HEALTH INEQUALITIES: GLOBAL AND LOCAL

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The Int'l Equity Center @ Pelotas

- Started with Cesar Victora's work in Countdown
- Aluisio invited to coordinate wholesale reanalysis of DHS and MICS surveys
- Collaboration with Countdown, GHO, LiST, Brazilian MoH & other work at JHBSPH, LSHTM
- We now have a small team of epidemiologists and statisticians

Centro Internacional de
EQUIDADE
em Saúde

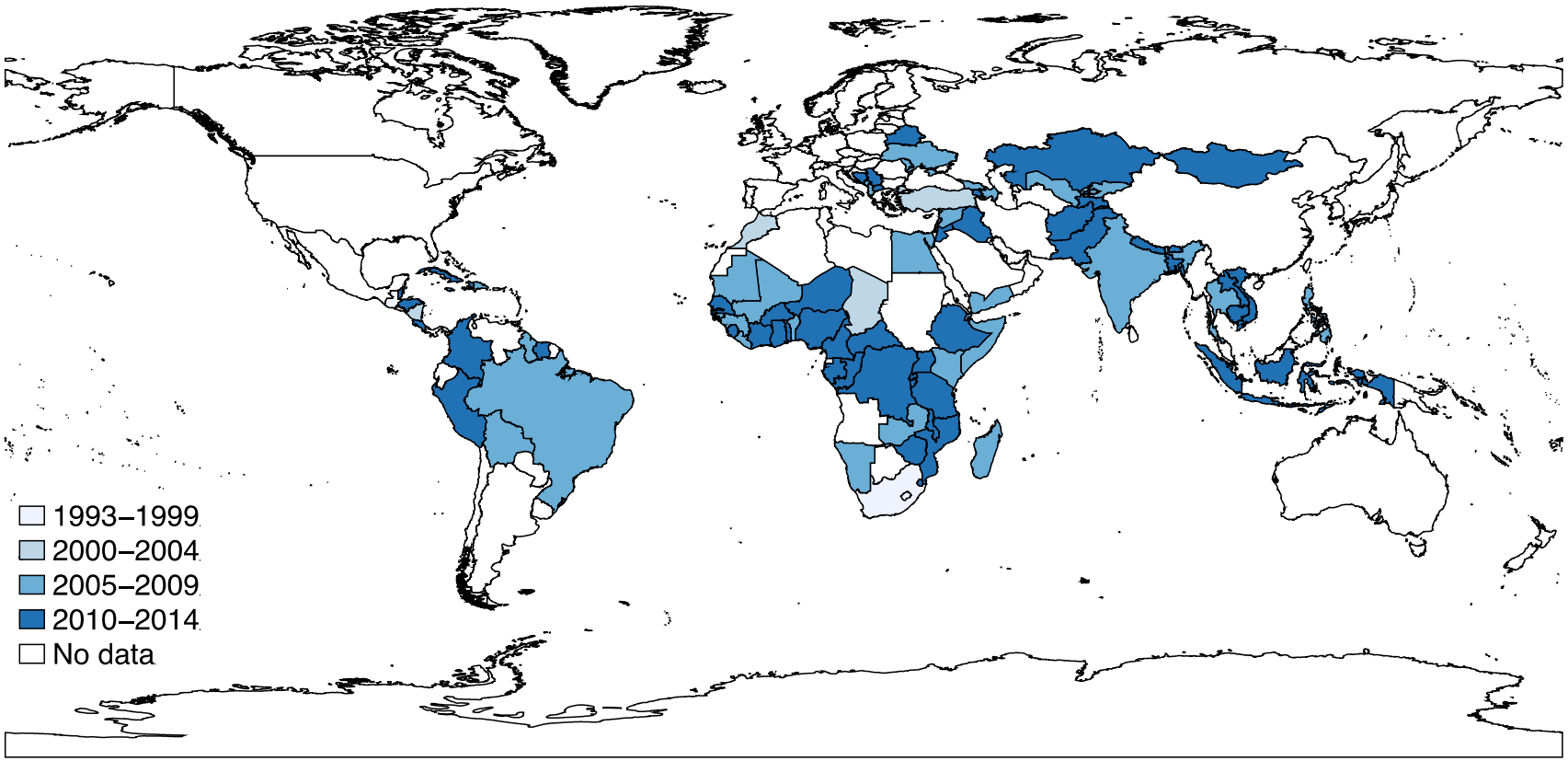
What we are doing

- Re-analysis of all DHS & MICS surveys
  - 177 DHS surveys
  - 70 MICS surveys

  } 94 countries

  - Starting with DHS3 / MICS3
- Indicators estimated
  - All coverage estimates relevant to Countdown and GHO
    - Meaning contraception, antenatal care, birth attendant, vaccines, etc.
  - Under-5 mortality and all components
  - Age-specific fertility rates
  - Nutritional scores, % of deficit and % children obese

