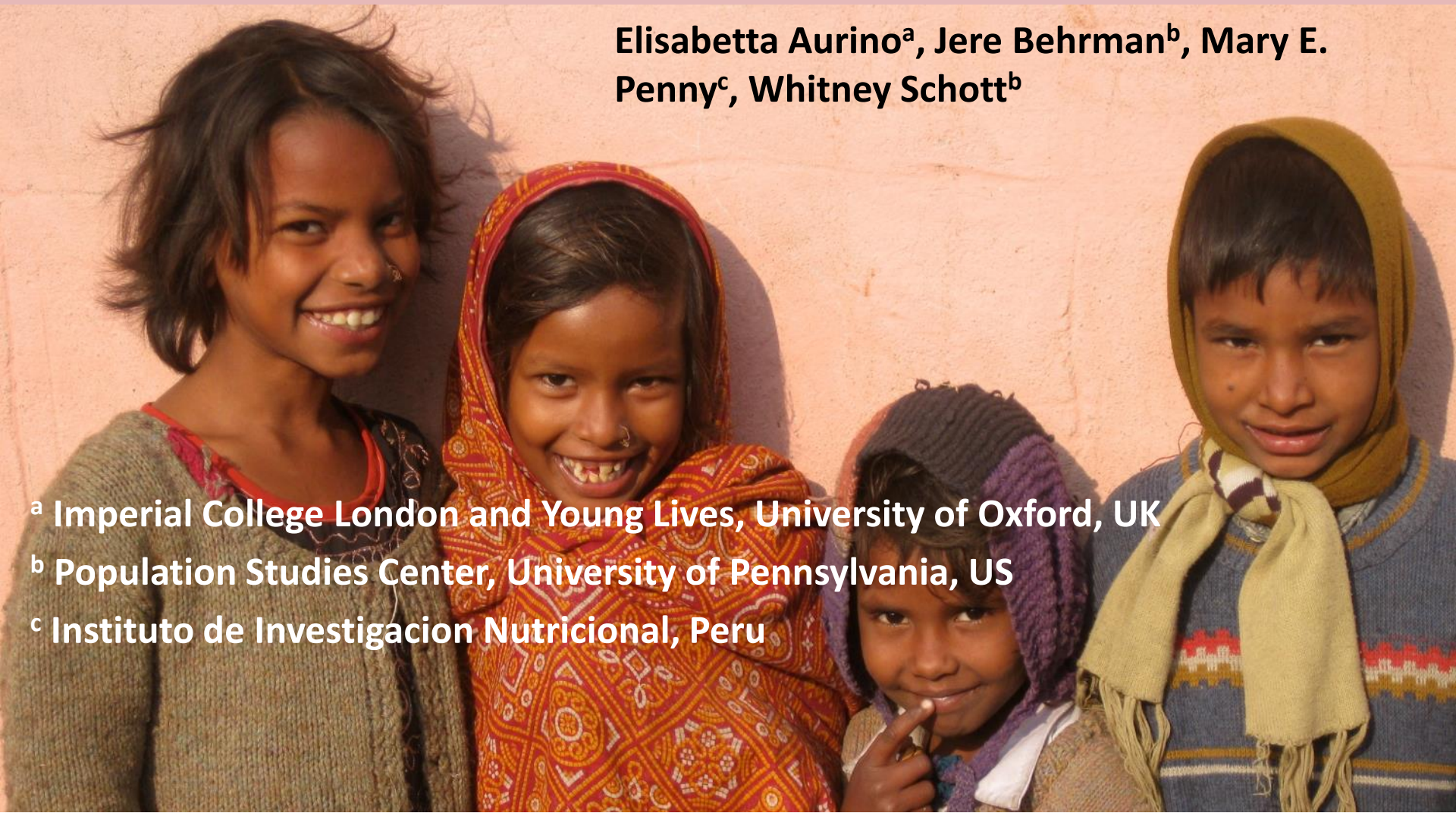
Education and Adolescent Motherhood: Evidence from Ethiopia, India, Peru and Vietnam



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Background: Why Adolescent Motherhood?

- Adolescence is a **critical developmental period** to life course health, economic and social trajectories (Sawyer et al, 2012; Patton et al 2016)

- With **70,0000 deaths** annually from complications from pregnancy and childbirth, adolescent pregnancy is the **leading cause of mortality** for girls aged 15-19 years (Temin & Levin 2009; UNFPA 2013; Handa et al 2016)

- Adolescent motherhood associated with:
  - Increased adolescent **morbidity** (e.g. anaemia, fistula)
  - **Lower birthweight** for the child (Temin & Levin 2009; Handa et al 2016)
  - Negative socioeconomic conseguences

- Issue of lack of basic human rights to education, health, safety, etc (UNFPA 2013; McQueston et al 2013)

Multiple pathways in the protective role of education to adolescent motherhood

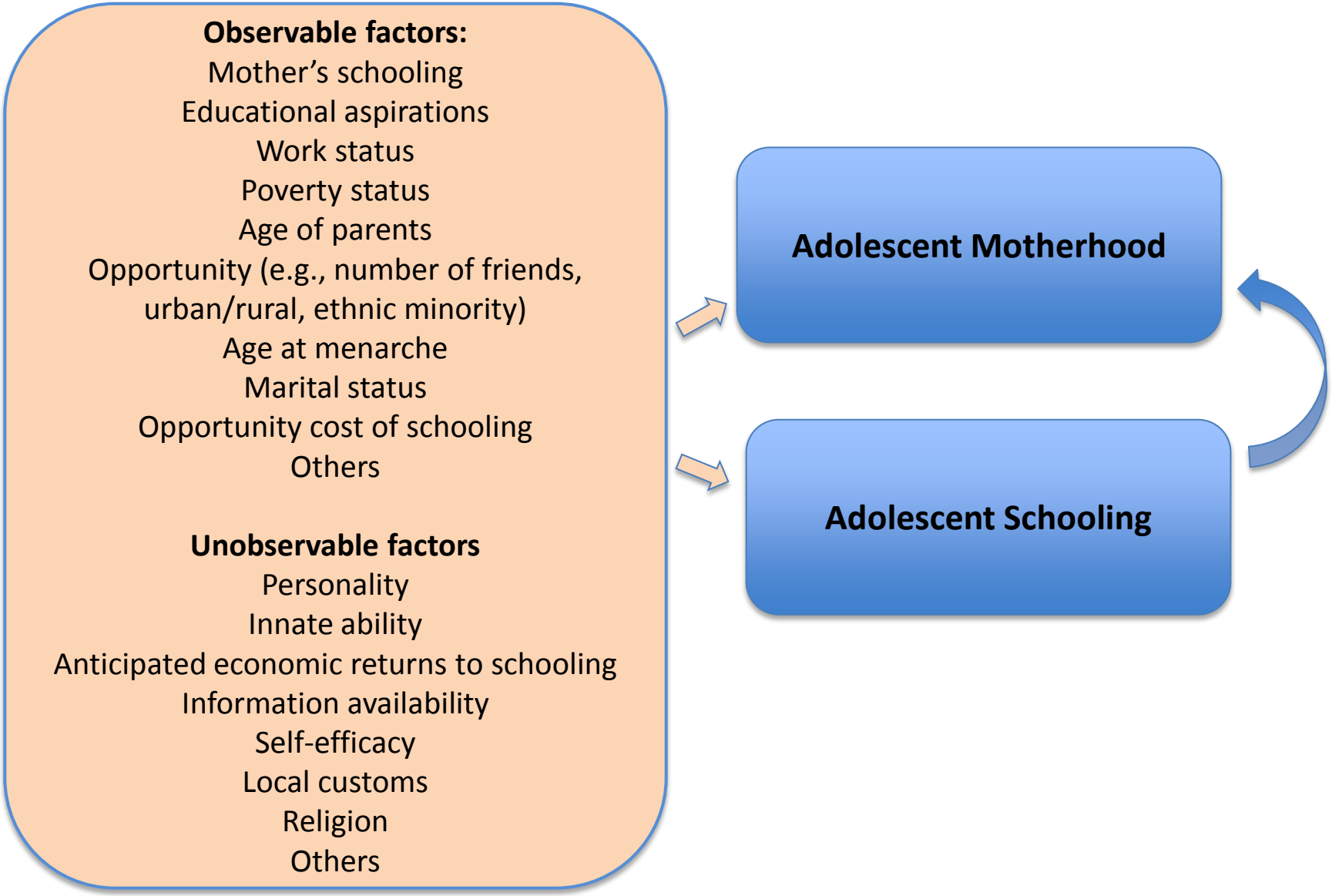
- Enrolment and attainment may delay the onset of first sexual intercourse, childbearing and change fertility preferences (Behrman 2015; Handa et al 2016)
- Education (including sexual education) can endow adolescent girls with skills that promote their decision-making ability and bairgaining power (Mensch and Lloyd 1998; Chuta 2016)
- Households often see primary completion as a necessary requirement before marriage/childbearing (Cohen and Bledsoe 1993)

