

Lifestyles and aging: the inseparable link between physical exercise and nutrition

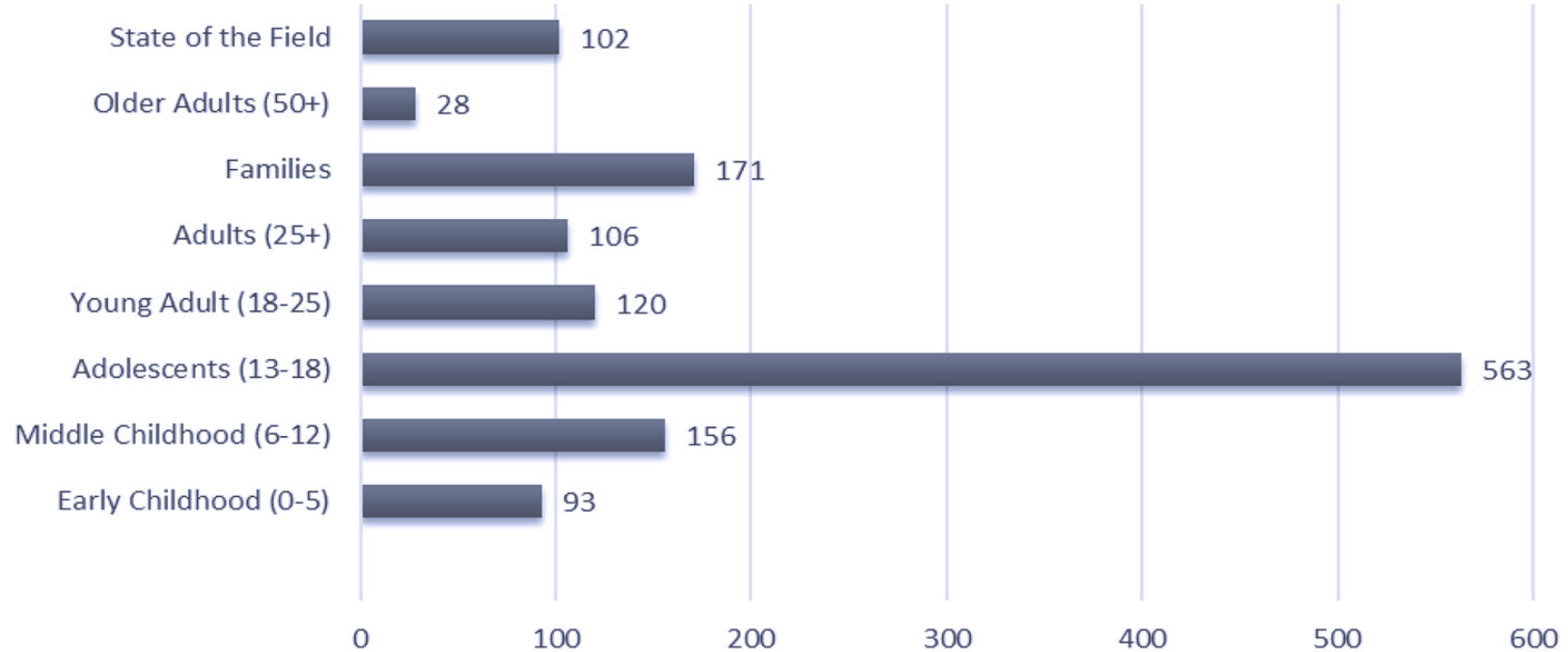


Stefania Maggi
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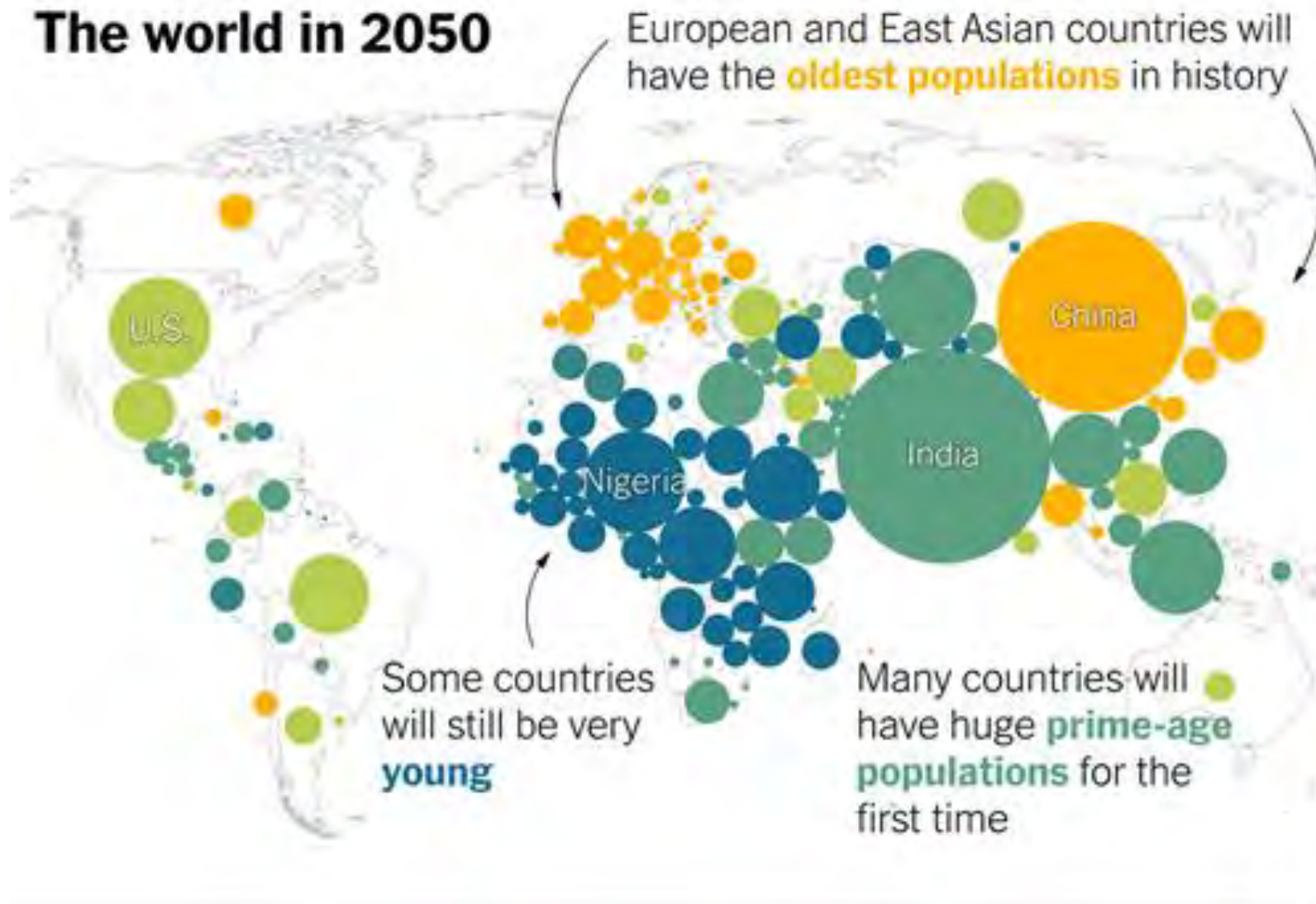
Fondazione Dieta Mediterranea

