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Leverhulme Centre for Integrative Research on Agriculture and Health

Methods, metrics and meta-analysis

Alan Dangour

Leverhulme Centre for Integrative Research in Agriculture and Health

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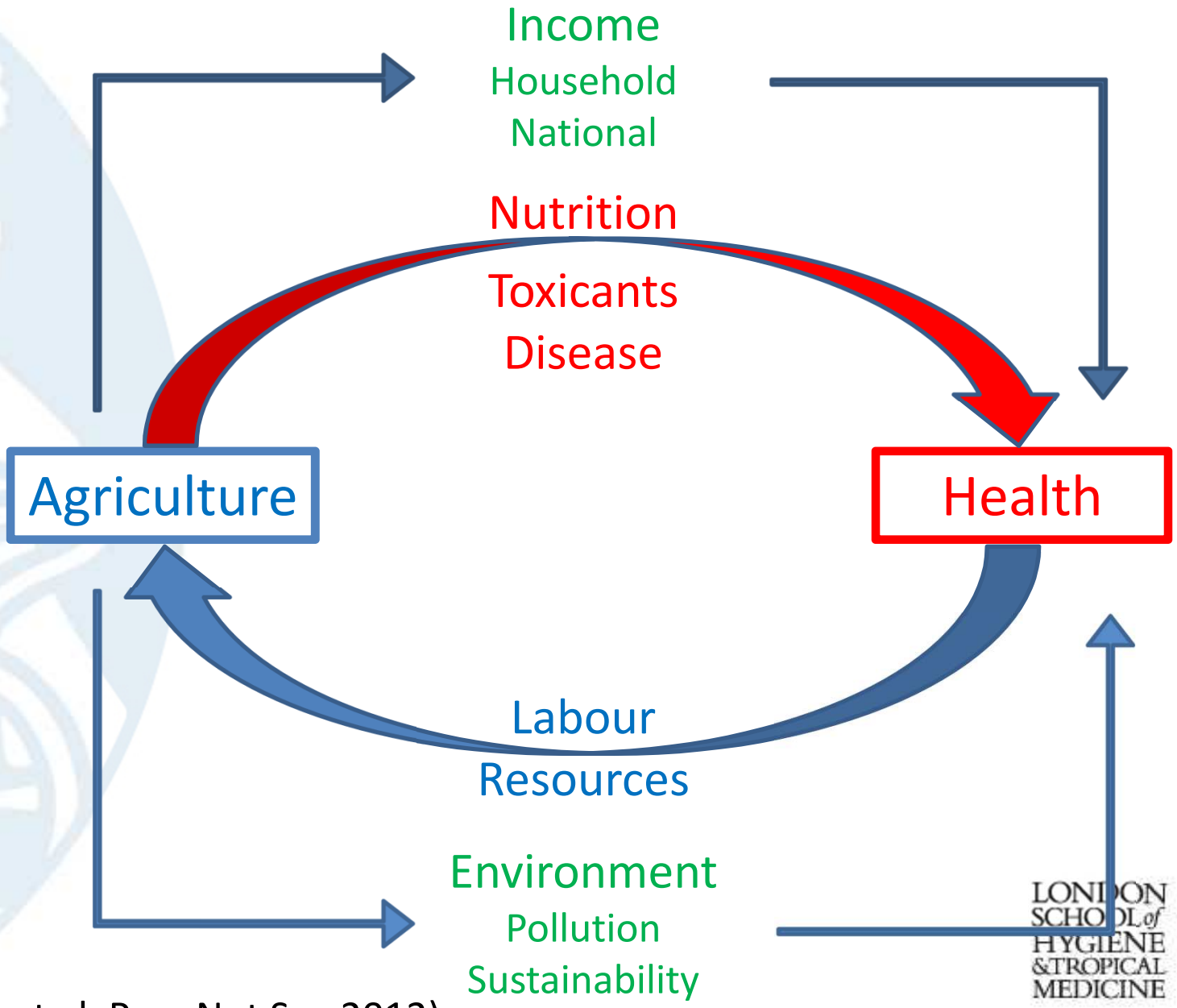

(Dangour et al. Proc Nut Soc 2012)