- **The literature has identified education as a key protective factor for adolescent motherhood and supporting girls in realising their full potential** (Handa et al 2016)

Challenges in assessing the literature

- **Quite heterogeneous in methods, data, indicators**
  - Most literature is cross-sectional, reporting associations
  - Most statistically-rigorous studies are undertaken in high-income countries
  - In LMICS, most studies focus on impact of interventions (eg. Baird et al 2015 and Handa et al 2016 examine CTs in Malawi and Kenya respectively; Duflo et al 2011 school-based intervention in Kenya)
- **Multiple definition of "adolescence"**
- **Variety of settings**
  - Need to understand the role of context better
- **Reverse causality**
  - A large literature examines the educational impact of fertility (Field & Ambrus 2008; for a good review: McQueston et al 2013)
- **Difficult to disentangle causality between education and fertility**

The issue of endogeneity



Literature at a glance: risk/protective factors for adolescent motherhood

		Risk factor	Protective factor
Schooling factors	School enrolment		✓
	Higher education attainment (e.g. grade, test scores)		✓
	Low educational aspirations	✓	
Individual level factors	Male		✓
	Older age	✓	
	Self-efficacy		✓
	Employed	✓	
	Early onset of puberty	✓	
	First sexual experience at younger age	✓	
	Knowledge about contraception		✓
	Contraception use		✓
Household-level factors	Single-parent household	✓	
	Higher parental education		✓
	Household poverty status		✓
	Urban residence		✓

Source: Gupta & Mahy 2003; WHO 2004; Grant and Hallman 2008; Kruger et al 2009; Carrasco 2012; Nunez & Florez 2012; Azevedo et al 2012; Favara et al 2016; Singh & Revollo 2016

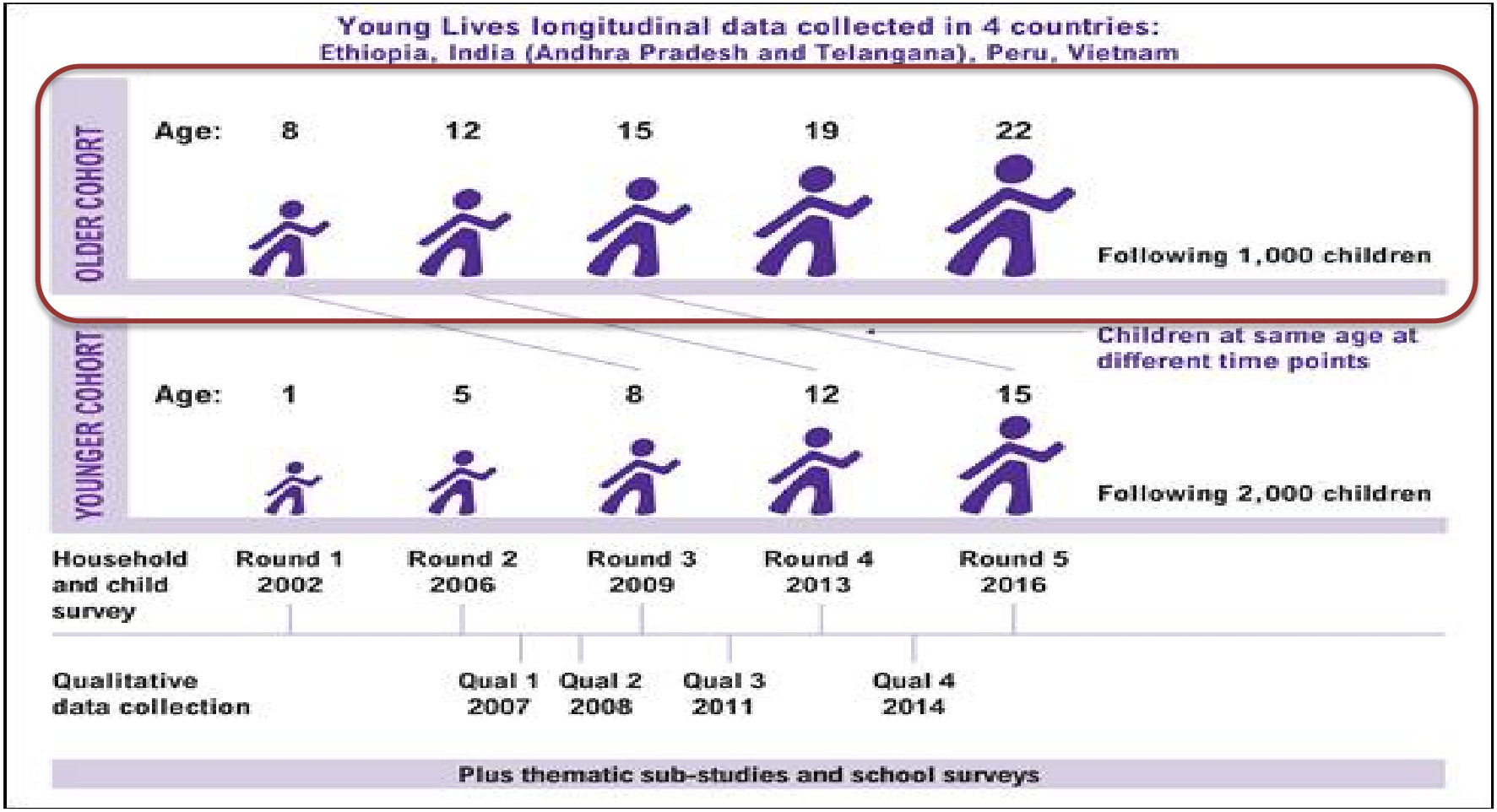
Longitudinal, mixed-method evidence from Young Lives

- Favara et al (2016) examine adolescent childbearing in **Peru**
  - School enrolment at age 15 years reduces the probability of early childbearing
  - No association with test scores at 15 years
  - Decreases in girls' education aspirations between 12 and 15 years increases chances of early childbearing
- Singh and Revollo (2016) using longitudinal YL data from **India** show that the chances of early childbearing are reduced by:
  - Enrolment at 15 years
  - Parental and child educational aspirations at 12 and 15 years
  - Caregiver's secondary education
- Roest (2016): qualitative evidence on the importance of education and social norms on delaying early marriage and childbearing in **India**
- Cueto and Leon (2016) examine the relation between education and sexual activity at 15 years in **Peru**
  - Higher grade attained and maternal education delayed early sexual initiation

Young Lives Study

- **Longitudinal study of poverty** led by Department of International Development at the University of Oxford, research/policy partners in Ethiopia, India, Peru and Vietnam
- **Pro-poor sample**: 20 sentinel sites in each country selected to reflect country diversity, rural-urban, livelihoods, ethnicity
- **Two age cohorts** in each country selected randomly in each sentinel site:
  - **Younger Cohort**: 2,000 children born in 2001-02
  - **Older Cohort**: 1,000 children born in 1994-95

Young Lives study design



Country contexts

	Ethiopia	India	Peru	Vietnam
Teenage mothers (% of women ages 15-19 who have had children or are currently pregnant)	12.4	16	13.2	3.4
Adolescent fertility rate (births per 1,000 women ages 15-19)	56.6	23.3	48.4	39.1
Adolescents out of school, female (% of female lower secondary school age)	41.7	7.4	9.3	N.A.
Adolescents out of school, male (% of male lower secondary school age)	38.6	12.6	10.5	N.A.
Policy	Child marriage (2013)	Child Marriage (2006)	National Plan for prevention teenage pregnancy (2016)	?