Latest surveys for each country



All indicators stratified

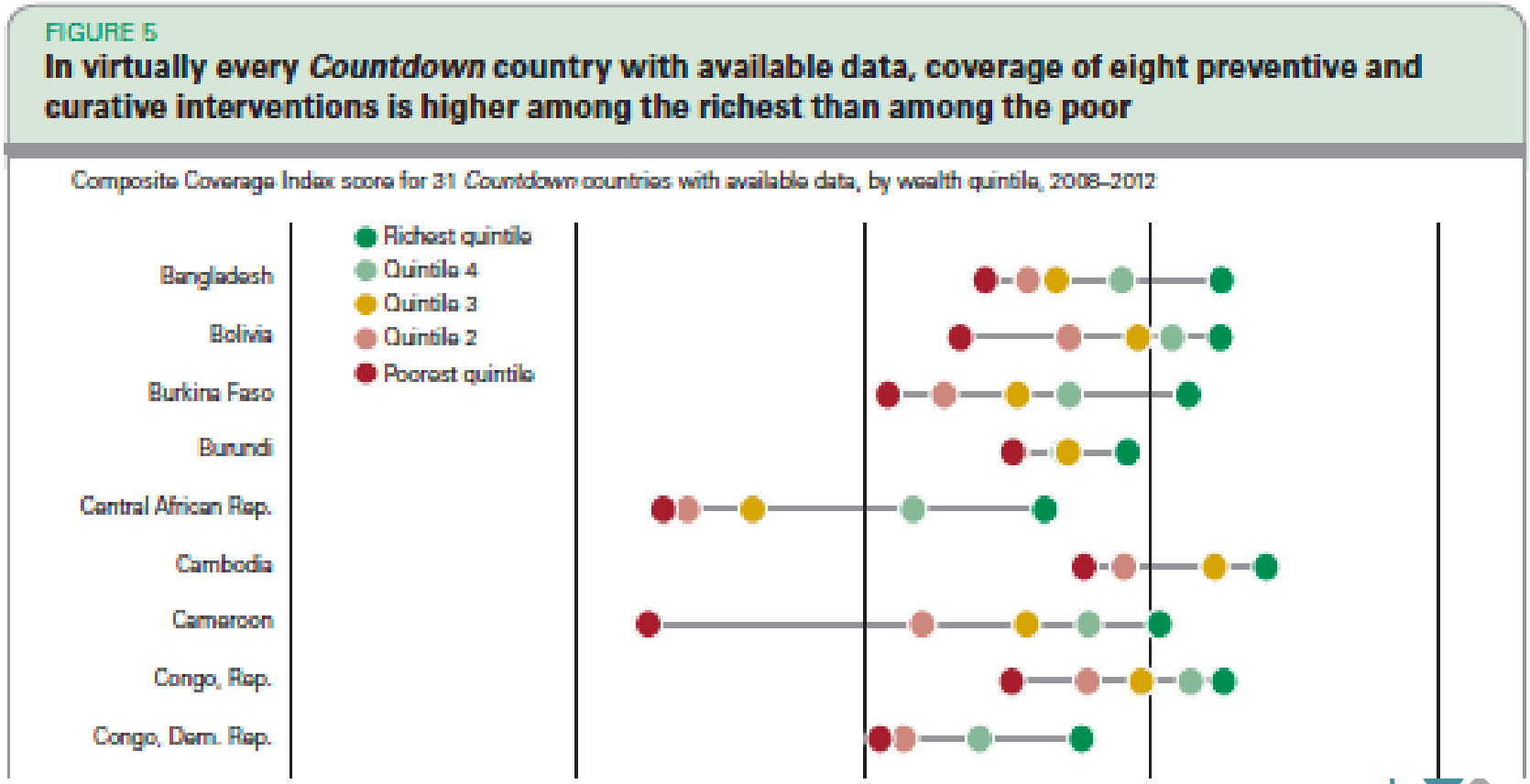
- By
  - Geographic region, urban/rural
  - Maternal education, maternal age
  - Wealth quintiles
  - Sex of the child
- We also calculate equity measures
  - Concentration index
  - Slope index of inequality
- We have std errors for all estimates

- WHERE IS ALL THAT GOING TO?

COUNTDOWN to 2015 reports

FIGURE 5

In virtually every *Countdown* country with available data, coverage of eight preventive and curative interventions is higher among the richest than among the poor



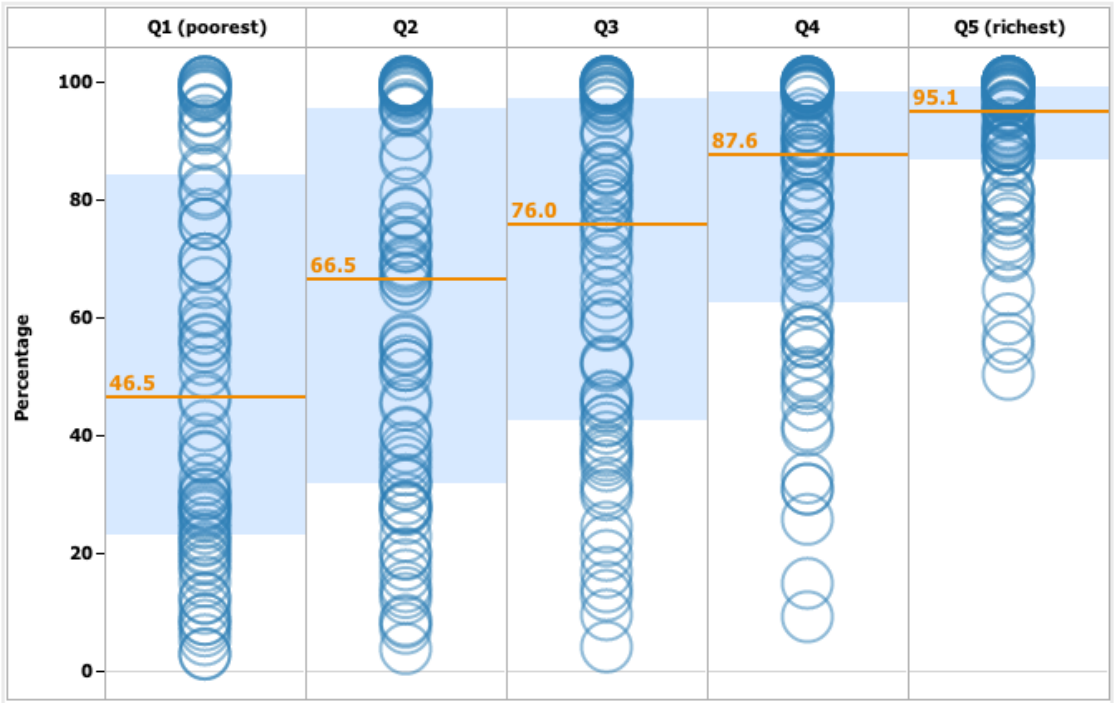
WHO Equity Monitor

Inequalities in health services: Births attended by skilled health personnel
Situation: Births attended by skilled health personnel by wealth quintile, 2005-2012

If visual does not show correctly, click on "Hide menu" on the upper left-hand corner. Apple Safari users, please ensure that you have "Accept all cookies" set in order to use this visualization.

Also available:

– Trends: Births attended by skilled health personnel by wealth quintile, 1996-2012



Source: Demographic Health Surveys (DHS) or Multiple Indicator Cluster Surveys (MICS)
DHS data are based on births in the three years prior to survey, and MICS data are based on births in the two years prior to survey.

Select country income group

- (All)
- Low income
- Middle income

Select WHO region

- (All)
- Africa
- Americas
- Eastern Mediterranean
- Europe
- South-East Asia
- Western Pacific

Select country

- Albania
- Armenia
- Azerbaijan
- Bangladesh
- Belarus
- Belize
- Benin
- Bolivia (Plurinational State of)

Papers

Equity in maternal, newborn, and child health interventions in Countdown to 2015: a retrospective review of survey data from 54 countries

Aluisio J D Barros, Carine Ronsmans, Henrik Axelson, Edilberto Loaiza, Andréa D Bertoldi, Giovanny V A França, Jennifer Bryce, J Ties Boerma, Cesar G Victora

Summary

Background Countdown to 2015 tracks progress towards achievement of Millennium Development Goals (MDGs) 4 and 5, with particular emphasis on within-country inequalities. We assessed how inequalities in maternal, newborn, and child health interventions vary by intervention and country.

