2021

OER Sustainable Diets Lecture

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Sustainable Diets

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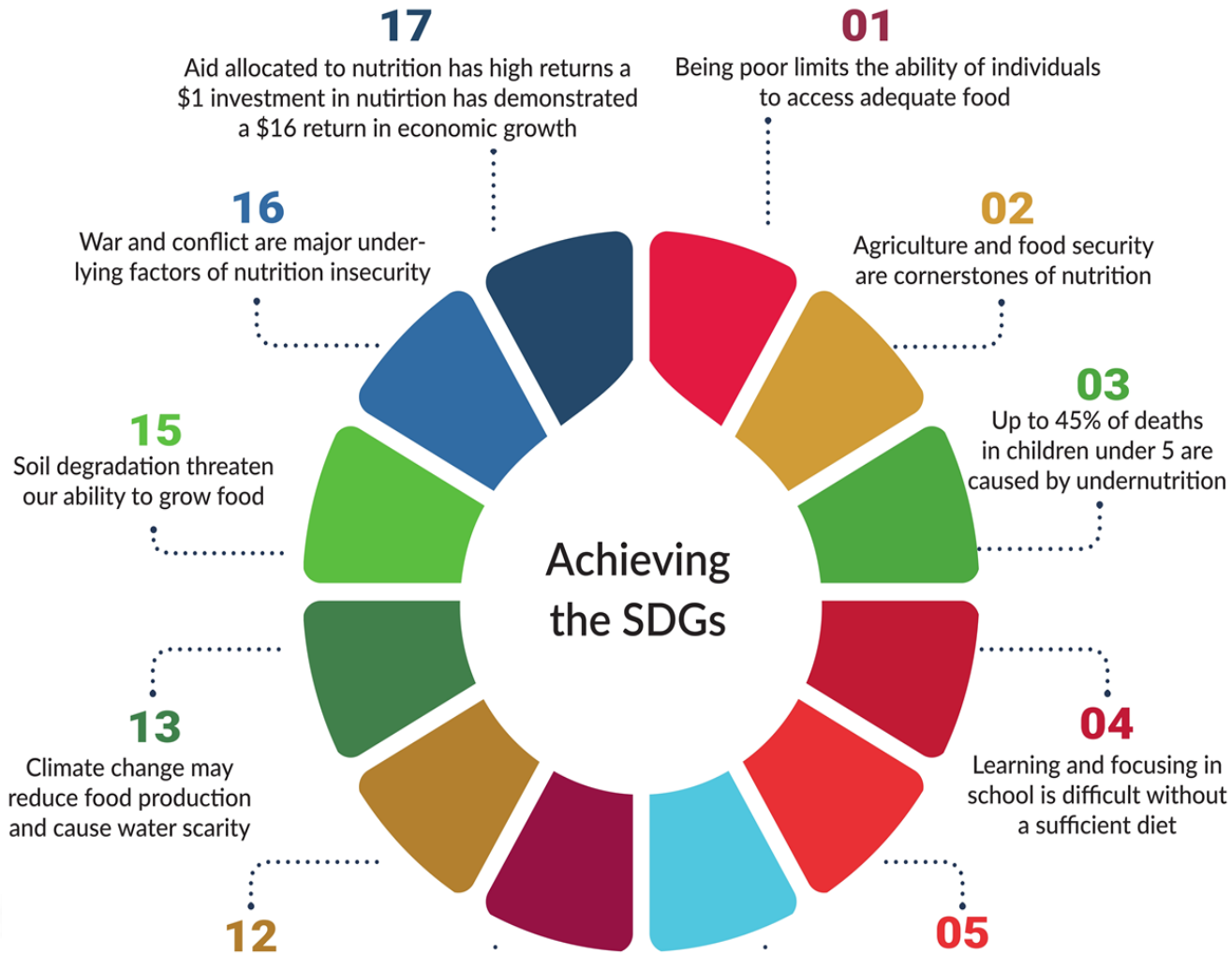
TU Dublin

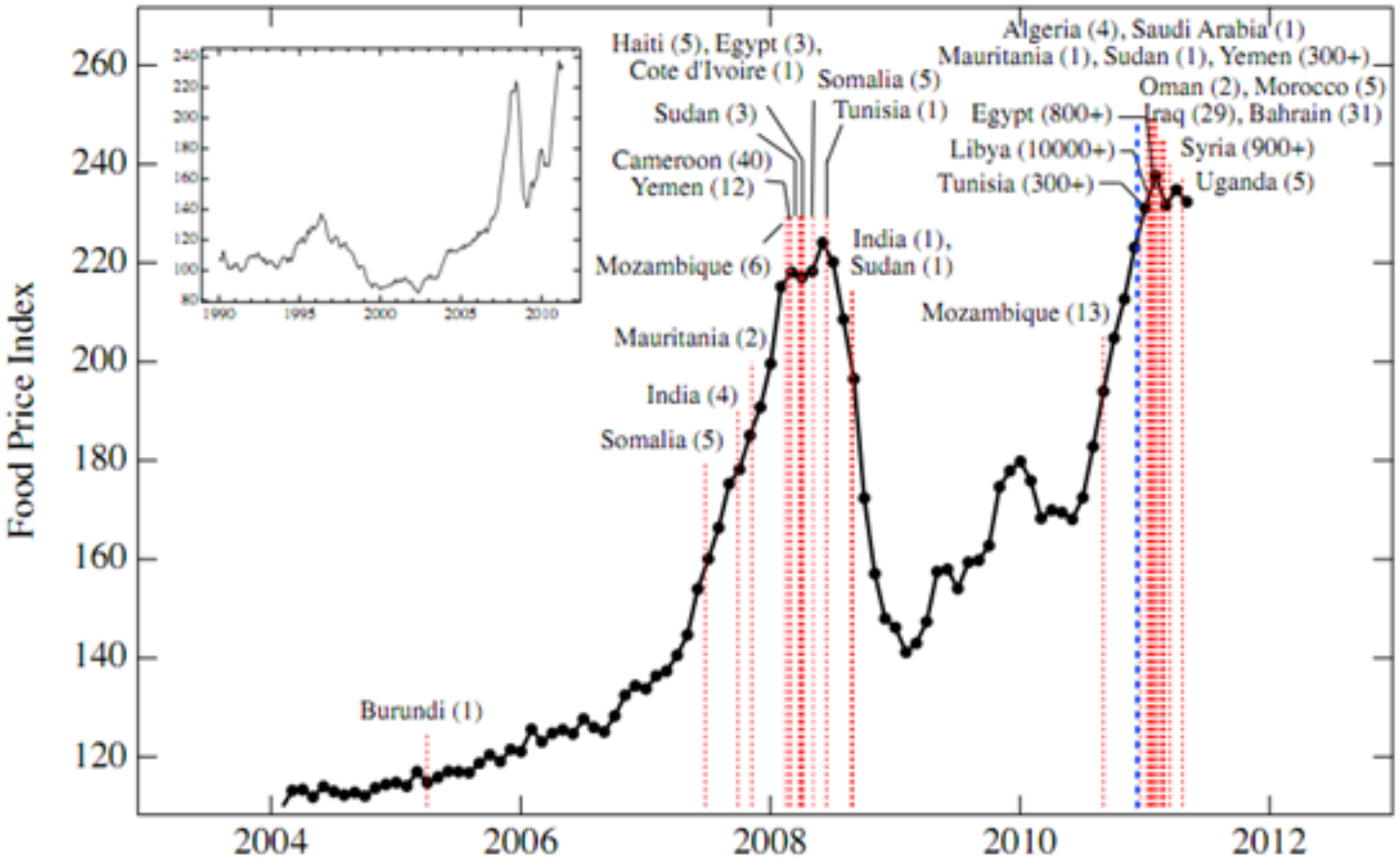
SDGs & Food and Health


Achieving the SDGs
01
Being poor limits the ability of individuals to access adequate food
02
Agriculture and food security are cornerstones of nutrition
03
Up to 45% of deaths in children under 5 are caused by undernutrition
04
Learning and focusing in school is difficult without a sufficient diet
05
When women control the family income, children's health and nutrition improve at a greater rate
06
Access to safe water and sanitation is an absolute prerequisite for nutrition
08
High levels of malnutrition in some countries may result in an 11% loss to GDP
12
Tackling resource use and degradation is key for sharing resources and improving access to quality food
13
Climate change may reduce food production and cause water scarity
15
Soil degradation threaten our ability to grow food
16
War and conflict are major underlying factors of nutrition insecurity
17
Aid allocated to nutrition has high returns a $1 investment in nutirtion has demonstrated a $16 return in economic growth

Nutrition is both a maker and a marker of development. Improved nutrition is the platform for progress in health, education, employment, empowerment of women and the reduction of poverty and inequality, and can lay the foundation for peaceful, secure and stable societies."

Ban Ki-moon, United Nations 8th Secretary General, a message for the SUN Movement Strategy and Roadmap (2016-2020).

Food Prices and Conflict

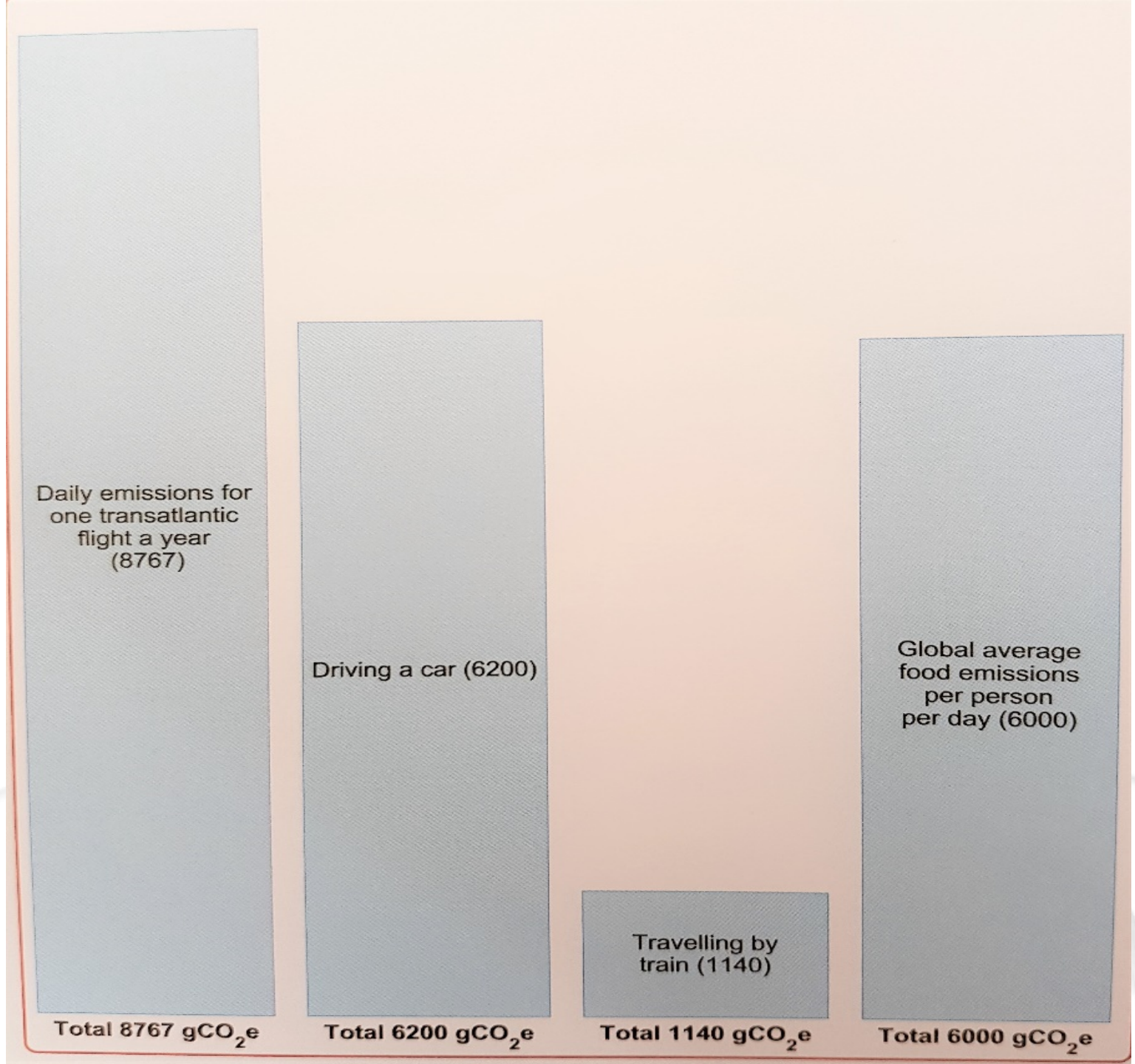


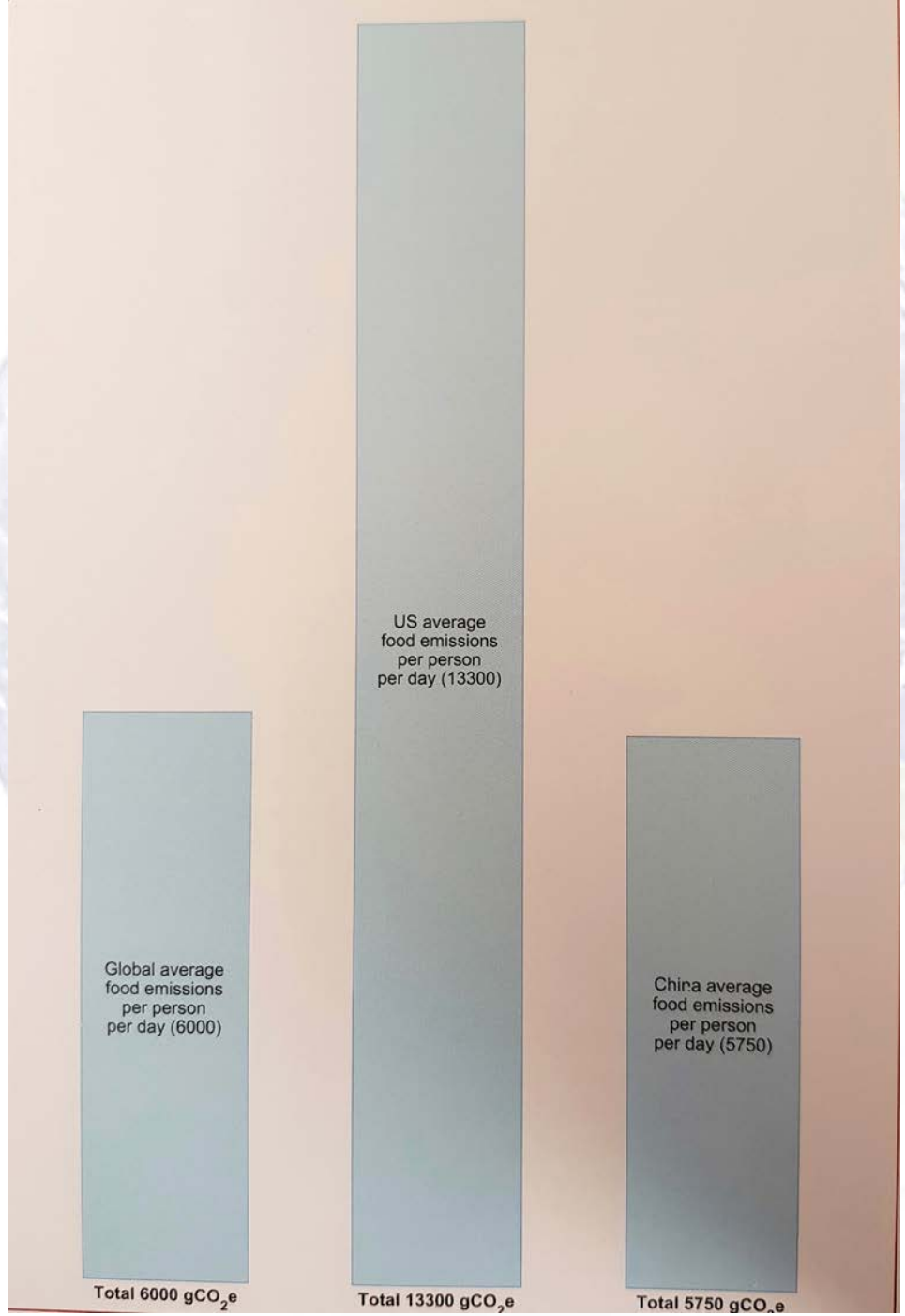
Of course speculation will always make a crisis worse if there is a weak point it will expose it

George Soros

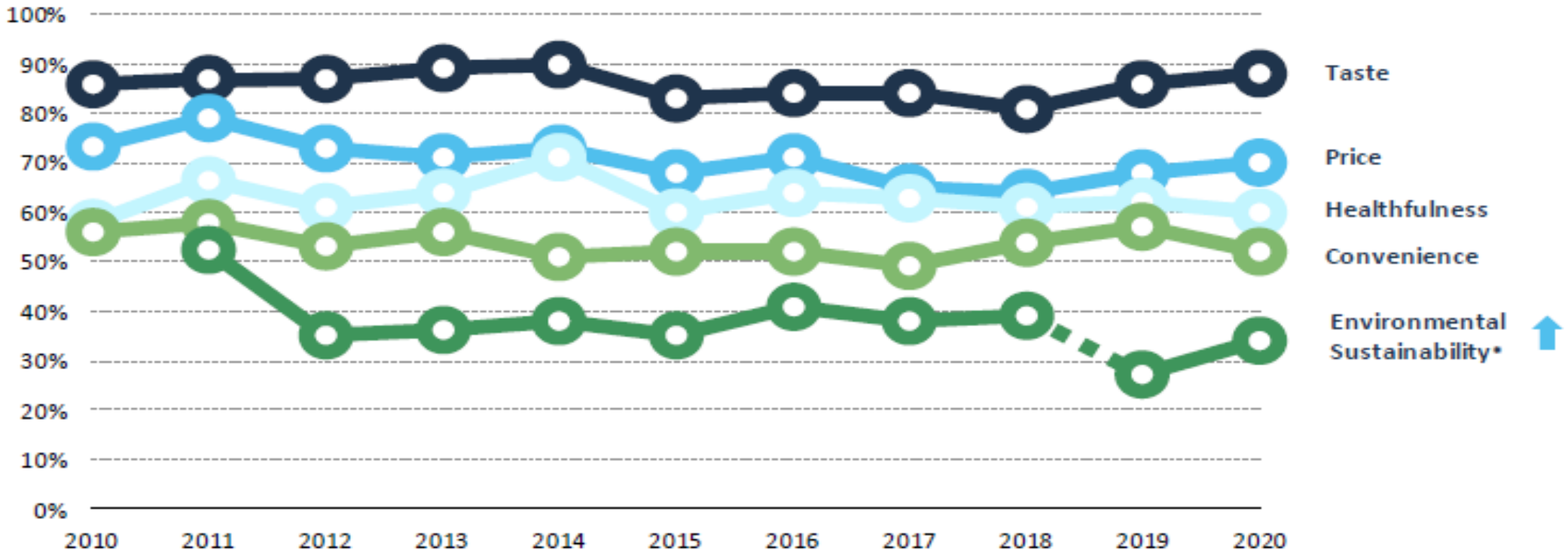
What is a sustainable diet?

