



UNIVERSITÄT
HEIDELBERG
ZUKUNFT
SEIT 1386

SYMPOSIUM

CLIMATE CHANGE, NUTRITION AND HEALTH:
GLOBAL CHALLENGES AND POTENTIAL SOLUTIONS

MAY 5-7, 2021

INRAE

Sustainable diet index in the NutriNet-Santé Study

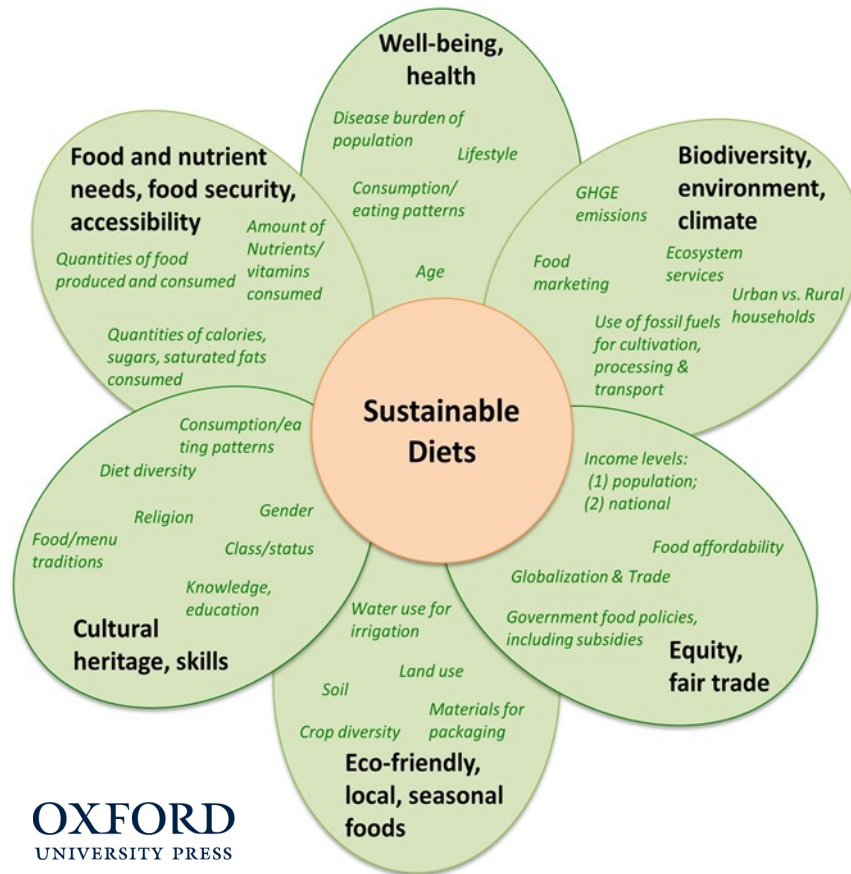
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Components of sustainable diets, FAO - 2010



□ Four key components:

▣ Nutritional and health-related

▣ Environment and biodiversity

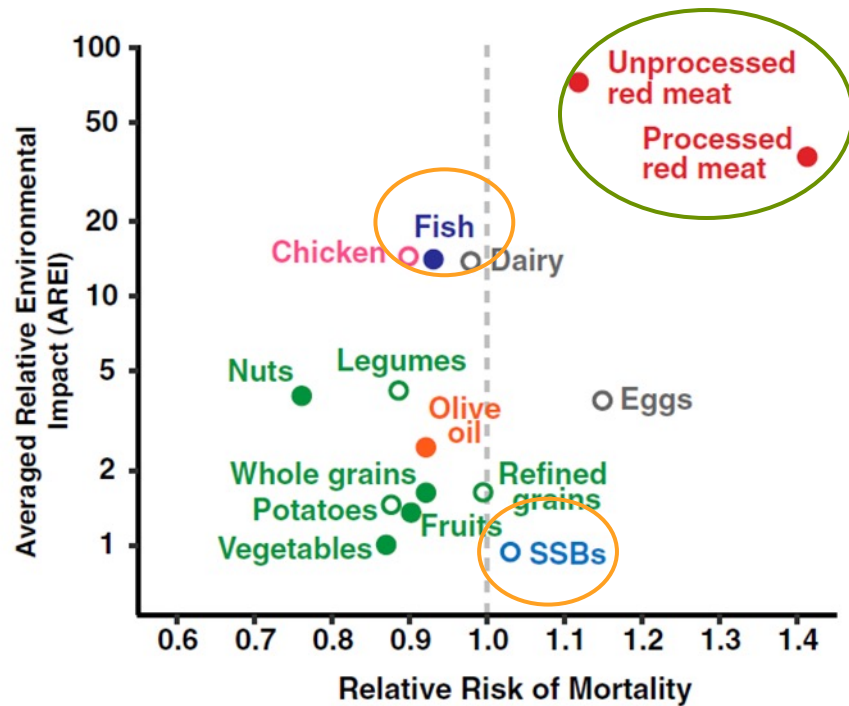
▣ Economic

▣ Sociocultural

➔ Interconnection between components

Understanding Sustainable Diets: A Descriptive Analysis of the Determinants and Processes That Influence Diets and Their Impact on Health, Food Security, and Environmental Sustainability Jessica L. Johnston, Jessica C. Fanzo, Bruce Cogill 2014

Conflicts and trade offs between dimensions



Clark et al. 2019

- Convergence between diet sustainability dimensions for most foods
- However, some sustainability components are not necessarily compatible with each other
 - e.g. healthiness of fish intake conflicts with its environmental impacts
 - e.g. high nutritional quality is often associated with higher cost

Perignon et al. 2017, Darmon & Darmon and Drewnowski, 2015

Sustainable Diet Index (SDI) – objectives

- Gaps in literature

- Most studies are not based on a multicriteria approach
- Under-representation of certain dimensions *Jones et al. 2016*

- Objectives:

- to develop and validate a **holistic individual index (SDI)** to assess diet **sustainability**, taking into account nutritional, environmental, economic and socio-cultural aspects in the NutriNet-Santé cohort study *Seconda et al. BJN 2019*

- to evaluate its relationships with health outcomes *Seconda et al. AJCN 2019, Seconda et al. EJE 2019*