Methods We reanalysed data for 12 maternal, newborn, and child health interventions from national surveys done in 54 Countdown countries between Jan 1, 2000, and Dec 31, 2008. We calculated coverage indicators for interventions according to standard definitions, and stratified them by wealth quintiles on the basis of asset indices. We assessed inequalities with two summary indices for absolute inequality and two for relative inequality.

Countdown to 2015
Maternal, Newborn & Child Survival

Lancet 2012; 379: 1225–33

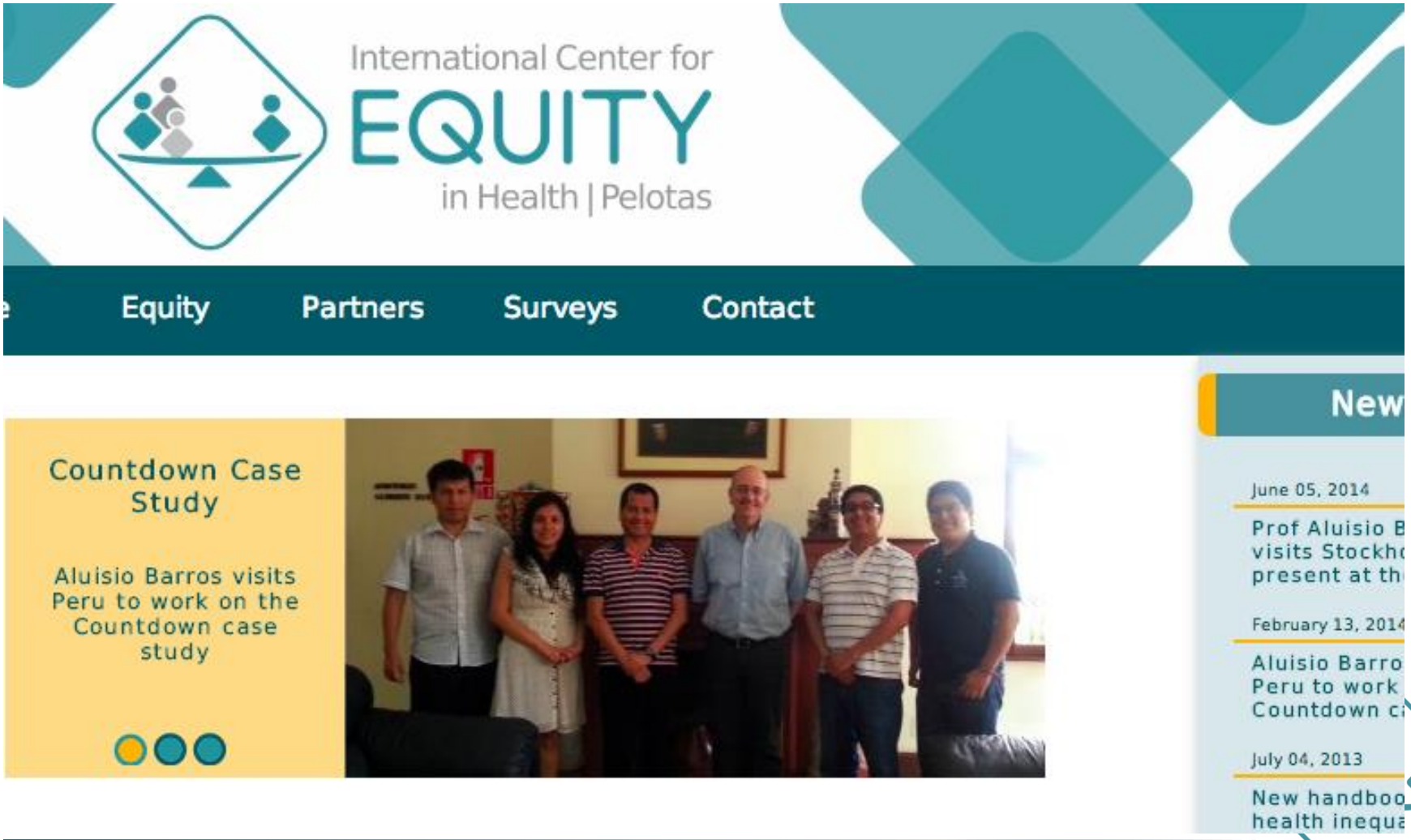
See Comment page 1178

Postgraduate Program in Epidemiology, Federal University of Pelotas, Pelotas, Brazil (A J D Barros PhD, A D Bertoldi PhD

Further activities

- We are now funded by the Wellcome Trust
- Collaborating with specific analyses
- Ready to receive post-docs
- We got funding to receive MSc and PhD students from abroad (esp. LAC) to work on health equity
- Collaborations with WHO, GAVI, PAHO for specific analyses on
  - Breastfeeding
  - Full immunization coverage
  - Equity in LAC

Please, visit www.equidade.org



The Pelotas birth cohorts

1982

Perinatal study on low birth weight

Originally, the idea was to study newborns only
But soon, the investigators realized that

it would be interesting to see the children
at age 1.

And there we have a birth cohort!

1 – 2 – 4 – 13 – 15 – 18/19 – 23 – 30 years

11 years later… 1993 e 2004

The second cohort was to start in 1992, but
funds were late...

And we have the 1993 cohort

For the third, 11 years were already
tradition
and we have the 2004 cohort

2015

Is on the way!

Development and IQ – 2004 cohort

- Psychological evaluation at 4 yrs of age
  - Child development = Battelle Development Inventory
  - IQ = WPPSI
    - Wechsler Preschool and Primary Scale of Intelligence

- At 6 yrs
  - IQ = WISC III
  - Mental health = DAWBA
  - Abuse / punishment = CTSPC

Stimulation score

Table 2 – Percent of children reporting activities or having a book in each category of stimulation score. 2004 Pelotas Birth Cohort, Brazil, 2006.

Stimulation score	Percent of children reporting each activity*				
	Story	Park	Visit	Book	TV
0	0.0	0.0	0.0	0.0	0.0
1	3.1	4.9	52.9	2.7	36.3
2	13.4	12.5	83.1	15.0	76.1
3	45.4	32.3	89.7	49.3	83.3
4	77.2	53.1	96.4	80.7	92.6
5	100.0	100.0	100.0	100.0	100.0

27	0.7
220	5.7
777	20.2
1,154	30.0
1,125	29.3
543	14.1

* Story – someone told or read a story to the child; park – child was taken to park or playground; visit – child went to someone else's place; book – child owns a story book; TV – watched TV for any amount of time. All activities relative to a reference period of one week prior to the interview.

