

**Lessons from surveillance of
MRSA bacteraemia in UK**

Professor Barry Cookson

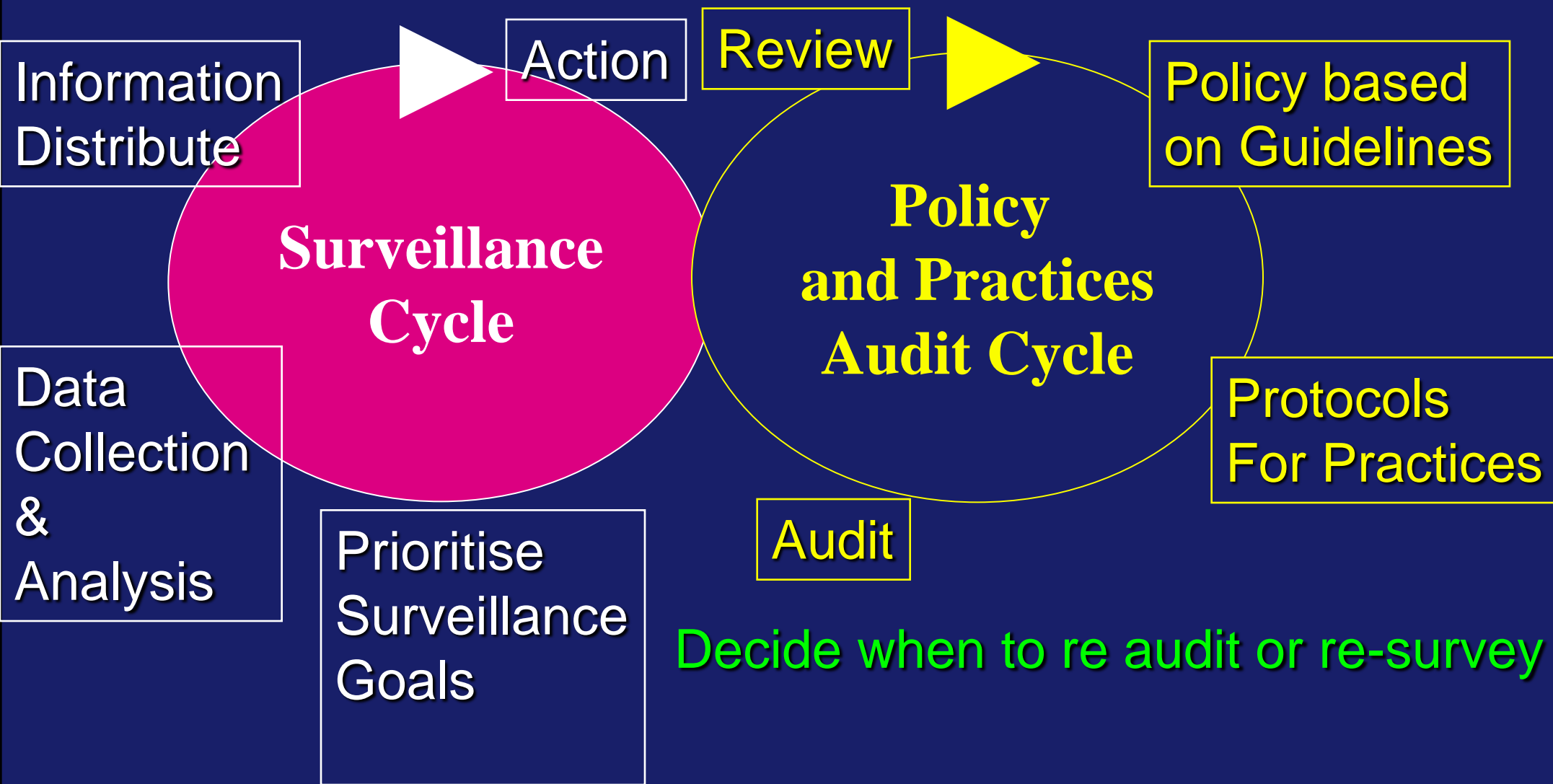
Agenda

- Surveillance process
- Different types of MRSA Surveillance
- Description of systems and findings
- Lessons learnt

Surveillance producing information for action



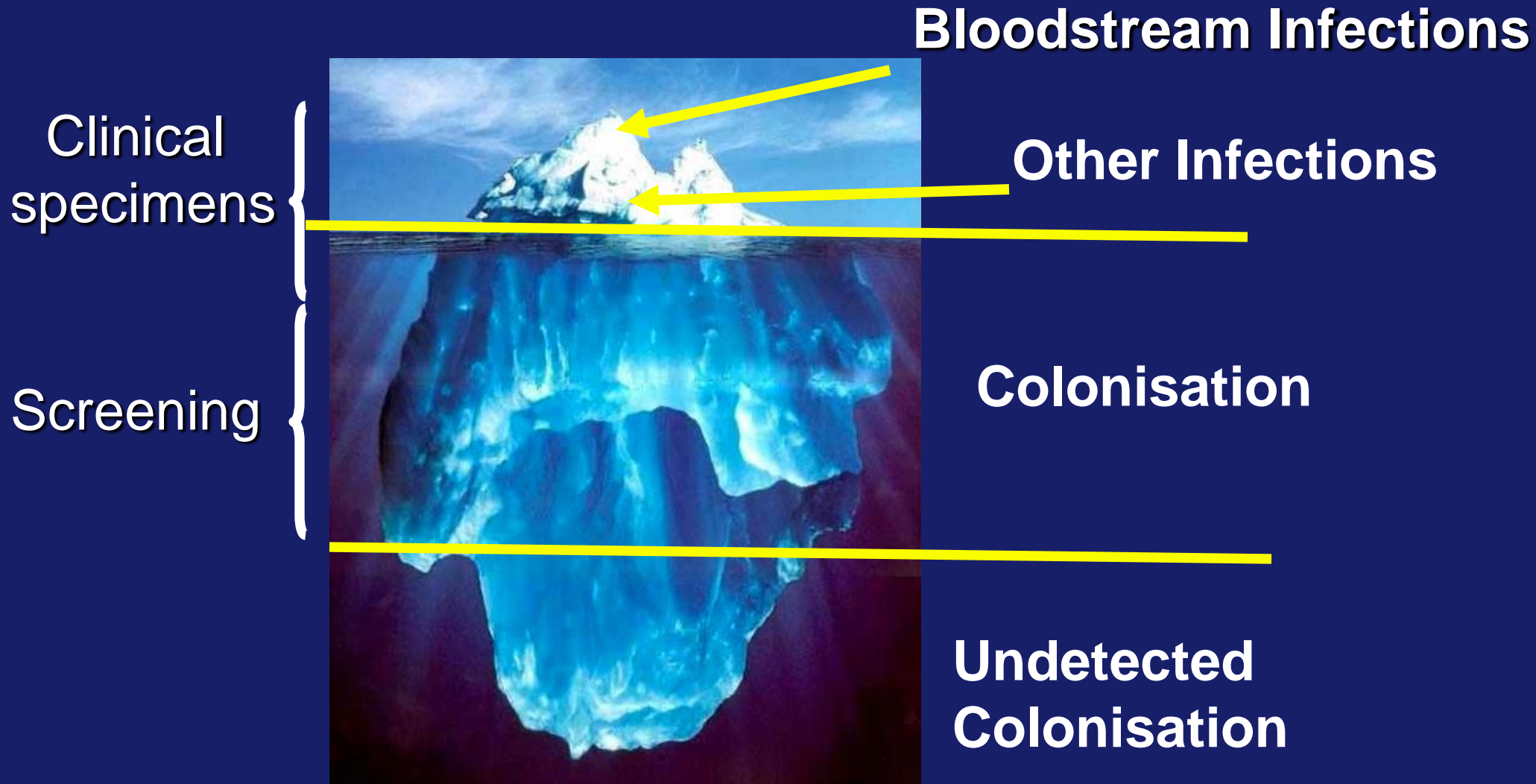
HAI and Antimicrobial Resistance Interacting Cycles



