

**Japanese National Forum on Patient Safety**  
**Saturday, May 30th, 2009**

**Improvement indicators**  
**for Quality & Safety in the UK**

30 May 2009

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## Subjects to be covered

1. History of adverse events in hospitals
2. Methods used by UK hospitals to improving patient safety – web sites
3. Hospital Standardised Mortality Ratios (HSMRs) in the UK and elsewhere
4. Detecting possible problems early and evaluating improvement initiatives
5. Examples of the use of HSMRs and SMRs of diagnoses for improvement.

## Web sites used in the UK

- <http://www.nhs.uk/Pages/HomePage.aspx>

**‘NHS Choices’ NHS public website**

- <http://www.nhs.uk/NHSEngland/Hospitalmortalityrates/Pages/Data.aspx#q03>

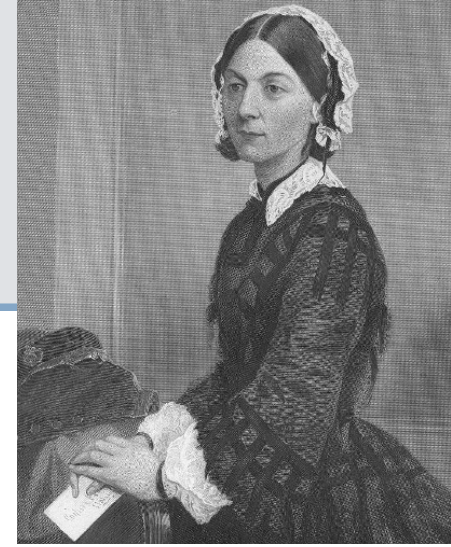
**‘NHS Choices’ NHS public website HSMRs**

- <http://www.drfoosterhealth.co.uk/>

**‘Dr Foster’ public website**

- <http://www.knowledge.ic.nhs.uk/index.asp>

**‘NHS Information Centre’ public website**



Childhood home, Embley Park      Later residence, Claydon House, Bucks

## Florence Nightingale (1820-1910), nurse

# Uniform hospital statistics would:

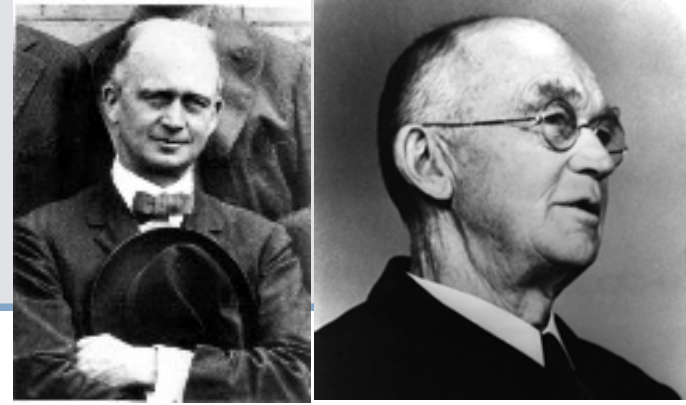
“Enable us to ascertain the relative mortality of different hospitals as well as of different diseases and injuries at the same and at different ages, the relative frequency of different diseases and injuries among the classes which enter hospitals in different countries, and in different districts of the same country”

Florence Nightingale 1863

## Ernest Amory Codman

(1869–1940) a Boston surgeon

A founder of the American College of Surgeons



### Noted

“calamities of surgery or those accidents and complications over which we have no known control. These should be acknowledged to ourselves and to the public and study directed to their prevention”

"I had made an error of skill of the most gross character and even (during the operation) failed to recognize that I had made it".

### His reforming attempts

“brought him mostly ridicule, poverty and censure”

## Quality of hospitals as institutions

Donabedian classified the elements of healthcare, and divided studies of its quality, into:-

- **structure** - the building, equipment, and human and financial resources
- **process** - what happens to patients
- **outcome** - the final results achieved: the patient's health status as a result of treatment.

**Outcomes** important for the patient.

# The healthcare patients require:

(Maxwell RJ, BMJ, 1984; 228:1470. BMA & NAHAT, 1995.

'Crossing the Quality Chasm', IOM, 2001)

- **Timely** ▶ available within a time period consistent with clinical need;
- **Patient centred** ▶ the best choice of treatment with patient sharing in the decision;
- **Effective & Safe** ▶ provides patient benefit, is safe, based on current evidence, avoids overuse and underuse
- **Efficient** ▶ without waste
- **Equitable** ▶ same quality care regardless of race, gender, wealth

## Harvard Medical Practice study of New York state hospitals (NEJM 1991)

- **30,000+** randomly selected patients in New York State hospitals
- **3.7%** had injuries from adverse medical care events
- **13.6%** had led to death
- **half** were preventable
- if Harvard figures apply to Japanese hospitals, implies **>40,000** preventable deaths from adverse events medical care events each year.



Adverse event studies (adapted from Charles Vincent)

Approx: 50% avoidable, 8% result in death, 6% in permanent disability

Total 210 hospitals involved, 100,429 admissions

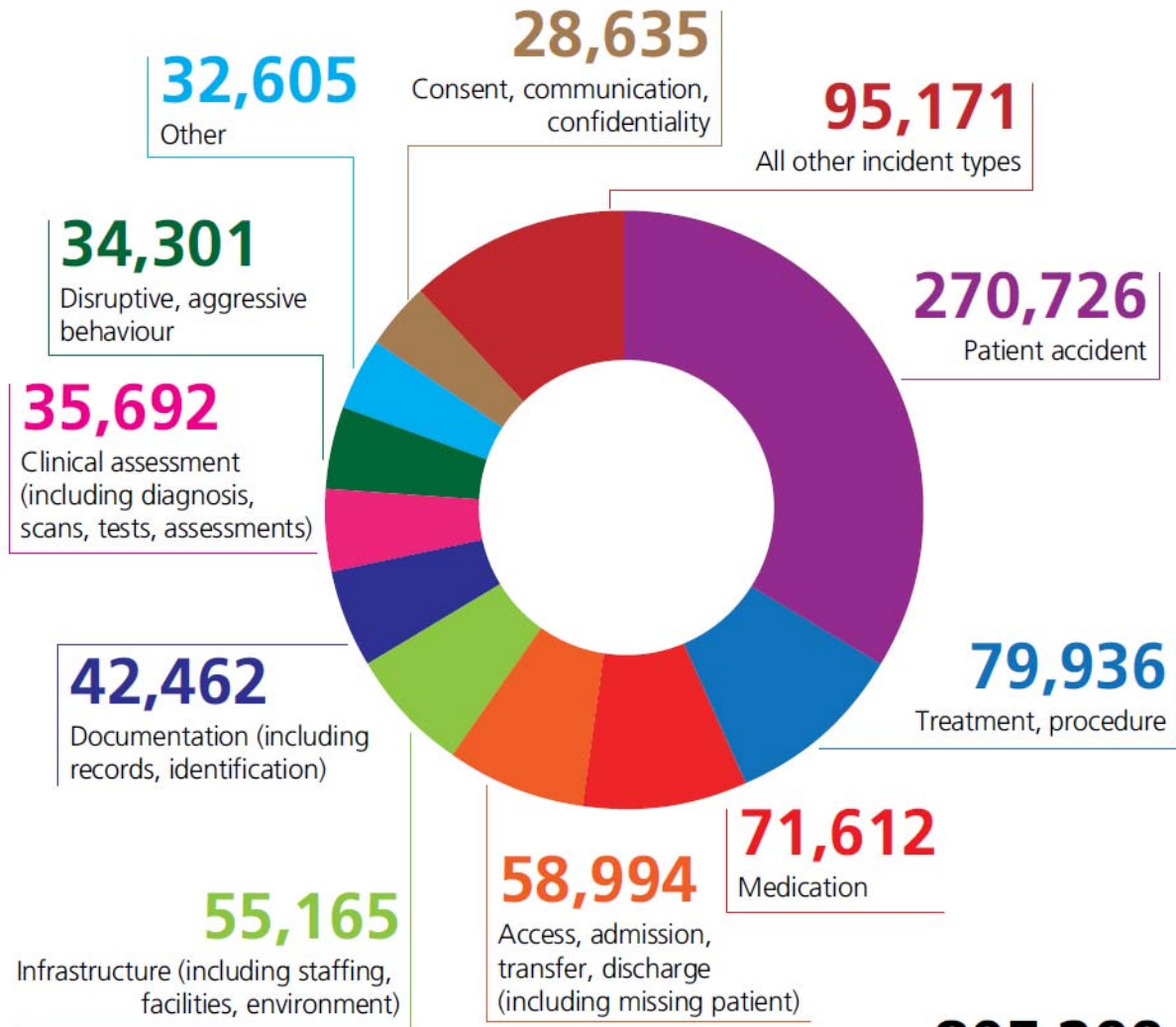
Weighted (by no. admissions) mean adverse event rate = 6.6% of admissions

For example: 8% of 5.7% of 1.6m IP admissions = 7,300 deaths annually, half avoidable

<u>Study</u>	<u>Number of hospitals</u>	<u>Date</u>	<u>Number of admissions</u>	<u>Adverse event rate (%)</u>
<b>California Insurance Feasibility</b> (The California study assessed 'potentially compensable' events)	23	1974	20,864	4.65
<b>Harvard Medical Practice</b>	51	1984	30,195	3.7
Utah-Colorado (UTCOS)	28	1992	14,052	2.9
Quality in Australian Health Care	28	1992	14,179	16.6
Denmark	17	1998	1,097	9.0
New Zealand	13	1998	6,579	11.2
United Kingdom	2	1999	1,014	10.8
Canada	20	2000	3,745	7.5
France (pilot only)	7	2002	778	14.5
Netherlands	21	2005-6	7,926	5.7

## National Patient Safety Agency (NPSA)

### Reported adverse event incident types in England Jul 07-Jun 08



**805,299**

Number of incidents reported

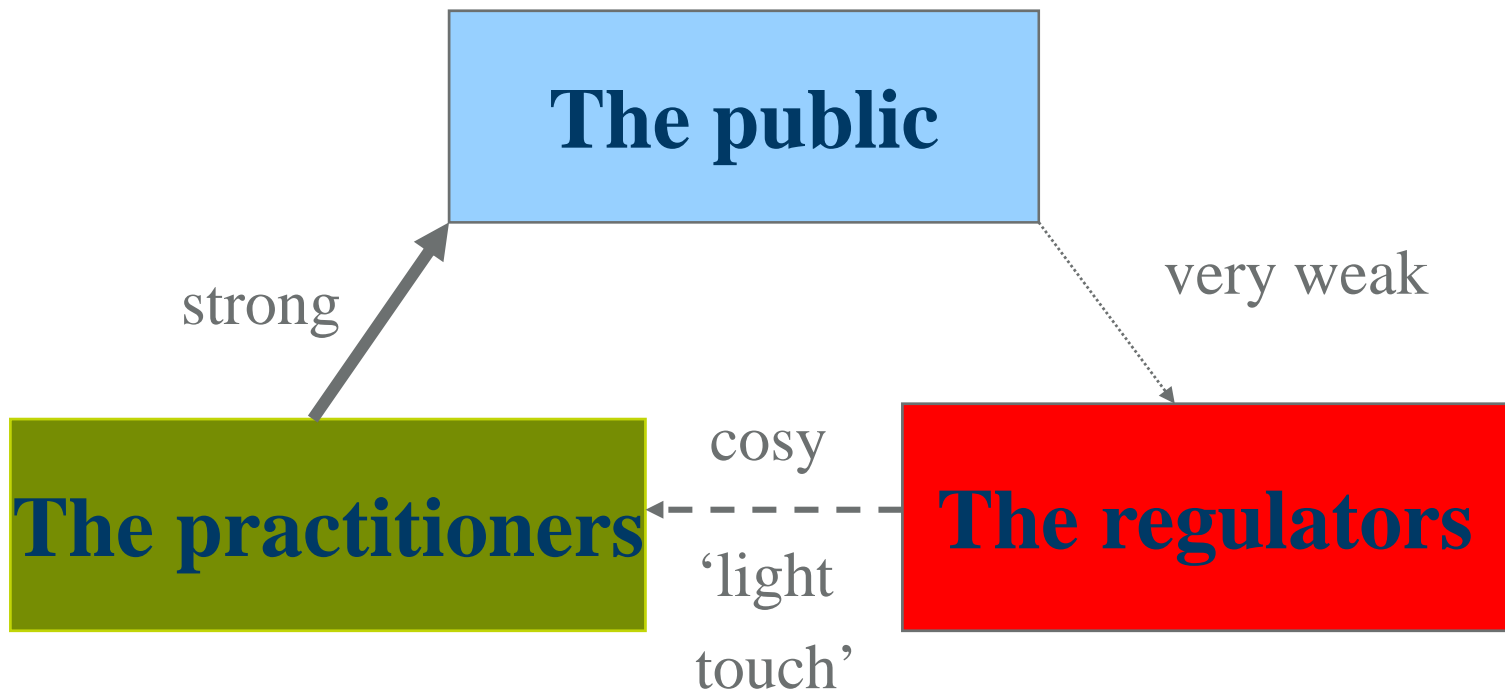
## **Do not blame individuals - improve the systems**

**“So far as I know, all modern, effective systems to assure and improve safety involve a culture in which the reporting of error or apparent error is a valued and positive act, which leads, not to blame, but to curiosity and study.”**

**(Berwick DM. BMJ 1998;316:1925)**

## The Safety Triad (Finance, Healthcare etc).

Who has the power and who has the incentive to improve safety?

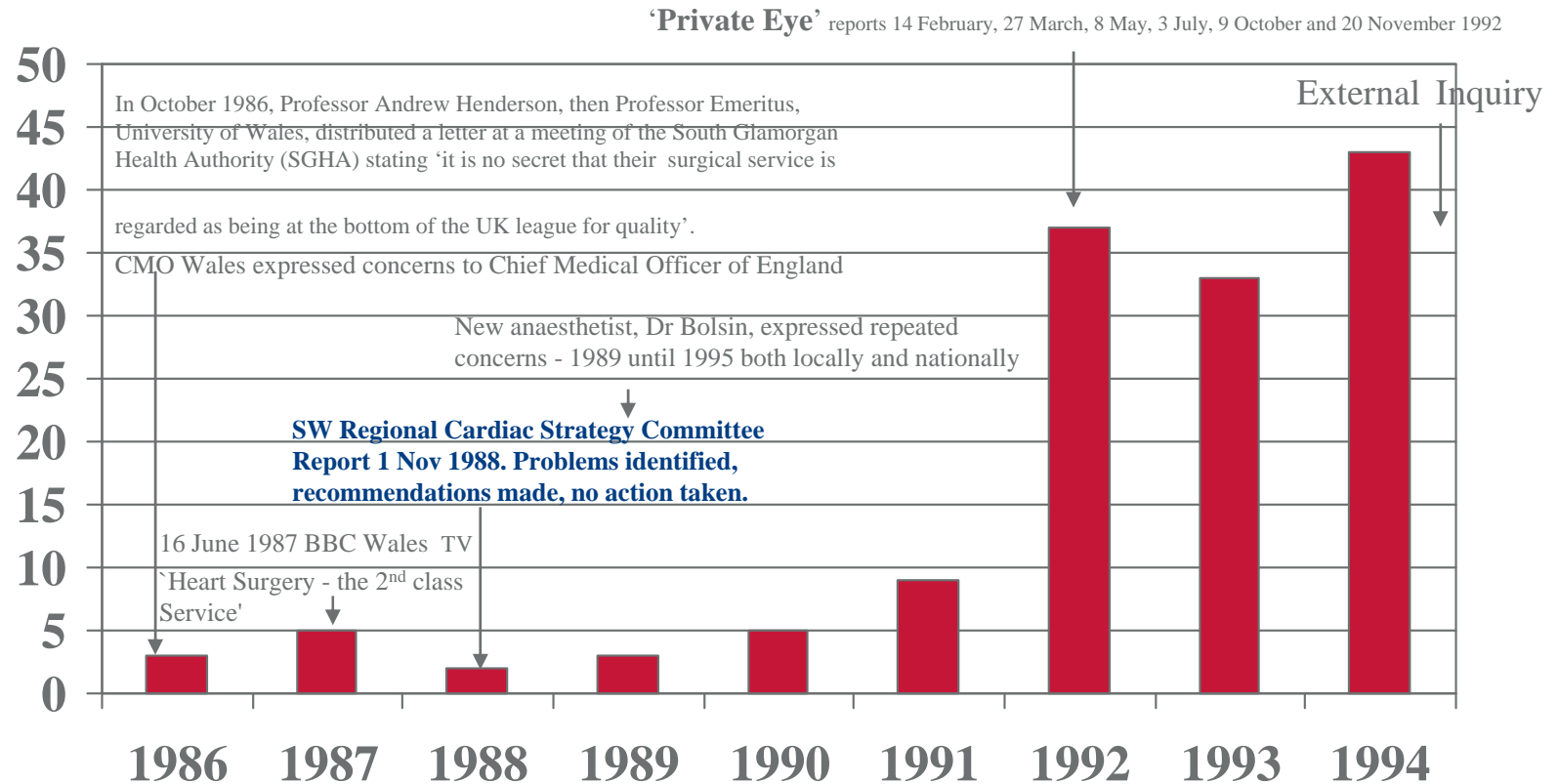


## Bristol Royal Infirmary Inquiry

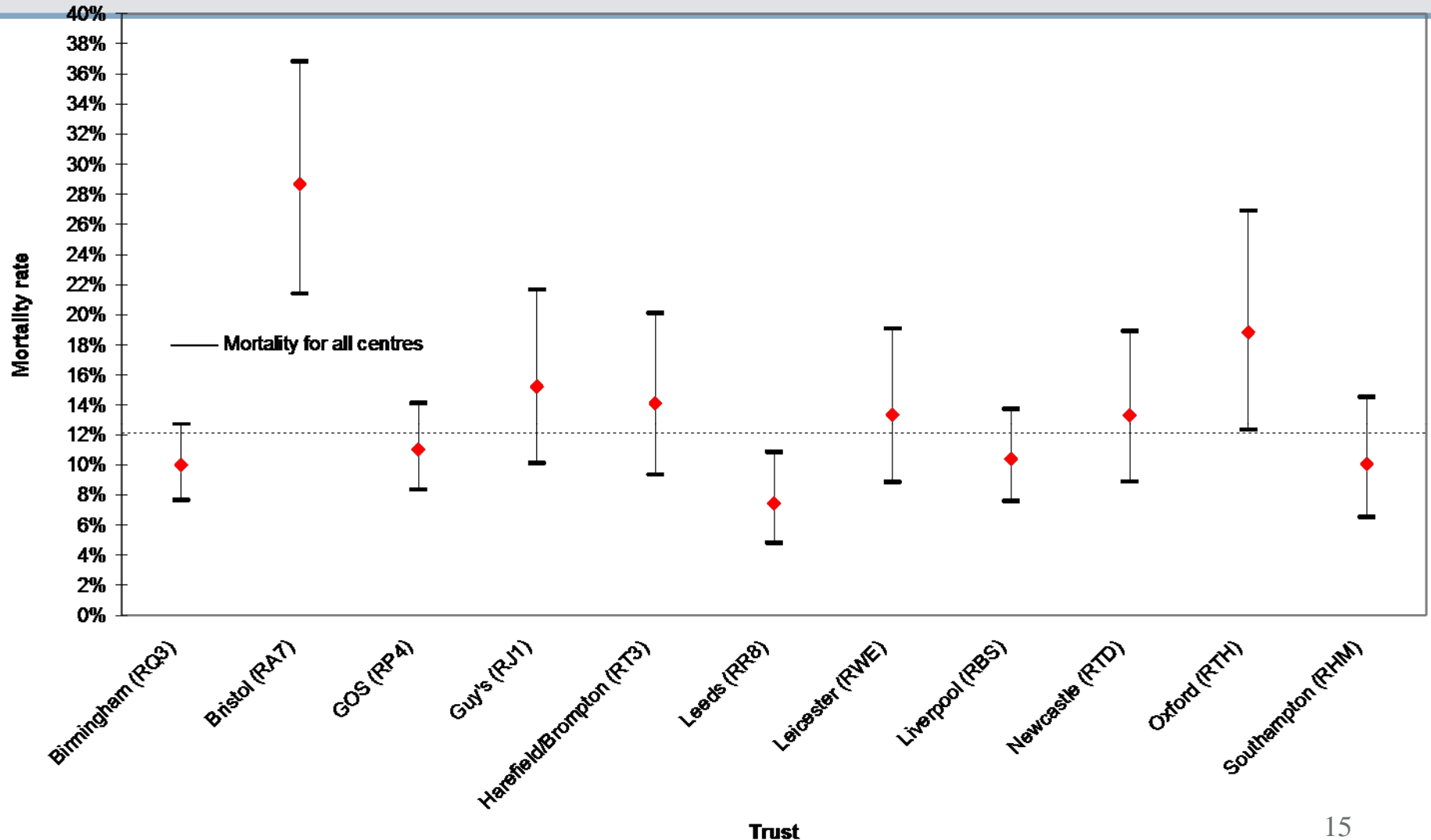


- Concerns regarding Bristol unit from 1986 led to an external Inquiry in February 1995
- All paediatric cardiac surgery was stopped until the appointment of another cardiac surgeon
- June 1996 parents' group first called for a Public Inquiry into the PCS services at the BRI
- 1998 GMC trial led to disciplining of 3 doctors of whom 2 were struck off and 1 restricted
- 1999 to 2001 Bristol Inquiry

