

Application of HLM in K-12 Program Evaluation

Xiaoxia Ai

Los Angeles Unified School District
Program Evaluation & Research Branch

Lorena Llosa

University of California, Los Angeles

Jeffrey A. White

Los Angeles Unified School District
Program Evaluation & Research Branch

**Annual Meeting of the American Evaluation Association
November 5, 2004**

Presentation Roadmap

- ❑ What is Hierarchical Linear Modeling (HLM)?
- ❑ Rationale for using HLM
- ❑ HLM in educational research
- ❑ Example
- ❑ Challenges
- ❑ Conclusions

What is HLM?

- Statistical technique appropriate for analyzing data of hierarchical structure
- Education systems
 - Students within classrooms
 - Classrooms within schools
 - Schools within districts
 - Districts within ...

Rationale for using HLM

- Substantive reasons
 - Contextual effects
 - Cross-level interactions
- Technical reasons
 - Unit of analysis problem
 - Standard error estimation

HLM in Educational Research

□ ERIC

- “HLM”: 62
- “Program evaluation”: 3475
- “Program evaluation” and “HLM”: 1

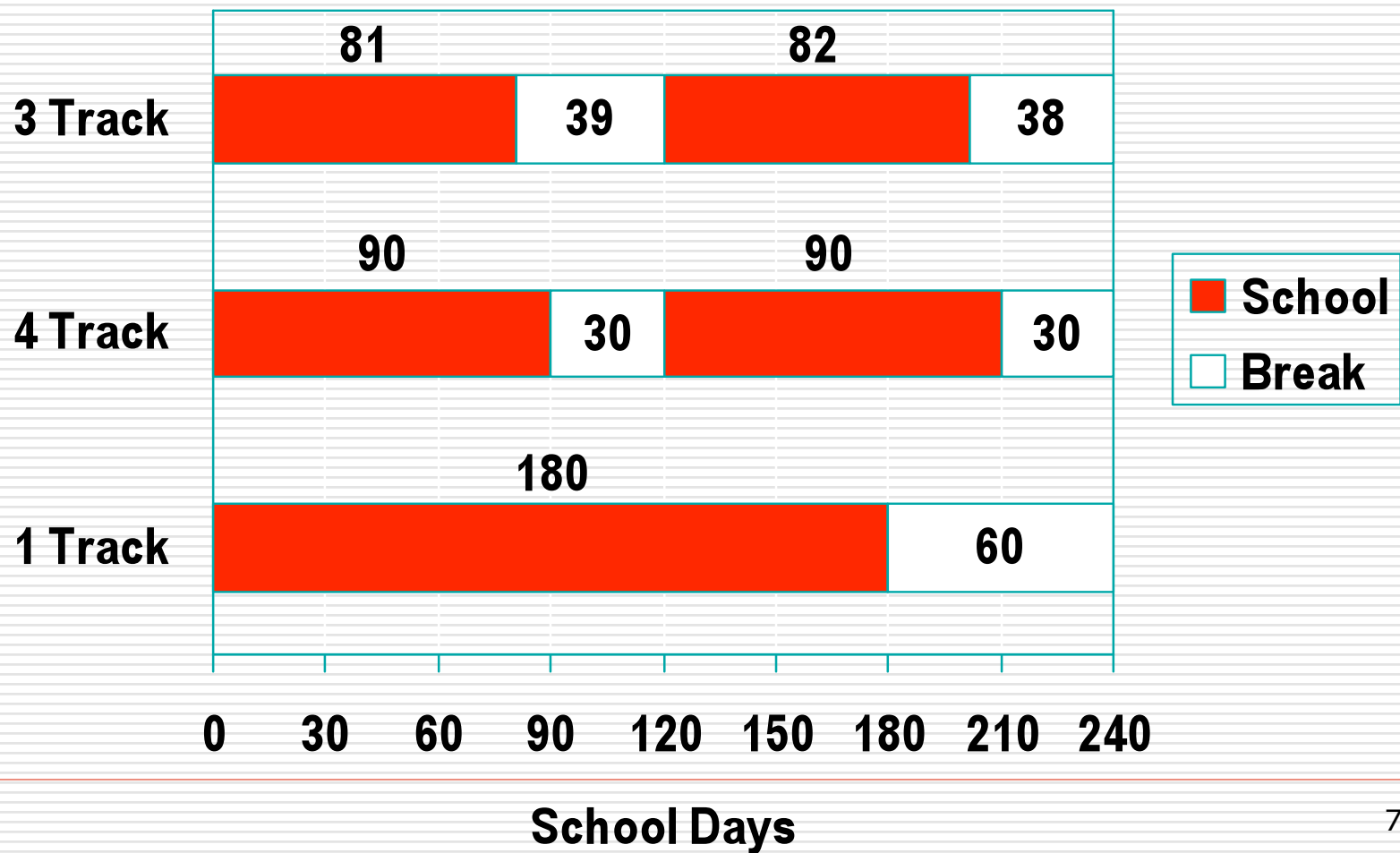
□ Education Index

- “HLM”: 115
- “Program evaluation”: 2399
- “Program evaluation and HLM”: 5

Example: LAUSD Calendar Study

- Does school calendar have an effect on student achievement?

