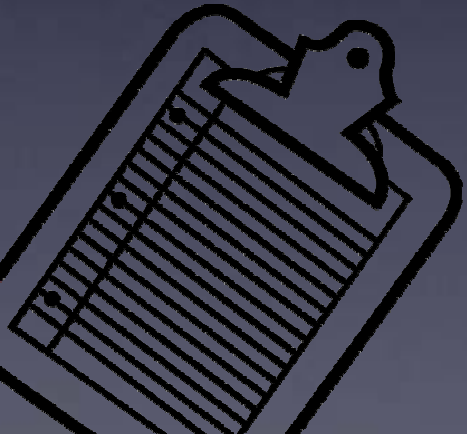
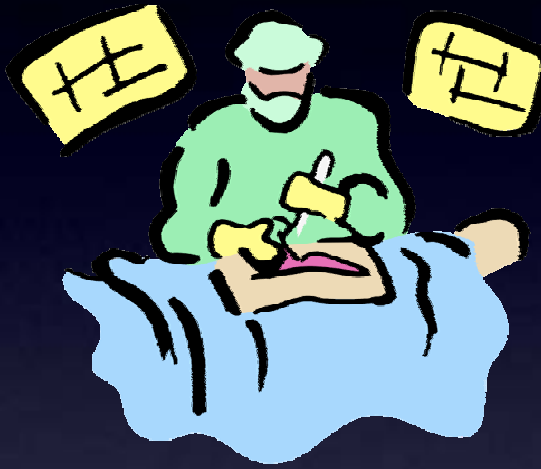


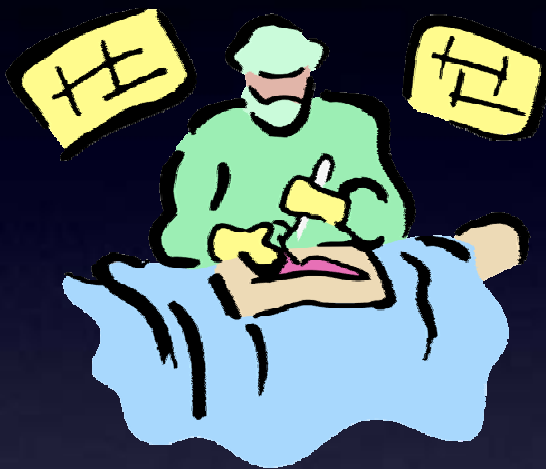
Validation of the Hospital Outcome Prediction Equation (HOPE) Model

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Dr John Santamaria (SVHM), Prof Frank Shann (RCH)

Clinical Indicators
For
Internal Medicine

?





Risk-adjustment

Data

Variable	Source: VAED field	Surrogate for
Male sex	Sex	Sex-related risk
Age (years)	Date of birth	Pre-admission risk
Nursing-home care resident	Admission Source	Pre-admission risk
Unplanned admission	Admission Type	Severity of illness
Inter-hospital transfer	Admission Source	Severity of illness
Hospital peer group	Hospital code	Casemix
Primary diagnosis (ICD-10)	Diagnosis (n=160)	Casemix
In-hospital death	Discharge Destination	Patient outcome

Dataset for HOPE model	Development	Validation
Date range	1/7/2004 – 30/6/2005	1/7/2005 – 30/6/2006
Number of episodes	379,676	384,480
Age (years)	59.0 [58.9- 59.2]	59.5 [59.5-59.6]
Sex: male	186,101 (49.0%)	191,136 (49.7%)
Unplanned (emergency)	252,458 (66.5%)	257,066 (66.9%)
Inter-hospital transfer	21,544 (5.7%)	22,416 (5.8%)
Nursing-home-care resident	3,193 (0.8%)	2,677 (0.7%)
In-hospital mortality	9,364 (2.5%)	9,493 (2.5%)

Inpatient Outcome Prediction Equation

1.Age (years)

2.Aged-care resident (B)

3.Inter-hospital transfer (C)

4.Diagnosis (D; n=95)

5.Emergency admission (E)

6.Sex (M)

•Predicted mortality risk: $p = e^y / (e^y + 1)$

where: $y = 0.05 \times \text{Age} + B + C + D + E + M - 8.25$

How reliable?