Gap in knowledge about prevention at different ages

Focus of articles published in the journal *Prevention Science*



The world in 2050

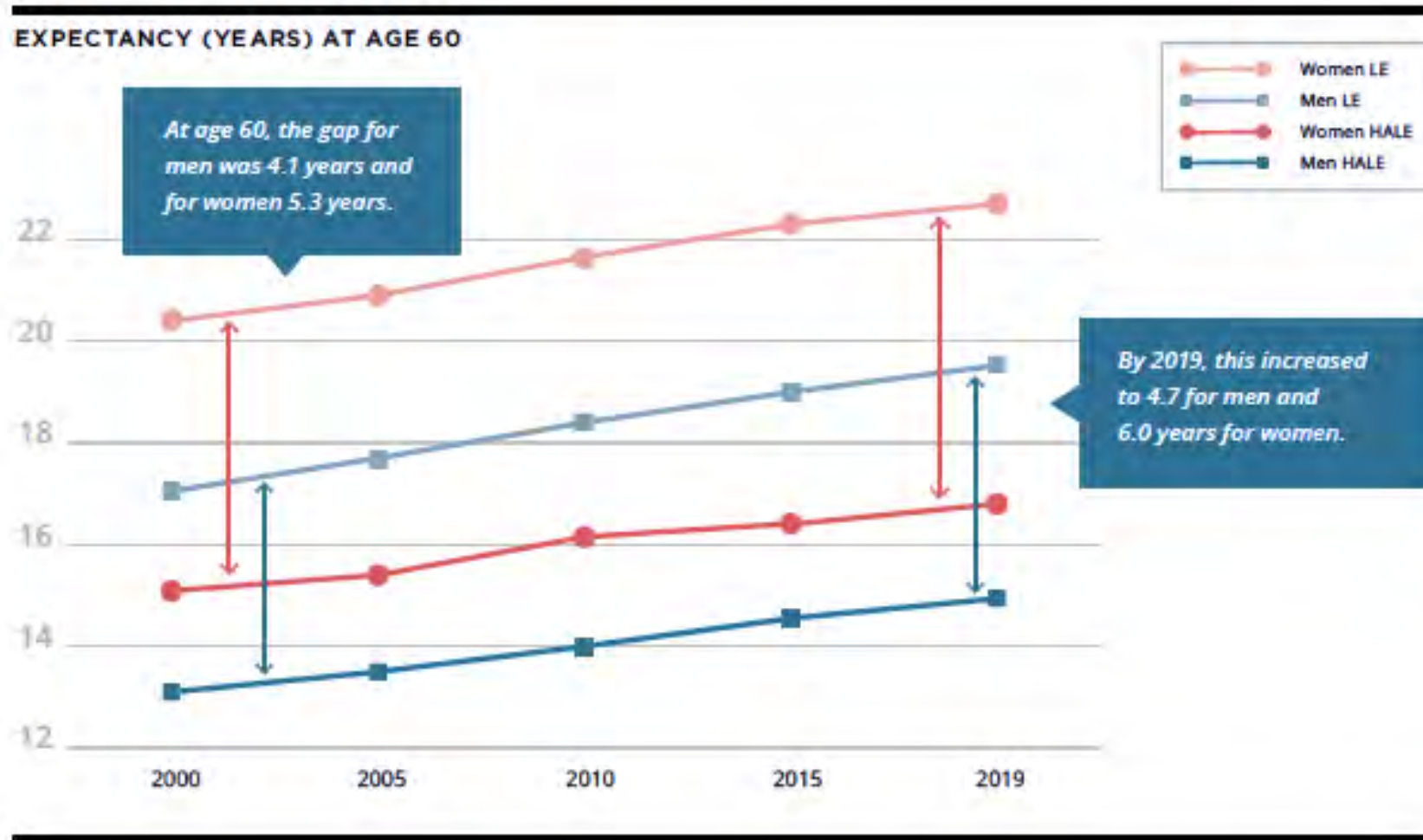


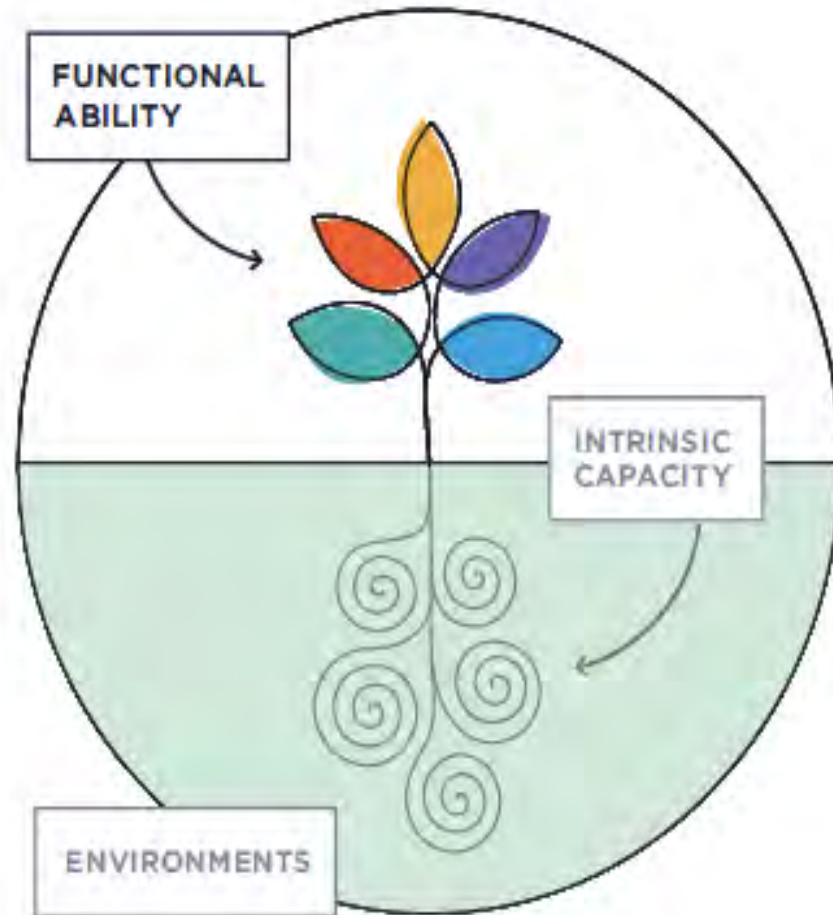
By 2050, people aged 65 and over will number more than 2 billion and make up nearly 40% of the population in parts of East Asia and Europe. Extraordinary numbers of retirees will depend on a small number of working-age people to support them, healthcare systems will be overwhelmed as cases of dementia, CVD, diabetes, etc. will triple.

Outline

- **UN Decade of Healthy Aging:
An opportunity for coordinated actions**
- Are nutrition and physical activity priorities in promoting Healthy Aging?
- Main goals of DHA and why better nutrition and physical activity fit into these goals

Gap increases between life expectancy and healthy life expectancy at age 60, 2000-2019





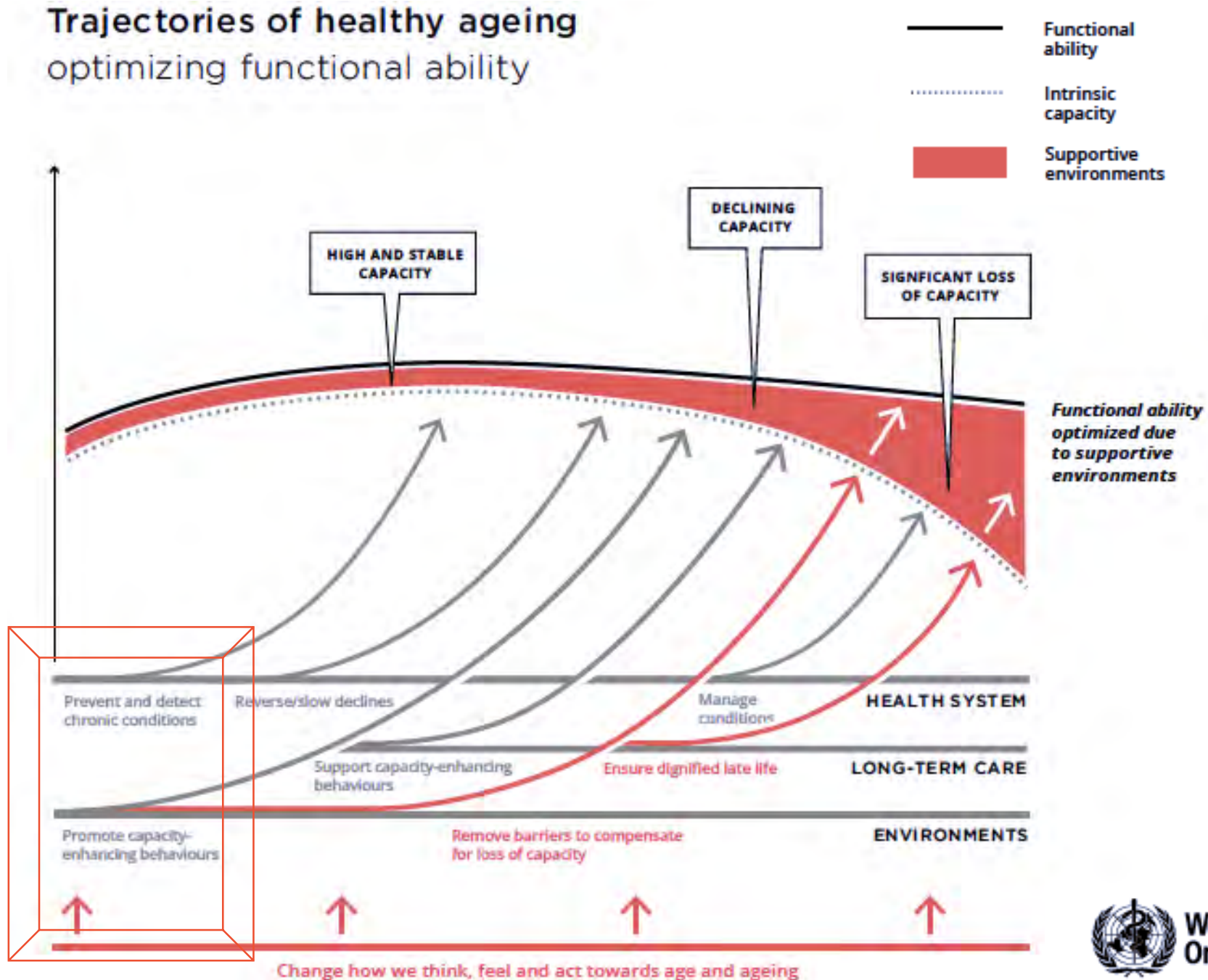
The United Nations has declared 2021-2030 the Decade of Healthy Aging, with WHO leading international actions to improve the lives of older people, their families and their community.

The Decade of Healthy Aging is a global collaboration bringing together governments, civil society, international agencies, practitioners, academia, media and the private sector for 10 years of concerted, catalytic and collaborative action to support longer, healthier lives.

