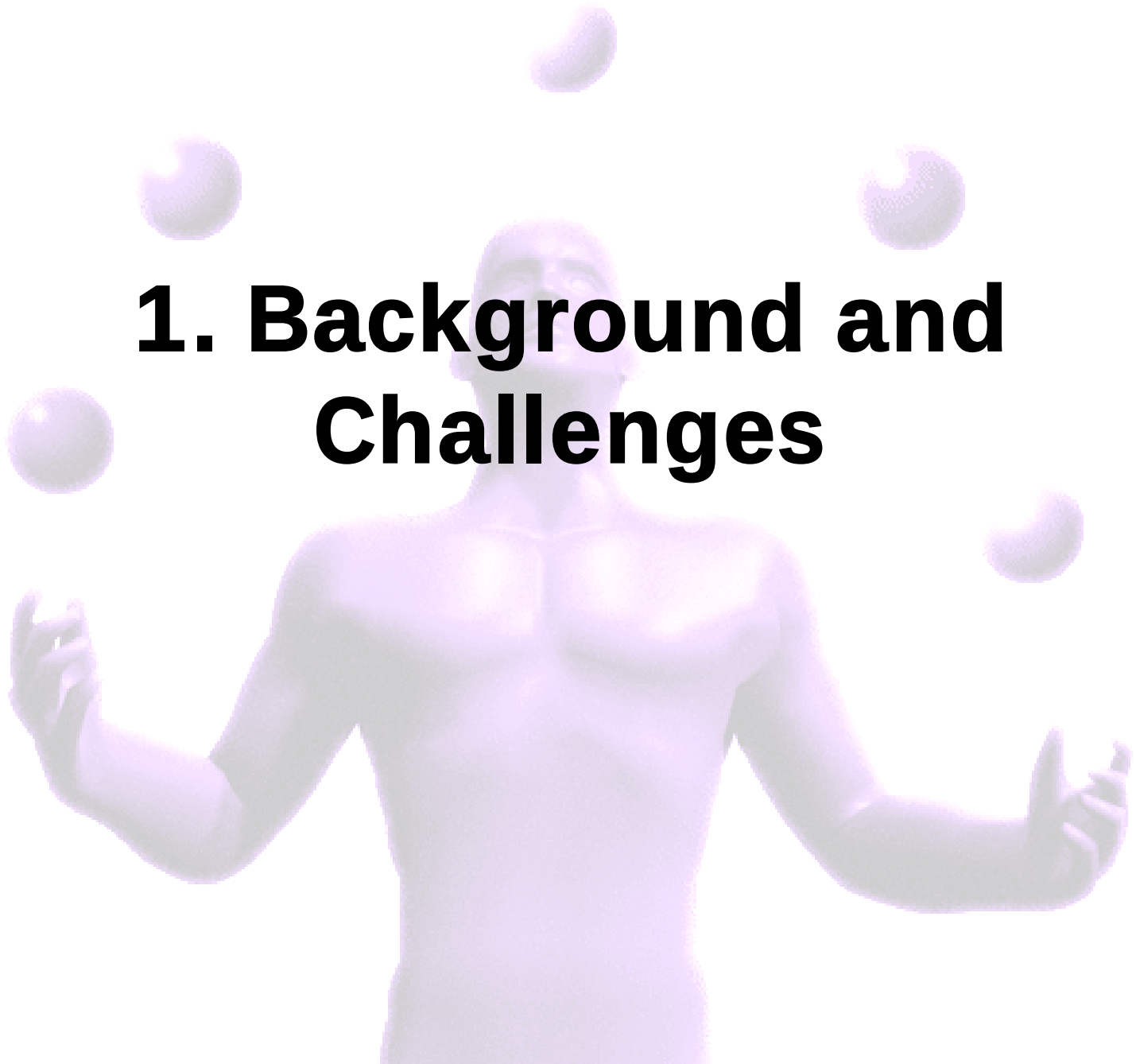
Scientific Uncertainty and Policy

Risk Solutions

Outline

1. Background and key challenges
2. Tackling scientific uncertainty
3. Tackling the people issues
4. Conclusions

Acknowledgements
Defra – who funded the work
Chris Rees – who did the really clever stuff
And all the members of our expert and stakeholder groups



1. Background and Challenges

Background

- 20 day standstill introduced post 2001 FMD outbreak
- Farmers found it very restrictive
  - Enormous pressure brought to bear
  - Result - many exemptions
- Defra needed to know if they could relax the regime before the spring movements in 2003

Challenges

- Information to inform the decision was required:
  - Quickly (by January 2003)
    - this was September 2002
- In the face of:
  - Considerable inherent uncertainty,
  - Shortage of data, and
  - Lack of trust and entrenched positions
- National enquiries had demanded a full cost benefit analysis

Work Streams

Cost benefit = Benefits ⇔ Costs

Reduction in cost of outbreaks

Cost of implementing regime

Epidemiology

1. Silent spread - Risk Solutions
2. InterSpread - VLA/Massey

Economics

- Surveys
- 2001 experience

VEERU consortium

Integration

Risk Solutions

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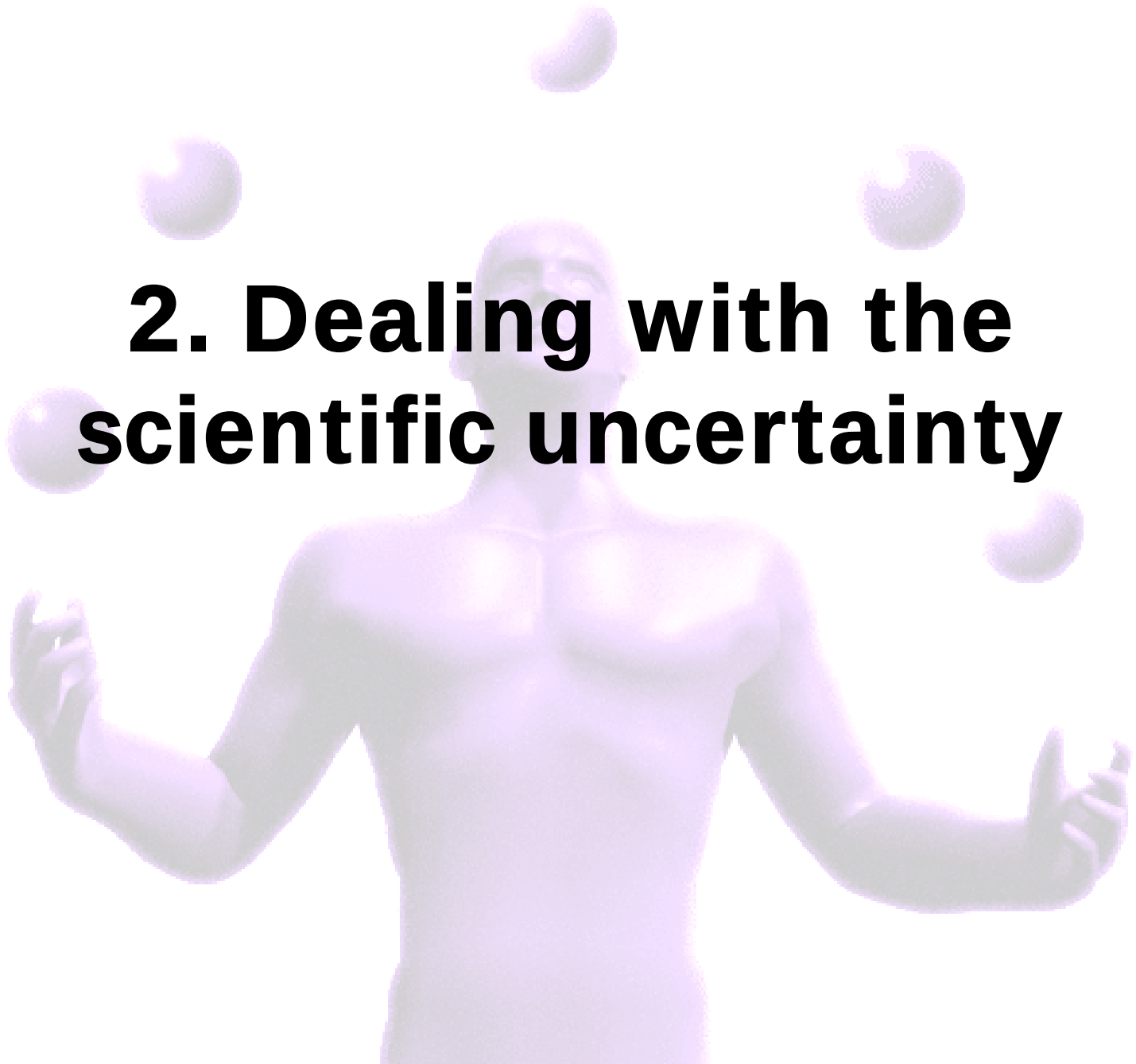
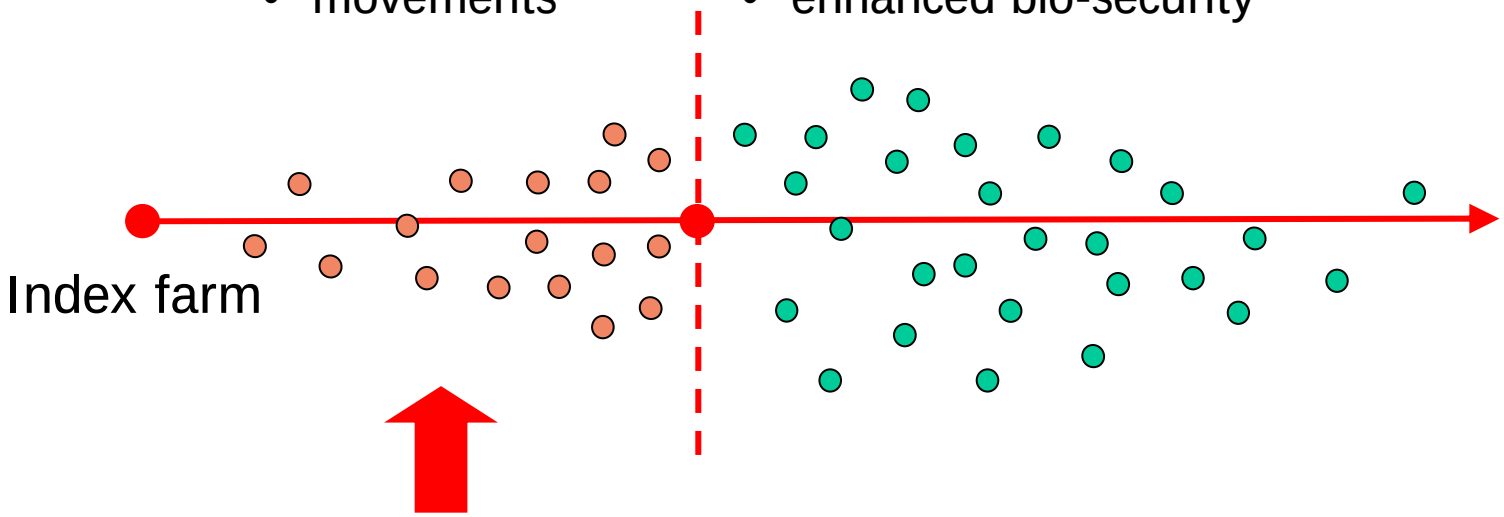