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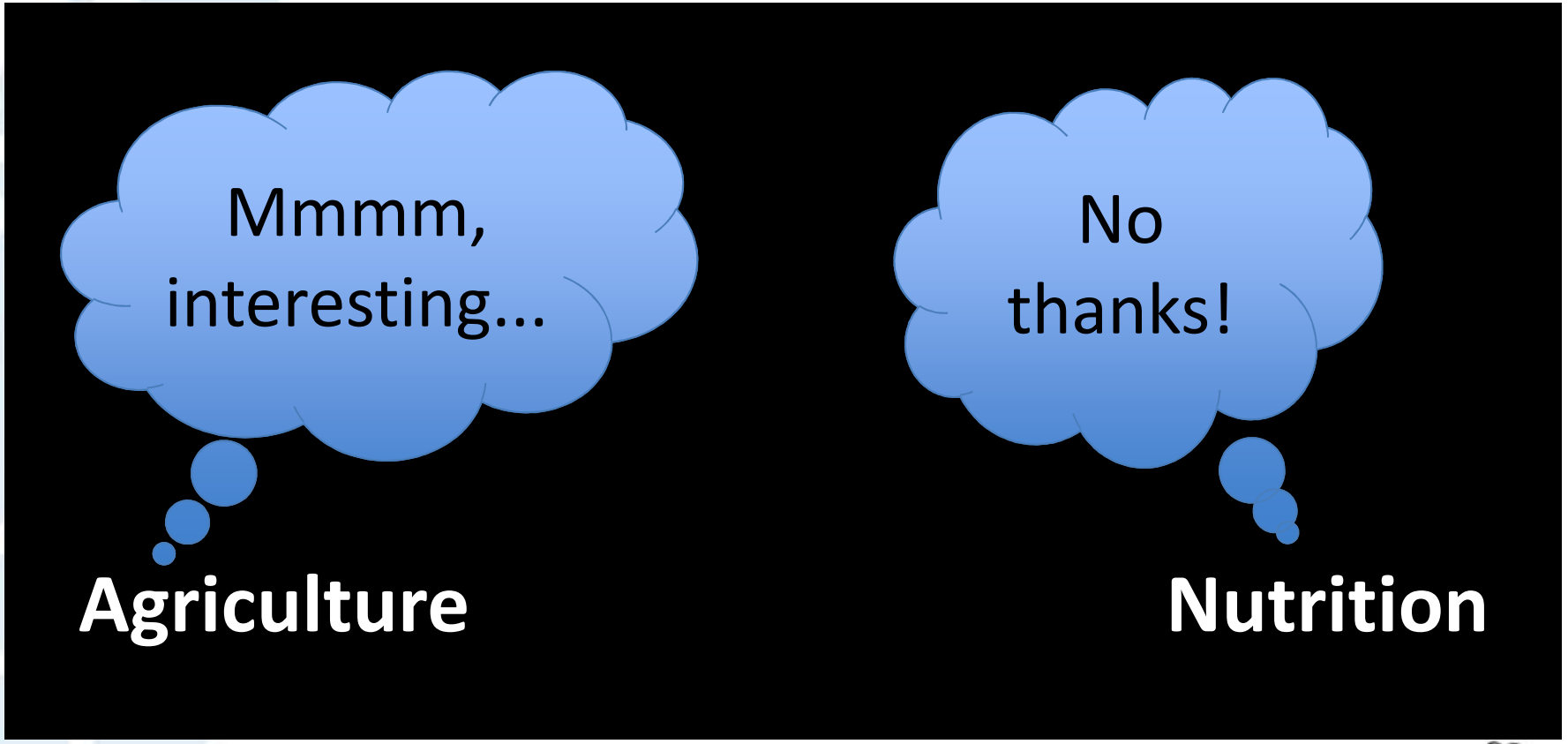
What do we know so far?

Not much for sure!



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Evidence to-date?

- Systematic review of evidence linking agricultural interventions with nutrition outcomes in children
- 23 studies included (15 on home gardens; <5 RCTs)

Conclusions The question posed by the review cannot be answered with any level of confidence. The data available show a poor effect of these interventions on nutritional status, but methodological weaknesses of the studies cast serious doubts on the validity of these results. More rigorous and better designed studies are needed, as well as the establishment of agreed quality standards to guide researchers in this important area.

