Thought for Food: what we eat affects planetary and human health

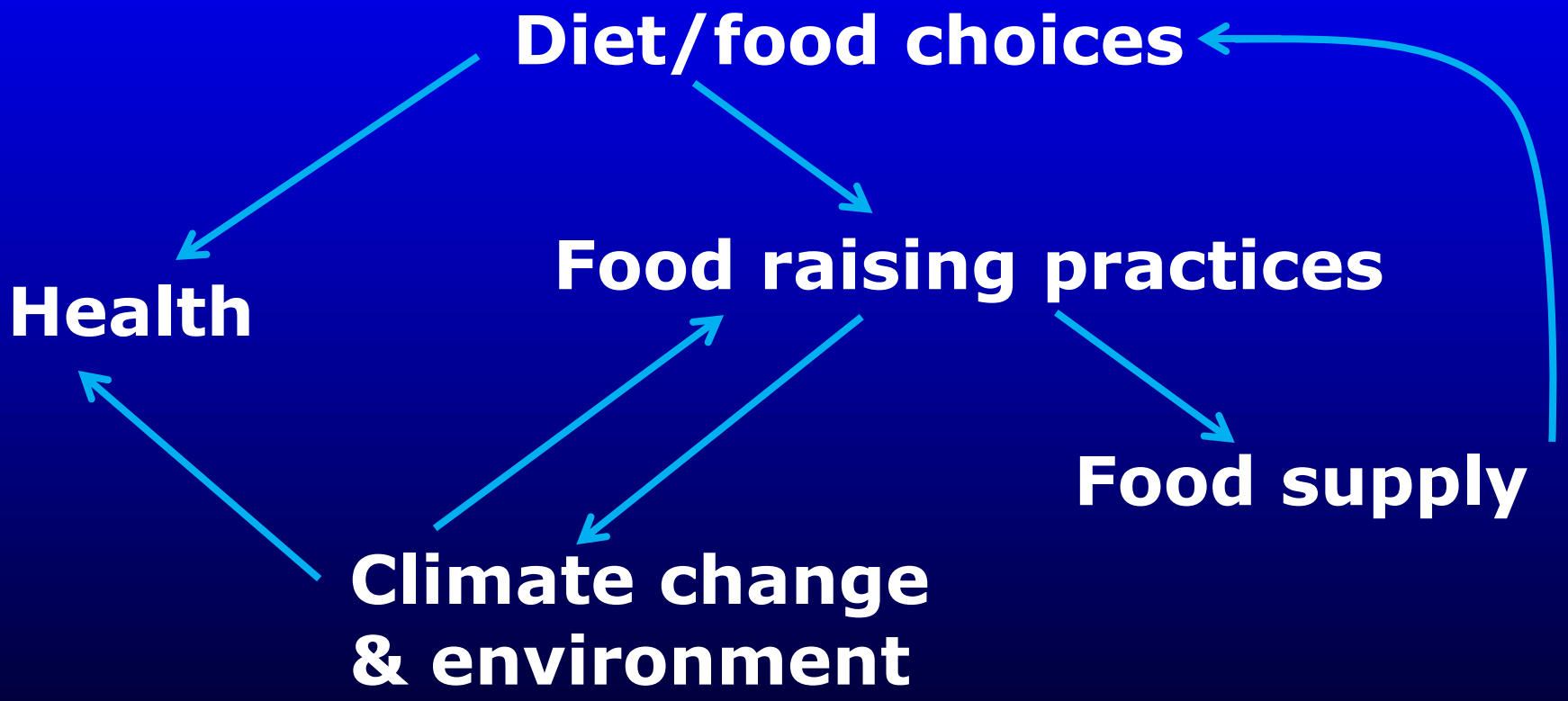
John D Potter MBBS PhD

Professor, Centre for Public Health Research
Massey University, Wellington

Member and Senior Advisor
Fred Hutchinson Cancer Research Center
and Professor Emeritus
University of Washington
Seattle, USA

Presentation at Adapt, Evolve, and Prosper
New Brighton, 7th March, 2020

A knot of intertwined relationships



Diet and Human Health

- **The majority of human cancers and other chronic diseases are influenced by:**
  - **food and drink**
  - **exercise patterns**
  - **body weight**
  - **smoking**
  - **work and workplaces**

Diet and Human Health

- Some of these habits and exposures are, in turn, influenced by:
  - culture
  - family
  - our times
- They are also shaped strongly by what foods and drinks are produced, advertised, and sold

Diet and Human Health

- Some people make conscious choices about these matters
- Very often, though, we do not examine our habits and just take them for granted

Diet and Human Health

- Perhaps we imagine that the way we eat, drink, and live now is the way we always have

- But is that true?

Rare in Nature

- Sugar
- Salt
- Fat
- Meat
- Alcohol
- Tobacco
- Poppies
- Coca
- Cannabis
- Coffee

We have a taste for them all – and, because they are rare in nature, there were no deleterious consequences to consumption, even sporadic overconsumption

Hence, we have not evolved natural curbs on their overconsumption

Rare in Nature

- Our response to their rarity – once we had established that we did not just have to gather and hunt – was to cultivate them to keep ourselves in calories and comfort
- Our commitment to this approach has led us – especially recently – to more and more intensity in the way we raise our food (and drugs)

Rare in Nature

Throughout human history, we raised and consumed modest amounts of these, *e.g.*:

- **Per capita sugar consumption in the UK around 1700 was less than 2kg/year**

Mintz, S: *Sweetness and Power* 1986

- **Per capita sugar consumption in NZ by 2008/9 was around 40kg/year (a 20- to 25-fold increase)**

Rare in Nature

- **Meat consumption in traditional agricultural societies was rarely higher than 5–10 kg a year; in most subsistence peasant societies of the Old World, meat was eaten no more frequently than once a week and relatively larger amounts were consumed, as roasts and stews, only during festive occasions.**

  Smil, V: Pop Devel Rev 2002;28:599

- **Meat consumption in New Zealand (also Australia and US) is now around 120 kg/year (a 12- to 24-fold increase) [India around 3 kg]**

