

## Comparison of Methods

- Two methods to measure same thing

*Blood glucose using Cobas & Yellow Springs*

*BP using ambulatory and conventional sphygmom.*

*Serum cholesterol with portable & lab based methods*

- Common to see scatter plot, correlation coefficient & p-value

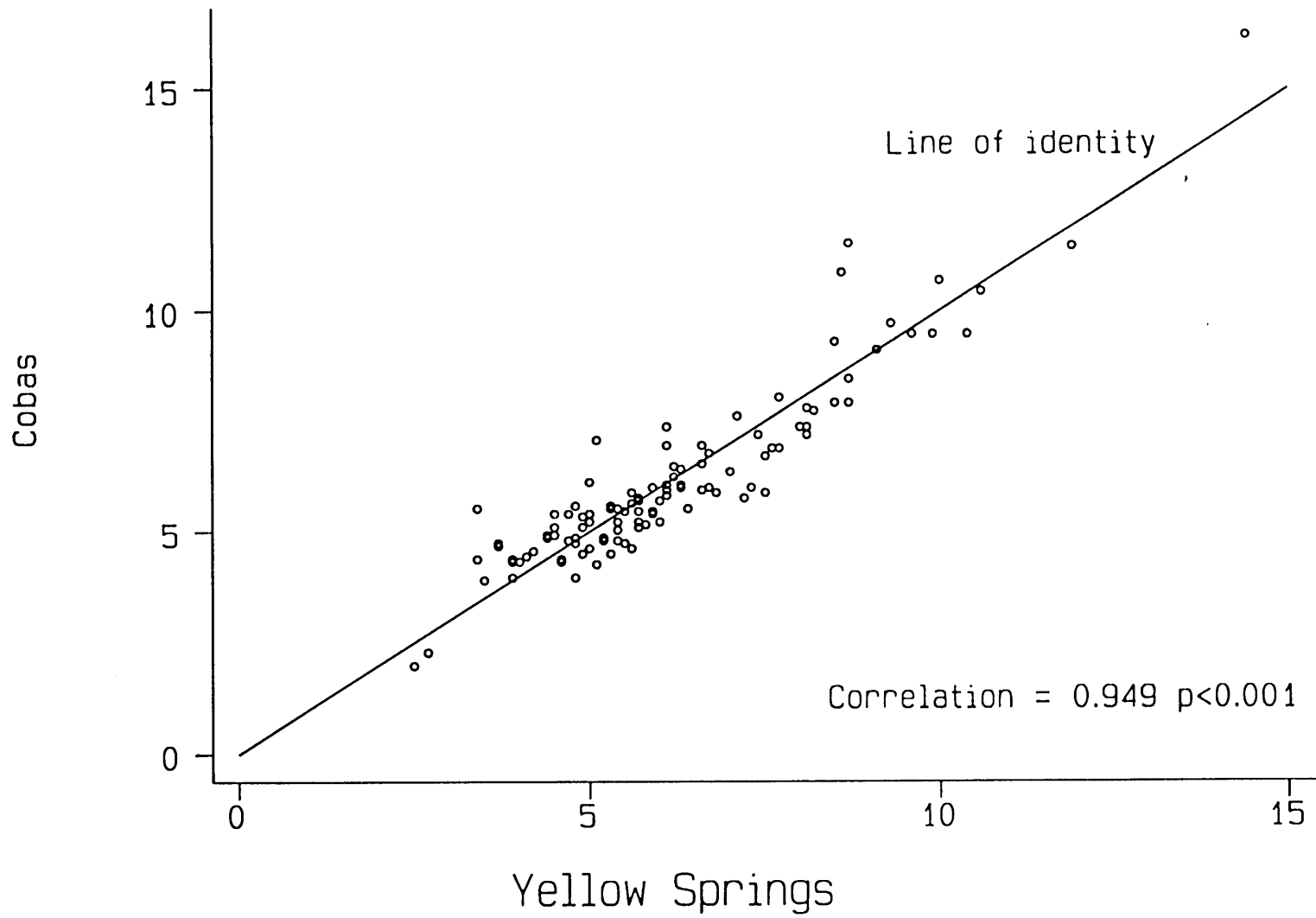
- Various problems with this:

→ p-value tests wrong hypothesis

→ correlation almost always very close to 1  
(value of 0.9 is quite poor here)

→ difficult to see important features

Glucose measurements



- 111 pairs of blood glucose measurements (one on Cobas, one YSI)

- Compute 111 differences Cobas - YSI

Mean = -0.01 SD = 0.746 (both in )

- Limits of agreement are therefore (-1.47, 1.45)

So value of 5.5 on YSI could be between 5.5-1.47 and 5.5+1.45 on Cobas

4.03      6.95

- No evidence of bias (t=-0.02, p=0.99)

- If there had been bias, could 'correct' one method relative to other

Bias (mean diff) of 1.2 means  
Cobas is systematically 1.2 higher than YSI

- How closely do methods agree?