- **Using your phone or on another tab**
- **Go to www.menti.com** and use the code **6266 6937**


Daily emissions for one transatlantic flight a year (8767)
Driving a car (6200)
Travelling by train (1140)
Global average food emissions per person per day (6000)
Total 8767 gCO_2e
Total 6200 gCO_2e
Total 1140 gCO_2e
Total 6000 gCO_2e

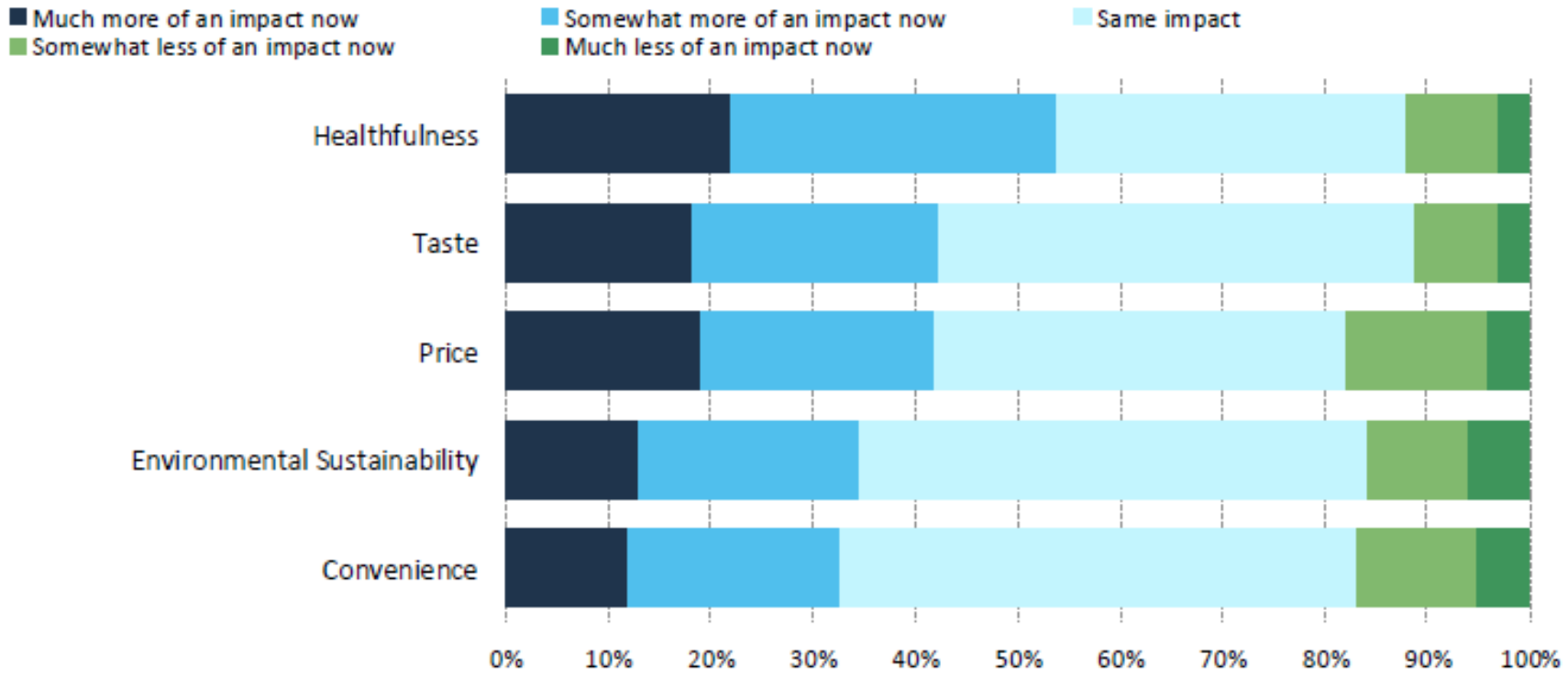

Global average food emissions per person per day (6000)
US average food emissions per person per day (13300)
China average food emissions per person per day (5750)
Total 6000 gCO_2e
Total 13300 gCO_2e
Total 5750 gCO_2e

Taste – consistently no.1 factor in purchasing for last decade in US



International Food Information Council Foundation- 2019 Food and Health Survey

Self reported Change in Purchase drivers Over the last 10 yrs



Q12: For each of the following, how has the impact on your decision to buy foods and beverages changed over the last 10 years? (n=1,011)

International Food Information Council Foundation- 2020 Food and Health Survey

Intention vs Behaviour

50% of us are likely to consider dietary changes to reduce impact on climate change

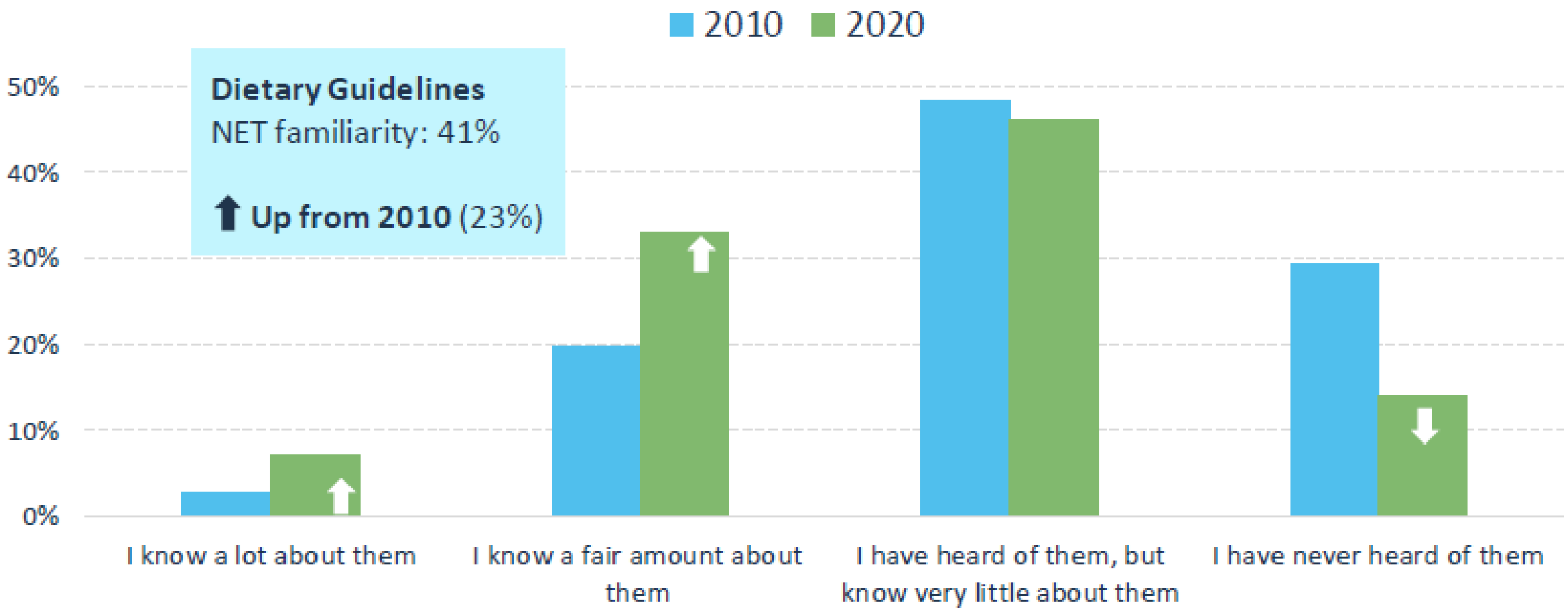
more than 50% of us eat meat

80% of us eat dairy

on a daily basis

Intention is there but significant barriers to behaviour change for the majority

Familiarity with Dietary Guidelines for Americans

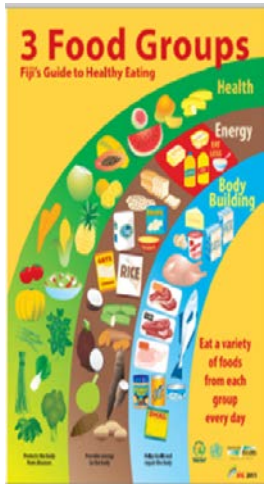


So what advice do we give and what should we give?

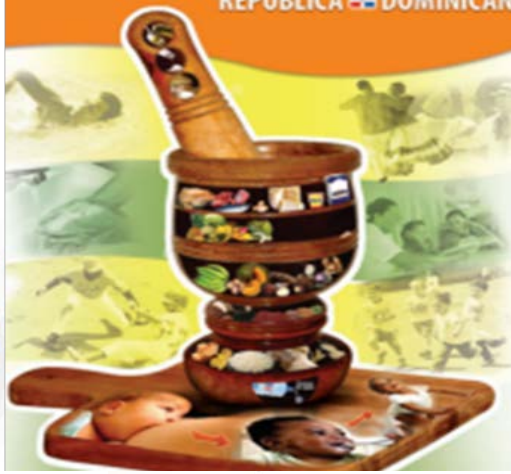
Food Based Dietary Guidelines

"Food-Based Dietary Guidelines (FBDGs) have been described as ***science-based*** ***recommendations*** *in the form of* ***guidelines for healthy eating****. They are primarily intended for* ***consumer information****, and as such, they should be appropriate for the region or* ***country****,* ***culturally acceptable*** *and* ***practical*** *to implement. Moreover, they should be* ***consistent, easily understood*** *and* ***memorable****"*

(EFSA 2010)


3 Food Groups
Fiji's Guide to Healthy Eating
Health
Energy
Body Building
RICE
Eat a variety of foods from each group every day


Eatwell Guide


REPUBLICA DOMINICAN

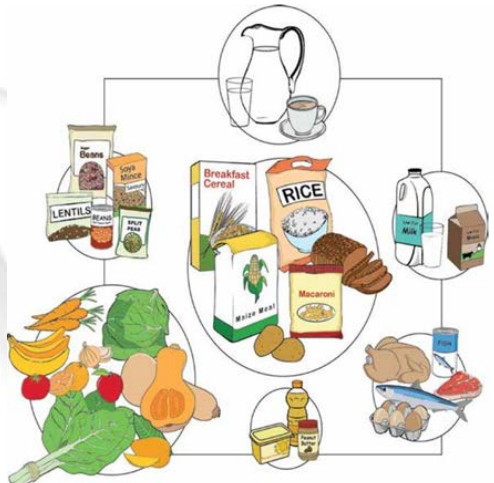

Food-Based
DIETARY
GUIDELINES
ANTIGUA & BARBUDA
USE YOUR PINEAPPLE TO HELP YOU CHOOSE FOODS WISELY


Vegetable
Fruit
Milk
Meat
Oil, sugar and salt


CEREALES, TUBÉRCULOS Y DERIVADOS


MEDITERRANEAN DIET

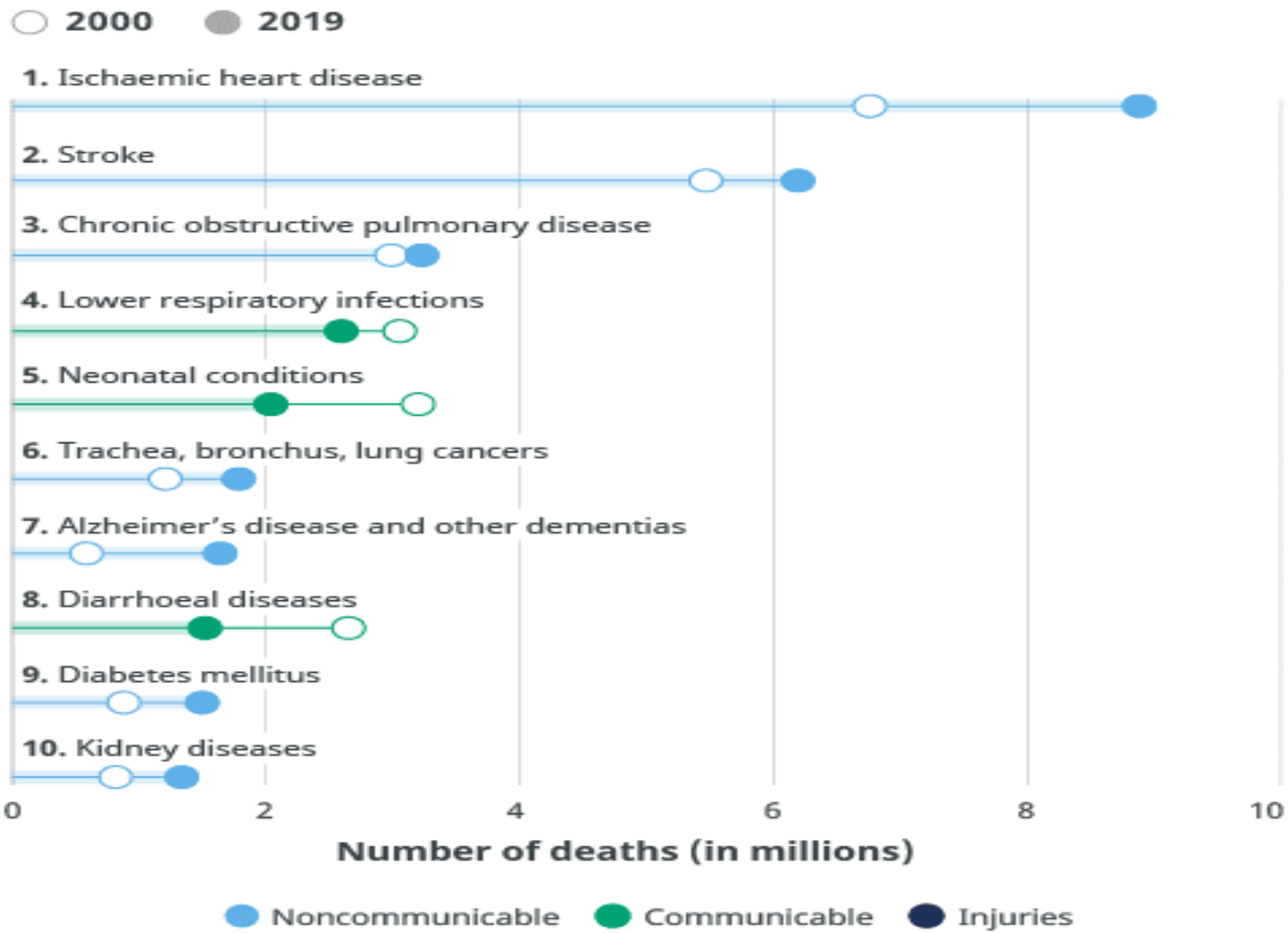

每天活动6000步


Breakfast Cereal
RICE
Macaroni
LENTILS

The Health Problem

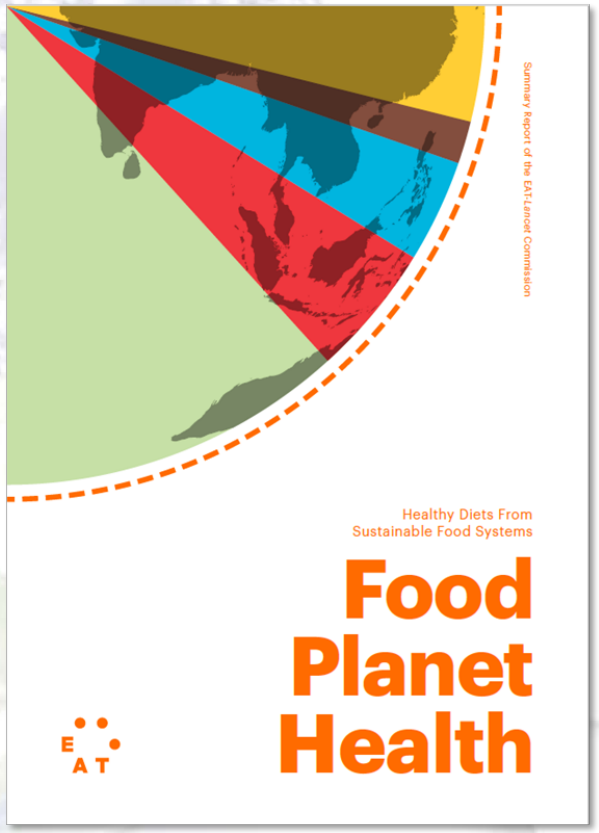
- nearly 800 million people are chronically undernourished
- 159 million children under five years of age stunted.
- Micronutrient deficiencies affect about 2bn people globally.
- The incidence overweight and obesity, with about 1.9 bn adults are overweight, including 600m obese. **while 462 million are underweight.**
- Globally, one in nine people are hungry or undernourished.
- Around 2 billion people did not have access to enough safe and nutritious food in 2019.
- Gender inequality also plays a role in driving malnutrition, as women and girls often eat last and least in a household. A third of all women of reproductive age worldwide suffer from anaemia, caused by iron deficiency. Teenage mothers and their babies can also be particularly vulnerable to malnutrition.
- 2.3M children die from malnutrition every year.
- 75% of malnourished children under five don't get the treatment they need.
- An estimated 14 million children under the age of five worldwide suffer from severe acute malnutrition, also known as severe wasting, yet only 25 percent of severely malnourished children have access to lifesaving treatment.
- **47 million children under 5 years of age are wasted, 14.3 million are severely wasted and 144 million are stunted, while 38.3 million are overweight or obese.**
- **Around 45% of deaths among children under 5 years of age are linked to undernutrition.**

