Alessandro Laviano

Università La Sapienza, Roma

Green Pathways in Clinical Nutrition: Evidence Based Innovation, Ethics and Governance (for the NetZero Era)

27 - 29 novembre 2025

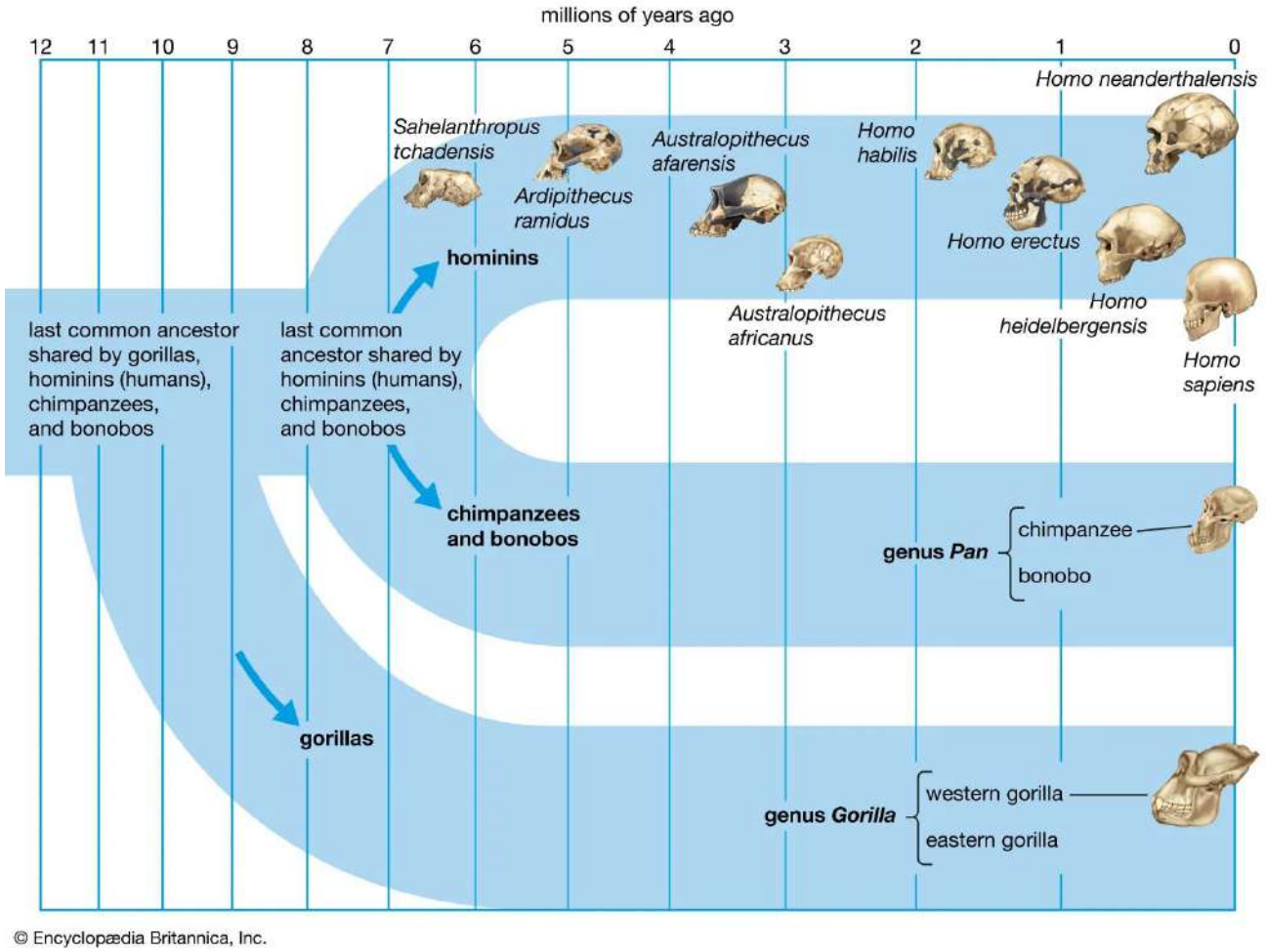
Padova Congress
Via Carlo Goldoni 8, Cancello C – Padova

Ἐν ἀρχῇ ἦν ὁ λόγος

Da preda a predatore

Meta-learning provides a robust framework to discern taxonomic carnivore agency from the analysis of tooth marks on bone: reassessing the role of felids as predators of *Homo habilis*

R. Soc. Open Sci. **12:** 250548



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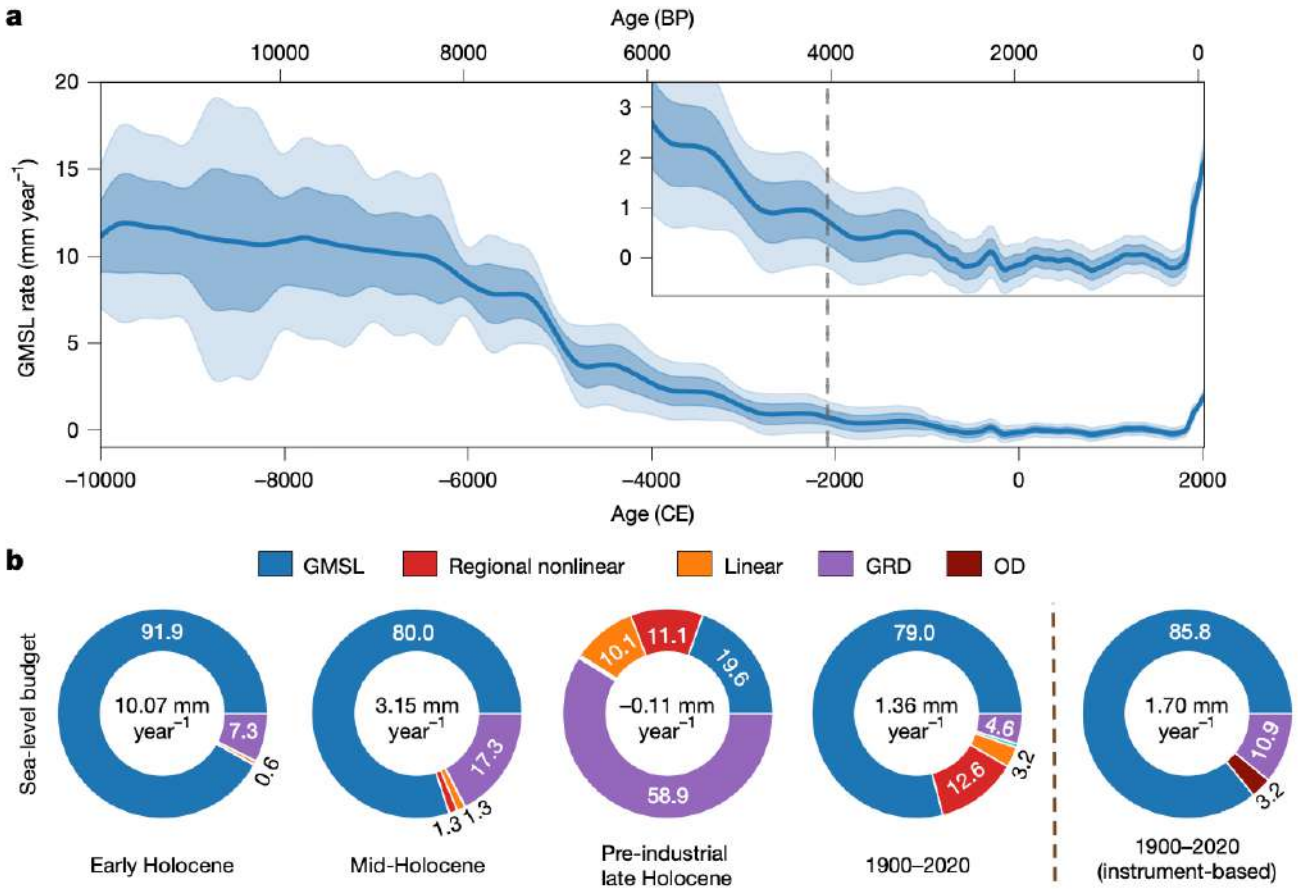
Modern sea-level rise breaks 4,000-year stability in southeastern China

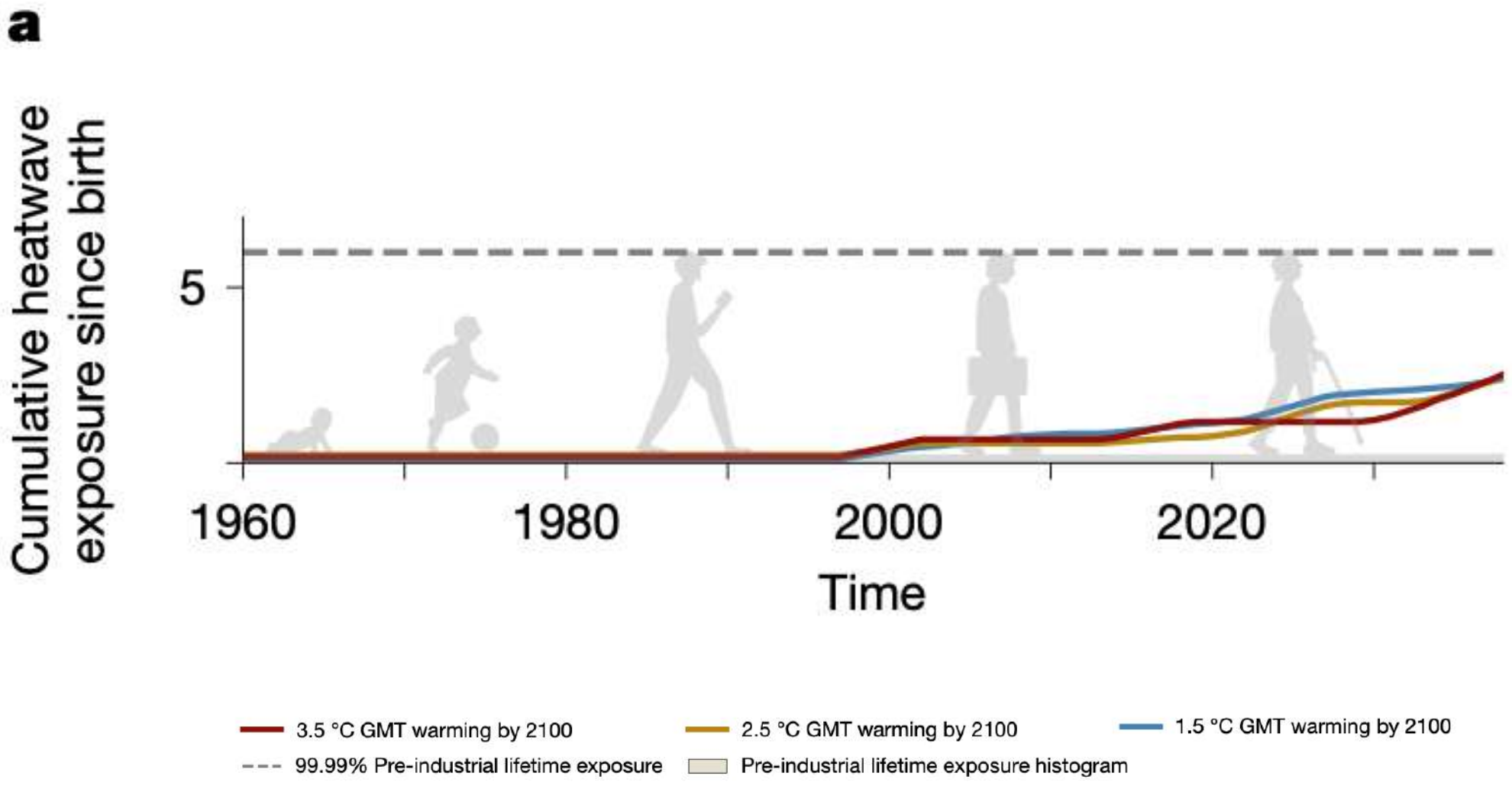
Yucheng Lin[1,2]✉, Robert E. Kopp[1,3], Haixian Xiong[4,5], Fiona D. Hibbert[6], Zhuo Zheng[7], Fengling Yu[8], Praveen Kumar[1,3], Sönke Dangendorf[9], Hailin Yi[10] & Yaze Zhang[11]



Global emergence of unprecedented lifetime exposure to climate extremes

Luke Grant[1,2]✉, Inne Vanderkelen[1,3,4], Lukas Gudmundsson[5], Erich Fischer[5], Sonia I. Seneviratne[5] & Wim Thiery[1]

Nature | Vol 641 | 8 May 2025



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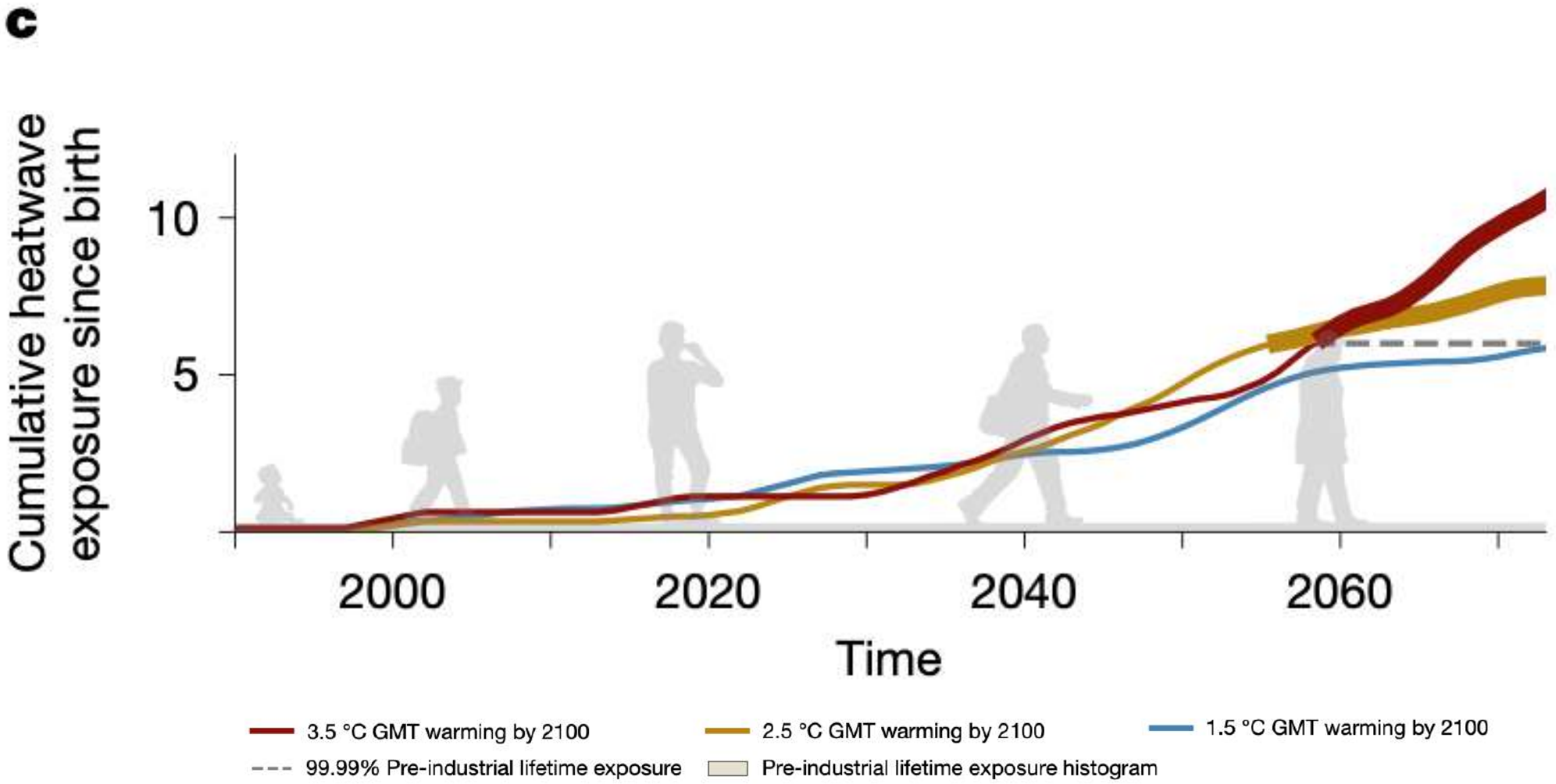