NutriNet-Santé cohort study – overview

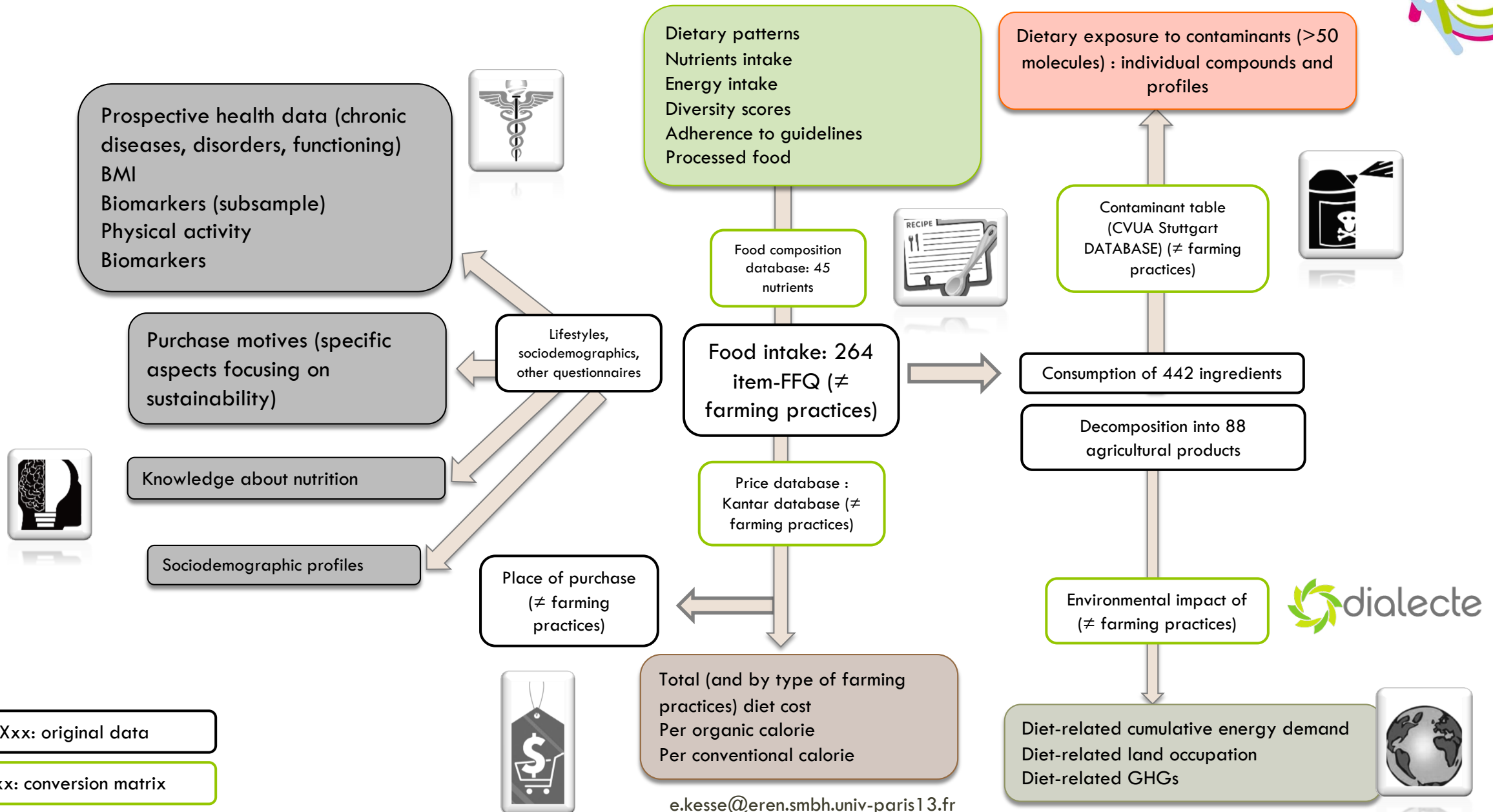


- ✦ A web-based prospective study - Follow-up: > 10 years
- ✦ Volunteers living in France aged ≥ 18 years: (about 180 000)
- ✦ Dedicated secure HTML interface for web-based questionnaires (www.etude-nutrinet-sante.fr)
- ✦ Biochemical samples and clinical examination in a subsample (> 20 000 subjects with blood and urine sampling)
- ✦ Record of health events during the follow-up

Aims:

- To investigate the relationships between **nutrition** (*nutrients, foods, dietary patterns, physical activity, nutritional status*) and **health outcomes** (*mortality, CVD, cancer, diabetes, obesity, hypertension, depression, cognitive decline, rheumatoid arthritis, migraine, quality of life, etc.*)
- To study the role of various **determinants** of dietary behaviours (*socio-economic, cultural, psychological, cognitive, sensory, etc.*) and nutritional status, and their interactions

NutriNet-Santé cohort study – sustainability evaluation



Sustainable Diet Index (SDI) – computation

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	Indicator	Weighting	Point attribution				
			Q1	Q2	Q3	Q4	Q5
Nutritional sub-index	Absolute value of difference between energy need and intake	$\frac{1}{2}$	5	4	3	2	1
	PANDiet index (/100)	$\frac{1}{2}$	1	2	3	4	5
Environmental sub-index	Land occupation Greenhouse gas emissions Primary energy consumption=>Recipe	$\frac{3}{4}$	5	4	3	2	1
	Organic food	$\frac{1}{4}$	1	2	3	4	5
Economic sub-index	Proportion of the income devoted to diet (%)	1	5	4	3	2	1
Sociocultural sub-index	Place of food purchase	$\frac{1}{2}$	1	2	3	4	5
	Ready-made products	$\frac{1}{2}$	5	4	3	2	1

