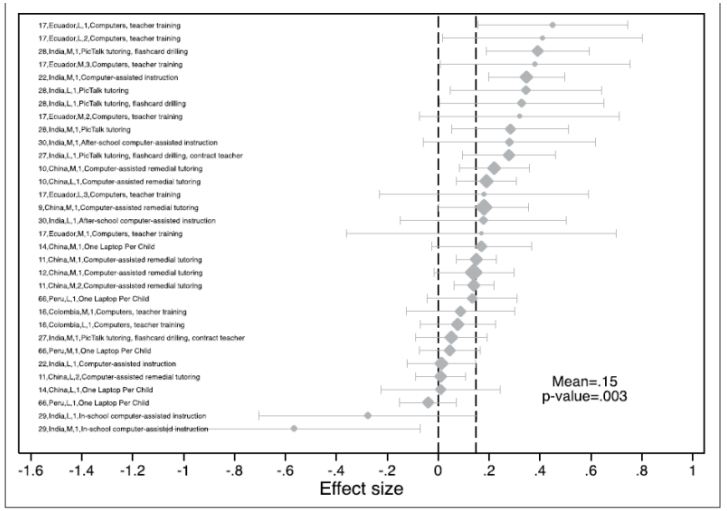
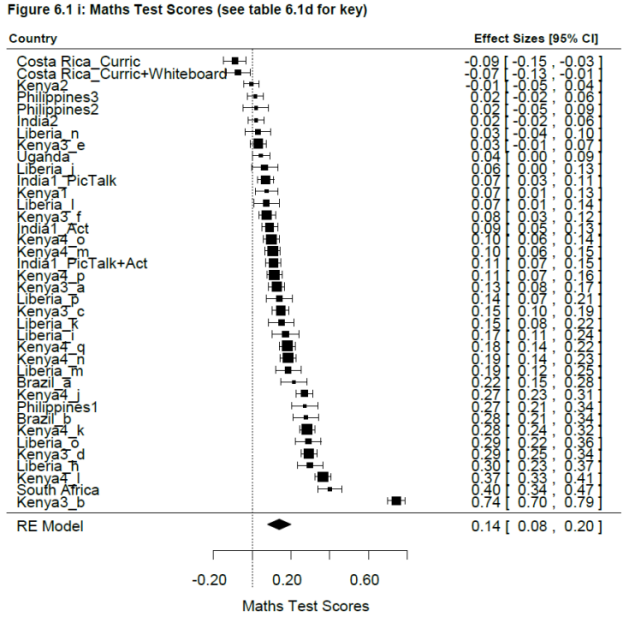
Impossible generalisations: meta-analyses of education interventions

Edoardo Masset
19th June 2019
Washington DC
RISE Conference

Meta-analysis of education studies

- They tell ‘what works’ in education
- But find different results
  - because looking at different studies
  - because the evidence base in heterogeneous





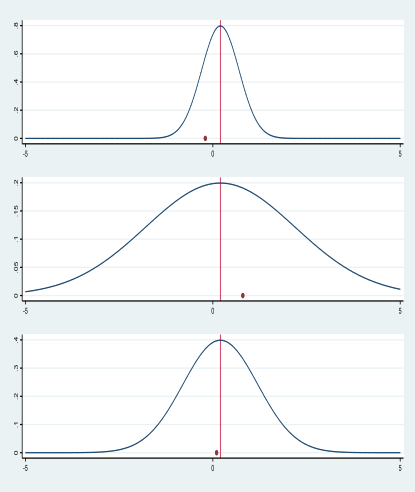
Krishnaratne et al. (2013), Sniltsveit et al. (2016), McEwan (2013)

Misunderstandings of meta-analyses

- 1st misconception: meta-analyses identify a universal effect applicable to all contexts
- 2nd misconception: the mean of a meta-analysis predicts the effect to be observed by a future study

