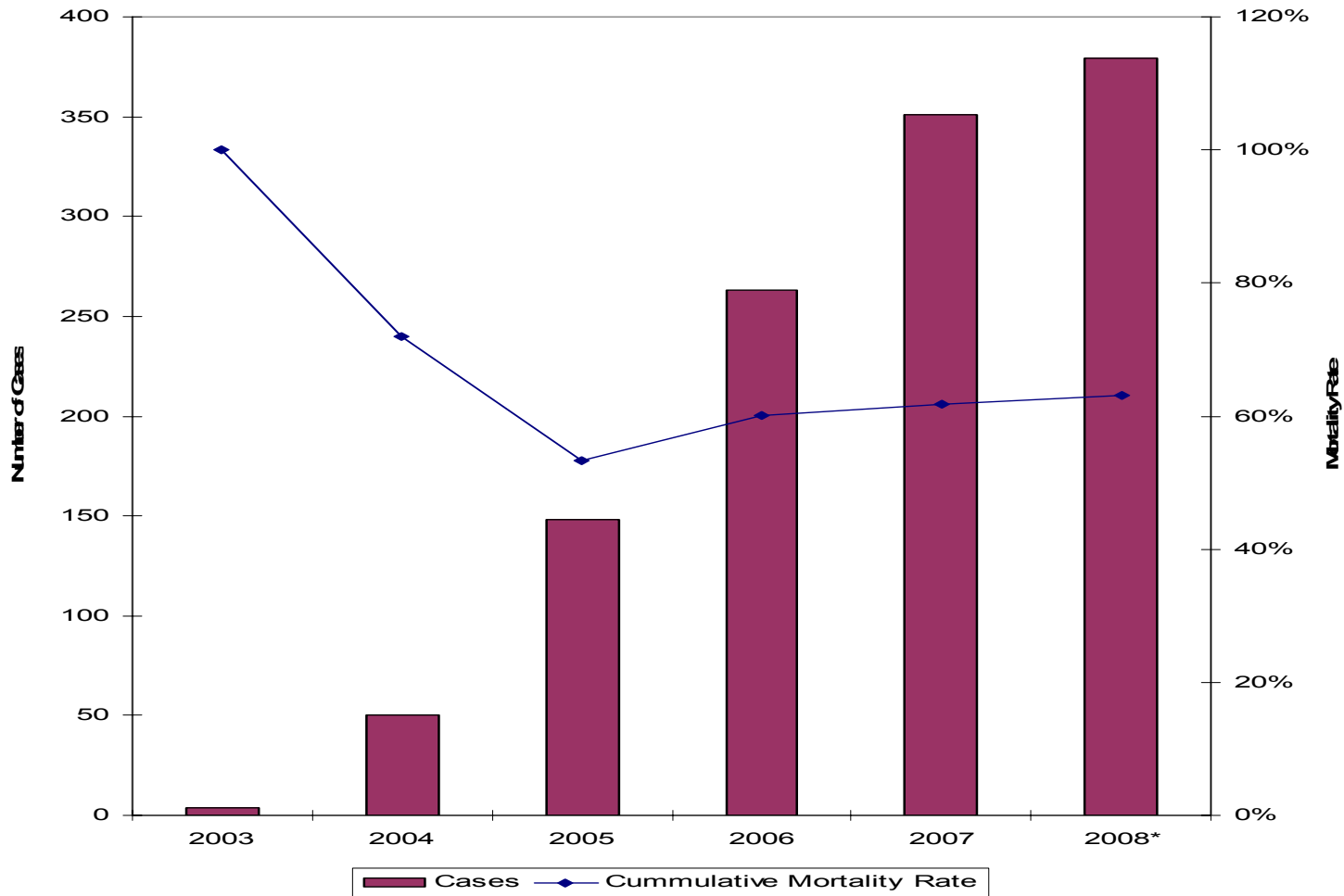
Status as of 17 March 2008
Latest available update





Avian Flu – Human Update

Confirmed Human Cases of H5N1 report to WHO





Avian Flu – Human Update

Location	Percent	Cases	Deaths	Mortality
<i>Indonesia</i>	35%	132	107	81%
<i>Viet Nam</i>	28%	106	52	49%
<i>Egypt</i>	13%	48	21	44%
<i>China</i>	8%	30	20	67%
<i>Thailand</i>	7%	25	17	68%
<i>Turkey</i>	3%	12	4	33%
<i>Others</i>	7%	26	18	69%
Total	100%	379	239	63%