Source: World Bank, World Development Indicators, latest year available (Retrieved on May 6, 2017)

Policy contexts

Ethiopia: *Alliance to End Child Marriage (September 2013)*

- Evidence of some decline, mostly before 15y, but strong regional variation

India: *Prohibition of Child Marriage Law (2006)*

- Raj et al (2009) use the latest data available (DHS 2005/06) on a sample of women aged 20-24y show that 44% and 22% married before 18y and 16y respectively

Peru: *National Plan for Prevention of Teen Pregnancies (2016-21)*

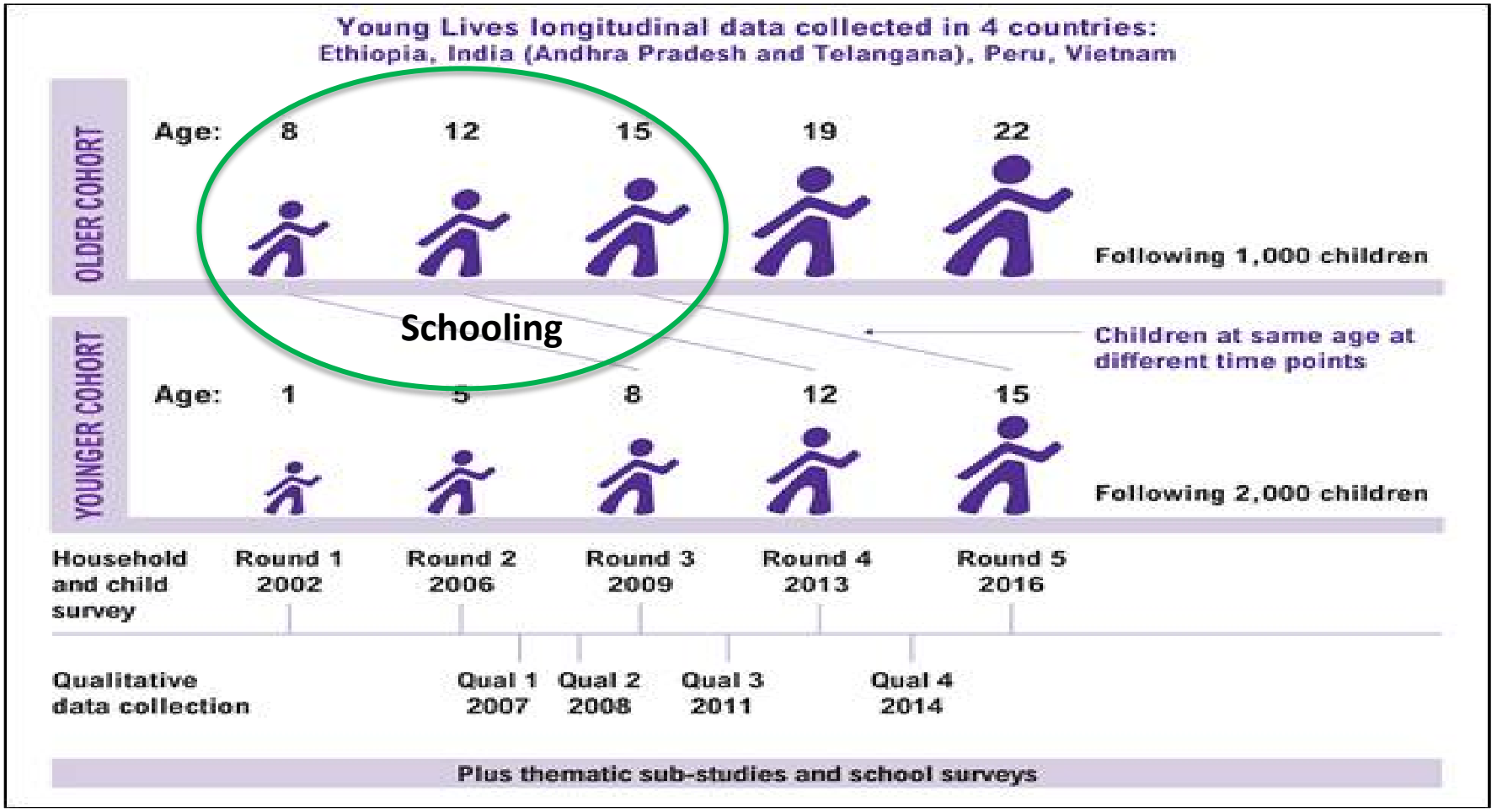
- Access to education and sexual education key pillars
- In 2015, 14% of adolescent girls (15-19y) were pregnant or given birth, with no improvement in the past 20 years

Vietnam: No policy seems currently in place

- The country compares favorably to neighbor countries in terms of prevalence (Nguyen et al 2016)
- However, it is difficult to determine the exact prevalence given the widespread stigma associated with teen pregnancies (Nguyen et al 2016)

Young Lives Older Cohort

Young Lives study design



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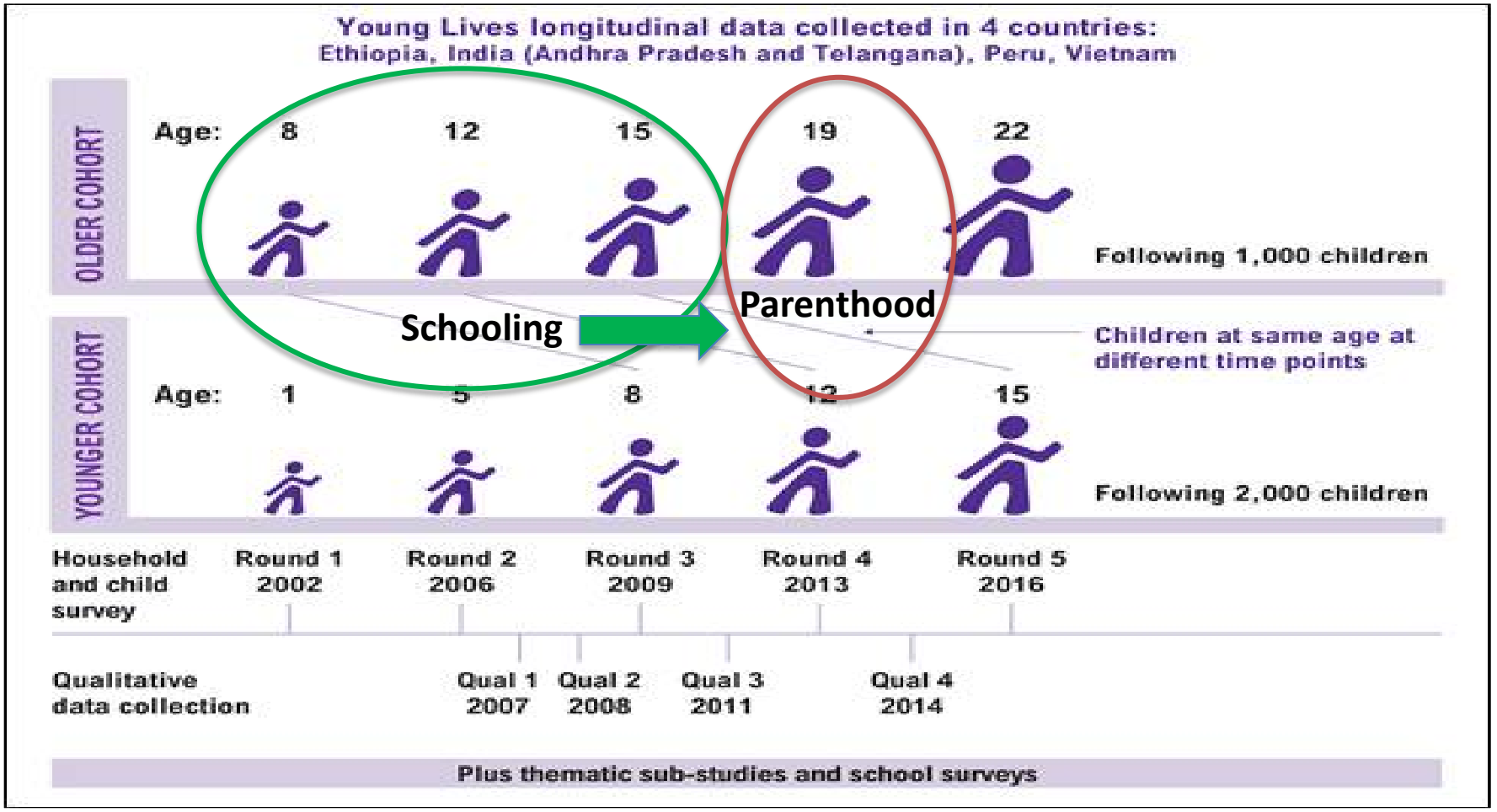

