



Azienda
Ospedaliero
Universitaria
Careggi



UNIVERSITÀ
DEGLI STUDI
FIRENZE

Le spezie

Salute, alimentazione e ricerca

Auditorium CTO, Careggi, Firenze



La dieta Mediterranea e le sue spezie nella prevenzione dei tumori

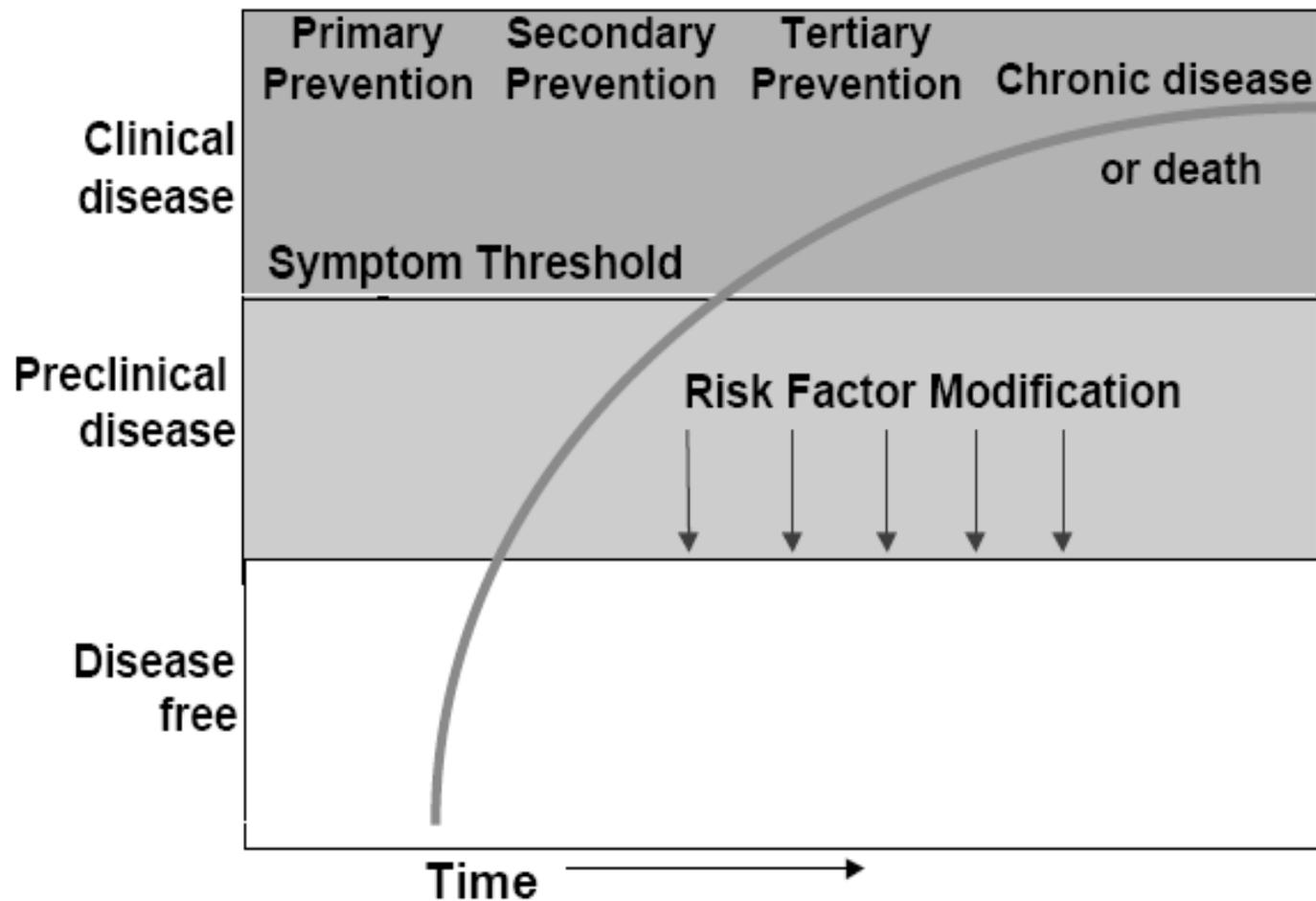


Prof. Francesco SOFI, MD, PhD
Dipartimento di Medicina Sperimentale e Clinica
Università degli Studi di Firenze
SOD Nutrizione Clinica
Azienda Ospedaliero-Universitaria Careggi

