Statistics 1B Interludes

11. Assessing performance using funnel plots

Comparing institutions without ‘league tables’

Mortality after fractured hip: traditional presentation using 95% confidence intervals

Funnel plot: an alternative to the ‘league table’
So what defines a funnel plot?

- Indicator \( y \) with ‘target’ \( t \) (the ‘null hypothesis’)
- Distribution of \( y \) (when in-control) depends on \( t \) and \( x \), where \( x \) is a measure of precision
- Plot \( y \) against \( x \)
- ‘Control limits’ (CL) are critical tail values of \( y \): for example \( y_u \) such that
  \[
P(Y > y_u | t, x) = 0.001
  \]
- Rejection regions for 2-sided tests
- NOT confidence intervals!
- Often use 95% (‘alert’) and 99.8% (‘alarm’)

The Bristol Inquiry into excess mortality

Outcomes for named surgeons now available for NHS
Framing

Useful to spot nonsense in the news
‘Three-fold variation’ in UK bowel cancer death rates
By Dominic Hughes
Health correspondent, BBC News

There is a big variation across the UK in the number of people who die from bowel cancer, figures show.

The death rate is lowest in the town of Royston, Lancashire, at one in 100,000 people, while the highest is found in Glasgow, at 31 in 100,000.

Bowel Cancer researchers say taking part in screening, awareness of symptoms and unhealthy diets probably all play a role in the variation.

Cardiac surgeons – New York State

‘Multiple comparisons’

- 5% of ‘average’ units will lie outside 95% control limits, by chance alone
- So if have 1000 institutions and 50 ‘high alerts’, expect 25 / 50 could be ‘false discoveries’
- Bonferroni – divide significance level by number of units
- Alternative approach - False Discovery Rate (FDR): proportion of discoveries that are deluded
- Neat statistical methods can control FDR
Fig. 1. CumulPr plot for the hospital-level data for New York State, 1999–2002. The circles denote the observed risk-adjusted mortality rates for each hospital, and the bars around these are 95% CIs. The dashed vertical lines represent the statewide mortality ratio of 2:1.