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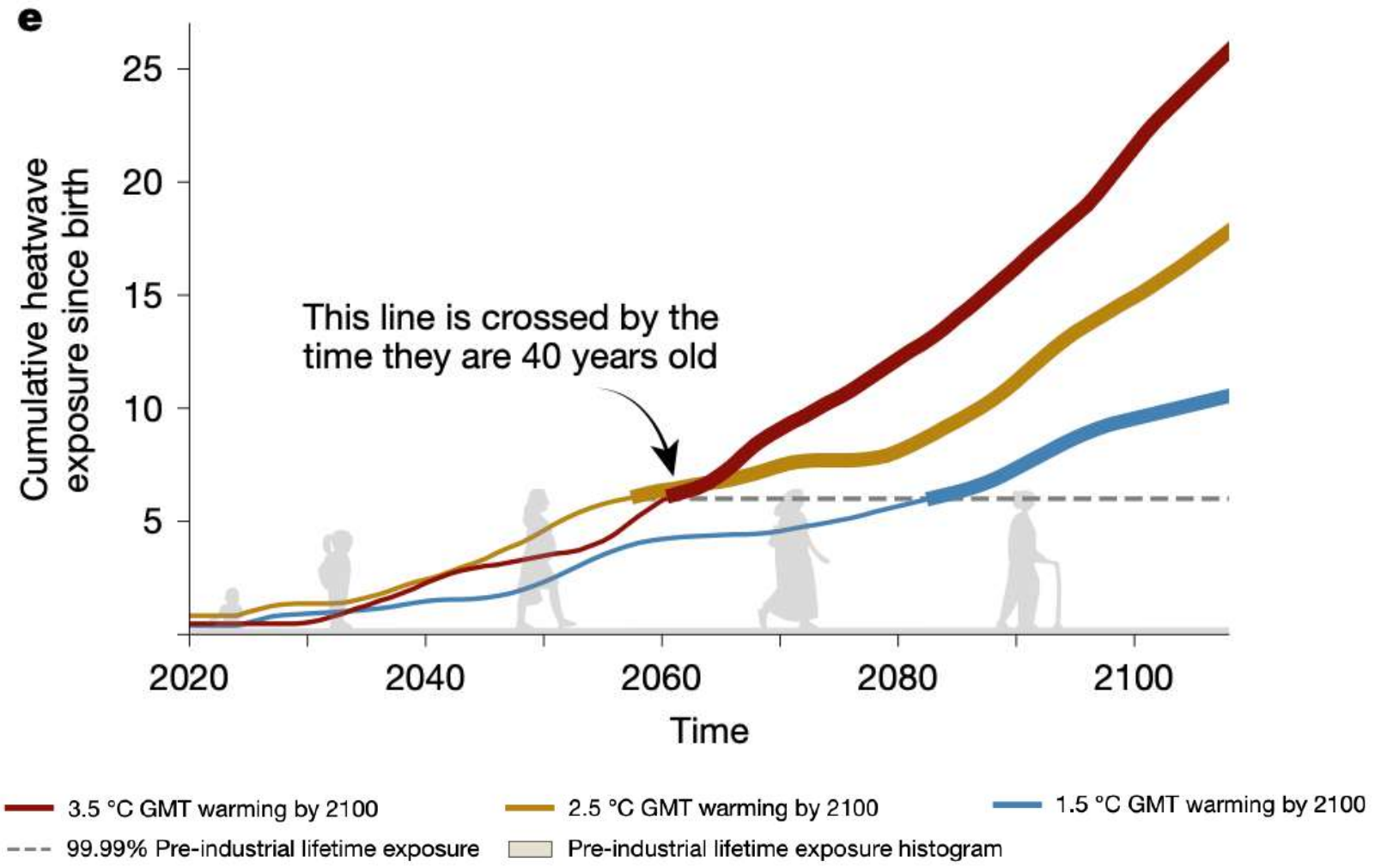
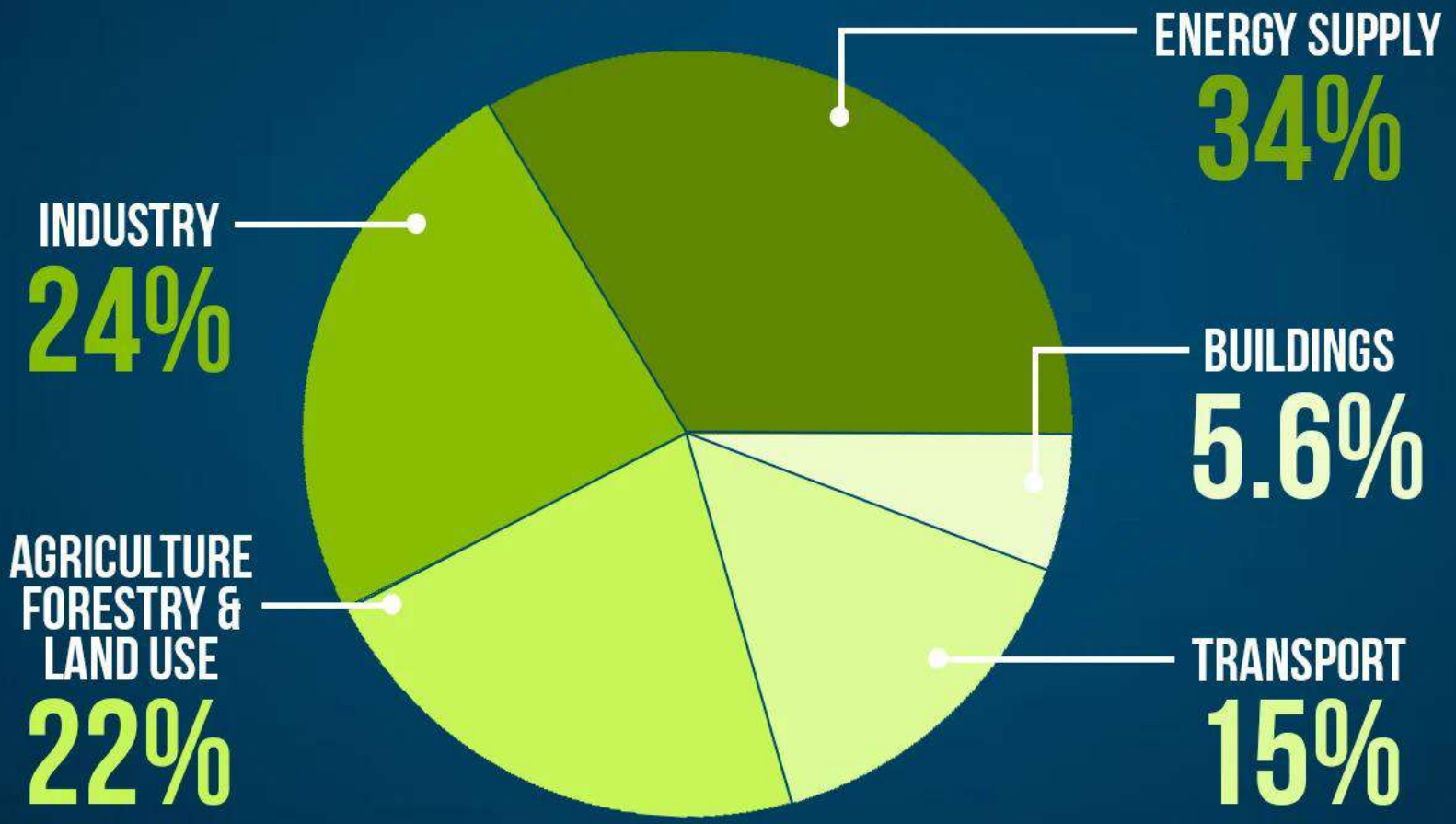


Food as a determinant of climate changes

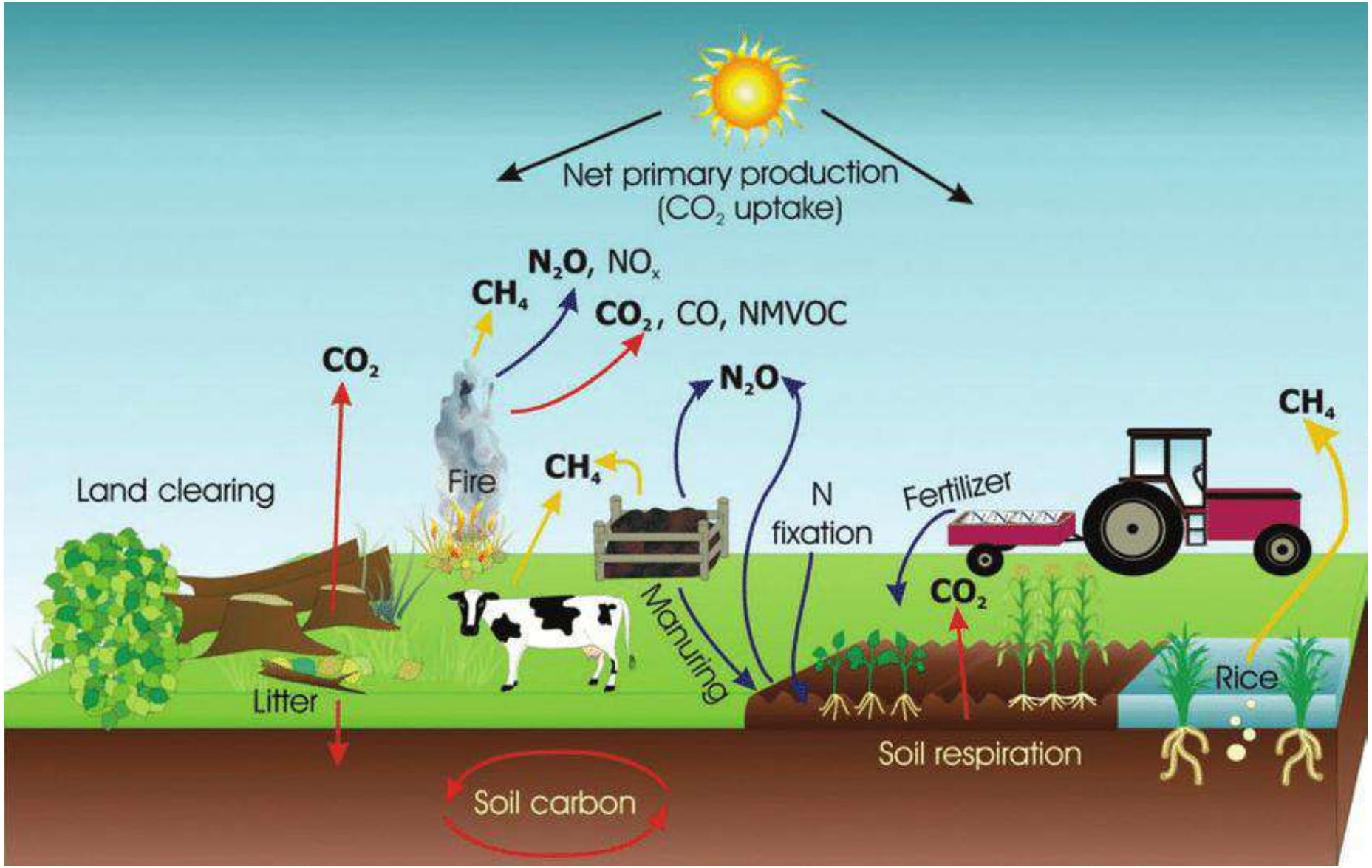
GREENHOUSE GAS EMISSIONS

Global Emissions by Sector



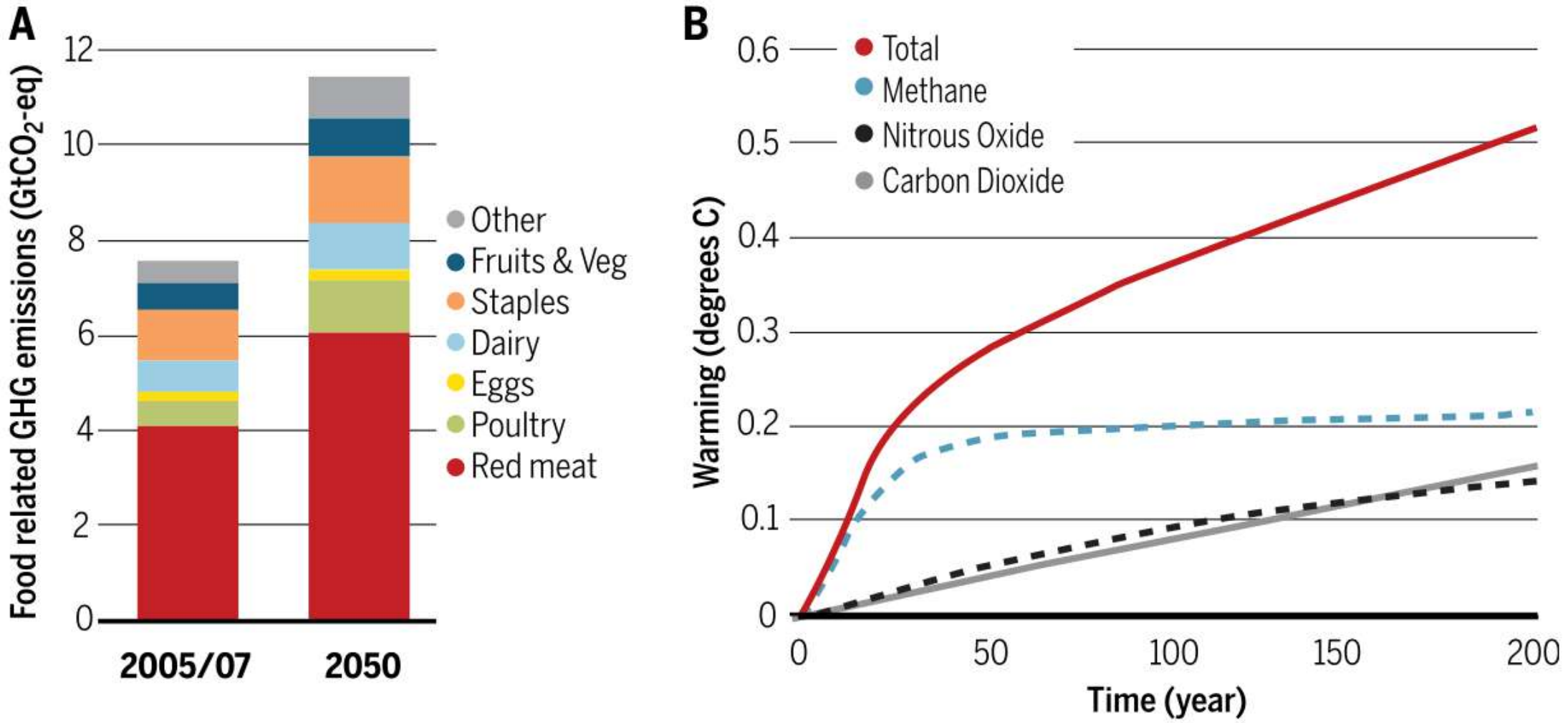
Global greenhouse gas emissions (2019) by sector.
Source: IPCC

CLIMATE CENTRAL


Net primary production
(CO_2 uptake)
N_2O, NO_x
CH_4
CO_2, CO, NMVOC
CO_2
N_2O
CH_4
Land clearing
Fire
CH_4
N
fixation
Fertilizer
CH_4
CO_2
Manuring
Litter
Rice
Soil respiration
Soil carbon

Meat consumption, health, and the environment

Godfray *et al.*, *Science* **361**, 243 (2018)



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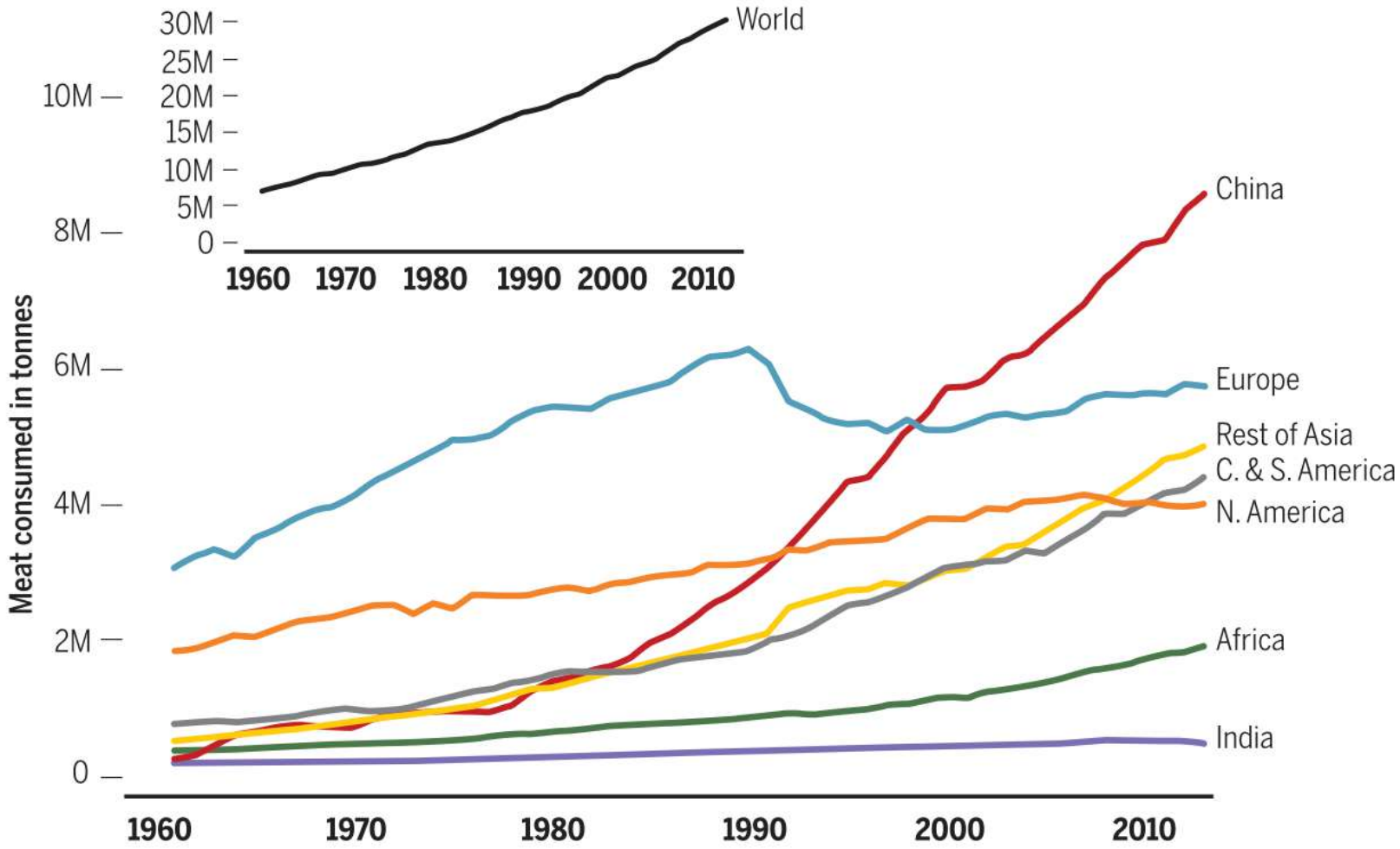
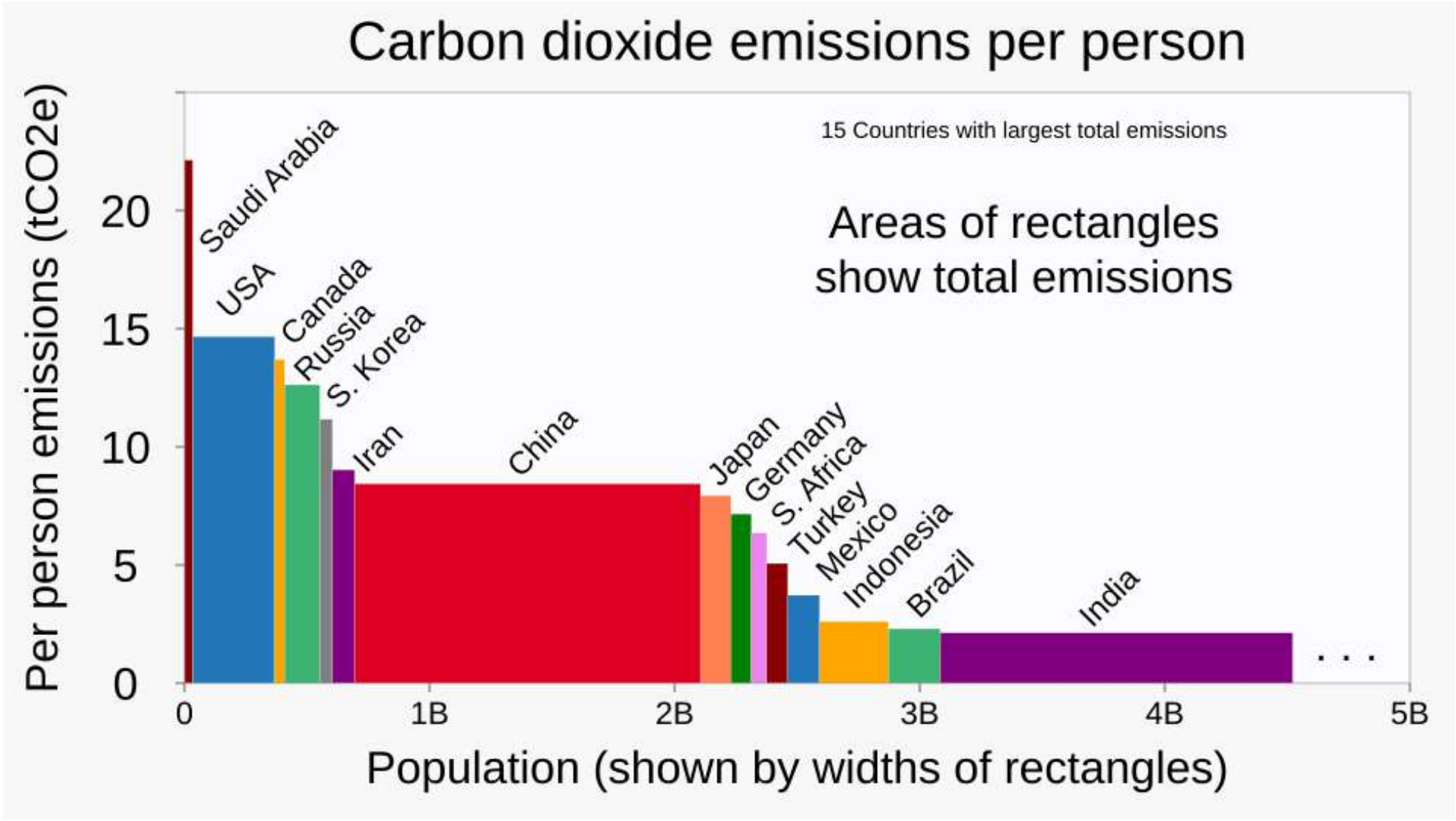


Total consumption of meat (in million metric tons) in different regions and (inset) globally. [Data are from www.fao.org/faostat/en/?#data.]


