



# **How we know what we know about the climate-undernutrition relation at the global level**

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- Briefly:
  - Food security and undernutrition at present
  - Climate/weather-undernutrition relation
- General modelling strategy used:
  - Advantages
  - Drawbacks (from the perspective of health)
- Draw some general conclusions about future directions

# Food security & undernutrition

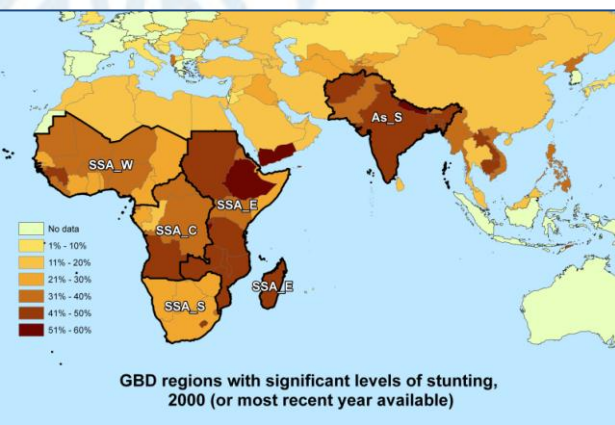


- **FAO 2012 : 870 million people chronically undernourished**
- **165 million children stunted**
- **35% of mortality in under 5s**