1. **DISCRIMINATION** (sensitivity & specificity)

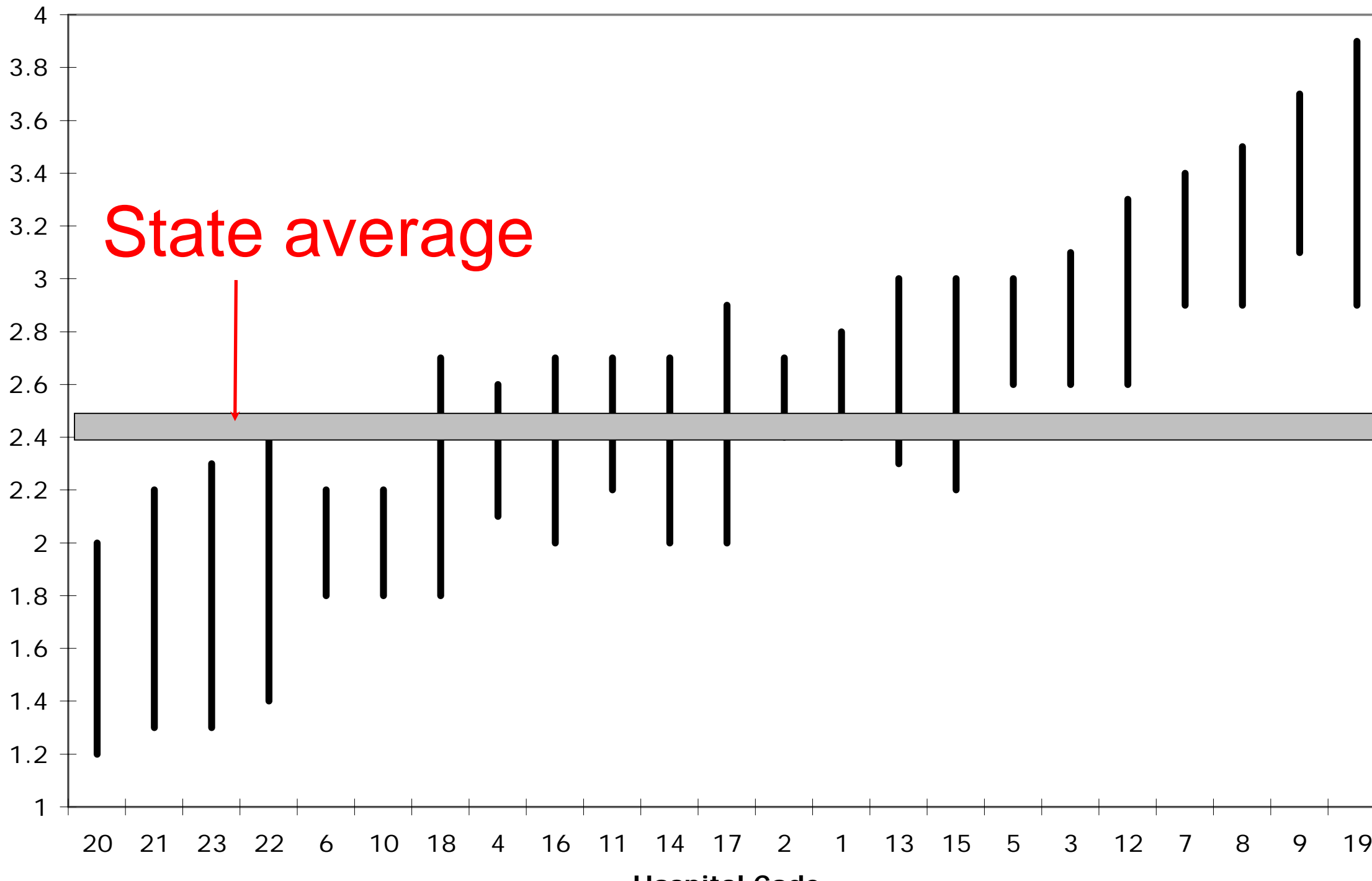
