

Strengths, Value and Pitfalls with the Use of Modern Statistical Procedures

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What is a “Modern Procedure”?

- Definition 1: Highly parametric method
 - Hierarchical models, e.g. latent variable
 - Structural equation models
 - Regression models?
- Definition 2: Computation-intensive method
 - Bayesian methods: MCMC, etc.
 - Nonparametric smoothing, regression
- Key tradeoff: Roles of theory versus data

Heart of the Matter

What might Modern Procedures gain ?

- The truth?
- Avoidance of spurious findings?
- Subtlety?
- Nothing?
- Obfuscation?

Example

Women's Health and Aging Study

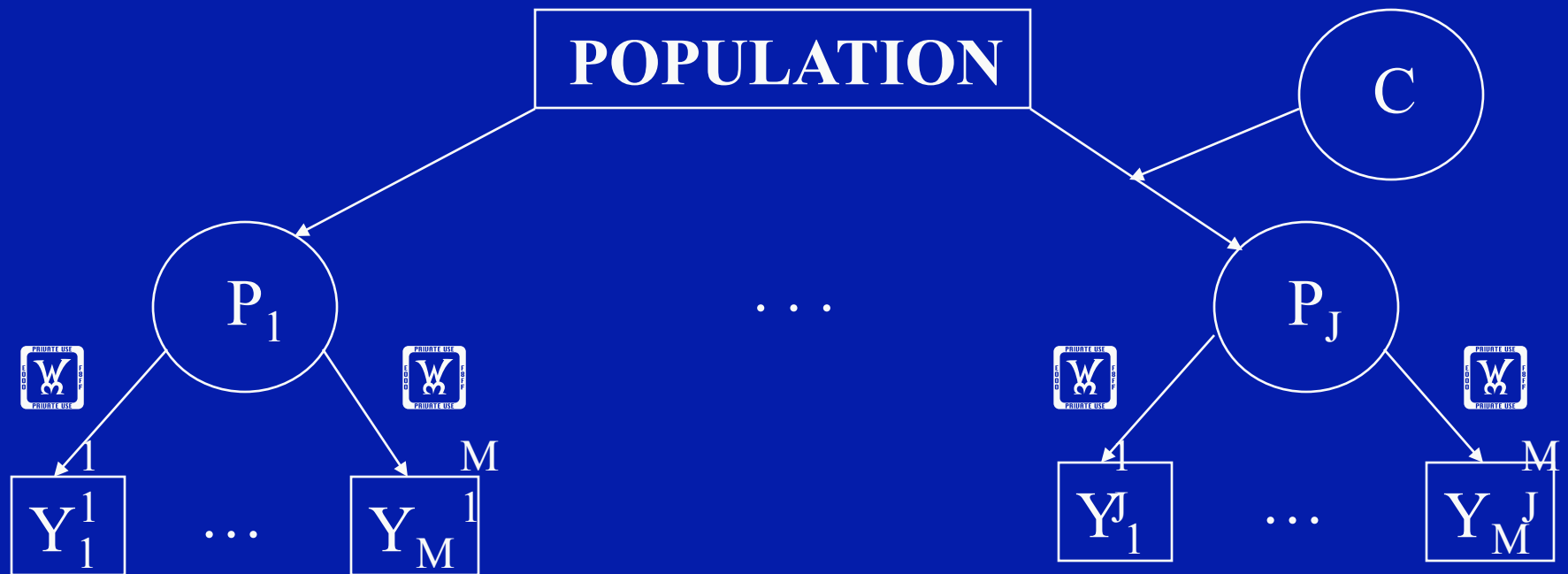
- ! Conceptual framework: Task hierarchy (*Fried et al., J Clin Epi, 1999*)
 - Difficulty ordering according to physiological demand
 - Basic functioning: bathing = most difficult; others = “parallel”

! **Idealized** conditional probabilities (Bs):

Task	Class 1	Class 2	Class 3
Bathing	0	1	1
Preparing Meals	0	0	1
Dressing	0	0	1
Use toilet	0	0	1

Model

Latent Class Analysis



$$\triangleright P_j = \Pr\{C = j\}; \quad \left[\begin{smallmatrix} \text{PROBABILITY MODEL} \\ \text{W} \\ \text{PROBABILITY MODEL} \end{smallmatrix} \right]_{mj} = \Pr\{Y_m = 1 | C = j\}$$

Refs: Goodman, BMKA, 1974; McCutcheon, SAGE, 1987; Bartholomew & Knott, E. Arnold, 1999

Example

Women's Health and Aging Study

- ! Conceptual framework: Task hierarchy (*Fried et al., J Clin Epi, 1999*)
 - Difficulty ordering according to physiological demand
 - Basic functioning: bathing = most difficult; others = “parallel”

! Modeled conditional probabilities (B_s):

Task	Class 1	Class 2	Class 3
Bathing	0	1	B_3
Preparing Meals	B_1	B_2	B_3
Dressing	B_1	B_2	B_3
Use toilet	B_1	B_2	B_3

> Constrained parameter space: $B_1 < .5$, $B_2 < .5$, $B_3 > .5$

Example

Free vs. “True-type” Estimation

TASK	Probabilities of Reporting Disability					
	Class 1 - ABLE		Class 2 - INTER		Class 3 - SEVERE	
	Free	TT	Free	TT	Free	TT
Bathe	0	0	1	1	.94	.85
Prepare Meals	.08	.07	.17	.25	.67	.85
Dress	.08	.07	.12	.25	.73	.85
Use toilet	.06	.07	.19	.25	.75	.85
Prevalence	.43	.43	.29	.38	.28	.19

Discussion

Recommendations?

- Avoid the complexity of threshold models?
- Accompany complex analyses by simple ones?
- Model / sensitivity checking?
- Other?