Purposes of Surveillance for Infection Control

- Detect changes in disease patterns and enable early investigation and application of **prevention** measures
- **Evaluate** prevention and control activities
- Provide information to **help plan** services and allocate resources
- To identify **at risk** patient groups

Typical « Low Grade HCAI Pathogens » (e.g. MRSA) An Iceberg Phenomenon



English MRSA Surveillance

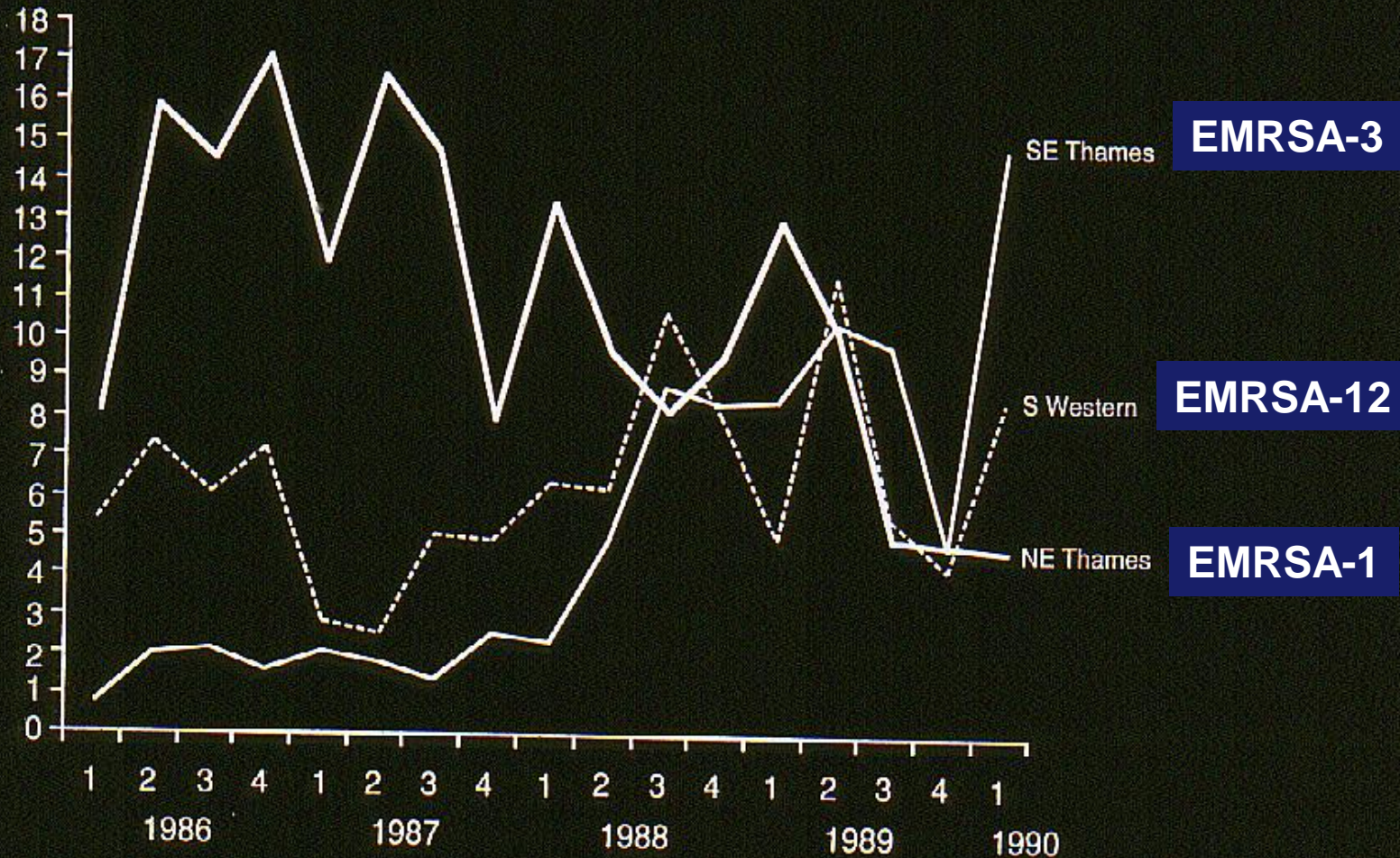
- Prevalence Surveys
 - Very small numbers of blood cultures
- Referred strains for typing
 - Biased samples from potentially all laboratories
 - Varied bloodstream proportions (<2000: 5%: >2010 ~50%)
- Surveillance networks
 - BSAC and EARSNet sentinel schemes
- Voluntary laboratory bloodstream referrals (~1983 – now: “COSURV”)
- Voluntary National Nosocomial Surveillance Scheme (1997-2002)
- Mandatory bloodstream referrals (2002 – Now)

UK 2006 Prevalence Survey

- Higher in older age groups
 - >65y: 8.7% (64% of population) (1993: 50%)
 - <65y: 5.6%
- 1.2% Infections caused by MRSA
- 1.7% had *C. difficile*
 - <65y: 0.7%
 - >65y: 2.3%