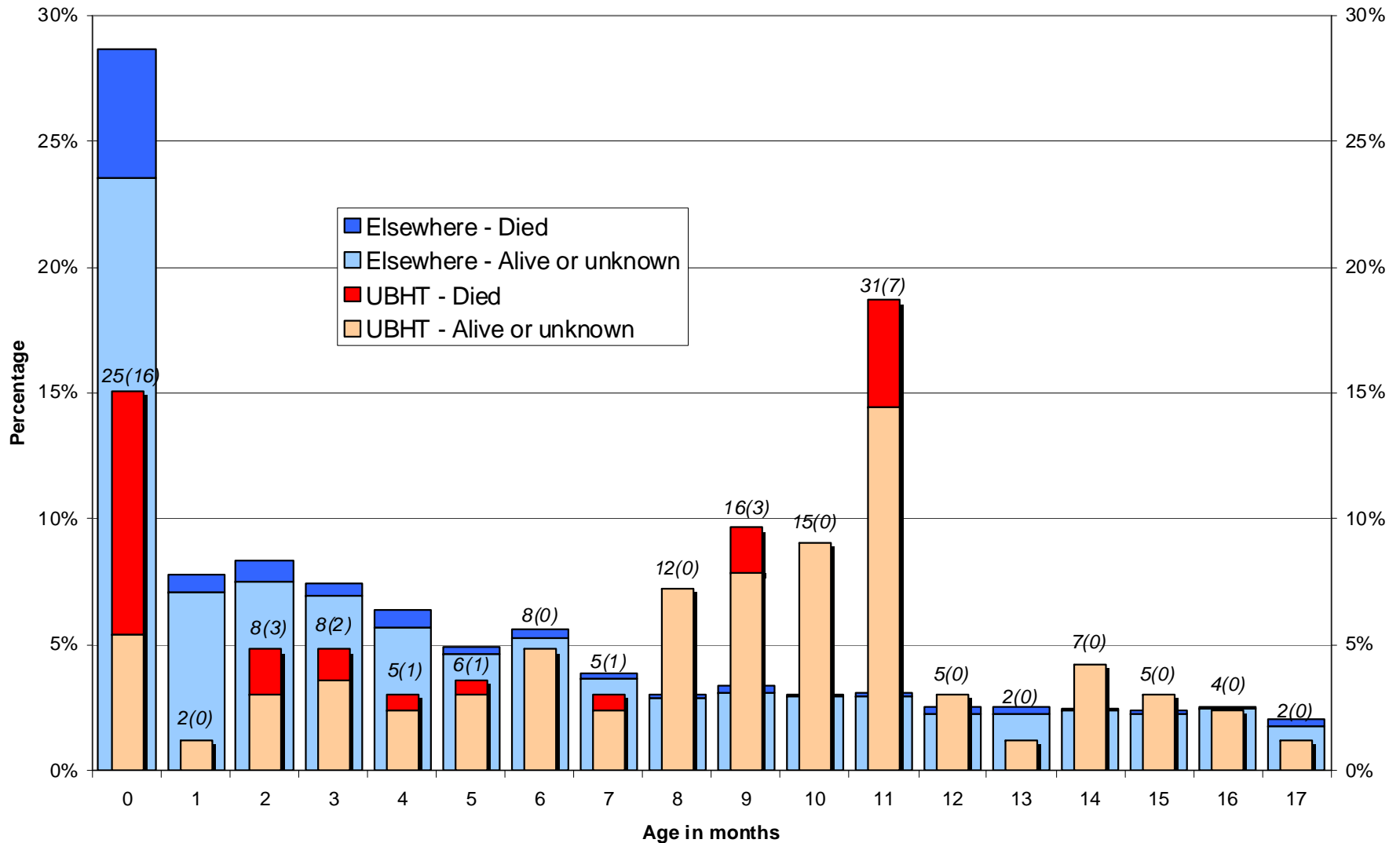
## Bristol paediatric cardiac surgery: Number of concerns expressed per year about Bristol



## Mortality rate for paediatric cardiac surgery, all open operations, aged under 1 year, Hospital Episode Statistics April 1991 to March 1995

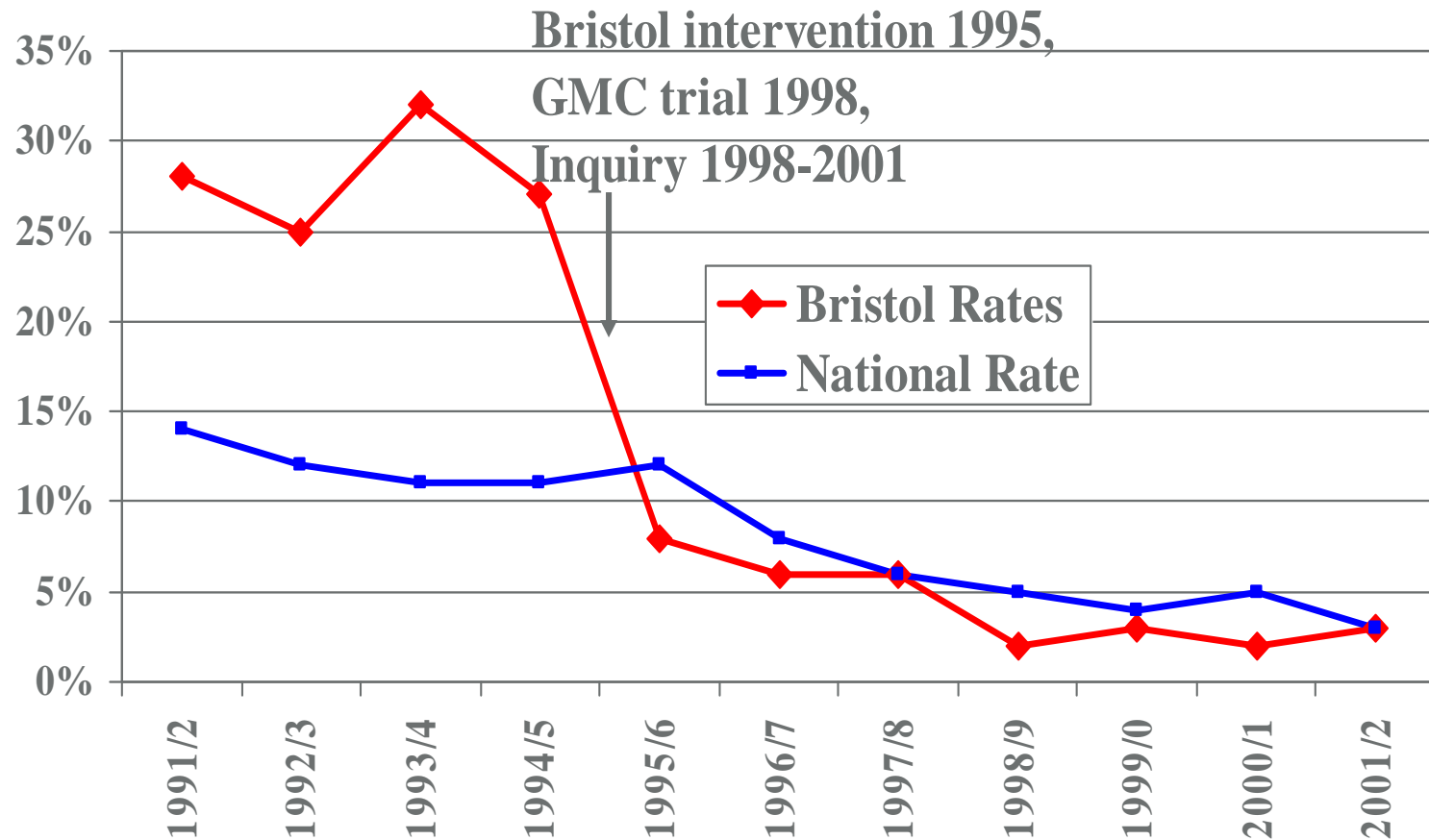


## Comparison of % open operations by age at surgery between Bristol and elsewhere (1 April 1991 to 31 March 1995) (Analyses by Nicky Best, Paul Aylin, Clare Marshall, Alex Bottle, David Spiegelhalter)



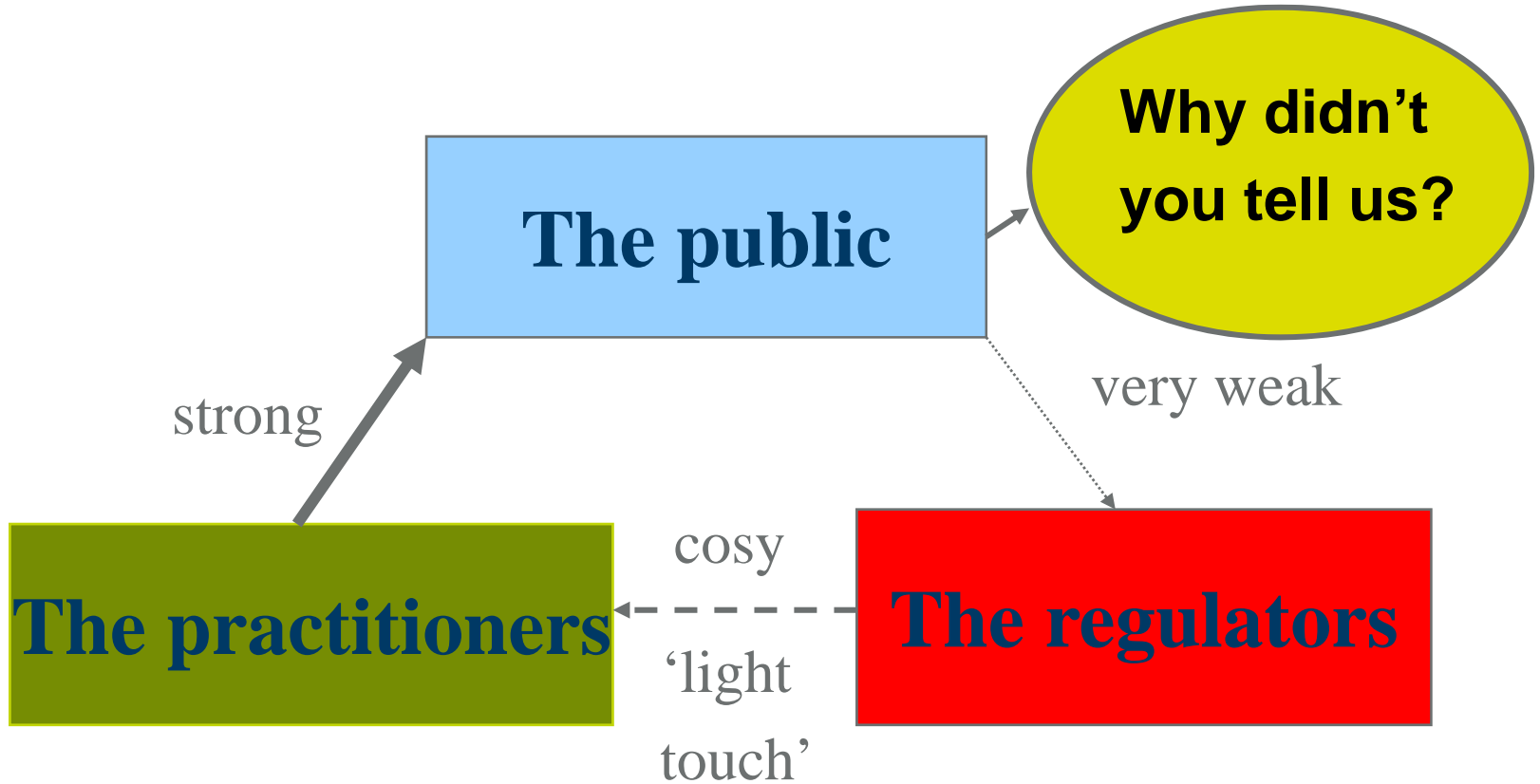


## Bristol & England Paediatric Cardiac Surgery (under 1 year, open heart ops) MORTALITY DROPPED FROM 27% TO 8% AFTER IMPROVEMENTS IN 1995



## The Safety Triad (Finance, Healthcare etc).

Who has the power and who has the incentive to improve safety?

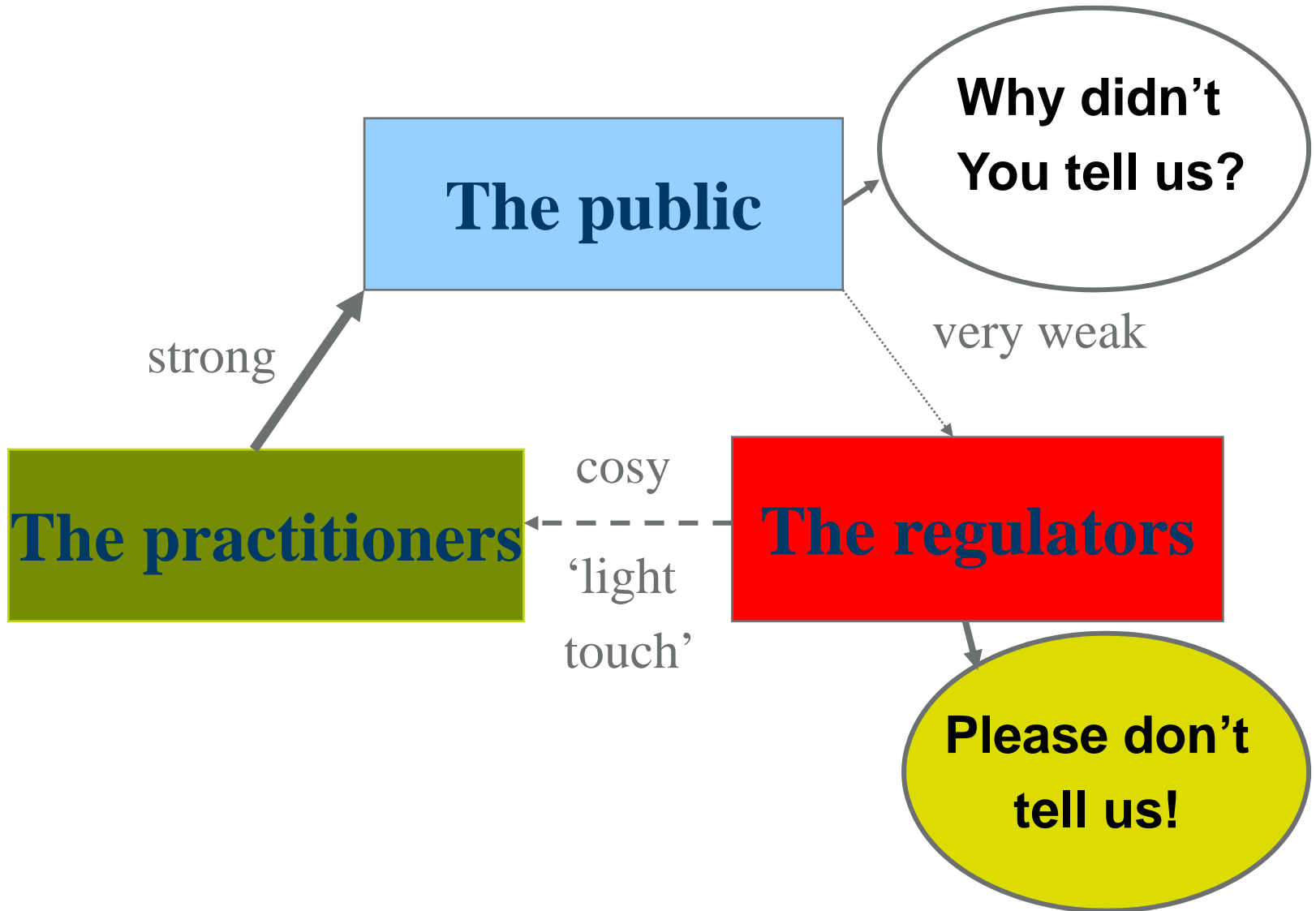


## Action by the Department of Health about Bristol

- On 19 July 1994 the ‘whistle-blower’, an anaesthetist Dr Bolsin, gave the doctor at the Department of Health (DoH), who dealt with clinical outcomes, an envelope which contained data about the problems at Bristol
- The DoH doctor told the Inquiry that he did not look at the data. He put it away in a filing cabinet.
- “The DoH, for historical and structural reasons, was simply unable adequately to respond when an issue of the quality of care was being raised”

## The Safety Triad (Finance, Healthcare etc).

Who has the power and who has the incentive to improve safety?



**Department of Health and doctors**

**Sir Graham Hart Permanent Secretary DoH 1992-97**

- “The profession had very deep reservations about the Department getting involved [in matters of clinical performance]. Reservations which, to some extent, ... on rational grounds, the Department shared”.
- “... if Ministers might be tempted to tread down that path of involvement and intervention [in matters of clinical performance], then they could be pretty sure that there would be a tremendous row about it with the profession, and that is something which you certainly do not want to do without forethought”

## Bristol Inquiry Report - data were available all the time

“Bristol was awash with data. There was enough information from the late 1980s onwards to cause questions about mortality rates to be raised both in Bristol and elsewhere had the mindset to do so existed.”

## Bristol (Kennedy) Inquiry Report Lack of monitoring

At a national level there was confusion as to who was responsible for monitoring quality of care. The confusion was not, however, just some administrative game of ‘pass the parcel’. What was at stake was the health, welfare, and indeed the lives of children. What was lacking was any real system whereby any organisation took responsibility for what a lay person would describe as ‘keeping an eye on things’.

## US survey of 1000 doctors and 500 members of the general public

(Robinson AR, Hohmann KB, Rifkin JI et al 2002 Physician and public opinions on quality of health care and the problem of medical errors. Archives of Internal Medicine 162:2186-2190)

- “It appears therefore that a much higher proportion of the general public are concerned about the safety of healthcare than doctors.”
- “If healthcare was an airline, only dedicated risk takers, thrill seekers and those tired of living would fly on it.”
- “The medical profession, in the United States at least, seem curiously unaware of the hazards of the system they work in.”



## Healthcare quality

**‘is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge’**

**(Lohr KN, Harris-Wehling J. Medicare: a strategy for quality assurance. Quarterly Review Bulletin 1991;17,(1):6-9)**

## The need for outcome measures

- Professor Michael Porter, Harvard, 2006:
  - “measuring outcomes is liberation, measuring process is servitude”
- Dr David Colin Thomé, UK, April 2009
  - A key lesson is that **all organisations should be focused on prioritising high quality patient care as judged by outcomes**, and whilst process targets are very helpful on the journey, they must not become a distraction from the bigger picture.

## Why measure mortality? Advantages of death rates as measures of outcomes

- Death is a definite unique event (unlike morbidity which is continuous and difficult to record)
- Deaths must be recorded by law, hence are likely to be a complete and accurate record (this applies to death certificates, but will not necessarily apply to hospital administrative records)
- Does not mean that process should not be measured, but care needed when comparing hospitals (some hospitals are more vigilant)

## Problems with morbidity measurement

- Measuring of the pre-operative condition
- Getting an agreed, universally recognised, measure and measurement methods that are consistent between units
- Bristol Inquiry: ‘...the better centres, that is, centres with a lower mortality in adult cardiac surgery, had a better record of rescue of the complications, that is, they recognised them earlier and treated them better, for the same severity score’
- Some evidence that hospitals with lower mortality rates tend to record a higher level of ‘adverse events’ ie they are more vigilant.