- Area under ROC plot > 0.8

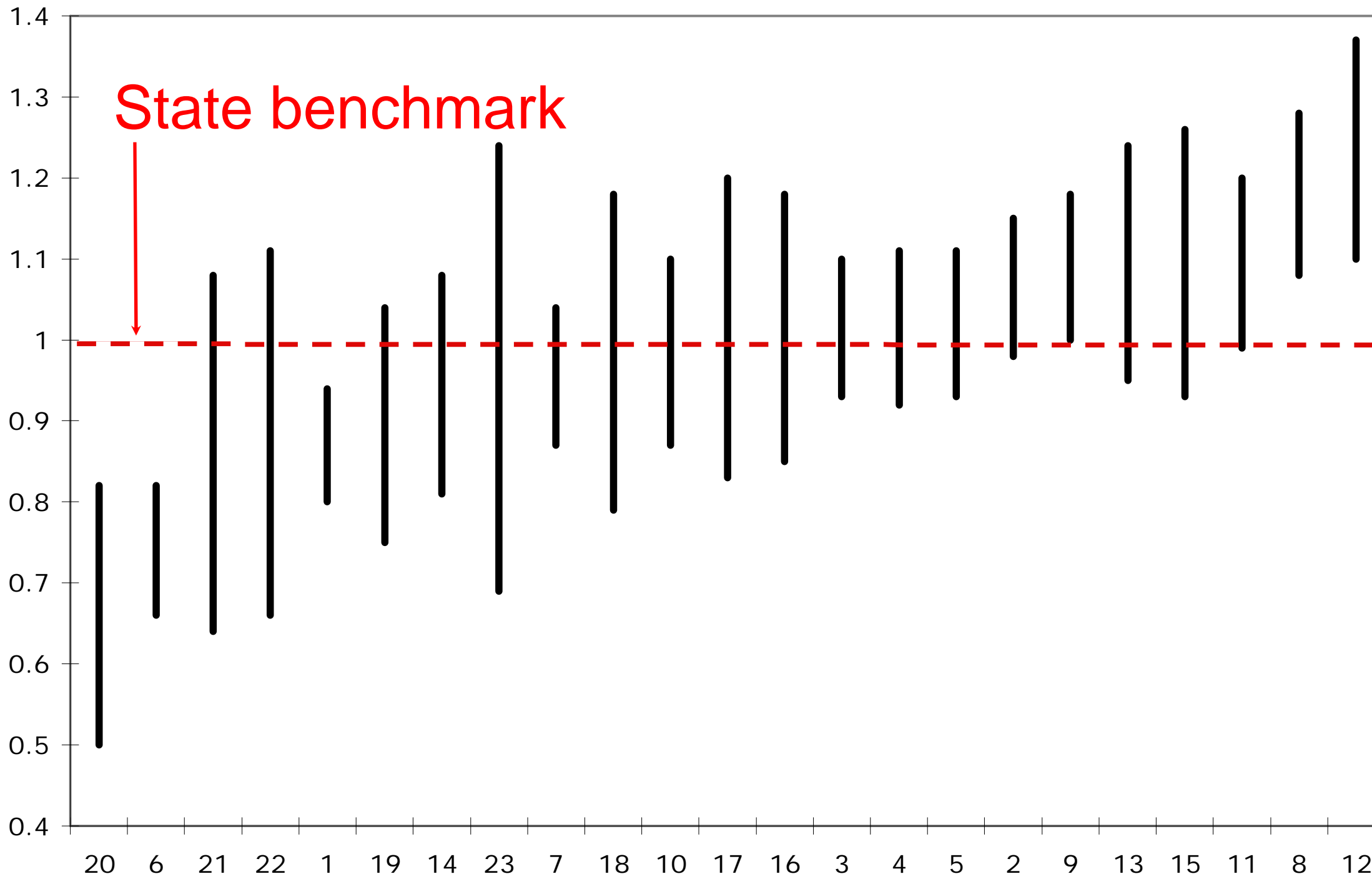
2. **CALIBRATION** (predictive accuracy)

