



RiCORE workshop

Dunkeld, Perthshire

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www.sams.ac.uk

What is SAMS

- SAMS is the Scottish Association for Marine Science
- Multidisciplinary research institution and partner of the University of the Highlands and Islands
- Based on the west-coast of Scotland, near Oban. ~170 staff
- Large team (~20) involved in marine renewable energy developments

“Turning off the DRIP – a step change in addressing the ecological impacts of marine renewable energy developments”

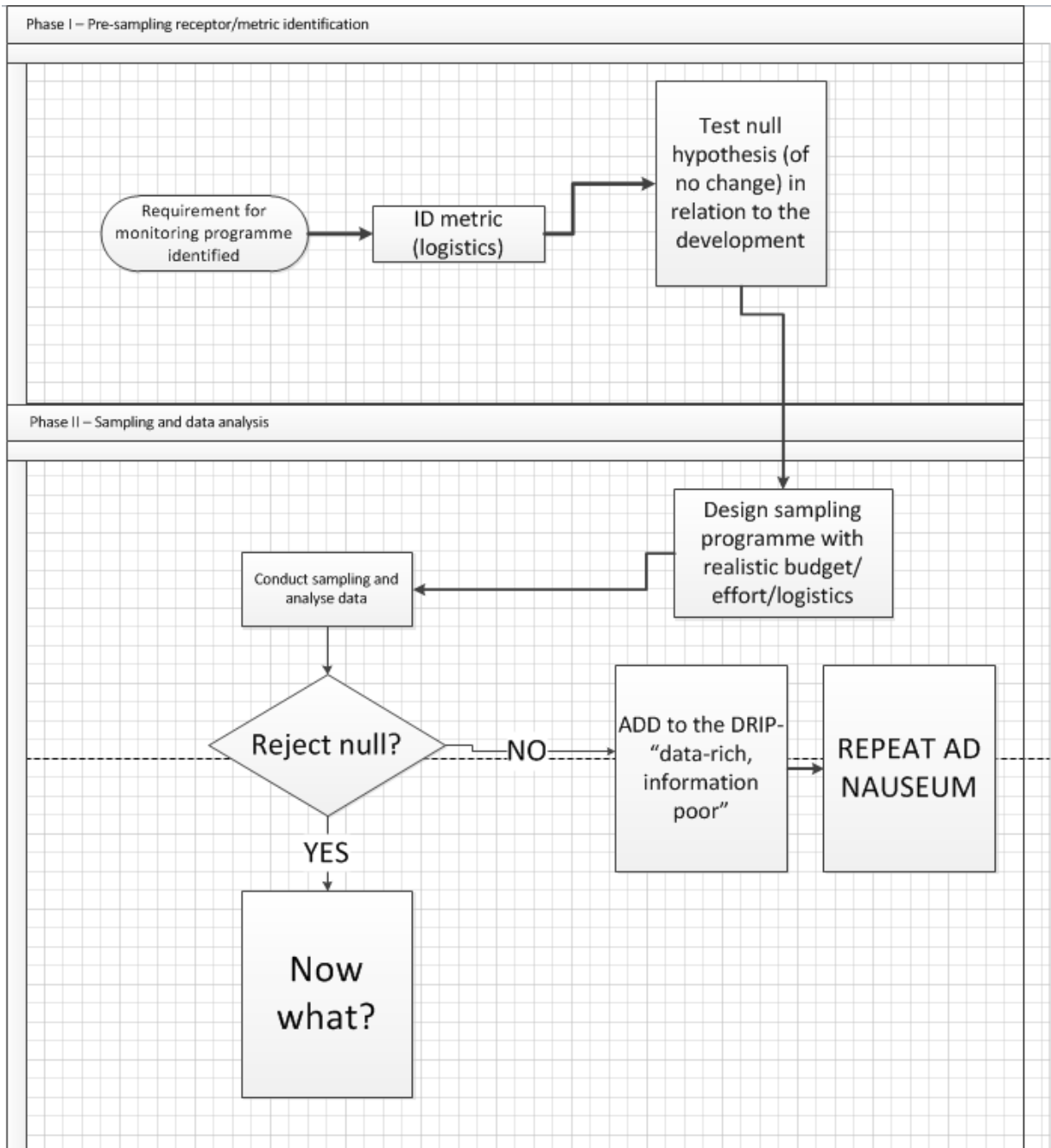
Tom Wilding et al (2015) – Journal of Applied Ecology, submitted.