Diverse Experience



Definitions

- Pandemic
 1. infects humans,
 2. causing serious illness with
 3. efficient and sustained human to human transmission
- WHO current ranking level 3 Pandemic Alert (On a scale of 1 to 6)

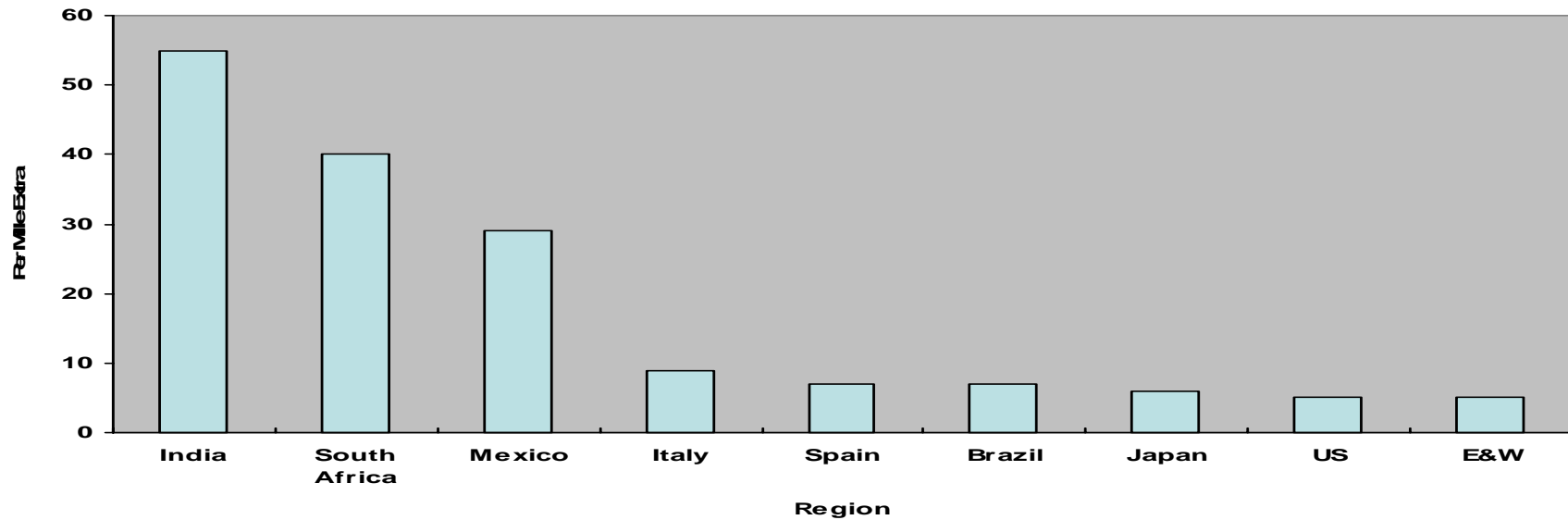
Inter-pandemic phase New virus in animals, no human cases	Low risk of human cases	1
	Higher risk of human cases	2
Pandemic alert New virus causes human cases	No or very limited human-to-human transmission	3
	Evidence of increased human-to-human transmission	4
	Evidence of significant human-to-human transmission	5
Pandemic	Efficient and sustained human-to-human transmission	6



Pandemic Mortality – History

- Frequency
 - Influenza Pandemic Frequency – 3-4% or 7.5 % ?
- Severity (Mortality)
 - “Mild” Pandemic (1957/1968), U Shaped Mortality, - .2 to .4 Per Mille
 - “Severe” Pandemic (1918), “V” Shaped Mortality, Significant Regional Variation