Number of incidents referred per region

per quarter: Marples and co-workers, LHCAI



EMRSA Incidents in 1995

Supra-Regional

EMRSA-3

EMRSA-15

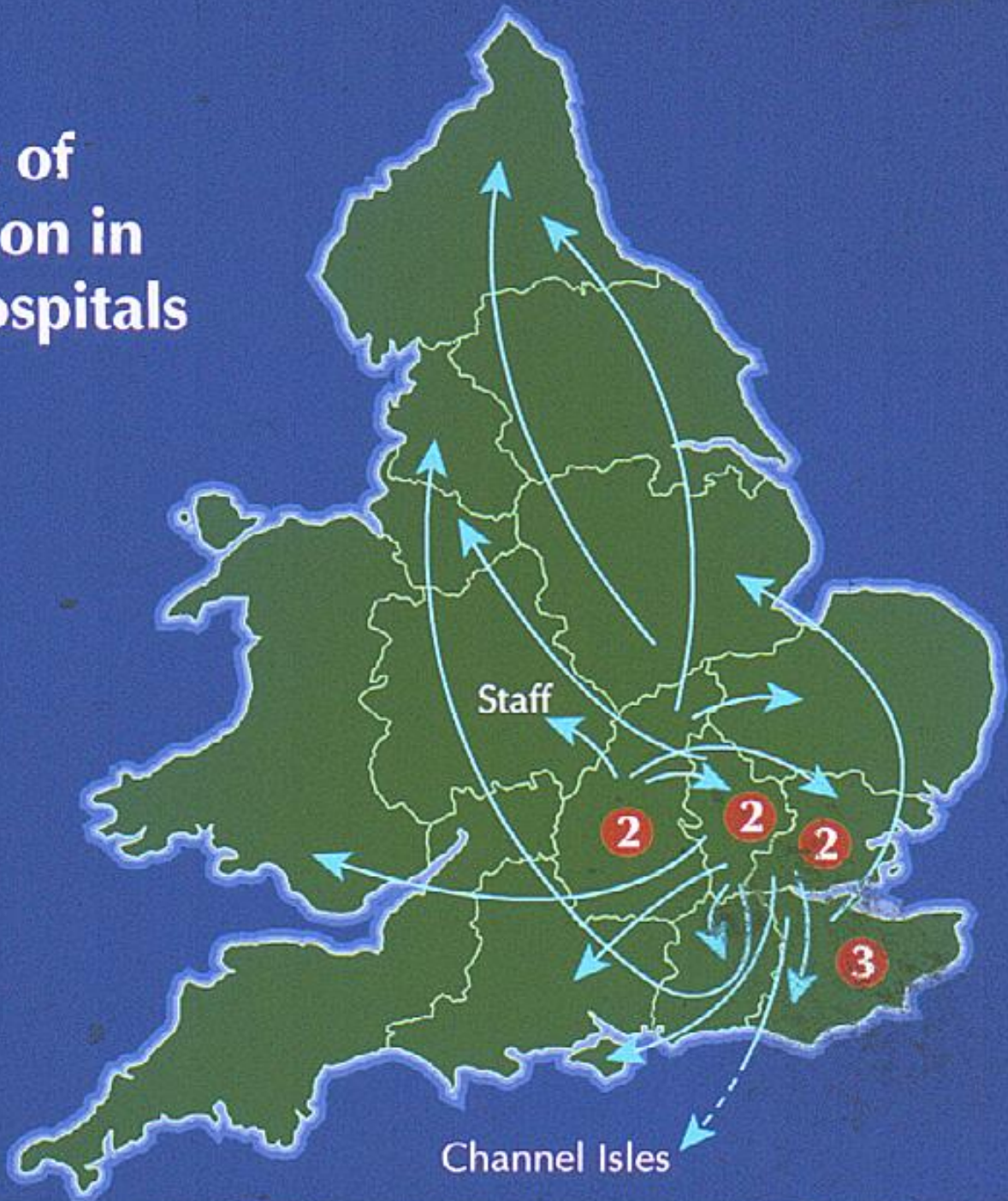
EMRSA-16

All are distinct clones by MLST/SCCmec



**Initial reported route of
EMRSA-16 introduction in
22 of 136 affected hospitals**

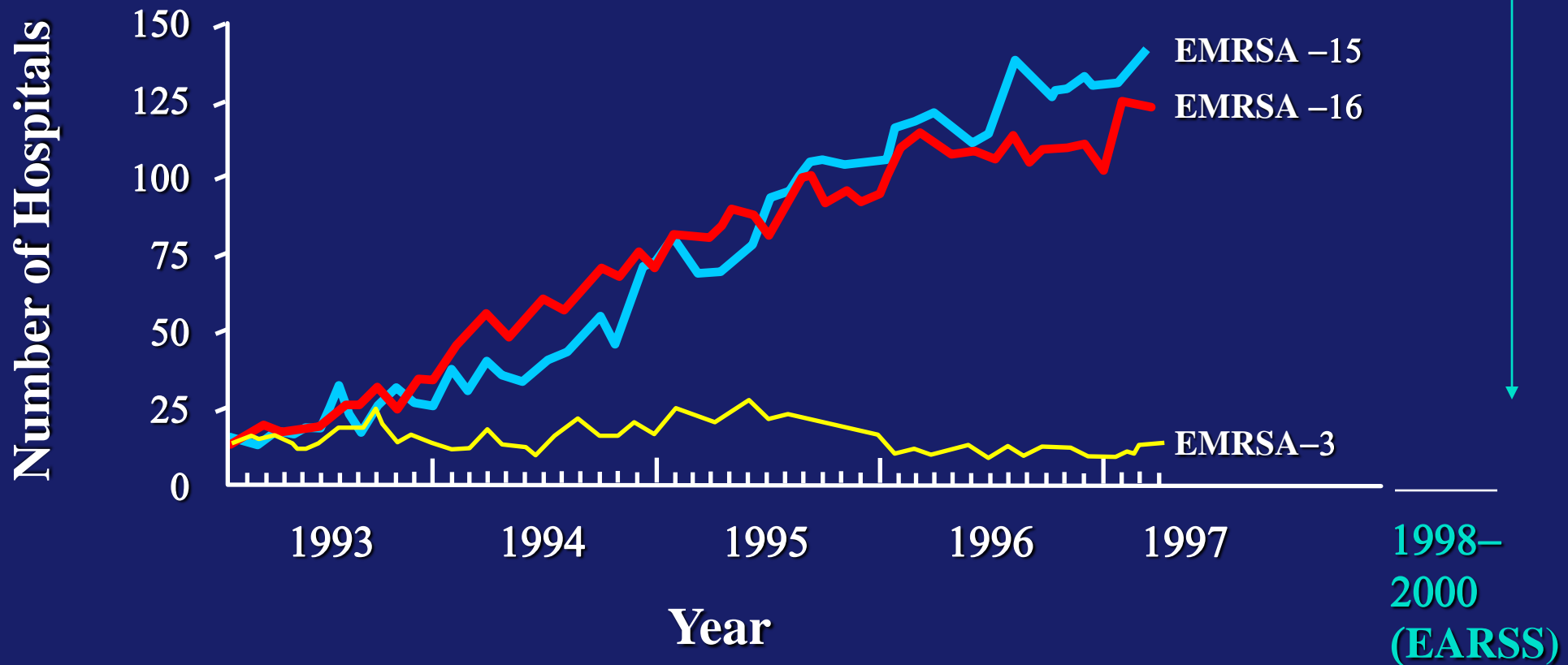
Jan 1992 - Sept 1994



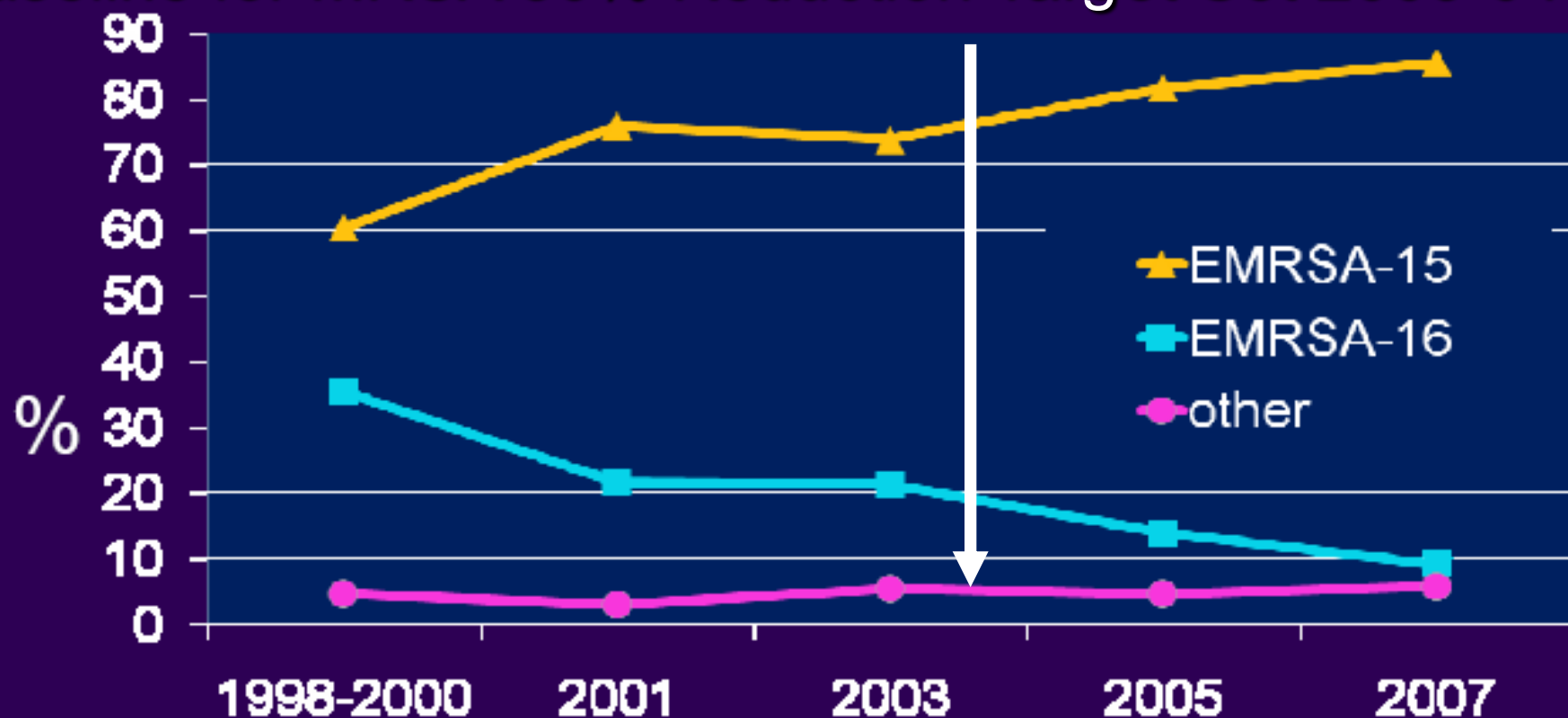
*Murchan et al, J Clin Microbiol 2004;
57: 345-346*