## Hospital Standardised Mortality Ratio

Originally developed in UK in 1990s

- *Jarman et al. "Explaining Differences in English Hospital Death Rates Using Routinely Collected Data," BMJ 1999;318:1515-1520*

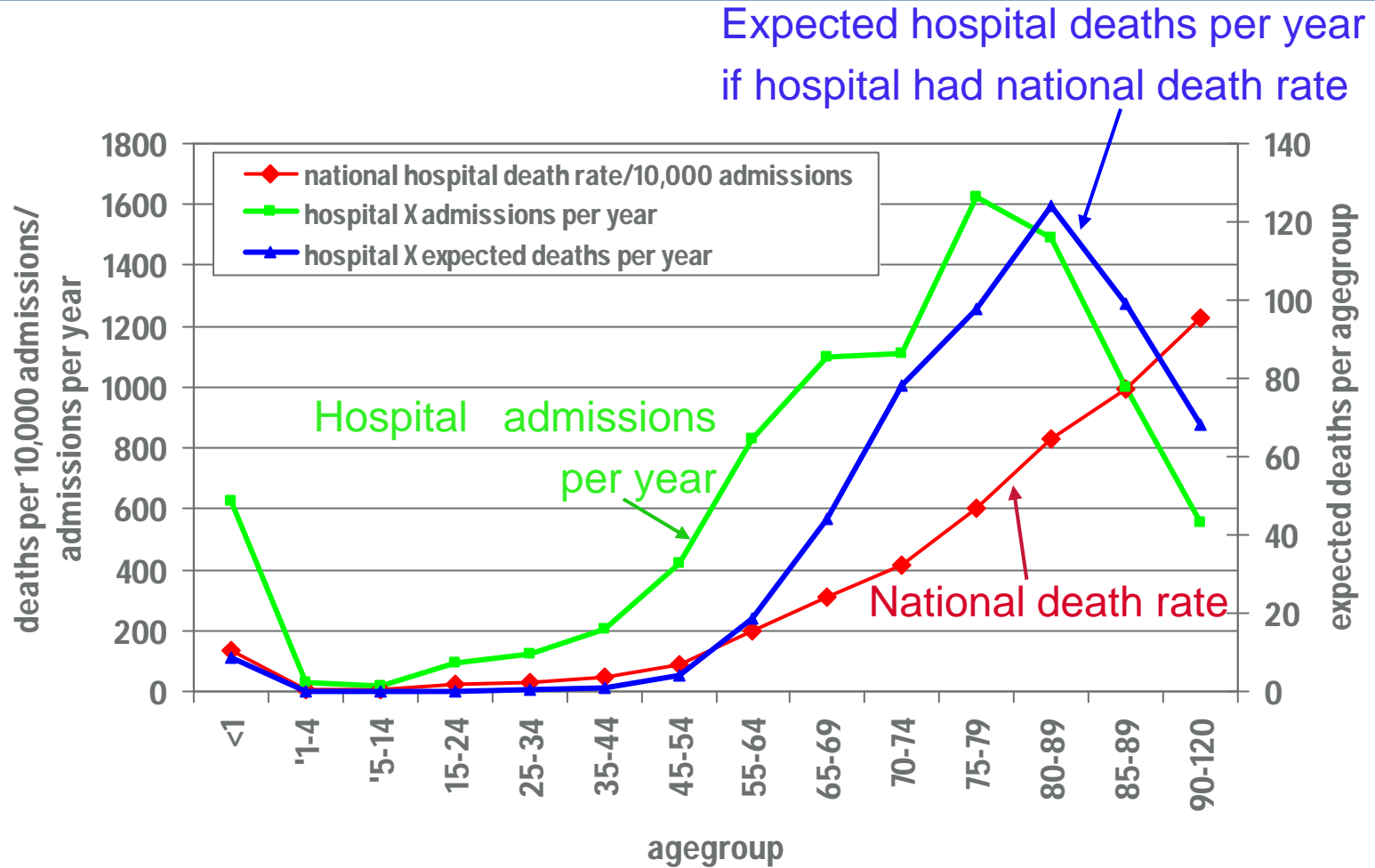
Indirect standardisation or logistic regression using top 80 diagnoses leading to 80% of all in-hospital deaths and adjusted for diagnosis, age, sex, admission source, admission type (emergency/elective/urgent), LOS

Published by NHS on NHS Choices website 30.04.09

<http://www.nhs.uk/NHSEngland/Hospitalmortalityrates/Pages/Data.aspx#q03>

## Example of indirect standardisation by age for one hospital

Sum of expected deaths = 540. Observed deaths = 600.  $HSMR = Obs/Exp \times 100 = 110$



## HSMRs at individual diagnosis level (covering top 80% deaths)

Model at SMR level (c stat 0.91) adjusts for (\* at HSMR level):

- **age\***
- **sex\***
- **emergency status\***
- **socio-economic deprivation**
- **diagnosis (accounting for 80% of all in hospital deaths)\***
- **diagnosis subgroup (3 digit ICD10)**
- **co-morbidity – Charlson index**
- **number of prior emergency admissions**
- **palliative care**
- **year**
- **month of admission (for some respiratory diseases)**



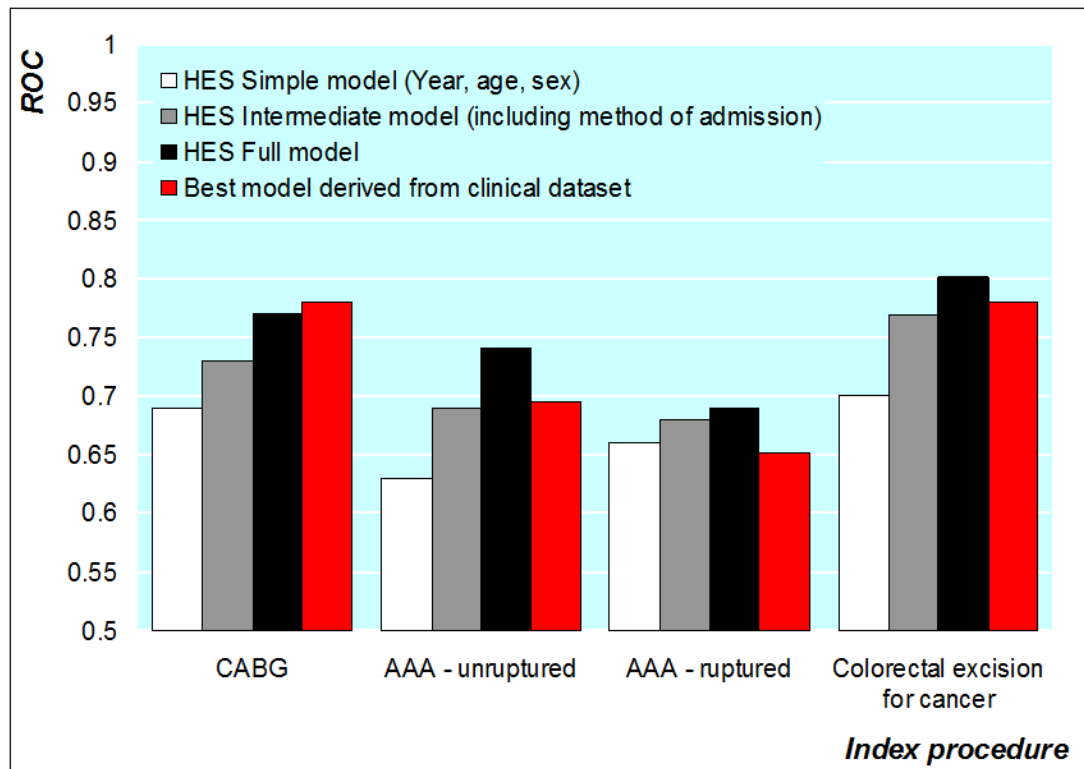
## English & Dutch Analyses: possible break down of the data by:

-- All --	GP Practice	PCT (resident)	
ACS condition	High-impact risk	PCT (resident) pre-Oct06	
Admission history (1 yr)	HRG	Peer (Best Performers)	
Admission history (3 yrs)	HRG (Episode)	Peer (Casemix by %vol)	
Admission method	HRG Chapter	Peer (Casemix by volume)	
Admission method (group)	ICD10 (3-char)	Peer (My current group)	
Admission source	ICD10 (4-char)	Peer (SHA)	
Admission type	ICD10 on discharge (3-char)	Peer (Unit)	
Age	Infection (secondary)	<b>Peer (Worst Performers)</b>	
Age (10-year)	Intended management	Procedure chapter	
Age (5-year)	Local Authority	Procedure group	
Age (Children)	LOS	Provider (original)	
Age (Geriatric)	LOS (0 or 1+)	Readm diagnosis (chapter)	Specialty type
Age (Neonates)	LOS (6 bands)	Readm diagnosis (group)	Spell of superspell
Age (Standard)	LOS (national quarter)	Readm provider	Spells in superspell
Chapter	LOS (Post-op)	Readmission days	Subgroup
Comorbidity	LOS (Pre-op)	Readmitted (28 days)	Tariff (£)
Country of residence	LOS (s/s - national quarter)	Risk decile	Team
Day of admission	LOS (short stay)	Risk quality	Team (of HRG)
Day of discharge	LOS (superspell)	Sex	Team (of procedure)
Day of operation	Month of admission	Site	Team (on admission)
Department	Month of discharge	Site (NHS/ISTC)	Team (on discharge)
Deprivation	NHS/Private patient	Specialised service	Transferee
Diagnosis chapter	OPCS4 (3-char)	Specialised/non-specialised	Transferrer
Diagnosis group	OPCS4 (4-char)	Specialty	Trend (Calendar Year)
Diagnosis group (discharge)	Patient classification	Specialty (of admission)	Trend (Financial Year)
Discharge destination	Patient safety indicator	Specialty (of discharge)	Trend (Month)
Episode of spell	PCT (registered)	Specialty (of HRG)	Trend (Quarter)
Episodes in spell	PCT (registered) pre-Oct06	Specialty chapter	Waiting Time
Ethnicity (Grouped)	PCT (resident)	Specialty code	Ward (census)



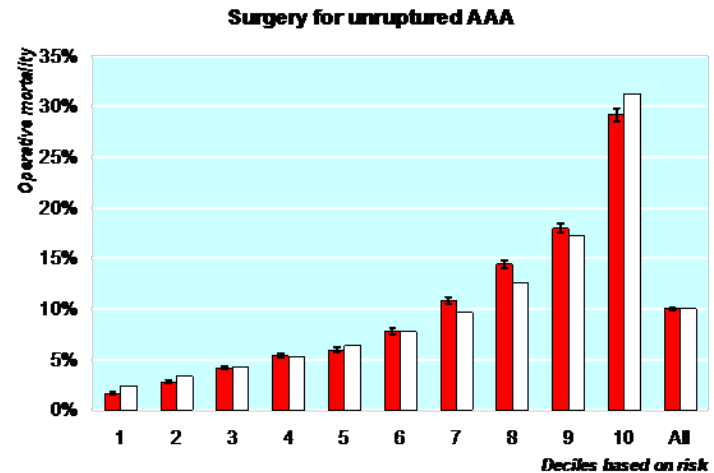
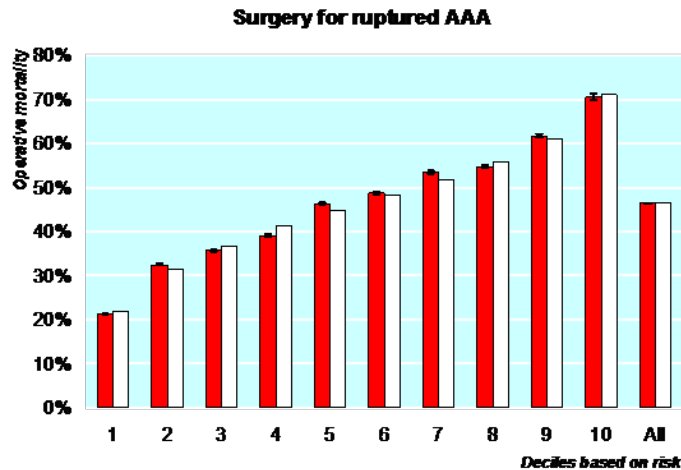
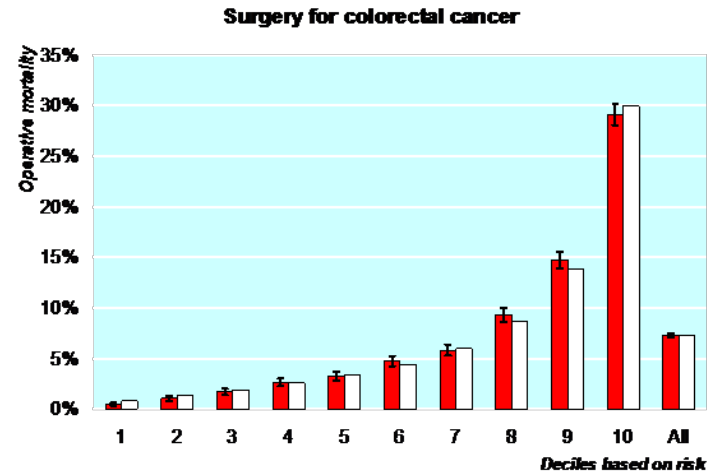
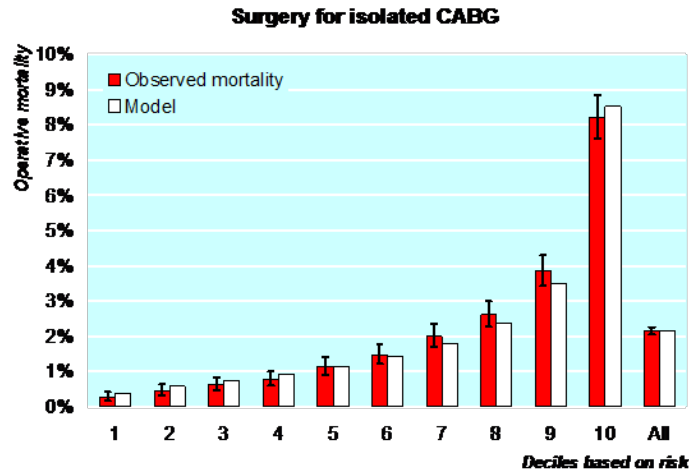
## Comparison of administrative & clinical databases

ROC curve areas comparing 'simple', 'intermediate' and 'complex' models derived from HES with models derived from clinical databases for four index procedures



## Comparison of administrative & clinical databases

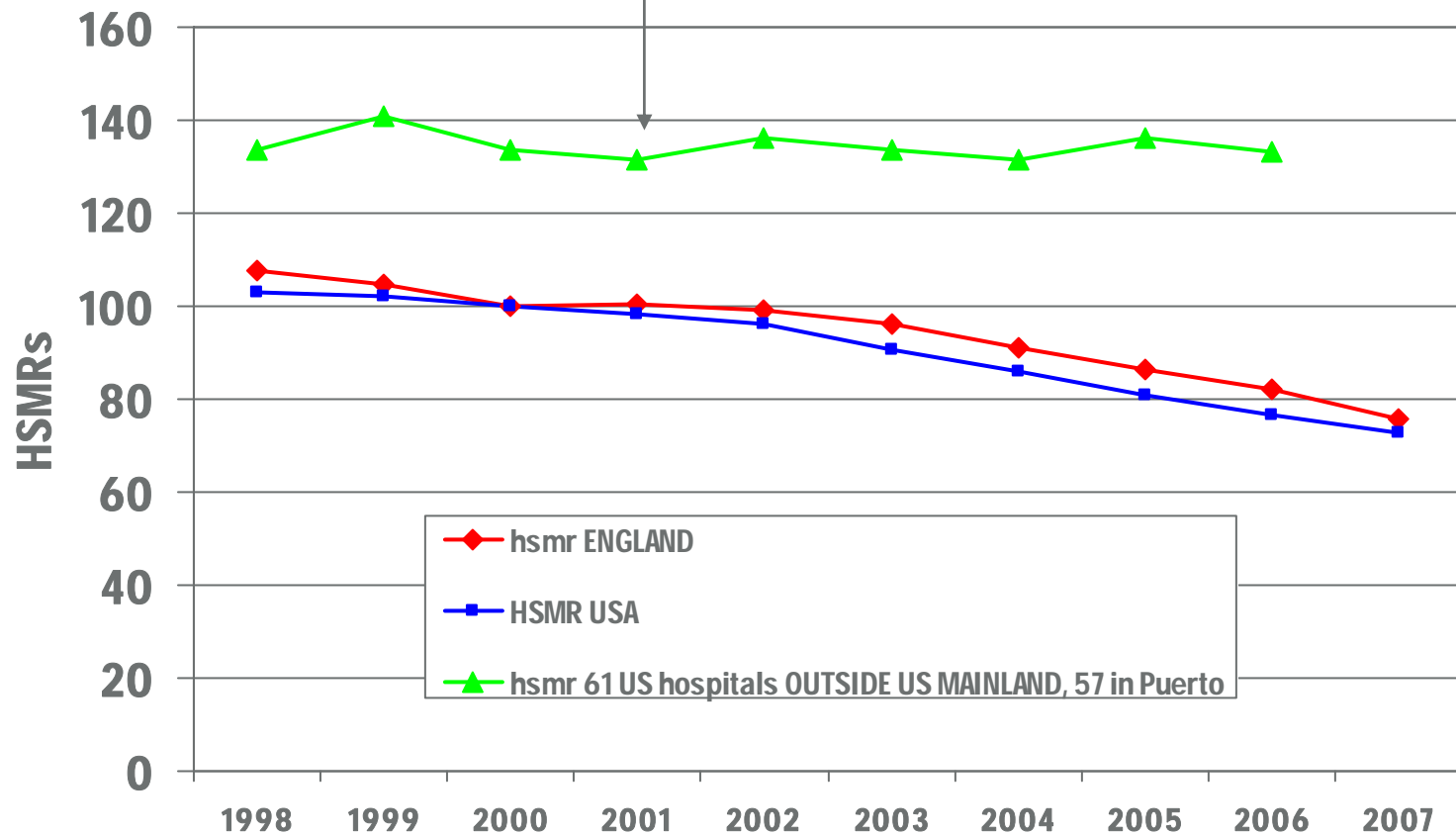
Calibration plots for 'complex' HES-based risk prediction models for four index procedures showing observed number of deaths against predicted based on validation set



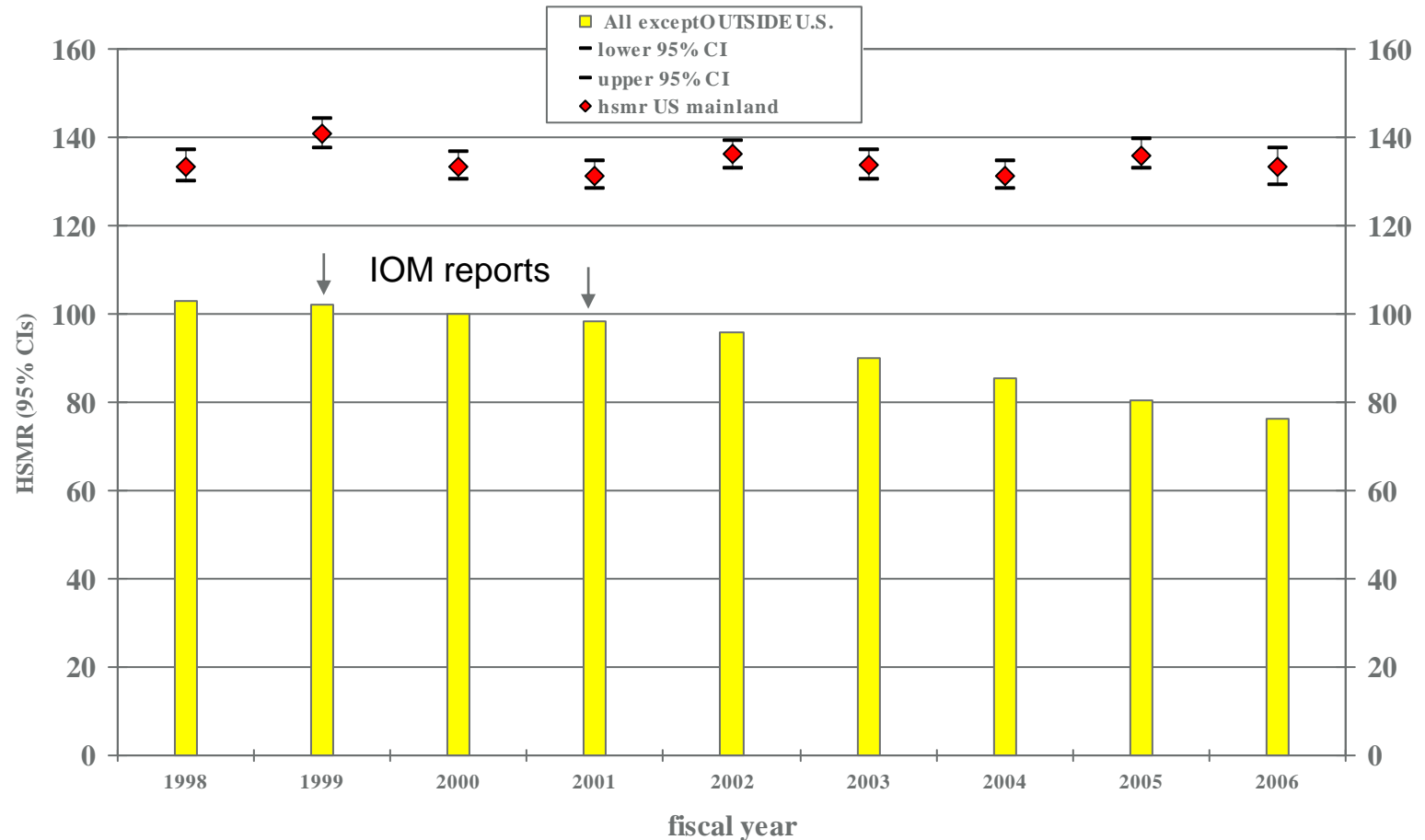


## HSMR comparisons of trends: England, US mainland & 61 US hospitals outside US mainland (57 in Puerto Rico & 4 others)

IOM report – Crossing the Quality Chasm  
& Bristol Royal Infirmary Inquiry Report



## US HSMRs: Continental US vs 61 Hospitals outside US mainland, 57 in Puerto Rico & 4 others (North Mariana Islands, Guam, Virgin Islands, American Samoa)



## National Survey of NHS Patients and HSMRs

Significant ( $p < 0.001$ ) associations were found between HSMR and the following questions in the National Survey of NHS Patients (with the poorer, more dissatisfied responses corresponding to higher mortality):-

- ‘If you had any anxieties or fears about your condition or treatment, did a doctor discuss them with you?’
- ‘If your family or someone else close to you wanted to talk to a doctor, did they have enough opportunity to do so?’
- ‘Did a member of staff explain the purpose of the medicines you were to take at home in a way you could understand?’
- ‘Did a member of staff tell you about medication side-effects to watch for when you went home?’
- ‘Would you recommend this hospital to your family and friends?’