Outline

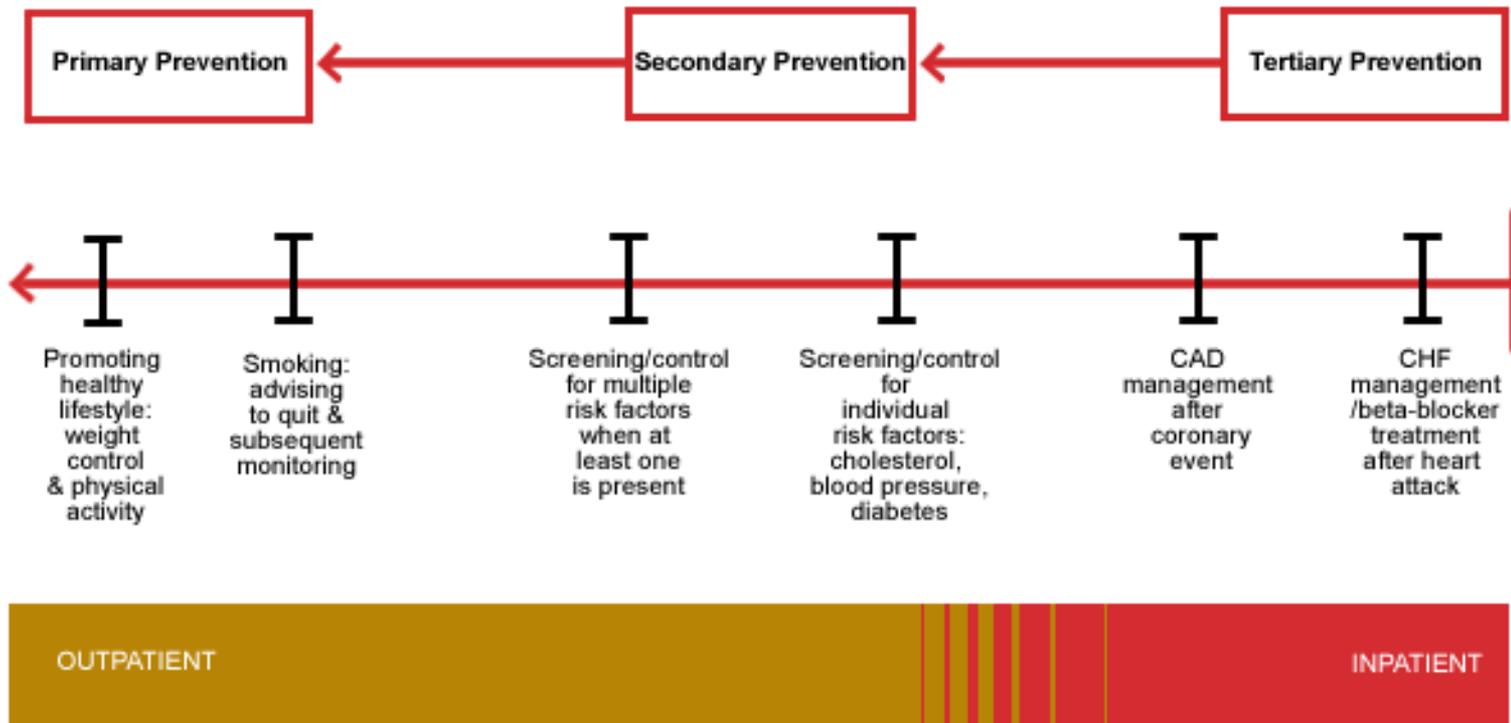
- **Prevenzione**
- **Alimentazione e prevenzione delle neoplasie**
- **Raccomandazioni**
- **Dieta Mediterranea e prevenzione delle neoplasie**
- **Le spezie nella Dieta Mediterranea**

