# Schooling, Statistics and Poverty: Measuring School Improvement and Improving Schools

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# Outline of Talk

- Controversy Over No Child Left Behind
- Statistical Issues Central
- Some Surprising Findings
- Relationship to the New Committee on Education at Chicago

# Background

- High Stakes Testing Under NCLB
- Key Aim: Improve schooling for poor children.

# From NCLB, 2001

- This law is intended to close “the achievement gap between high- and low-performing children, especially the achievement gaps between minority and non-minority students, and ***between disadvantaged students and their more advantaged peers***”

# Theory of Action

- Hold schools accountable for outcomes
- Allow flexibility in achieving these outcomes
- Key role of statistical evidence

# Debate over re-authorization

- There is considerable support for accountability
- Some strong opposition
- A controversy over statistics

# The Controversy

- How to Measure School Quality
- How to Measure School Improvement

- Quality of Statistical Evidence is Key to the Theory of Action!

# Dominant Approach

- School mean proficiency = quality
- Change in proficiency between cohorts = improvement

- But
  - student proficiency = cumulative effects of prior experience
  - School-mean proficiency reflects student intake
  - Change in school mean reflects change in intake

# High Failure Rates of High-Poverty Schools

- In 2004, 66% of all Illinois schools found to be “in need of improvement” were in Chicago.
- Indeed, over 60% of Chicago schools were so classified.
- Similarly, 69% of those schools found to be in need of in the state of New York were in New York City.

# Are High-Poverty Schools Failing?

- Sociological theory predicts this:
  - Deprivation of resources (Pfeffer and Salancik (1978)
  - Role models, collective socialization, peers
    (Jencks and Mayer, 1989)
  - Cohesion and informal social control
    (Sampson, Raudenbush, and Earls, 1997)
  - Social Capital
    (Coleman, 1989)
  - Academic Pacing
    (Barr and Dreeben, 1983)

# Supporting perceptions of failure

- Past empirical evidence on “contextual effects”
  - Reviews by Willms (1986), Hoffer (2003)
  - Neighborhood effects (Garner and Raudenbush (1991)
- Accounts in the popular literature (Kozol’s “Savage Inequalities”)

# However…

Likely bias of NCLB results

Importance of public perception
(Lowry, 2002)

# An Alternative: “Value Added”

- Hold Schools Accountable for Kids’ *Growth* Not Status
- School Improvement = Change in Value Added
- Intuitive Appeal
- Creates an “even playing field” for high poverty schools

# Objections to Value Added

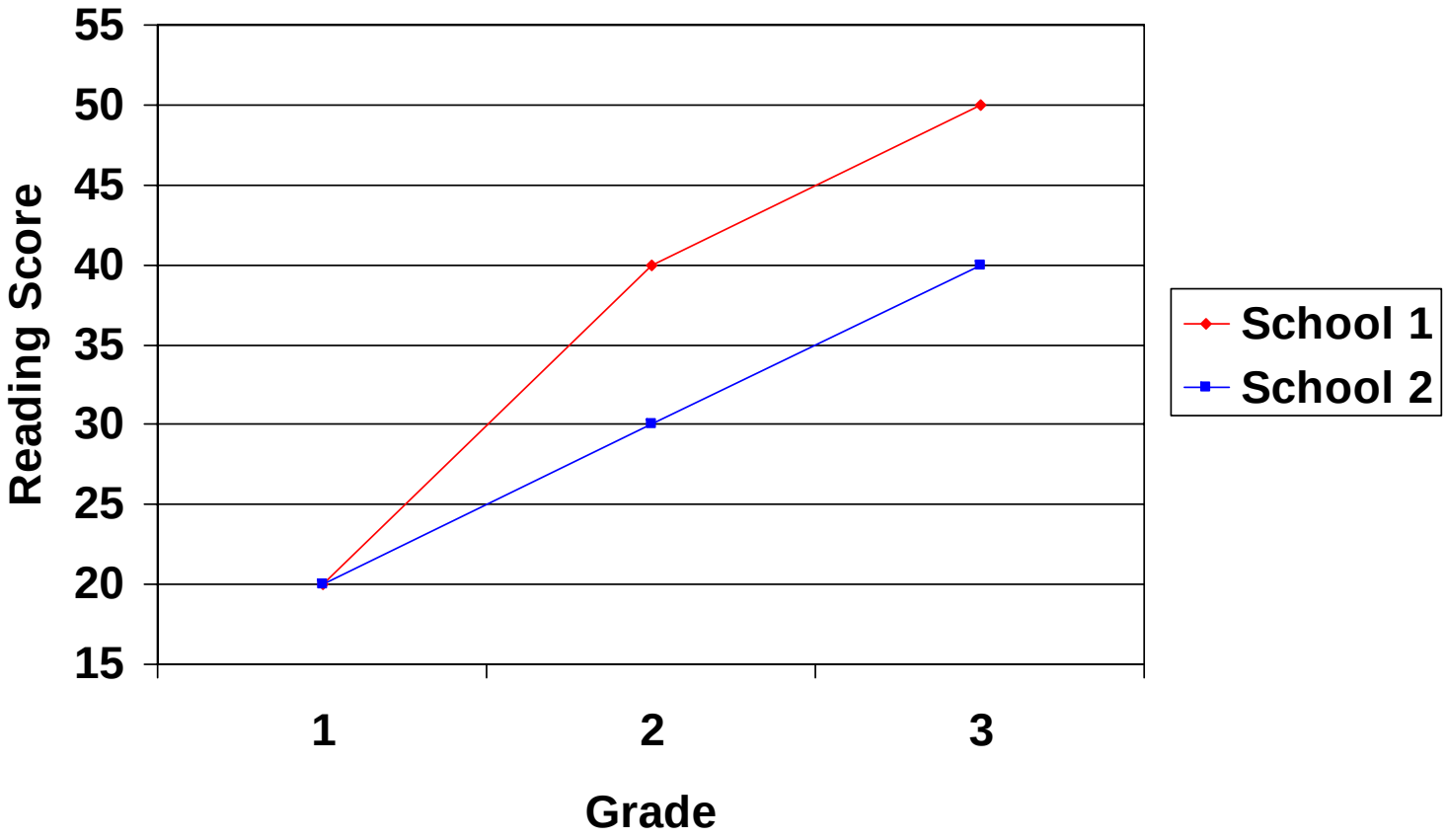
- Annual testing
- Must track students over time
- Need equated tests
- Challenging data analysis
  - Problem of transparency
  - School district capacity

# Inferential Issues

Reliability of “change in change”

Potential bias of controlling for prior school effects

# Figure 1. Average reading achievement trajectories of two hypothetical schools



- Moreover, school differences in growth could reflect differences in intake
- Or differences in summer learning.

# My Investigation

- Analyze Four Data Sets Spanning K-12
- Compare effectiveness indicators based on **mean proficiency** (*a la* NCLB) versus **value added**

- Examine how high and low poverty schools fare on these

# Comparisons

- Grades k-1 (Early Childhood Longitudinal Study)
- Grades 1-3 (Sustaining Effects Study)
- Grades 1-5 (DC accountability data)
- Grades 8-12 (National Educational Longitudinal Study)

# Finding 1

Mean Proficiency and Value Added Give Quite Different Results

## Table 4: Correlations between Mean Proficiency and Value Added, Grades 2-5 (Washington D.C. data)

| Sample | Grade | Reading | Math |
|---|---|---|---|
| Starting in 98 | 2 | .40 | .62 |
| Starting in 98 | 3 | .34 | .45 |
| Starting in 98 | 4 | .49 | .35 |
| Starting in 98 | 5 | .44 | .47 |
| Starting in 99 | 3 | .33 | .47 |
| Starting in 00 | 4 | .30 | .33 |
| Starting in 01 | 5 | .35 | .40 |

# Finding 2

Mean Proficiency Strongly Biased Against High Poverty Schools

# Design of Early Childhood Longitudinal Study (ECLS)

| | | | | |
|---|---|---|---|---|
| Age | 60 months | 69.5 months | 72.5 months | 82 months |
| Grade | Fall K | Spring K | Fall 1 | Spring 1 |