2. Dealing with the scientific uncertainty

Time line

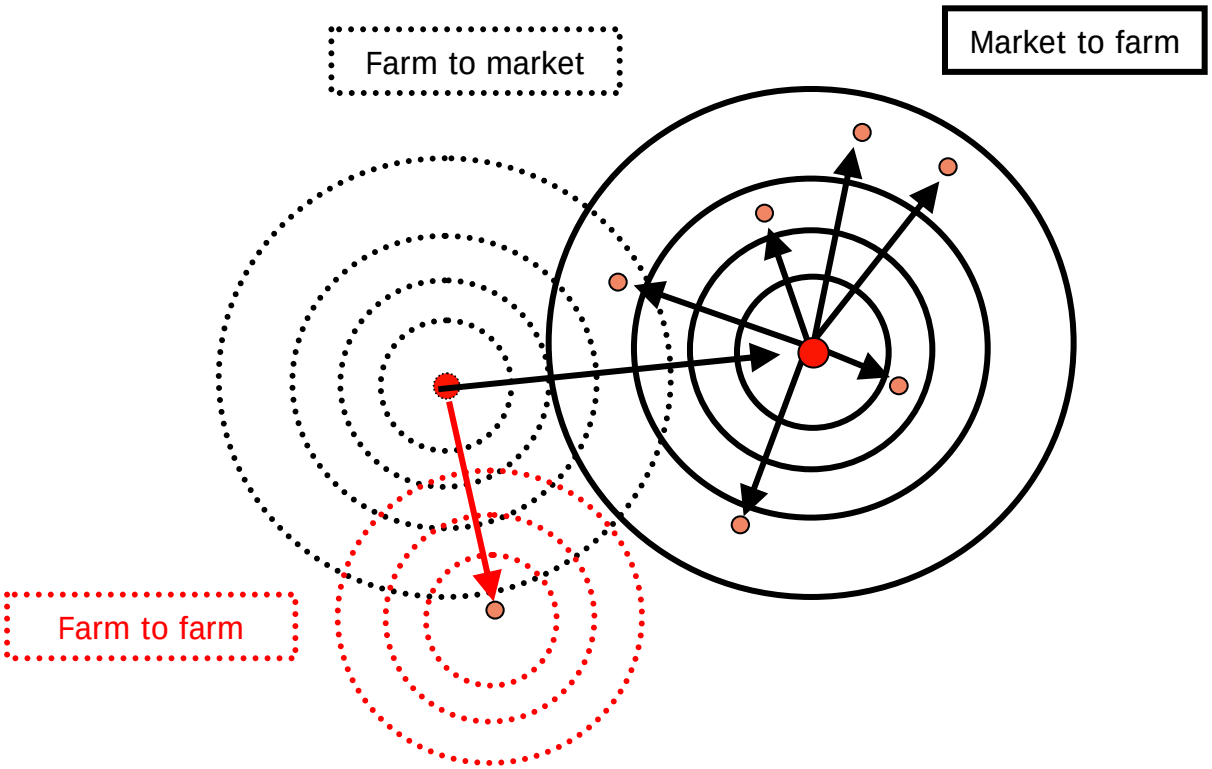
Silent spread
- plumes
- local spread
- movements

Disease detected
- national movement ban
- culling and tracing
- enhanced bio-security



Standstill regime acts here to:
- reduce number of moves
- provide time to detect disease

Animal movements



Issues

- Dealing with the complexity
  - capturing the key variables in an appropriate way

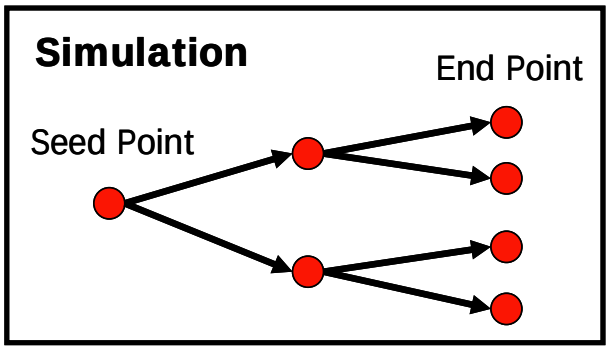
- Dealing with the uncertainty
  - “Natural” variability eg:
    - biological
    - operational
  - Knowledge based – “just don’t know precisely” eg:
    - patterns of livestock movements
    - how members of the public will react