La scommessa della prevenzione



La “NUOVA” scommessa della prevenzione

CVD Care Continuum

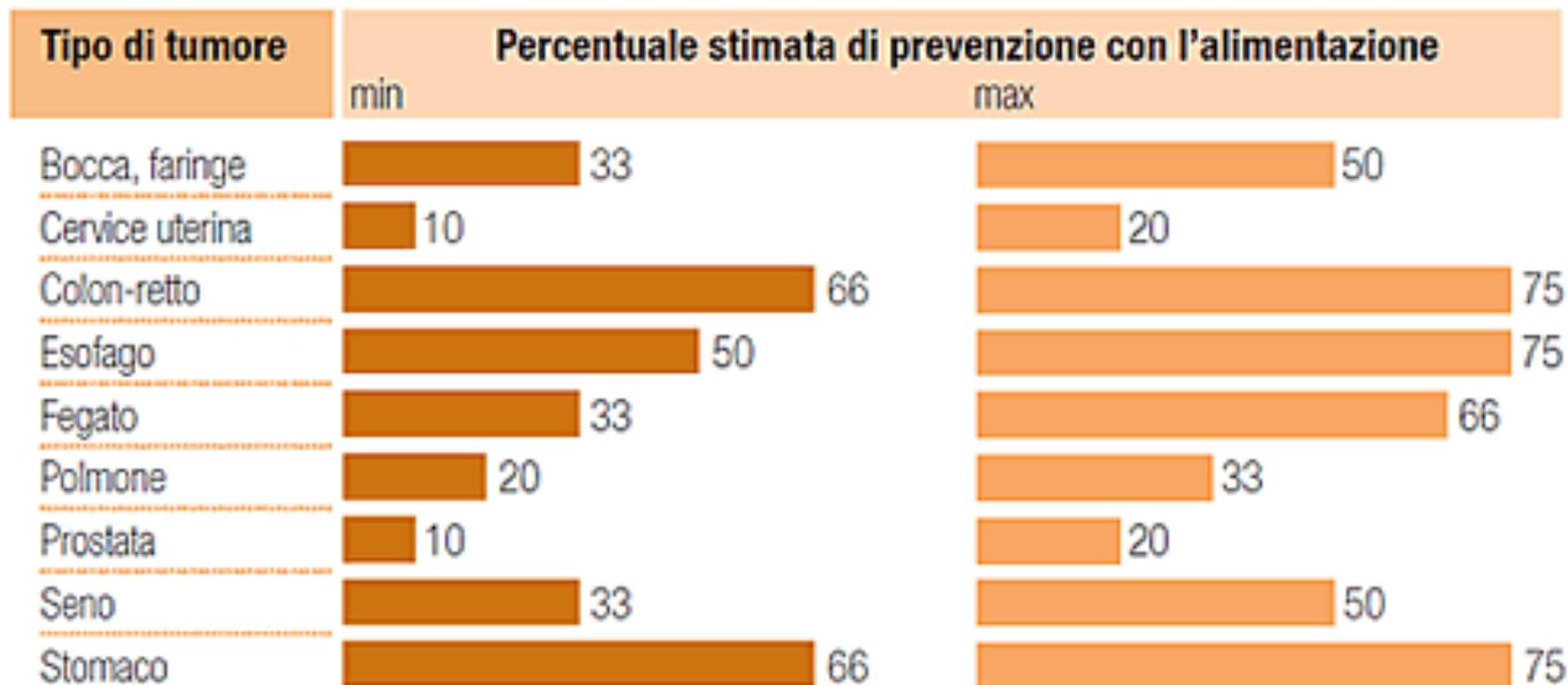


Alimentazione e prevenzione di malattia

Se fossimo in grado di fornire a ciascuno la giusta dose di nutrimento ed esercizio fisico, né in difetto né in eccesso, avremmo trovato la strada per la salute

Ippocrate (460-377 a.c.)

Alimentazione e neoplasie



Fonte: Food, nutrition and prevention of cancer - American Institute for Cancer Research.