Carbon dioxide emissions per person
15 Countries with largest total emissions
Areas of rectangles
show total emissions
Per person emissions (tCO2e)
0
5
10
15
20
Saudi Arabia
USA
Canada
Russia
S. Korea
Iran
China
Japan
Germany
S. Africa
Turkey
Mexico
Indonesia
Brazil
India
. . .
0
1B
2B
3B
4B
5B
Population (shown by widths of rectangles)

Istat | RAPPORTO ANNUALE 2025

- Massimo storico per l'aspettativa di vita alla nascita (81,4 M; 85,5 F), ma continua a ridursi il numero di anni attesi in buona salute, soprattutto per le donne che toccano il minimo dal 2014

Anno 2024

56,6 anni

SPERANZA DI VITA IN BUONA SALUTE ALLA NASCITA – DONNE

UOMINI: 59,8 ANNI

Istat | RAPPORTO ANNUALE 2025

Anno 2023

2,9 milioni

PERSONE CON DISABILITÀ

5,0% DELLA POPOLAZIONE

★ Diminuisce la quota di persone con disabilità che stanno male o molto male (dal 61,0% del 2010 al 57,3% del 2023), è ridotta quella di persone con disabilità che stanno bene/molto bene (9,8%)

Food in the Anthropocene: the EAT–*Lancet* Commission on healthy diets from sustainable food systems

	Percentage	Number	Comments
Comparative Risk Model*	19%	11 100 000 (using Global Burden of Disease number of total deaths; 158 regions)	Changes in fruits, vegetables, nuts, and legumes were main contributors
Global Burden of Disease Model†	22·4%	10 886 000 (195 countries)	Changes in sodium, fruits, vegetables, whole grains, and nuts were main contributors
Empirical Disease Risk‡	23·6%	11 600 000 (190 countries)	Estimates based on a 10-variable index of diet quality

*Dietary factors included high consumption of red meat (including beef, lamb, and pork), low consumption of fruits, vegetables, legumes, nuts and seeds, fish, and being underweight, overweight, and obese.[131] †The Global Burden of Disease estimates[132] are based on an optimal diet similar to the reference diet. Dietary factors included fruits, vegetables, legumes, whole grains, nuts and seeds, milk, red meat, processed red meat, sugar-sweetened beverages, fibre, calcium, marine n-fatty acids, polyunsaturated fat, trans fatty acids, sodium. ‡The Alternative Healthy Eating Index-2010[133,134] used in the analysis included vegetables (potatoes not included), fruits, whole grains, sugar-sweetened beverages and fruit juices, nuts and legumes, red meat, trans fatty acids, marine n-3 fatty acids, polyunsaturated fat, and sodium (alcohol not included).

Table 3: **Estimated avoided premature deaths among adults by global adoption of reference diet**

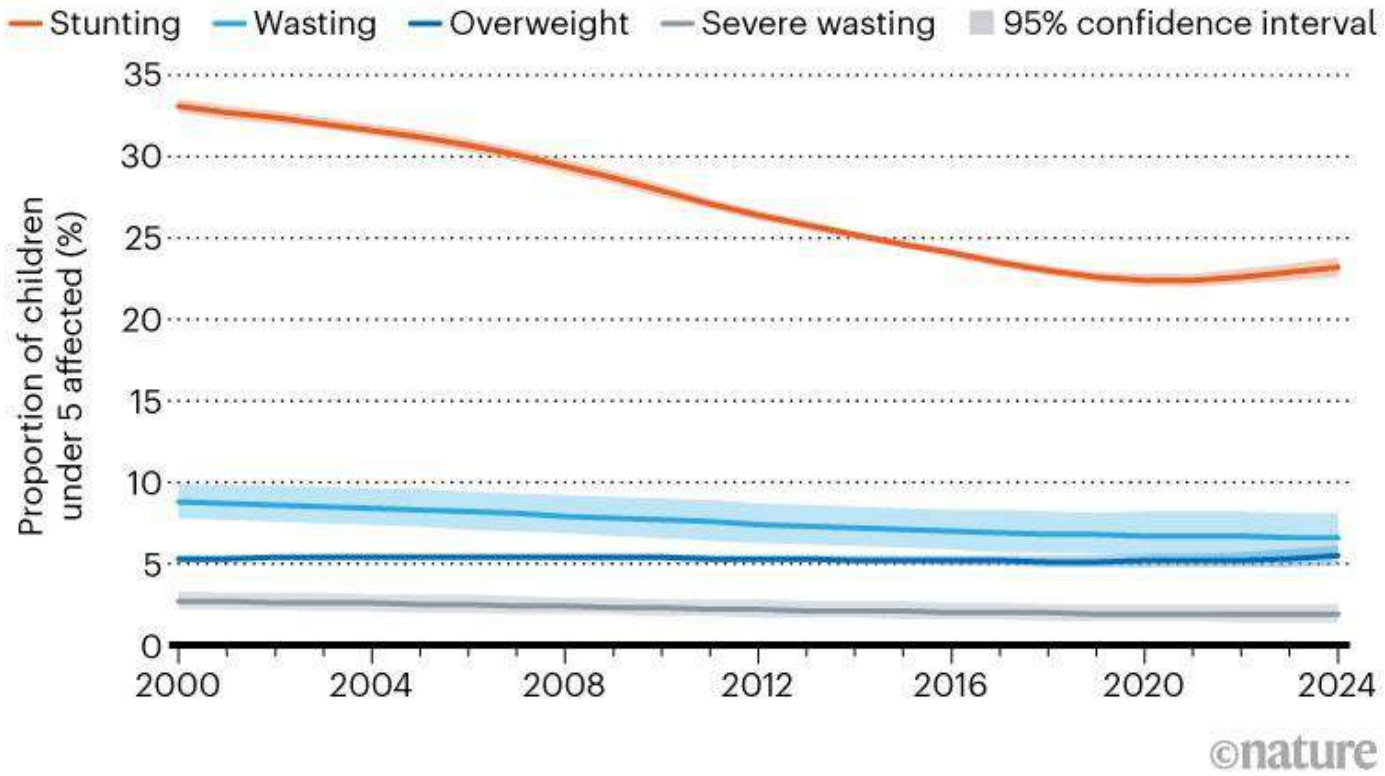
Lancet 2019; 393: 447–92

More food, less malnutrition?

The spectre of malnutrition is back and must be tackled - fast

STALLED PROGRESS

After decades of decline in the prevalence of stunting in children under the age of five, the trend has gone into reverse, according to data from the UN children's agency UNICEF, the World Health Organization and the World Bank.



Corporations took control of our food — but we can reclaim it

Power and profit drive what ends up on people's plates, but meaningful change will take more than just improving consumer choice. **By Laura Kelly**

"Their pursuit of profit drives the manufacture of ultra-processed products that are designed to be addictive."


Sailing to the disaster ...

A global assessment of food and non-food spending: evidence from 173 countries and implications for food security

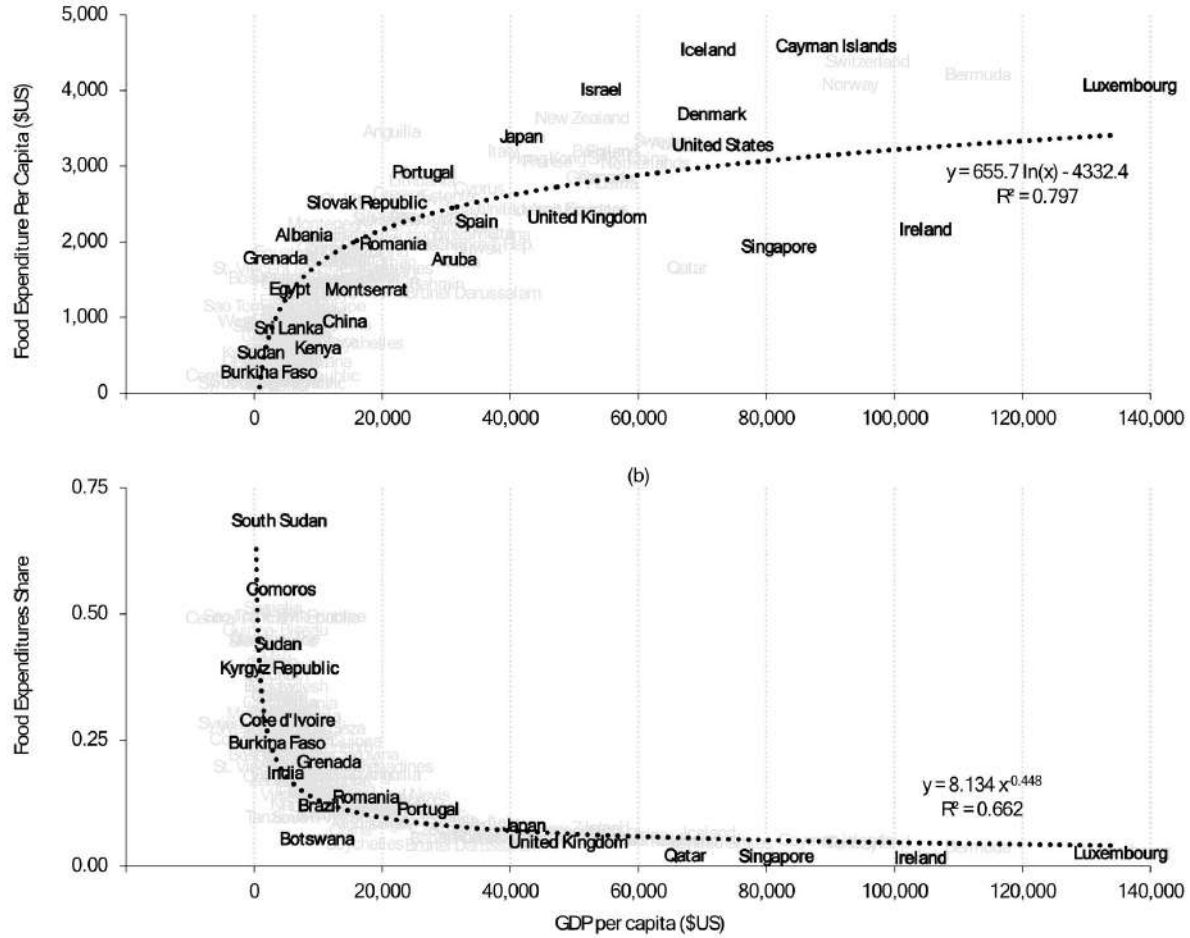


Fig. 1 Food expenditure per capita and food expenditure share across countries based on the 2021 ICP data. Source: World Bank (2024)

Nzayiramya *et al. Agriculture & Food Security* (2025) 14:20
https://doi.org/10.1186/s40066-025-00538-z

A global assessment of food and non-food spending: evidence from 173 countries and implications for food security

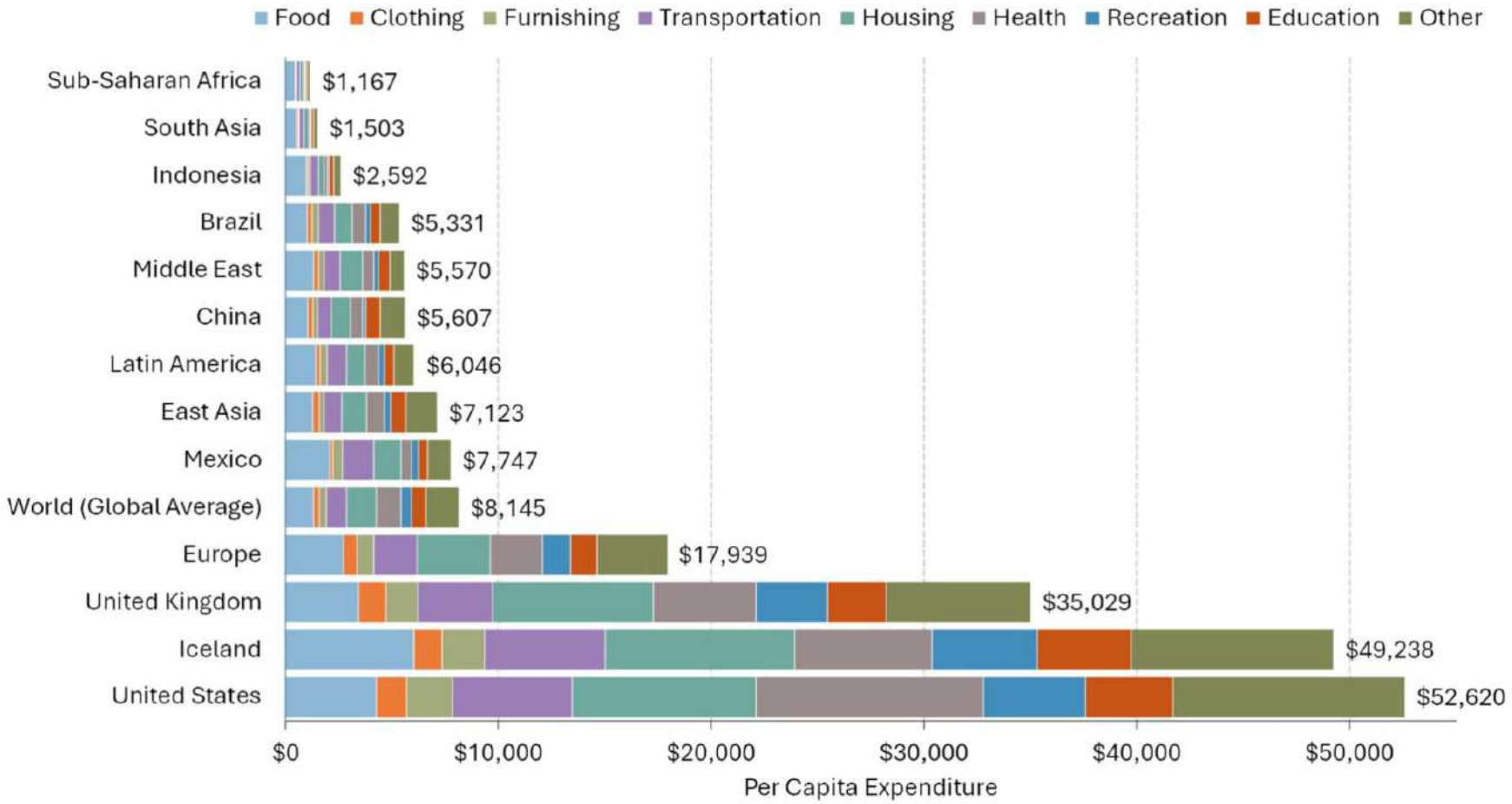


Fig. 2 Comparison of per capita expenditure across selected countries and regions based on the 2021 ICP data. Source: World Bank (2024)

Nzayiramya *et al. Agriculture & Food Security* (2025) 14:20
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Food in the Anthropocene: the EAT–*Lancet* Commission on healthy diets from sustainable food systems

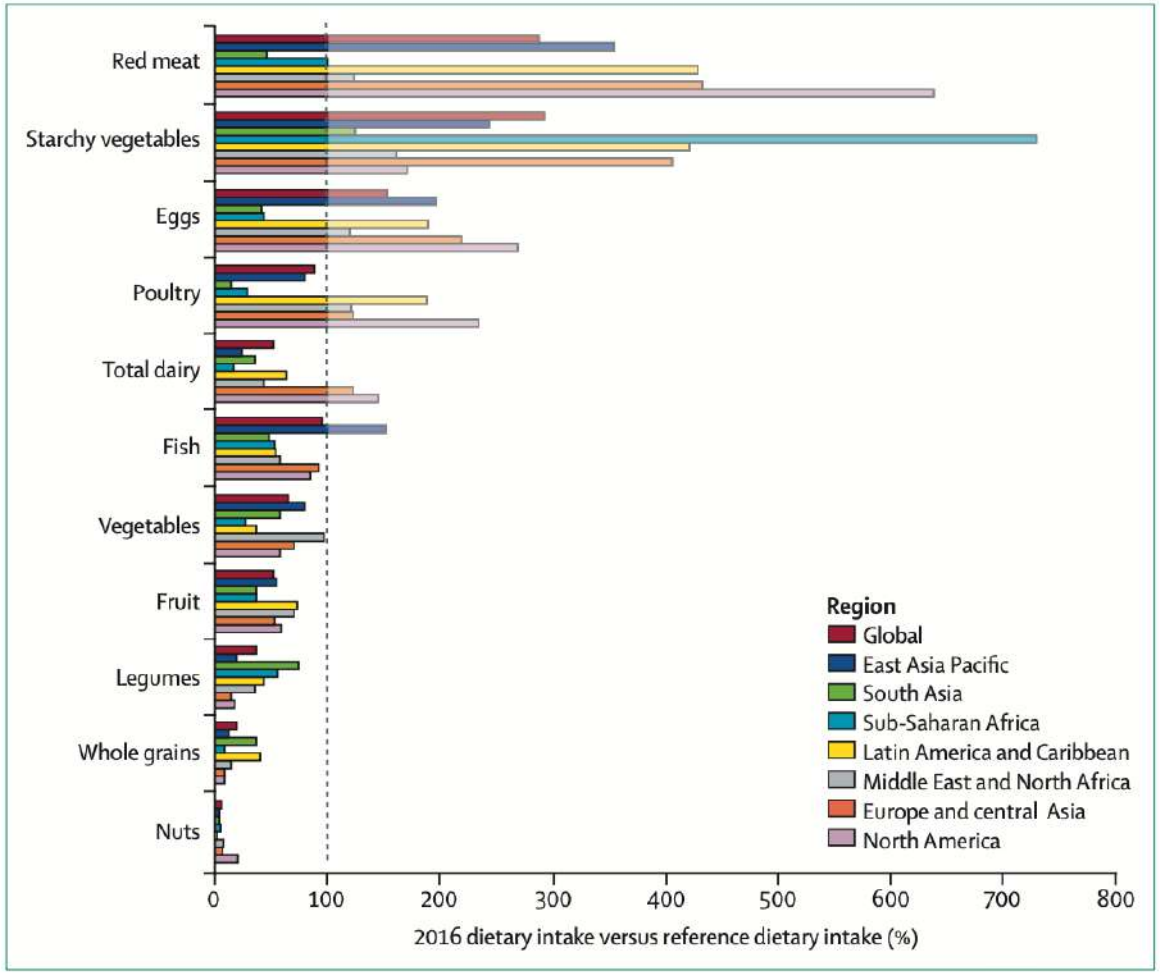


Figure 1: **Diet gap between dietary patterns in 2016 and reference diet intakes of food**

