The Impact of Mothers' Intellectual Human Capital and Long-Run Nutritional Status on Child Human Capital in Guatemala

Jere Behrman*, Alexis Murphy**, Agnes Quisumbing**,
and Kathryn Yount***

*U Pennsylvania
**IFPRI
***Emory University

Motivation

- Investments in human capital, particularly in early childhood, yield returns throughout the life cycle

- Many studies have documented the impact of maternal schooling on child human capital outcomes (survival, nutritional status, schooling)

- However, most of these studies have focused ONLY on schooling, possibly neglecting other aspects of women's human capital

- Neglect is not benign: it may lead us to disregard other policy levers for intervening in the intergenerational transmission of human capital, and therefore interrupting the intergenerational transmission of poverty

Investing in mothers' human capital is also a decision

- Most studies of impacts of maternal human capital take it as given (for example, years of schooling)
- In reality, the stock of human capital is determined by parental decisions regarding schooling, environmental factors such as the supply and quality of schools, and "shocks" or unexpected events such as changes in labor market conditions as well as interventions designed to increase the stock of human capital

This study

- Investigates impact of various measures of mother's intellectual human capital and long-run nutritional status on a wide range of child human capital outcomes
- Uses longitudinal data collected over 35 years in Guatemala
- Unlike previous studies, treats all measures of maternal human capital (intellectual and biological) as behaviorally determined
- Examines the use of an index of mother's cognitive skills as an alternative to schooling as a measure of intellectual human capital

Longitudinal data set has information on three generations

- G1: parents of current mothers (grandparents)
- G2: mothers who participated in a nutritional intervention
- G3: children of G2 mothers

Linking child outcomes to investments in mother's human capital: A conceptual framework

G3 child outcomes = f (G2 mother's human capital, observed G3 individual characteristics , unobserved endowments, error term 1)

G2 mother's human capital = k (Parental G1 family background, initial community prices and policies, genetic and other endowments, G2 mother's individual characteristics, changes in markets, policies, and other conditions (at critical ages for the determination of K), error term 2)

Estimation of impacts on child outcomes needs to consider:

1. Mother's human capital K is determined by genetic and other endowments that have direct effects on child outcomes , either directly or because of intergenerational correlations

2. Both biological and intellectual human capital are likely to be determined by common factors, and will be correlated. Estimation therefore needs to account for both biological and intellectual human capital.

Instrumental variables (IV) only feasible option

Data

Come from studies undertaken by the Instituto de Nutricion de Centro America y Panama (INCAP), Emory University, and IFPRI

Data sources

Longitudinal study 1969-77(children < 7 yrs): Atole (high protein) or Fresco (calories) supplementation

Follow-up study 1988-89 (youth 11-26 yrs)[+]
Generational Study 1996-99 (mothers and children)

Nutrition, human capital and economic productivity, 2001-2006 (adults 25-40 years)