Raccomandazioni



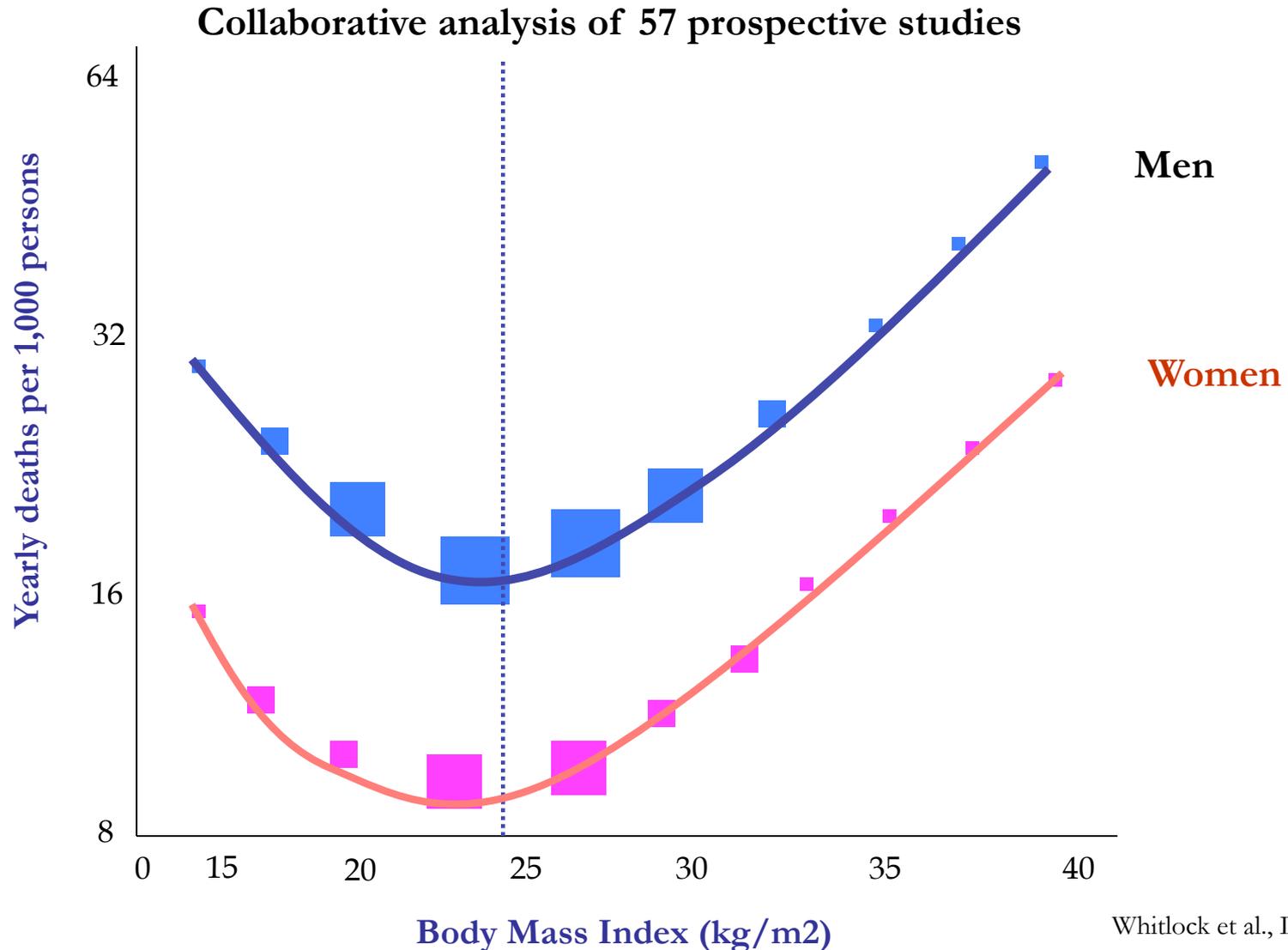


World Cancer Research Fund