Stimulation & maternal schooling on child development at 2 y of age

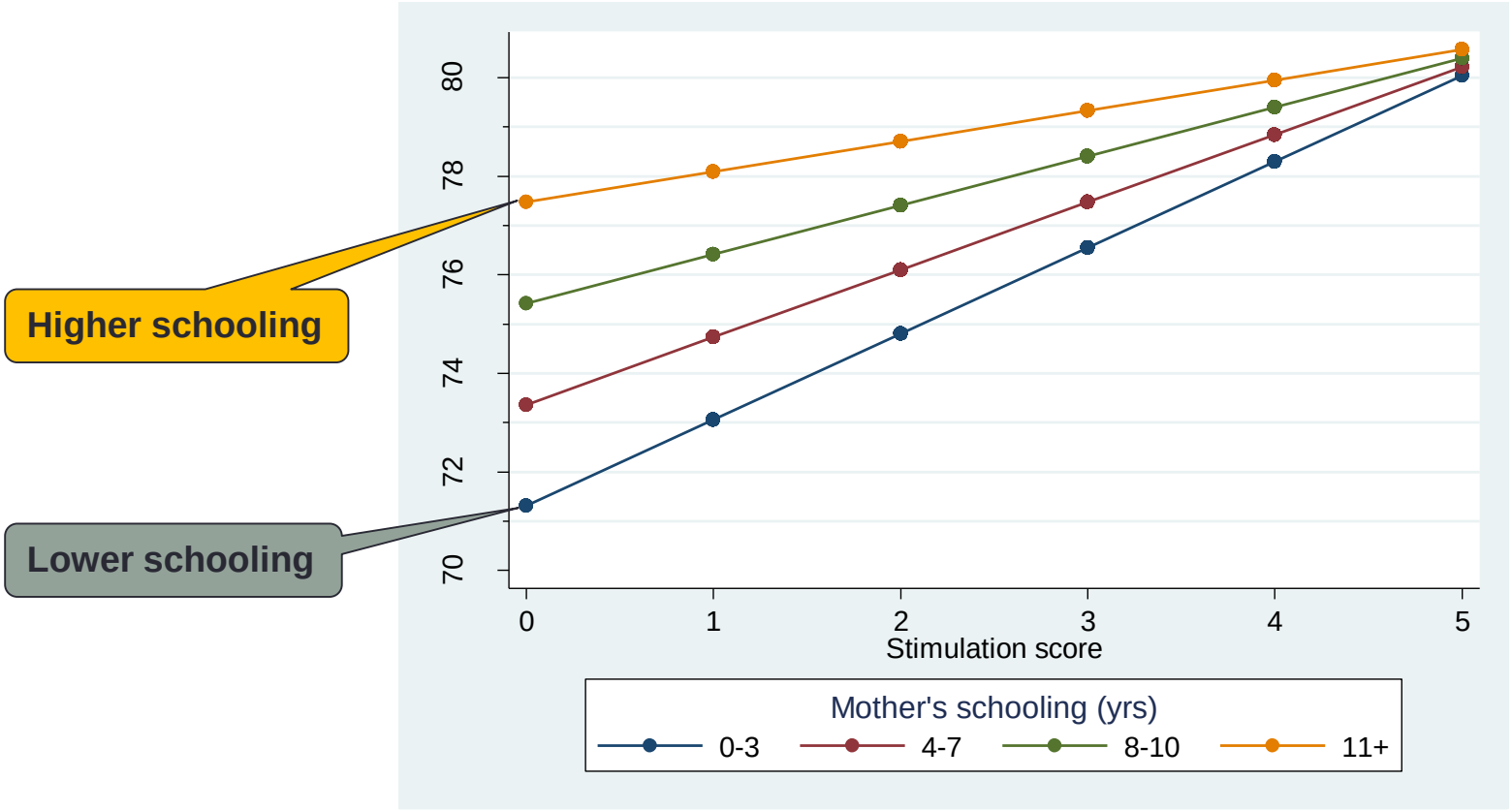
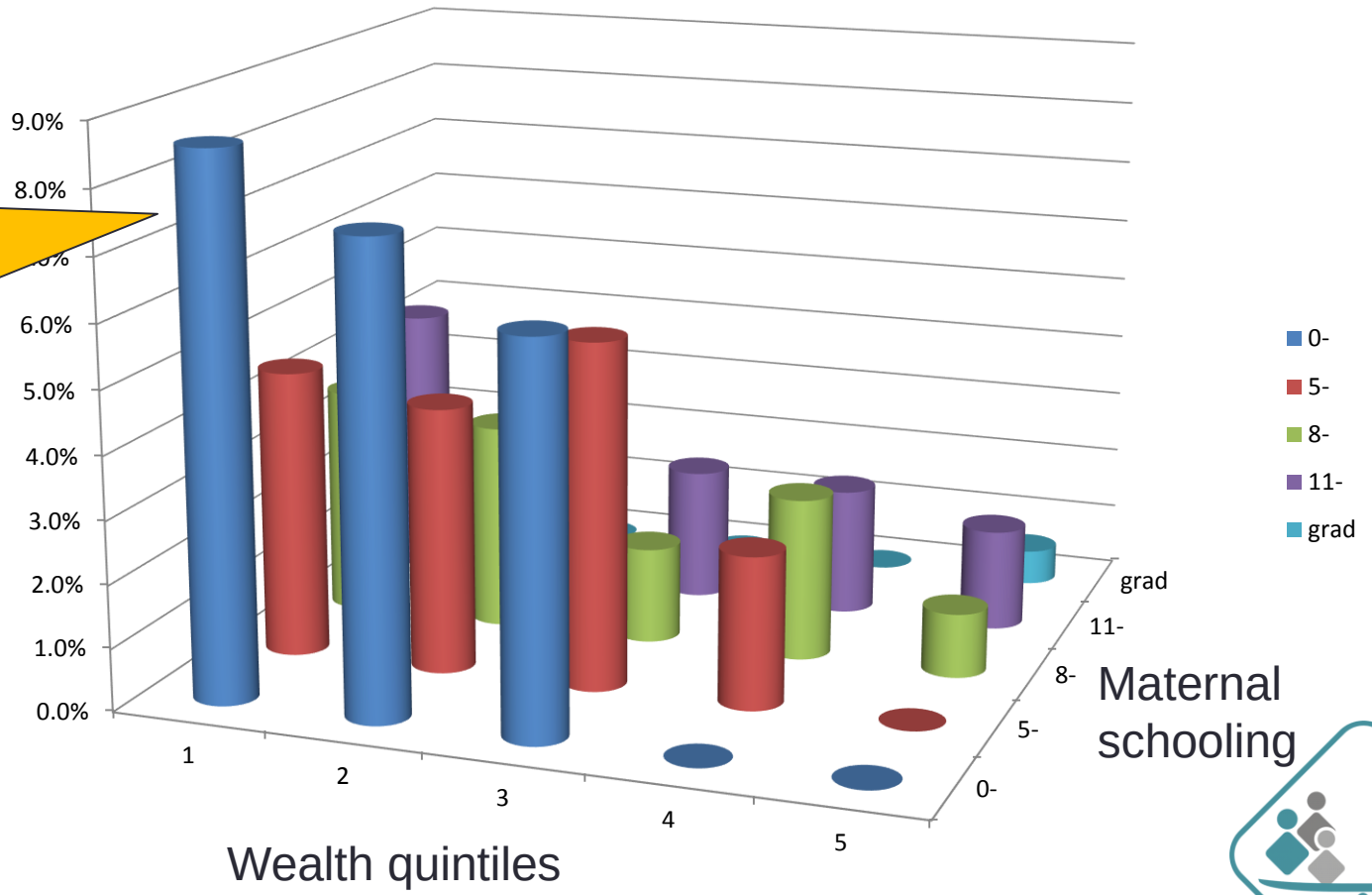


