



# What does stunting really mean?

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# Motivation: concern

- Last decade:
  - Unprecedented increase in attention to undernutrition;
  - Reducing child stunting has become a global development objective.
- The strong focus on stunting:
  - Enabled successful advocacy for nutrition;
  - But also... led to confusion and misunderstanding about meaning of stunting among researchers, donors, and agencies active in nutrition.
- My concern:
  - “Overselling” the importance of stunting;
  - Drawing attention away from where the focus should be;
  - “Underdelivering” on stunting may cause the world to lose interest.
- Cause of this confusion: poor understanding of the difference between growth as an outcome vs. a marker.

*Disclaimer: I am a strong believer in the importance of improving nutrition*



# The problem in a nutshell

## Key premise

Any intervention aimed at improving linear growth retardation...  
.... will subsequently lead to improvements in the correlates of  
poor growth

*(based on the literature: largely untrue)*



Stunting has become a  
primary development  
objective



Stunting is used to count those  
affected & for individual (rather  
than population-level) assess-  
ment:

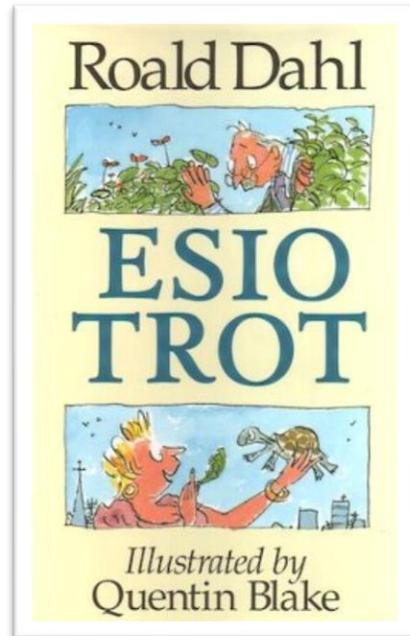
*"... 155 million children ... suffer from  
stunting. These children begin their lives at a  
marked disadvantage"*

*"cost per case of stunting averted"*



Interventions not  
improving stunting are  
considered a failure

# Outcome vs. marker – Esio Trot



## Mr Hoppy

- shy old man;
- secretly in love with Mrs Silver.

## Mrs Silver

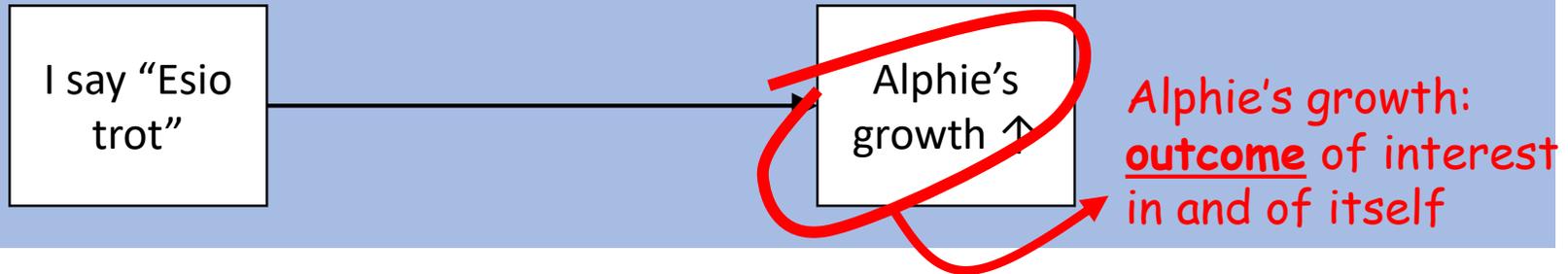
- has a small pet tortoise (Alfie);
- wishes she knew how to make Alfie grow.

