

# Fertility preference, differential stopping behavior, and investment in child human capital in the developing world

Deon Filmer  
Jed Friedman  
Norbert Schady

Development Research Group  
The World Bank

Presentation for  
Gender, Poverty and Demography Workshop  
March 25, 2008

# Selected literature on impact of family size on child welfare

- **Identifying the impact of family size on investments in child health and education is hard**
- **Some of the literature simply ignores endogeneity**
  - **Some early exceptions**
    - Rosenzweig and Wolpin (1980) who use the birth of twins as an exogenous shock to household size to identify the impact of size on child schooling investments.
    - Behrman and Wolfe (1987) use information on the families of sibling adults to control for unobserved family attributes.
    - Rosenzweig and Schultz (1987) use unexpected fertility shocks to control for selected family size.
  - **Some more recent literature**
    - Angrist and Evans (1998): instrumental variables (IV) strategy based on sibling sex mix in families with two or more children in the US to look at labor supply decisions. (IV justification: Preference for mixed sibling sex composition leads to exogenous additional birth)
    - Angrist, Lavy and Schlosser (2005): same IV approach, along with information on multiple births, to identify the exogenous impact of family size and find no evidence for a quantity-quality tradeoff using data from Israel.
    - Black, Devereux, and Salvanes (2004) use multiple births as an identifying instrument and find no quantity-quality tradeoff using data from Norway – once birth-order effects are accounted for.
    - Henderson et al. (forthcoming) use the sex-composition of the first two children in a family to identify the impact of family size on child weight-for-age in Indonesia. They find an effect, although it is confined to higher birth-order children.
    - Pande (2003) reduced form relationship between sex ratios and child nutritional outcomes, finds that the sex composition of older siblings affects nutritional outcomes and immunization among younger siblings, and that the strength of this relationship differ for boys and girls.

## Sibling gender mix and fertility

- **Literature on the relationship between the gender composition of sibships and the probability of additional fertility**
  - Korea: Park (1983), Arnold (1985), Bairagi (1987) and Larsen, Chung, Das Gupta (1998)
  - India: Arnold, Choe and Roy (1998), Dreze and Murthi (2001) and Jensen (2007)
  - Vietnam: Haughton and Haughton (1998)
  - Malaysia (ethnic Chinese): Pong (1994) and Leung (1998)
  - Egypt: Yount, Langsten and Hill (2000)
  - Multicountry-Europe: Hank and Kohler (2000), Andersson et al (2006)
  - Multicountry-Developing countries: Arnold (1992, 1997)

# Goals of our paper

- Analysis of over 150 household surveys from more 65 developing countries.
- Goal 1: Document patterns of fertility behavior in response to different sibling gender mix
  - Broaden range of settings in which this behavior has been analyzed to date, and explore regional patterns
  - Investigate different patterns within countries
    - by urban/rural residence
    - by education of the mother
    - across cohorts over time.
- Goal 2: Analyze impact of family size on gender gaps in HD outcomes
  - Adopt general identification strategy (differential stopping behavior) in an analysis of data from many developing countries in order to explore the impact of family size on child welfare outcomes.
  - In addition, use unanticipated multiple births, as an identifying variable, and contrast these results with those from the gender composition instrument.
  - Analyze differential effects by gender of the child

# Data

## Sub-Saharan Africa

Benin	1996, 2001
Burkina Faso	1992-1993, 1998-1999, 2003
Burundi	1987
Cameroon	1991, 1998, 2004
Central African Republic	1994-1995
Chad	1996-1997, 2004
Comoros	1996
Ethiopia	2000, 2005
Gabon	2000-2001
Ghana	1988, 1993-1994, 1998-1999, 2003
Guinea	1999, 2005
Ivory Coast	1994, 1998-1999, 2005
Kenya	1988-1989, 1993, 1998, 2003
Lesotho	2004
Liberia	1986
Madagascar	1992, 1997, 2003-2004
Malawi	1992, 2000, 2004
Mali	1987, 1995-1996, 2001
Mozambique	1997, 2003
Namibia	1992, 2000
Niger	1992, 1998
Nigeria	1990, 1999, 2003
Rwanda	1992, 2000, 2005
Senegal	1986, 1992-1993, 1997, 2005
South Africa	1998
Sudan	1989-1990
Tanzania	1991-1992, 1996, 1999, 2004
Togo	1988, 1998
Uganda	1988-1989, 1995, 2000-2001
Zambia	1992, 1996-1997, 2001-2002
Zimbabwe	1988-1989, 1994, 1999, 2005-2006
Armenia	2000, 2005