Figure 3 – Interaction between stimulation score and maternal schooling in a linear regression model with development score as outcome, not controlled for other variables.

Wealth and schooling on low IQ (IQ<70) at 4 y of age

15 times higher than rich high-schooling group



Now, trying to predict who will be disadvantaged at age 6

- Main objective
  - Identify early life (perinatal and during first year of life) predictors of low cognitive performance at age 6
- Rationale
  - If we can identify children at high risk of presenting low IQ at age 6 early in their lives, it may be possible to intervene!
  - Criteria must be simple enough to be used in primary health care settings
- Work with PhD student Fabio Camargo-Figuera from Colombia

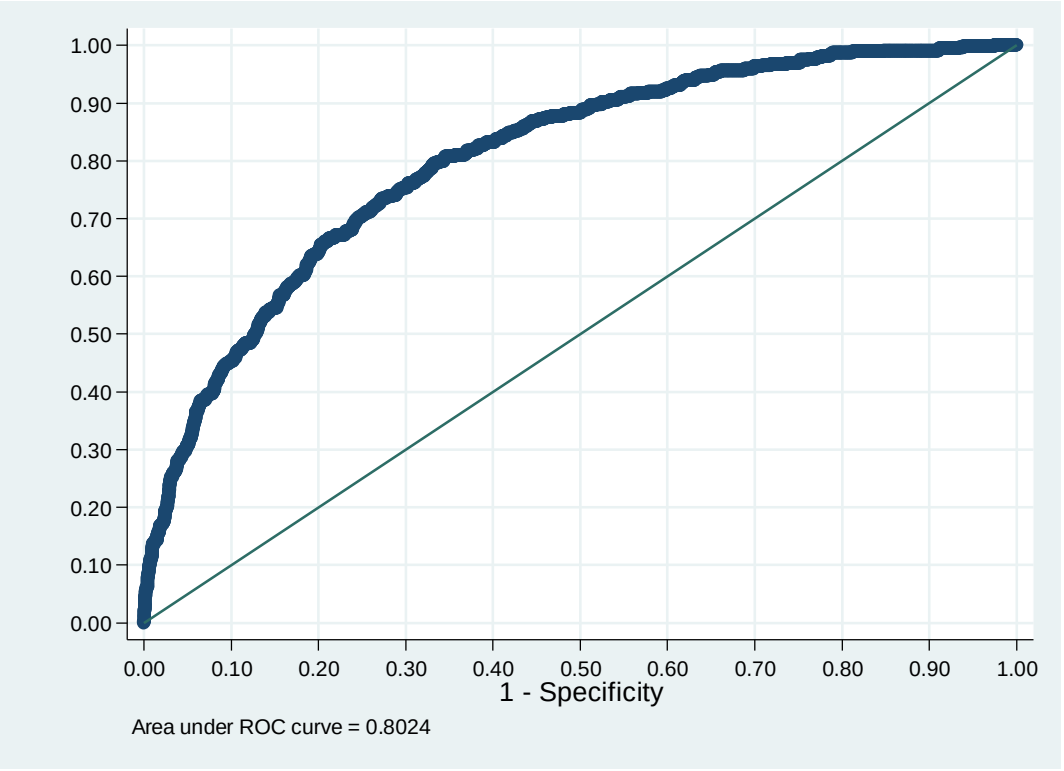
We selected socioeconomic and biological variables (1st year of life)

- Socioeconomic variables
  - Age and schooling of parents
  - Skin colour
  - Family composition
  - Employment & income
  - Smoking habits
  - Child care
- Biological & health
  - Antenatal care & pregnancy morbidity
  - Delivery type and neonatal morbidity
  - Birth weight & gestational age
  - Maternal depression
  - Breastfeeding
  - Nutritional status
  - Maternal perception of child's health

