Department
for Environment
Food & Rural Affairs

Bovine TB: the science-policy challenges

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- England's TB strategy
- The TB problem
- Controlling the problem
- What would success look like?
- Measuring success

England's Bovine TB Strategy

Aims to:

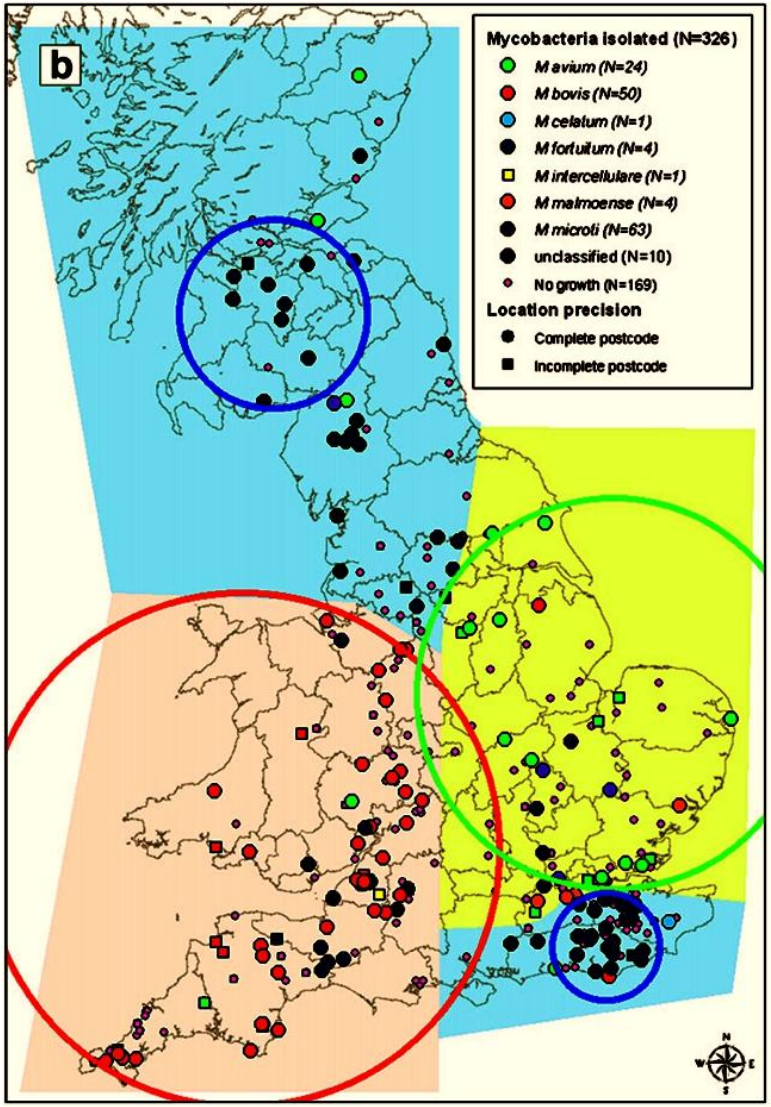
Achieve Officially TB free status for England by 2038 whilst maintaining a sustainable livestock industry by:

- Improved epidemiology and modelling with intervention tailored to local TB risk in cattle, badgers and other non-bovines;
- Development of new tools to control bTB, e.g. vaccines, diagnostics and alternative badger controls;
- Increasingly farmer-led activity with a new model of governance and funding.

The Hazard: *Mycobacterium bovis*

- Closely related to *M. tuberculosis*
- *M. microti* and *M. avium* also occur in the environment
- Tough slow-growing obligate pathogen causing intracellular infection
- Hard to detect and can remain dormant for many years
- Dynamics of infection are complex and probably relate to host susceptibility

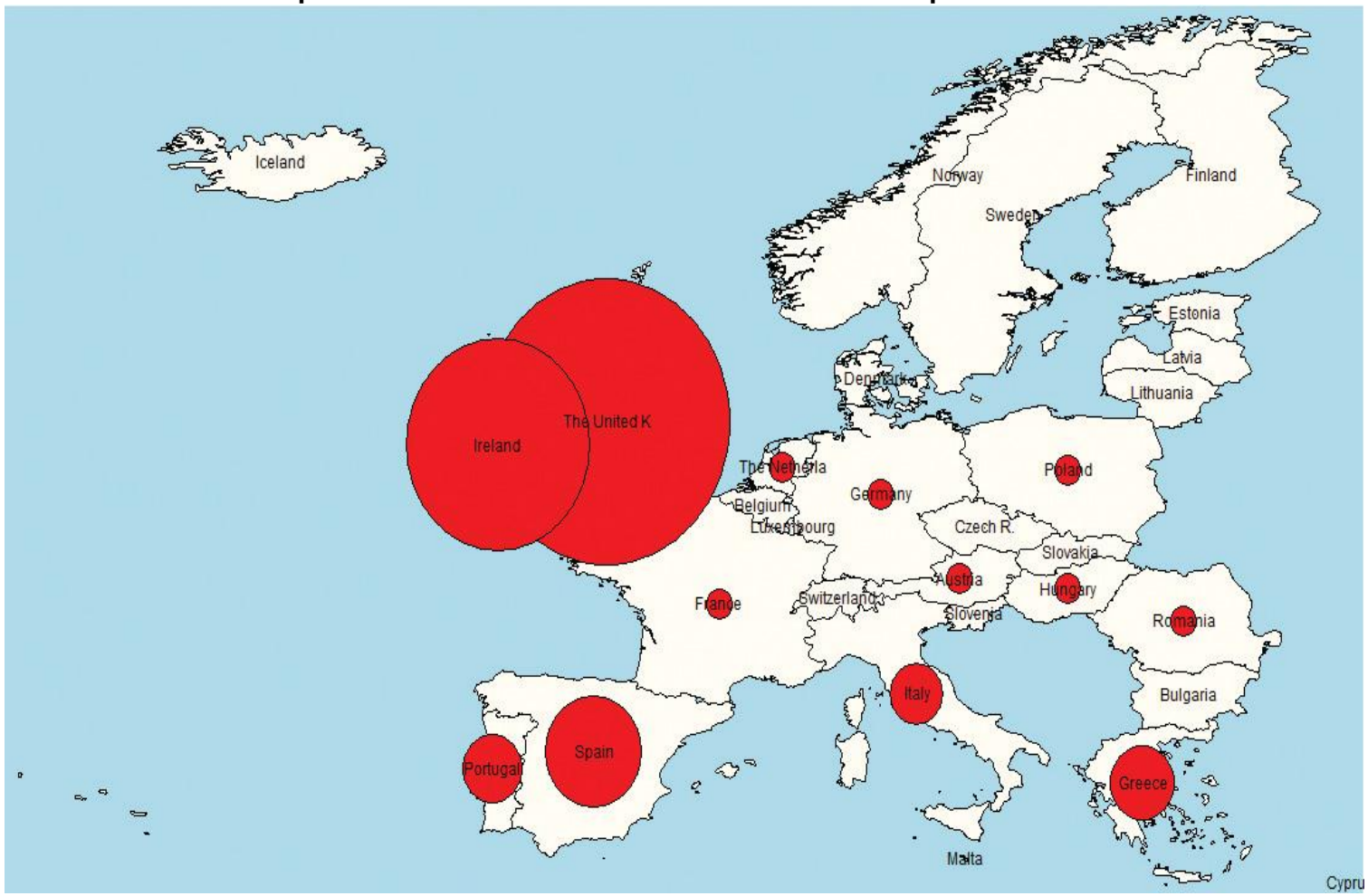
Important to keep an open mind about routes and sources of infection



