

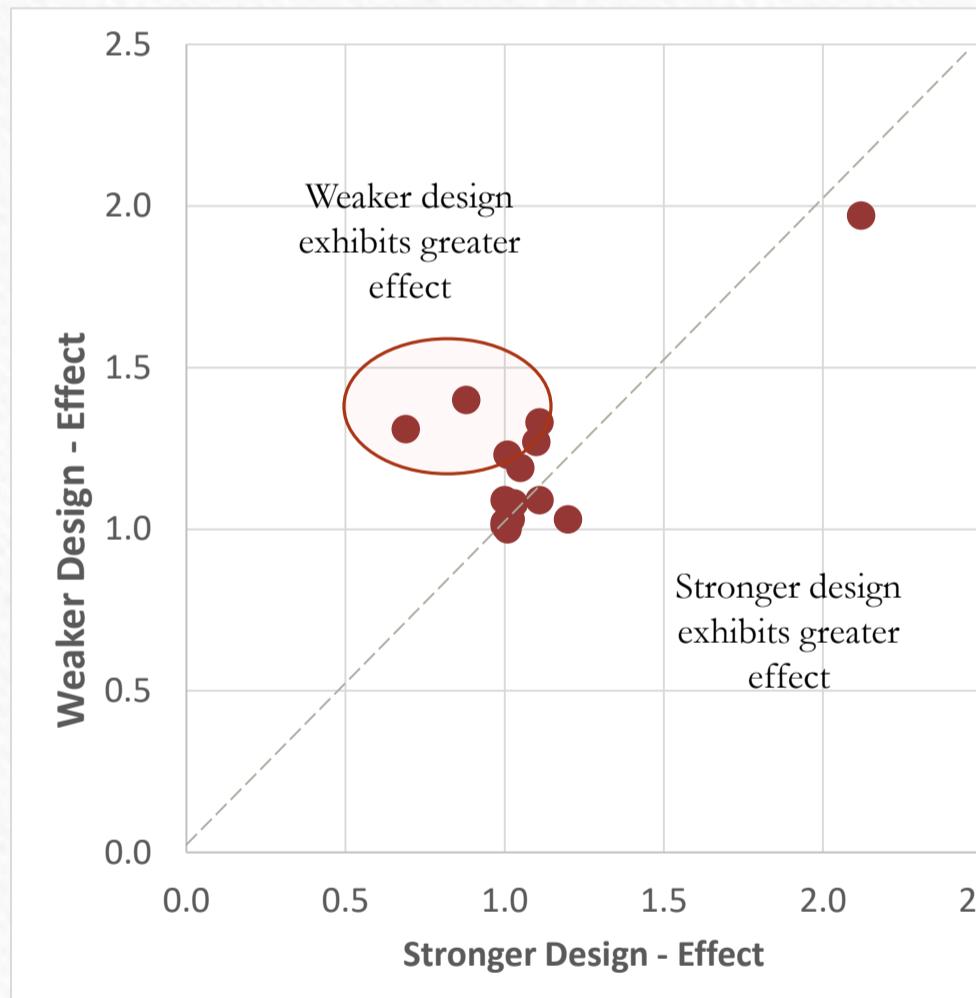
Meta-Analytic Methods for Evidence Triangulation in Environmental Epidemiology

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- A review of Environmental Health (Sheehan and Lam)¹ examined 48 meta-analyses for consistency with publication guidelines
- Of these, 8 studies (17%) were amenable to triangulation.
- Most synthesized evidence using the combination of cohort and case-control studies, few included randomized designs

Relationship between Effects for Different Study Designs



- Most estimates are weak in strength (OR or RR 0.8-1.25)
- Fifty percent of estimates differ by 5% or less signaling consistency despite heterogeneity in the overall effect
- When they differ the estimate from the weaker design is greater than that of the stronger design
- Half of the meta-analyses synthesized more weaker-design evidence, while for the other half was about even

Statistical Methods Developed to Synthesize Evidence from Different Study Designs

Approach	Advantages	Disadvantages
Naïve: pooling without concern for study design	Simple	Each study design contributes its own biases to the overall estimate Biases may interact in unpredictable ways, difficult to tease out
Bayesian: weaker designs informs prior for stronger designs	Weaker evidence potentially updated with stronger evidence Flexible	More complex to fit
Hierarchical: study design has own level in the model hierarchy	Models specific features of study design (e.g. sources of bias), adjusting for them Flexible	More complex to fit

Recommendations

- Special care should be given to the extraction of effects, many reports consider OR and RR as the same measure (only when outcome is rare they approximate), consider pertinent transformations
- Perform sensitivity analysis to test the robustness of findings, this is particularly true under a Bayesian framework (i.e. looking for robustness in results for different prior propositions)

References

1. Sheehan MC, Lam J. Use of systematic review and meta-analysis in environmental health epidemiology: a systematic review and comparison with guidelines. *Curr Envir Health Rpt* 2015;2:272-83.