

29.09.2022

# Avoiding **meat** will not fix Planetary Health: the need to factor in adequate **nutrition**

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*Vrije Universiteit Brussel, Brussels, Belgium*

# Meat 4.0 - the post-industrial paradigm

- (Ruminant) meat is now often **unfairly presented as destructive** for both human and planetary health, and generally as unethical
- **Solutions tend to be simplistic:** ‘alternatives’ (either animal cell-based or plant-based) are promoted by various high-profile players (public-private partnerships)
- Misleading claims are common (“**The Science**” says...)



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28 SEP 2018 | PRESS RELEASE | CITIES AND LIFESTYLES

## Plant-based meat revolutionaries win UN's highest environmental honor



**Ingredients list, Beyond Burger:** Water, pea protein isolate, expeller-pressed canola oil, refined coconut oil, contains 2% or less of the following: cellulose from bamboo, methylcellulose, potato starch, natural flavor, maltodextrin, yeast extract, salt, sunflower oil, vegetable glycerin, dried yeast, gum arabic, citrus extract (to protect quality), ascorbic acid (to maintain color), beet juice extract (for color), acetic acid, succinic acid, modified food starch, annatto (for color).

Typically ultra-processed products based on protein isolate, oil, additives, ...

# Meat 4.0 - the post-industrial paradigm

Reductionist/simplistic messages now even coming from academia



University of Oxford  
@UniofOxford

'A vegan diet is probably the single biggest way to reduce your impact on planet Earth, not just greenhouse gases, but global acidification, eutrophication, land use and water use' >

[po.st/FqUUmm](https://po.st/FqUUmm)

[J.Poore, School of Geography & Environment]

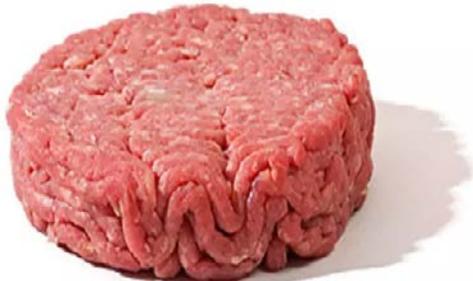
#TruePlanet



University of Oxford  
@UniofOxford

What if we all turned vegan by 2050? It's the way to beat climate change argues Dr Marco Springmann

[po.st/HIUvuP](https://po.st/HIUvuP)



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Typically ultra-processed products based on protein isolate, oil, additives, ...

# A more **balanced** scientific debate is needed

Is there still a place for animal agriculture in future foodscapes?

The answer is largely “yes!”, but also: “it depends”.

## Animal source foods in ethical, sustainable & healthy diets

A dynamic white paper - #ALEPH2020

ALEPH2020

ASFs and Livestock

Ethics

Planet

Human health

Experts

Concept: what is this website about?



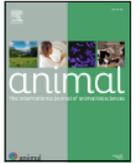
The **ALEPH2020 initiative** (Animal source foods and Livestock: Ethics, Planet, and Human health) was launched at the end of 2020 by a broad international and interdisciplinary consortium of 40+ scientific experts. The acronym refers to the first letter of the Proto-Canaanite alphabet 'Aleph', which later also morphed into the Greek 'Alpha' and Latin 'A'. Originally, the letter was derived from the West Semitic word for 'ox' depicted in a Proto-Sinaitic glyph, on its turn likely obtained from an Egyptian hieroglyph showing a bovine head. As such, it not only represented a vocal sound and scriptural element, but also notions of strength, vitality, fertility, and generosity. Throughout human prehistory and history, animals (either hunted or domesticated) and animal source foods (ASFs) have always held these connotations, as they were essential for survival and sustenance.



Contents lists available at [ScienceDirect](#)

Animal

The international journal of animal biosciences



Animal board invited review: Animal source foods in healthy, sustainable, and ethical diets – An argument against drastic limitation of livestock in the food system



Frédéric Leroy<sup>a,\*</sup>, Fabien Abraïni<sup>b</sup>, Ty Beal<sup>c,d</sup>, Paula Dominguez-Salas<sup>e,f</sup>, Pablo Gregorini<sup>g,h</sup>, Pablo Manzano<sup>i,j,k</sup>, Jason Rowntree<sup>l</sup>, Stephan van Vliet<sup>m</sup>

- Outcomes depend on practical specificities, not on the fact that animals are involved.
- As for any food, the challenge is to promote best practices and limit harm.
- Well-managed animals contribute to food security, ecological function and livelihoods.
- Heavy reduction of livestock may lead to a fragile food system and societal damage.

# (1) Unethical?

cf. <https://aleph-2020.blogspot.com>

## Animal source foods in ethical, sustainable & healthy diets

A dynamic white paper - #ALEPH2020

ALEPH2020

ASFs and Livestock

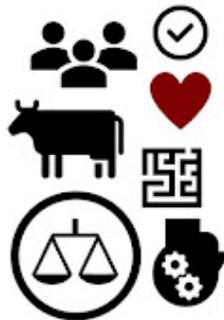
Ethics

Planet

Human health

Experts

### Ethics



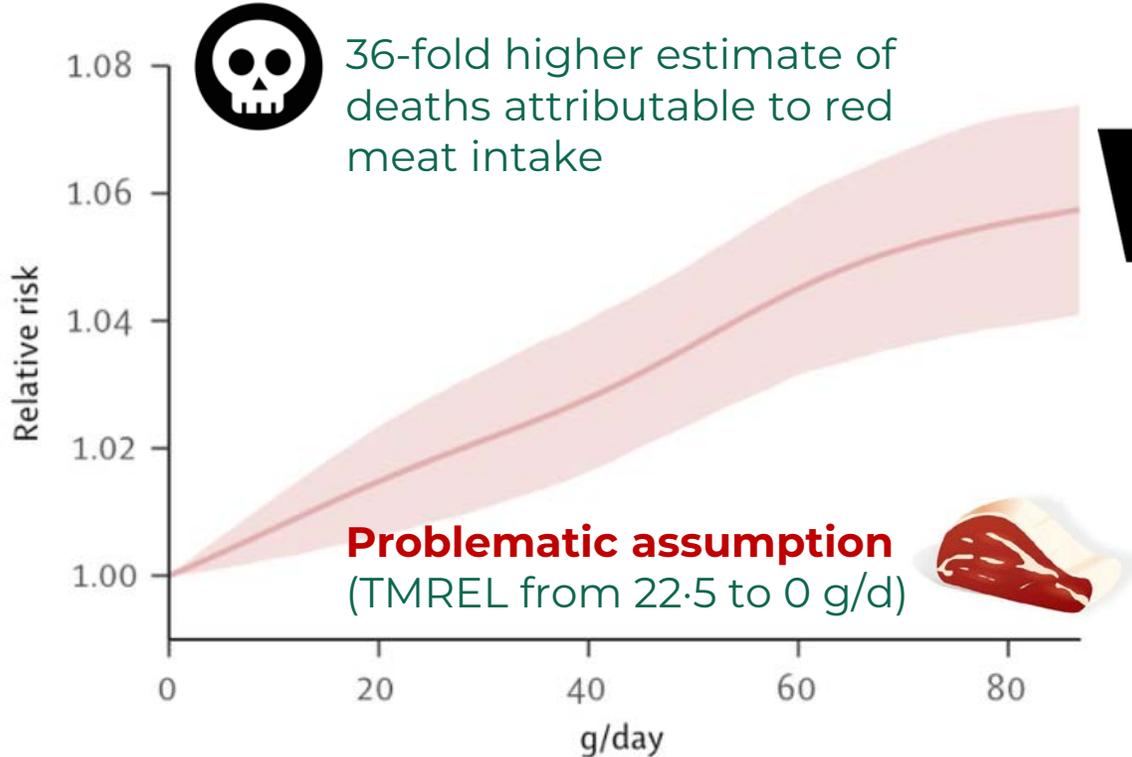
Ethics are standards of what is to be expected from each other and ourselves in specific situations, requiring social transactions. Whether eating animal source foods (ASFs) is considered justified or not is nonetheless a personal matter, depending on one's worldview, beliefs, and expectations. The ethical dimension, which cannot be isolated from **health** and **sustainability**, relates to the hunting, domestication, keeping, and/or killing of animals to generate food and other important products. Animal welfare is generally accepted as an ethical standard, even if not all of animal husbandry is currently meeting the criteria. Some animal right activists, however, wish to move beyond welfare; they not only argue for animal *rights*, but also favor a severe reduction or, sometimes, radical *elimination* of ASFs. This, however, would give rise to its own set of ethical complications.

- Why there is reason for concern (and hope for improvement)
- Why the mainstream ethical case against livestock is unbalanced
- Why eliminating livestock would come with its own concerns

# (2) Unhealthy?

## Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019

GBD 2019 Risk Factors Collaborators\*



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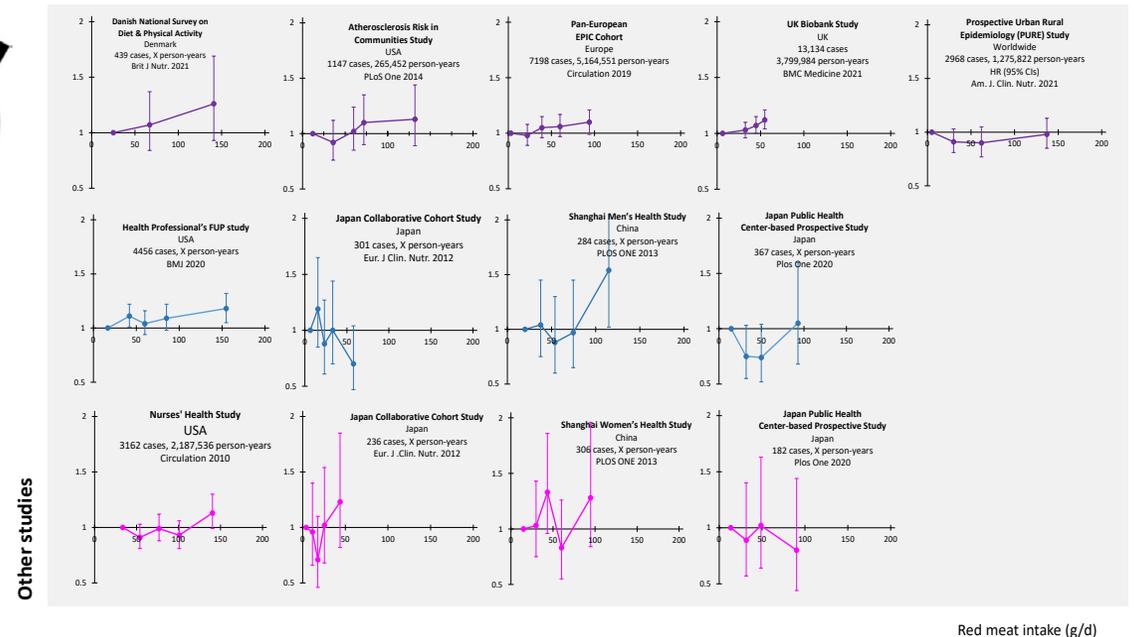
PDF [85 KB]