Lancet 2019; 393: 447–92

Food in the Anthropocene: the EAT–*Lancet* Commission on healthy diets from sustainable food systems

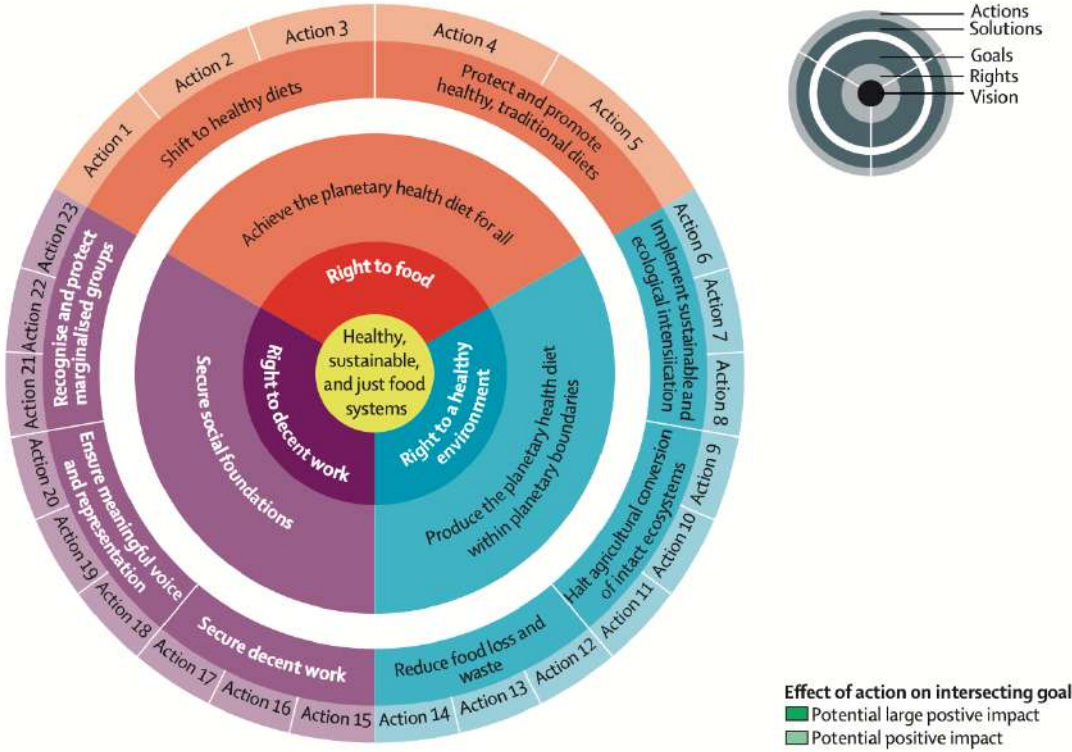
	Control variable	Boundary (uncertainty range)
Climate change	Greenhouse-gas (CH_4 and N_2O) emissions	5 Gt of carbon dioxide equivalent per year (4·7–5·4)
Nitrogen cycling	Nitrogen application	90 Tg of nitrogen per year (65–90;* 90–130†)
Phosphorus cycling	Phosphorus application	8 Tg of phosphorus per year (6–12;* 8–16†)
Freshwater use	Consumptive water use	2500 km^3 per year (1000–4000)
Biodiversity loss	Extinction rate	Ten extinctions per million species-years (1–80)
Land-system change	Cropland use	13 million km^2 (11–15)

*Lower boundary range if improved production practices and redistribution are not adopted. †Upper boundary range if improved production practices and redistribution are adopted and 50% of applied phosphorus is recycled.

***Table 2:* Scientific targets for six key Earth system processes and the control variables used to quantify the boundaries**

Lancet 2019; 393: 447–92

The EAT–*Lancet* Commission on healthy, sustainable, and just food systems



Effect of action on intersecting goals:
Potential large postive impact
Potential positive impact

Solution	Action		Health	Environment	Justice
1 Shift to healthy diets	1	Use taxes and subsidies to shift affordability of unhealthier foods towards the affordability of healthier foods			
	2	Combine advertisement restrictions with mandatory warning labels on unhealthy foods			
	3	Increase purchasing power for households in the lowest quintile through different social protection measures			
2 Protect and promote healthy, traditional diets	4	Recognise and include traditional healthy foods and diets in food-based dietary guidelines and public procurement programmes (eg, school meal programmes)			
	5	Support local markets, including the development of value chains, to promote consumer demand of underused, healthy, and locally produced crops			

Lancet 2025; 406: 1625–700

The EAT–*Lancet* Commission on healthy, sustainable, and just food systems

	Per capita recommended intake (g/day [range])	Per capita recommended intake (kcal/day)
Plant foods*		
Whole grains†	210 (20–50% of daily energy intake)	735
Tubers and starchy roots‡	50 (0–100)	50
Vegetables§	300 (200–600)	95
Fruits¶	200 (100–300)	145
Tree nuts and peanuts	50 (0–75)	275
Legumes‖	75 (0–150)	275
Animal-sourced foods**		
Milk or equivalents (eg, cheese)	250 (0–500)	145
Chicken and other poultry	30 (0–60)	60
Fish and shellfish††	30 (0–100)	25
Eggs	15 (0–25)	20
Beef, pork, or lamb	15 (0–30)	45
Fats, sugar, and salt		
Unsaturated plant oils‡‡	40 (20–80)	355
Palm and coconut oil	6 (0–8)	55
Lard, tallow, and butter§§	5 (0–10)	..
Sugar (added or free)	30 (0–30)	115
Sodium	<2	..

Lancet 2025; 406: 1625–700

The EAT–*Lancet* Commission on healthy, sustainable, and just food systems

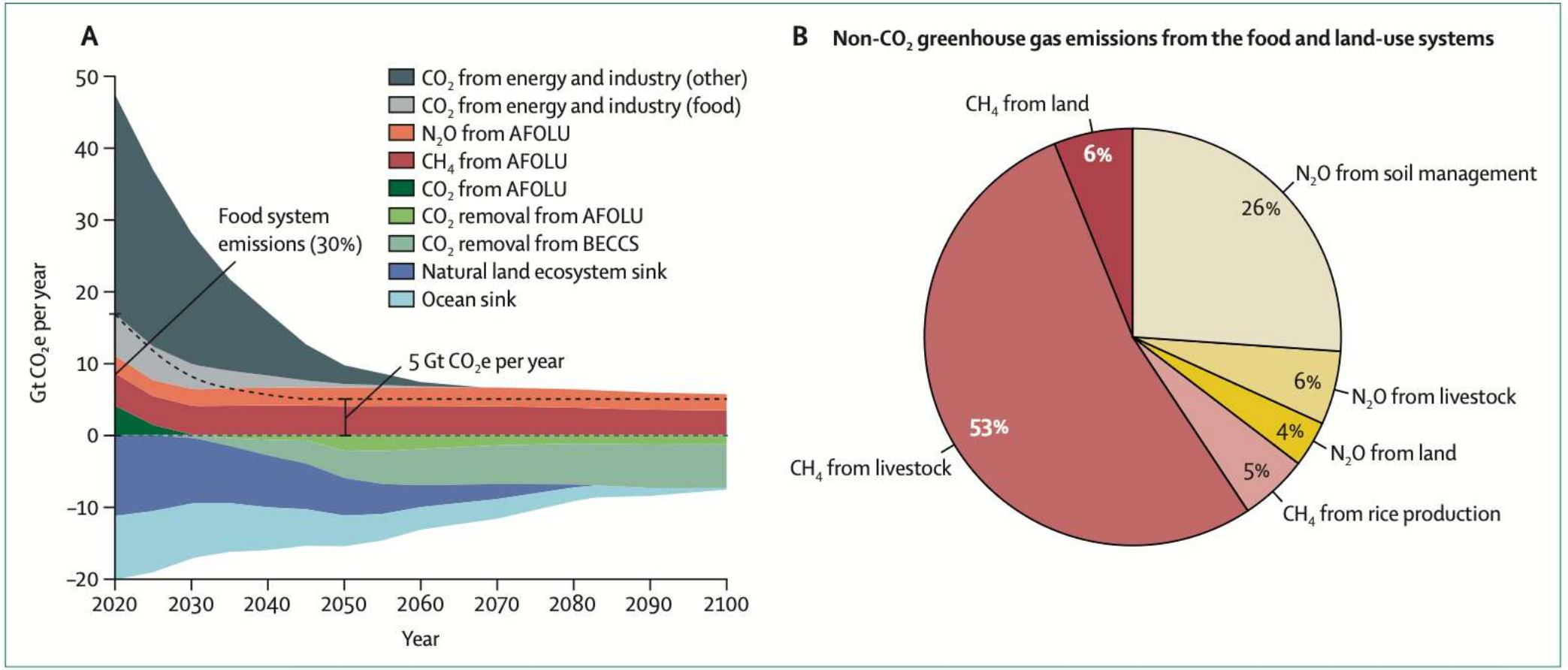
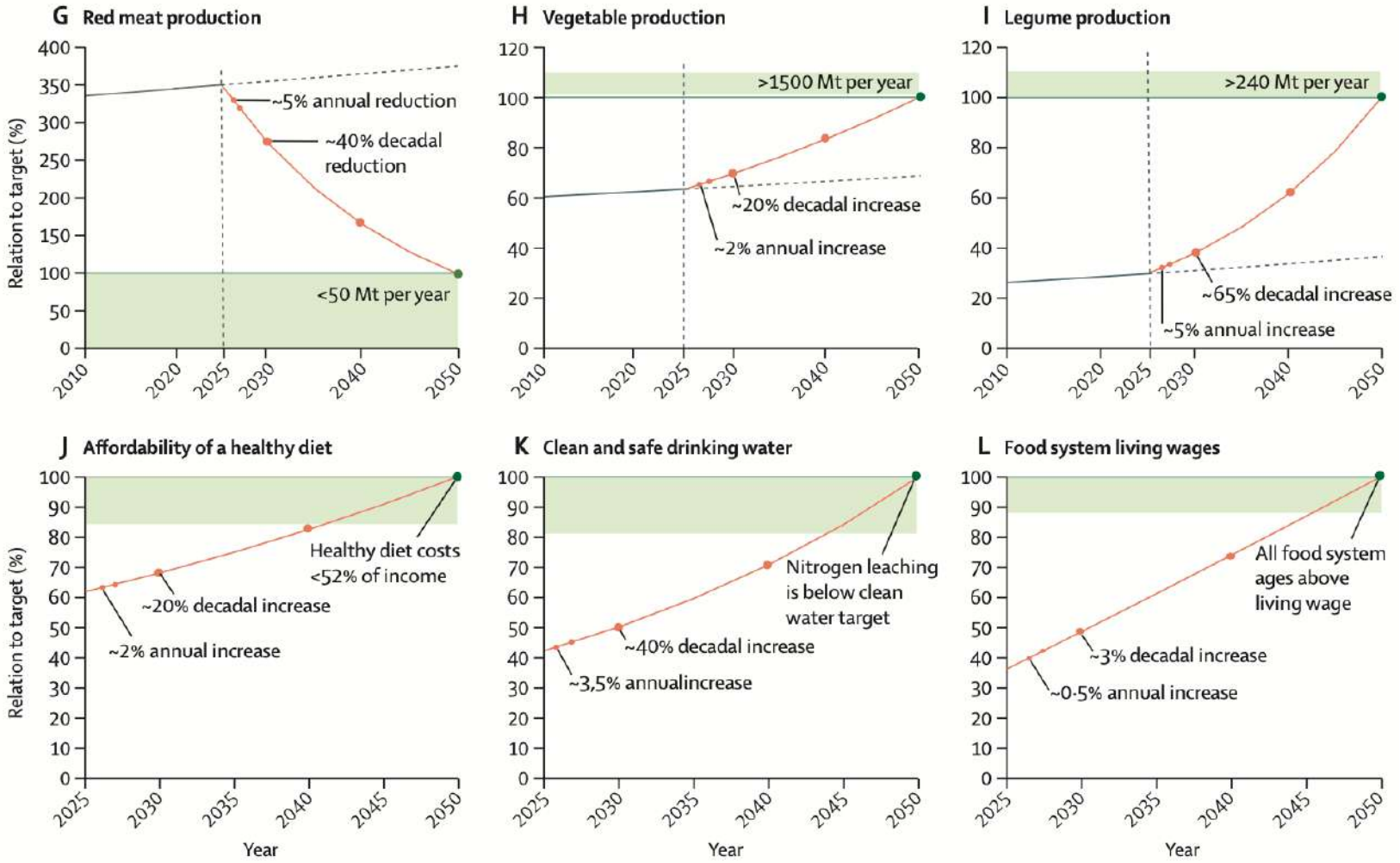


Figure 3: **Emission pathways to 1·5°C and food systems shares**

The EAT–*Lancet* Commission on healthy, sustainable, and just food systems



Lancet 2025; 406: 1625–700


Plant-based diet and protein anabolism
Microsoft Bing

Association between adherence to EAT-Lancet diet and risk of sarcopenia and sarcopenic obesity in adults

Liheng Chen[1,8], Yushan Liao[2,8], Zehua Li[3,8], Jing Yan[1], Peng Liu[4], Yu Sun[5], Wen Jin[5], Weibin Cheng[6,7]✉ and Jingbin Guo[1]✉

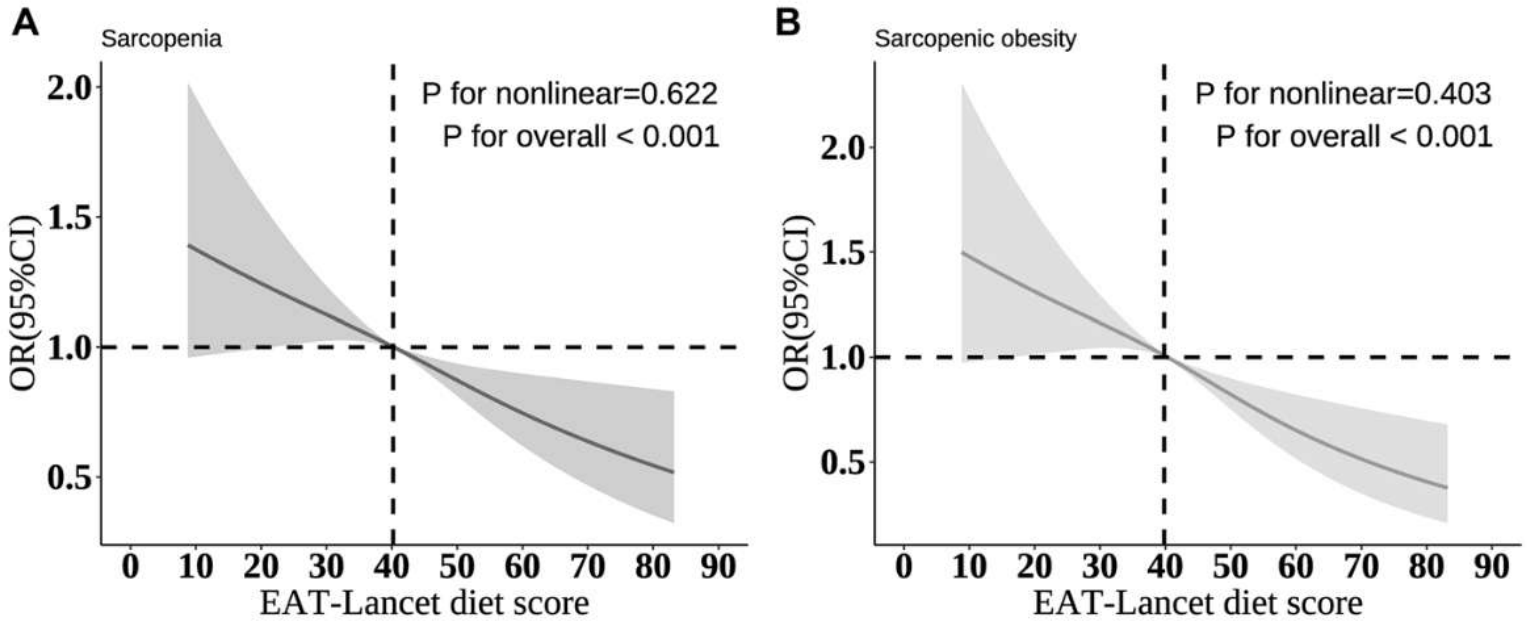


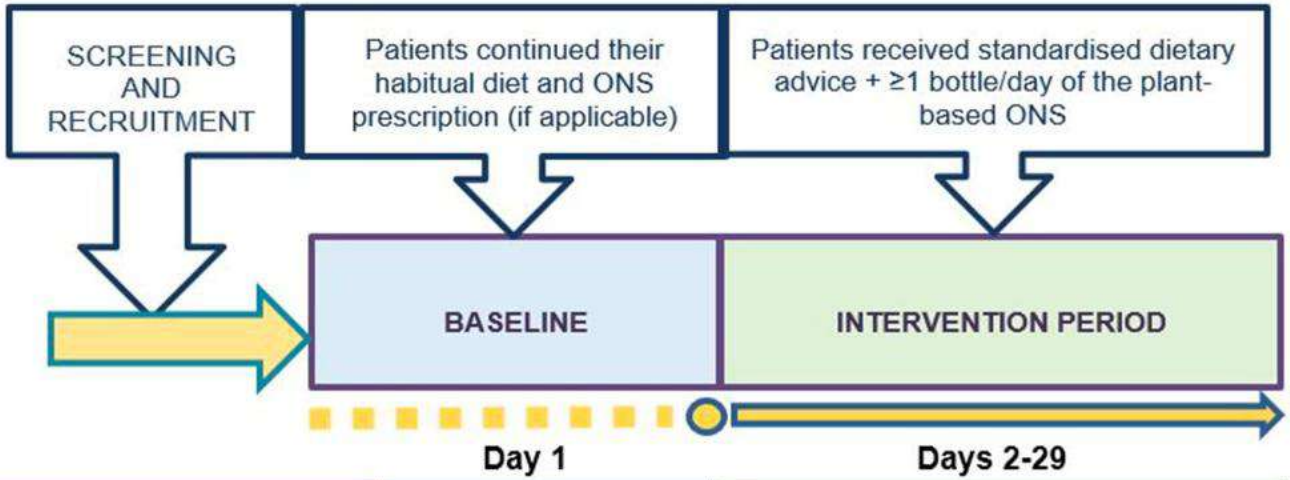
Fig. 2 Restricted cubic spline analysis of association between EAT-Lancet diet score and sarcopenia and sarcopenic obesity. A Sarcopenia, **B** Sarcopenic obesity. The model was adjusted for sex, age, ethnicity, marital status, education level, PIR categories, smoking status, drinking status, physical activity, hypertension, stroke, diabetes, coronary artery disease, and total energy intake. OR odds ratio, CI confidence interval.