Epidemiology

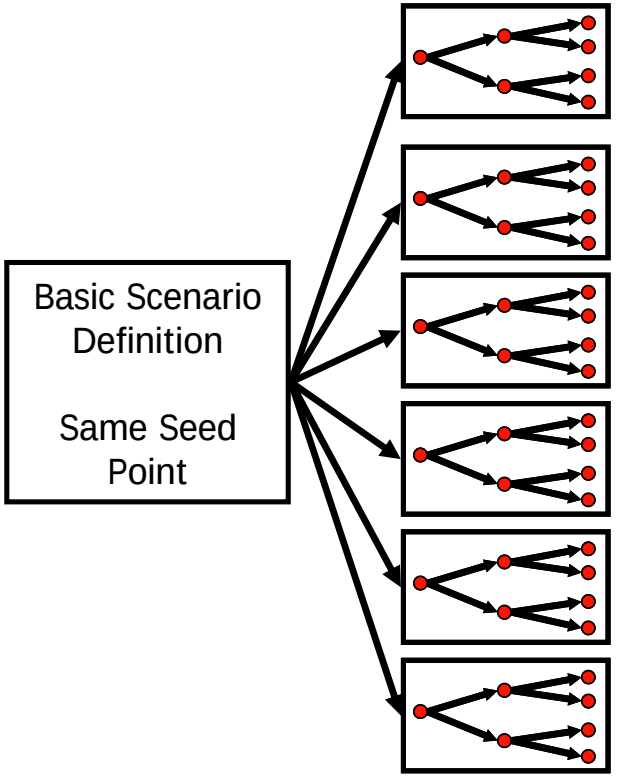
Approach

- Model developed iteratively
  - focusing on what was most important to the decision
- Uncertainty treated formally and explicitly though e.g.:
  - simulation modelling
  - scenario analysis