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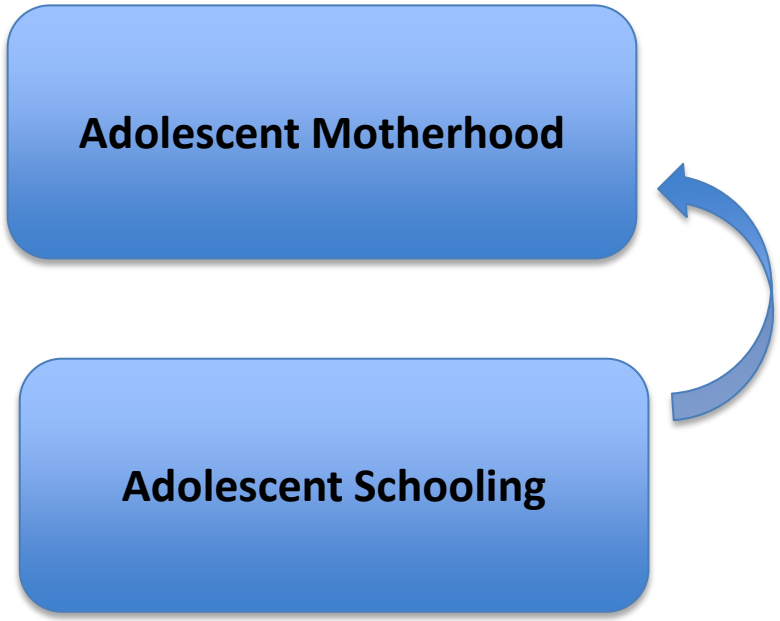

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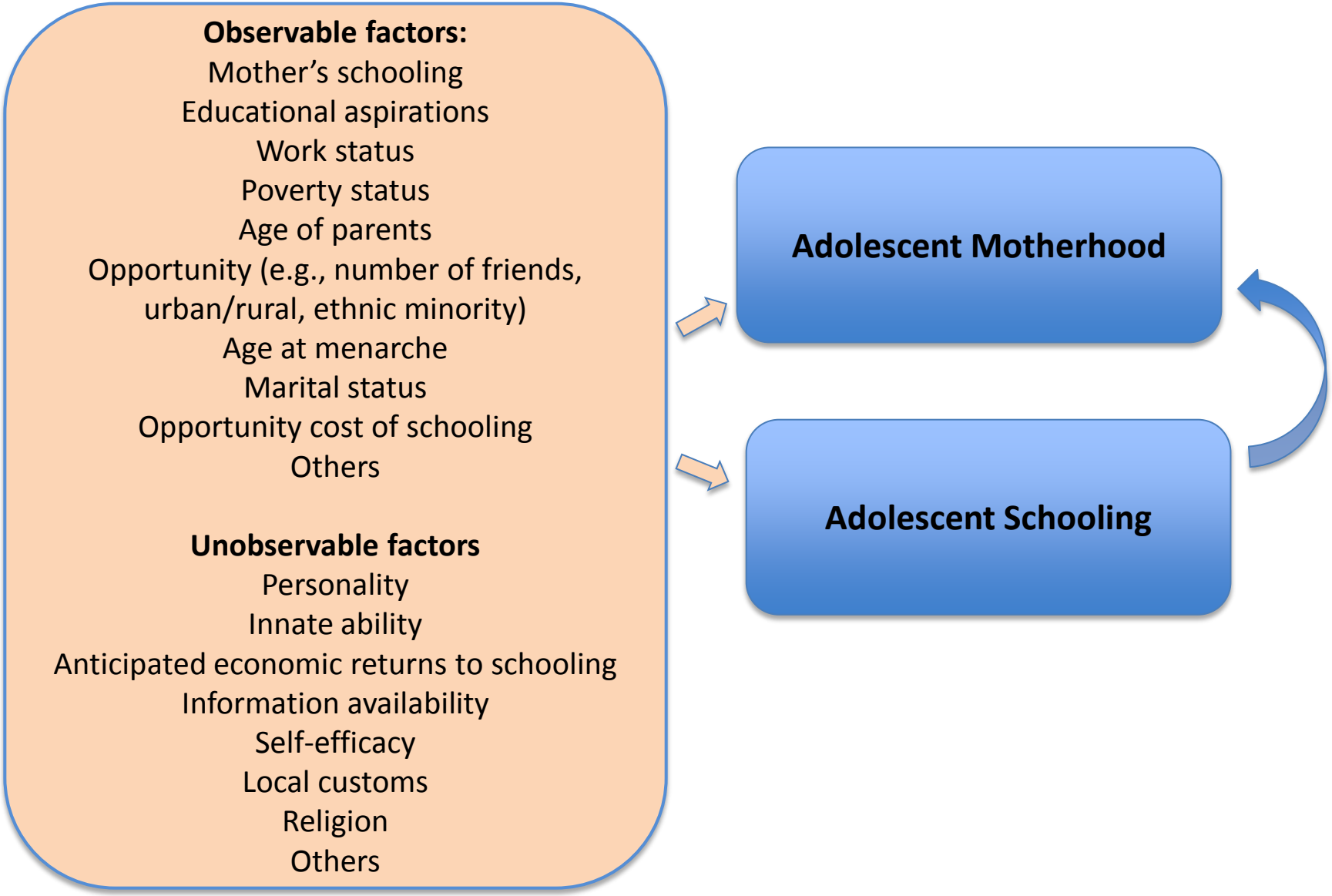
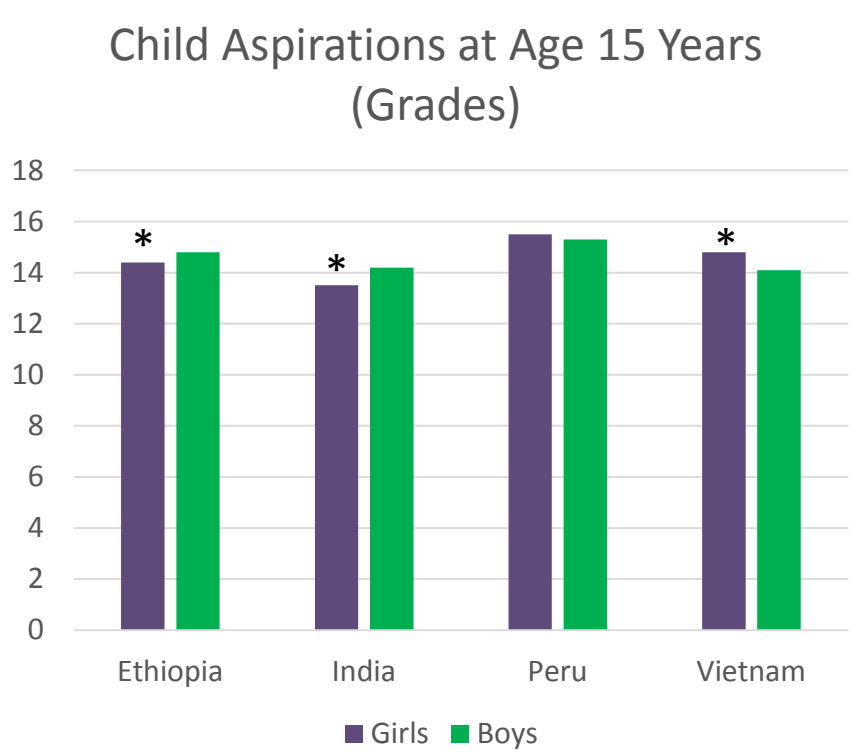
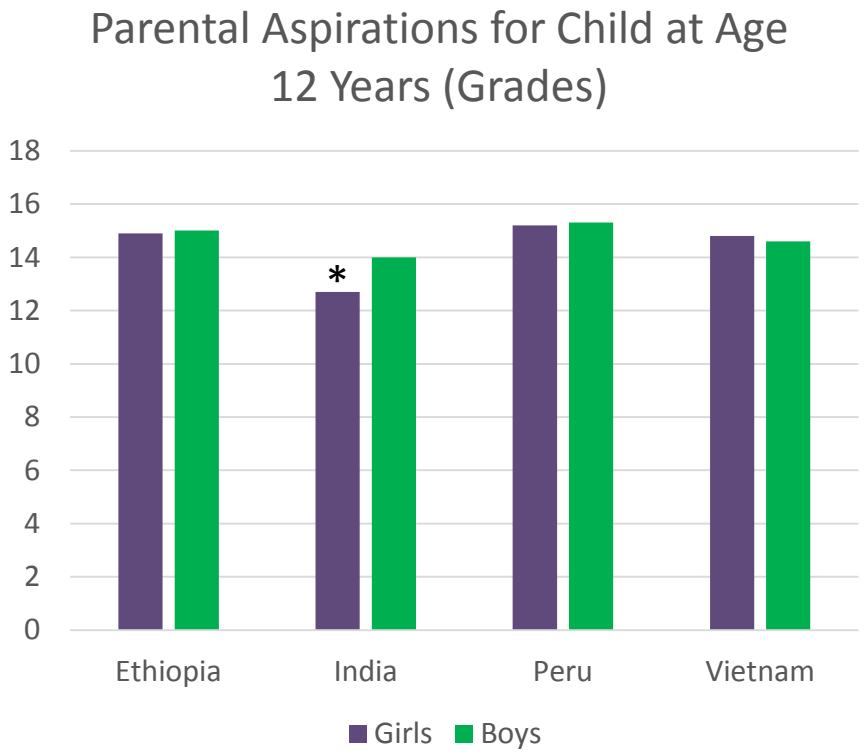