### 36-fold higher estimate of deaths attributable to red meat intake in GBD 2019: is this reliable?

Alice V Stanton · Frédéric Leroy · Christopher Elliott · Neil Mann · Patrick Wall · Stefaan De Smet

Published: February 25, 2022 · DOI: [https://doi.org/10.1016/S0140-6736\(22\)00311-7](https://doi.org/10.1016/S0140-6736(22)00311-7)

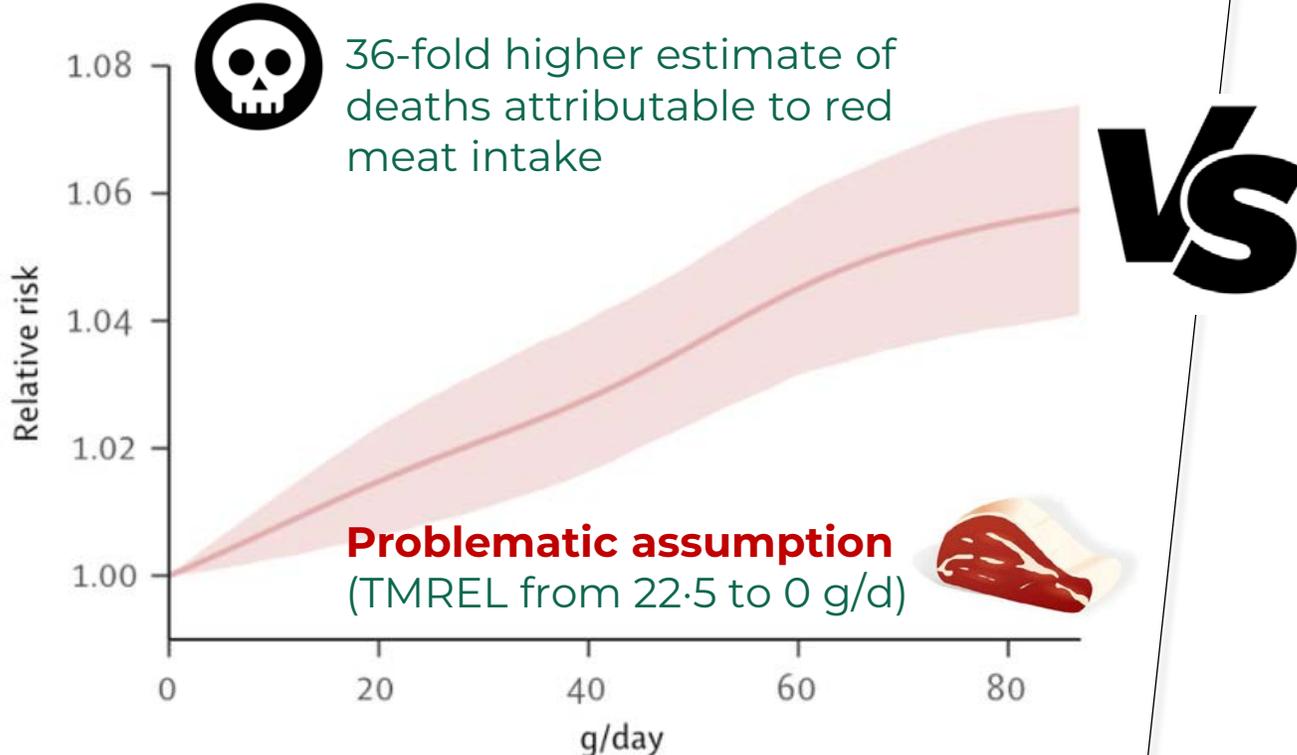
### Contradicted by large-scale studies for levels below 75 g/d (and very uncertain above that)



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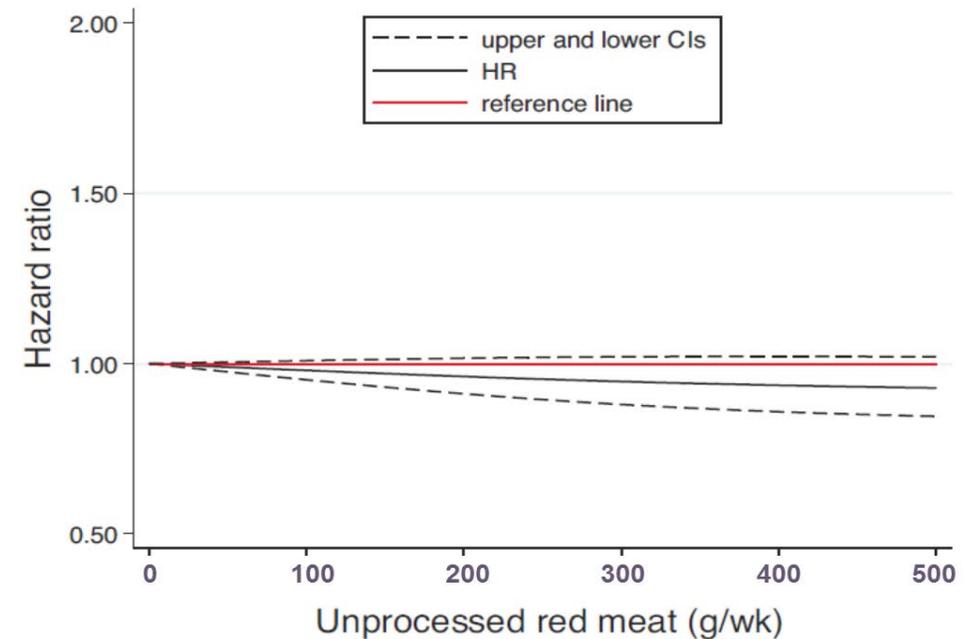
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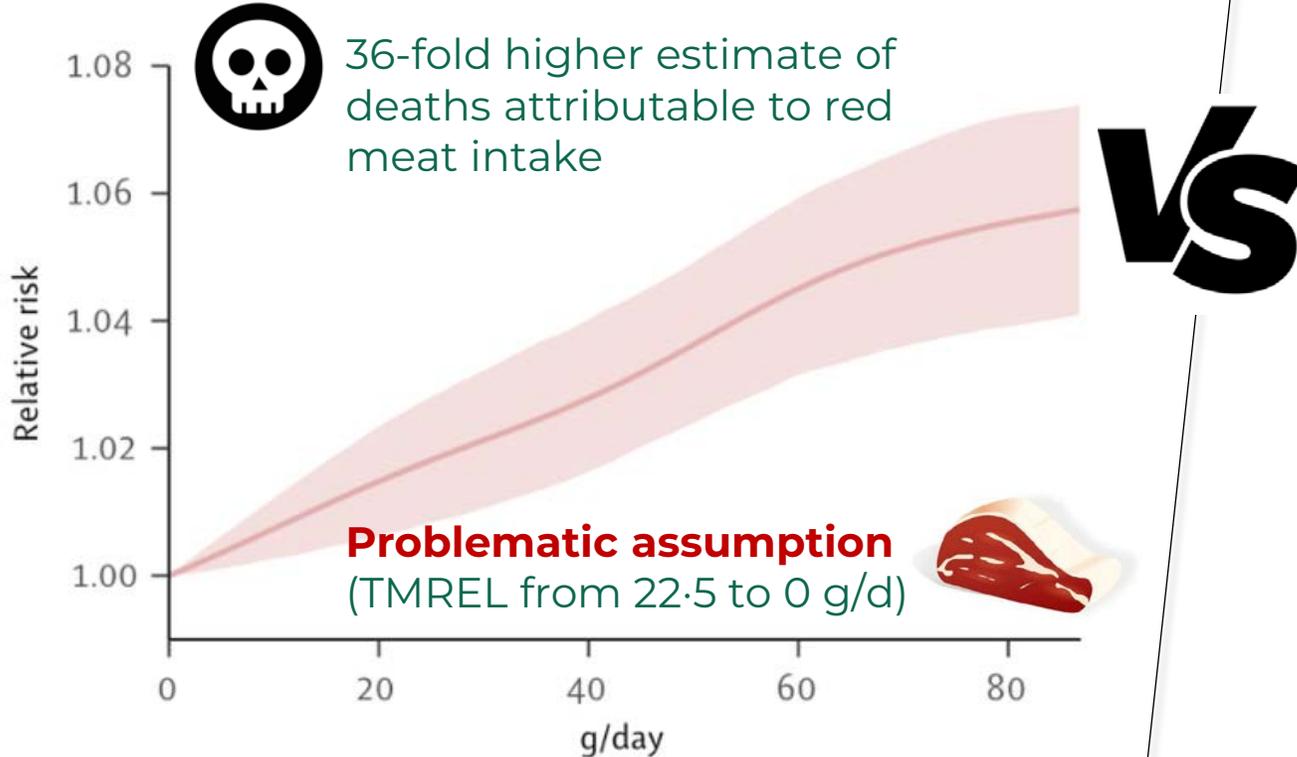
**Example:** Prospective Urban Rural Epidemiology (PURE) Study - American Journal Clinical Nutrition 202)



