Population-level measurement of children's developmental health

Expecting the unexpected and attempting to measure the unmeasureable

Offord CENTRE FOR CHILD STUDIES

INRICH 2019

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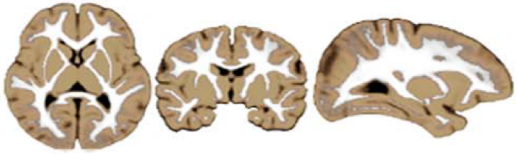
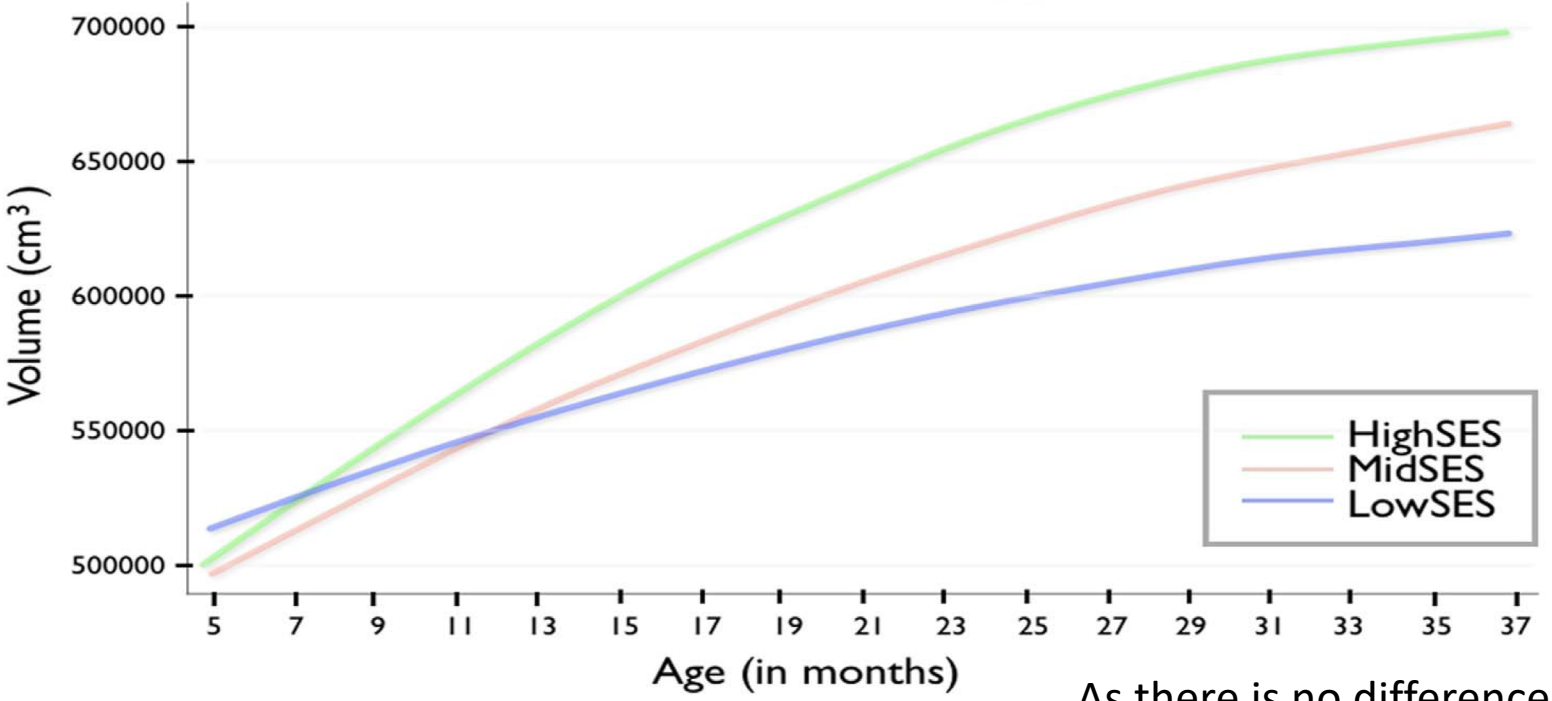
7 June 2019

EDI EARLY DEVELOPMENT INSTRUMENT

Note: please contact me if you want to re-use any of these slides

Total Gray Matter





As there is no difference at birth, there is no reason there should be differences at 3 years except for persisting inequity

Source: Hanson et al. 2013

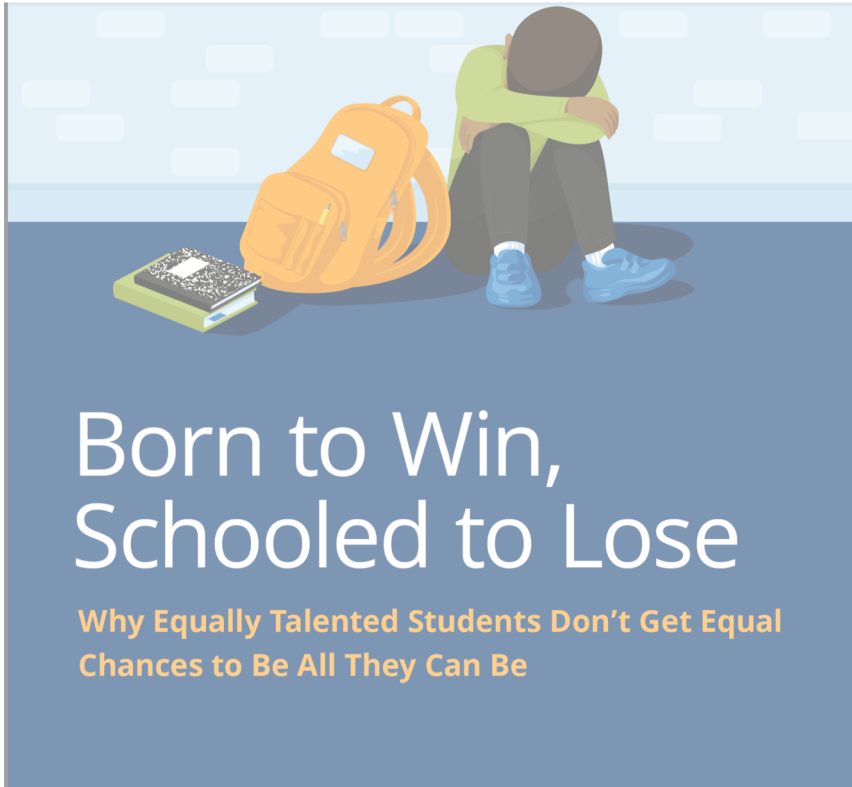
School readiness?
Or (better)
Developmental health