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(Masset et al. BMJ 2012)

What are we doing now?

Running fast

(Bruegel the Elder, 1563)

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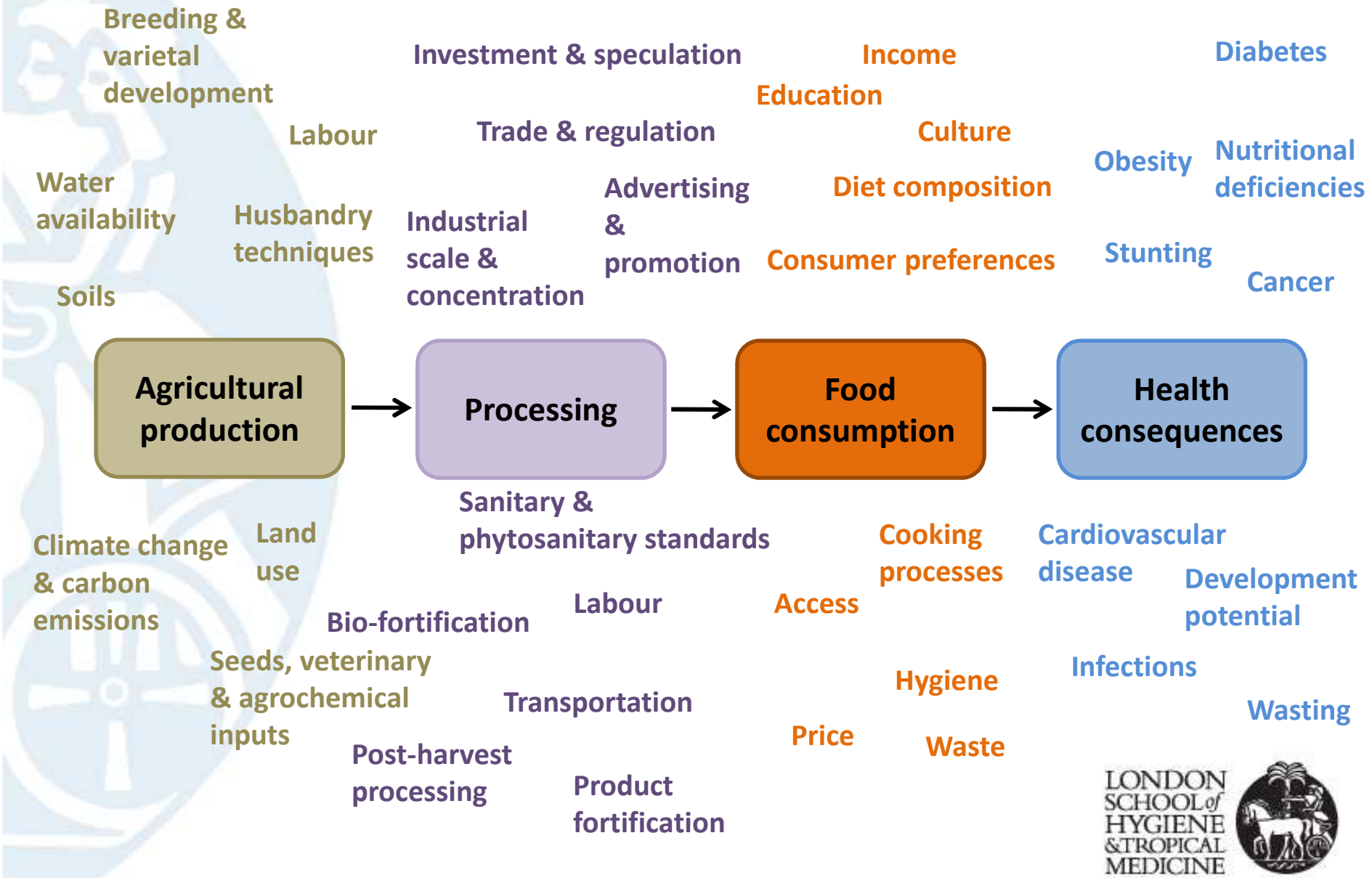
Breeding & varietal development
Investment & speculation
Income
Diabetes
Education
Labour
Trade & regulation
Culture
Obesity
Nutritional deficiencies
Water availability
Advertising & promotion
Diet composition
Husbandry techniques
Industrial scale & concentration
Consumer preferences
Stunting
Cancer
Soils
Agricultural production
Processing
Food consumption
Health consequences
Sanitary & phytosanitary standards
Climate change & carbon emissions
Land use
Cooking processes
Cardiovascular disease
Development potential
Labour
Access
Bio-fortification
Seeds, veterinary & agrochemical inputs
Hygiene
Infections
Transportation
Wasting
Price
Waste
Post-harvest processing
Product fortification
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MR. MESSY