- Overall: SMR \approx 1.0
- 10-row contingency table:

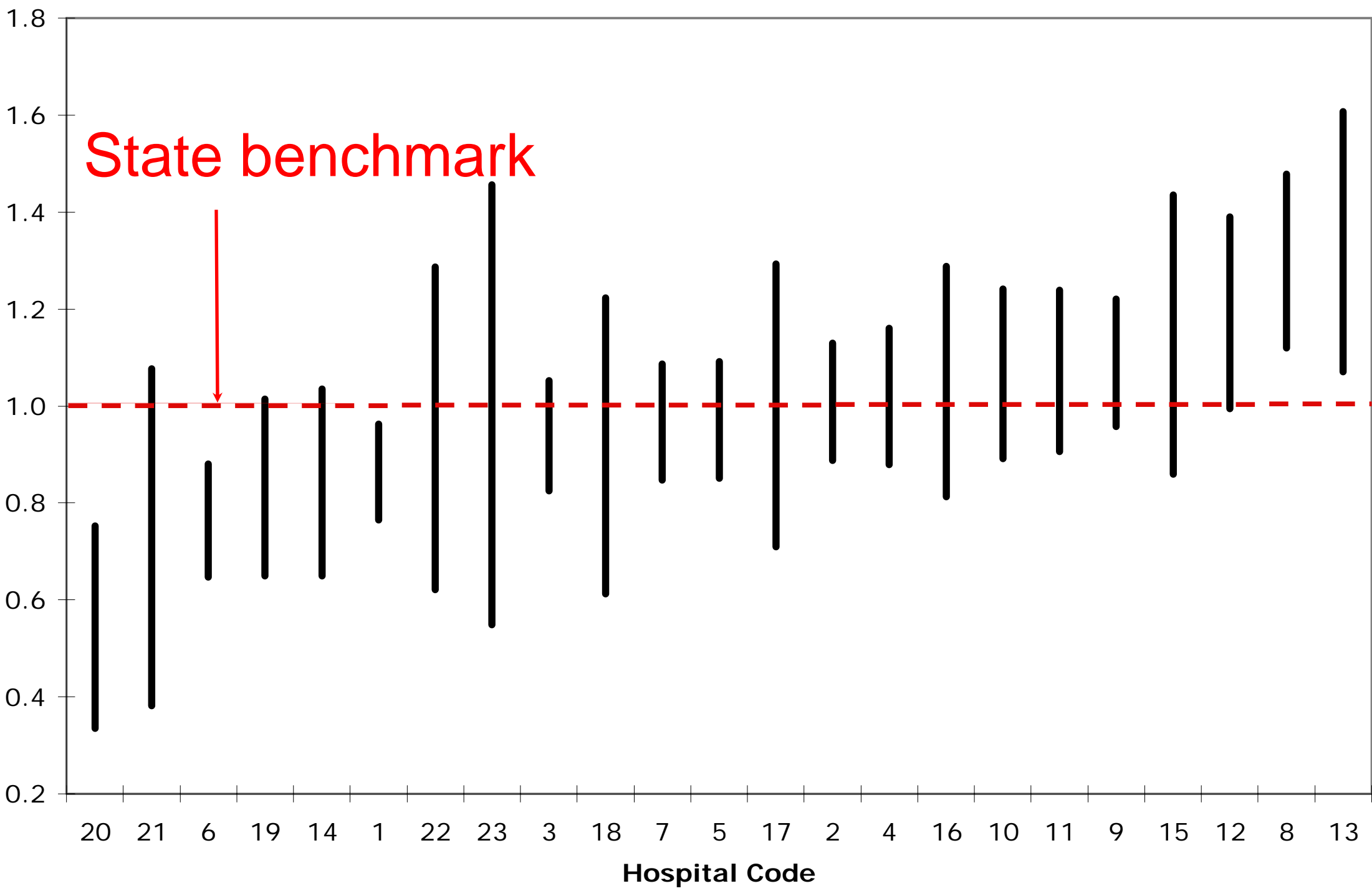
Hosmer-Lemeshow $X^2 < 15.6$ ($p > 0.05$)