# Outcome vs. marker – Esio Trot (2)

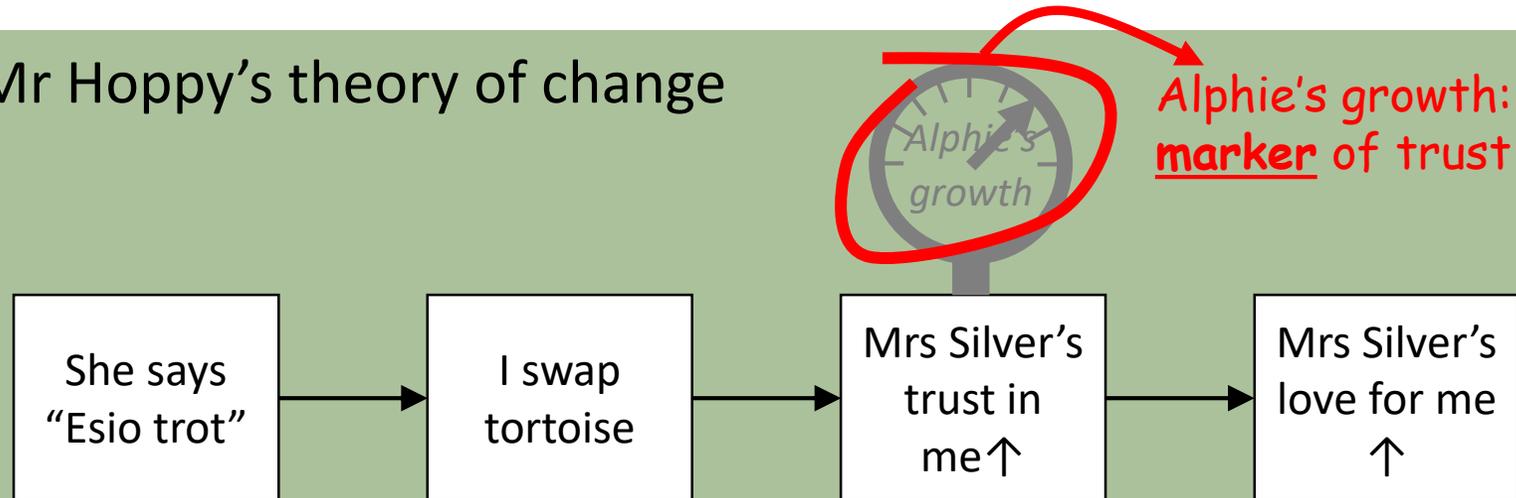


# Growth in Esio Trot: theory of change

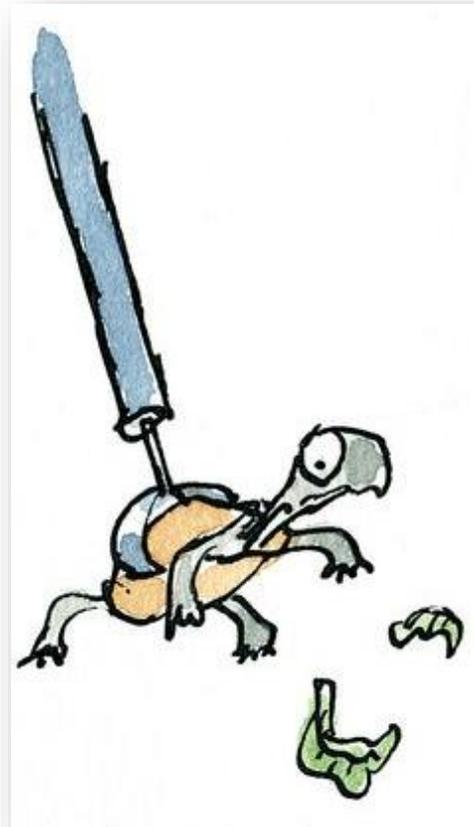
## Mrs Silver's theory of change



## Mr Hoppy's theory of change



# From tortoise growth to child stunting



# What we are writing...

in the first 5 years of life.<sup>5</sup> Stunting also has effects on long-term outcomes, such as educational attainment, increased formal employment, and physiologic functioning.<sup>6</sup>

(1). Stunting has numerous short- and long-term consequences, including increased childhood morbidity and mortality (2, 3), delayed gross and motor development (4), and long-term educational and economic consequences (5).

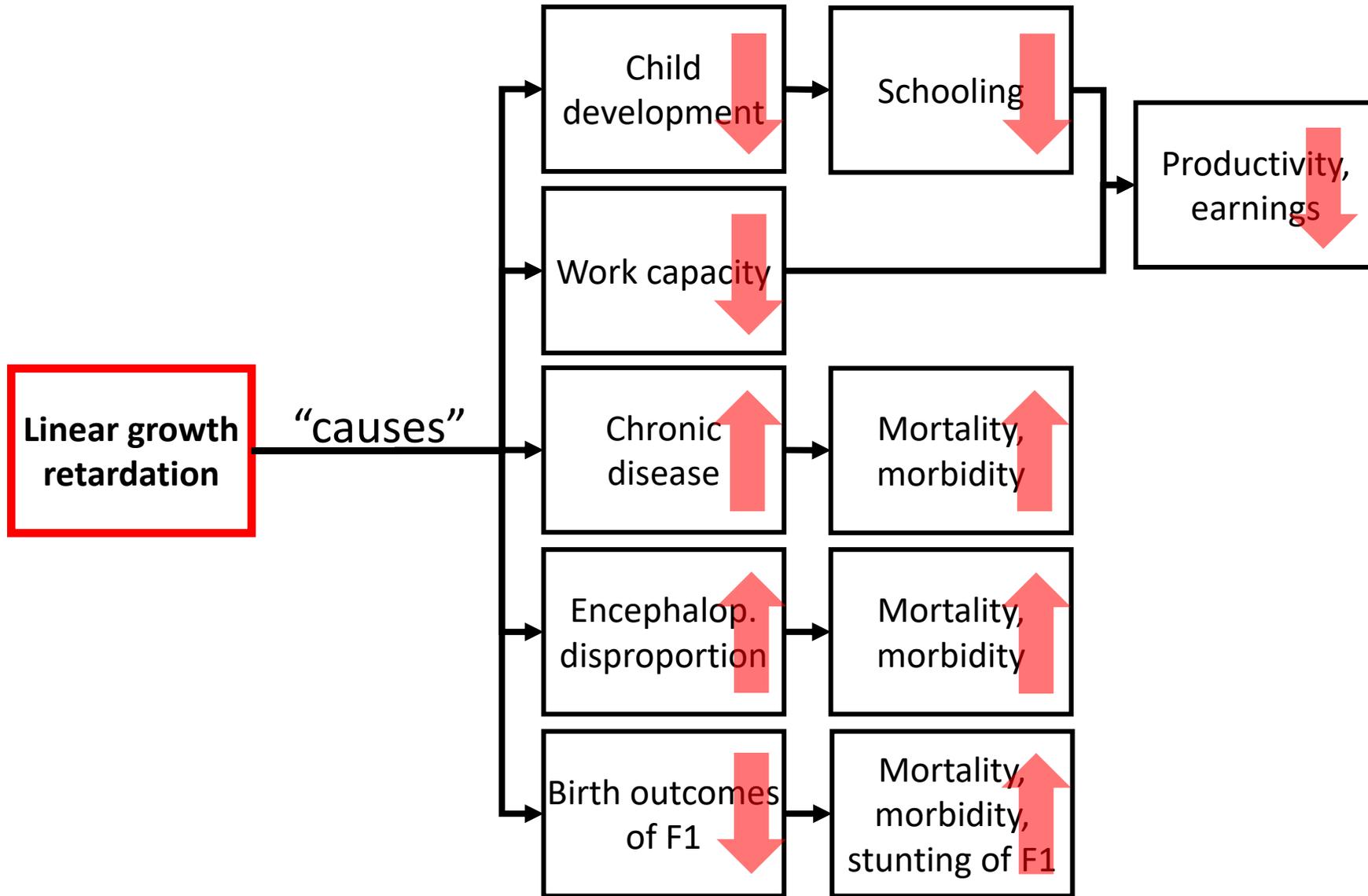
within countries.<sup>21</sup> Stunting early in life has been associated with consequences that threaten equity throughout the life span, including delayed school entry, early school termination, and poor school performance, resulting in reduced work capacity and human capital.<sup>25-27</sup> Early stunting has been used

malnutrition.<sup>3</sup> Stunting more pervasively hinders developmental potential and human capital of entire societies due to its longer-term impact on cognitive function and adult economic productivity; it is therefore considered the best surrogate marker of child health inequalities.<sup>4,5</sup>

Recent comprehensive review (McGovern, IJE 2017):

Over half of the 68 papers on linear growth or height made these types direct causal claims

# What we are telling the world....



# The world has heard us... (1)

Causal view is now strongly embedded among agencies and donors active in nutrition:

- Widespread adoption of the view that stunting leads to developmental delays, lower levels of schooling, reduced earnings, and chronic disease risk.
- Linear growth retardation and stunting have become a primary development objective.
- General belief that eliminating stunting will automatically lead to meaningful benefits in a large number of other domains.