Hospitals affected each month by EMRSA-3, EMRSA-15, or EMRSA-16

95% of *S. aureus* BSIs
due to E-15 and E-16



- * E-16 decline precedes the MRSA decline from mid 2000
- * No evidence E15 easier to control or less invasive



Ellington *et al.*, *J. Antimicrob. Chemother.* (2010) 65 (3): 446-448

- UK MRSA very clonal with a >80% due to EMRSA-15 or -16
- EMRSA-16 in decline, EMRSA-15 dominates

HARMONY European Network

Five International EU EMRSA clones :

A - “Iberian clone”:.:

Belgium EC-1: Finland E7, 10: France A, B, C:

N. German I: Spain E1 : Sweden: Portugal

B - Belgium EC-3: Finland E1

**C - UK E3: South German II: Slovenia: Finland :
Belgium**

**D - UK E16: Sweden II (via Cyprus): Denmark: Finland E5:
Belgium, German, Belgium, USA, Spain,**

E - UK EMRSA –15: Germany: Belgium

HARMONY – imported strain experiences

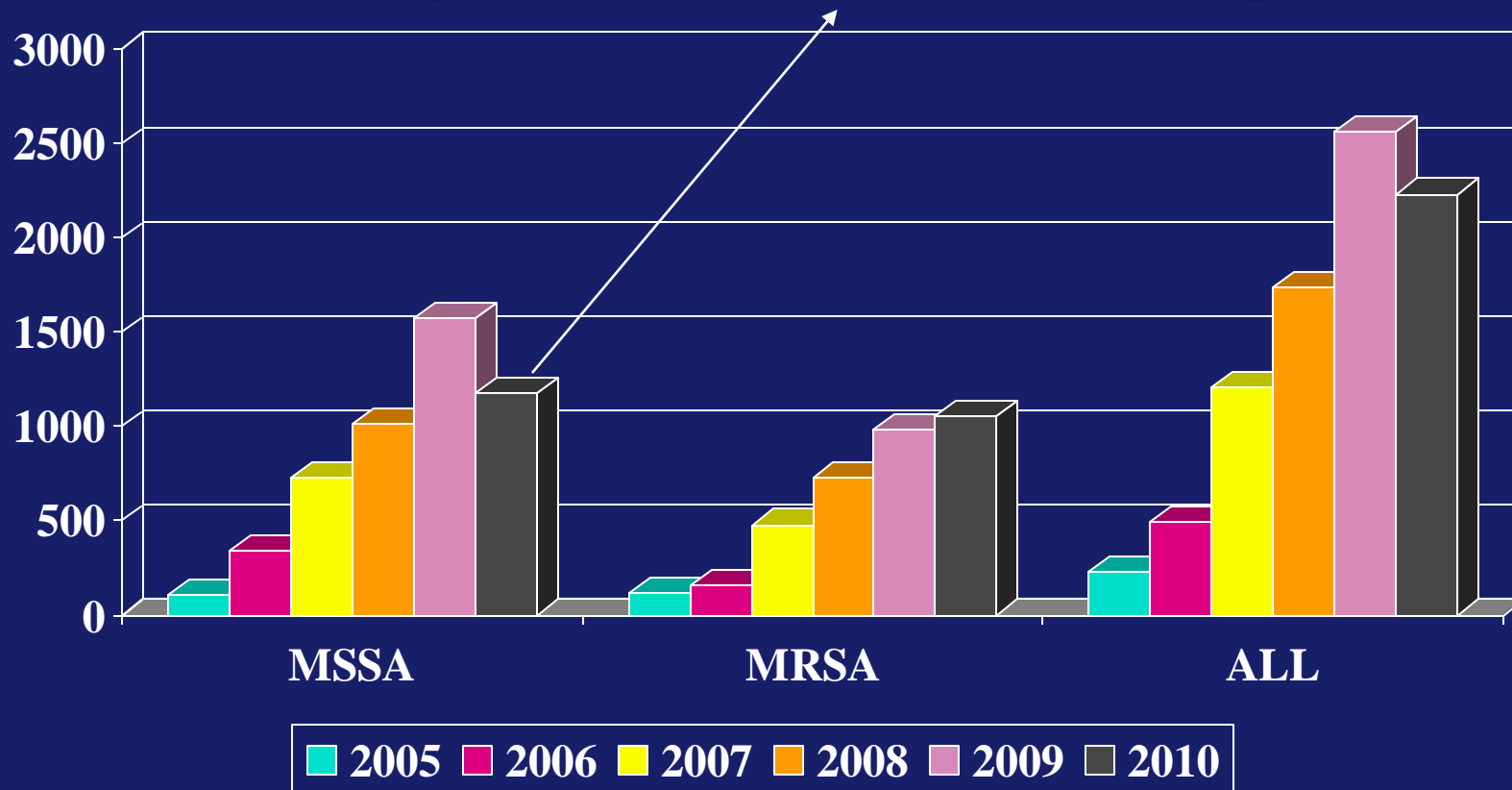
- **Finland**: E-3 related and E-16: intra-city restriction: low inter-hospital transfer rates. Community strains emerging
- **Sweden** : Polish strain in Stockholm, E-16 in Gottenburg. Most patients in side or two-bedded rooms. “Found the weak parts of the system.” : poor policy implementation.
Bed occupancy now rising (and MRSA)
- **The Netherlands**: E-15 and E-16 spread rapidly intra-wards again finding the less compliant areas (“never seen anything like the speed”). Control possible with search and destroy
- **Staffing shortages reported in all countries**

Challenge of Community MRSA

- Recent PVL-related MRSA HCAI fatalities
- Increasing problems in US and parts of Europe
- Spread occurring within US Hospitals as occurred in Western Australia
- England has several different clones not all positive for Panton Valentine Leucocidin: all have *SCCmecIV*
- Voluntary referral system shows WERE small nos
Holmes et al, *J. Clin. Microbiol.* 2005; 43: 2384-2390
- Ciprofloxacin resistant CA MRSA emerging!
- Porcine MRSA problems (NL, BE, DK, DE)

