Urinary qualitative organic acid analysis: Differing analytical approaches and performance

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Scheme design

- Nine heat treated urine samples per year from real patients with differing metabolic disorders

- Participants are asked to:
  - Identify the major analytical findings
  - Indicate the most likely diagnosis
  - Suggest any further investigations needed to confirm or clarify the diagnosis

Samples circulated

- Maple syrup urine disease
- Propionic aciduria
- Medium chain acyl CoA dehydrogenase deficiency
- 4-hydroxybutyric aciduria
- DOPA metabolites
- 3-methycrotonyl CoA carboxylase defn
- Glutaric aciduria type 1
- Primay hyperoxaluria type 1
- D-glyceric aciduria
- Malonic acidria
- Methylmalonic aciduria
- Urea cycle disorder
- Fumarate hydratase deficiency

Samples circulated

- Isovaleric aciduria
- Mevalonic aciduria
- Multiple acyl CoA dehydrogenase deficiency
- 2-hydroxyglutaric aciduria
- Methyl glutaconic aciduria
- Ethylene glycol poisoning
- Phenylketonuria
- Pyroglutamic aciduria
- Dihydropyrimidine dehydrogenase deficiency
- Holocarboxylase synthetase deficiency
- Beta ketothiolase deficiency
- Valproate therapy

Scoring

- Satisfactory   2
- Helpful but incomplete   1
- Unhelpful   0
- Slightly misleading   -1
- Misleading   -2

Total annual achievable   **18**

Score and variation in performance – 10 years experience
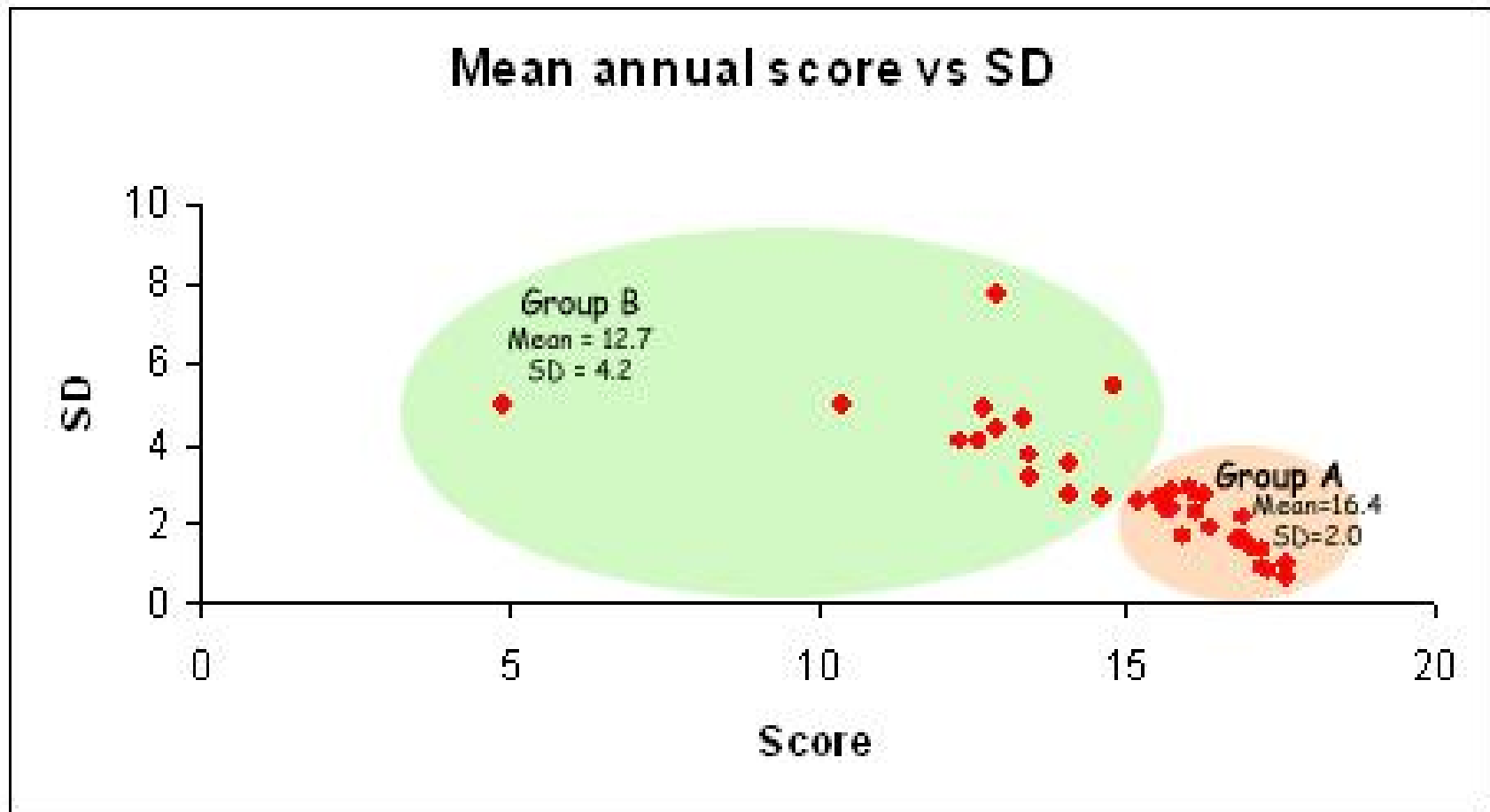
Methodological approaches

