Population Quantity, Quality and Mobility

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Demographic Transition

Pop QQM

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Introduction

**Demographic
Transition**

Education

Global Population
Aging

Population Mobility

Policy Implications

Demographic Transition

World Population Size
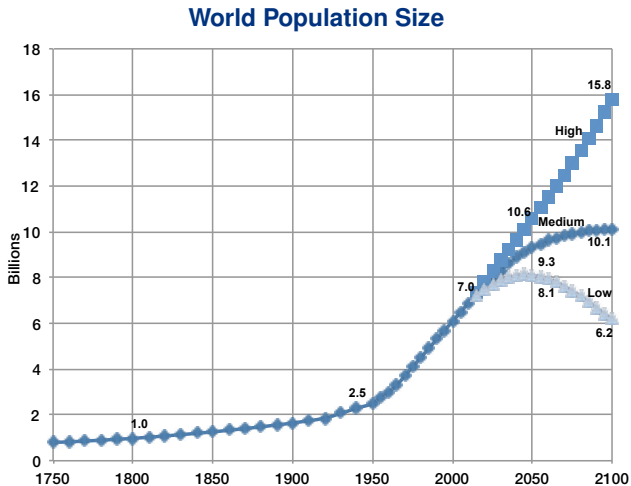
Source: United Nations World Population Prospects 2010

Demographic Transition

World Population Growth

Source: United Nations World Population Prospects 2010

Demographic Transition

Increasing well-being *despite rapid population growth* attributed to six factors:

- **Market responses**

- **Innovation**

- **Globalization**

- **Urbanization**

- **Fertility decline**

- **Investments in children and child quality**

Population and Food

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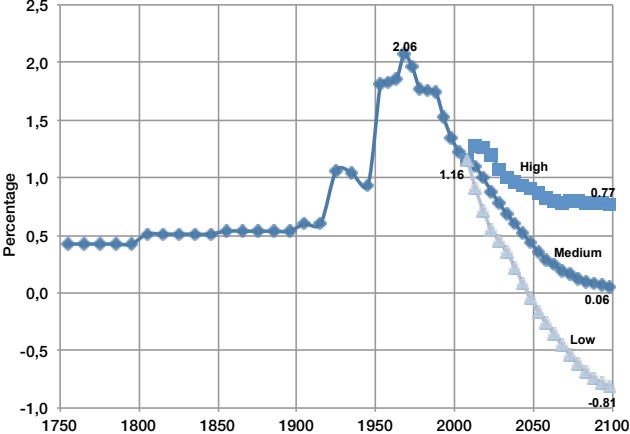Real agricultural prices and world population, 1900–2010
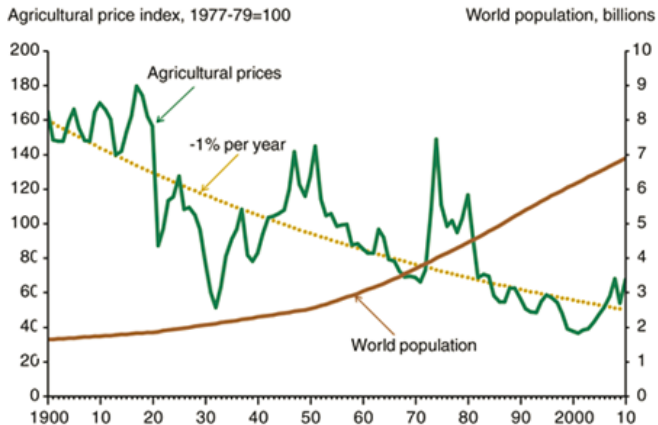
Taxonomy of Population Q&Q

Population Quantity and Quality, Looking Forward from 2014				
		Late Stages in DT and Population Quantity		
		High Fertility, High Population Growth	**Potential "Demographic Dividend"**	**Post-Transition Older Population Structure**
Population Quality (Health, Nutrition, Education)	**Low**	Much of Sub-Saharan Africa	Much of South Asia	
	Medium		Most of Latin America and the Carribean	Much of East Asia
	High			Most OECD countries

Education

Education is accumulation of knowledge

- Education occurs in many venues

- Education also occurs over the life cycle

- Emphasis heavily on one form of education, formal schooling

- Most information on formal schooling, some on early childhood development (ECD)

- Schooling enrollment has expanded impressively, although quality problems remain

GDP Growth by Education

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GDP Growth by Educational Attainment
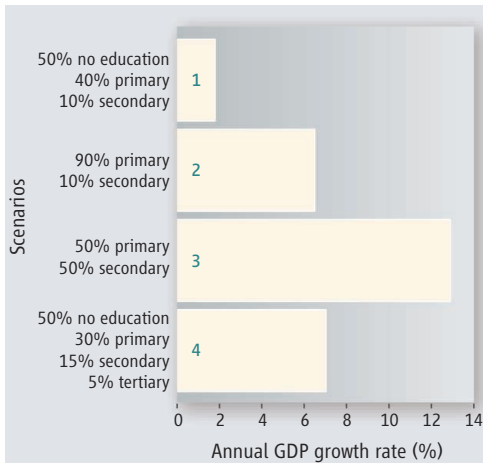
Source: Lutz, Wolfgang; Cuaresma, Jesus Crespo & Sanderson, Warren (2008). The Demography of Educational...