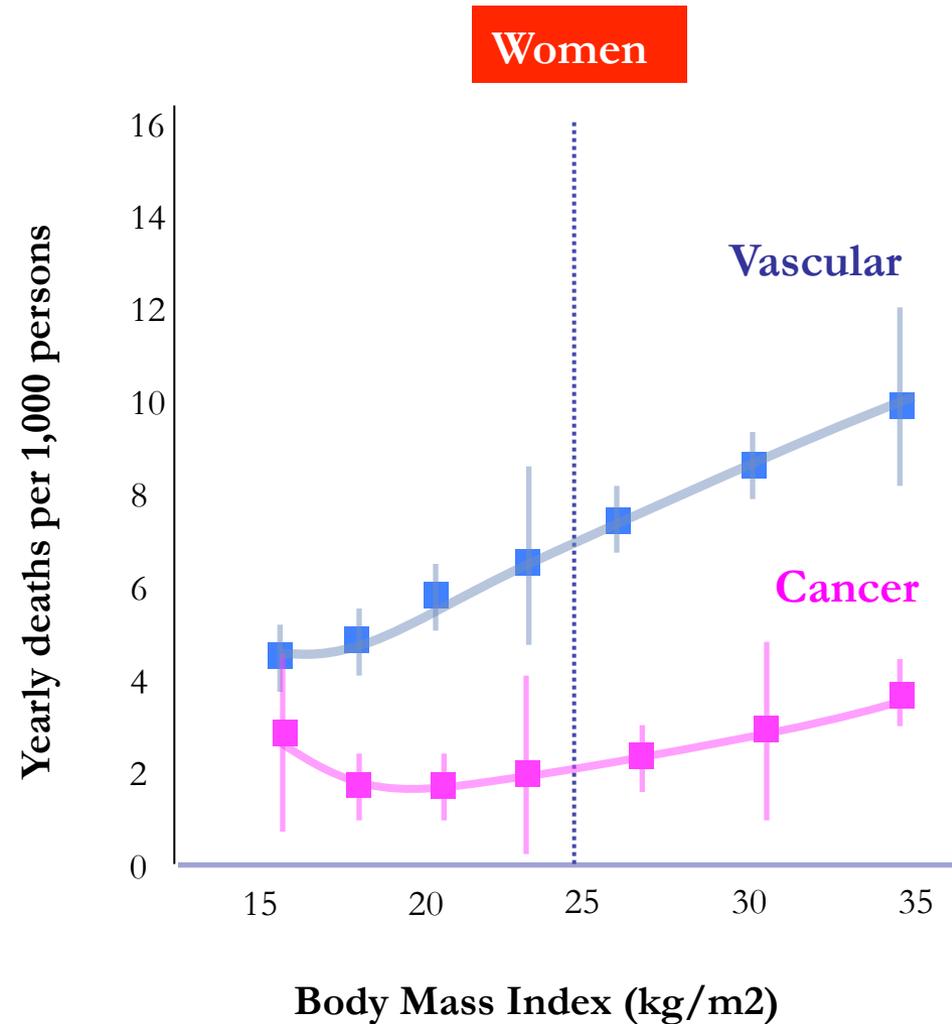
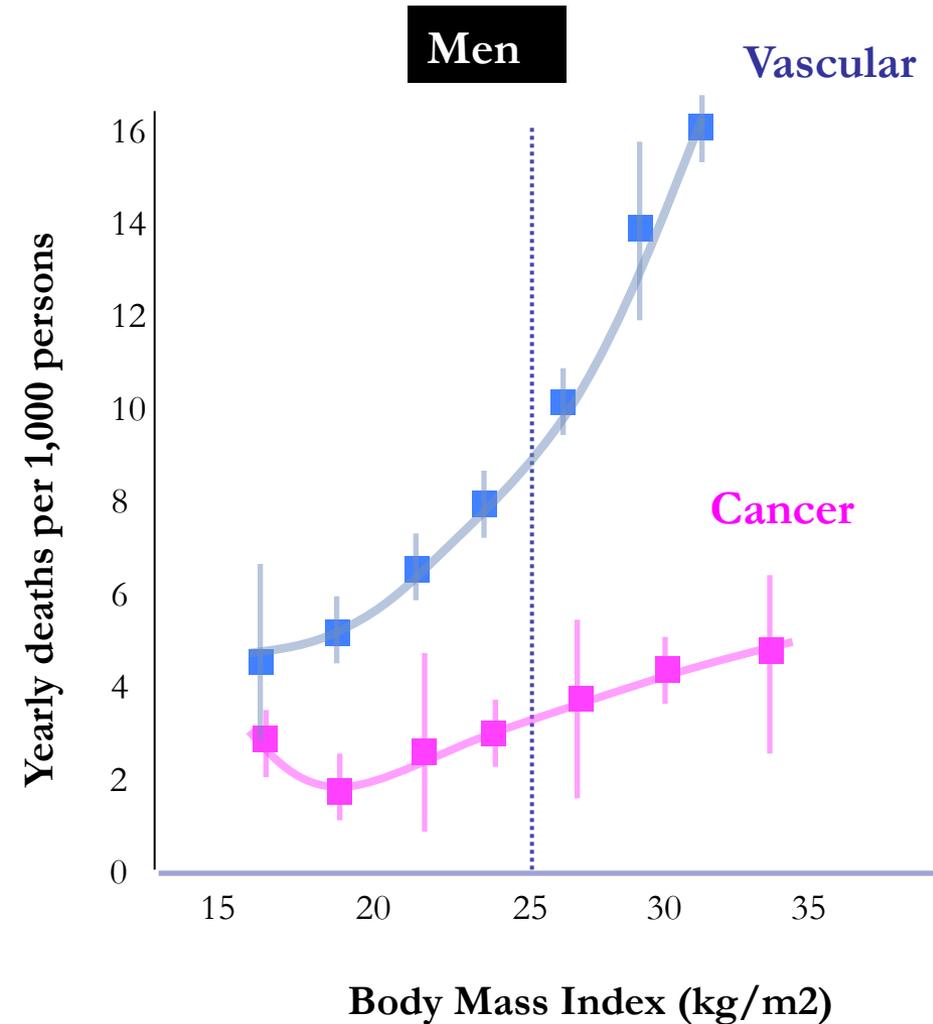