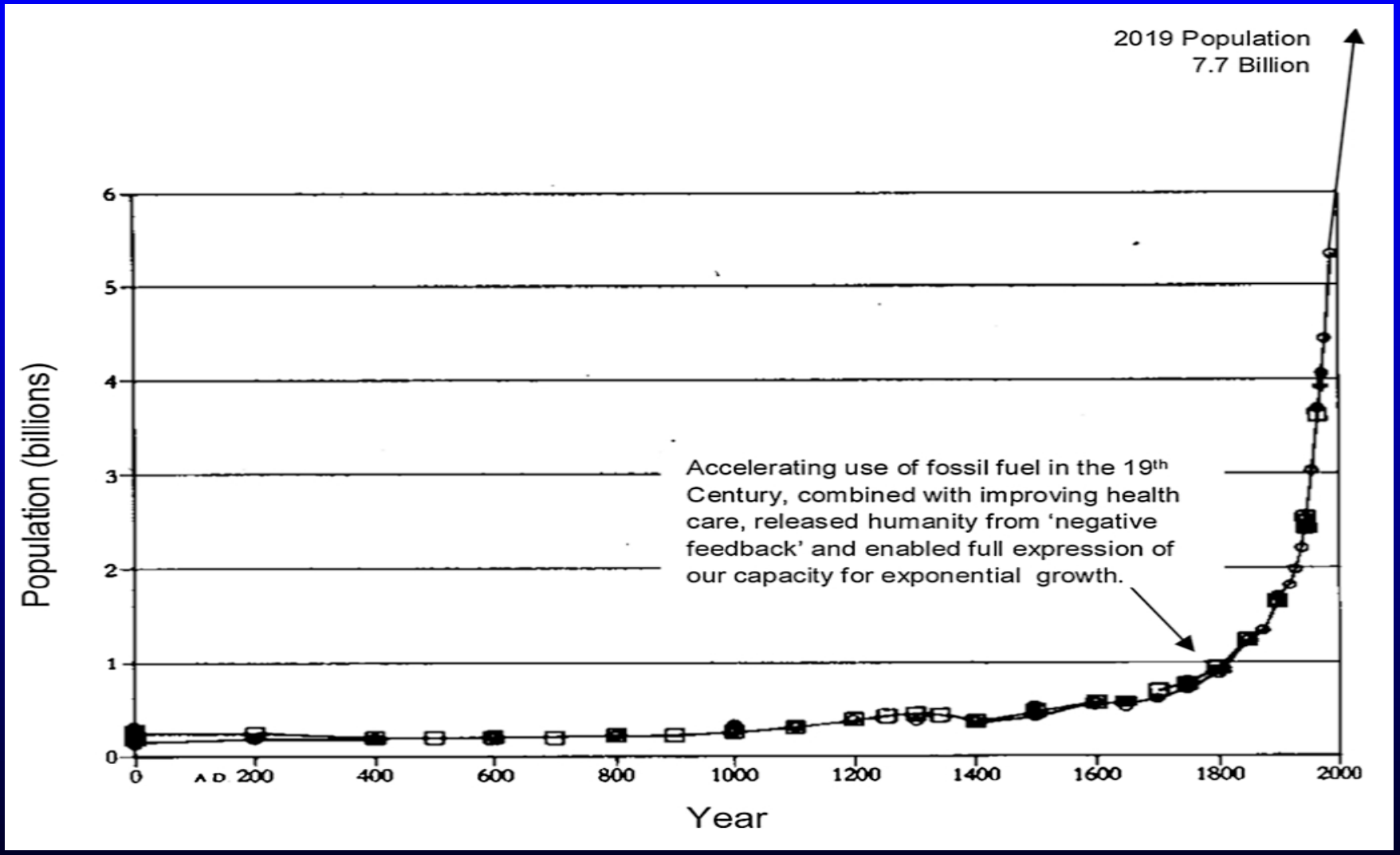
Rare in Nature

- **Alcohol was not part of human dietary intake at all until we became agriculturalists at various times in the last 10-15 thousand years and learned how to ferment carbohydrates**

- **Per capita current average alcohol consumption in NZ is 2 drinks per day: 35 million litres of pure alcohol per year**

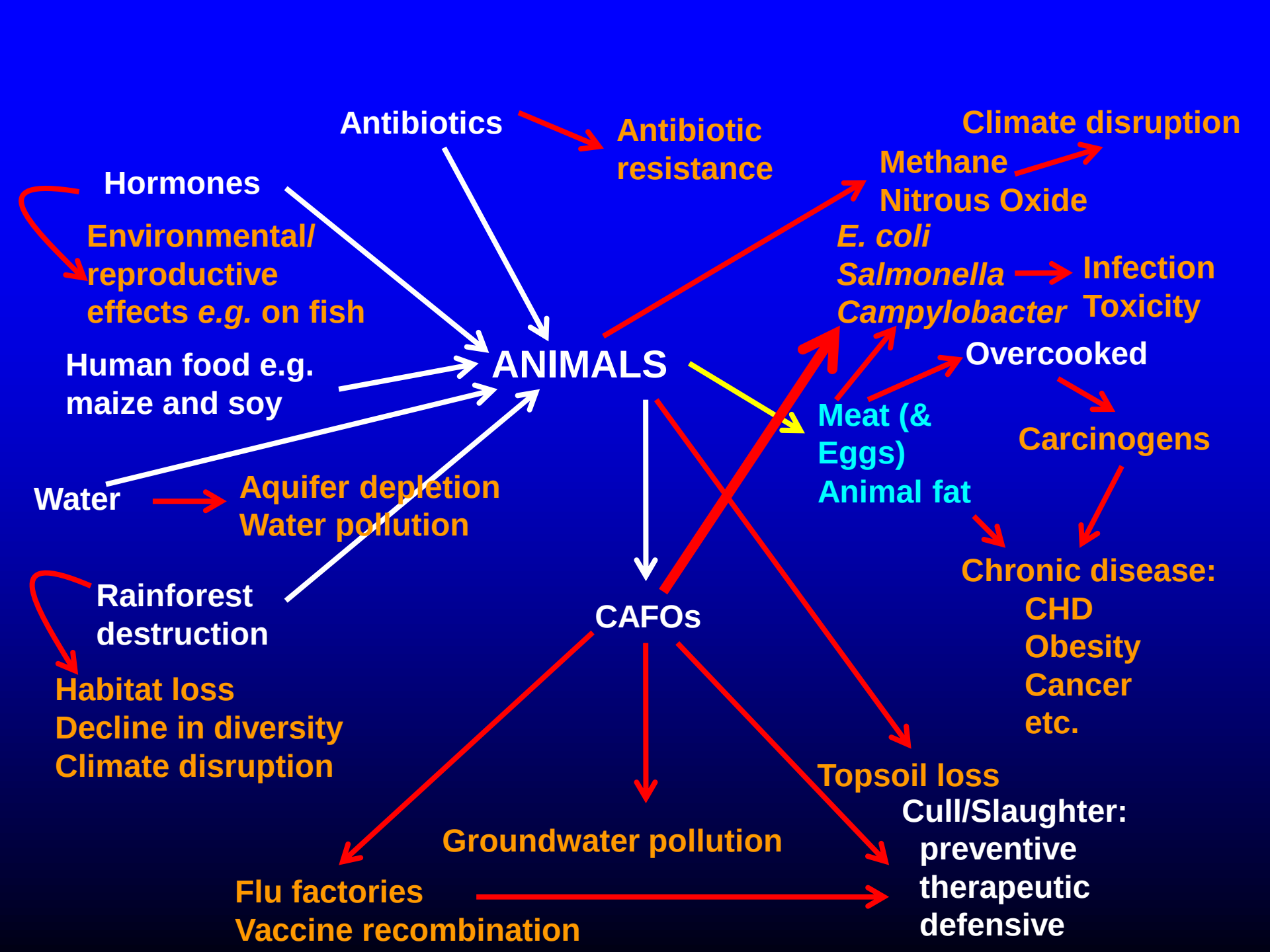
https://www.alcohol.org.nz/resources-research/facts-statistics

