HEALTH CO-BENEFITS OF A LOW-ENVIRONMENTAL IMPACT DIET

AND THE ANTHROPOMETRIC DEVELOPMENT OF THE CHILD

PhD IN **SUSTAINABLE DEVELOPMENT** AND **CLIMATE CHANGE**

UNIVERSITÀ DI TORINO

SILVIA MARITANO, silvia.maritano@unito.it

PHD SDC

30+ UNIVERSITIES

102 SCOLARSHIPS

6 CURRICULA

ONE COMMON GOAL

To direct research towards
new sustainable development models,
in order to **minimize the impact of humankind**
on the planet and to **reduce inequalities**

PhD IN **SUSTAINABLE DEVELOPMENT**
AND **CLIMATE CHANGE**

PHD SDC

The impact of climate change on the **structure**, **function** and **health** of biotic and abiotic components of **ecosystems**

Study the **human health** risks associated with climate change and their **interconnections**

PHD SDC

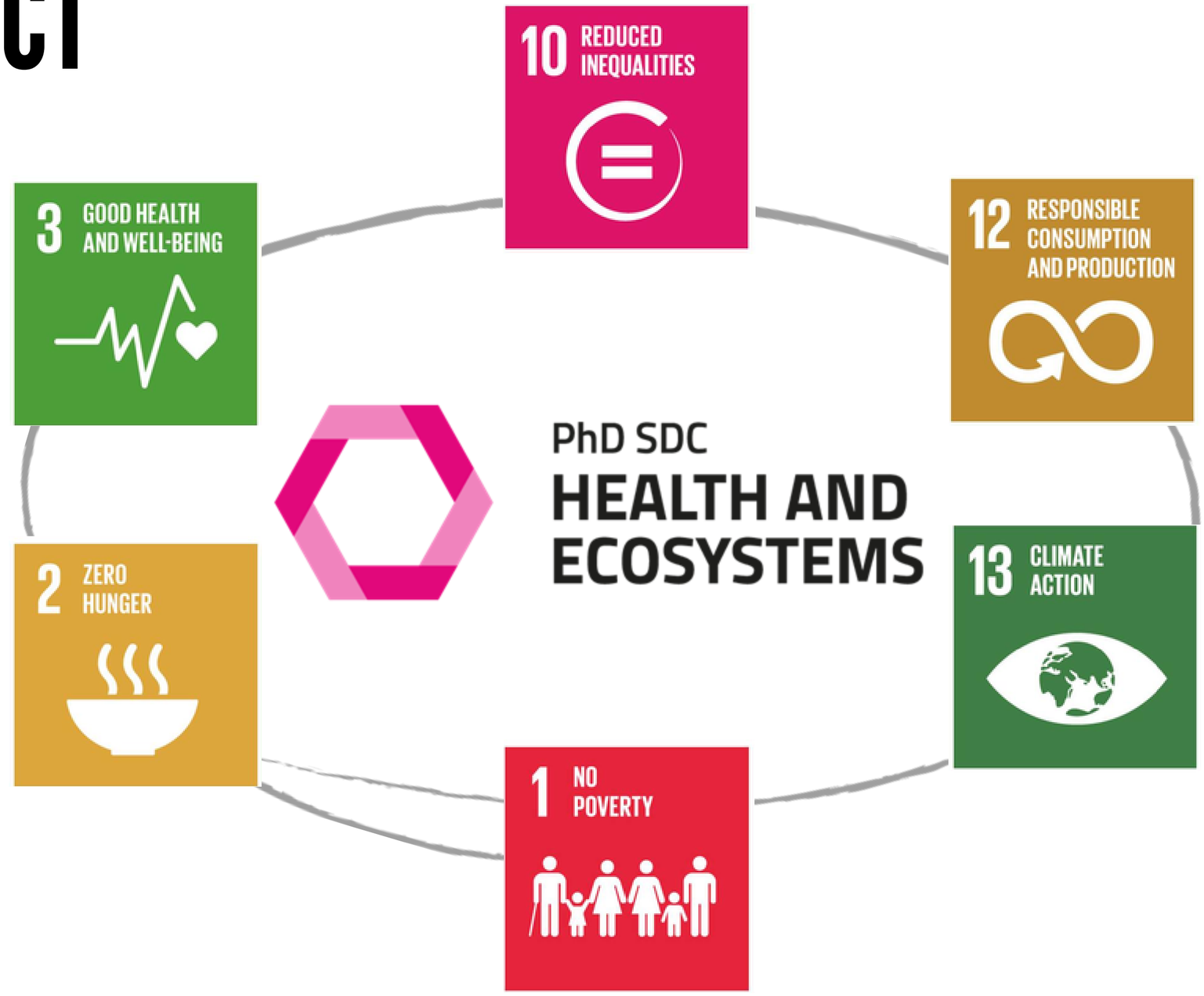
The impact of climate change on the **structure**, **function** and **health** of biotic and abiotic components of **ecosystems**

Study the **human health** risks associated with climate change and their **interconnections**

Accounting for not only climate but **global change**

i.e. planetary-scale changes in the Earth system which encompass the variety of changes connected to the rapid increase in human activities which started around mid-20th century

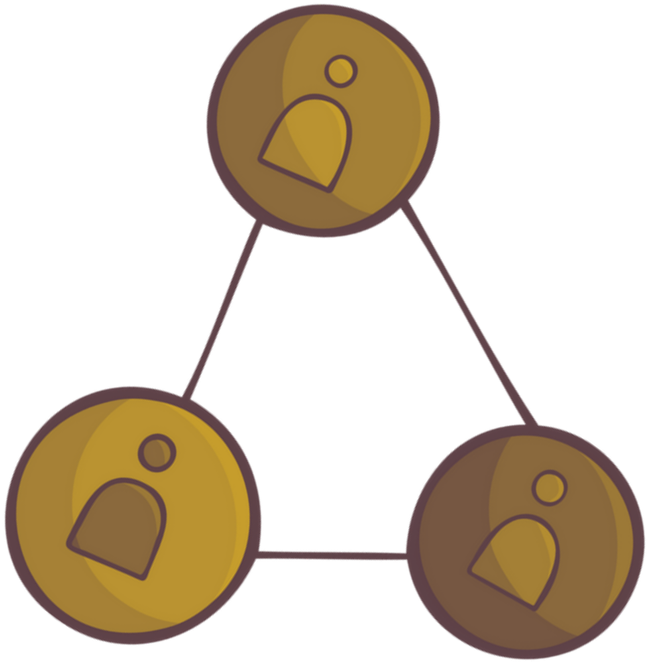
THE PROJECT


10 REDUCED INEQUALITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
3 GOOD HEALTH AND WELL-BEING
PhD SDC
HEALTH AND ECOSYSTEMS
2 ZERO HUNGER
13 CLIMATE ACTION
1 NO POVERTY

THE PROJECT

LIFESTYLE

Individual actions' impact on environment and health

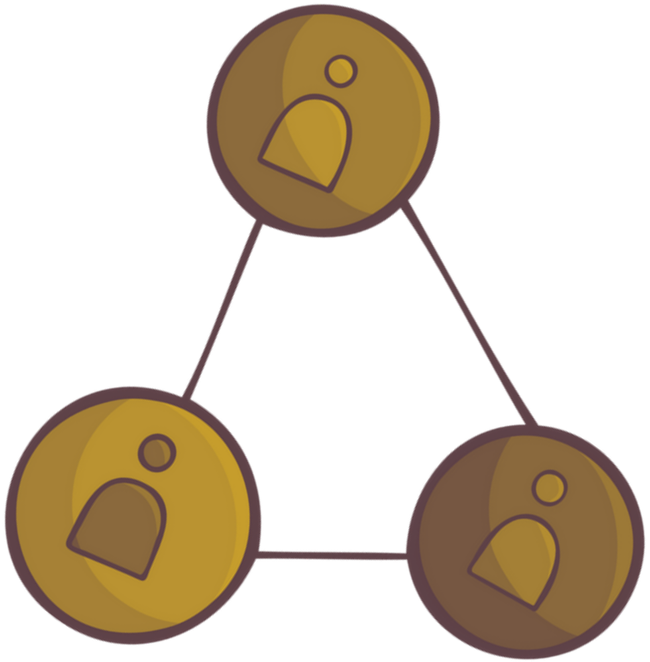


THE PROJECT

LIFESTYLE

Individual actions' impact on environment and health

SOCIO- ECONOMIC DETERMINANTS OF HEALTH



How socio-economic factors are able to **shape** individual's impact and health

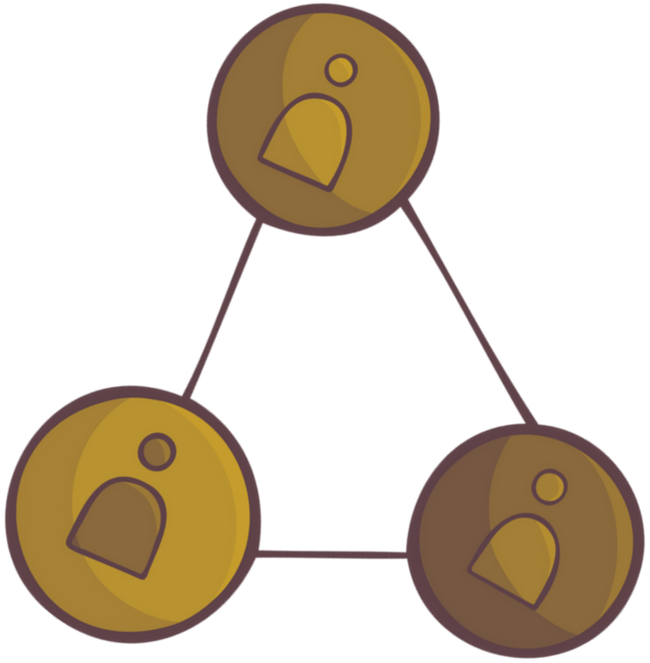
THE PROJECT

LIFESTYLE

Individual actions' impact on environment and health

SOCIO- ECONOMIC DETERMINANTS OF HEALTH

How socio-economic factors are able to **shape** individual's impact and health



PLANETRARY HEALTH

The health of **human** civilization and the **natural system** on which it depend

CO-BENEFITS

We live in ecosystems with a delicate balance

Human activities have strong consequences on them

But also our health depends on a delicate balance

And is deeply affected by the ecosystem's health and environmental parmeters

**IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtneret al.]. Cambridge University Press. In Press.*

CO-BENEFITS

We live in ecosystems with a delicate balance

Human activities have strong consequences on them

But also our health depends on a delicate balance

And is deeply affected by the ecosystem's health and environmental parmeters

Co-benefit definition (IPCC)

*Co-benefits are defined as mitigation benefits resulting from an adaptation response**

Health-related co- benefitsa are those positive effect on health arising from mitigation/adaptation actions and poilcies and vice versa

*IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtneret al.]. Cambridge University Press. In Press.

DIET

WHY DIET?

Diet is one of the lifestyle-related factors that most affect **both climate change** and human health.

*IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtneret al.]. Cambridge University Press. In Press.

WHY DIET?

Diet is one of the lifestyle-related factors that most affect **both climate change** and human health.

In region with excess calories consumption a **dietary shift** towards foods with a **higher share in plant based** foods and with greater dietary diversity **and reduced** consumption of **animal-sourced** foods and **unhealthy** foods(as defined by scientific panels such as EAT-Lancet) has both **mitigation** and **adaptation** benefits along with reduced mortality from diet related non-communicable diseases, health, biodiversity and other environmental co-benefits (high confidence) (1)

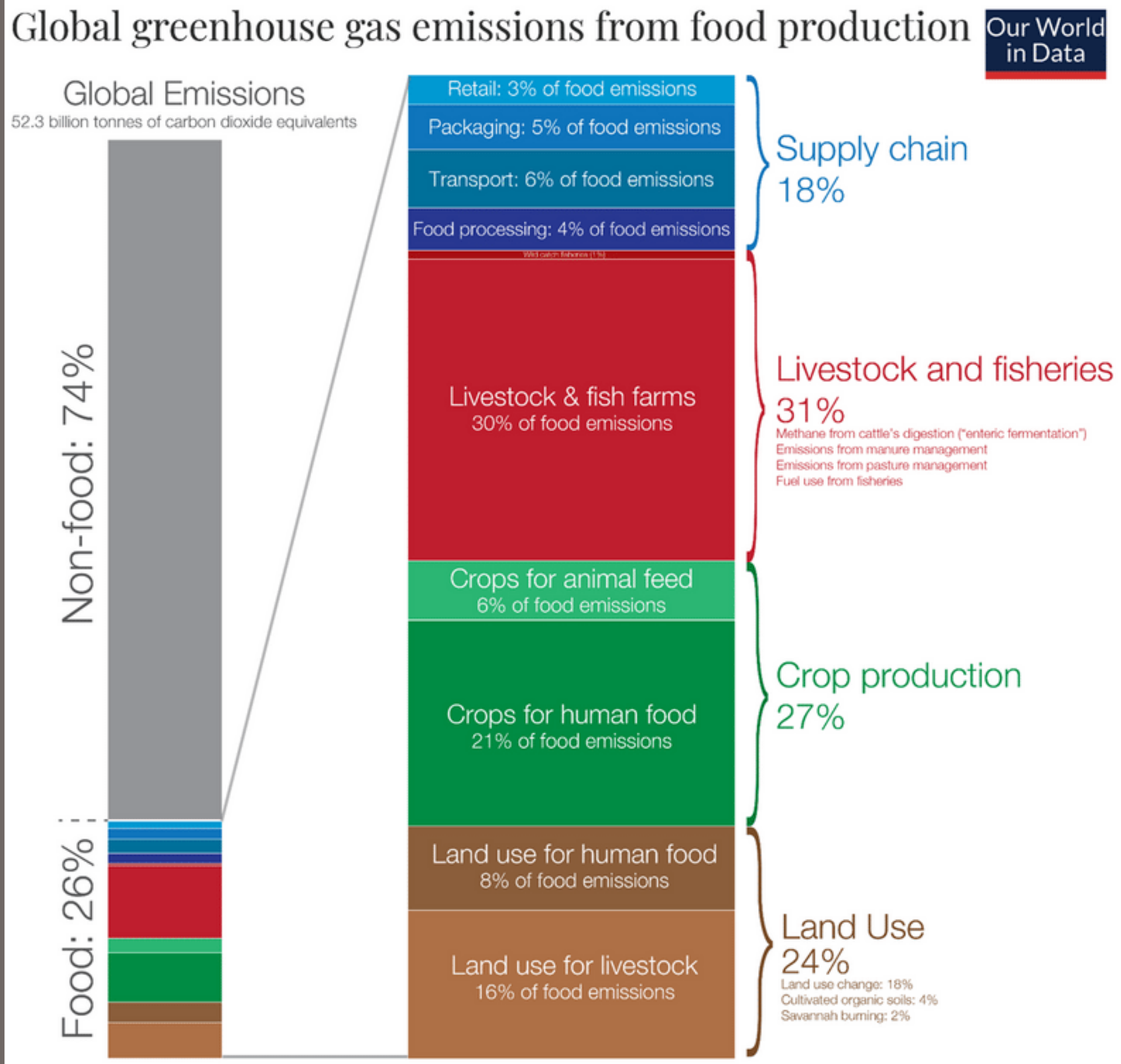
Reducing food waste, especially of environment- and climate-costly foods would further extend these benefits

*IPCC, 2022: Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtneret al.]. Cambridge University Press. In Press.

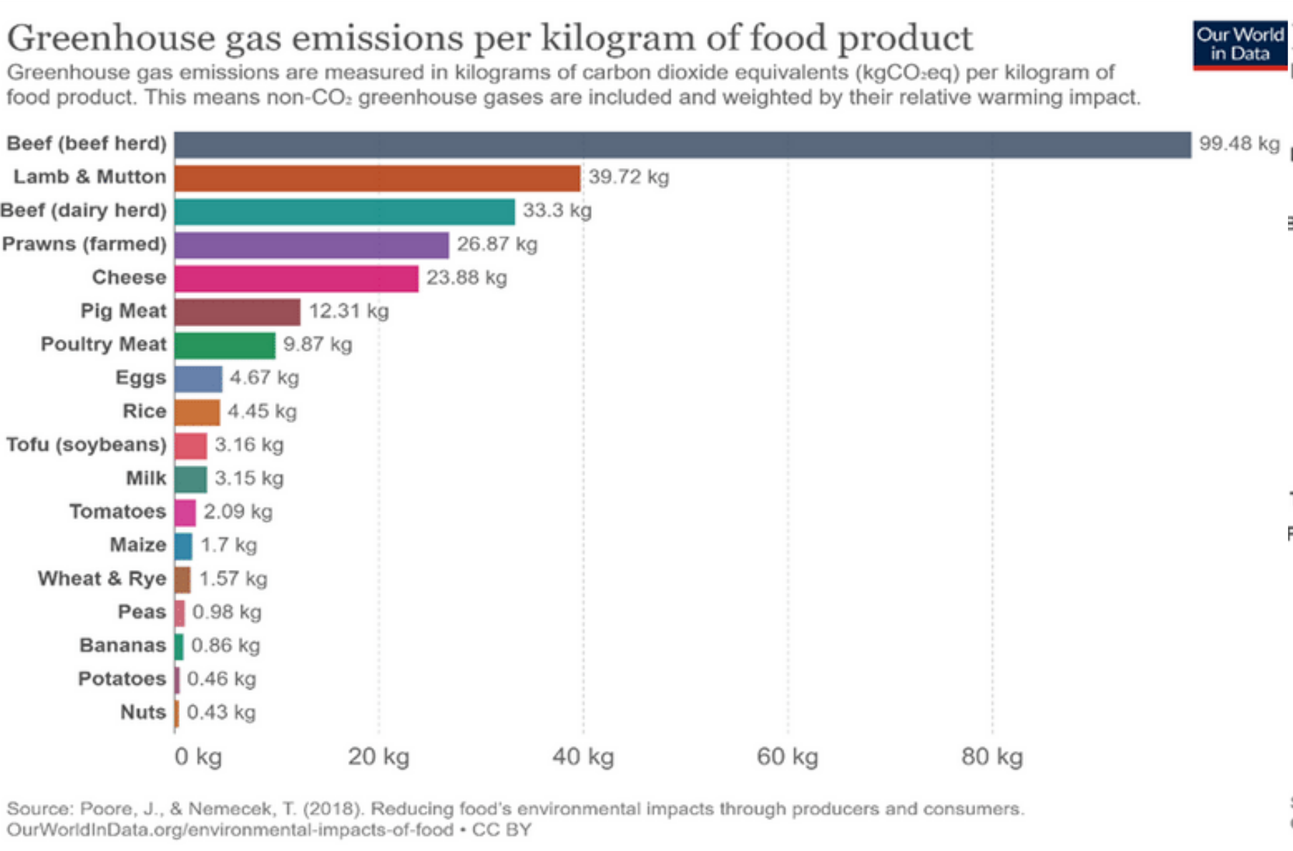
WHY DIET?