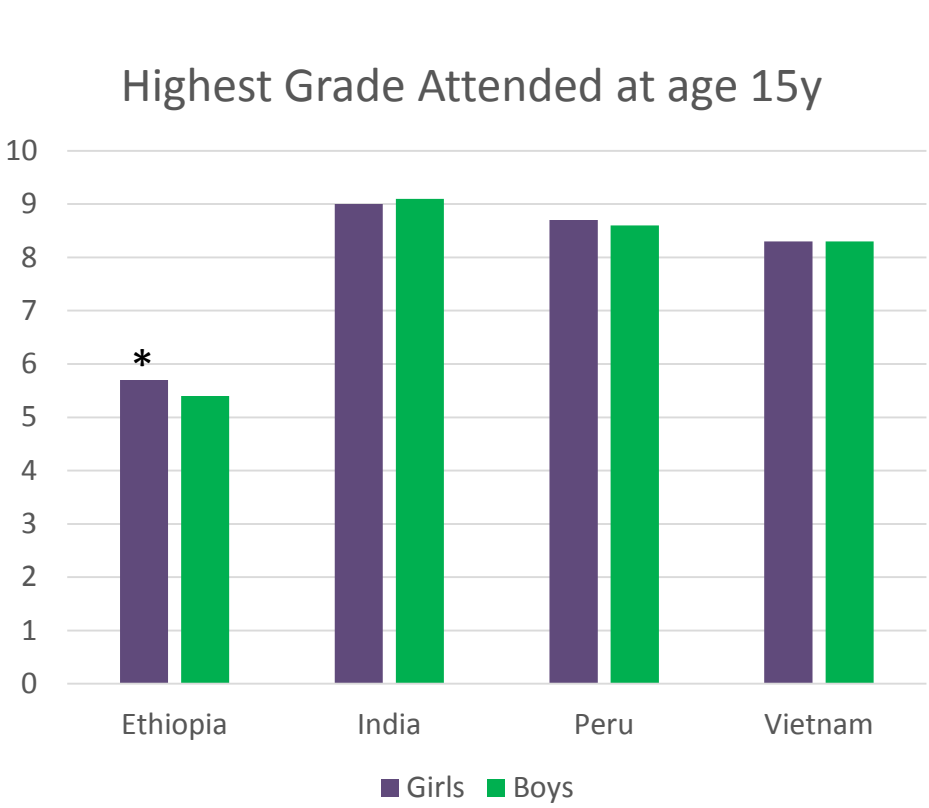
Schooling in Older Cohort, Young Lives

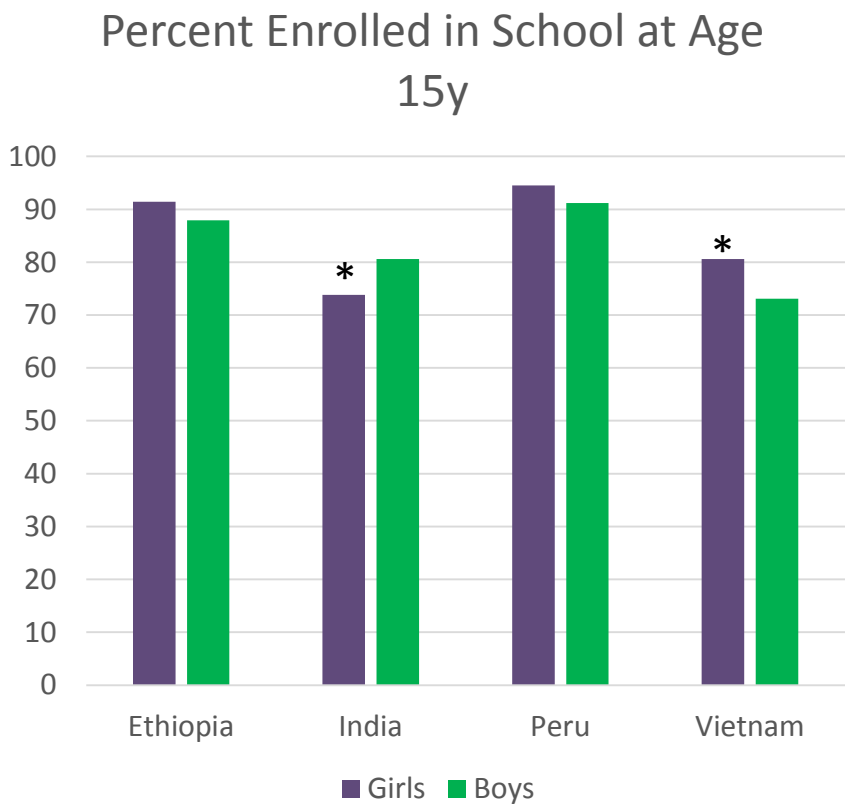




* $p<0.05$ difference in means for girls vs. boys

Schooling in Older Cohort, Young Lives





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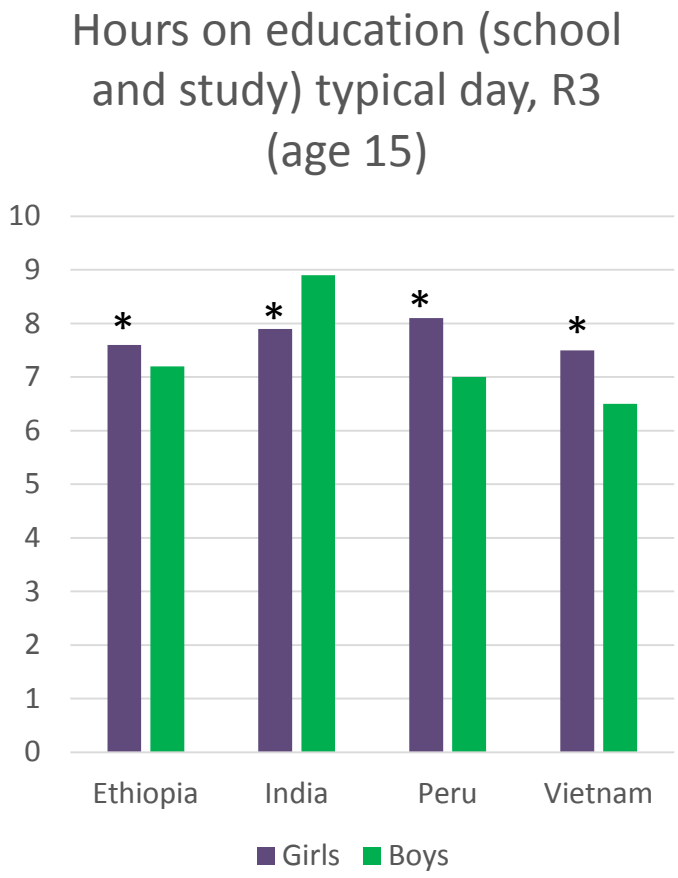