## The Millennium Development Goals Report 2012

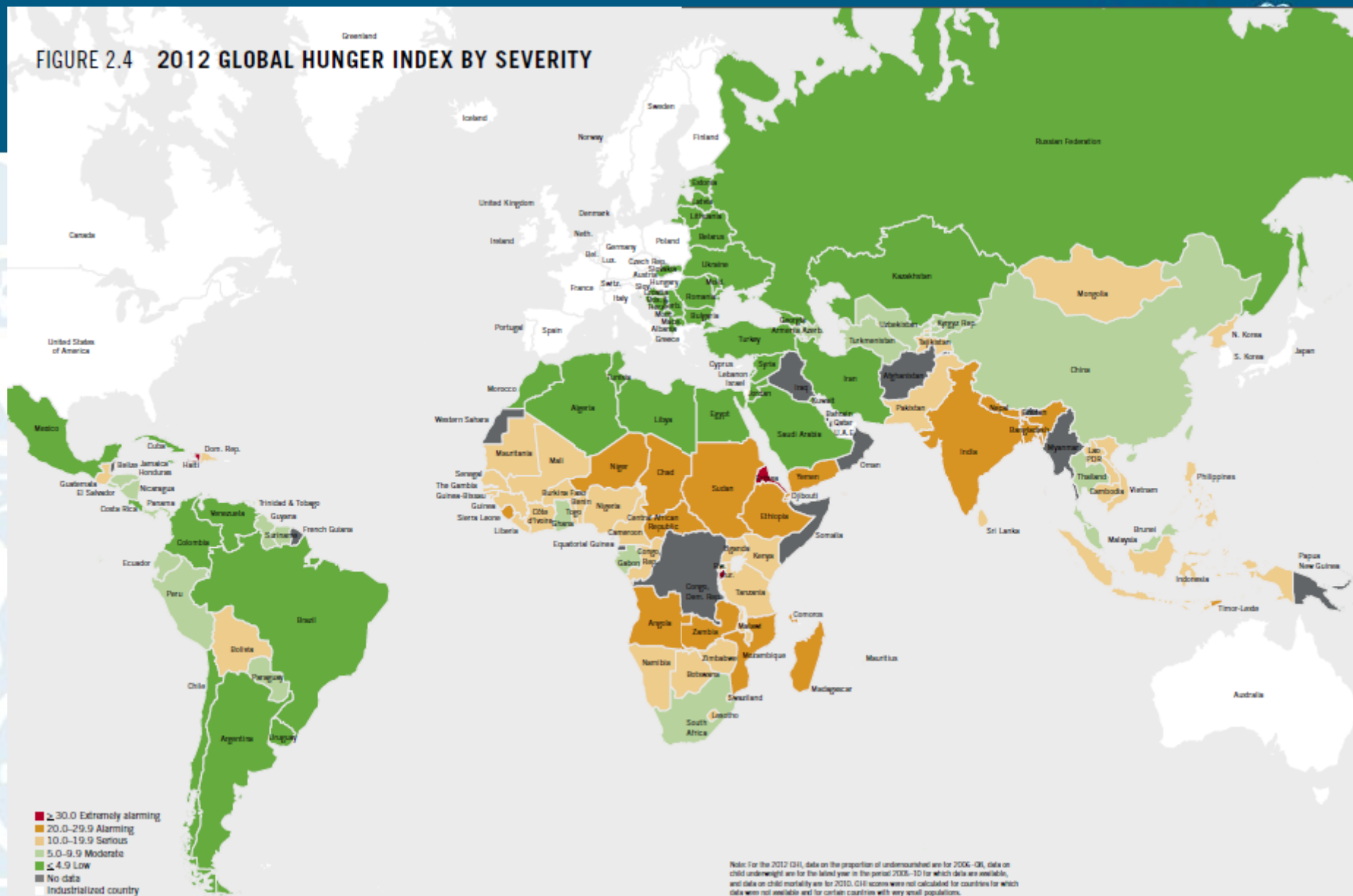
- Hunger remains a global challenge

The most recent FAO estimates of undernourishment set the mark at 850 million living in hunger in the world in the 2006/2008 period—15.5 per cent of the world population. This continuing high level reflects the lack of progress on hunger in several regions, even as income poverty has decreased. Progress has also been slow in reducing child undernutrition. Close to one third of children in Southern Asia were underweight in 2010.



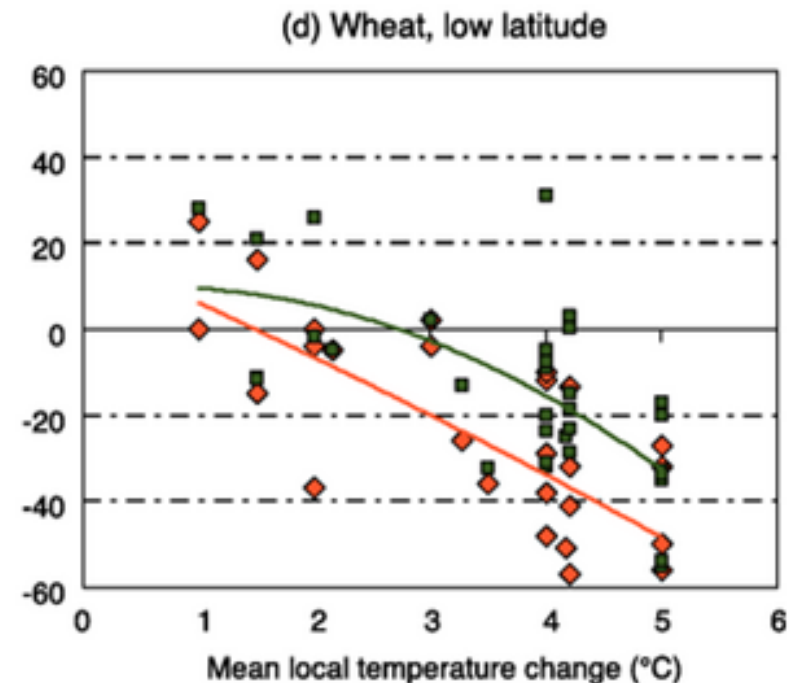
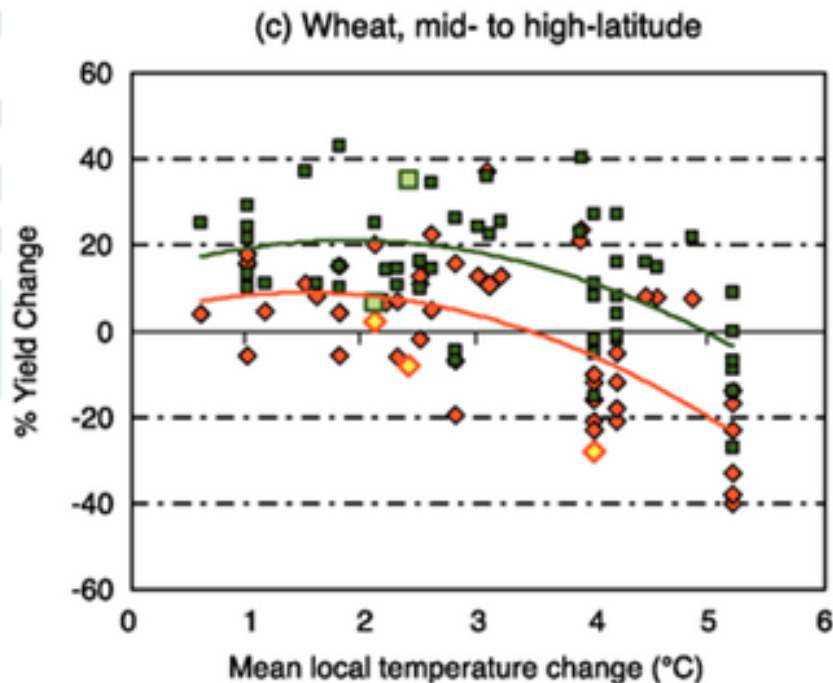
**Sources: FAO 2012; Black 2013; UN 2012**