(if I have a glucose of 5.62 on Cobas, what might it be on YSI?)

- associated question, is there a bias:  
is one method systematically higher?

Use method of Altman & Bland: Lancet, 1986, i, 307–310

- Look at differences between methods

- how big can difference be?

'limits of agreement'       $\text{mean} \pm 1.96 \times \text{SD}$

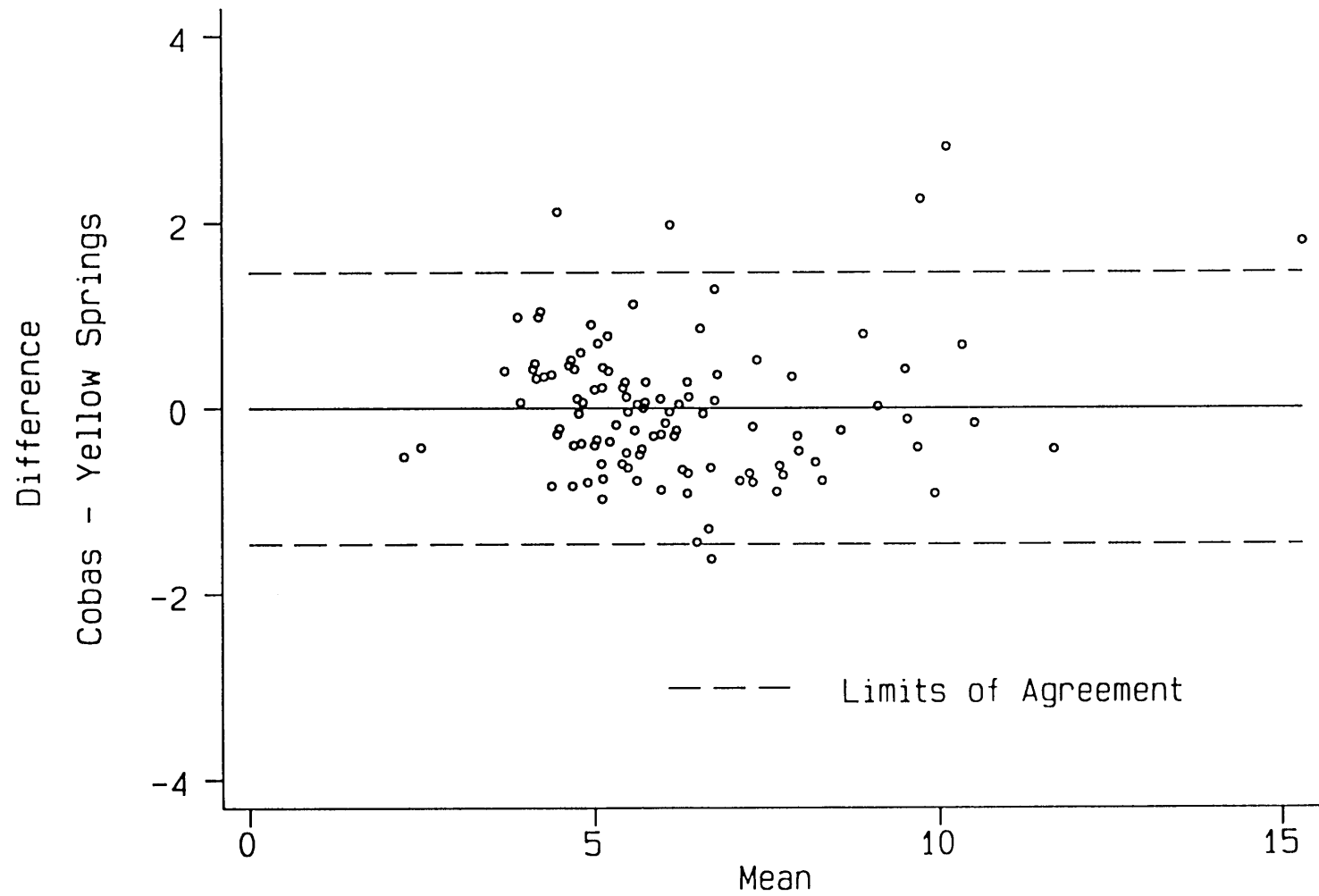
← (of differences)

- is there a bias?

t-test on differences

◇ Data on blood glucose from Dr DSF Matthews

# Glucose measurements



- What to conclude from limits of agreement of  $\pm 1.45$ ?
  - Not a statistical question
  - Technique designed to present data appropriately
  - Methods are in agreement if a discrepancy of 1.45 is of no clinical or practical importance.

This concludes the more important 'half' of the technique

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## Second Part of Method

- Degree of agreement may depend on amount of glucose
  
- Plot Difference versus Mean
  - Here 'Mean' is mean of each pair  
i.e  $(\text{Cobas} + \text{YSI}) / 2$
  
  - If spread in differences increases with mean, try logs
  
  - If there is a trend in graph, one method has higher SD than other