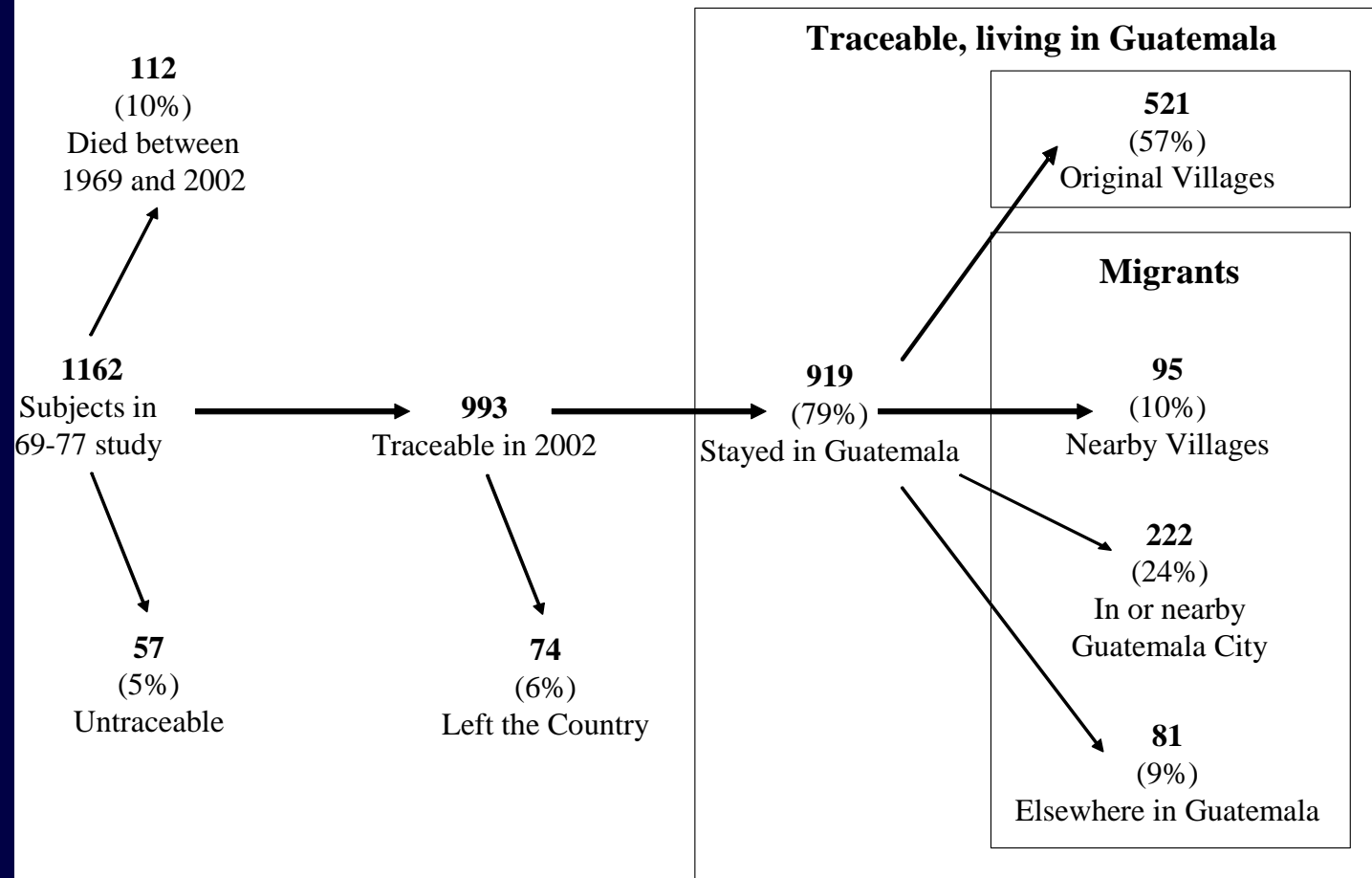# Then and now

Original supplementation trial (1969-77)

Human capital study (2001-2006)

Figure 1
Sample sizes for residents and migrants – Women only

Measures of maternal human capital
Relevant data point for mothers: Age 18, or time when marriage/parenting decisions are being made

Intellectual human capital

- Completed schooling attainment, measured in 2002-4

- Cognitive skills: reading scores and Raven's scores

### Biological human capital

- Maternal height at age 18

What factors affect the stock of maternal human capital?

- G2 parental characteristics and family background (G1 mother's and father's schooling attainment, SES score in 1975)
- Community characteristics during G2 mother's childhood
- Natural, market, or policy events affecting investment in mom's human capital: student teacher ratios at age 7, boom in local markets at age 15➔these vary by single year cohorts within each village and across villages
- Experimental nutritional intervention affecting G2 mothers: dummy for whether exposed to intervention from 0 to 36 months, dummy for Atole x exposure

Summary of child (G3) outcomes

	Mean	SD	n
Anthropometry at birth			
Birth weight (kg)	2.98	0.46	576
Birth length (cm)	48.24	2.13	556
36-month Z scores			
LAZ	-1.79	1.02	459
WAZ	-1.26	1.09	459
WHZ	-0.26	0.96	459
Schooling			
Deviation from cohort mean	0.02	2.64	1175