Leading causes of death globally



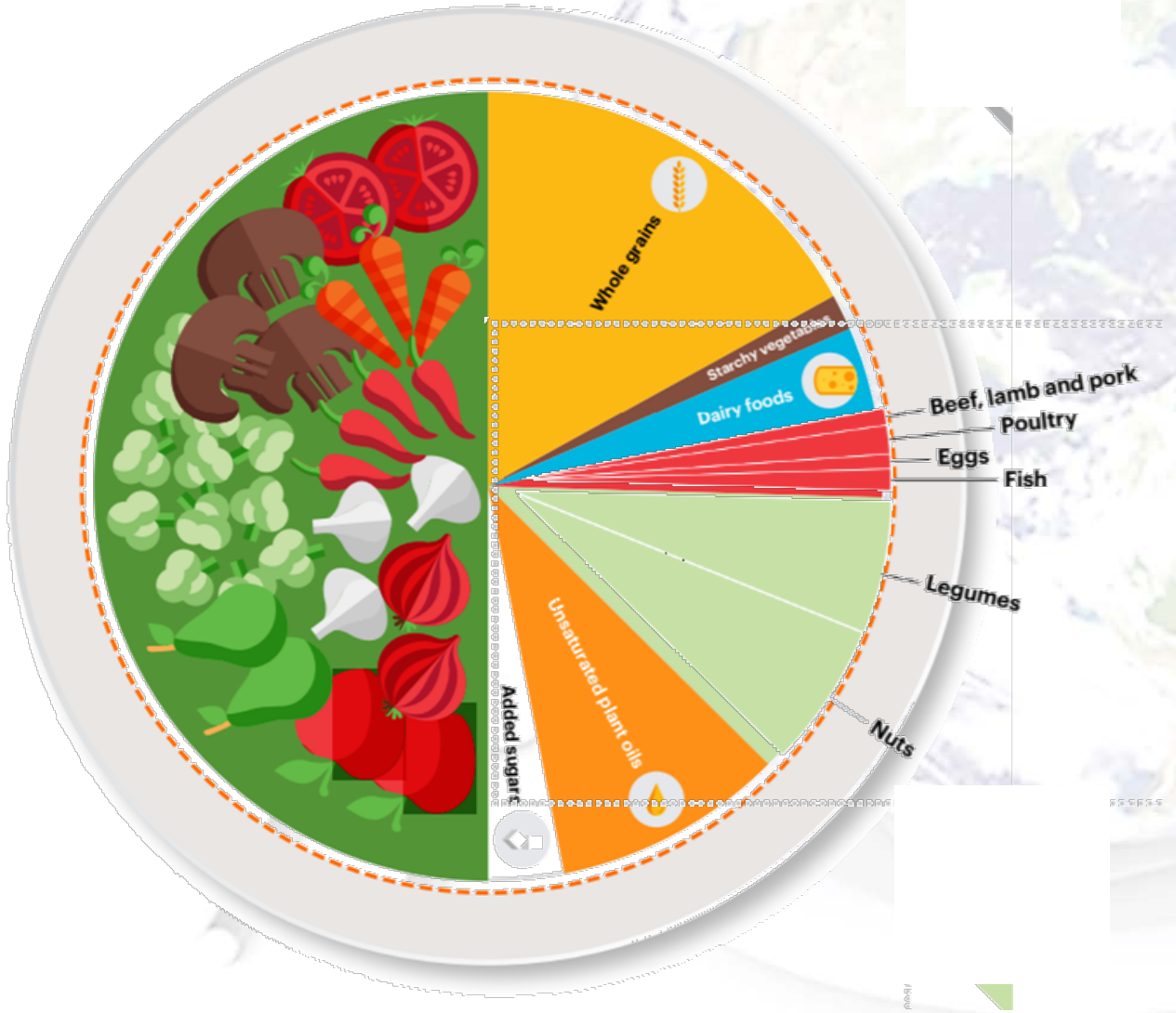
Source: WHO Global Health Estimates.

what dietary patterns that are both healthy and sustainable look like?



http://www.fao.org/documents/card/en/c/d8dfeaf1-f859-4191-954f-e8e1388cd0b7/

EAT-Lancet Planetary Health Diet



	Macronutrient intake grams per day (possible range)	Caloric intake kcal per day
Whole grains		
Rice, wheat, corn and other	232	811
Tubers or starchy vegetables		
Potatoes and cassava	50 (0–100)	39
Vegetables		
All vegetables	300 (200–600)	78
Fruits		
All fruits	200 (100–300)	126
Dairy foods		
Whole milk or equivalents	250 (0–500)	153
Protein sources		
Beef, lamb and pork	14 (0–28)	30
Chicken and other poultry	29 (0–58)	62
Eggs	13 (0–25)	19
Fish	28 (0–100)	40
Legumes	75 (0–100)	284
Nuts	50 (0–75)	291
Added fats		
Unsaturated oils	40 (20–80)	354
Saturated oils	11.8 (0-11.8)	96
Added sugars		
All sugars	31 (0–31)	120