Note: NHS Patient Survey asks specific questions eg: “How long did you wait?”; “Were you in pain?”; “How long in pain?”

## Monthly warnings (alerts) of possible problems

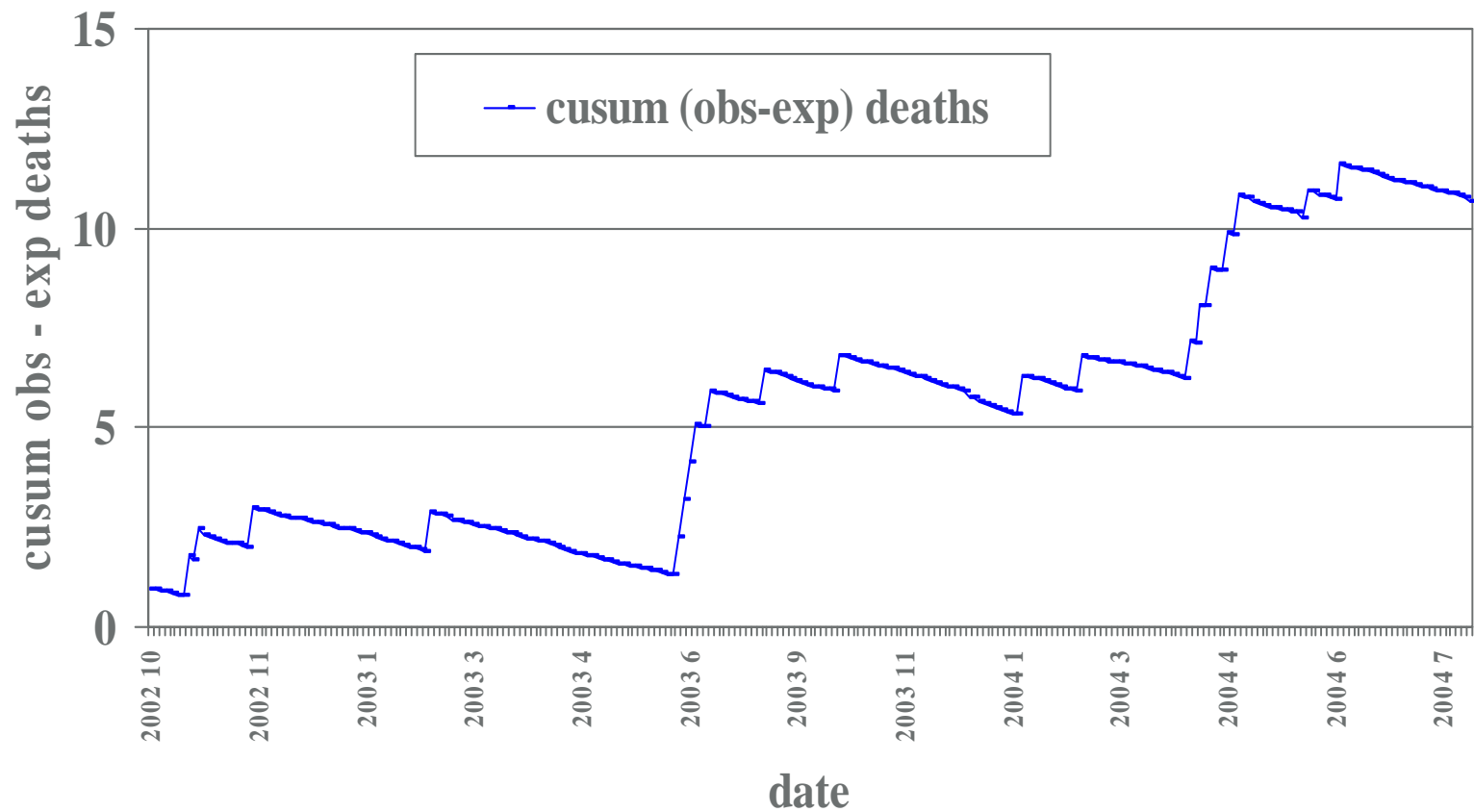
- Normal administrative hospital data is collected for all English hospitals every month and analysed at Imperial College and Dr Foster Intelligence
- For diagnoses and procedures covering 90% of all hospital deaths the ratio of the cumulative sum (CUSUM) of the log of the odds ratio of observed to expected deaths is calculated for each patient cumulatively
- CUSUM charts are plotted and alerts noted: if significant at 99.9% level letter sent to Chief Executive of hospital from Imperial College.

## CUSUM charts

- Based on log-likelihood (odds ratio) CUSUM to detect a predetermined increase in risk of interest
- Taken from Steiner et al (2000); pre-op risks derived from logistic regression of national data
- The CUSUM statistic is the log-likelihood test statistic for binomial data based on the predicted risk of outcome and the actual outcome
- Models adjust for age, sex, emergency status, etc.
- Chief Executives receiving an alert are required to take necessary action under Clinical Governance.



# US: CUSUMs chart observed – expected deaths: hypertension & heart failure: 250 admissions over 2 years



# Steiner method for log (odds ratio or likelihood) chart

## Monitoring surgical performance using risk-adjusted cumulative sum charts

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VERN T. FAREWELL

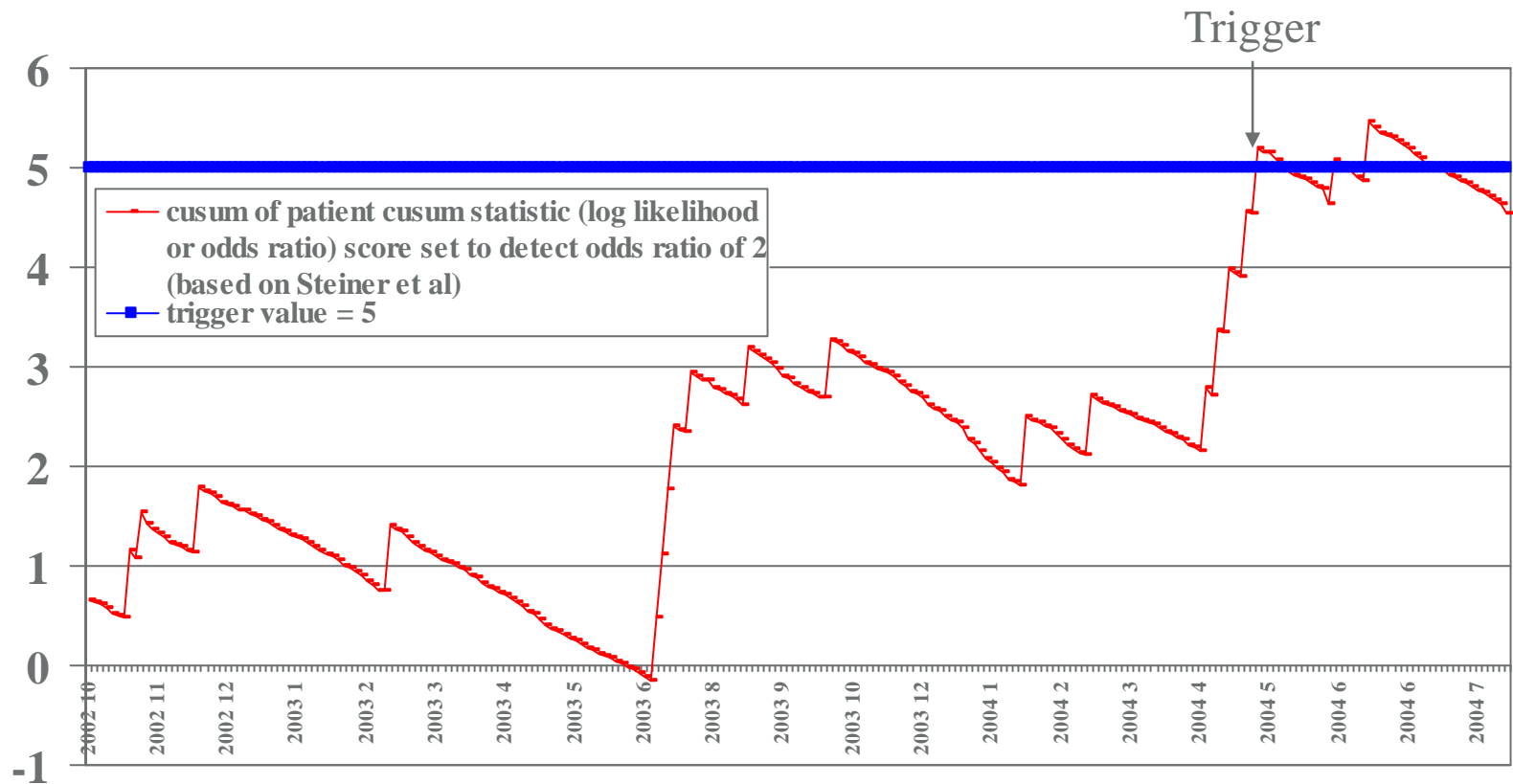
*Department of Statistical Sciences, University College London, UK*

TOM TREASURE

*St. George's Hospital Medical School London, UK*

$$W_t = \begin{cases} \log \left[ \frac{(1 - p_t + R_0 p_t) R_A}{(1 - p_t + R_A p_t) R_0} \right] & \text{if } y_t = 1 \\ \log \left[ \frac{1 - p_t + R_0 p_t}{1 - p_t + R_A p_t} \right] & \text{if } y_t = 0 \end{cases}$$

## US CUSUM chart - log (likelihood or odds ratio): hypertension & heart failure: 250 admissions over 2 years



## England: Mortality warnings/alerts

- Sent monthly from Imperial College to CEO of any acute hospital trust in England alerting them if they have an SMR with less than 1 in 1000 chance (99.9% CI) that it is double the national death rate over previous 12 months
- Copied to Healthcare Commission (now CQC)
- 78 diagnoses, 128 procedures, 90% deaths
- To Chief Executive, copy Medical Director
- Note could be due to:
  - Poor coding
  - Inadequate case-mix adjustment
  - Quality of care

## Healthcare Commission: Investigates serious failings in healthcare

- “The Healthcare Commission is empowered by section 52(1) of the Health and Social Care (Community Health and Standards) Act 2003 to conduct investigations into the provision of healthcare by or for an English NHS body.
- We usually investigate when allegations of serious failings are raised, particularly when there are concerns about the safety of patients...
- In investigating allegations of serious failings in healthcare, we aim to help organisations to improve the quality of care they provide, to build or restore public confidence in healthcare services, and to seek to ensure that the care provided to patients is safe throughout the NHS.”

## Example of monthly warning/alerts: diagnosis = Acute MI

XXXXXXXXX University Hospitals NHS Foundation Trust

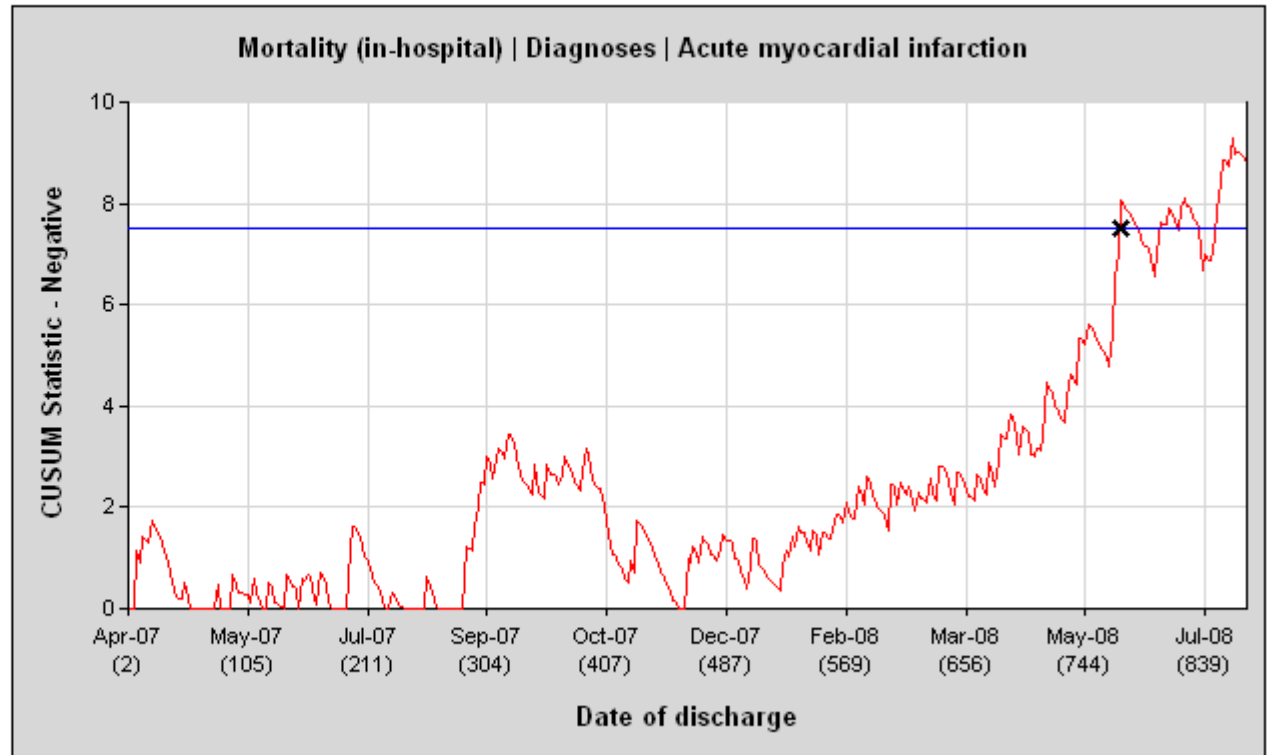
Basket: Diagnoses - RTM  
 Outcome: Mortality (in-hospital)  
 Benchmarks: Data year

Chapter: Circulatory  
 Diagnosis: Acute myocardial infarction  
 Department: All  
 Team: All

Admission type: All  
 Sex: All  
 Age Range: All  
 Deprivation: All

Spells: 863  
 Superspells: 817 (805/12)  
 First / Last: Apr-07 / Jul-08  
 Deaths: 98 (12%)  
 Expected: 73.4 (9%)  
 O-E: 24.6 (3%)  
 Relative Risk: 133.5 (108.4–162.7)  
 C-Statistic: 0.74 (Average)  
 LoS: 9.7 / 9.9  
 Alerts (X): 1 (May-08)  
 FAR / SDR: 0.7% / 99.4%

FAR = false Alarm Rate



## Example of monthly warning/alert: procedure = plastic repair of aortic valve

XXXXXX

University Hospitals NHS Foundation Trust

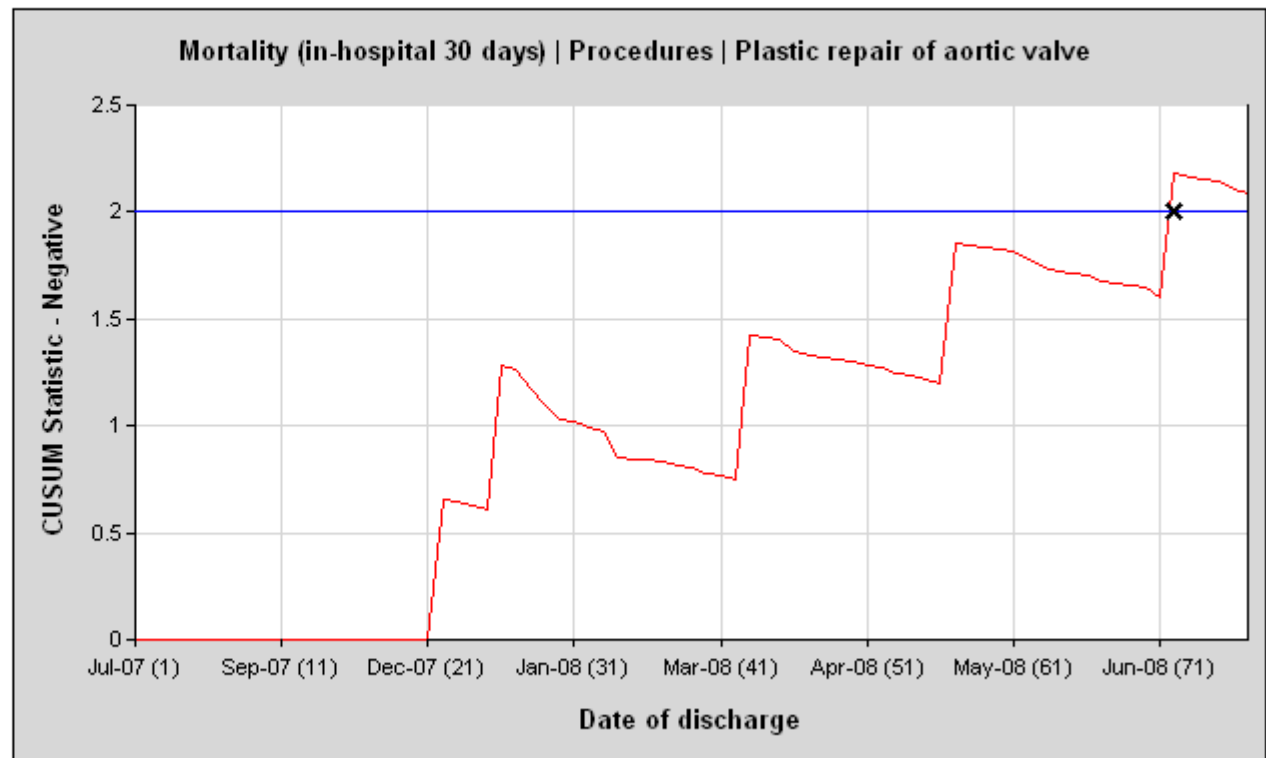
Basket: Procedures - Other RTM  
Outcome: Mortality (in-hospital 30 days)  
Benchmarks: Data year

Chapter: Heart  
Procedure: Plastic repair of aortic valve  
Department: All  
Team: All

Admission type: All  
Sex: All  
Age Range: All  
Deprivation: All

Spells: 77  
Superspells: 77 (77/0)  
First / Last: Jul-07 / Jul-08  
Deaths: 5 (6.5%)  
Expected: 1.7 (2.2%)  
O-E: 3.3 (4.3%)  
Relative Risk: 298.2 (96.1-696)  
C-Statistic: 0.76 (Average)  
LoS: 14.2 / 15.8  
Alerts (X): 1 (Jun-08)  
FAR / SDR: 0.9% / 0.3%

FAR = False Alarm Rate



## Healthcare Commission investigation at Mid Staffordshire NHS Foundation Trust - First Public Report 18 March 2008

Healthcare Commission press release 18 March 2008

- “The Healthcare Commission has also recently received a number of concerns from individual patients and relatives, about standards of care at ward level.”
- “The Healthcare Commission is therefore launching an investigation at Mid Staffordshire NHS Foundation Trust.”
- “The trust’s data on outcomes for patients has also recently caused the Dr Foster Unit at Imperial College London to bring concerns to the attention of the trust and the Healthcare Commission.”

*The aim is to avoid the need for a publicised investigation*



“The SHA [Strategic Health Authority] was not aware of any concerns regarding the quality of services provided by the trust before Dr Foster Intelligence published its Hospital Guide in April 2007.”

**NHS: Mid Staffordshire Foundation Trust**  
**House of Lords Statement by Baroness Thornton**

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“The [Healthcare] commission became aware of high mortality rates for specific conditions or operations at this trust during the summer of 2007, through its routine analysis and statistics known as **hospital standardised mortality ratios, or SMRs, produced by the Dr Foster research unit, based at Imperial College**”

Hansard 18 Mar 2009 : Column 233

## Some of the problems at Mid Staffordshire.

Professor Sir George Alberti. 29 April 2009

- Understaffing of A&E - too few consultants, middle-grade doctors and nurses
- Initial patient assessment by untrained receptionists
- Poor supervision of junior doctors
- Weak leadership of nurses and inadequate nurse training
- Poor equipment in A&E
- Long delays and tendency to move patients to the Emergency Assessment Unit (EAU), Clinical Decision Unit (CDU) and “assess and treat” area in order to meet the 4 hour target before they had been investigated or any diagnosis made
- Lack of protocols and clear pathways
- Chaotic, large, understaffed EAU with little training for the nurses
- Poorly equipped EAU.
- Poor handover from EAU to medical and surgical wards
- Insufficient beds for coronary care or strokes
- Major delays for emergency operations
- Inadequate numbers of experienced surgeons with poor 24/7 cover
- Poor post-operative care
- Very poor patient care on the medical and surgical wards
- Inadequate handling of patient complaints

## Healthcare Commission report on Mid Staffordshire NHS Hospitals Trust 18 March 2009

### “Hospital standardised mortality ratio

The hospital standardised mortality ratio (HSMR) is a comparative measure of an acute trust's overall mortality developed by the Dr Foster Research Unit. It does not cover all admissions, but focuses on a group of diagnoses that accounts for 80% of all deaths in hospitals in England. The HSMR accounts for the case mix of patients at the time they are admitted to the trust, adjusting for a number of factors that include the primary diagnosis, age, sex, ‘comorbidities’, deprivation and method of admission... A value for the HSMR of 100 indicates mortality that is equivalent to what would be expected, given the case mix. Values greater than 100 indicate higher than expected mortality, and values less than 100 indicate lower than expected. In the 2007 Dr Foster Hospital Guide, the trust was classified as having high mortality, with a one-year (2005/06) HSMR of 127 and a three year (2003-2006) HSMR of 125.”