By Roger Hargreaves

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Cross-sectoral work

- Are there nutrition/health benefits associated with agricultural strategies to reduce GHG emissions?
- Linked environment, diet, health

  (Friel, Dangour, Garnett et al. Lancet 2009)
- Even messier example included economy

  (Lock, Smith, Dangour et al. Lancet 2010)

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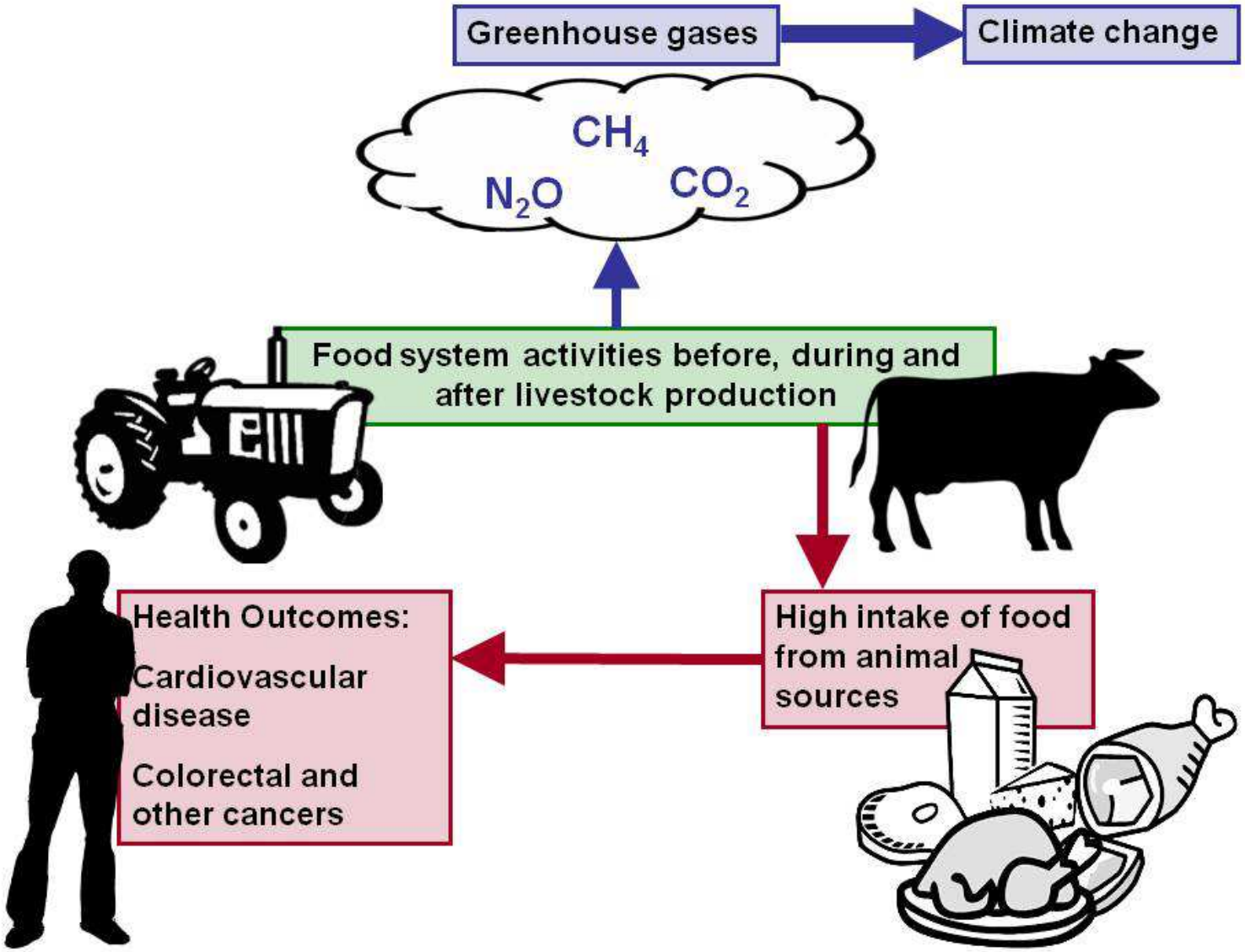
Conceptual framework