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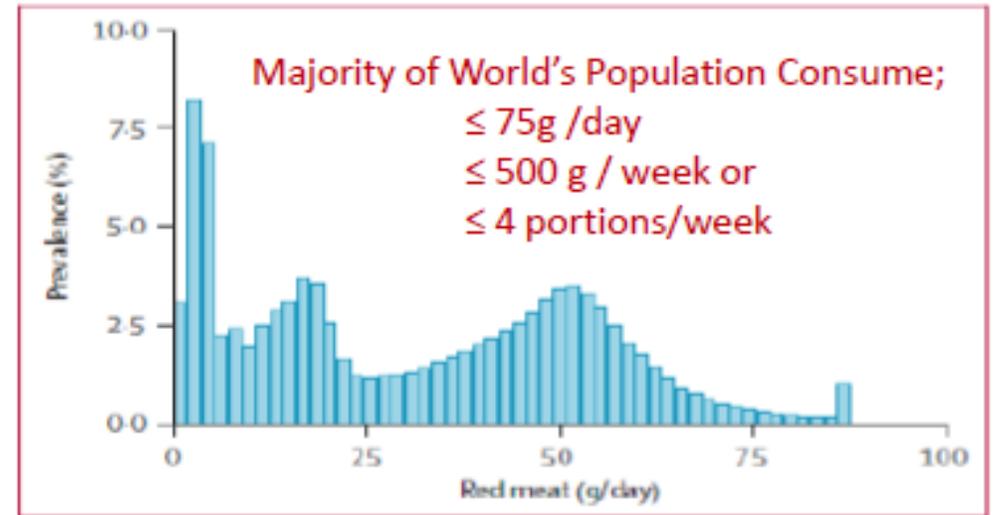
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Intake is mostly **lower than recommendations** to begin with (health priority?)

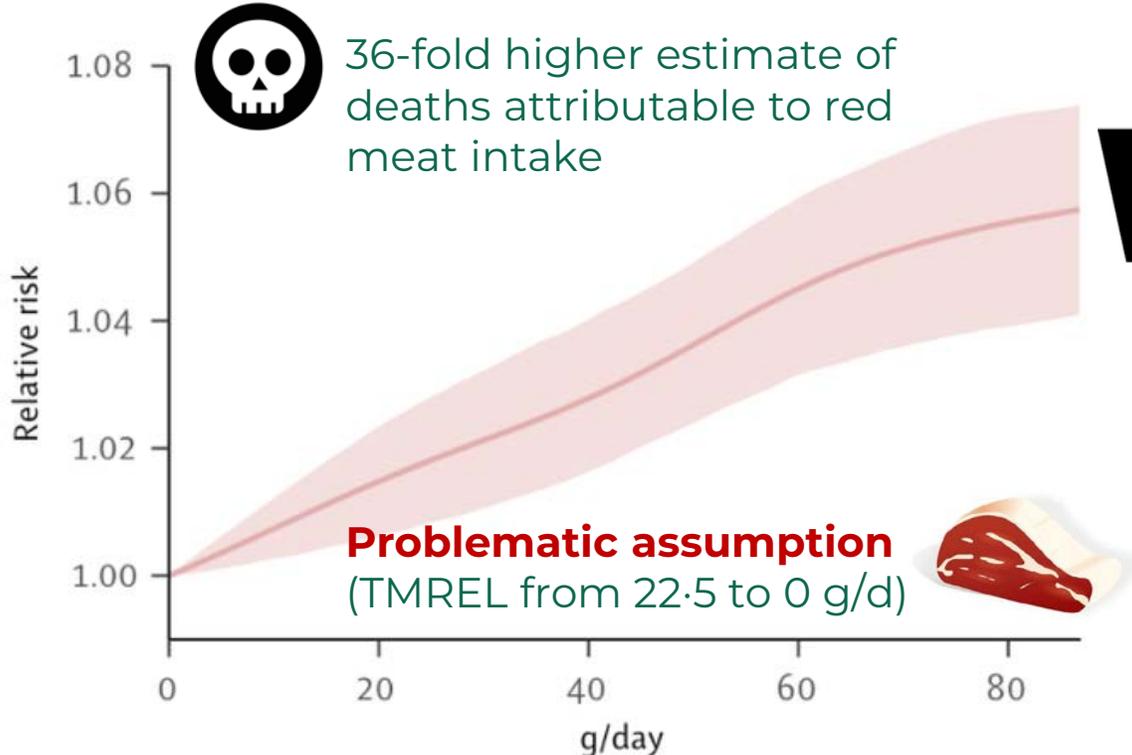
### GBD Estimation of Red Meat Consumption 2019



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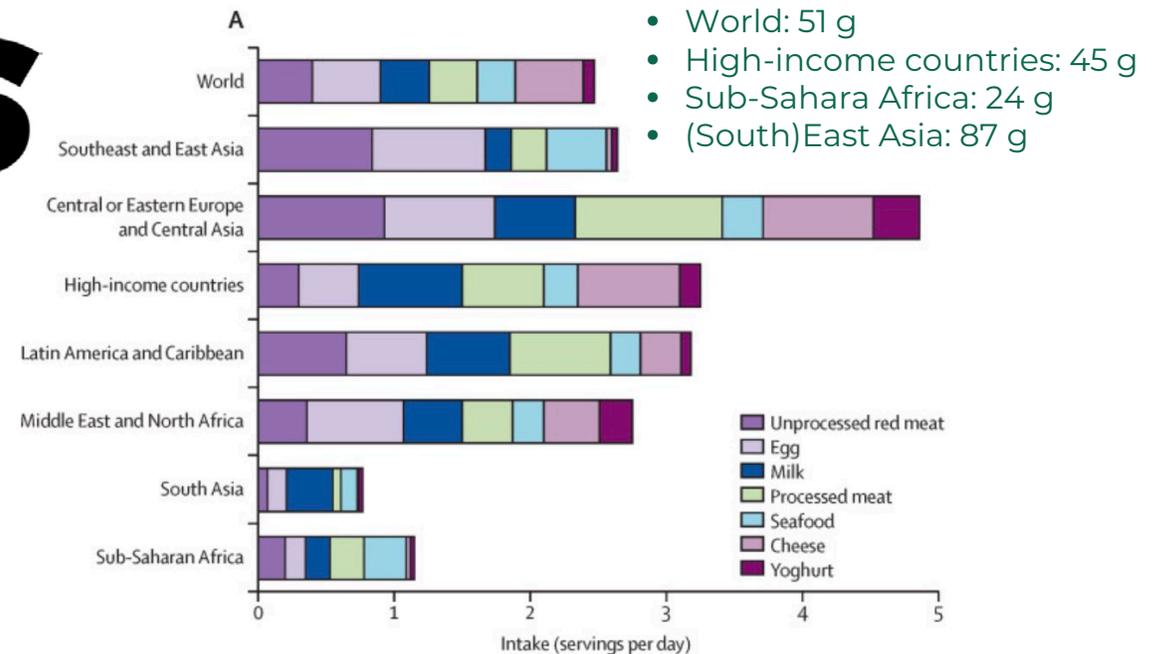
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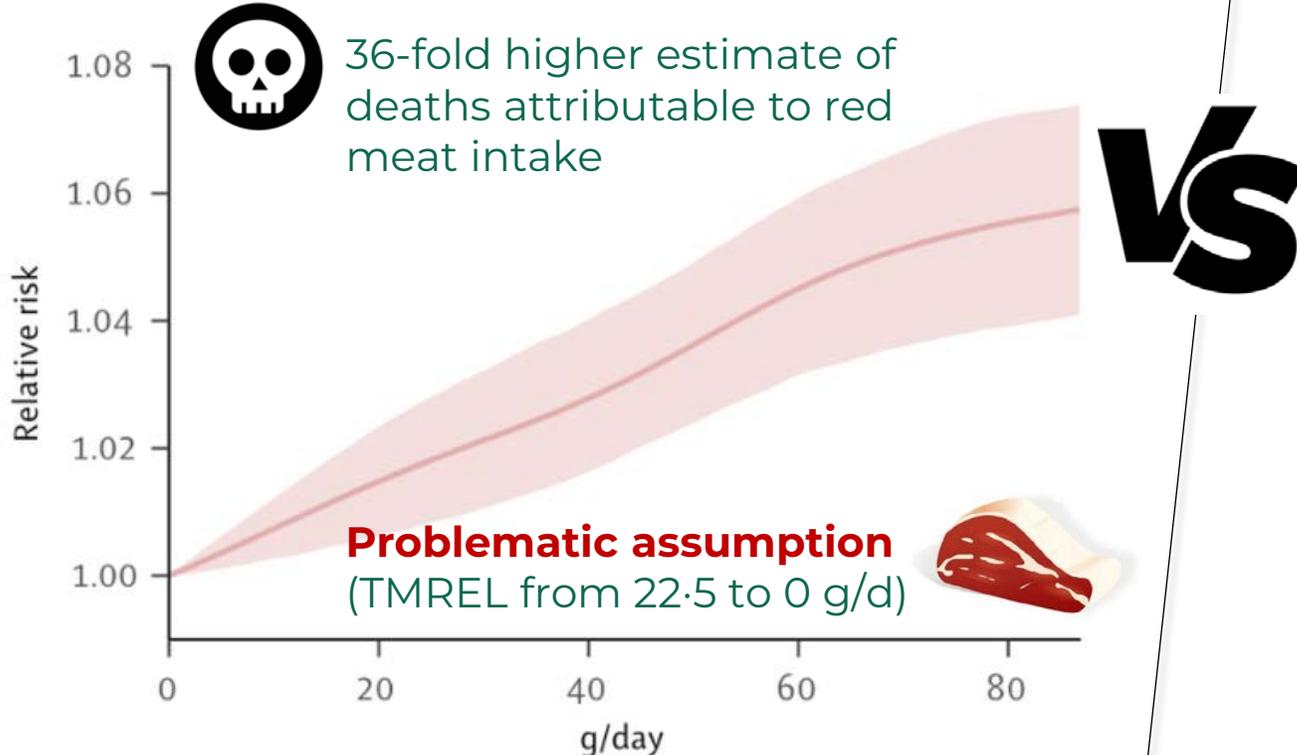
**Misconception** that high-income countries overeat red meat compared to the rest of the world



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Published: February 25, 2022 · DOI: [https://doi.org/10.1016/S0140-6736\(22\)00311-7](https://doi.org/10.1016/S0140-6736(22)00311-7)

What would be the **net health effect** when further reducing red meat intake, especially in populations with elevated needs?