DECADE OF HEALTHY AGEING



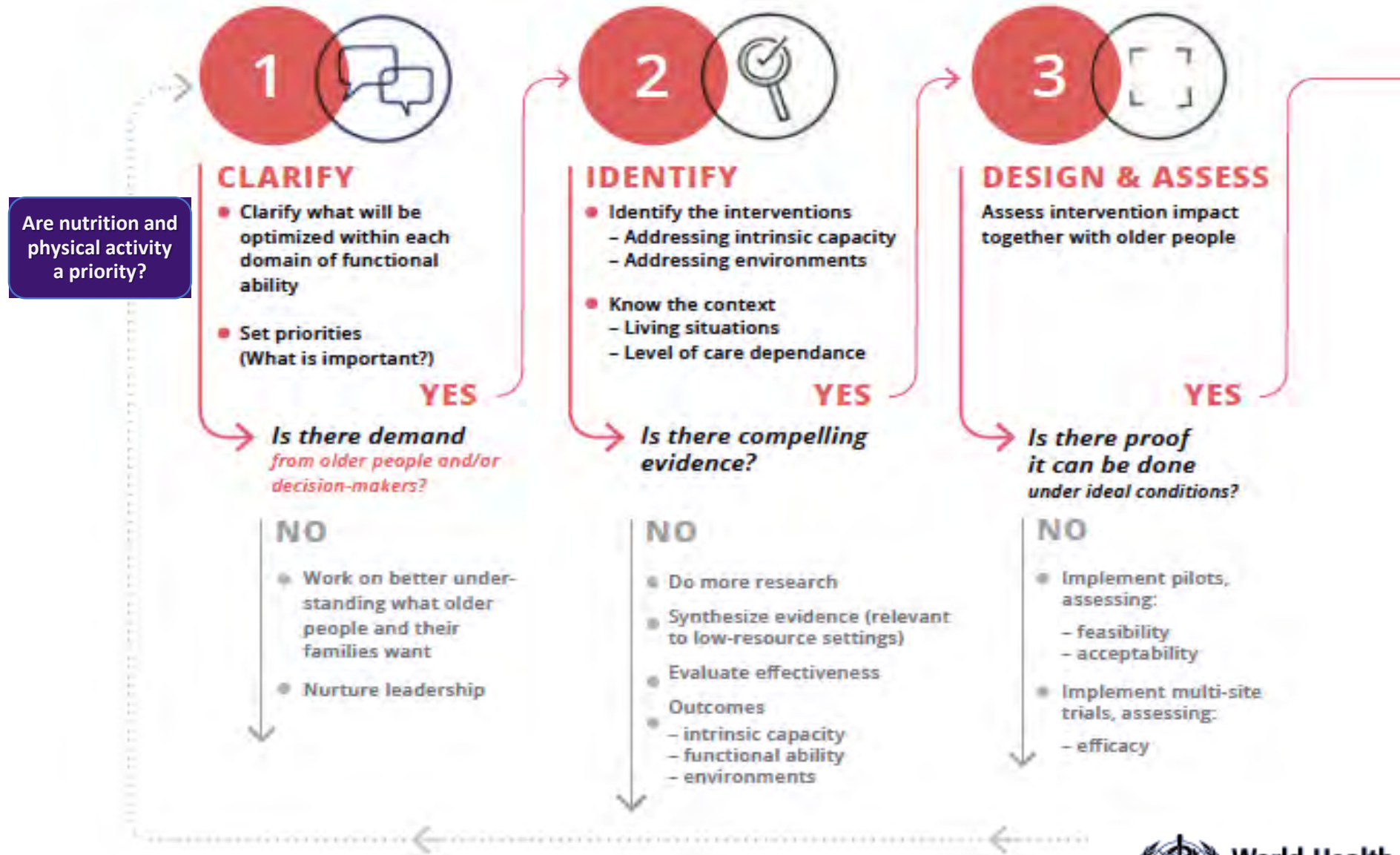
Trajectories of healthy ageing optimizing functional ability



Outline

- UN Decade of Healthy Aging:
An opportunity for coordinated actions
- **Are nutrition and physical activity priorities in promoting Healthy Aging?**
- Main goals of DHA and why better nutrition and physical activity fit into these goals

The pathway to optimize functional ability



World Health Organization

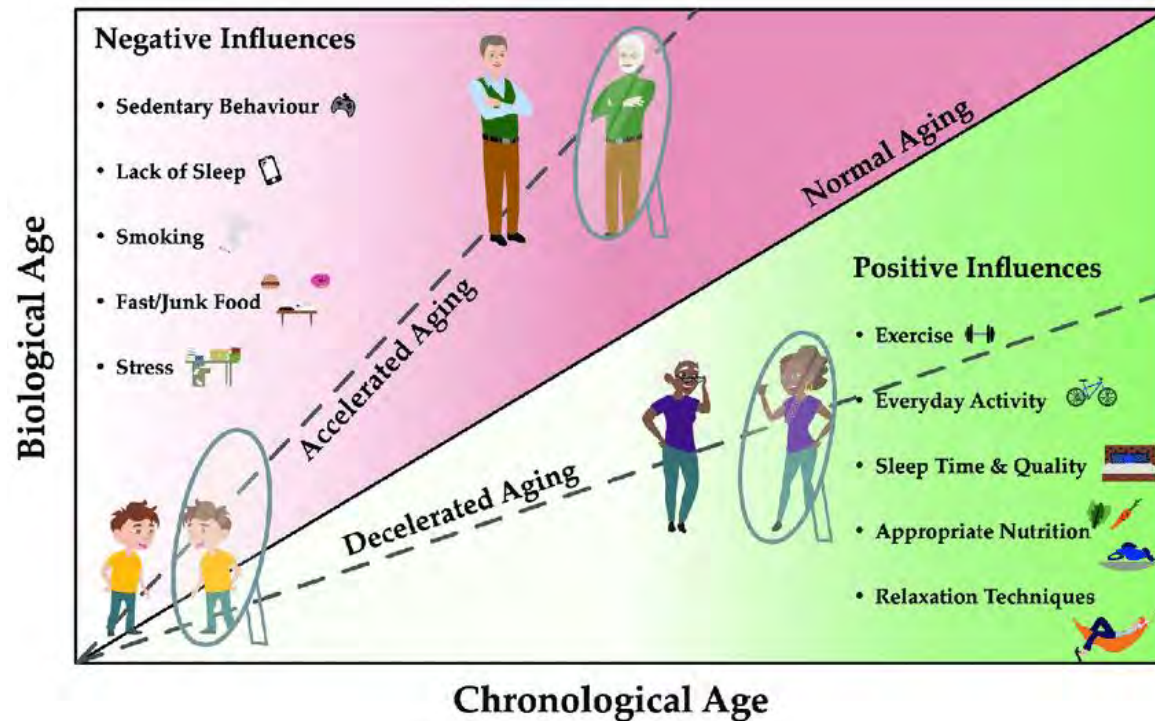
Each individual can contribute to modulating the aging process, but it is not enough...

Chronological age

It only measures the time that has passed since we were born

Biological age

Considers individual variability in the functional and morphological conditions of our organism



Biological age is a better indicator of health and takes into account many factors:

- Genetics
- Comorbidities and their treatments
- Physical activity
- Diet
- Lifestyle in general
- Environment in which you live

Systems biology and omics sciences, bioinformatics and artificial intelligence necessarily require multidisciplinary interactions

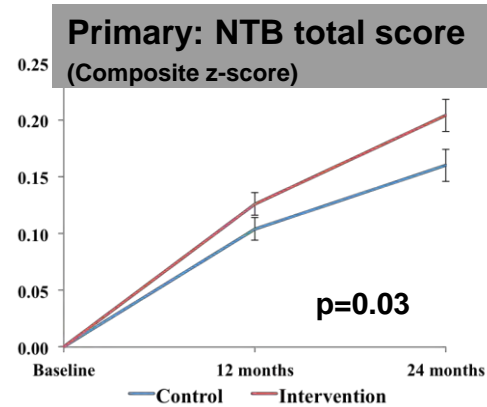


FINGER

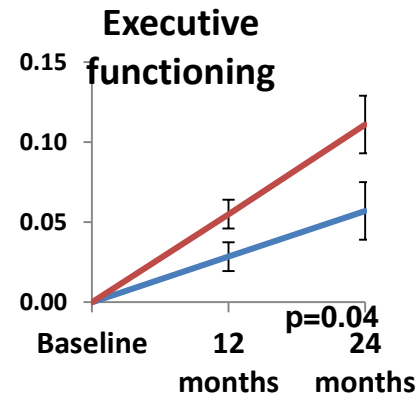
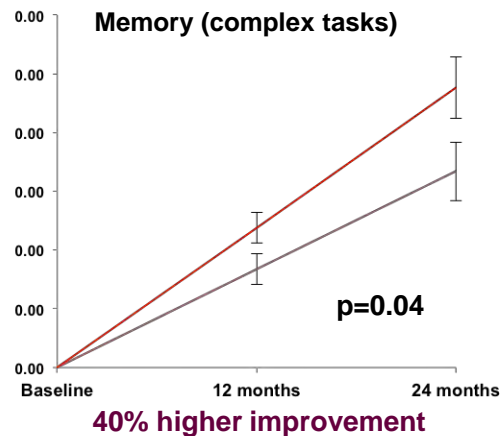
- **Objective:** To **reduce cognitive impairment** in an at risk population through a 2-year multi-domain life-style intervention
 - **Target population:** 60-77 year old persons (n= 1200) from previous population-based non-intervention studies (FINRISK, D2D)
 - **Time schedule:** Screening began in September 2009 and was completed in 2011. The intervention will be completed in 2013
-