## Healthcare Commission report on Mid Staffordshire NHS Hospitals Trust 18 March 2009

- **“Dr Foster Intelligence real-time monitoring system**
- The real-time monitoring system produced by Dr Foster Intelligence uses standardised methodologies (designed by Professor Sir Brian Jarman and Dr Paul Aylin) to allow trusts to compare their clinical outcomes against all other acute trusts in England, and against a local peer group. The system is also able to monitor outcomes for specific consultant teams, and by specialty. Where a significant divergence in a clinical outcome is detected, an automated alert is produced.”

## HSMRs, monthly warnings/alerts, Healthcare Commission

- The warnings are sent confidentially
- The Healthcare Commission has other information eg patient complaints
- The Healthcare Commission can inspect and give improvement advice
- The problems at Bristol need not occur

## Examples of use of HSMRs and SMRs for improvement

- Bolton Hospital - fractured neck of femur (fractured hip)
- Northwest London Hospital – a hospital that had had problems
- Walsall Hospital – had the highest HSMR in 2001
- US hospitals – Owensboro, Tallahassee, Missouri Baptist, Henry Ford

## Use of mortality measures

### Evidence for value of reducing delay in operation for # NOF

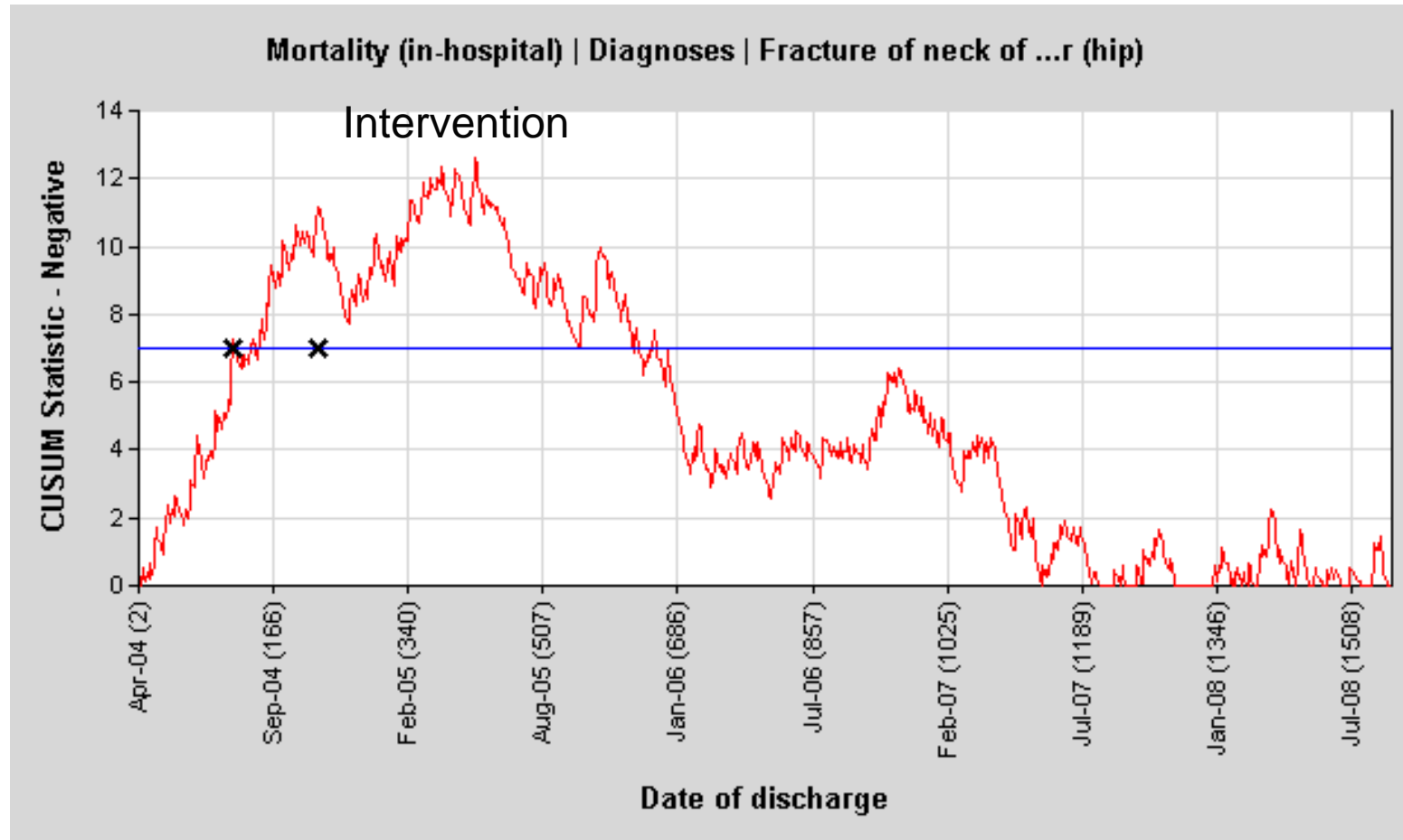
- Bottle A, Aylin P. Mortality associated with delay in operation after hip fracture: observational study. *BMJ* 2006;332:947-951
- “Delay in operation was associated with an increased risk of death in hospital, which was reduced but persisted after adjustment for comorbidity.”
- Bolton also appointed orthopaedic geriatricians



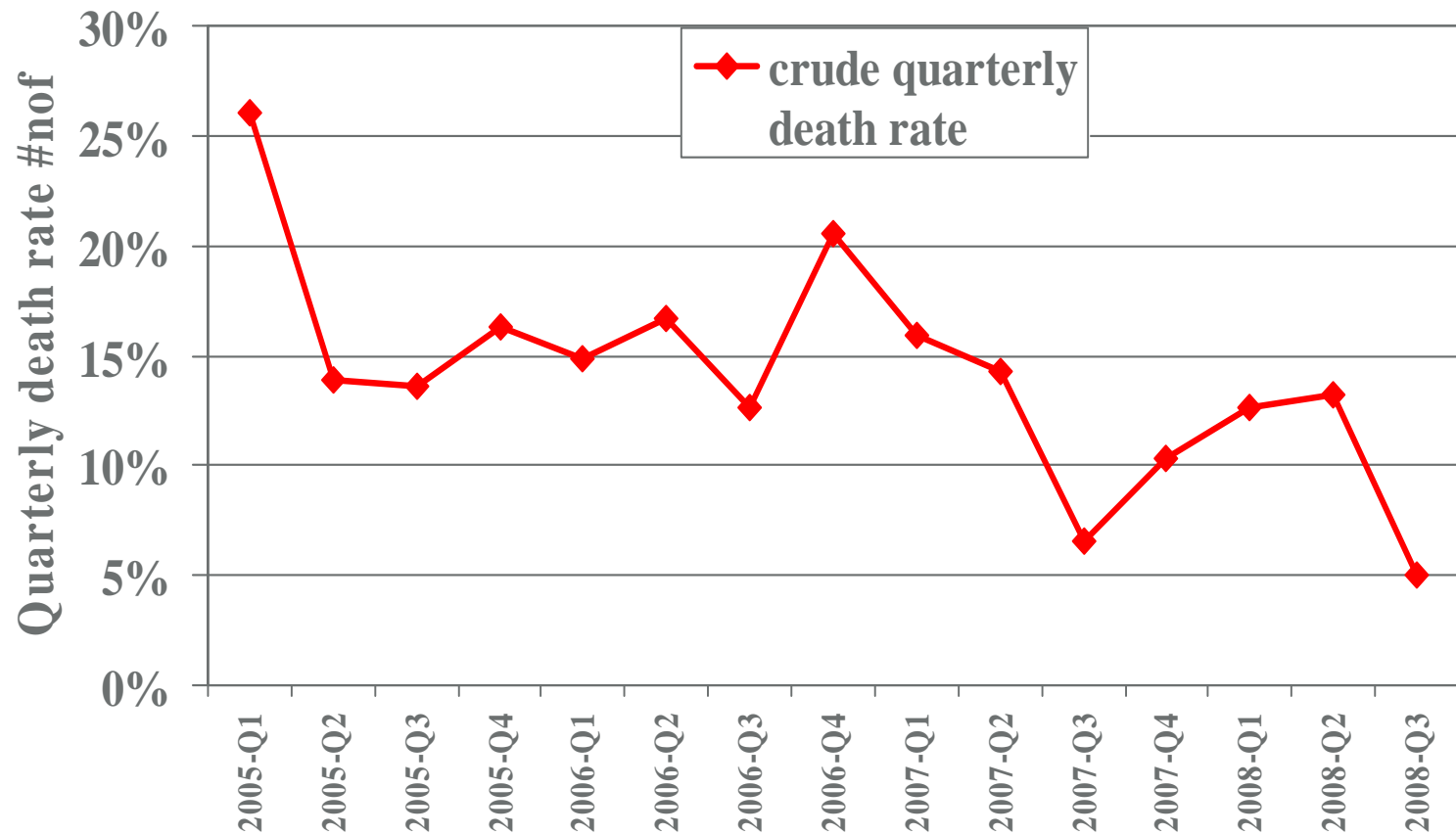
## Bolton Hospital # NOF actions

- Reduced time to theatre in medically unfit patients to a mean of 3 days
- Overall time to theatre reduced by 30%
- Length of stay reduced by 32%

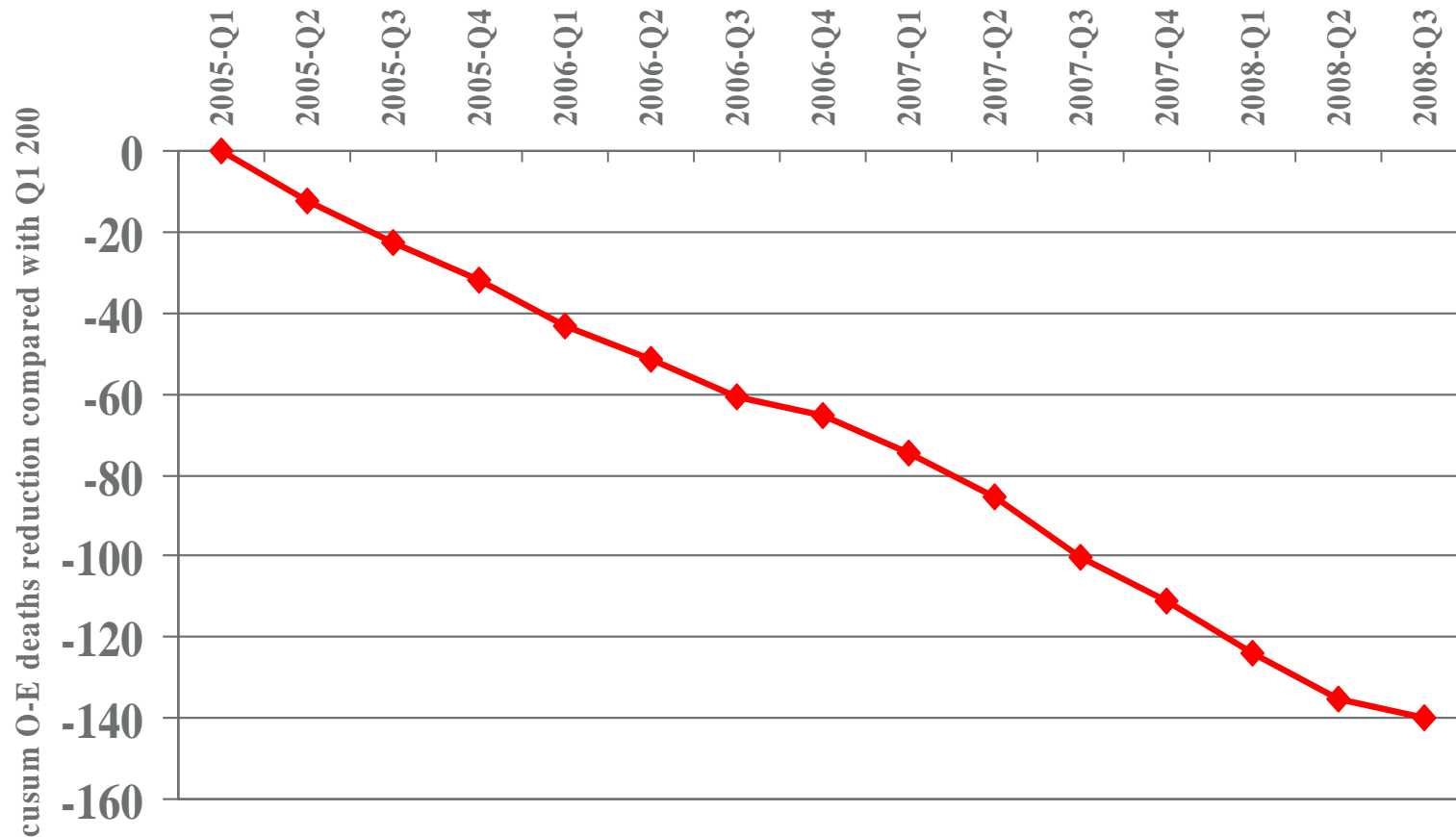
## Bolton: fractured neck of femur Jan 2004 – Sep 2008



**Bolton: # neck of femur Jan 2004 – Aug 2008**  
**Quarterly crude death rate #nof**



**Bolton: Cusum reduction of Obs – Exp deaths # NOF compared with expected if Q1 2005 death rate continued**



## North & West London – aimed to avoid 110 deaths

- Aim: 110 deaths reduction, starting from April 2007 going to March 2008.
- Looked up the 25 main causes of death
- Targeted eight areas for care bundles

Stroke	COPD
Heart failure	MRSA
C Diff	CVP
VAP	SSI
- Actually achieved 256 fewer deaths (in the HSMR diagnoses) [data from Liz Todd, NWLH]

# Reducing avoidable mortality (from Liz Rob NWLH)

The North West London Hospitals **NHS**  
NHS Trust

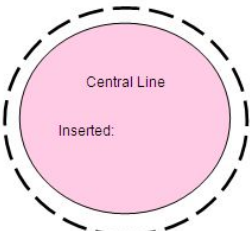
Date/time: |  
Clinical area:  
Operator, & grade:

Patient label

### Central Line Asepsis Checklist

Central Line Asepsis Bundle		
Line insertion – infection reduction	TICK, or give reason for variation (e.g. item not available)	Initials
Surgical hand scrub * + gloves, surgical gown, hat, mask (all 4)		
Maximal body drape *		
2% Chlorhexidine skin antiseptis * (Chloraprep™ applicator)		
Catheter site:  (avoid femoral wherever possible)	Left <input type="checkbox"/> Right <input type="checkbox"/> Subclavian <input type="checkbox"/> Internal jugular <input type="checkbox"/> Femoral <input type="checkbox"/>	
Chlorhexidine-impregnated foam dressing * (BioPatch™)		
Line insertion – safety	TICK, or give reason for variation (e.g. item not available)	Initials
USS guidance †		
CXR		
Transduce waveform before drug infusion * (exclude intra-arterial placement)		
Post-insertion line care	Agreed with Nursing	Initials
Hand hygiene and no-touch technique for all contact with line *		
Date label → daily line review / prompt removal when no longer needed *		

\* CDC level 1A recommendation  
\*\* CDC level 2A recommendation  
† NICE or Critical Care Network recommendation  
‡ Local (Trust) practice



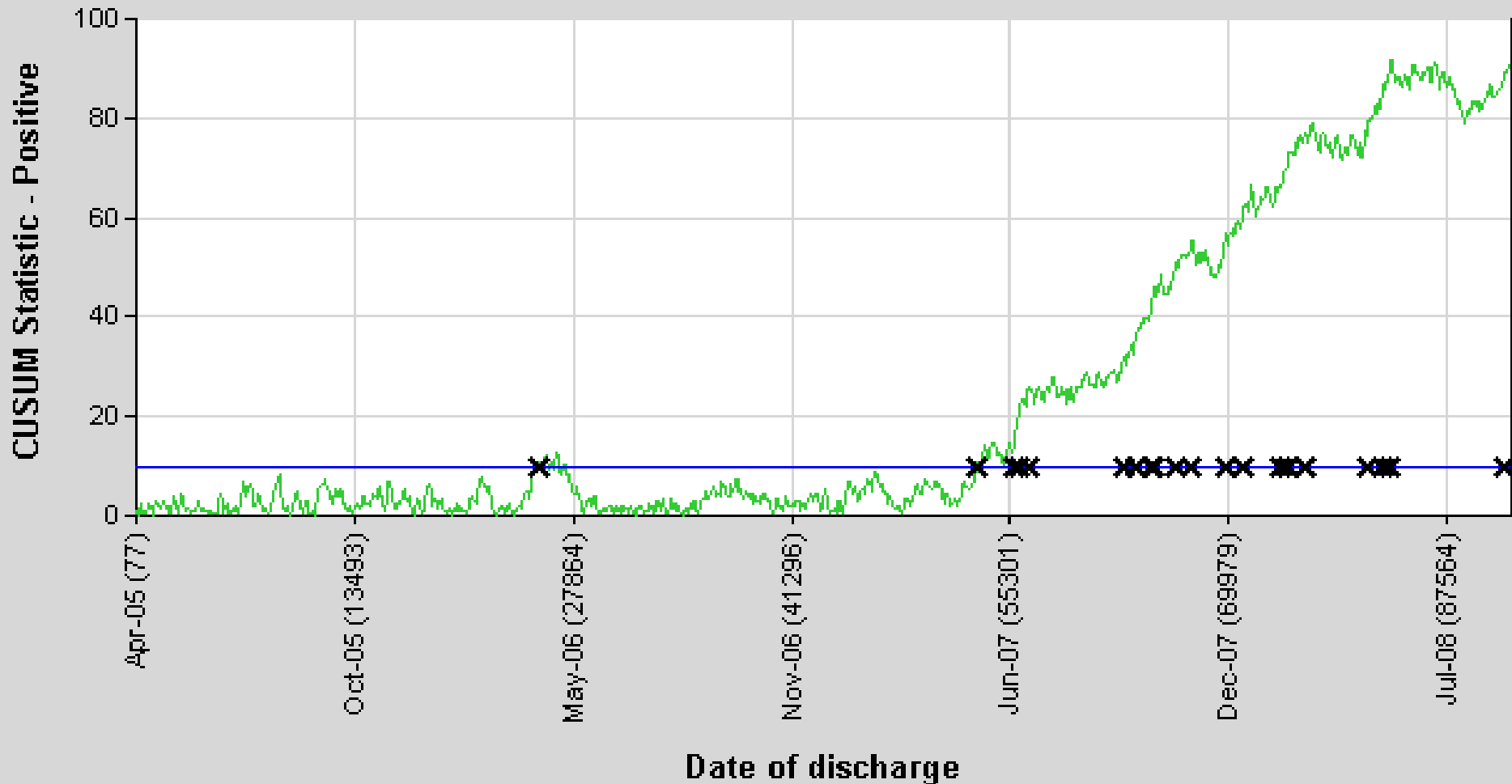
**Instructions**

1. Attach patient details and fill in box
2. Detach **square sticker**, place in medical notes, and fill in.
3. Detach **round sticker** and place on ICU daily chart/anaesthetic chart/A&E card (wards: front of medical notes)
4. File this backing sheet (with patient label) in designated audit tray for your clinical area.