Gunn-Moore et al.
Journal of Feline Medicine and Surgery (2011) 13, 934-944

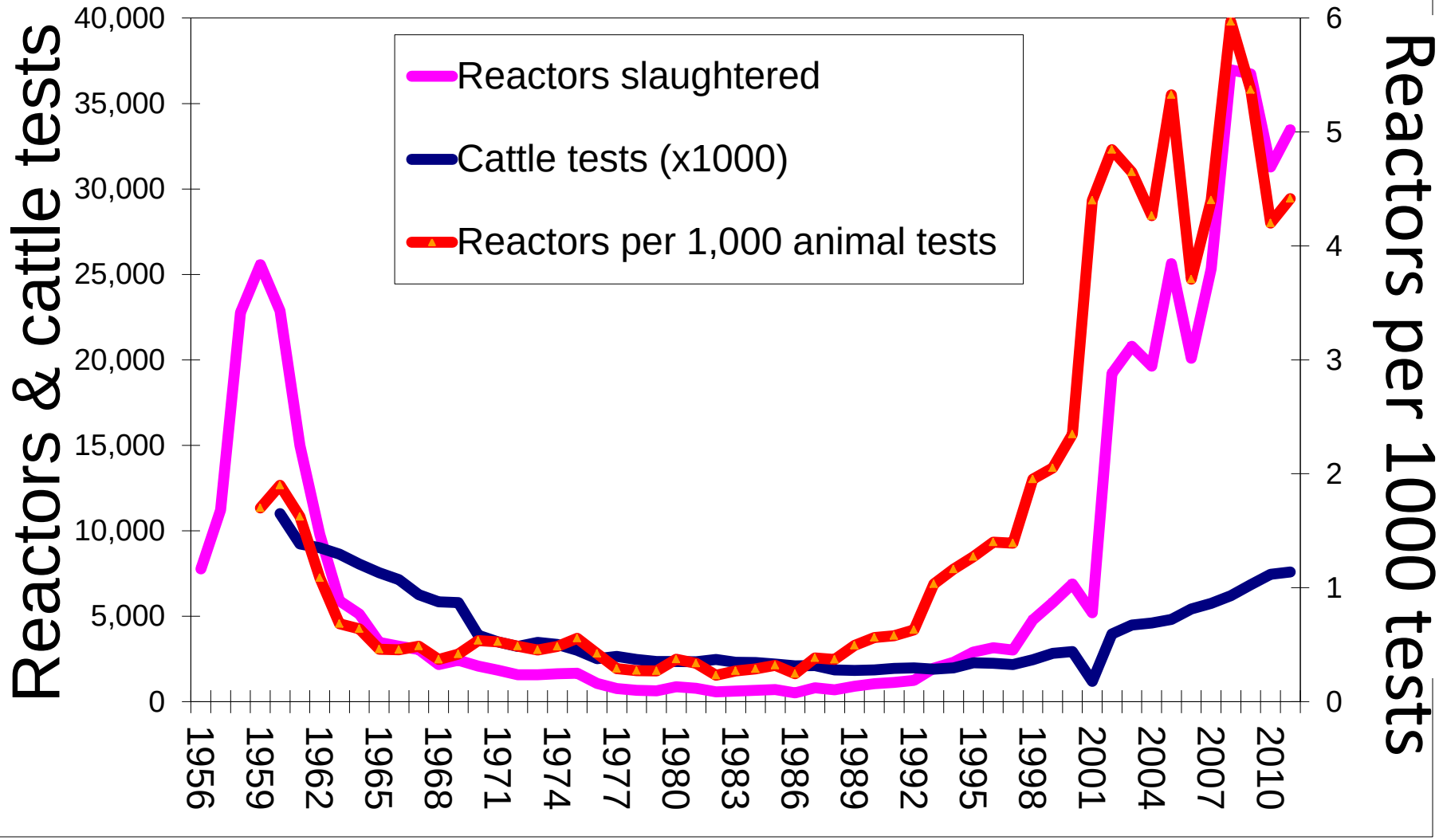
The Hazard: scale of the problem

National herd prevalence for bovine TB in European Member States



UK has the largest bTB problem in Europe

The Problem: Historical trends in GB



The Problem: Historical trends

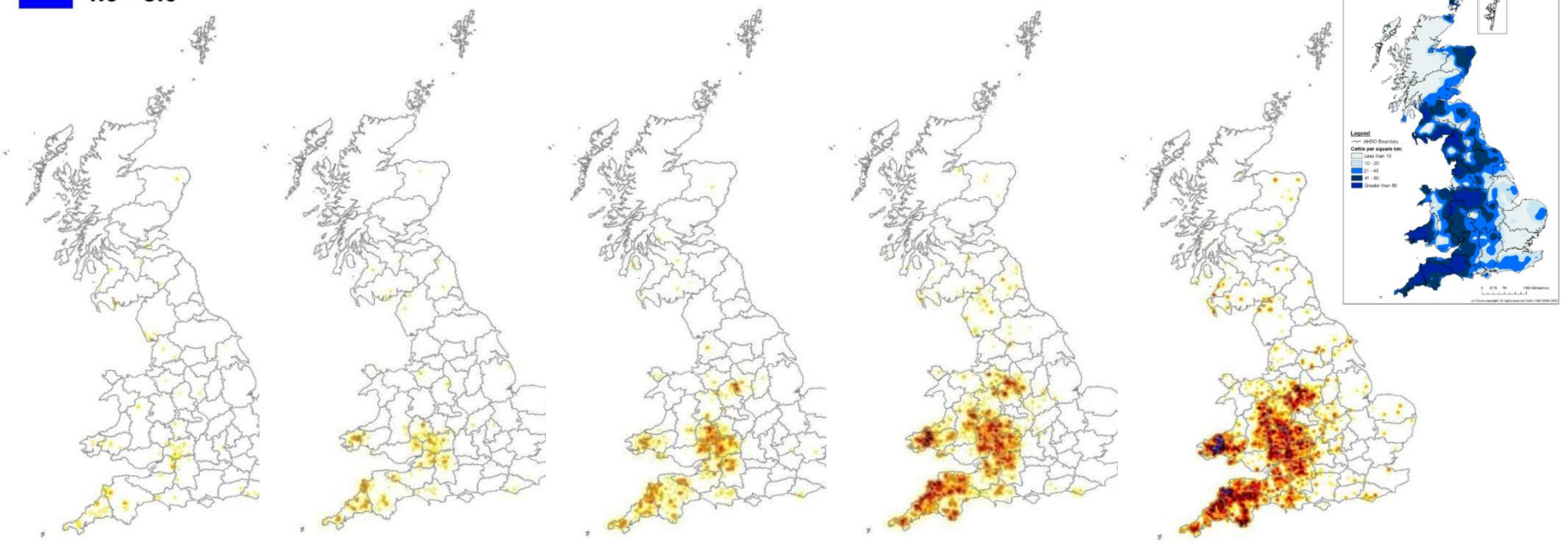
Geographical spread of bTB

Density (cases/km²/year)

- None
- >0 - 0.06
- 0.06 - 0.12
- 0.12 - 0.25
- 0.25 - 0.50
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 8.0