We were once much rarer too

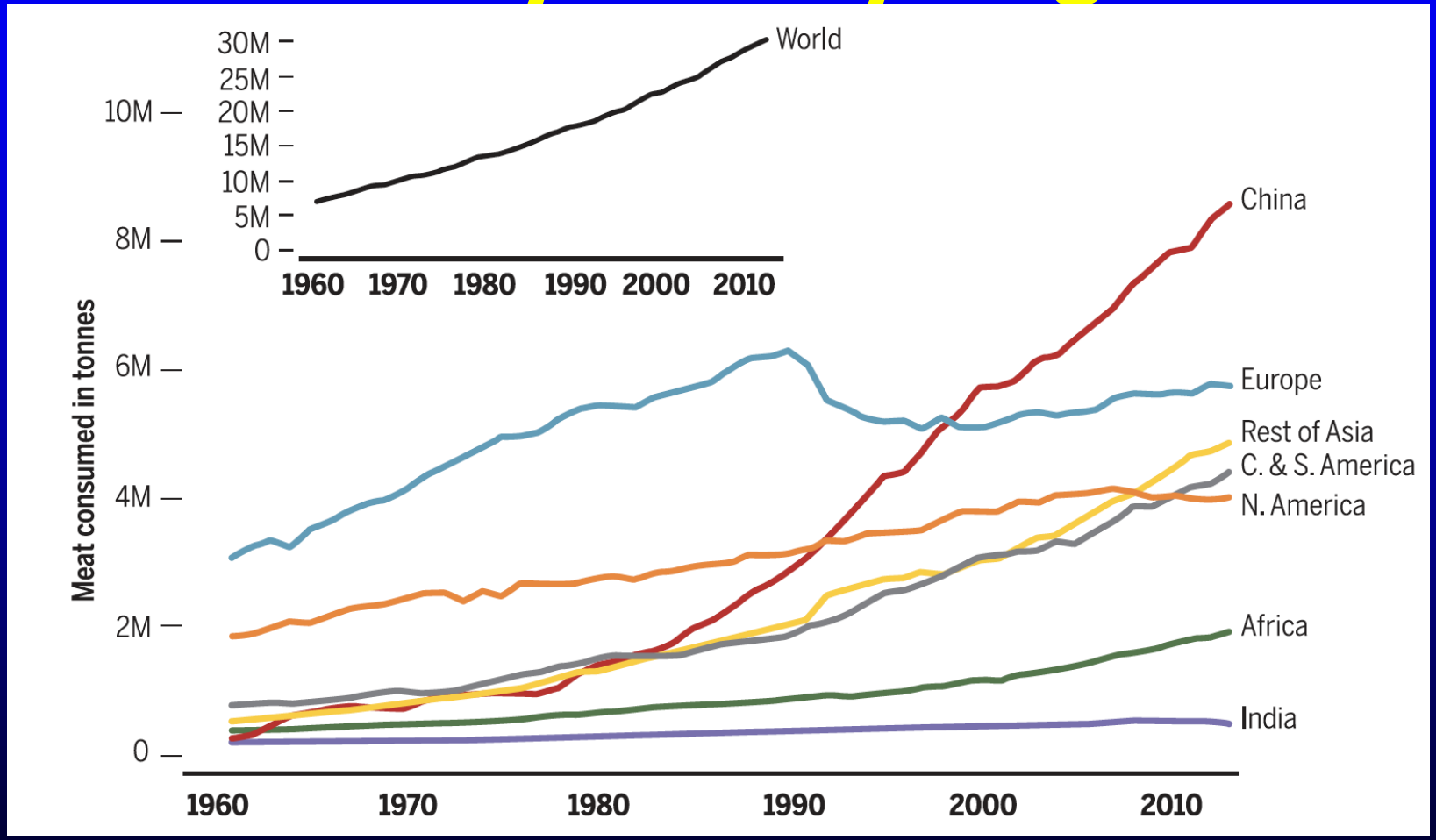


Rare in Nature

- **Indeed, our demand and our capacity increasingly stretch the boundaries of what is possible**
- **Deleterious consequences – to our planet and our health – abound**
- **One example**


Antibiotics
Antibiotic resistance
Climate disruption
Methane
Nitrous Oxide
Hormones
Environmental/ reproductive effects e.g. on fish
E. coli
Salmonella
Campylobacter
Infection
Toxicity
Human food e.g. maize and soy
ANIMALS
Overcooked
Meat (& Eggs)
Animal fat
Carcinogens
Water
Aquifer depletion
Water pollution
Chronic disease:
CHD
Obesity
Cancer
etc.
Rainforest destruction
CAFOs
Habitat loss
Decline in diversity
Climate disruption
Topsoil loss
Groundwater pollution
Cull/Slaughter:
preventive
therapeutic
defensive
Flu factories
Vaccine recombination

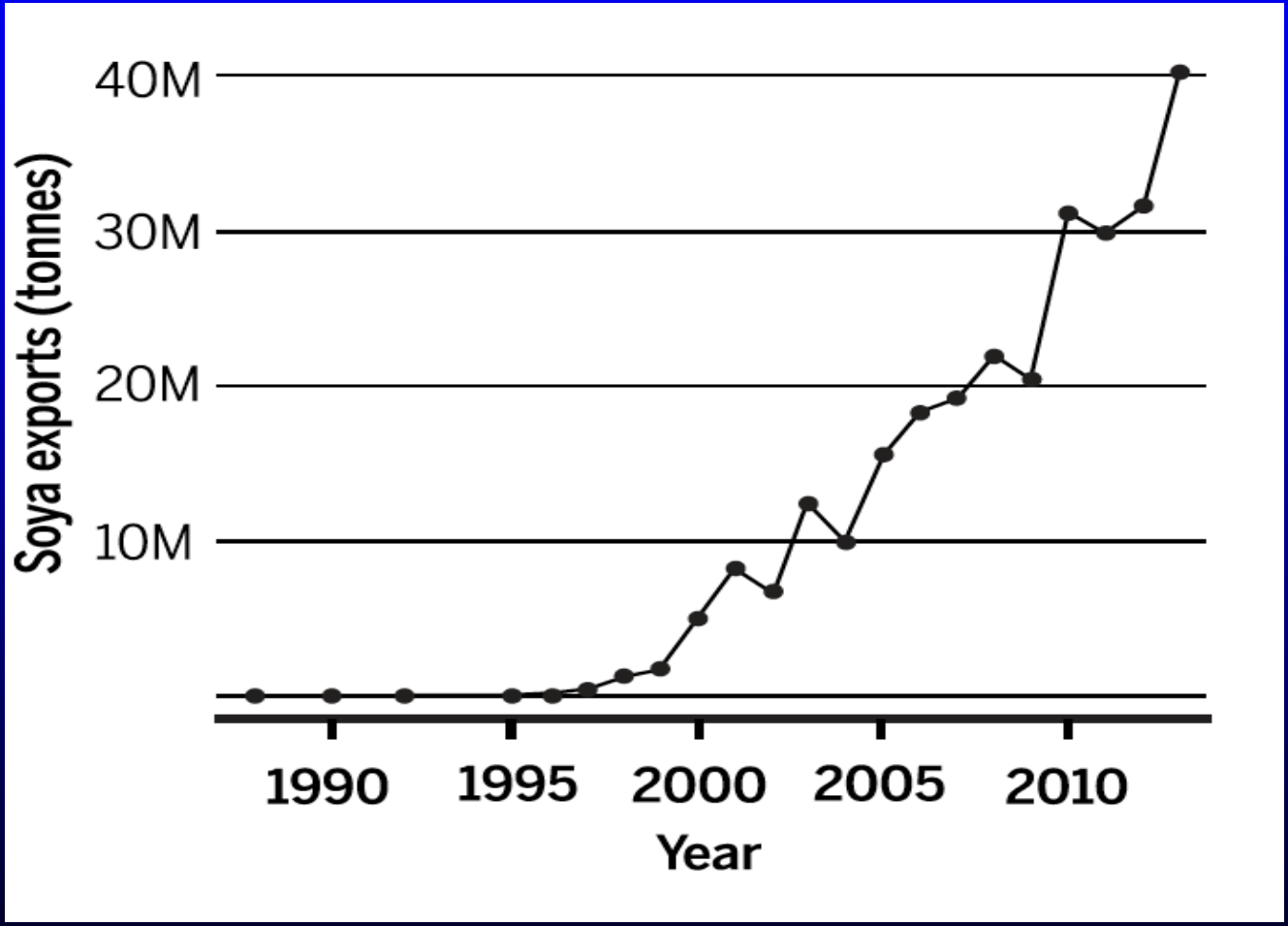
Total Consumption of Meat Globally and by Region