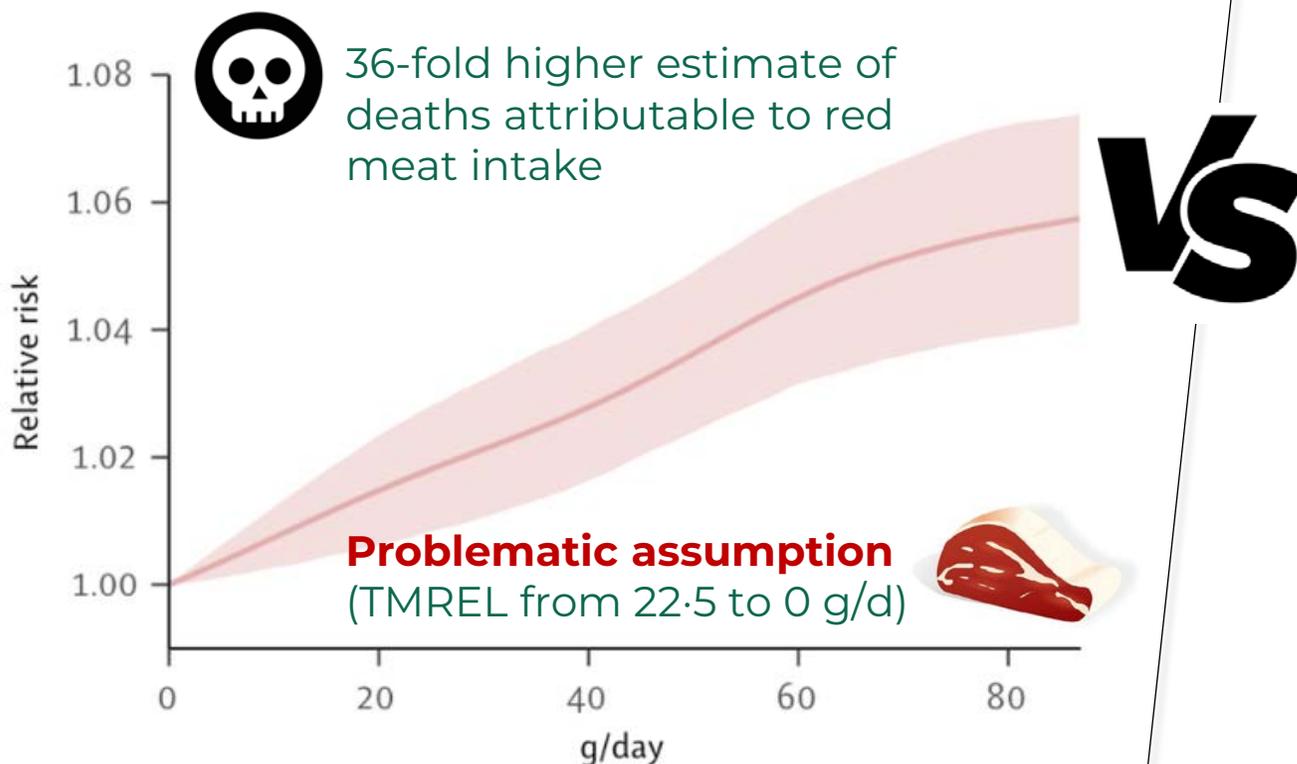
*“the GBD 2019 Risk Factors Collaborators should clarify if the additional deaths and DALYs from iron deficiency anaemia, sarcopenia, and child and maternal malnutrition that would result from the imposition of a red meat TMREL of zero have been included in the GBD 2019 estimates.”*



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CORRESPONDENCE | VOLUME 399, ISSUE 10332, E27-E28, APRIL 02, 2022

PDF [60 KB]

### 36-fold higher estimate of deaths attributable to red meat intake in GBD 2019: is this reliable? – Author's reply

Christopher J L Murray · on behalf of the GBD Risk Factors Collaborators

Published: March 21, 2022 · DOI: [https://doi.org/10.1016/S0140-6736\(22\)00518-9](https://doi.org/10.1016/S0140-6736(22)00518-9)

CORRESPONDENCE | VOLUME 400, ISSUE 10350, P427-428, AUGUST 06, 2022

PDF [76 KB]

### Troubling assumptions behind GBD 2019 on the health risks of red meat

Vanessa L Z Gordon-Dseagu · Martin J Wiseman · Kate Allen · Judy Buttriss · Christine Williams

Published: August 06, 2022 · DOI: [https://doi.org/10.1016/S0140-6736\(22\)01283-1](https://doi.org/10.1016/S0140-6736(22)01283-1)

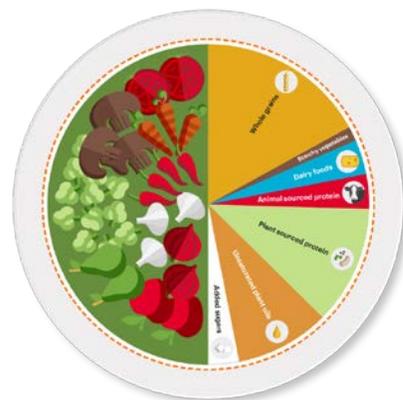
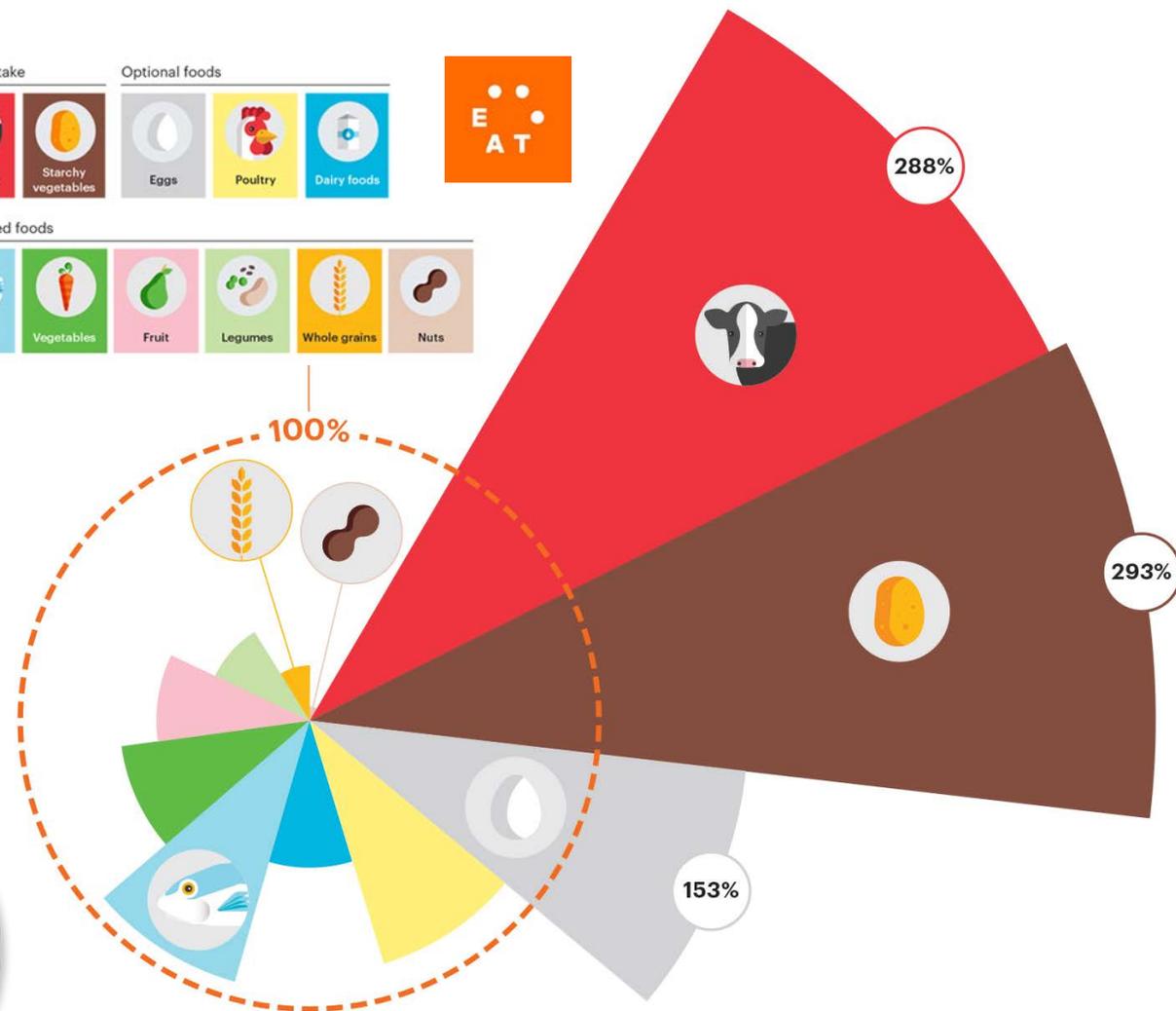
# (2) Unhealthy?

## Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems

Walter Willett, Johan Rockström, Brent Loken, Marco Springmann, Tim Lang, Sonja Vermeulen, Tara Garnett, David Tilman, Fabrice DeClerck, Amanda Wood, Malin Jonell, Michael Clark, Line J Gordon, Jessica Fanzo, Corinna Hawkes, Rami Zurayk, Juan A Rivera, Wim De Vries, Lindiwe Majele Sibanda, Ashkan Afshin, Abhishek Chaudhary, Mario Herrero, Rina Agustina, Francesco Branca, Anna Lartey, Shenggen Fan, Beatrice Crona, Elizabeth Fox, Victoria Bignet, Max Troell, Therese Lindahl, Sudhvir Singh, Sarah E Cornell, K Srinath Reddy, Sunita Narain, Sania Nishtar, Christopher J L Murray

Transformation to healthy diets by 2050 will require substantial dietary shifts, including a greater than 50% reduction in global consumption of unhealthy foods, such as red meat and sugar, and a greater than 100% increase in consumption of healthy foods, such as nuts, fruits, vegetables, and legumes. However, the changes needed differ greatly by region.

**Unsupported claim**  
that meat is intrinsically  
« unhealthy »



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Prof. Gordon Guyatt  
McMasters University

## Unprocessed Red Meat and Processed Meat Consumption: Dietary Guideline Recommendations From the Nutritional Recommendations (NutriRECS) Consortium <sup>FREE</sup>

Annals of Internal Medicine  
CLINICAL GUIDELINES | 19 NOVEMBER 2019

Bradley C. Johnston, PhD; Dena Zeraatkar, MSc; Mi Ah Han, PhD; Robin W.M. Vernooij, PhD; Claudia Valli, MSc; Regina El Dib, PhD; Catherine Marshall; Patrick J. Stover, PhD; Susan Fairweather-Taitt, PhD; Grzegorz Wójcik, PhD; Faiz Bhatia, PEng; Russell de Souza, ScD; Carlos Brotans, MD, PhD; Joerg J. Meerpohl, MD; Chirag J. Patel, PhD; Benjamin Djulbegovic, MD, PhD; Pablo Alonso-Coello, MD, PhD; Malgorzata M. Bala, MD, PhD; Gordon H. Guyatt, MD

VS

GRADE

“The panel suggests that **adults continue current unprocessed red meat consumption** (weak recommendation, low-certainty evidence). Similarly, the panel suggests adults continue current processed meat consumption (weak recommendation, low-certainty evidence).”

# (2) Unhealthy?

- **Risk?**

Trivial rise in absolute risk estimates – also: complexity!

- **Hazard?** (cf. IARC/WHO)

Mostly based on selected observational studies (problems with residual confounding, healthy user bias, food frequency questionnaires, ...)

- **Exposure?**

Dose, importance of diet matrix, and effects of food preparation

- **Vulnerability?**

Role of individual differences e.g., differing homeostasis of iron or responses to saturated fat)



Co-consumption of Vegetables and Fruit, Whole Grains, and Fiber Reduces the Cancer Risk of Red and Processed Meat in a Large Prospective Cohort of Adults from Alberta's Tomorrow Project

by [Katerina Maximova](#)<sup>1</sup>, [Elham Khodayari Moez](#)<sup>1</sup>, [Julia Dabravolskaj](#)<sup>1</sup>, [Alexa R. Ferdinands](#)<sup>1</sup>, [Irina Dinu](#)<sup>1</sup>, [Geraldine Lo Siou](#)<sup>2</sup>, [Ala Al Rajabi](#)<sup>3</sup> and [Paul J. Veugeliers](#)<sup>1</sup>

All-Cause Cancers <sup>b</sup>			
Vegetables and Fruit (Serving/Day) <sup>d</sup>			
	<55 years: <4	<55 years: 4–6	<55 years: >6
	≥55 years: <3	≥55 years: 3–5	≥55 years: >5
Red meat (gram/week) <sup>e</sup>			
<250	1.04 (0.79–1.36)	1.02 (0.89–1.17)	Ref.
250–500	1.17 (0.92–1.47)	1.01 (0.85–1.21)	0.88 (0.76–1.02)
>500	<b>1.31</b> (1.02–1.69)	1.01 (0.79–1.29)	<b>0.78</b> (0.57–1.05)

# (3) Unsustainable?

- **No simple answer** to what is a multi-dimensional and intricate question
- Depends largely on (1) **practice** and (2) choice of **metrics**
- Focus of this presentation will be on the need to factor in **essential nutrition**



Animal board invited review: Animal source foods in healthy, sustainable, and ethical diets – An argument against drastic limitation of livestock in the food system

Frédéric Leroy<sup>a,\*</sup>, Fabien Abraini<sup>b</sup>, Ty Beal<sup>c,d</sup>, Paula Dominguez-Salas<sup>e,f</sup>, Pablo Gregorini<sup>g,h</sup>, Pablo Manzano<sup>i,j,k</sup>, Jason Rowntree<sup>l</sup>, Stephan van Vliet<sup>m</sup>



## Animal source foods in ethical, sustainable & healthy diets

A dynamic white paper - #ALEPH2020

ALEPH2020

ASFs and Livestock

Ethics

Planet

Human health

Experts

### Planet



The concept of sustainability, sometimes vaguely defined as 'meeting the needs of the present without compromising the ability of future generations to meet theirs', refers to the three pillars of economy (prosperity), environment (planet), and society (people). **Health**, therefore, but also **ethical** acceptance, should not be overlooked when developing sustainable scenarios for future food production. Although some practices within animal husbandry can have clear and worrying negative impacts on the environment, we argue that livestock should always be part of the solution (as its elimination would make matters worse). This is feasible but would, however, imply an amplification of best practices besides the mitigation of unsustainable elements. Also, it requires a steering away from reductionist metrics and a move towards more holistic assessments and practical farming wisdom.

- Greenhouse gas emissions
- Feed-food competition
- Land use and biodiversity
- Biochemical flows, soil, and water quality
- Water wastage

# (3) Unsustainable?

Numerator

litre

ha

CO<sub>2</sub>  
-eq

< Sustainability

Various complexities & trade-offs!



Denominator

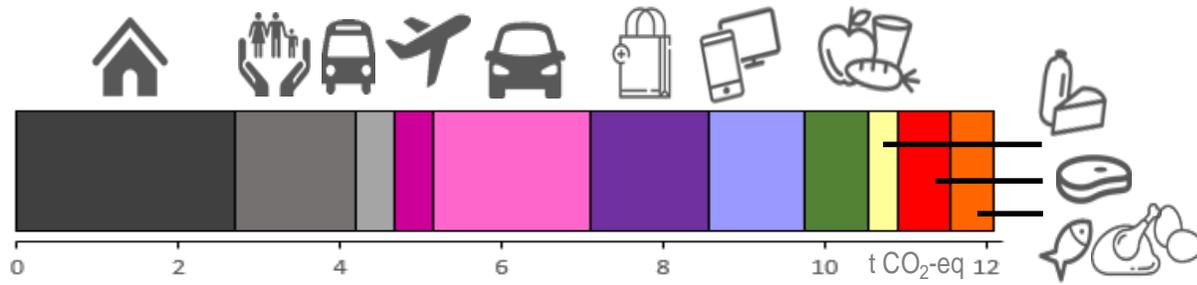
kg  
food

kcal

kg  
protein

< Unit of nutrition

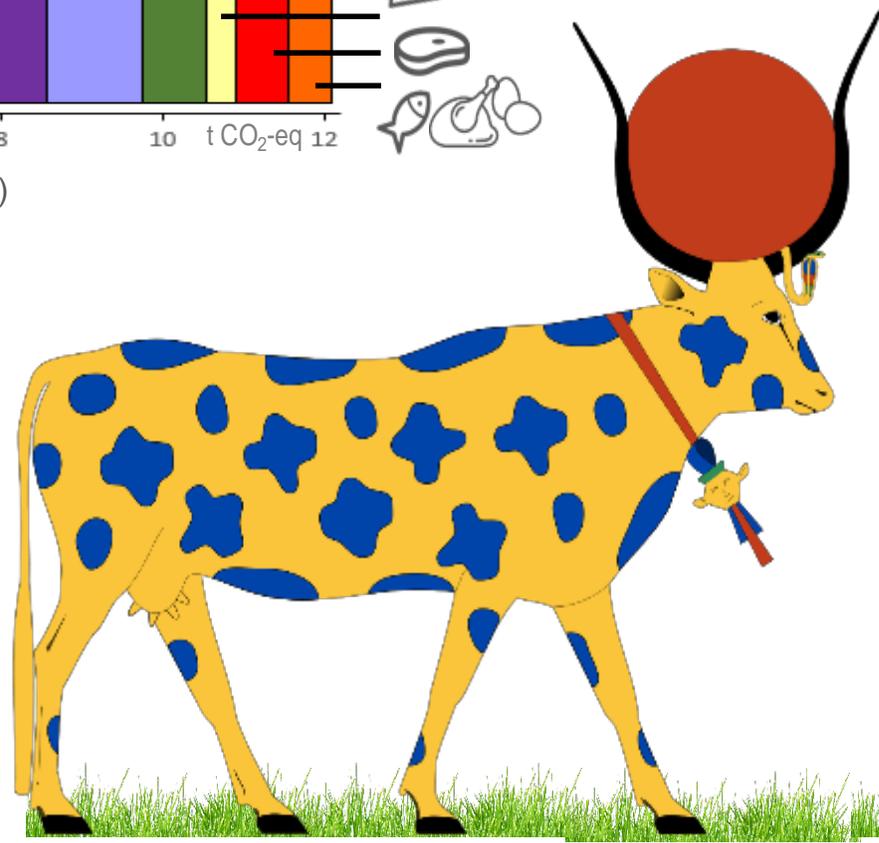
# (3) Unsustainable?