Main results of the FINGER study

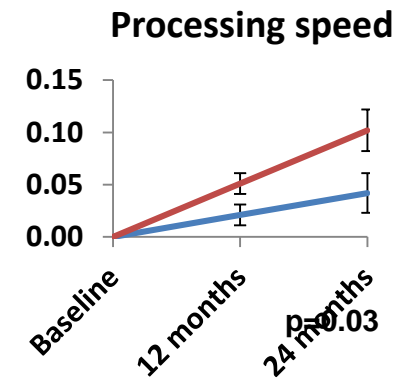
FINGER



25% higher improvement



83% higher improvement



150% higher improvement

Red - intervention
Blue - control

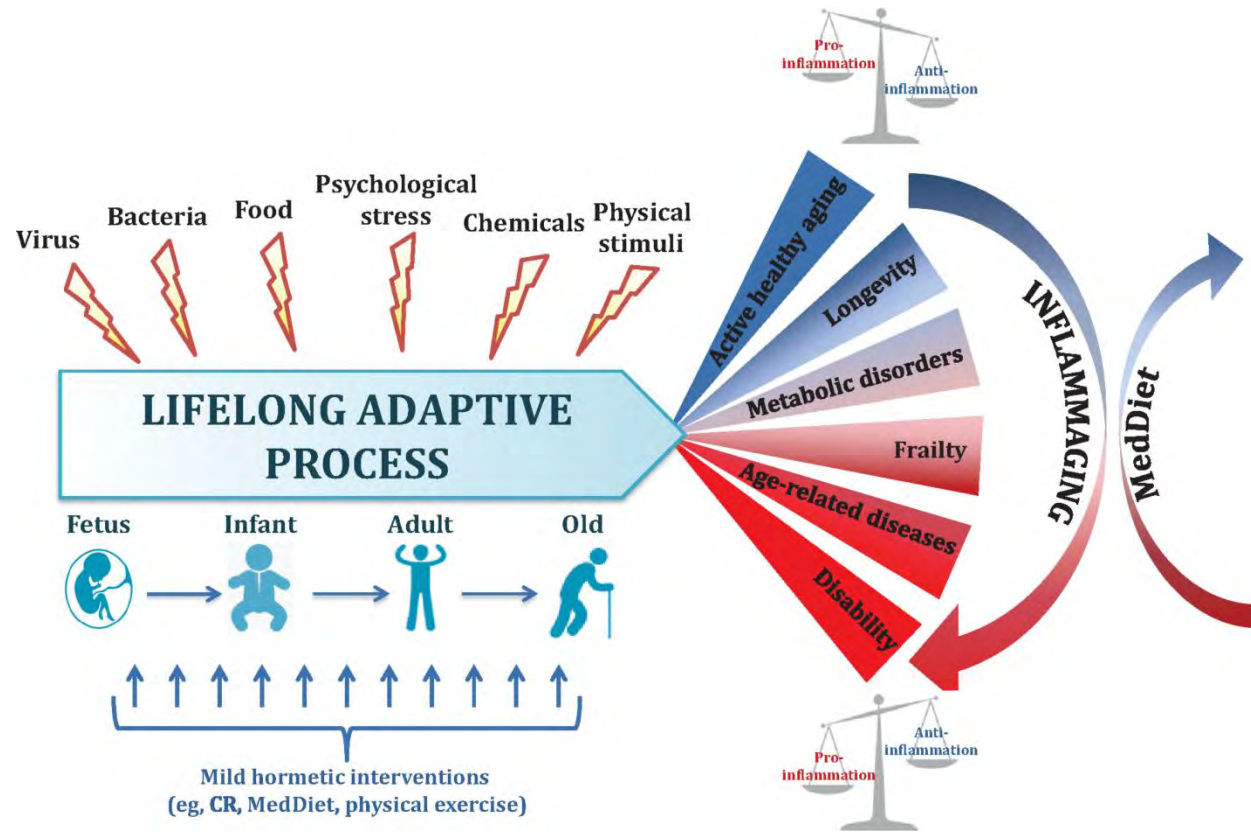
Lines = estimates for change from baseline to 1 & 2 years
Error bars = standard errors
P-values = difference in trajectories over time between groups

- Lower risk for cognitive decline
- 30% lower risk for functional decline (IADL)
- Better health related quality of life (Strandberg et al, Eur Ger Med 2017)

Isn't the Mediterranean Diet in itself a multicomponent intervention?



The Mediterranean Diet, understood as nutrition and physical exercise, fights inflammaging



Combined effect of adoption of the Mediterranean Diet and physical activity on metabolic risk factors in the elderly population: systematic review and meta-analysis of 11 RCTs

Table 2. Combined effect of the Mediterranean diet and physical activity on metabolic risk factors.

Outcome or Subgroup	Studies	Participants	Effect Estimate (MD, 95% CI)	<i>p</i> -Value	<i>I</i> ²
Body weight (kg) ^a	6	1153	−3.68 (−5.48, −1.89)	<0.001	95%
Up to 2 years of intervention	4	532	−6.53 (−10.86, −2.19)	0.003	93%
More than 2 years of intervention	2	621	−0.59 (−1.08, −0.10)	0.020	0%
Waist circumference (cm)	4	701	−1.62 (−2.58, −0.66)	<0.001	77%
Body mass index (kg/m ²)	5	825	−0.64 (−1.10, −0.18)	<0.001	82%
Systolic blood pressure (mm Hg)	4	765	−0.83 (−1.57, −0.09)	<0.001	95%
Diastolic blood pressure (mm Hg)	4	765	−1.96 (−2.57, −1.35)	<0.001	48%
Insulin (μU/mL)	3	379	−2.13 (−4.86, 0.60)	0.130	98%
HOMA-IR index	3	379	−0.90 (−1.22, −0.58)	<0.001	74%
Glucose (mg/dL)	3	379	−7.32 (−9.82, −4.82)	<0.001	74%
Triglycerides (mg/dL)	4	785	−18.47 (−20.13, −16.80)	<0.001	44%
HDL-cholesterol (mg/dL)	4	785	+3.99 (1.22, 6.77)	<0.001	98%
Total cholesterol (mg/dL)	4	785	−6.30 (−9.59, −3.02)	<0.001	63%

CI; confidence intervals; HDL, high density lipoprotein cholesterol; HOMA-IR, homeostatic model assessment of insulin resistance; MD, mean difference. Findings are based on random-effects meta-analysis (inverse variance), apart from triglycerides (fixed effects). *I*² represents the magnitude of heterogeneity. ^a Sensitivity analysis, with studies stratified according to intervention duration.

Table 4 Hazard ratios for cardiovascular mortality in relation to four lifestyles in Golestan Cohort Study

Model	Unhealthy diet and inactive	Unhealthy diet but Active	Healthy Diet but Inactive	Healthy diet and active
Total (2,043/ 40,692)				
Case/n	757/ 11,427	480/12177	522/8922	284/8170
Age and sex adjusted HR	1.00	0.81 (0.72, 0.91)	0.88 (0.78, 0.98)	0.68 (0.59, 0.78)
Fully adjusted HR ¹	1.00	0.83 (0.74, 0.94)	0.94 (0.84, 1.05)	0.74 (0.65, 0.86)
Male (1,152/ 17,626)				
Case/ n	319/ 3131	387/7101	230/2613	216/4798
Age adjusted HR	1.00	0.88 (0.76, 1.03)	0.93 (0.78, 1.1)	0.70 (0.58, 0.83)
Fully adjusted HR ²	1.00	0.90 (0.77, 1.06)	0.99 0.83, 1.17	0.74 (0.62, 0.89)
Female (891 / 23,019)				
Case/ n	438/ 8,296	93/ 5,076	292/ 6,309	68/ 3,372
Age adjusted HR	1.00	0.64 (0.51, 0.80)	0.84 (0.72, 0.97)	0.67 (0.51, 0.86)
Fully adjusted HR ²	1.00	0.65 (0.52, 0.82)	0.90 (0.77, 1.05)	0.75 (0.58, 0.97)
BMI < 30(1,620/ 30,837)				
Case/ n	600/8,481	386/9,908	414/6,120	220/6,328
Age and sex adjusted HR	1.00	0.77 (0.67, 0.88)	0.93 (0.82, 1.05)	0.66 (0.56, 0.77)
Fully adjusted HR ³	1.00	0.79 (0.69, 0.91)	0.98 (0.86, 1.11)	0.72 (0.61, 0.84)
BMI ≥ 30 (421/ 9,850)				
Case/ n	155/2,943	94/2,267	108/2,800	64/840
Age and sex adjusted HR	1.00	1.02 (0.77, 1.34)	0.72 (0.56, 0.92)	0.77 (0.56, 1.04)
Fully adjusted HR ³	1.00	1.05 (0.79, 1.38)	0.81 (0.63, 1.04)	0.85 (0.63, 1.16)