[Data are from: www.fao.org/faostat/en/?#data.]

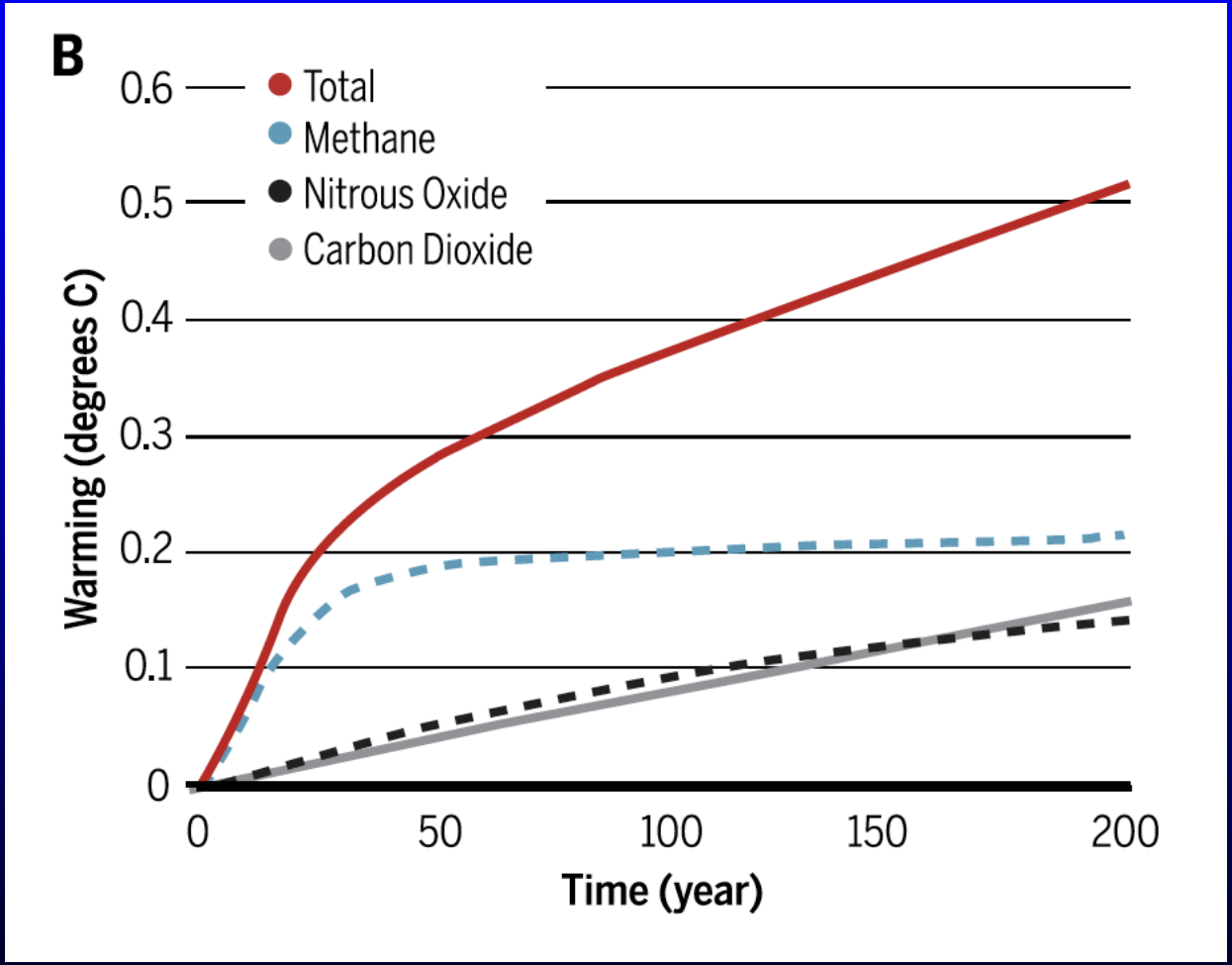
Godfray et al., Science 2018;361:243

Exports of Soy for Livestock from South America to China



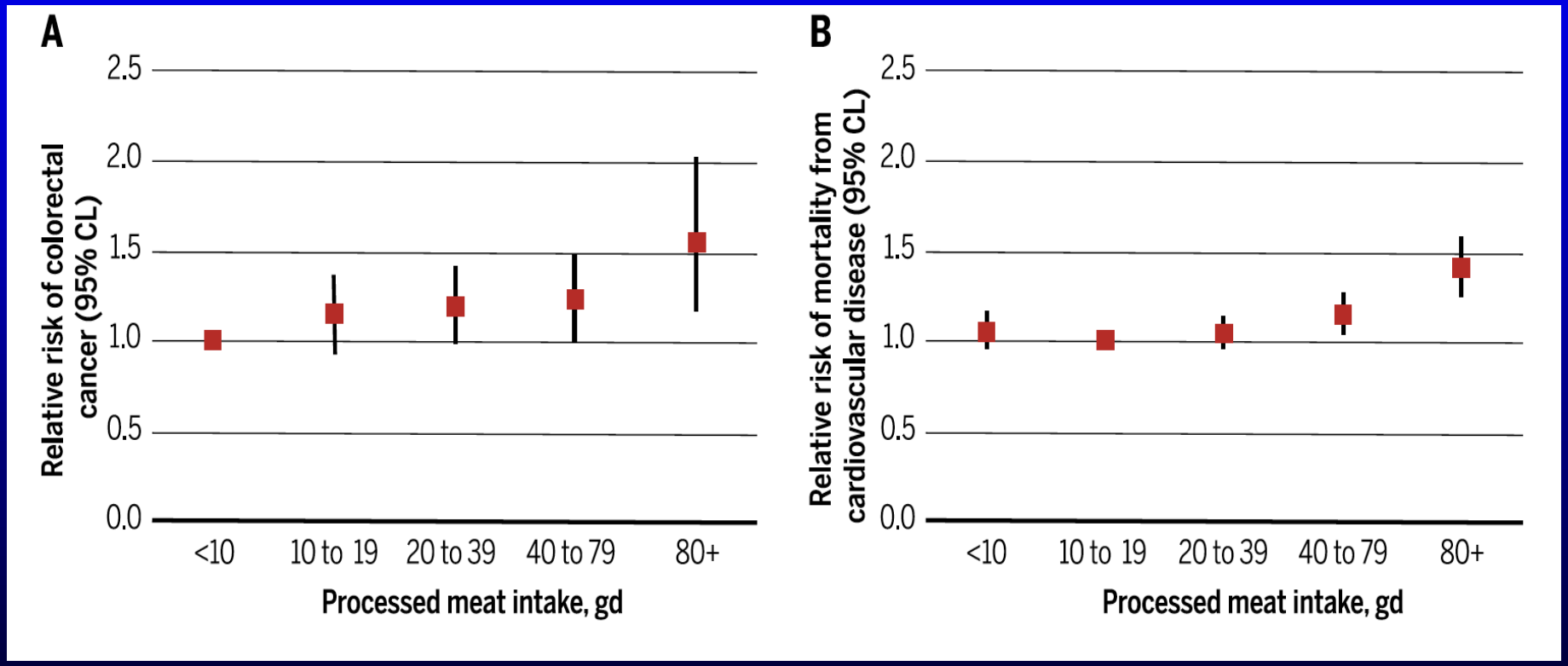
Godfray et al., Science 2018;361:243

Livestock and Warming by Greenhouse Gases



Godfray et al., Science 2018;361:243

Processed Meat and RR of Bowel Cancer & Death from Cardiovascular Disease



Godfray et al., Science 2018;361:243

Alcohol and Disease Burden

Evidence of a causal impact of average amount of alcohol consumed on:

- **Tuberculosis**
- **Mouth, tongue, and throat cancer**
- **Oesophageal cancer**
- **Colon and rectum cancer**
- **Liver cancer**
- **Female breast cancer**
- **Diabetes**
- **Alcohol-use disorders**

Rehm et al Addiction 2010;105:817

Alcohol and Disease Burden

As well as:

- **Depression**
- **Epilepsy**
- **Heart disease**