# The world has heard us... (2)

Causal thinking has also triggered research on the determinants and effects of linear growth retardation which further contribute to confusion:

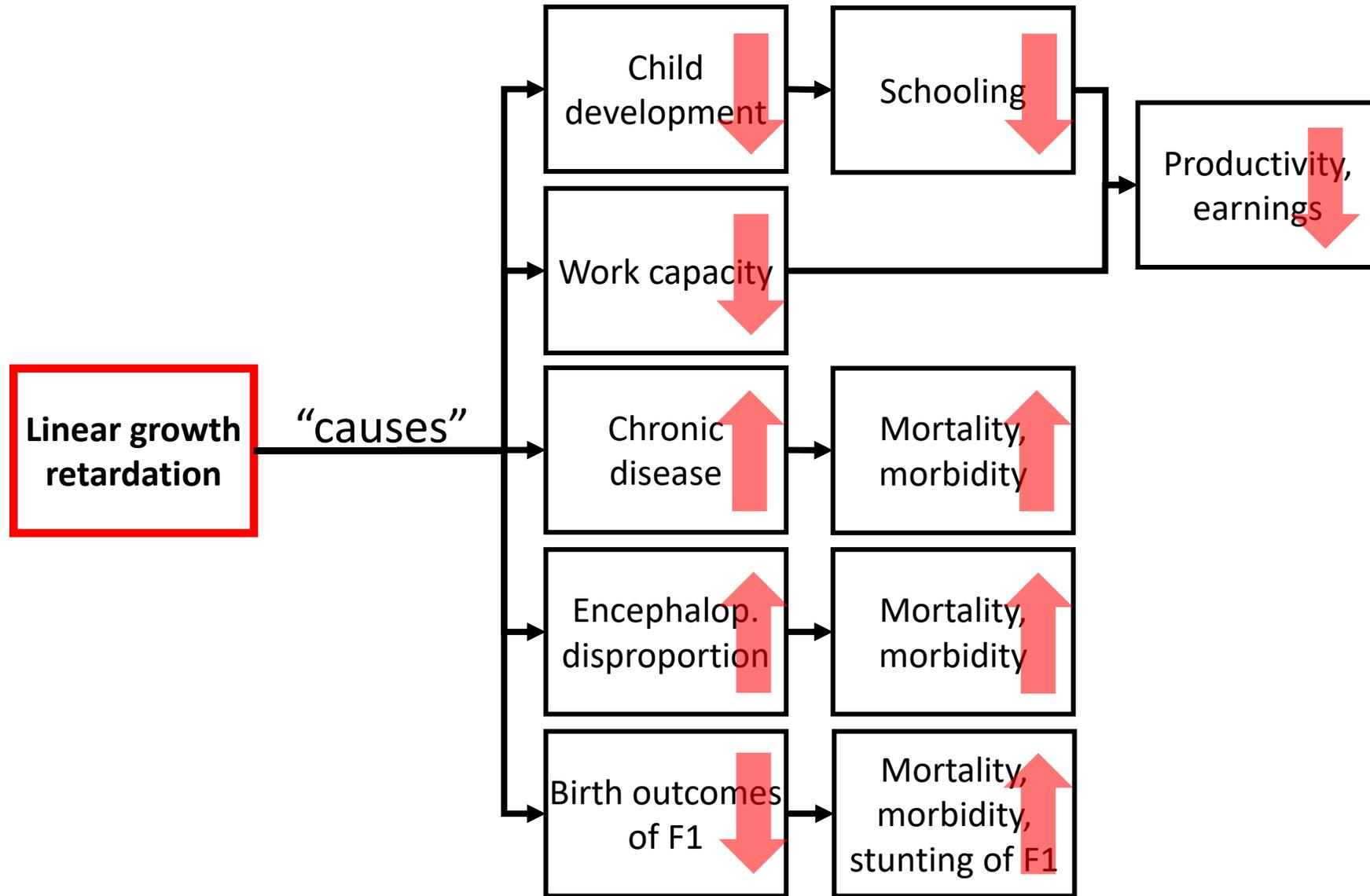
- Aflatoxin:

Rationale: if aflatoxin exposure is a confirmed cause of linear growth retardation in children, then reducing aflatoxin exposure will have positive effects on other outcomes (e.g. cognition).