- Developmental health concept: encompasses a wide range of developmental outcomes, physical, mental, behavioural adjustment, literacy, mathematics achievement (Keating & Hertzman, 1999)

- It is a reflection of the early childhood experiences, at home and in the community

Kindergarten "performance" and the concept of developmental health

- A population of US children from kindergarten to age 25
- Kindergarten success measured by a math test score
- Family SES is more predictive of later outcomes than the test score



Carnevale et al. 2019

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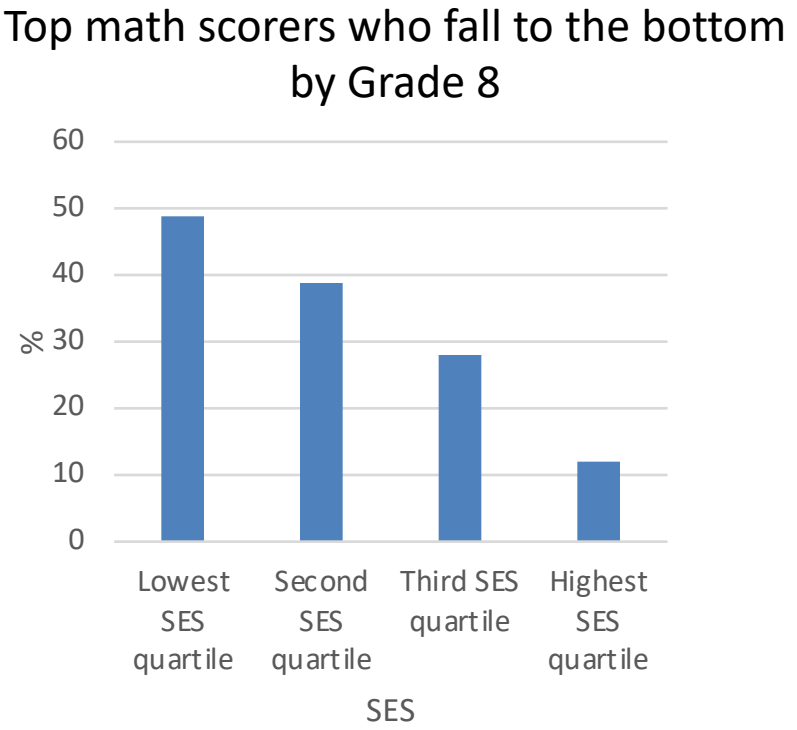
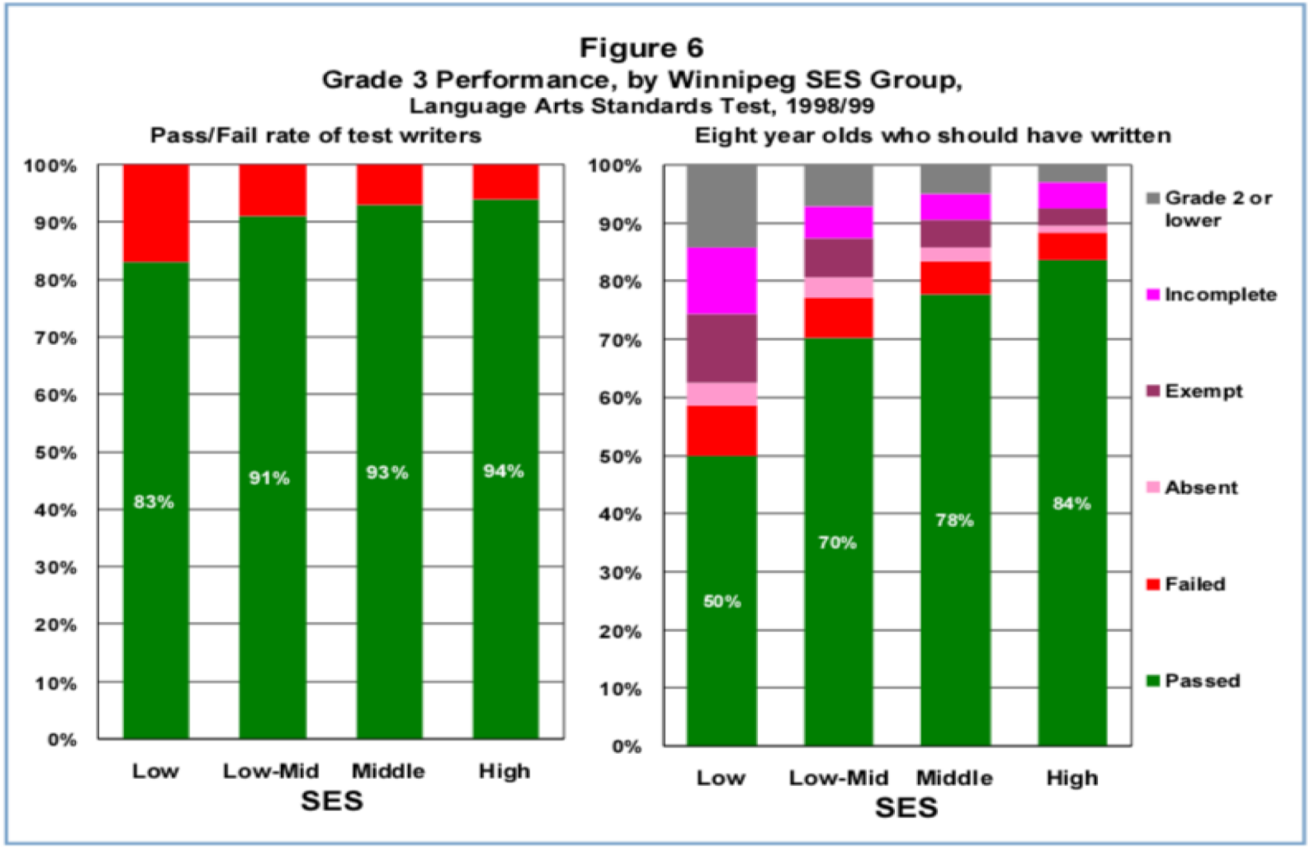