- **Stroke**
- **Heart rhythm disorders**
- **Pneumonia**
- **Cirrhosis of the liver**
- **Preterm birth complications**
- **Fetal alcohol syndrome**

Rehm et al Addiction 2010;105:817

And all we seem to be able to remember is that alcohol is good for blood cholesterol and heart disease…

And all we seem to be able to remember is that alcohol is good for blood cholesterol and heart disease…

… and even that turns out not to be true

Alcohol and Disease Burden

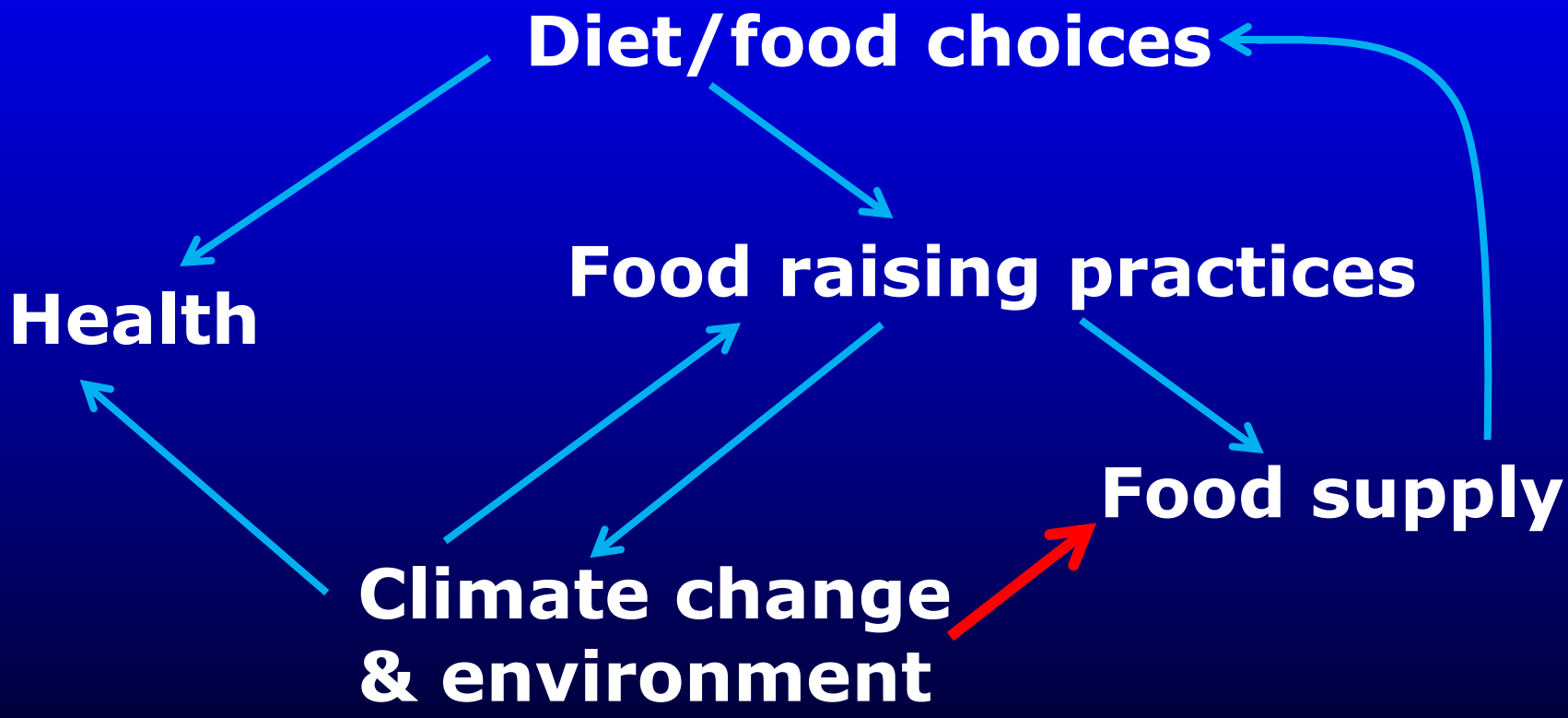
- **Alcohol use is a leading risk factor for global disease burden and causes substantial health loss**
- **Risk of all-cause mortality, and of cancers specifically, rises with increasing levels of consumption**
- **Level of consumption that minimises health loss is zero drinks/week**

- **New Zealand: 2 drinks/day**

So what should we do about New Zealand's alcohol-control policies?