Number of skin (and interferon-gamma) test reactors and slaughterhouse

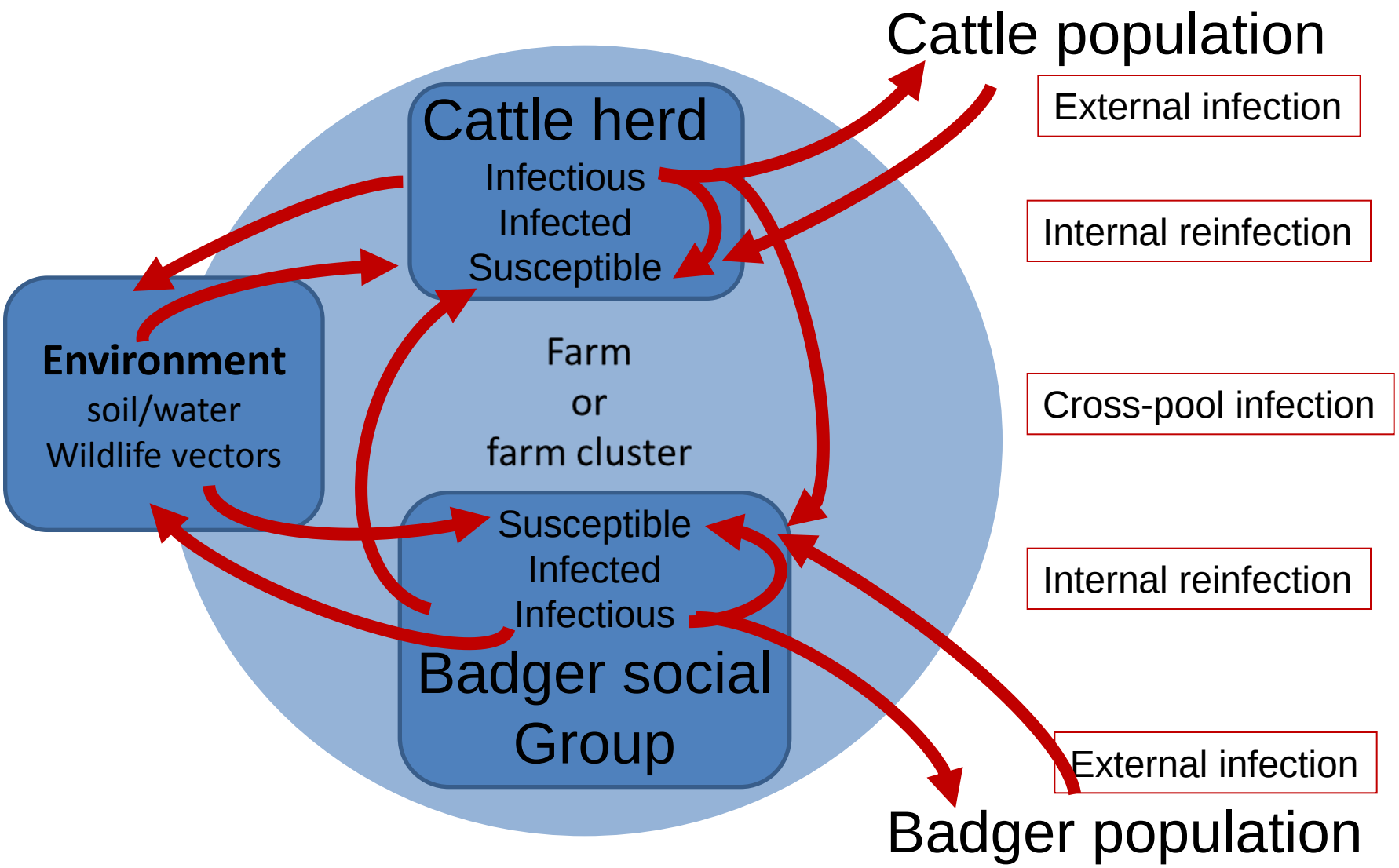
Distribution of cattle



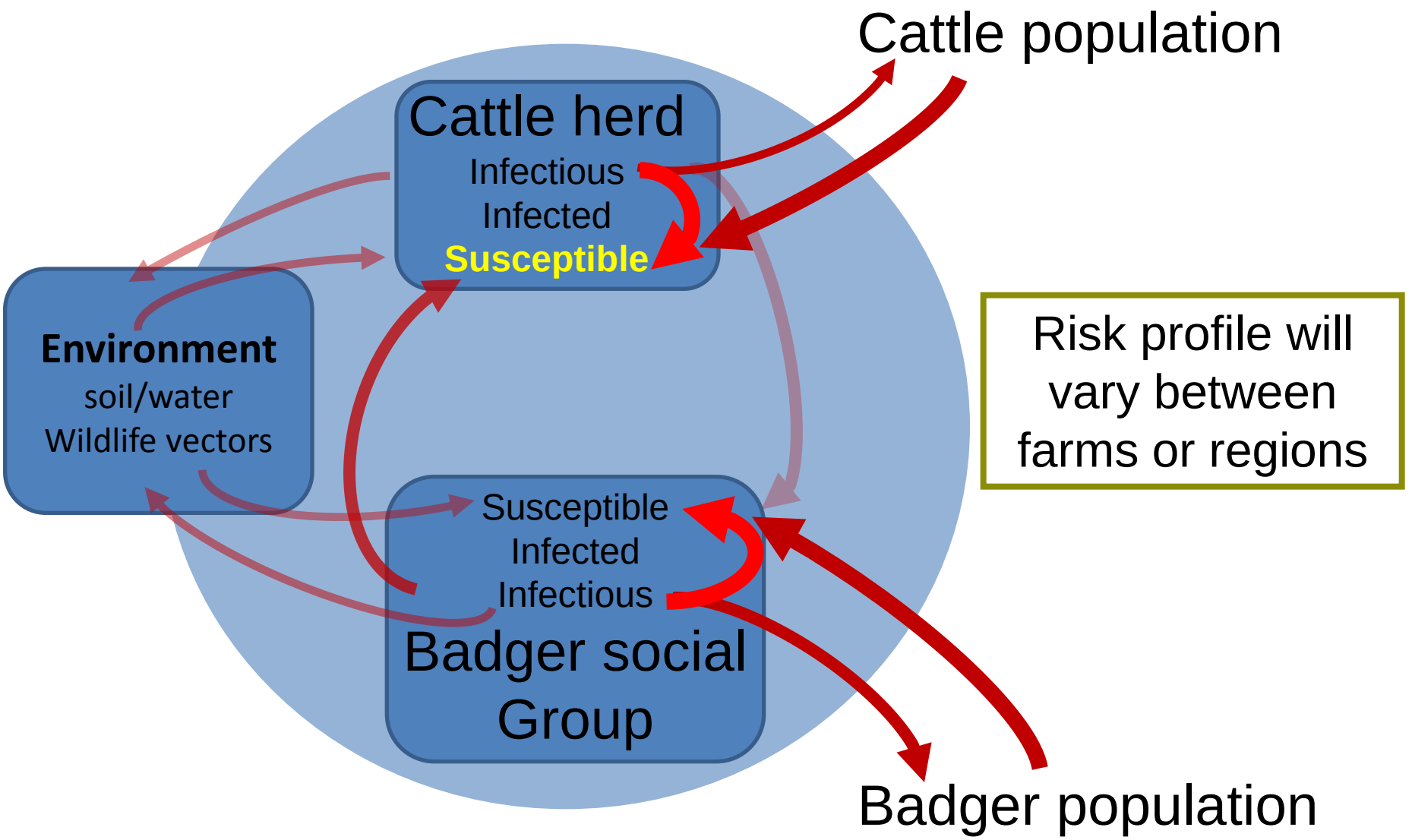
1986-90 1991-95 1996-2000 2001-05 2006-10

Data from AHVLA and The cattle Book 2008

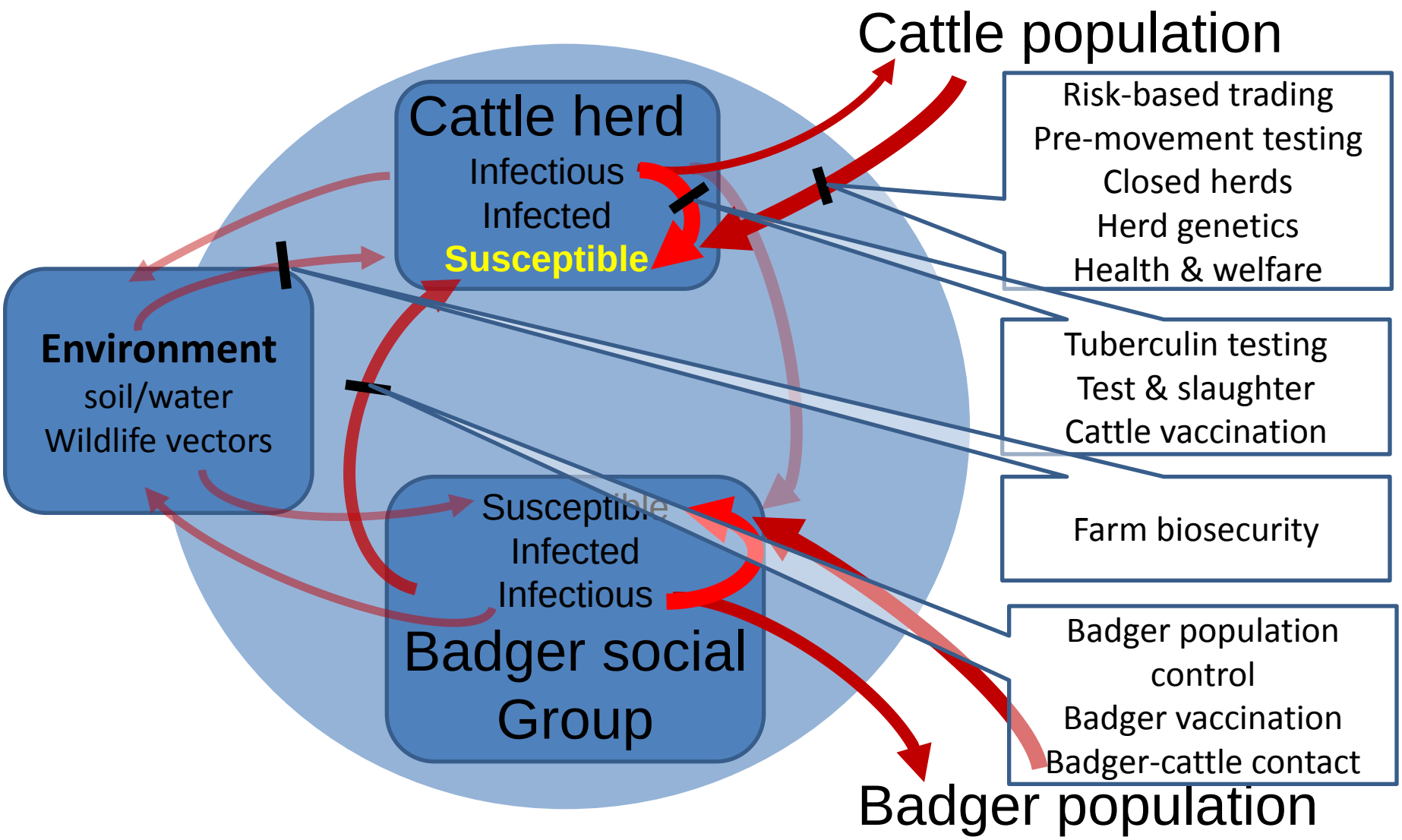
The Problem: The disease cycle



The Problem: Risks



The Problem: Routes of control



The Problem: Routes of control

Risk-based trading
Pre-movement testing
Closed herds
Herd genetics
Health & welfare

Tuberculin testing
Test & slaughter
Cattle vaccination

Farm biosecurity

Badger population control
Badger vaccination
Badger-cattle contact

Disease management : systems-based

Risk-based trading
Pre-movement testing
Closed herds
Herd genetics
Health & welfare

Tuberculin testing
Test & slaughter
Cattle vaccination

Farm biosecurity

Badger population control
Badger vaccination
Badger-cattle contact

Defines a system of intervention adapted to the risks of disease in different circumstances