# Model for individual growth

$$\pi_{1ij} = kindergarten\ \ learning\ \ /\,month$$
$$\pi_{2ij} = summer\ \ learning\ \ rate\,/\,month$$
$$\pi_{3ij} = first-grade\ \ learning\ \ rate\,/\,month$$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# Model for Individual Differences in Learning

$$\pi_{0ij} = \gamma_{00} + \gamma_{01}(High\ Poverty)_j + u_{0j} + r_{0ij}$$

$$\pi_{1ij} = \gamma_{10} + \gamma_{11}(High\ Poverty)_j + u_{1j} + r_{1ij}$$

$$\pi_{2ij} = \gamma_{00} + \gamma_{01}(High\ Poverty)_j + u_{2j}$$

$$\pi_{3ij} = \gamma_{30} + \gamma_{31}(High\ Poverty)_j + u_{3j} + r_{3ij}$$

$$\begin{pmatrix} u_{0j} \\ u_{1j} \\ u_{2j} \\ u_{3j} \end{pmatrix} \sim N(\mathbf{0}, \mathbf{\Omega}), \quad \begin{pmatrix} r_{0j} \\ r_{1j} \\ r_{2j} \end{pmatrix} \sim N(\mathbf{0}, \boldsymbol{\tau})$$

# Under Our Model,

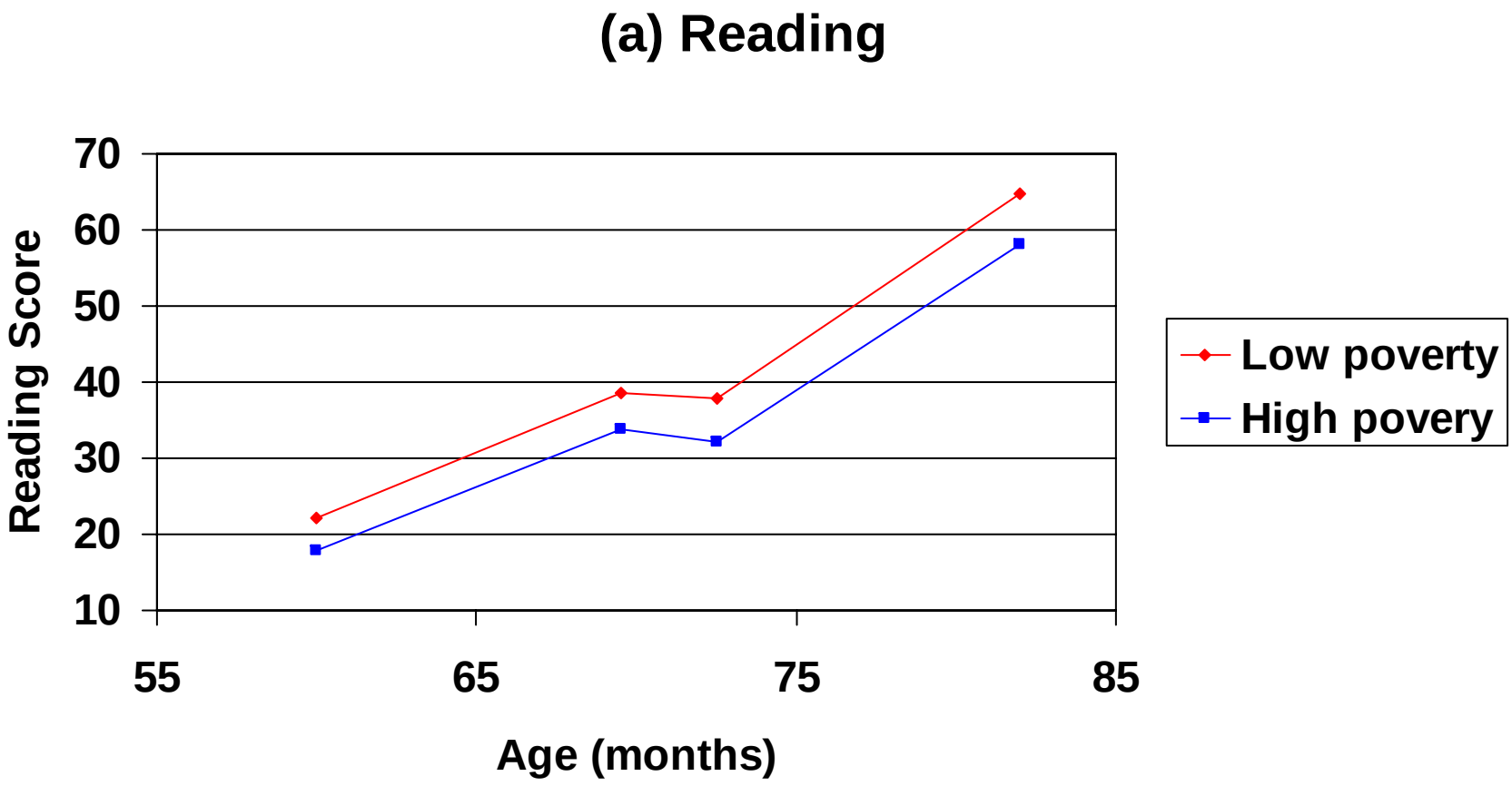
- **Mean Proficiency in grade 1**

  = E(fall k status + k learning + summer learning
  + grade 1 learning)

- **Value Added in grade 1**

  = E(summer learning + grade 1 learning )

# Early Childhood Longitudinal Study (ECLS)



# Comparing Indicators

School Pov associated with Fall k status, summer loss, First grade growth

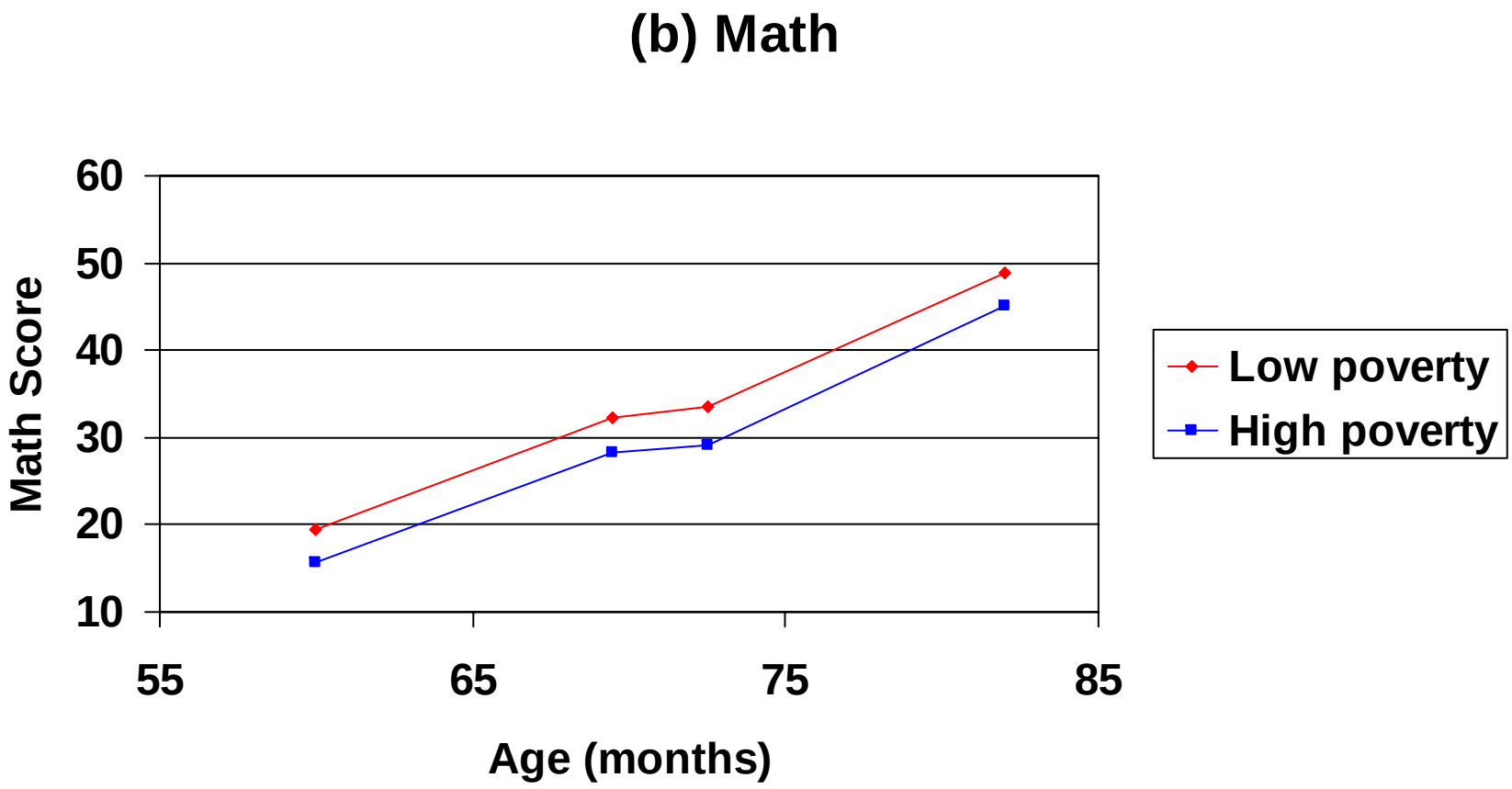
NCLB indicators WOULD be quite strongly correlated with School Poverty