## Europe and Central Asia

Kazakhstan	1995, 1999
Kyrgyzstan	1997
Moldova	2005
Turkey	1993, 1998
Uzbekistan	1996

## Latin America and Caribbean

Bolivia	1989, 1993-1994, 1998, 2003-2004
Brazil	1986, 1991-1992, 1996
Colombia	1986, 1990, 1995, 2000, 2005
Dominican Republic	1986, 1991, 1996, 1999, 2002
Ecuador	1987
El Salvador	1985
Guatemala	1987, 1995, 1998-1999
Haiti	1994-1995, 2000, 2005
Honduras	2005
Mexico	1987
Nicaragua	1997-1998, 2001
Paraguay	1990
Peru	1986, 1991-1992, 1996, 2000
Trinidad & Tobago	1987

## Middle East and North Africa

Egypt	1988, 1992-1993, 1995-1996, 2000, 2003, 2005
Morocco	1987, 1992, 2003-2004
Tunisia	1988
Yemen	1991-1992

## South Asia

Bangladesh	1993-1994, 1996-1997, 1999-2000, 2004
India	1992-1993, 1998-2000
Nepal	1996, 2001, 2006
Pakistan	1990-1991
Sri Lanka	1987

## East Asia and Pacific

Cambodia	2000, 2005
Indonesia	1987, 1991, 1994, 1997, 2002-2003
Philippines	1993, 1998, 2003
Thailand	1987
Vietnam	1997, 2002

## Fertility response to sibling gender mix

- Estimate determinants of having an additional child

$$B_{wp} = a + b_{mp}M_{wp-1} + b_{fp}F_{wp-1} + u_{wp} \quad \text{for } p=2,\dots,5$$

- Differential Stopping Behavior (DSB) =  
Incremental probability of having additional children after zero male children ( $b_m$ ) – Incremental probability of having additional children after zero female children ( $b_f$ )