The policy challenge is to provide effective disease control that is proportionate to the joint objectives of maintaining both a viable industry and a viable badger population

Disease management : systems-based

Risk-based trading
Pre-movement testing
Closed herds
Herd genetics
Health & welfare

Tuberculin testing
Test & slaughter
Cattle vaccination

Farm biosecurity

Badger population control
Badger vaccination
Badger-cattle contact

All interventions to control the disease are modulated by choices made by people

This is primarily a sociological problem
secondarily an epidemiological problem

Disease management: scale-based

Risk-based trading
Pre-movement testing
Closed herds
Herd genetics
Health & welfare

Tuberculin testing
Test & slaughter
Cattle vaccination

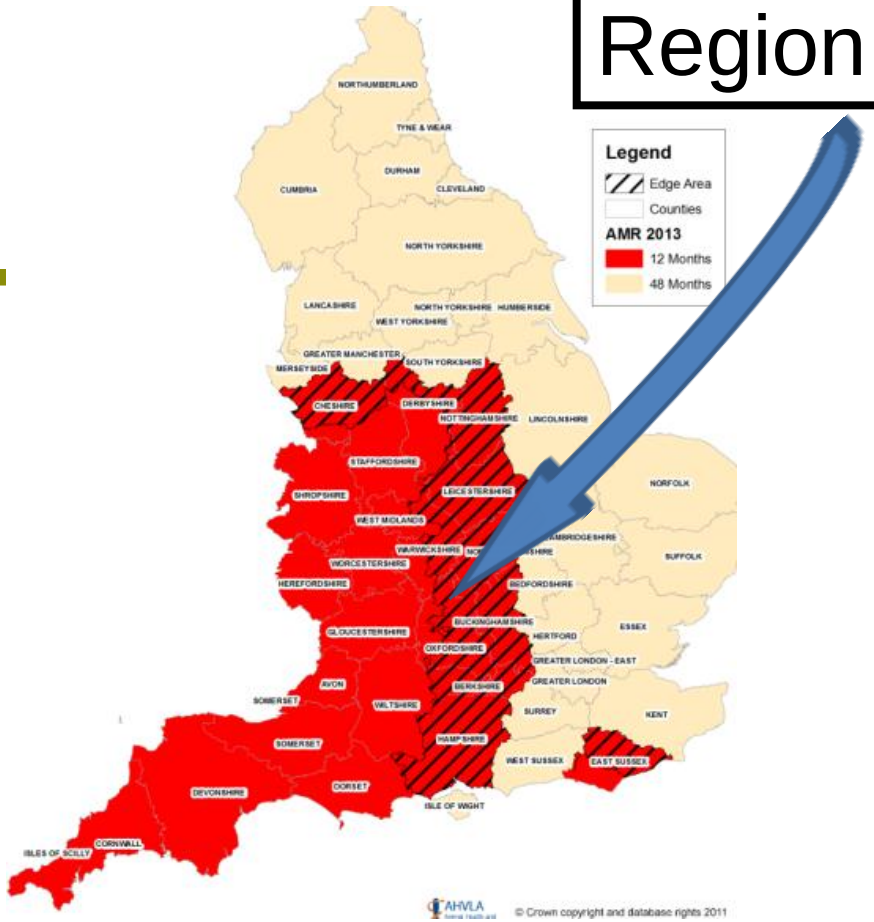
Farm biosecurity

Badger population control
Badger vaccination
Badger-cattle contact

Farm

Farm cluster

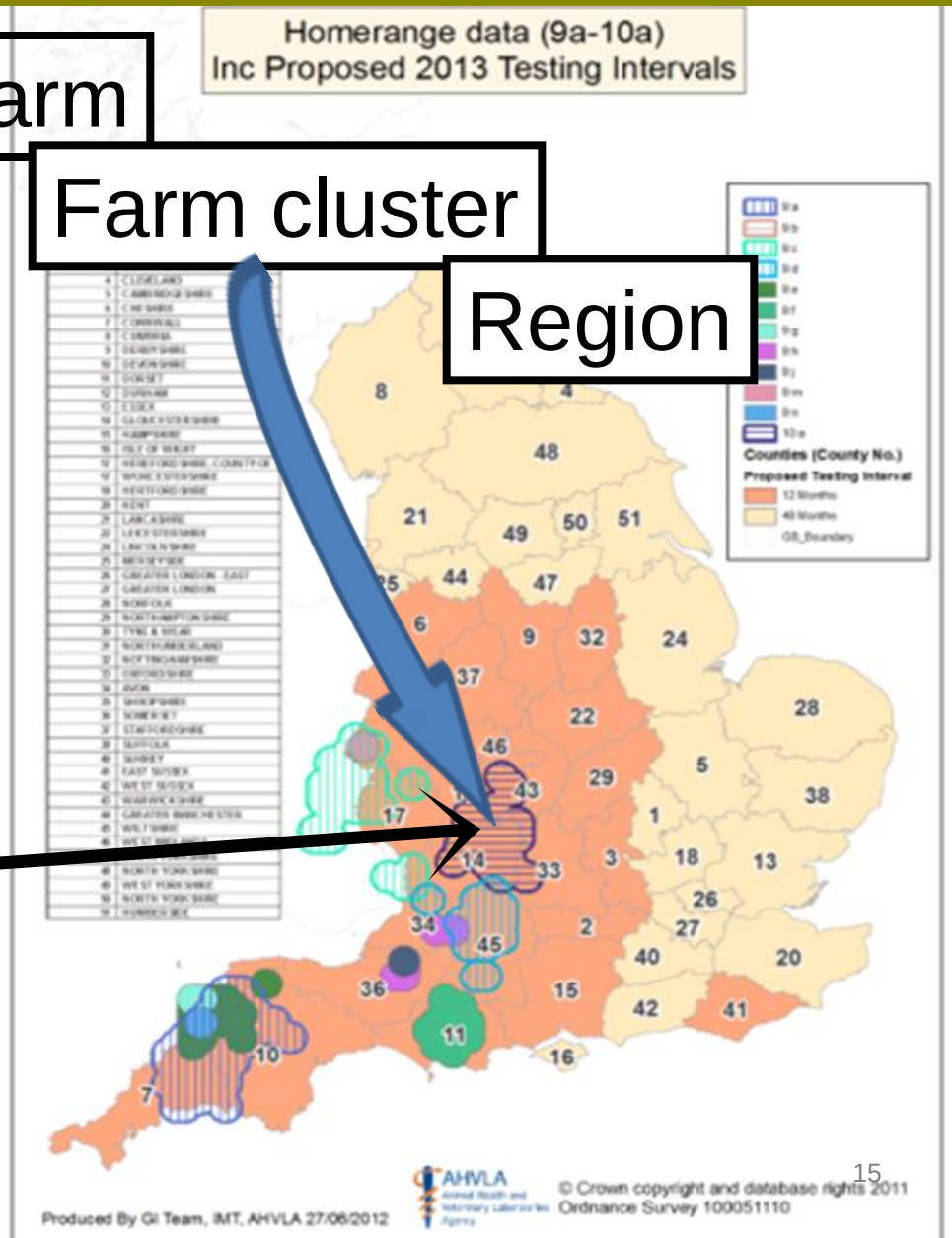
Region



Disease management: scale-based

- Badgers may be indirectly responsible for ~50% of infections in cattle
- But as few as 6% may be because of direct infection
- Whole genome sequencing showing relationships