International Journal of Obesity

A multi-center prospective study of plant-based nutritional support in adult community-based patients at risk of diseas[illegible] malnutrition

Delsoglio et al.

10.3389/fnut.2023.1297624



OUTCOME	Baseline (Day 1)	Intervention period (Day 29)#
Clinical diagnoses, medication use and physical activity level	HCP	HCP
Compliance**	P*/HCP*	P/HCP
Reason for requiring a plant-based ONS	P	
Anthropometrics and malnutrition risk	HCP	HCP
Nutrient intake	HCP	HCP
Appetite	P	P
Acceptability	P*/HCP*	P/HCP
GI tolerance	P/HCP	P/HCP
Nutritional goal	HCP	HCP
Safety	*Adverse events were recorded throughout the study by the investigating HCP, where applicable.*	

Delsoglio et al.
10.3389/fnut.2023.1297624

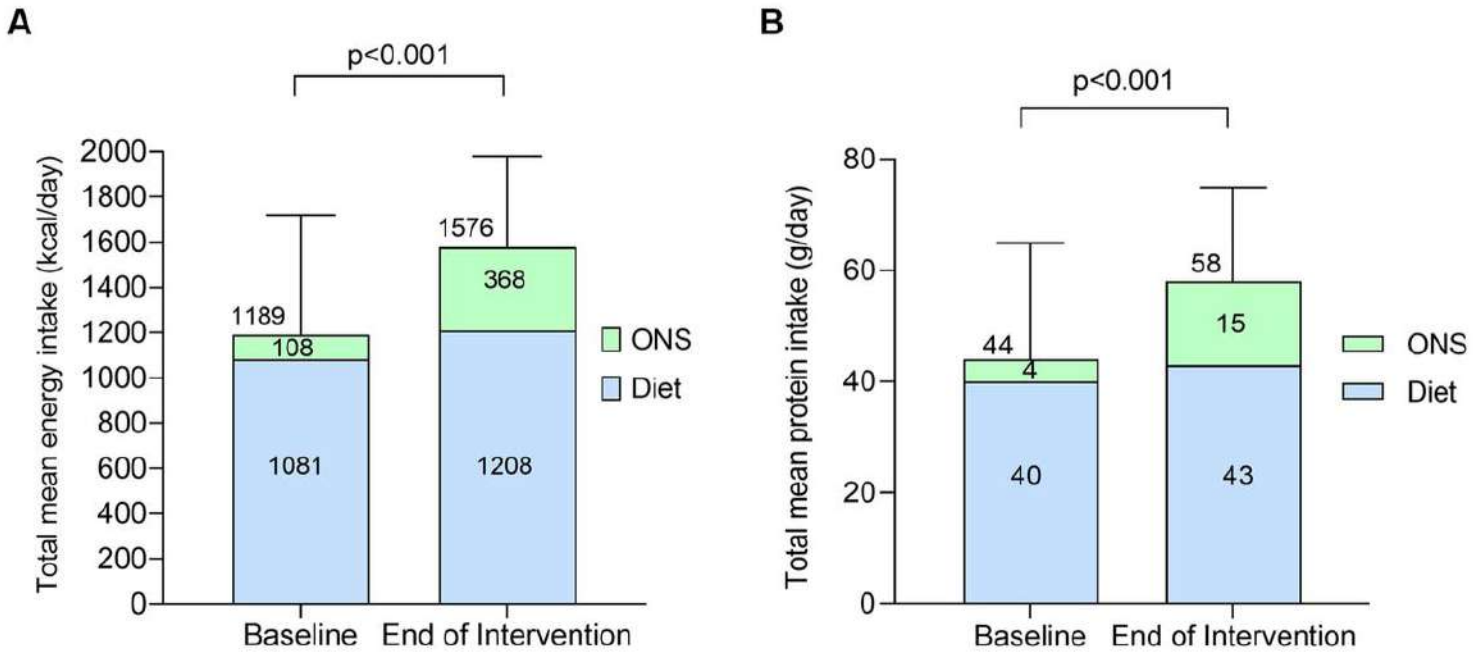


FIGURE 5
Total mean energy [**(A)**, kcal/day] and protein intake [**(B)**, g/day] from diet alone and with ONS at baseline and end of intervention [$n = 23$, means (SD)]. Data were analyzed by paired samples t-test.

10.3389/fnut.2023.1297624

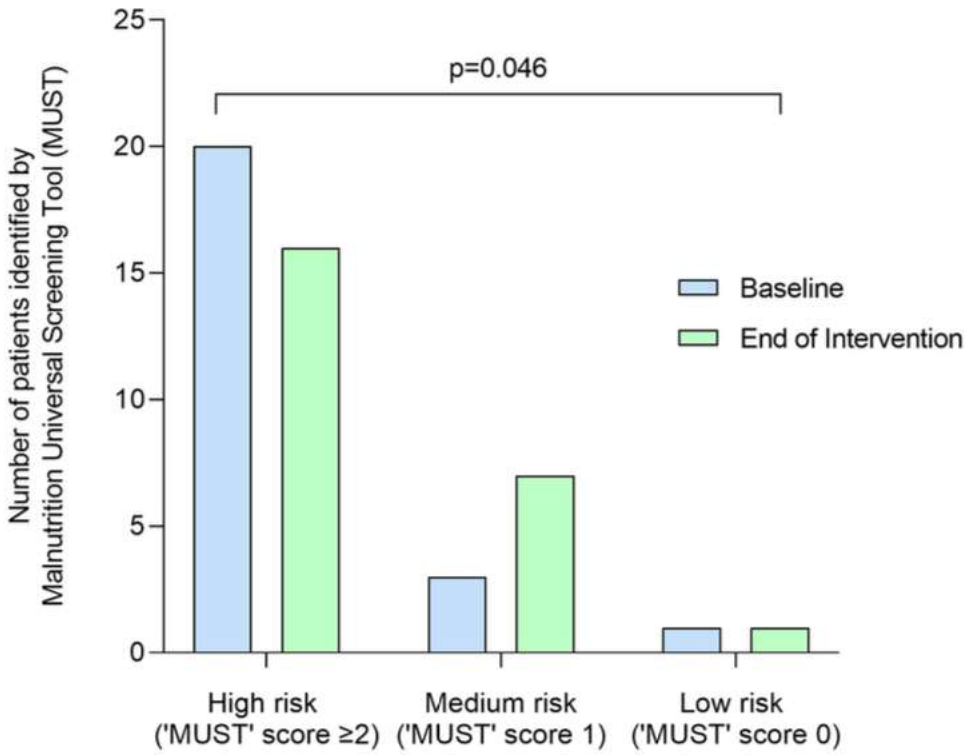


FIGURE 4
Number (*n*) of patients identified as at high risk ('MUST' score = ≥2), medium risk ('MUST' score = 1) and low risk ('MUST' score = 0) of malnutrition at baseline and end of intervention by the Malnutrition Universal Screening Tool (MUST). Data were analyzed by Wilcoxon signed-rank test.

10.3389/fnut.2023.1297624

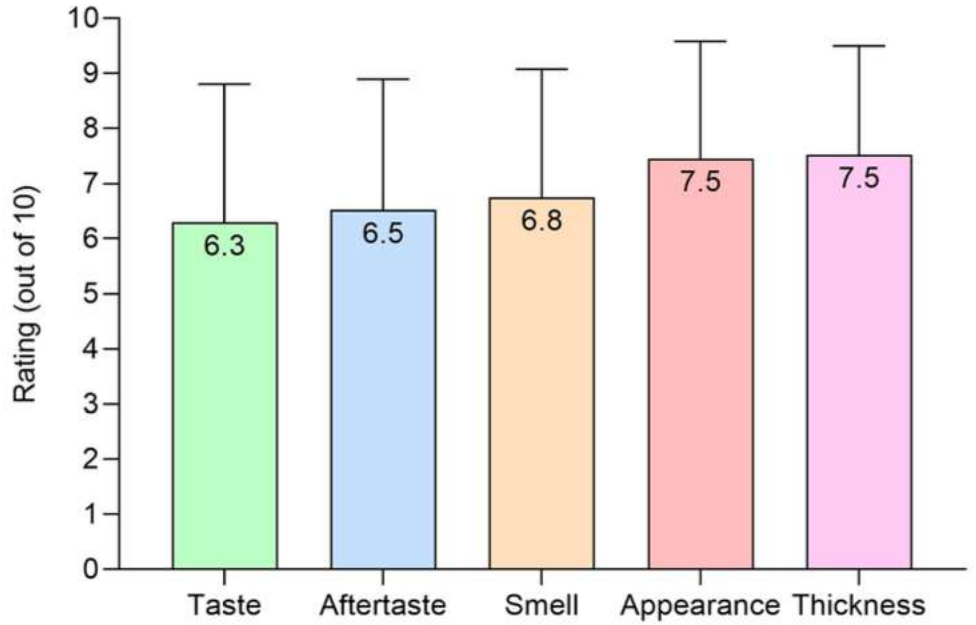
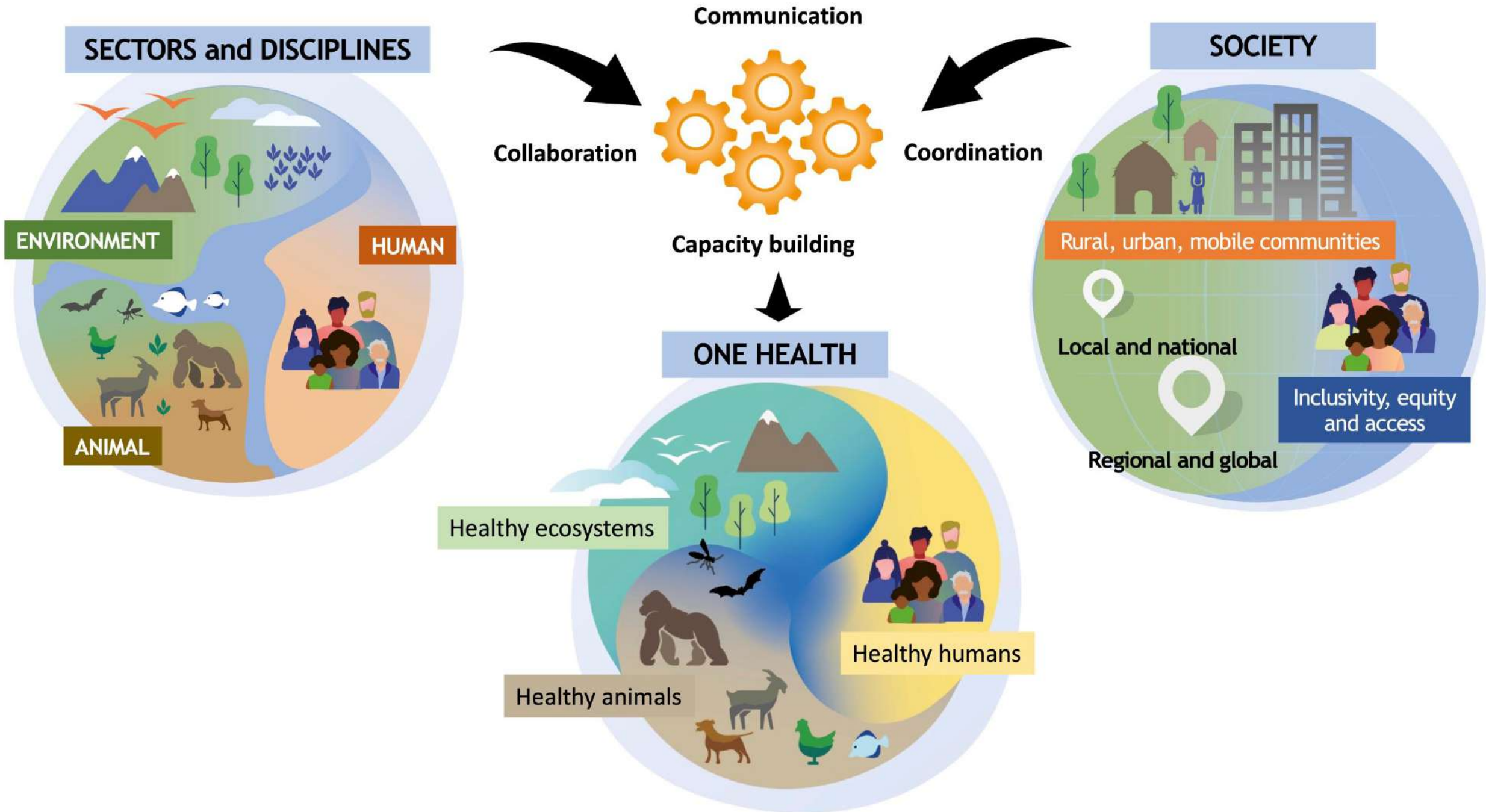


FIGURE 6
Sensory outcomes (out of 10) for the plant-based ONS at end of intervention [$n = 24$, means (SD)].


Solutions?
Trinity College, Dublin


SECTORS and DISCIPLINES
ENVIRONMENT
HUMAN
ANIMAL
Communication
Collaboration
Coordination
Capacity building
ONE HEALTH
Healthy ecosystems
Healthy humans
Healthy animals
SOCIETY
Rural, urban, mobile communities
Local and national
Inclusivity, equity and access
Regional and global

Reducing food's environmental impacts through producers and consumers

Poore *et al.*, *Science* **360**, 987–992 (2018)

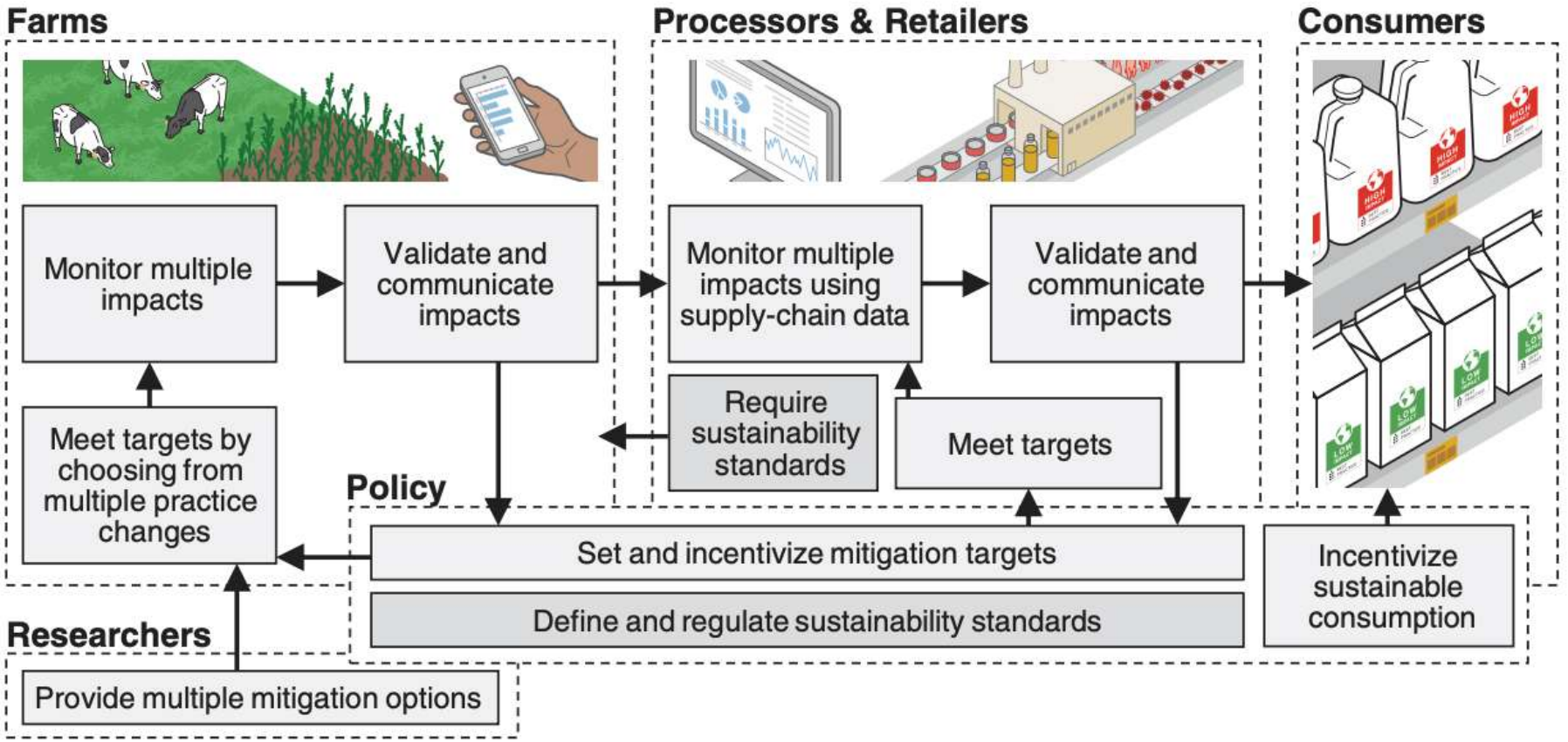
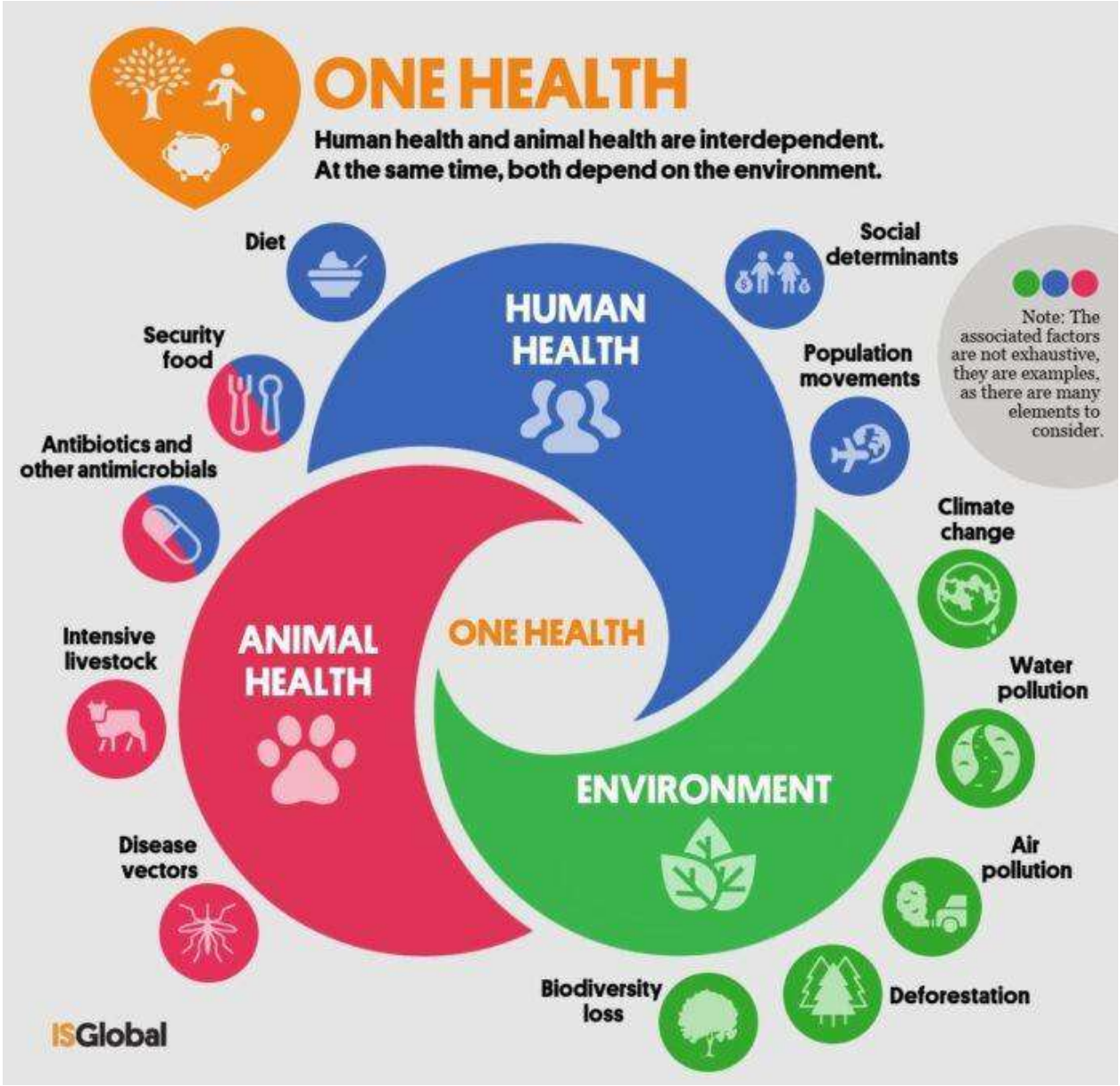