Abbreviations: *BMI*, body mass index, *HR* hazard ratio

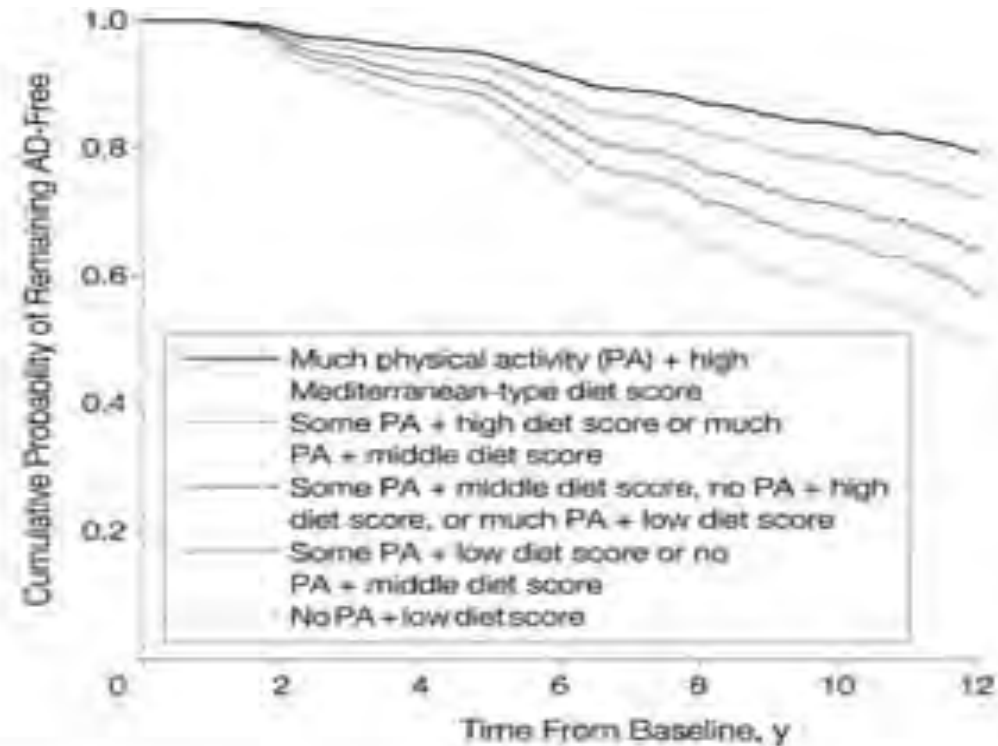
¹ Adjusted for age, gender, BMI, energy intake, cigarette, opioid use, education, marital status, history of hypertension, and wealth score

² Adjusted for age, BMI, energy intake, cigarette, opioid use, education, marital status, history of hypertension, and wealth score

³ Adjusted for age, gender, energy intake, cigarette, opioid use, education, marital status, history of hypertension, and wealth score

> 50,000 participants > 40 yrs followed for 13 yrs

Alzheimer Disease (AD) Incidence in Individuals by No, Some, or Much Physical Activity and Low, Middle, and High Mediterranean-Type Diet Adherence Scores



No. at risk	0	2	4	6	8	10	12
Much PA + high diet	200	192	141	60	45	35	19
Some PA + high diet or much PA + middle diet	496	470	332	135	106	73	37
Some PA + middle diet, no PA + high diet, or much PA + low diet	573	525	374	168	121	82	35
Some PA + low diet or no PA + middle diet	421	377	241	99	72	48	27
No PA + low diet	190	165	103	39	27	18	9

N=1888 >77 yrs

Med diet and Physical activity: better together than apart for the mortality prevention

n=19,446


Participants enrolled in the **Seguimiento Universidad de Navarra SUN cohort** (7,416 men & 12,030 women)

136-item food frequency questionnaire → 9-item Mediterranean Diet score (MDS)

17-item physical activity questionnaire → 8-item Physical Activity (PA) score

Modifiable Lifestyle (MDS & PA) Risk Factors on All-cause Mortality

277 deaths



Several studies have shown that a poor quality diet increases the risk of mortality.



Q1 vs Q4 MDS:
HR = 1.70 (1.10 – 2.62)



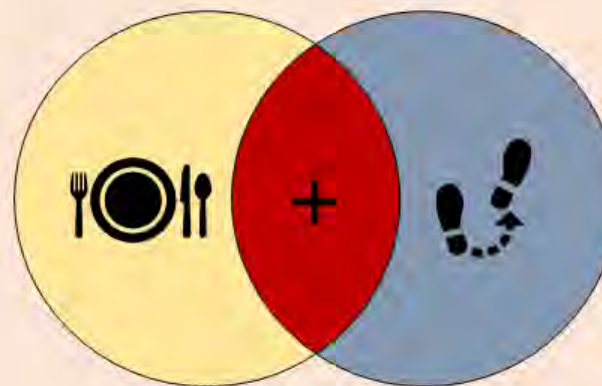
Several studies have shown that low physical activity increases the risk of mortality.



Low vs High PA:
HR = 1.32 (1.02 – 1.70)



There is a current research gap in studying the complexity of combined lifestyle factors beyond isolated behaviors. A comprehensive interaction analysis on both multiplicative and additive scales provides key insight on the nature and impact of joint effects.

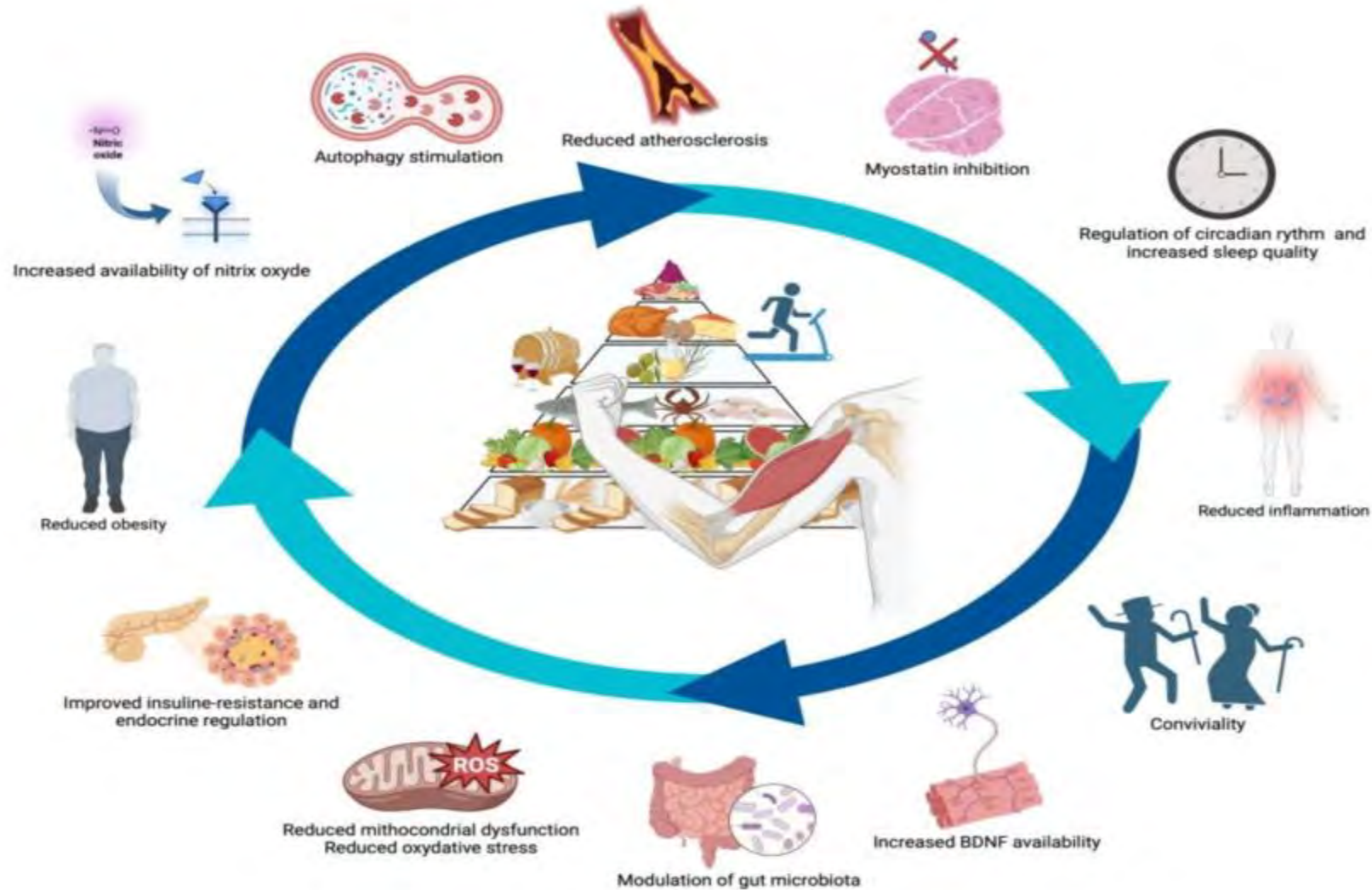


Q1 MDS-high PA vs Q4 MDS-low PA:
HR = 2.31 (1.33 – 4.01)

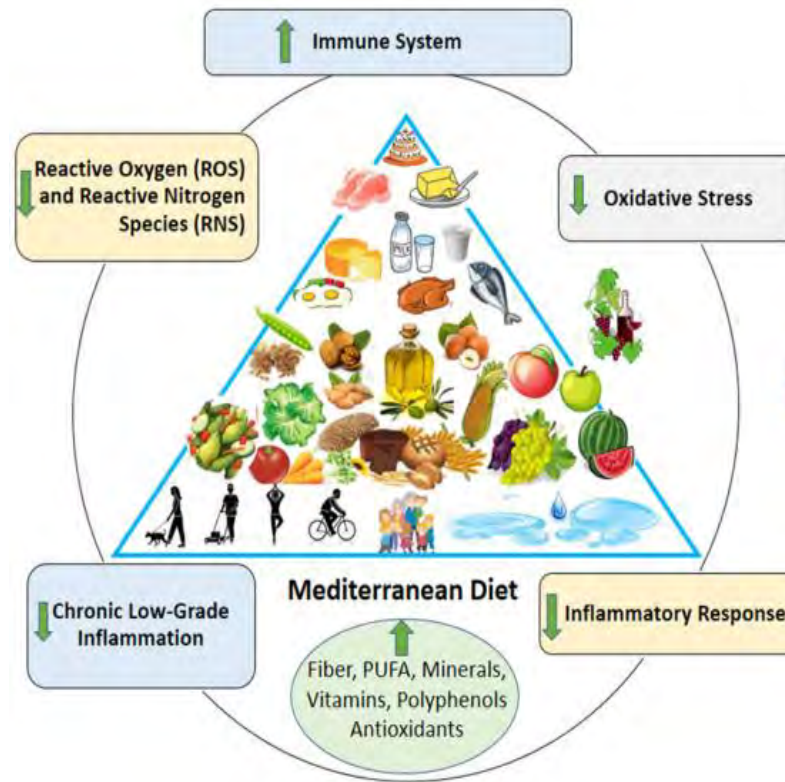


Synergistic effect increases mortality risk across MDS/PA risk factor combinations