Fixed-effect meta-analysis

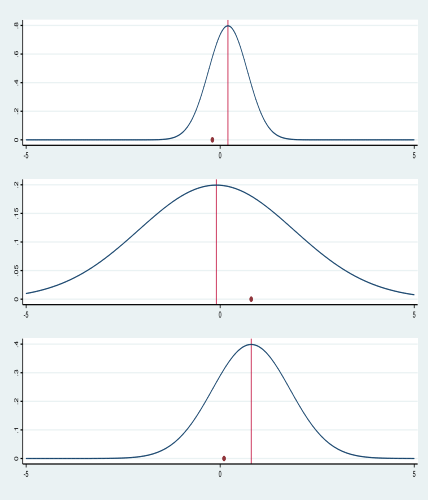
- Assume that all interventions have the same effect
- The mean is converging to the ‘true’ universal effect
- The confidence interval is the result of sampling variation



Sources of heterogeneity

- Sources of heterogeneity in education
  - Differences in populations
  - Differences between interventions
  - Differences in outcomes, biases and measurement error

Random-effects meta-analysis



- Assume that interventions have different effects
- The mean is simply our estimate of the mean effect

Confidence intervals and prediction intervals

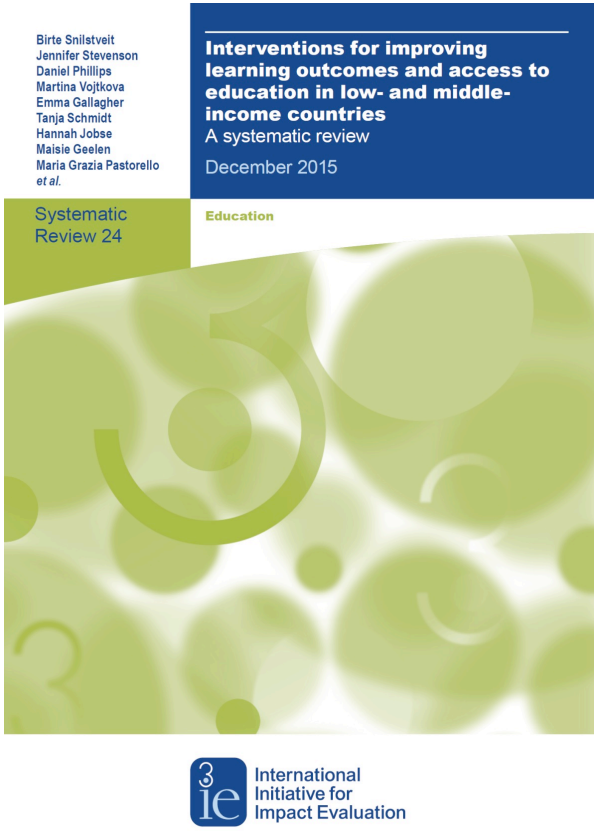
- **Confidence intervals** describe the accuracy of the mean
- The impact of a new intervention similar those included studies is given by a **prediction interval**
- Prediction intervals rarely used, overstating impacts in meta-analyses

$$CI = \mu \pm Z^{\alpha} \sqrt{\sigma_{\mu}^2}$$

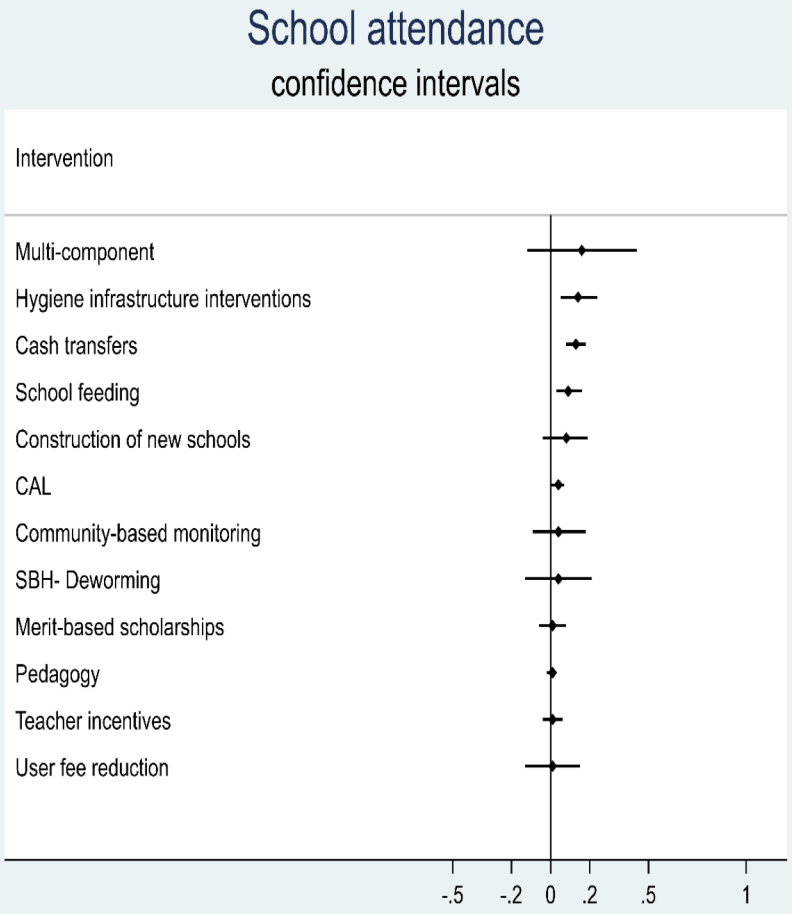
$$PI = \mu \pm t_{df}^{\alpha} \sqrt{\sigma_{\mu}^2 + \sigma_{b}^2}$$