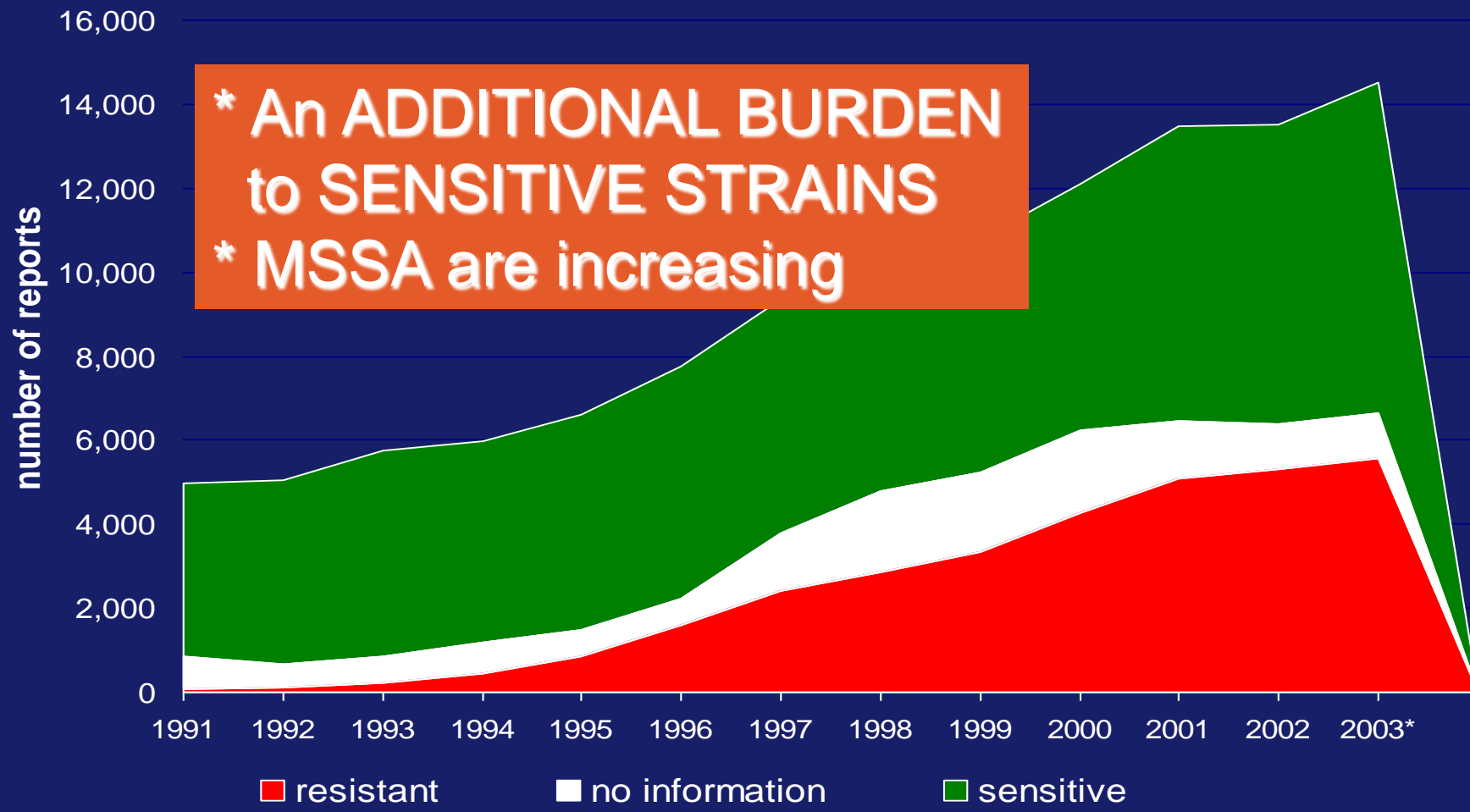
Number of Community Acquired PVL-*S. aureus* identified by the HPA Staphylococcus Reference Unit

Fall mainly due to one centre testing own in 2010



Voluntary: MRSA Bacteraemia in England & Wales: 1991 – 2003

14-fold increase: doubled in last six years

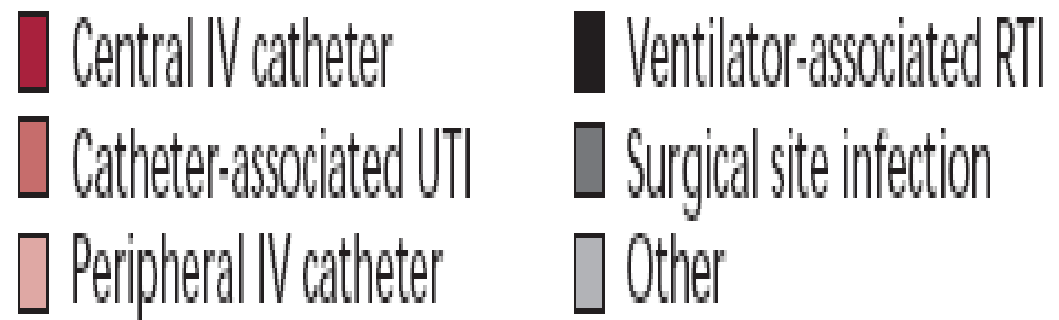
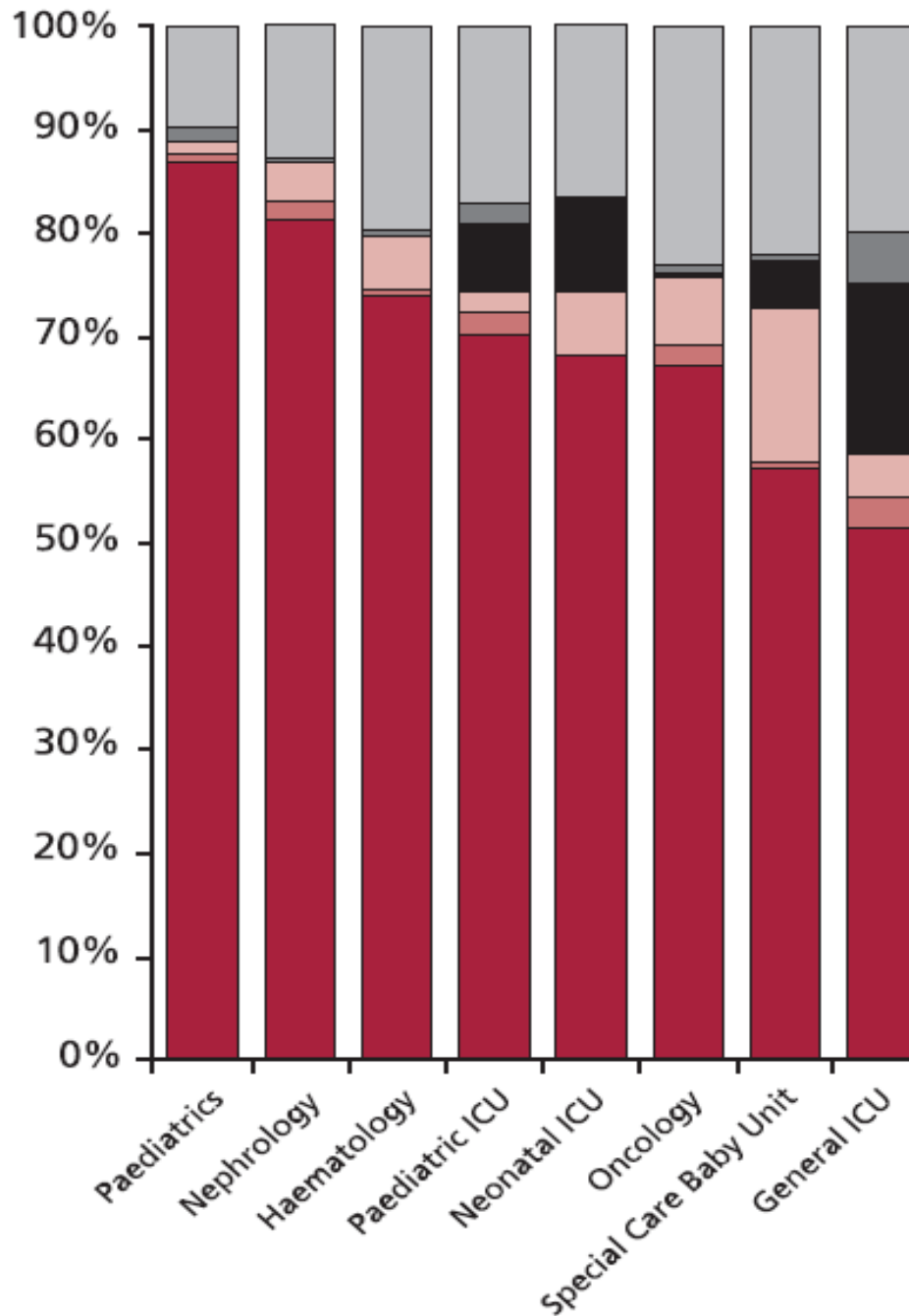