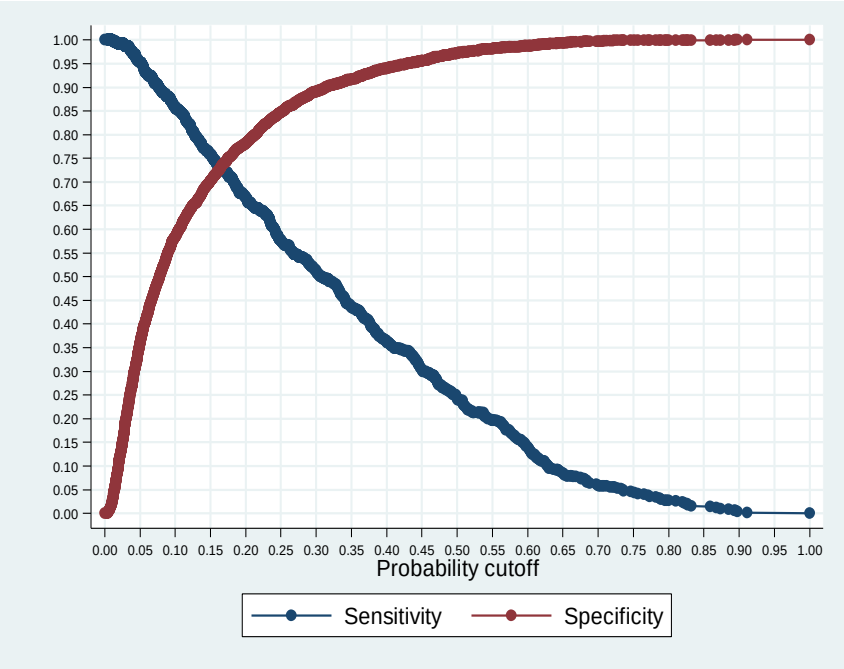
Final predictive model

Predictor	OR[a] (95% CI)	p-value
Male	1.5 (1.2–1.8)	p = 0.0002
Skin color: non-white mother and father	1.9 (1.5–2.1)	p = 0.0000
Father unemployed at the child's birth	1.6 (1.2–2.0)	p = 0.0002
Mother unemployed during the child's first 12 months of life	1.5 (1.2–1.8)	p = 0.0003
Household income at the child's birth (<1, 1-2, 2-4, 4+* MW)	1.3 (1.2–1.5)	p = 0.0000
Maternal education (0-3, 4-8, 9+* years of schooling)	1.8 (1.6–2.2)	p = 0.0000
Number of siblings at the child's birth: 3 or more	1.8 (1.3–2.3)	p = 0.0001
Number of persons per room at age 12 month: 3 or more	1.6 (1.3–2.0)	p = 0.0000
At least one smoking parent during pregnancy	1.3 (1.1–1.6)	p = 0.0145
Duration of breastfeeding		p = 0.0000
<1 month	2.2 (1.6–3.1)	
1–11 months	1.3 (1.0–1.6)	
≥12 months	1	
Head circumference-for-age deficit during the first year of life	1.7 (1.2–2.4)	p = 0.0022
Height-for-age deficit during the first year of life	1.3 (1.0–1.7)	p = 0.0524
Maternal perception of the child's health status (good/fair/poor)	1.4 (1.2–1.8)	p = 0.0009

ROC curve: area = 0.8



Sensitivity x specificity: 72% x 74%



- Cut-off probability = 17%
- About 1/3 test positive
- Positive predictive value = 35%
- Negative predictive value = 93%
- We have to treat 1000 to “save” 350

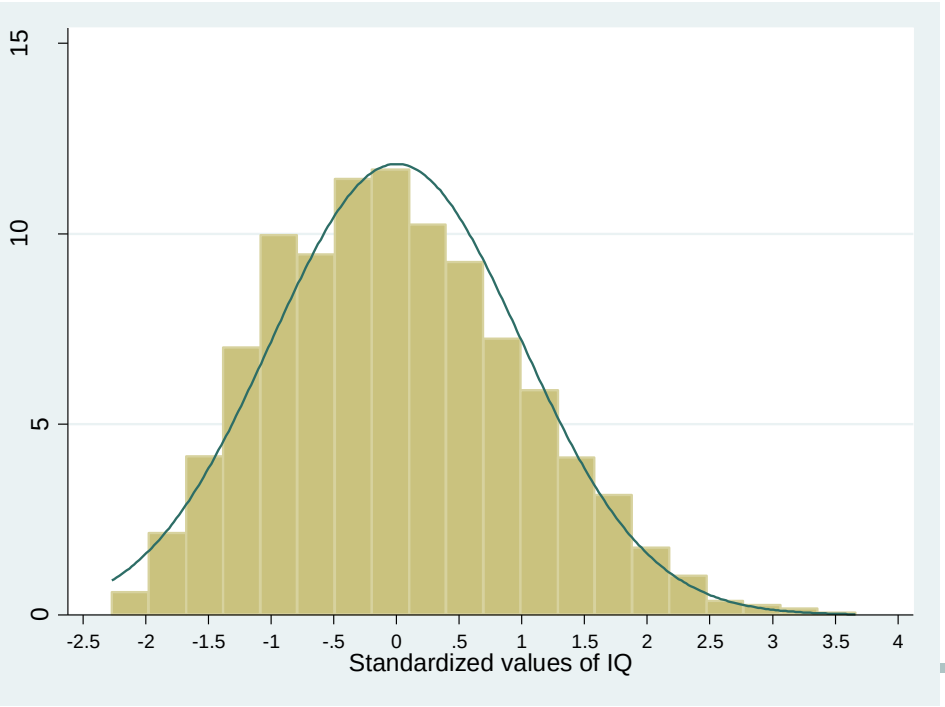
So, what can be done?

- The predictive model is not as good as we had expected
  - About 1/3 of the children are identified as high risk
  - Again only 1/3 of them are true positives
- This may imply in a huge effort from health/education services
- On the other hand, the interventions proposed are simple and cheap
  - Improve mother-child interaction – time and quality
  - Use common household objects as toys
  - Make existing social facilities available for young children
- The result may well be worthwhile!

Determinants of IQ at 6 years

- Objective
  - Identify early social and biological determinants of IQ at age 6, with special interest in determining the effect of child stimulation