Possible mechanisms on which the benefit is based of the association between Med Diet and physical activity



The Mediterranean Diet as a potential strategy against chronic and infectious diseases



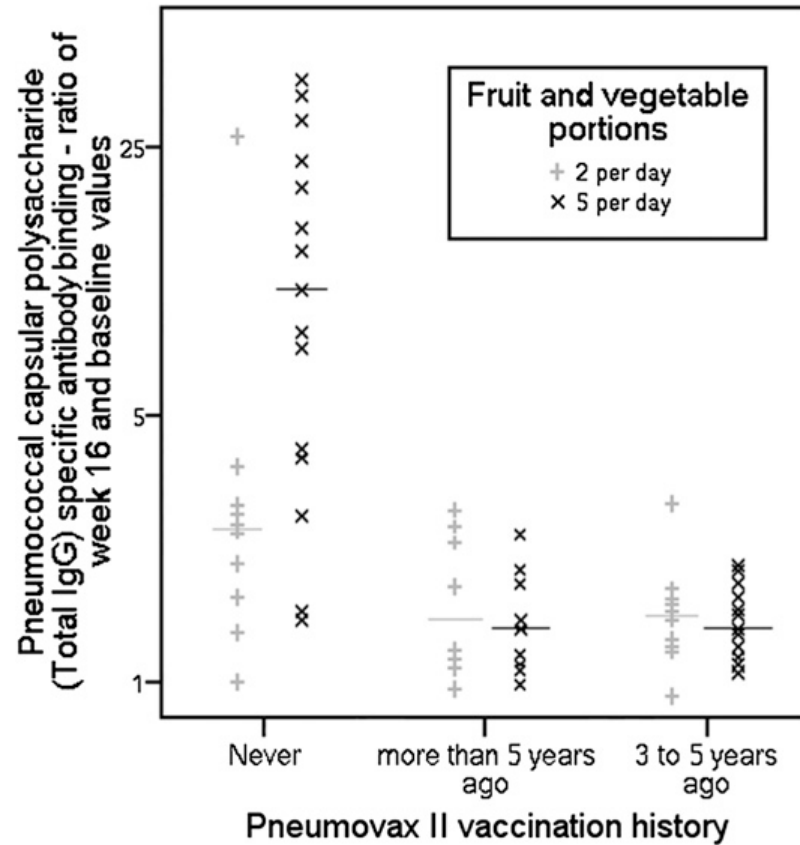
We have more than 70 years of clinical and experimental research on the role of the Mediterranean diet in the prevention and treatment of major age-associated chronic diseases (cardiovascular, metabolic, neoplastic, neurodegenerative diseases) and more recently also of sarcopenia and frailty

Several more recent observational studies have demonstrated a protective effect of Mediterranean diet also on the risk of Infections, including Covid-19, and their complications, including mortality

***“Healthy aging in the context of the Mediterranean diet–health-environment trilemma”
Maggi S. et al, 2021***

Ferro et al, Medicina 2021

RCT on the effect of fruit and vegetable consumption on the immune function of elderly individuals



Consumption of 5 servings of fruit and vegetables is associated with a significant better Antibody-response to pneumococcal vaccine in 82 elderly people who had never been vaccinated before: effect mainly on naive B cells, not on memory cells

Role of supplementation with prebiotics or probiotics in the antibody response after influenza vaccination: systematic review and meta-analysis

The mean hemagglutination inhibition antibody titers of vaccine strains in probiotics/prebiotics and control groups

Vaccine strain	Probiotics/prebiotics group	Control group	Mean differences (% of increase)	P-value
A/H1N1	42.89	35.76	7.14 (20.0)	0.002
A/H3N2	105.40	88.25	17.19 (19.5)	0.01
B	34.87	30.73	4.17 (13.6)	0.03

Meta-analysis 20 studies-1979 adults

Short-term probiotic supplementation enhances cellular immune function in healthy elderly: systematic review and meta-analysis of controlled studies

Larry E. Miller^{a,*}, Liisa Lehtoranta^b, Markus J. Lehtinen^b

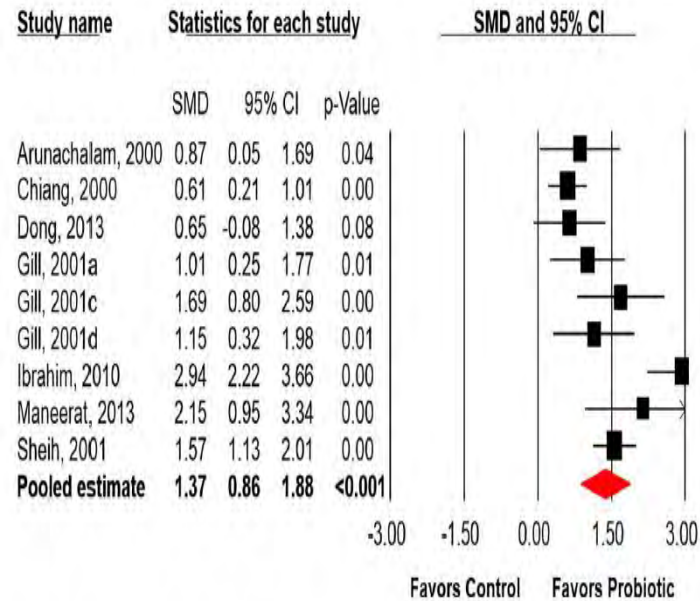


Fig. 2 – Forest plot of PMN phagocytic capacity with consumption of probiotic vs control. Random-effects meta-analysis using the SMD statistic. The SMD of probiotics relative to control is plotted for each study. A pooled estimate of SMD (diamond) and 95% CI (diamond width) summarizes the effect size. Effects to the left of 0 indicate greater PMN phagocytic capacity with control; effects to the right of 0 indicate greater PMN capacity with probiotics. When the horizontal bars of an individual study, or the pooled diamond width, cross 0, the effect is not significantly different. The pooled SMD was 1.37 (95% CI: 0.86-1.88, $P < .001$), representing a large treatment effect in favor of probiotics.

What we eat and the physical activity we perform are "probably the most powerful and flexible tools we have to achieve chronic and systemic modulation of the aging process..."

However, the implementation of preventive strategies has lagged behind knowledge

The problem is not what we don't know, but what we know and then fail to implement

Outline

- UN Decade of Healthy Aging:
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- **Main goals of DHA and why better nutrition and physical activity fit into these goals**

Successful examples: American Association of Retired Persons (AARP)

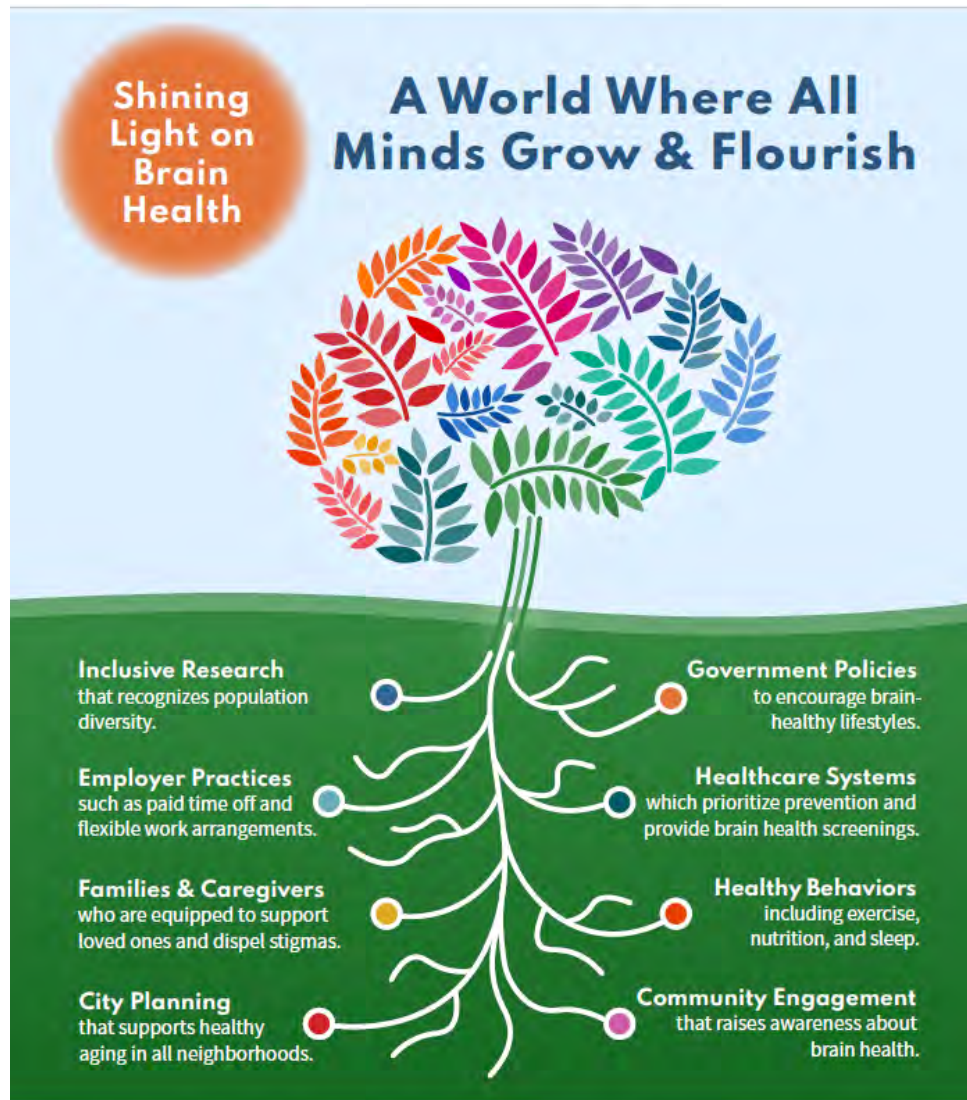
Global Council on Brain Health
A COLLABORATIVE FROM **AARP**