Simulations and outbreak scenarios

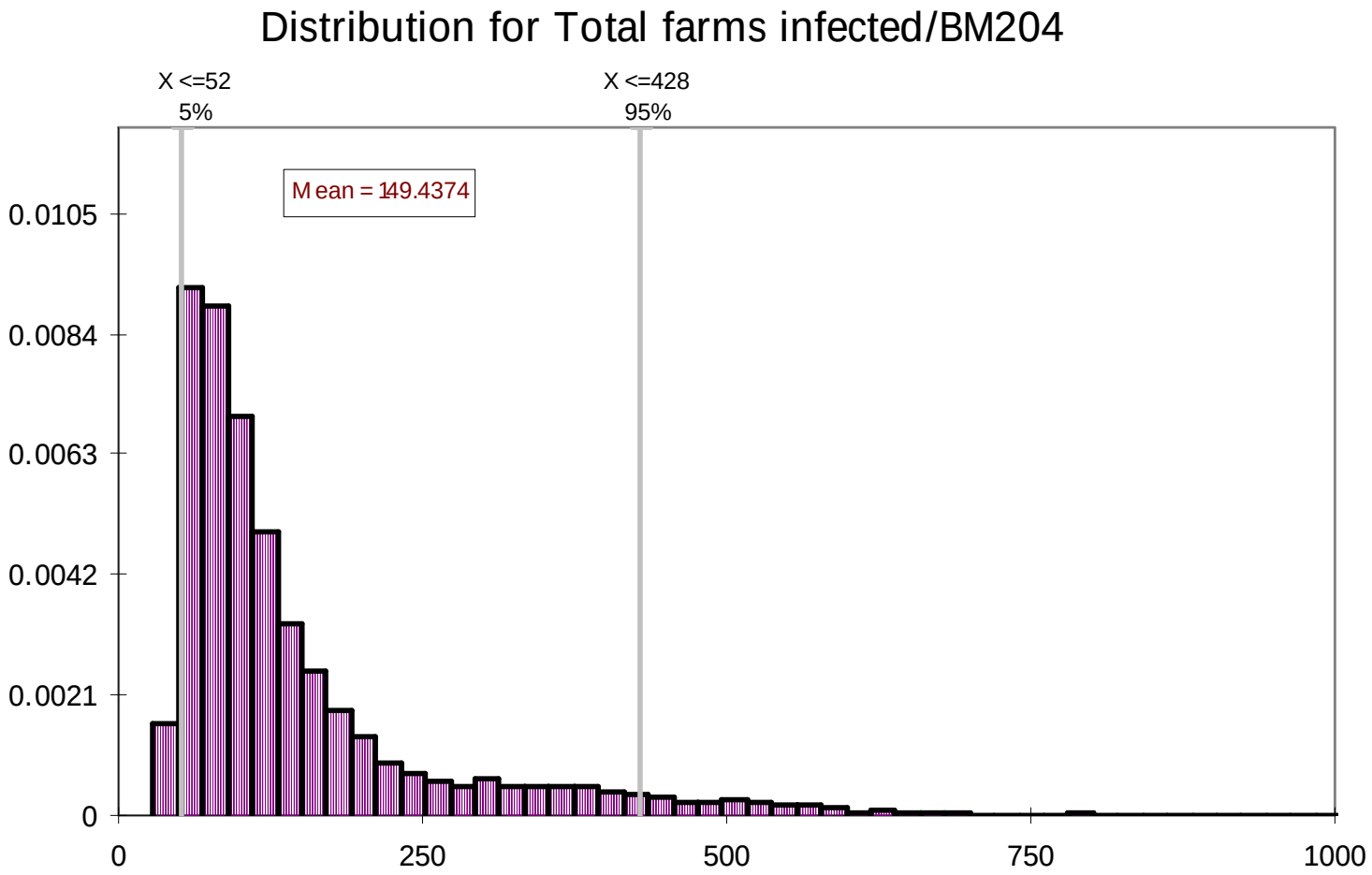


A single simulation of an outbreak

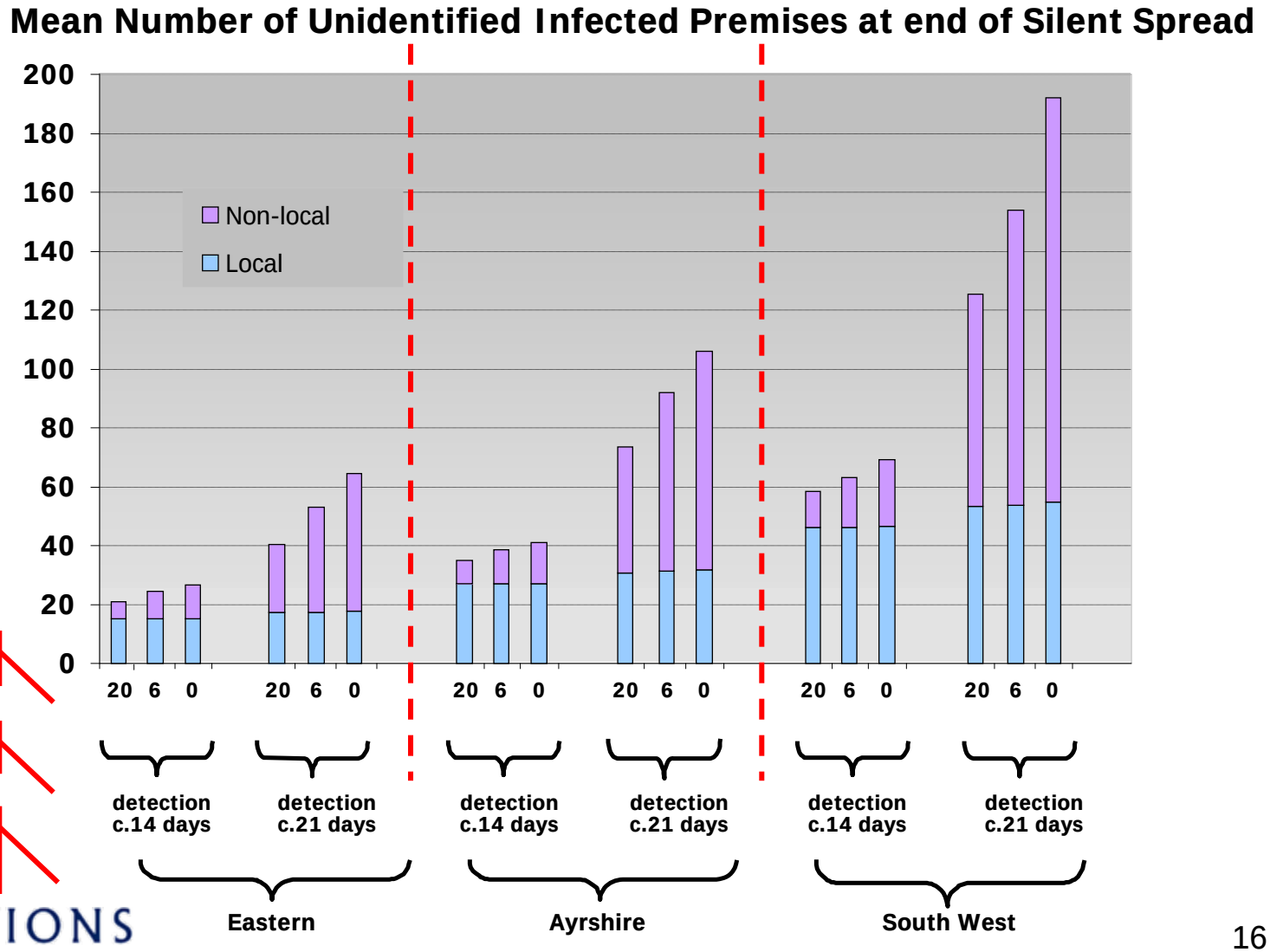


Multiple simulations of a single defined outbreak scenario

Typical results for a scenario



Outbreak scenarios



Standstill period

Time to detection

Initial outbreak region

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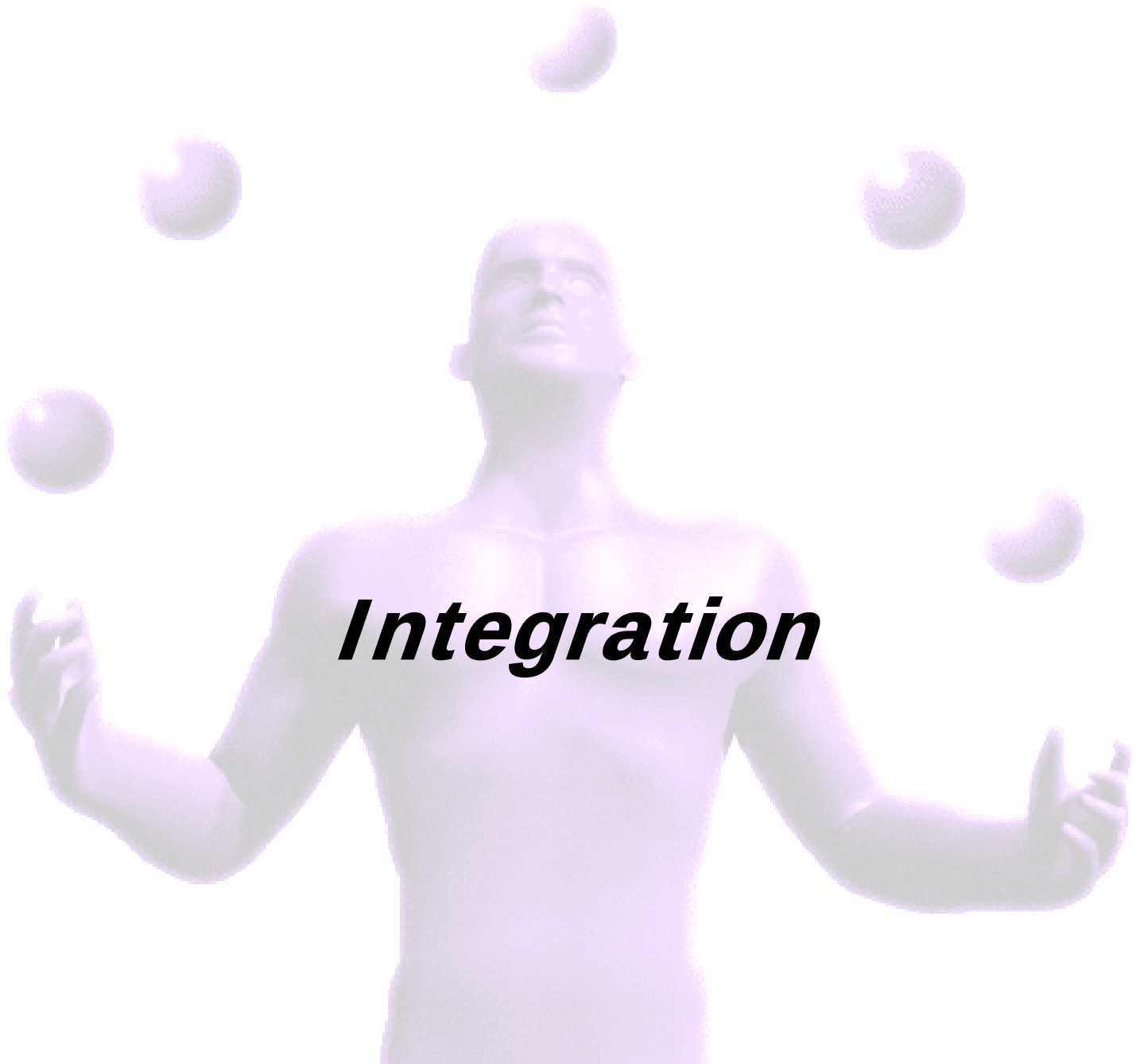


Integration

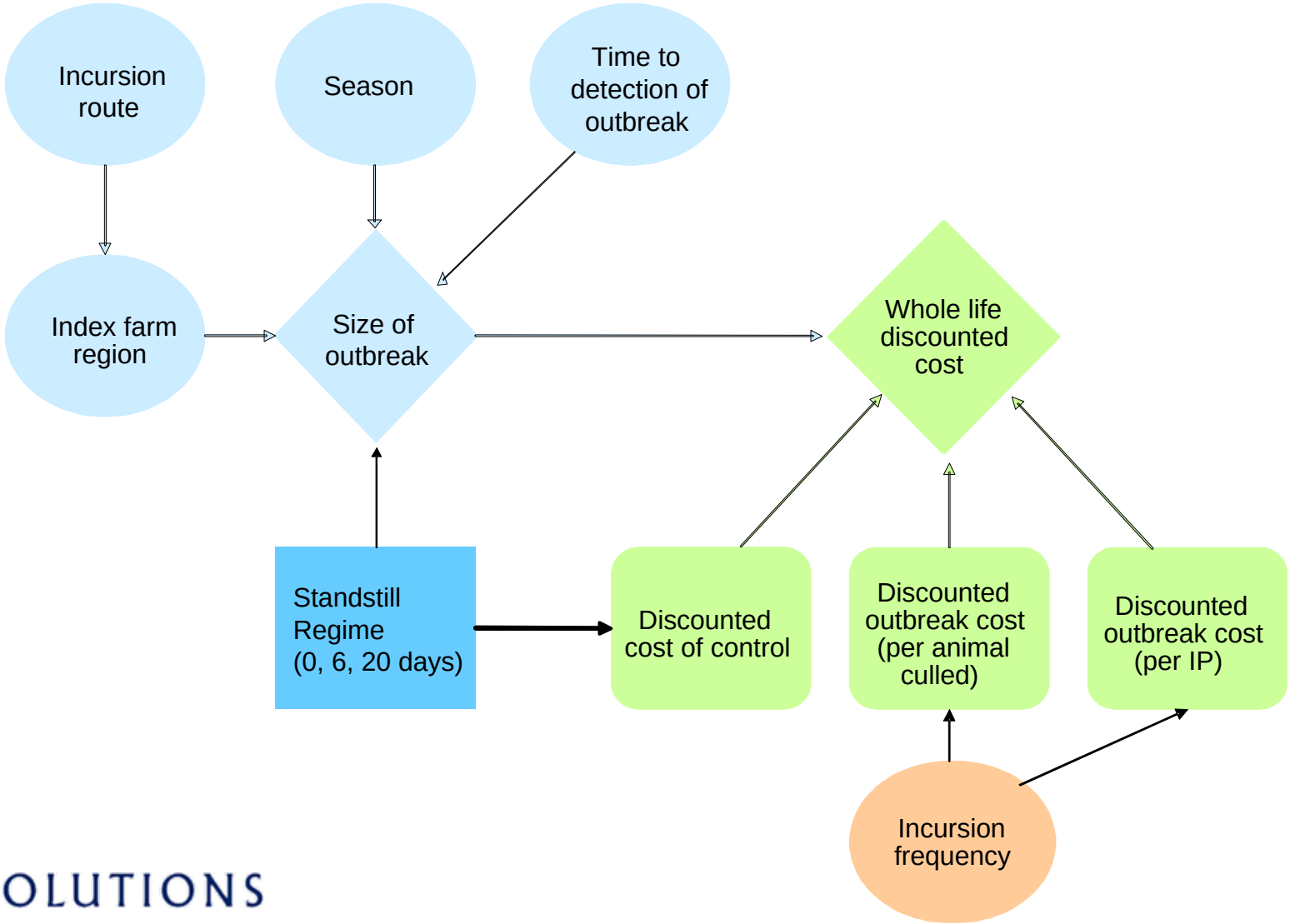
Challenges

- CBA compares:
  - year on year cost of controls

  with
  - reduced cost of outbreaks

  when:
    - we cannot know when the next outbreak will be
    - we cannot know precisely what that outbreak will look like
    - we cannot know how markets and the public will react
- Economic data uncertain for both costs of control and costs of outbreak
- Solution:
  - bring results together in an integration model (a decision tree)
  - use full range data not just means
  - use sensitivity and scenario analysis
  - present data in a variety of ways to explore different dependencies

Integration model



CBA measures

- Whole Life Discounted Cost
  - The overall cost to the economy, taking into account both:
    - the cost of the regime and
    - the cost of any outbreaks that occur under the regime
  - We seek to MINIMISE this.