- IQ Distribution at 6 years

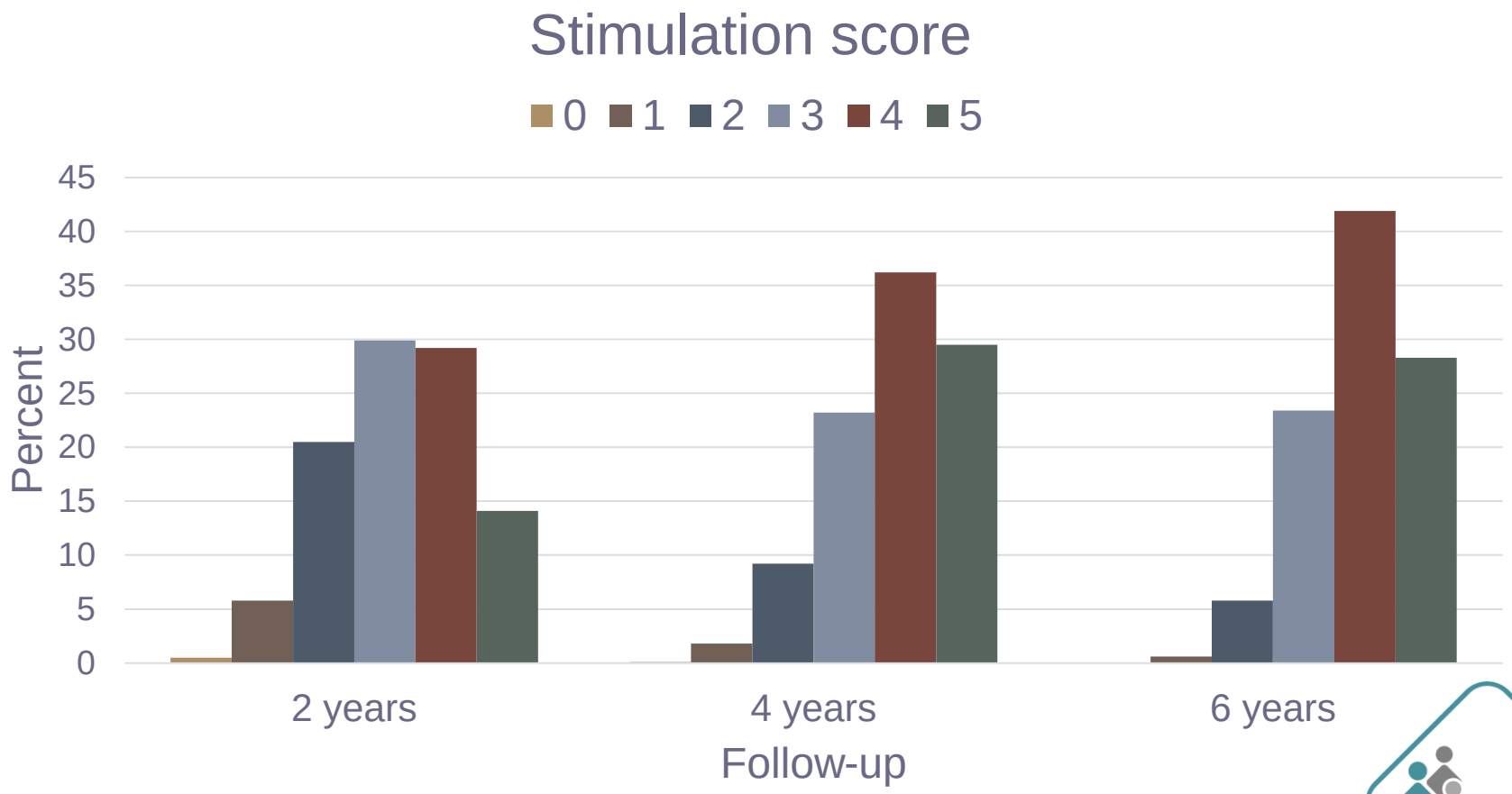


- IQ used in continuous form
  - Linear regression
- IQ standardized
  - Mean zero; s.d.=1
  - 1 s.d. = 16 IQ points

Conceptual model for analysis

- Level 1:
  - Child sex - Parents' skin color – Maternal education - Employment & wealth
- Level 2:
  - Maternal physical activity - Smoking parent - Antenatal care - Delivery type - Birth weight - Gestational age - Number of siblings
- Level 3:
  - Nutritional status - Breastfeeding duration - Hospitalizations - Episodes of maternal depression
- Level 4:
  - Child stimulation at age 2, 4 & 6
    - Outcome: IQ at age 6

Stimulation during early childhood



Main results

- Of a broad set of potential social and biological determinants, those essentially social were the most impactful.
- Maternal education, wealth, parents' skin color and number of siblings were the most powerful social determinants of IQ at age 6.
- Duration of breastfeeding, head circumference-for-age deficit were the most powerful biological determinants of IQ at age 6.
- The effect of stimulation was important. Interaction between stimulation and maternal education was present.

IQ differences at age 6 by employment, education & wealth

- Adjusted analyses by level 1

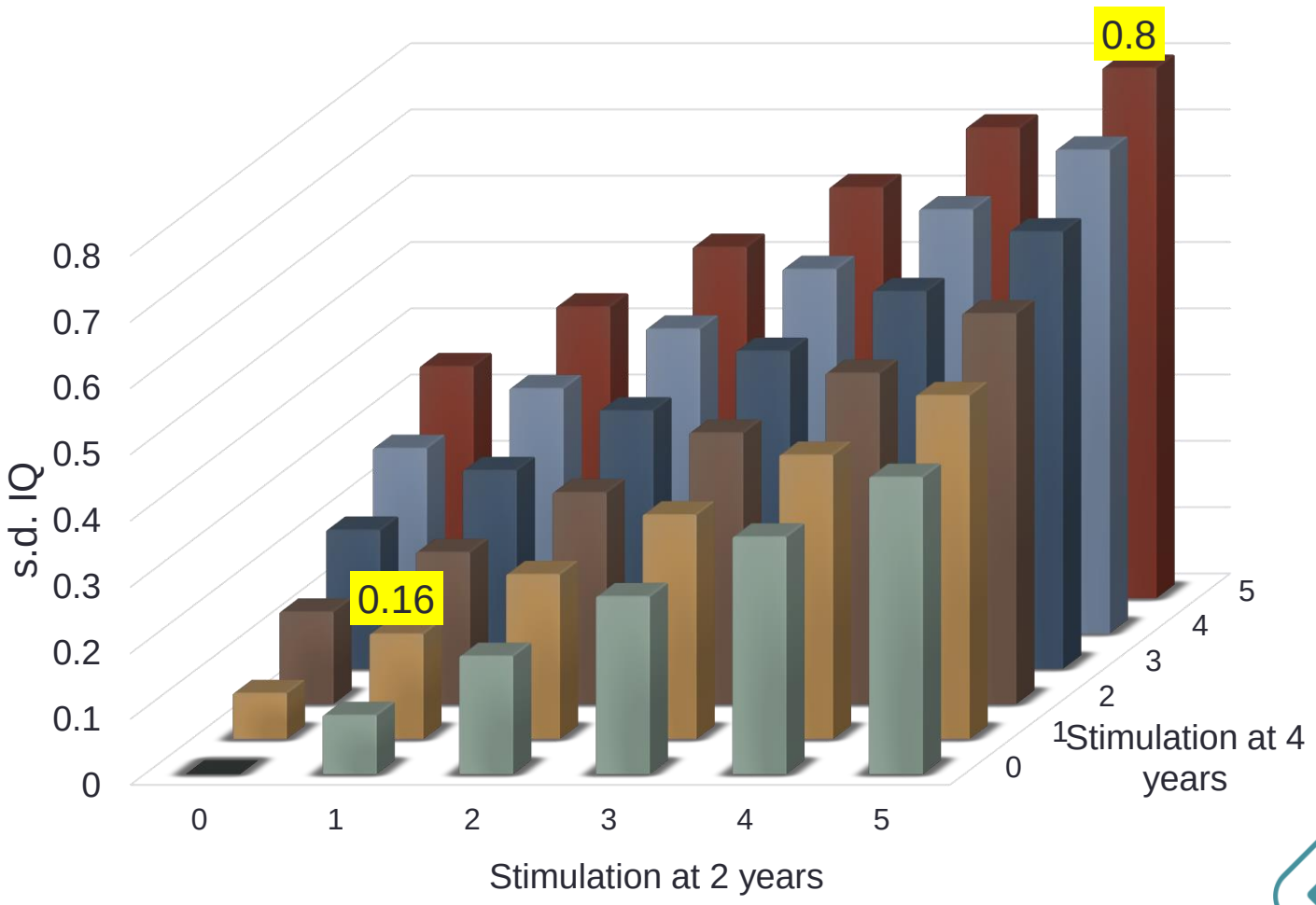
	diff	CI 95%	
Maternal education (yrs)	p<0.001		
≥ 12	0.0		
9-11	-0.3	-0.4	-0.2
5-8	-0.6	-0.8	-0.5
0-4	-0.9	-1.0	-0.8
Wealth quinitiles (IEN)	p<0.001		
Q5 (richest)	0.00		
Q4	-0.2	-0.3	-0.1
Q3	-0.3	-0.4	-0.2
Q2	-0.4	-0.5	-0.3
Q1 (poorest)	-0.6	-0.7	-0.5
Mother employed	p<0.001		
Yes	0.0		
No	-0.1	-0.2	-0.1
Father employed	P=0.004		
Yes	0.0		
No	-0.1	-0.2	0.0