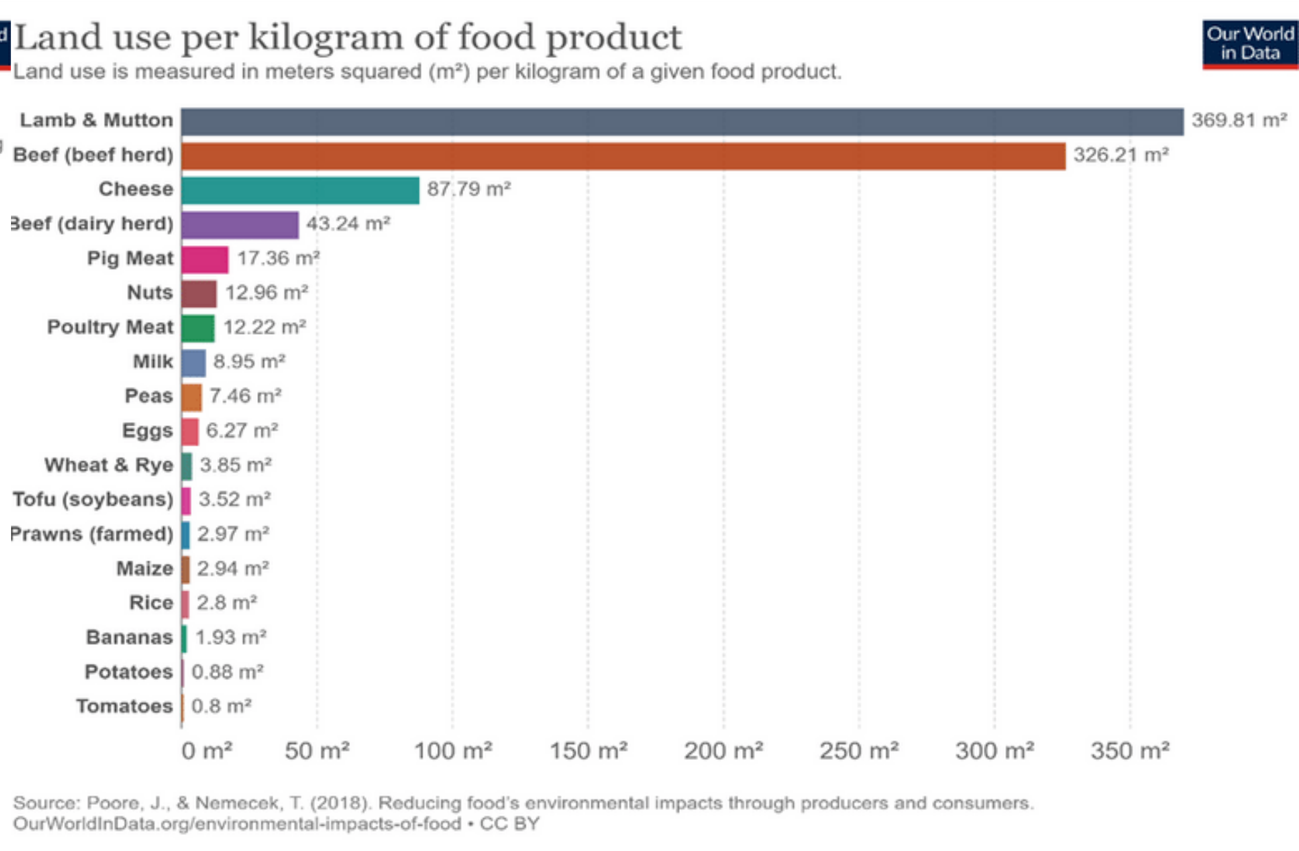
The **food sector** is responsible for the 20 to 30% of global GHG emissions

The emissions **intensity** varies according to the stage of the production chain

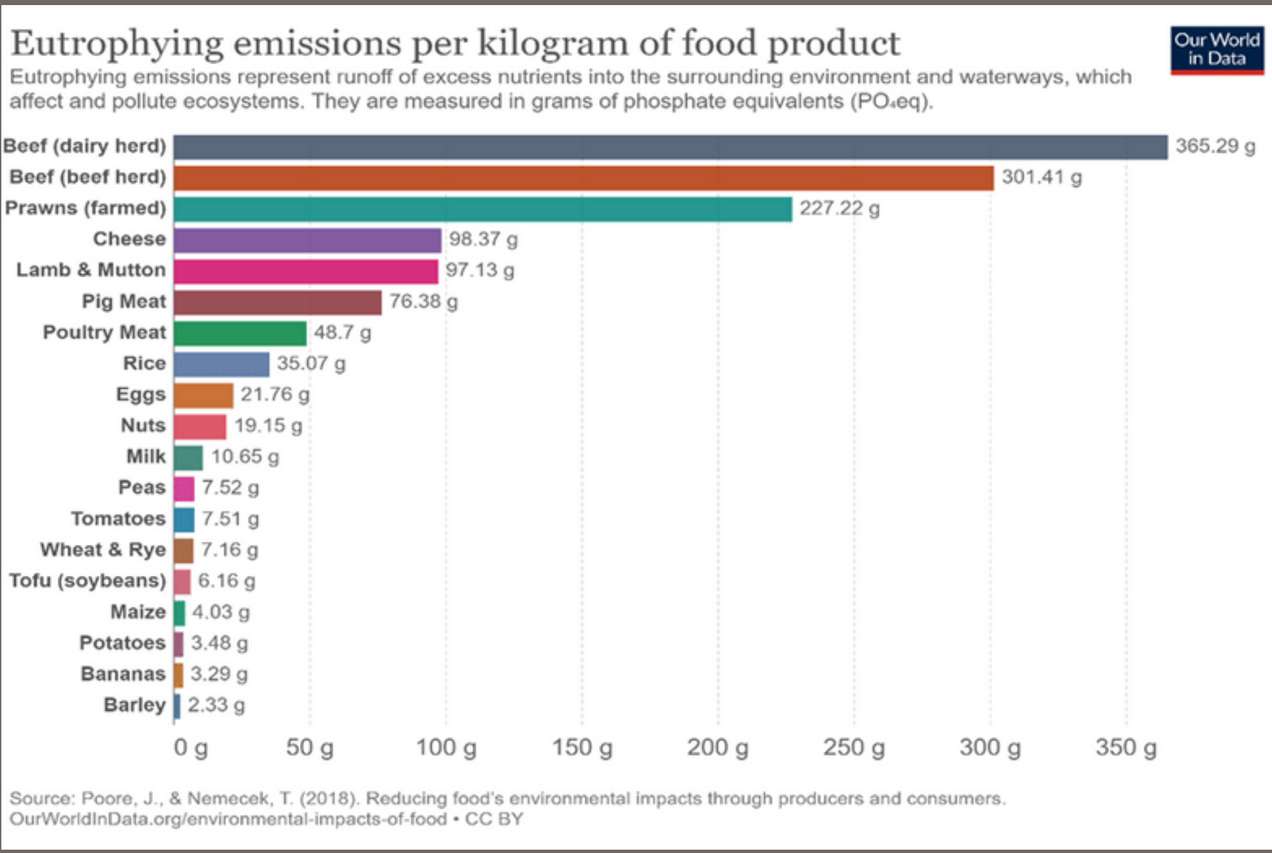


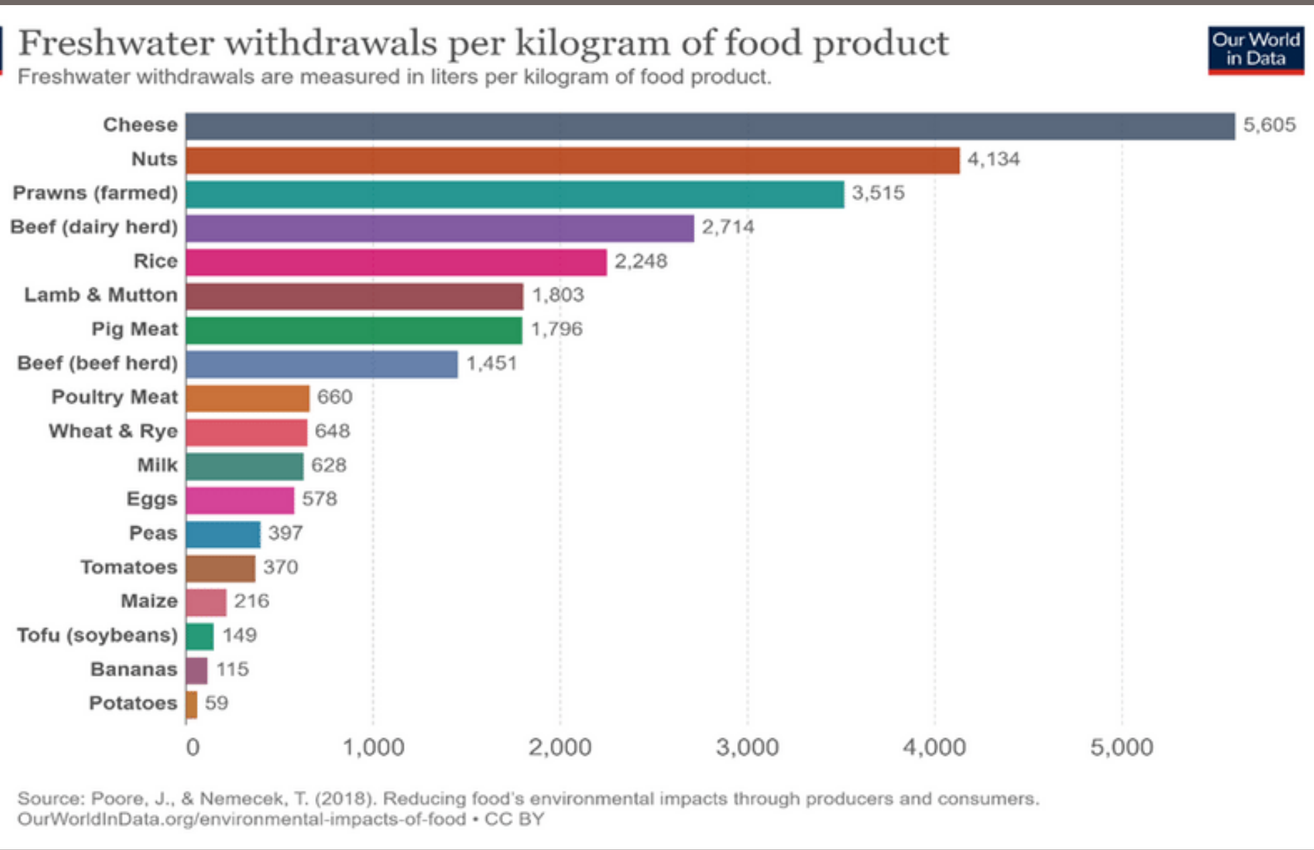
WHY DIET?


Greenhouse gas emissions per kilogram of food product
Greenhouse gas emissions are measured in kilograms of carbon dioxide equivalents (kgCO₂eq) per kilogram of food product. This means non-CO₂ greenhouse gases are included and weighted by their relative warming impact.
Our World in Data
Beef (beef herd) 99.48 kg
Lamb & Mutton 39.72 kg
Beef (dairy herd) 33.3 kg
Prawns (farmed) 26.87 kg
Cheese 23.88 kg
Pig Meat 12.31 kg
Poultry Meat 9.87 kg
Eggs 4.67 kg
Rice 4.45 kg
Tofu (soybeans) 3.16 kg
Milk 3.15 kg
Tomatoes 2.09 kg
Maize 1.7 kg
Wheat & Rye 1.57 kg
Peas 0.98 kg
Bananas 0.86 kg
Potatoes 0.46 kg
Nuts 0.43 kg
0 kg
20 kg
40 kg
60 kg
80 kg
Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers.
OurWorldInData.org/environmental-impacts-of-food • CC BY


Land use per kilogram of food product
Land use is measured in meters squared (m²) per kilogram of a given food product.
Our World in Data
Lamb & Mutton 369.81 m²
Beef (beef herd) 326.21 m²
Cheese 87.79 m²
Beef (dairy herd) 43.24 m²
Pig Meat 17.36 m²
Nuts 12.96 m²
Poultry Meat 12.22 m²
Milk 8.95 m²
Peas 7.46 m²
Eggs 6.27 m²
Wheat & Rye 3.85 m²
Tofu (soybeans) 3.52 m²
Prawns (farmed) 2.97 m²
Maize 2.94 m²
Rice 2.8 m²
Bananas 1.93 m²
Potatoes 0.88 m²
Tomatoes 0.8 m²
0 m²
50 m²
100 m²
150 m²
200 m²
250 m²
300 m²
350 m²
Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers.
OurWorldInData.org/environmental-impacts-of-food • CC BY

WHY DIET?


Eutrophying emissions per kilogram of food product
Eutrophying emissions represent runoff of excess nutrients into the surrounding environment and waterways, which affect and pollute ecosystems. They are measured in grams of phosphate equivalents (PO_4eq).
Our World in Data
Beef (dairy herd) 365.29 g
Beef (beef herd) 301.41 g
Prawns (farmed) 227.22 g
Cheese 98.37 g
Lamb & Mutton 97.13 g
Pig Meat 76.38 g
Poultry Meat 48.7 g
Rice 35.07 g
Eggs 21.76 g
Nuts 19.15 g
Milk 10.65 g
Peas 7.52 g
Tomatoes 7.51 g
Wheat & Rye 7.16 g
Tofu (soybeans) 6.16 g
Maize 4.03 g
Potatoes 3.48 g
Bananas 3.29 g
Barley 2.33 g
0 g
50 g
100 g
150 g
200 g
250 g
300 g
350 g
Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers.
OurWorldInData.org/environmental-impacts-of-food • CC BY

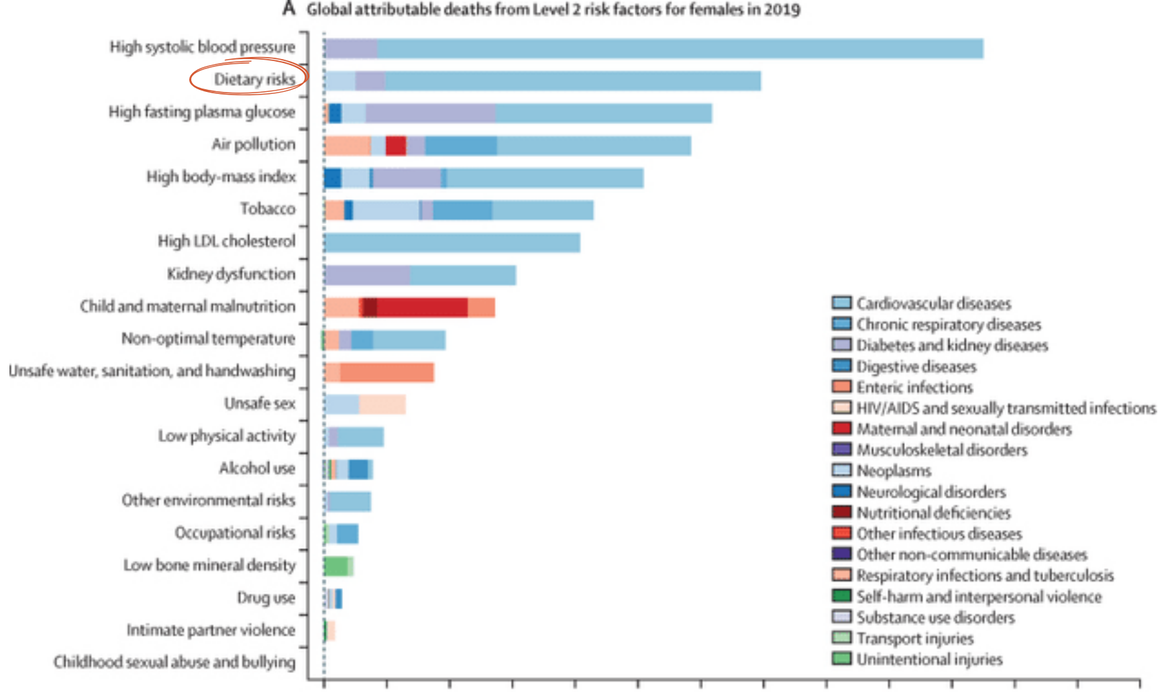

Freshwater withdrawals per kilogram of food product
Freshwater withdrawals are measured in liters per kilogram of food product.
Our World in Data
Cheese 5,605
Nuts 4,134
Prawns (farmed) 3,515
Beef (dairy herd) 2,714
Rice 2,248
Lamb & Mutton 1,803
Pig Meat 1,796
Beef (beef herd) 1,451
Poultry Meat 660
Wheat & Rye 648
Milk 628
Eggs 578
Peas 397
Tomatoes 370
Maize 216
Tofu (soybeans) 149
Bananas 115
Potatoes 59
0
1,000
2,000
3,000
4,000
5,000
Source: Poore, J., & Nemecek, T. (2018). Reducing food's environmental impacts through producers and consumers.
OurWorldInData.org/environmental-impacts-of-food • CC BY