World Pop by Education Level
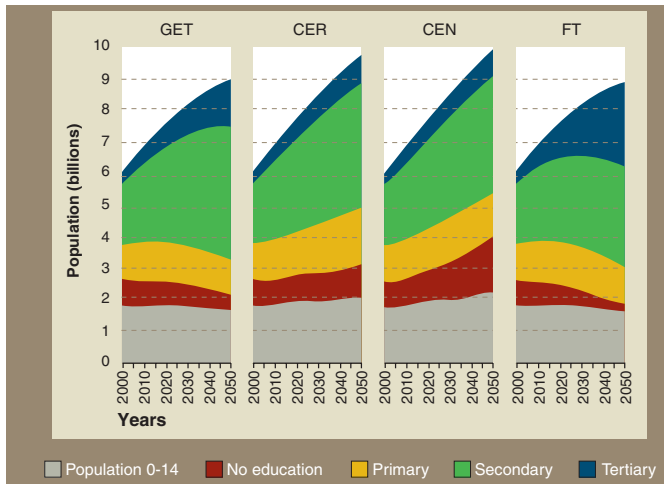
Source: Lutz, Wolfgang; Cuaresma, Jesus Crespo & Sanderson, Warren (2008). The Demography of Educational Attainment and Economic Growth. Science, 319(5866), 1047-1048

Early Childhood Education

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Effect on Cognitive Skills in MLICs

Intervention type	Median	Range
Center-based preschool and day care	0.33	0.06–1.15
Parent and parent-child interactions	0.28	-0.05–0.80

Global Population Aging

Proportion of Population Age 60 and over, 1950–2050

Shifting Disease Burdens

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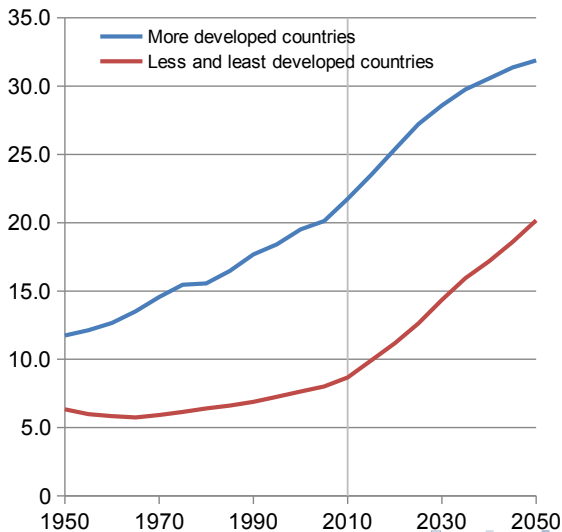
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Global Death Ranks for Top 8 Causes of Death in 2010

Disorder	2010 Mean rank (95% UI)	% change (95% UI)
1 Ischaemic heart disease	1·0 (1 to 1)	35 (29 to 39)
2 Stroke	2·0 (2 to 2)	26 (14 to 32)
3 COPD	3·4 (3 to 4)	–7 (–12 to 0)
4 Lower respiratory infections	3·6 (3 to 4)	–18 (–24 to –11)
5 Lung cancer	5·8 (5 to 10)	48 (24 to 61)
6 HIV/AIDS	6·4 (5 to 8)	396 (323 to 465)
7 Diarrhoea	6·7 (5 to 9)	–42 (–49 to –35)
8 Road injury	8·4 (5 to 11)	47 (18 to 86)

Urbanization

- In 1800 only about 3% of world population lived in urban areas

- Today, 50% of world population in urban areas

- First city with 1+ million was probably London (in 1811)

- Today, 456 cities with > 1 million inhabitants

- 1.4 billion people live in cities with >1 million

- Currently, 23 cities with >10 million population

- By 2025, 37 cities with >10 million population

Urban Population by Region
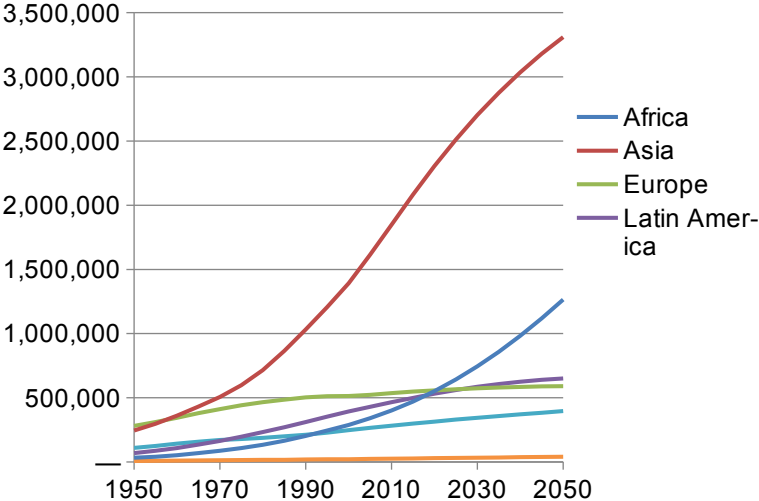
International Migration

Stock of international migrants 2010

Policy Implications

Important aspects of policy recommendations

▶ **Distributional and efficiency policy motives:** Policy
  hierarchies with direct and prices tending to be highest,
  tradeoffs or complementarities.

