Nutrition and Aging

Christine Zoumas, MS, RD

Department of Family and Preventive Medicine and Public Health

UC San Diego Moores Cancer Center

The Healing Foods Program

UNIVERSITY of CALIFORNIA, SAN DIEGO

MEDICAL CENTER MOORES CANCER CENTER

Definition of Nutrition

The process by which the human body utilizes food for the maintenance of health, for growth, and for the normal functioning of every organ and tissue

Nutrient Needs in Aging

- Physiological and metabolic changes normally associated with aging

- Presence of or risk for diseases associated with aging

Nutrient Categories

- Classification based on chemical grouping
  - Water
  - Carbohydrate
  - Protein
  - Lipids
  - Vitamins
  - Minerals
- Classification based on quantity needed
  - Macronutrients (carbohydrate, protein, lipids)
  - Micronutrients (minerals and vitamins)

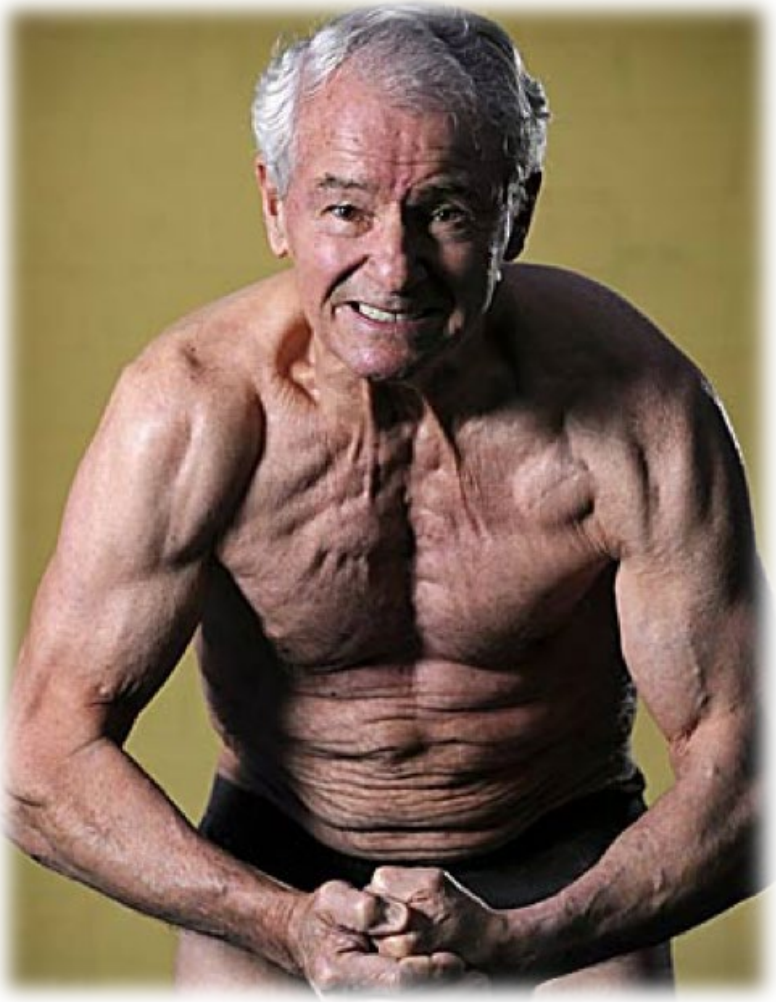
Energy (kcals)

Carbohydrates	Proteins	Lipids (Fat)	Alcohol
			
4 kcal/gram	*4 kcal/gram*	*9 kcal/gram*	*7 kcal/gram*

Energy Requirements

Determined by:

- Age
- Gender
- Weight
- Height
- Level of Physical Activity

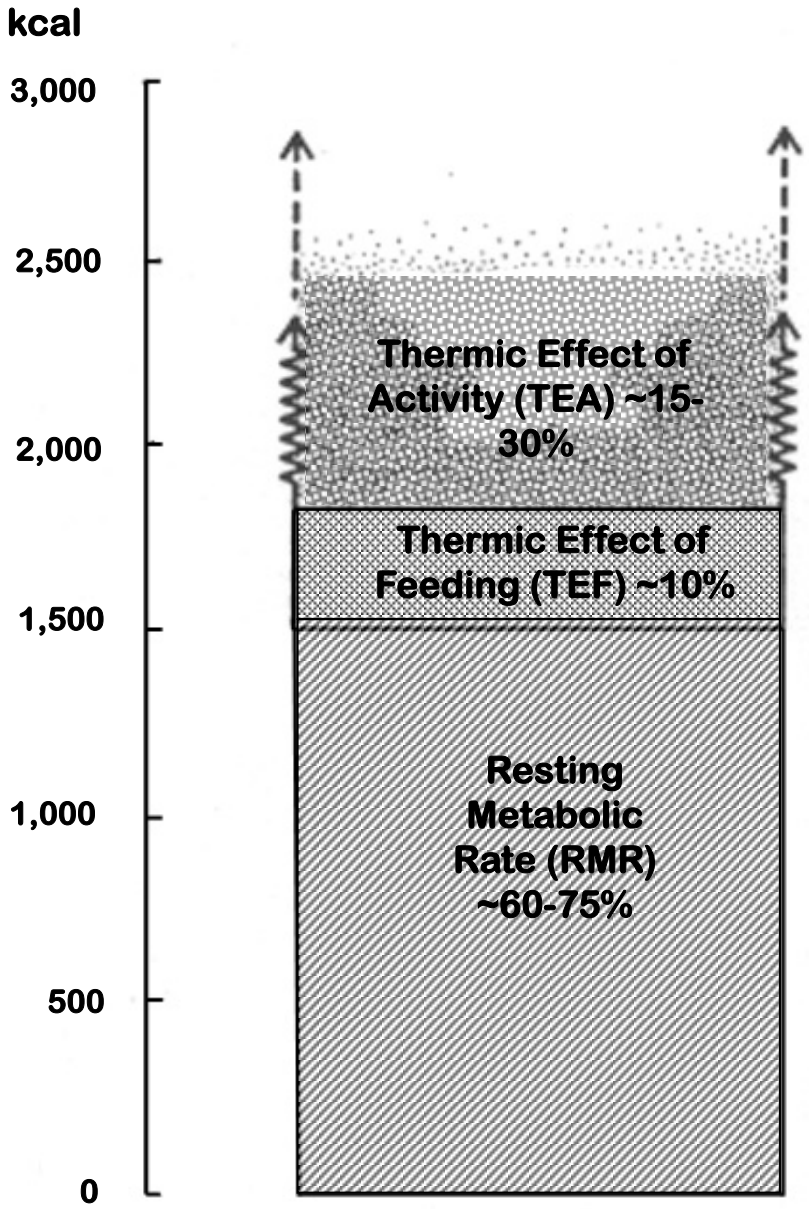


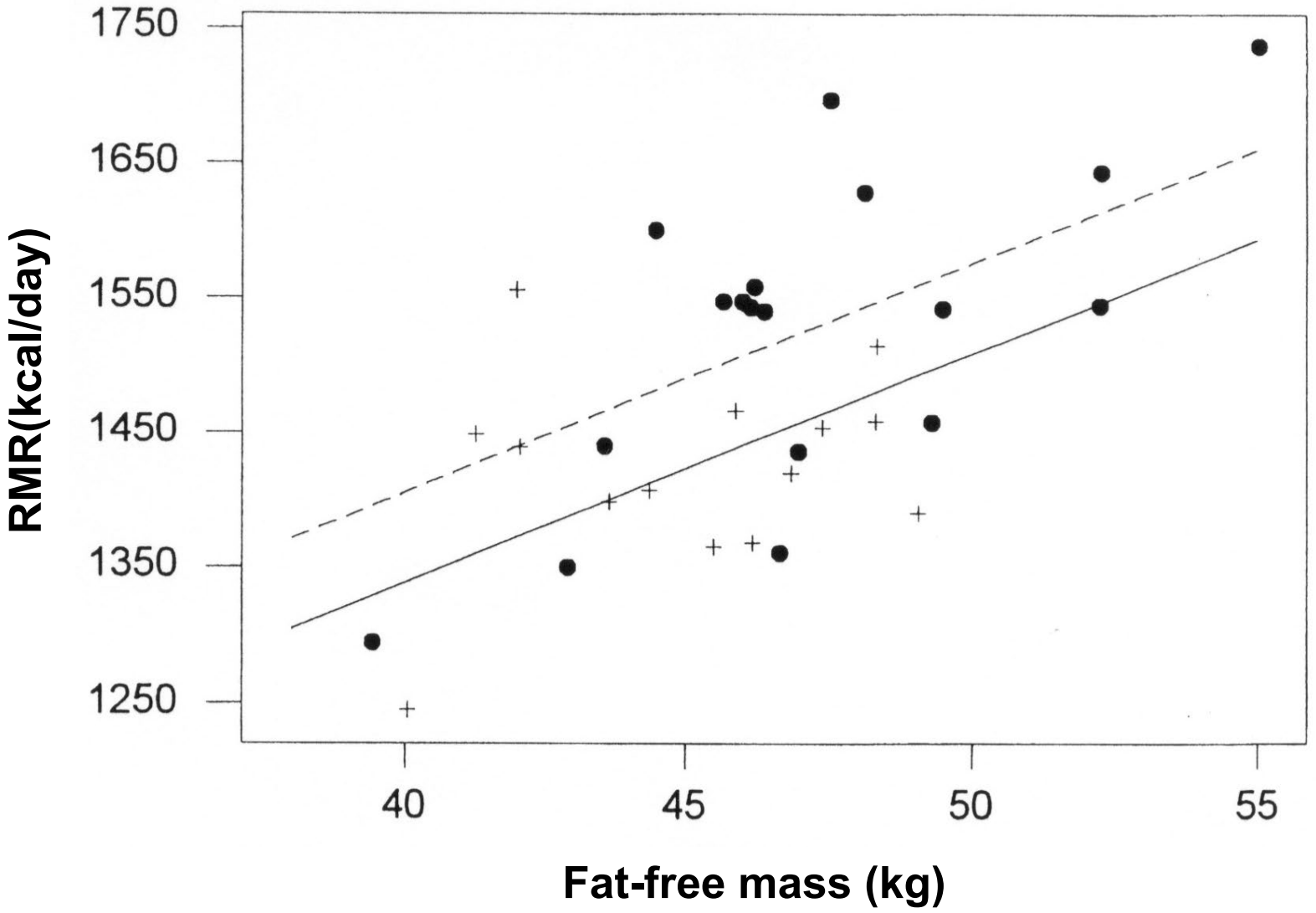
Average Total Energy Expenditure from Doubly-Labeled Water Measurements

Age (yrs)	Females: TEE (kcal/day)	Males: TEE (kcal/day)
13-17	2727	3373
18-29	2488	3301
30-39	2392	3421
40-64	2345	2751
65-74	2057	2637
>75	1459	2201

Energy Balance

24-Hour Energy Expenditure





Gilliant-Wimberly et al. *J Am Diet Assoc*. 2001;101:1181

Protein Needs

General protein requirements

- RDA: 0.8 g/kg body weight for adults

Protein and Aging Controversy

Current evidence may indicate the RDA may be inadequate

Declining protein intake may contribute to the frailty syndrome

Protein Metabolism in Aging

- Extrinsic factors that cause skeletal muscle depletion
  - Insufficient protein intake
  - Skeletal muscle inactivity
- Changes in the sensitivity of skeletal muscle to branched-chain amino acids
- Threshold of amino acids necessary to stimulate skeletal muscle protein synthesis is increased with aging