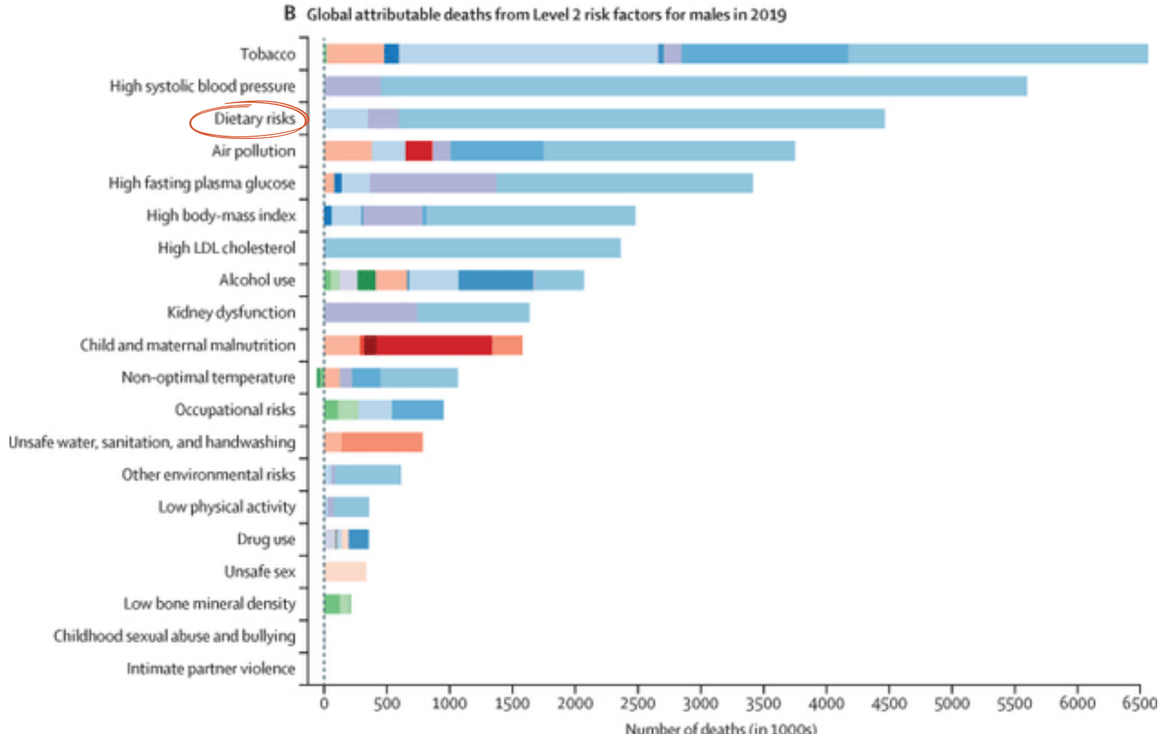
WHY DIET?

Diet related factors are responsible for **188 million** (95% CI 156–225) **DALYs** and **7.94 million** (6·47–9·76) **deaths** in the over 25 population

The considered dietary risk were:

- Diet low in vegetables
- Diet low in legumes
- Diet low in whole grains
- Diet low in nuts and seeds
- Diet low in milk
- Diet high in red meat
- Diet high in processed meat
- Diet high in sugar-sweetened beverages
- Diet low in fibre
- Diet low in fruits
- Diet low in calcium
- Diet low in seafood omega-3 fatty acids
- Diet low in polyunsaturated fatty acids
- Diet high in trans fatty acids
- Diet high in sodium

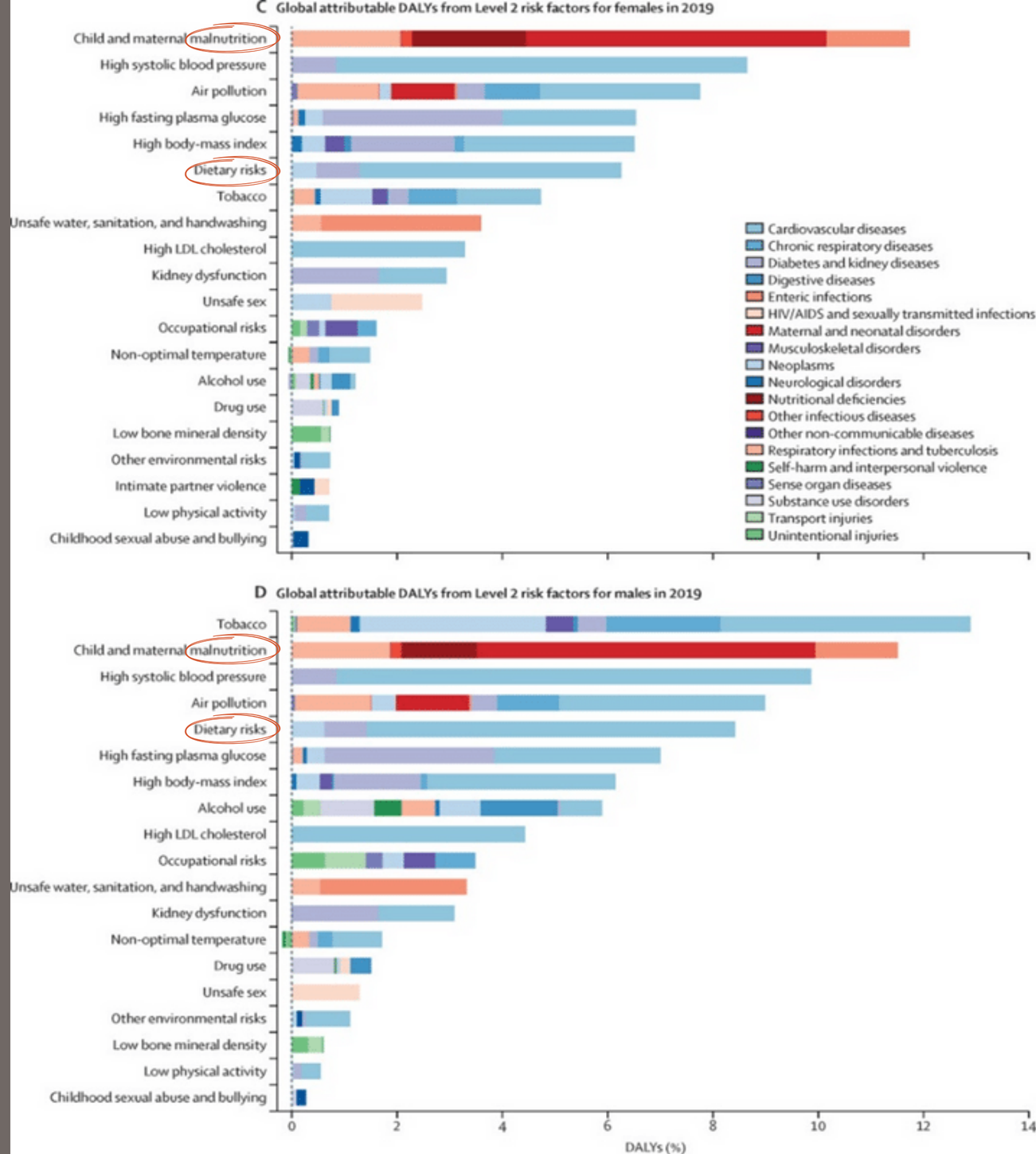




Murray, Christopher JL, et al. "Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019." The Lancet 396.10258 (2020): 1223-1249

WHY DIET?

On the other hand child and maternal malnutrition causes **295 million** (95% CI 253-350) **DALYs** and **2·94 million** (2·49–3·51) **deaths**



Murray, Christopher JL, et al. "Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019." The Lancet 396.10258 (2020): 1223-1249

BACKGROUND - EAT LANCET

The Lancet, together with the *Stockholm Resilience Centre* created the **EAT Lancet Commission** with the aim of promoting guidelines for a Planetary Health diet, both sustainable and good for human health

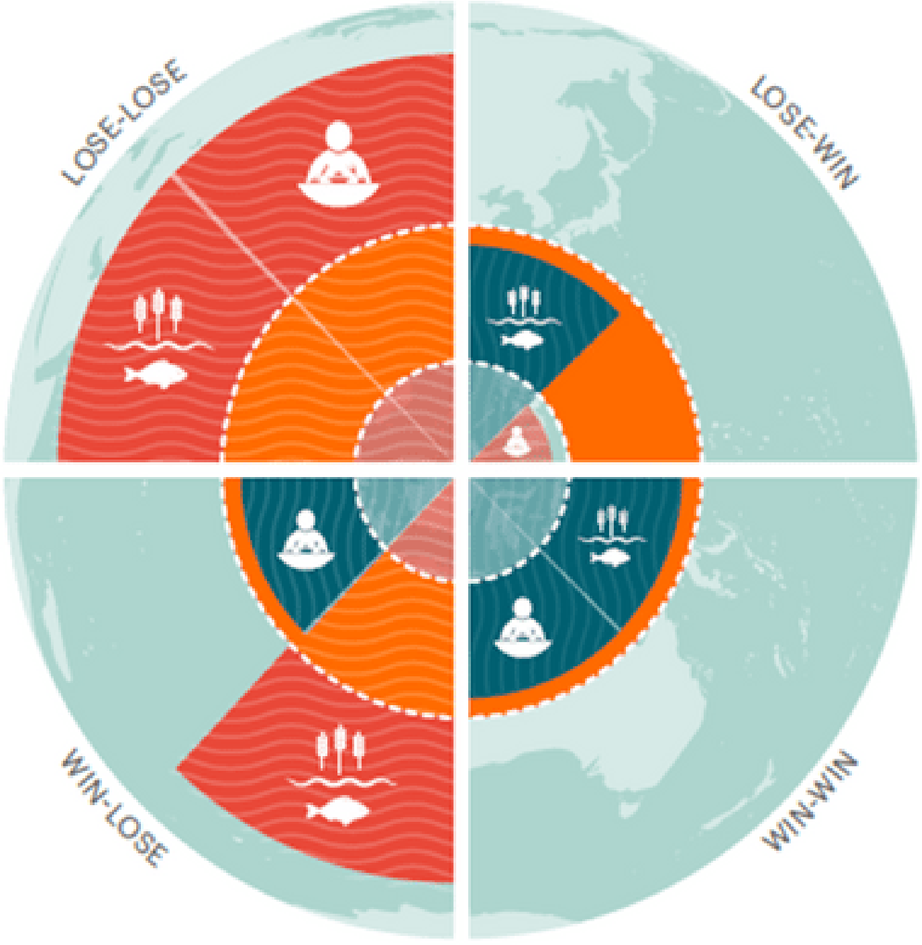


Figure 2

Scientific targets define the safe operating space for food systems and are represented here by the orange ring. The wedges represent either dietary patterns or food production, and together they reflect various dietary patterns that may or may not meet scientific targets for human health and environmental sustainability, i.e. outside of the safe operating space. These dietary patterns can be "healthy and unsustainable" (win-lose), "unhealthy and sustainable" (lose-win), "unhealthy and unsustainable" (lose-lose) and "healthy and sustainable" (win-win).

EAT LANCET

	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

Table 1
Scientific targets for a planetary health diet, with possible ranges, for an intake of 2500 kcal/day.

Figure 3
A planetary health plate should consist by volume of approximately half a plate of vegetables and fruits; the other half, displayed by contribution to calories, should consist of primarily whole grains, plant protein sources, unsaturated plant oils, and (optionally) modest amounts of animal sources of protein. For further details, please refer to section 1 of the Commission.

The global adoption of the planetary health diet has been estimated to **avoid** about **10·8–11·6 million deaths per year**, (19·0–23·6%).

Murray, Christopher JL, et al. "Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019." The Lancet 396.10258 (2020): 1223-1249

BACKGROUND - EPIC

Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study

Jessica E. Laine et al

Inside the EPIC (European Prospective Investigation into Cancer and Nutrition) multicentric cohort

Diet data has been collected with quantitative and semi quantitative Food Frequency Questionnaires

BACKGROUND - EPIC

Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study

Jessica E. Laine et al

Inside the EPIC (European Prospective Investigation into Cancer and Nutrition) multicentric cohort

For each food item GHG emissions and LU per consumed quantity of food has been calculateds

Diet data has been collected with quantitative and semi quantitative Food Frequency Questionnaires

BACKGROUND - EPIC

Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study

Jessica E. Laine et al

Inside the EPIC (European Prospective Investigation into Cancer and Nutrition) multicentric cohort

Diet data has been collected with quantitative and semi quantitative Food Frequency Questionnaires

For each food item GHG emissions and LU per consumed quantity of food has been calculateds

Individual total GHGE e LU has been calculated and were modelled as quartiles

BACKGROUND - EPIC

Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study

Jessica E. Laine et al

Inside the EPIC (European Prospective Investigation into Cancer and Nutrition) multicentric cohort

Diet data has been collected with quantitative and semi quantitative Food Frequency Questionnaires

For each food item GHG emissions and LU per consumed quantity of food has been calculateds

Individual total GHGE e LU has been calculated and were modelled as quartiles

A pooled analysis across the EPIC cohorts was conduted, comparing the fourth LU/GHGE quartile to the first and computing the HR for specific an all cause mortality

BACKGROUND - EPIC

	Events (%)	Greenhouse gas emissions: adjusted hazard ratios* (95% CI)			Land use contributions; adjusted hazard ratios* (95% CI)		
		Second quartile†	Third quartile†	Fourth quartile†	Second quartile†	Third quartile†	Fourth quartile†
All-cause mortality	46 636 (10·5%)	0·96 (0·94–0·99)	1·02 (0·99–1·04)	1·13 (1·10–1·16)	0·99 (0·96–1·01)	1·05 (1·03–1·08)	1·18 (1·15–1·21)
Cause-specific mortality							
Coronary heart disease mortality	4944 (1·1%)	0·88 (0·81–0·96)	1·06 (0·97–1·14)	1·19 (1·10–1·30)	1·003 (0·93–1·09)	1·12 (1·04–1·21)	1·38 (1·27–1·49)
Cardiovascular disease mortality	6393 (1·4%)	0·99 (0·93–1·07)	1·03 (0·95–1·10)	1·19 (1·10–1·28)	0·97 (0·91–1·04)	1·04 (0·97–1·11)	1·18 (1·10–1·27)
Respiratory disease mortality	2479 (0·6%)	0·89 (0·78–0·99)	0·95 (0·84–1·06)	1·02 (0·91–1·15)	0·89 (0·91–1·00)	1·02 (1·09–1·14)	1·09 (0·97–1·22)
Cancer mortality	14 095 (3·2%)	1·03 (0·98–1·08)	1·11 (1·05–1·16)	1·16 (1·10–1·22)	1·06 (1·01–1·11)	1·14 (1·09–1·20)	1·21 (1·16–1·27)

*Models adjusted for age at recruitment, marital status, education, physical activity, smoking status, and body-mass index. Pooled analyses (all countries) were also adjusted for country. †The first quartile is the reference value.

***Table 2*: Adjusted hazard ratios for all-cause and cause-specific mortality estimated for greenhouse gas emissions and land use contributions from diet modelled as quartiles**

Laine, Jessica E., et al. "Co-benefits from sustainable dietary shifts for population and environmental health: an assessment from a large European cohort study." The Lancet Planetary Health 5.11 (2021): e786-e796.

CAN A DIET WITH LOW-ENVIRONMENTAL IMPACT INFLUENCE CHILDREN ANTHROPOMETRIC DEVELOPMENT AND THEIR LIFE-COURSE RISK FACTORS? HOW?

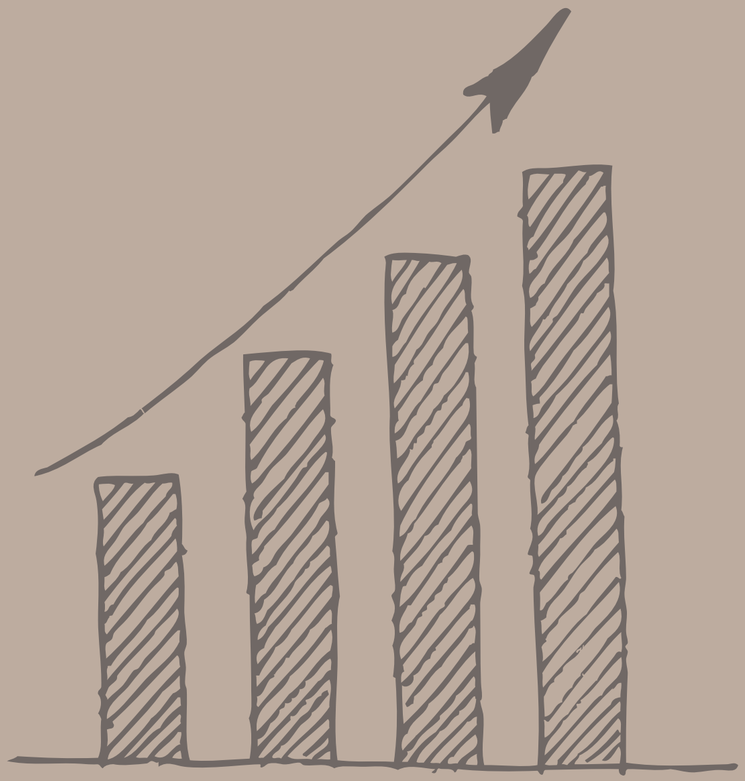
WHY CHILDREN?

When does a chronic disease start?

Specific exposures and conditions act during the whole course of life. If they occur in critical period (*i.e. time window when intrinsic changes in the organisation of living systems or sub-systems occurs rapidly) they* more easily manifest their consequences in a favourable or unfavourable direction.