Grade-1 Value Added indicators:

- Would be weakly associated with School Pov, for two reasons:

1. Summer loss is greater in high pov schools
2. Modestly lower growth during grade 1 in high pov schools

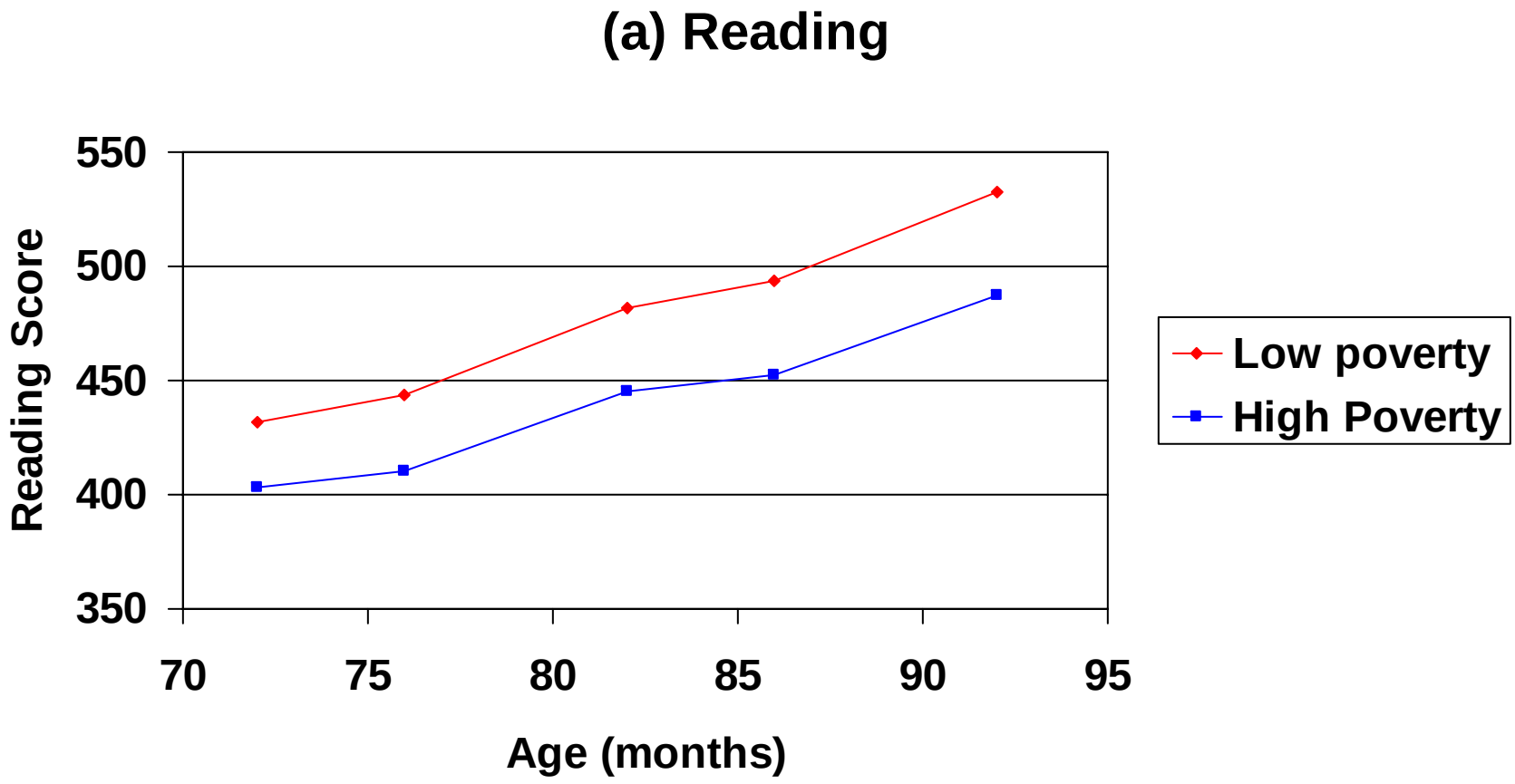
**Figure 3. Mean trajectories, high and low poverty schools (ECLS)**



# Comparing Indicators

- School Poverty associated only with Fall K entry status. No association with summer loss or academic year growth.
- So NCLB indicators WOULD be quite strongly correlated with School Poverty
- Value Added indicators would NOT be so associated

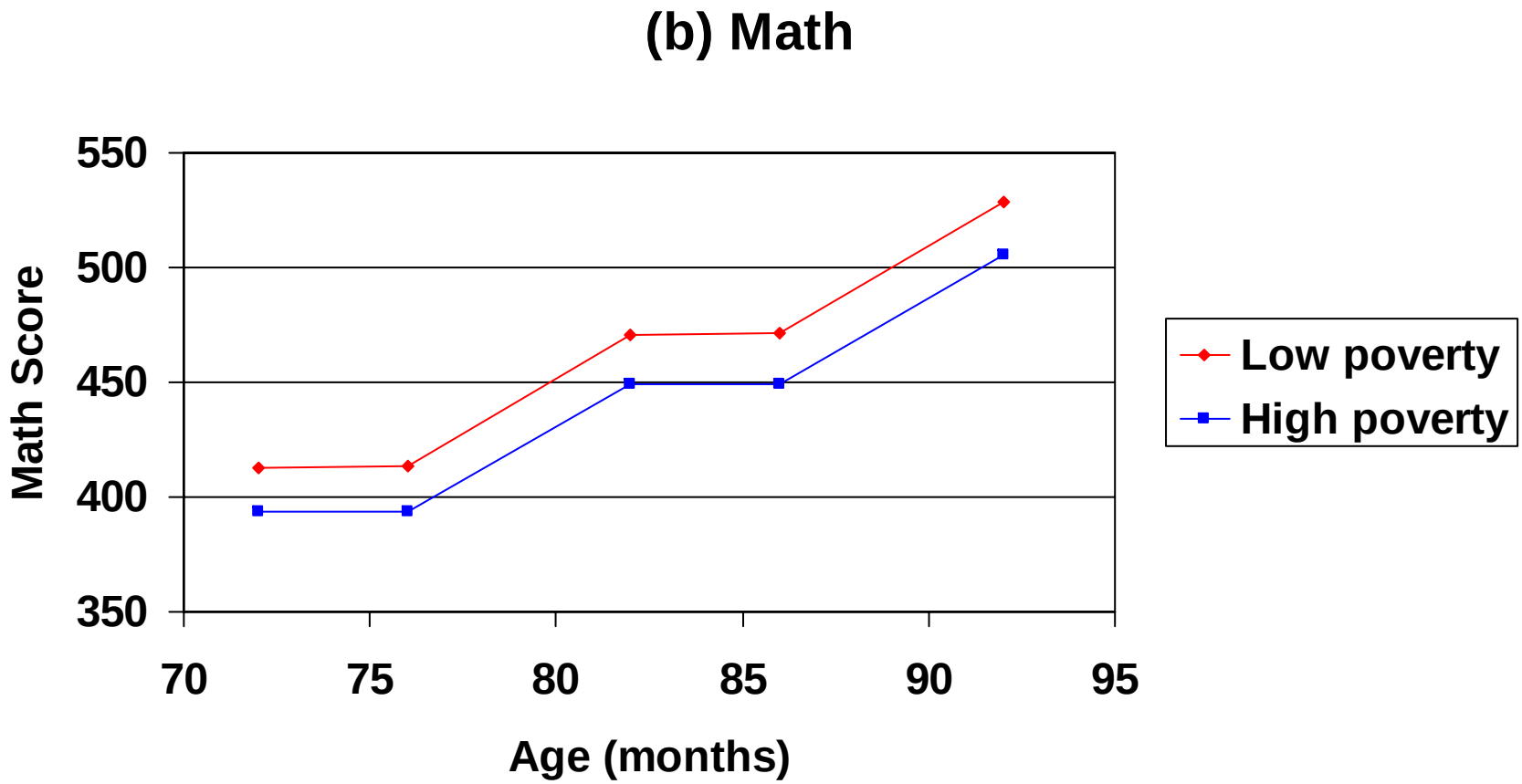
**Figure 5. Average trajectories, Grades 1-3, high and low poverty schools (Sustaining Effects Study)**



# Comparing Indicators

- School Poverty associated only with entry status (spring grade 1) and summer growth.
- So NCLB indicators WOULD be quite strongly correlated with School Poverty
- Value Added indicators would be WEAKLY correlated with School Pov
  - and then only because summer growth is less in high poverty schools!