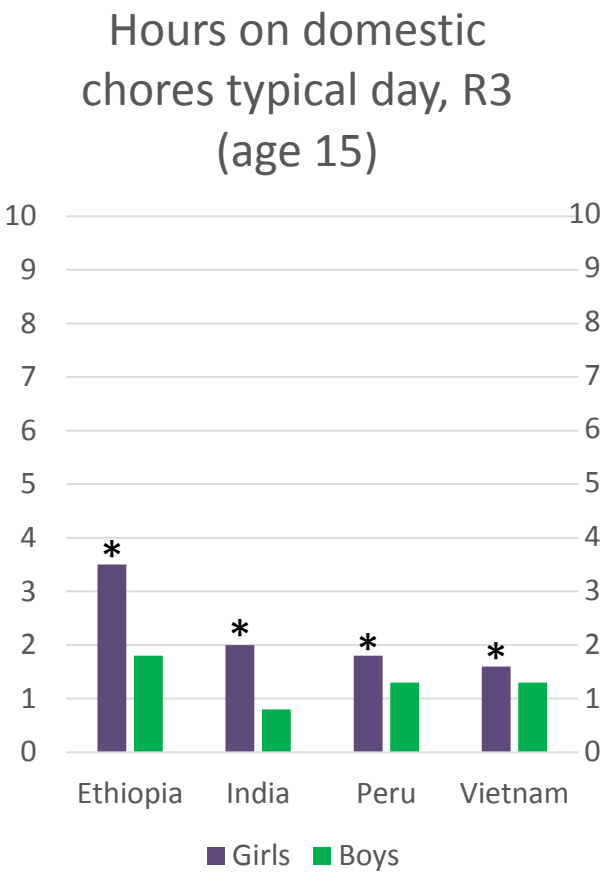

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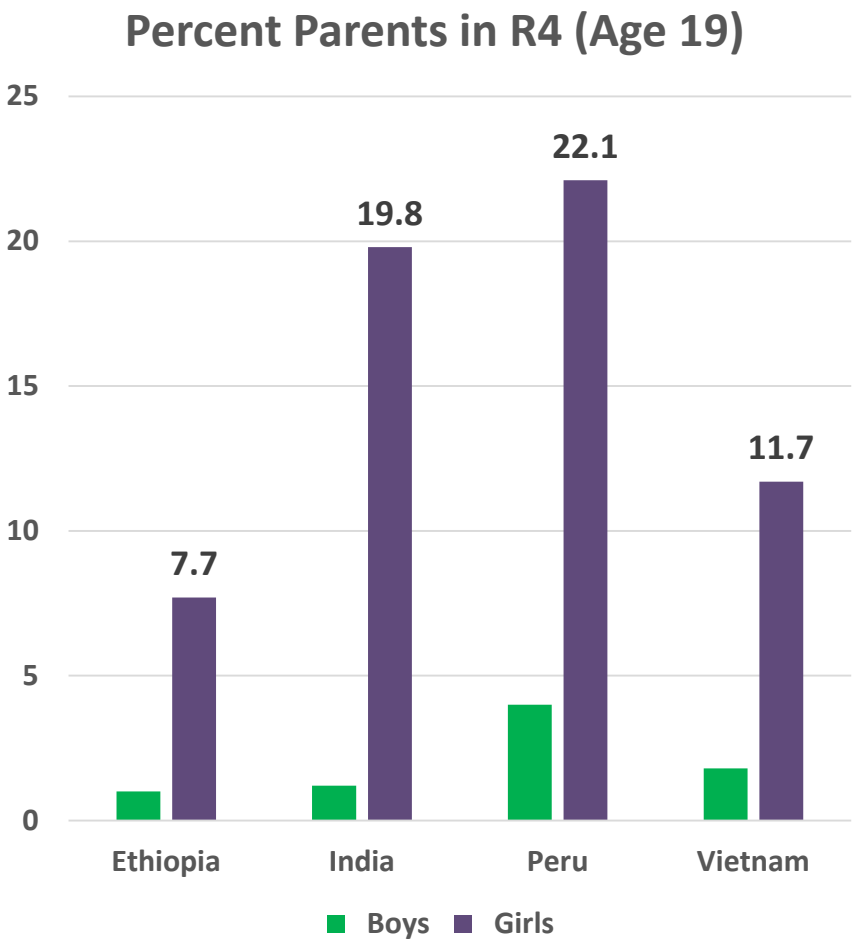
Parenthood in Older Cohort, Young Lives



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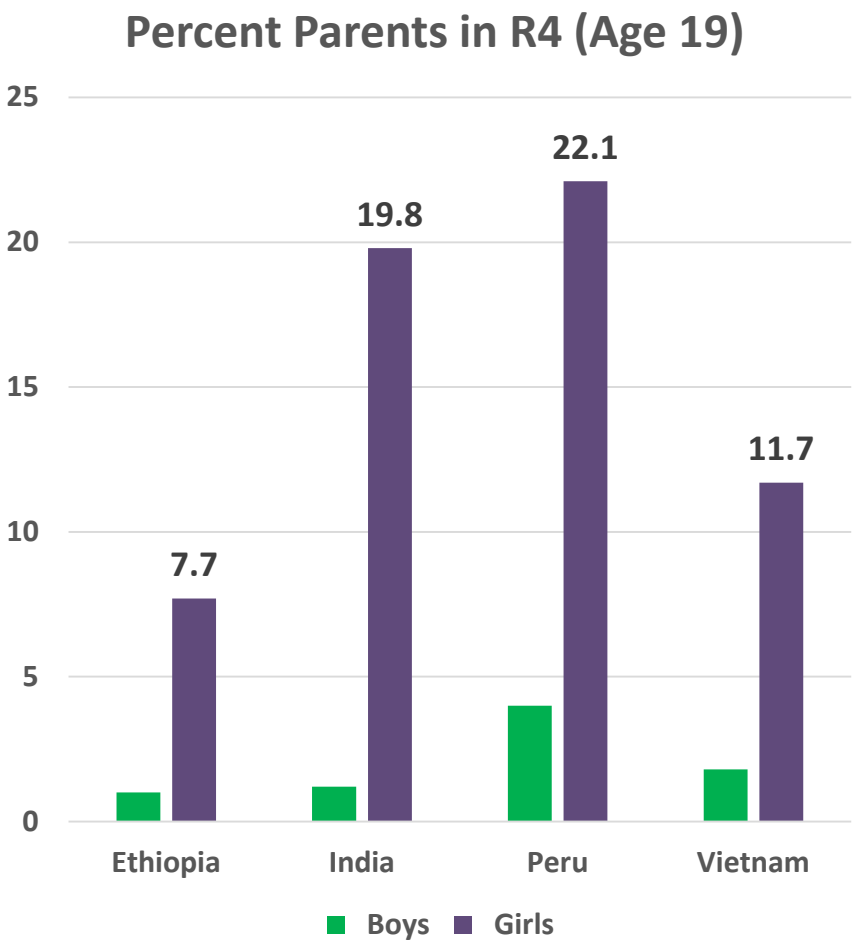
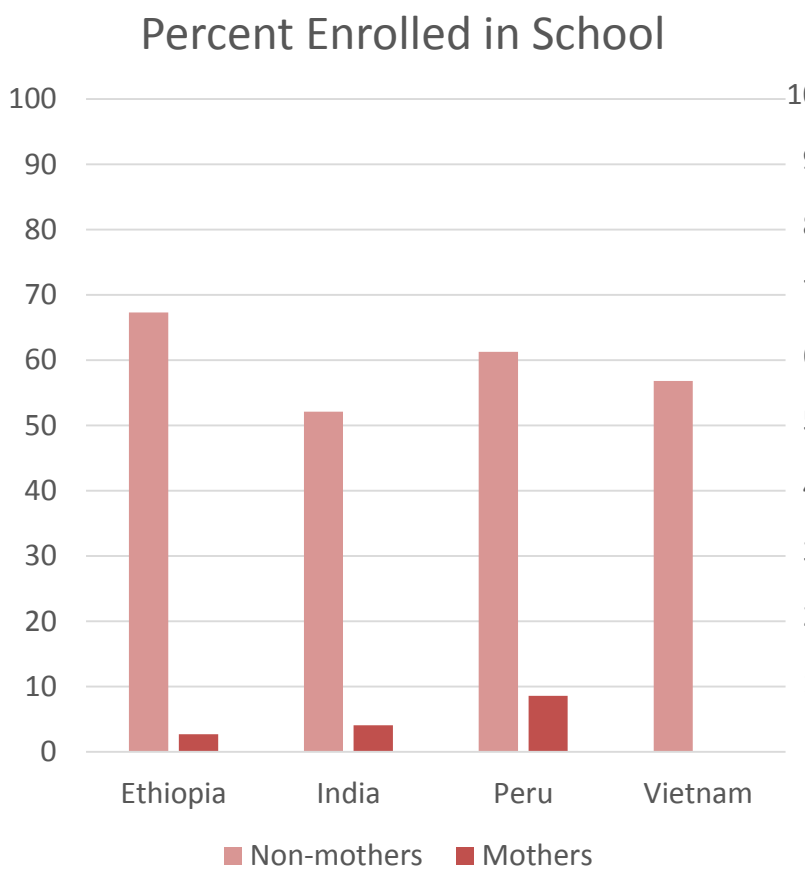
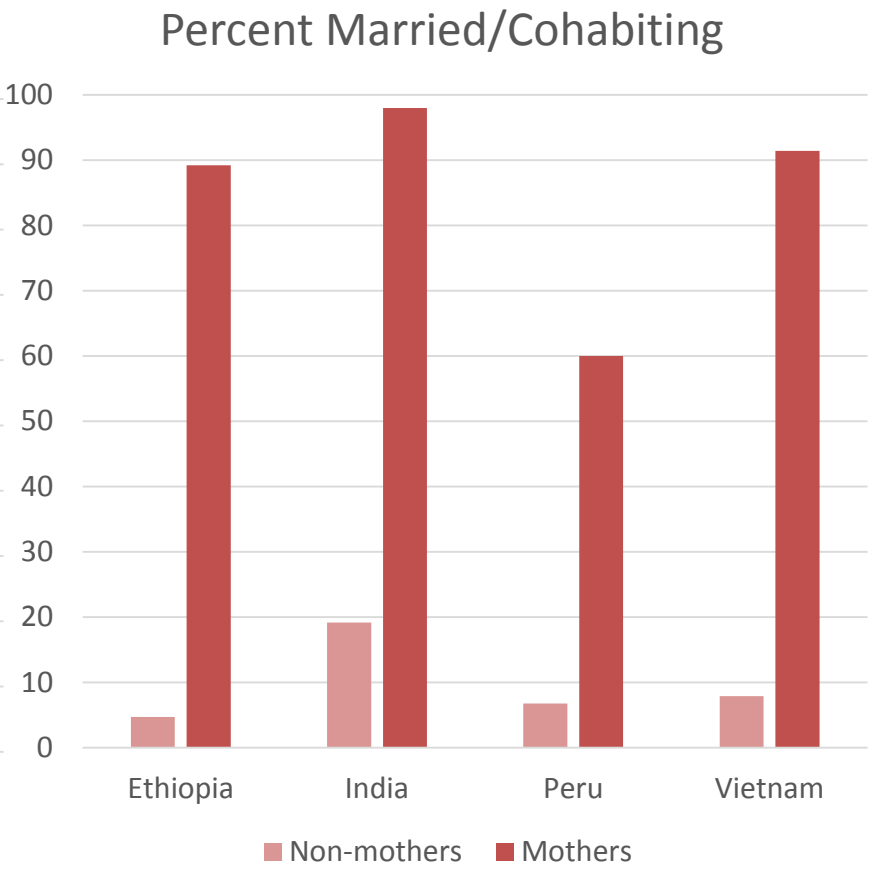