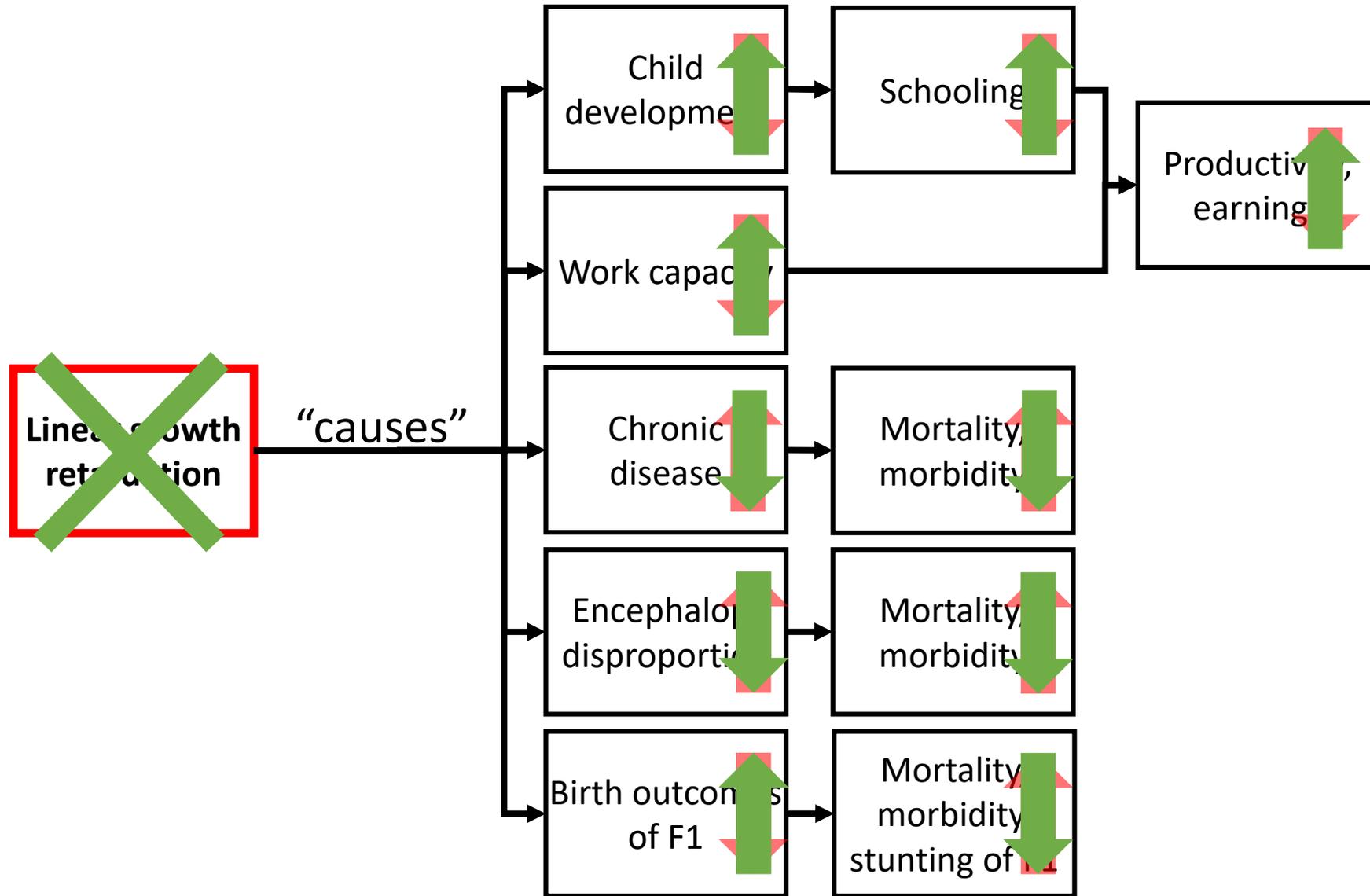
- Catch-up growth:

Rationale: recovery from linear growth retardation will lead to improved cognitive outcomes.

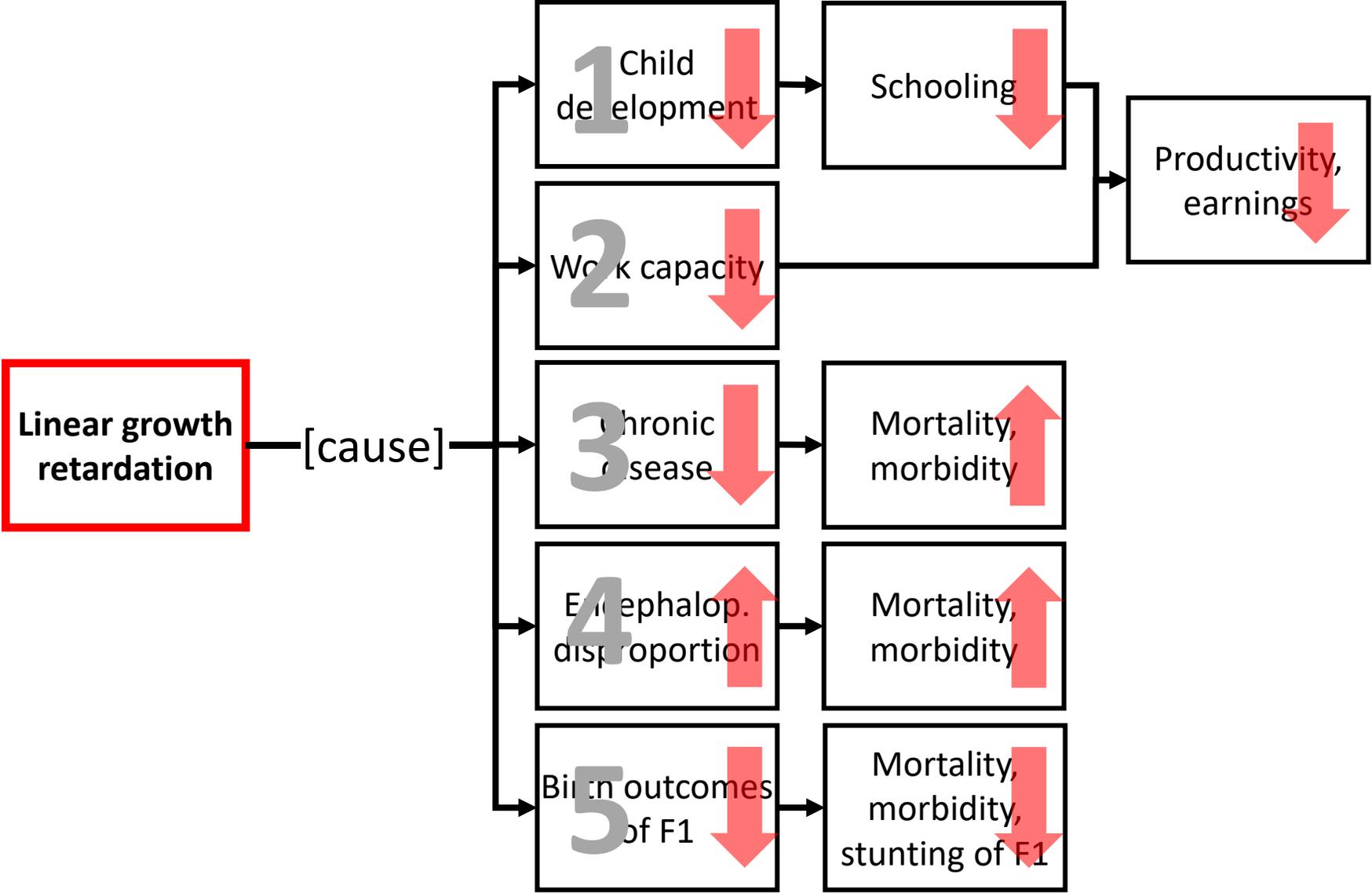
# What this causal thinking implies...