GHG and health – results

- 30% drop in animal source food production required to meet 2030 UK GHG target
- Diet / health modelling
  - saturated fat intake → ischaemic heart disease
- 30% reduction in saturated fat consumption
  - 17% drop in premature deaths (~18,000 deaths)
- "Significant co-benefit to health"
- Economy: "Winners and losers"

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Eat fewer sausages and 'save the planet'

By **Daniel Martin**
Political Reporter

CUTTING a sausage a day from the average British diet is necessary to save the planet, scientists claim.

Their controversial report, which partly blames meat-eaters for climate change, was backed by Environment Secretary Hilary Benn's department last night.

The scientists called for a 30 per cent reduction in the number of farm animals bred for meat to prevent rising temperatures and rising sea levels.

The average meat intake in men is 970g a week and in women 550g a week. A 30 per cent reduction in men is equivalent to seven 40g sausages, two 130g chicken breasts, four 70g lamb chops or 12 bacon rashers of 25g.

Such a reduction would also bring significant health benefits, the scientists said, by reducing premature deaths from heart disease in Britain by 17 per cent – equivalent to 18,000 lives a year.

They claimed food production from animals was a major source of agricultural greenhouse gas emissions, and that by 2030, rising demand for meat was expected to drive up livestock production globally by 85 per cent from 2000 levels, leading to substantial emission increases.

Tasty: Sausages are popular

The authors, led by Dr Alan Dangour, from the London School of Hygiene and Tropical Medicine, and Dr Sharon Friel, from the Australian National University in Canberra, wrote in the medical journal The Lancet that improvements in agricultural efficiency were 'necessary but not sufficient to meet targets to reduce emissions'.

Although the Department for Environment, Food and Rural Affairs said it would not comment on the 30 per cent figure, it released a statement to say: 'There are lots of ways people can cut their carbon footprint and impact on the environment – and reducing the amount of meat in our diets is one option.'

But the backing of vegetarian Mr Benn's department, which is specifically responsible for promoting farming, drew strong criticism from farmers and scientists who said cutting meat consumption was not the way to combat climate change.

Peter Kendall, president of the National Farmers' Union, said: 'Farmers will be angry that yet again we have an ill-informed and simplistic report which appears to completely misunderstand agriculture's emissions and its role in climate change.

'This report advocates a 30 per cent reduction in livestock numbers in countries that have the most efficient production systems and hence the lowest emissions.

'What we need to do is look at doing things more efficiently rather than simply cutting livestock numbers.

'The car industry is praised for producing more efficient and environmentally friendly vehicles rather than being told to cut production.

'Other governments that value their livestock production are looking at exciting and innovative ways to reduce agriculture's environmental impacts while understanding the need to produce more food for an expanding global population.'

Professor Ian Crute, chief scientist at the Agriculture and Horticulture Development Board, which advises the meat industry, said: 'A large fall in meat eating or turning vegetarian is not the solution to climate change – it would make only a marginal difference to greenhouse gas emissions.

'The challenge is to produce meat more sustainably – which is already happening in countries such as the UK, which is leading global thinking in this area.'

d.martin@dailymail.co.uk

On-going work

- 151 current/planned relevant studies (in 2012)
- 46 different funders BMGF, CIDA, USAID, IDRC, DFID
- Research most often directed at improving the production and availability of nutritious foods
  - Biofortification & other crop improvements
  - Indigenous/local foods/agrobiodiversity
  - Value chains for nutritious foods

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UKaid from the Department for International Development

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Clear gaps

- Whole research chain i.e. from ag to nutrition
- Cost-effectiveness of interventions
- Population “sub”-groups (urban/male)
- Indirect effects on nutrition
- Effects of agriculture policy on nutrition
- Political economy of agriculture-for-nutrition policies
- Nutrition-related non-communicable diseases
- Development of methods and metrics

What do we need?