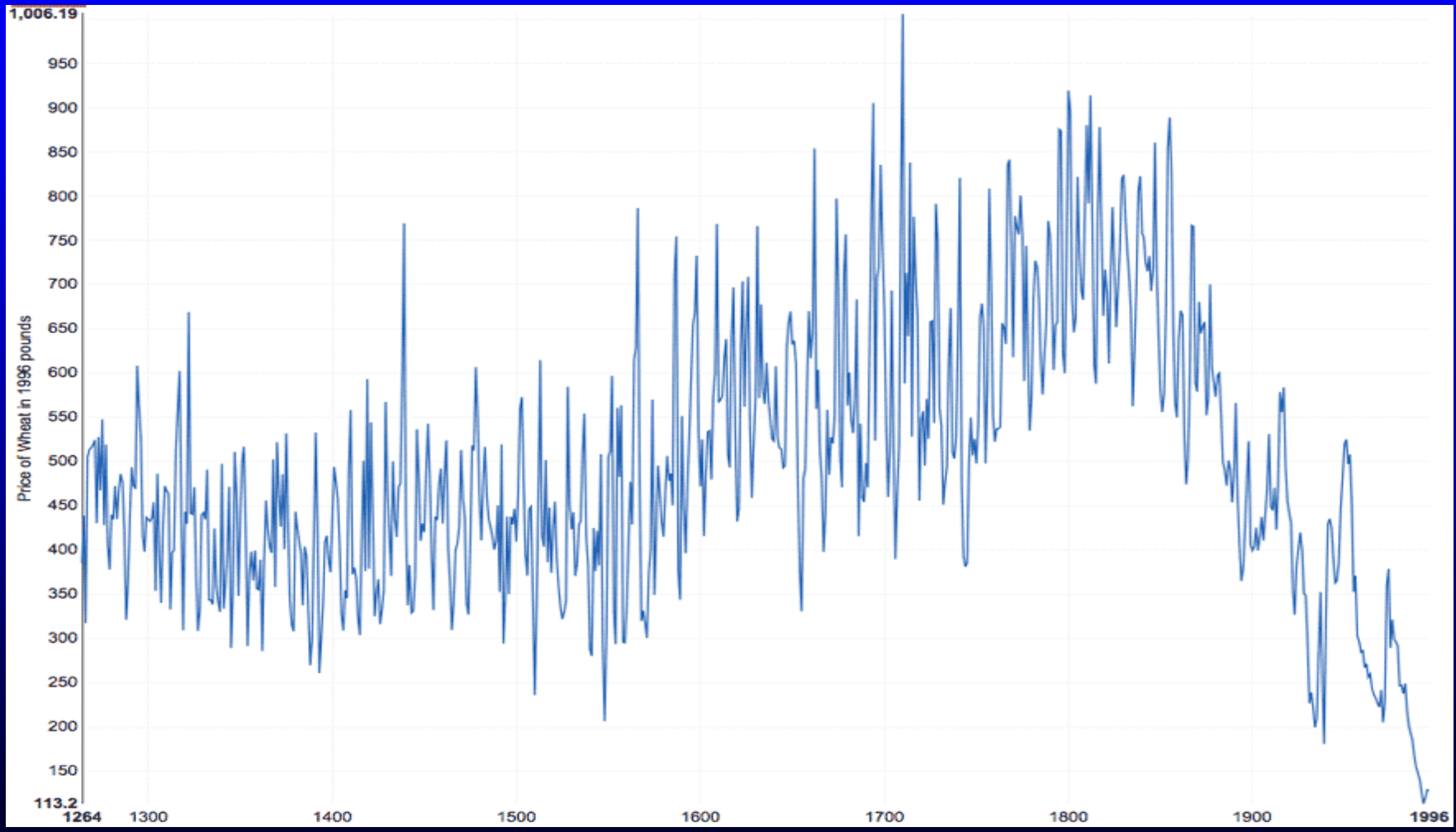
Global Burden of Disease 2016 Alcohol Collaborators: Lancet 2018 392:1015

A nexus of intertwined relationships



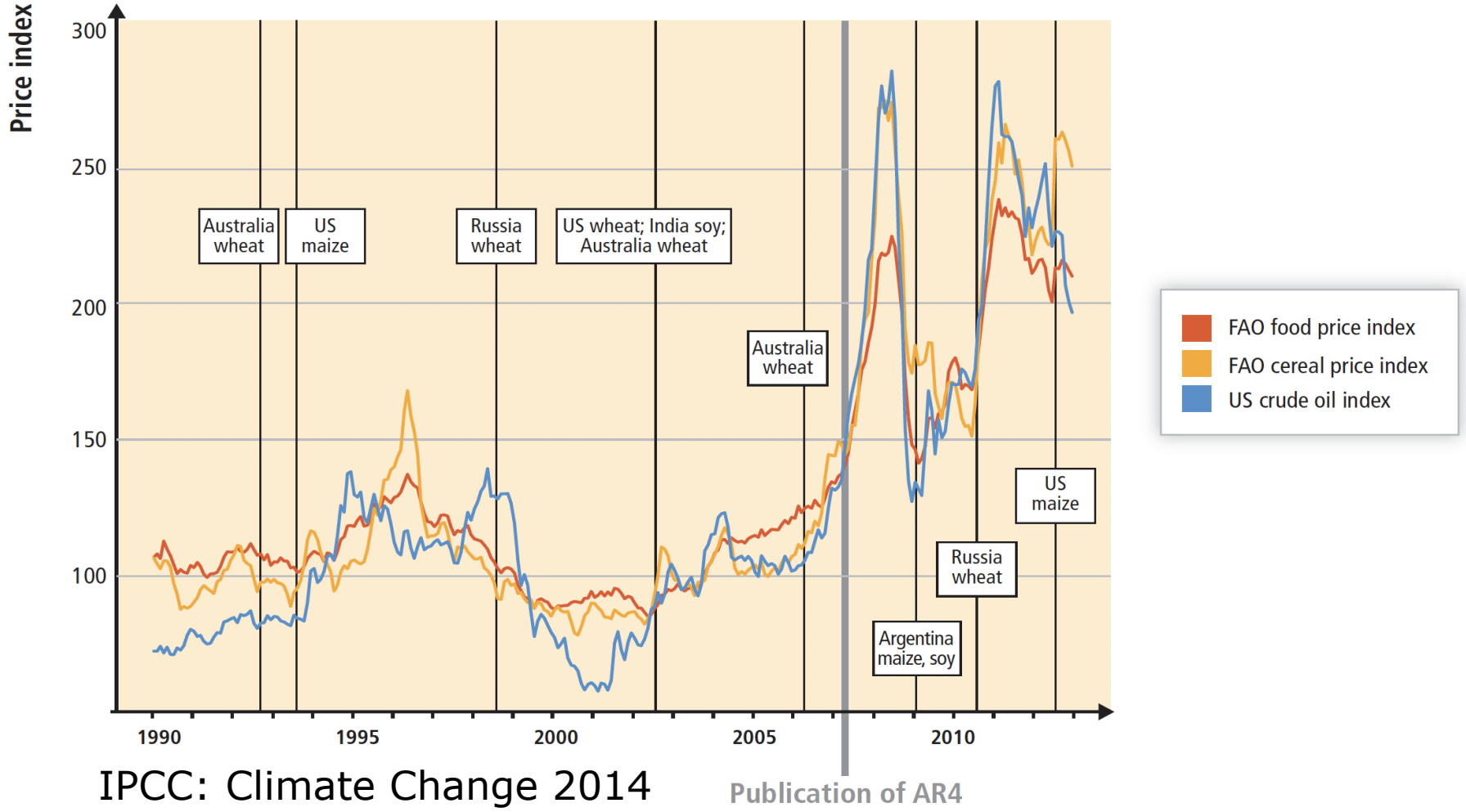
What is climate change doing to food raising and the food supply?