* 2003 is provisional data

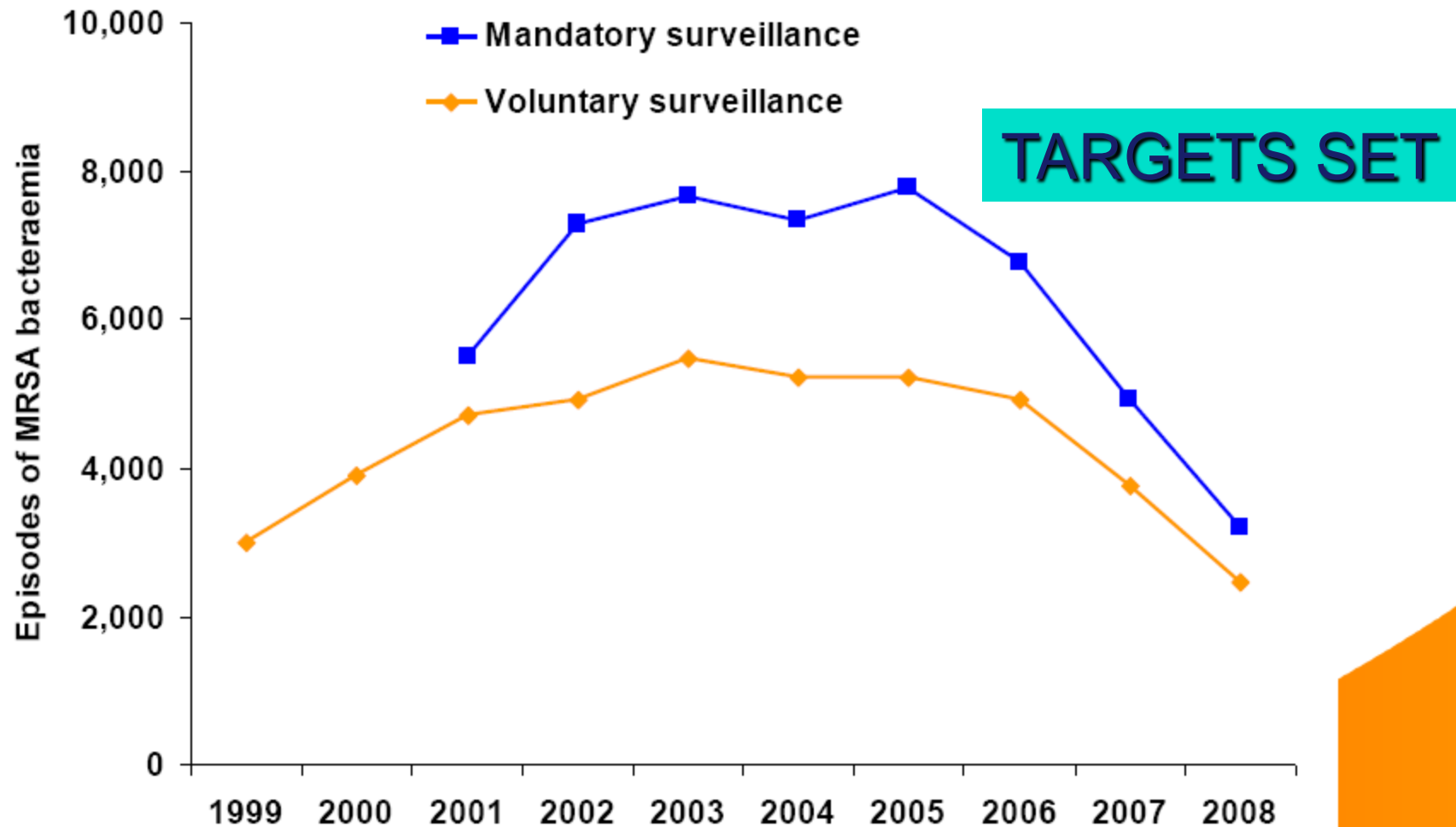


Reported sources of HAB by specialty NINSS 1997-2002

Sources varied by specialty:
device-related sources accounted
for half of the bacteraemia



Mandatory & Voluntary Surveillance MRSAB: 1999-2008



Trigger Factors?

April 2001	Mandatory Acute Hospital MRSA bacteraemia surveillance: no 48h cut off: no transfer recording
July 2003	Director IPC created
July 2004	Matrons Charter
July 2004	Target for reduction of MRSA bacteraemia: 2003-04 halved by 07-08
Sept 2004	cleanyourhands campaign
Oct 2004	Towards Cleaner Hospitals
June 2005	Saving Lives published: Seven Bundles followed
Oct 2005	Enhanced MRSA bacteraemia surveillance: CE Responsible

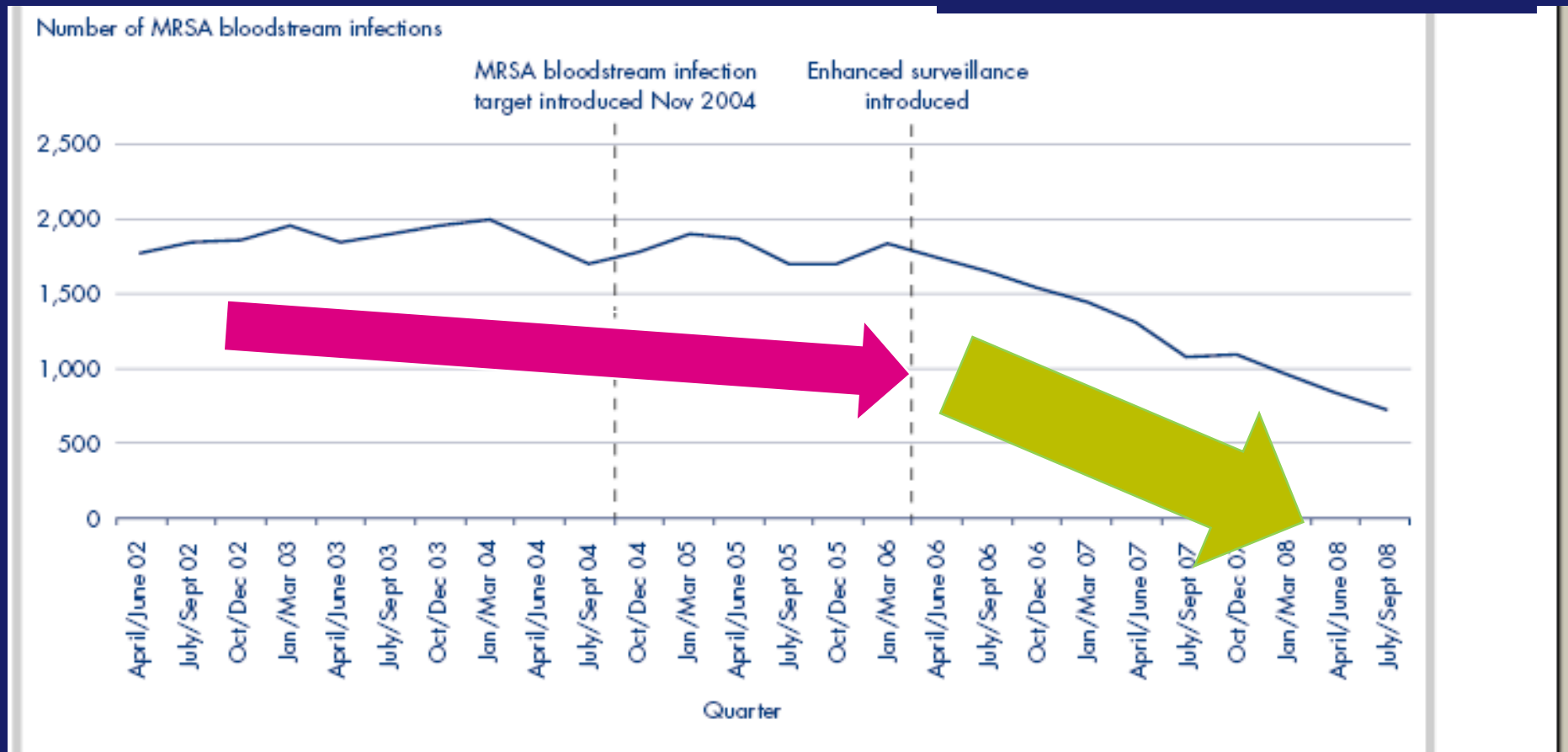
Trigger Factors?