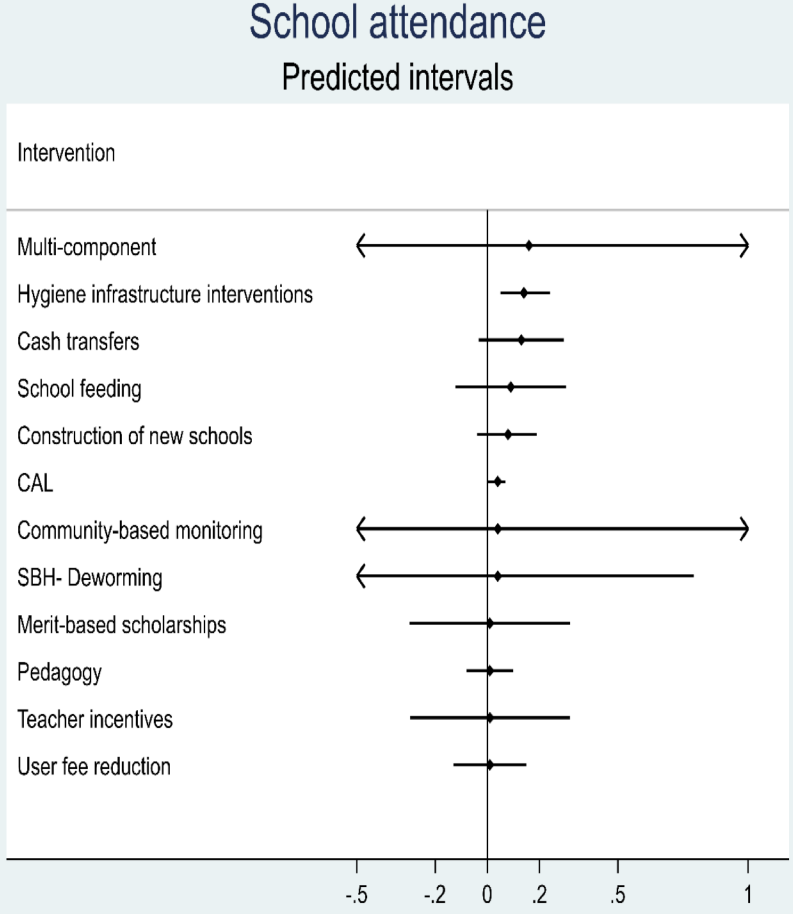
Education systematic reviews

- 3ie systematic review: 238 studies, 216 programmes, 20 intervention categories
- CCT have largest impact on participation outcomes, while SF is ‘promising’
- Structured pedagogy have largest impact on learning, while merit-based scholarships, SF, extra time and remedial education are ‘promising’
- Some interventions have zero impact