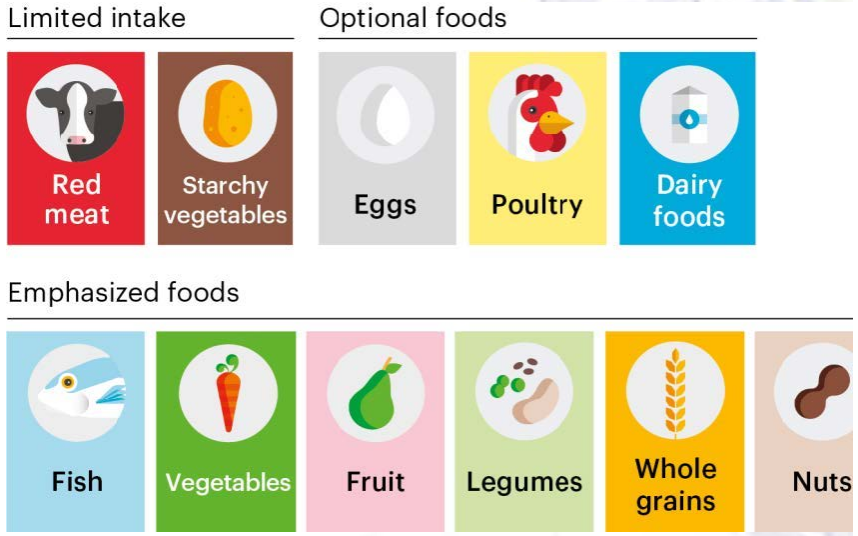


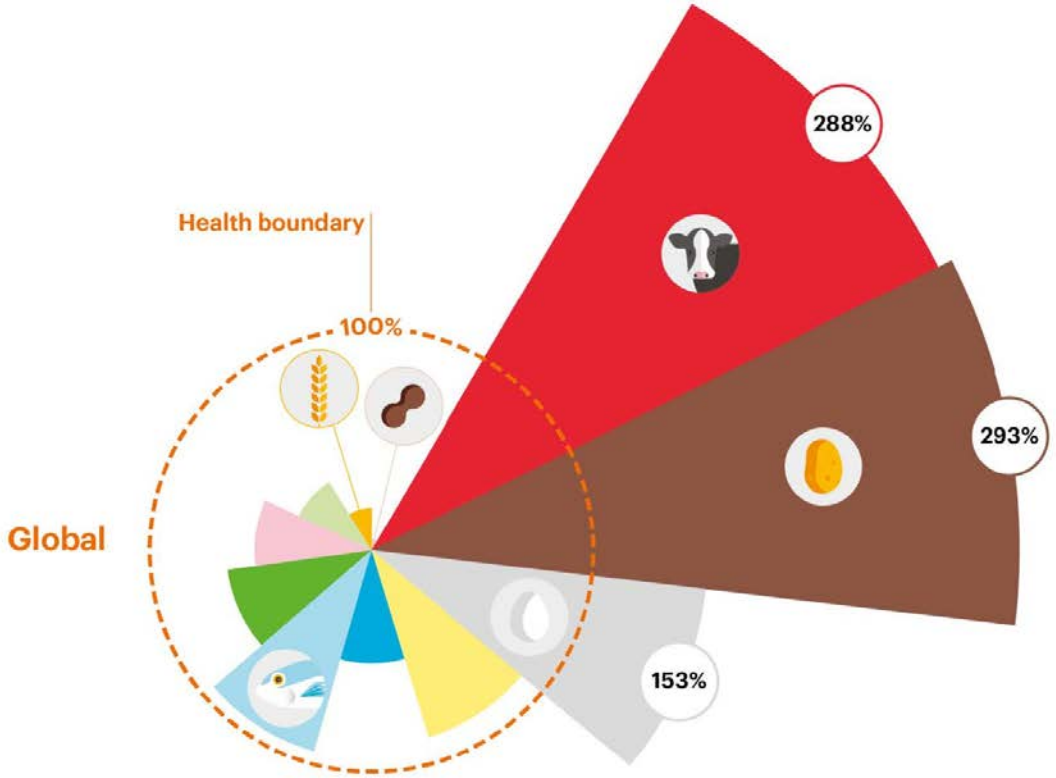




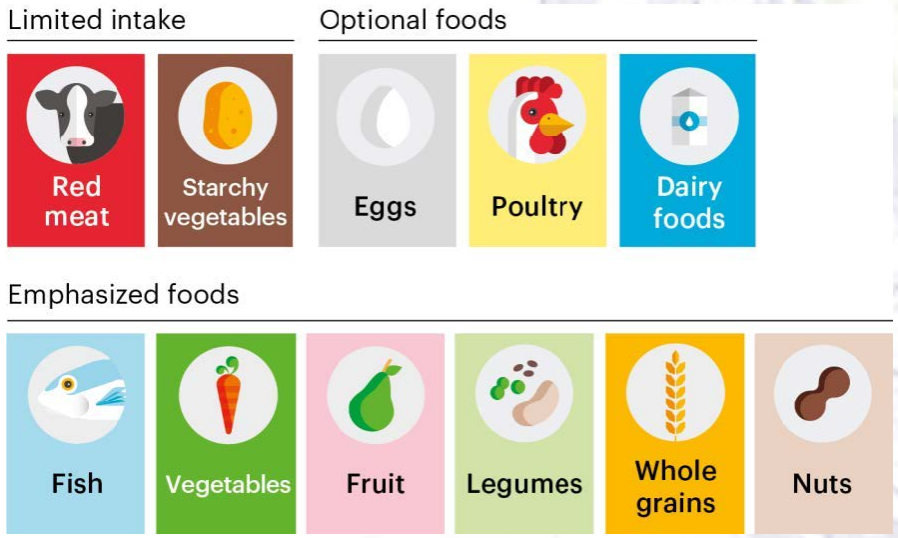


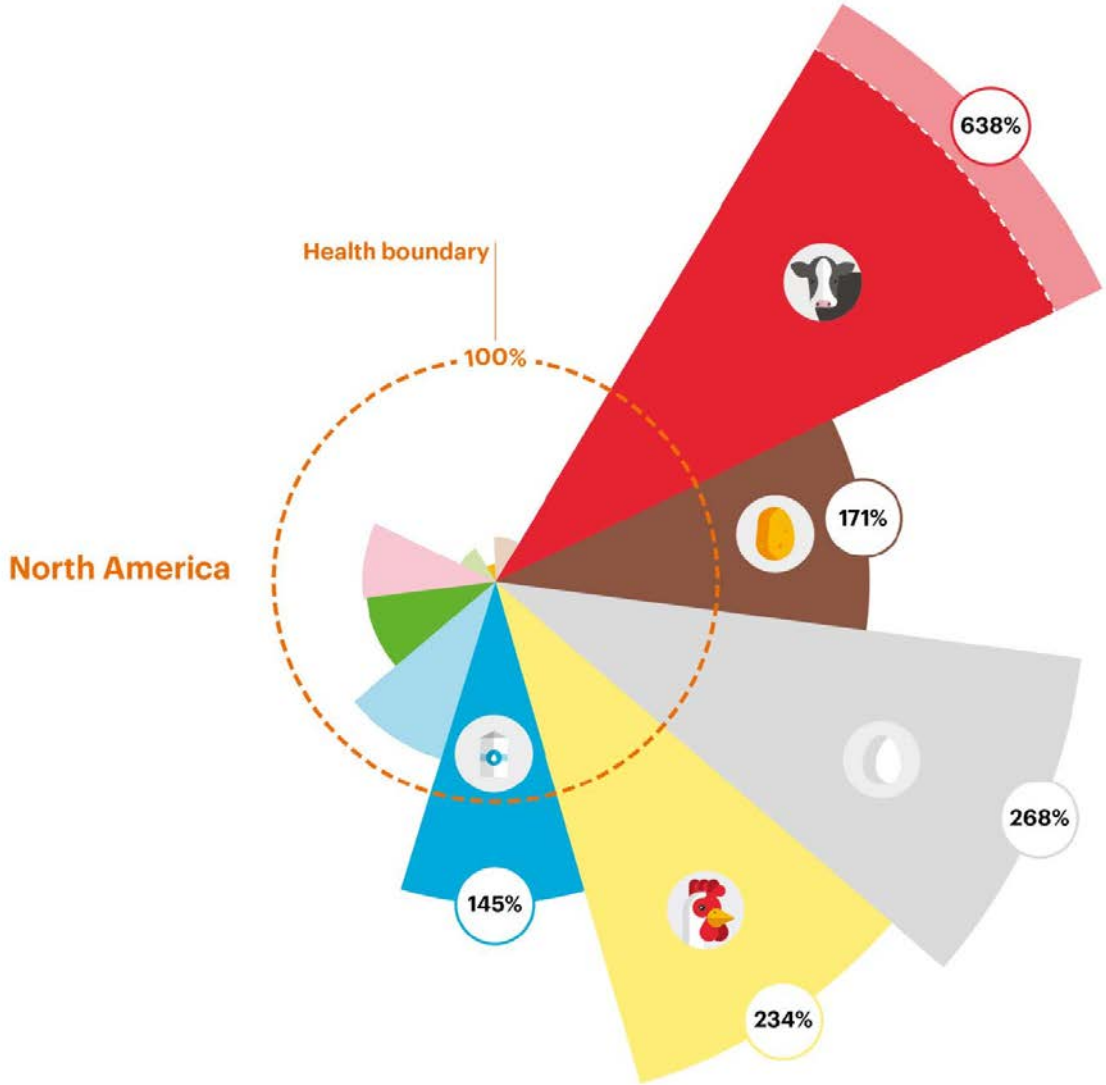

Food Intake vs Planetary Health Diet



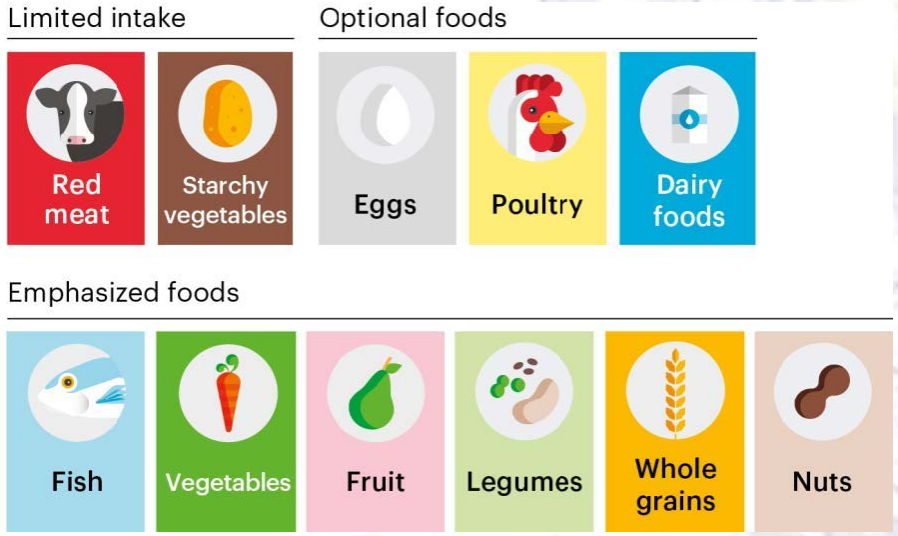


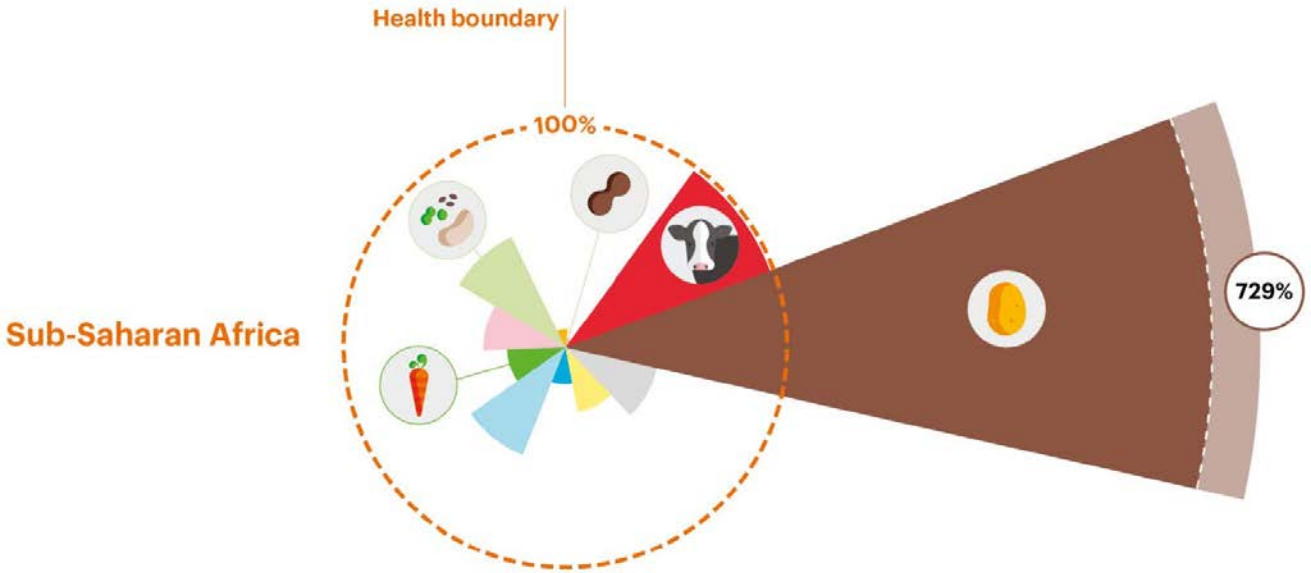
Food Intake vs Planetary Health Diet



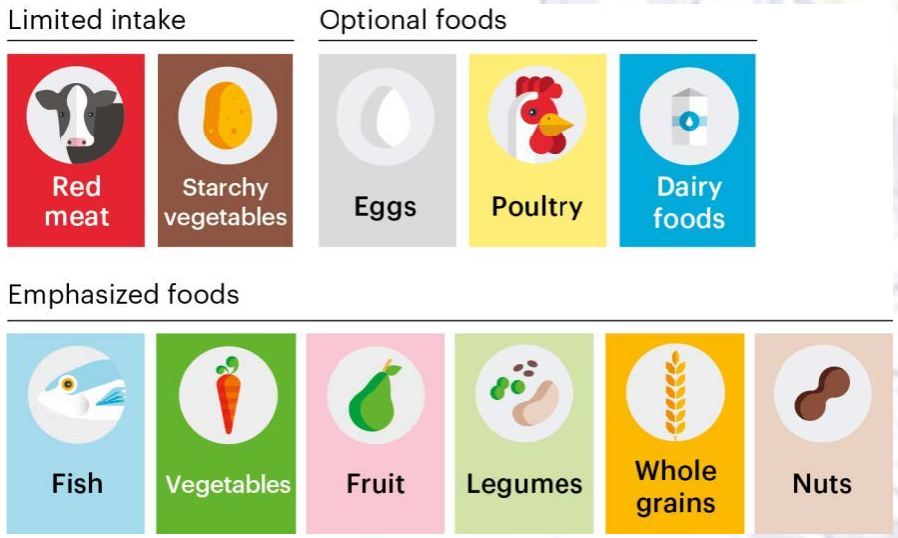


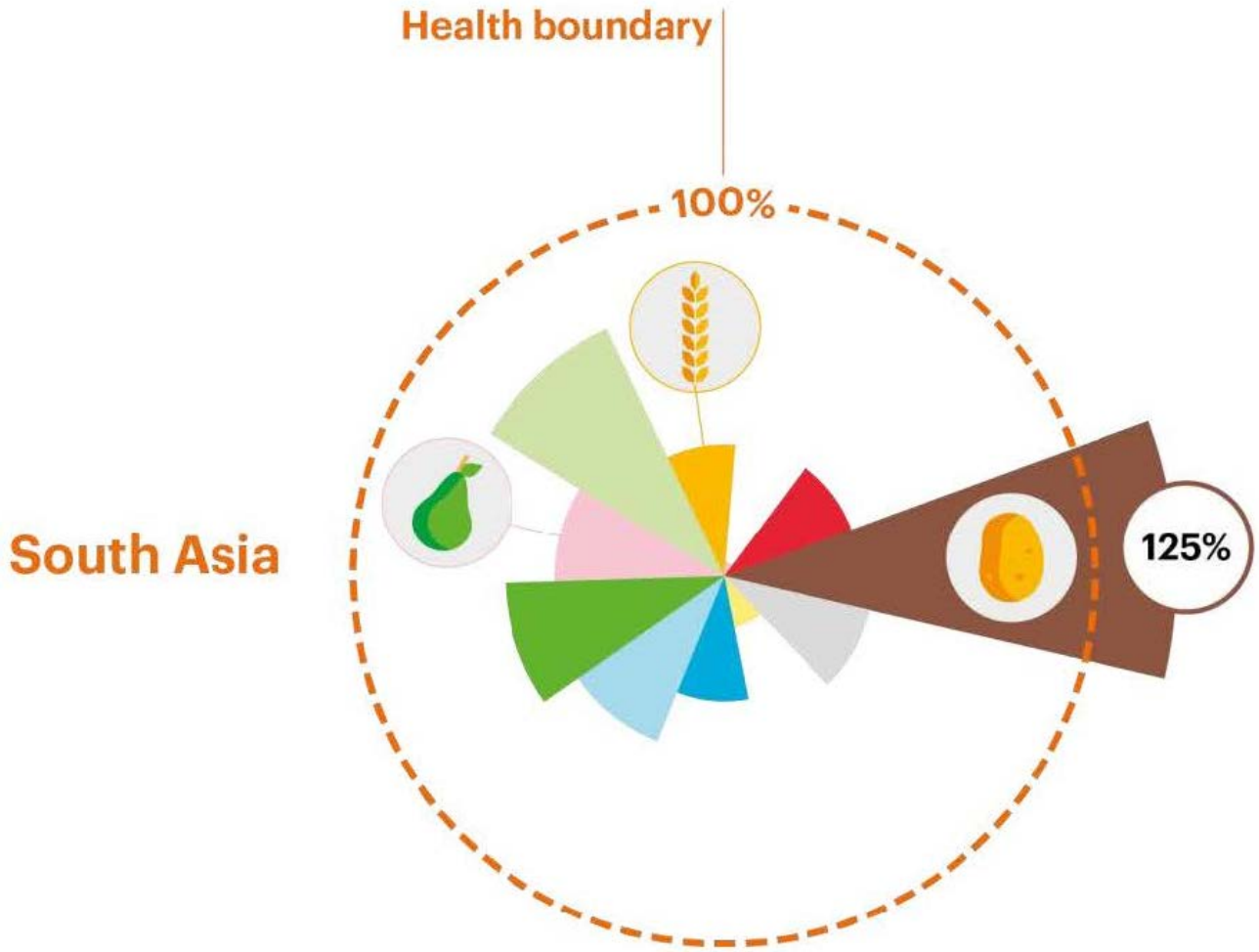
Food Intake vs Planetary Health Diet





Food Intake vs Planetary Health Diet





More plant proteins

Plant proteins – lower protein quantity but more rounded nutritional profile:

- Complex carbohydrate, fibre and minerals

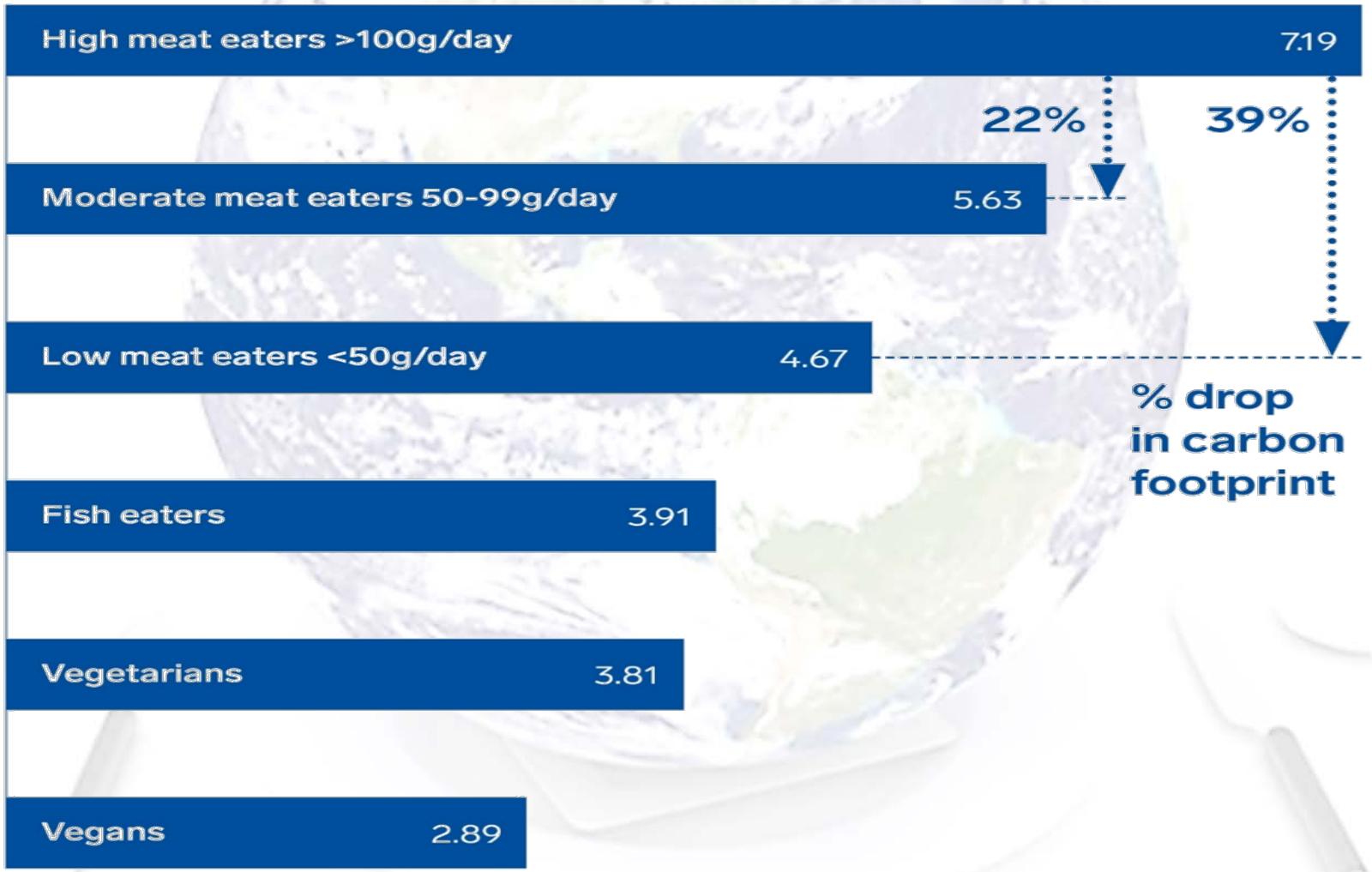
Current Irish/ European protein intakes far exceed recommendations for all age groups

- Even vegans

Essential Amino Acids (EAAs)

- Even a diet based purely on plants + meets energy requirements over the course of a day can meet all EAA needs
- Plant protein combinations at each meal time not needed
- Nitrogen balanced is achieved over a course of a whole day

Veganism & Vegetarianism



Protein

- **Encourage non-animal protein foods daily**
- Go meat free several days a week
- Starchy foods / wholegrain cereals: low in protein, but can support overall protein intake as eaten in high quantities

Canned chickpeas	Brown lentils	Mixed Nuts	Tofu	Mycoprotein
7g/100g	9g/100g	7g/30g	17g/75g	11g/100g

Iron

Animal protein

70g beef

2-2.5mg

- **Iron from plant sources less bioavailable.**
- **Inhibited by phytates, polyphenols & tannins naturally found in plant foods.**
- Optimising non-haem absorption in plant-based diets:
  - Consume high tannin / polyphenol containing foods e.g. tea, coffee, spinach at least 2 hours away from non-haem iron foods.
  - Choose lower phytate options e.g. tubers, canned beans
  - Including some animal protein e.g. fish or chicken may help enhance absorption

Fortified Cereal	Wholemeal Bread	Tinned prunes	Lentils	Mixed Nuts
2.8-4.4mg/30g	2mg/2 slices	1.8mg/80g	3.3mg/100g	0.6-1.9mg/30g

Animal source

200ml semi-skimmed milk

248mg

Calcium

- Low intakes in teenagers and young women.
- Calcium ubiquitous in the diet with significant quantities coming from white flour-based products
- Switching to fortified plant-based alternatives will not compromise calcium intakes – bioavailability from alternatives same as dairy.
- Low oxalate calcium rich dark green veg e.g. broccoli and pak choi – double bioavailability compared to dairy.