- **GCMS**   **82/84**
- **Ethylacetate extraction or similar**   **79/84**
- **TMS derivitisation**   **83/84**
- **Oximation**   **50/84**
- **Int std used**   **82/84**
- **Int QC used**   **50/84**
- **Average age of equipment**   **7.2 y**
- **Average number of peaks annotated**   **47**

Interpretative approaches

- **Extracted ion chromatograms used**   **71/84**
  to aid identification
- **Auto-naming software used**   **40/84**
- **Grade of staff used to annotate**   **18 non graduate**
  66 graduate
- **Regular staff rotation**   **25/84**
- **Grade of staff used to interpret**   **2 non graduate**
  82 graduate
- **Regular staff rotation**   **8/84**
- **Group vs Individual interpretation**   **29 vs 55**

Other analytical factors

- **Average length that the service has been offered**   **16 y**
- **Average annual workload (samples/y)**   **1046**
- **Average sample turnaround time**   **8d**
- **Out of hours service available**   **26/84**
- **Average cost (where stated)**   **113 Euro**
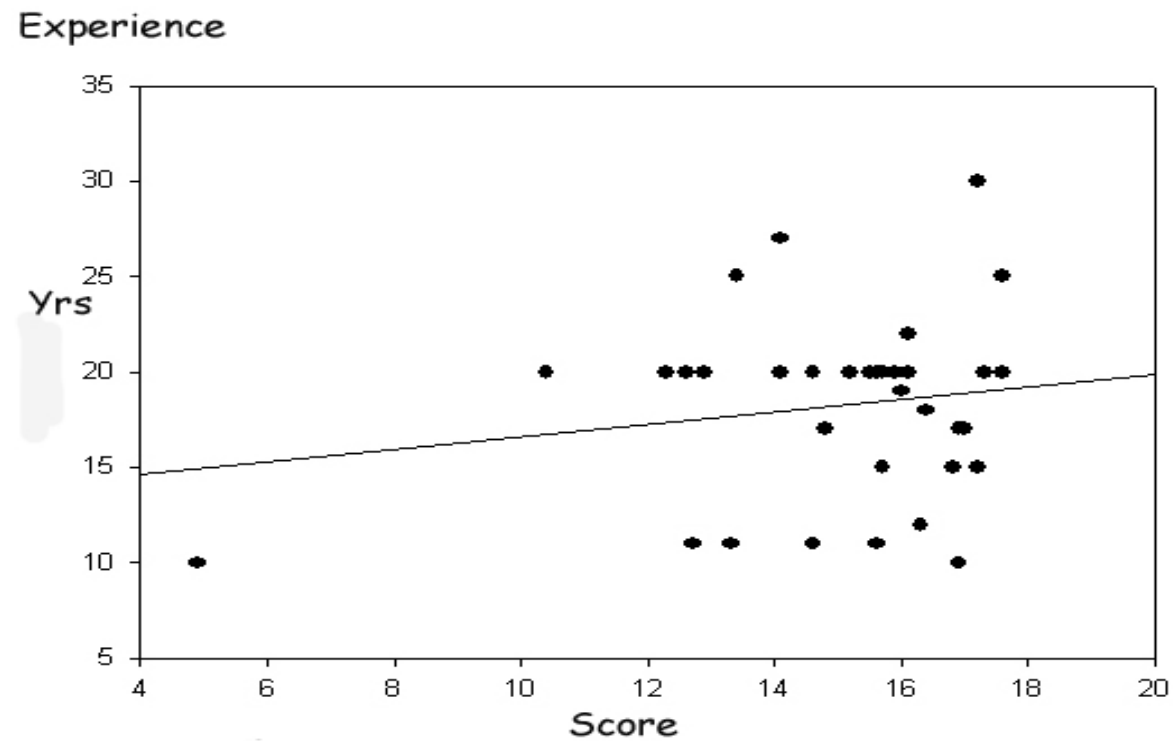
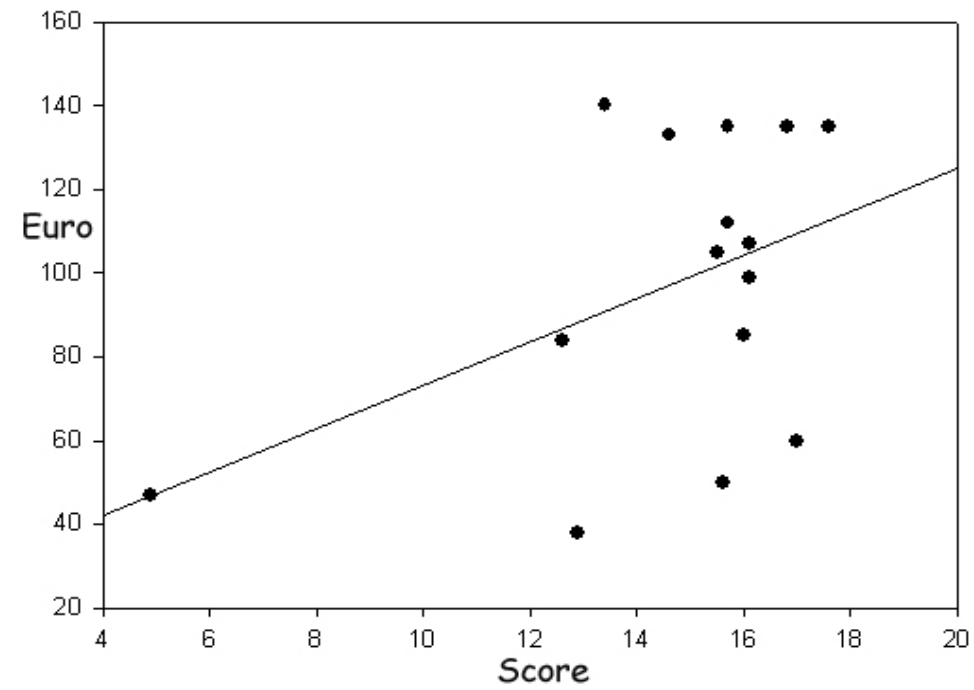# Workload vs Score