Carnevale et al. 2019



We don’t know what we don’t know

Brownell et al. 2004

Call for "social reporting" at the community level (Offord et al. 1999): Need data to monitor child development over time, in context, reliably, for populations of children

Measuring child development

- Incorporate aspects of the major developmental areas
- Allow for association with external factors
- Reliable, valid, and sensitive
- Comparable across groups of children

EDI
EARLY DEVELOPMENT INSTRUMENT

Population-level measure of child development in 5 major developmental domains

Completed by Kindergarten teachers for each child

Physical Health and Well-being

Social Competence

Emotional Maturity

Language and Cognitive Development

Communication Skills and General Knowledge

But not all children enter kindergarten with optimal developmental health

Early Childhood Outcomes by Different Level of Poverty at Birth (*n* = 46589)

Outcomes	Group 1A: Household and Neighbourhood Poverty at Birth (*n* = 2951) *n* (%)	Group 1B: Household Poverty Only at Birth (*n* = 2766) *n* (%)	Group 1C: Neighbourhood Poverty Only (*n* = 5902) *n* (%)	Group 2: Not Born Into Poverty (*n* = 34970) *n* (%)
Vulnerable on 1 or more EDI domains	1499 (50.8)	1348 (48.7)	1754 (29.7)	7740 (22.1)

Also, moving into neighbourhood poverty before age 2 was associated with higher risk of vulnerability at school entry, moving out of neighbourhood poverty with lower risk

We can't all be Manitoba….
(re granularity of data)

Roos et al. 2019

CanNECD

Canadian Neighbourhoods and Child Development Study (Guhn, Janus, et al. 2016)

798,788
EDIs completed

12
Jurisdictions

2,058
Neighbourhoods

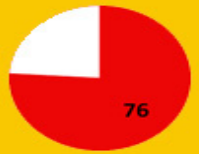
2,500
Taxfiler & Census Variables

Overall Vulnerability

100

SES

Lowest vulnerability



Highest vulnerability

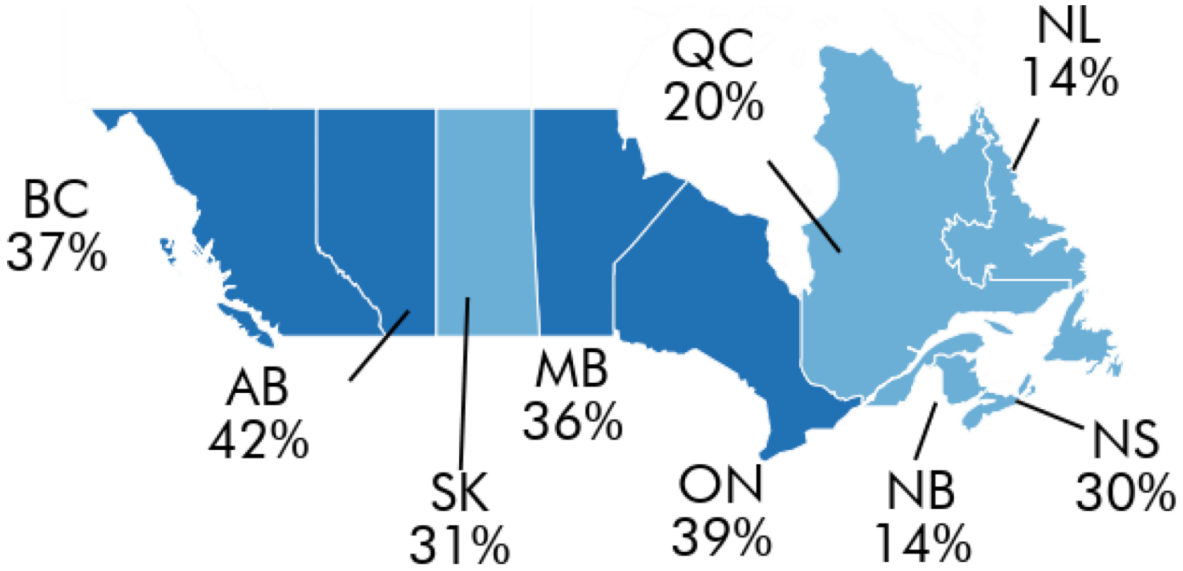
49 **153**

Lowest SES **Highest SES**

Why SES Index?

