

Taking the analysis of trial-based economic evaluations to the next level: the importance of accounting for clustering

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Mohamed El Alili, MSc, (corresponding author)

1. Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam
Public Health Research Institute, De Boelelaan 1085, 1081 HV, Amsterdam, the Netherlands.
Tel.: +31 20 598 73 17, Fax: +31 20 6462457, Email: m.elalili@vu.nl

Johanna M. van Dongen, PhD

1. Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam
Public Health Research Institute, Amsterdam, the Netherlands. Email: j.m.van.dongen@vu.nl
2. Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam
Movement Sciences Research Institute, Amsterdam, the Netherlands.

Keith S. Goldfeld, PhD

1. Department of Population Health, NYU School of Medicine, New York, United States of
America. Email: keith.goldfeld@nyulangone.org

Martijn W. Heymans, PhD

1. Department of Epidemiology and Biostatistics, Amsterdam UMC, Location VUmc, Amsterdam
Public Health Research Institute, Amsterdam, The Netherlands. Email:
mw.heyman@amsterdamumc.nl

Maurits W. van Tulder, PhD

1. Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam
Public Health Research Institute, Amsterdam, the Netherlands. Email:
maurits.van.tulder@vu.nl
2. Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam
Movement Sciences Research Institute, Amsterdam, the Netherlands.

3. Department of Physiotherapy & Occupational Therapy, Aarhus University Hospital, Aarhus, Denmark

Judith E. Bosmans, PhD

1. Department of Health Sciences, Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam Public Health Research Institute Amsterdam, the Netherlands. Email: j.e.bosmans@vu.nl

Online Resource 1: Specification of ICC in *simstudy*

For QALYs, the ICC was defined using the following formula;

$$\text{Intraclass Correlation Coefficient} = \frac{\text{Between-cluster variance}}{\text{Between-cluster variance} + \text{within-cluster variance}}$$

where between-cluster variance refers to the variance of QALYs between clusters and the within-cluster variance refers to the variance of QALYs amongst participants within clusters.

For costs, ICCs were defined using the following formula:

$$\text{Intraclass Correlation Coefficient}_{\text{Gamma}} = \frac{\text{Between cluster variance}}{\text{Between cluster variance} + \Psi_1(1/v)}$$

The cluster means for costs are normally distributed on the log scale (i.e. lognormal), and the variance of the cluster means represents the between-cluster variance. The within-cluster variance, however, is gamma-distributed. In the *simstudy* package,¹ the within-cluster variance depends on both the cluster mean and a dispersion factor (v):

$$\text{Within-cluster variance} = \text{Dispersion factor } (v) \times \text{mean}^2$$

Nakagawa et al.² show that with a gamma distribution the within-cluster variance has a lognormal distribution, and can be estimated using the trigamma function (Ψ_1) of the dispersion factor (v).

References

1. Goldfeld, K., *simstudy: Simulation of Study Data*. 2018.
2. Nakagawa, S., P.C.D. Johnson, and H. Schielzeth, *The coefficient of determination R^2 and intra-class correlation coefficient from generalized linear mixed-effects models revisited and expanded*. J R Soc Interface, 2017. **14**(134).