# Modeling Relationship between Alcohol Policy Perception and Alcohol Consumption in '01 Harvard College Alcohol Survey (CAS)

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# Objective

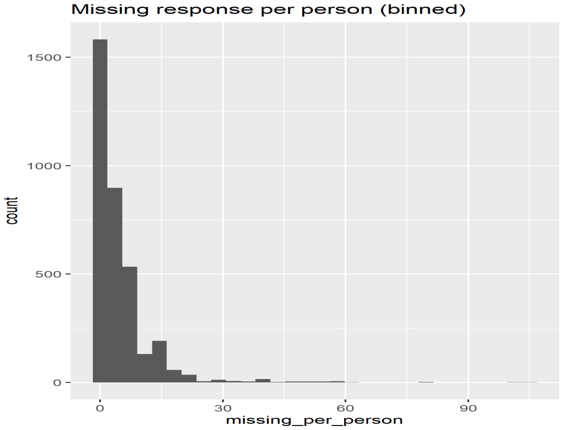
- Data: 2001 Harvard College Alcohol Study (CAS)
- 10904 participants (unknown response rate)
- Investigate the correlation structure between **subjective beliefs about campus alcohol policy** and **objective measures of alcohol consumption**
- *Section B* for subjective questions, *Section C* for objective questions
- Standard survey modeling techniques: factor analysis, structural equations model, item response theory

# Data Processing

- Consistent ordering of responses
- More stringent alcohol policy beliefs (1) -> Less stringent
- Less alcohol consumption (1) -> More consumption
- Aggressive pruning of the variables before modeling
- Unreliable responses classified based on
- Response to A7: A (alone) is not allowed with other responses (family/partner/roommate)
- Response in Section C: participants who chose 1 in C10 and answered C11–C15, etc.
- `WEIGHT01` used as sampling weights (intended for cross-sectinoal studies)

# Missing Reponses

- Missing response rate adjusted for questions that only target certain demographic subgroups



# Missing Responses for Each Section

## What A Structural Model Looks Like

...Graphic plot here (believe will be better to include it soon to give the big picture)...

# Structural Equations Modeling (SEM)

- Survey responses $X_i$ can be grouped together as repeated measurements of a lower-dimensional, latent *factors*: alcohol beliefs, alcohol consumption attitude, ...
- Factor analysis identifies the loadings $\Lambda$ of latent variable $\eta_i$.

$$X_i = \Lambda\eta_i + \epsilon_i,\ \eta_i \sim N(0, I),\ \epsilon_i \sim N(0, I)$$

- Structural Equations Models extend factor analysis by specifying within-question correlations and regressing $\eta_i$ on predictors.
    - All of our model predictors are directly observed rather than "manifested" by questions: age, gender, ...

That is,

$$\eta_i = \Gamma Z_i + \epsilon_{\eta,i}, \epsilon_{\eta,i} \sim N(0, I)$$

, where $Z_i$ are demographic predictors

- Causal interpretation is **not** necessary (though often made!).

# Modeling Challenges

- The model is clearly misspecified: Gaussian error assumption is made on ordered response
  - Asymptotic standard errors of factor loading estimators are valid for nonnormal factor analyses (Anderson and Amemiya, 1988)
  - In practice can cause lower goodness-of-fit
- Complete case analysis due to excessive computation in maximizing the full likelihood
- (ANYTHING ELSE??)

# Main Results

A MATRIX PLOT OF LOADINGS (FACTOR CORRELATION) WILL BE GREAT HERE, RATHER THAN ANY ESTIMATE FIGURES ...

# Model Diagnostics

- Various statistics to evaluate model fit in practice: TLI, BL89, CFI, RMSEA (Hu and Bentler, 1999)
- (INCLUDE RESULTS HERE . . . )

# Interpretation

. . .

# Conclusion

- ...
- Limitations
- Alternative approaches to account for ordered response
- Theory-driven priors may improve fit of more complex models
- Need information to correct for estimate biases

# Reference


- “Asymptotic Chi-Square Tests for a Large Class of Factor Analysis Models,” Anderson, T. W. and Amemiya, Y. *The Annals of Statistics*, 16(2), 1988.
- “Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives,” Hu, L.-T. and Bentler, P. M. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1999.