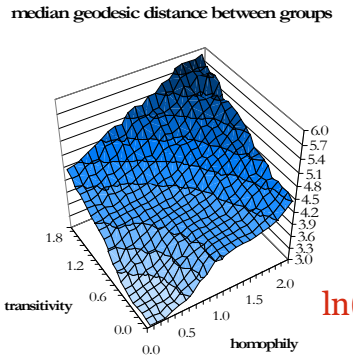
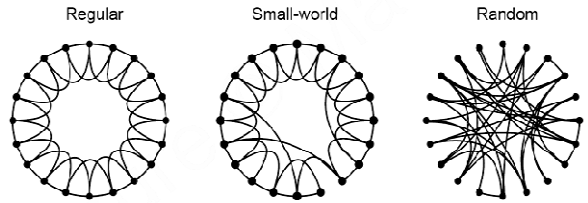
university of groningen / behavioural and social sciences / sociology

Some aspects of applying peer influence models in substance use

SRA Biennial Meeting, 8-10 March 2012, Vancouver BC

Christian Steglich c.e.g.steglich@rug.nl

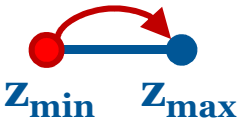




$$\ln\left(\frac{\Pr(x^c \rightarrow_i x^b)}{\Pr(x^c \rightarrow_i x^a)}\right) = \sum_{k=1}^{K} \beta_k \left(s_{ik}(x^b) - s_{ik}(x^a)\right)$$

Modelling initiation of substance use

Upward change is the only change:



Two approaches!

- de la Haye et al. & Green et al. work with an objective function model
- Light et al. work with a rate function model (Greenan, 2012) compatible with survival / event history analysis

Comparison of results on all data sets would be interesting.

The survival analysis approach may be the better one for unidirectional change processes (because more specific in identification of who gets opportunity to initiate).

Quite different substances

- **Marijuana:** *"Influence within close, personal relationships – not wider peer group."*
- **Alcohol:** At later ages typically group consumption…
- **Smoking:** Often selection based on opportunity to meet; here: *"preference for non-smoking students to befriend smokers" – vicious circle!*

Good reasons for substance-specific expectations.

Interaction effects and partial collinearity tested – that's new & adds substantive usefulness to the method!

Maybe also think of interaction with structural effects.

Multiple data sets combined

- Marijuana study: 2 AddHealth schools
- Alcohol study: 14 schools, different ages
- Smoking study: 16 schools (8 matched pairs)

Heterogeneity seems to be high.

Where do results look problematic in particular?

Meta-analysis of results could include network-level predictors *[if there are sufficiently many cases, not just 2].*

Take into consideration *network size* and *density*.

Specific aspects of the three studies

- Marijuana study:
  - Why not study cannabis use together with other substances? Notably tobacco (with which it typically is consumed). [Pearson et al. 2006]; *candidate moderator*
- Alcohol study:
  - How reliable are self-reported alcohol scores at this age?
  - What behaviour would you expect influence on, this age?
- Smoking study:
  - Extremely high peer influence coefficients – convergence?
  - Try survival models & this way get better rate functions.

What I had been wondering for a while

What about intervention programs now?

- If selection plays a role, can peer-led interventions work?
- Don't they presume influence? Doesn't selection thwart any success of such programs?

Green et al.: *"selection mechanisms may **create an environment for more direct forms of social influence** to operate. Although friendships were based on smoking, in both CHOICE schools friendships were also established among program participants, which may, over time, **create protective peer environments** that could counteract effects of smoking-based selection that exposes non-smokers to pro-smoking environments…"*

& now for something slightly different…

Bill's question (Schiphol, 6 March 2012)

"Are you as developers satisfied with how the method is being applied?"

Background:

The first paper using the method in developmental research was…

Burk, William J., Steglich, Christian E.G., and Snijders, Tom A.B. (2007). Beyond dyadic interdependence: Actor-oriented models for co-evolving social networks and individual behaviors. *International Journal of Behavioral Development*, 31, 397-404.

Answers I thought of in the plane

Based on experience with others' work as a reviewer, I can say a few things that I don't appreciate.

By and large: Very competent work!

But let's briefly address the "few things"
& whether they played a role in today's presentations…

Thing #1, some people do have continuous-time data… ☺

Such data should be easier to analyse:

- No imputation of unobserved change necessary!
- Why first aggregate to panel data, then impute continuous data?
- Why replace data by guesswork, albeit educated?
- Why use SIENA?

Methods unfortunately not (yet) accessible to general public; see Brandes, Lerner & Snijders (2009); Stadtfeld (2012); Butts (2010); others.

Thing #2, endowment & creation effects… ☹

The 'objective function' approach implies that the coefficients express satisfaction with an outcome state:

- Not unequivocally attributable to a change pattern!
- E.g., sex homophily means 'creation of ties to same sex others' as well as 'maintenance of relations to same-sex others'. *[for behaviour, there are similar issues]*
- Too often overlooked & just one story told!

Solution: work with 'creation' and 'endowment' effects if really interested in just one story, otherwise tell two.

Thing #3, dynamic interpretation…

In consequence of the above, when endowment & creation effects are not separated:

- Quick and easy dynamic interpretation is often not warranted! E.g., …
- A negative main effect of *sports* on *smoking* does typically not mean sporters smoke less over time.
- It means sporters, when deciding about their smoking, exhibit a lower tendency to increase smoking than non-sporters. Still, they might increase…

Solution: just be careful in the wording of conclusions.

Thing #4, the BIG thing…
context effects, unobserved confounders ☹

When social actors are exposed to same context…

- they may change their behaviour due to this exposure (say, with response lag t_{beh})
- they may also form social ties to one another due to sharing this context (say, with response lag t_{net})

When context isn't part of the model, we have a problem:

- If $t_{beh} > t_{net}$ the tie change precedes behaviour change, which the model will pick up as "peer influence".
- Analogously, if $t_{beh} < t_{net}$ the model will diagnose "peer selection" based on behaviour.

Solution… or at least 'attempt at one':

Assess important contexts as far as possible, include context variables into model specifications!

- Main effect of *context exposure* on behaviour change, effect of *context sharing* on network change.

Selection in unmeasured contexts can partly be represented by its consequences.

- Interdependence of tie variables shared in same context: *reciprocity* and *triangulation* tendencies.

Influence in unmeasured contexts remains a problem.

So the main answer to Bill would be this…

A big limitation that researchers need to be aware of (but typically aren't showing awareness of) is this:

> *Diagnoses of peer influence always come conditional on the model assumption that all relevant context information is known & part of the modelling!*

This may sound more dramatic than it is – it is the usual warning with which statistical results about causality in temporal analysis come with.

Thanks for attending!