AL MODEL			>0.80	~1.0	<15.6	>0.05
Capital 1	25,032	2.4-2.8	0.83-0.85	0.80-0.94	5.37	0.72
Capital 2	24,410	2.4-2.7	0.85-0.87	0.98-1.15	13.73	0.09
Capital 3	21,305	2.6-3.1	0.83-0.86	0.93-1.10	24.95	0.002
Capital 4	19,569	2.1-2.6	0.88-0.90	0.92-1.11	10.99	0.20
Capital 5	19,395	2.6-3.0	0.86-0.88	0.93-1.11	9.89	0.27
Capital 6	18,780	1.8-2.2	0.87-0.90	0.66-0.82	23.17	0.003
Capital 7	17,605	2.9-3.4	0.85-0.87	0.87-1.04	3.99	0.86
Capital 8	16,980	2.9-3.5	0.87-0.89	1.08-1.28	10.56	0.23
Capital 9	16,590	3.1-3.7	0.84-0.87	0.99-1.18	12.99	0.11
Capital 10	15,178	1.8-2.2	0.89-0.92	0.87-1.10	11.36	0.18
Capital 11	14,010	2.2-2.7	0.86-0.89	0.99-1.10	12.18	0.14
Capital 12	11,287	2.6-3.3	0.87-0.89	1.10-1.37	12.54	0.13
Capital 13	9,102	2.3-3.0	0.84-0.88	0.95-1.24	11.66	0.17
Capital 14	8,076	2.0-2.7	0.83-0.87	0.81-1.08	13.15	0.11
Capital 15	6,728	2.2-3.0	0.86-0.90	0.93-1.26	8.63	0.37
Capital 16	6,565	2.0-2.7	0.83-0.88	0.85-1.18	5.18	0.74
Capital 17	5,070	2.0-2.9	0.86-0.90	0.83-1.20	5.21	0.74
Capital 18	4,948	1.8-2.7	0.85-0.89	0.79-1.18	8.74	0.36
Capital 19	4,731	2.9-3.9	0.73-0.80	0.75-1.04	18.48	0.02
Capital 20	4,289	1.2-2.0	0.82-0.90	0.50-0.82	13.71	0.09
Capital 21	3,564	1.3-2.2	0.84-0.91	0.64-1.08	5.86	0.66