FIGURE 2.4 2012 GLOBAL HUNGER INDEX BY SEVERITY

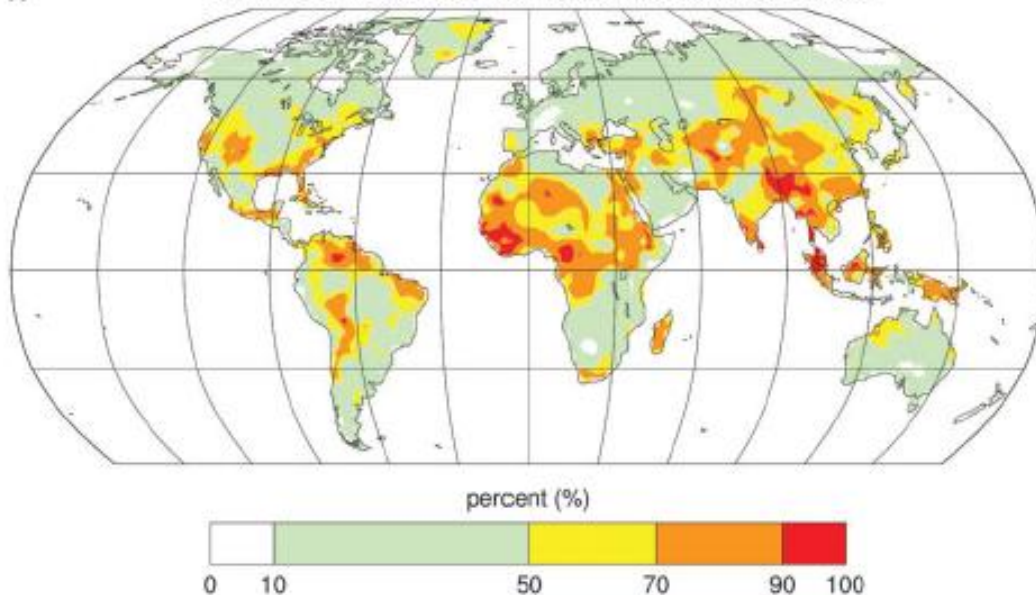


# Climate change - undernutrition

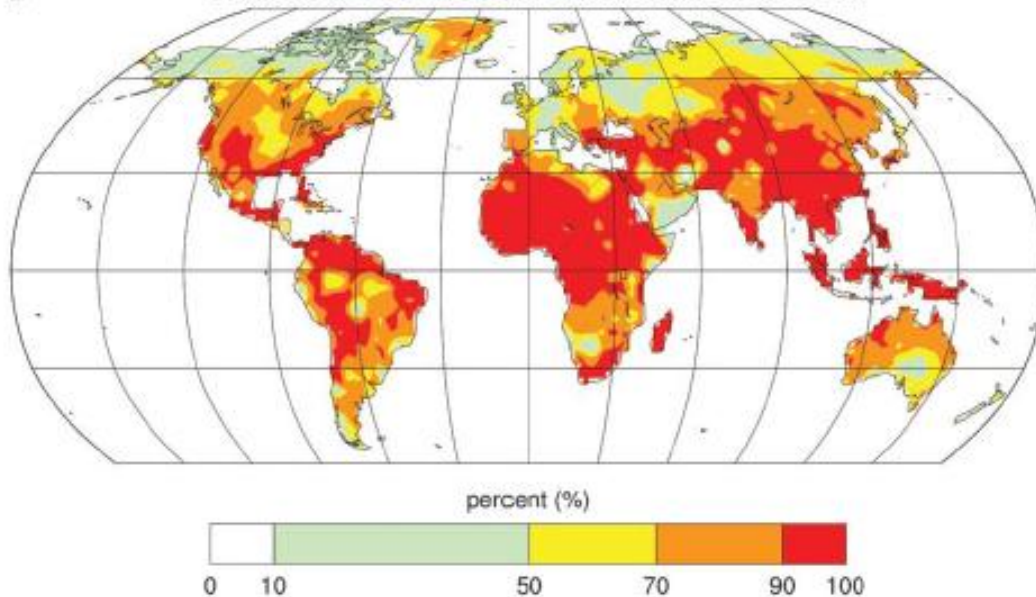
- Via lens of crop productivity...  
...which has an intuitive relation to undernutrition



A Summers in 2040-2060 Warmer than Warmest on Record



B Summers in 2080-2100 Warmer than Warmest on Record