# Country-level results on DSB

Region	Country	zero boys (1)	zero girls (2)	(1) - (2)	test_diff	Mean Kids	Med Kids	Desired Boys/Girls
LAC	Bolivia	0.037 **	0.021 **	-0.004	0.457	3.82	3	1.07
	Brazil	0.017 **	0.021 **	-0.004	0.692	3.10	2	0.97
	Colombia	0.022 **	0.027 **	-0.005	0.428	2.97	2	0.90
	DomRep	-0.014 **	0.018 **	→ -0.032	0.000 **	3.26	3	0.77
	Ecuador	0.027 **	0.040 **	-0.013	0.316	3.80	3	
	EISal	0.051 *	0.026	0.025	0.499	1.81	2	
	Guatemala	0.013 **	0.026 **	→ -0.013	0.081 *	4.02	3	1.03
	Haiti	0.003	0.011 **	-0.008	0.284	3.83	3	0.89
	Honduras	0.036 **	0.025 **	0.012	0.137	3.40	3	0.97
	Mexico	0.057 **	0.030 **	0.026	0.026 **	3.98	3	
	Nicaragua	0.007	0.018 **	→ -0.011	0.098 *	3.61	3	0.87
	Paraguay	0.021 **	0.007	0.014	0.265	3.67	3	
	Peru	0.015 **	0.021 **	-0.005	0.238	3.63	3	1.00
Tri&Tob	0.028 **	0.056 **	→ -0.028	0.083 *	3.21	3		
MENA	Egypt	0.066 **	0.017 **	→ 0.049	0.000 **	3.92	3	1.16
	Morocco	0.032 **	0.022 **	→ 0.010	0.046 **	4.34	4	1.02
	Tunisia	0.070 **	0.019 **	→ 0.051	0.000 **	4.27	4	
	Yemen	0.015 **	0.009 *	→ 0.007	0.365	5.46	5	
ECA	Armenia	0.273 **	-0.014	→ 0.288	0.000 **	2.44	2	1.08
	Kazakhstan	0.090 **	0.048 **	→ 0.042	0.004 **	2.52	2	0.97
	KyrgyzRep	0.087 **	0.029 **	→ 0.059	0.000 **	3.23	3	1.00
	Moldova	0.056 **	0.043 **	0.013	0.492	2.05	2	
	Turkey	0.131 **	0.014 **	→ 0.116	0.000 **	3.21	3	1.08
	Uzbekistan	0.124 **	0.051 **	→ 0.073	0.000 **	3.29	3	1.03
SA	Bangladesh	0.065 **	0.019 **	→ 0.045	0.000 **	3.57	3	1.24
	India	0.109 **	0.004 **	→ 0.106	0.000 **	3.44	3	1.41
	Nepal	0.088 **	-0.031 **	→ 0.119	0.000 **	3.65	3	1.50
	Pakistan	0.018 **	0.019 **	-0.001	0.921	4.60	4	
	SriLanka	0.054 **	0.044 **	0.011	0.333	3.28	3	
EA	Cambodia	0.023 **	0.045 **	→ -0.022	0.000 **	3.87	3	0.95
	Indonesia	0.026 **	0.032 **	→ -0.006	0.093 *	3.28	3	1.01
	Philippines	0.030 **	0.027 **	0.003	0.485	3.62	3	0.95
	Thailand	0.033 **	0.026 **	0.007	0.587	3.06	3	
	Vietnam	0.156 **	0.032 **	→ 0.124	0.000 **	2.81	2	1.10

# Country-level results on DSB

Region	Country	zero boys (1)	zero girls (2)	(1) - (2)	test_diff	Mean Kids	Med Kids	Desired Boys/Girls
AFR	Benin	0.014 **	0.006		0.263	4.34	4	1.09
	BurFaso	0.003	0.007 *		0.429	4.46	4	1.18
	Burundi	0.028 **	0.006	→	0.087 *	4.34	4	
	Cameroon	-0.011 **	0.026 **	→	0.000 **	4.06	3	1.01
	CAR	-0.012	0.020 **	→	0.004 **	3.86	3	0.92
	Chad	0.019 **	0.021 **		0.781	4.55	4	1.14
	Comoros	0.013	0.014		0.958	4.67	4	
	Cotelv	0.015 **	0.001		0.132	3.81	3	0.98
	Ethiopia	0.012 **	0.019 **		0.262	4.54	4	1.16
	Gabon	0.009	0.037 **	→	0.032 **	3.58	3	0.94
	Ghana	0.012 **	0.010 **		0.661	3.83	3	1.04
	Guinea	0.032 **	0.015 **	→	0.005 **	4.29	4	1.15
	Kenya	0.029 **	0.016 **		0.008 **	4.24	4	1.06
	Lesotho	-0.009	0.024 **	→	0.020 **	3.02	2	1.00
	Liberia	0.049 **	0.036 **		0.275	3.91	3	
	Madagascar	0.014 **	0.001	→	0.054 *	4.16	3	1.04
	Malawi	-0.003	0.025 **	→	0.000 **	4.09	3	0.94
	Mali	0.014 **	0.015 **		0.801	4.74	4	1.18
	Mozambique	-0.001	0.008		0.333	3.90	3	0.98
	Namibia	0.033 **	0.050 **	→	0.079 *	3.35	3	0.94
	Nigeria	0.016 **	0.023 **		0.253	4.34	4	1.14
	Niger	0.010 **	0.018 **		0.214	4.85	4	1.23
	Rwanda	0.019 **	0.001	→	0.001 **	4.41	4	1.04
	Senegal	0.008 **	0.002		0.228	4.38	4	1.30
	SoAfrica	0.015 *	0.029 **		0.196	2.75	2	
	Sudan	0.040 **	0.005	→	0.000 **	4.89	4	
	Tanzania	0.026 **	0.009 **	→	0.003 **	4.01	3	1.02
	Togo	0.017 **	0.011 **		0.471	4.16	4	1.01
	Uganda	-0.004	0.010 **	→	0.018 **	4.42	4	0.95
	Zambia	0.016 **	0.009 **		0.207	4.12	3	0.96
Zimbabwe	0.000	0.017 **	→	0.006 **	3.57	3	1.00	