More Protein

- Proposed RDA for elderly: 1.0-1.2 g/kg for optimal skeletal muscle and bone health
- Regular aerobic exercise is beneficial, due to effects on skeletal muscle insulin sensitivity
- Protein supplementation

Dietary Fat

Requirements

- 12-19 g/day essential fatty acids: *n*-6 linoleic acid, *n*-3 α-linolenic acid (ALA, precursor of eicosapentaenoic acid [EPA] and docosahexaenoic acid [DHA])

- 2015 Dietary Guidelines: type is the issue

Omega-3 Fatty Acid

- albacore tuna
- mackerel
- salmon
- walnuts
- canola
- soybeans
- flaxseed

Omega-3 Fatty Acids

Current evidence

- Higher blood DHA concentration linked to better visual memory, abstract skills, and cognitive function in adults
- DHA supplements at a dose achievable with food sources (0.3-1.7 g/day) may have positive effects in adults with mild cognitive impairment

Walnuts

- Rich in ALA, anti-inflammatory compounds
- Rodent model studies and PREDIMED suggest positive effects on age-related cognitive decline

Mediterranean Diet

High Intake

- Olive oil
- Fruit
- Nuts
- Vegetables
- Cereals

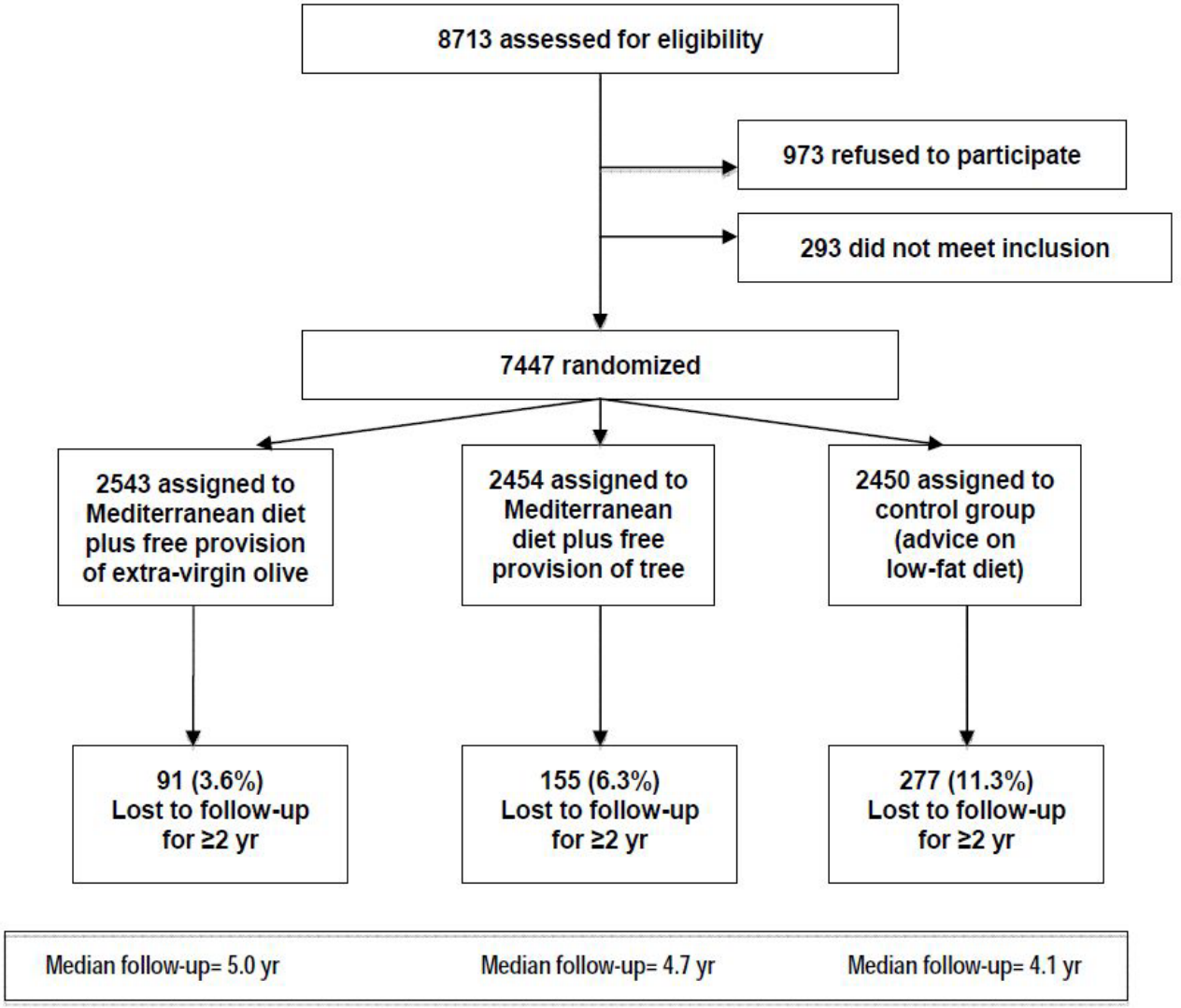
Moderate Intake

- Fish
- Poultry

Low Intake

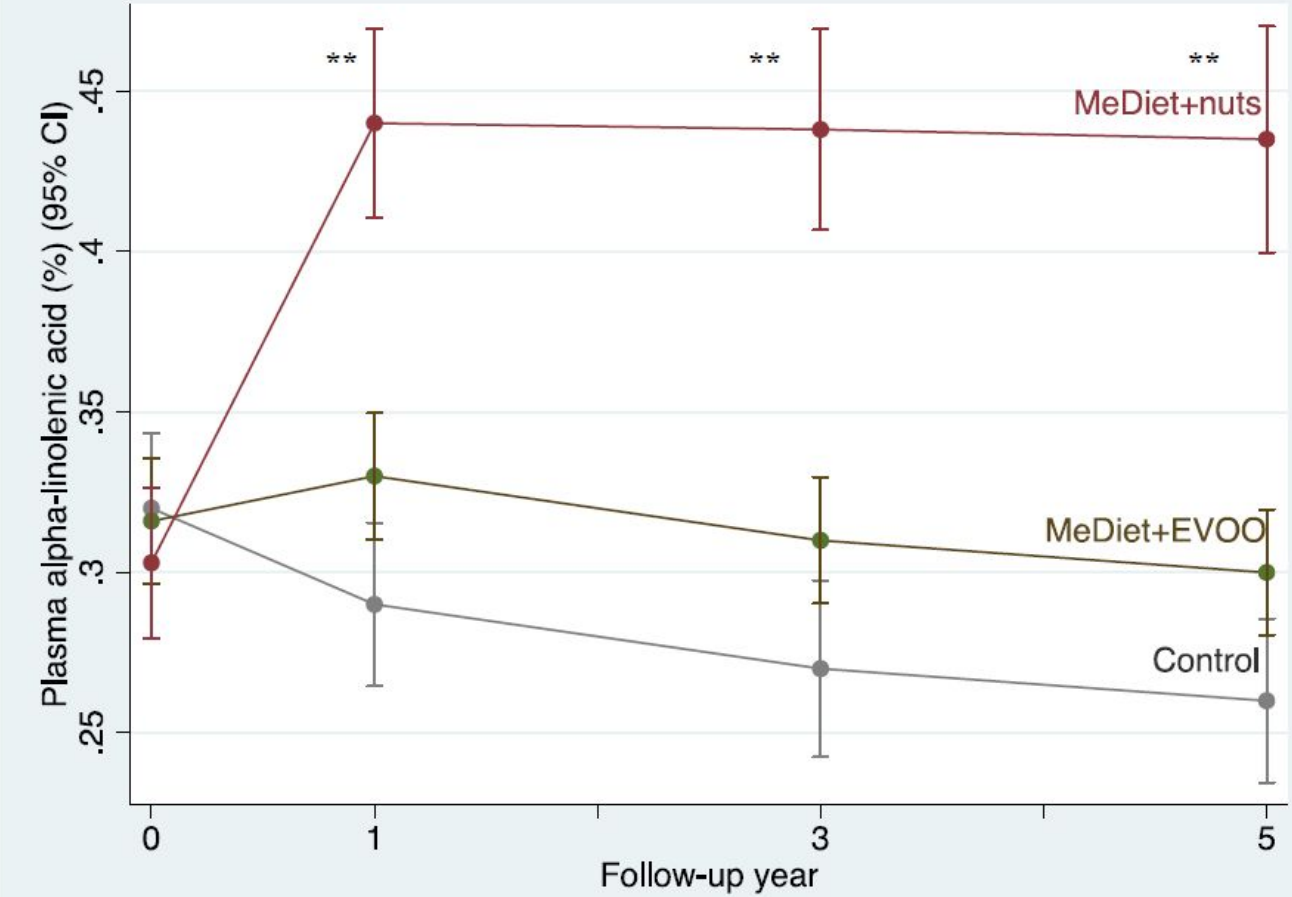
- Red meat
- Processed meats
- Sweets
- Alcohol