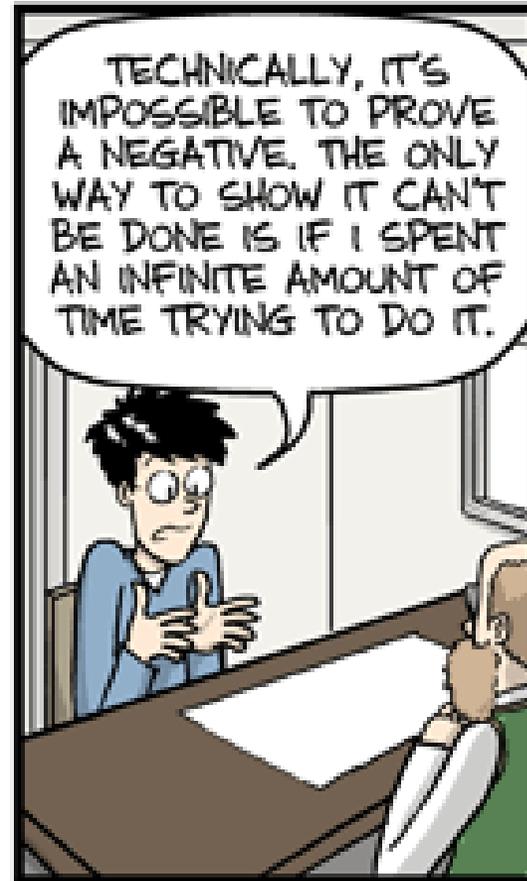


# What this causal thinking implies...



# What does the evidence say?





JORGE CHAM © 2009

# 1 What does the evidence say: Stunting → child development?

- Strong association:  
Reason: shared determinants (suboptimal nutrition, inadequate care, and repeated infections)
- But... not causally linked – linear growth is *\*not\** part of the mechanistic path to delayed development
- Two mechanisms have been raised as potentially causal:
  - smaller body size → reduced motor activity → ability to explore and access stimulation?  
Motor development: depends on balance, myelination, muscle strength, and endurance, but not of (bone length).
  - Rosenthal effect: short child stature → lower caregivers' expectations → lower child stimulation
    - Unlikely where the majority of children suffer from some degree of linear growth retardation.
    - Rosenthal effect much more likely to operate through child's actual "developmental performance"

## **Conclusion:**

- no evidence that linear growth retardation causes delays in child development
- based on our current understanding of mechanisms, it is not likely that they are causally related.

# 2

## What does the evidence say:

### Stunting → work capacity and earnings?

- Earnings are consistently associated with height
- Reasons to question the causality of this association:
  - No credible biological (or other) mechanism explains the effect of stature on earnings at the population level.
  - Height-earnings association present in developed economies too:
    - relative height (rather than height in absolute terms) is of importance.
    - association will *\*not\** disappear when linear growth retardation is eliminated
  - Behrman and colleagues statistically separated the effects of physical and intellectual human capital on wages:
    - Guatemala Oriente trial: population largely active in the agricultural sector
    - Only intellectual and not physical human capital increased annual income.

### **Conclusion:**

- No evidence that linear growth retardation causes lower earnings
- Based on our current understanding of mechanisms, it is not likely that they are causally related.

# 3 What does the evidence say: Stunting → chronic disease?

- Linear growth retardation and stunting often reported to be associated with adult chronic disease risk
- Available evidence:
  - Mechanisms of developmental origins: changes in the structure and function of critical organs (brain, pancreas, kidney); changes in gene expression; changes in cellular senescence; but *\*not\** linear growth
  - Epidemiological evidence:
    - COHORTS: Lower birthweight (birth length not measured) and lower linear growth rates *\*not\** associated with increases in adult cardiovascular risk or plasma glucose concentration.
    - South-Africa: Children not-stunted at 24 months had *\*higher\** BMI-for-age Z-score (BMIZ) at 18 years
    - Peru: Stunting at 12 mo associated with a *\*decreased\** risk of having a high BMIZ (35).

## **Conclusion:**

No evidence that linear growth retardation causes chronic disease risk

# 4 What does the evidence say: Stunting → encephalopelvic disproportion

- Linear growth retardation at childhood → shorter adult height → smaller pelvic inlet → mismatch between size of fetal head and dimensions of the birth canal
- Stature and pelvic size are linked to skeletal size

## **Conclusion:**

Association between linear growth retardation at childhood and obstructed labor at adulthood is causal.

## **Burden of obstructed labor:**

- Mortality: 3% of total (i.e. around 10,000 maternal deaths per year)
- Disability:
  - 40% of the total number of years lost due to disability (among all maternal disorders)
  - Has dropped significantly over time.
- But... the fraction of this burden attributable to linear growth retardation is not known
- Mortality and morbidity burden is relatively small and declining

# 5

What does the evidence say:

Stunting → birth outcomes next generation?

- Childhood linear growth retardation → maternal short stature → children small-for-gestational-age (SGA).
- Due (in part) to maternal physical constraints associated with short stature