Total footprint of a Frenchman (12 t CO<sub>2</sub>-eq/y)



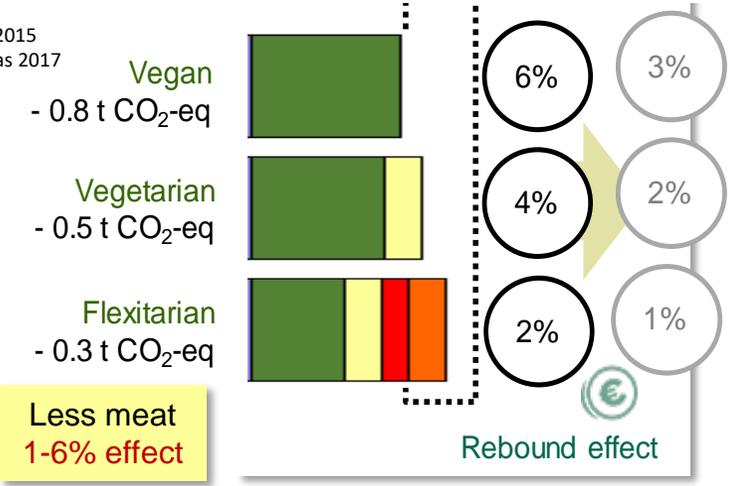
## Hyperbolic claims



**New Study: Vegan Diet Reduces Carbon Footprint by 73%**

**Study: Going vegetarian can cut your food carbon footprint in half**

Hällstrom et al. 2015  
Wynes & Nicholas 2017



**Nutritional and greenhouse gas impacts of removing animals from US agriculture**  
– White & Hall (2017) – PNAS

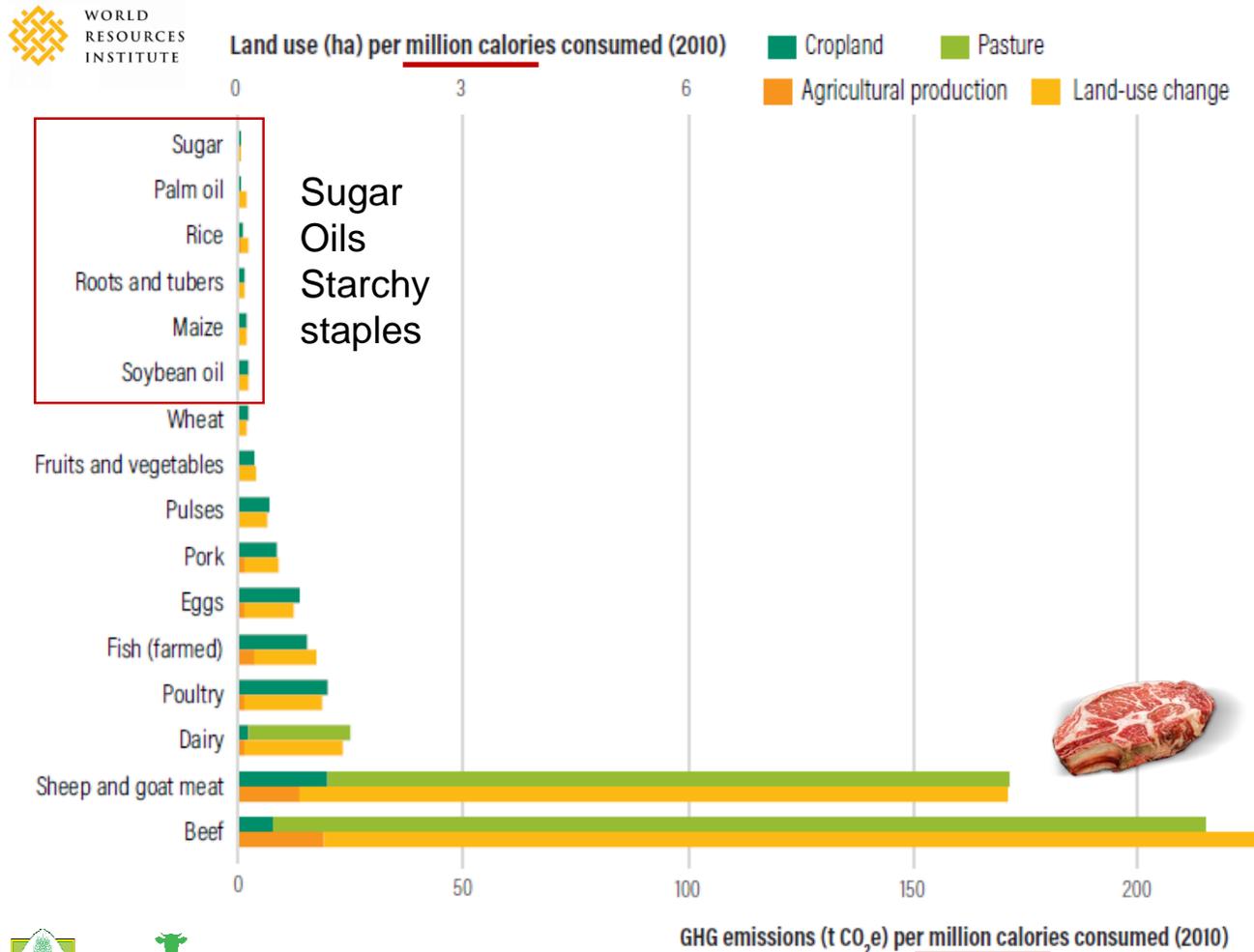
The plants-only systems had greater excess of dietary energy and resulted in a greater number of **deficiencies in essential nutrients.**



Vegan US  
2.6% effect

# (3) Unsustainable?

Figure 6-6a | Foods differ vastly in land-use and greenhouse gas impacts



## Energy and nutrient density of foods in relation to their carbon footprint <sup>FREE</sup>

Adam Drewnowski , Colin D Rehm, Agnes Martin, Eric O Verger, Marc Voinnesson, Philippe Imbert

*The American Journal of Clinical Nutrition*, Volume 101, Issue 1, 1 January 2015, Pages 184-191, <https://doi.org/10.3945/ajcn.114.092486>

One question is whether the higher GHGE cost of some foods can be **offset** by their higher **nutritional value**.

# Essential nutrition

- **Lots of misconceptions!**
- “what may be surprising is that certain **healthy foods**, including most fruits and vegetables, nuts and seeds, whole grains, and chicken, are not particularly dense in bioavailable micronutrients commonly lacking in low- and middle-income countries. [Nutrition policies] may benefit from specifically targeting the most **micronutrient-dense foods** - organs, small fish, dark green leafy vegetables, shellfish, ruminant meat, eggs, milk, and canned fish with bones”

Beal & Ortenzi (GAIN)  
Priority Micronutrient Density in Foods

	2+ nutrients	Iron	Zinc	Vitamin A	Calcium	Folate	Vitamin B <sub>12</sub>
Liver	Very high	Very high	Very high	Very high	Low	Very high	Very high
Spleen	Very high	Very high	Very high	Low	Low	Low	Very high
Small dried fish	Very high	Very high	Very high	Very high	Very high	Low	Very high
Dark leafy greens	Very high	High	Low	Very high	Very high	Very high	Low
Bivalves	Very high	Very high	Very high	Very high	Very high	Moderate	Very high
Kidney	Very high	Very high	Very high	High	Low	High	Very high
Heart	Very high	Very high	Very high	Low	Low	Moderate	Very high
Crustaceans	Very high	Moderate	Very high	Low	Moderate	Low	Very high
Goat	Very high	Very high	Very high	Low	Low	Low	Very high
Beef	Very high	High	Very high	Low	Low	Low	Very high
Eggs	Very high	Moderate	Very high	Very high	Low	Very high	Very high
Cow milk	Very high	Low	High	Very high	Very high	Low	Very high
Canned fish w/ bones	Very high	Moderate	Very high	Low	Very high	Low	Very high
Lamb/mutton	Very high	High	Very high	Low	Low	Low	Very high
Cheese	Very high	Low	Very high	Very high	Very high	Low	Very high
Goat milk	High	Low	Moderate	High	Very high	Low	Low
Pork	High	Low	Very high	Low	Low	Low	Very high
Yoghurt	Moderate	Low	Low	Low	Very high	Low	Very high
Fresh fish	Moderate	Low	Moderate	Low	Low	Low	Very high
Pulses	Moderate	Moderate	Moderate	Low	Low	Very high	Low
Teff	Moderate	Very high	Moderate	Low	Low	High	Low
Vit A-rich fruit/veg	Low	Low	Low	Very high	Low	High	Low
Other vegetables	Low	Low	Low	Low	Low	Low	Low
Quinoa	Low	Moderate	Moderate	Low	Low	Very high	Low
Canned fish w/o bones	Low	Low	Moderate	Low	Low	Low	Very high
Seeds	Low	Low	High	Low	High	High	Low
Fonio	Low	Moderate	Moderate	Low	Low	Moderate	Low
Chicken	Low	Low	High	Low	Low	Low	High
Other fruits	Low	Low	Low	Low	Low	High	Low
Millet	Low	Moderate	Moderate	Low	Low	Moderate	Low
Unrefined grain prod	Low	Low	Moderate	Low	Low	Moderate	Low
Sorghum	Low	Moderate	Low	Low	Low	Low	Low
Roots/tubers/plantains	Low	Low	Low	Low	Low	Low	Low
Whole grains	Low	Low	Moderate	Low	Low	Low	Low
Nuts	Low	Low	Low	Low	Low	Low	Low
Refined grain products	Low	Low	Low	Low	Low	Low	Low
Refined grains	Low	Low	Moderate	Low	Low	Low	Low