PREDIMED Trial



PREDIMED Study. *NEJM* 2013

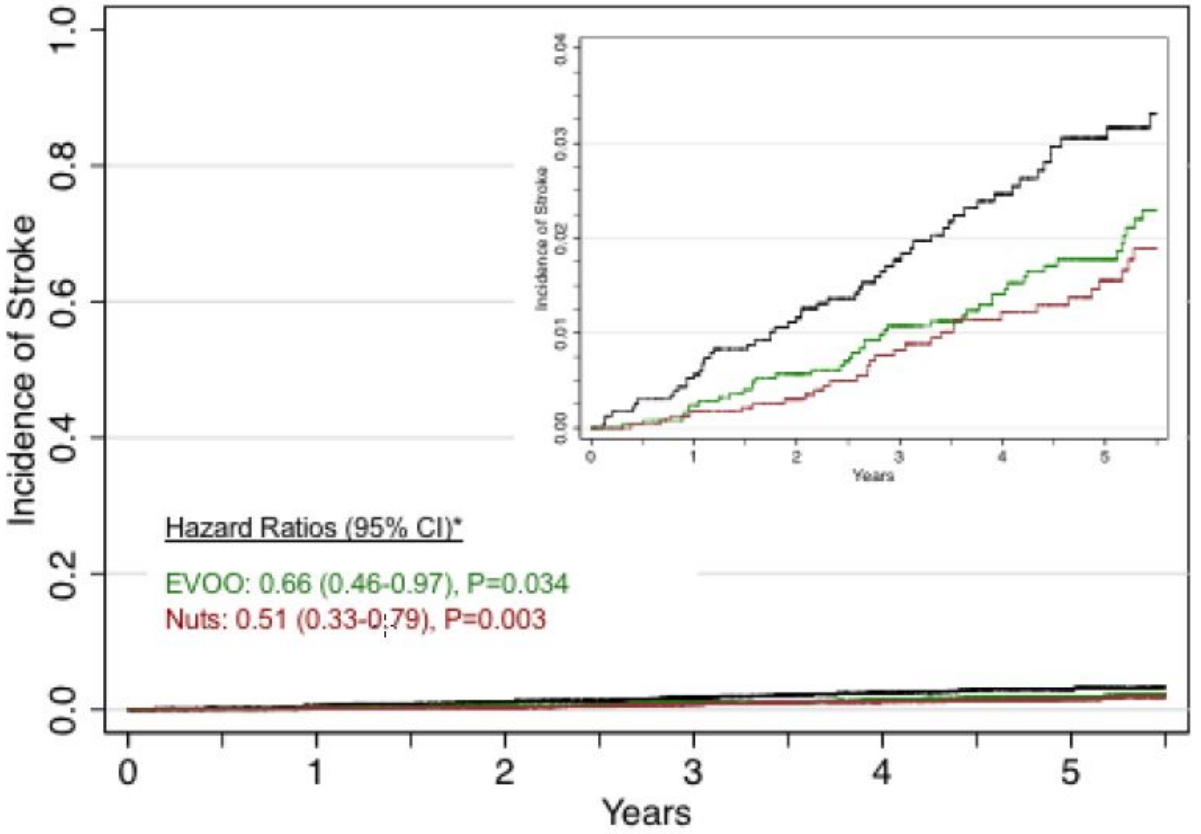
Figure S5. Plasma Alpha-Linolenic Acid (%) in the Three Arms of the Trial (95% Confidence Intervals) at Baseline and at 1, 3 and 5 Years of Follow-up (N = 375).