Fortified plant drink	Broccoli	Silken Tofu	Dried Figs	Tahini paste
240mg/200ml	35mg/80g	105mg/75g	60-70mg/30g	129mg/15g

Zinc

Animal source
70g beef
5.3-6.7mg

- Meat currently major dietary source.
- Teenage boys and girls have significantly low intakes:
  - 20% of boys and >25% girls below LRNI.
- Plant sources, with the exception of mycoprotein, are lower in zinc.
- Optimise by adding sprinkles of seeds and nuts onto cereals, soups and yoghurts + choosing wholemeal / wheatgerm breads

Mycoprotein	Tofu (Firm)	Wheatgerm Bread	Peanut Butter
7mg/100g	1.5mg/75g	1.8mg/2 slices	1.2mg/40g

Vitamin B12

Animal source

70g beef – 1.4-2.1mcg

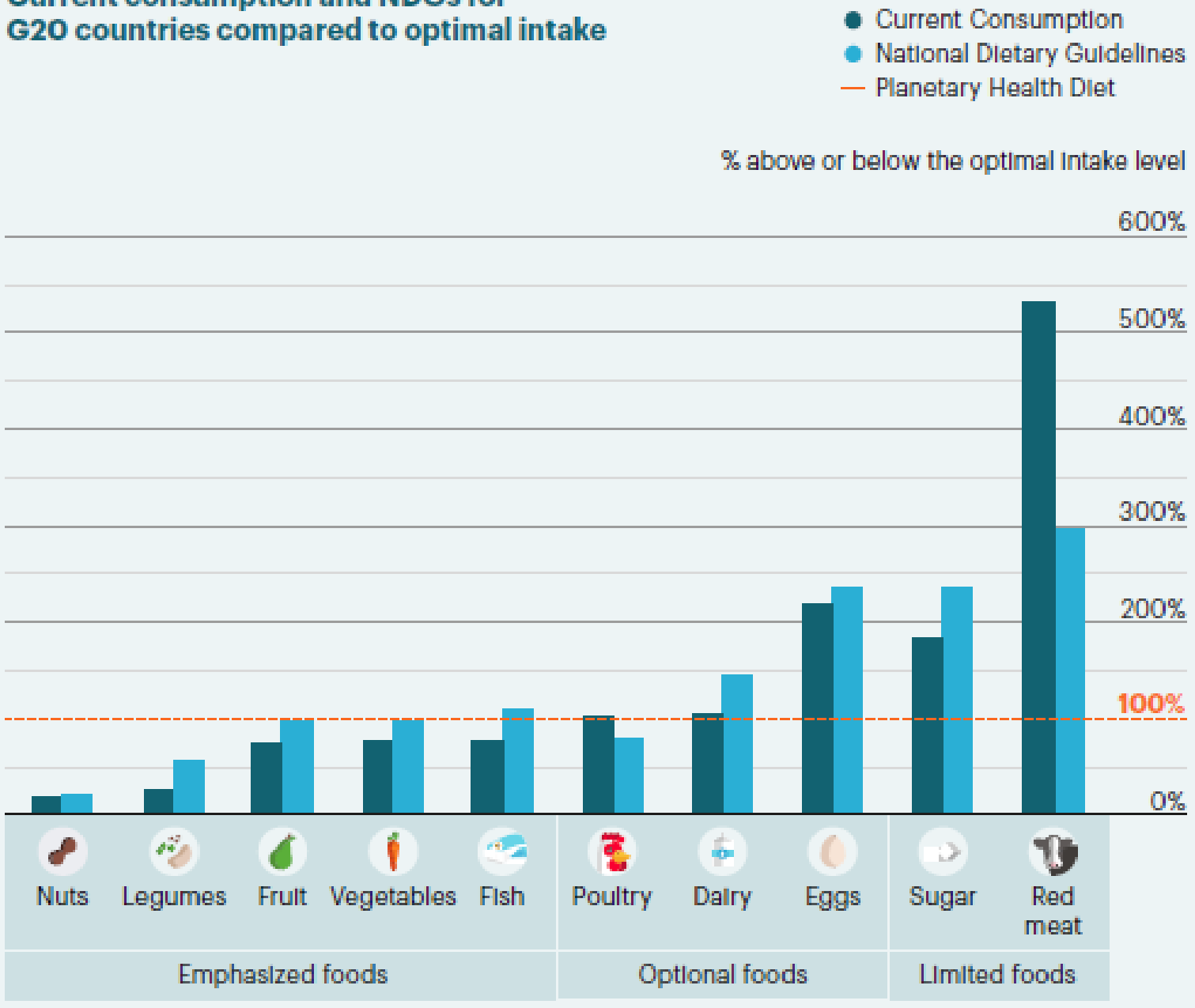
200ml milk – 1.8mcg

- A healthy sustainable diet does not have to exclude meat and dairy which will provide adequate vitamin B12.
- Those wishing to follow a dairy and meat free diet → high risk of vitamin B12 deficiency:
  - Especially if fortified plant-based options are not consumed daily
- Fortified plant food sources include plant-based drinks, yeast extract and most fortified breakfast cereals.

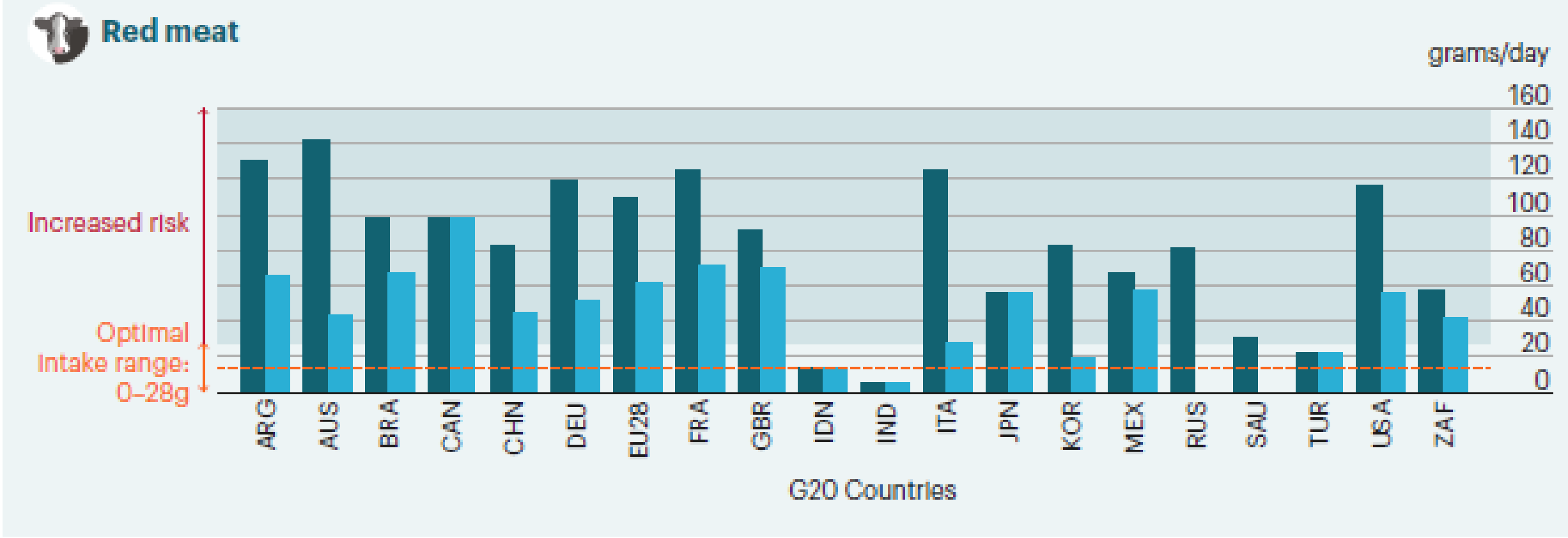
Fortified cereal (30g) with fortified plant drink (150ml)	**150g of fortified soya yoghurt**	**Yeast Extract (Marmite) Two toast slices**
1.1mg	**0.6mg**	**0.6mg**

G20 Countries
NDG vs Planetary Guidelines

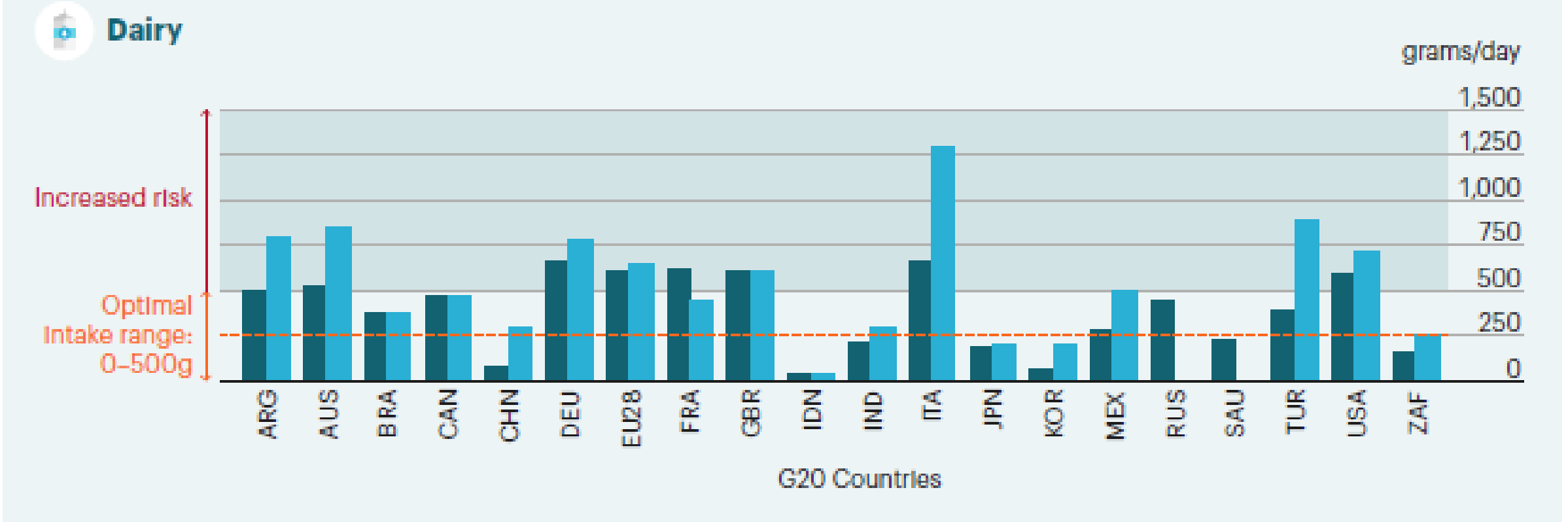
Current consumption and NDGs for G20 countries compared to optimal intake



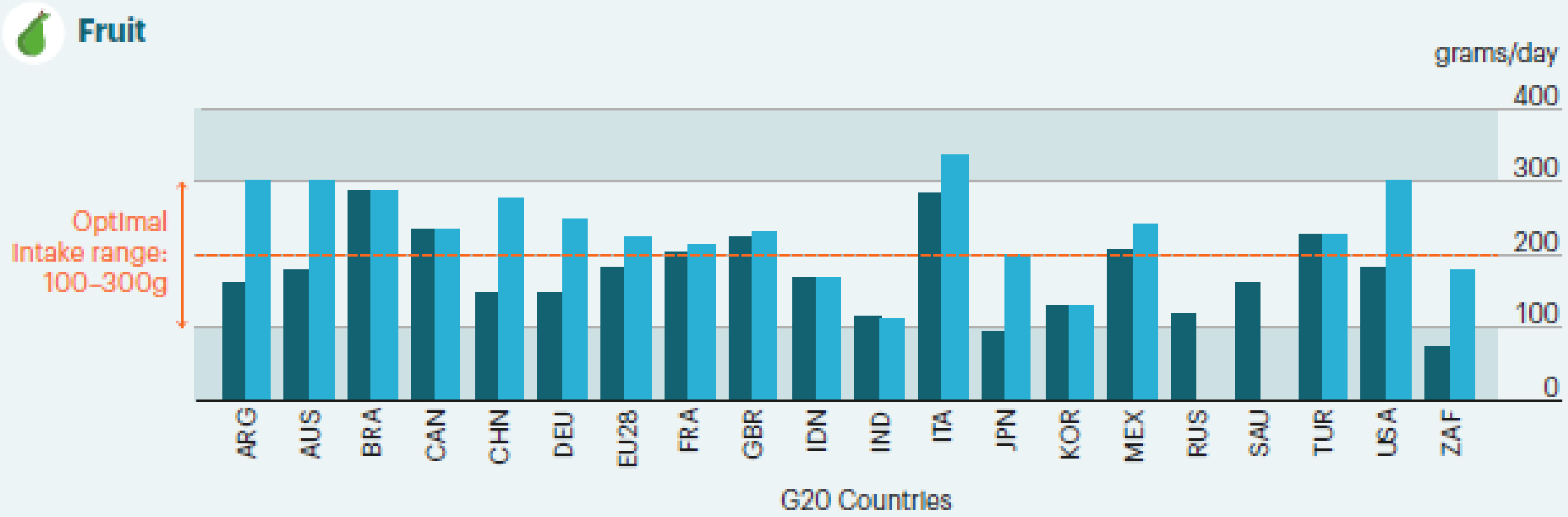
Meat


Current Consumption
National Dietary Guidelines
Planetary Health Diet
Red meat
grams/day
160
140
120
100
80
60
40
20
0
Increased risk
Optimal intake range: 0–28g
ARG
AUS
BRA
CAN
CHN
DEU
EU28
FRA
GBR
IDN
IND
ITA
JPN
KOR
MEX
RUS
SAU
TUR
USA
ZAF
G20 Countries

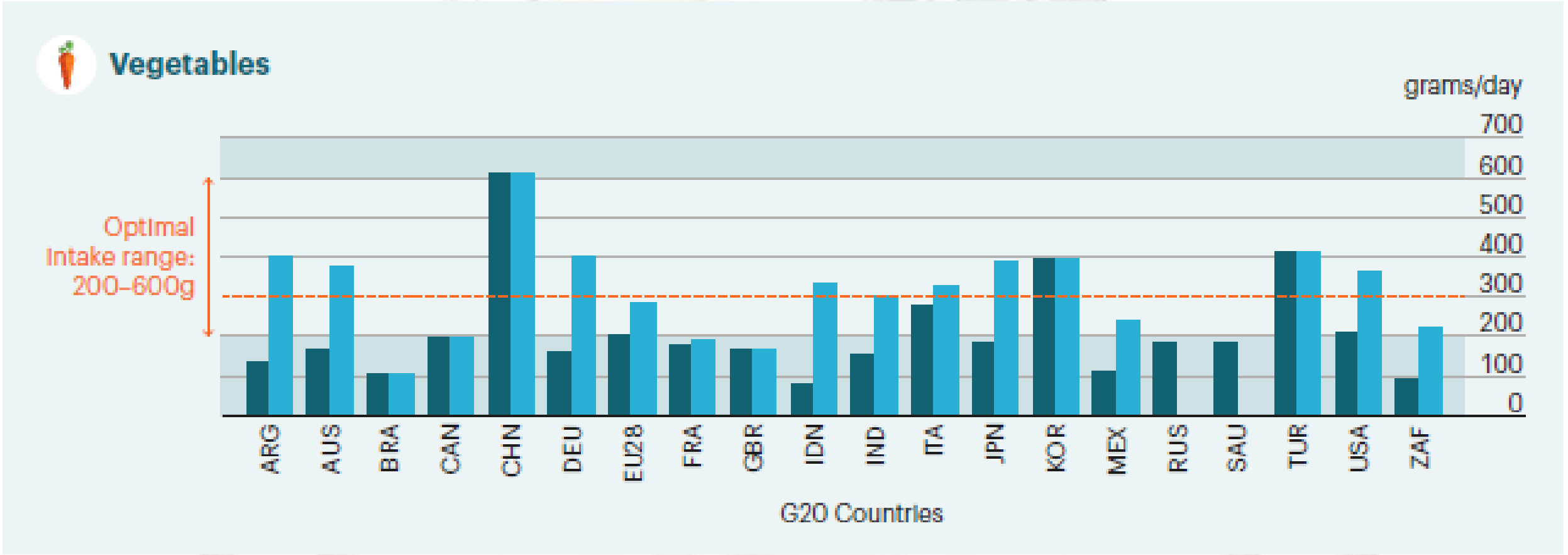
Dairy


Current Consumption
National Dietary Guidelines
Planetary Health Diet
Dairy
grams/day
1,500
1,250
1,000
750
500
250
0
Increased risk
Optimal
Intake range:
0–500g
ARG
AUS
BRA
CAN
CHN
DEU
EU28
FRA
GBR
IDN
IND
ITA
JPN
KOR
MEX
RUS
SAU
TUR
USA
ZAF
G20 Countries

Fruit


Current Consumption
National Dietary Guidelines
Planetary Health Diet
Fruit
grams/day
400
300
200
100
0
Optimal
Intake range:
100–300g
ARG
AUS
BRA
CAN
CHN
DEU
EU28
FRA
GBR
IDN
IND
ITA
JPN
KOR
MEX
RUS
SAU
TUR
USA
ZAF
G20 Countries