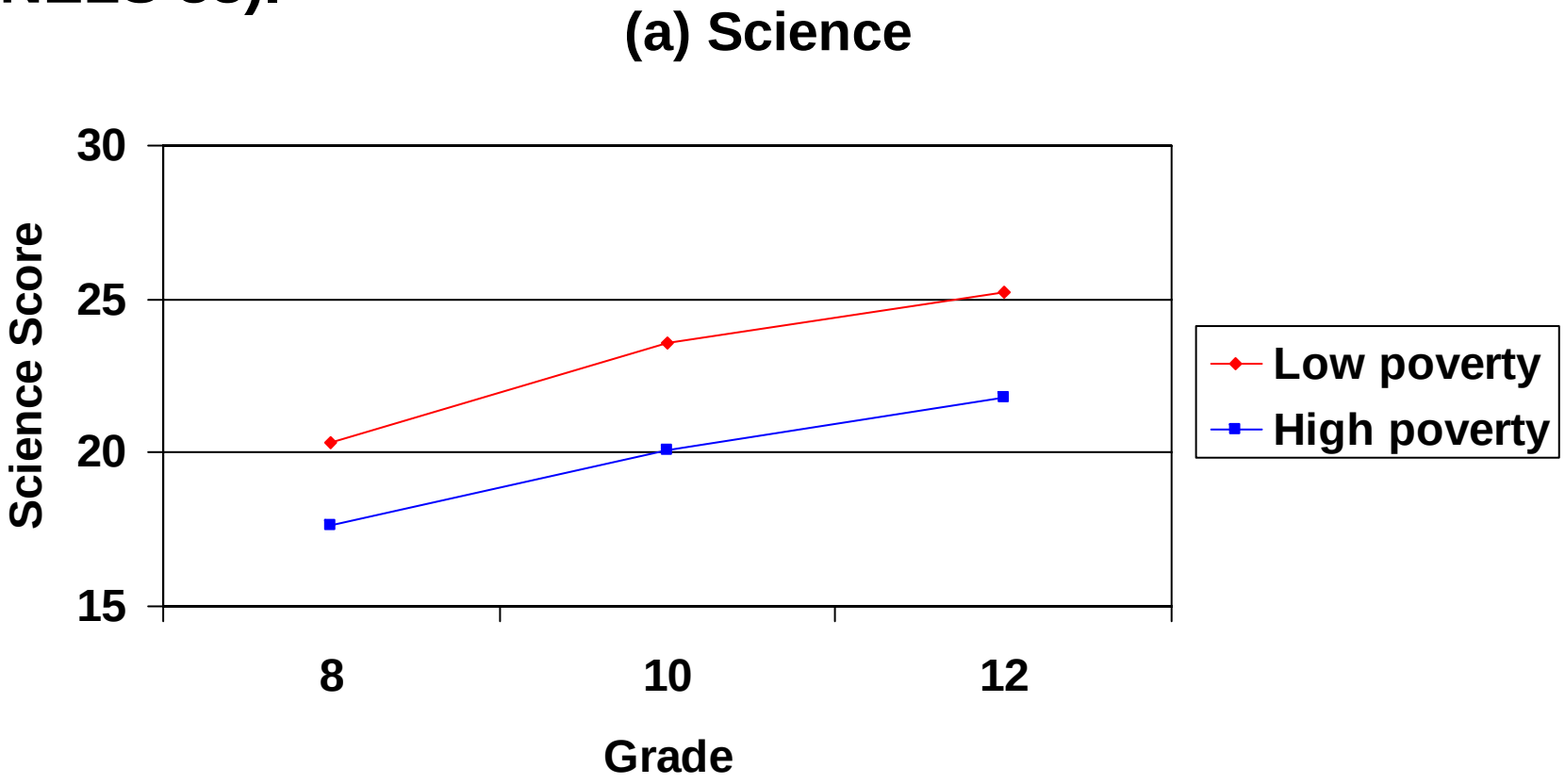
**Figure 5. Average trajectories, Grades 1-3, high and low poverty schools (Sustaining Effects Study)**



# Comparing Indicators

- School Poverty associated with entry status (spring 1) only.
- So NCLB indicators WOULD be quite strongly correlated with School Poverty
- Value Added indicators would NOT.

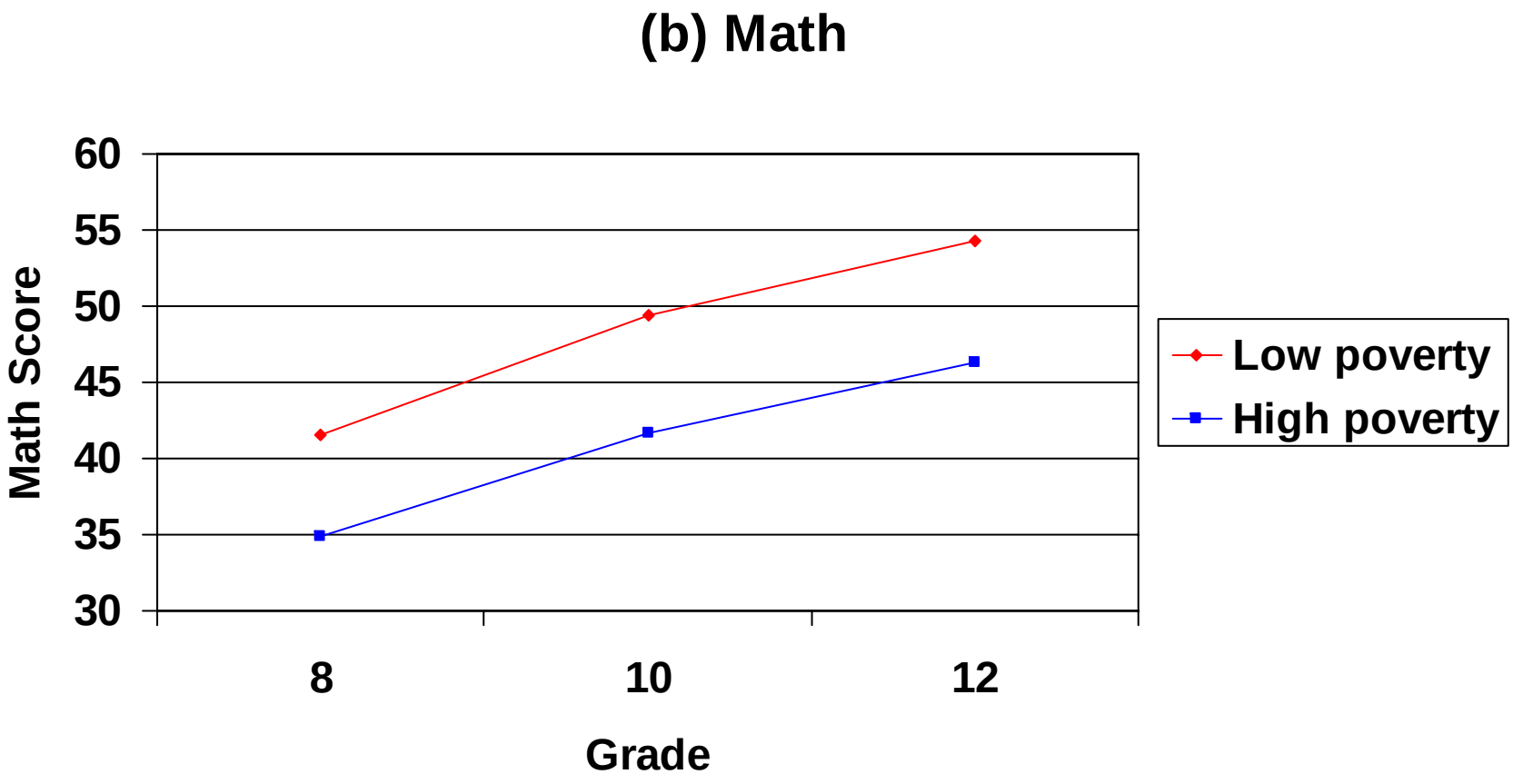
**Figure 6. Average achievement trajectories, Grades 8-12 (NELS 88).**