SES reflects important environmental differences that may not be captured by income alone, in particular for families with young children

% Variance in children's vulnerability explained by the neighbourhood SES index



Note: not enough data for the territories and PEI

(Do not cite or reproduce without permission)

Neighbourhood SES and variance explained

	Typically developing CanNECD study	Children with special needs CCHICS study
Physical Health & Well-Being	23%	17%
Social Competence	18%	17%
Emotional Maturity	14%	12%
Language & Cognitive Development	28%	29%
Communication Skills & General Knowledge	29%	19%

Forer et al. submitted; Zeraatkar et al. submitted

Neighbourhood disadvantage acts on children with and without special needs in a similar way.

- The EDI data in Canada are colour-blind
- But they are not sex-blind

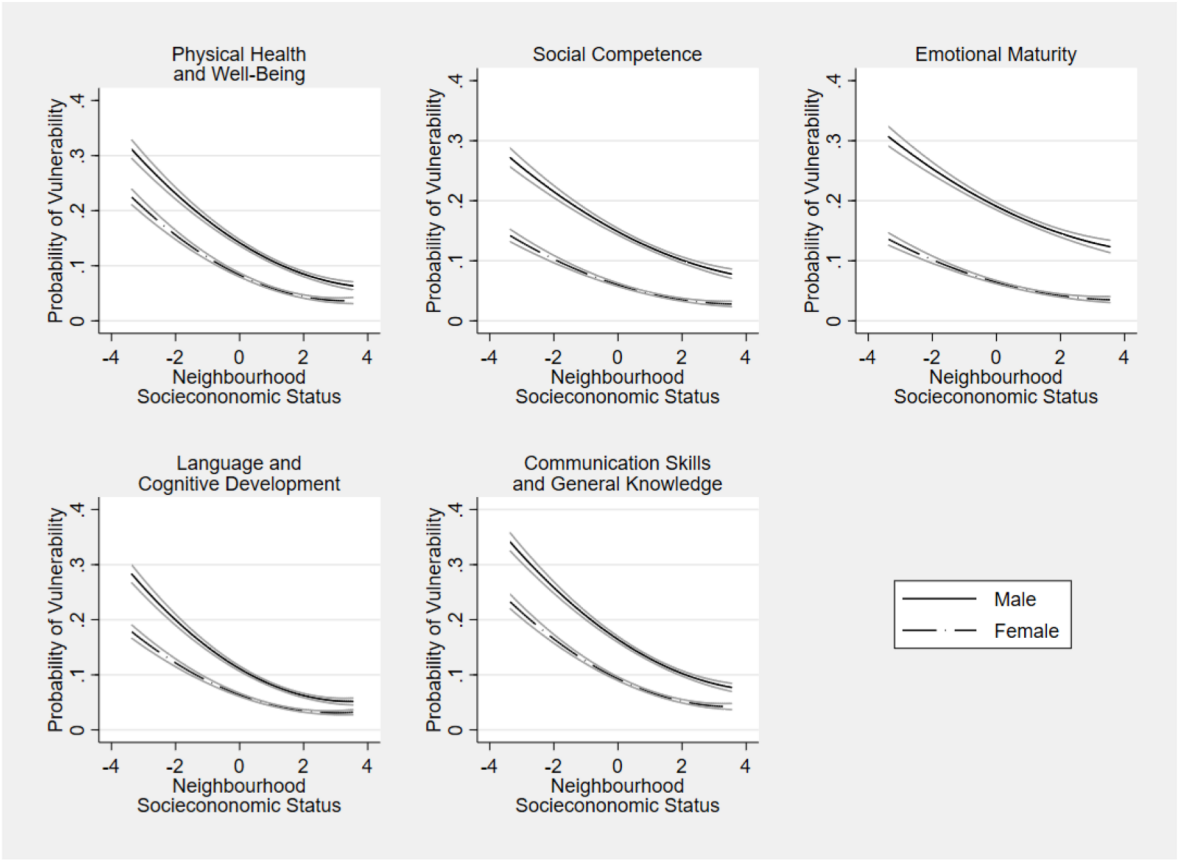


Figure 2: Fitted relationships between neighbourhood socioeconomic status (standardized scores), sex and the probability of vulnerability on the five domains of the EDI using logistic regression with 95% simulation-based confidence intervals shown (1000 simulations).