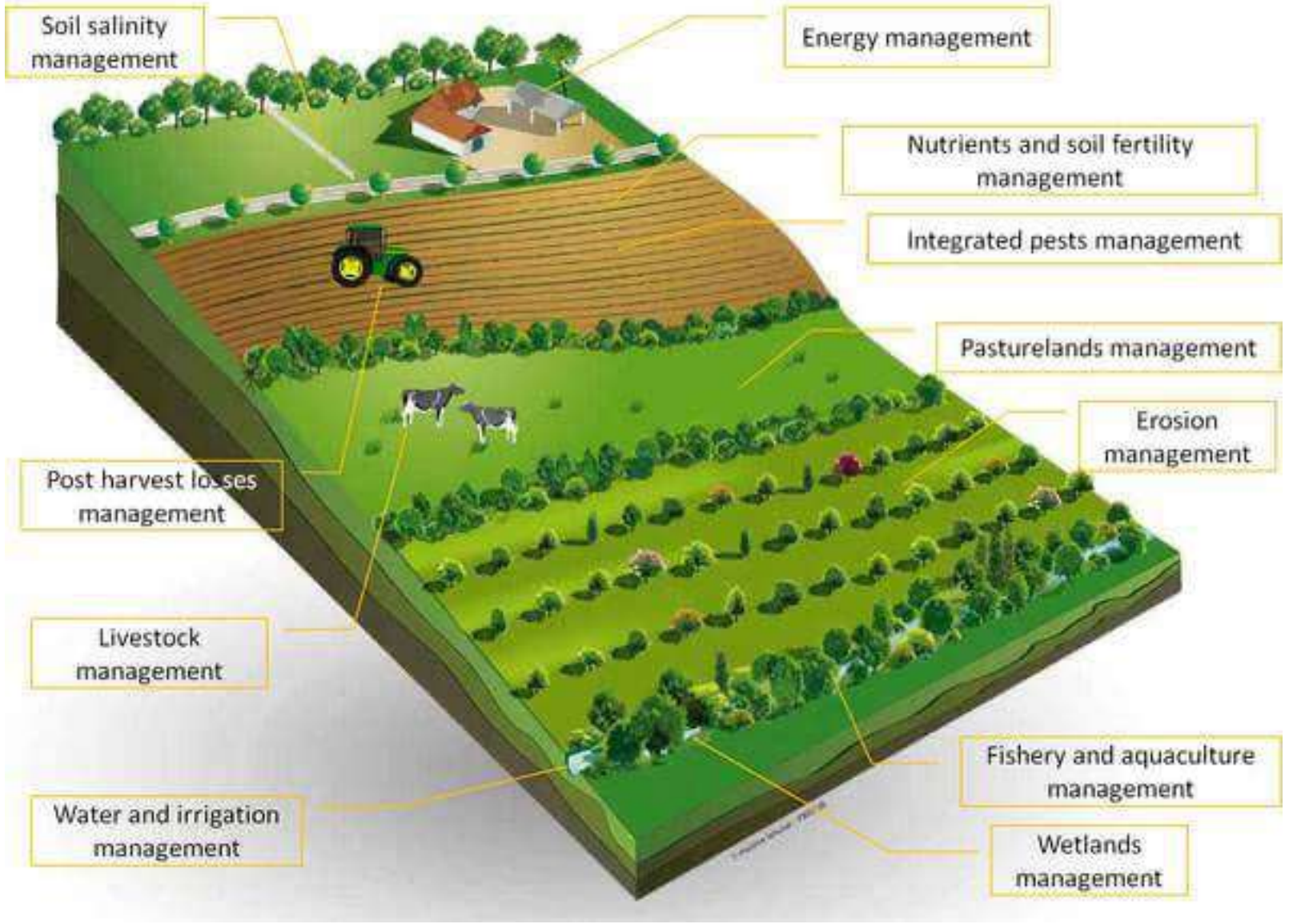
Fig. 4. Graphical representation of the mitigation framework.


ONE HEALTH
Human health and animal health are interdependent.
At the same time, both depend on the environment.
Diet
Social determinants
Security food
Population movements
Antibiotics and other antimicrobials
Climate change
Intensive livestock
Water pollution
Disease vectors
Air pollution
Biodiversity loss
Deforestation
HUMAN HEALTH
ANIMAL HEALTH
ENVIRONMENT
ONE HEALTH
Note: The associated factors are not exhaustive, they are examples, as there are many elements to consider.
ISGlobal

Conclusioni

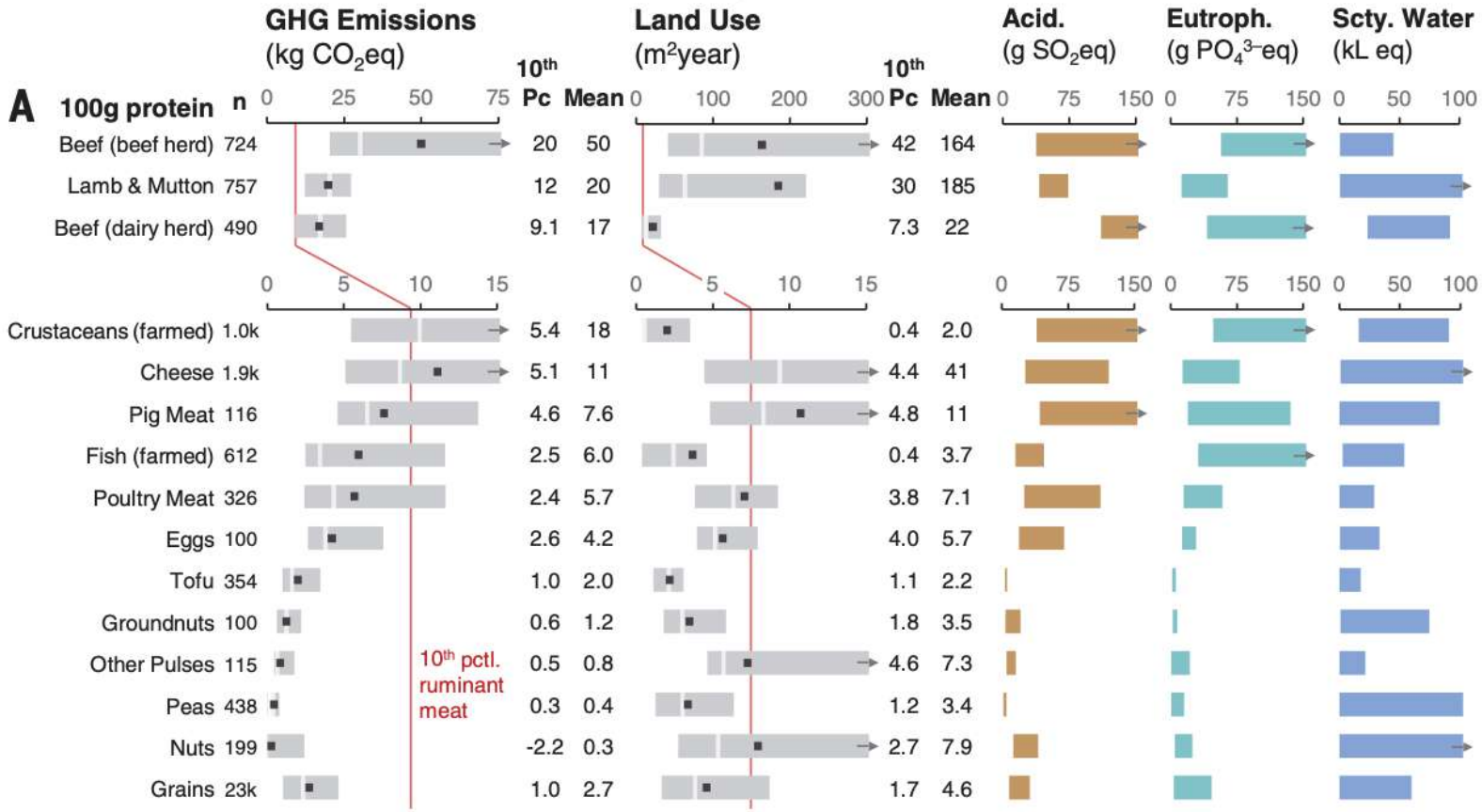
- Inconsapevolmente, stiamo assistendo ad una rapida evoluzione della vita sulla terra.
- Proseguendo sulla strada intrapresa, potremmo compromettere la vita su questo pianeta (Bill Gates docet!)
- Solo un movimento planetario di idee ed azioni possono modificare il destino del pianeta.
- Le scelte alimentari sono libere, ma devono essere responsabili.
- La responsabilità nasce dalla conoscenza.

Grazie per l’attenzione


Soil salinity management
Energy management
Nutrients and soil fertility management
Integrated pests management
Pasturelands management
Erosion management
Post harvest losses management
Livestock management
Fishery and aquaculture management
Water and irrigation management
Wetlands management

Reducing food's environmental impacts through producers and consumers

Poore *et al.*, *Science* **360**, 987–992 (2018)



The EAT–*Lancet* Commission on healthy, sustainable, and just food systems

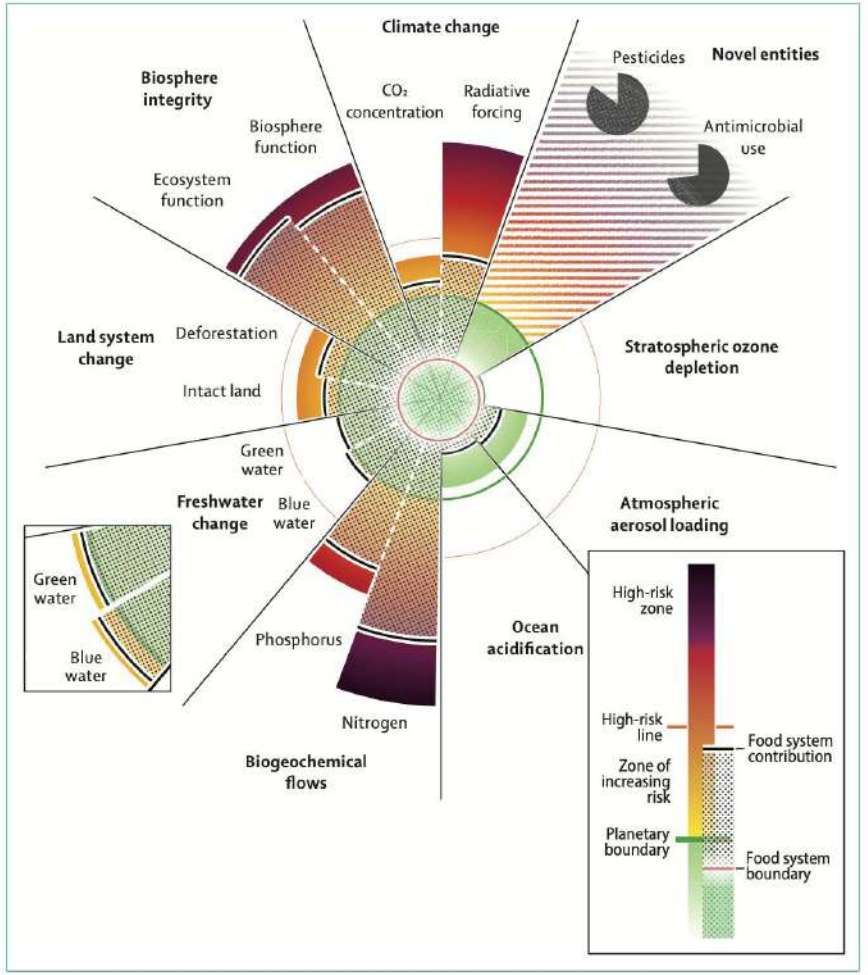


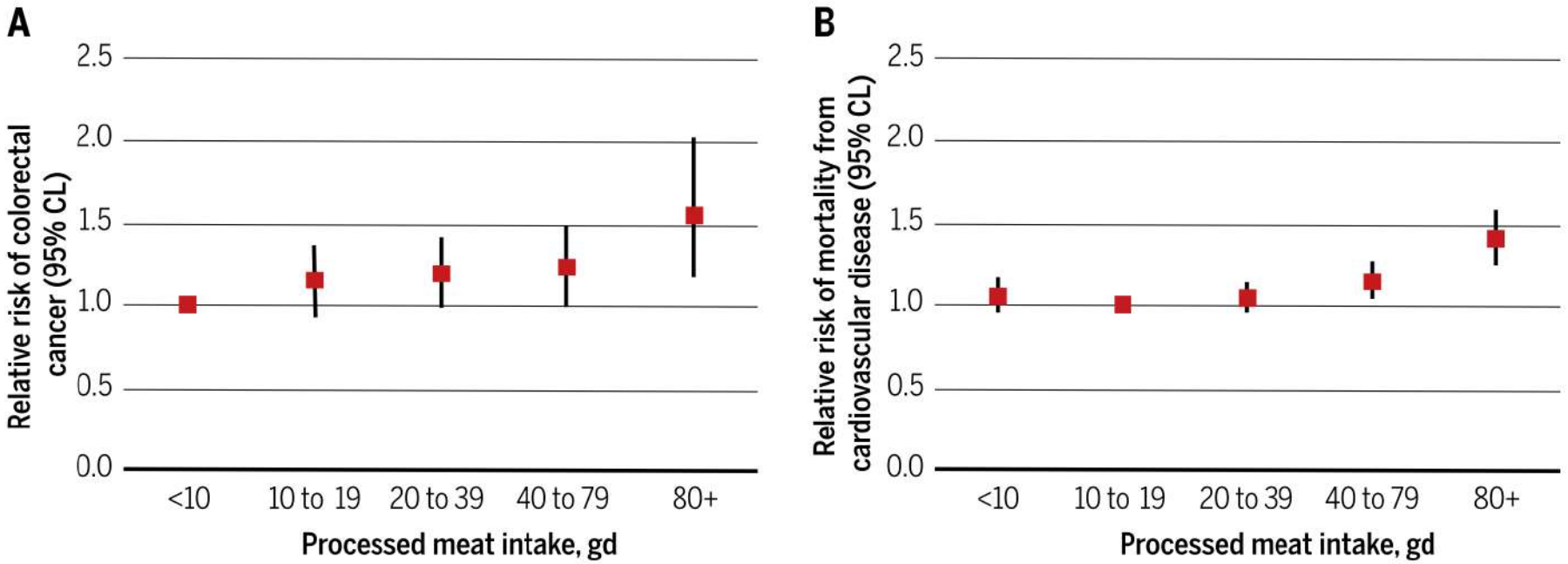
Figure 1: Status of food system pressures across all nine planetary boundaries (indicated by the black dotted pattern) and the food system boundaries (red line)

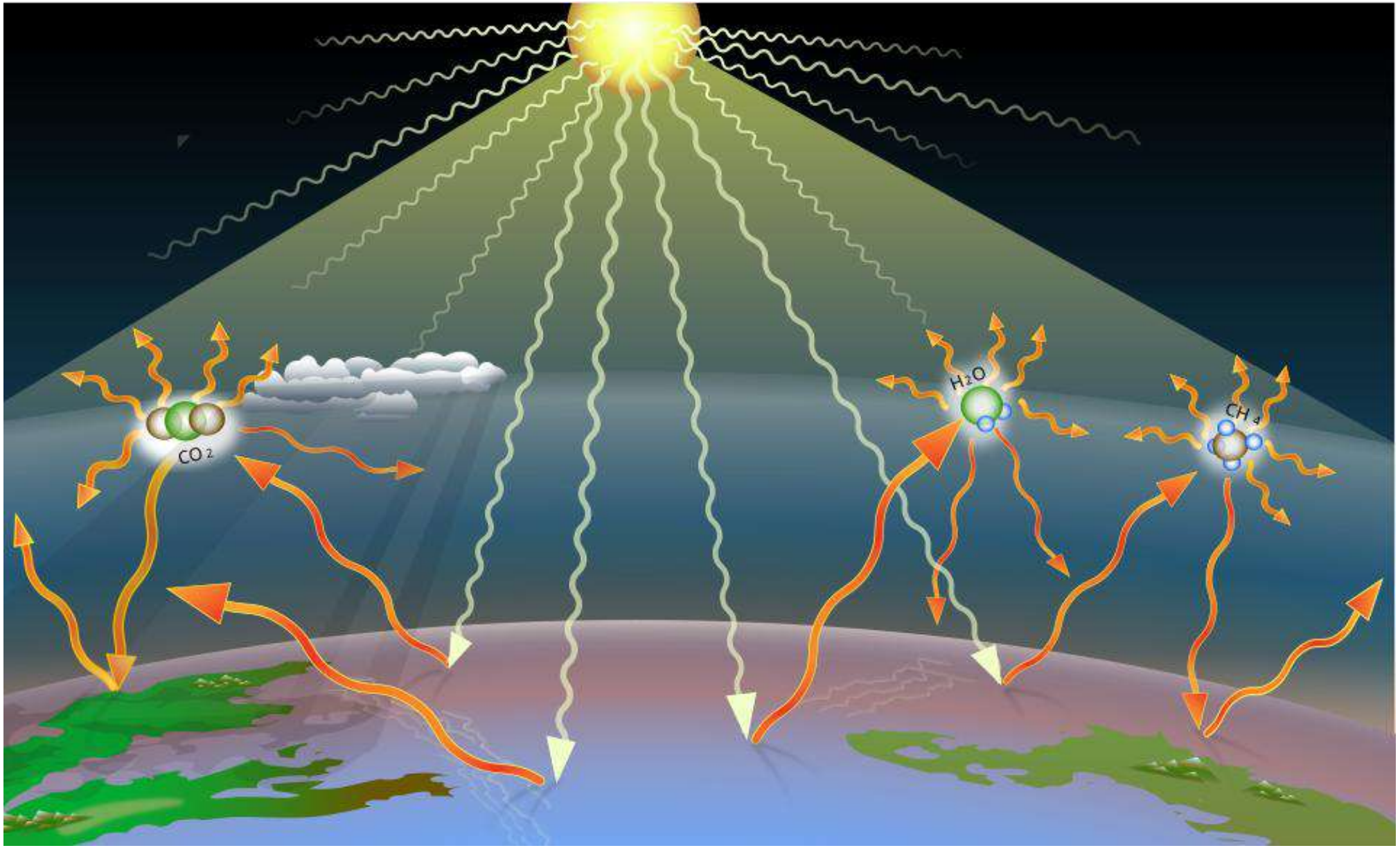
Lancet 2025; 406: 1625–700

Meat consumption, health, and the environment

Godfray *et al.*, *Science* **361**, 243 (2018)

Fig. 2. Meat and health. (**A**) The relative risk of colorectal cancer as a function of average processed meat intake [from (*95*)]. (**B**) The relative risk of cardiovascular death as a function of average processed meat intake [from (*27*)].