**P<0.001 from baseline by paired t-test.
MeDiet, Mediterranean diet; EVOO, extra-virgin olive oil.

Figure S6. Kaplan-Meier Estimates of Incidence of each Separate Component of the Primary End-point (cont.).

B) Stroke



Number at risk

Control group	2450	2268	2020	1583	1268	946
MeDiet+EVOO	2543	2486	2320	1987	1687	1310
MeDiet+Nuts	2454	2343	2093	1657	1389	1031

PREDIMED Study. *NEJM* 2013

PREDIMED Effects on Depression and Age-Related Cognitive Decline

- After 3 years, participants who were on the Mediterranean diet supplemented with nuts had substantially improved concentrations of plasma brain-derived neurotrophic factor (BDNF)

- Subset assessed for neuropsychological testing
  - Higher intakes of olive oil, coffee, walnuts and wine improved both memory and overall cognitive functions
  - Intake of walnuts, among all nuts, was associated with substantial improvements in working memory

Saturated Fat & Trans Fatty Acids and Risk for Dementia

Dietary fat, especially **saturated fat** and **trans fatty acids**, could impact the brain through the effects on cardiovascular conditions

Current evidence

Laboratory studies suggest several biological mechanisms that could link saturated fat and trans fatty acids to increased risk for dementia

Solid Fats (Saturated Fats)

- Foods high in saturated fatty acids are usually solid at room temperature.
- As a general guideline, harder and more stable fats are more saturated
- Source is usually fat from animal products, such as butter, ice cream, whole milk & meats
- Oils include coconut, palm and palm kernel oil

Saturated Fatty Acids and Cardiovascular Disease Risk

- **Saturated fatty acids** (SFA), 5-6% of total energy
- There is a dose-response relationship between SFA and LDL-C.
  - Diets high in SFA raise, and reduction of SFA lowers, LDL-C levels.
- Current US average SFA intake: 11% of total energy intake.

Trans-Fatty Acids

Food manufactures and restaurants/fast foods are moving to using oils and preparation methods to eliminate the formation of trans-fatty acids in foods.

Nutrition Facts

8 servings per container
Serving size **2/3 cup (55g)**

Amount per serving
Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Trans Fatty Acids and Cardiovascular Disease Risk

- Trans fatty acids raise serum LDL-C levels.
- The recommendation is to keep trans FA as low as possible.
- *The average intake was estimated at 2.7% prior to labeling requirement (in 2006), now intakes are shifting lower*.