# Comparing Indicators

- School Poverty negatively associated with 8th grade status and average growth;
- NCLB indicators strongly associated with School Pov
- Value-added indicators also associated.
- But….
  - Corr (school mean status and school mean growth)=.68
  - Corr (student status and growth)=.68

**Figure 6. Average achievement trajectories, Grades 8-12 (NELS 88).**



# Comparing Indicators

- Story nearly identical to that in the case of Science

# Finding 3: Value Added is Not a Gold Standard!

Affected by summer learning

Growth rates are correlated with status of kids prior to entry to school

Open to several interpretations

# Finding 4

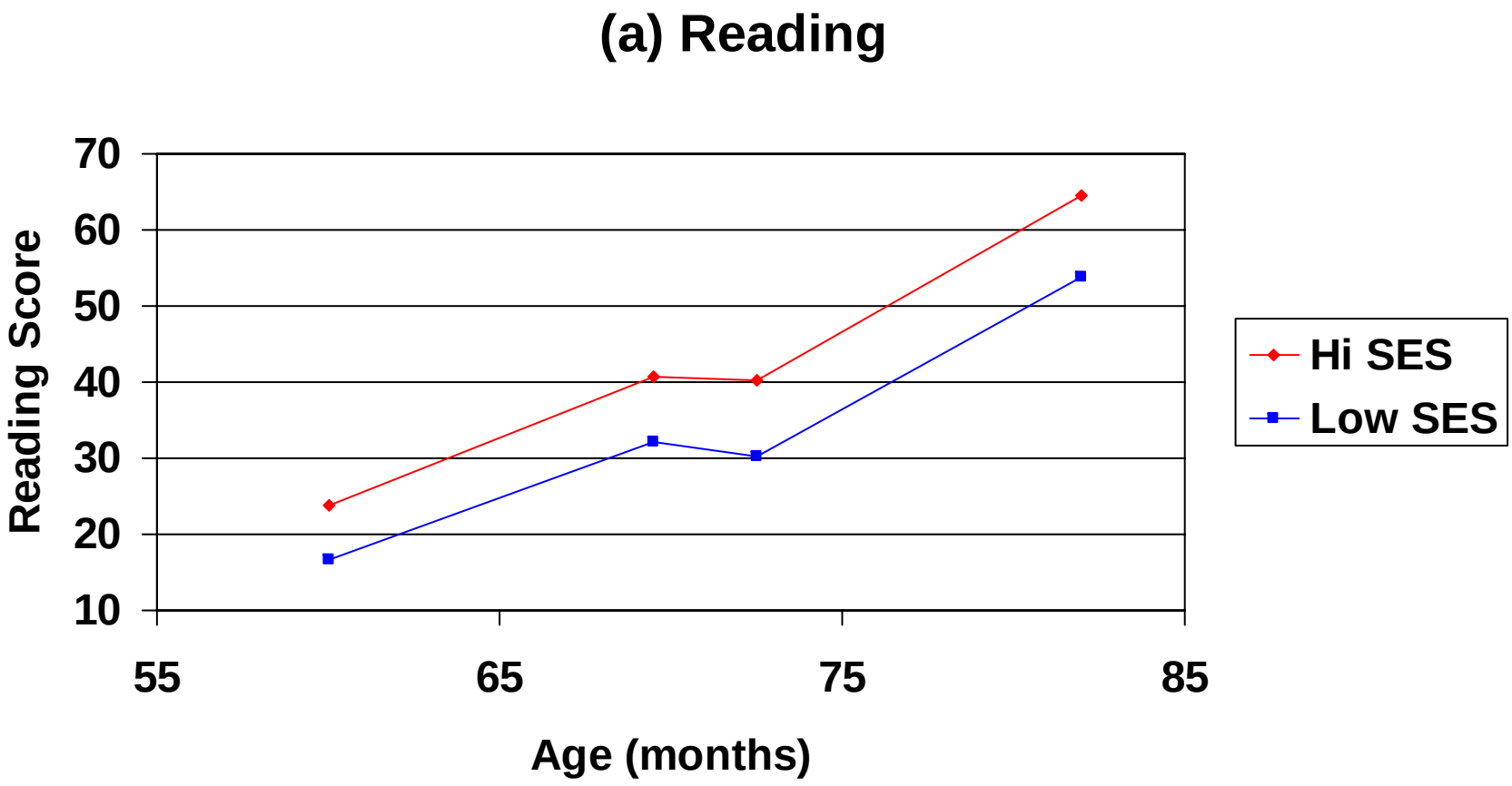
- Surprisingly weak association between school poverty and academic learning rates
  - Especially in early years
  - Especially in math

# Emerging Questions

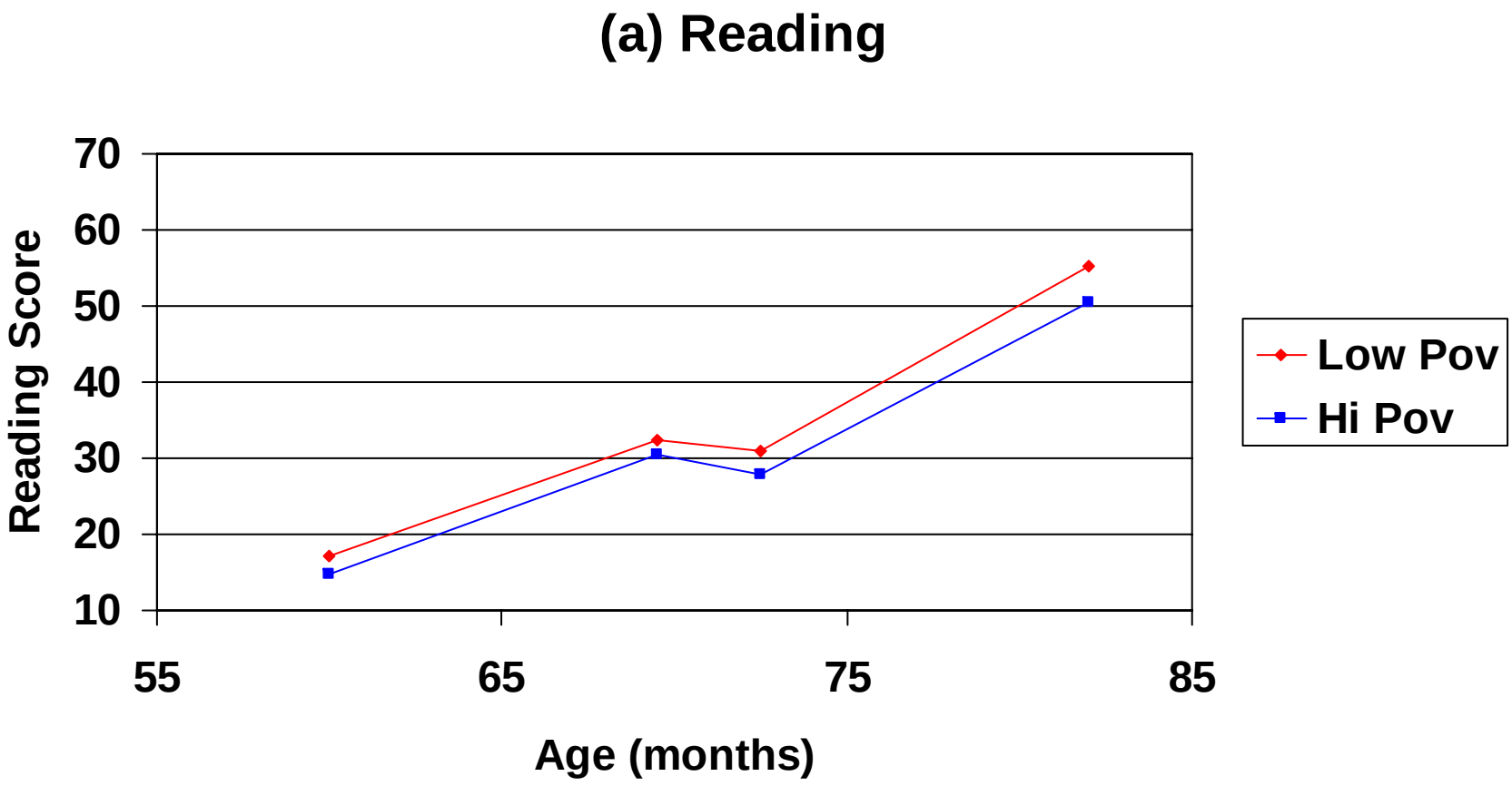
- Do poor students in high-poverty schools learn much less than the poor students in low-poverty schools?