▶ **Assessing probable rates of return to policies
  challenging**

▶ **Incentives and commitment schemes**

Benefit/costs for investments in POP QQM, life cycle framework
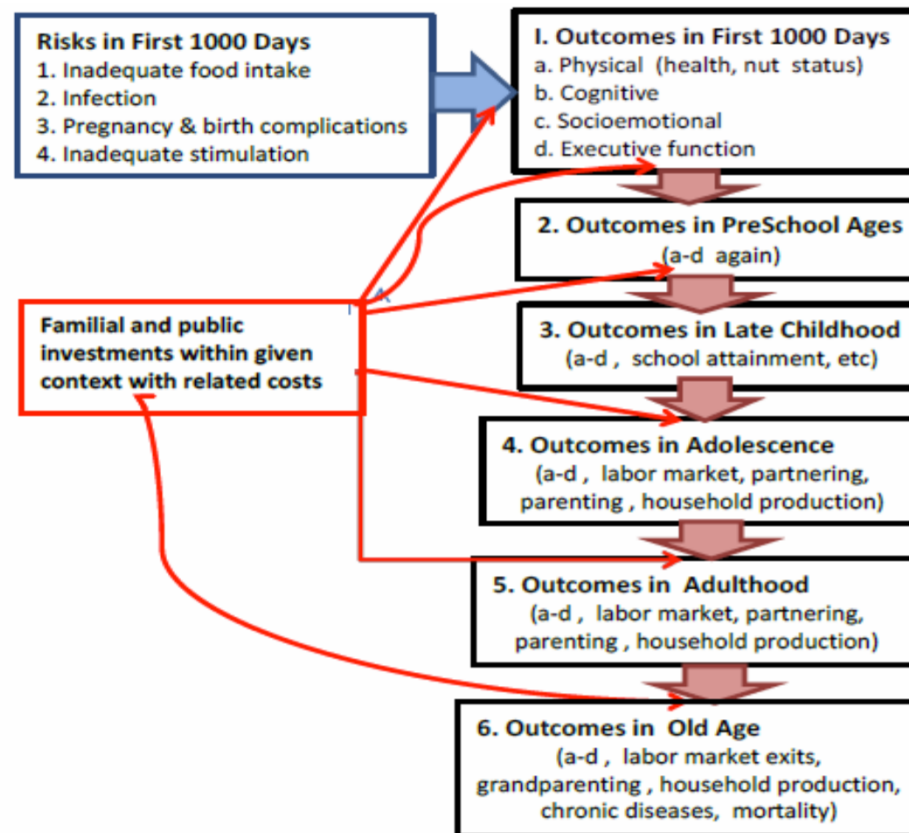
Figure 1: A lifecycle approach to investments in the First 1000 days

Critical Components of Benefits vs. Costs or Payoffs to Interventions

Multiple impacts over life cycle of interventions

1. Challenge in estimating impacts given unobserved factors.
2. Present discounted values & survival probabilities
3. Substitution concurrently and over life cycle
4. Weighting different impacts to get benefits
5. Context dependent because markets, policies, etc. differ

Resource costs over life cycle for interventions

1. Public and private resource costs
2. Not same as public (or supplier) expenditures
3. Resource costs of distortions for raising public funds
4. Context dependent

Policies with High Benefit-Cost Ratios

Priorities with high benefit-cost ratios (BCRs)

	BCR
1. Achieving **universal access to sexual and reproductive health (SRH) services** by 2030, and **eliminating unmet need for modern contraception** by 2040	> 90
2. **Reducing barriers to migration** within low- and middle-income countries, as well as between low- and middle-income countries and high-income countries	> 45

Policies with Probably High BCRs

Priorities with probably high, but difficult to quantify, benefit-cost ratios (BCRs)

	BCR
3. **Elimination of age-based eligibility criteria for retirement**, and the development of public pension systems that are based on expected years of remaining life given fixed characteristics	*high* (but difficult to quantify)
4. Programs facilitating **more efficient and more equitable urbanization**	*high* (but difficult to quantify)

Policies with Probably Low BCRs

Priorities with relatively low benefit-cost ratios (BCRs)

	BCR
5. Maintenance and expansion of public **pension eligibility at "relatively young old ages"**	*low* (but difficult to quantify)
6. Family policies aimed at **increasing low fertility in high-income countries** (with the exception of the expansion of early childhood education and high-quality day care)	*low* (most likely < 1, but difficult to quantify)

Policies: Education

▶ Subsidies based on **distribution and efficiency**

▶ Increase parental knowledge of importance of and means of **early-life child stimulation**

▶ **Pre-school programs** for children 3-5 years old

▶ Increased incentives for **enrollment of girls**; increased incentives for **boys to progress** through school

▶ **Schooling policies** (a) neutrality wrt school ownership, (b) monitor quality of schooling, (c) incentives for improving schooling quality

▶ More general education over **life cycle**

Understimulation

1. Related to family background with gaps in cognitive skills arising at early preschool ages and persisting into school years (Chile, Colombia, Ecuador, Nicaragua, Peru).