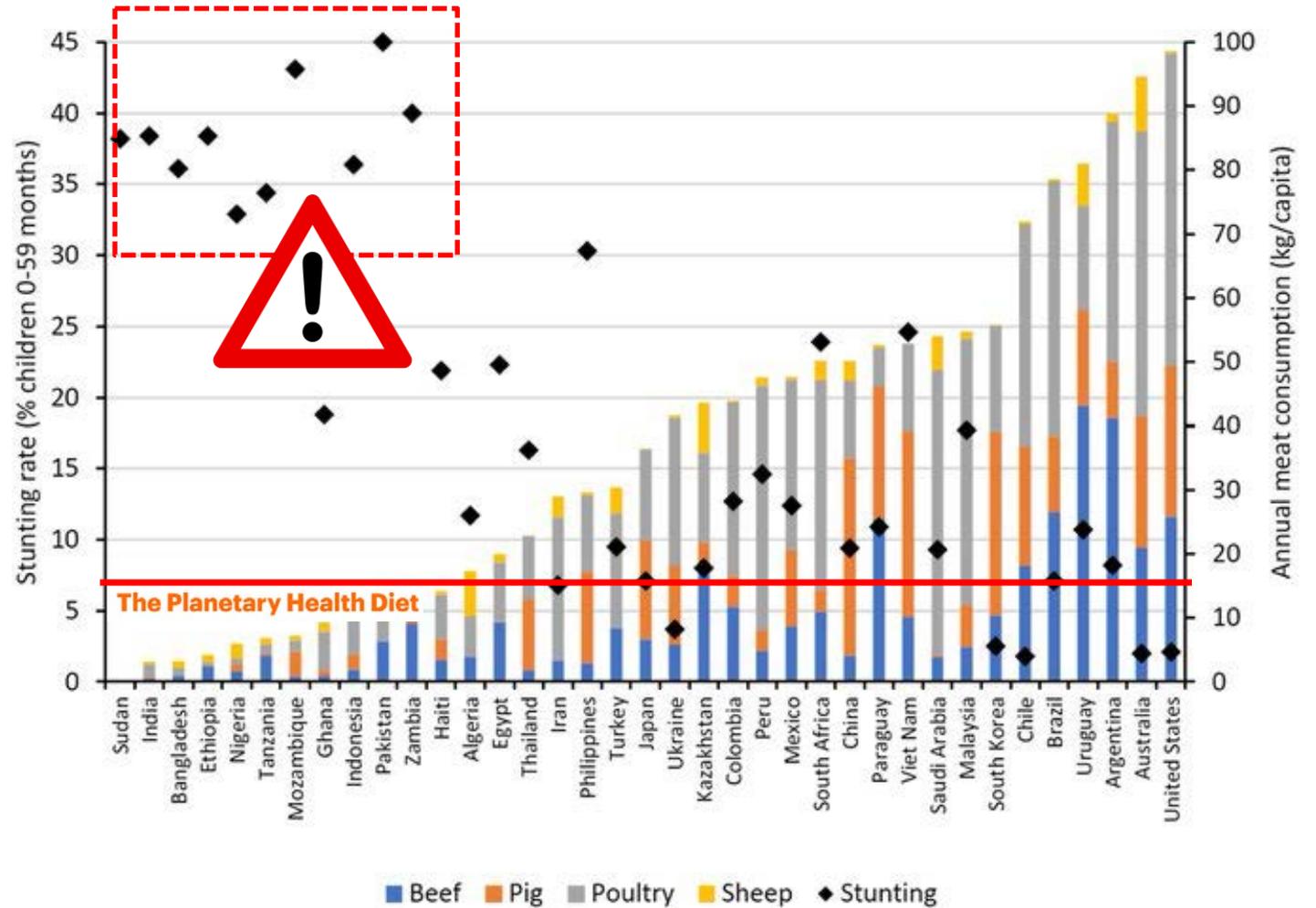
# Essential nutrition

- Lots of misconceptions!
- Planetary Health Diet in practice?

If the global population followed current consumption patterns in individual G20 countries or adopted their NDGs only India and Indonesia would have food consumption patterns that are within the planetary climate boundary for food



Adesogan et al.



# Essential nutrition

- Could there be a “too low” intake level?

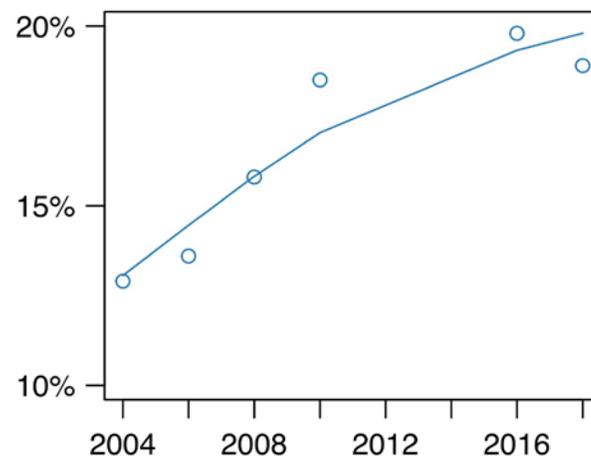
- **Populations with elevated needs**

may often benefit from more rather than less meat, not only in LMICs but also including premenopausal women, young children, and older adults in the West

- **Example of iron**

- 40-49% of Australian and UK teenage girls
- 8% (boys) to 15% (girls) of Australian toddlers (2-3y)

Iron deficiency in US women 15–49



August 4, 2021

## Changing Diets Mean More Americans Are Anemic Now

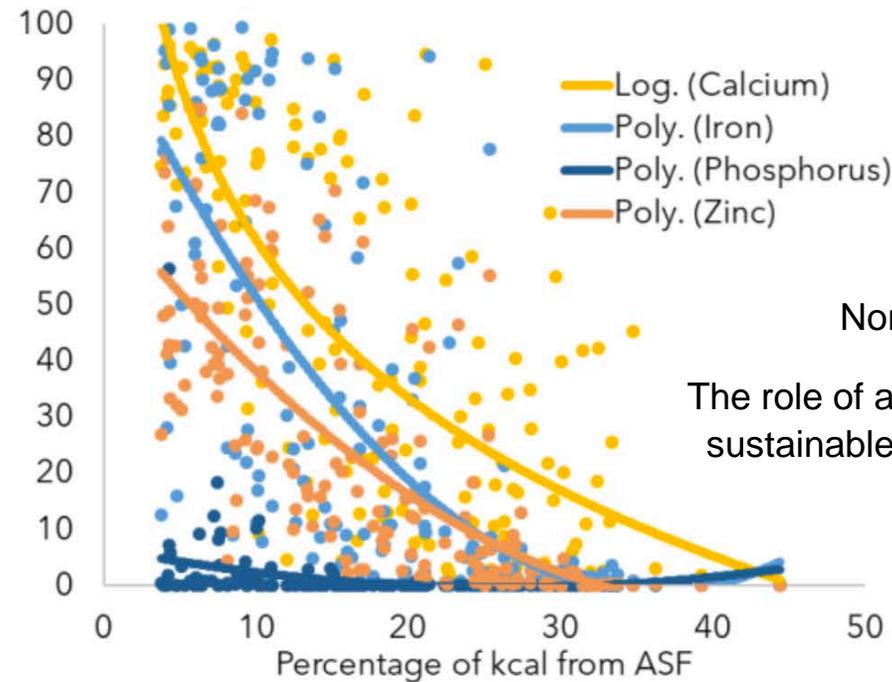
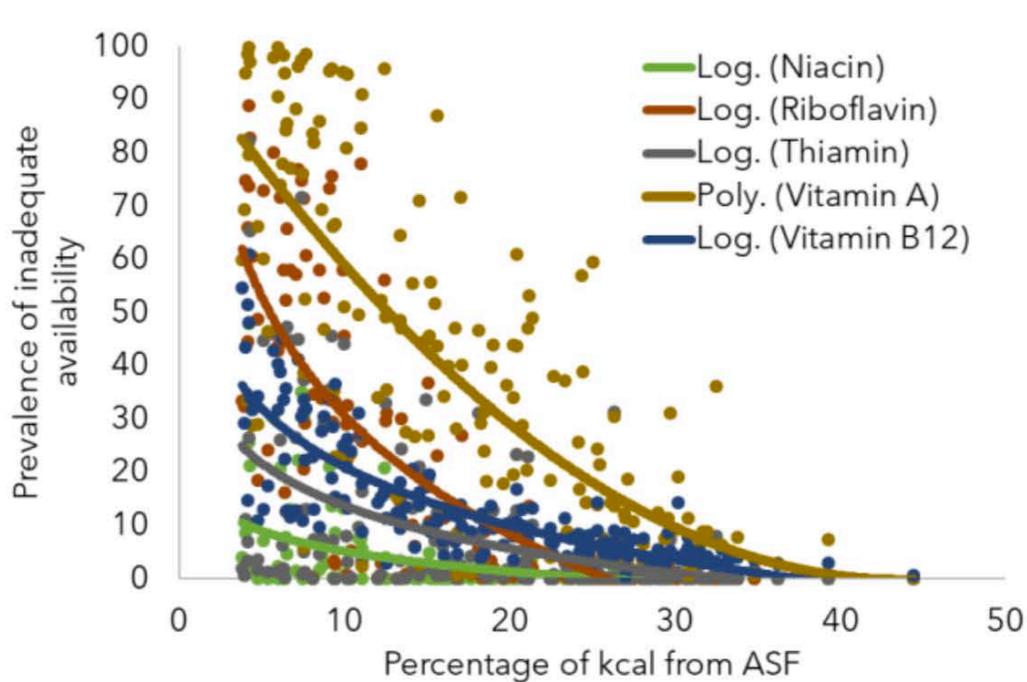


Denise Mann  
HealthDay Reporter

Mei et al. 2021 The Lancet

# Essential nutrition

- **How much is needed?** Difficult to answer for a number of reasons, but average national diets low in ASFs do not meet needs for essential micronutrients; **increasingly difficult when levels of ASFs drop (< 30% of kcal intake)**



Nordhagen et al. (2020)

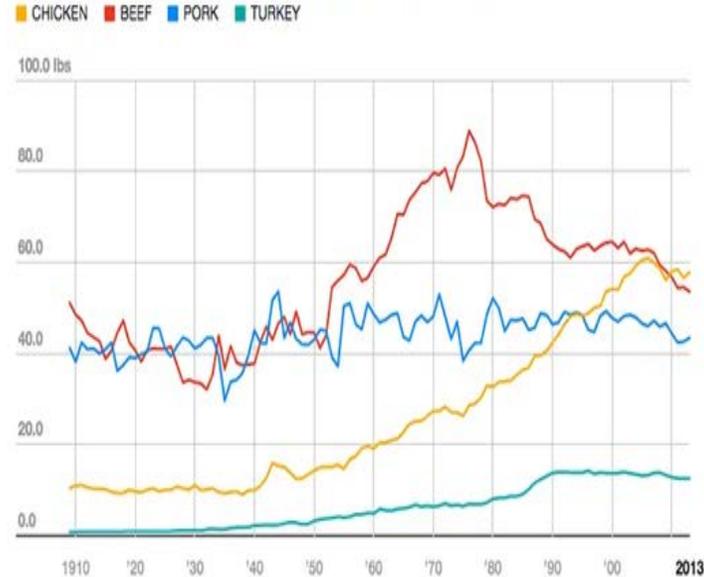
The role of animal-source foods in healthy, sustainable, and equitable food systems