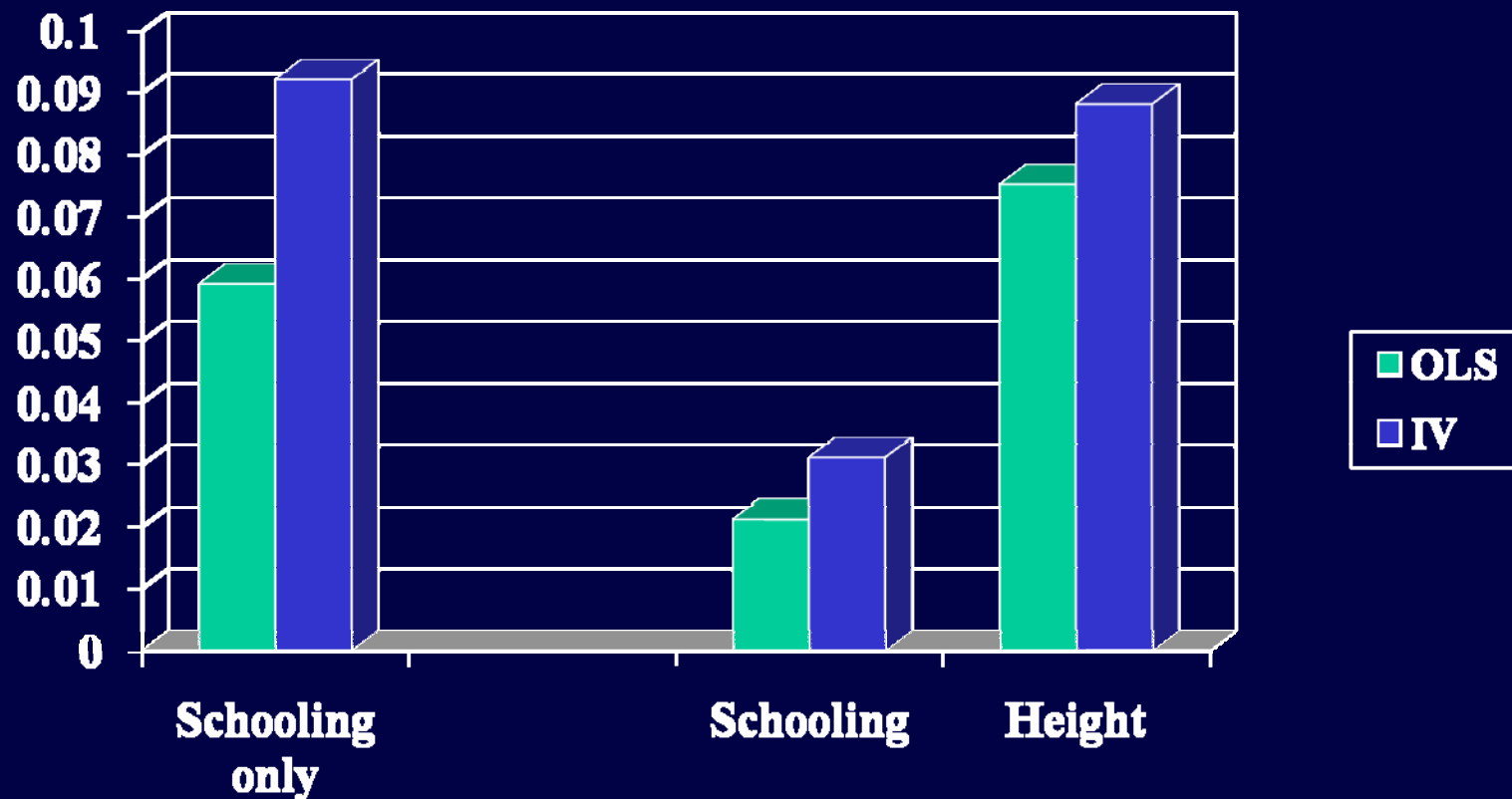# Impact of schooling and height on birthweight (coefficients)
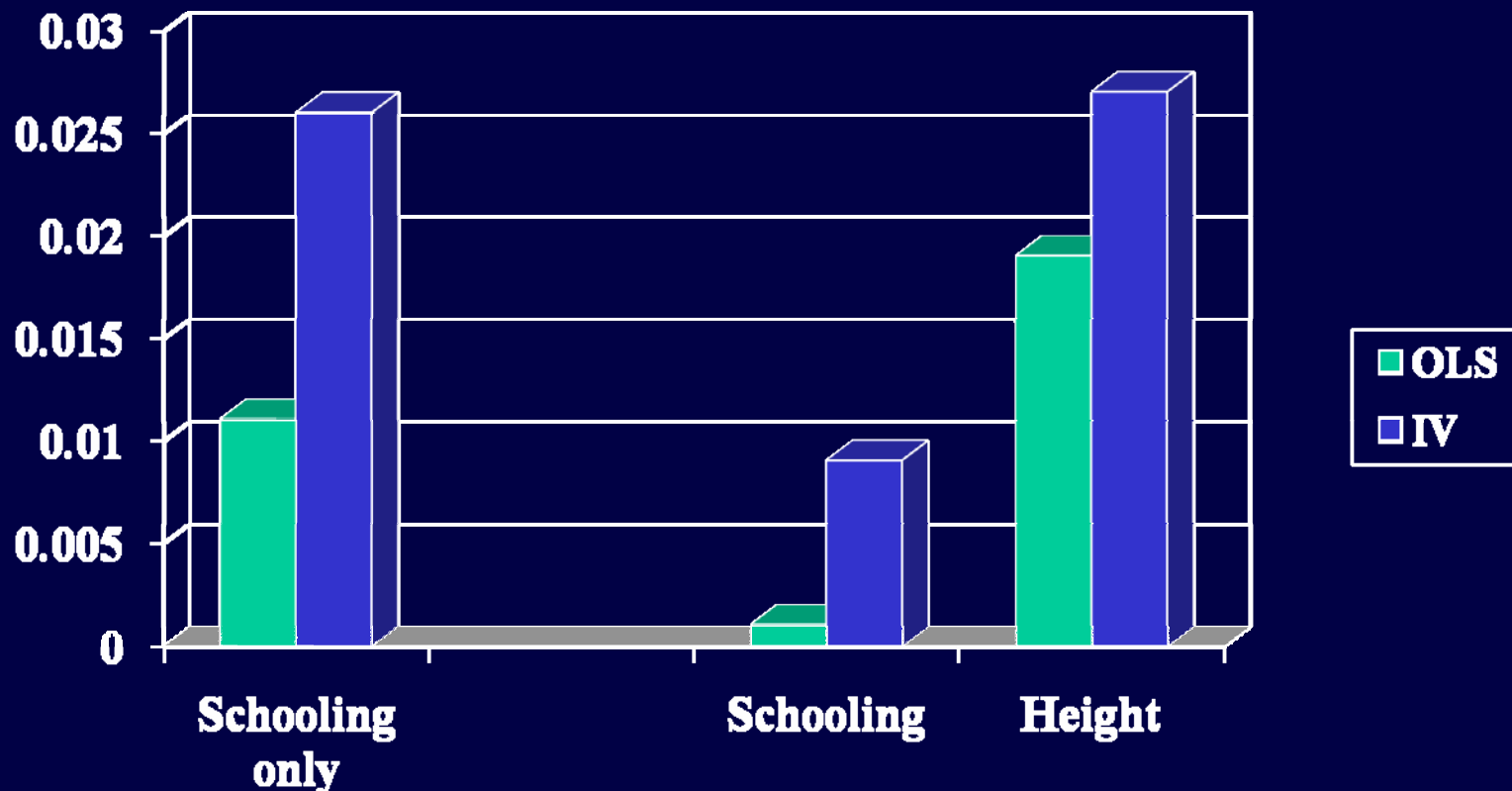
Schooling is not significant

