Paper idea - 10 things I hate about path analysis

Path analysis is a powerful technique and rising in popularity in ecology

However, it has limitations and assumptions that are not readily apparent to SEM neophytes. In this paper we outline ten common misunderstandings and drawbacks, using our own experiencing using this modeling approach in ecology, IPM and horticultural models.

1. Path analysis is a poor technique for data exploration and requires detailed prior knowledge of the system’s components.

2. Path analysis makes explicit assumptions about the direction of causation.

3. Path analysis analyzes networks of regression-like linear models, not linear models with high-level factors (e.g. categorical predictors).

4. Path analyses can include interaction terms, but interpretability quickly becomes an issue

5. Path analysis, specifically the piecewiseSEM package, cannot do analyses reliably with overfitted mixed models. In same cases mixed model approaches cannot be employed at all with certain ecological data.

6. Visualization of path analyses is difficult to automate, making creation of a diagram the most time-consuming part of the process.

7. Scaling coefficients so effect sizes can be compared across networks has drawbacks. It obfuscates patterns that would otherwise be very easy to see with just regression/ANOVA.

8. Path analysis’s “test of directed separation” doesn’t tell you what the best interaction network is, merely whether or not you have constructed a valid structural equation model

9. You cannot run a fully specified path model with all potential connections illustrated

10. Indirect effects are easily resolved with path analysis, but illustrating them clearly is difficult in a single network visualization