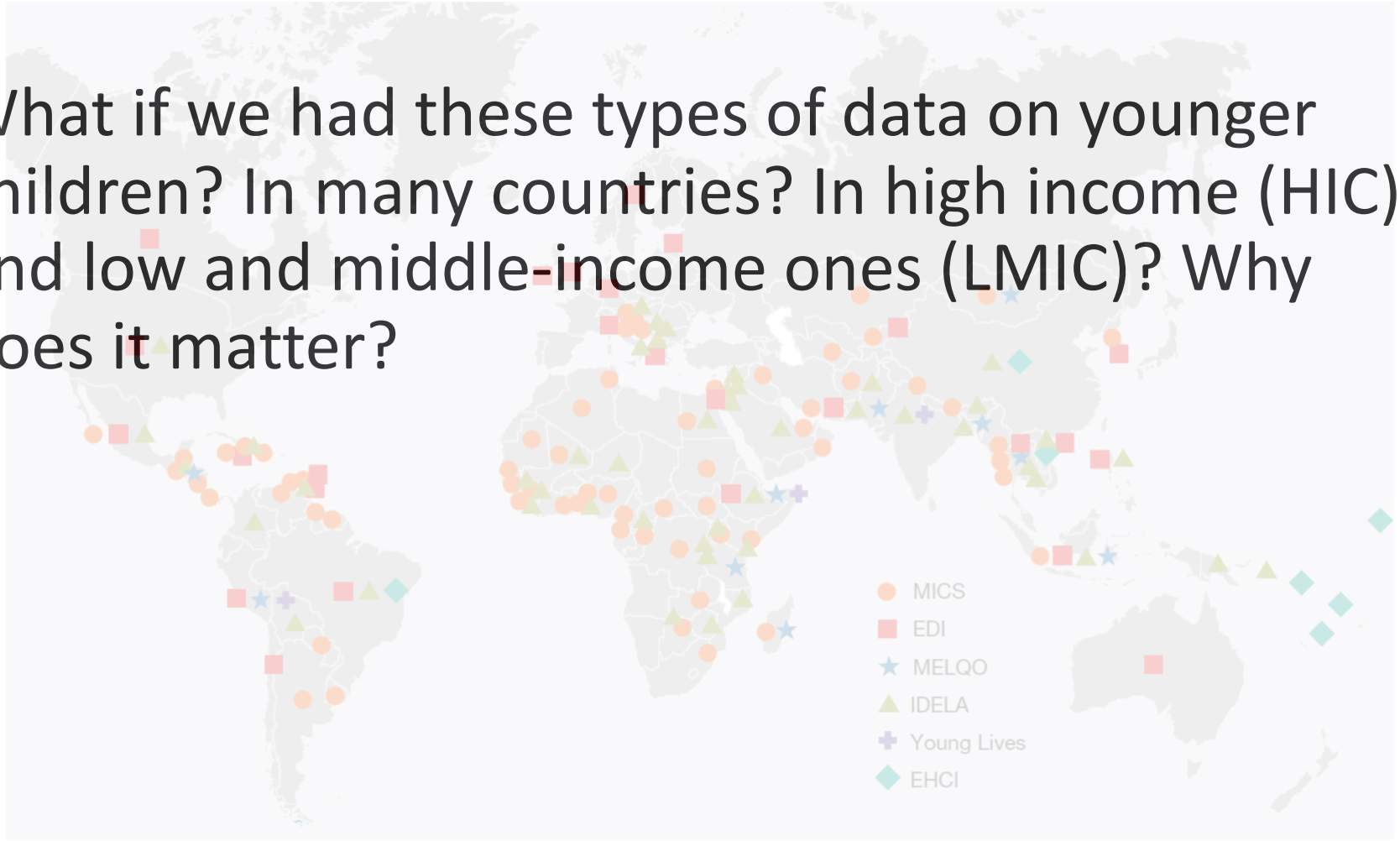
Webb et al., under review

Adding things up

(Methodological point #3)

- Large-scale data collections are shallow though broad
- In-depth data collections are intensive but supply estimates for interpreting the large-scale ones

What if we had these types of data on younger children? In many countries? In high income (HIC) and low and middle-income ones (LMIC)? Why does it matter?



1990

MICS

1995

WE CAN END POVERTY 2015 MILLENNIUM DEVELOPMENT GOALS

2000

General Assembly

Sixty-fifth session

2010

RIO+20 United Nations Conference on Sustainable Development

2012

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK
A GLOBAL INITIATIVE FOR THE UNITED NATIONS

2014

2015 TIME FOR GLOBAL ACTION FOR PEOPLE AND PLANET

SDGs

2015

SUSTAINABLE DEVELOPMENT GOAL 4

Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

TARGETS

INDICATORS

4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

4.1.1 Proportion of children and young people: (a) in grades 2/3; (b) at the end of primary; and (c) at the end of lower secondary achieving at least a minimum proficiency level in (i) reading and (ii) mathematics, by sex

4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education

4.2.1 Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex

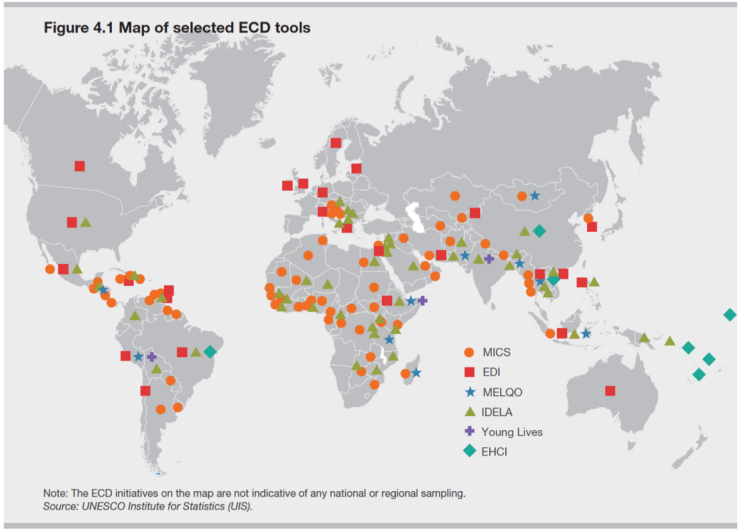
4.2.2 Participation rate in organized learning (one year before the official primary entry age), by sex

Informed conversation about measurement

Target 4.2: Opportunities and challenges

Challenges:

- indicator is a static number, requires depth and dynamics
- nature of learning and development is heterogenous
- neither of the data collecting methods is perfect (direct observation, assessment, informant interview)