## By the end of the century:

In the *tropics and sub-tropics*,  
>90% prob that growing  
season temps will exceed the  
most extreme seasonal temps  
over 1900 to 2006.

In *temperate regions*, hottest  
seasons on record will  
represent the future norm

(in many locations)



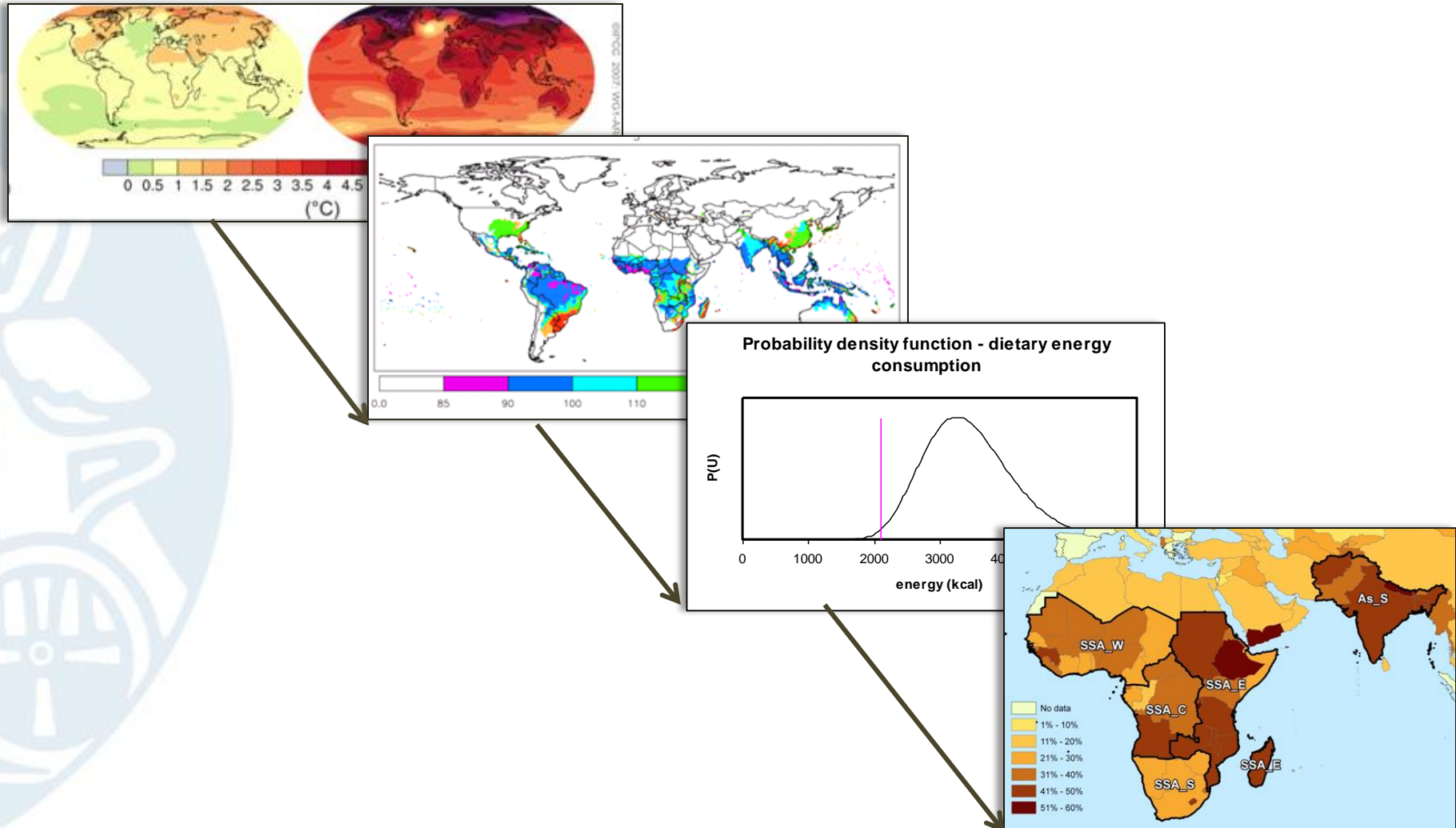
# How do we know what we know...