Kuh D, Ben-Shlomo Y, Lynch J, et alLife course epidemiologyJournal of Epidemiology & Community Health 2003;57:778-783.

EXCESS WEIGHT



Levels and Trends in Child Malnutrition: Key Findings of the 2021 Edition; UNICEF World Health Organization: New York, NY, USA, 2020
Withrow, D. and Alter, D.A. (2011), The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. Obesity Reviews,

EXCESS WEIGHT

Overweight and obesity have alarming rates worldwide, affecting 38.9 million children <5 years.

Prevalence of excess weight in **preschool age** are over **25%** in Southern Europe, USA and Australia

Levels and Trends in Child Malnutrition: Key Findings of the 2021 Edition; UNICEF World Health Organization: New York, NY, USA, 2020
Withrow, D. and Alter, D.A. (2011), The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. Obesity Reviews,

EXCESS WEIGHT

Overweight and obesity have alarming rates worldwide, affecting 38.9 million children <5 years.

Prevalence of excess weight in **preschool age** are over **25%** in Southern Europe, USA and Australia

Obesity **decrease** health-related **quality of life** and overall **life expectancy**, and increase risk of several **NCDs,** such as Type 2 Diabetes and CHD, whose genesis It is emerging convincingly that begins in childhood, with childhood obesity as an important factor

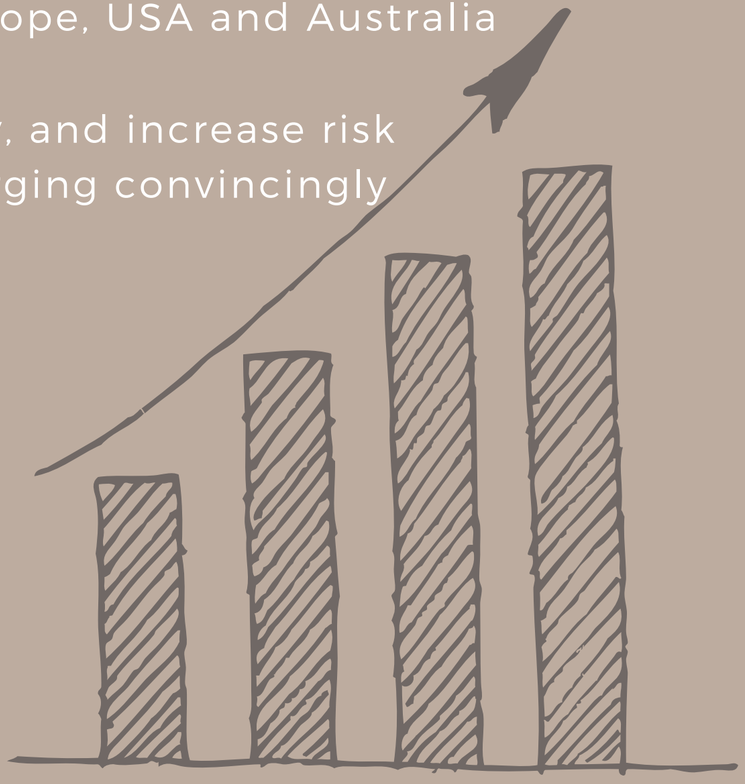
Levels and Trends in Child Malnutrition: Key Findings of the 2021 Edition; UNICEF World Health Organization: New York, NY, USA, 2020
Withrow, D. and Alter, D.A. (2011), The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. Obesity Reviews,

EXCESS WEIGHT

Overweight and obesity have alarming rates worldwide, affecting 38.9 million children <5 years.

Prevalence of excess weight in **preschool age** are over **25%** in Southern Europe, USA and Australia

Obesity **decrease** health-related **quality of life** and overall **life expectancy**, and increase risk of several **NCDs,** such as Type 2 Diabetes and CHD, whose genesis It is emerging convincingly that begins in childhood, with childhood obesity as an important factor



Obesity and its comorbidities are preventable and:

- Obesity account for between **0.7%** and **2.8%** of **countries' total healthcare expenditures**.

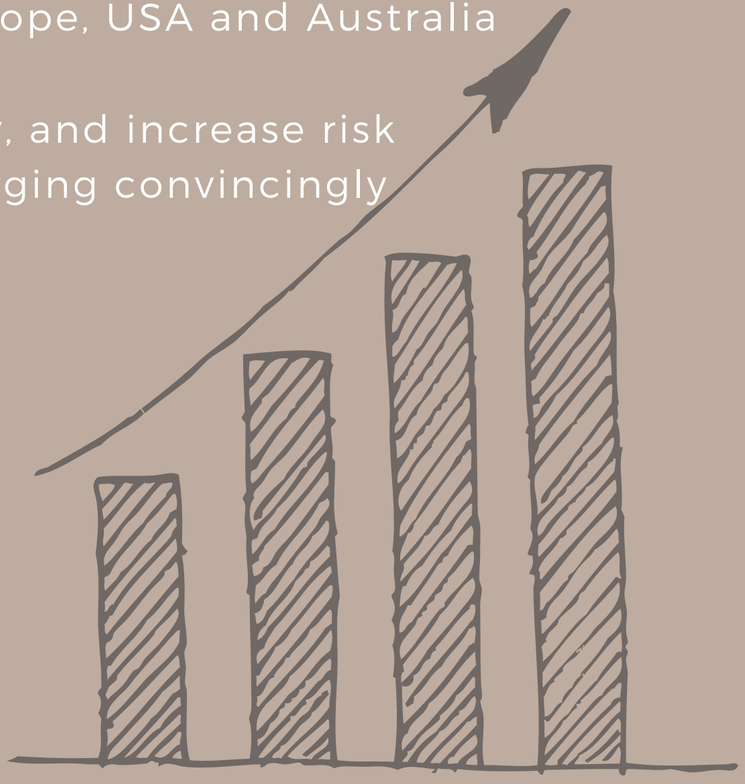
Levels and Trends in Child Malnutrition: Key Findings of the 2021 Edition; UNICEF World Health Organization: New York, NY, USA, 2020
Withrow, D. and Alter, D.A. (2011), The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. Obesity Reviews,

EXCESS WEIGHT

Overweight and obesity have alarming rates worldwide, affecting 38.9 million children <5 years.

Prevalence of excess weight in **preschool age** are over **25%** in Southern Europe, USA and Australia

Obesity **decrease** health-related **quality of life** and overall **life expectancy**, and increase risk of several **NCDs,** such as Type 2 Diabetes and CHD, whose genesis It is emerging convincingly that begins in childhood, with childhood obesity as an important factor



Obesity and its comorbidities are preventable and:

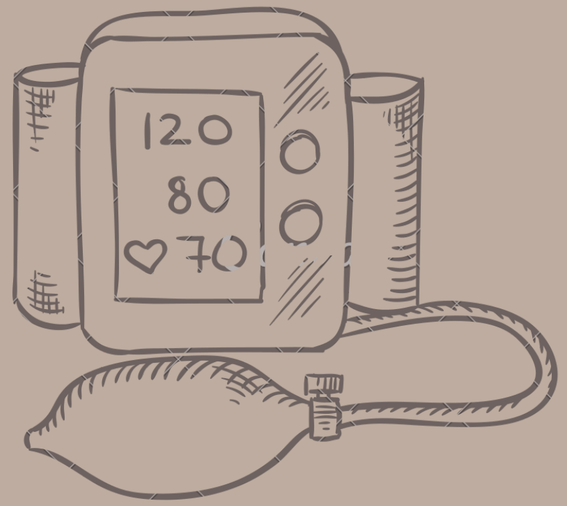
- Obesity account for between **0.7%** and **2.8%** of **countries' total healthcare expenditures**.
- Obese individuals have medical costs approximately **30% greater** than their normal weight peers

Levels and Trends in Child Malnutrition: Key Findings of the 2021 Edition; UNICEF World Health Organization: New York, NY, USA, 2020
Withrow, D. and Alter, D.A. (2011), The economic burden of obesity worldwide: a systematic review of the direct costs of obesity. Obesity Reviews,

BLOOD PRESSURE

Hypertension in children and adolescents is a growing health problem.

In persons three to 18 years of age, the prevalence of prehypertension and hypertension are **3.4% and 3.6%** respectively, which rise to 20-30% in obese adolescents.



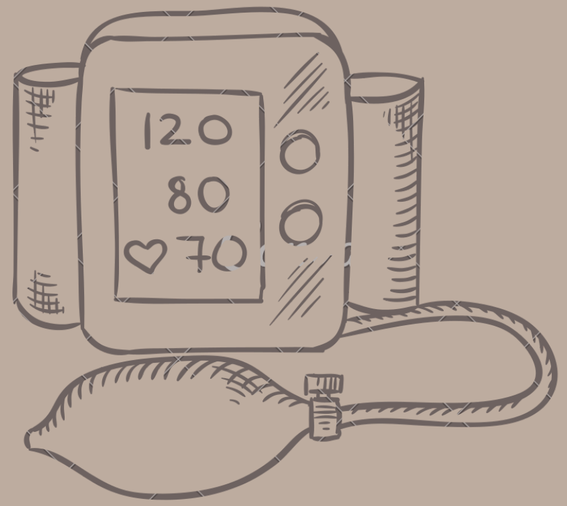
Riley, M., Hernandez, A. K., & Kuznia, A. L. (2018). High Blood Pressure in Children and Adolescents. American family physician, 98(8), 486–494.

BLOOD PRESSURE

Hypertension in children and adolescents is a growing health problem.

In persons three to 18 years of age, the prevalence of prehypertension and hypertension are **3.4% and 3.6%** respectively, which rise to 20-30% in obese adolescents.

This is a known risk factor for **hypertension in adulthood** which is the leading cause of premature death around the world



Riley, M., Hernandez, A. K., & Kuznia, A. L. (2018). High Blood Pressure in Children and Adolescents. American family physician, 98(8), 486–494.

HOW

HIGH EMISSIONS FOOD HABITS

High animal protein intake

Arnesen, Erik Kristoffer et al. "Protein intake in children and growth and risk of overweight or obesity: A systematic review and meta-analysis." Food & nutrition research vol. 66 10.29219/fnr.v66.8242. 21 Feb. 2022

Higher BMI
critical period: 12 mo and 5-6y

High Ultra-processed food intake

Higher BMI and obesity

LOW EMISSIONS FOOD HABITS

High vegetable intake

Bahreynian, Maryam, et al. "Association of dietary fiber intake with general and abdominal obesity in children and adolescents: The Weight disorder survey of the CASPIAN-IV Study." Mediterranean Journal of Nutrition and Metabolism 11.3 (2018): 251-260.

Higher fiber intake associated with lower BMI

HOW

OVERALL DIET IMPACT

UNKNOWN FACTORS AND EFFECTS

CAN A DIET WITH LOW-ENVIRONMENTAL IMPACT INFLUENCE CHILDREN ANTHROPOMETRIC DEVELOPMENT AND THEIR LIFE-COURSE RISK FACTORS? HOW?

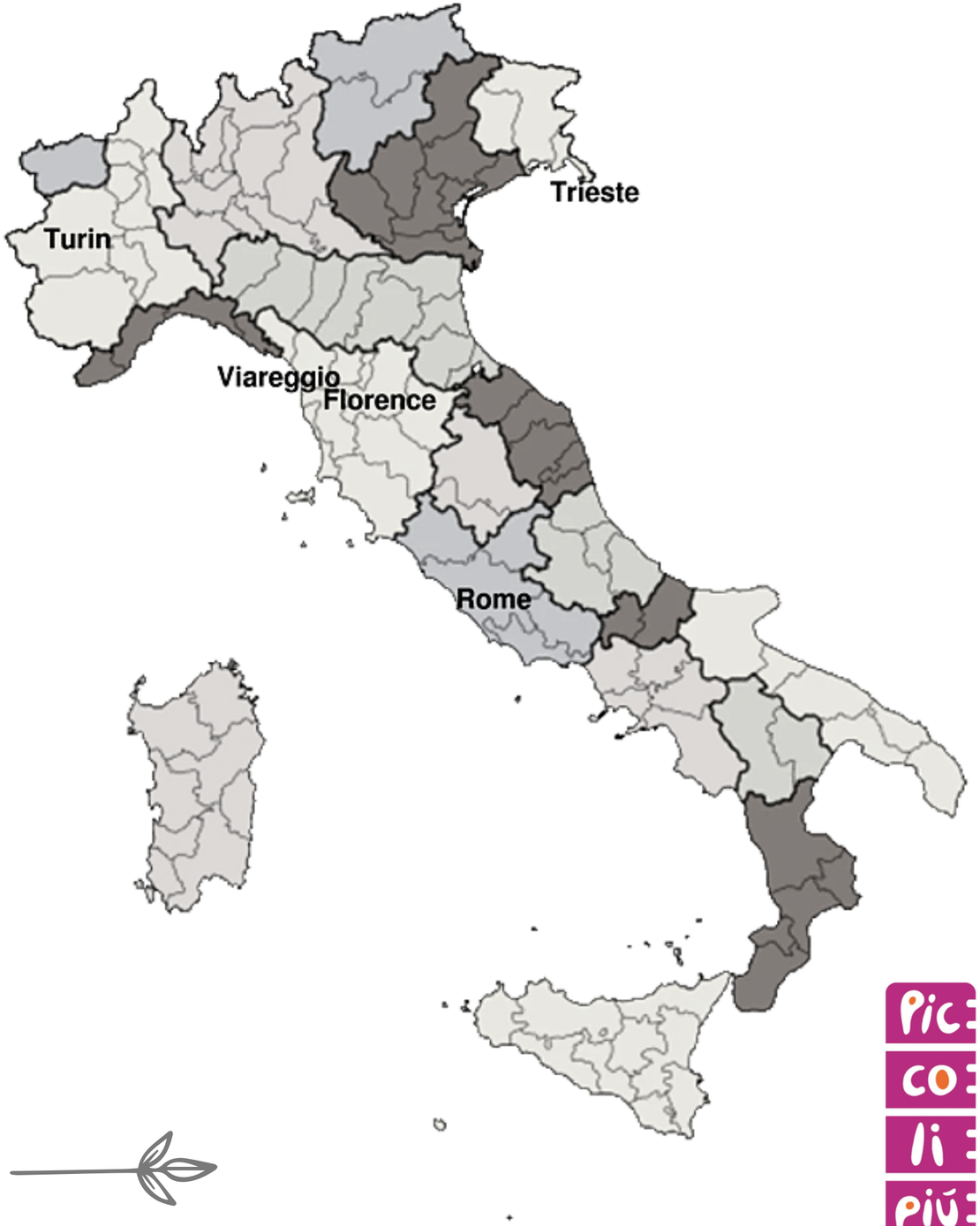
Negative vs positive association impact

THE COHORT

3000 children recruited at birth since 2011

Follow-up questionnaires and outpatient visits were carried out at 6, 12 and 24 months and every 2/3 years afterwards.

A **semiquantitative Food Frequency Questionnaire** was compiled by the mother at child 4th year

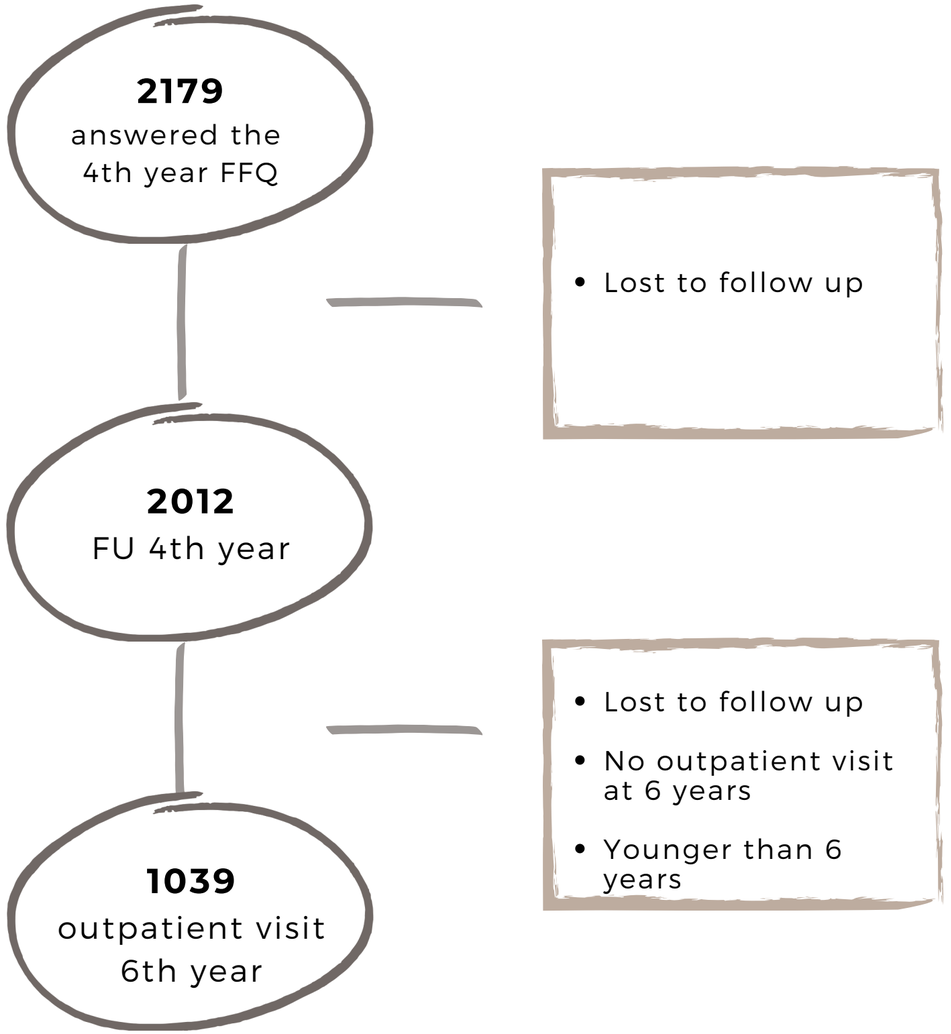


Farchi, S., Forastiere, F., Vecchi Brumatti, L. et al. Piccolipiù, a multicenter birth cohort in Italy: protocol of the study. BMC Pediatr 14, 36 (2014).