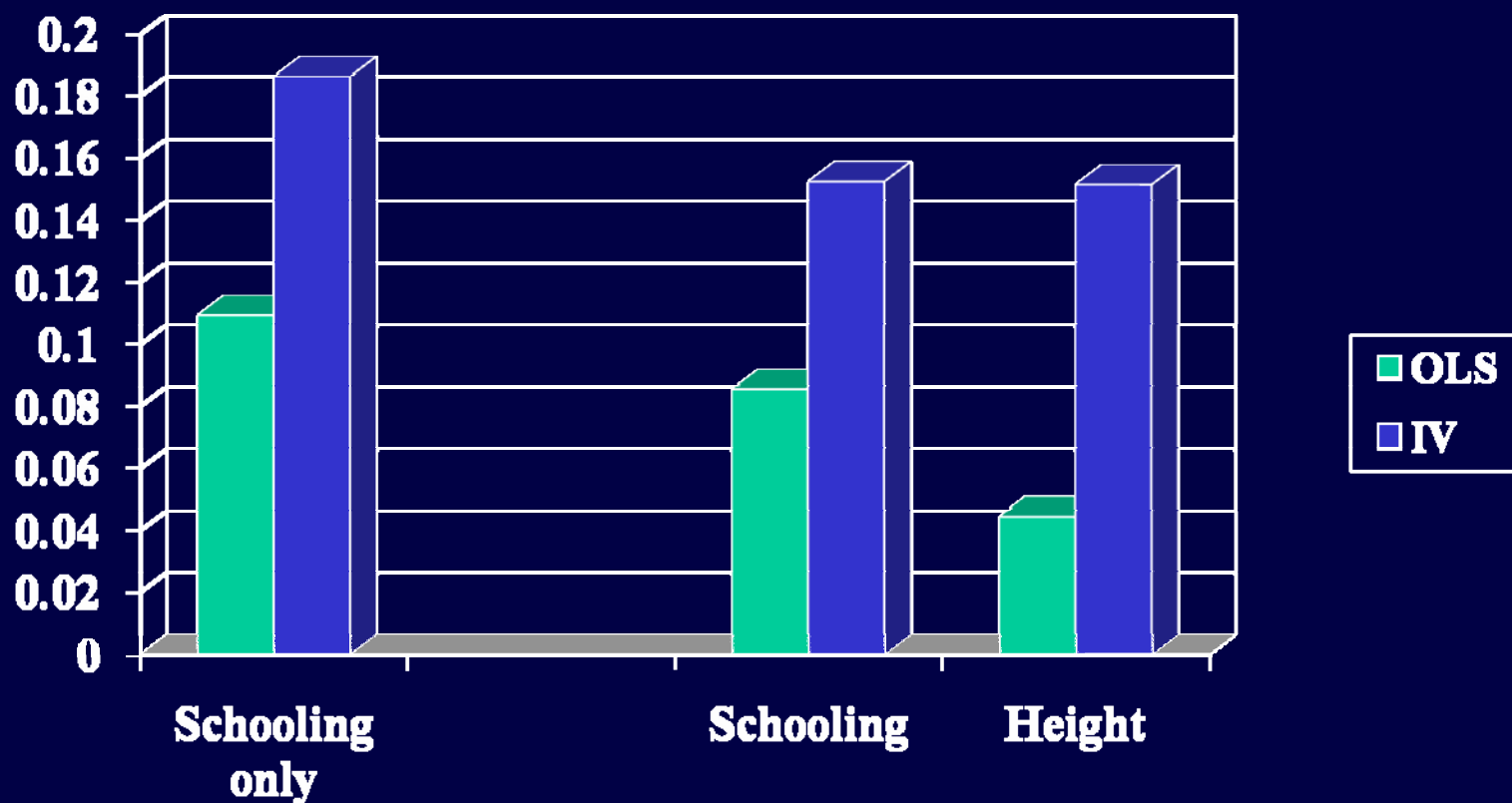Height significant at 5% (IV) and 1% (OLS)