Annual workload vs Score
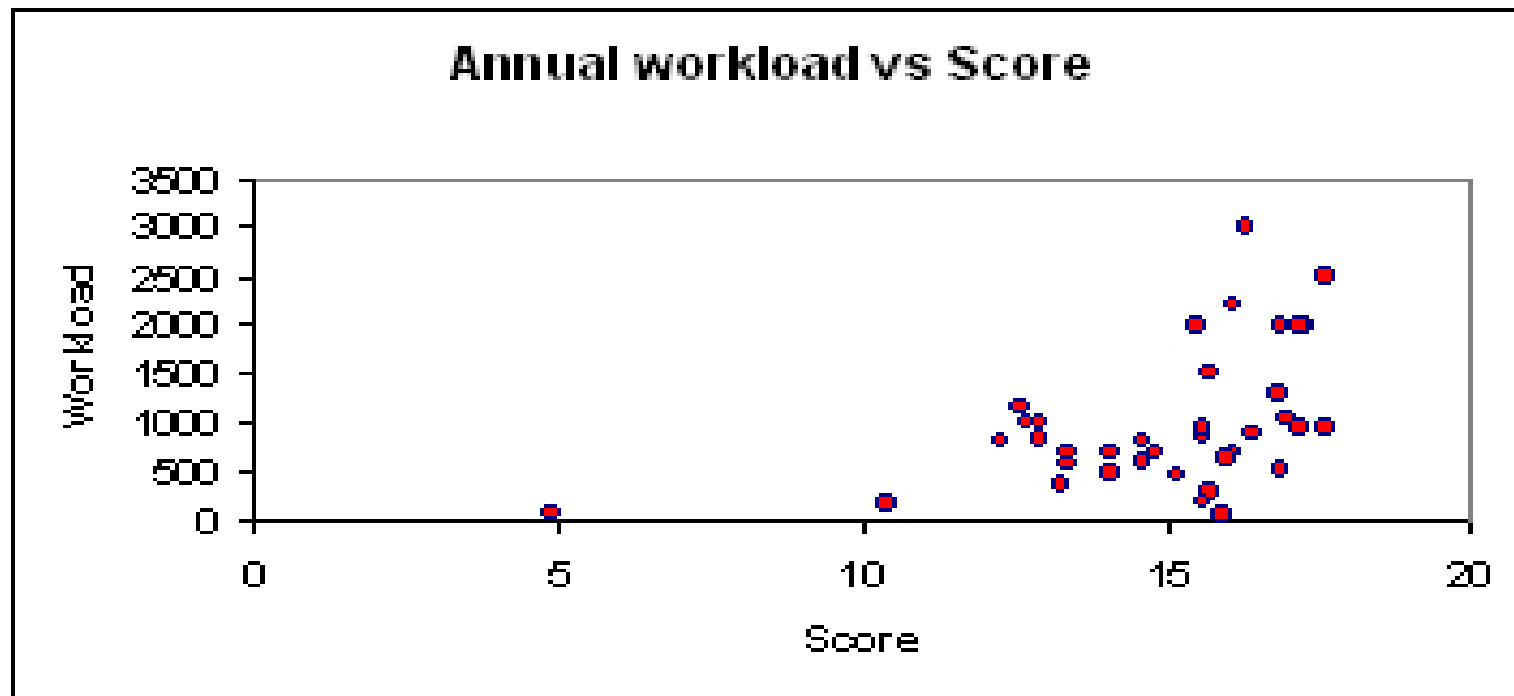
Number of peaks named vs Score
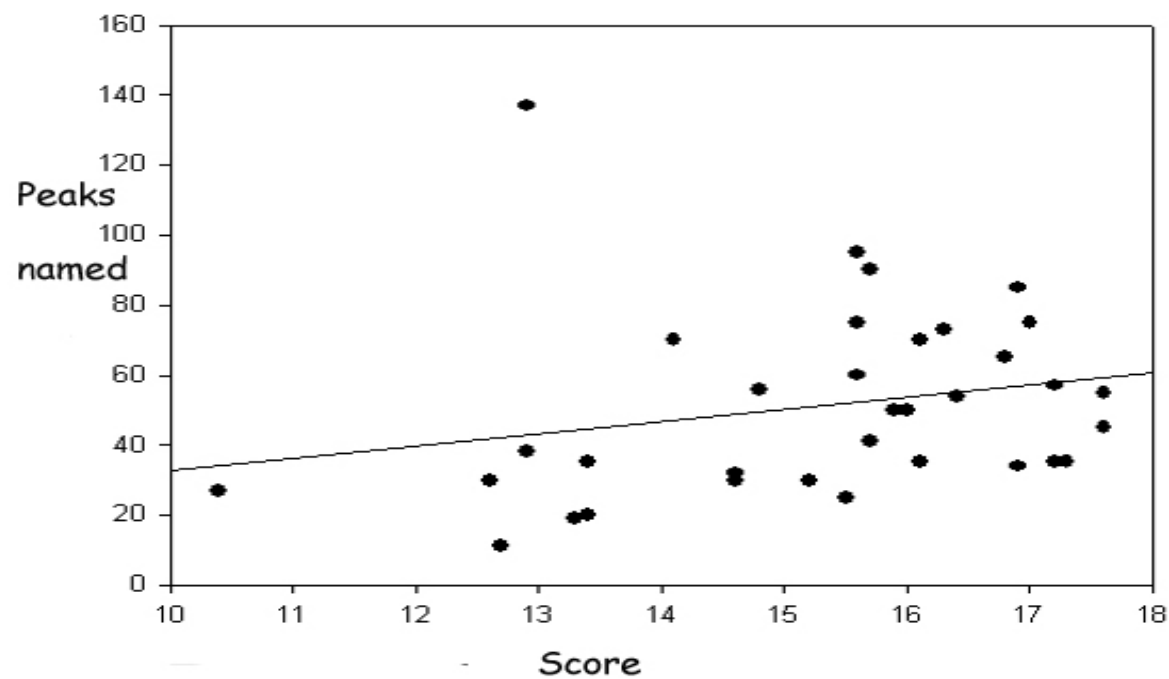
Years service offered vs Score

Assay cost

Factors without association

l No association with oximation

l No association with grade of staff or rotation

l No association with use of auto-naming software

l No association with group or individual interpretation

l No association with the spectral library used

l No association with the use of extracted ion chromatograms

l No association with the turnaround time offered

Conclusions

- There is a great deal of consistency of approach
- It is possible to do consistently badly
- Belong to an EQA scheme and take the results seriously
- Consider the need to offer a service very carefully if the annual workload is less than 500/annum
- Annotate exhaustively
- Do worry too much about the subtleties of approach but do whatever you do thoughtfully and carefully

SSIEM attendance