Deliverable from: ICES Working Group on Marine Benthos and Marine Renewable Energy Developments.

Background

- DRIP – data rich, information poor
- Much of the existing monitoring data is ‘DRIPPY’
- DRIPPY data arises because of fundamental problems with the questions being asked :
 - Null hypotheses of no impact are usually tested but are inevitably false
 - Thresholds of acceptable change are not set
 - Spatial/temporal scales are not specified (local v. regional)
- Current situation: looking for something but we don’t know what it is we’re looking for!

Current methodology

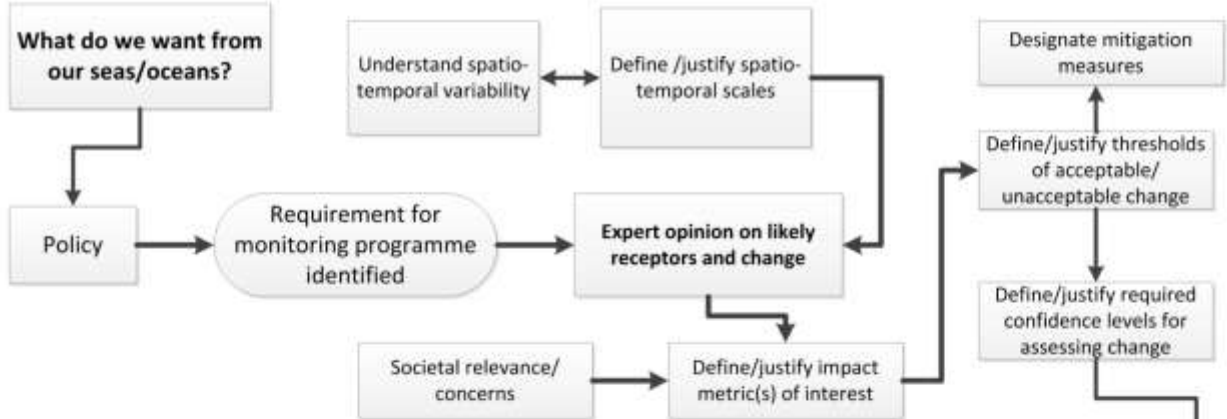


Problems

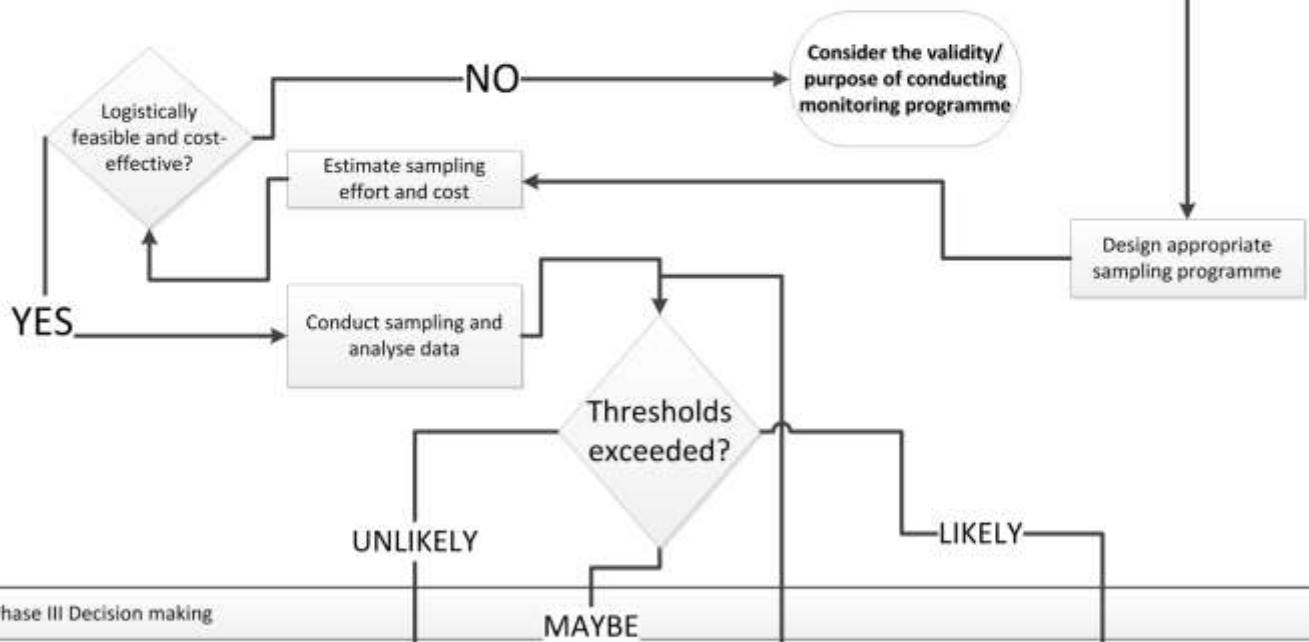
- Null accepted – problems
 - Conceptually flawed – no evidence of impact is not evidence of no impact
 - Scientific understanding is not developed, needless monitoring continues
- Null rejected – problems
 - Not threshold related – i.e. should we actually care?
 - Are the spatial/temporal scales relevant?
 - If mitigation is necessary, what mitigation should occur?