1. Cerca di essere più magro possibile senza diventare sottopeso

BMI and all-cause mortality in 900,000 adults



Mortality rates and in 900,00 adults



Obesità & rischio neoplastico

x 3

Adenocarcinoma esofageo

Carcinoma prostatico

x 2

Tumore pancreas

Cancro colon-retto



X 1.50

Carcinoma mammario
(postmenopausa)

Tumore vescica

x 2-3

Tumore endometriale

x 1.68 nelle F

x 4.52 nei M

Carcinoma epatocellulare

Carcinoma ovarico

Neoplasie
del sistema ematopoietico
(linfoma non-Hodgkin, leucemia e mieloma multiplo)

Neoplasie tiroidee



World Cancer Research Fund



1. Cerca di essere più magro possibile senza diventare sottopeso
2. **Mangia una varietà di frutta e verdura, cereali integrali e legumi**

Frutta e verdura e rischio neoplastico

FRUIT

Breast cancer

Lung cancer

Bladder cancer

Stomach cancer

Colon and rectum

VEGETABLES

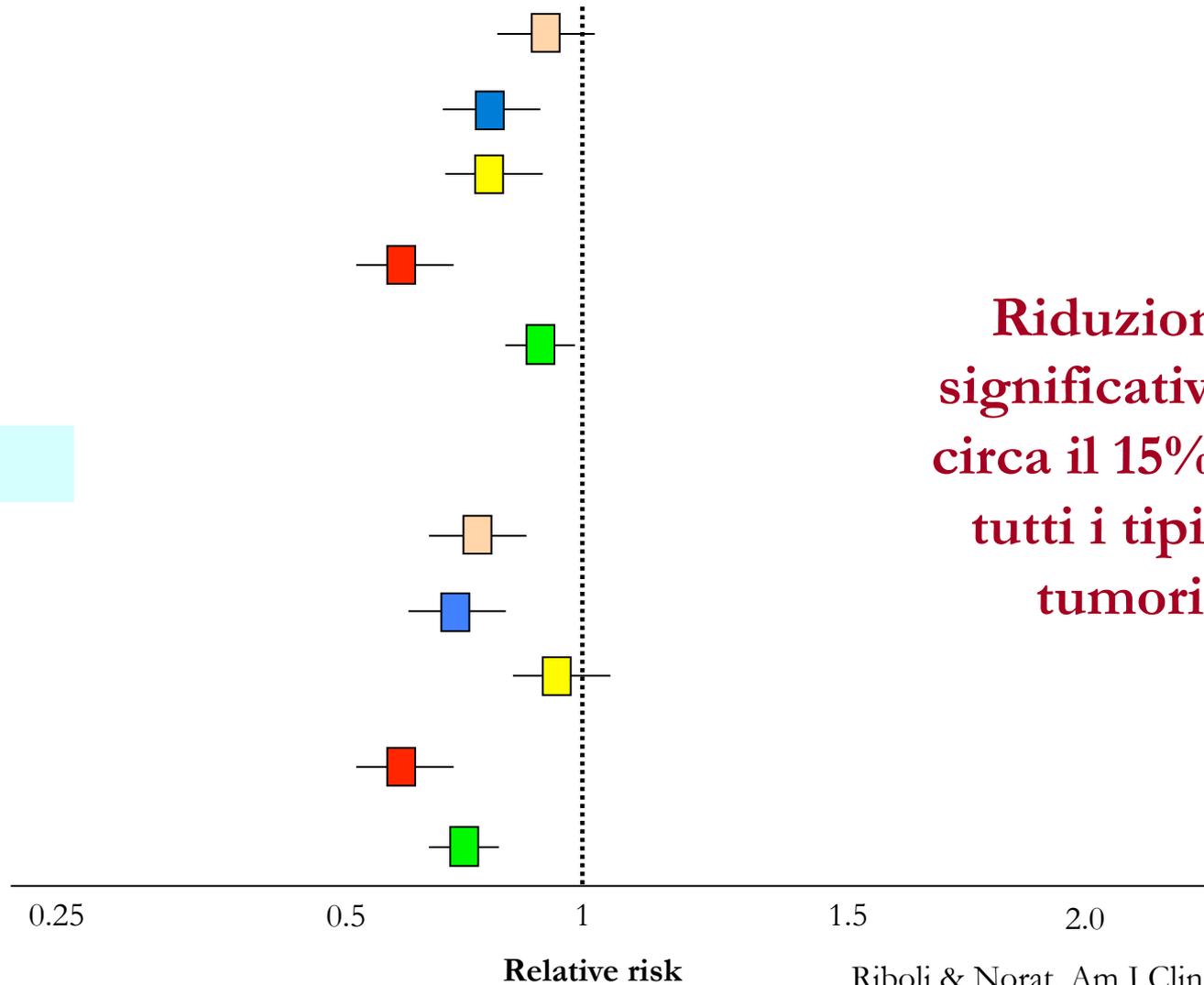
Breast cancer

Lung cancer

Bladder cancer

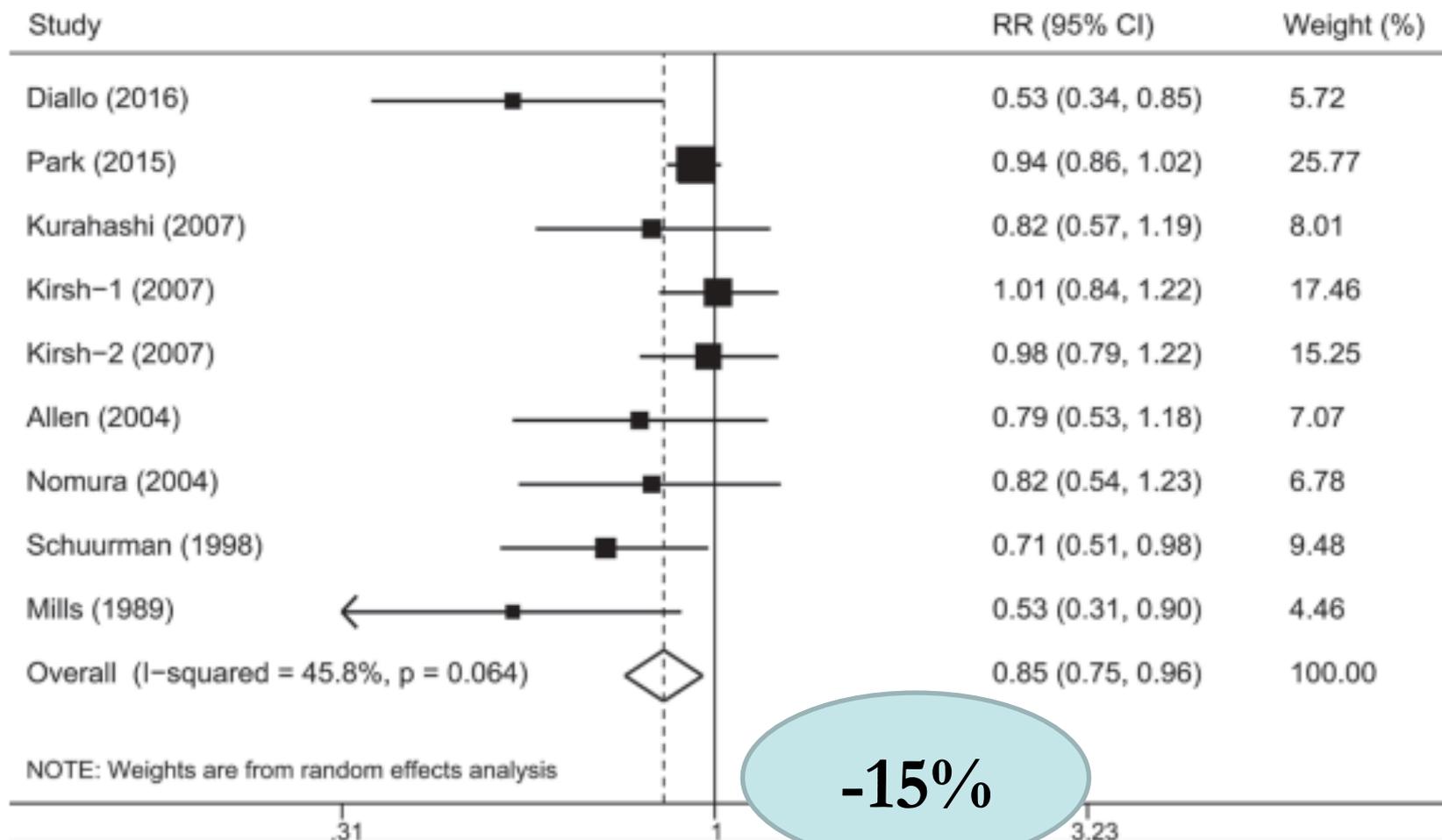
Stomach cancer

Colon and rectum



**Riduzione
significativa di
circa il 15% per
tutti i tipi di
tumori**

Consumo di legumi e carcinoma prostata





World Cancer Research Fund



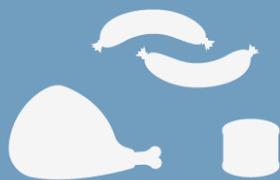
1. Cerca di essere più magro possibile senza diventare sottopeso
2. Mangia una varietà di frutta e verdura, cereali integrali e legumi
3. **Limita il consumo di carne rossa ed evita la carne processata**