3 School Calendars



Analytic Choices

- ❑ Compare mean performance across calendars
- ❑ Model relationship using OLS regression considering background characteristics
- ❑ Model relationship using HLM

Variables of Interest

Student Level

- 2000 SAT/9 Reading NCE Scores
- 2001 SAT/9 Reading NCE Scores

School Level

- School Calendars
 - Single, 3-Track, 4-Track
- Socio-Economic Status
 - School Characteristic Index

HLM Equations

Level 1 (student level)

$$2001 \text{ NCE} = \beta_{0j} + \beta_{1j} (2000 \text{ NCE}) + \varepsilon_{ij}$$

Level 2 (school level)

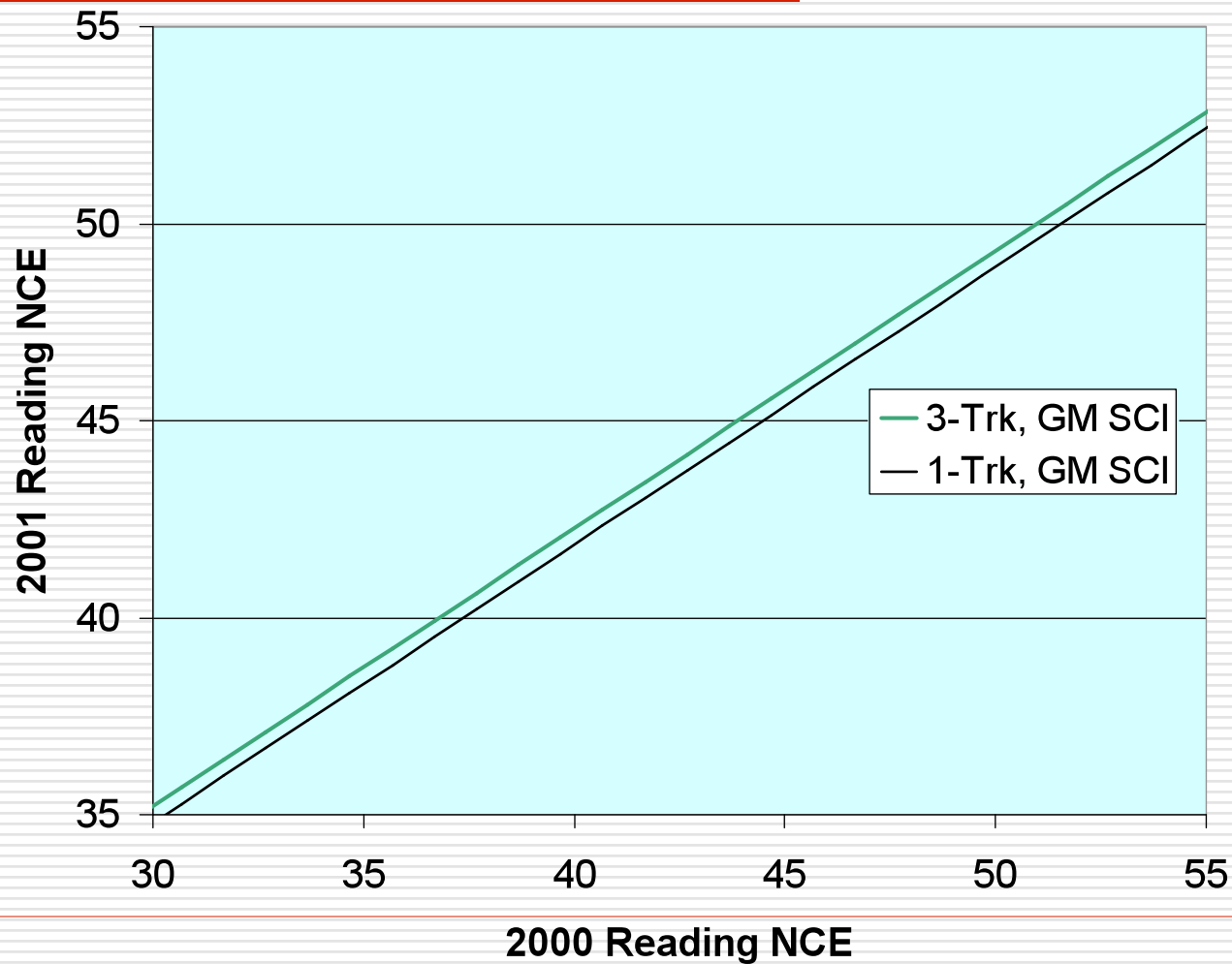
$$\beta_{0j} = \gamma_{00} + \gamma_{01} (\text{SCI } 2001) + \gamma_{02} (\text{CAL}_{3T}) + \gamma_{03} (\text{CAL}_{4T}) + \mu_0$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11} (\text{SCI } 2001) + \gamma_{12} (\text{CAL}_{3T}) + \gamma_{13} (\text{CAL}_{4T}) + \mu_1$$