Impact of schooling and height on LAZ (coefficients)

Schooling significant only without height
Height significant at 1%

Impact of schooling and height on child schooling deviation from cohort mean (coefficients)

Both schooling and height are significant at 1%
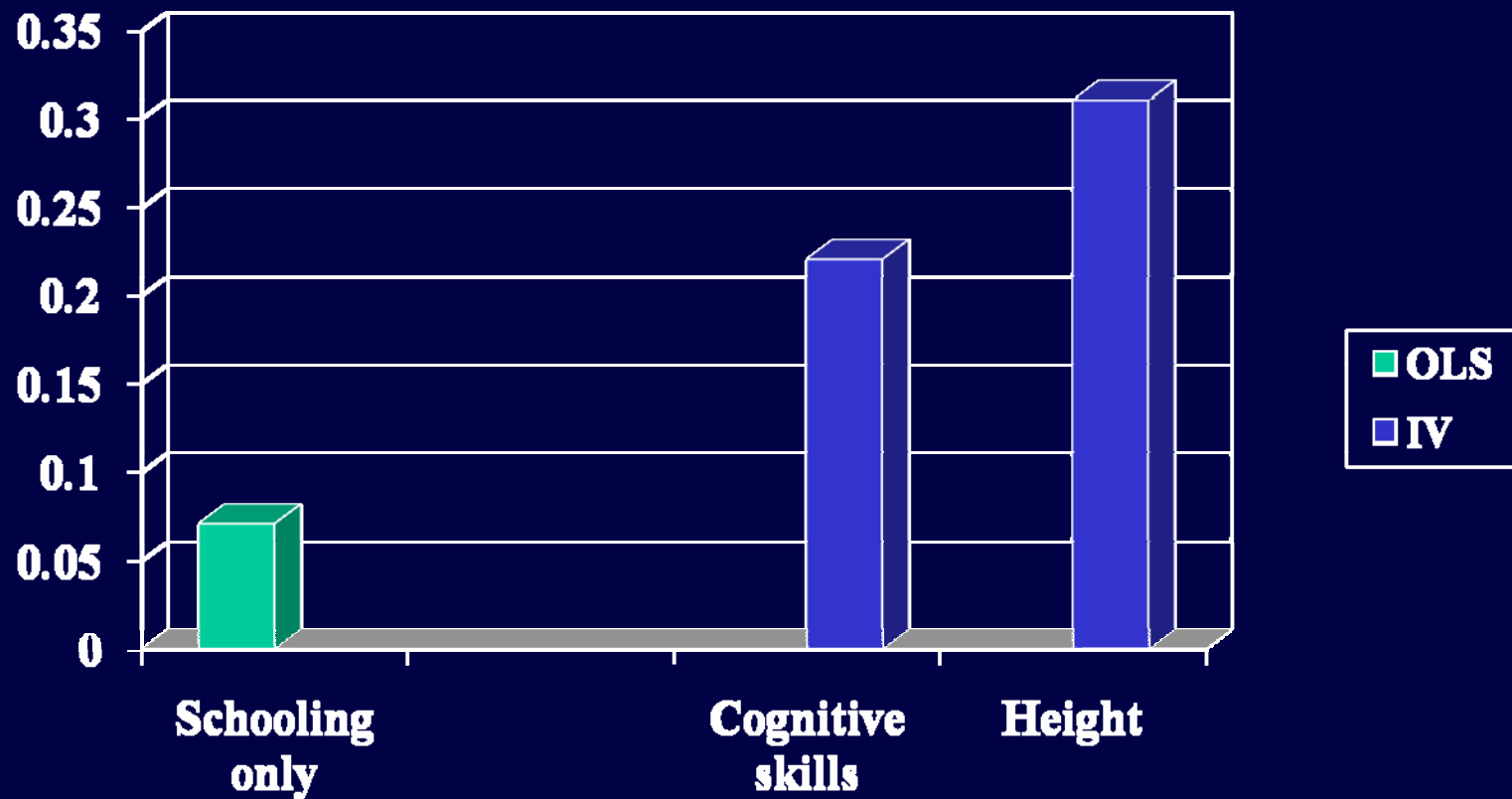
(schooling significant at 5% in IV w/ height)