THE COHORT

Information from:

- Baseline
- 4th year FFQ and F-U questionnaire
- 6th year's anthropometrics



THE FFQ

4 YEARS OLD CHILD

PREVIOUS 2 MONTHS

46 FOOD ITEMS

Frequency of consumption

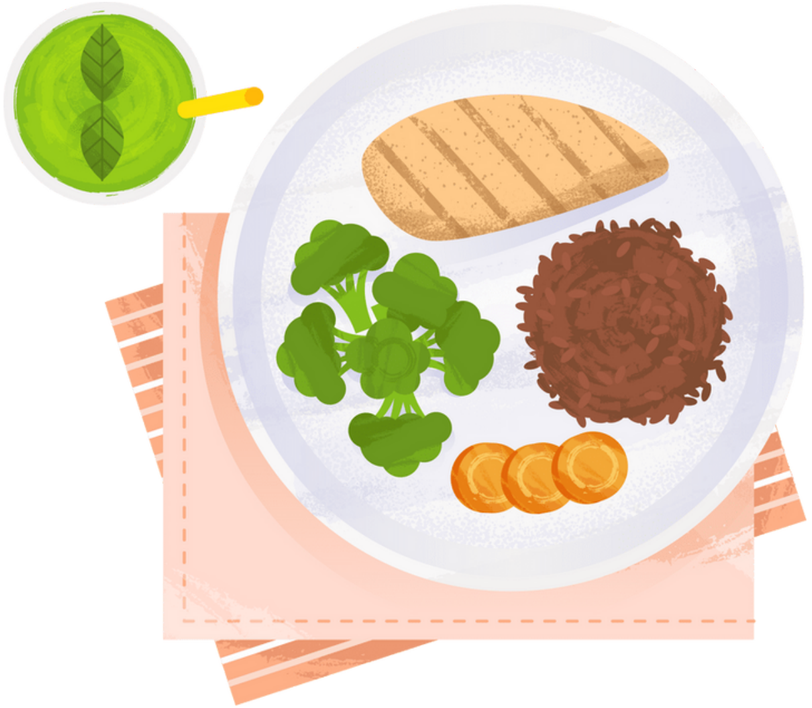
NO

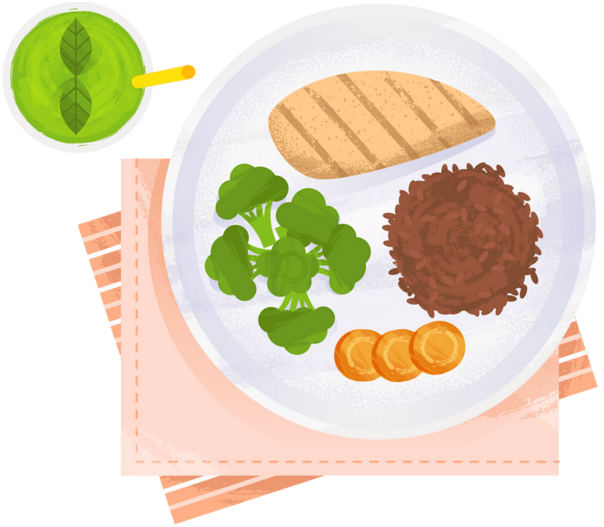
YES daily

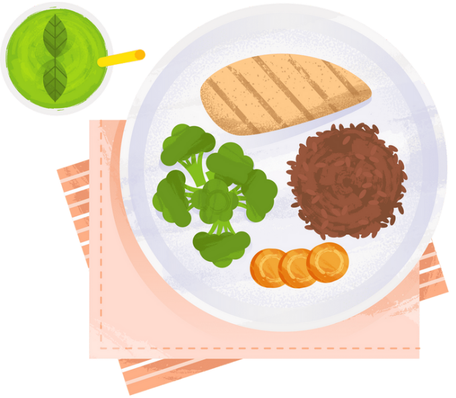
YES weekly -> Monthly

Portion size

The questionnaire was built according to the Scotti Bassani pediatric food portions Atlas







- Grams
- Energy intake
- Nutrient intake

EXPOSURE ASSESMENT

DAILY LU/GHGE

- SHARP matrix
- FoodEx2 code

DAILY GRAMS

$$\text{times/day*g/time} + \frac{\text{times/w * g/ time}}{7} + \frac{\text{times/m* g/time}}{30}$$

GRAMS

- SB
- FAO/WHO

CALORIES

- SB
- BDA
- USDA

PORTIONS

GHGE AND LU ESTIMATION

FoodEx2 EFSA *(Erupenan Food Safety Authority)* catalogue browser -> FoodEx2 hierarchical encoding

SHARP-ID provide attributional **Life Cycle Analyses** using environmental indicators (GHGE and LU)

Mertens, Elly et al. "SHARP-Indicators Database towards a public database for environmental sustainability." Data in brief vol. 27 104617. 7 Oct. 2019

GHGE AND LU ESTIMATION

FoodEx2 EFSA *(Erupenan Food Safety Authority)* catalogue browser -> FoodEx2 hierarchical encoding

SHARP-ID provide attributional **Life Cycle Analyses** using environmental indicators (GHGE and LU)

GHGE: kg of CO2 equivalent per kg of food as eaten*

LU: m2 of land/ year per kg of food as eaten

Mertens, Elly et al. "SHARP-Indicators Database towards a public database for environmental sustainability." Data in brief vol. 27 104617. 7 Oct. 2019

GHGE AND LU ESTIMATION

FoodEx2 EFSA *(Erupenan Food Safety Authority)* catalogue browser -> FoodEx2 hierarchical encoding

SHARP-ID provide attributional **Life Cycle Analyses** using environmental indicators (GHGE and LU)

GHGE: kg of CO2 equivalent per kg of food as eaten*

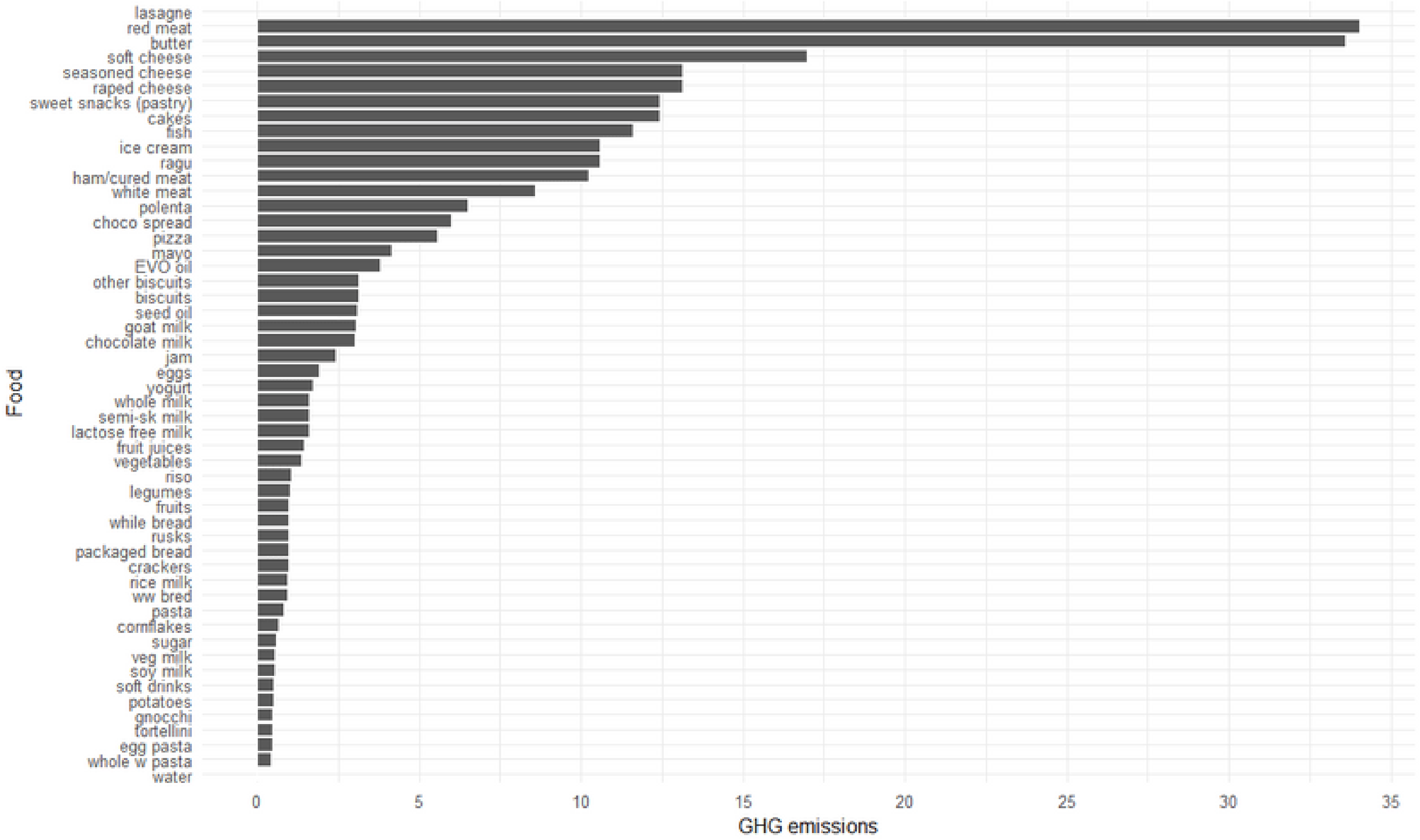
LU: m2 of land/ year per kg of food as eaten

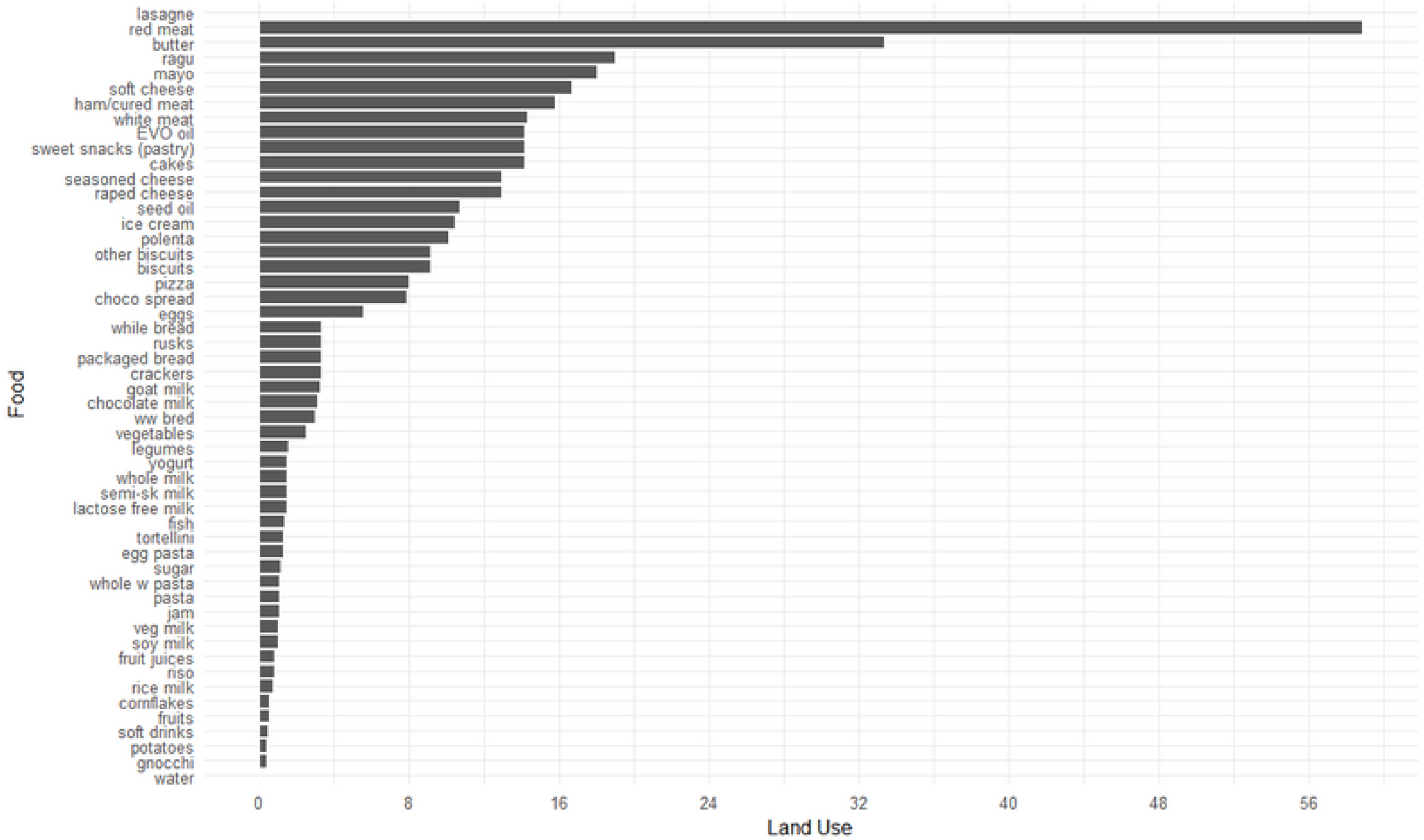
It combined **inventory data** of **182** primary products. While, based on similarities in type, production system and ingredient composition, estimates of GHGE and LU were obtained per kg of food as eaten for **944 food items** coded with FoodEx2-and consumed in four European countries, (i.e. Denmark, Czech Republic, Italy and France)

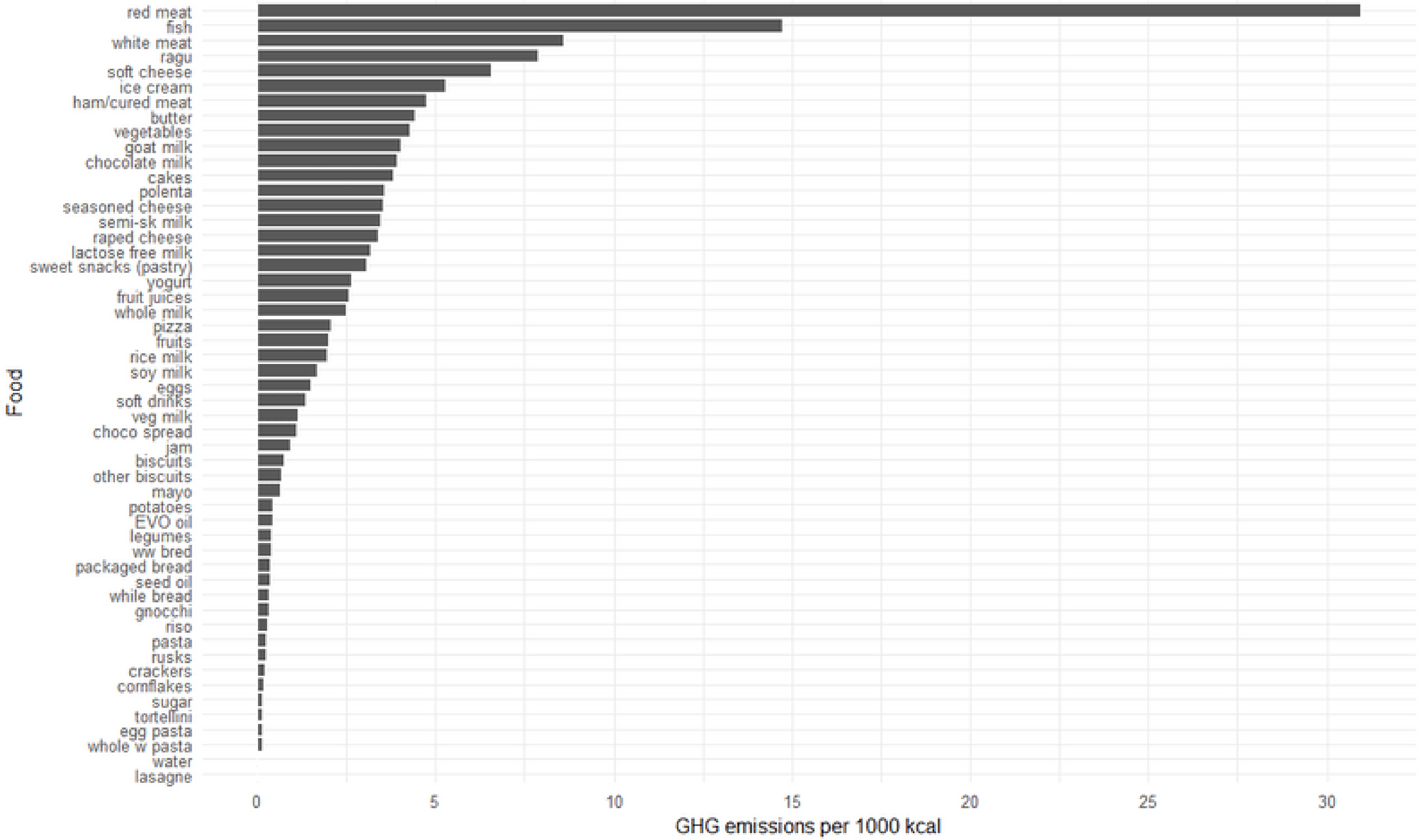
NB. They used primary data on production, trade and transport, and adjusted for consumption amount using conversions factors for production, edible portion, cooking losses and gains, and for food losses and waste to derive estimates of **GHGE and LU for the foods as eaten**.