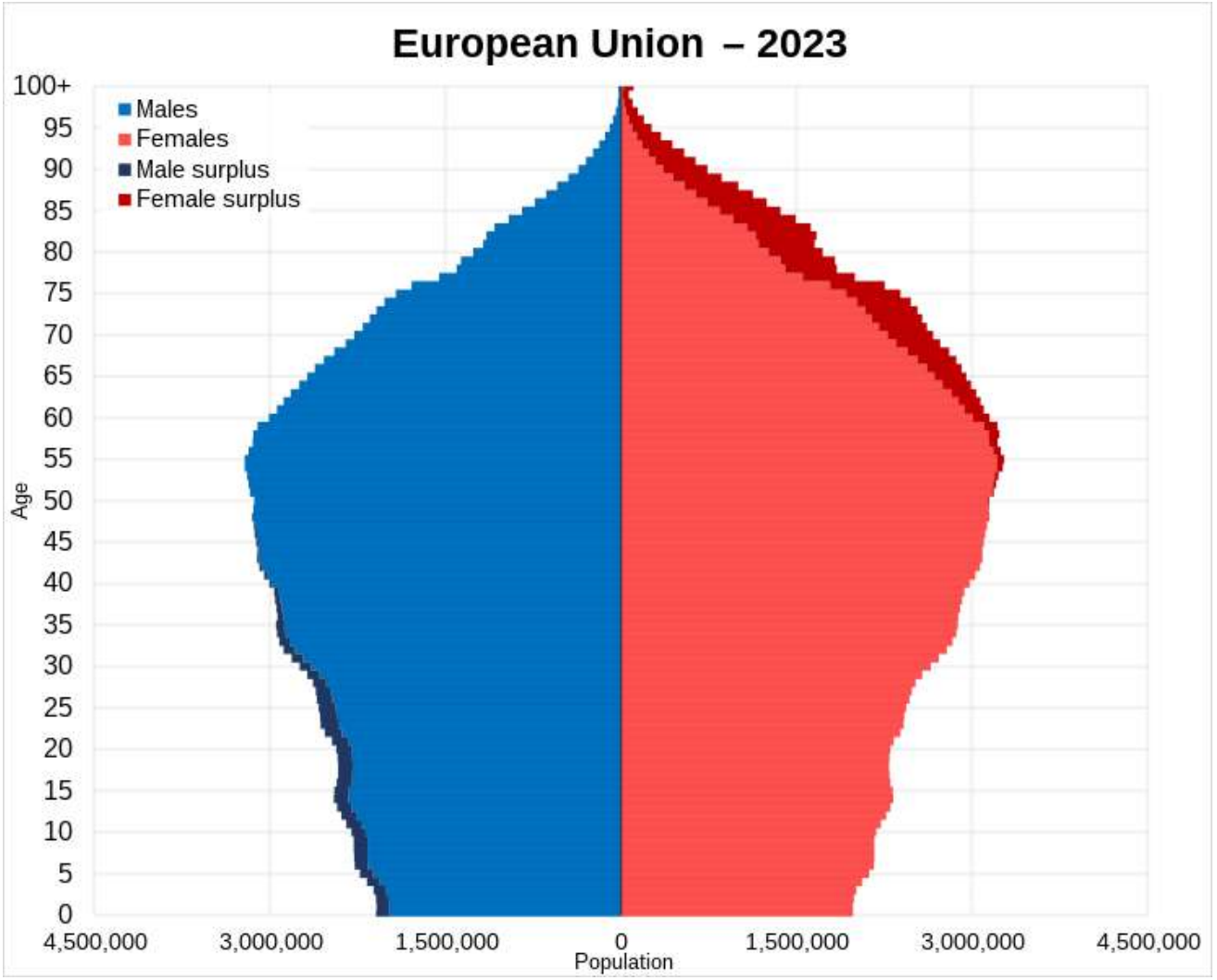



CO2
H2O
CH4


1 SCONFIGGERE LA POVERTÀ
2 SCONFIGGERE LA FAME
3 SALUTE E BENESSERE
4 ISTRUZIONE E QUALITÀ
5 PARITÀ DI GENERE
6 ACQUA PULITA E SERVIZI IGIENICO SANITARI
7 ENERGIA PULITA E ACCESSIBILE
8 LAVORO DIGNITOSO E CRESCITA ECONOMICA
9 IMPRESE INNOVAZIONE E INFRASTRUTTURE
10 RIDURRE LE DISUGUAGLIANZE
11 CITTÀ E COMUNITÀ SOSTENIBILI
12 CONSUMO E PRODUZIONE RESPONSABILI
13 LOTTA CONTRO IL CAMBIAMENTO CLIMATICO
14 VITA SOTT'ACQUA
15 VITA SULLA TERRA
16 PACE, GIUSTIZIA E ISTITUZIONI SOLIDE
17 PARTNERSHIP PER GLI OBIETTIVI
2 FAME ZERO

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

A changing scenario

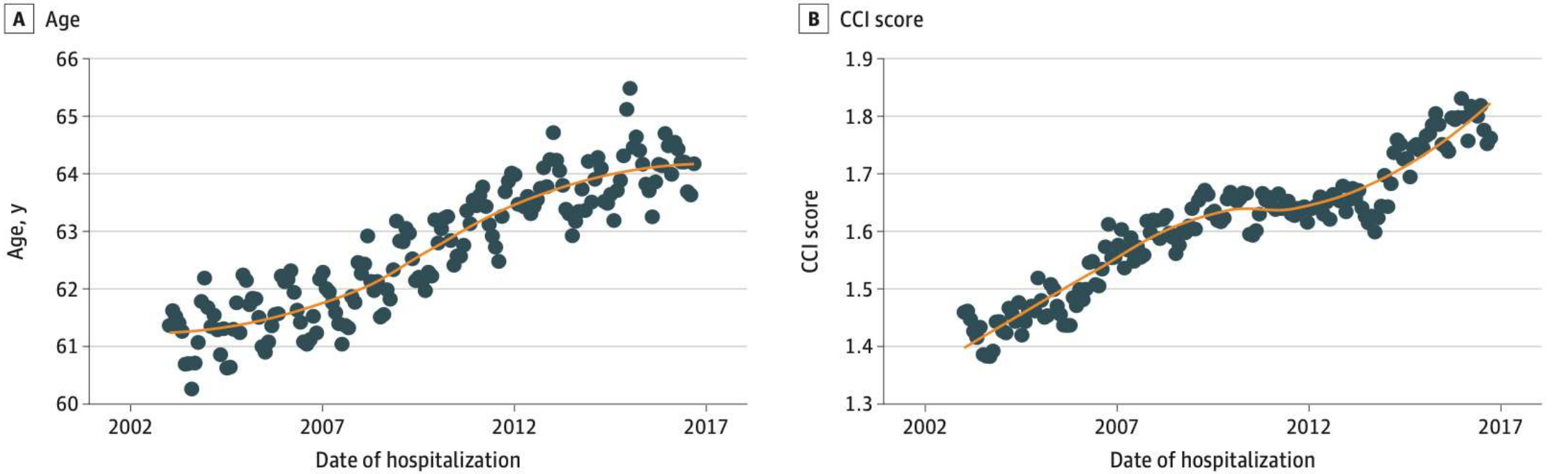


Population-Based Trends in Complexity of Hospital Inpatients

JAMA Internal Medicine Published online January 8, 2024

Hiten Naik, MD; Tyler M. Murray, MD; Mayesha Khan, MA; Daniel Daly-Grafstein, MSc; Guiping Liu, PhD; Barry O. Kassen, MD, MACP; Jake Onrot, MD; Jason M. Sutherland, MSc, PhD; John A. Staples, MD, MPH

Figure 3. Trends in Continuous Measures of Complexity, 2002-2017



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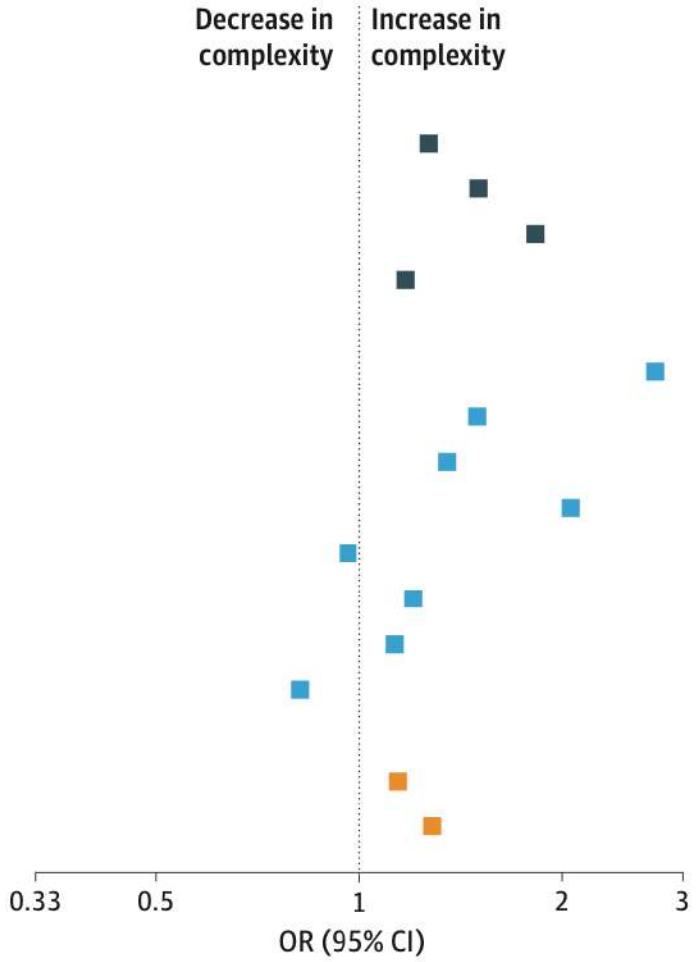
Factor	Baseline prevalence, %	Increase in prevalence, % (95% CI)	OR (95% CI)
Patient factors at admission			
Age ≥75 y	31.9	5.3 (5.1 to 5.5)	1.27 (1.25 to 1.28)
Multimorbidity	8.7	3.8 (3.7 to 3.9)	1.50 (1.47 to 1.53)
Polypharmacy	9.7	6.6 (6.5 to 6.7)	1.82 (1.78 to 1.85)
Hospitalization in prior year	49.4	3.9 (3.7 to 4.1)	1.17 (1.16 to 1.18)
Hospital course			
Admission via ED	79.0	12.2 (12.0 to 12.3)	2.74 (2.71 to 2.77)
Arrival via ambulance	42.1	9.9 (9.8 to 10.1)	1.49 (1.48 to 1.51)
Any interhospital transfer	25.7	6.1 (5.9 to 6.2)	1.35 (1.33 to 1.36)
Multiple acute medical problems	5.0	4.7 (4.6 to 4.8)	2.06 (2.02 to 2.09)
Any ICU stay	10.7	−0.4 (−0.5 to −0.3)	0.96 (0.95 to 0.97)
Any adverse event	9.1	1.6 (1.5 to 1.8)	1.20 (1.19 to 1.22)
Prolonged length of stay	23.9	2.3 (2.1 to 2.4)	1.13 (1.12 to 1.14)
Died in hospital	6.3	−1.1 (−1.2 to −1.0)	0.81 (0.80 to 0.83)
Outcomes within 30 d of discharge			
Unplanned readmission	14.4	1.7 (1.5 to 1.8)	1.14 (1.12 to 1.16)
Death	2.9	0.8 (0.7 to 0.9)	1.28 (1.25 to 1.31)

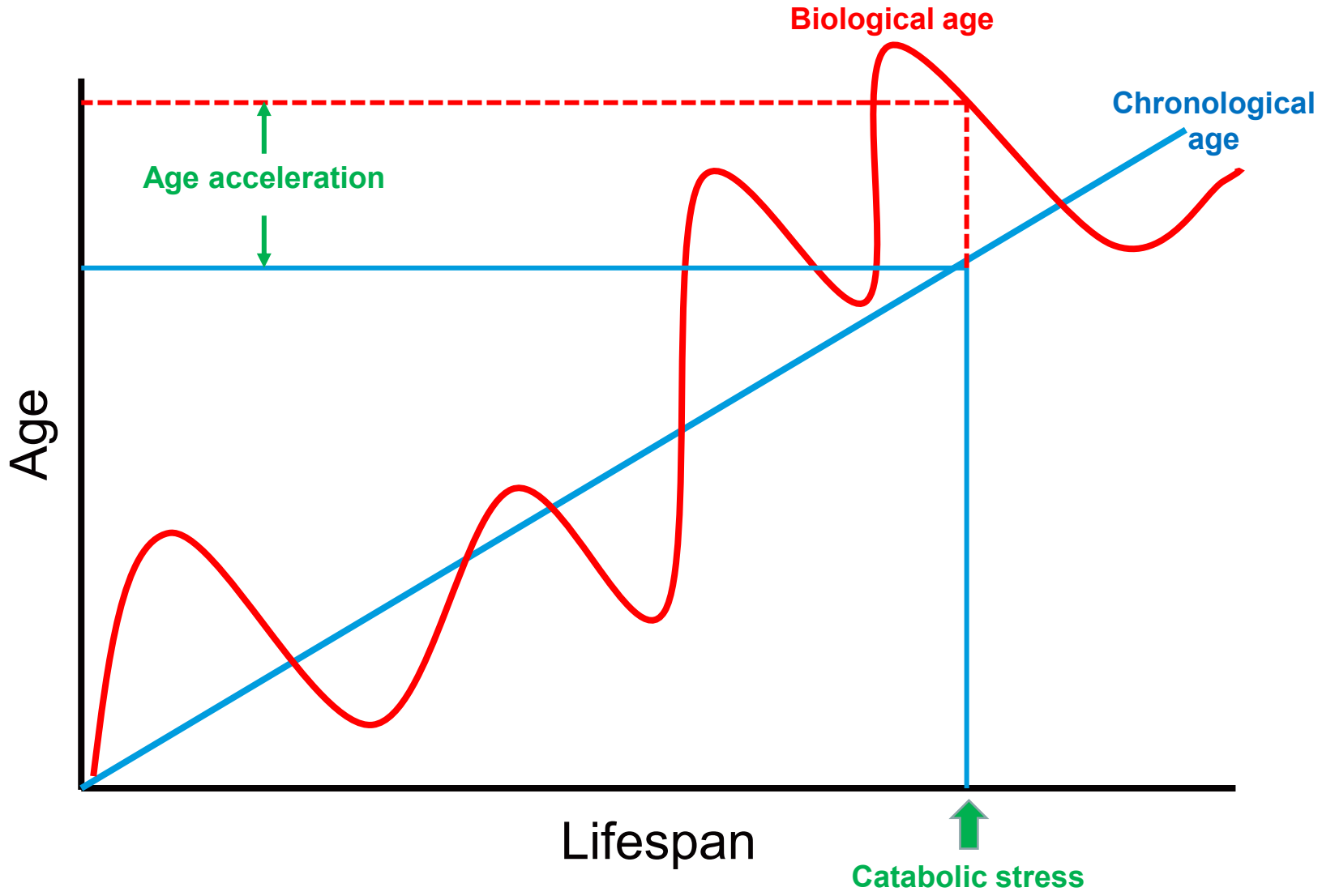


Individualised nutritional support in medical inpatients at nutritional risk: a randomised clinical trial

	Intervention group (n=1015)	Control group (n=1013)
Sociodemographics		
Mean age (years)	72·4 (14·1)	72·8 (14·1)
Age group (years)		
<65	177 (17%)	178 (18%)
65–75	349 (34%)	322 (32%)
>75	489 (48%)	513 (51%)
Male sex	525 (52%)	539 (53%)
Nutritional assessment		
Mean body-mass index (kg/m²)*	24·9 (5·4)	24·7 (5·3)
Mean bodyweight (kg)	70·9 (16·4)	70·9 (16·4)
NRS 2002 score (%)†		
3 points	310 (31%)	314 (31%)
4 points	391 (39%)	384 (38%)
5 points	263 (26%)	261 (26%)
>5 points	51 (5%)	54 (5%)