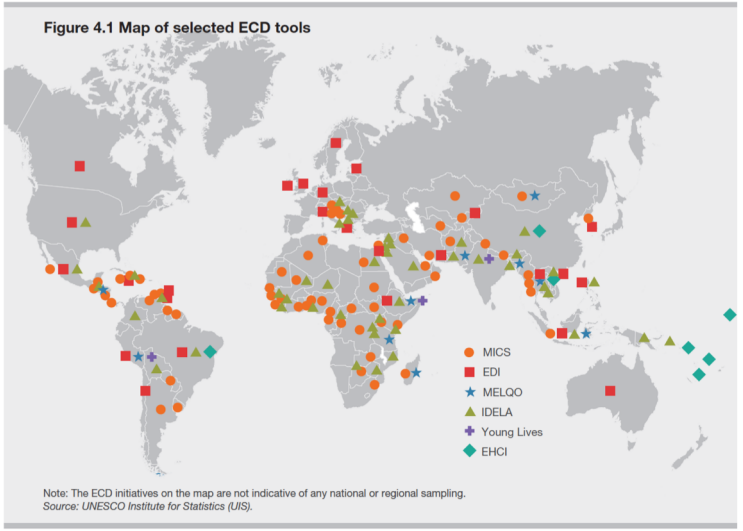
Source: SDG4 2018 Data Digest, UIS

Informed conversation about measurement

Target 4.2: Opportunities and challenges

Opportunities:

- Motivation in finding ways to measure that goes beyond gold standards
- Enhanced support of platforms for data sharing
- Development of techniques for data harmonization

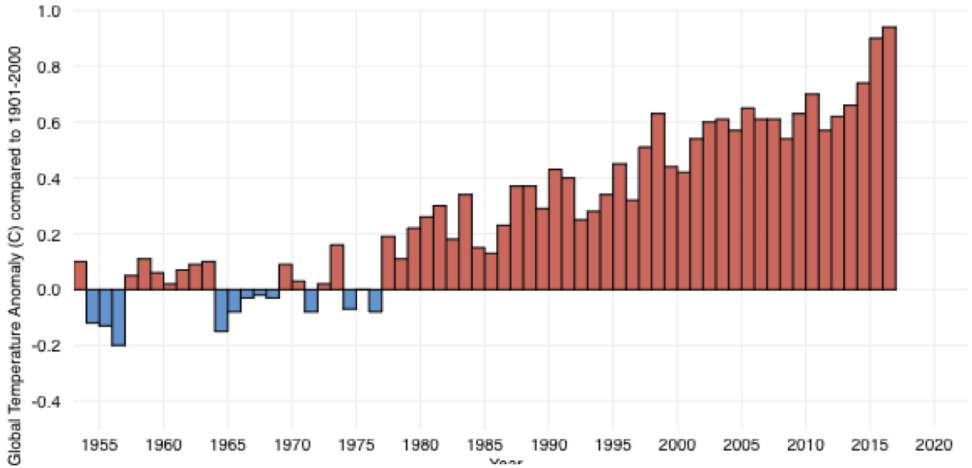


Source: SDG4 2018 Data Digest, UIS

Why the urgency?

- The global need to document and alleviate inequalities ramped up through the focus on SDGs – as well as at least two types of adversities that increased and are finally noticed: movement of populations and climate crisis
- An individual record hits people more strongly than regional statistics, but it is keeping records that brings policy changes, and makes them stick

Crucial more so because the reference points are changing

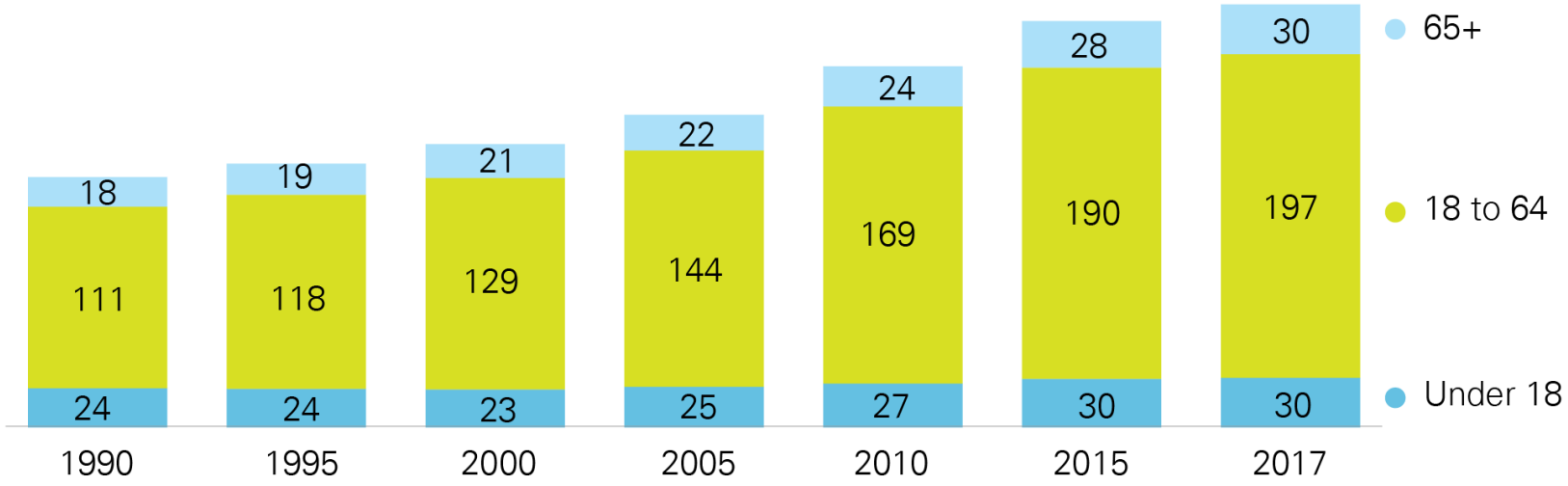


Source: NOAA

Special vulnerability of children in the face of climate change:

- Susceptibility to disease, food insecurity
- Impact of early trauma
- Risk of PTSD
- Disrupted education
- Disrupted sense of security

In 2017, there were 258 million people worldwide living outside their country of birth; 30 million of them were children. Among the world's migrants are nearly 20 million refugees – some 10 million of whom are children.