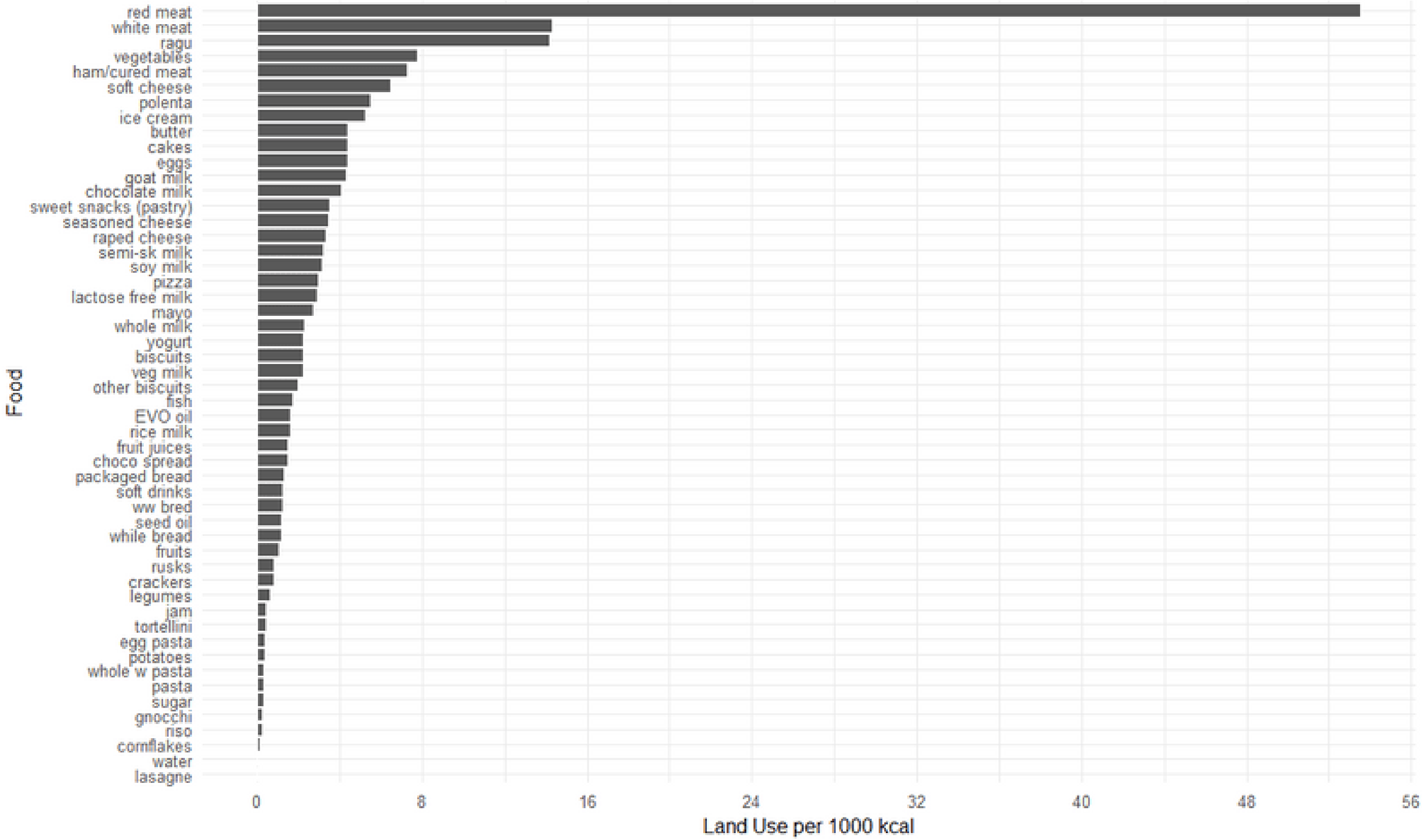
* 1kgCH4 equal to 25 kgCO2, and 1kgN2O equal to 298 kgCO2 (IPCC 2007)

Mertens, Elly et al. "SHARP-Indicators Database towards a public database for environmental sustainability." Data in brief vol. 27 104617. 7 Oct. 2019


lasagne
red meat
butter
soft cheese
seasoned cheese
raped cheese
sweet snacks (pastry)
cakes
fish
ice cream
ragu
ham/cured meat
white meat
polenta
choco spread
pizza
mayo
EVO oil
other biscuits
biscuits
seed oil
goat milk
chocolate milk
jam
eggs
yogurt
whole milk
semi-sk milk
lactose free milk
fruit juices
vegetables
riso
legumes
fruits
while bread
rusks
packaged bread
crackers
rice milk
ww bred
pasta
cornflakes
sugar
veg milk
soy milk
soft drinks
potatoes
gnocchi
tortellini
egg pasta
whole w pasta
water
Food
0
5
10
15
20
25
30
35
GHG emissions


lasagne
red meat
butter
ragu
mayo
soft cheese
ham/cured meat
white meat
EVO oil
sweet snacks (pastry)
cakes
seasoned cheese
raped cheese
seed oil
ice cream
polenta
other biscuits
biscuits
pizza
choco spread
eggs
while bread
rusks
packaged bread
crackers
goat milk
chocolate milk
ww bred
vegetables
legumes
yogurt
whole milk
semi-sk milk
lactose free milk
fish
tortellini
egg pasta
sugar
whole w pasta
pasta
jam
veg milk
soy milk
fruit juices
riso
rice milk
cornflakes
fruits
soft drinks
potatoes
gnocchi
water
Food
0
8
16
24
32
40
48
56
Land Use


red meat
fish
white meat
ragu
soft cheese
ice cream
ham/cured meat
butter
vegetables
goat milk
chocolate milk
cakes
polenta
seasoned cheese
semi-sk milk
raped cheese
lactose free milk
sweet snacks (pastry)
yogurt
fruit juices
whole milk
pizza
fruits
rice milk
soy milk
eggs
soft drinks
veg milk
choco spread
jam
biscuits
other biscuits
mayo
potatoes
EVO oil
legumes
ww bred
packaged bread
seed oil
while bread
gnocchi
riso
pasta
rusks
crackers
cornflakes
sugar
tortellini
egg pasta
whole w pasta
water
lasagne
Food
0
5
10
15
20
25
30
GHG emissions per 1000 kcal


red meat
white meat
ragu
vegetables
ham/cured meat
soft cheese
polenta
ice cream
butter
cakes
eggs
goat milk
chocolate milk
sweet snacks (pastry)
seasoned cheese
raped cheese
semi-sk milk
soy milk
pizza
lactose free milk
mayo
whole milk
yogurt
biscuits
veg milk
other biscuits
fish
EVO oil
rice milk
fruit juices
choco spread
packaged bread
soft drinks
ww bred
seed oil
while bread
fruits
rusks
crackers
legumes
jam
tortellini
egg pasta
potatoes
whole w pasta
pasta
sugar
gnocchi
riso
cornflakes
water
lasagne
Food
0
8
16
24
32
40
48
56
Land Use per 1000 kcal

EXPOSURE ASSESMENT

QUALITY

QUANTITY

Daily diet-related
GHG EMISSIONS
AND LAND USE

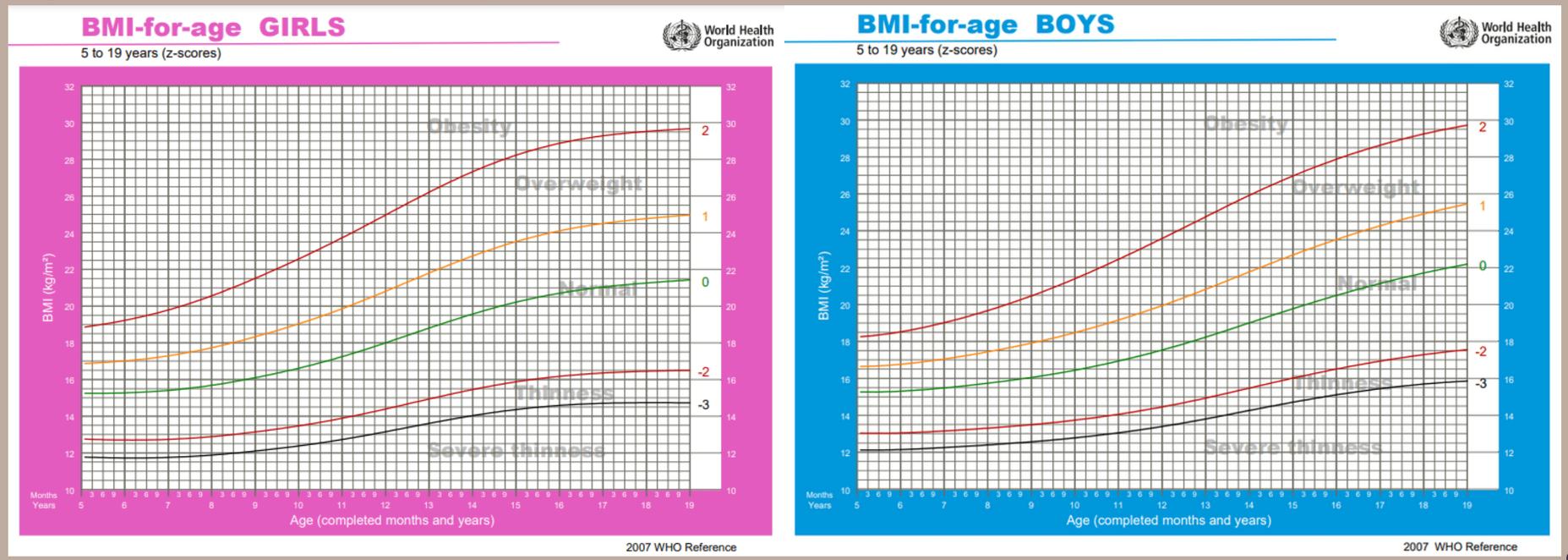
GHGE /LU
INTENSITY
per kcal

$$= \frac{\text{Tot GHGE (LU)/day}}{\text{Tot kcal /day}}$$

OUTCOME(S)

PRIMARY OUTCOME

Height and **weight** measurments at 6 years -> **BMI**

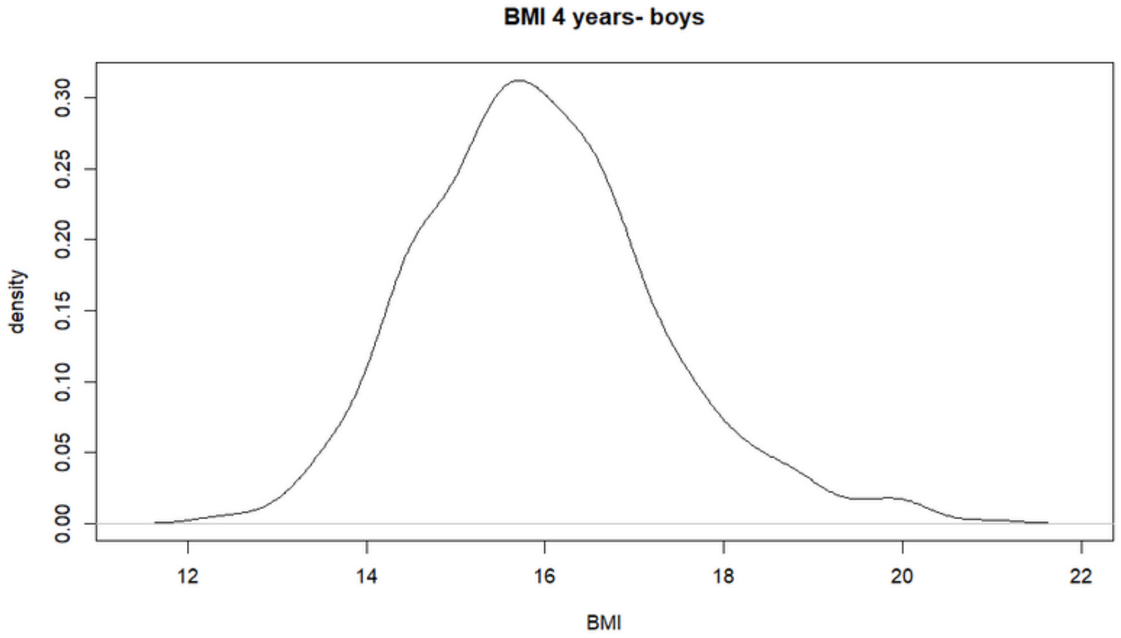


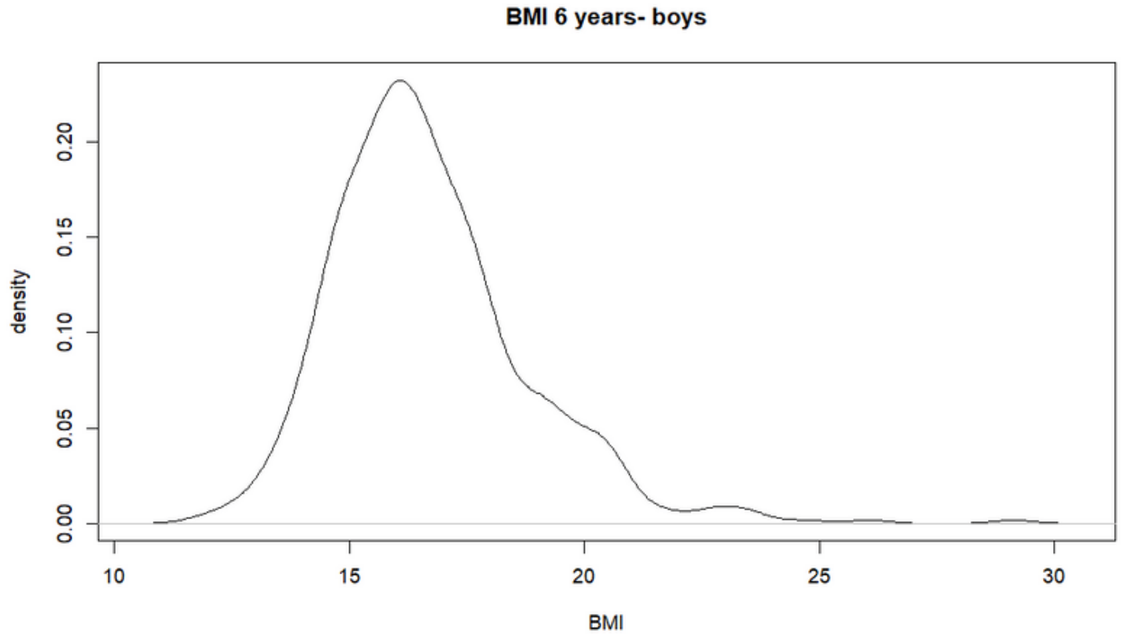
SECONDARY OUTCOMES

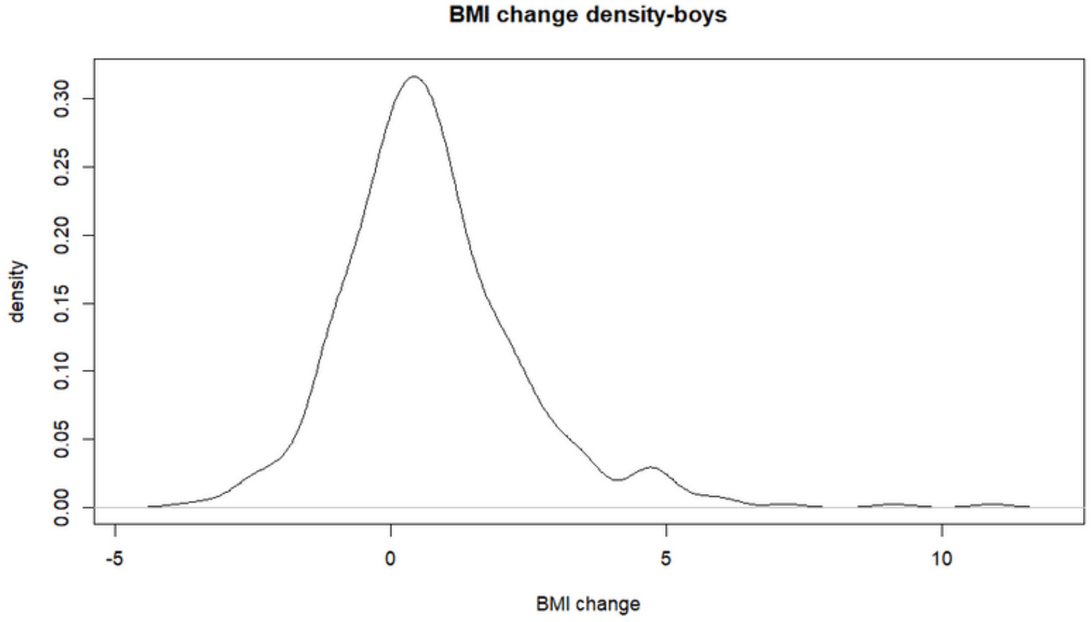
Blood Pressure

Abdominal circumference

Cacciari, E., Milani, S., Balsamo, A., Spada, E., Bona, G., Cavallo, L., Cerutti, F., Gargantini, L., Greggio, N., Tonini, G., & Cicognani, A. (2006). Italian cross-sectional growth charts for height, weight and BMI (2 to 20 yr). Journal of endocrinological investigation