29 388 individuals

♀ 75%

65% post-secondary graduation 

→ four equally weighted sub-indexes reflecting the four sustainability domains (FAO)

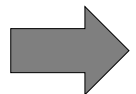
SDI is computed for each participant of the cohort, participants is ranked i.e. into five equal groups (quintiles, Q)

Q1 = participants with the lowest SDI (low diet sustainability) and Q5 = those with the highest (high diet sustainability)

Sustainable Diet Index (SDI) and individual characteristics

- Higher SDI is associated with
 - ▣ Lower environmental impact (as reflected by the ReCIPE)
 - ▣ Lower difference between energy content needed and intake
 - ▣ Higher organic food consumption
 - ▣ Lower contribution of food to total budget and ready-made product consumption
 - ▣ Higher nutritional quality (as reflected by the nutrient-based PANDiet index), greater number of places of food purchase

- Sustainable diets were associated with:
 - ▣ ↗ favourable socioeconomic profiles
 - ▣ ↗ being a woman
 - ▣ ↗ being a vegetarian
- ➔ However the SDI is inversely correlated with dietary monetary cost

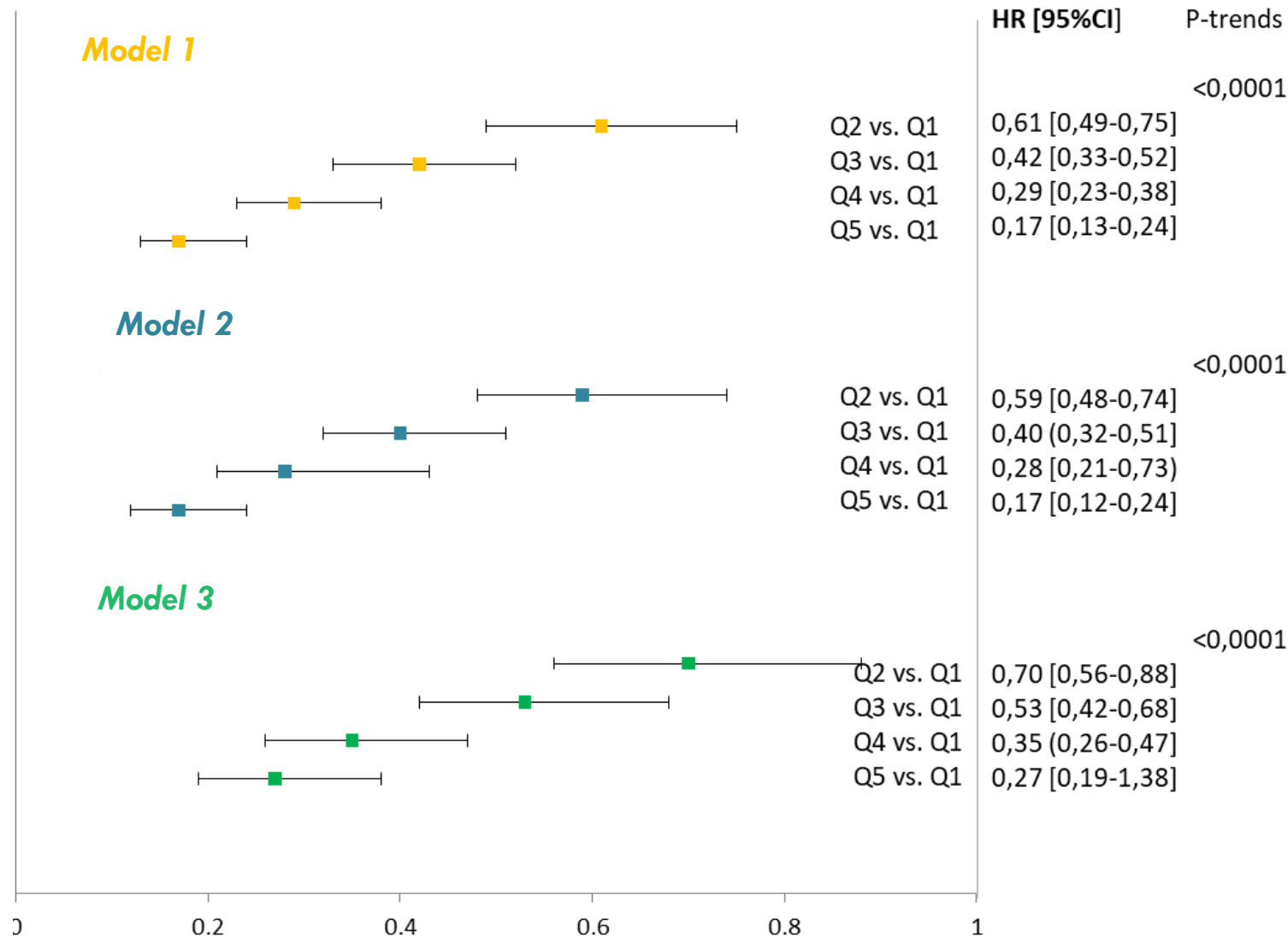


Raise the question of accessibility and affordability of sustainable diets for some subgroups

Sustainable Diet Index (SDI) – obesity risk

- **Objective:** prospective association between the SDI and obesity risk
- **Study sample:** N=15,626 NutriNet-Santé participants of the NutriNet-Santé study (of whom 76% were women), mean follow-up=3y, 281 incident cases
- Use of multi-adjusted cox models

Sustainable Diet Index (SDI) – obesity risk



□ Negative associations between the SDI and the risk of obesity (Q5_{high sustainability} vs Q1_{low sustainability})

Model 1: adjusted for sex, age, height

Model 2: model 1+ physical activity, tobacco status, alcohol intake, free-alcohol energy intake, income per household, marital status, menopausal status, diploma, occupation