Methods

- Study design, study design, study design
- Some (but not all) agricultural innovations are amenable to trials
  - biofortified crops, mobile messages, home gardens
- Evidence from other disciplines
  - regression discontinuity analysis, counterfactual decomposition, qual/quant mixed methods
- Learning across disciplines

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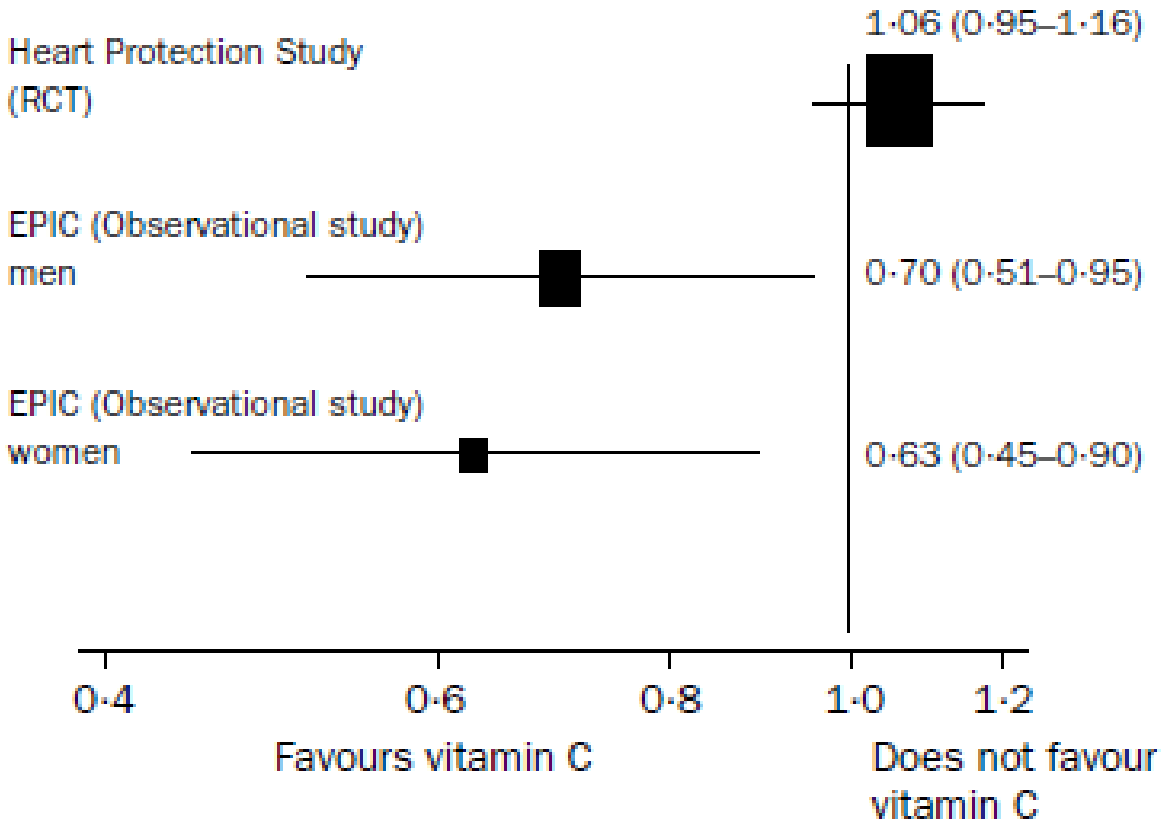
Intervention vs. observation



Estimates of the effects of an increase of 15·7 µmol/L plasma vitamin C on coronary heart disease 5-year mortality

(Lawler, Lancet 2004)

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Metrics

- Direct pathways
  - how likely are impacts on stunting?
  - dietary intake/diversity, micronutrient status
- Indirect pathways
  - income / livelihoods
  - expenditure on schooling, WASH, health care...
- Policy outcomes
  - evaluation methods
  - measurable outcomes

