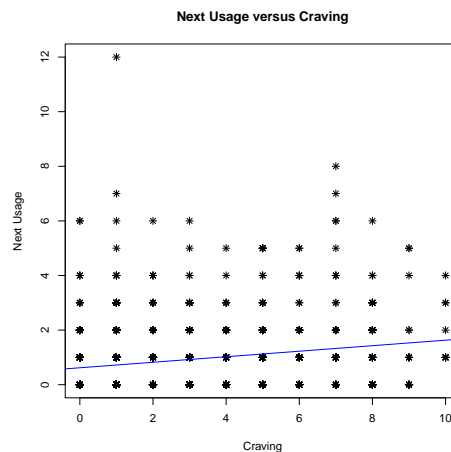


Modeling Longitudinal Count Data with Excess Zeros and Time-Dependent Covariates: Application to Drug Use

(1) EMA DATA

- i Count Response
- ii Longitudinal Data Collection
- iii Excess Zeros Expected
- iv Time-Dependent Covariates



(2) Subject-Specific Models

- i Mixed Hurdle Model: Decompose TDC Effects
- Random Component:

$$Y_{ij}|u_i \sim HurP(\pi(\mathbf{x}_{it}, \mathbf{z}_{it}; u_i), \lambda(\mathbf{x}_{it}, \mathbf{z}_{it}; u_i))$$

$$u_i \sim \mathcal{N}(0, \sigma_u^2)$$

$$f_{ij}(y_{ij}|u_i; \pi_{it}, \lambda_{it}) = \begin{cases} \pi_{it} & y_{ij} = 0 \\ (1 - \pi_{it}) \frac{f(y_{ij}|u_i; \lambda_{it})}{1 - f(0; \lambda_{it})} & y_{ij} > 0 \end{cases}$$

Systematic Components:

$$\text{logit}(\pi_{it}) = \mathbf{x}_{l,it}\boldsymbol{\alpha} + \mathbf{z}_{it}\mathbf{u}$$

$$\ln(\lambda_{it}) = \mathbf{x}_{c,it}\boldsymbol{\beta} + \mathbf{z}_{it}\mathbf{u}$$

(3) Population-Averaged Models

i Hurdle GEE: Independent Working Correlation Structure

$$\sum_{i=1}^N \left(\frac{\partial \pi_i}{\partial \boldsymbol{\alpha}} \right) \mathbf{V}_{l,i}^{-1} (\mathbf{y}_{bin} - \boldsymbol{\pi}_i) = \mathbf{0}$$

$$\sum_{i=1}^N \left(\frac{\partial \boldsymbol{\mu}_i}{\partial \boldsymbol{\beta}} \right) \mathbf{V}_{c,i}^{-1} (\mathbf{I}_{(y_i>0)}) (\mathbf{y}_i - \boldsymbol{\mu}_i) = \mathbf{0}$$

ii Hurdle GMM: Select Types of TDC

$$Q_l(\boldsymbol{\alpha}) = (\mathbf{G}_l(\boldsymbol{\alpha}; \mathbf{Y}, \mathbf{Z}))^T \mathbf{W}_l^{-1} (\mathbf{G}_l(\boldsymbol{\alpha}; \mathbf{Y}, \mathbf{Z}))$$

$$Q_c(\boldsymbol{\beta}) = (\mathbf{G}_c(\boldsymbol{\beta}; \mathbf{Y}, \mathbf{X}))^T \mathbf{W}_c^{-1} (\mathbf{G}_c(\boldsymbol{\beta}; \mathbf{Y}, \mathbf{X}))$$

$$g_{l,ij}(\boldsymbol{\alpha}; \mathbf{Y}_i, \mathbf{Z}_i) = \frac{\partial \pi(\mathbf{z}_{is})}{\partial \alpha_k} (I_{(Y_{it}=0)} - \pi(\mathbf{z}_{it}))$$

$$g_{c,ij}(\boldsymbol{\beta}; \mathbf{Y}_i, \mathbf{X}_i) = \frac{\partial \mu(\lambda(\mathbf{x}_{is}))}{\partial \beta_k} (I_{(Y_{it}>0)} [Y_{it} - \mu(\lambda(\mathbf{x}_{is}))])$$

(4) Results

	Mixed Hurdle	Hurdle IGEE	Hurdle GMM
Logistic			
craving	0.223*** (W) -0.219 (B)	-0.170***	-0.169***
controls	<i>Not Significant</i>	.	**
Count			
craving	-0.077*** (W) 0.160 (B)	0.049**	0.048***
cum GPA	0.056	-0.056	-0.056***
controls	<i>Not Significant</i>	.	**