## Region-level results on DSB

- In Middle Eastern, North African, and South and Southeast Asian countries
  - clear evidence that families with a higher share of female children show a greater likelihood of having an additional child.
- Other regions
  - different patterns: for example in Latin American countries there appears to also be a desire for at least one child of each gender.

Region	zero boys (1)	zero girls (2)	(1) - (2)	test_diff	Mean Kids	Med Kids	Desired Boys/Girls
LAC	0.029 **	0.025 **	0.004	0.434	3.41	3	0.95
MENA	0.050 **	0.016 **	→ 0.033	0.000 **	4.26	4	1.12
ECA	0.122 **	0.027 **	→ 0.095	0.000 **	3.08	3	1.03
SA	0.092 **	0.007 **	→ 0.084	0.000 **	3.58	3	1.38
EA	0.051 **	0.031 **	→ 0.020	0.000 **	3.24	3	1.01
AFR	0.015 **	0.016 **	-0.001	0.740	4.17	4	1.09

# Heterogeneity in DSB: Location and education

- By urban/rural location

Region	urb_zm (1)	urb_zf (2)	(1) - (2) [A]	Mean kids	rur_zm (3)	rur_zf (4)	(3) - (4) [B]	Mean kids	[A] - [B]
LAC	0.037 **	0.024 **	0.013 **	3.129	0.018 **	0.025 **	-0.007	3.835	0.020 *
MENA	0.066 **	0.025 **	0.041 **	3.710	0.041 **	0.011 **	0.029 **	4.671	0.011 **
ECA	0.130 **	0.019 **	0.111 **	2.752	0.113 **	0.038 **	0.075 **	3.493	0.035 **
SA	0.107 **	0.009 **	0.099 **	3.305	0.087 **	0.007 **	0.081 **	3.673	0.018 **
EA	0.044 **	0.035 **	0.009 *	3.036	0.054 **	0.029 **	0.025 **	3.338	-0.016 **
AFR	0.025 **	0.015 **	0.010 **	3.577	0.012 **	0.016 **	-0.004 *	4.404	0.014 **

- By mother's education

Region	hi_zm (1)	hi_zf (2)	(1) - (2) [A]	Mean kids	lo_zm (3)	lo_zf (4)	(3) - (4) [B]	Mean kids	[A] - [B]
LAC	0.037 **	0.025 **	0.012	2.449	0.028 **	0.027 **	0.001	4.191	0.011
MENA	0.089 **	0.021 **	0.068 **	2.706	0.046 **	0.015 **	0.031 **	4.815	0.037 **
ECA	0.110 **	0.034 **	0.076 **	2.715	0.137 **	0.013 **	0.123 **	3.510	-0.048 **
SA	0.155 **	-0.003	0.158 **	2.529	0.081 **	0.006 **	0.075 **	3.911	0.084 **
EA	0.068 **	0.035 **	0.033 **	2.829	0.036 **	0.028 **	0.008 *	3.753	0.025 **
AFR	0.032 **	0.013 **	0.018 **	3.108	0.009 **	0.015 **	-0.005 **	4.687	0.024 **