- Let’s take a look at social inequality in ECLS

# Growth as a function of student social background: ECLS



# Growth as a function of school poverty for low SES students



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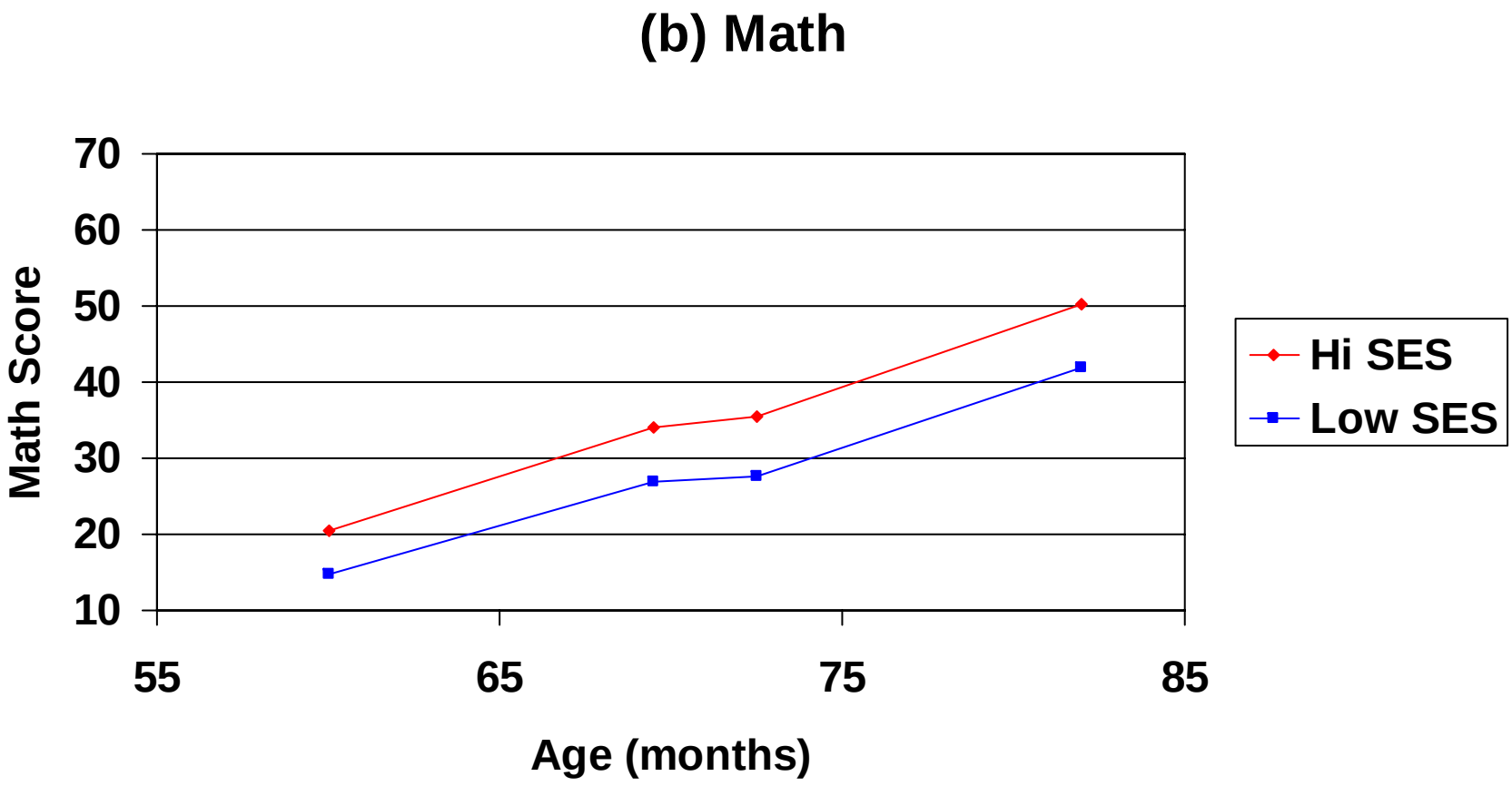