- Benefit to Cost Ratio
  - The return per unit cost invested, a measure of the effectiveness of an investment
  - We seek to MAXIMISE this.

Scenario analysis

Movement frequency	Time to detection	Cost of outbreak	Cost of regime	Outbreak risk by region	Outbreak Frequency
High		Tourism High			1 in 5yrs
	21 days		6d £8.4m	By susceptible species	1 in 10yrs
Average					1 in 20 yrs
	14 days	Tourism Low	6d £6.5m	By pigs only	1 in 40 yrs
Low					. . .

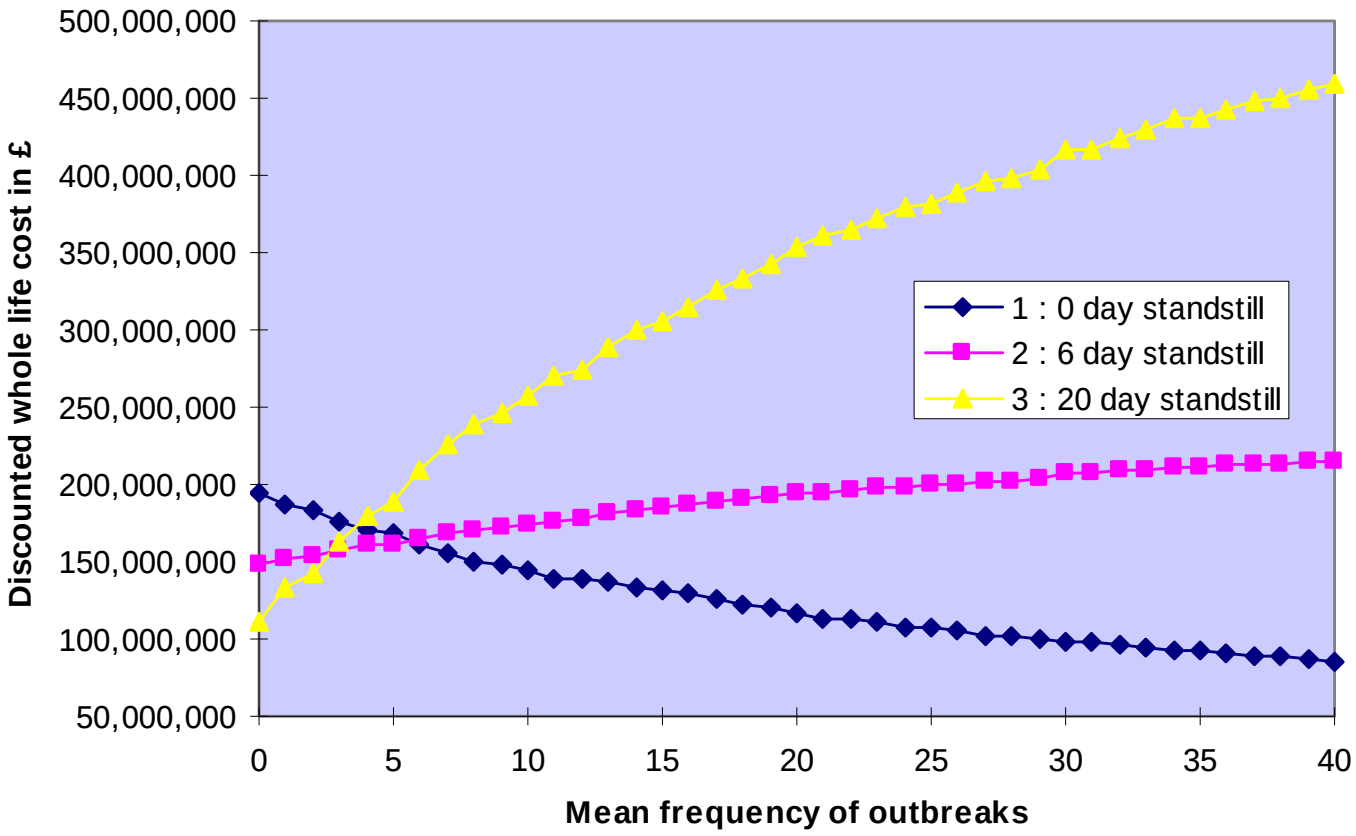
Case A

Movement frequency	Time to detection	Cost of outbreak	Cost of regime	Outbreak region
High		Tourism High		
	21 days		6d £8.4m	By susceptible species
Average				
	14 days	Tourism Low	6d £6.5m	By pigs only
Low				

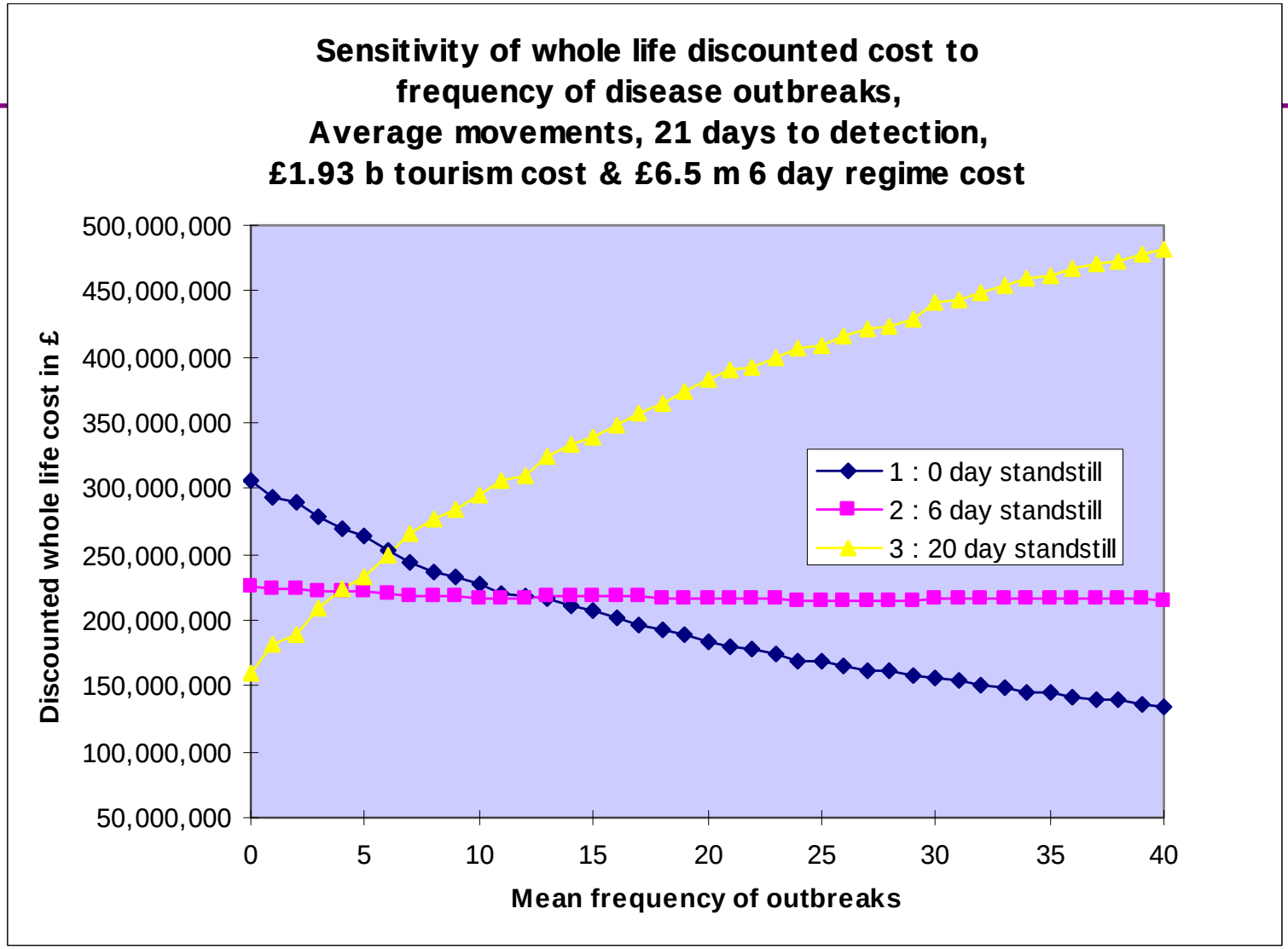
A

A

Sensitivity of whole life discounted cost to frequency of disease outbreaks, Average movements, 21 days to detection