Preliminary conclusions with schooling and height only

- Using schooling as only measure of mother's human capital overestimates impact of schooling

- OLS estimates understate impact of maternal nutritional status

- Maternal nutritional status (height) may be more important than intellectual capital in determining child health and anthropometric outcomes

Does schooling really measure what moms know? Constructing an index of mom's cognitive skills

- We have rich data on cognitive skills: reading scores, math scores, and Raven's progressive matrices tests
- Index based on reading scores and Raven's scores for ages prior to or at age at first birth
- We don't use math scores because they were not assessed in 2002-04, and can't therefore use the same methods of imputation as we did for the other two measures

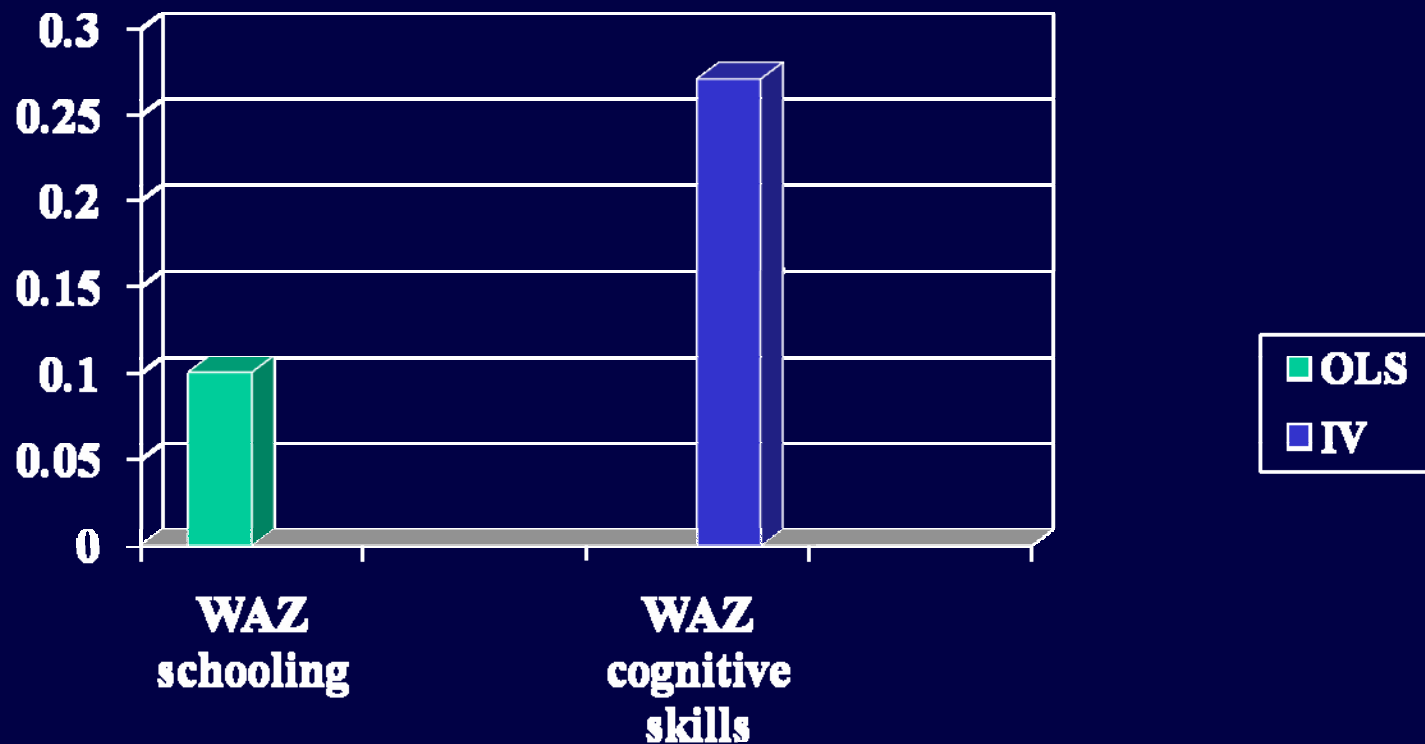# Impact on LAZ at 36 months: Change in LAZ from 1 SD increase in mom's human capital (in SDs)
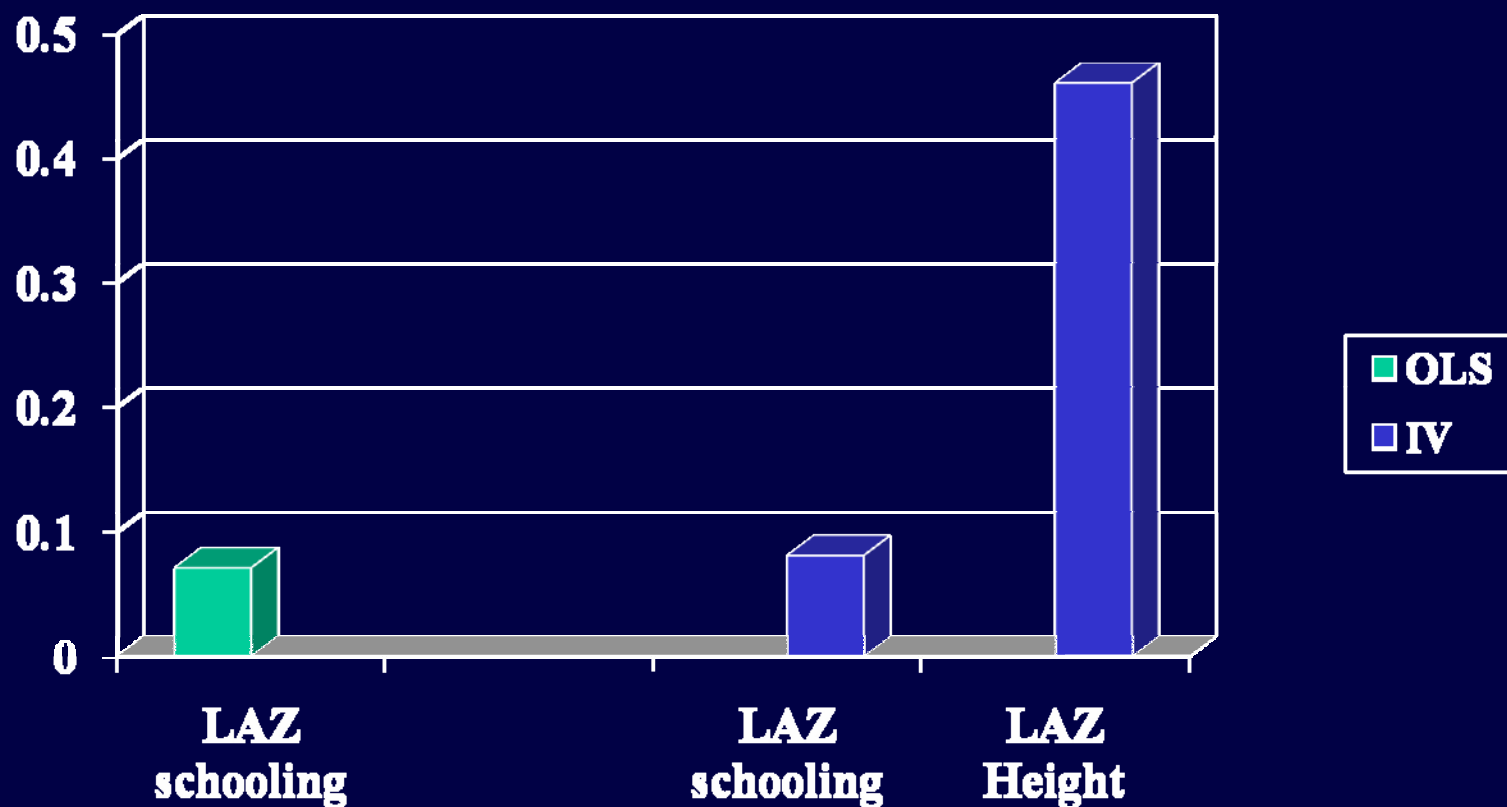
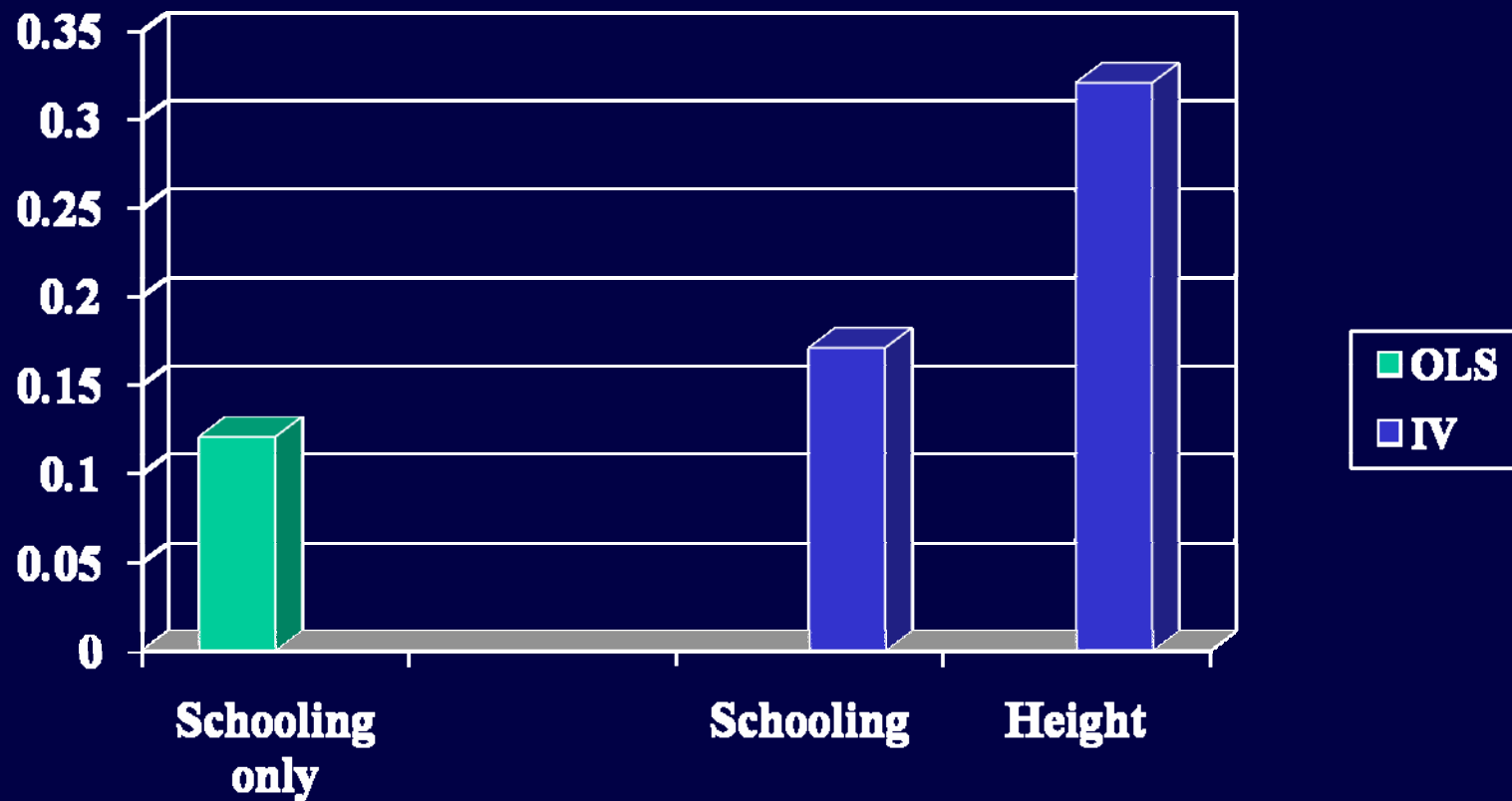