Oct 2006	Code of Practice to prevent HCAI published as part of the Health Act : The STICK
2006	Improvement Teams: varied why went in and what done: The CARROT
May 2007	Healthcare Commission inspection programme: against Code

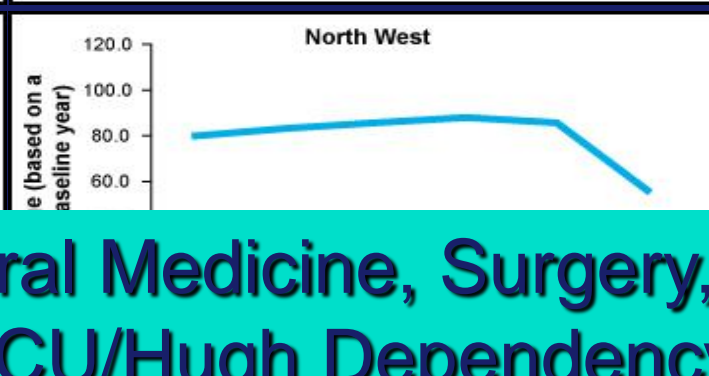
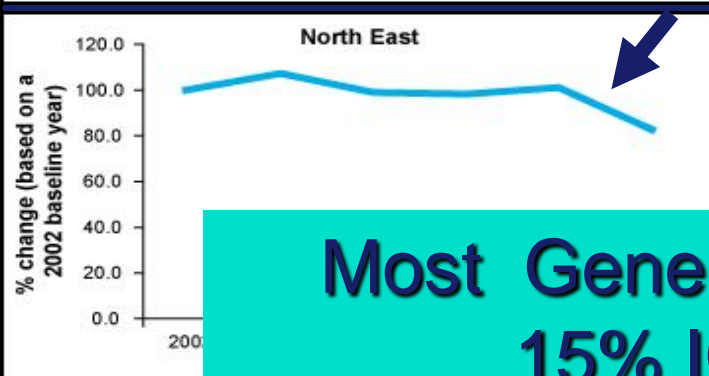
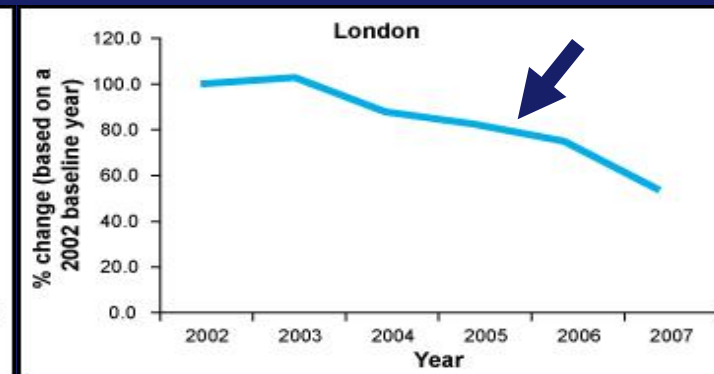
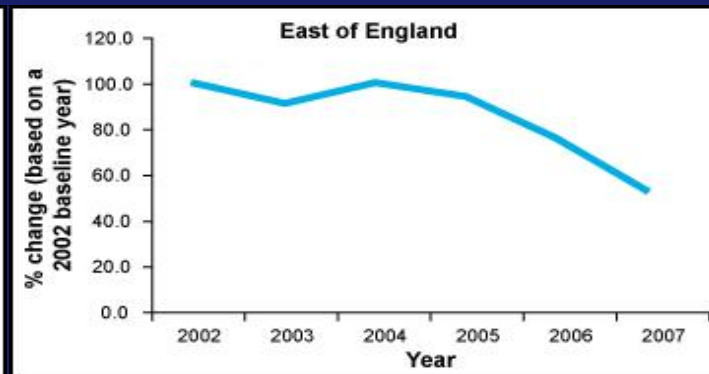
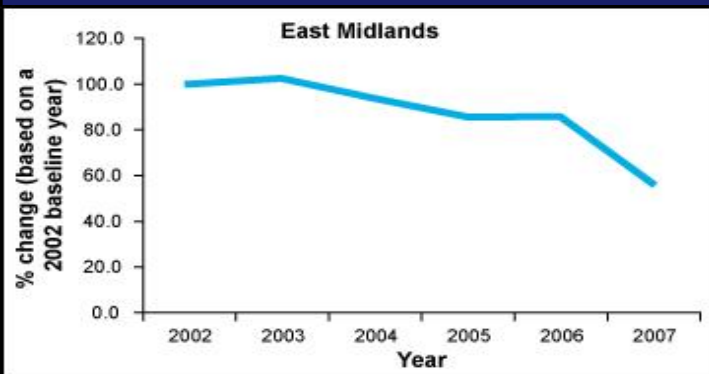
NAO 2008 Report: MRSAB Trends

2003-04
7700

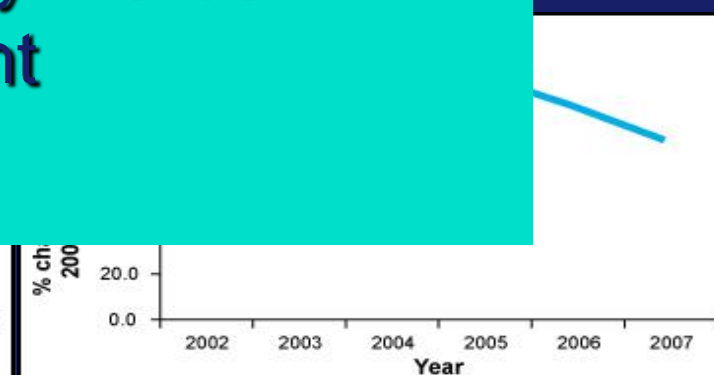
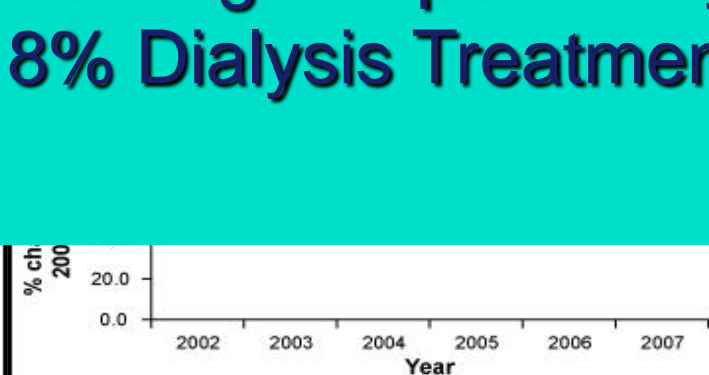
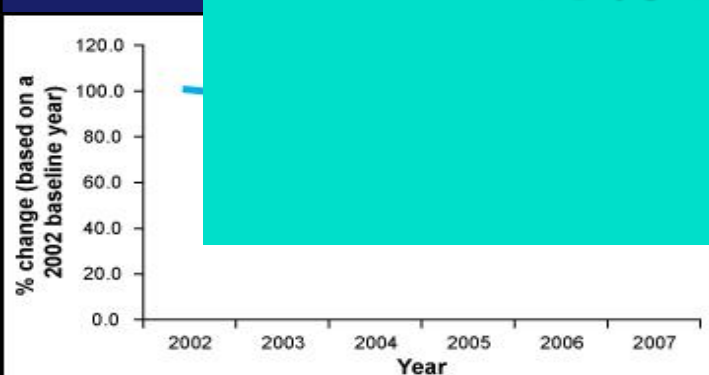
2007-08 **2008-09**
12% of Trusts Increased
25% >80% Reductions



MRSA bacteraemia annual reports in England by region, January 2002 to December 2007



Most General Medicine, Surgery, Elderly Care
 15% ICU/High Dependency Wards
 8% Dialysis Treatment