Sustaining Brain Healthy Behaviors

Simple Steps to Benefit Your Brain Health

6
PILLARS OF BRAIN HEALTH

- BE SOCIAL**
Keep in touch with friends & family, don't let yourself get isolated.
- ENGAGE YOUR BRAIN**
Find ways to stimulate your thinking, explore new interests and hobbies.
- MANAGE STRESS**
Practice relaxation, adopt a stable daily schedule.
- ONGOING EXERCISE**
Move throughout the day, target 2.5 hours a week of moderate physical activity.
- RESTORATIVE SLEEP**
Get 7 to 8 hours of restful sleep every day.
- EAT RIGHT**
Choose a nutritious, heart-healthy diet of fish, veggies, and fruits.



Individual choices are made in a broader social and environmental context, which requires a multidimensional approach to encourage a healthy lifestyle: it is therefore not just an individual responsibility, but a collective one

Learn more at GlobalCouncilonBrainHealth.org
Building Better Brain Health for All People: GCBH Recommendations on Removing Barriers and Improving Opportunities Around the World
Contact: GCBH@aarpp.org | DOI: doi.org/10.26419/pia.00107.002

Global Council on
Brain Health
A COLLABORATIVE FROM **AARP**



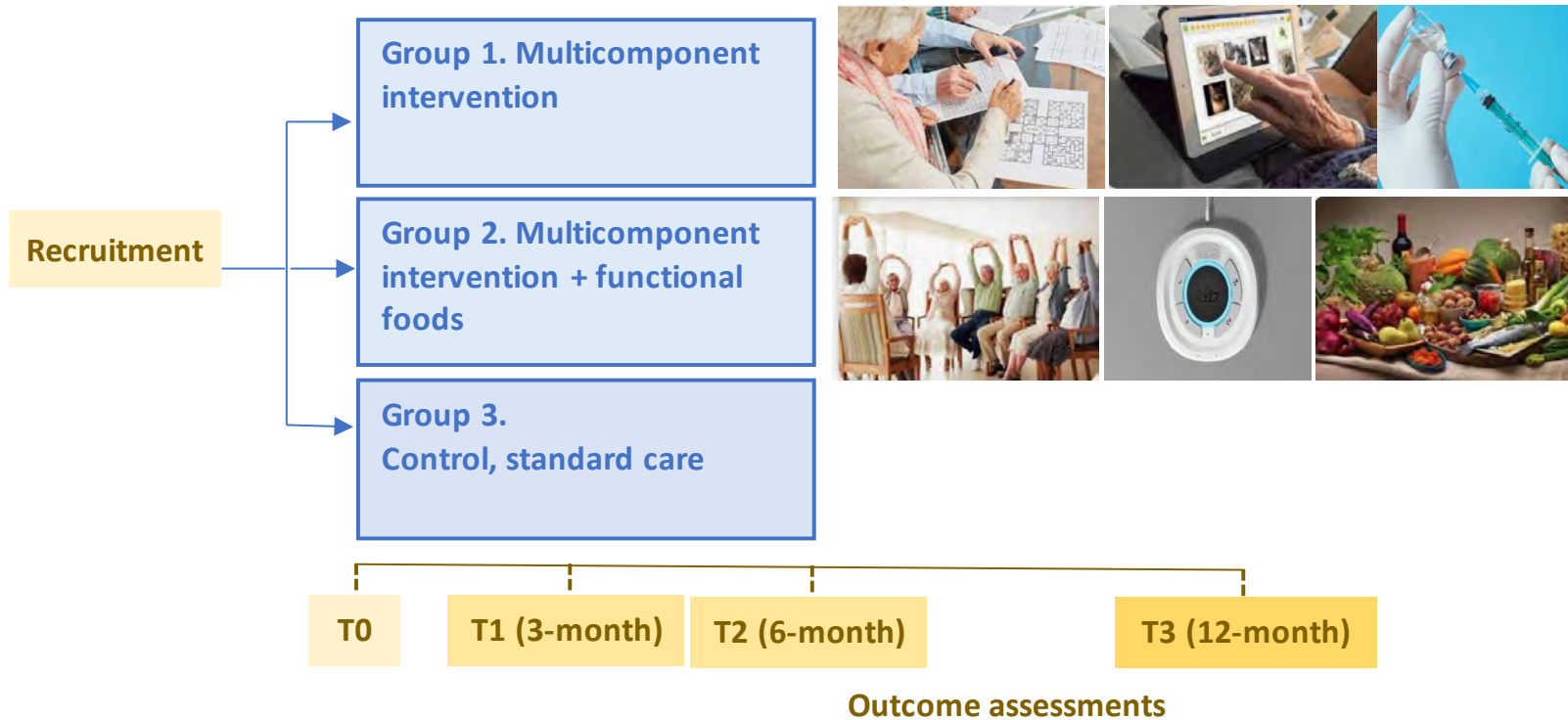
**Interventions and technologies to reduce the
burden of age-related diseases, disorders
and disabilities**

**WP3. Multicomponent interventions
to improve functional and cognitive wellbeing
in older adults in Long Term Care Facilities**

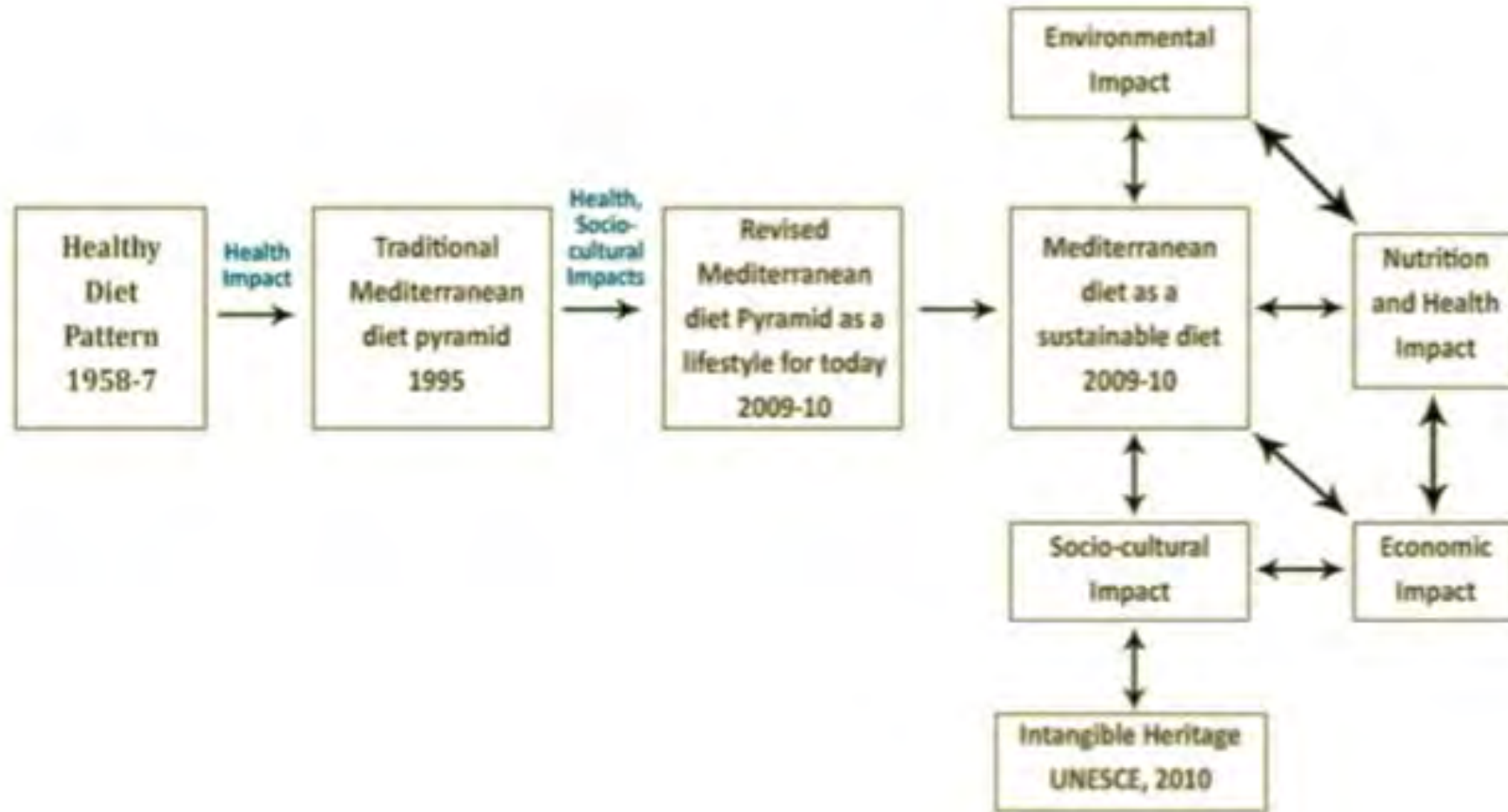
PI: Stefania Maggi (CNR-IN)