Genetics shows many mini-epidemics

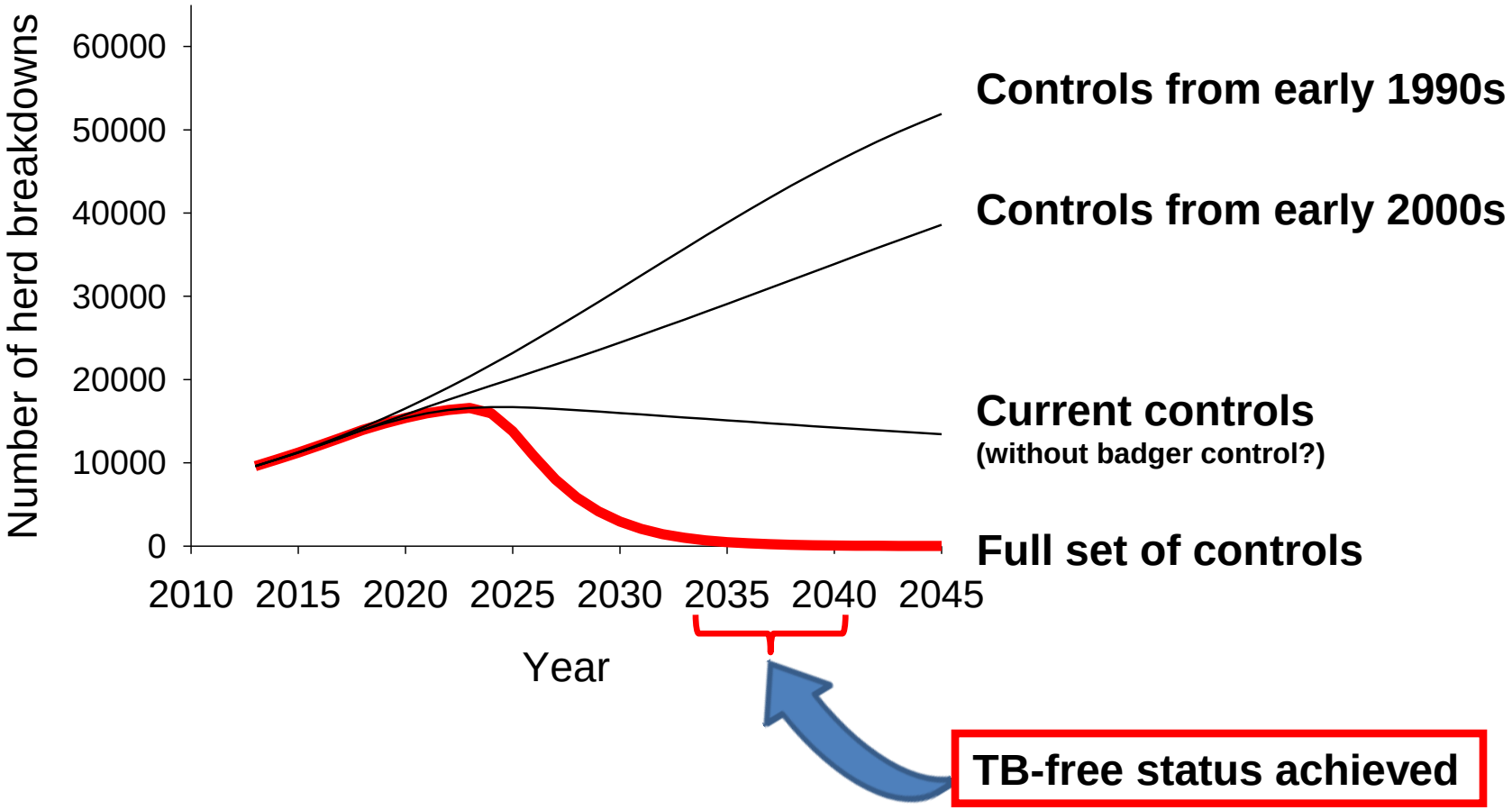


Donnelly & Hone, 2010;
Donnelly & Nouvellet, 2013;
Biek et al, 2012

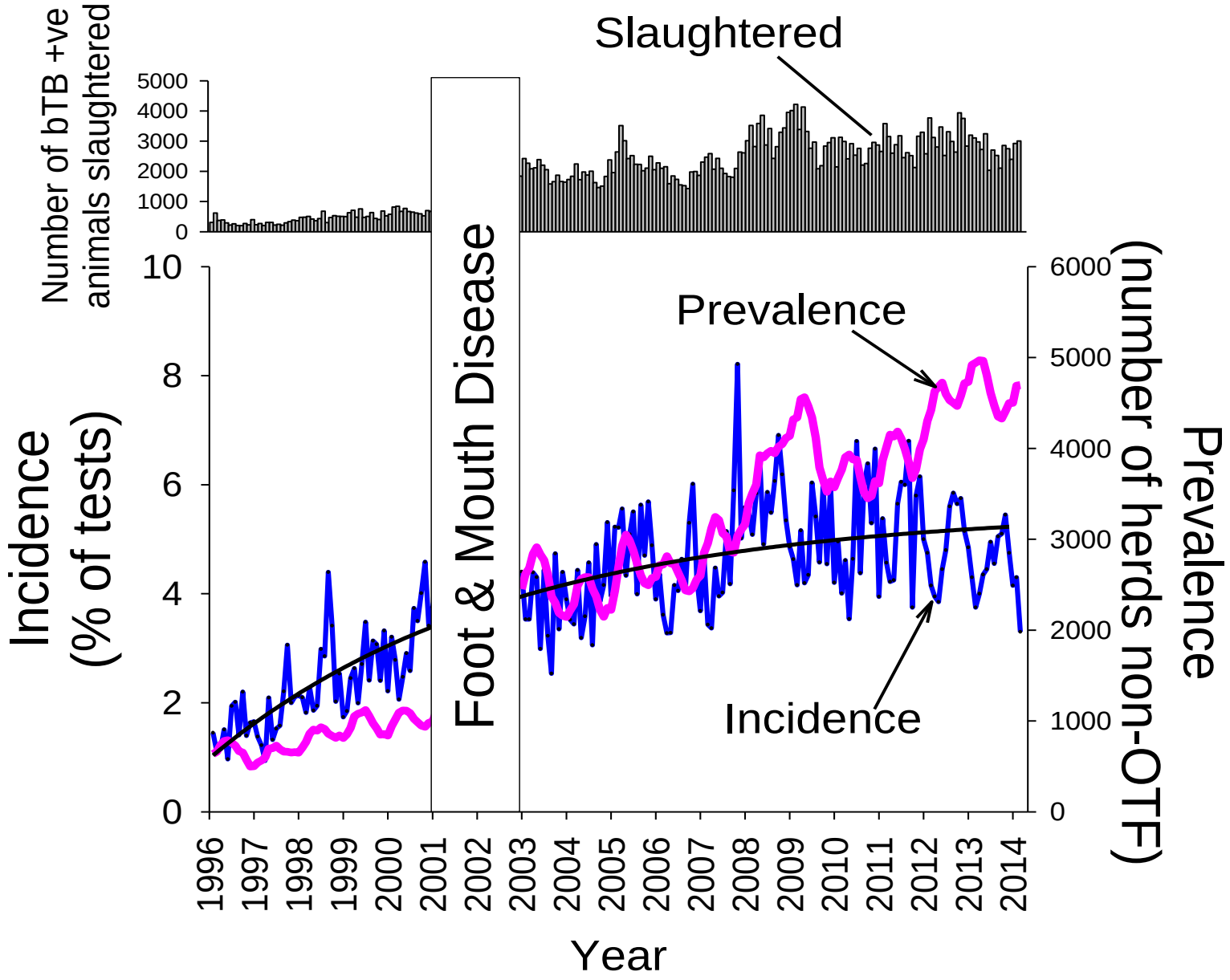
What would success look like?