2. Costs (less maternal-child interaction) and gains (more income?) from maternal employment, with the latter larger for Chile (and parental stress reduced).

3. Trained community women in Colombia result in significant improvements in child cognitive skills (0.26 SD) and receptive vocabulary (0.22 SD).

4. Absence of both parents reduces math and language test performance (5 percentile points) in rural Chinese primary-school children (60+ million "left-behind").

Nonparametric regressions of PPVT scores on age in months, by wealth quartile
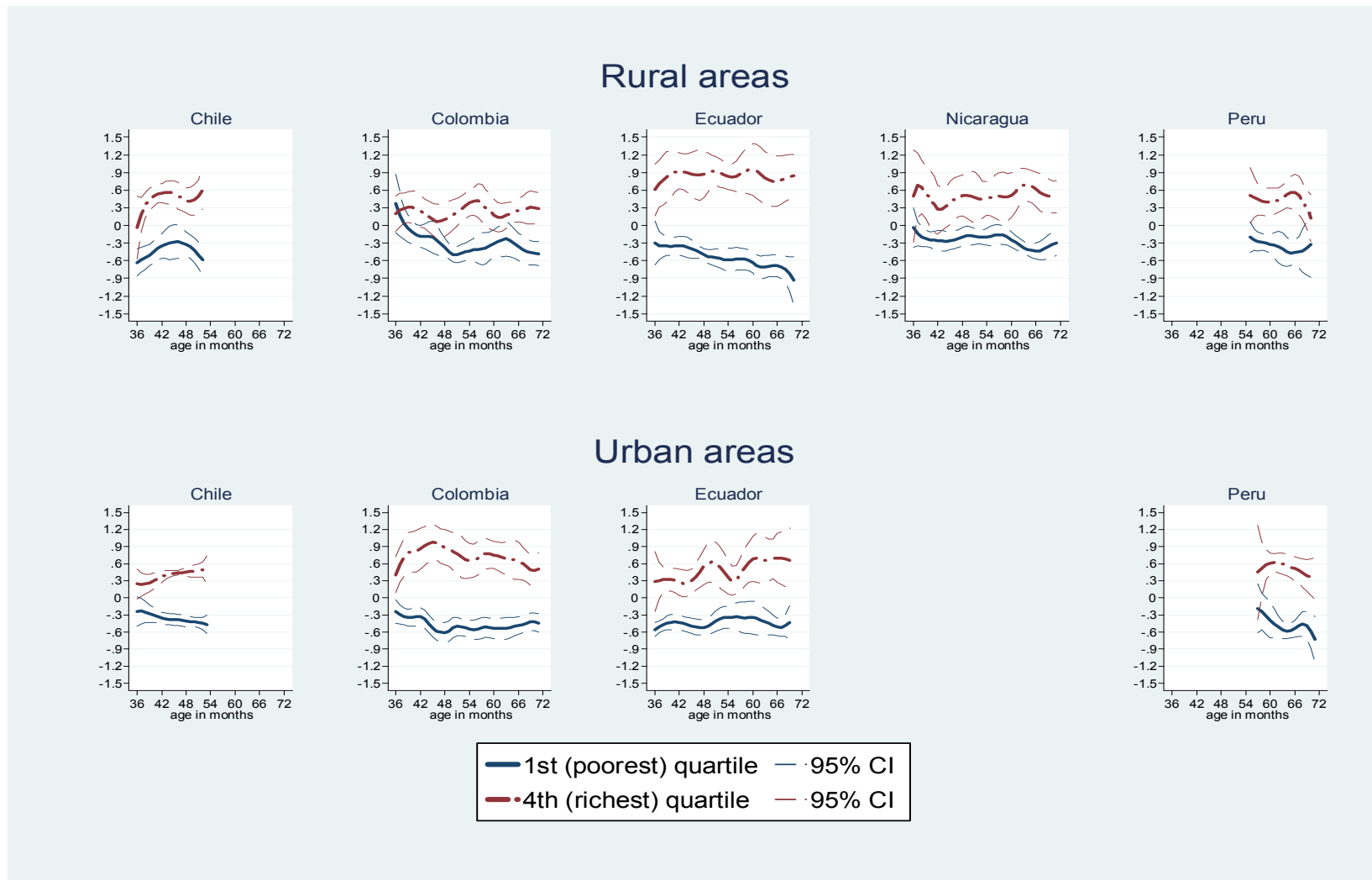
Benefit-cost ratios for early life stimulation programs

	Home visits	Daycare	Preschool
Discount rate = 3%			
Chile	3.3	1.3	4.4
Colombia	3.0	1.1	3.9
Guatemala	2.8	0.9	4.0
Discount rate = 6%			
Chile	1.6	0.5	2.5
Colombia	1.5	0.5	2.2
Guatemala	1.4	0.4	2.3