# Essential nutrition

## What is the current status?

- Case of the USA: already **70% of kcal from plants** (but mostly grains, oils, sugar), while red meat has been decreasing since the 1980s

Annual U.S. meat consumption, pounds per capita



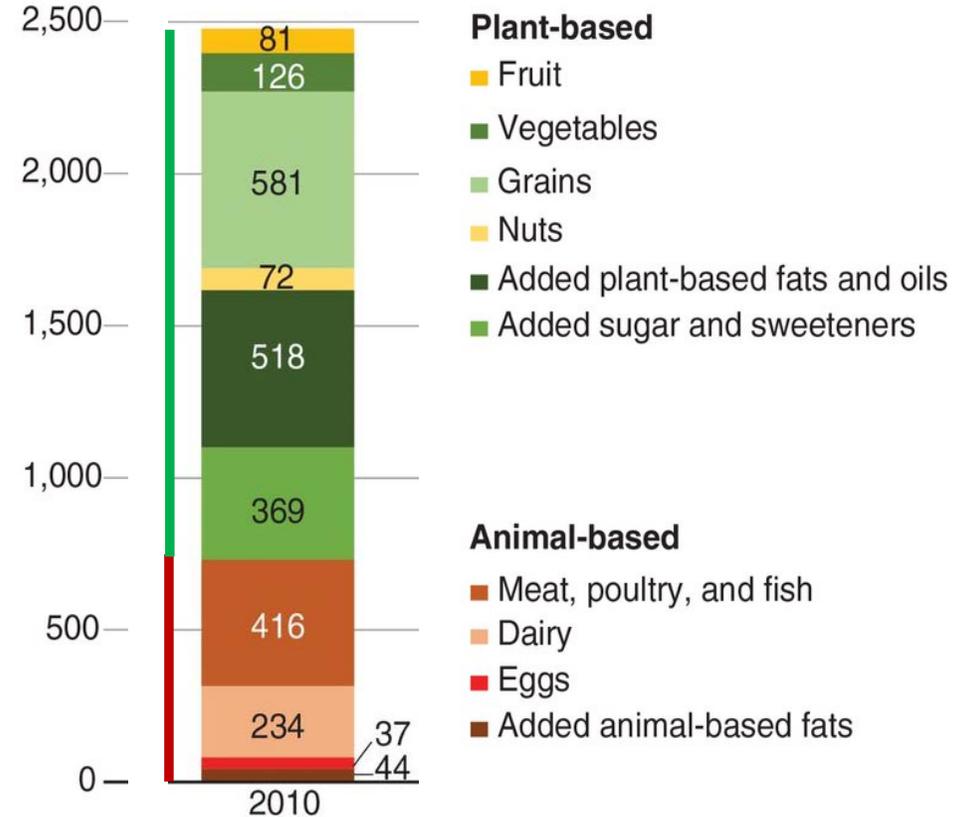
Note: The USDA uses meat available in our food supply, minus estimated loss at the retail and consumer levels, as a proxy for consumption.

Source: U.S. Department of Agriculture

## Loss-adjusted availability of U.S. calories by food group

Added fats and oils are added to food during processing or preparation and do not include naturally occurring fats, such as in meat, dairy products, nuts, and avocados. Added animal-based fats include butter, lard, and edible beef tallow.

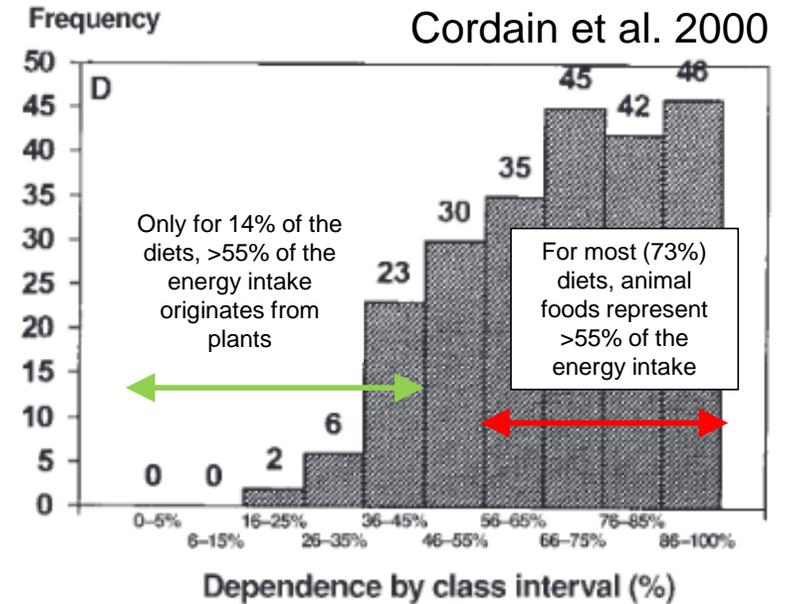
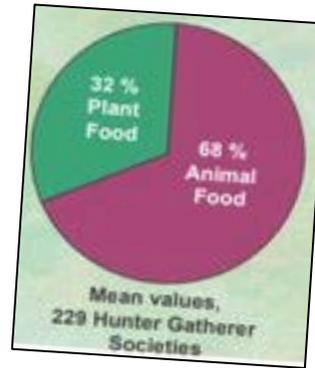
Source: USDA, Economic Research Service Loss-Adjusted Food Availability data.



# Essential nutrition

## What was the case ancestrally?

- Ancestral-type diets have variable amounts of ASFs - **typically at >30%** of kcal, whereas most are at >50%, and the mean is 70% (26-99%)
- Such levels are not *necessarily* optimal, but at least evolutionary compatible

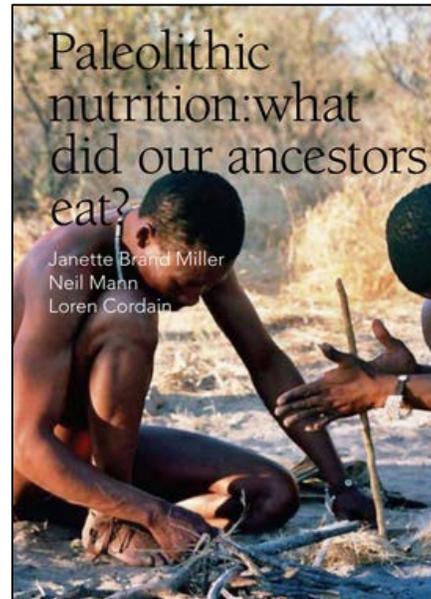


Public health policies may need to assess **evolutionary knowledge** when developing food-based dietary guidelines, especially for children

### Child dietary patterns in *Homo sapiens* evolution: A systematic review

Lora L Iannotti , Emmanuel A Gyimah, Miranda Reid, Melissa Chapnick, Mary Kate Cartmill, Chessa K Lutter, Charles Hilton, Theresa E Gildner, Elizabeth A Quinn

*Evolution, Medicine, and Public Health*, Volume 10, Issue 1, 2022, Pages 371-390,



Population	Location	Latitude %	animal food
Aborigines	Australia	12S	77
Ache	Paraguay	25S	78
Anbarra	Australia	12S	75
Efe	Africa	2N	44
Eskimo	Greenland	69N	96
Gwi	Africa	23S	26
Hadza	Africa	3S	48
Hiwi	Venezuela	6N	75
!Kung	Africa	20S	33
!Kung	Africa	20S	68
Nukak	Columbia	2N	41
Nunamiut	Alaska	68N	99
Onge	Andaman	12N	79

# Essential nutrition

## Potential problems are well described

- **Vegan and vegetarian mothers**  
(long-chain  $\omega$ -3 FAs, iron, vitamin B12, ...)
- **Confused young parents**
- **Clinical case reports**

Article



EMBO  
Molecular Medicine

## Vegan diet in young children remodels metabolism and challenges the statuses of essential nutrients

Topi Hovinen<sup>1,†</sup> , Liisa Korkalo<sup>2,†</sup> , Riitta Freese<sup>2</sup> , Essi Skaffari<sup>2</sup> , Pirjo Isohanni<sup>1,3</sup> ,  
Mikko Niemi<sup>4,5</sup> , Jaakko Nevalainen<sup>6</sup> , Helena Gylling<sup>7</sup> , Nicola Zamboni<sup>8</sup> ,  
Maijaliisa Erkkola<sup>2</sup>  & Anu Suomalainen<sup>1,5,9,\*</sup> 

CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION  
2019, VOL. 59, NO. 13, 2052–2060  
<https://doi.org/10.1080/10408398.2018.1437024>

REVIEW

## Is vegetarianism healthy for children?

Nathan Cofnas

Balliol College, University of Oxford, Oxford OX1 3BJ, UK

### Macrobiotic Dutch infants (4-18 m)

- **Ubiquitous deficiencies** (energy, protein, Ca, Fe, vit. B2, B12, D)
- Retarded growth, fat and muscle wasting, slower psychomotor development, rickets
- Breast milk: less vit B12, Ca, Mg



Van Dusseldorp et al., Am J Clin Nutr 1999

Schneede et al., Pediatr Res 1994



Dagnelie & van Staveren, Am J Clin Nutr 1994

Dagnelie et al., Am J Clin Nutr 1989, 1990

# Conclusions

- **Simplistic claims** are often taken for granted and do not only affect public opinion, but also policy and science  
(e.g., “meat is unethical”, “meat is unhealthy”, “meat destroys the planet”)
- Upon scrutiny, the impact of meat on human, animal, and planetary health is **contextual** and should be evaluated as such
- To establish sustainable production levels for red meat, a wide set of **metrics** needs to be considered holistically
- The balancing of metrics should at all times respect the importance of **essential nutrition**