Vegetables


Current Consumption
National Dietary Guidelines
Planetary Health Diet
Vegetables
grams/day
700
600
500
400
300
200
100
0
Optimal
Intake range:
200–600g
ARG
AUS
BRA
CAN
CHN
DEU
EU28
FRA
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IDN
IND
ITA
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MEX
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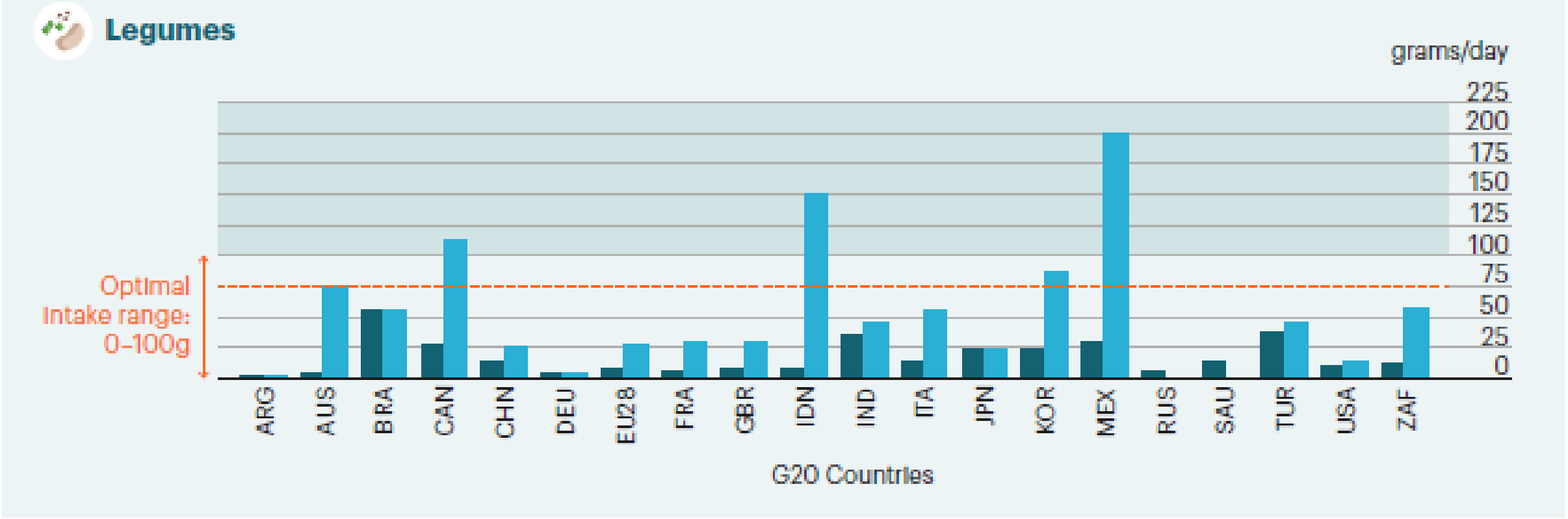
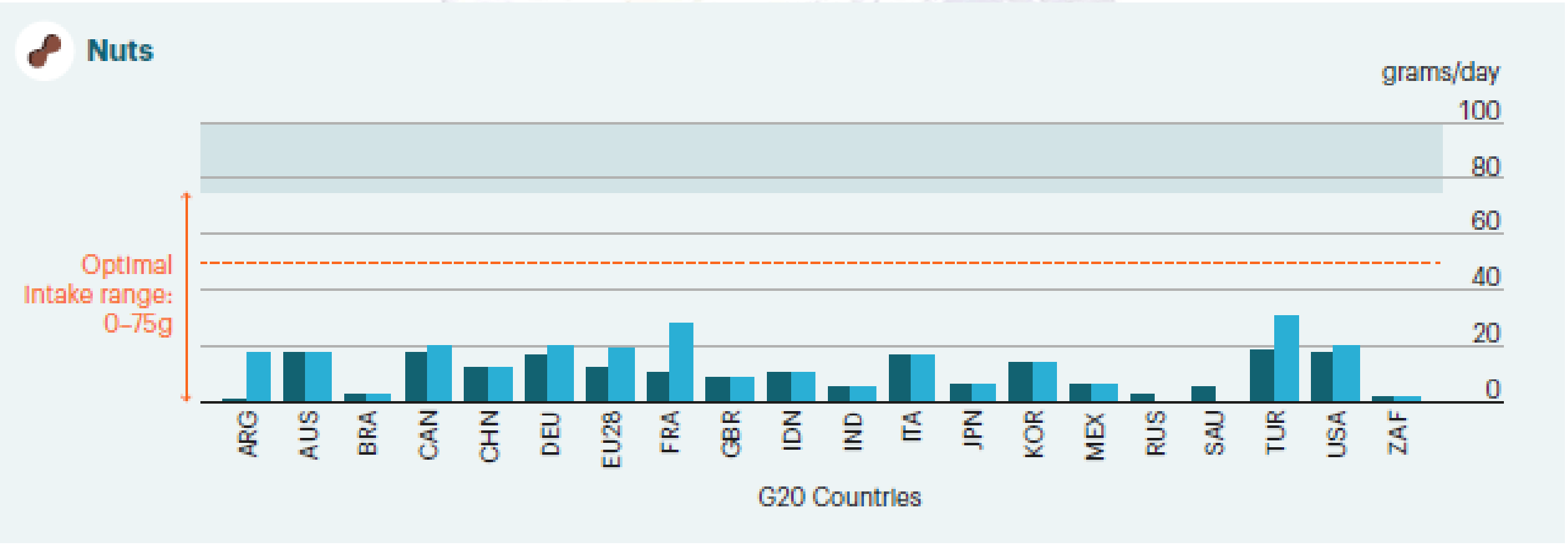
USA
ZAF
G20 Countries

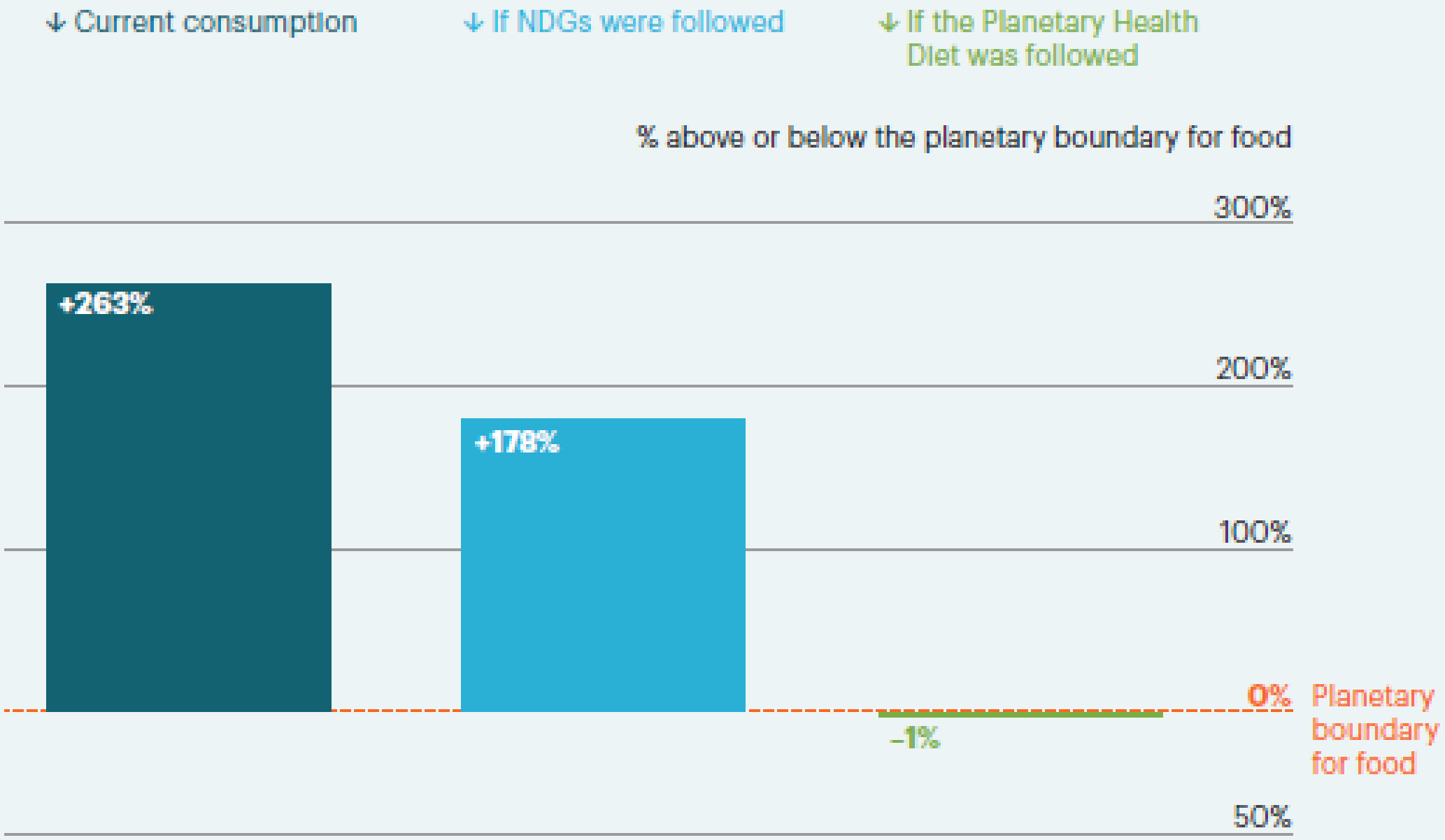
Legumes

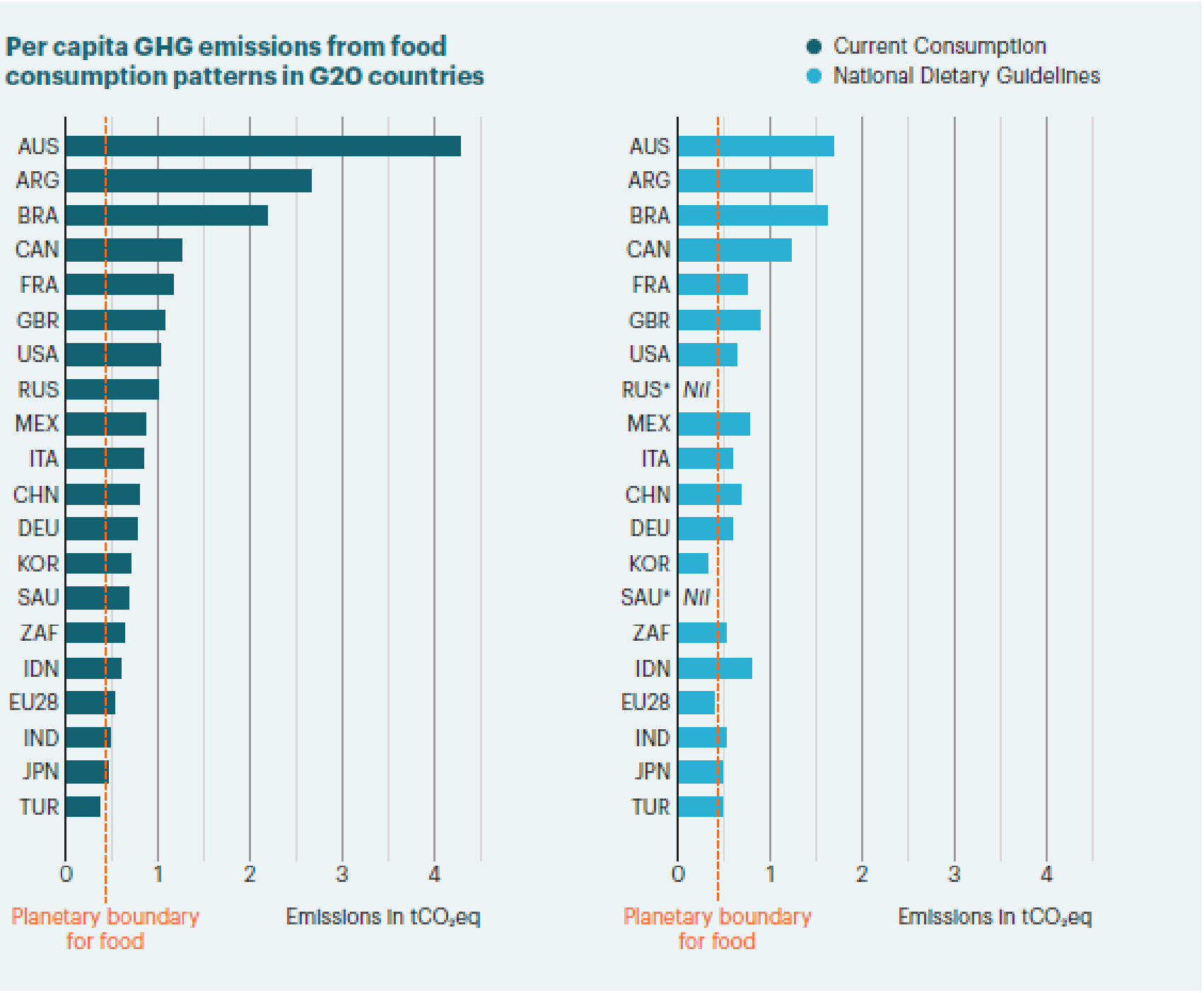

Legumes
Current Consumption
National Dietary Guidelines
Planetary Health Diet
grams/day
225
200
175
150
125
100
75
50
25
0
Optimal Intake range: 0–100g
ARG
AUS
BRA
CAN
CHN
DEU
EU28
FRA
GBR
IDN
IND
ITA
JPN
KOR
MEX
RUS
SAU
TUR
USA
ZAF
G20 Countries

Nuts


Current Consumption
National Dietary Guidelines
Planetary Health Diet
Nuts
grams/day
100
80
60
40
20
0
Optimal
Intake range:
0–75g
ARG
AUS
BRA
CAN
CHN
DEU
EU28
FRA
GBR
IDN
IND
ITA
JPN
KOR
MEX
RUS
SAU
TUR
USA
ZAF
G20 Countries

Projected food-related GHG emissions if G20 consumption patterns are adopted globally




Per capita GHG emissions from food consumption patterns in G20 countries
Current Consumption
National Dietary Guidelines
AUS
ARG
BRA
CAN
FRA
GBR
USA
RUS
MEX
ITA
CHN
DEU
KOR
SAU
ZAF
IDN
EU28
IND
JPN
TUR
RUS*
SAU*
Nil
0
1
2
3
4
Planetary boundary for food
Emissions in tCO2eq

The ecological foodprint if G20 food consumption patterns are adopted globally

India	0.84
Indonesia	0.90
China	1.77
Japan	1.86
Saudi Arabia	2.08
Turkey	2.11
South Korea	2.30
South Africa	2.94
Mexico	3.03
Germany	3.36
Russia	3.42
EU28	3.52
UK	3.98
Canada	4.50
Italy	4.64
France	5.02
Brazil	5.21
USA	5.55
Australia	6.83
Argentina	7.42

Planetary boundary for food

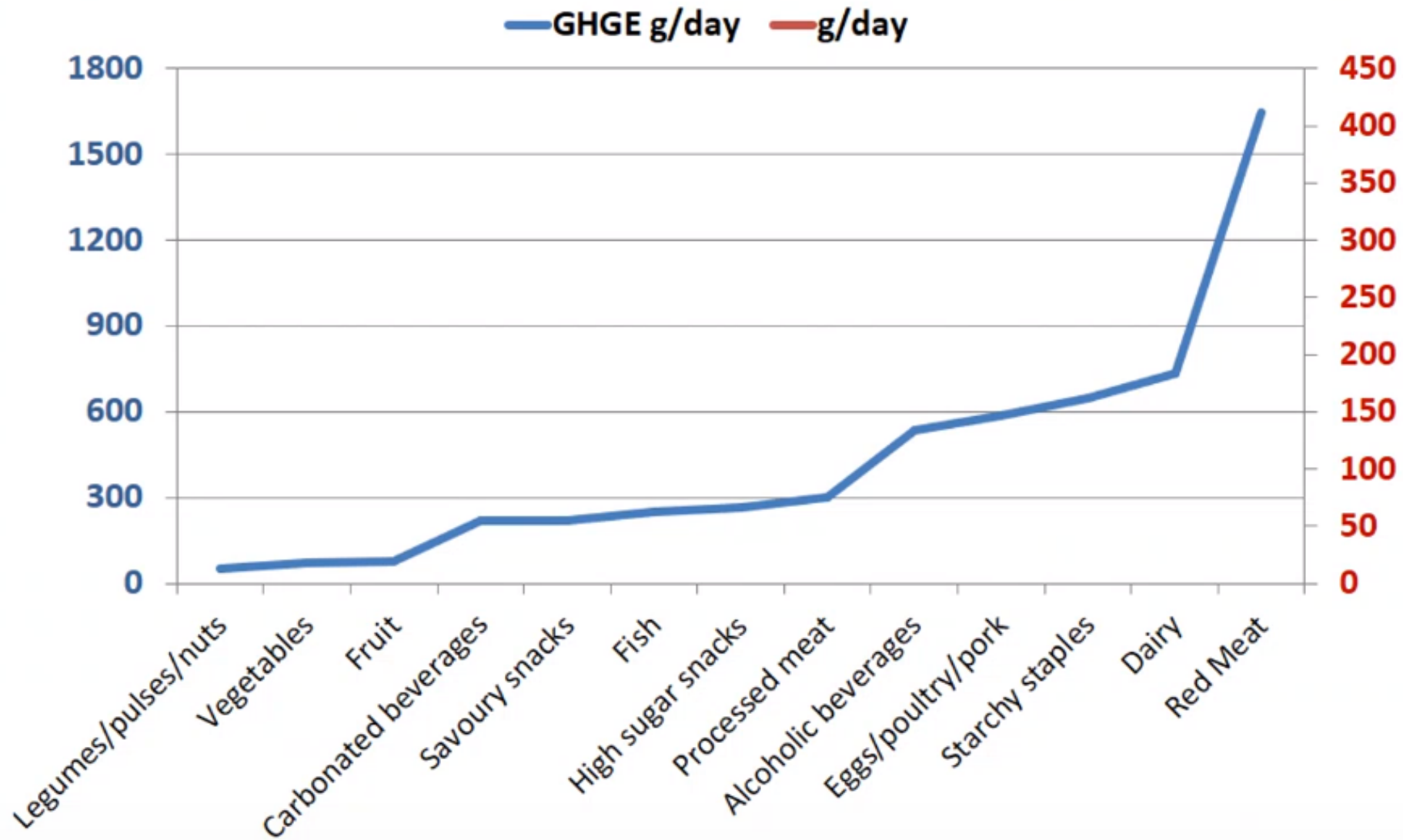
The ecological foodprint if NDGs are adopted globally

Indonesia	0.84
India	1.00
South Korea	1.06
China	1.51
Japan	1.89
Saudi Arabia*	2.08
Germany	2.35
South Africa	2.43
EU28	2.52
Turkey	2.84
Mexico	2.94
Italy	2.95
France	3.17
UK	3.34
Australia	3.37
Russia*	3.42
USA	3.46
Brazil	3.92
Canada	4.49
Argentina	4.67

Planetary boundary for food

What about Ireland?

Daily food group consumption & emissions



Excessive Food Consumption in Irish Adults: Implications for Climatic Sustainability and Public Health 2018

- Currently in the Irish diet, animal products contributed 48.1% to total dietary GHGE,
- red meat 22.4%,
- dairy 12.0%
- eggs, poultry and pork 9.2%.
- While foods of animal origin were found to have high GHGE, they only constituted approximately a 25% of EI
- Hence, recommendations to reduce consumption of meat would have little or no impact on energy intake.