Region Preschool Enrollment Rates (%) 1999-2008

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
World	32.6	34.2	34.8	34.6	36.1	37.1	39.5	40.3	42.8	43.6
Arab States	14.7	15.5	15.3	15.7	16.4	16.5	17.4	18.7	18.1	18.7
Central and Eastern Europe	49.7	50.8	52.7	54.4	57.8	59.7	60.9	62.7	64.6	66.3
Central Asia	20.3	21.7	23.6	24.7	25.7	25.9	26.7	27.7	28.5	28.7
East Asia and the Pacific	38.2	39.2	39.9	38.6	39.8	...	...	44.3	46.9	48.5
Latin America and the Caribbean	55.6	57.8	60.0	55.2	60.5	60.3	64.7	65.7	65.9	68.5
North America and Western Europe	75.1	75.9	78.0	79.0	77.6	78.1	79.2	80.3	81.0	79.9
South and West Asia	21.3	25.1	25.2	27.0	29.0	30.7	35.2	35.8	...	...
Sub-Saharan Africa	11.7	12.1	12.2	12.4	13.2	14.2	14.8	15.5	16.1	16.7

Source: dhttp://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx Table 20D: Regional average of enrolment ratios for pre-primary to tertiary education (ISCED 0-6)

Estimating benefits of investing in early child development (Lancet 2011)

- Used data from 73 countries to estimate long-term effects of one type of ECD intervention – preschool.

- Countries with higher preschool enrolment have smaller gap in attained schooling between highest income quintile and other quintiles

Preschool's lasting positive effects
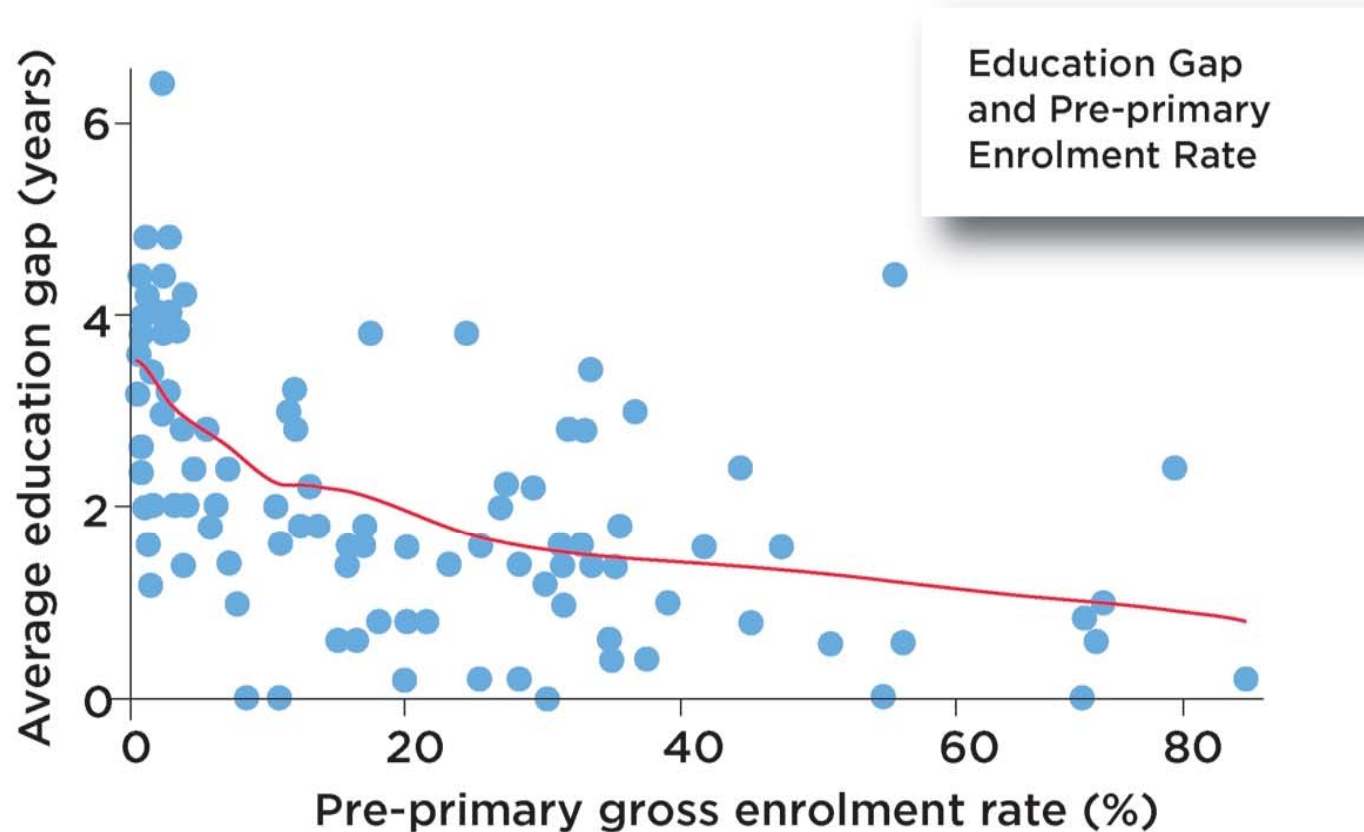
Association of preschool enrolment and the schooling gap for 73 low-income and middle-income countries. Schooling gap defined as the gap between schooling attainment of the wealthiest quintile of youth compared with youth in other wealth quinites. Average education gap is for those aged 15–19 years. Pre-primary gross enrolment rate is from 8–12 years earlier. Bandwidth=0·8.