# Heterogeneity in DSB: Across cohorts

	Birth years		DSB		DSB		Difference	Mean Kids	
	Oldest	Youngest	Oldest		Youngest			Oldest	Youngest
Armenia	51-55	61-65	0.273	**	0.258	**	-0.015	2.93	2.45
Bangladesh	44-48	59-63	0.005		0.076	**	0.071 **	6.92	4.25
Bolivia	44-48	59-63	-0.009		0.034	*	0.043	5.87	4.48
Brazil	42-46	52-56	-0.064	**	0.026		0.090 **	5.02	3.21
BurFaso	49-53	59-63	-0.029	**	0.073	**	0.102 **	7.51	5.80
Cambodia	51-55	61-65	-0.022	*	-0.035	**	-0.013	6.03	3.99
Cameroon	45-49	60-64	-0.003		-0.010		-0.007	6.79	5.54
Colombia	40-44	60-64	0.014		0.047	**	0.032 **	5.85	2.90
DomRep	43-47	58-62	-0.061	**	-0.064	**	-0.003	5.60	3.37
Egypt	39-43	59-63	-0.015		0.059	**	0.075 **	6.38	4.15
Ethiopia	43-47	53-57	0.010		-0.001		-0.011	7.33	5.92
Ghana	44-48	59-63	0.014		0.027		0.013	6.73	4.59
Guatemala	44-48	54-58	-0.016		0.007		0.023	6.09	5.05
Haiti	51-55	61-65	0.028		-0.008		-0.036	5.75	4.67
India	44-48	54-58	0.066	**	0.105	**	0.039 **	5.18	4.04
Indonesia	44-48	59-63	-0.038	**	-0.001		0.037 *	5.32	3.20
Kazakhstan	50-54	55-59	0.022		0.115	**	0.093	3.13	2.70
Kenya	43-47	58-62	0.032	**	-0.024		-0.056 *	7.84	5.24
Madagascar	49-53	59-63	-0.006		0.005		0.011	6.97	4.94
Malawi	50-54	60-64	-0.033	**	-0.017		0.016	6.87	5.63
Mali	46-50	56-60	0.036	**	0.013		-0.023	6.99	6.53
Morocco	39-43	59-63	0.041	**	0.024		-0.017	7.47	3.86
Nepal	46-50	61-65	0.090	**	0.187	**	0.097 **	6.10	4.22
Nicaragua	48-52	58-62	-0.062	**	0.015		0.078 **	5.99	4.45
Nigeria	49-53	59-63	-0.004		0.035	**	0.039	6.41	5.83
Peru	41-45	56-60	0.023		-0.042	**	-0.065	5.99	3.78
Philippines	44-48	59-63	0.029	*	0.018		-0.011	5.67	3.91
Rwanda	51-55	61-65	-0.008		0.038	**	0.046	6.93	5.09
Senegal	46-50	61-65	0.012		0.054	**	0.042	7.09	5.24
Tanzania	45-49	60-64	-0.016		-0.009		0.006	7.39	5.35
Turkey	44-48	54-58	0.061	**	0.142	**	0.081	5.00	3.47
Uganda	46-50	56-60	0.026		0.032	*	0.006	7.64	6.27
Vietnam	48-52	58-62	0.090	**	0.174	**	0.084	4.54	2.78
Zambia	47-51	57-61	0.018		-0.002		-0.020 **	7.74	5.88
Zimbabwe	46-50	61-65	0.062	**	-0.065	**	-0.127 **	6.48	3.80

# Fertility response to sibling gender mix

- **Conclusions**

- Gender composition is a significant determinant of subsequent fertility in many countries, and regions
- Son preference in MENA, ECA, SA and EA
- Results do not suggest that “modernization,” as defined by urbanization, higher education levels, or changes over time, is associated with a reduction in the expression of son-preference
  - Apparent inverse U-shape between average number of children and expression of son-preference

# Goals of our paper

- Analysis of over 150 household surveys from more 65 developing countries.
- Goal 1: Document patterns of fertility behavior in response to different sibling gender mix
  - Broaden range of settings in which this behavior has been analyzed to date, and explore regional patterns
  - Investigate different patterns within countries
    - by urban/rural residence
    - by education of the mother
    - across cohorts over time.
- Goal 2: Analyze impact of family size on gender gaps in HD outcomes
  - Adopt general identification strategy (differential stopping behavior) in an analysis of data from many developing countries in order to explore the impact of family size on child welfare outcomes.
  - In addition, use unanticipated multiple births, as an identifying variable, and contrast these results with those from the gender composition instrument.
  - Analyze differential effects by gender of the child