## ...about future undernutrition under climate change?

- 12 modelling papers over last 20 years
  - regardless of scenarios or specific outcome, all found climate change likely to increase hunger/undernutrition
  - undernourishment may increase 5-25% globally
  - stunting may increase (relatively) 23% in parts of Africa
- All use the same general strategy

# How do we model it?





# Advantages of strategy

- Detailed attention to:
  - climate under given emissions
  - climate-crop relation for major crops
  - movement of food via global market
  - national food availability and undernutrition

i.e. intuitive aspects

- Global level focus
- Quantifies impacts
- Facilitates multi-disciplinary work
- Readily incorporates improved models and new scenarios

# Drawbacks of strategy

**1** Not a property of the strategy itself...

... rather that it is the only strategy that has been used.



# Drawbacks of strategy

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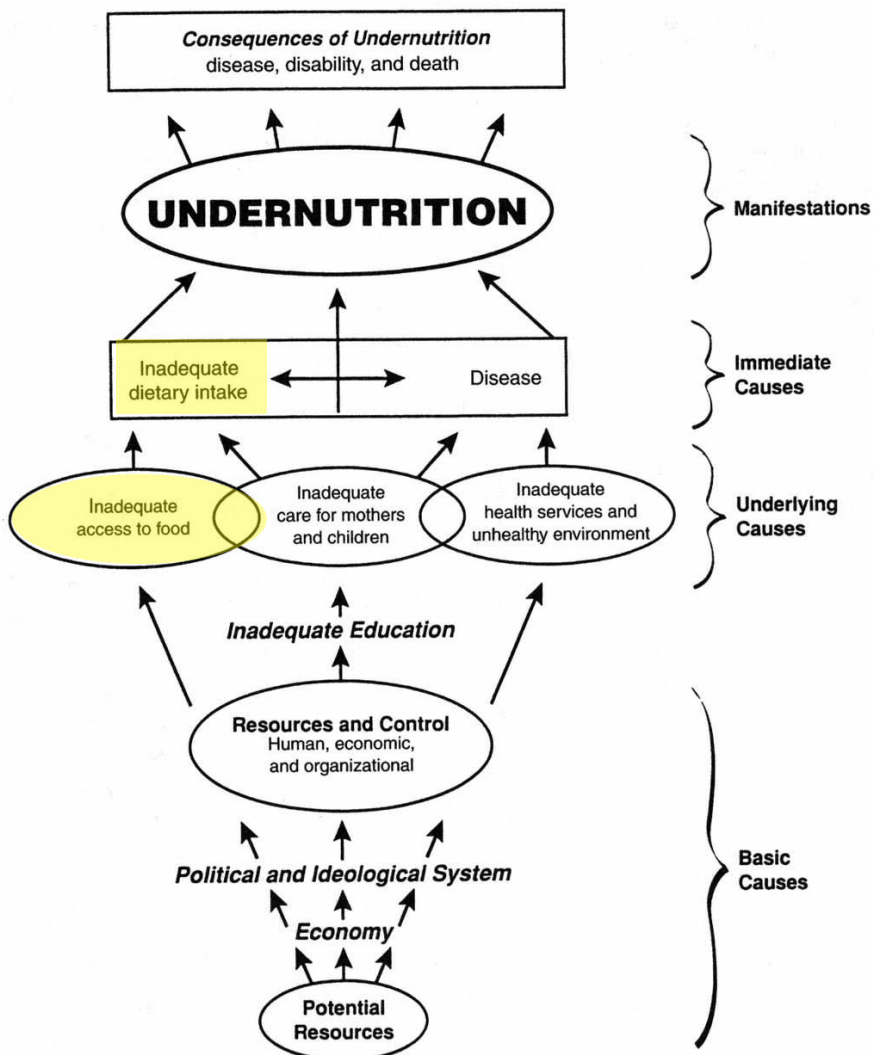
**Flipside of benefit of quantification:**