Regional Impact - 1918





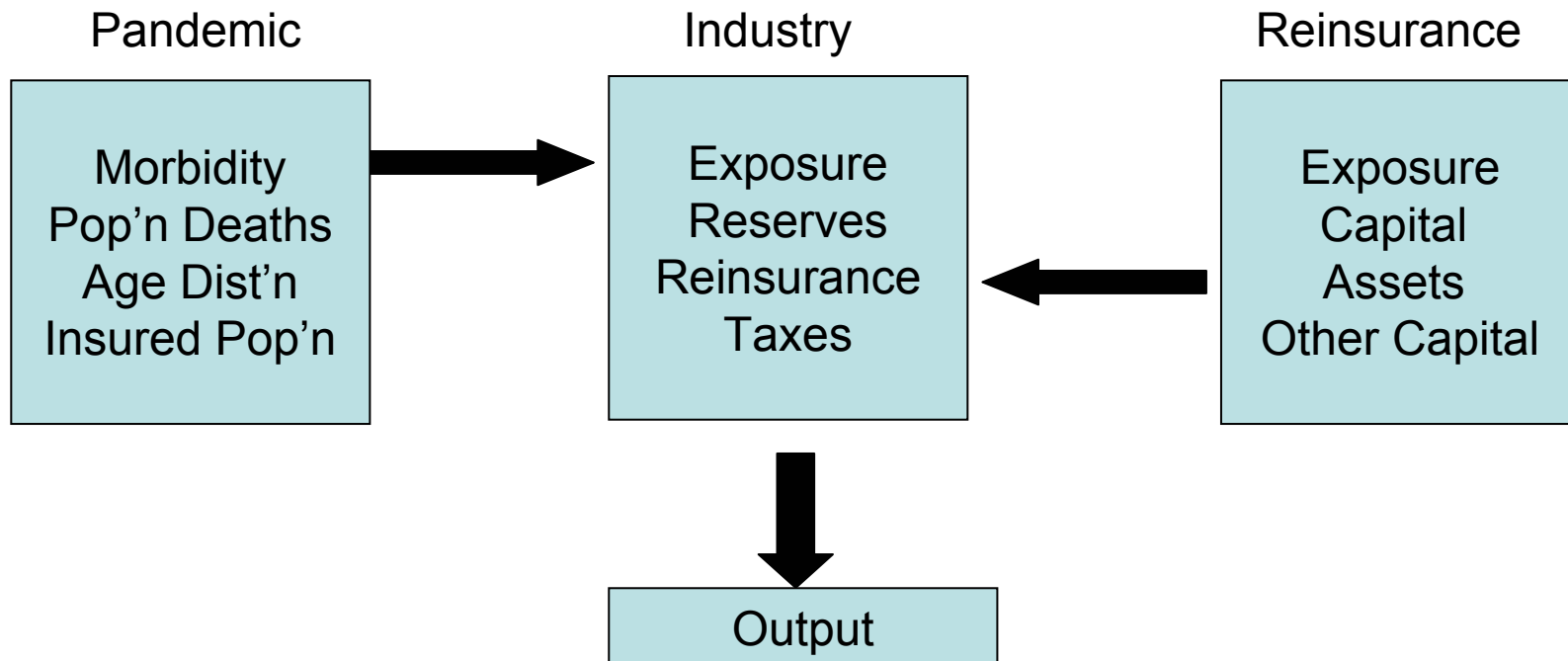
Adjustment to Historic Data

- Evolution over time
 - Lethality of the Virus – big parameter error
 - Age Structure of Population ↓
 - Transmission ↑
 - Improvement in underlying health ↓
 - Impact of Vaccines ↔
 - Antibiotics, Anti Virals ↓ ↓
- From Population to Insured
 - Age Structures – company specific
 - Selection effect ↓
 - Medical Underwriting ↓



US Society of Actuaries

- “Potential Impact of Pandemic Influenza on the US Life Insurance Industry” – May 2007
- “What If”, assessment, based on 1957 and 1918





Summarised Output

Moderate : “U”, + .7 per Mille, 57% Adjustment for insured

Severe : “V\”, + 6.5 per Mille, 77% Adjustment for insured

	Moderate	Severe
– Gross Claims	\$6.8bn (100%)	\$126bn (100%)
+ Reserve Release	\$0.9bn (13.2%)	\$28bn (22 %)
+ Reinsurance Credit	\$1.8bn (26.5%)	\$24bn (19.1%)
+ Tax Credit	\$1.4bn (20.6%)	\$34.6bn (27.5%)
= Net After Tax	\$2.7bn (39.7%)	\$64.2bn (51.2%)