Model 3: model 2+ baseline BMI

Seconda et al AJCN 2019

Sustainable Diet Index (SDI) – CVD and cancer risk

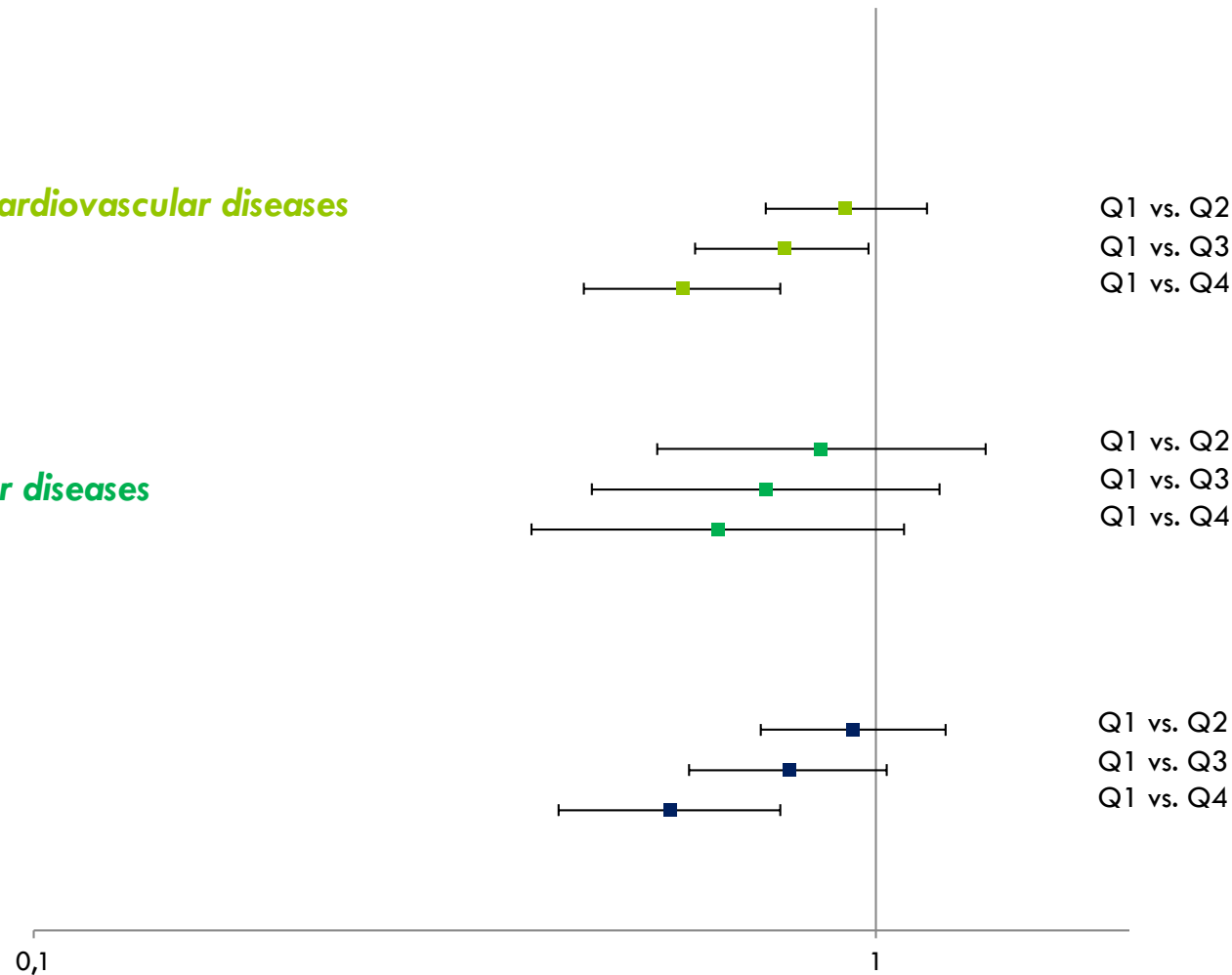
- **Objective:** prospective association between the SDI and chronic disease risk
- **Study sample:** N=29 388 participants, 640 validated cases (483 cancer cases, 158 cardiovascular disease cases), mean follow-up=4y
- **Use of multi-adjusted cox models** (adjustment for age (time scale), sex, diploma, smoking status, income by household unit, occupational status, alcohol status, family history of cancer or cardiovascular diseases, physical activity, energy consumption, and (for women) parity, postmenopausal status, use of hormonal treatment for menopause, and use of oral contraception. Adjusted for height when cancers are studied)

Sustainable Diet Index (SDI) – CVD and cancer risk

Cancers and cardiovascular diseases

Cardiovascular diseases

Cancers



□ Negative associations between the SDI and the risk of overall chronic diseases

■ Significant association with cancer risk

■ Non significant association with cardiovascular diseases
➔ possibly lack of power

Sustainable Diet Index (SDI) – methodological considerations

□ Methodological considerations:

- 1–5 scoring → arbitrary but used to discriminate sufficiently the participants without having too many categories
- equal weights to the four sub-indexes were allocated to reflect the absence of hierarchy in the FAO definition
- inclusion of other indicators (water footprint, fair trade) to better account for potential conflicts between sustainability components
- short follow-up time in etiological studies
- context-specific → adaptation and validity in other context and settings

Conclusions

- SDI
 - based on a multicriteria approach
 - tool to address diet sustainability and to follow sustainability-related dietary patterns changes + the link with long-term health
 - adaptation and validation in other contexts needed

- Achieving healthy diets from sustainable food systems requires careful consideration of local and regional realities

Thank you!

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+ all the team (informaticians,
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