More rational approach

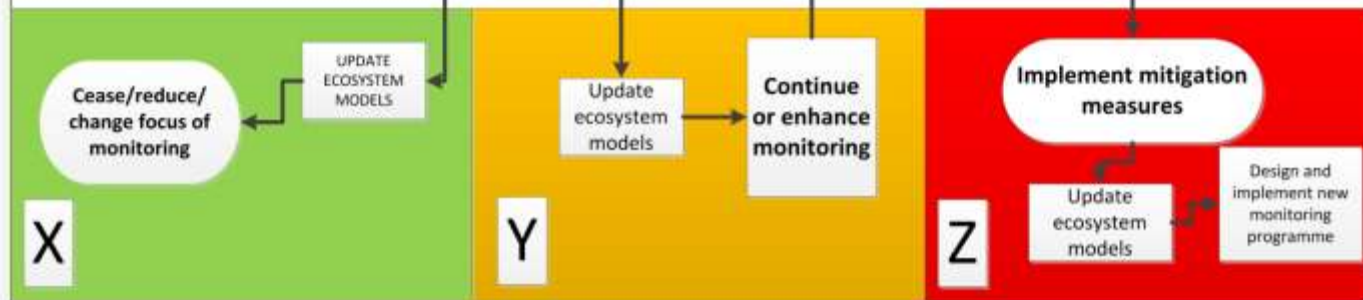
Phase I – Pre-sampling receptor/metric identification, threshold setting /justificaiton



Phase II – Sampling and data analysis (comparison against threshold)