Age at First Birth	Number of Mothers			
	Ethiopia	India	Peru	Vietnam
12	0	1	0	0
13	1	3	0	0
14	1	4	3	1
15	0	6	5	2
16	6	16	15	6
17	10	31	23	15
18	14	30	32	21
19	6	14	6	7
Total	38	104	84	52

Percent of adolescent mothers with first birth before age 16:	**9.7**

Situation in R4, Mothers vs. Non-mothers





Correlation across key schooling variables

- High correlation, so focus on clusters of schooling variables

	Parental aspirations for child R2	Child aspirations in R3	Highest grade attended R3	Enrolled in R3	PPVT R3	Math R3	Schooling R3	Domestic R3
Parental aspirations for child R2 (in grades)	1							
Educational aspirations in R3 (in grades)	0.39	1.00						
Highest grade attended R3	0.26	0.34	1.00					
Enrolled in R3	0.39	0.52	0.34	1.00				
PPVT R3 (in age-adj SD)	0.33	0.34	0.42	0.31	1.00			
Math R3 (in age-adj SD)	0.32	0.35	0.35	0.38	0.57	1.00		
Time spent schooling R3 (hrs/day)	0.37	0.48	0.45	0.86	0.38	0.44	1.00	
Time on domestic tasks R3 (hrs/day)	-0.11	-0.13	-0.27	-0.20	-0.14	-0.15	-0.30	1.00
Time on caregiving R3 (hrs/day)	-0.02	-0.03	-0.13	-0.08	-0.07	-0.07	-0.15	0.20

Methods

- Logistic regression of adolescent motherhood on clusters of education variables:
  - Model 1: Grades attended and cognitive ability
    - Highest grade attended
    - PPVT score
    - Math score

    } in age-adjusted standard deviations
  - Model 2: Aspirations
    - Child aspirations for schooling (grades)
    - Parental aspirations for child schooling (grades)
  - Model 3: Time Use
    - Time spent on domestic chores (hours in typical day)
    - Time spent caregiving (hours in typical day)
    - Time spent on school or studying (hours in typical day)

Methods (con't)

- Ordinary Least Squares (linear probability model)
  - Highest grade attended
- Instrumental Variables Regressions using Model 1

Adolescent Motherhood, Logistic Regression (Odds Ratios)

	Model 1	Model 1 Adj[a]	Model 2	Model 2 Adj[a]	Model 3	Model 3 Adj[a]
Highest grade attended R3	0.89*	0.89*				
PPVT R3 (in age-adj SD)	0.89	0.99				
Math R3 (in age-adj SD)	0.59**	0.65**				
Parental aspirations for child R2 (in grades)			0.91**	0.94*		
Educational aspirations in R3 (in grades)			0.87**	0.87**		
Time spent caregiving R3 (hrs/day)					0.97	0.98
Time on domestic tasks R3 (hrs/day)					1.04	1.04
Time on education R3 (hrs/day)					0.82**	0.83**
Maternal schooling (grades completed)		0.92**		0.92**		0.93**
Early puberty		2.94**		2.49**		2.46**
Ethiopia	0.23**	0.30**	0.47**	0.43**	0.34**	0.42**
Peru	1.16	1.98*	2.12**	3.08**	1.55*	2.53**
Vietnam	0.52**	0.82	0.75	1.02	0.53**	0.77
Constant	0.60	0.04	5.20**	0.22	0.88	0.11
Observations	1,405	1,292	1,732	1,589	1,762	1,615

** p<0.01, * p<0.05

[a] Adjusted models also include controls for adolescent age, urban residence, wealth index, mother's age

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Instruments for Highest Grade Attended

- Good instruments should be correlated with highest grade attended but *not* with whether adolescent becomes a mother; ideally exogenous

Instruments for Highest Grade Attended

- Minutes travel to school (current school for those in school, previous school for those not attending school)
- Average schooling of adolescent's mother, by cluster
- Number of older siblings in the household in R3
- Number of children under 6 in the household in R3




Instruments for Highest Grade Attended

- Combination 1:
  - Minutes to school
  - Average maternal schooling (by cluster)
- Combination 2:
  - Number of older siblings in the household in R3
  - Number of children under 6 in the household in R3
- **Combination 3: All four instruments above**




Instrumental Variables: First Stage

Combo 3: Minutes to school, average maternal schooling in cluster, number of older siblings in HH, number of children under 6 in HH

Predicting Highest Grade Attended:

Number of obs =	1585
F(12, 1572) =	124.28
Prob > F =	0

	Coef.	Std. Err.	t
Minutes travel to school	0.009	0.002	4.15
Average maternal schooling level by cluster	0.097	0.025	3.82
Number older siblings in HH	-0.115	0.034	-3.34
Number of children under 6 in HH	-0.313	0.069	-4.56
Early Puberty	-0.033	0.102	-0.32
Age of adolescent's mother R3	-0.005	0.007	-0.77
Age of adolescent R3 (years)	0.304	0.119	2.56
Urban residence R3	-0.078	0.125	-0.63
Wealth index R3 (1-100)	0.026	0.003	9.35
Ethiopia	-2.557	0.134	-19.15
Peru	-0.641	0.153	-4.19
Vietnam	-1.359	0.153	-8.88
Constant	2.994	1.782	1.68

Partial R-squared of excluded instruments: 0.0226

Test of excluded instruments:

F(2, 1574) = 18.16

Prob > F = 0.0000

Shea

Variable	Partial R2	F(2, 1574)	P-value
Years attended	0.0226	18.16	0.0000

Underidentification tests:

	Chi-sq(2)	P-value
Anderson canon. corr. likelihood ratio stat.	36.16	0.0000
Cragg-Donald N*minEval stat.	36.58	0.0000

Ho: matrix of reduced form coefficients has rank=K-1 (underidentified)

Ha: matrix has rank>=K (identified)

Weak identification statistics:

Cragg-Donald (N-L)*minEval/L2 F-stat 18.16

Anderson-Rubin test of joint significance of endogenous regressors B1 in main equation, Ho:B1=0

F(2,1574)= 6.13 P-val=0.0022

Chi-sq(2)= 12.34 P-val=0.0021

Instrument Diagnostics

Sargan statistic (**overidentification test** of all instruments): 0.687

Chi-sq(1) P-val = 0.4073

Adolescent Motherhood, Instrumental Variables Estimates

Combo 1: Minutes to school, average maternal schooling in cluster
Combo 2: Number of older siblings, number of children under 6 in HH
Combo 3: 1 and 2 combined

