



# The Use and Usefulness of Latent Variable Models

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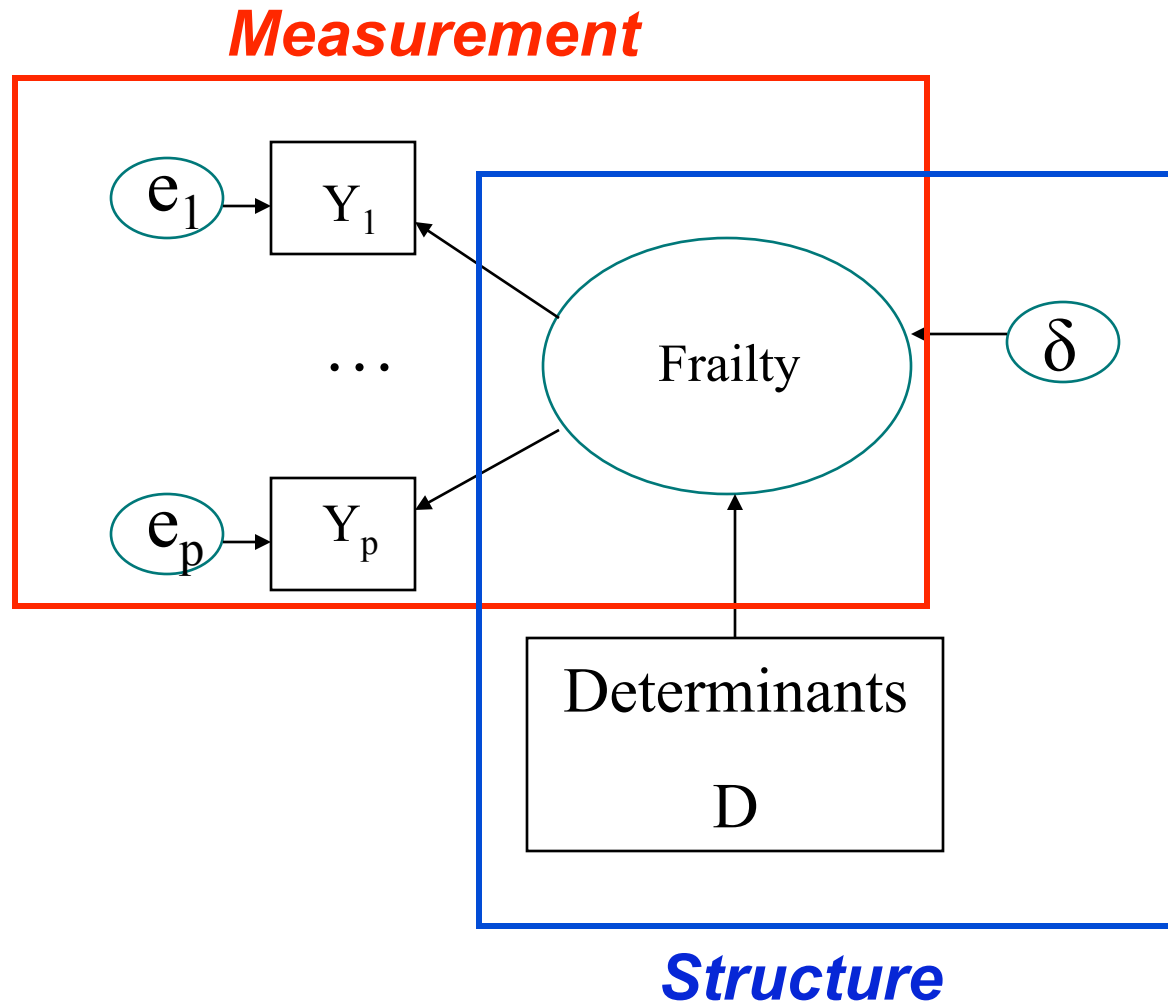
# Why should I care?

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- Latent variable models are
  - Statistical models
  - Widely used in public health disciplines
  - Great for investigating measurement
  - Dangerous
  - Controversial
- Overlap with department foci
- If not us, then who?

# What is a latent variable model?

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# What is a Latent Variable model?

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- Measurement

$$F_{Y|\eta,d}(y|\eta,d)$$

- Structure

$$F_{H|d}(\eta|d)$$

- Marginal

$$\int F_{Y|\eta,d}(y|\eta,d) dF_{H|d}(\eta|d)$$



## Pros and Cons

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- Why the widespread usage?
  - Theoretical underpinnings / testing
  - Handling of measurement errors
  - Complexity
- Why the danger / controversy?
  - Sensitivity to assumptions (e.g. *aliasing*)
  - Indeterminacy (e.g. *identification*)
  - Temptation to reify (e.g. Gould, 1981)



## My work: Assumption violations

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- **Key idea:** Randomly generated pseudo-LVs can be used as if they were observed LVs
  - For model-checking
  - For delineating target if wrong model

### *References*

*Bandeem-Roche et al., JASA, 1997*

*Bandeem-Roche et al., AJE, 1999*

*Xue & Bandeem-Roche, BMCS, 2002*

*Huang & Bandeem-Roche, PSYMKA, 2004*



## Most recent: Two-stage residuals

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- Subject: Growth mixture modeling
- Findings
  - Theory: Asymptotic residual behavior
  - LV dimensions: qnorm plot
  - Mean model: residuals vs. covariates
  - Variance model: qqplot
  - Multiple randomizations

*Wang, Brown, Bandeen-Roche, JASA (to appear)*



## Most important next steps

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- Credible model space delineation
- Unification of LV, less model-driven approaches
- Creative measmt, structural models
- Designs
- Alternatives to LV approaches
- Case studies





# Thanks

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