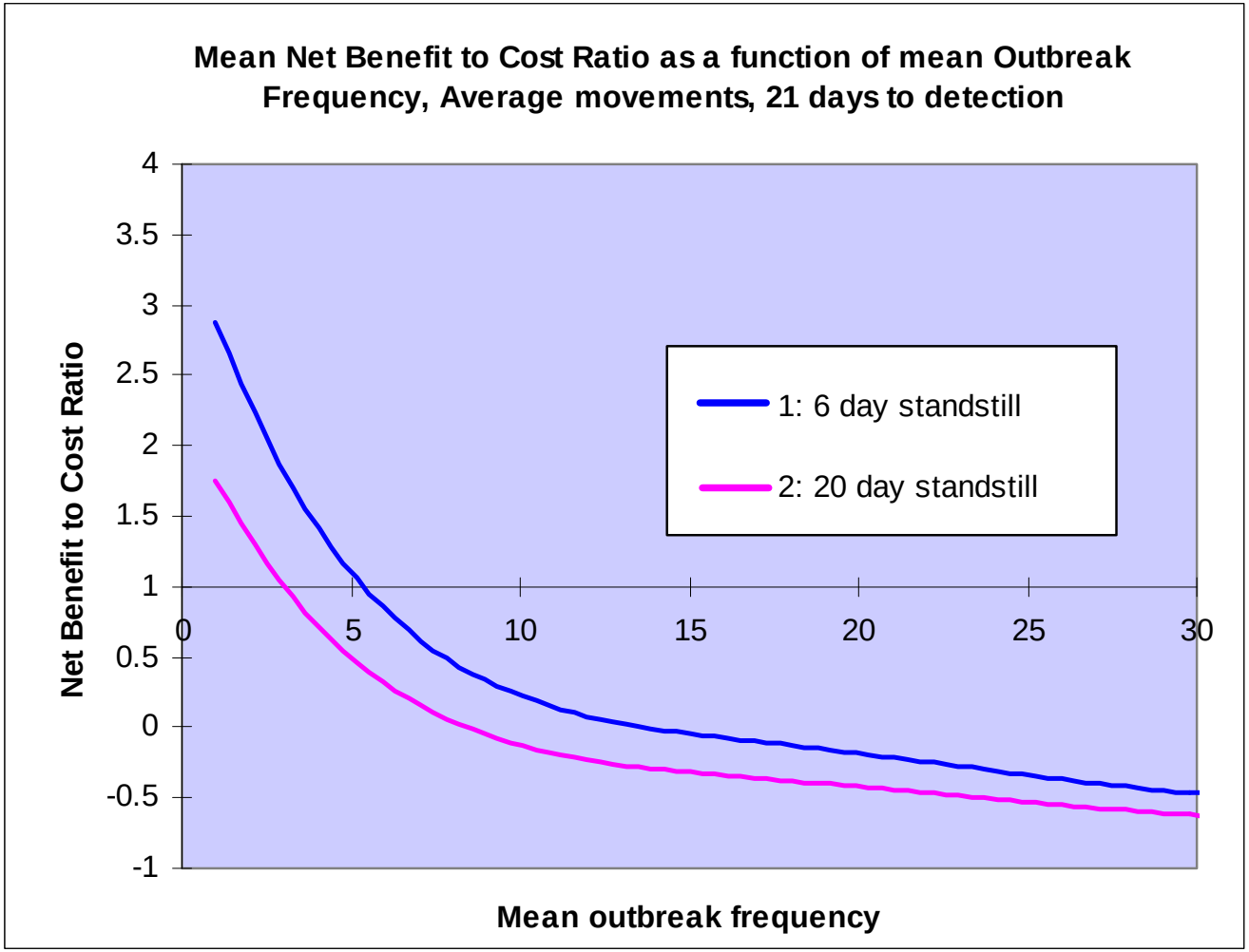


B


Sensitivity of whole life discounted cost to frequency of disease outbreaks, Average movements, 21 days to detection, £1.93 b tourism cost & £6.5 m 6 day regime cost
Discounted whole life cost in £
500,000,000
450,000,000
400,000,000
350,000,000
300,000,000
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
0
5
10
15
20
25
30
35
40
Mean frequency of outbreaks
1 : 0 day standstill
2 : 6 day standstill
3 : 20 day standstill

Net benefit to cost ratio

A



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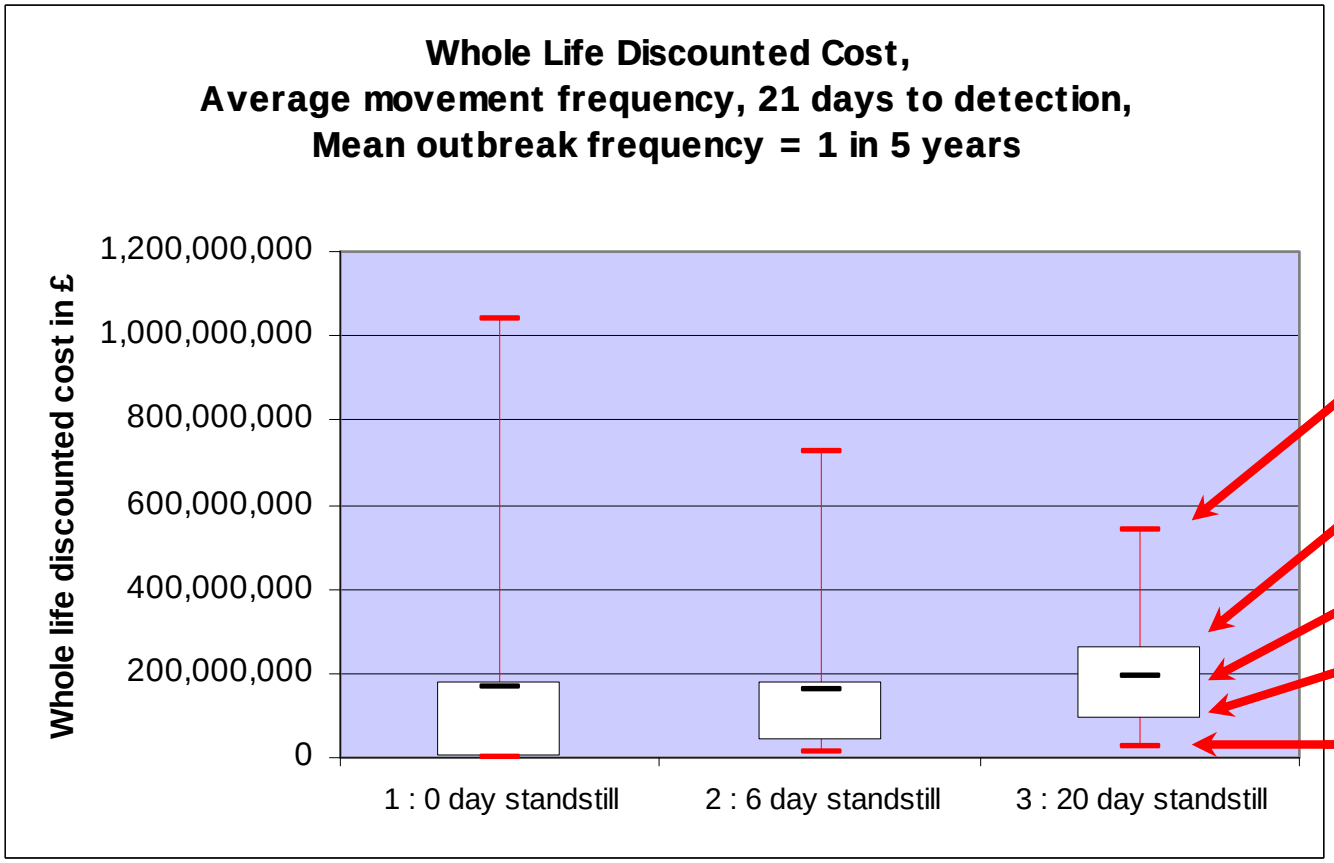
Distribution of Outcomes