Increasing preschool enrolment: Benefit-to-cost ratio of 6.4 - 17:1

- Increasing preschool enrolment benefits attained schooling
- Estimated increase in future earnings US $11 - 34 billion
- Benefit-to-cost ratio from 6.4 to 17:1, depending on % preschool children enrolled (25% - 50%)
- Conservative estimate – only one early child development intervention

Policies: Health & Nutrition

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- ► Where malnutrition high: **macro nutrients** and **micronutrients**

- ► Investments in adult health ("**healthy aging**") to facilitate higher productivity at older ages.

- ► **Prevention of common chronic diseases:** behavioral and structural changes

- ► **Health systems in LMICs:** reorient to changing realities of disease composition

- ► **Social safety nets**, health and pension systems untied from labor market participation.

Malnutrition

1. Primarily undernutrition (though increasing obesity), varies by country/region.

2. Early-life growth faltering & underweight affected significantly by inadequate proteins in Guatemala and the Philippines.

3. Animal source food consumption increases relatively rapidly with income, especially among poorer households, in Peru.

4. Considerable recovery and faltering after FTD with increase on average in HAZ and in height deficits   (Brazil, Ethiopia, Guatemala, India, Peru, South Africa, Vietnam)

5. Child cognitive skills associated with growth faltering in FTD, but also with subsequent growth faltering/recovery, which affected by family just like growth faltering in FTD.

6. Evidence of long-run effects (e.g., Guatemalan INCAP study, Indonesian Ramadan exposure) & that schooling may be proxying for preschool investments in many studies.

% of under-fives (2006-2010*) suffering from: stunting (WHO), moderate & severe
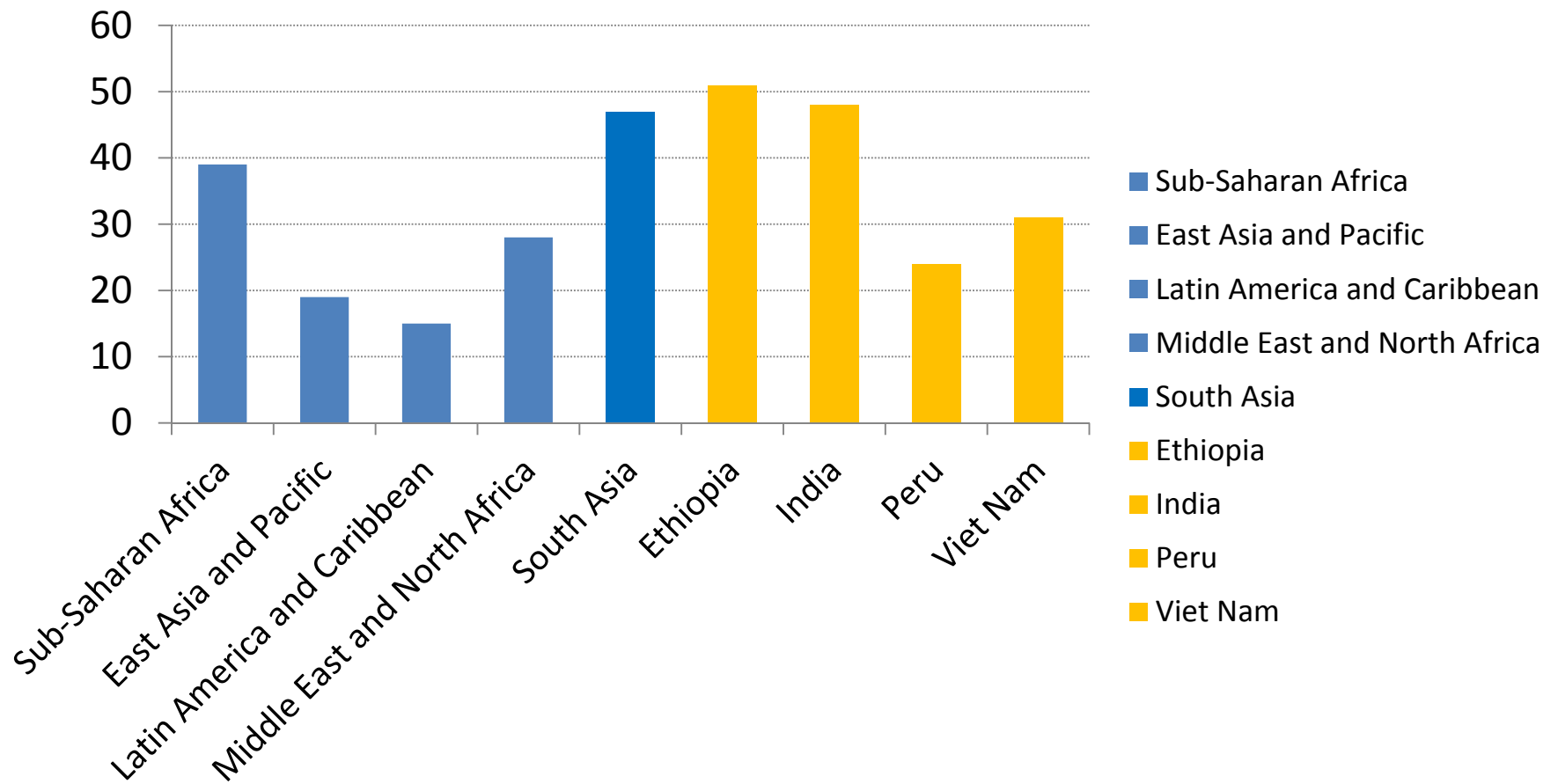
Z scores in the 1969-77 Guatemalan INCAP Data

