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Non-parametric Methods

Some Caveats...

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| **DDI** Data-Driven
Innovation

Outline

- Key reading – Bland and Altman (2009)
- Positive aspects
- Aspects requiring care...
- Conclusion

Bland, JM and Altman, DG (2009) Analysis of continuous data from small samples. BMJ 339, p961-962

Positive Aspects

- Useful tools for difficult analyses with substantial non-Normality
- Helpful with variables that are “scores”, e.g. from visual analogue scales or similar = limited range of values (1-5?) *
- Can have almost equal power to parametric equivalents when sample sizes large (but latter’s assumptions are less critical there).

* Note that tests will have to adjust for ***ties*** (equal values -> equal ranks), so can be some complexity from this.

Aspects requiring care...

- Non-parametric methods focus on hypothesis testing
- Don't estimate useful numerical quantities (e.g. difference in means in 2-sample problem)
- Confidence intervals not straightforward:
 - can be calculated for median/ difference in medians etc
 - not intrinsic to test (not constructed in terms of median)
 - needs extra assumptions (symmetric distribution, differ only in median)
 - assumptions almost as strong as for t-test!

- Power with small samples is a big issue
 - See Bland & Altman (2009)
 - E.g. Mann-Whitney test cannot ever produce $p < 0.05$ for comparison of 2 groups, each with 3 observations.
- Be sceptical of any statement: “Non-parametric methods needed for small samples” – methods at most inefficient here.

Conclusion

- Non-parametric methods have some useful applications
- Weaknesses for small samples
- More limited/ restricted than parametric methods
- Care required in their use