Conceptual model of the way forward

Cumulative effects of controls – all are needed

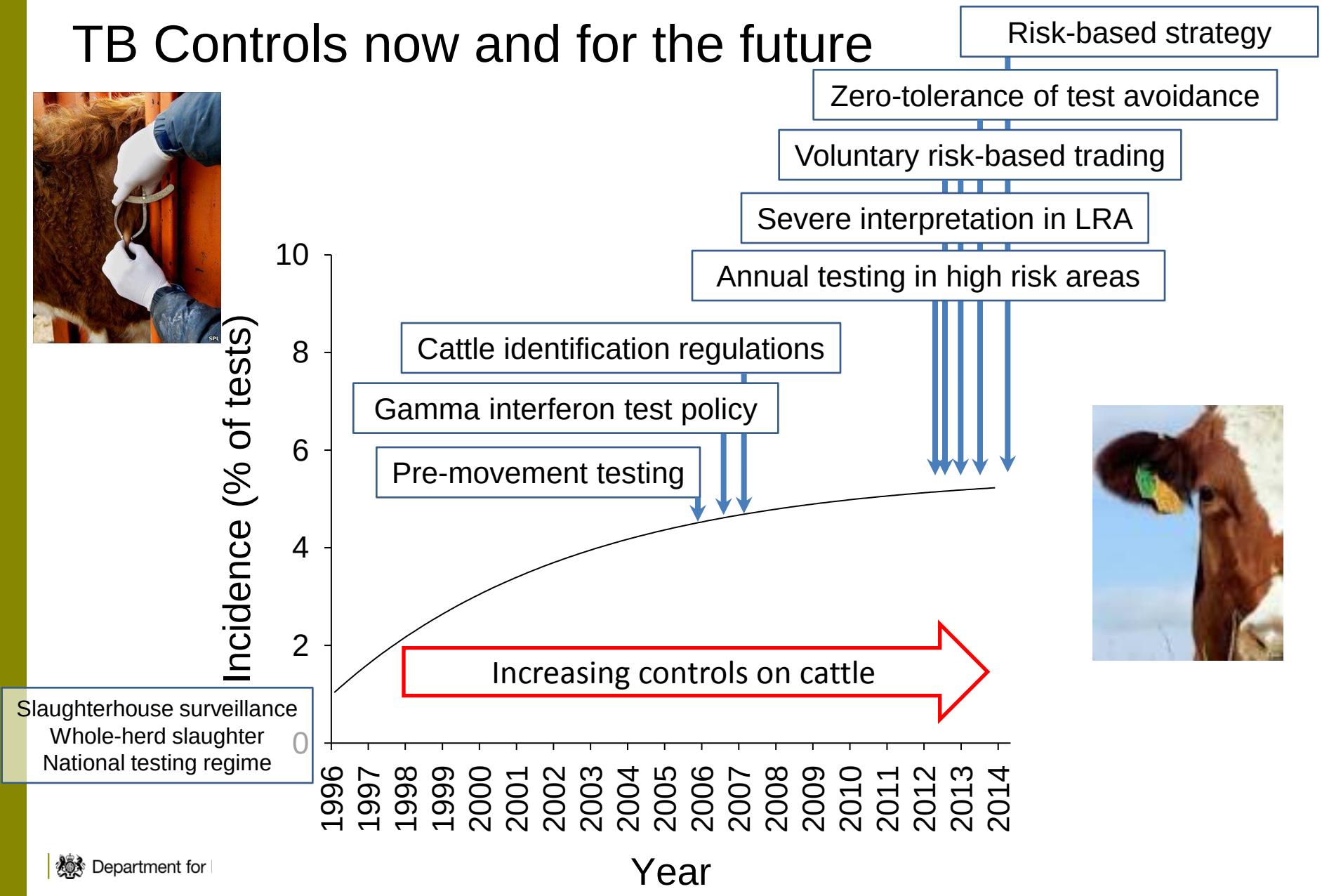


Status: measuring success



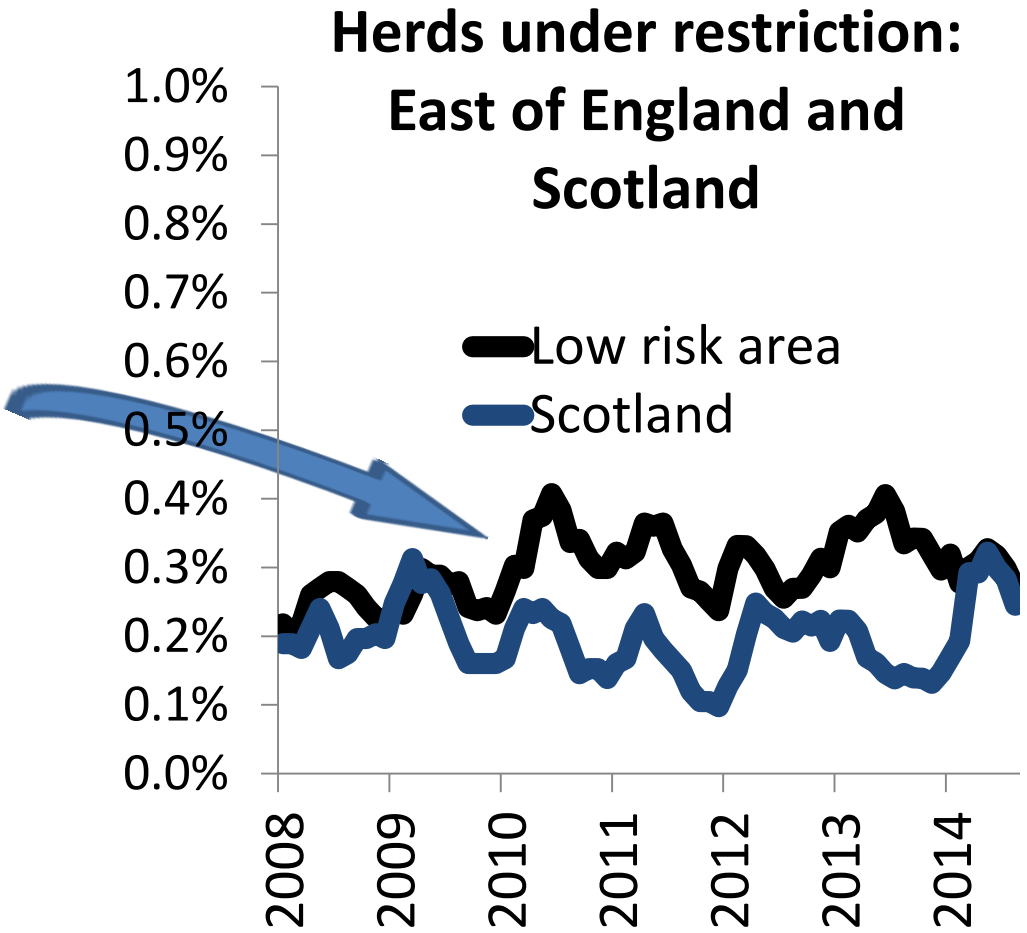
Status: measuring success

TB Controls now and for the future



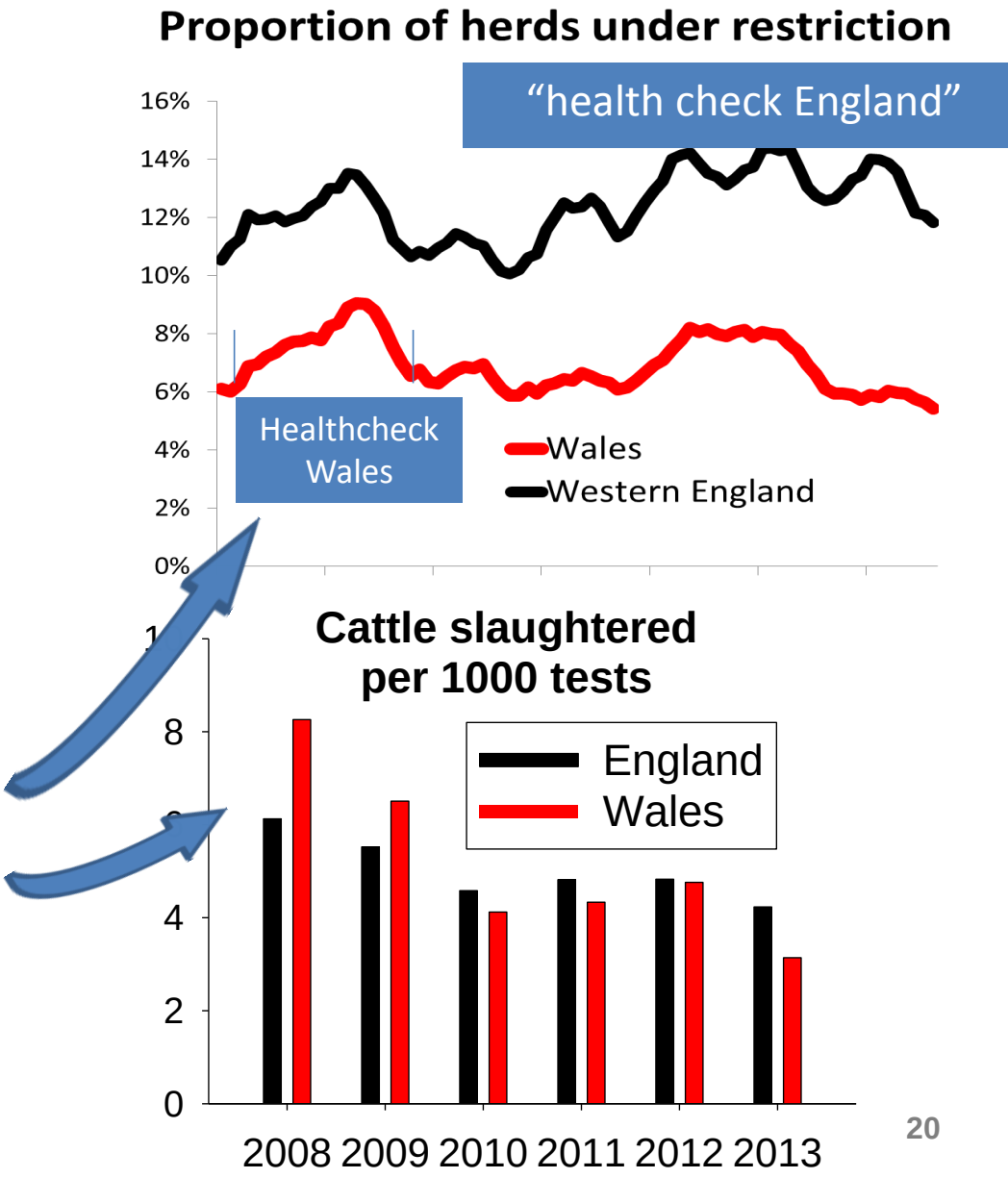
Status: England versus Scotland

- bTB strategy aims for bTB-free status for low TB area in England
- Evidence shows very close to performance of Scotland which has TB-free status



Status: England versus Wales

- Wales carried out a “TB Health check” in 2008/2009
- England introduced similar levels of testing after 2012
- There is no effective difference in testing regimes between high risk areas in England and those in Wales
- The evidence shows similar rates of success in England as in Wales



Principles for future management

- Focus on controlling the hazard, i.e. *Mycobacterium bovis*;
- Bear down on the highest impact risks using the latest and most relevant evidence;
- Ensure that future interventions are designed to minimise these risks and are applied proportionately to the regional/local circumstances; and
- Ensure those who are responsible for managing behaviours that change risks are aware of their responsibilities and incentivised to deliver effective disease control.

The strategic approach

- Systems-based
- Scale-based
- Risk-based