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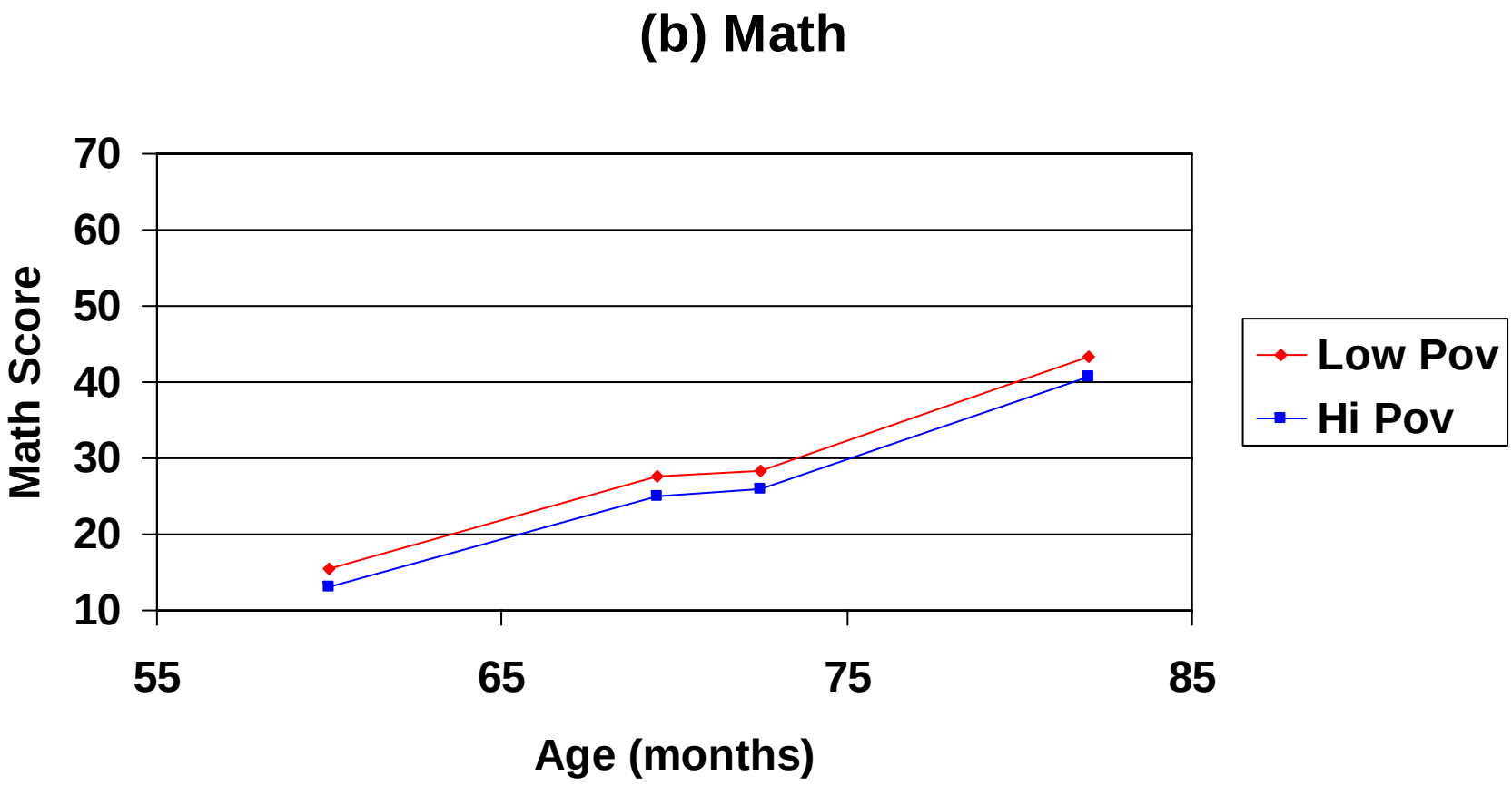
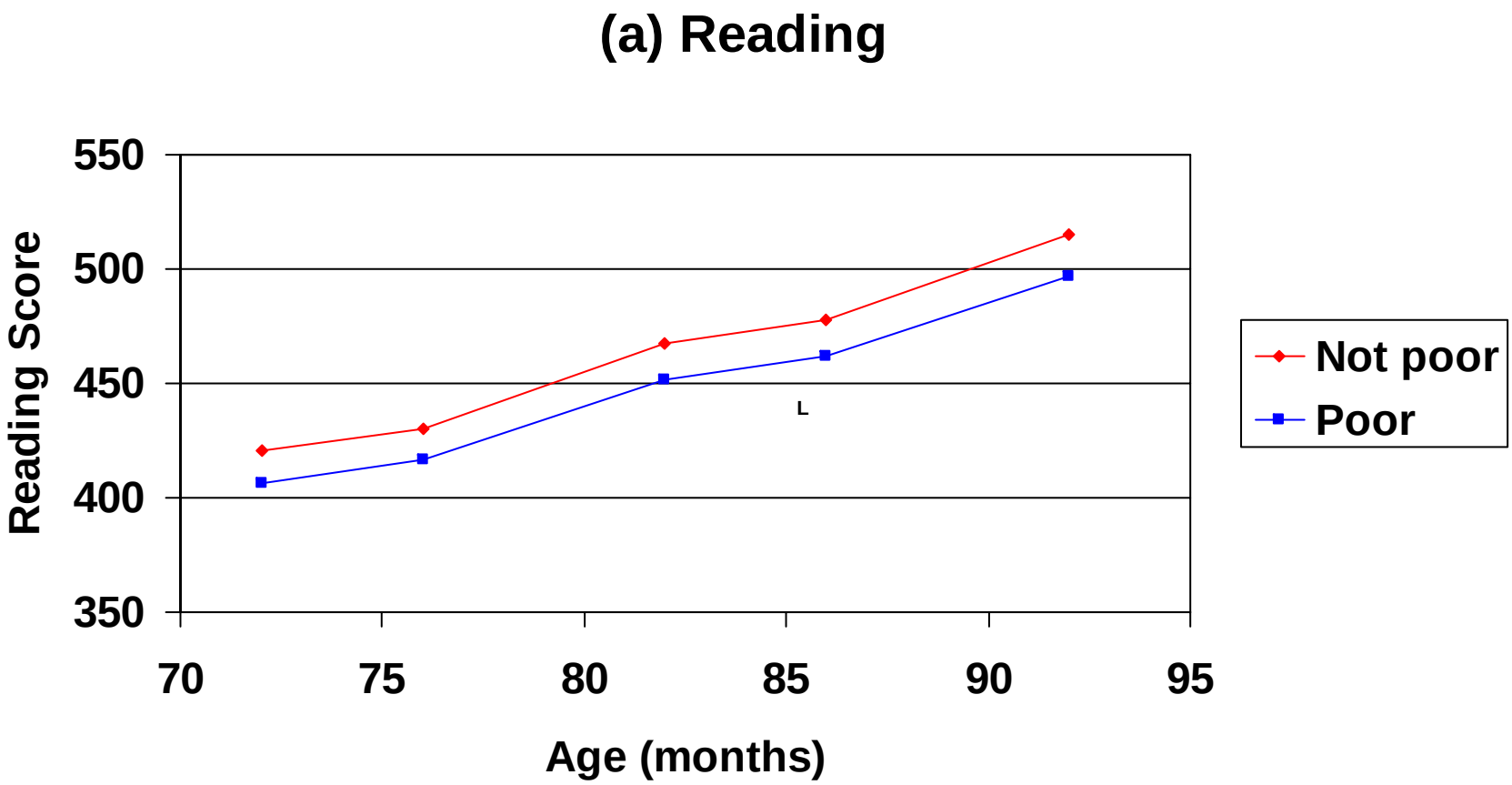
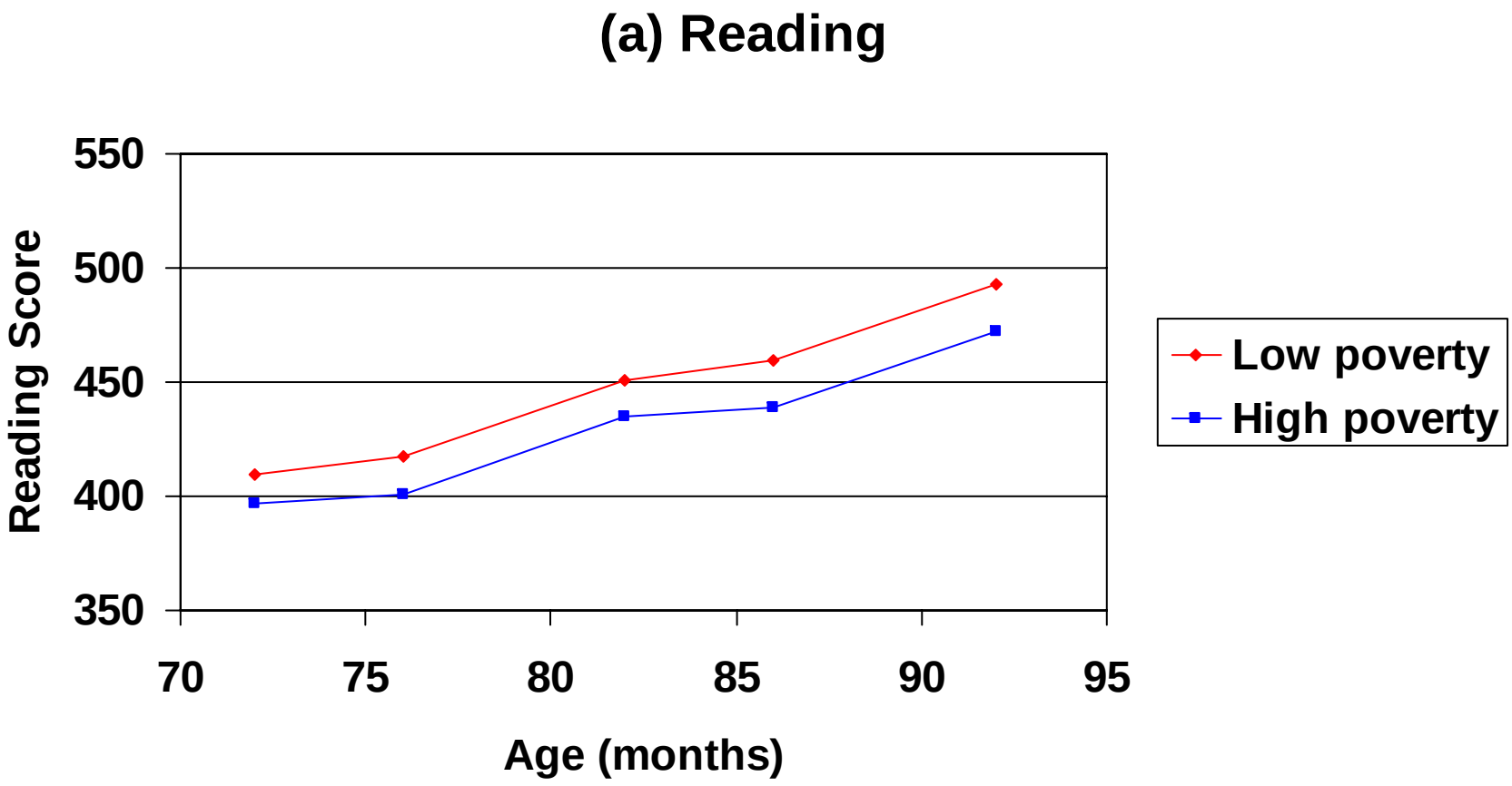