Red Meat

DoH WCR recommnedations

- Eating smaller portions (about the size of a deck of cards) means that you can have red meat more often and still have no more than 350–500g a week.
- 50-75g per day

EAT Lancet report

- Aim to **consume** no more than 98 grams of **red meat** (pork, **beef** or lamb), 203 grams of poultry and 196 grams of fish per week. Approach food in moderation. Consuming too much food can lead to weight gain and other health problems and it is also a challenge for the environment.
- **14g per day- meatball**

Meat Consumption & dietary characteristics of Irish Meat consumers

	Processed pork indulgers	All things meat	Chicken eaters	Fish eaters	Beef focused	Diverse moderates
Cluster size (%)	13	4	20	21	21	21
Age (years)	45	56	38	50	43	45
Body mass index	28	28	27	27	27	26
Energy from meat (%)	28	26	22	19	19	14
Energy from fat (%)	37	36	34	35	34	34
Fat from meat (%)	37	38	28	26	25	19
Beef (g/day)	88	41	43	33	124	30
Chicken (g/day)	49	38	138	35	39	46
Fish (g/day)	8	36	15	79	20	11
Pork (g/day)	108	24	28	37	30	39
Lamb (g/day)	6	66	2	4	1	17
Turkey (g/day)	3	9	1	2	1	4
Game, offal (g/day)	1	22	0	1	0	2

202g/d | 131g/d | 73 g/d | 74 g/d | 155g/d | 86 g/d

Teasgasc 2017

GHG emissions Calculations

GHG emissions calculations of Irish Diet

- Life cycle analysis (LCA)
  - Considered production - consumer waste
- #Emissions factor assigned to each of the 67 food groups

Three distinct patterns observed in NANS

- Defining food groups:
  - Processed meat
  - Savoury snacks
  - Alcoholic beverages
- **Total GHGE**
- *Men*: 9.0 *kg* CO_2eq
- Women: 5.8 *kg* CO_2eq

Unsustainable
25%

- Defining food groups:
  - Fruit & vegetables
  - Fish
  - Dairy
- **Total GHGE**
- *Men*: 7.7 *kg* CO_2eq
- Women: 5.1 *kg* CO_2eq

Nutritionally
Sustainable
26%

- Defining food groups:
  - Red meat
  - Dairy
  - Starchy staples
- **Total GHGE**
- *Men*: 7.4 *kg* CO_2eq
- Women: 5.1 *kg* CO_2eq

Culturally
Sustainable
48%

Mean GHGEs from food groups across clusters

Male	Unsustainable		Nutritionally Sustainable		Culturally Sustainable	
Food Groups	x̄	%	x̄	%	x̄	%
Red Meat	2131	21	1603	19	2263	28
Dairy	607	7	925	12	877	12
Starchy Staples	657	8	817	11	764	11
Eggs, poultry, pork	707	8	735	10	680	10
Alcoholic drinks	1749	18	328	4	605	8
Processed meat	685	8	248	3	327	5
High sugar snacks	168	2	385	5	306	5
Fish	96	1	486	7	212	3
Savoury Snacks	606	7	188	3	142	2
Carbonated beverages	489	6	180	2	165	2
Vegetables	36	0.4	111	2	56	0.8
Fruit	28	0.3	155	2	54	0.8
Legumes, pulses, nuts	40	0.5	82	1	40	0.6
Daily Total (kg Co_2 eq)	**9.0**		**7.7**		**7.4**	

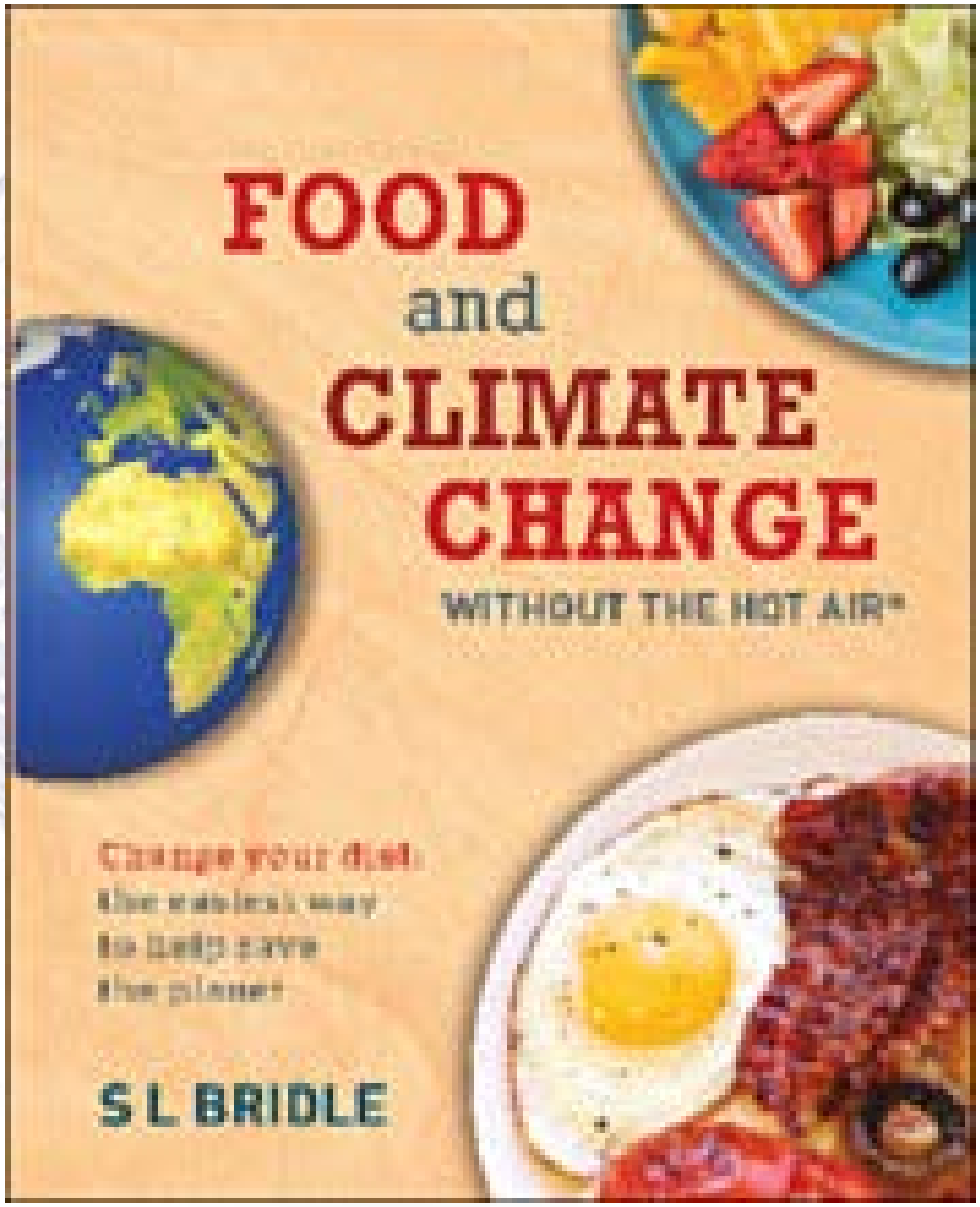
Food Waste

How about the UK – What type of foods do we waste most?

In the UK, 15m tonnes of food is lost or wasted each year and consumers throw away 4.2m tonnes of edible food each year. The foods most commonly found in British bins are bread, vegetables, fruit and milk.

What does this mean for the average family?

The average family throws away £700 worth of perfectly good food a year, or almost


FOOD
and
CLIMATE
CHANGE
WITHOUT THE HOT AIR®
S L BRIDLE

What causes more climate change- Poll time!

Cereal with milk

Large Latte

Two boiled eggs

What causes more climate change- Poll time!

Cereal with milk

519 gCO_2e

Large Latte

1275 gCO_2e

Two boiled eggs

659 gCO_2e

Latte with Sugar in Cardboard Cup

Instant Coffee

0.04 × 100 grams => 66 gCO2e
Source: FACCWTHA

Electricity, 2 kW

0.0412 × 60 minutes => 39 gCO2e
Source: FACCWTHA

Tap Water

2.5 × 100 grams => 0 gCO2e
Source: FACCWTHA

Milk

500 × 1 gram => 1100 gCO2e
Source: FACCWTHA

Plastic Milk Carton

0.4 × 1 carton => 40 gCO2e
Source: FACCWTHA

Sugar

4 × 1 gram => 10 gCO2e
Source: FACCWTHA

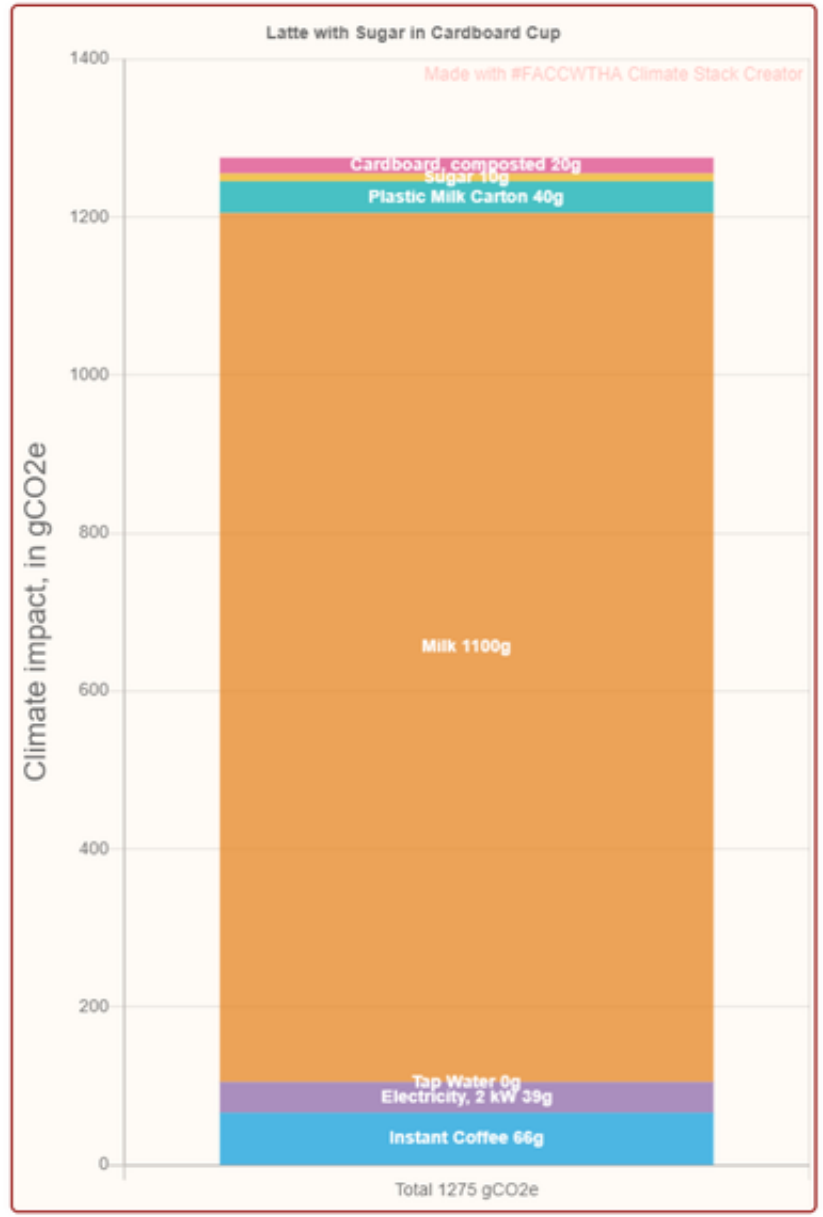
Cardboard, composted

20 × 1 gram => 20 gCO2e
Source: FACCWTHA

Latte with Sugar in Cardboard Cup

Total 1275 gCO2e

43% of a target daily budget of 3 kg emissions.



What causes more climate change- Poll time!

Chicken sandwich

Cheese sandwich

Peanut Butter & Jam sandwich

What causes more climate change- Poll time!