Mandatory Reporting >2010

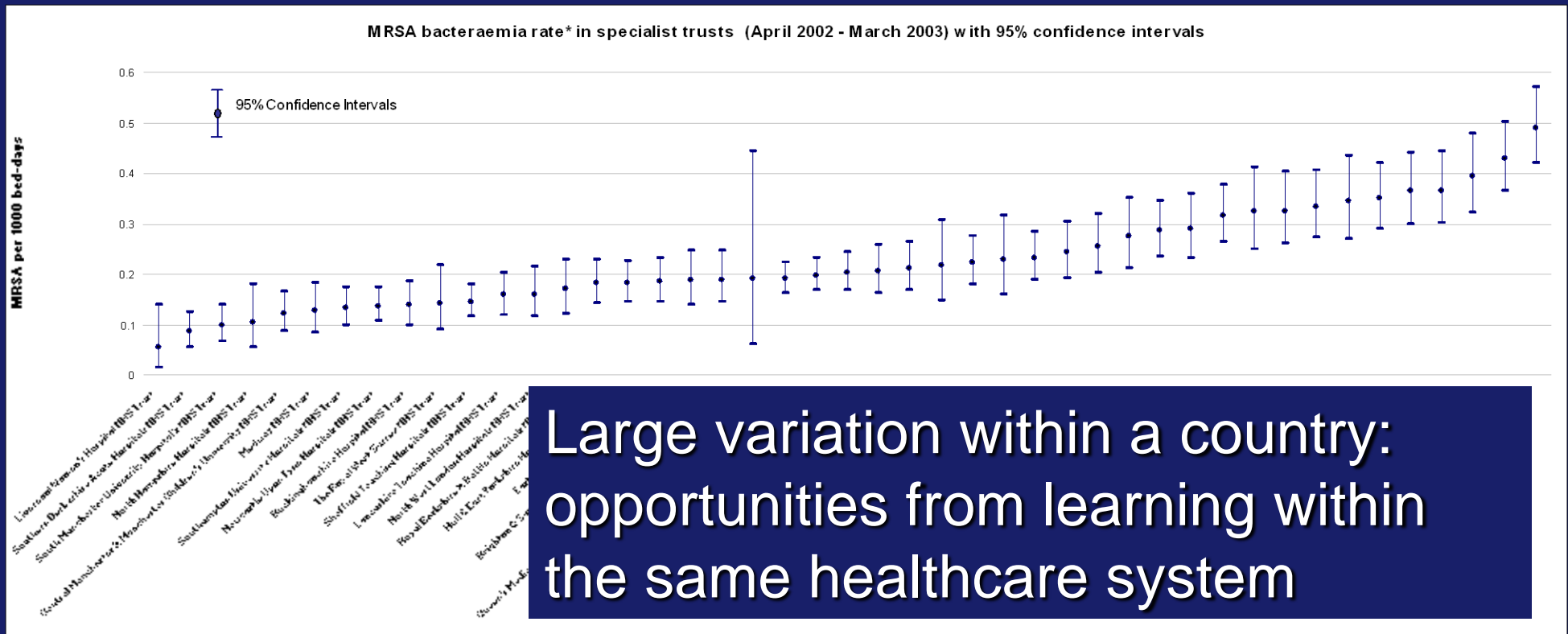
Reviewing still!

- “Reduction” moves to “Objectives”
- Current Objectives !
 - Aim for consistency across hospitals
 - So benefiting from better performing ones
- The challenge relates to their baseline rates
 - All organisations to meet the median level
 - Reduce to median **OR** by 20% whichever is **greater**
- Issues: if better than median reduce to the best performing quartile **or** by 20%, whichever is **less**
- Median recalculated each year

Are the MRSA Bacteraemia data to be believed?

- CE made responsible for locking the data down
- Many checks e.g. HCC, CQC
- No significant reductions in blood cultures taken
- Death reporting
(ONS) data
also decreased

MRSA bacteraemia (MRSAB) rate in specialist Trusts (April 2002 - March 2003)



Healthcare Commission Analysis of Healthcare Associated Infection 2006

Rates of MRSA bacteraemia (MRSAB)

- Lower if better hand hygiene parameters
- Higher if single rooms to isolate patients were less available

Mears A *et al*, *J Hosp Infection*, 2009; 71: 307-313

Healthcare Commission Analysis

Lower MRSAB and C difficile infection (CDI) rates:

- Better **bed management** parameters
- Inclusion of infection control in **appraisal** and **personal development plans**

Higher rates:

- Protected time for infection control training for all healthcare workers
- May be an example of “**reactive practice**”

**Very Early in the
implementation of
Saving Lives and pre
Improvement Team**

The logo features a stylized blue hand with a large blue water droplet falling from the palm, set against a yellow background.

cleanyourhands[®]
campaign

The World's First National Hand Hygiene Improvement Campaign

- **Rolled out to all 187 acute NHS hospitals
Dec 2004 to June 2005**
- **4 year campaign**

Conclusions NOSEC Study

Stone et al, BMJ in press

- Will be published in BMJ 5th May 2012

Lessons Learnt (1)

- Mandation, Chief Executives held responsible and targets were important for England
- Strive to make infection prevention and control EVERYONE's duty of care
- Consider legislation if all else fails to improve safety culture and infection prevention and control and antimicrobial stewardship
- Must have checks in place so “gaming” does not destroy data credibility
 - External inspection
 - Parallel systems e.g. death notification, sentinel networks

Lesson (2)

- MRSA BSIs are the tip of the iceberg: consider other surveillance to inform ICP e.g. SSI
- Use all the data at your fingertips: surveillance is an art as well as a science!
- Sustaining is difficult
 - Timely feed-back of information
 - Mutual reward theory
- Balance benefits of national surveillance with priorities of local surveillance
- Benchmarking potentially dangerous: customers need to “own” the approach: reports on www need to explain the many caveats

Lesson (3)

- Lost opportunities: try to plan studies prospectively to interact surveillance with process surveillance and intervention activities
- Design complex interventions using ORION, STROBE, CONSORT
- “Honest brokers” do not be seen as anyone’s “lackeys”

CA MRSA Risk Assessment to inform Prevention and Control Strategies

- Surveillance information
 - If no data or gaps consider funding or encouraging keen hospitals or CMM/ID HCWs
 - What data are there for infections in hospitals?
 - PPS/Incidence in BSIs and other infections?
 - Specific surveys e.g. in community or A&E e.g. SSSI or on admission?
 - Are there isolate data accompanying these
 - No of strains and sources
 - AST markers to distinguish from local HAI MRSA e.g. ciprofloxacin resistance useful
 - PVL in strains

PVL may not be sole virulence factor

- Pathogenicity associated with PVL-SA may be associated with other factors:
 - Arginine Catabolism Mobile Element (ACME)
 - α -toxin
 - regulation of gene expression
 - newly described cytolytic peptides

CA MRSA Strategy continued

- Source or Reservoirs?
 - Link with typing and virulence marker data
 - Half of serious skin infections are not PVL in England
 - Within 48h admission
 - Abroad and where?
 - Consider staff as a possible risk e.g. South Sea islands
 - Consider “5cs”s

CDC guidance : risk factors for PVL-related infection the "5 C's":

1. Contaminated items e.g. towels, worn out saunas, gym, drug abusers, IV or gym equipment
2. Close contact
3. Crowding
4. Cleanliness
5. Cuts and other Compromised skin integrity

Can combine e.g. close contact sports may have poor hygiene e.g. sharing towels or poor laundry, abrasion and cuts

Anticipate e.g. sporting events such as Olympics many countries visiting and close contact sports

Northern America

- Following settings have been identified as higher risk for transmission from an individual colonised or infected with CA-MRSA:
 - Households
 - Close contact sports e.g.: wrestling, American football, rugby, judo
 - military training camps
 - Gyms
 - Prisons

CA MRSA Risk Assessment to inform Prevention and Control Strategies

- Ditto from referrals for typing?
- Burden of disease proportion of SA and MRSA, per bed days, over time?
- Pets and Livestock Associated issues interact with veterinary laboratories
- Veterinary workers and staff with close contact with at risk animals

CA MRSA Strategy continued

- Pick up CA MRSA spreading in hospitals early: ensure have good MRSA prevention and control in place (IPC and ASP)
- Have good public health measures in the community so at risk areas are “secure”
- Review these regularly ensuring surveillance and process surveillance cycles are interacting

Culture!

- Views differ
 - We will defeat the staphylococcus MSSA PVL too!
 - How much skin disease with PVL negative MSSA strains?
 - Consider burden of disease: severe disease if rare and skin and soft tissue infection common in PVL MSSA then consider expense of family screening and increased resistance to topical disinfectants and oral agents