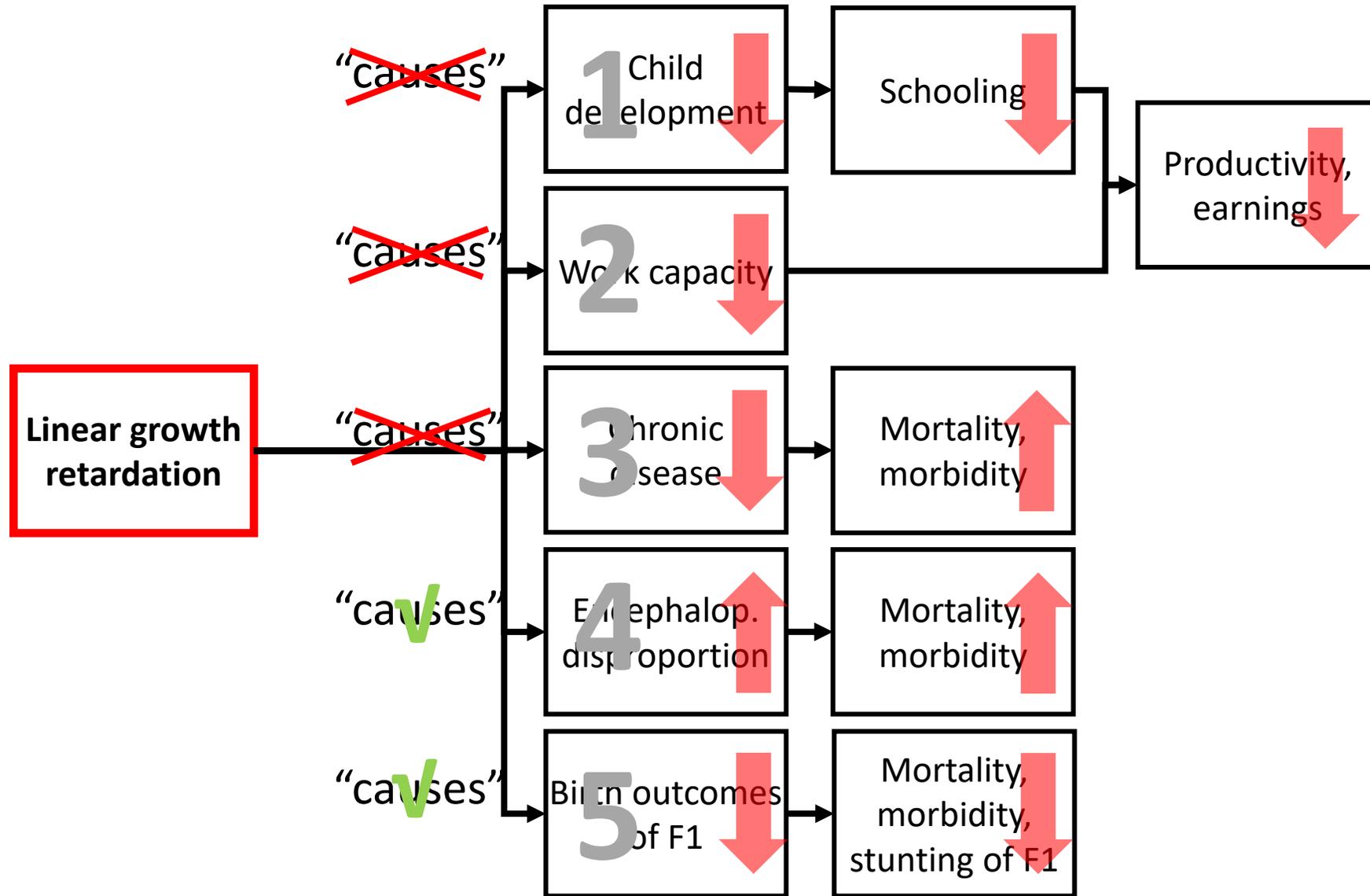
## **Conclusion:**

Association between linear growth retardation at childhood and birth outcomes is causal.

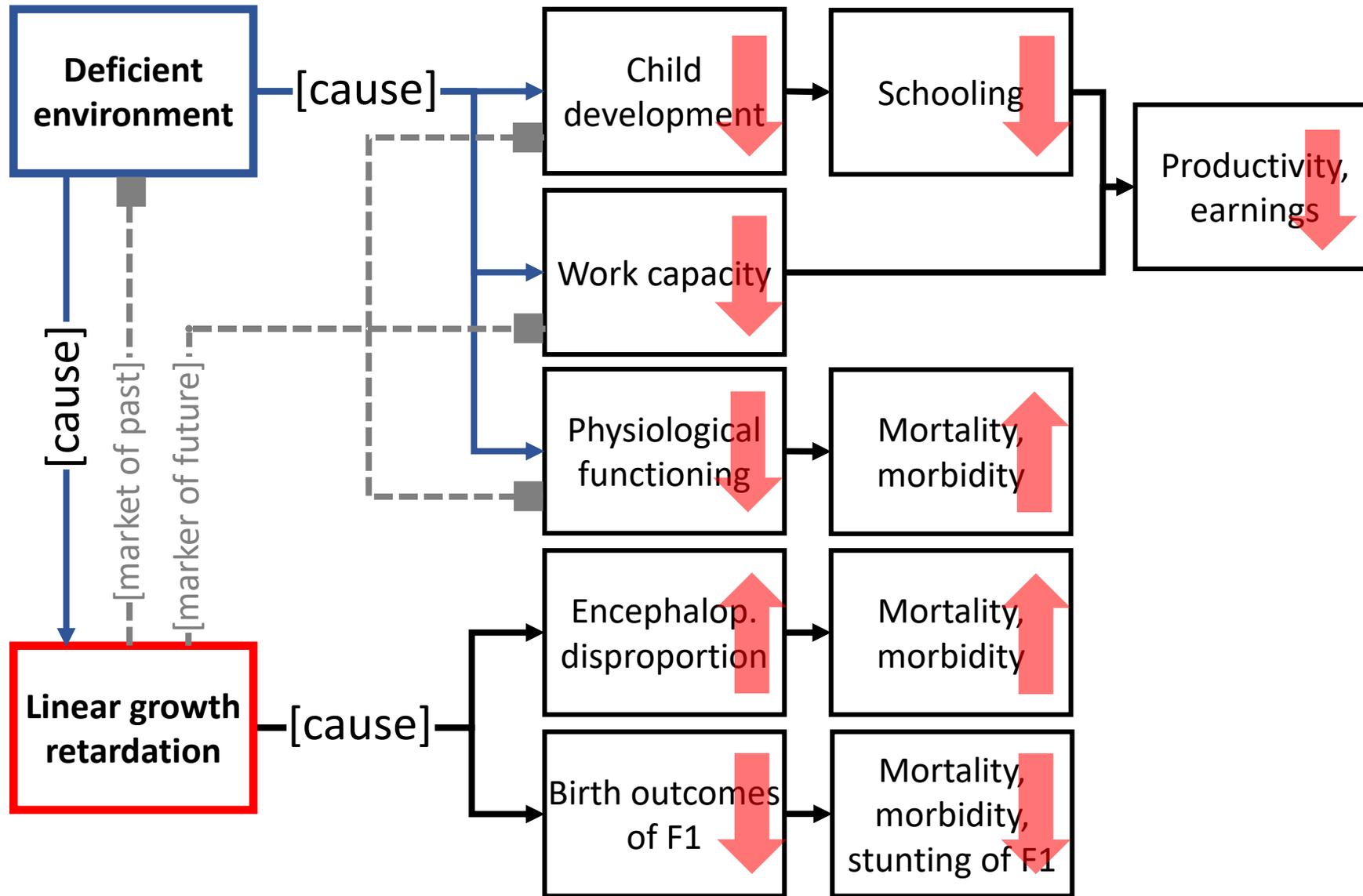
## **Burden:**

- Mortality: 3.6% of neonatal deaths (or 97,200 deaths globally) due to maternal short stature
- Morbidity: unknown which proportion could be averted when eliminating maternal short stature.
- Eliminating maternal short stature would have a modest effect on neonatal mortality and an unknown effect on child morbidity.