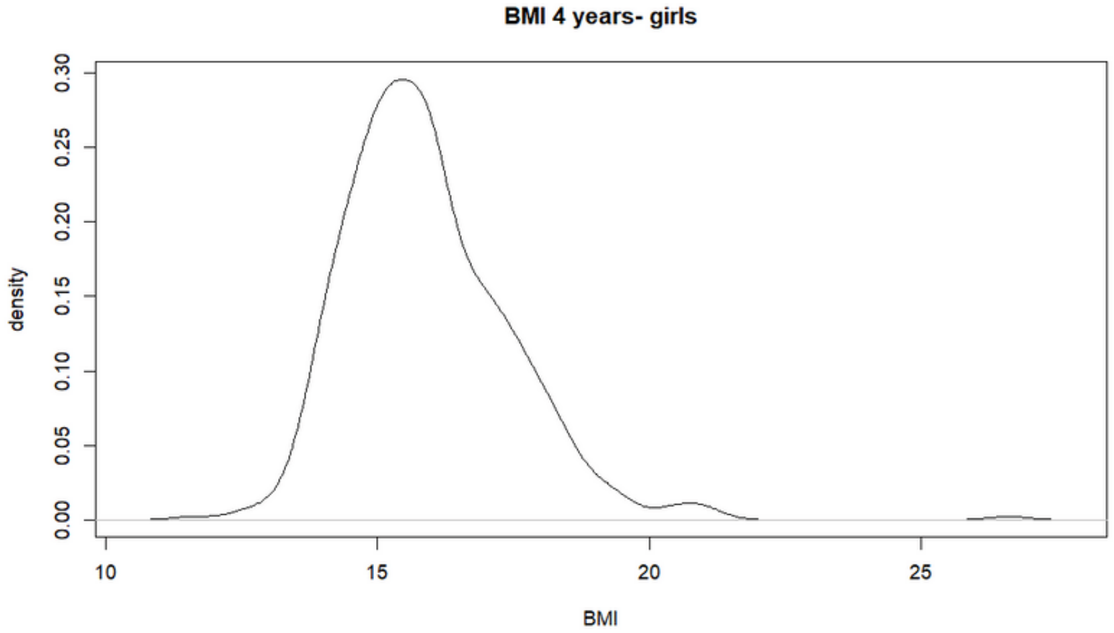


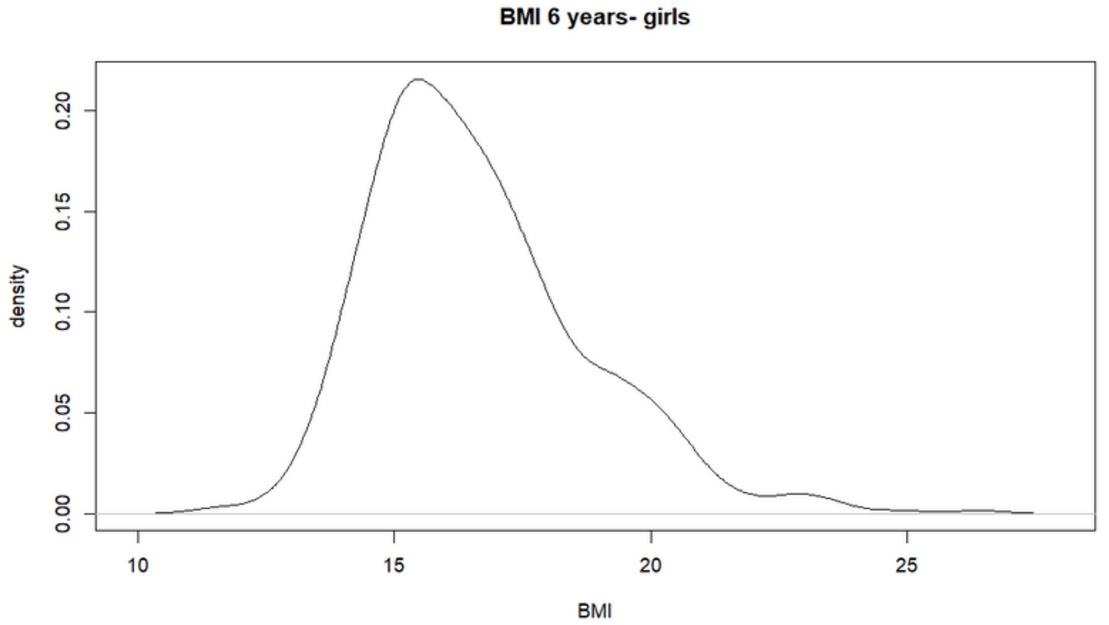
BMI PP 50%

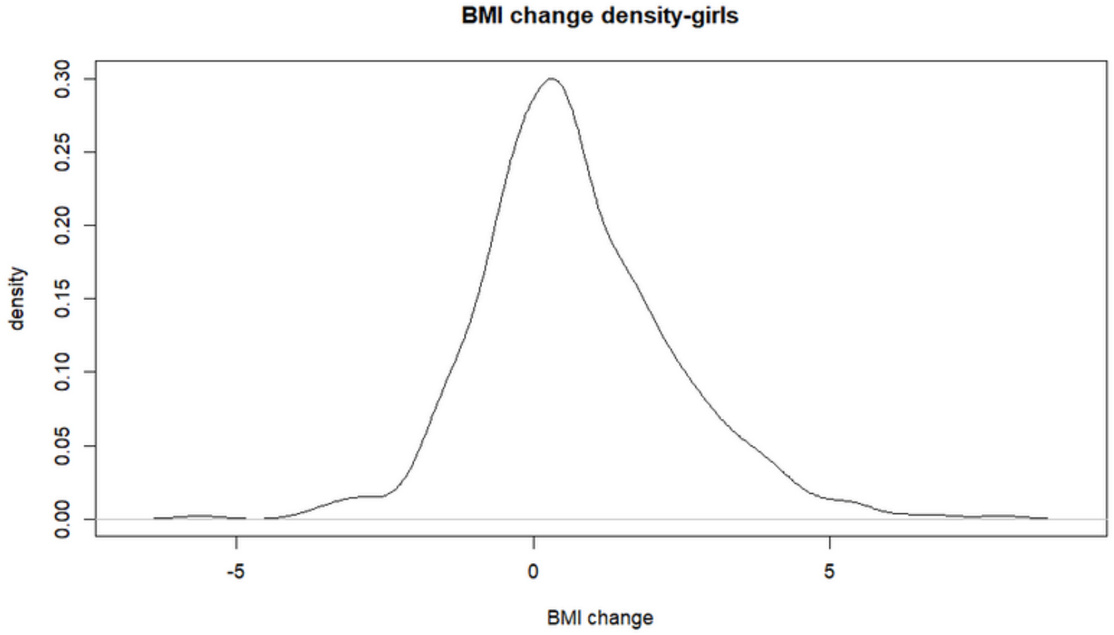
4aa 15.8

6aa 16.4

Change median + 0.6





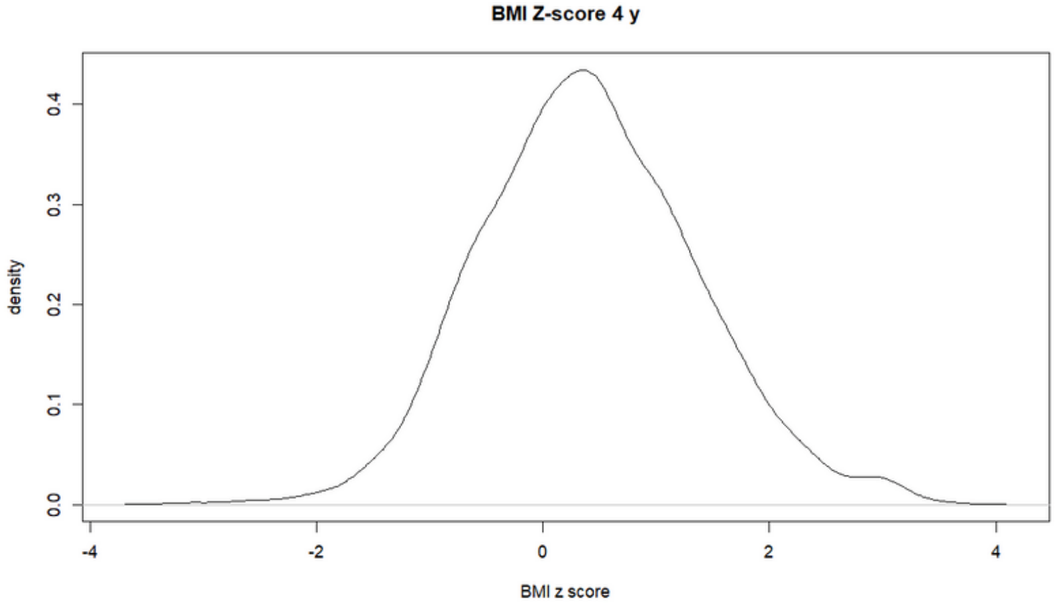


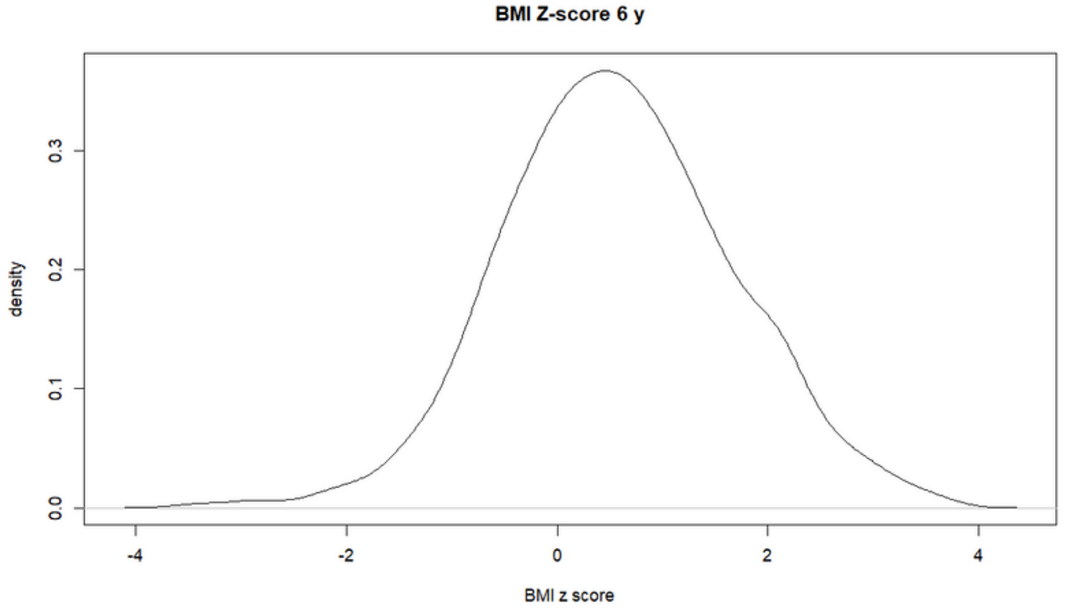
BMI PP 50%

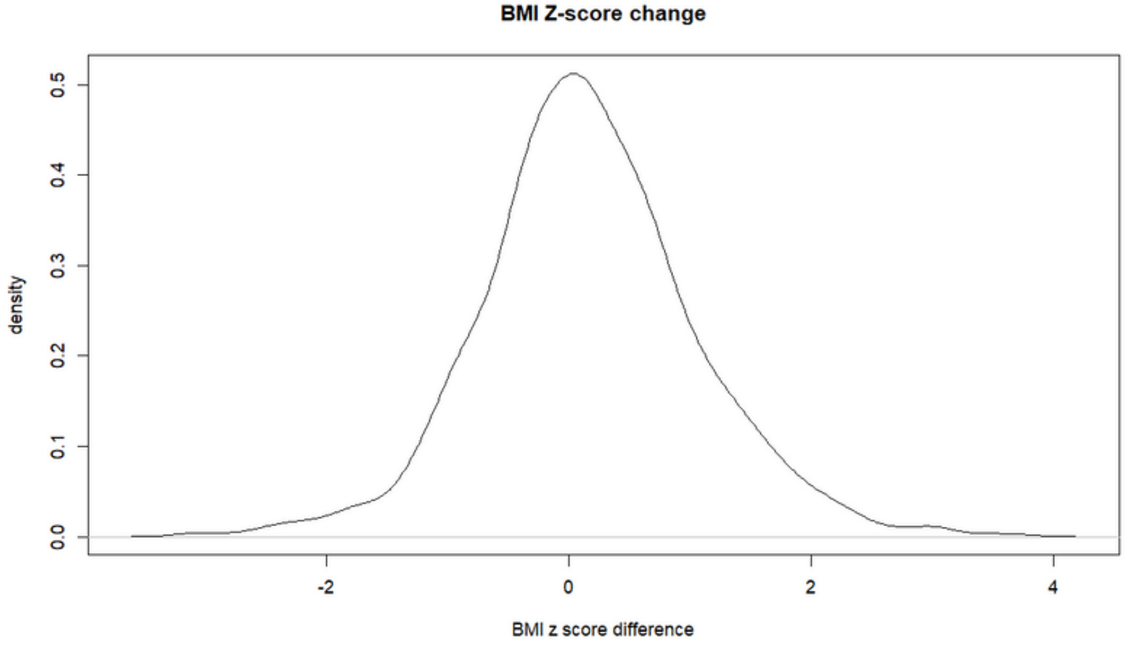
4aa 15.7

6aa 16.2

Change median + 0.5


BMI Z-score 4 y
density
0.0
0.1
0.2
0.3
0.4
-4
-2
0
2
4
BMI z score


BMI Z-score 6 y
density
0.0
0.1
0.2
0.3
-4
-2
0
2
4
BMI z score


BMI Z-score change
density
0.0
0.1
0.2
0.3
0.4
0.5
-2
0
2
4
BMI z score difference

THE ROLE OF SEP

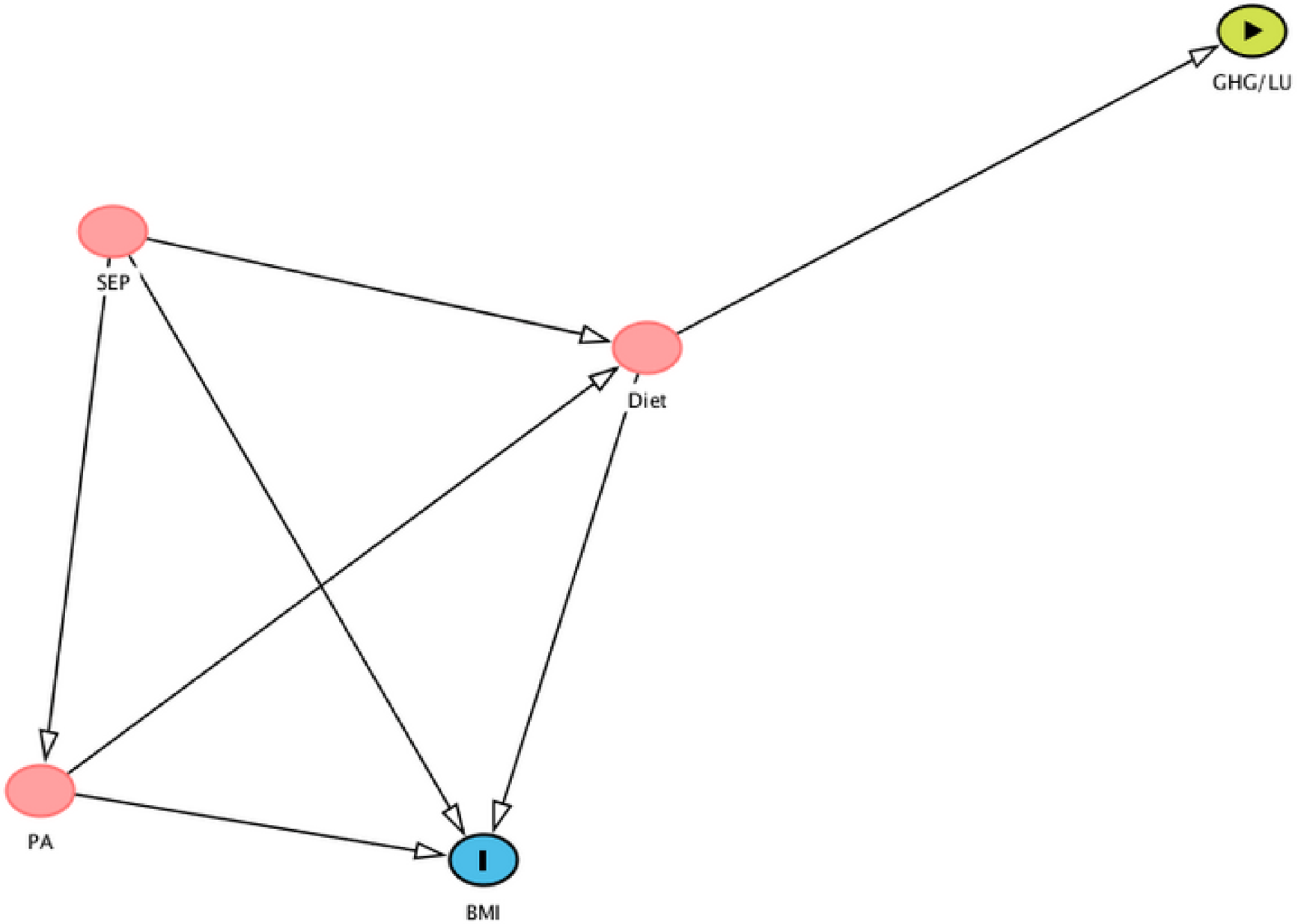
“Equivalized Household Income Indicator (EHII)”, which measures the equivalized disposable household income, previously validated in the cohort and associated with BMI in 2 to 4 years children.

It includes the following:

- **Maternal variables:** age, educational level, occupational status, ISCO code, country of birth, marital status and cohabitation status (living with/without a partner).