2005 Capital and Surplus = \$256bn

Full transparency

Excel Templates available



Items of Interest/Note

- Insured to Population

	Moderate	Severe
25th Percentile	50%	52%
50th Percentile	57%	77%
75th Percentile	62%	85%

- Burden on Reinsurers

- 90% R/I – 9 companies, 75% R/I – 5 Companies
- 45%/55% Onshore/Offshore
- Severe Occurrence \$2.4bn > Onshore R/I Resources
- 9% Shortfall across onshore/offshore



Closer to home

- Society of Actuaries
 - Colin Murray update on Avian Flu
- “Facultute” or “Instity” of Actuaries Pandemic Working Party
 - Mortality Stress Scenario
 - Health Care Conference
 - ICA Experience



Reinsurance Industry Papers

- Swiss Re “Pandemic Influenza : A 21st Century Model for Mortality Shocks”
 - Tour de Force
 - History of Influenza
 - Develops a model and parameters
 - Discusses outcomes
 - Evolves from past experience
 - From Population to Insured Population
 - Regional variation
 - Summary finding =>

Occurrence Probability	Severity
1 in 100	+0.4 to +0.7 per mille
1 in 200	+1 to +1.5 per mille
1 in 500	+1.6 to + 3.1 per mille



Other Industry Papers

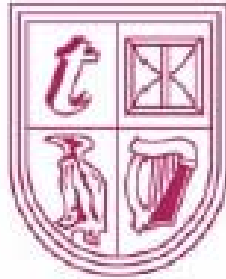
- Other Reinsurance Papers
 - Munich Re – embedded in “Topics” – Caution on Forecasts
 - Gen Re – embedded in Risk Matters – Modelled Scenario, focus on Waves - Non allowance for improvements
 - Others – nothing apparent
- Brokers
 - AON “Exploding the Myths” – good paper
 - Marsh “Avian Flu: Preparing for a Pandemic” - focus on risk management



Rating Agency Papers

- Mortality Capital Charges embedded in standard models
- Rating of mortality bonds
- Commentary on Impact
 - Fitch “Bird Flu – Will it Ruffle the Industry’s Feathers” –
 - Moody’s “Bird Flu Risk for US Life Insurers” –
 - Standard and Poors
 - “How Ready is the US for a Pandemic” – Impact of Insurance Claims +50%.
 - Standard and Poors – “Global Life Reinsurance Pandemic Exposure”
- Assumptions on Extra Mortality

Agency	Low	High
S&P	.625 per mille	1.5 per mille
Moody’s	.5 per mille	2 per mille
Fitch	.7 per mille	.7 per mille



Part II

Regulatory Approaches
Governmental Responses



Regulatory approaches - FSA

- ICA
 - INSPRU 7.1
 - Consider all possible outcomes, however unlikely any one outcome might be, and set capital as protection against all but the most extreme losses
 - Own assessment
 - Stress tests / scenario analyses for each of major sources of risk
 - Insurance sector briefing – ICAS one year on
 - Catastrophe dealt with approximately
 - Challenging – limited data on extreme events
 - Repeat of previous pandemic
 - Most firms no credit for “hedging” from different contract types



Regulatory approaches - FSA

Pandemic Working Party update to CILA II Sept. 2007

http://www.actuaries.org.uk/data/assets/pdf_file/0004/30010/Ward.pdf

- 29 firms (of 44 sampled) has useable data
- 59% of firms used per mille uplift
 - Range - 11.5 ‰ to 0.5 ‰
 - Mean = 5.1 ‰
- 41% of firms used per cent increase
 - Range - 9.9 ‰ to 0.7 ‰
 - Mean = 4.0 ‰
- Aggregate effect: 4.6 ‰
- Contribution to ICA
 - 30% to 2%
 - Mean = 7 %



Financial Regulator

- Augmented solvency model for Life Reinsurance
 - Watson Wyatt report May 2006
 - Stress tests based on UK insured data
 - Approach based on previous work for FSA
 - 99.5 percentile:- 30% one off increase
 - Reserves based on 50% of this
 - “Shock” to **5 ‰** at all ages