A



Findings

Conclusions - epidemiology

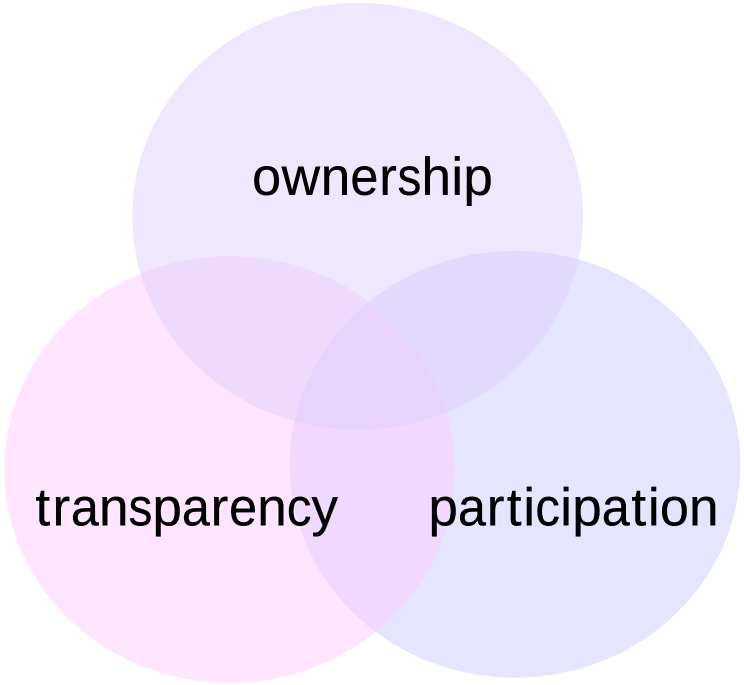
- Standstill regimes do help limit disease spread
- Arrive at same conclusions using two independent models – increases confidence in results

Conclusions - economics

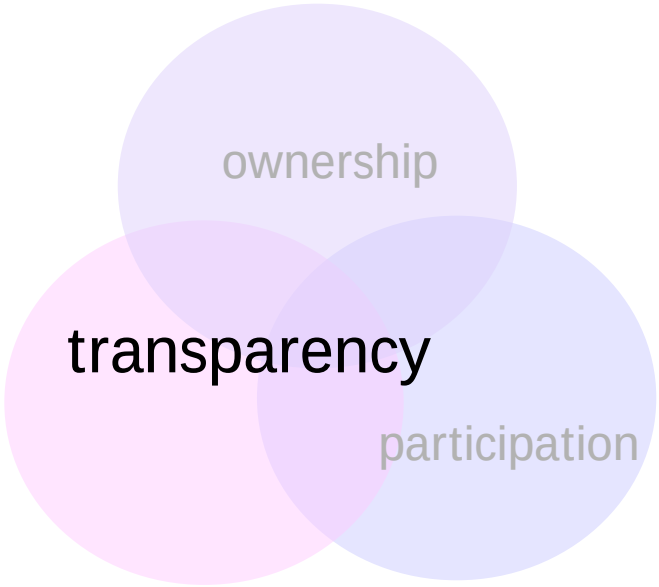
- No black or white answer
- Following conclusions robust to wide range of inputs:
  - Standstill controls justified if outbreak frequency is about 1 in 12 years or less (based on means)
  - Standstills are effective in capping the total cost of very large outbreaks
  - The 6-day regime acts in some ways like an “insurance policy”
  - Benefit to cost ratio of the 6 day regime always exceeds 20 day regime

3. Dealing with the people perspective

Three principles

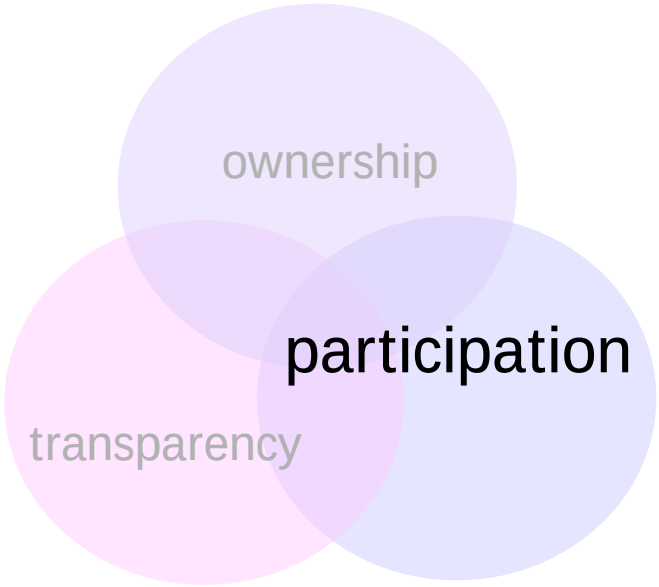


Practice



- “show ‘n tells”
- wide range of stakeholder groups
  - full stakeholder
  - mini stakeholder
  - expert group
  - senior Government group
- language, terminology and presentation