	OLS		IV combo 1		IV combo 2		IV combo 3	
	Coef.	t	Coef.	z	Coef.	z	Coef.	z
Highest grade attended in R3	**-0.034**	**-6.36**	**-0.124**	**-3.15**	**-0.088**	**-2.6**	**-0.103**	**-3.73**
Early puberty (by age 12)	0.113	5.1	0.118	4.9	0.116	5.05	0.118	5.04
Age of adolescent's mother	-0.001	-0.4	-0.002	-1.1	-0.001	-0.87	-0.001	-0.98
Age of adolescent (years)	0.055	2.11	0.083	2.7	0.071	2.49	0.077	2.68
Urban residence in R3	-0.04	-1.67	-0.028	-1.08	-0.032	-1.29	-0.031	-1.24
Wealth index in R3	-0.002	-3.19	0.001	0.59	0	-0.29	0.000	0.16
Ethiopia	-0.236	-7.59	-0.481	-4.3	-0.383	-3.96	-0.424	-5.21
Peru	0.032	1.14	-0.010	-0.3	0.008	0.24	-0.001	-0.04
Vietnam	-0.092	-3.64	-0.182	-3.93	-0.143	-3.48	-0.162	-4.35
Constant	-0.221	-0.57	0.063	0.14	-0.045	-0.11	-0.008	-0.02
Observations	1,600		1,585		1,585		1,600	

Adolescent Motherhood, Instrumental Variables Estimates

Combo 1: Minutes to school, average maternal schooling in cluster
Combo 2: Number of older siblings, number of children under 6 in HH
Combo 3: 1 and 2 combined

	OLS		IV combo 1		IV combo 2		IV combo 3	
	Coef.	t	Coef.	z	Coef.	z	Coef.	z
Highest grade attended in R3	**-0.034**	**-6.36**	**-0.124**	**-3.15**	**-0.088**	**-2.6**	**-0.103**	**-3.73**
Early puberty (by age 12)	0.113	5.1	0.118	4.9	0.116	5.05	0.118	5.04
Age of adolescent's mother	0.001	0.4	0.002	1.1	-0.001	-0.87	-0.001	-0.98
Age of adolescent (years)	0.055	2.11	0.083	2.7	0.071	2.49	0.077	2.68
Urban residence in R3	-0.04	-1.67	-0.038	-1.08	-0.032	-1.29	-0.031	-1.24
Wealth index in R3	0.002	-3.19	0.001	0.59	0	-0.29	0.000	0.16
Ethiopia	-0.236	-7.59	-0.481	-4.3	-0.383	-3.96	-0.424	-5.21
Peru	0.032	1.14	-0.010	-0.3	0.008	0.24	-0.001	-0.04
Vietnam	-0.092	-3.64	-0.182	-3.93	-0.143	-3.48	-0.162	-4.35
Constant	-0.221	-0.57	0.063	0.14	-0.045	-0.11	-0.008	-0.02
Observations	1,600		1,585		1,585		1,600	

In other words, using a *simple linear probability model*, one additional grade attended is associated with *3.4 percentage points* lower probability of becoming a mother. Using *instruments* to deal with endogeneity, this number approaches *10 percentage points.*

Adolescent Motherhood, Instrumental Variables Estimates

Combo 1: Minutes to school, average maternal schooling in cluster
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Early puberty (by age 12)	0.113	5.1	0.118	4.9	0.116	5.05	0.118	5.04

	95% Confidence Interval	
Highest grade attended in R3 (IV Coefficient combo 1)	-0.200	-0.047
Highest grade attended in R3 (IV Coefficient, combo 2)	-0.154	-0.022
Highest grade attended in R3 (IV Coefficient, combo 3)	-0.157	-0.049

Observations	1,600		1,585		1,585		1,600	

Discussion

- Strong negative relationship between highest grade attended and adolescent parenthood
- Evidence suggestive that not taking into account endogeneity may *underestimate* true relationship
- Many forces acting simultaneously on schooling and motherhood
- Very **diverse** cultural, religious, etc. contexts within the four countries
- Measurement error may also play a role

Discussion

- Next steps:
  - Refine instruments
  - Examine grades attended in R4 in relation to aspirations
  - Examine relationship in other direction -- between adolescent parenthood and changes in educational aspirations, highest grade attended at R4 or R5

Thank you!

Photo Credits:

2016 NdM calender (GRADE NdM)

Young Lives

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Adolescent Motherhood, Logistic Regression (Odds Ratios)

	Model 1	Model 1 Adj[a]	Model 2	Model 2 Adj[a]	Model 3	Model 3 Adj[a]	Model 4	Model 4 Adj[a]
Highest grade attended R3	0.89*	0.89*					1.12*	1.17*
PPVT R3 (age-adj standard deviations)	0.89	0.99					0.9	0.97
Math R3 (age-adj standard deviations)	0.59***	0.65**					0.71***	0.75*
Parental aspirations for child R2 (grades)			0.91**	0.94*			0.96	0.97
Educational aspirations R3 (grades)			0.87**	0.87**			0.96	0.94
Time spent caregiving R3 (hrs/day)					0.97	0.98	0.99	0.96
Time on domestic tasks R3 (hrs/day)					1.04	1.04	1.02	0.99
Time on education R3 (hrs/day)					0.82**	0.83**	0.85***	0.84**
Maternal schooling (grades completed)		0.92**		0.92**		0.93**		0.93*
Early puberty		2.94**		2.49**		2.46**		2.71**
Ethiopia	0.23**	0.30**	0.47**	0.43**	0.34**	0.42**		
Peru	1.16	1.98*	2.12**	3.08**	1.55*	2.53**		
Vietnam	0.52**	0.82	0.75	1.02	0.53**	0.77		
Constant	0.60	0.04	5.20**	0.22	0.88	0.11		
Observations	1,405	1,292	1,732	1,589	1,762	1,615		

** p<0.01, * p<0.05

[a] Adjusted models also include controls for adolescent age, urban residence, wealth index, mother's age

Instruments for Highest Grade Attended

- Good instruments should be correlated with highest grade attended but *not* with whether adolescent becomes a mother; ideally exogenous

	Adolescent mother in R4	Highest grade	Minutes to school	Average maternal schooling	Number of older brothers
Adolescent mother in R4	1				
Highest grade	-0.0533	1			
Minutes to school	-0.0261	-0.0623	1		
Cluster average maternal schooling	-0.0736	0.3418	-0.1997	1	
Number of older brothers	0.0291	-0.2375	0.047	-0.1878	1
Number under age 6	0.036	-0.2861	0.0034	-0.1161	0.001

Schooling in Older Cohort, Young Lives

	Ethiopia		India		Peru		Vietnam	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
Highest grade attended, R3 (age 15)	**5.7***	5.4	9.0	9.1	8.7	8.6	8.3	8.3
Enrolled in R3 (age 15)	91.4	87.9	**73.8***	80.6	94.5	91.2	**80.6***	73.1
Grades aspired to, R3 (age 15)	**14.4***	14.8	**13.5***	14.2	15.5	15.3	**14.8***	14.1
Parental aspirations (grades), R2 (age 12)	14.9	15.0	**12.7***	14.0	15.2	15.3	14.8	14.6
Hours on education typical day, R3 (age 15)	**7.6***	7.2	**7.9***	8.9	**8.1***	7.0	**7.5***	6.5
Hours on domestic chores typical day, R3 (age 15)	**3.5***	1.8	**2.0***	0.8	**1.8***	1.3	**1.6***	1.3
Hours caregiving typical day, R3 (age15)	**0.9***	0.5	**0.4***	0.1	0.9	0.8	**0.2***	0.1

* $p<0.05$ difference in means for girls vs. boys

Situation in R4, Mothers vs. Non-mothers

	Non-mothers	Mothers	Non-mothers	Mothers
	Percent (n)	Percent (n)	Percent (n)	Percent (n)
	Lives in spousal HH		Urban residence	
Ethiopia	5.7 (383)	78.4 (37)	44.9 (439)	16.2 (37)
India	19.0 (385)	96.0 (101)	26.6 (395)	14.1 (99)
Peru	6.8 (220)	58.6 (70)	76.1 (247)	68.6 (70)
Vietnam	7.4 (408)	81 (58)	20.7 (434)	6.9 (58)
Total	10.0 (1,396)	80.5 (266)	38.3 (1,515)	27.3 (264)
	Enrolled in school		Married/Cohabitating	
Ethiopia	67.3 (382)	2.7 (37)	4.7 (382)	89.2 (37)
India	52.1 (384)	4.1 (98)	19.2 (385)	98.0 (101)
Peru	61.3 (217)	8.6 (70)	6.8 (220)	60.0 (70)
Vietnam	56.8 (403)	0.0 (58)	7.9 (405)	91.4 (58)
Total	59.1 (1,386)	4.2 (263)	10.0 (1,392)	85.3 (266)