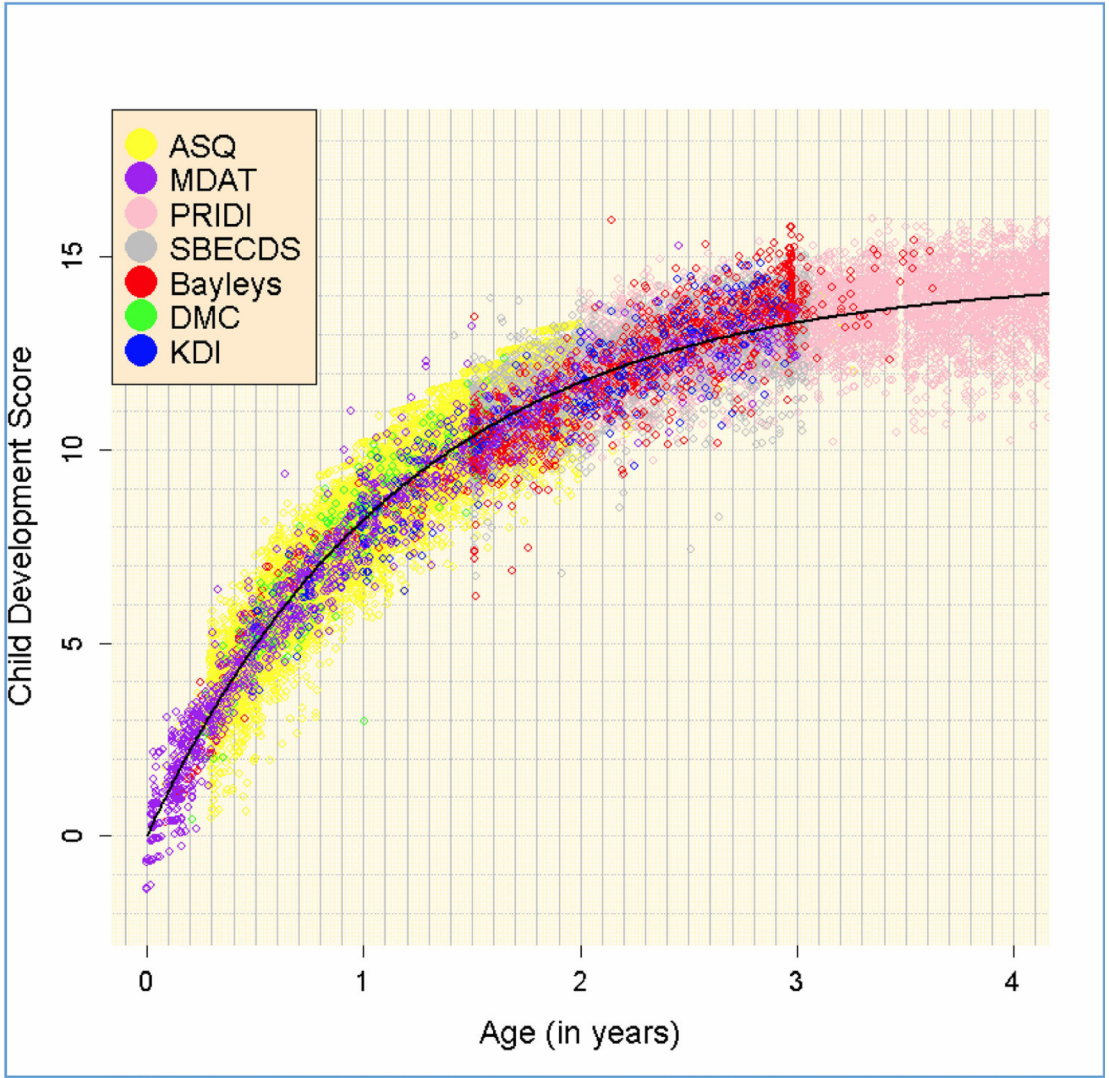
Inequalities keep persisting despite efforts

If early development is the key to turn off the inevitability of the socioeconomic inequities turning into life-long disadvantage, is measurement equitable enough?

Is measurement equitable among settings?

Plot of **developmental ability** by age (years) and by tool

ASQ Ages and Stages Questionnaires;
DMC
Developmental Milestones Checklist; KDI Kilifi Developmental Inventory;
MDAT, Malawi Developmental Assessment Tool;
PRIDI, Regional Project on Child Development Indicators;
SBECDS, Saving Brains Early Childhood Development Scale (now CREDI)



Lancaster et al. 2018 BMJ Global Health

GSED

Development of a project

CREDI: Caregiver Reported Early Development Instrument

IYCD: Infant & Young Child Development

Also Caregiver-reported

GCDG: Global Child Development Group

Developmental Score (latent variable with interval properties represents development)

Global Scale of Early Development (GSED)

Harmonized tool:

1. GSED Short Form: Population measure
2. GSED Long Form: Program evaluation

Thanks to
WHO
Bill & Melinda Gates Foundation
Grand Challenges Canada
Bernard van Leer Foundation
Hilton Foundation
Children's Investment Fund Foundation

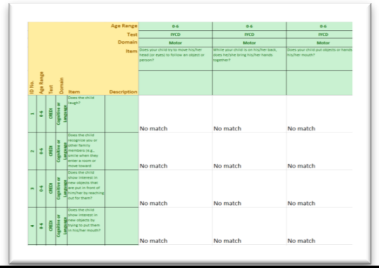
GSED

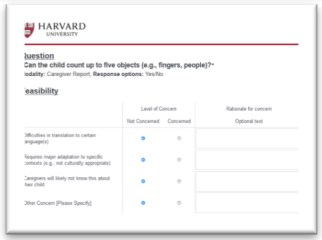
Matching, Feasibility and Domaining Studies