Chicken sandwich

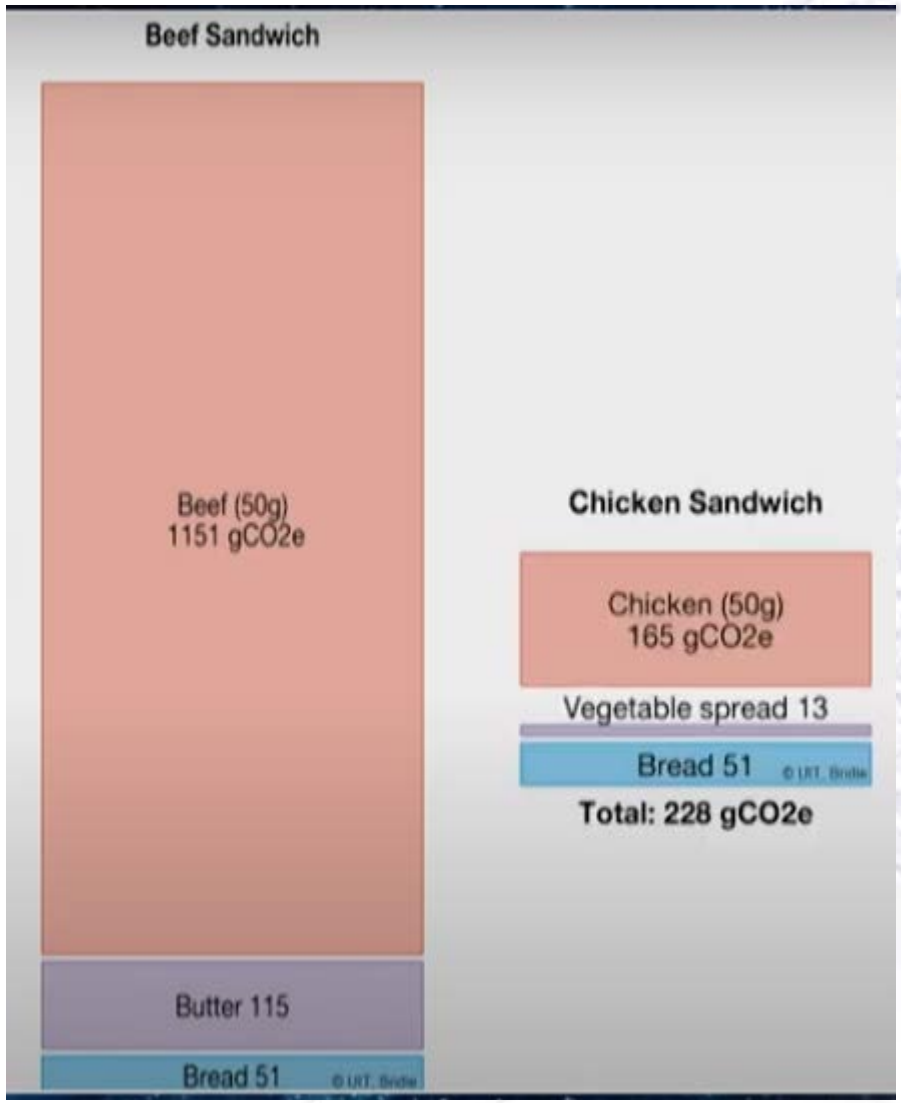
509 gCO_2e

Cheese sandwich

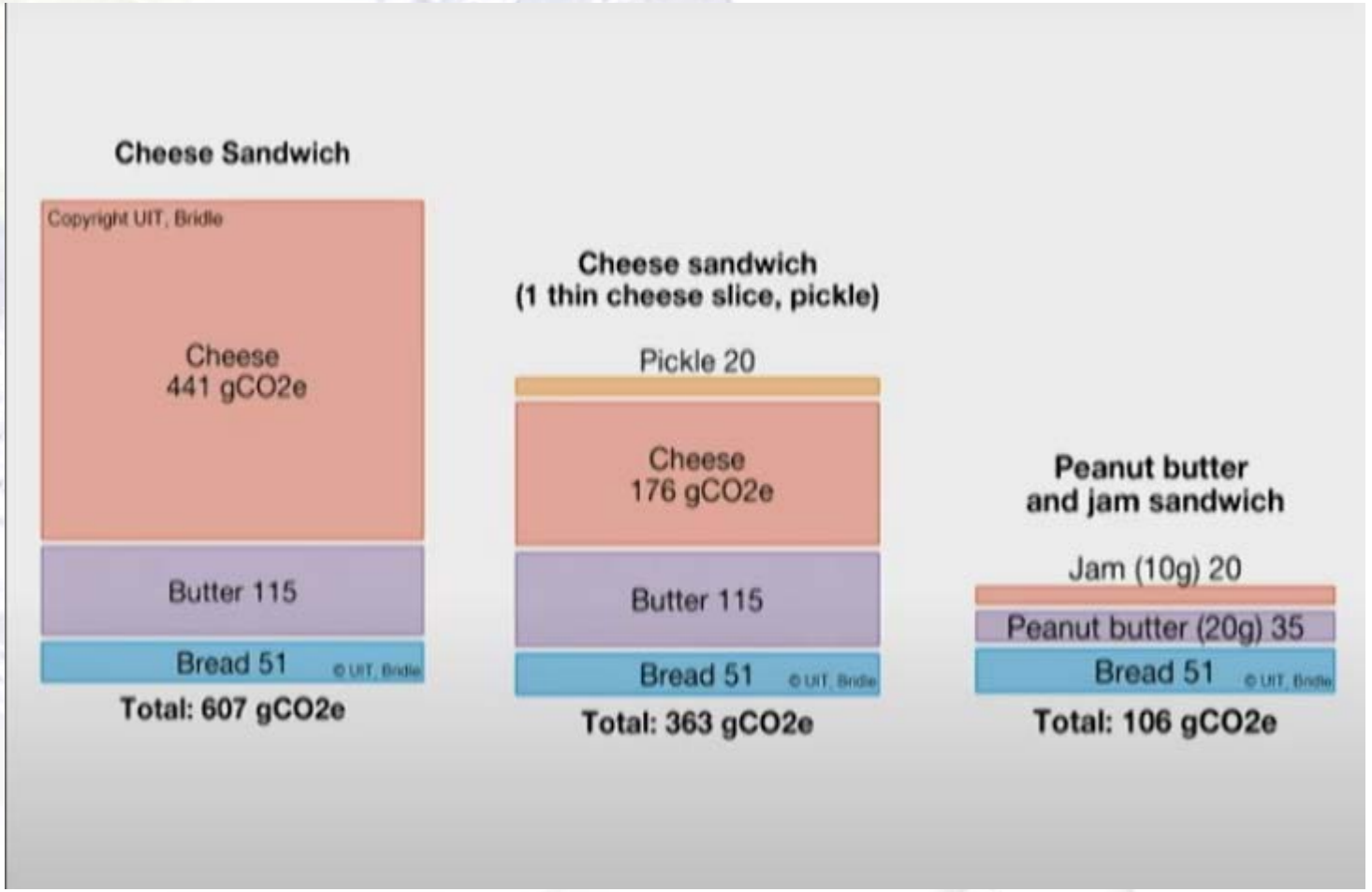
938 gCO_2e

Peanut Butter & Jam sandwich

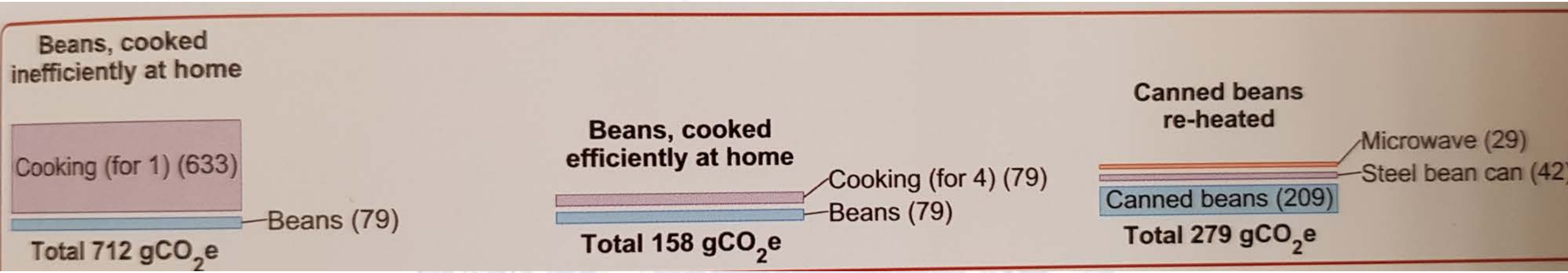
176 gCO_2e

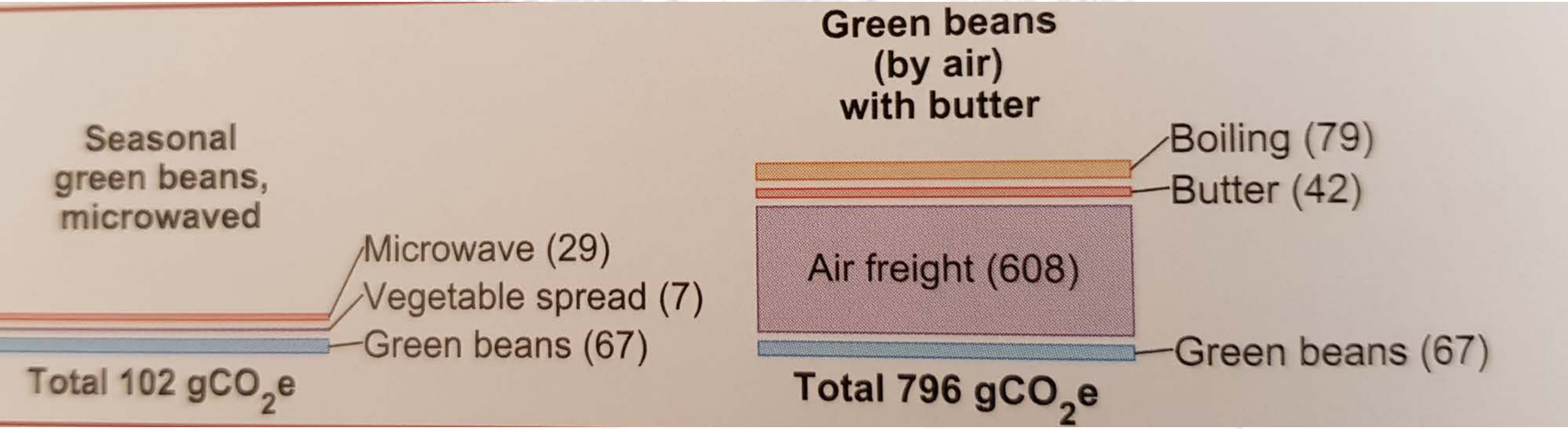

Beef Sandwich
Beef (50g)
1151 gCO2e
Butter 115
Bread 51
© UIT, Bridle

Chicken Sandwich
Chicken (50g)
165 gCO2e
Vegetable spread 13
Bread 51
© UIT, Bridle
Total: 228 gCO2e

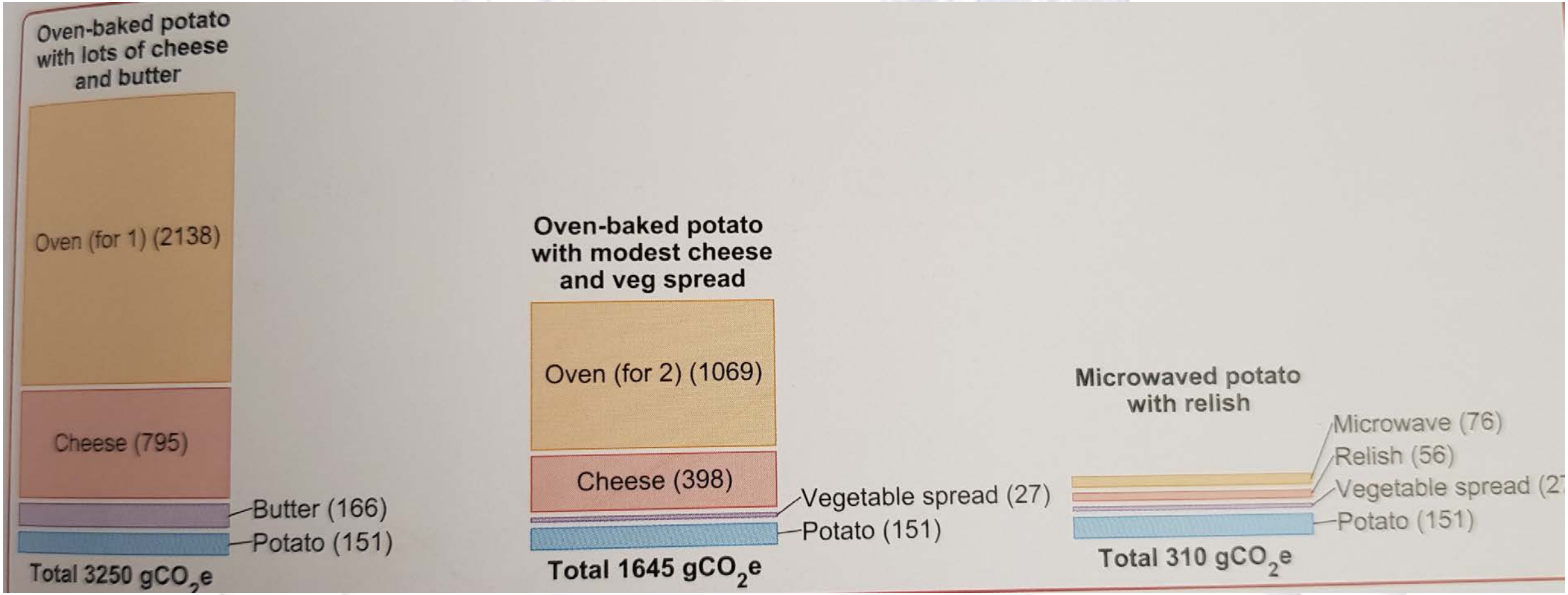

Cheese Sandwich
Copyright UIT, Bridle
Cheese
441 gCO2e
Butter 115
Bread 51
© UIT, Bridle
Total: 607 gCO2e
Cheese sandwich
(1 thin cheese slice, pickle)
Pickle 20
Cheese
176 gCO2e
Butter 115
Bread 51
© UIT, Bridle
Total: 363 gCO2e
Peanut butter
and jam sandwich
Jam (10g) 20
Peanut butter (20g) 35
Bread 51
© UIT, Bridle
Total: 106 gCO2e

1317 gCO2e


Beans, cooked inefficiently at home
Cooking (for 1) (633)
Beans (79)
Total 712 gCO2e
Beans, cooked efficiently at home
Cooking (for 4) (79)
Beans (79)
Total 158 gCO2e
Canned beans re-heated
Microwave (29)
Steel bean can (42)
Canned beans (209)
Total 279 gCO2e


Seasonal green beans, microwaved
Microwave (29)
Vegetable spread (7)
Green beans (67)
Total 102 gCO2e
Green beans (by air) with butter
Boiling (79)
Butter (42)
Air freight (608)
Green beans (67)
Total 796 gCO2e

Cooking methods matter!



Is the planetary health diet nutritionally sufficient?

- It would:
- Improve intakes of healthy mono and polyunsaturated fatty acids
- Reduce consumption of saturated fats.
- increase essential micronutrient intake (eg iron, zinc, folate, vit A)
- Increase calcium in low-income countries
- Low in vitamin B12 intakes may be inadequate and supplements or fortified foods may be needed

- Does the diet work for everyone?
- The diet is designed to meet nutritional requirements of healthy individuals over 2 years old (with energy intake depending on age, body size, and physical activity), but the authors note that there are also special considerations for adolescent women, and pregnant and breastfeeding women, who often have different nutritional requirements. This is one reason that ranges are given for each dietary component, recognizing the needs and preferences of individuals may differ.

Does Planetary diet work for everyone

- The Commission does not address children <2 yrs because breast feeding is the highest priority and these children have different requirements to support rapid growth.
- Some premenopausal women may have extra iron requirements because of menstrual losses and taking a supplement is less expensive and without adverse consequences of high red meat intake.
- The special needs of pregnant and lactating women are recognized and can be met within the ranges of the suggested diet.
- Other medical conditions

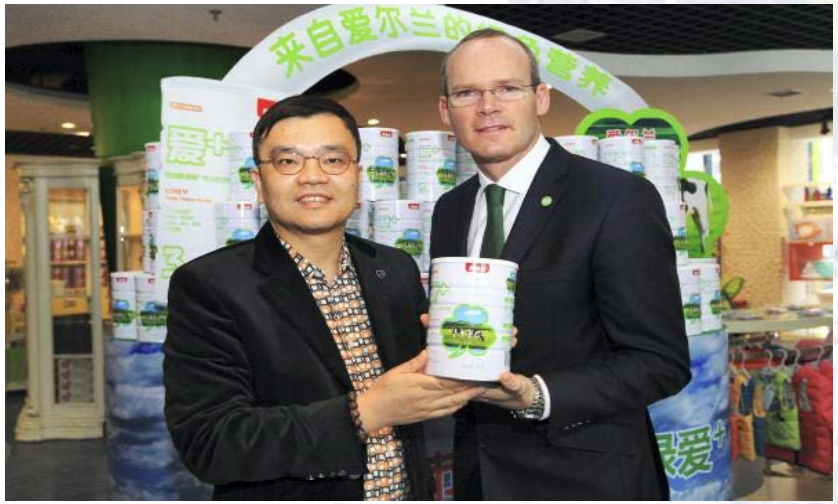
A final thought!

The Paradox

The Paradox

1kg powdered infant milk requires roughly 4,000L water.

The Paradox



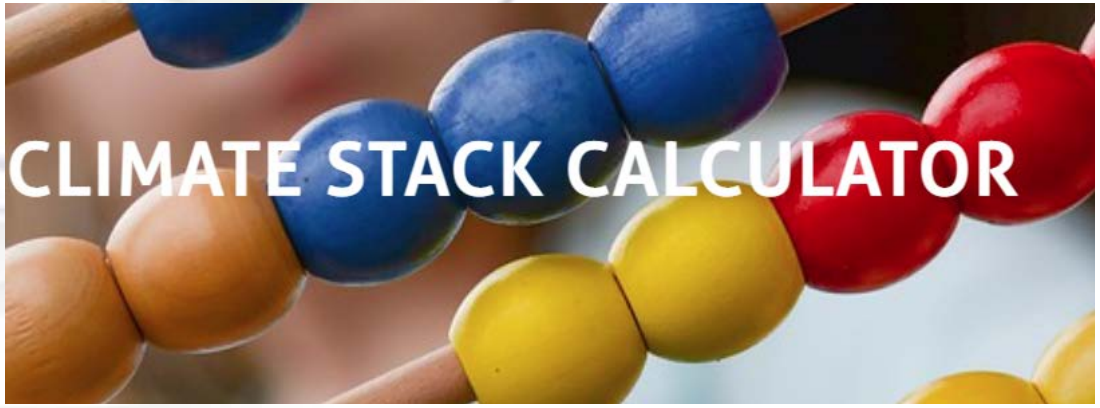
The baby killer

https://www.youtube.com/watch?v=bIjaILLKHNM

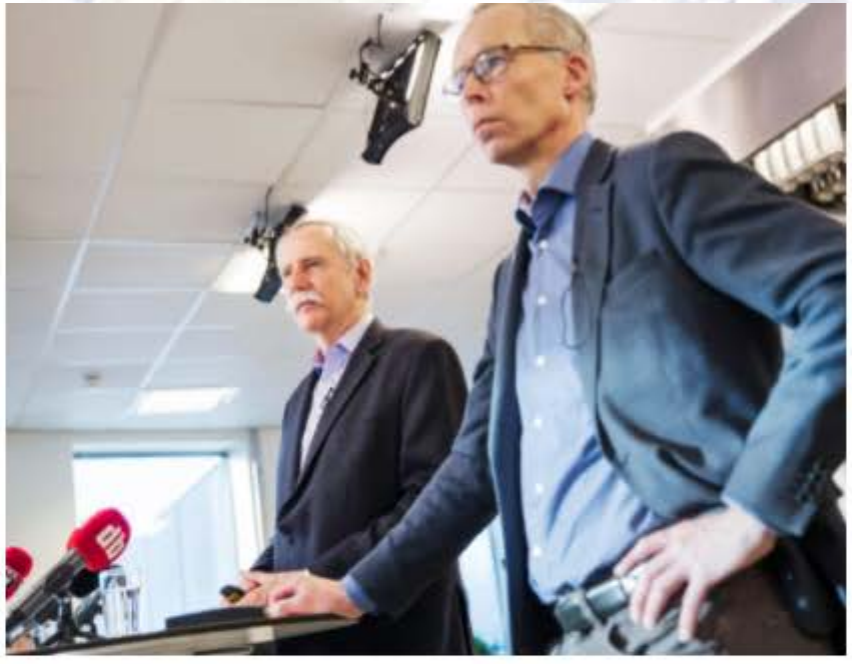
Breastmilk substitutes (BMS)

- FAO (2013) “GHG emissions from cattle represent about 65% (4.6 gigatonnes CO2-eq), of total sector emissions”.
- In BMS also requires a lot of resources for production and packaging including: paper, aluminium, plastic, cardboard, tin, plastic and steel.
- In addition to the input resources, Irish infant formula also has a lot of food miles, considering the industry’s target markets are in Asia & Africa
- **Global BMS Market** was estimated at $57.12 Billion in 2019 and is expected to reach $110.26 Billion by 2026.
- The **global BMS Market** is expected to grow at a compound **annual** growth rate of 9.8% from 2019 to 2027

Resources- Take a bite out of Climate Change



Resources- https://eatforum.org/eats-podcast-lets-rethink-food/



Podcast —

EO: The Big Picture

EAT's founder & executive chair Dr. Gunhild Stordalen reflects on the

forum.org/learn-and-discover/e1-the-planetary-health-diet/

Podcast —

E1: The Planetary Health Diet

Prof. Walter Willett and Prof. Johan

Podcast —

E2: Why Choose Plants

Chefs and culinary entrepreneurs Claus Meyer and Alice Zaslavsky give their best