Using Aggregate State Assessment Data to Assess the Impact of School-Based Interventions

A Comparison of Student-Level and School-Level Data

Robin Jacob
University of Michigan

The School Leadership Improvement Study

- 3 yr study of McREL's Balanced Leadership (BL) professional development program for school principals
- 100 principals in Michigan randomly assigned to BL program or "as is" control
- Original design assumed the use of individual student-level test scores and called for estimating a two-level hierarchical model (students nested within schools)

Difficult to Obtain Student-Level Data

- FERPA concerns
- Resource constraints
- But school-level average test scores by grade publicly available
- What if we had to use aggregate school-level data instead?

Will the two models (student-level and school level) yield the same results?

- Yes (see Raudenbush & Bryk, 2002) if…
  - School-level data are based on exact same data
  - Data are balanced (i.e. same number of students per school)
  - No covariates are included in the models
- But what if these conditions don't hold?

Questions to Explore

- Q1: Will student-level analysis yield comparable results to a school-level analysis even with unbalanced data and the inclusion of covariates?
- Q2: Are school-level public-use data the same data as would be included in a restricted-use student-level file?
- Q3: Does the inclusion of student-level covariates substantially improve the precision of the model?

Q1: Use Simulated Data

- Create a Simulated Data Set (500 repetitions)
  - 100 schools (half treatment, half control)
  - 100 students per school (on average)
  - Simulated treatment effect of 0.20 points
- Vary the degree of unbalance in school sample sizes
  - Constant
  - Moderate
  - High
- Include covariates or not

Findings

- When completely balanced (all schools with 100 students per school) results are identical
- Even with unbalanced data and school-level covariates, on average, the two models yield almost identical results

Simulation Results: Aggregate vs. Student-Level Data

	Student-level model vs. Aggregate model			
	Degree of Unbalance			
	Moderate		High	
	% of estimates that differed by more than 10%	Max diff. across 500 simulations	% of estimates that differed by more than 10%	Max diff. across 500 simulations
No covariates	0%	.0034	4.4%	.0347
Covariates	0%	.0033	0.4%	.0220

Q2-Q3: Use Data from a Previous Study

- 78 Michigan public elementary schools serving grades four and five
  - Student scaled scores on the 4th grade 2005 MEAP in mathematics and reading from restricted-use file
  - Student-level demographic information from restricted-use file
  - School-level demographic data and prior achievement from Michigan Department of Education website
  - Researcher generated treatment variable

Question 2: Are data the same?

- In MI, school-level public use data appear to be based on the same data as the restricted-use student-level file
  - Average percent proficient in math: 74.0% vs. 74.1%
- Minimum reporting requirements can be problematic
  - Implications for rural schools and subgroup analyses

Question 3: Does the inclusion of covariates from a restricted-use file substantially improve precision?

- Student-level covariates
  - Special Ed, Free or Reduced Price Lunch, Limited English Proficient(LEP), Female, Minority
- Additional aggregate school-level covariates
  - Percent Special Ed, Percent LEP, Percent female

Assessing the Precision of the Estimates

- Minimum Detectable Effect (MDE)
  - Smallest effect you have a good chance of detecting
- Minimum Detectable Effect Size (MDES)
  - Smallest effect size you have a good chance of detecting
  - MDE/standard deviation of the outcome

Do Covariates Make a Difference?

	School-level data	Student-level data		
	Model 1	Model 2	Model 3	Model 4
School-level covariates	YES	YES	YES	YES
Student-level covariates	NO	NO	YES	YES
Additional aggregate school-level covariates	NO	NO	NO	YES
Minimum detectable effect size (MDES)	0.201	0.201	0.204	0.182

Findings

- Student-level covariates add little in terms of precision (see also Bloom, Richfield-Hayes & Black, 2005)
- Aggregate school-level covariates based on student-level data (e.g. % special ed, % LEP) do increase the precision somewhat
  - This may be one benefit of obtaining student-level data, although in our data the increase in precision is relatively small

Some Things You Can't Do with School-Level Achievement Data

- Conduct subgroup analyses based on student characteristics
  - However, many studies don't have adequate power for such analyses
  - Disaggregated data is now available on many state websites
- Conduct analyses in which you follow individual students over time or model growth
  - Such analyses are almost always outside the experimental framework
  - May not be necessary to answer key research questions

Conclusions

- The same results can often be obtained using aggregate data
- This data is often more readily available than individual data
- Researchers should carefully consider whether or not aggregate data can adequately meet their needs

Questions?

Robin Jacob
rjacob@umich.edu

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