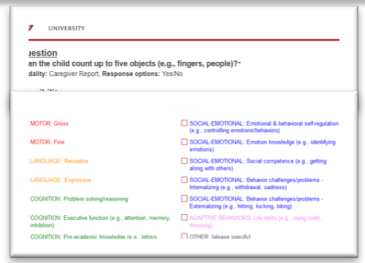
Objectives

- The Matching exercise gives us the "glue" that holds the three tests together – the matched items.
- The feasibility exercise gives us some initial thoughts on the practical applicability of items across different contexts.
- The domaining exercise allows us to estimate to what extent we are measuring the different domains that make up the construct of "development".

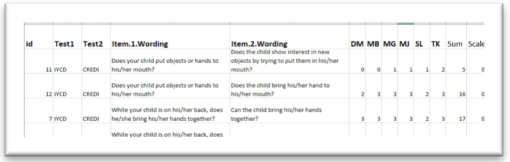
Processes



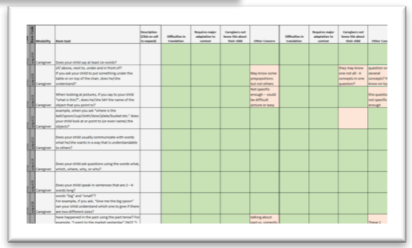




Products



id	Test1	Test2	Item.1.Wording	Item.2.Wording	DM	MB	MG	MJ	SL	TK	Sum	Scale
11	IYCD	CREDI	Does your child put objects or hands to his/her mouth?	Does the child show interest in new objects by trying to put them in his/her mouth?	0	0	1	1	1	2	5	0
12	IYCD	CREDI	Does your child put objects or hands to his/her mouth?	Does the child bring his/her hand to his/her mouth?	2	3	3	3	2	3	16	0
7	IYCD	CREDI	While your child is on his/her back, does he/she bring his/her hands together?	Can the child bring his/her hands together?	3	3	3	3	2	3	17	0
			While your child is on his/her back, does									



	A	B	C	D	E	F	G	H	I
1						Age Range	0-6	0-6	0-6
2						Test	IYCD	IYCD	IYCD
3						Domain	Motor	Motor	Motor
4						Item	Does your child try to move his/her head (or eyes) to follow an object or person?	While your child is on his/her back, does he/she bring his/her hands together?	Does your child put objects or hands to his/her mouth?
5	ID No.	Age Range	Test	Domain	Item	Description			
6	1	0-6	CREDI	Cognitive or Language	Does the child laugh?		No match	No match	No match
7	2	0-6	CREDI	Cognitive or Language	Does the child recognize you or other family members (e.g., smile when they enter a room or move toward		No match	No match	No match
	3	0-6	CREDI	Cognitive or Language	Does the child show interest in new objects that are put in front of him/her by reaching out for them?				

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	id	Test1	Test2	Item.1.Wording	Item.2.Wording	DM	MB	MG	MJ	SL	TK	Sum	Scaled
2	11	IYCD	CREDI	Does your child put objects or hands to his/her mouth?	Does the child show interest in new objects by trying to put them in his/her mouth?	0	0	1	1	1	2	5	0.28
3	12	IYCD	CREDI	Does your child put objects or hands to his/her mouth?	Does the child bring his/her hand to his/her mouth?	2	3	3	3	2	3	16	0.89
4	7	IYCD	CREDI	While your child is on his/her back, does he/she bring his/her hands together?	Can the child bring his/her hands together?	3	3	3	3	2	3	17	0.94
5	9	IYCD	GCDC	While your child is on his/her back, does he/she bring his/her hands together?	Hands Together	3	3	3	3	2	3	17	0.94

Results

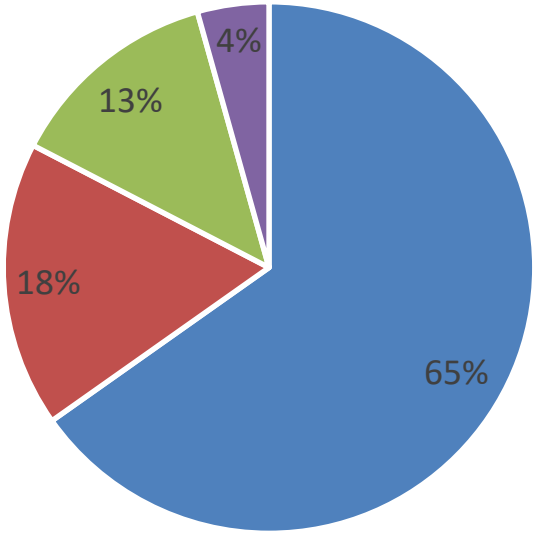
1. A new assessment of child development
2. In the process of its development, created a methodology and algorithm to link data collected with different tools with overlapping items

Methodological points summary

1. Measures of child development need to be comprehensive, not focused on one skill
2. Cannot forget contextual components (e.g., SES)
3. Large/broad vs. in-depth, narrower studies
4. Sustainable Development Goals: Is the measurement equitable?
5. How much work does it take to arrive at a consensus measurement? (and is it necessary?)

Papers using EDI data published in 2018

N=23



Imagine how much better we would be able to understand child development using linked data, if such data were available for even younger children than those measured with the EDI

Linkage Cross-sectional Protocol/data profile Intervention

Thank You!

(All)

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