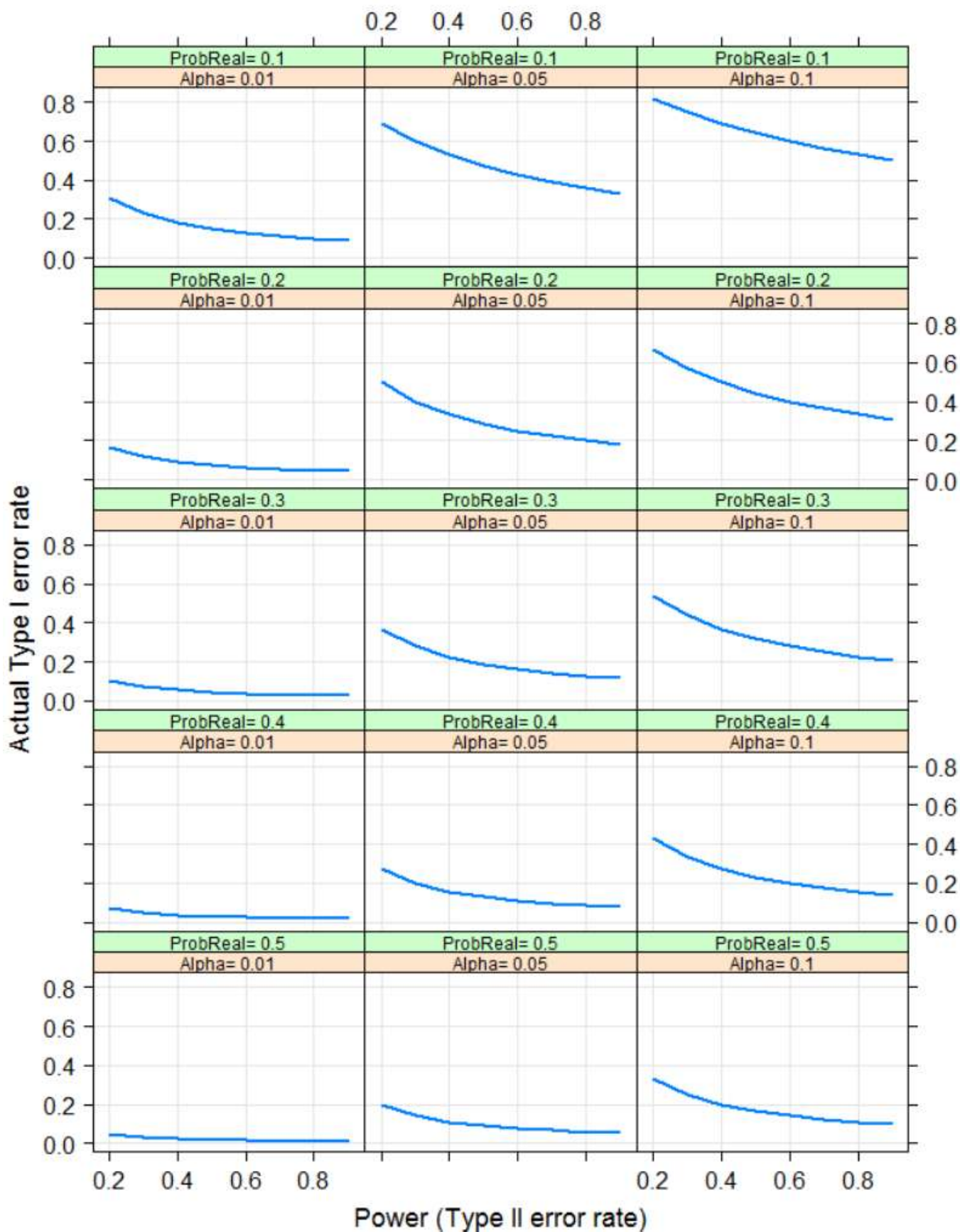


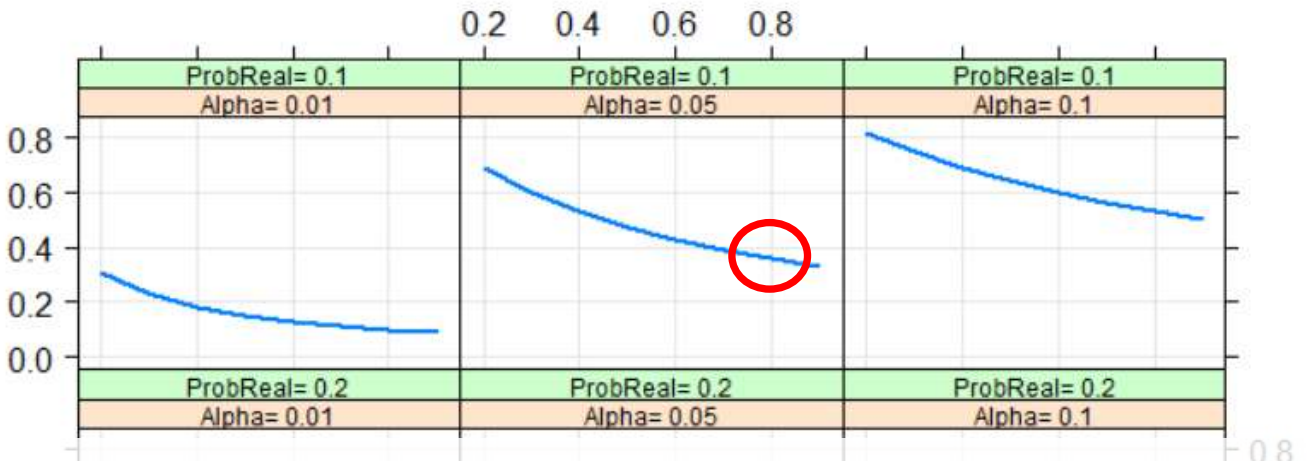
Phase III Decision making



Perspective: what is evidence?

- Classical /Frequentist approach:
P value = $P(\text{Data} \mid \text{Null being true})$
- Null = should relate to threshold exceedance (but often set to zero)
- BUT we're interested in $P(\text{Null being true} \mid \text{Data})$
- To estimate this we need prior knowledge (estimate) of the probability of the null being true.





Assume:

1. probability of threshold exceedance (risk) is 0.1
2. alpha level of 0.05
3. power of 0.8.