Guantemalan INCAP: Impact on education-related outcomes

Outcome	β (se)			Mean
	HAZ	STUNTED		
Age Start School	-0.200*	0.739		6.80
	(0.118)	(0.449)		
Repeated primary grade	0.004	-0.045		0.44
	(0.048)	(0.179)		
Grade progression	0.013	-0.057		0.84
	(0.024)	(0.095)		
Age left school	0.728***	-2.768**		12.5
	(0.269)	(1.120)		
Highest grade attained	0.968***	-3.857***		4.70
	(0.303)	(1.271)		
SIA z score (reading)	0.335***	-1.153***		0
	(0.100)	(0.405)		
Raven's z score	0.277***	-1.044***		0
	(0.088)	(0.351)		

Impact on marriage market outcomes

Outcome	β (se)			Mean
	HAZ	STUNTED		
Age, spouse (current union)	1.428***	-5.129***		33.3
	(0.500)	(1.916)		
Highest grade attained, spouse	1.005***	-3.572***		4.65
	(0.327)	(1.320)		
Height, spouse	1.018*	-3.456*		155.7
	(0.526)	(1.964)		
Age differential (spouse age – own age)	1.368***	-4.900***		0.76
	(0.497)	(1.888)		
Schooling differential (spouse's grade attainment – own grade attainment)	-0.436	1.860		-0.04
	(0.389)	(1.525)		

Impact on fertility-related outcomes

Outcome	β (se)			Mean
	HAZ	STUNTED		
First birth before 18	-0.073	0.299		0.24
	(0.050)	(0.189)		
Interval between first and second birth	0.290	-0.823		3.02
	(0.240)	(0.939)		
Number of pregnancies	-0.664***	2.069**		3.23
	(0.238)	(0.870)		
Any infant deaths (<1y)	-0.041	0.117		0.15
	(0.033)	(0.119)		
Any child deaths (<5y)	-0.066*	0.171		0.175
	(0.038)	(0.136)		

Impact on health-related outcomes

Outcome	β (se)		Mean
	HAZ	STUNTED	
Overweight or obese	0.047	-0.214	0.52
	(0.043)	(0.177)	
Log fat free mass	0.078***	-0.326***	3.79
	(0.009)	(0.056)	
Log strength, dominant hand	0.061***	-0.239***	3.41
	(0.018)	(0.079)	
Log v02 max	0.034	-0.188	2.82
	(0.037)	(0.153)	
Hypertensive or prehypertensive	0.051	-0.216	0.31
	(0.039)	(0.149)	
Diabetic or prediabetic	0.027	-0.120	0.21
	(0.037)	(0.143)	
Metabolic syndrome	0.037	-0.141	0.31
	(0.038)	(0.148)	

Impact on labour market outcomes, men

Outcome	β (se)			Mean
	HAZ	STUNTED		
Log hourly earnings	0.194**	-0.529		2.15
	(0.089)	(0.367)		
Log hours worked	-0.131**	0.282		7.67
	(0.066)	(0.246)		
Log income	0.041	-0.234		9.84
	(0.101)	(0.416)		
Skilled labour or white collar work	0.153**	-0.457*		0.36
	(0.065)	(0.268)		
Operates own fulltime business	0.048	-0.116		0.20
	(0.043)	(0.175)		

Impact on labour market outcomes, women

Outcome	β (se)			Mean
	HAZ	STUNTED		
Log hourly earnings	0.039	-0.019		1.70
	(0.132)	(0.544)		
Log hours worked	0.183	-0.537		6.62
	(0.167)	(0.718)		
Log income	0.137	-0.214		8.33
	(0.214)	(0.938)		
Skilled labour or white collar work	0.170***	-0.574*		0.08
	(0.060)	(0.332)		
Operates own fulltime business	0.090*	-0.297		0.37
	(0.048)	(0.190)		

Impact on poverty and consumption outcomes

Outcome	β (se)			Mean
	HAZ	STUNTED		
Log per capita household consumption	0.190**	-0.664**		8.76
	(0.059)	(0.233)		
Lives in household that is poor	-0.094**	0.322*		0.29
	(0.045)	(0.173)		

# Benefit/cost estimates of reducing stunting in heavily-burdened countries

- Benefits and costs over life cycle (Fig. 1)
- Individual stunted at age 36m has 66% lower per capita income when age 25-42 y (INCAP) if stunting treated as endogenous; assume half income gains are realized.
- Costs of intervention (Table 1).
- Intervention package estimated to reduce stunting by 36% (Bhutta *et al*).
- Predicted income increase 11.4%.
- Apply to predicted per capita incomes for 2036-2050 (i.e., first 15 y of working lives if born in 2015 and start work when 21 y) of those stunted in infancy (based on current income levels and projected growth rates) in selected countries in which stunting widespread.
- Construct net present value of increased income using 5% discount rate.