Child stimulation effect

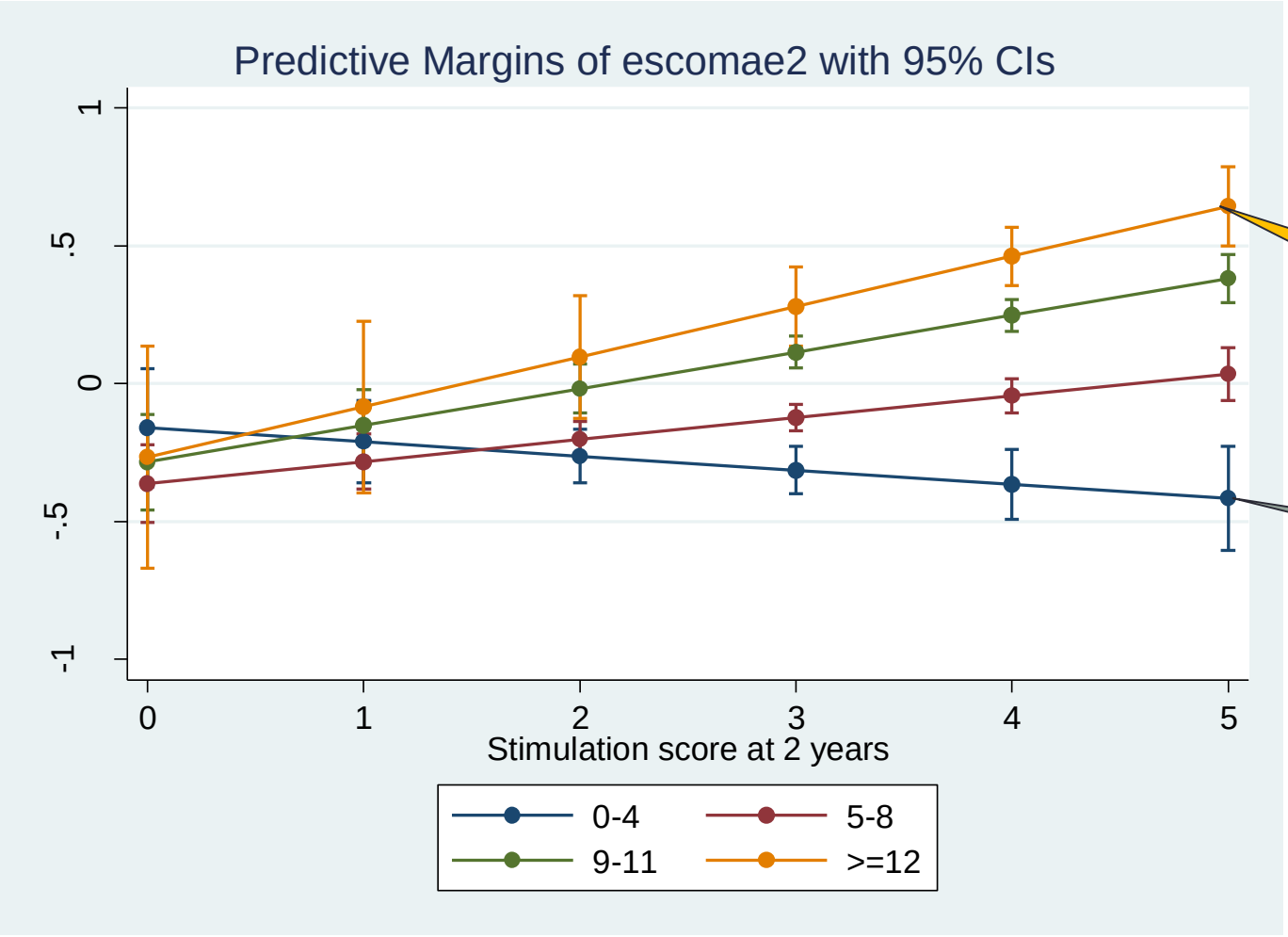
- Adjusted effect (all levels) of stimulation score on IQ
- Conditional regression for stimulation effect

	diff	CI 95%	
Stimulation: score 0 to 5	$p < 0.001$		
Stimulation score 2 years	0.09	0.06	0.11
Stimulation score 2-4 years	0.07	0.04	0.10
Stimulation score 4-6 years	0.04	0.00	0.07

Child stimulation effect



Interaction:
child stimulation & maternal education



Conclusions

- Several markers are relevant to predicting low child IQ at age 6
  - Mostly social determinants
  - We derived a “good” predictive score (AUC = 0.8)
  - But a large number of children will be flagged as high risk
  - Simple, effective intervention with mothers during contact with health services may be the answer
- Stimulation along life is important for IQ at age 6
  - Decreasing importance with age
  - We have to bear in mind the limitations of our indicator
- We found an interaction with maternal education
  - Opposite to previous result for child development
  - Children from more educated mothers benefit most