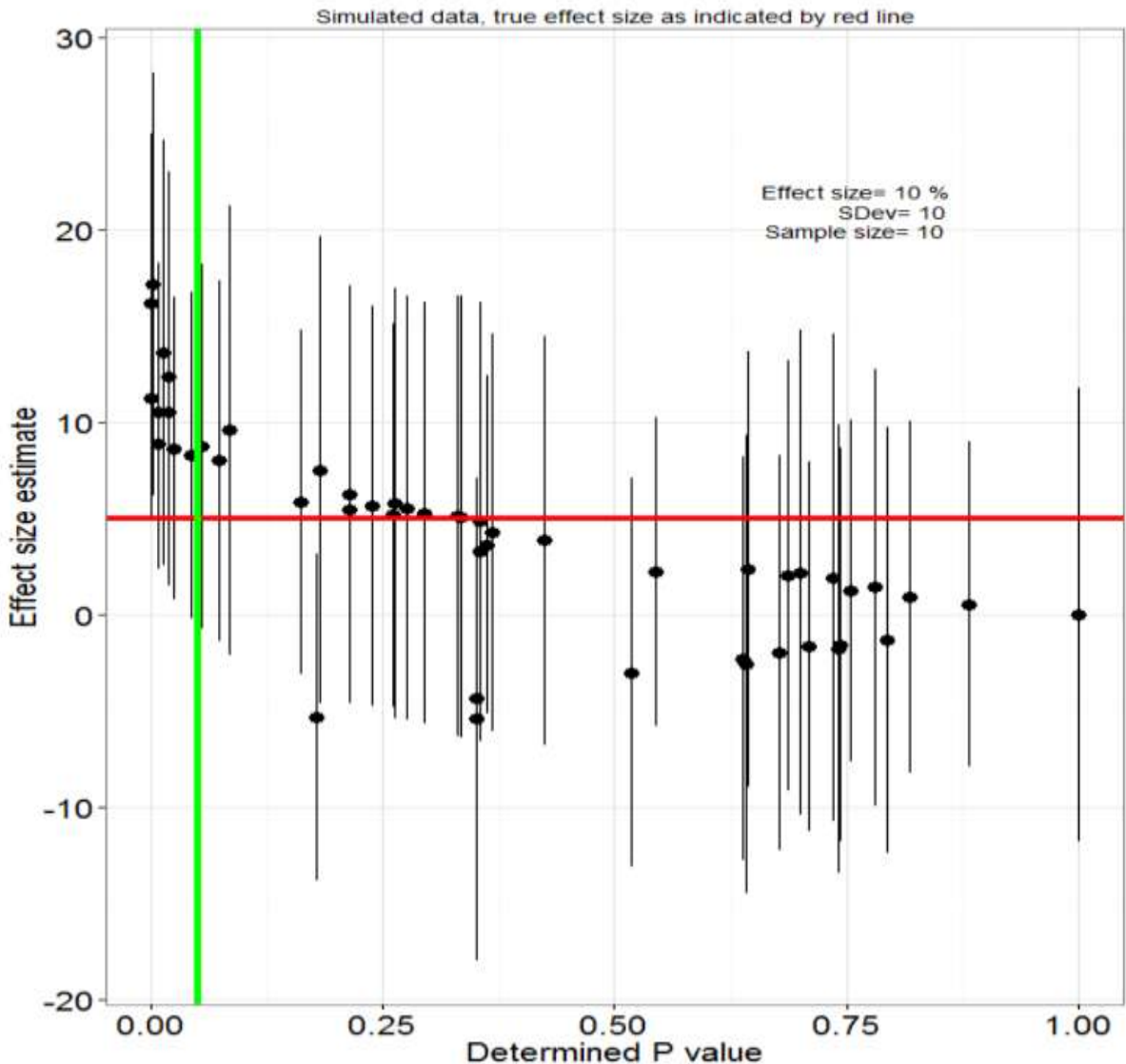
Then:

If the null is rejected there is a 36% chance of this being wrong. Is this acceptable?



Other aspects

- Truth inflation with underpowered sampling : if you do find an effect it is likely to be \sim twice the actual magnitude



Conclusions

- The long-standing 'null hypothesis significance testing' approach is a barrier to logical decision-making
- Evidence-based decision making requires a profound understanding of how to evaluate evidence
- Is scope for improvement in this regard in the MRE sector.