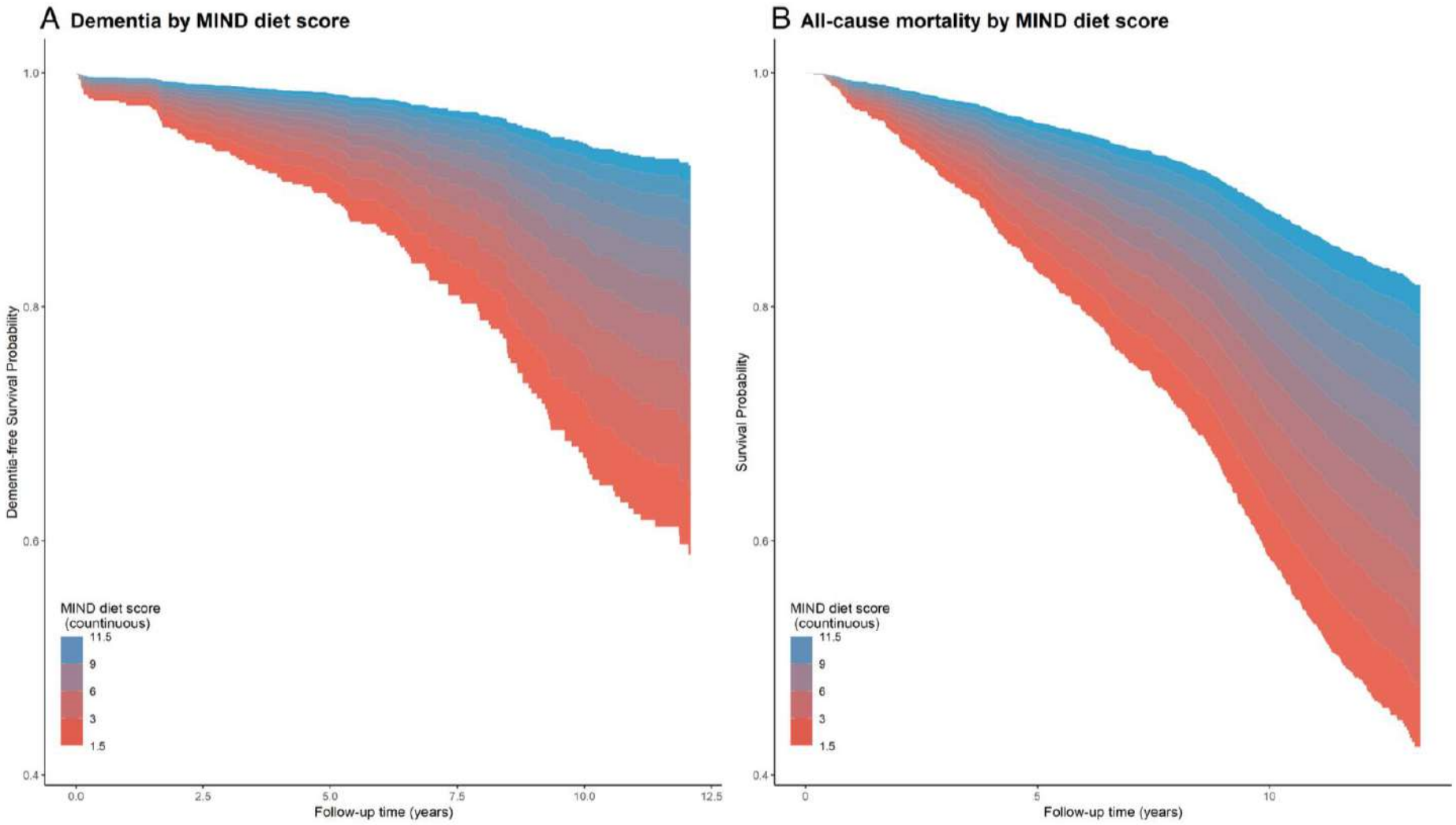
Schuetz P et al. Lancet 2019

Chronological vs biological age



Diet, Pace of Biological Aging, and Risk of Dementia in the Framingham Heart Study

ANN NEUROL 2024;00:1–11



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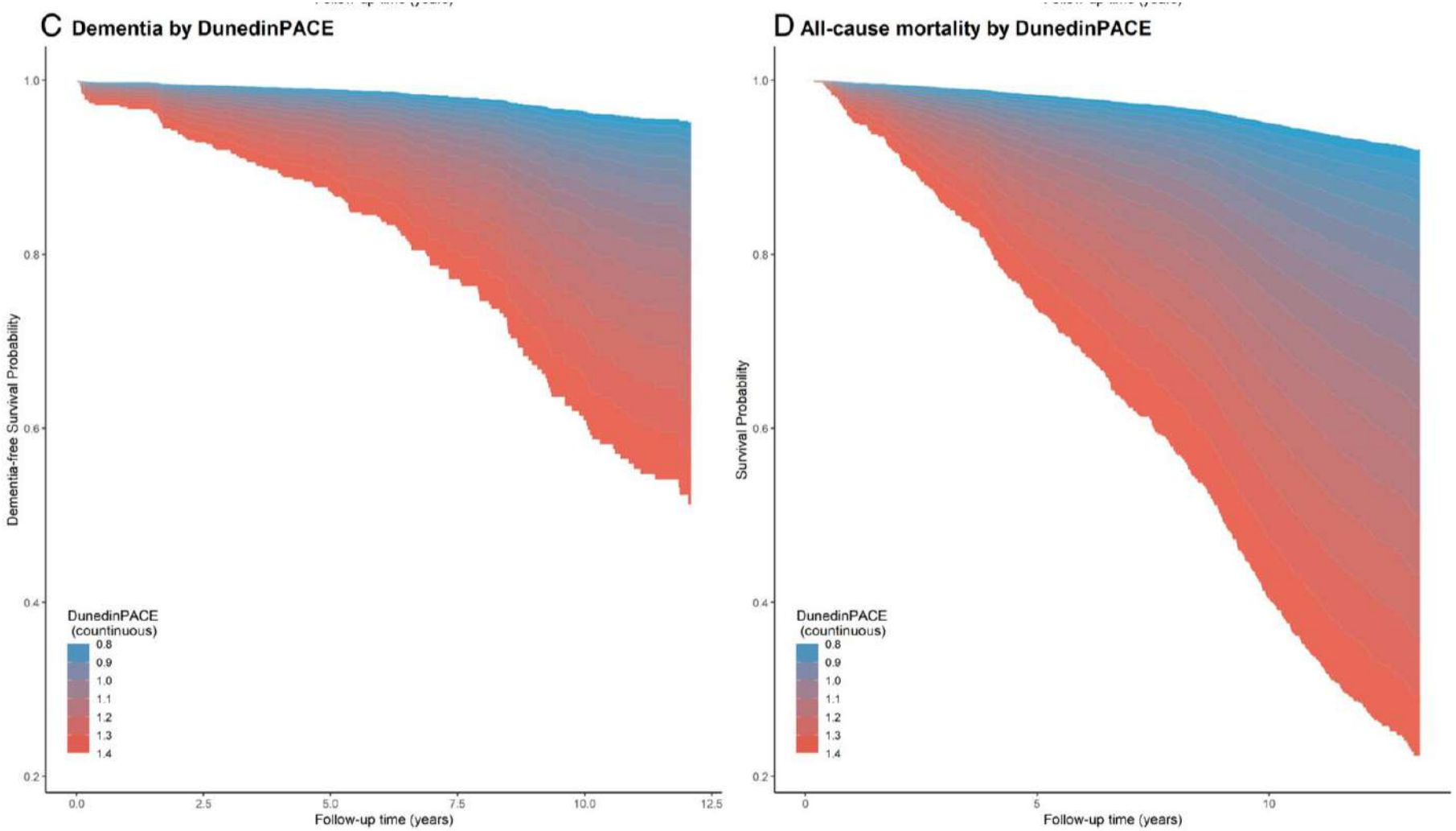

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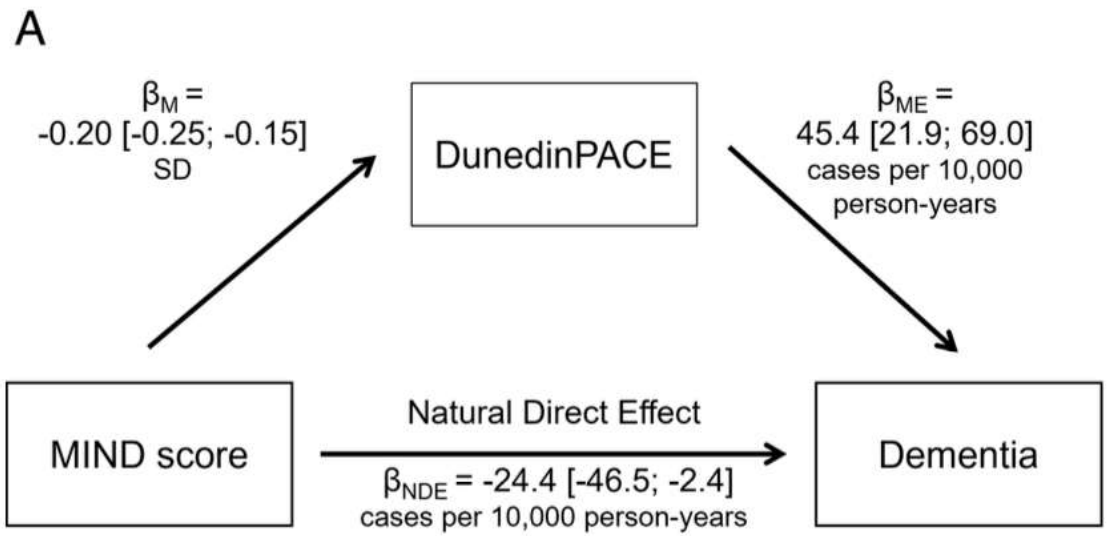
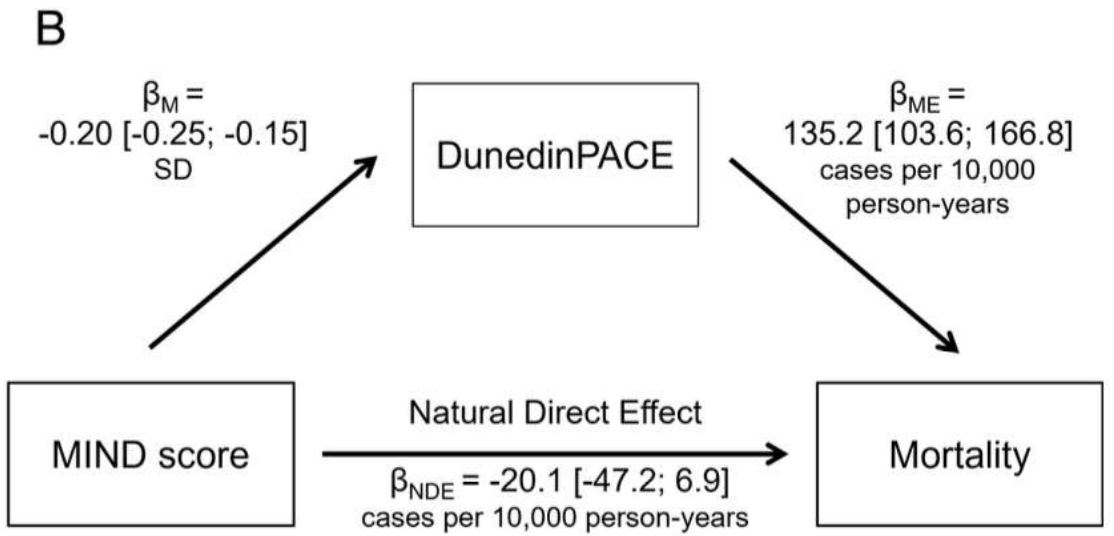


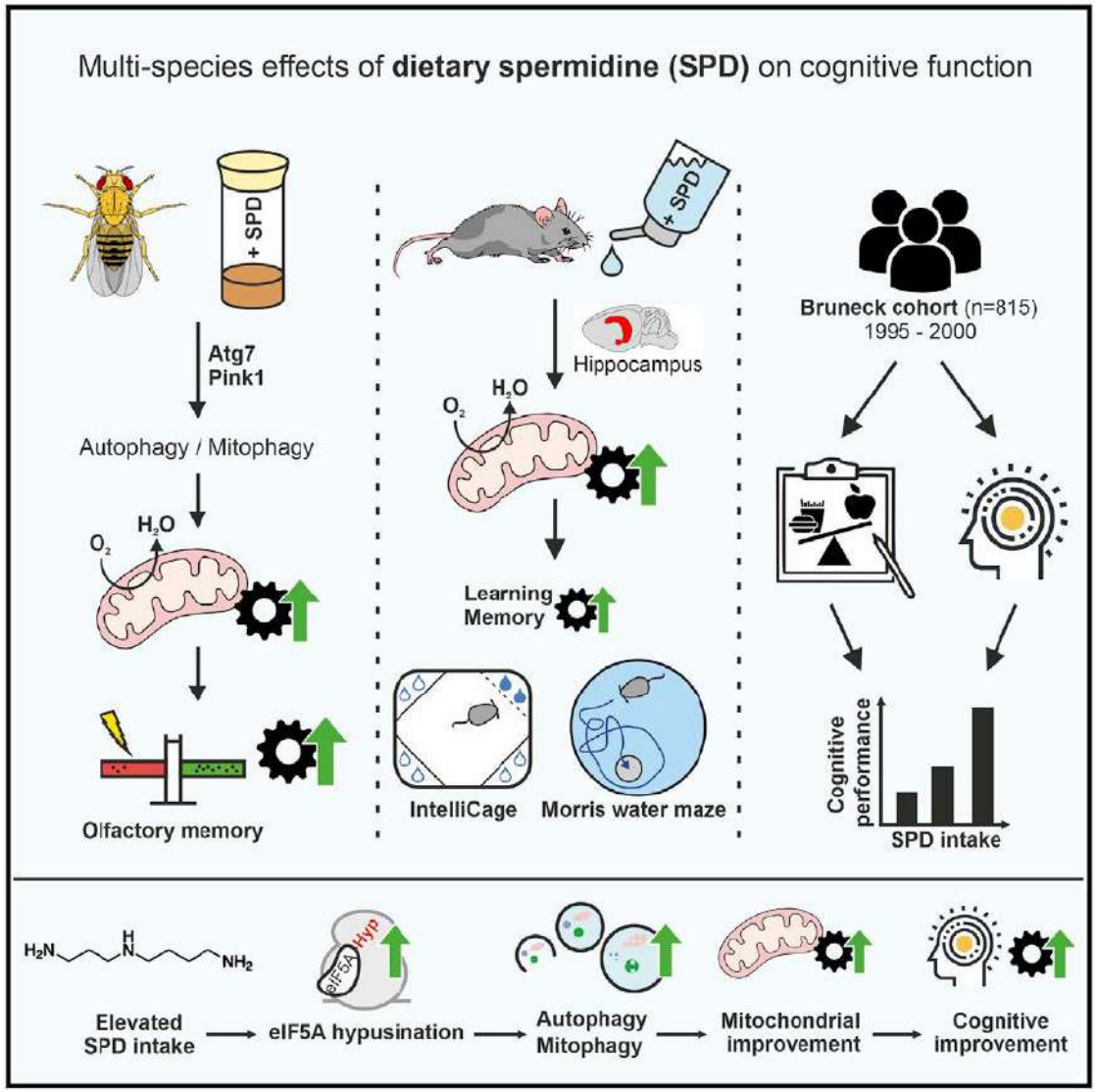


Natural Indirect Effect, β_{NIE} = -9.1 [-14.7; -4.2] cases per 10,000 person-years
Total Effect, β_{TE} = -33.6 [-55.6; -11.7] cases per 10,000 person-years
Proportion mediated, 0.27 [0.11; 0.79]

β_{NIE} = -27.2 [-36.7; -18.8] cases per 10,000 person-years
β_{TE} = -47.3 [-74.8; -20.0] cases per 10,000 person-years
0.57 [0.34; 1.32]

Dietary spermidine improves cognitive function

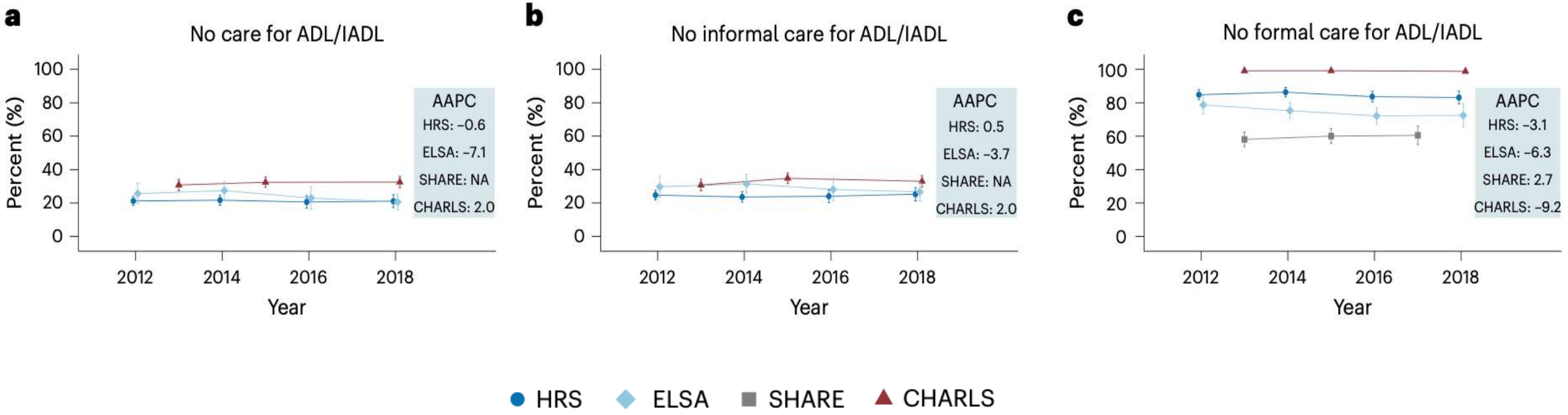
Schroeder et al., 2021, Cell Reports *35*, 108985



Absence of care among community-dwelling older adults with dementia and functional limitations

Zhuoer Lin[1,2,9], Yuting Qian[2,9], Thomas M. Gill[3], Xiaohui Hou[4], Heather Allore[3,5,6], Shanquan Chen[7] & Xi Chen[2,6,8]

Nature Aging | Volume 5 | April 2025 | 548–557



Impact of therapeutic food compared to oral nutritional supplements on nutritional outcomes in mildly underweight healthy children in a low-medium income society

Sadia Fatima [a, b], Dalia Malkova [a], Charlotte Wright [a], Konstantinos Gerasimidis [a, *]

Clinical Nutrition 37 (2018) 858–863

Table 1
Nutritional composition of RUTF and ONS.

	Per 100 g		Delivered per day	
	RUTF	ONS	RUTF (92 g)	ONS (340 ml)
Energy (kcal)	545	150	500	510
(kJ)	2281	630	2093	2142
Macronutrients				
Protein, g	13.6	3.4	12.5	11.56
Carbohydrates, g	35.0	18.8	32.2	63.92
Fat, g	35.7	6.8	32.9	23.12
Minerals				
Sodium, mg	189	67	<189	227.8
Potassium, mg	1111	140	1051	476
Calcium, mg	320	84	276	285.6
Phosphorus, mg	394	75	276	255
Magnesium, mg	92	17	84.6	57.8
Zinc, mg	14	1.5	12.9	5.1
Iron, mg	11.5	1.5	10.6	5.1

RUTF, ready to use therapeutic food; ONS, oral nutritional supplement.

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