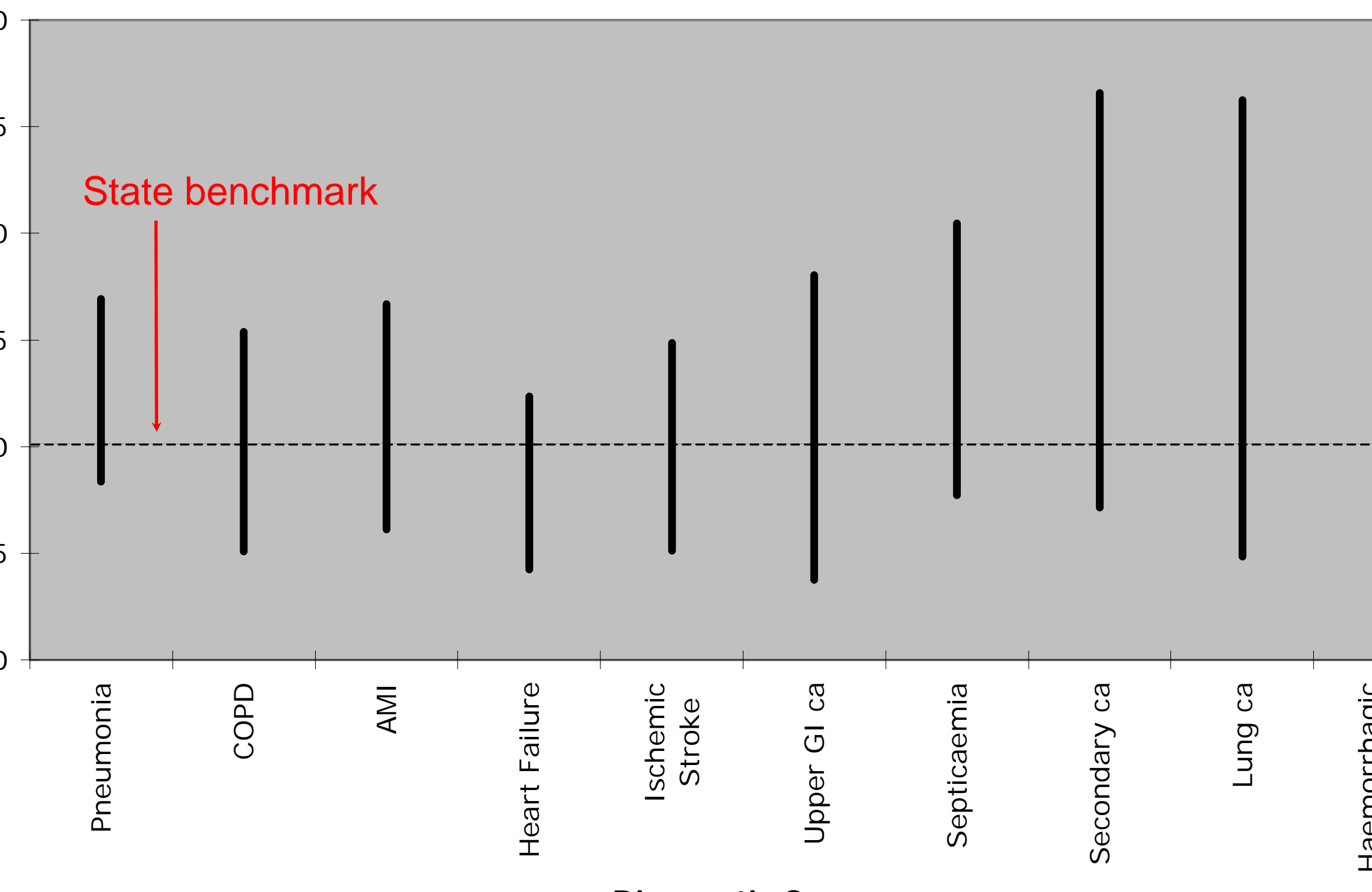




Description	ICD-10AM Codes	Percent of all State admissions	Fatality Rate
Pneumonia	J100-J199	2.7%	7.2%
Stroke	I630-I699	1.3%	6.1%
Secondary malignancy	C760-C799	1.3%	5.8%
Myocardial infarction	I210-I219	2.4%	5.3%
Heart failure	I50-I599	1.9%	5.0%
Intracranial haemorrhage	I600-I629	0.4%	4.7%
Septicaemia	A40-A499	0.8%	4.4%
Chronic pulmonary disease	J400-J449	2.5%	4.0%
Respiratory malignancy	C30-C399	0.6%	3.1%
Upper gastrointestinal malignancy	C150-C219	1.1%	2.9%



Northern Hospital 2005-06. Standardised Mortality Rates



Equation (HOPE) model

1. State benchmarks from VAED

2. Application:

- Monitoring. Research. Accreditation.
- Global: whole-hospital
- Focused: diagnosis specific

Questions