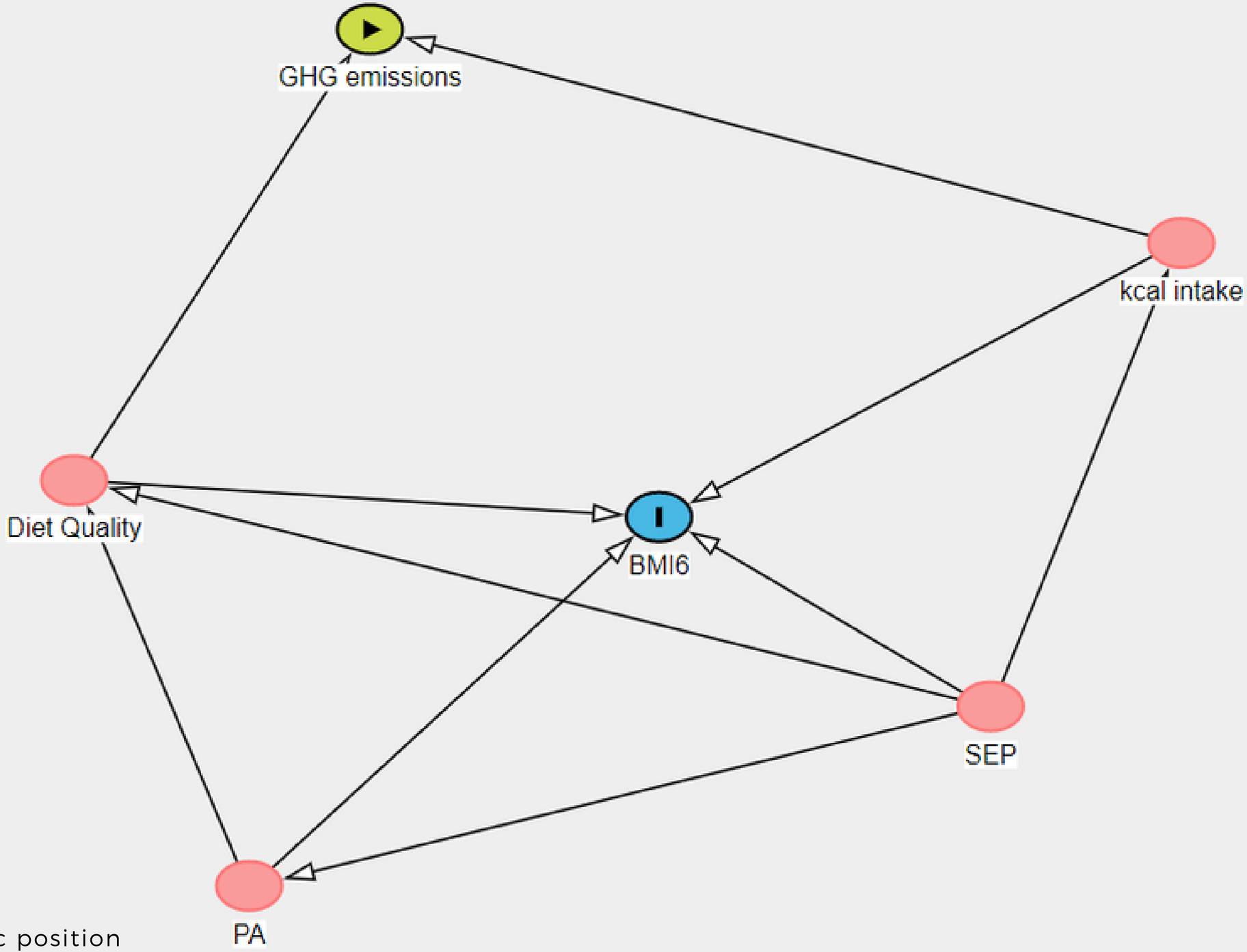
- **Household variables:**dwelling type, tenure status, number of rooms, and family size

Pizzi C, Richiardi M, Charles MA, et al. Measuring Child Socio-Economic Position in Birth Cohort Research: The Development of a Novel Standardized Household Income Indicator. Int J Environ Res Public Health. 2020;17(5):1700. Published 2020 Mar 5



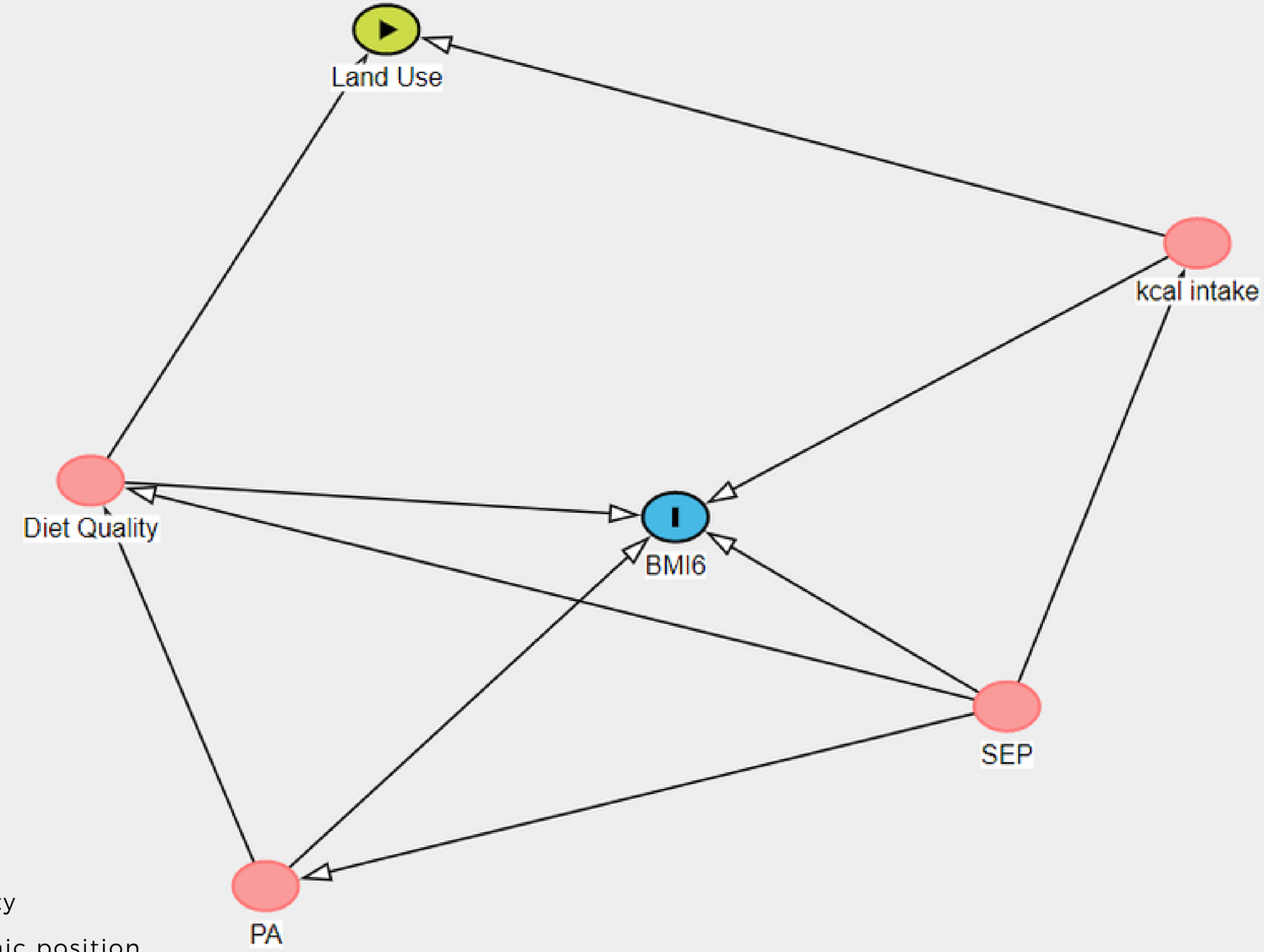
PA: physical activity

SEP: socio-economic position



PA: physical activity

SEP: socio-economic position



PA: physical activity

SEP: socio-economic position

ANALYSES

Test for linearity of data -> GLM or non-linear models
Continuous outcomes (BMI z scores)
Binary outcomes (OW/OB)

Accounting for potential confounders:

- Physical activity
- SEP

Additional analyses

- Kcal intake
- PCA (see later)

DISCUSSION

DEVELOPING AGE

Crucial age and different requirements

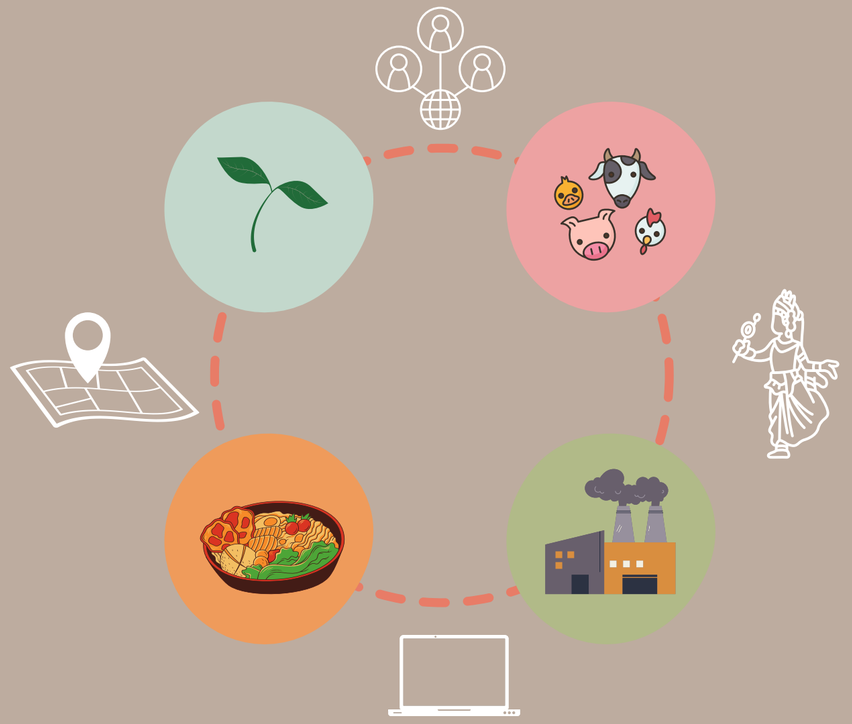
FINDING'S IMPLICATIONS

Emission and land use assessed quantitavely.

Qualitative indication needed to have more indication to the children's diet pattern: run the PCA of diet patterns in the PP cohort and analyze the component's relation with BMI, OW, OB

FINAL CONSIDERATIONS

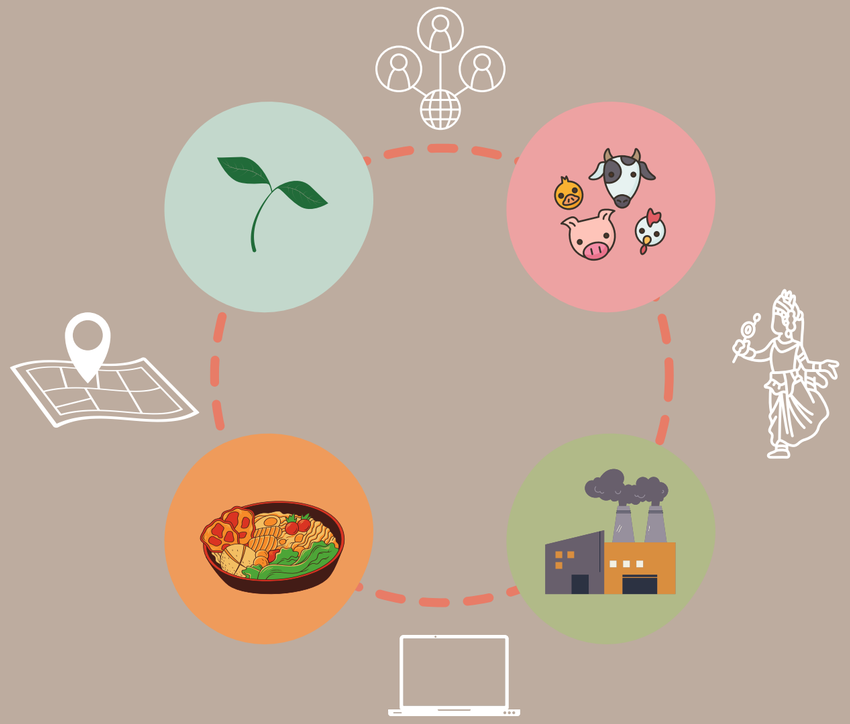
Dietary behaviour is complex as most food-related decisions are made at a subconscious level (Marteau et al., 2012). Food choices are **shaped by** serveral factors as the **food system**, **food**and **socio-cultural environments.**



FINAL CONSIDERATIONS

Dietary behaviour is complex as most food-related decisions are made at a subconscious level (Marteau et al., 2012). Food choices are **shaped by** serveral factors as the **food system**, **food**and **socio-cultural environments.**

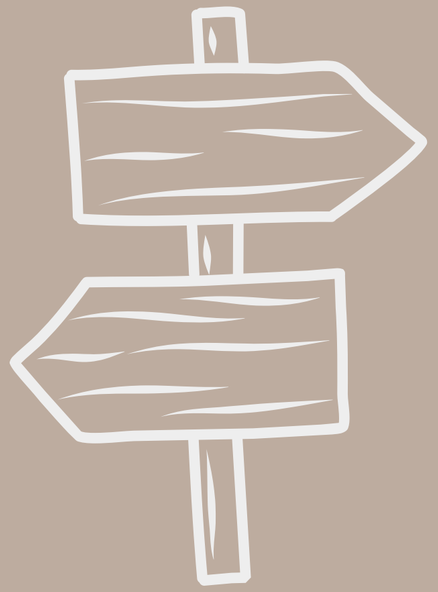
Several **parameters** need to be considered as food availability, accessibility and affordability, as well as fod desirability, convenience and marketing.



Policy and macro-level decisions are needed to shape those factors in a science-based direction

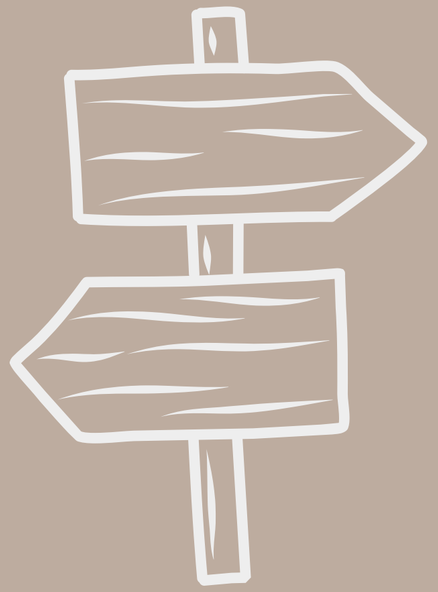
FINAL CONSIDERATIONS

Science-based guidelines on a enviromental-friendly and healthy diet are needed, and needs to be extended to **all ages** to shape and guide positive lifestyle changes



FINAL CONSIDERATIONS

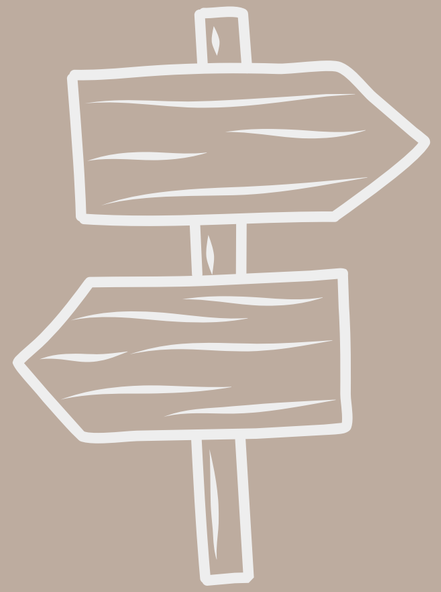
Science-based guidelines on a enviromental-friendly and healthy diet are needed, and needs to be extended to **all ages** to shape and guide positive lifestyle changes



Health implications of a climate-friendly diet needs to be further delucitated, and especially for particularely **vulnerable** categories e.g. children

FINAL CONSIDERATIONS

Science-based guidelines on a enviromental-friendly and healthy diet are needed, and needs to be extended to **all ages** to shape and guide positive lifestyle changes



Health implications of a climate-friendly diet needs to be further delucitated, and especially for particularely **vulnerable** categories e.g. children

Although lifestyle impact is big, achieving dietary change for personal health reasons has proven difficult. Thus, a dietary change for climate needs to be accompanied by careful **attention** to the factors that **shape dietary choices** and behaviours.

FINAL CONSIDERATIONS

Parallel to individual choices, other actions needs to be implemented

- Changes in **market regulamentations** which may change desirability of climate-unfriendly and/or unhealthy food

FINAL CONSIDERATIONS

Parallel to individual choices, other actions needs to be implemented

- Changes in **market regulamentations** which may change desirability of climate-unfriendly and/or unhealthy food

- **Subsides for** disadvantaged families to make healthy food choices accessible to everyone

FINAL CONSIDERATIONS

Parallel to individual choices, other actions needs to be implemented

- Changes in **market regulamentations** which may change desirability of climate-unfriendly and/or unhealthy food
- **Subsides for** disadvantaged families to make healthy food choices accessible to everyone
- **Cultural shift:** sensitization of the population and educational effort

TAKE HOME MESSAGES

- **Human** and **planet's** health are related and we urgently need to use our instruments to protect and improve both of them.

TAKE HOME MESSAGES

- **Human** and **planet's** health are related and we urgently need to use our instruments to protect and improve both of them.

- The analysis of **diet pattern** is complex and need the integration of quantitative and qualitative aspects

TAKE HOME MESSAGES

- **Human** and **planet's** health are related and we urgently need to use our instruments to protect and improve both of them.

- The analysis of **diet pattern** is complex and need the integration of quantitative and qualitative aspects

- Since lifestyle, and most of all diet has a notable impact on health and environment **dietary reccomendation** on children's diet are fundamental and needs to be implemented and studied

TAKE HOME MESSAGES

- **Human** and **planet's** health are related and we urgently need to use our instruments to protect and improve both of them.

- The analysis of **diet pattern** is complex and need the integration of quantitative and qualitative aspects

- Since lifestyle, and most of all diet has a notable impact on health and environment **dietary reccomendation** on children's diet are fundamental and needs to be implemented and studied

- **Cultural shift** and policies needs to be implemented in parallel to an educational effort

THANK YOU!!!

PhD IN **SUSTAINABLE DEVELOPMENT** AND **CLIMATE CHANGE**

UNIVERSITÀ DI TORINO

SILVIA MARITANO, silvia.maritano@unito.it