# Impact of family size on child outcomes

- OLS regression

$$Y_{iw} = \alpha + \beta T_w + \mu_{iw}$$

1. ever-attended school for children age 9-14
2. current enrollment in school for children age 9-14
3. z-score of weight/age for children age 0-4
4. z-score of height/age for children age 0-4
5. z-score of weight/height for children age 0-4

- Instrumental variables

$$T_w = \gamma + \delta Z_w + \varepsilon_{iw}$$

1. the number of males in the first two births
2. a dummy equal to one if neither of the first two children was male
3. a dummy equal to one if neither of the first two children was female
4. a dummy equal to one if the first birth was a multiple birth
5. (2), (3) and (4) together

# Association between child outcomes and family size (OLS)

		<b>All</b>		<b>Male</b>		<b>Female</b>		<b>All</b>		<b>Male</b>		<b>Female</b>		
LAC	Attended	-0.023	**	-0.025	**	-0.022	**	Weight/Age	-0.099	**	-0.085	**	-0.111	**
	Enrollment	-0.014	**	-0.014	**	-0.014	**	Height/Age	-0.139	**	-0.136	**	-0.143	**
								Weight/Height	-0.025	**	-0.010		-0.039	**
MENA	Attended	-0.010	**	-0.001		-0.018	**	Weight/Age	-0.038	**	-0.037	**	-0.040	**
	Enrollment	-0.013	**	-0.005	**	-0.020	**	Height/Age	-0.067	**	-0.063	**	-0.072	**
								Weight/Height	0.000		-0.001		0.000	
ECA	Attended	-0.024	**	-0.014	**	-0.032	**	Weight/Age	-0.103	**	-0.122	**	-0.083	**
	Enrollment	-0.043	**	-0.031	**	-0.049	**	Height/Age	-0.153	**	-0.164	**	-0.141	**
								Weight/Height	-0.018	*	-0.033	**	-0.002	
SA	Attended	-0.016	**	-0.018	**	-0.012	**	Weight/Age	-0.047	**	-0.050	**	-0.043	**
	Enrollment	-0.016	**	-0.018	**	-0.015	**	Height/Age	-0.076	**	-0.077	**	-0.076	**
								Weight/Height	0.002		-0.005		0.008	
EA	Attended	-0.006	**	-0.006	**	-0.005	**	Weight/Age	-0.040	*	-0.058	**	-0.018	
	Enrollment	-0.008	**	-0.011	**	-0.006	**	Height/Age	-0.068	**	-0.097	**	-0.036	
								Weight/Height	0.019		0.009		0.028	
AFR	Attended	-0.006	**	-0.007	**	-0.005	**	Weight/Age	-0.010	**	-0.009	*	-0.012	**
	Enrollment	-0.002	**	-0.003	**	-0.001		Height/Age	-0.013	**	-0.017	**	-0.009	
								Weight/Height	-0.002		0.002		-0.006	

Note: Model includes mother age, mother's age squared, urban-rural dummy, and mother's education level

# Instrumental variables approach

First stage estimates of impact of instrument (gender composition at parity 2) on total family size

- Sample of 9-14 year olds

	Number of males	Joint model					
		No females	No males	Multiple	No females	No males	Multiple
LAC	-0.007	-0.002	0.019	-0.252	0.005	0.021	-0.252
MENA	-0.170 **	-0.134 **	0.328 **	0.446 **	-0.029	0.316 **	0.429 **
ECA	-0.210 **	-0.204 **	0.351 **	-0.301	-0.096 **	0.321 **	-0.323
SA	-0.121 **	-0.137 *	0.188 **	0.763	-0.087	0.157 **	0.762
EA	-0.023	0.002	0.066 *	0.147	0.025	0.074 **	0.133
AFR	0.009	0.017	-0.007	0.174	0.016	-0.001	0.157