## Example of a care bundle - central venous catheter

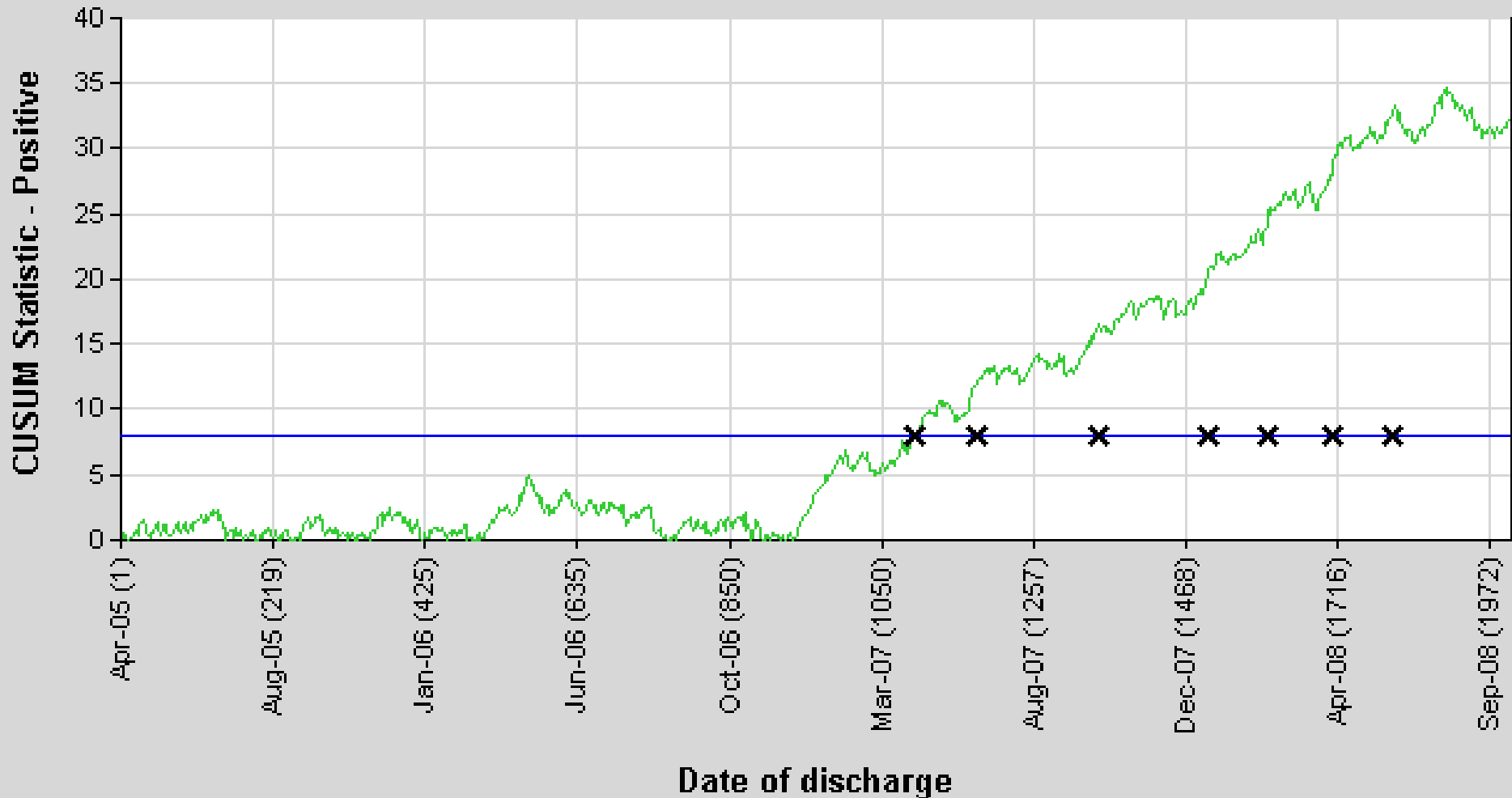
# North & West London – cusum chart showing improvement starting in April 2007: 56 HSMR CCS diagnoses

Mortality (in-hospital) | Diagnoses - 56 HSMR groups



## North & West London – cusum chart showing improvement starting in April 2007: Stroke

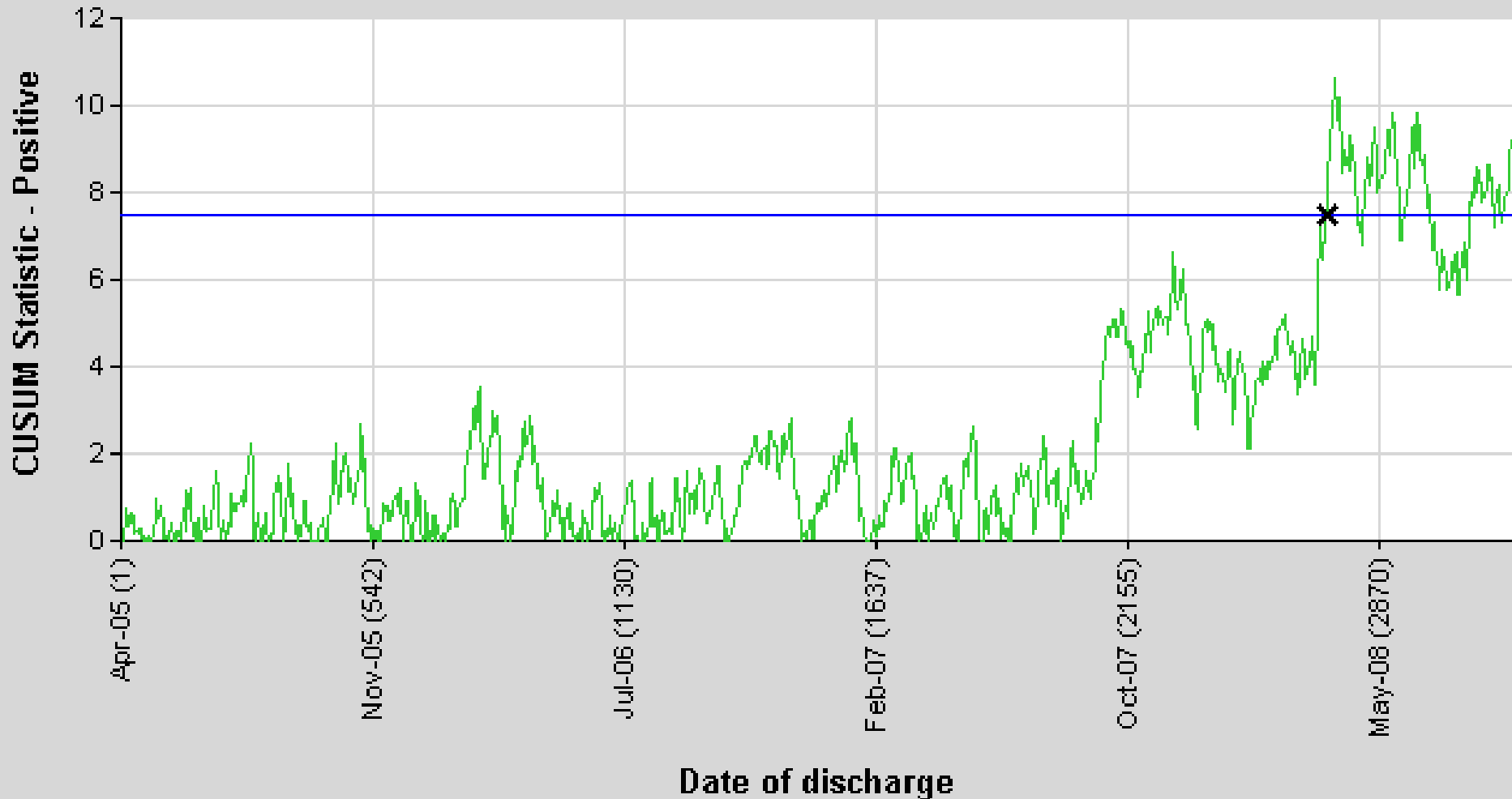
Mortality (in-hospital) | Diagnoses | Acute cerebrovascular disease





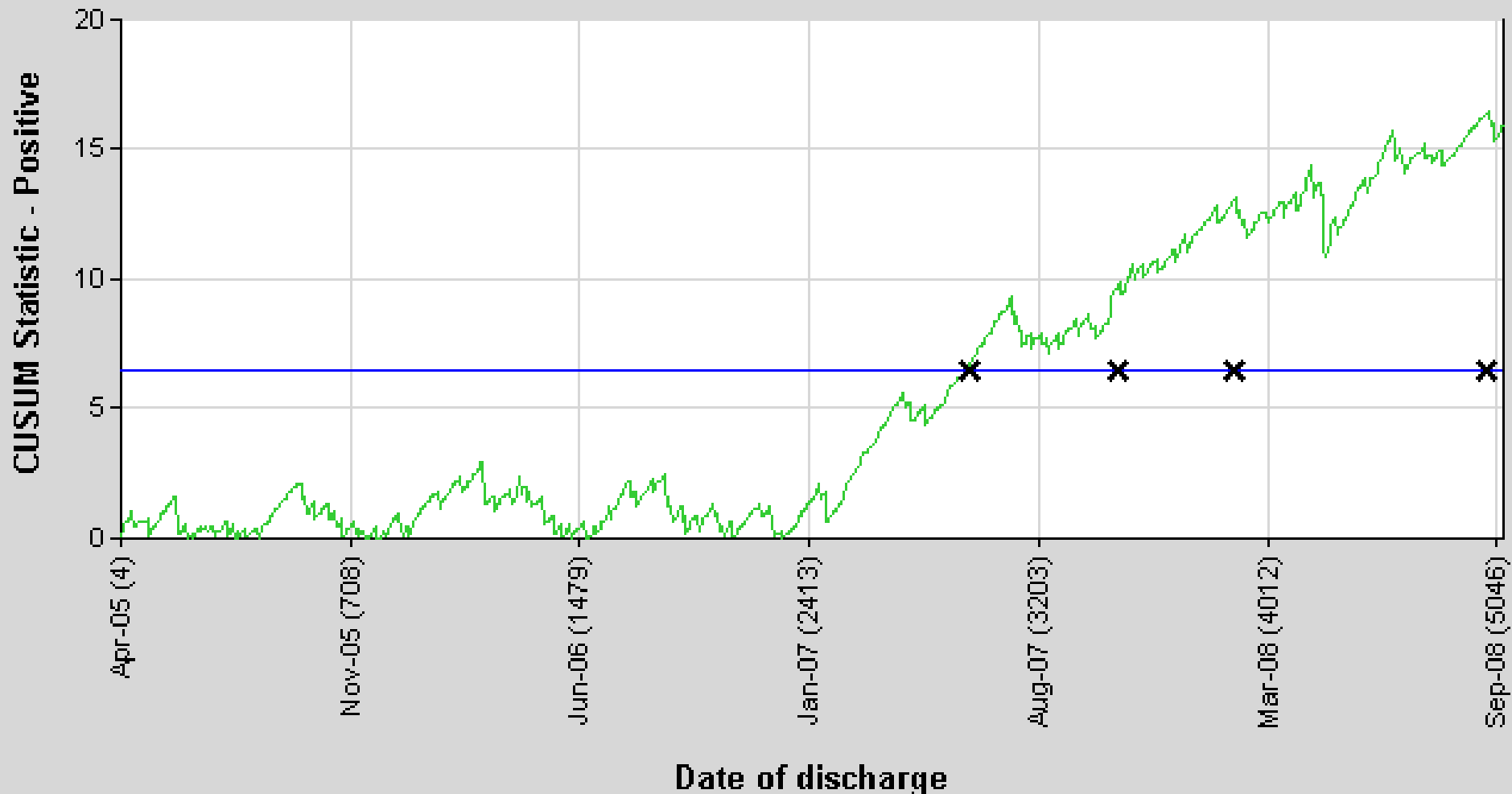
## North & West London – cusum chart showing improvement starting in April 2007: Pneumonia

Mortality (in-hospital) | Diagnoses | Pneumonia

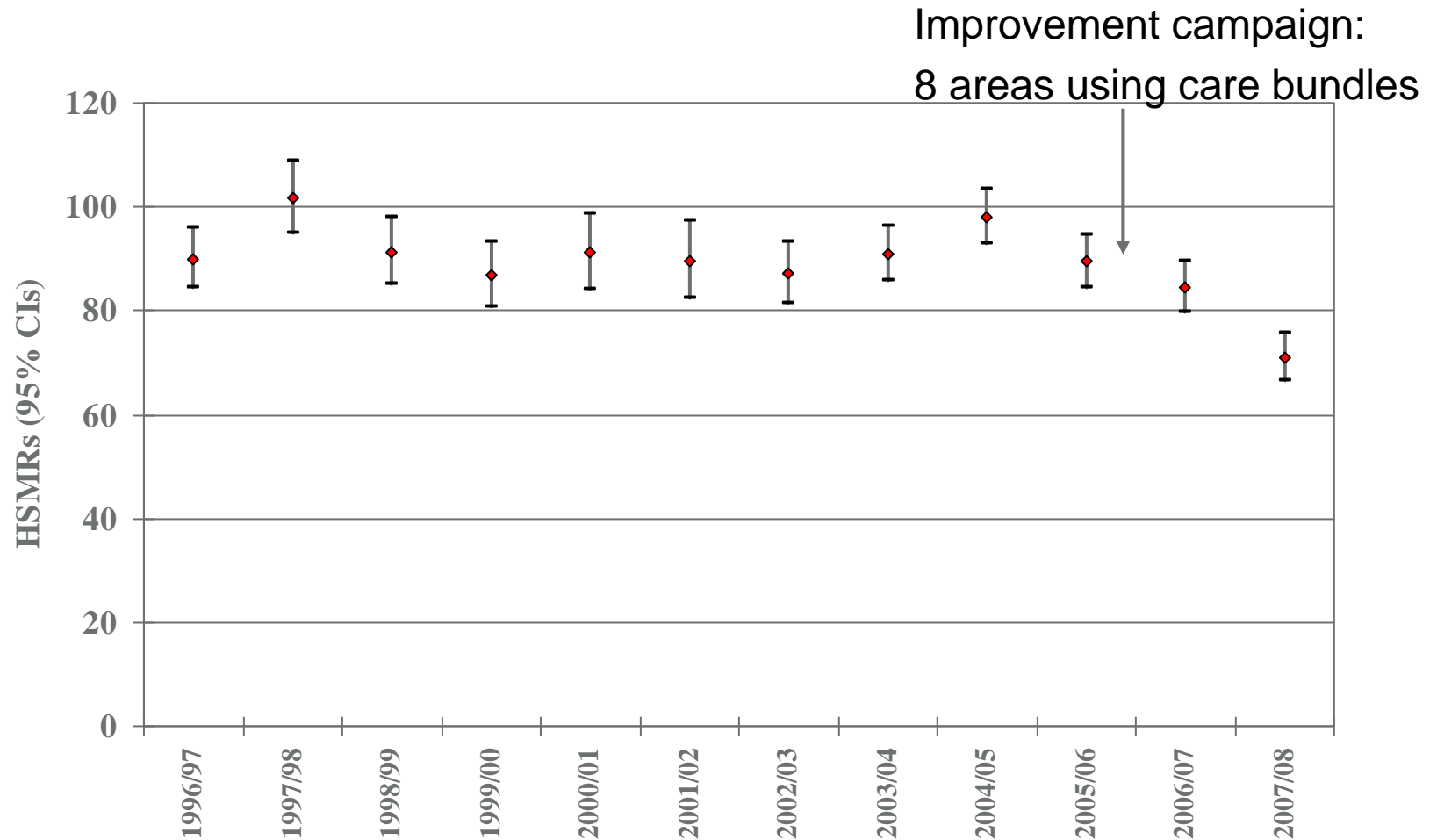


## North & West London – cusum chart showing improvement starting in April 2007: UTIs

Mortality (in-hospital) | Diagnoses | Urinary tract infections

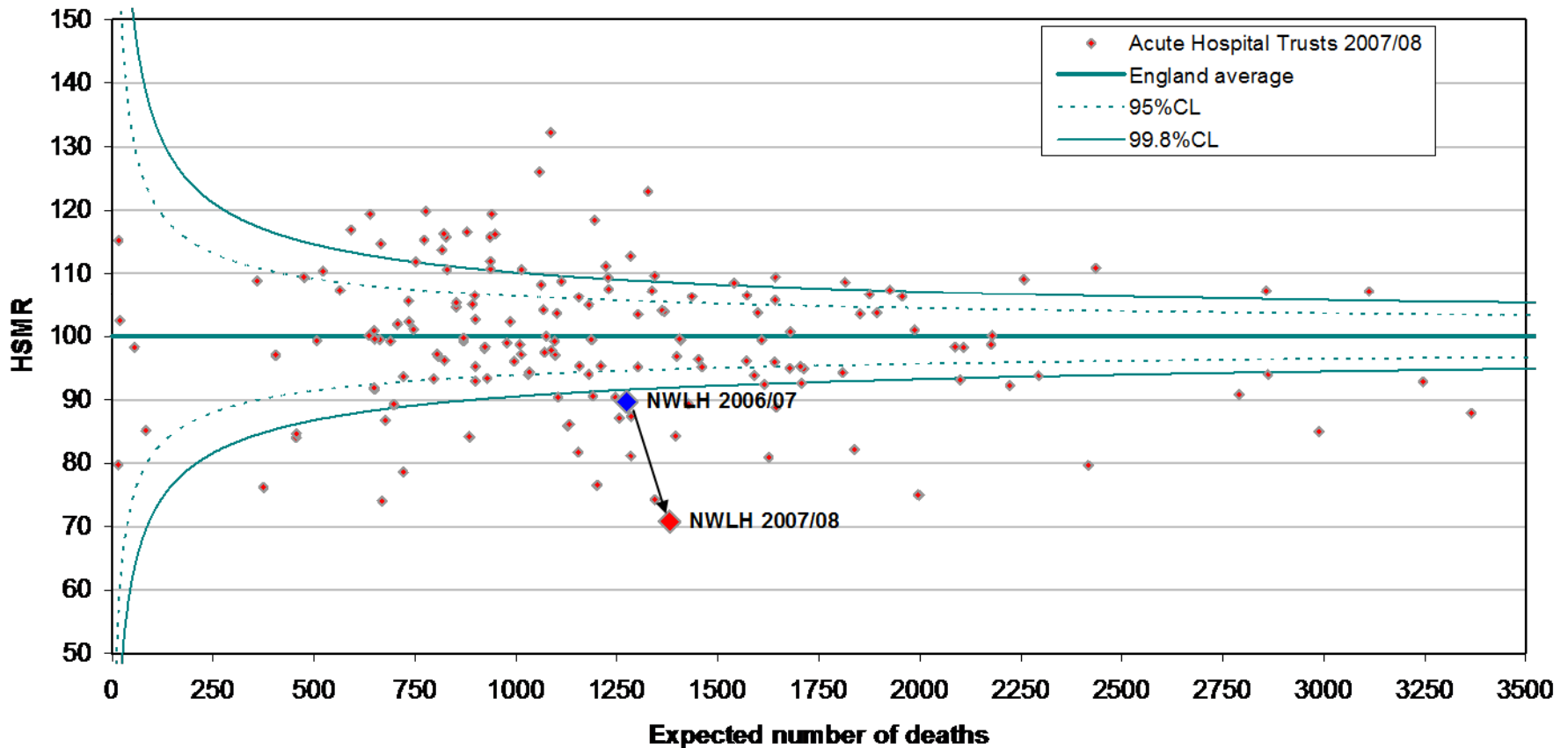


# North & West London Hospitals Trust HSMRs (England = 100 every year)



## Funnel plot showing change of NWLH HSMR 2006-7 to 2007-08

**HSMRs 2007/08: NWLH 2006/07 HSMR shown with blue diamond, 2007-08 HSMR with red diamond  
(all HSMRs use year 2007/08 England HES data as reference baseline)**



## NWLH Summary of mortality reduction in 2007-08

- Observed – Expected deaths 2007-08 if the trusts had had the 2006-07 HSMR in 2007-08:
  - Non-targeted diagnoses = -68
  - Targeted diagnoses = -174
  - All HSMR diagnoses = -255

## NWLH Summary of mortality reduction from 2004-05

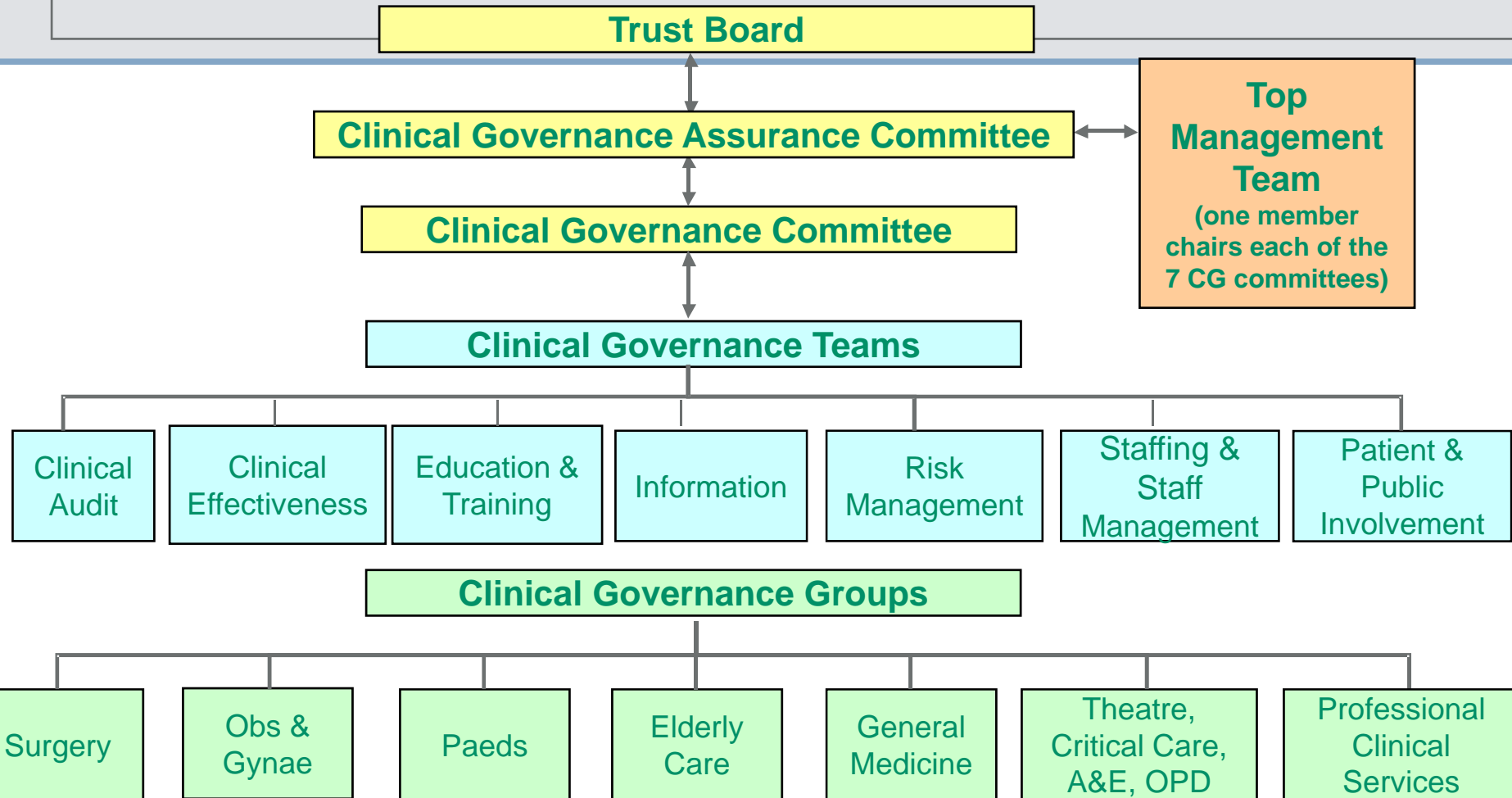
### Observed – Expected deaths if had 2004/05 HSMR each year

	<u>HSMR</u>	<u>Deaths</u>	<u>Expected</u>	<u>Deaths if 2004/05 HSMR had applied</u>	<u>Difference from observed deaths</u>	<u>Cusum difference from observed deaths</u>
<b>2004/05</b>	<b>116.7</b>	1,446	1,240	1,446	0	0
2005/06	100.9	1,241	1,230	1,435	-194	-194
2006/07	89.7	1,142	1,274	1,486	-344	-538
2007/08	71.0	976	1,375	1,604	<b>-628</b>	-1,166

## Walsall hospital's mortality reductions

- Walsall Hospital NHS Trust had the highest HSMR (130) in England when data first published on 21 January 2001
- Initially questioned data extensively
- Queries regarding hostels and management of stroke by GPs in the area
- Eventually decided to accept data and implement wide range of changes.

