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## **Mixed models for correlated compositional data: applied to microbiome studies in Indonesia**

Martin, I.

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## Stellingen behorend bij het proefschrift getiteld

### **“Mixed models for correlated compositional data: applied to microbiome studies in Indonesia”**

1. The resistance of certain helminth species towards anthelmintic treatment alters the composition of gut microbiome. (this thesis)
2. The choice of subject-specific or category-specific random effect in multivariate count outcome depends on the research interest, i.e. whether one is interested in the regression estimates or on the marginal correlation. (this thesis)
3. The relative abundance of Bacteroidetes is associated with IL-10 response to LPS and helminth infections interferes this relationship. (this thesis)
4. Addressing the measurement error of microbiome sequencing data improves the accuracy of the estimated effect of a covariate on an outcome in a joint model. (this thesis)
5. A statistical model which combines a conjugate and a normally distributed random effect for modelling subject-specific variation is an alternative for non-Gaussian outcomes but more research on models' goodness of fit is still needed. (Molenberghs, et.al., *Statistical Science*, 2010).
6. A well designed study, poorly analyzed can be rescued by a reanalysis, but a poorly designed study is beyond the redemption of even sophisticated statistics (Campbell, et. al., *Medical Statistics: A Textbook for Health Sciences*, 2007).
7. Researchers should be aware that the tool to analyze species in ecology cannot be applied directly to high-throughput sequencing data. (Gloor, et. al., *Frontiers in Microbiology*, 2017)
8. Details matter. It is worth waiting to get it right (Steve Jobs, 1955 - 2011).  
*We may use simple and practical assumptions to speed up on method development, but most of the time we missed its important feature and leads to false inference.*
9. Similar to sequenced data, communication contains noise. It is important to filter it to convey the true message.
10. The presence of a regulator in a diverse community is essential to ensure its stability and avoid dominance of certain group.

Ivonne Martin  
8 October 2019