Water Requirements

Adequate intake = 2.7 - 3.7 L/day (9 to 12.5 cups of fluids per day)

Fluid Sources

- Drinking water
- Beverages
- Moisture in foods

Hydration Challenges

- Physiologic changes associated with aging
- Sensation of thirst, and reduced appetite
- Problems with access to fluids
- Cognitive disorders

Vitamins

Fat-soluble

- Vitamin A
- **Vitamin D**
- Vitamin E
- Vitamin K

Water-soluble

- Thiamin
- Riboflavin
- Niacin
- **Folate**
- **Vitamin B_{12}**
- Vitamin B_6
- Vitamin C
- Biotin
- Pantothenic acid

Vitamin B12

- Increased prevalence of atrophic gastritis with hypochlorhydria in association with aging, which limits the bioavailability of the protein- and peptide-bound vitamin B12 as it occurs in food
- Deficiency is associated with impaired neuropsychiatric functions and dementia

Natural Sources

- Eggs
- Meat
- Poultry
- Shellfish,
- Milk
- Milk products

Fortified Foods

- Grain products
- Cereals

Supplements

Folate

High prevalence of subclinical folate deficiency in older adults

Low folate status is associated with cognitive impairment and dementia in older adults

- No consistent evidence that supplementation improves cognitive function or slows cognitive decline (studies with longer follow-up are needed)

Vitamin D

RDA (600 IU for 51-70 years, 800 IU for >70 years)

Vitamin D

Food Sources:

- Fatty fish such as salmon and tuna
- Cheese and egg yolks
- Mushrooms exposed to UV light
- Milk in the US is fortified
- Fortified products

Note that vitamin D has adverse effects at high doses, so amounts should not exceed the Tolerable Upper Limit (4000 IU)

Minerals and Trace Elements

Minerals

- Potassium (K)
- Sodium (Na)
- Chloride (Cl)
- **Calcium (Ca)**
- Phosphorus (P)
- Magnesium (Mg)

Trace elements

- **Iron (Fe)**
- Zinc (Zn)
- Manganese (Mn)
- Copper (Cu)
- Fluoride (F)
- Iodine (I)
- Chromium (Cr)
- Molybdenum (Mo)
- Selenium (Se)

Calcium

RDAs

- 51-70 years: 1000 mg/day for men and 1200 mg/day for women
- 70 years and older are 1200 mg/day for men and women

Food Sources Include: Dairy products, including both low-fat and nonfat products, are excellent sources, and numerous food products (e.g., juice, bread, cereals) are now fortified with calcium

Iron

- Requirements are considerably lower for women age 50 and older (8 mg/day)
- Potential pro-oxidant effects of excess iron are a concern because this may increase the risk for cardiovascular disease
- Iron supplementation not recommended for older adults unless treating iron-deficiency anemia

Dietary Factors and Risk and Progression of Alzheimer's Disease

- Nutritional factors could affect the process of neurodegeneration through several mechanisms
  - Altering oxidative stress
  - Improving vascular function
  - Reducing inflammation
- Although some of the evidence is supportive of the potential of dietary factors to be protective, current data do not support specific dietary recommendations

Healthy Dietary Pattern

Dietary Patterns

A diet high in **processed and red meat, potatoes, refined grains, and sugar sweetened beverages and foods.**

A diet that contains a **variety of vegetables and fruits, whole grains, and fish or poultry or that is lower in red and processed meats.**

The Mediterranean Diet and Alzheimer's Disease

Longitudinal prospective studies have suggested that the Mediterranean diet is protective against mild and advanced cognitive impairment, including Alzheimer's disease

Other Health-Promoting Dietary Patterns

DASH Diet

Increased intake of vegetables and fruit (9-12 svg/day), low-fat dairy products (2-3 svg/day), and reduced saturated fat (≤7% of energy) and total fat (≤25% of energy)

New Nordic Diet

High in fruit and vegetables, nuts, whole grains, game, fish and shellfish; also includes dairy products (2 c milk and 1 oz cheese/day), eggs, and beverages


BIZARROCOMIC.BLOGSPOT.COM
2·8·11
Take one a day with tomato and cucumber.
FARMACY
K2

Questions…

czoumas@ucsd.edu