# The Walsall Clinical Governance Structure (Dr Mike Browne)

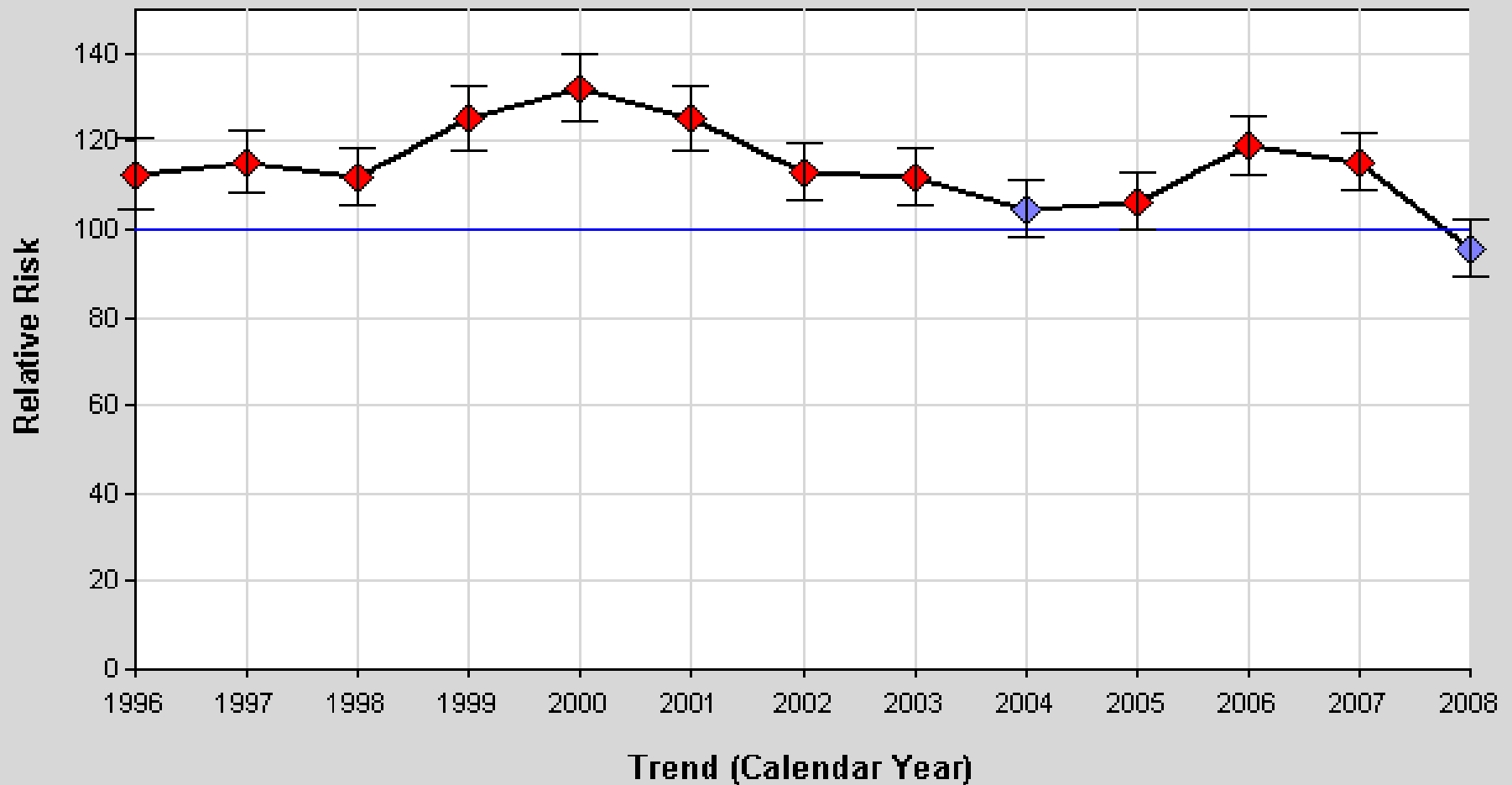




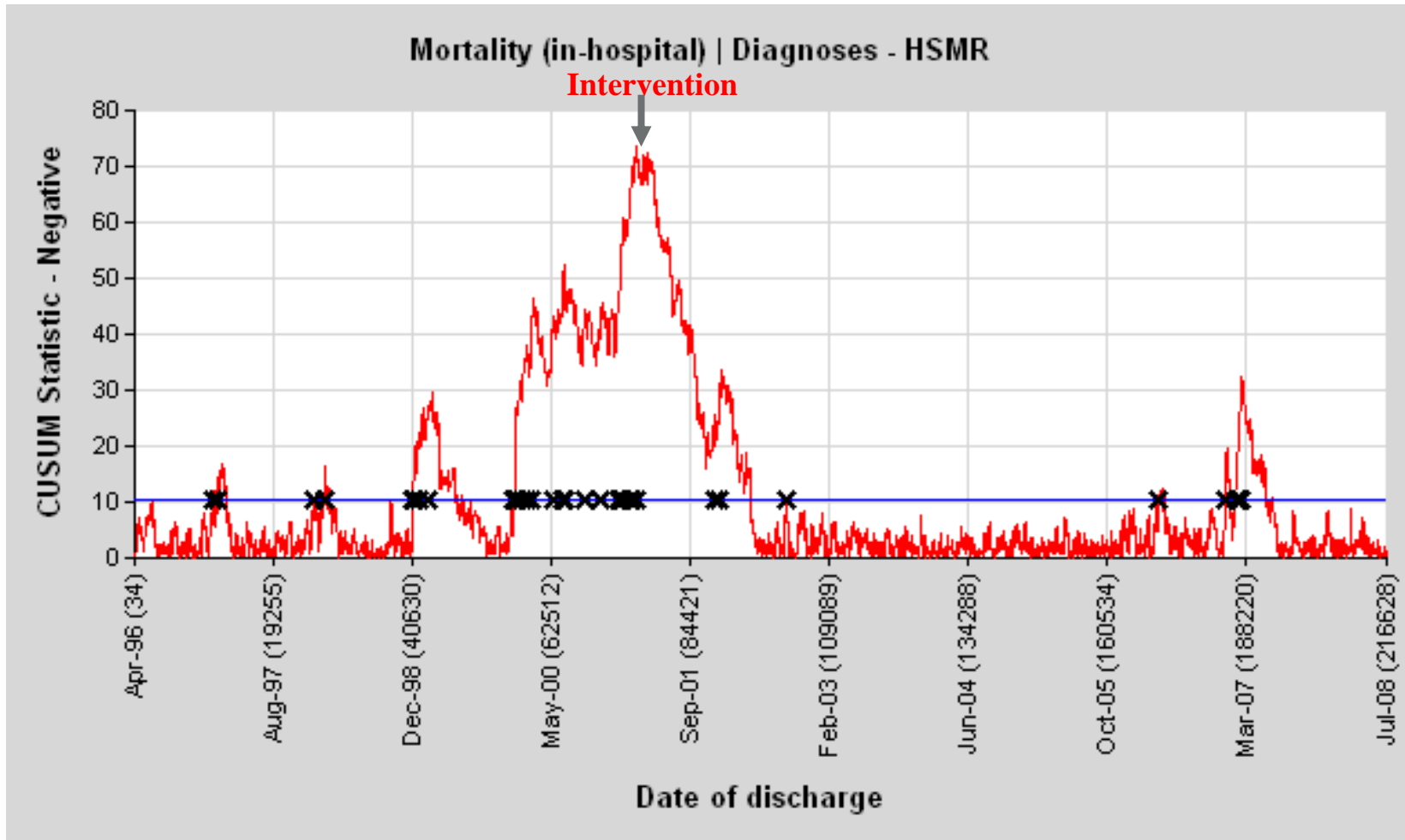
## Walsall change of HSMR – intervention started in 2001



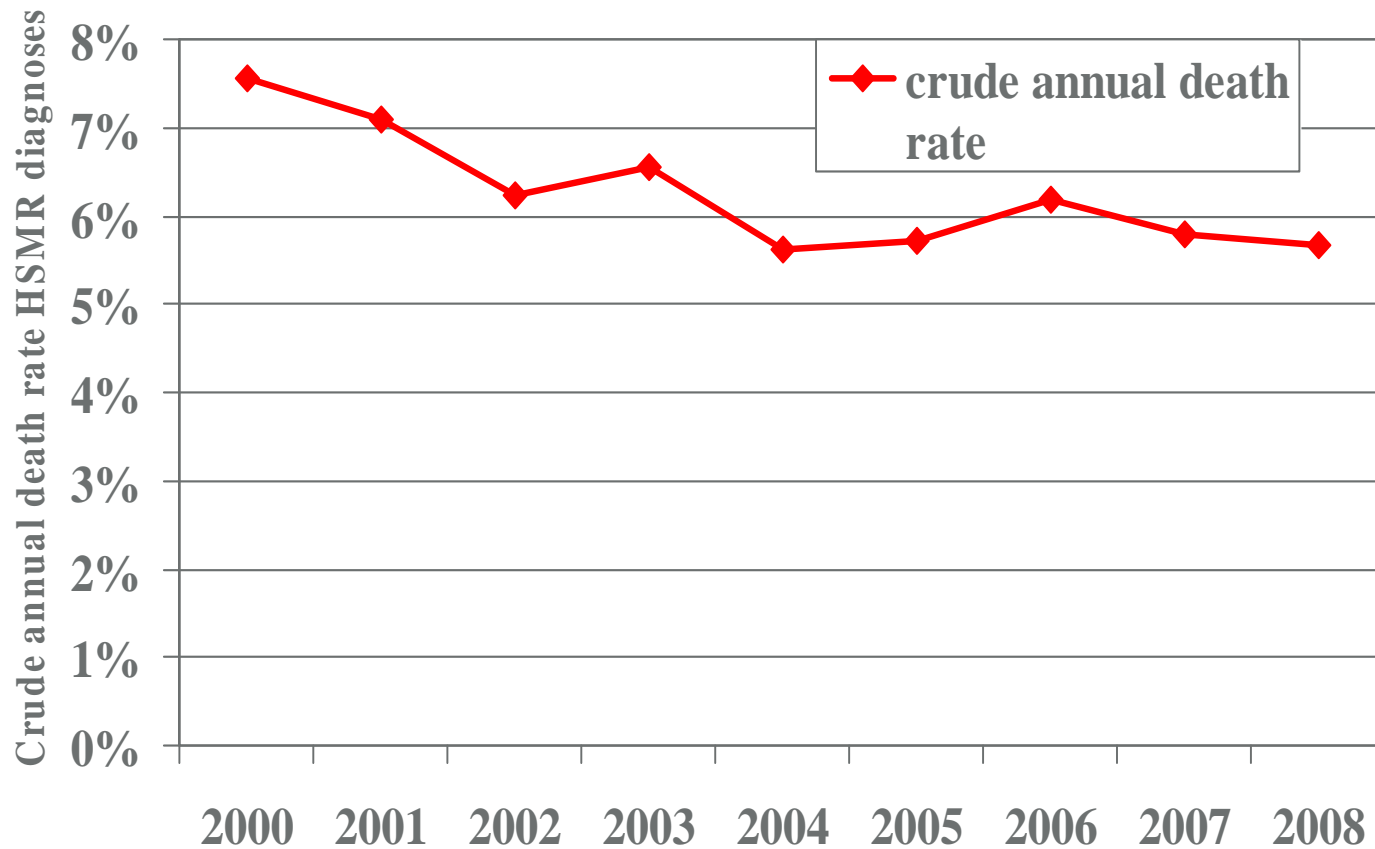
Mortality (in-hospital) | Diagnoses - 56 HSMR groups



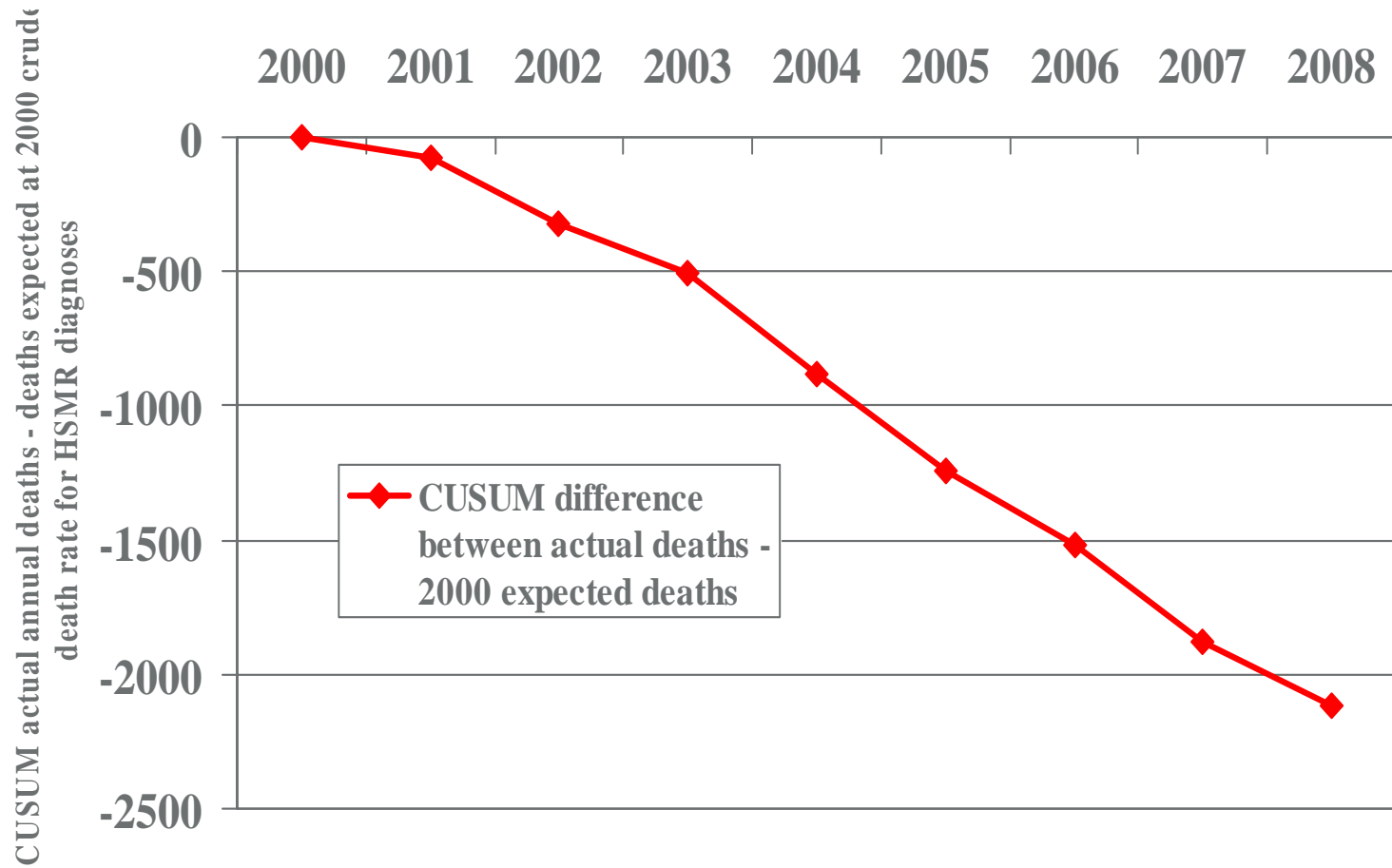
# Walsall HSMR cusum analysis – intervention started after HSMRs published Jan 2001



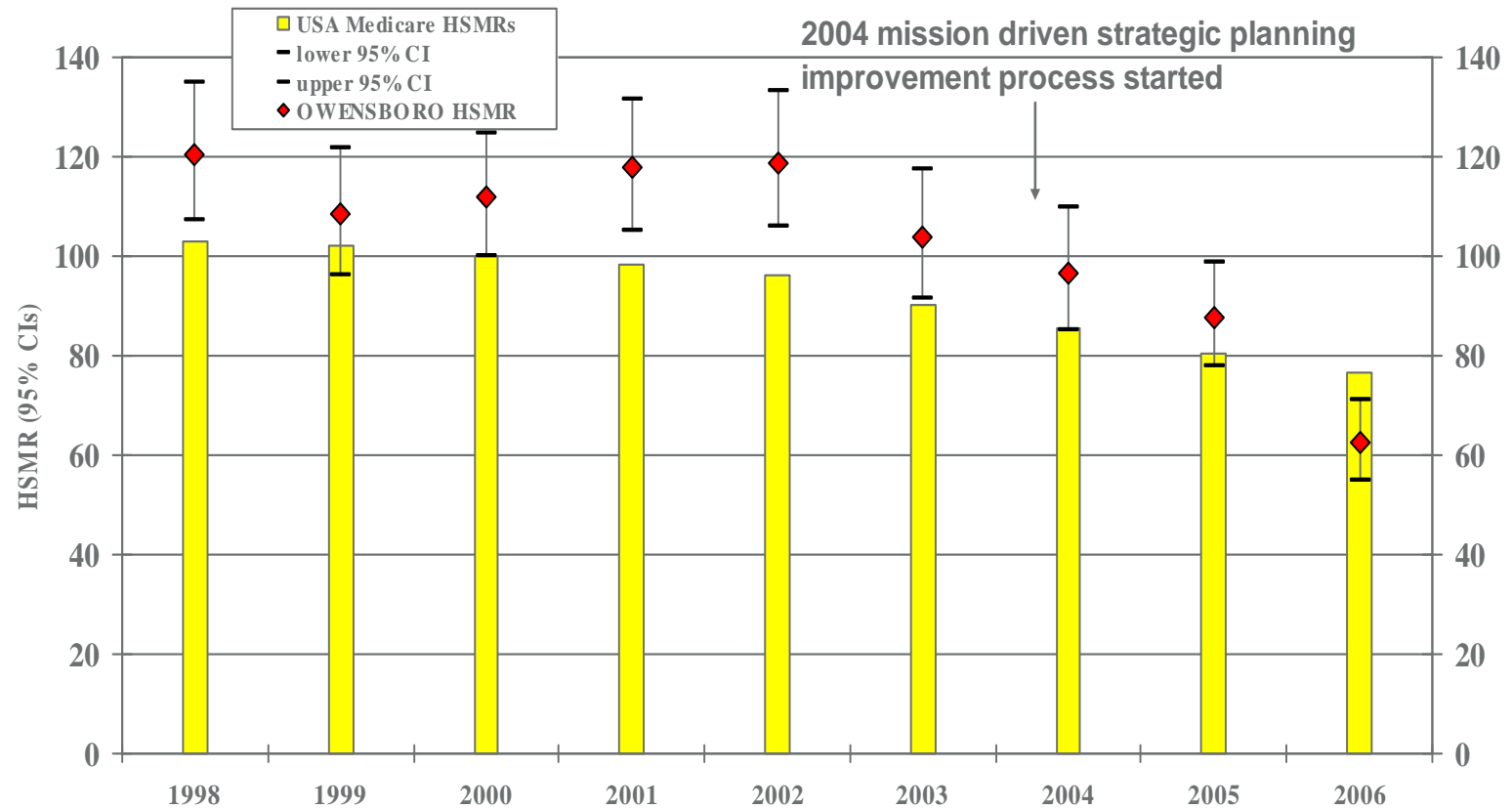
Walsall annual death rate for HSMR diagnoses