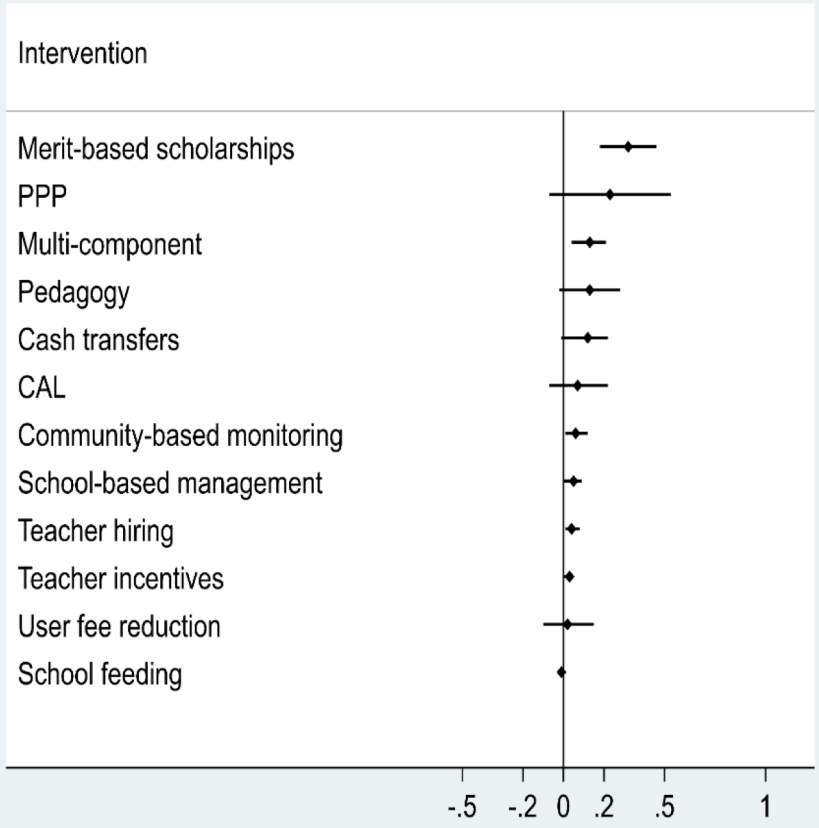


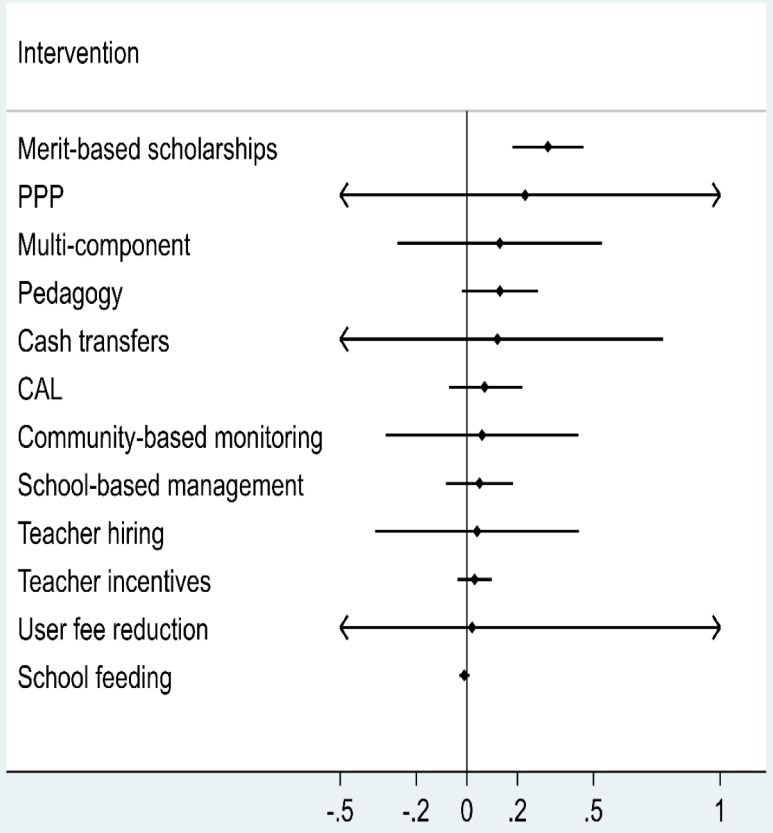
School attendance



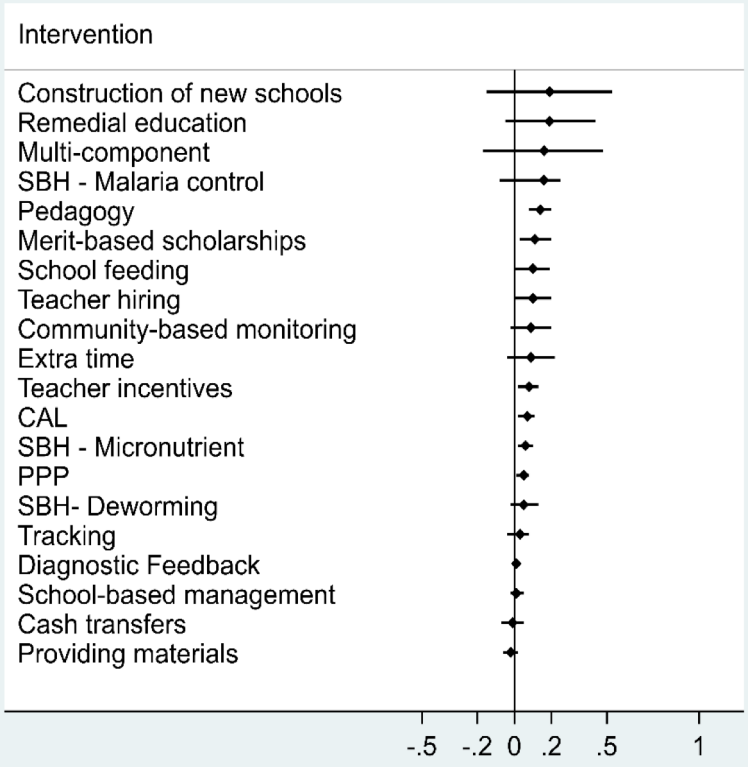


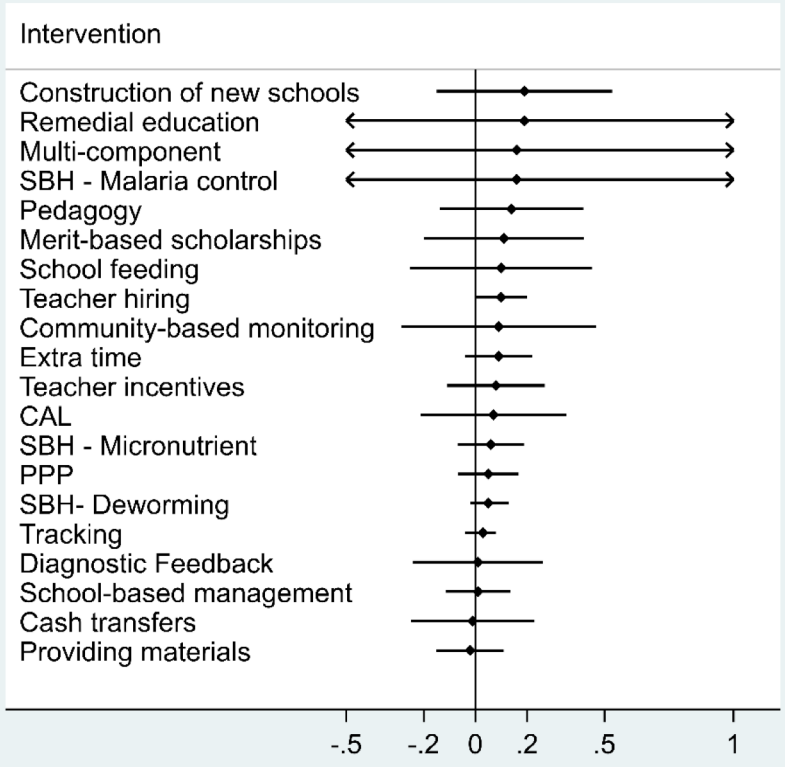
School completion



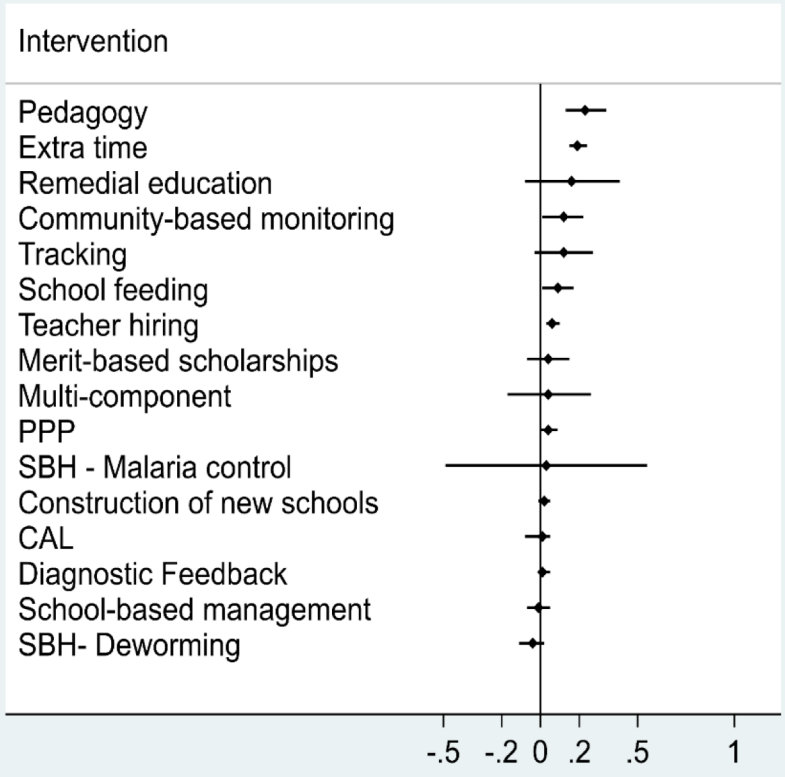


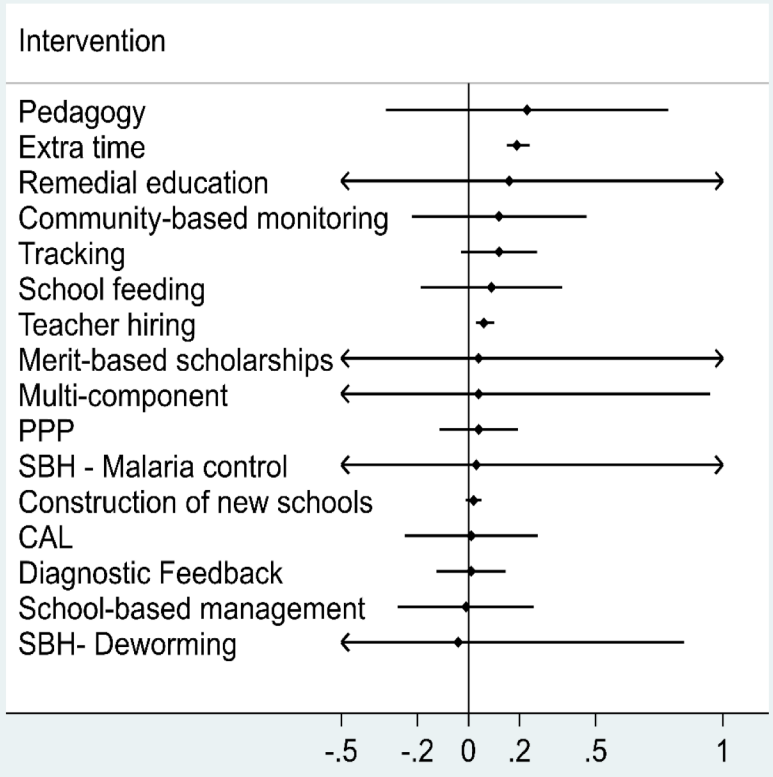
Maths test scores





Reading test scores





What works in education?

- No intervention is predictably more effective or more promising
- Heterogeneity is very high for all outcomes
- Heterogeneity is underestimated by prediction intervals:
  - New studies likely to be different from those included
  - Publication bias

Conclusions for education meta-analyses

- More studies will not reduce heterogeneity
  - ➢ Heterogeneity likely to increase with number of studies
- Redefining intervention categories:
  - ➢ More precise categories will make more homogeneous groups

Addressing heterogeneity

- The grand mean is not very useful, can be misleading
- Analyse heterogeneity
  - extent by category
  - sources of heterogeneity
- Lessons for single studies: explore mechanisms do not just estimate effect sizes

Thank you