Financial Regulator

- Final Model
- Actual Mortality stress tests requirements include:
 - + 30% to Qx for following year
 - Reserves + 10% at all ages.
 - Shock/Pandemic +**2** ‰ for all ages in respect of the year following the calculation.
- Recent alternative
 - Internal Capital Model
 - QIS4 calibrations



Solvency II / CEIOPS

- QIS1 – nothing (technical provisions only)
- QIS2
 - +3.0 ‰
 - No obvious calibration source
 - CP7 & CP9 mention scenarios like 1918 Spanish Flu epidemic / earthquakes / terrorist attack
 - Results buried within general mortality module also covering trend / volatility
 - Feedback suggested calibration to historic data



Solvency II / CEIOPS

- QIS3
 - 1.5 ‰
 - WHO – Avian Flu epidemic (SARS, ebola)
 - Watson Wyatt 2004 report re ICA
 - 1918: 5 per mille but allowing for medical advances use 1.5 per mille
- QIS3 results – masked by CAT lapse scenario
 - Ireland:- Inter-quartile range 1%-30% of undiversified SCR



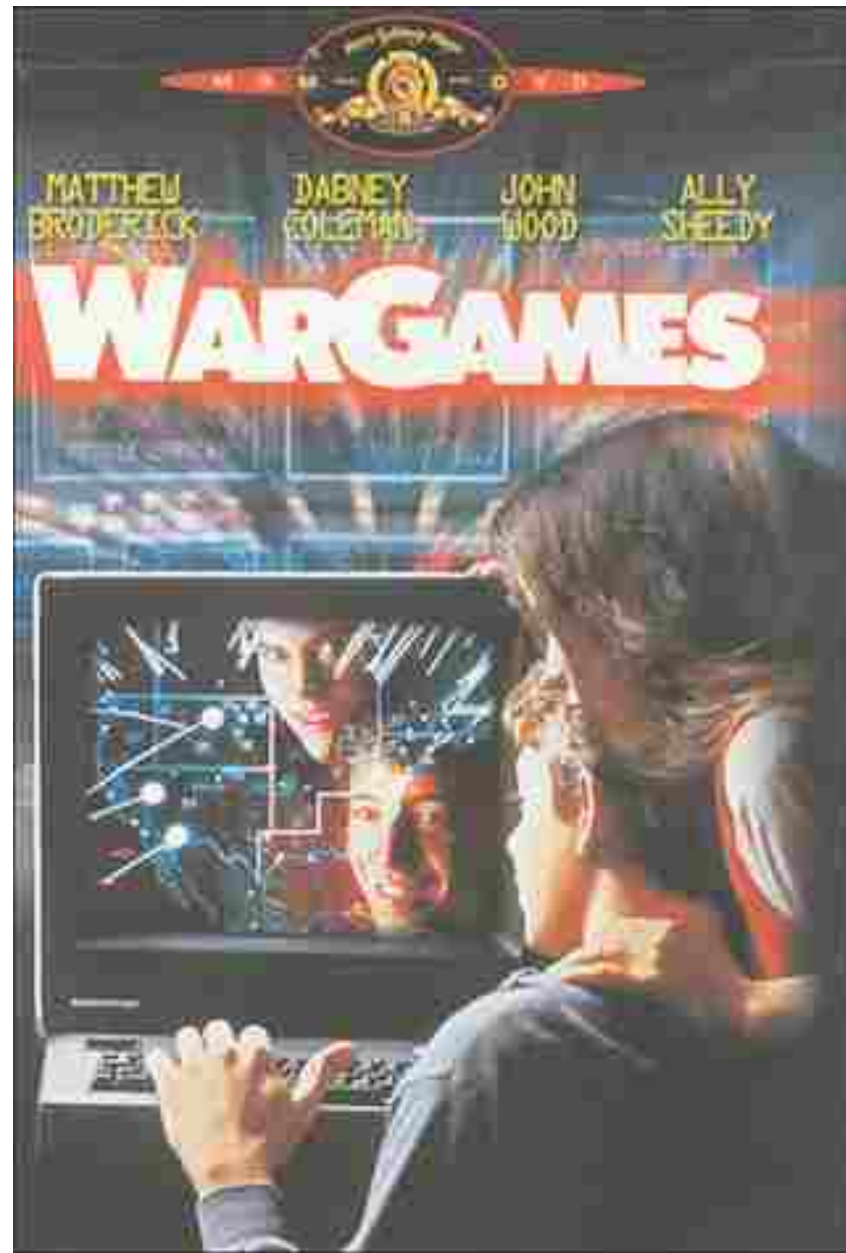
Solvency II / CEIOPS

- QIS4
 - 1.5 ‰ (no change)
 - Calibration – reference to Swiss Re paper
 - *“the excess mortality within an insurance portfolio is estimated to be between 1 and 1.5 deaths per 1000 lives in most developed countries”*



Irish perspective – risk profiles

	Gross Sum @ Risk €millions	Net Sum @ Risk €millions	Gross Impact (using 1.5 ‰) €millions	Net Impact (using 1.5 ‰) €millions
Direct domestic	328,904	148,420	493.4	222.6
Direct offshore	52,961	24,789	79.4	37.1
Direct totals	381,865	173,209	572.8	259.8
Reinsurers	?	?	?	?





Government risk management responses

- UK – Market wide Exercise 2006
 - 6 weeks in October / November 2006
 - 70 companies / 3,500 people
 - Objectives
 - Improve preparedness
 - Assess sector-wide issues to be addressed collectively



Government risk management responses

- UK – Market wide Exercise 2006
 - Absenteeism – 15% up to 49% with clusters of 60%
 - Heaviest impact – provision of customer-facing retail financial services
 - No overall cash shortages but bottlenecks
 - Wholesale markets – reduced trading
 - Keep markets open – reduced hours
 - Insurers least impacted but major challenge in paying surge of claims



Government risk management responses

- US – FSIIC / FSSCC exercise report 2007
 - <http://www.fspanfluexercise.com>
- September 24th – October 12th 2007 (3 weeks)
- 2,700 U.S. financial services organisations
- Objectives