Walsall CUSUM actual annual actual deaths - deaths expected at 2000 crude death rate for HSMR diagnoses

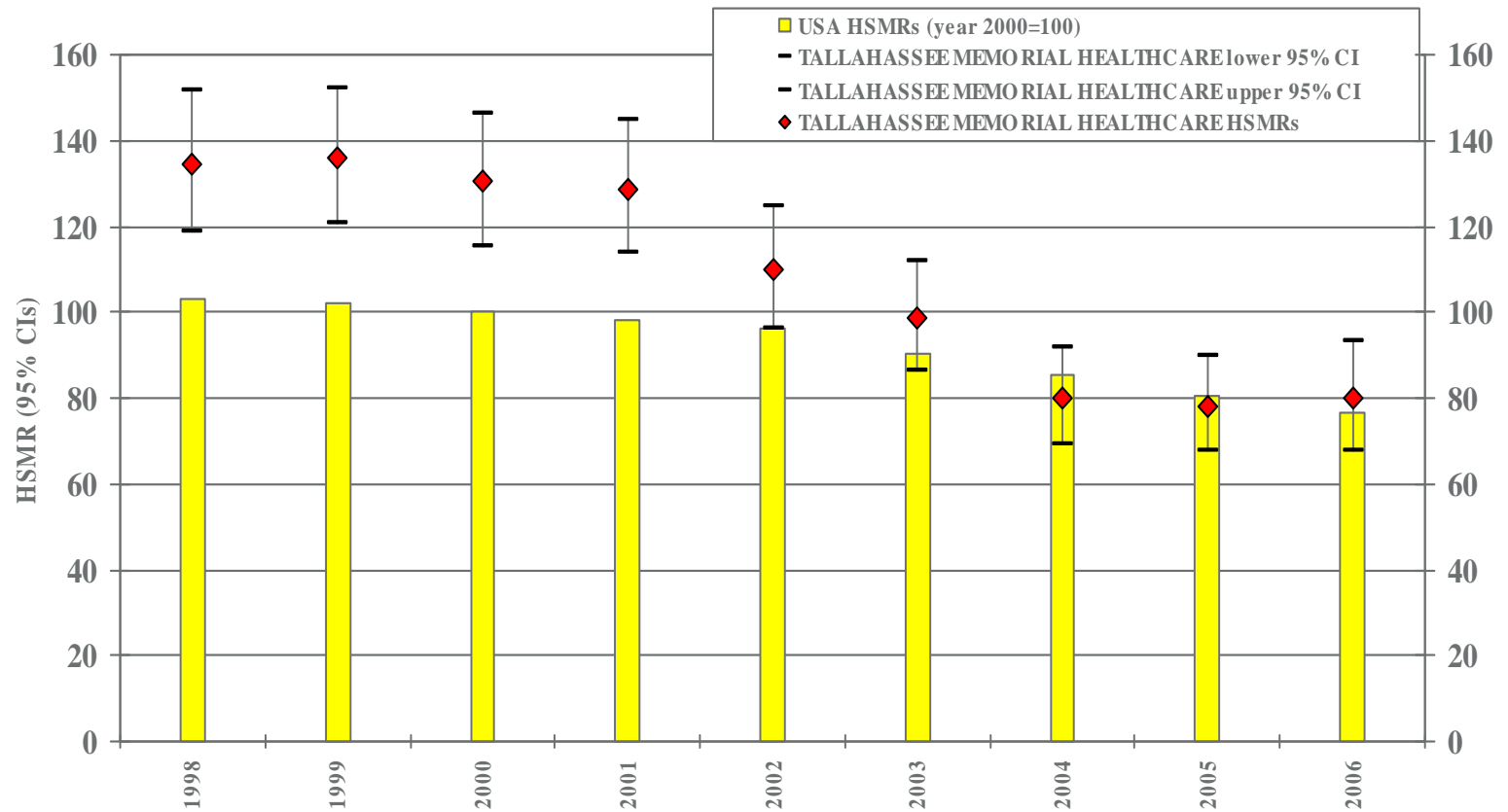


## Owensboro medical Health System, Owensboro, KY

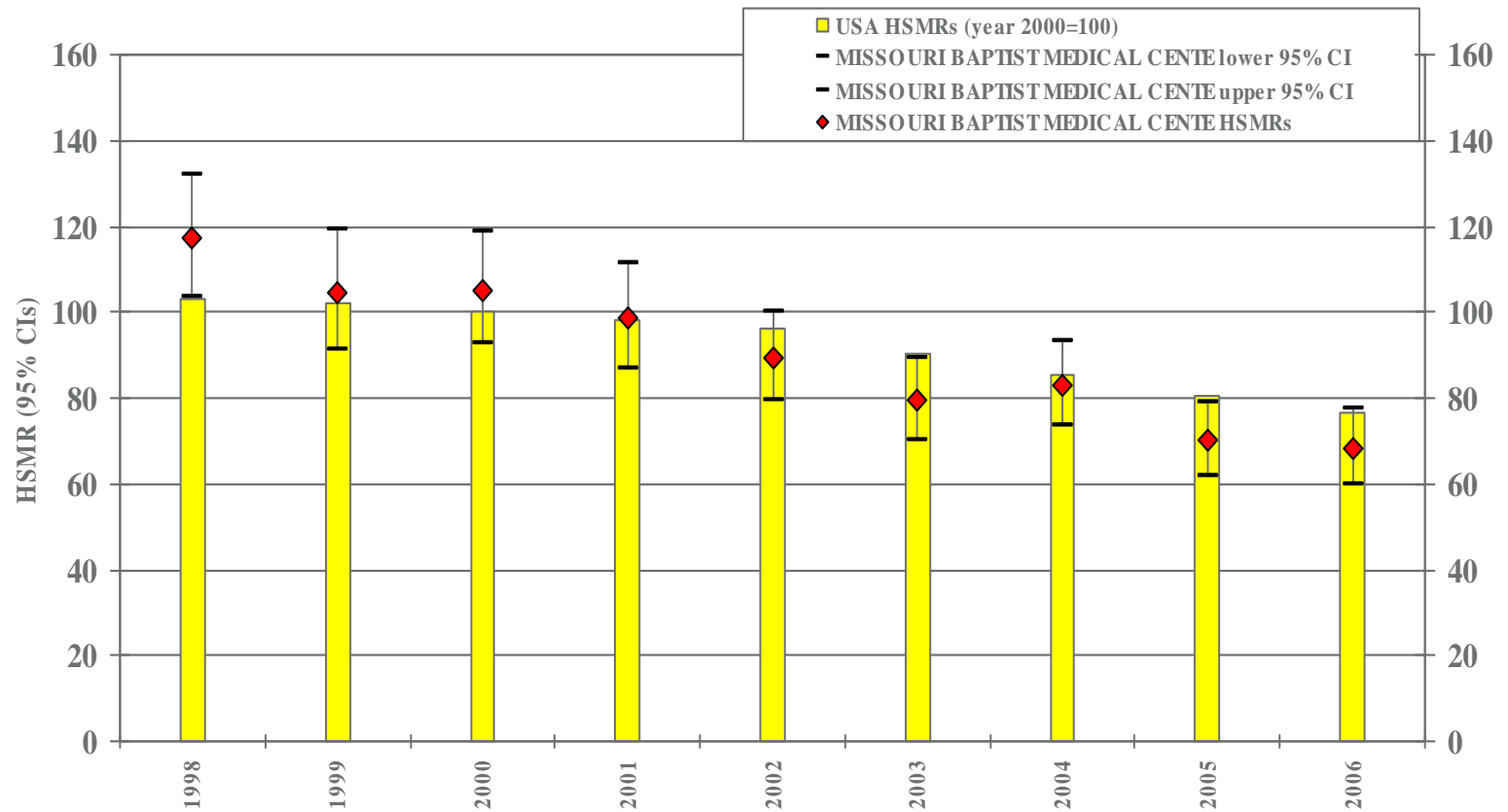


# TALLAHASSEE MEMORIAL HEALTHCARE

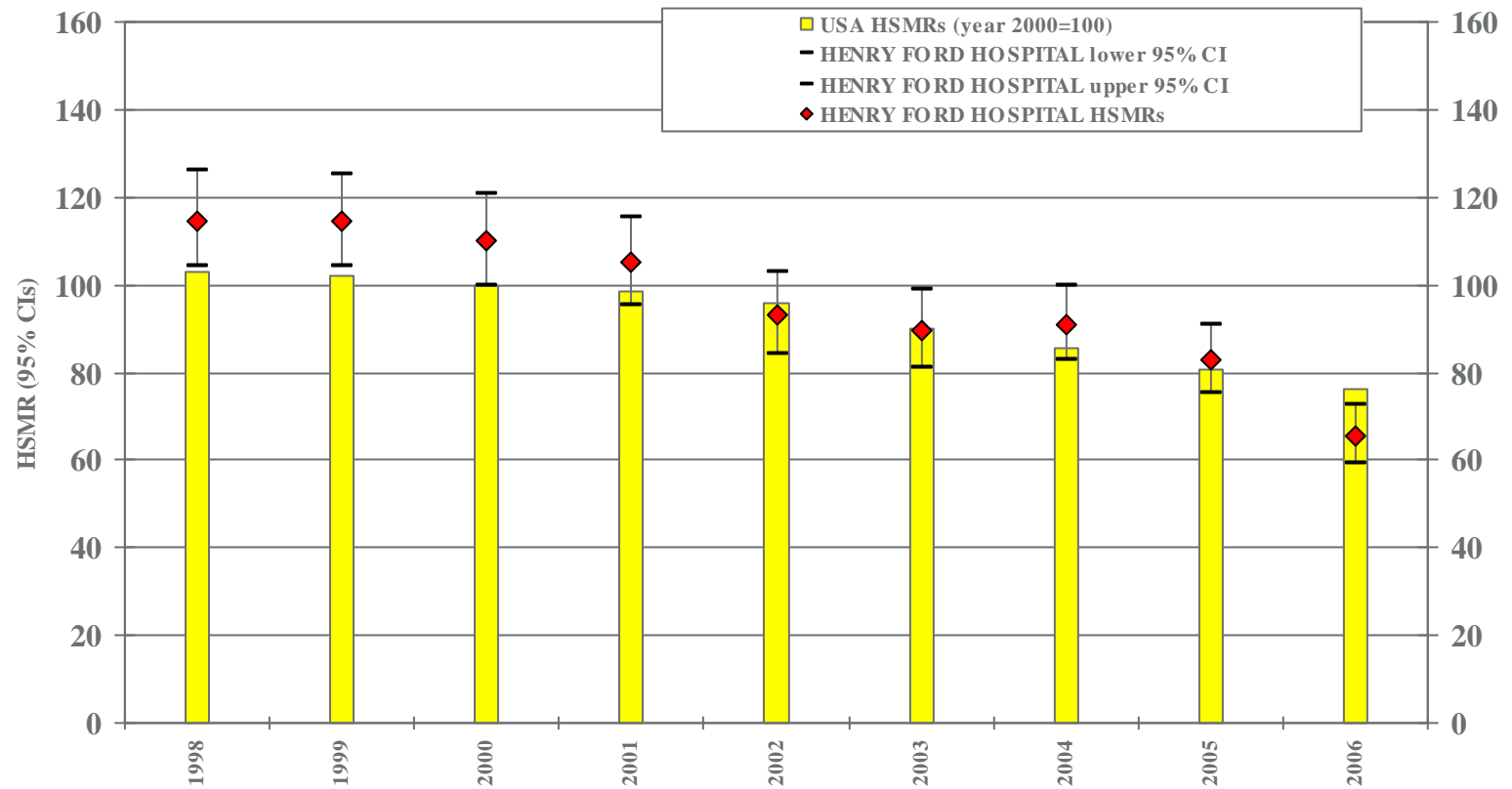
## regression-adjusted HSMRs - 2002 interventions started



# MISSOURI BAPTIST MEDICAL CENTER, regression-adjusted HSMRs



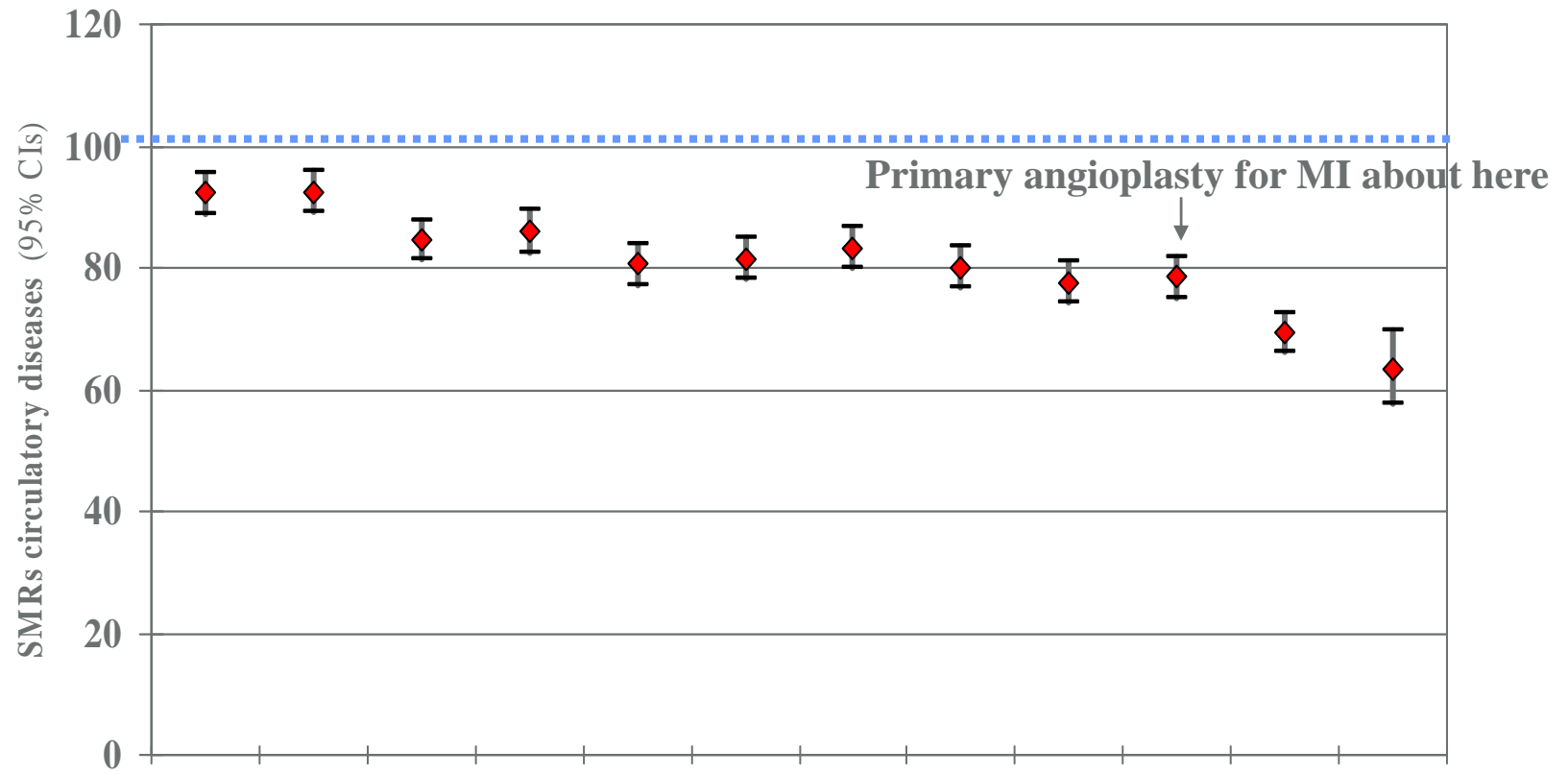
# Henry Ford hospital, non-regression adjusted HSMRs





## London Teaching Hospital Trusts\* - circulatory diseases SMRs (England = 100 each year)

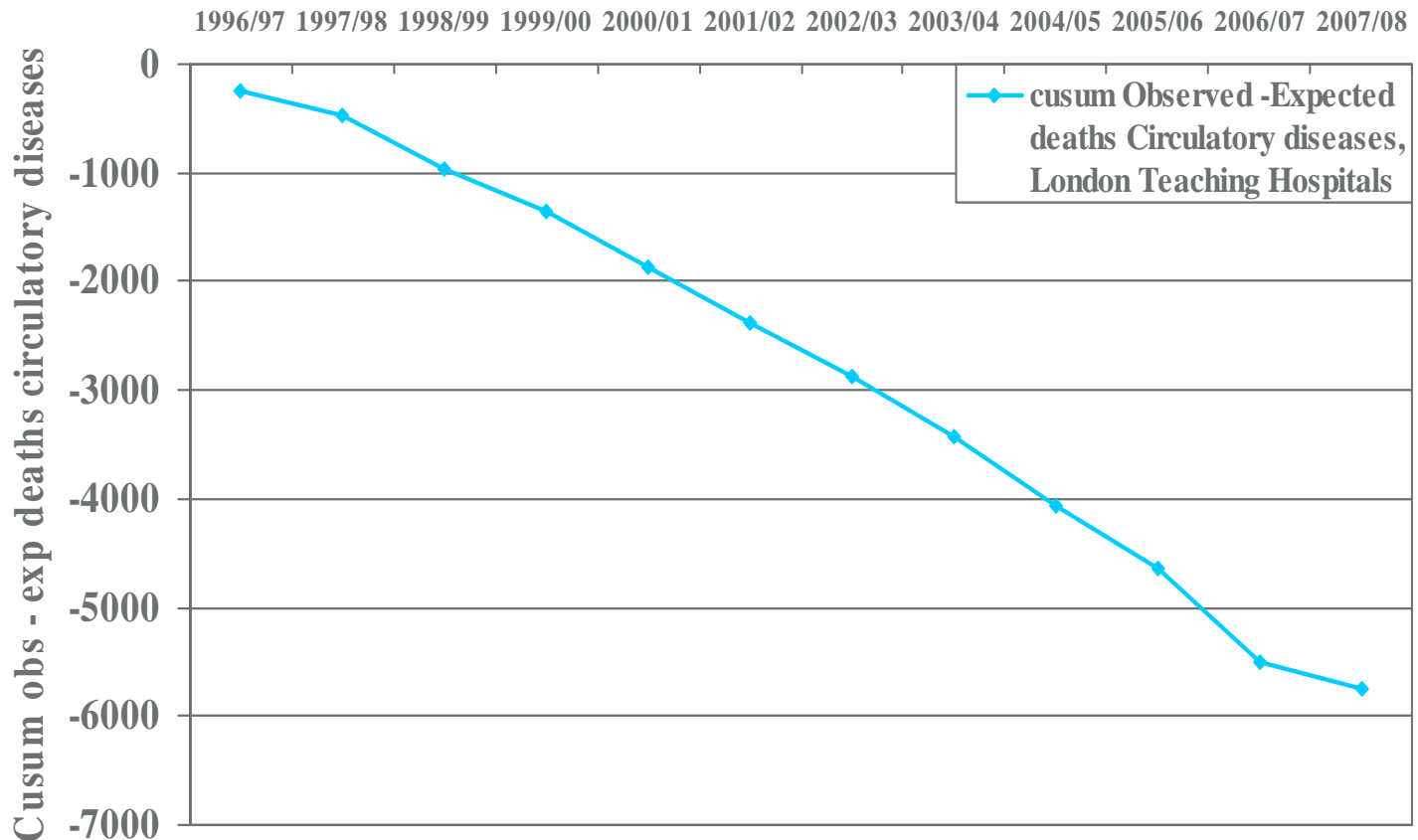
Source: B. Jarman, Dr Foster Unit, Faculty of Medicine, Imperial College London. Based on HES data



\*St Mary's, St George's, King's College Hospital, Guy's and St Thomas, Royal Free, Bart's, Chelsea and Westminster, Hammersmith

London Teaching hospitals\*, Circulatory diseases  
CUSUM Observed - Expected deaths from 1996 to 2007  
Comparison with expected deaths based on England overall as norm

Source: B. Jarman, Dr Foster Unit, Faculty of Medicine, Imperial College London. Based on HES data



\* St Mary's, St George's, King's College Hosp, Guy's & St Thomas', Royal Free, UCL, Barts & The London, Chelsea & Westminster, Hammersmith