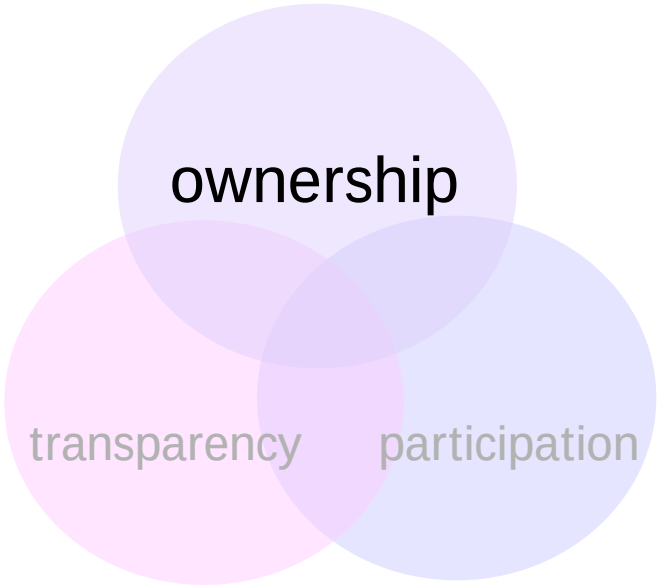
Practice



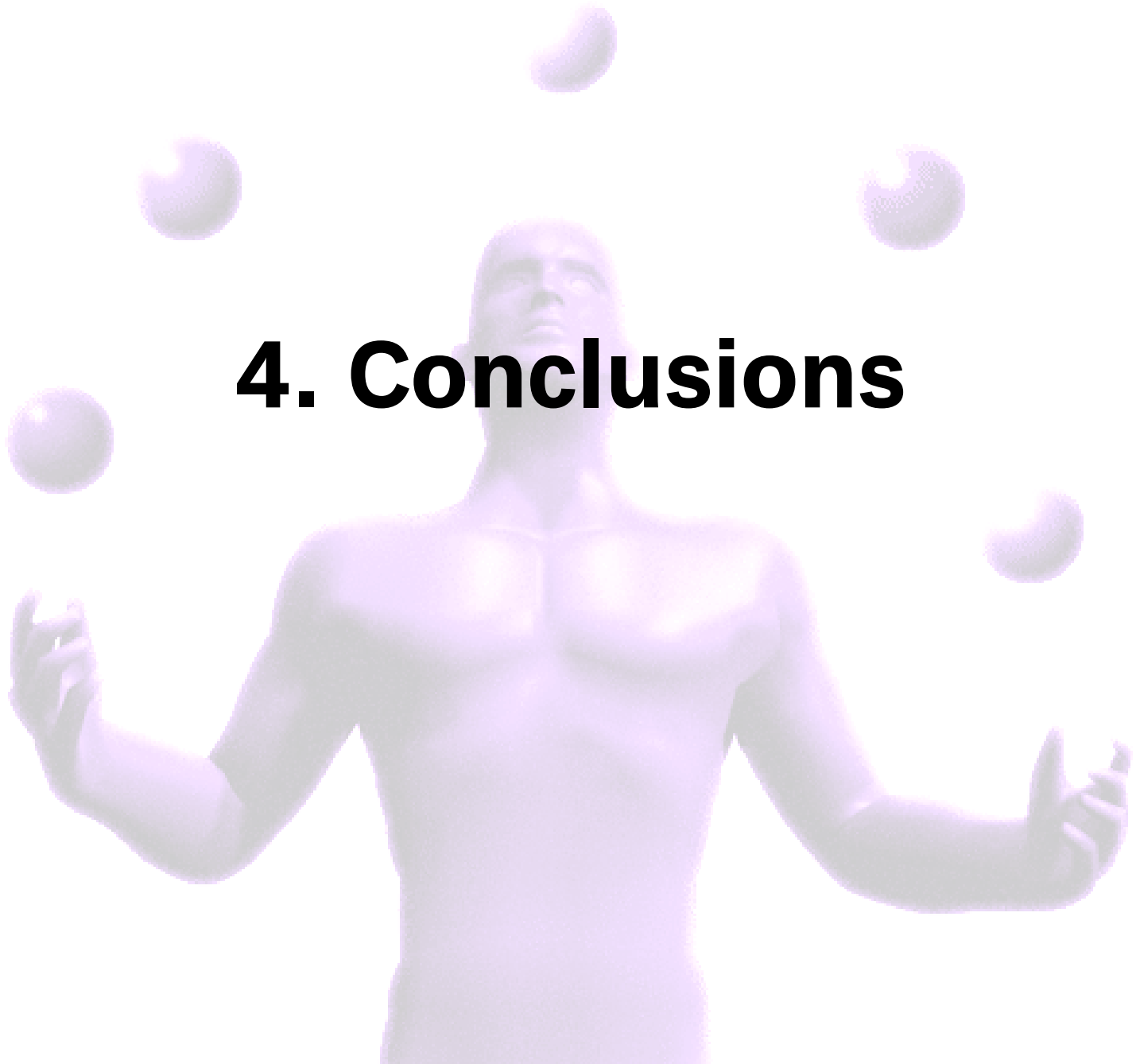
Groups:

- steered development of the models
- provided data/expert judgement
- commented on results and steered analysis strategy

Practice



- listened and responded positively to input and criticism
- “threw bricks” our selves
- tested alternative views on inputs and showed impact
  - even when we knew that it would make no difference to the decision
- didn’t presume to tell officials what the policy should be



4. Conclusions

Did it work?

- The Silent Spread model came to be described as the collective brain of the expert group
- Results initially considered as counter-intuitive were accepted by all parties
- The integration modelling provided an effective way of combining and exploring a wide range of scenarios and uncertainties
- Officials presented range data from this model to the minister and allowed us to present the results simultaneously to the minister and farmers' groups
- Restrictive legislation was relaxed

YES

Conclusions

Quantification pitfalls:

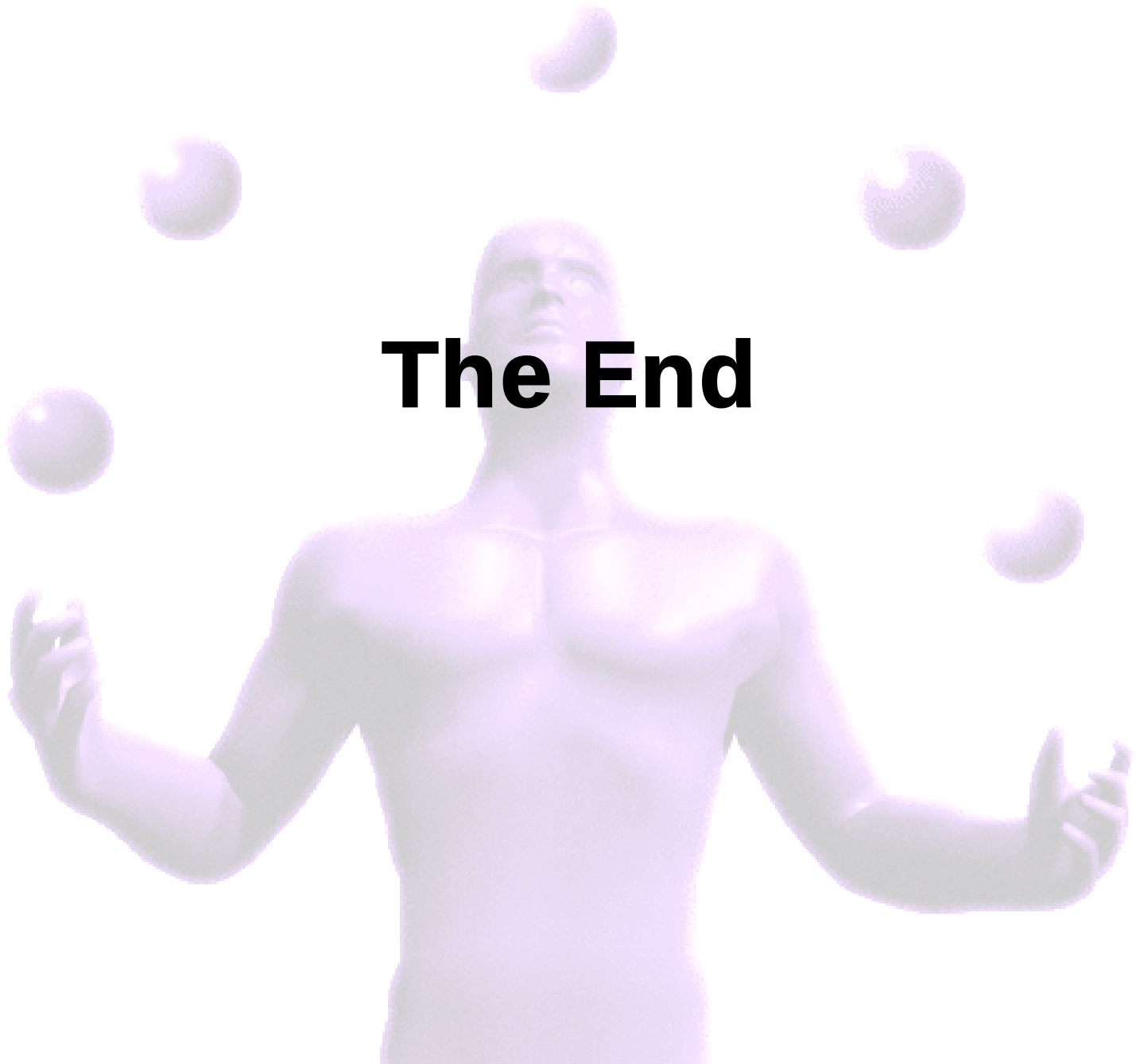
- Modelling for modelling sake
  - focusing models on the things that are scientifically fascinating, but have little significance to the decision to be made
- Modelling in isolation/failing to engage
  - and trying to impose solutions
- Paying lip service to the engagement process
  - failing to listen and respond
- Forgetting that a model is just a model
  - its outputs must always be challenged and related to the real world

This type of highly participative process is not cheap

- So use confined to major decisions where there is significant uncertainty and controversy

Conclusions

- In complex, controversial, or uncertain situations quantitative modelling can help:
  - understand the issues
  - clarify the options and
  - reach decisions
- In cases such as the one illustrated here it was essential
- But you cannot neglect the people aspects
- You need to actively seek participation both:
  - to get buy in to the modelling, and
  - to ensure you are modelling the right things, in the right way, with the best available information



The End