- Sample of 0-4 year olds

	Number of males	Joint model					
		No females	No males	Multiple	No females	No males	Multiple
LAC	0.037	-0.053	-0.158 *	-0.075	-0.117	-0.197 *	-0.028
MENA	-0.020	0.030	0.085 **	-0.312 **	0.070 *	0.112 **	-0.361 **
ECA	-0.069	-0.007	0.174 **	-0.142	0.064	0.198 **	-0.172
SA	-0.083 **	-0.076 **	0.143 **	0.011	-0.029	0.134 **	-0.011
EA	0.011	0.098	0.070	0.186	0.139	0.117	0.174
AFR	0.050 **	0.092 **	-0.039	0.088	0.089 **	-0.009	0.073

Note: 9-14 year olds corresponds to sample for estimating impact on Attended; 0-4 year olds corresponds to sample for estimating impact on weight/age

# Instrumental variables approach

## Estimates of impact of family size on child outcomes

- Schooling outcomes

	Outcome	Number of males	No females	No males	Multiple	Joint
LAC	Attended	1.926	-1.157	0.572	-0.113	0.061
	Enrollment	-0.009	-0.060	-0.032	-0.168	-0.095
MENA	Attended	-0.097 **	-0.149 **	-0.073 **	-0.018	-0.066 **
	Enrollment	-0.092 **	-0.145 **	-0.068 **	-0.021	-0.062 **
ECA	Attended	-0.021	-0.012	-0.025 *	0.120	-0.020
	Enrollment	-0.139 **	-0.203 **	-0.105 **	0.077	-0.112 **
SA	Attended	-0.621 **	-0.613 *	-0.627 **	0.021	-0.535 **
	Enrollment	-0.559 **	-0.551	-0.566 **	0.111	-0.466 **
EA	Attended	0.214	-1.725	0.104	0.090	0.070
	Enrollment	-0.269	0.939	-0.048	-0.272	-0.008
AFR	Attended	-2.578	-7.235	-1.284	0.062	-0.005
	Enrollment	-3.635	-	-1.418	0.039	-0.008

# Instrumental variables approach

## Estimates of impact of family size on child outcomes

- Nutrition outcomes

	Outcome	Number of males	No females	No males	Multiple	Joint	
LAC	Weight/Age	-0.670	0.529	-0.231	-1.249	-0.097	
	Height/Age	-1.586	1.092	-0.605	-0.316	-0.301	
	Weight/Height	0.071	0.149	0.096	-1.504	0.101	
MENA	Weight/Age	0.330	0.580	0.230	0.249	0.260	*
	Height/Age	0.321	0.565	0.222	0.288	0.290	*
	Weight/Height	0.341	0.557	0.263	0.156	0.227	
ECA	Weight/Age	0.125	0.933	-0.211	-1.150	-0.208	
	Height/Age	-0.195	0.473	-0.472	-2.632	-0.543	
	Weight/Height	0.461	1.023	0.226	0.823	0.292	
SA	Weight/Age	-0.030	0.052	-0.098	-0.054	-0.047	
	Height/Age	0.264	0.237	0.289	-0.226	0.102	
	Weight/Height	-0.050	0.120	-0.211	0.205	0.041	
EA	Weight/Age	0.296	-1.181	-0.345	-1.184	-0.591	
	Height/Age	2.217	-2.225	0.290	-1.800	-0.416	
	Weight/Height	-0.195	0.037	-0.220	0.123	-0.225	
AFR	Weight/Age	-0.165	-0.320	0.285	-0.177	-0.215	**
	Height/Age	-0.271	-0.390	0.075	-0.234	-0.284	**
	Weight/Height	-0.198	-0.236	-0.088	-0.047	-0.095	

# Impact of family size on child outcomes

- Preliminary findings
  - Strong association between family size and schooling and anthropometric outcomes
  - IV approach yields a first stage in some cases; and suggests an impact of family size on outcomes in some settings
- Further work
  - Gender disaggregated outcomes
  - Validity of IV approach
  - Other outcomes
  - Within-family differences