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1. Introduction

- Distributional disparities of students in poverty exist within school districts
- Race-based student assignment plans are being invalidated
- Some school districts are moving to class-based student assignment plans without research into their effect on academic achievement

2. Design And Methodology

- Tried to get data from several large metropolitan school districts in the Midwest
- Analyzed 17,571 8th-graders from the 1988 National Education Longitudinal Study (NELS) base year database
- HLM - a "new" statistical model

3. Results

- After statistically controlling for all of the other student- and school-level demographic factors in the study...
    - individual poverty has a negative effect on student achievement
    - school poverty has a negative effect on student achievement
    - school poverty level has an equalizing effect on the poverty-achievement slope

4. So What?

- Surprisingly, not a lot of large-scale research into effects of poverty on academic achievement
    - this adds to the paltry research base
- Three solutions all appear to have serious shortcomings
    - increased resource allocation
    - class-based intra-district student assignment plans
    - class-based inter-district student assignment plans

5. Questions?

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Full Hierarchical Linear Model for All Academic Subject Areas

$$Y_{ij} = \beta_{0j} + \beta_{1j}(SES_{ij}) + \beta_{2j}(Sex_{ij}) + \beta_{3j}(Minority_{ij}) + \beta_{4j}(LEP_{ij}) + r_{ij}$$

Y_{ij}	=	achievement score for student i in school j [Y = mathematics, reading, science, or social studies]
β_{0j}	=	expected school achievement score (i.e., the school mean) [there is a separate β_{0j} for each of the j schools]
β_{pj}	=	expected change in the achievement score (Y_{ij}) for a unit change in X (i.e., the expected X-achievement slope) [X = SES, sex, minority status, or LEP status]
r_{ij}	=	unique random effect (i.e., the residual error) for student i in school j on the achievement score (Y_{ij})

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\% \text{ Free Lunch}_j) + \gamma_{02}(\% \text{ Minority}_j) + \gamma_{03}(\text{School Size}_j)$$
$$+ \gamma_{04}(\text{Student-Teacher Ratio}_j) + \gamma_{05}(\text{Urban}_j) + \gamma_{06}(\text{Rural}_j) + \mu_{0j}$$

γ_{00}	=	expected achievement score for all schools (i.e., the grand mean)
γ_{0j}	=	change in the expected school achievement score (β_{0j}) for a unit change in W [W = % free lunch, % minority, school size, student-teacher ratio, urban, or rural]
μ_{0j}	=	unique random effect of school j on the expected school achievement score (β_{0j}) after controlling for all W predictor variables

$$\beta_{pj} = \gamma_{p0} + \gamma_{p1}(\% \text{ Free Lunch}_j) + \gamma_{p2}(\% \text{ Minority}_j) + \gamma_{p3}(\text{School Size}_j)$$
$$+ \gamma_{p4}(\text{Student-Teacher Ratio}_j) + \gamma_{p5}(\text{Urban}_j) + \gamma_{p6}(\text{Rural}_j) + \mu_{pj}$$

γ_{p0}	=	expected (i.e., mean) X-achievement slope across schools [X = SES, sex, minority status, or LEP status]
γ_{pj}	=	change in the expected X-achievement slope (β_{pj}) for a unit change in W [X = SES, sex, minority status, or LEP status; W = % free lunch, % minority, school size, student-teacher ratio, urban, or rural]
μ_{pj}	=	unique random effect of school j on the expected X-achievement slope (β_{pj}) [X = SES, sex, minority status, or LEP status] after controlling for all W predictor variables

Significant Effects in Full HLM Models for All Academic Subject Areas
(N = 17,571 students in 783 schools)[a]

Fixed Effects[b]	Outcome Variables			
	Mathematics	Reading	Science	Social Studies
Model for school means				
Intercept (γ_{00})	-0.08 ***	-0.04 **	-0.05 **	-0.06 ***
% Free lunch in school (γ_{01})	-0.13 ***	-0.07 ***	-0.08 ***	-0.07 ***
% Minority in 8th grade (γ_{02})	-0.04 *	-0.05 **	-0.08 ***	-0.07 **
School size (γ_{03})				
Student-teacher ratio (γ_{04})			-0.03 *	-0.03 *
Urban (γ_{05})				
Rural (γ_{06})			0.09 *	
Model for SES-Achievement Slopes				
Intercept (γ_{10})	0.32 ***	0.31 ***	0.29 ***	0.31 ***
% Free lunch in school (γ_{11})	-0.07 ***	-0.04 **	-0.05 ***	-0.04 **
% Minority in 8th grade (γ_{12})			-0.05 **	-0.03 *
School size (γ_{13})	0.04 **	0.03 *		0.06 ***
Student-teacher ratio (γ_{14})				
Urban (γ_{15})				
Rural (γ_{16})				0.05 *
Model for Sex-Achievement Slopes				
Intercept (γ_{20})		0.24 ***	-0.12 ***	-0.08 ***
% Free lunch in school (γ_{21})				
% Minority in 8th grade (γ_{22})				
School size (γ_{23})				
Student-teacher ratio (γ_{24})				
Urban (γ_{25})				
Rural (γ_{26})			0.09 *	
Model for Minority Status-Achievement Slopes[c]				
Intercept (γ_{30})	-0.32 ***	-0.30 ***	-0.32 ***	-0.29 ***
% Free lunch in school (γ_{31})	0.06 *			
% Minority in 8th grade (γ_{32})				
School size (γ_{33})	0.08 **	0.08 **	0.13 ***	0.12 **
Student-teacher ratio (γ_{34})				
Urban (γ_{35})	-0.17 *		-0.22 **	-0.17 *
Rural (γ_{36})			-0.11 *	

* p < .05; ** p < .01; *** p < .001

[a] Although the sample sizes listed are unweighted, all statistics were computed using both the NELS student- and school-level weights.

[b] The HLM results presented here include adjustment for the four within-school variables. The model for the LEP-achievement slopes is not included in this table because LEP was used as a fixed parameter (i.e., it was not allowed to vary randomly between schools).

[c] Students were considered minorities if they were not White or Asian-American / Pacific Islander.