# Growth as a Function of Student Poverty: Sustaining Effects Data



# Growth as a Function of School Poverty for Poor Children: Sustaining Effects Data



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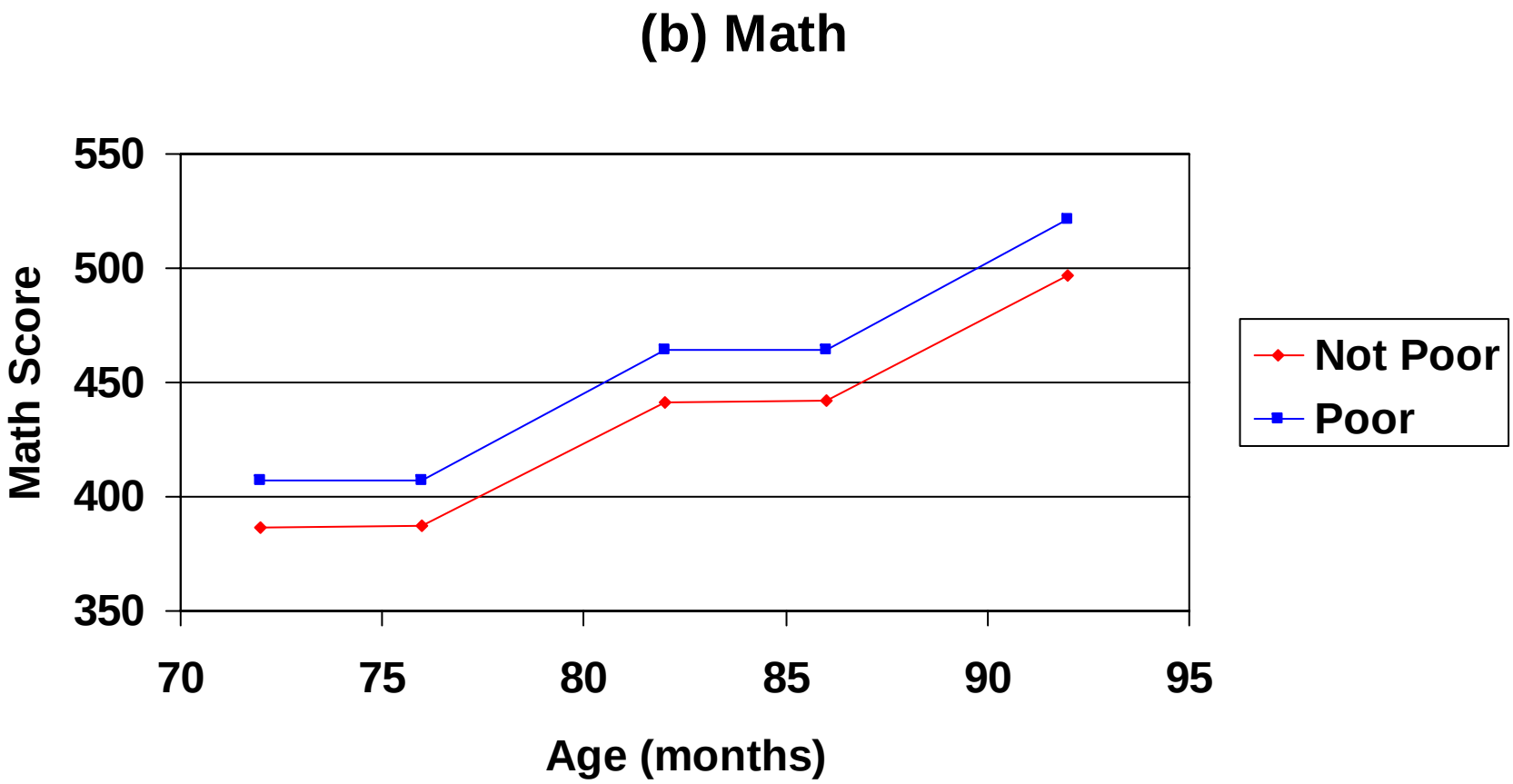

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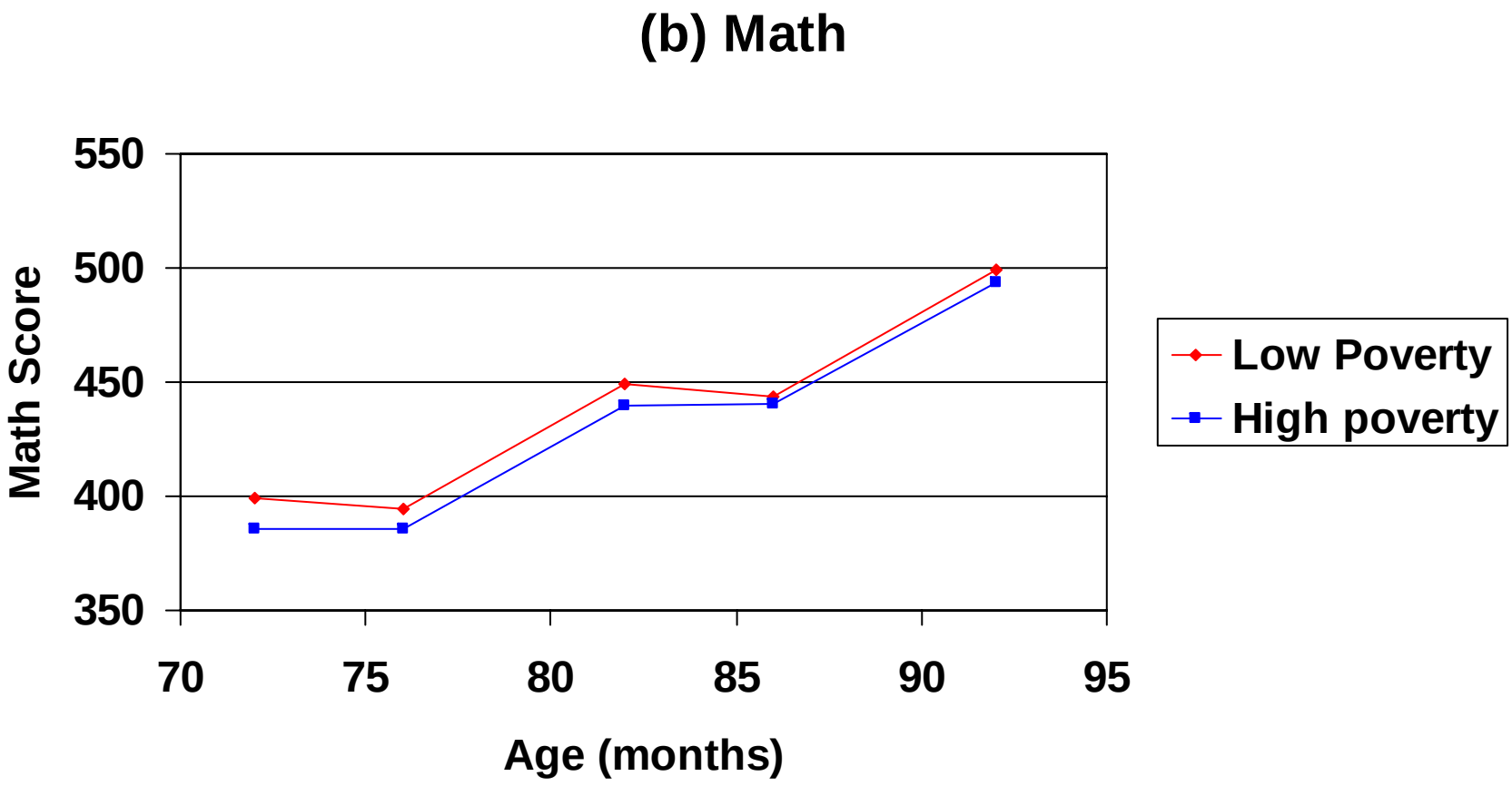

# Conclusions

- “Mean proficiency” seriously biased against high poverty schools
- “Value added” biased more subtly
- Growth rates in high- and low-poverty schools are quite similar.
- Accountability may motivate educators, but how can it overcome social inequality?

# Hypotheses

- School and neighborhood social context are “weak forces” in shaping cognitive skill in the early years
- Making high poverty schools “look like” low poverty schools will not eliminate social disparities

# So What Are the “Strong Forces?”

- Interactions with caregivers prior to K
  - Shape language
  - General knowledge
  - Concept Development

  (Goldin-Meadow, Huttenlocher, Levine)
- Interventions and Policy Options

  (Raver; Keels; Heckman, Neal)

# Strong Forces (cont'd)

- Ambitious instruction in literacy and math during the early years
  - Nicole Woodard-Iliev, Tim Knowles
  - Stein in Science
  - Sally, Usiskin in Math
- Integrating social services with instruction
  - (Roderick, Courtney)

# “The Chicago Model for Urban Schooling”

- Explicating and practicing our theory
  - (Yowell, Knowles)
  - Preparing teachers (Stodolsky)

- Testing the Theory: 7 experiments
  - (Schanzenbach, Easton)

# Final Prediction

- The University of Chicago is positioned to make seminal contributions to understanding and reducing social inequality in cognitive skills
- We are attuned to the “strong forces!”
- Keys
  - Interdisciplinary interchange
  - Testing the ideas we practice