**To quantify, need data.**

**To make projections, need data for present and future.**

**If no data, factor necessarily left out,  
*no matter how important it may be.***

# Undernutrition: causes



## Changing prevalence:

1970 to 1995, reduction in child underweight attributable to:

- 43%, improved female education
- 26%, increase food availability
- 19%, improved water access

(Smith and Haddad, 2000, IFPRI)

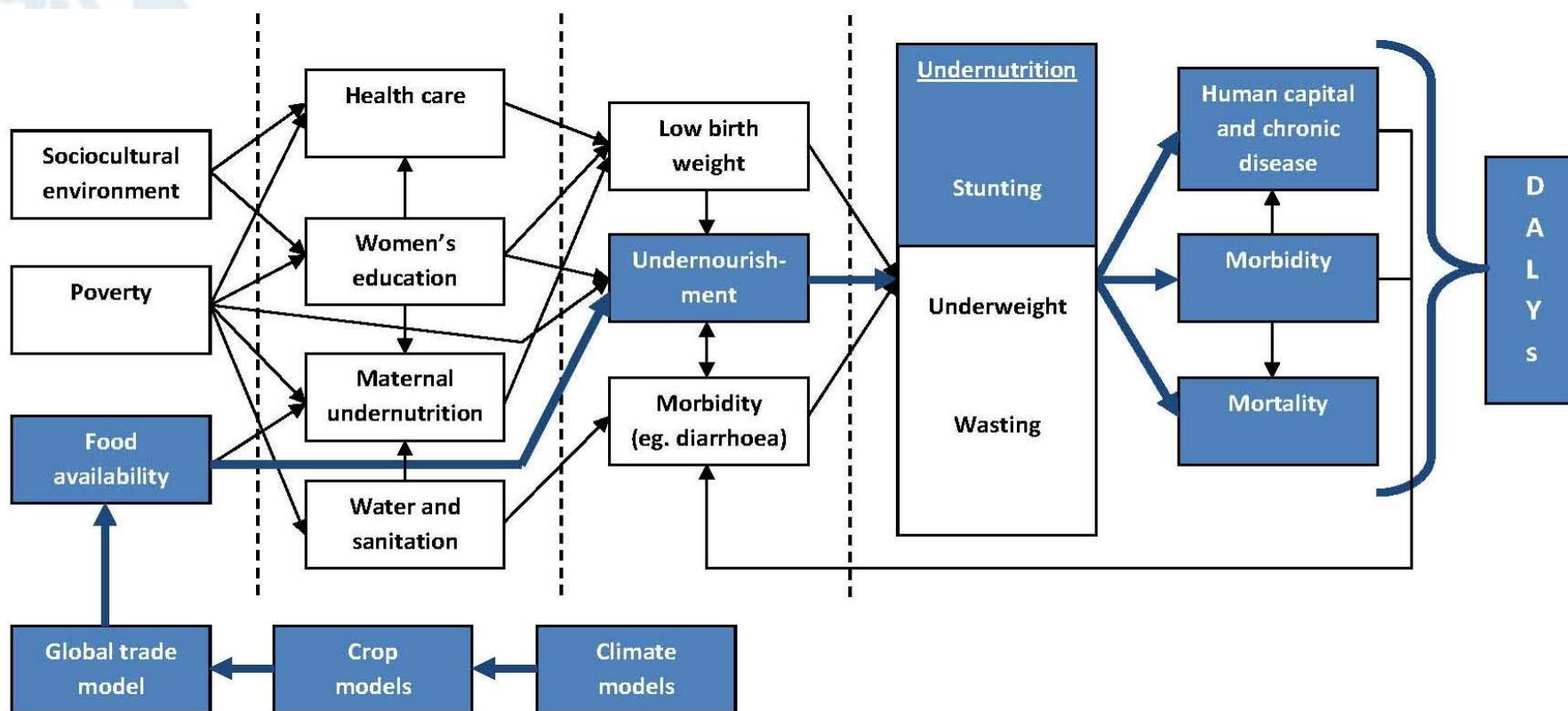
## Irreversible stunting at 24 months:

- 25% (8-38%) due to having  $\geq 5$  episodes of diarrhoea
- (Checkley et al, 2008, Int J Epi)

# What do we have data for?



## Modelled pathway: climate to child



# Drawbacks of strategy

## 3 Existing health models are static

### (i) Within system feedbacks

e.g.

- Individual level: undernutrition-diarrhoeal disease
- Global level: cheap imports reducing viability of local production increasing dependence on cheap imports

### (ii) Structural change

e.g.

- Reduced viability of local production driving rural-urban migration, and, changing vulnerability to global food price fluctuations



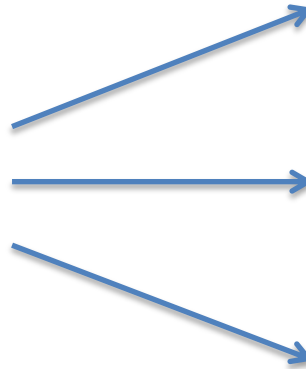
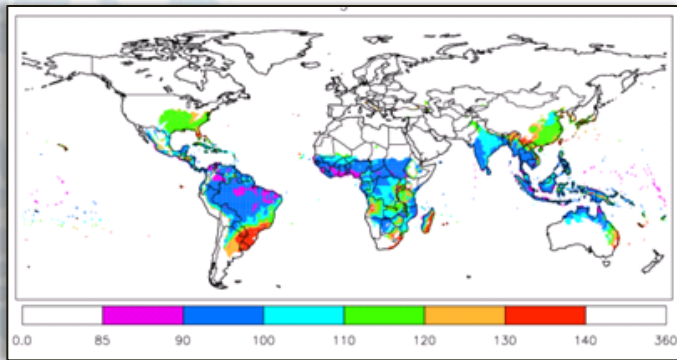


# Drawbacks of strategy



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**Enforced vantage point: crop productivity**



# Theories of undernutrition

Assumptions regarding the role of increased food production in alleviating hunger	Assumptions regarding role of population growth	
	Non-Malthusian	Neo-Malthusian
<b>Productionist</b>	<u>'Modernization'</u> Hunger caused by lack of modernization and tech	<u>'Productionist Neo-Malth'</u> Hunger caused by food production falling behind population growth
<b>Non-productionist</b>	<u>'Political Economy'</u> Hunger is caused by social inequality and poverty produced both locally AND globally	<u>'Ecological Neo-Malth'</u> Hunger is caused by population growth and environmental degradation

# Conclusions

**Develop alternative strategies...**

**... but how?**

- **Model building as an ongoing process (Levins 1966)**
- **Alternative explanatory programmes, heuristically (Abbott 2004)**
- **Dynamics**
- **Theories**