Consumo di carne e rischio neoplastico

INSACCATI E CARNI ROSSE → L'ALLARME DELL'OMS

CARNE LAVORATA

SALUMI - INSACCATI
CARNE CONSERVATA



GRUPPO 1 - contiene cancerogeni certi

CARNE ROSSA

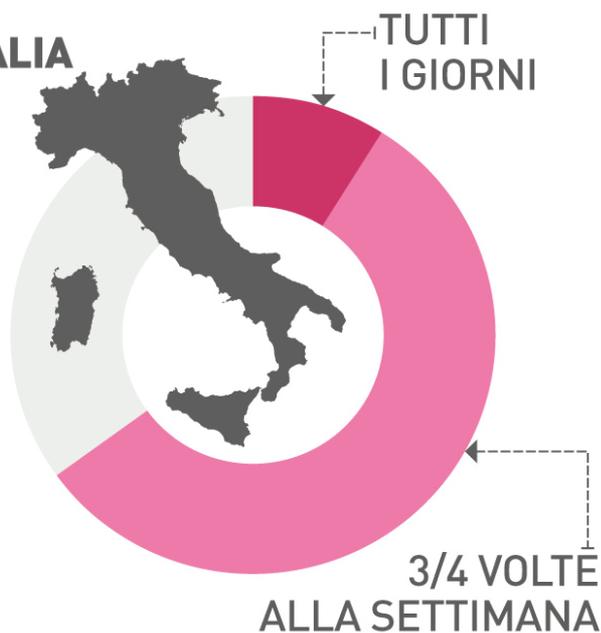
AGNELLO - PECORA - CAPRA
MANZO - VITELLO
CAVALLO - MAIALE



GRUPPO 2A - cancerogeni probabili

IL CONSUMO DI CARNE IN ITALIA

(FONTE: AIOM 2010)



**CANCRO
COLON-RETTO**
55.000 diagnosi
nel 2013
IN ITALIA

ASSUMERE
UNA PORZIONE
DI 50 GRAMMI
DI CARNE LAVORATA
AL GIORNO
AUMENTA IL RISCHIO
DI CONTRARRE
IL CANCRO
DEL 18%

+18%

IL CONSIGLIO

Gli oncologi
per il momento
sono prudenti;
il consiglio
è di consumare
queste carni
con moderazione