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Meta-analysis

- Requires multiple studies with
  - similar design
  - similar intervention
  - similar outcome variables
- How do we deal with “clinical heterogeneity”?
- How do we include other study designs?
- We must share raw data
  - Dangour et al. 2013 (n=5 trials; n=>4500 children)

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Annals of Internal Medicine | Research and Reporting Methods

Influence of Reported Study Design Characteristics on Intervention Effect Estimates From Randomized, Controlled Trials

- Combined 234 meta-analyses; 1973 trials
- Characteristic: double blind or not
- Outcomes: mortality, other objective, subjective

(Savovic, Arch Intern Med 2012)

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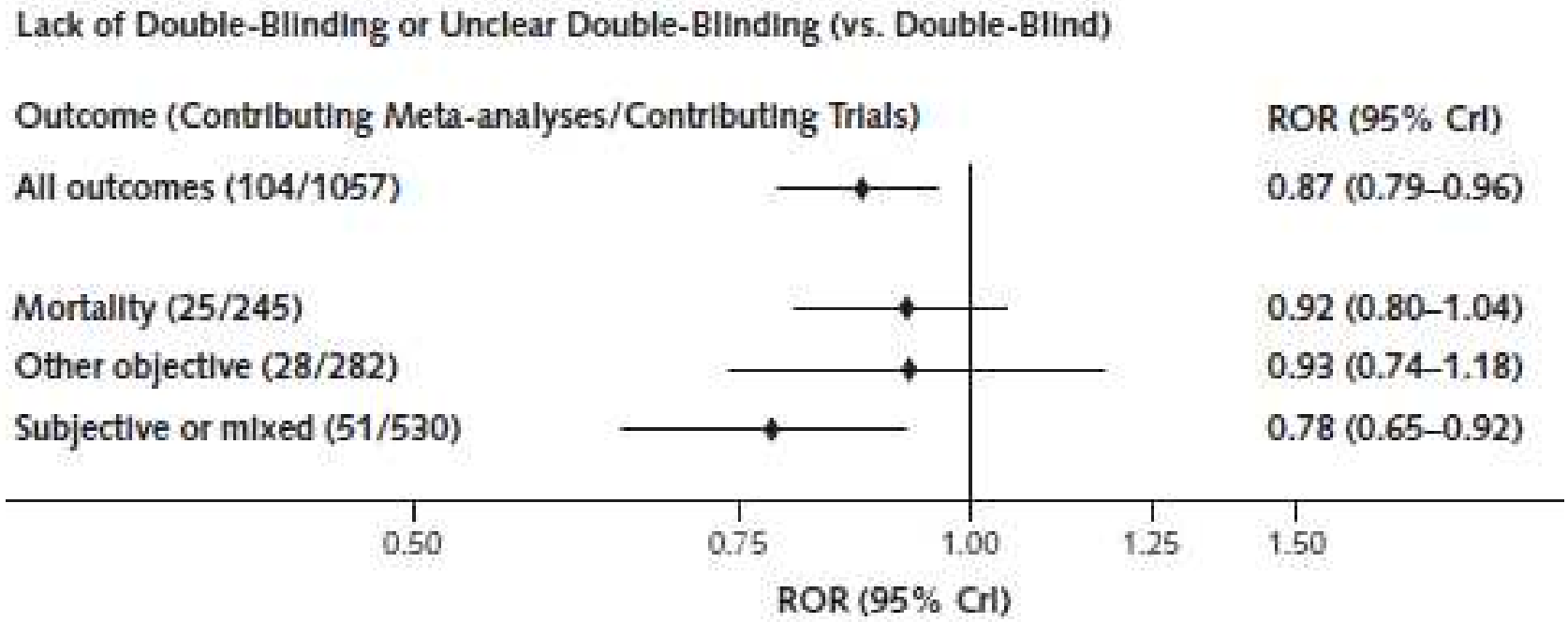
Double-blinding



(Savovic, Arch Intern Med 2012)

Final words

- Robust evidence needed to tackle global health, environmental and nutrition problems
- Unprecedented enabling policy environment

But we urgently need:

- Carefully asked research questions
- Carefully designed research studies
- New partnerships forged across disciplines
- Innovative thinking and problem solving

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