WP3: Interventions and outcomes assessment



Mediterranean diet: from a healthy diet to a sustainable dietary pattern



Sustainability thematic areas

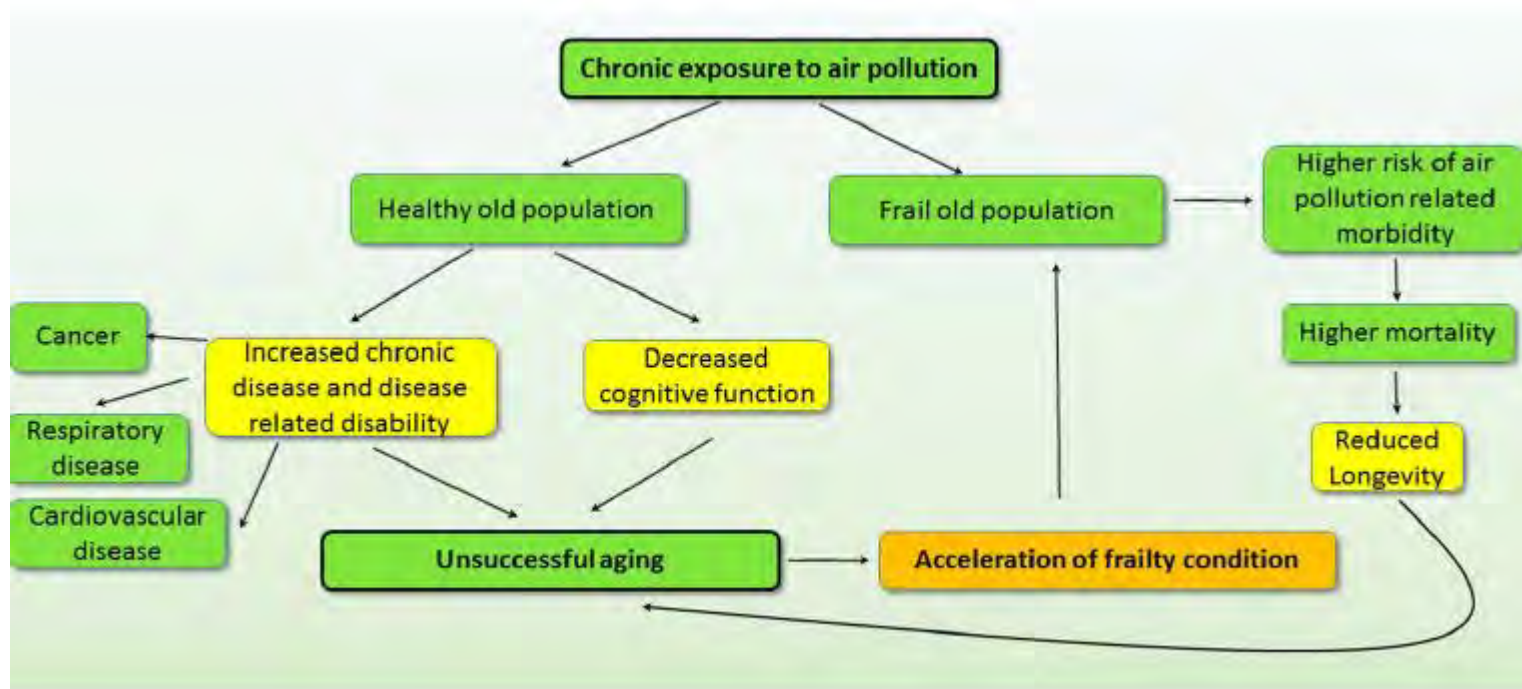
(1) nutrition, health

(2)

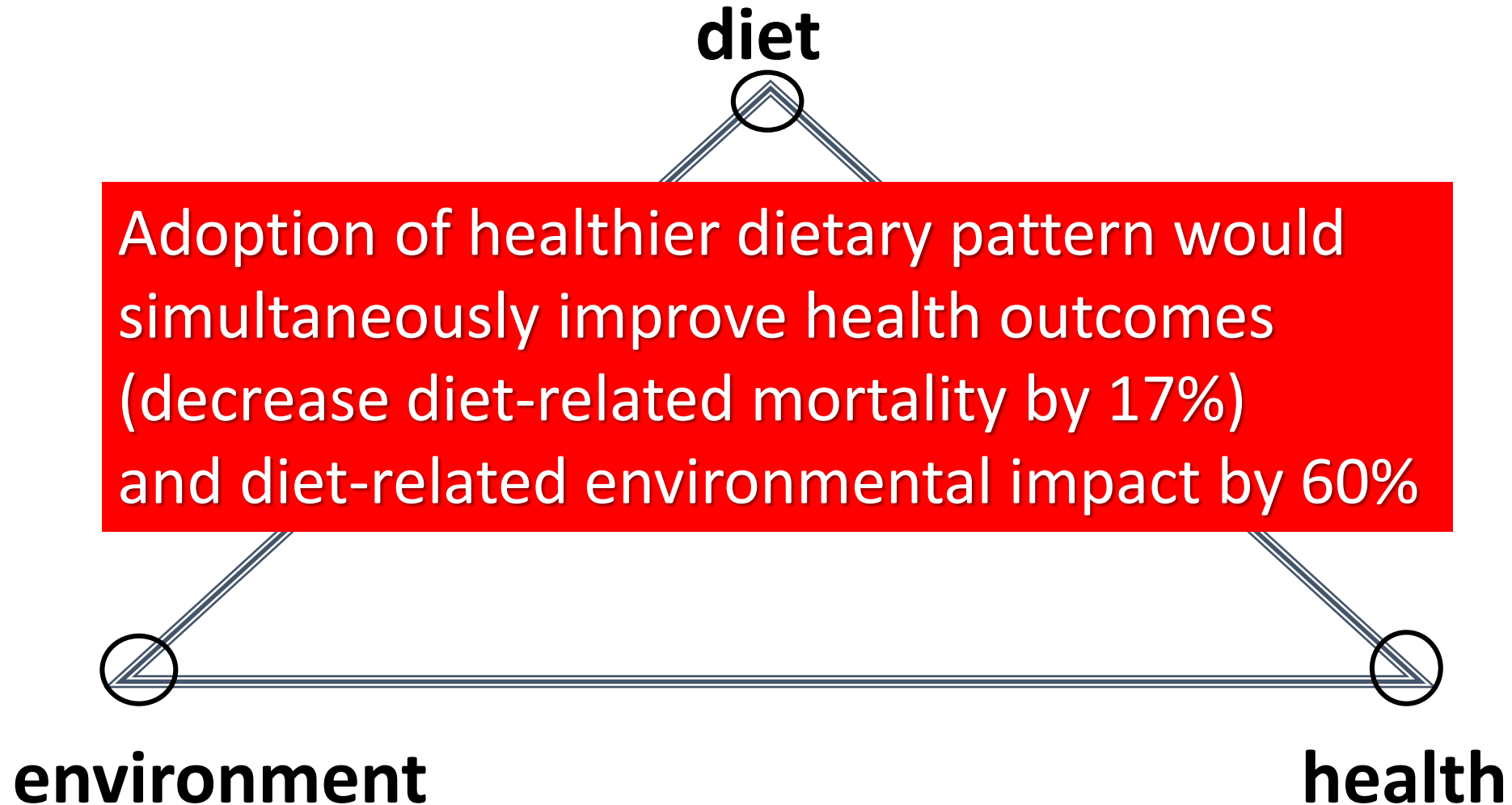
The assessment and development of sustainable diet models requires awareness among consumers, producers, and governments that agriculture, food, nutrition, health, culture, environment, and sustainability are strongly interdependent

Mediterranean diet is more environmentally sustainable (**lower environmental impact**) than average consumption patterns mainly because of its smaller meat portions and emphasis on plant-based dietary diversity.

Potential pathways by which chronic exposure to air pollution might lead to unsuccessful aging and subsequent frailty.



The diet, health, and environment Trilemma



Conclusions

The promotion of a healthy lifestyle, and in particular of a Mediterranean dietary model, which includes regular physical activity, represents an ecological model of promoting individual health and public health

- Guidelines for improving nutritional status and promoting physical activity have been published by governments in most industrialized countries since the early 1900s
- Diet and physical activity remain the most effective and most malleable means we have to prevent major chronic diseases and disability
- Efforts to change lifestyle must be multidisciplinary and coordinated across medical, sociological, political and economic fields