 - Enhance understanding of systemic risks
 - Opportunity to test plans
 - Impact of critical infrastructures on financial services sector
- Scenario
 - Update 1 (2 weeks) 25% absenteeism
 - Update 2 (6 weeks) 49% absenteeism (peak)
 - Update 3 (12 weeks) 35% absenteeism



Government risk management responses

- Outcomes
- Undue optimism expressed in respondents ability to conduct “business as usual”
- Limited effectiveness of risk responses (increasingly so as pandemic endured)
- Effectiveness and consistency of policy exclusions



Government risk management responses



Office of Emergency Planning

HOME • EMERGENCIES • HANDBOOK • BEING PREPARED • FAQs • NEWS • PUBLICATIONS • LINKS

Only this site Other government sites

SEARCH

Emergencies

The most common emergencies that arise concern unexpected events which require a rapid response from the emergency services - the Garda Síochána, the Health Services Executive and the fire service. Other emergencies require a longer term sustained response from the emergency services and various State agencies.

Major Emergencies

The following could constitute a major emergency:

- Severe weather
- Flooding
- Chemical spills
- Transport accidents (air, sea, rail, road)
- Accidents at sea
- Major pollution incidents at sea
- Bomb explosions / suspicious packages
- Nuclear incident
- Influenza pandemic
- Animal disease outbreak

A major emergency is any event which, usually with little or no warning, causes or threatens injury or death, serious disruption of essential services or damage to property, the environment or infrastructure beyond the normal capabilities of the principal emergency services. It requires the mobilisation of additional resources to ensure an effective and co-ordinated response.

Major Emergency Plans

Each Principal Response Agency (Garda Síochána, Health Service Executive



Severe weather



Flooding



Chemical Spills



Transport accidents



Accidents at sea



Pollution at sea



Unusual Packages



Influenza pandemic



Nuclear Incidents



Animal Diseases

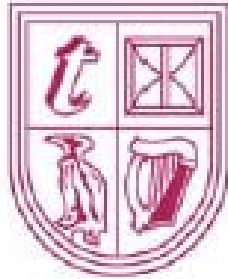


Government risk management responses

- <http://www.emergencyplanning.ie>
 - Influenza pandemic is 1 of 10 emergencies
 - Department of Health lead agency
 - Business continuity checklists
 - 10 cases studies including IFSC-based company, largely back-office work
 - Impact modelling
 - Scenario 1:

Hospitalisations	5,823
Deaths	3,917
 - Scenario 2:

Hospitalisations	78,346
Deaths	52,937



Part III & Closing

Extreme Mortality Bonds

Summary

Discussion



Extreme Mortality Bonds

- 2003 – Swiss Re – Vita I
- Followed up in 2005 and 2007 VITA II/VITA III
- 2008 Significant Activity
- Summary

Company	Issue Name	Issue Dates	Territories Covered
Swiss Re	VITA (I, II, III)	2003/05/07	US/CAN/UK/GER/JAP
Scottish Re	Tartan Re	2006	US
Axa Insurance	Osiris	2006	US/FR/JAP
Scor	Unnamed “Swap”	2008	US/Europe
Munich Re	Nathan Re	2008	US/UK/Canada/Germany

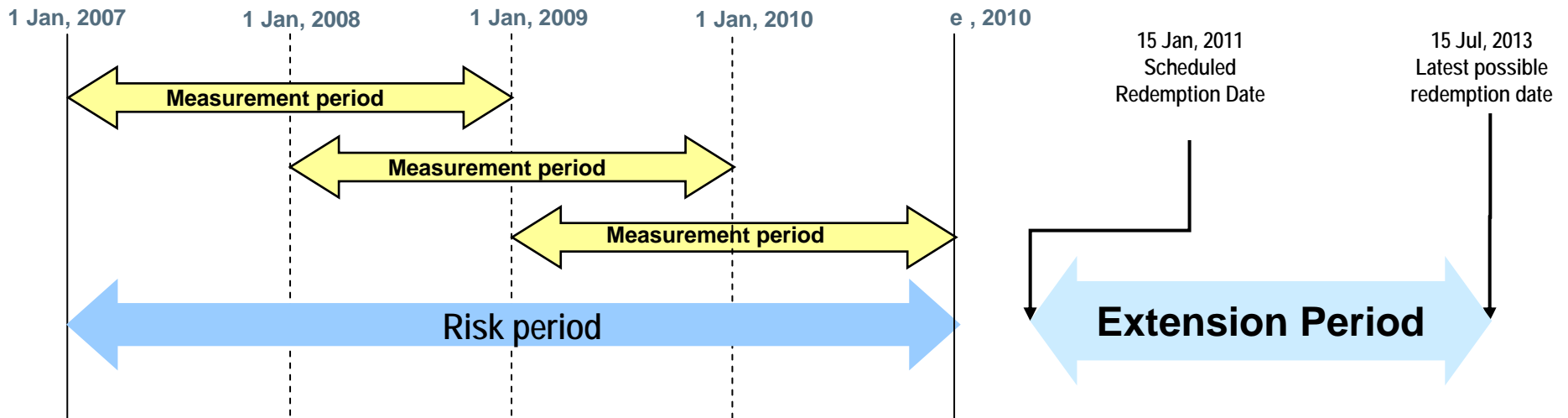


Extreme Mortality Bonds

- Reinsurance/Retrocession Protection contracts
- Cover established by reference to identified and publicly available population statistics
- as weighted and recombined to best replicate the cedants actual exposure
- Responding to all cause adverse experience in mortality
- A metric similar to a loss ratio
- With attachments at or above the 1 in 200 level