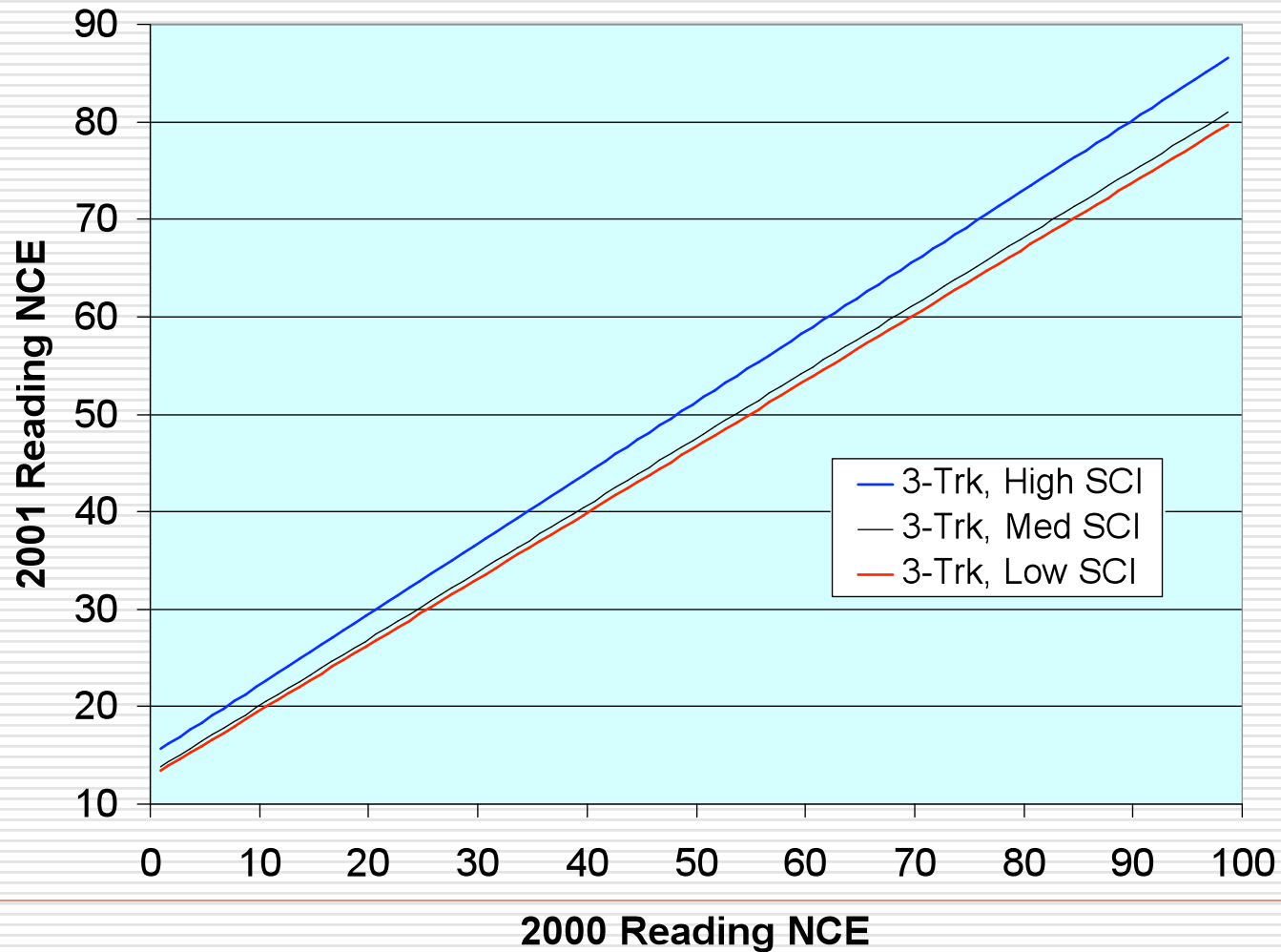
HLM Results

	Reading	
FIXED EFFECT	<i>Elementary</i>	
Intercept1 (B0)		
Mean Adjusted NCE (G00)	43.033	**
Three Track (G02)	0.413	*
Four Track (G03)	0.148	
SCI (G01)	0.176	**
Slope (B1)		
Mean Pretest (MD_RNCE)		
Intercept2 (G10)	0.705	**
Three Track (G12)	0.000	
Four Track (G13)	0.005	
SCI (G11)	0.002	**

Effect of School Calendar on Student Pre-Post Relationship



Effect of School SCI on Student Pre-Post Relationship



Challenges

- Data
 - Sample size
 - Primary key (ID) that links variables across levels
- Software
- People
 - Statistical background
- Dissemination of information

Conclusions

- ❑ Powerful yet underutilized tool for evaluations
- ❑ Potential application of HLM in other settings
- ❑ Technical and substantive considerations

Contact Information

Xiaoxia Ai

xiaoxia.ai@lausd.net

Lorena Llosa

lorenas@ucla.edu

Jeffrey White

jeff.white@lausd.net

<http://PERB.LAUSD.net>