Schooling significant in OLS only; height significant at 5% in IV

Impact on WAZ at 36 months: Change in WAZ from 1 SD increase in mom's human capital (in SDs)

Schooling significant in OLS at 10%; cognitive skills significant at 1% in IV; height not significant

Impact on schooling: Change in deviation from cohort mean from 1 SD increase in mom's human capital (in SDs)

Both schooling and height are significant at 5%

Comparing standard estimates with preferred (IV) estimates

- With IV, maternal human capital has larger estimated coefficients
- Impacts of one SD increase in mother's intellectual human capital are larger than in the standard estimates
- Maternal schooling important for child schooling and LAZ, but cognitive skills significant for other indicators of child human capital
- Maternal height is significant and has larger effect sizes than maternal intellectual human capital for half of the G3 outcomes

Maternal biological AND intellectual human capital are important

- Maternal human capital more important when we take into account its being a product of decisions

- Maternal cognitive skills predict child biological human capital better than maternal schooling attainment

- For some outcomes maternal biological human capital is significant and has bigger impacts than intellectual human capital

Different aspects of mom's human capital matter for different child outcomes

- Maternal schooling attainment predicts child schooling attainment well (better educated moms are better able to deal with school requirements)

- Other studies have shown that maternal schooling and acquired cognitive skills are associated with better hygiene practices (Webb et al. 2008a) and better maternal care during episodes of diarrhea

Policy implications of this study

- This work strengthens the case for investing in women's human capital, especially in its biological component

- There are strong intergenerational links, because investments in women's human capital will have pay-offs in the next generation

- Intervene as early as possible: pregnancy to end of pre-school period. There are double dividends to investing early

Broader policy implications

- There are other opportunities to invest in human capital at different stages of the life cycle, to break the intergenerational transmission of poverty

- Each stage of the life cycle offers different opportunities for investment, as well as different vulnerabilities

- Public policy should ensure that the appropriate investments are made, and that these are pro-poor