# Summary of evidence



# New framework: outcome vs. marker





# New?

*“Stunting [...] predicts generalized functional impairment on a wide range of biological, behavioral and social dimensions in children and adults from developing countries [...]. Some of these functional correlates, such as poor school performance, **are not direct outcomes** of growth failure, but **instead reflect shared causes**, whereas others, such as reduced lean body mass in the adult, undoubtedly are.”*

(Martorell, Khan, Schroeder, 1994)

*“...stunting is related to long-term consequences in two ways... as a **direct cause** of short adult height... as a **key marker** of the underlying processes...”*

(Dewey and Begum, 2011)

*“... it’s **not actually a child’s height we’re concerned about**. Rather, **stunting is a proxy** for something much more important: how children are developing cognitively, emotionally, and physically...”*

(Bill and Melinda Gates, 2017)

# Just semantics?

*“It does not matter. Whatever is good to reduce stunting is also good for the other outcomes”*

Three reasons to disagree:

- **Improving linear growth is often not necessary:**

We do not have to fix growth completely to have significant and \*meaningful\* impacts on important outcomes.

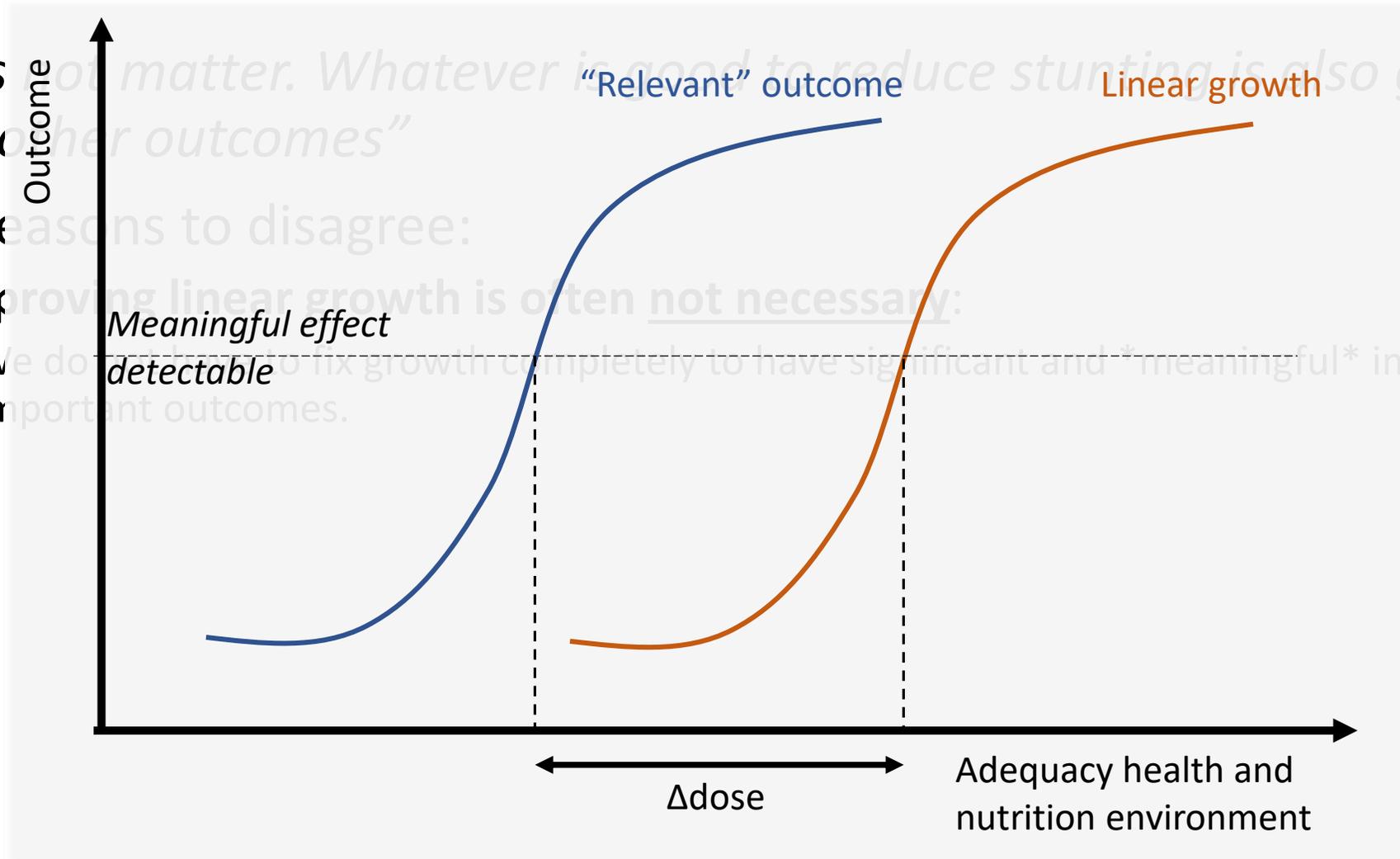
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*Linear growth*

Adequacy health and nutrition environment

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- **Improving linear growth is often not sufficient:**

A well-growing child with anemia in an environment lacking stimulation is unlikely to develop properly.

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- **Improving linear growth is often not sufficient:**

A well-growing child with anemia in an environment lacking stimulation is unlikely to develop properly.