Wheat price since 13th Century (in 1996 £)



Max Roser: https://ourworldindata.org/food-prices

Recent Reversal of Long-term Downward Trend in Food Prices



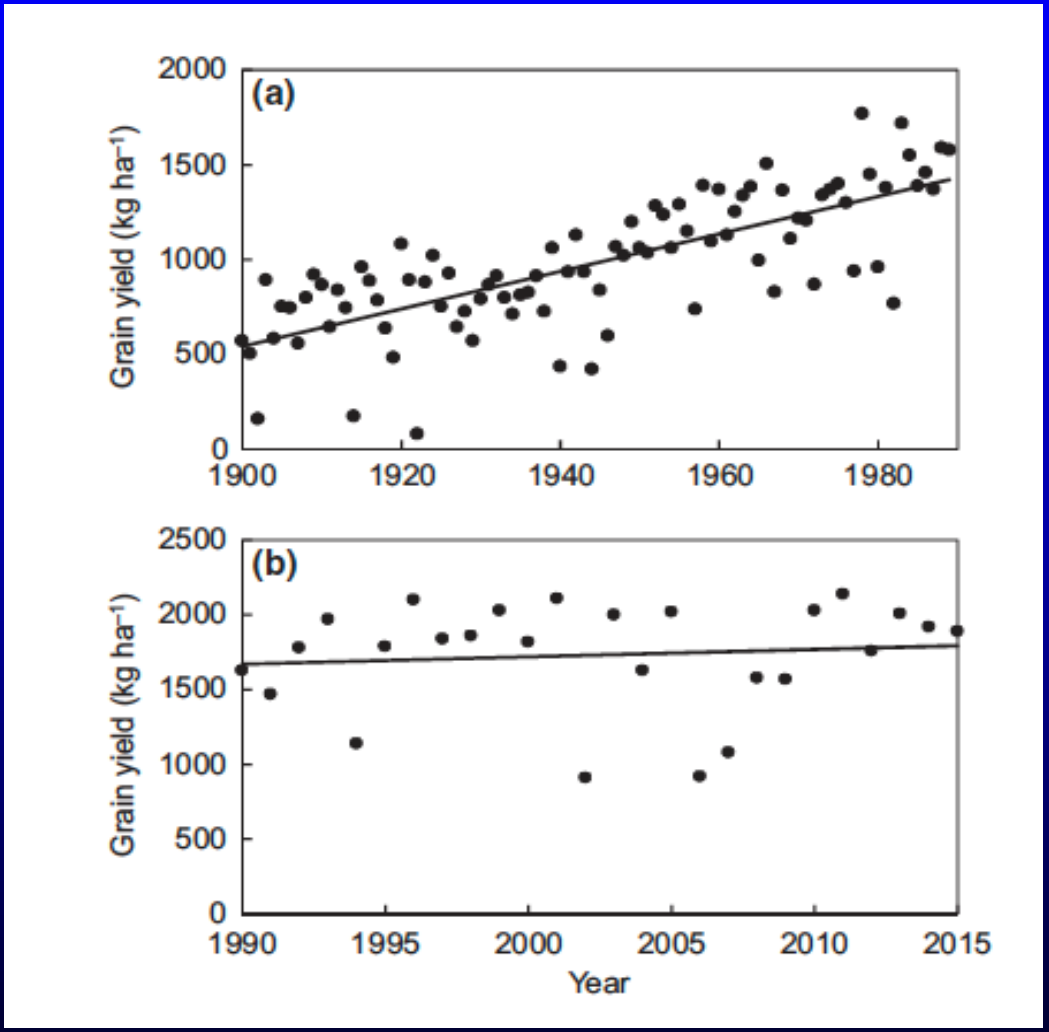
IPCC: Climate Change 2014

http://www.fao.org/worldfoodsituation/foodpricesindex & http://faostat.fao.org/

Climate Change and Wheat

Contrasting time series of Australian wheat yields:
(a) 1900-1989 (Yield = 9.8826 x Year – 18234; R^2 = 0.5592; P <10^{-10})

(b) 1990-2015 (Yield = 5.160 x Year – 8608; R^2 = 0.0121; P = 0.593) with no statistically significant trend



Hochman et al. Glob Change Biol 2017;23:2071

Climate Change and Other Foods

Two other major human staples are also under stress:

- **Maize is increasingly under threat as temperatures rise**
- **Rice, in some contrast, is under threat from rising levels of CO_2 in the atmosphere**