Per child costs of interventions to reduce stunting in children under 36 months (from Horton 2010)

Intervention	Child age range (months)	Cost per unit	Total cost per child
Community based nutrition programs	0 – 59	$7.50 per child	$7.50
Vitamin A supplementation	6-59	$1.20 per year	$4.80
Zinc supplementation	6-59	$1.00 per year (2-3 treatments/year)	$4.00
Multiple micronutrient powders	6-23	$3.60 per course (3 courses recommended)	$10.80
Deworming	12-59	$0.25 per round (1 round/year)	$1.00
Iron-folic acid supplementation for mothers during pregnancy		$2.00 per pregnancy	$2.00
Iron fortification of staples	12-59	$0.20 per year	$0.80
Universal salt iodization	12-59	$0.05 per year	$0.20
Providing complementary foods	6-23	$0.11 per day $0.14 per day in India	$56.88
Community based management of malnutrition	6-59		$8.13*

Results

Benefits/costs in selected high-burden countries substantially exceed one (Figure 2).
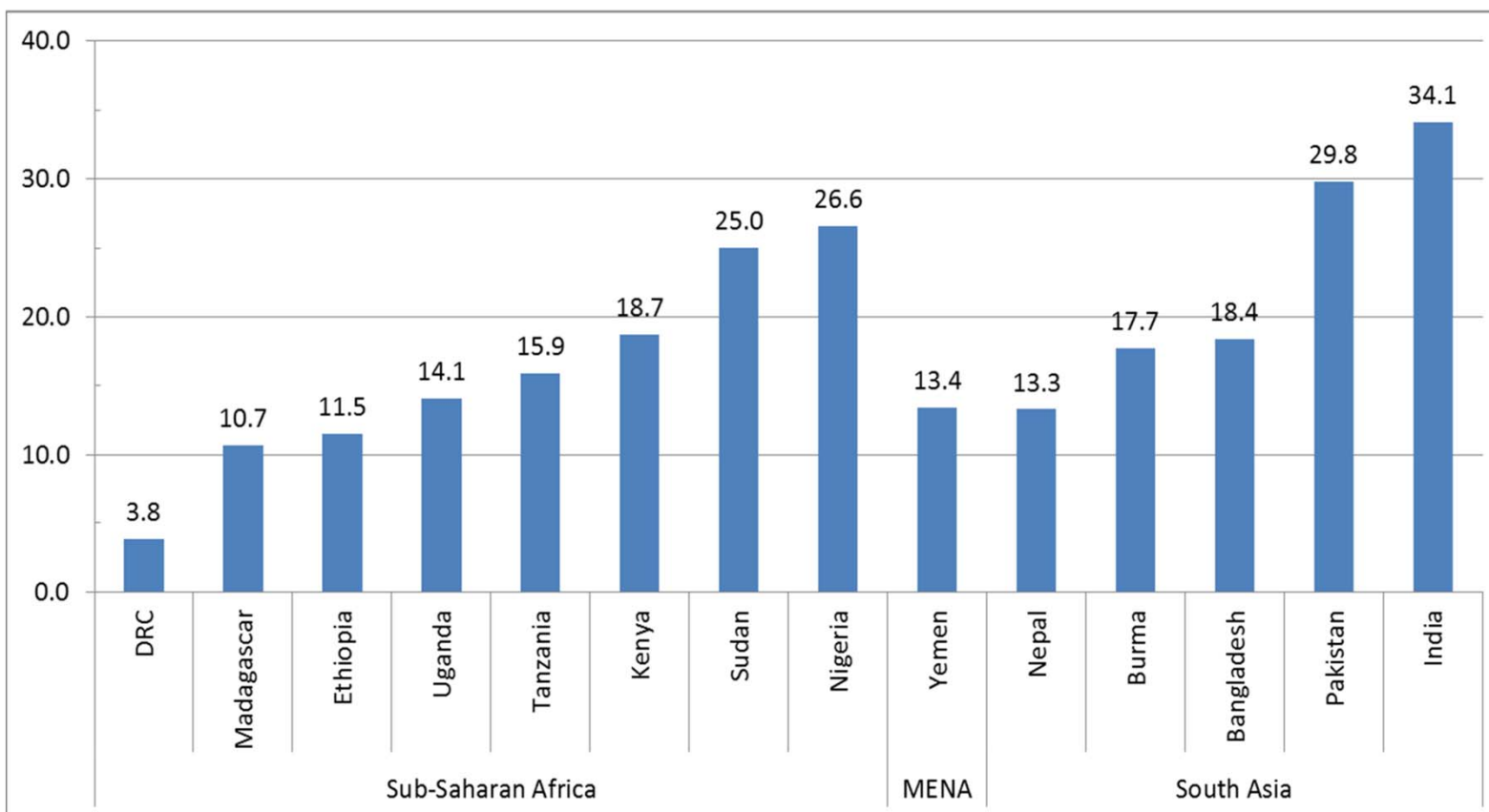
Thank you!

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