Implications for structure

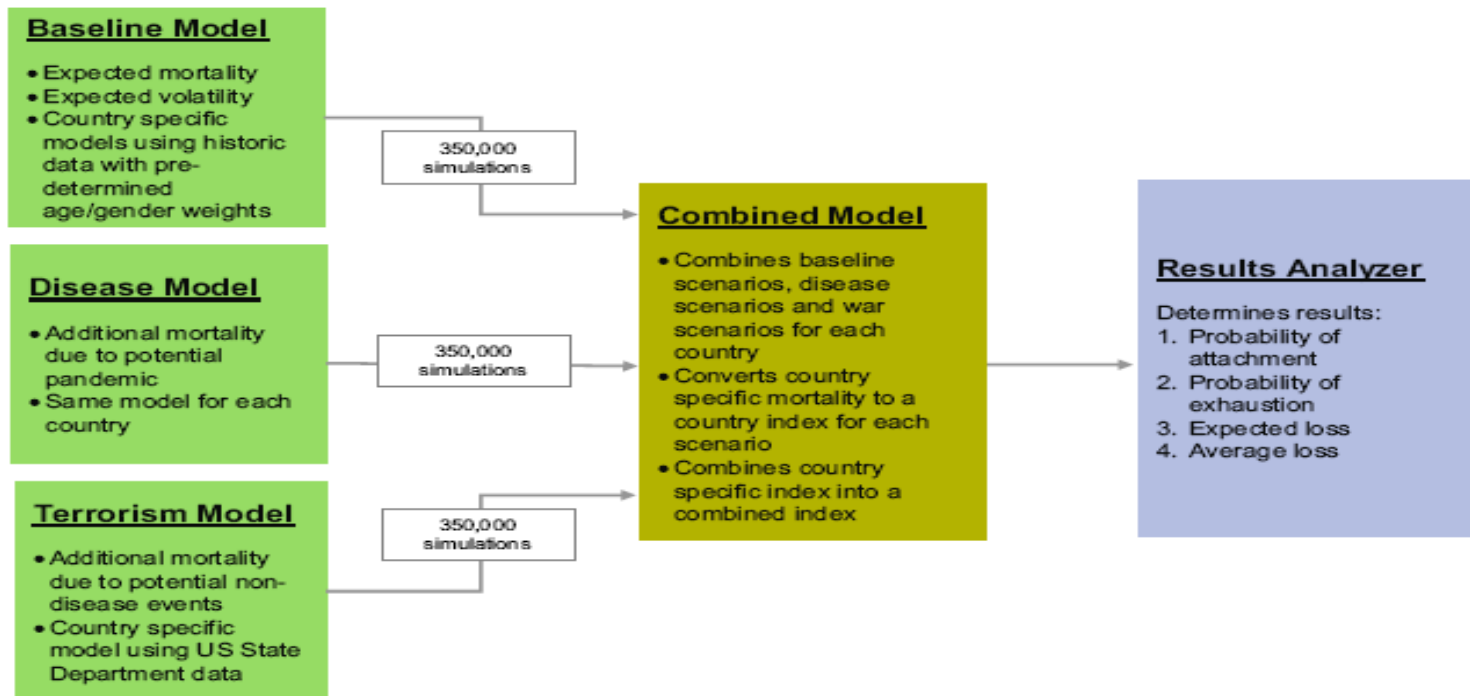


- Multi Year Protection/Risk Period
- Each “event” measured over a multi year period
- Need for a development of extension period (IBNR)



All Cause Mortality Modelling

- Aggregate Excess of Loss / Stoploss Protection
- Traditional pricing approach
- model for a base line claims activity with “add ons” for specific known catastrophe exposures
- Milliman “all cause” mortality scenario generator :





Observed Output – Osiris/Axa

Notes	D	C	B	A
Rating (Unwrapped)	BB+	BBB	A	A
Attachment	106%	110%	114%	119%
Probability	0.53%	0.26%	0.12%	0.05%
Baseline	0.0%	0.0%	0.0%	0.0%
Disease	97.7%	98.8%	95.7%	96.1%
Terrorism	0.0%	0.0%	0.0%	0.0%
Baseline and Disease	2.0%	1.0%	3.9%	3.7%
Baseline and Terrorism	0.0%	0.0%	0.0%	0.0%
Disease and Terrorism	0.2%	0.2%	0.3%	0.2%
Baseline, Disease and Terrorism	0.1%	0.0%	0.0%	0.0%
Total	100%	100%	100%	100%

Stability of Base Mortality (in part due to structure) + Height of Attachment
 => Effectively Catastrophic Protection



Recap

- Pandemic
 - Definition
 - Avian Flu Update
 - Past Experience
- Review of Status From
 - Profession
 - Industry
 - Regulators
 - Governmental Agencies
- Extreme Mortality Bonds



Discussion/Challenges

- Paucity of Information
- Consensus settling on 1.5 per mille for 1 in 200
- Same approach for Pricing, Capital and Aggregate ?
- Reinsurance Aggregation ?
- Extreme mortality bonds ?