Tigchelaar et al. PNAS 2018;115:6644

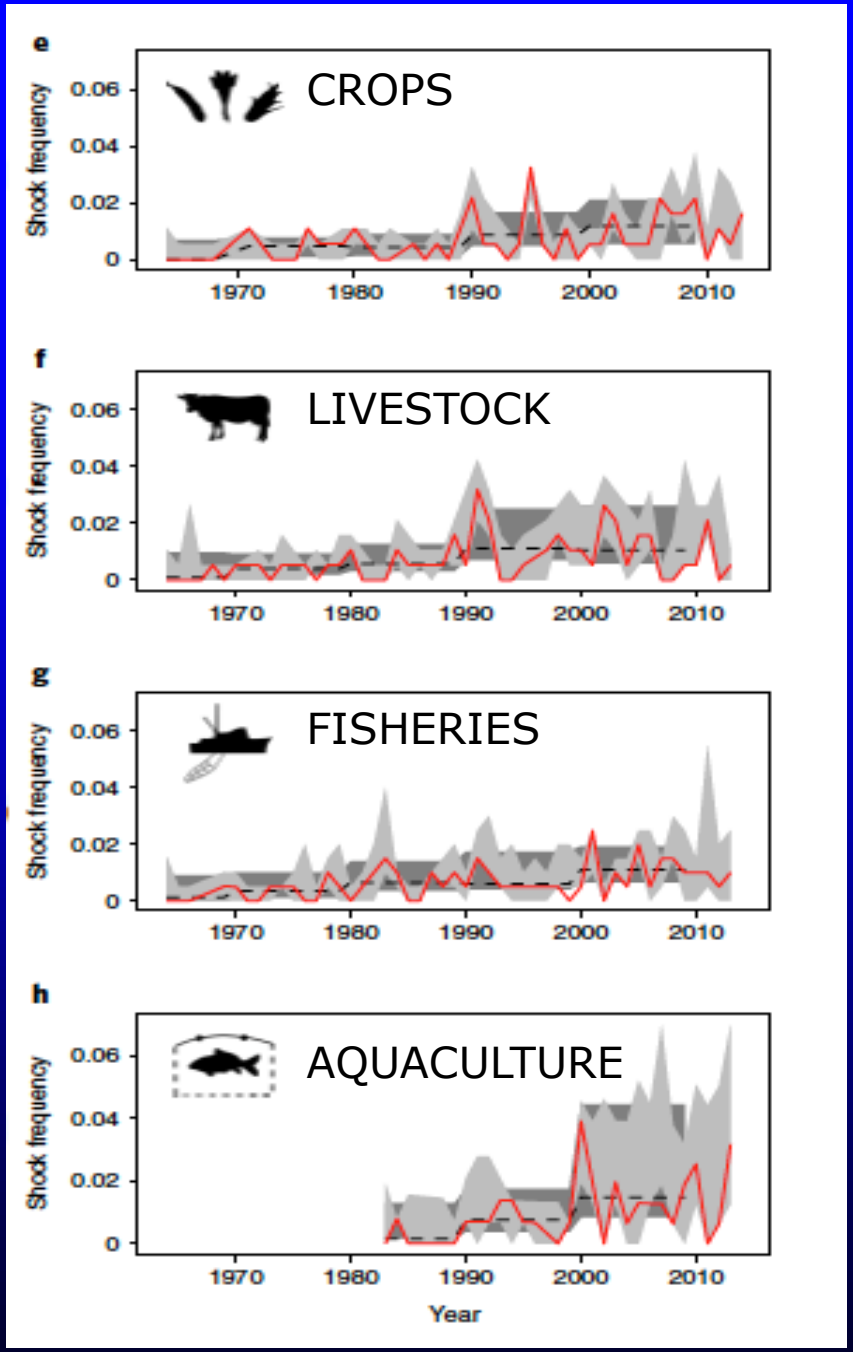
Zhu et al. Sci Adv 2018; 4: eaaq1012

Climate Change and Coastal Losses

- Seagrass decline New Zealand
- Great Barrier Reef bleaching (temperature)
- Mangrove inundation in Indo-Pacific region (sea-level rise)
- Kelp forest loss in Western Australia (temperature)

- These are all, among many other roles, nurseries for fish and marine invertebrates
- Combined with overfishing, this does not bode well even for the medium term

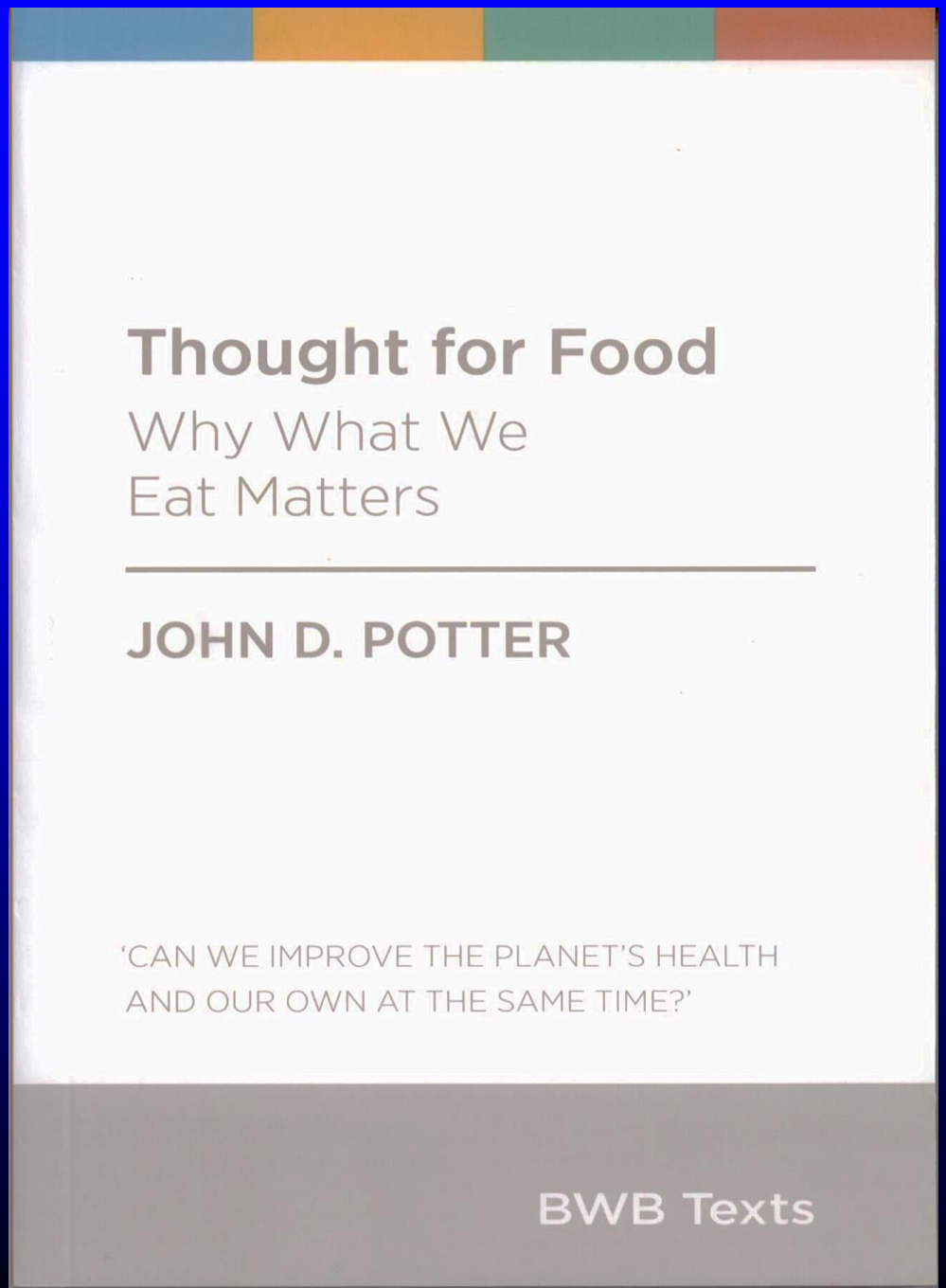
Trends in food-production shock frequency in crop, livestock, fisheries, and aquaculture sectors from 1961–2013



Cottrell et al Nature Sustainability 2019;2:130

What is climate change doing to food raising and the food supply?

It is starting to make our food supply more uncertain – one more reason to think seriously about how we should respond to climate change



Potter, JD BWB Texts 2018

It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent upon each other in so complex a manner, have all been produced by laws acting around us.

We seem, increasingly, to find ways to mock those laws. But we do so at growing peril to ourselves and the planet.

Darwin, C: *Origin of Species* 1859