- **Improving linear growth is often not cost-efficient:**

Addressing outcomes directly is more efficient than trying to address them indirectly through linear growth.

e.g.: obstructed labor can be prevented (nearly) entirely with good operative delivery;

# Just semantics? (2)

- Single focus on stunting unnecessarily downplays the importance of interventions that “only” improve ...
  - infant & young feeding practices;
  - dietary adequacy;
  - water, hygiene, and sanitation practices.
- Single focus on stunting may undermine efforts to engage other sectors in nutrition-sensitive programs:
  - Agriculture sector: more likely to “sign up” for improvements in diet than for linear growth.
  - Social protection: more likely to commit to reducing poverty than to reducing stunting.
- Sense of fatalism: *“little or nothing that can be done after 2 years of age”*
  - Growth retardation continues beyond 2 years
  - Interventions in other domains (e.g. ECD) can still make a difference

# Proposed way forward

- **Be specific**

- Undernutrition  $\neq$  stunting; stunting  $\neq$  linear growth retardation
- Be explicit about reason for focus on stunting:
  - Population assessment? To count those affected? Program design and evaluation?
  - In programs, is it used as a marker of another outcome (and why is that outcome not addressed directly?) or is it an outcome of immediate interest (and why was it chosen as an outcome?)

- **Population assessment: ok**

Good marker for population assessment (comparing regions, assessing changes over time)

# Proposed way forward (cont'd)

- **Counting cases: limitations**

- Use of stunting to count the number of children affected has limitations (Perumal, 2018)
- Other exercises using stunting to count those affected (e.g. cost per case of stunting averted) will result in inaccurate estimates

- **Programs and impact evaluation: growth not a good primary outcome**

- Stunting linked causally to two outcomes which can be more effectively addressed through direct interventions
- Rather, focus on what matters \*and\* can sensibly “respond” to the intervention:
  - e.g.: morbidity, dietary intake, food security, child development, immune function, nutrient status, body composition, ...

# In case you cannot get enough of this...

## Perspective: What Does Stunting Really Mean? A Critical Review of the Evidence

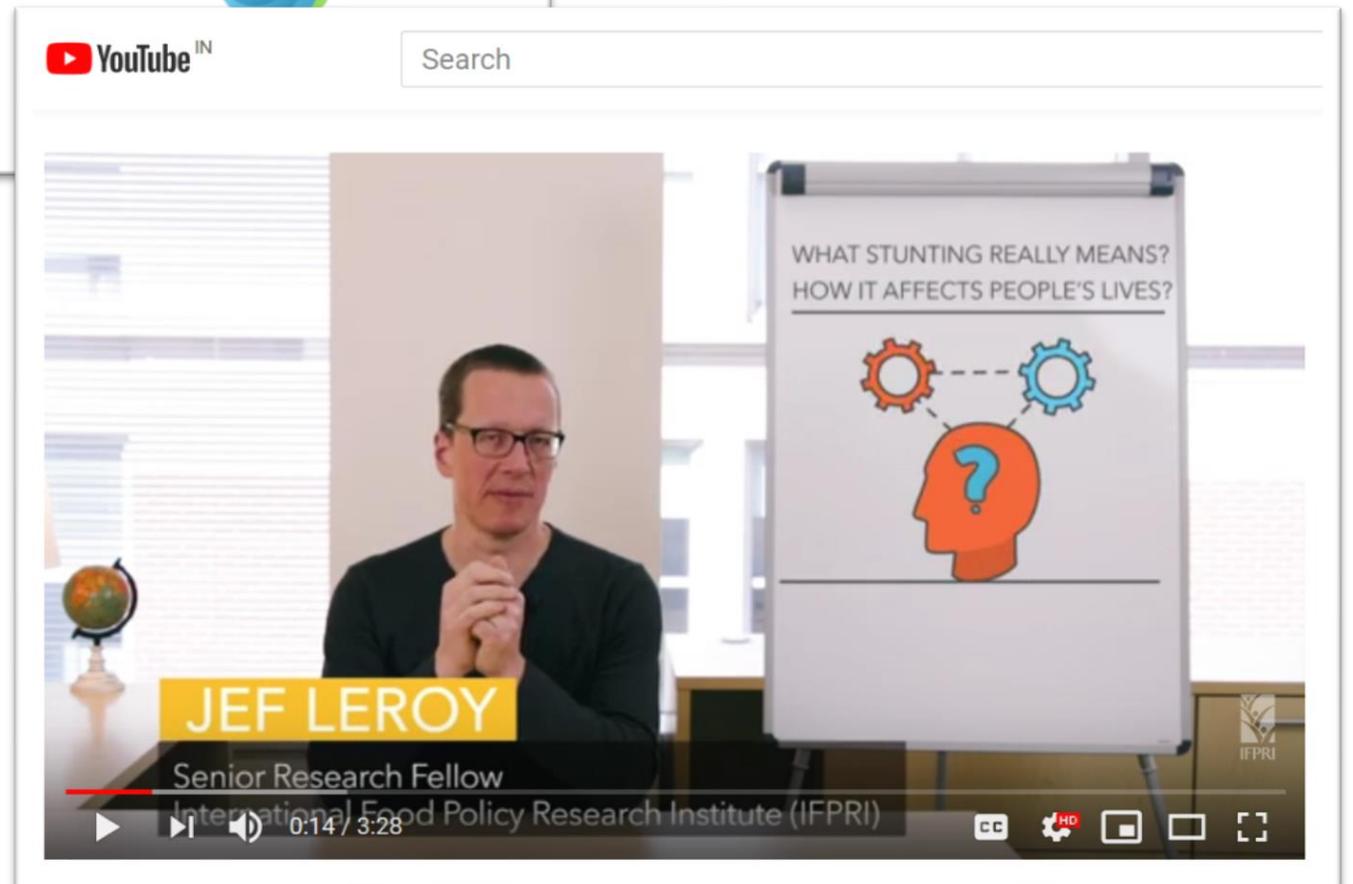
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WHAT STUNTING REALLY MEANS?  
HOW IT AFFECTS PEOPLE'S LIVES?

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0:14 / 3:28

# Thank you!



"Why, Mr Hoppy!.. Of course I'll marry you!"  
'It's all due to Alfie,' Mrs Silver said, slightly breathless.  
'Good old Alfie,' Mr Hoppy said. 'We'll keep him for ever.'"