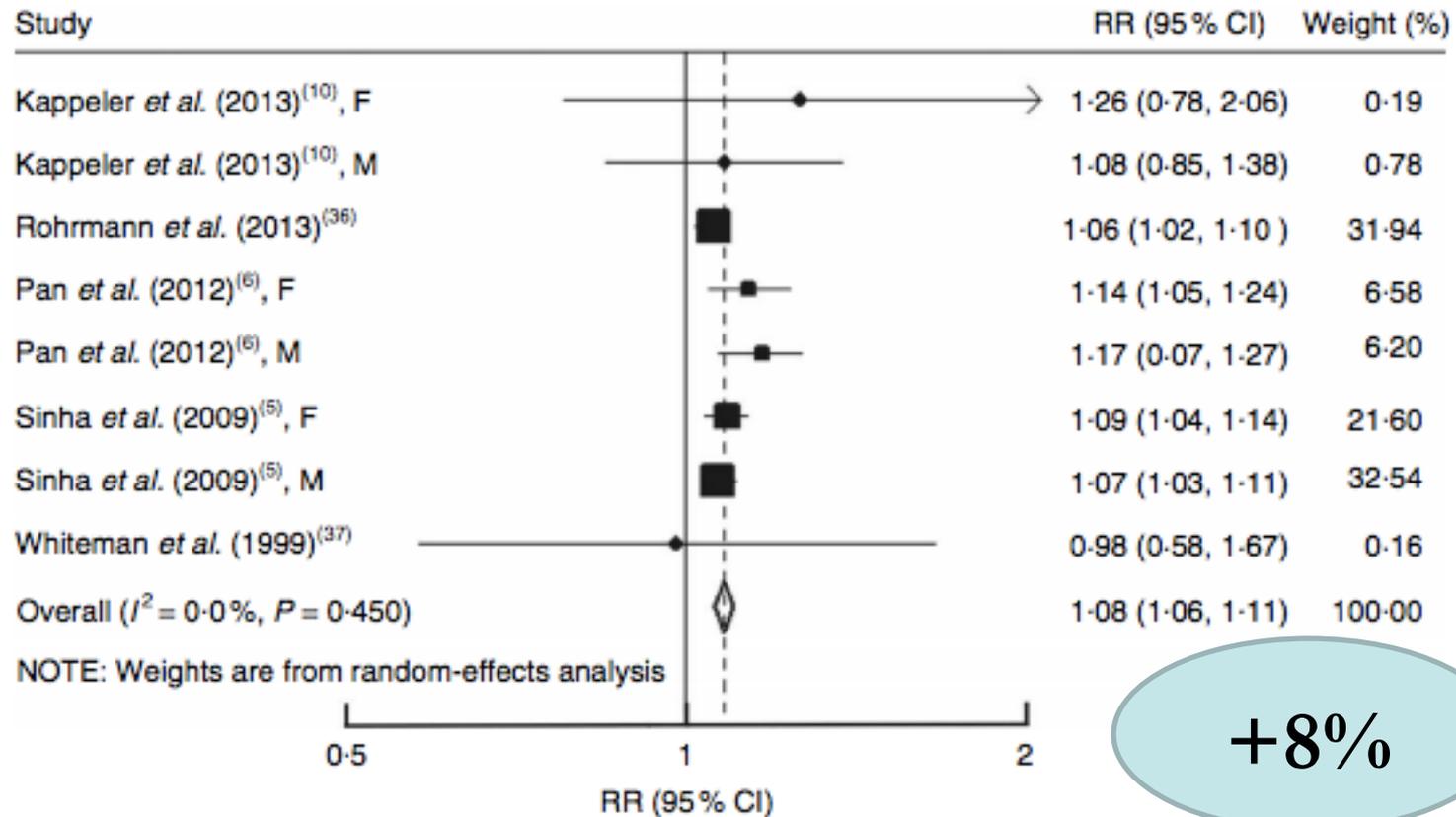
Review Article

Red and processed meat consumption and mortality: dose–response meta-analysis of prospective cohort studies

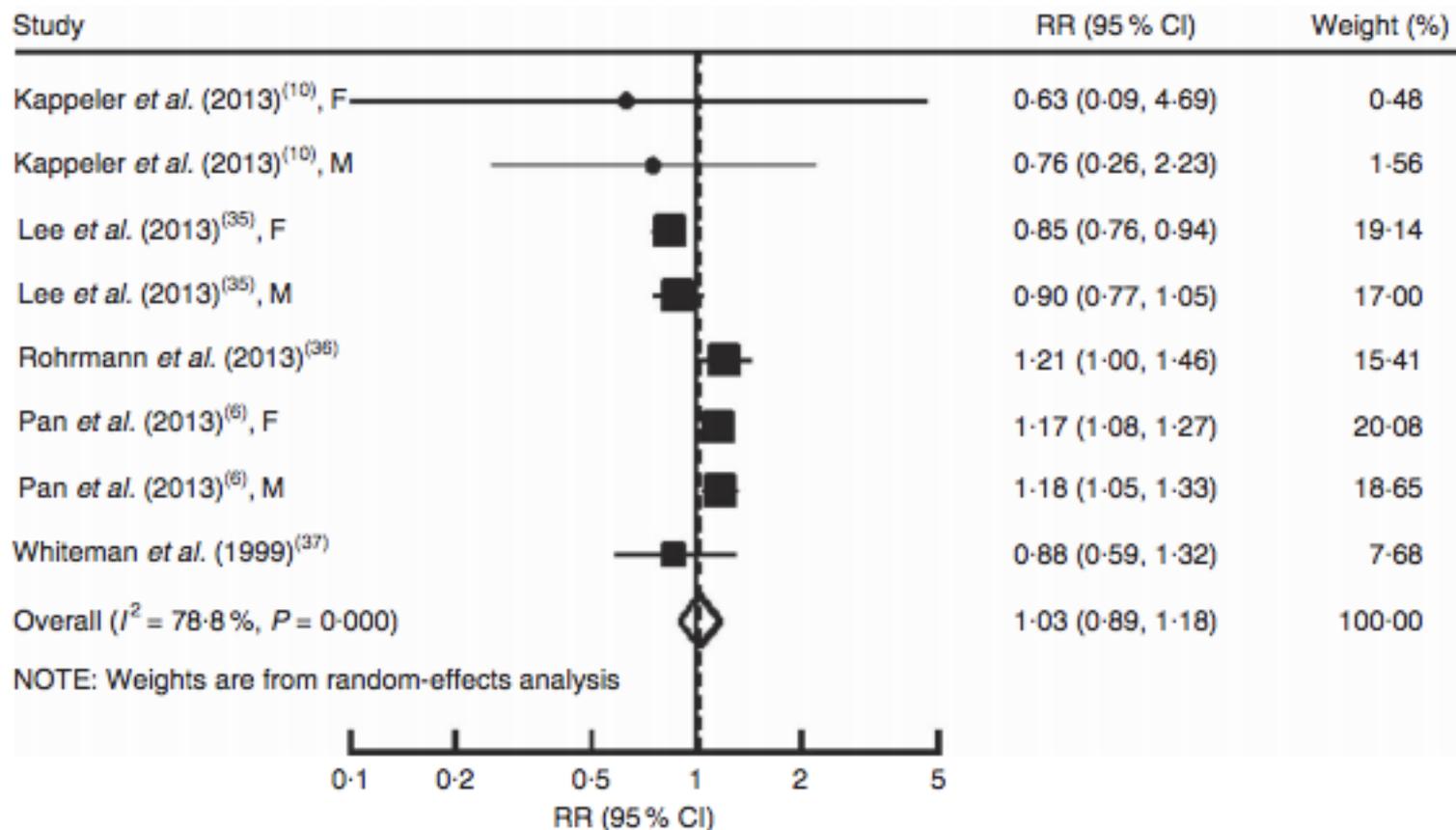
Xia Wang¹, Xinying Lin², Ying Y Ouyang³, Jun Liu³, Gang Zhao⁴, An Pan^{5,*} and Frank B Hu^{6,7,*}

17 studi prospettici di coorte
45,738 morti per neoplasie

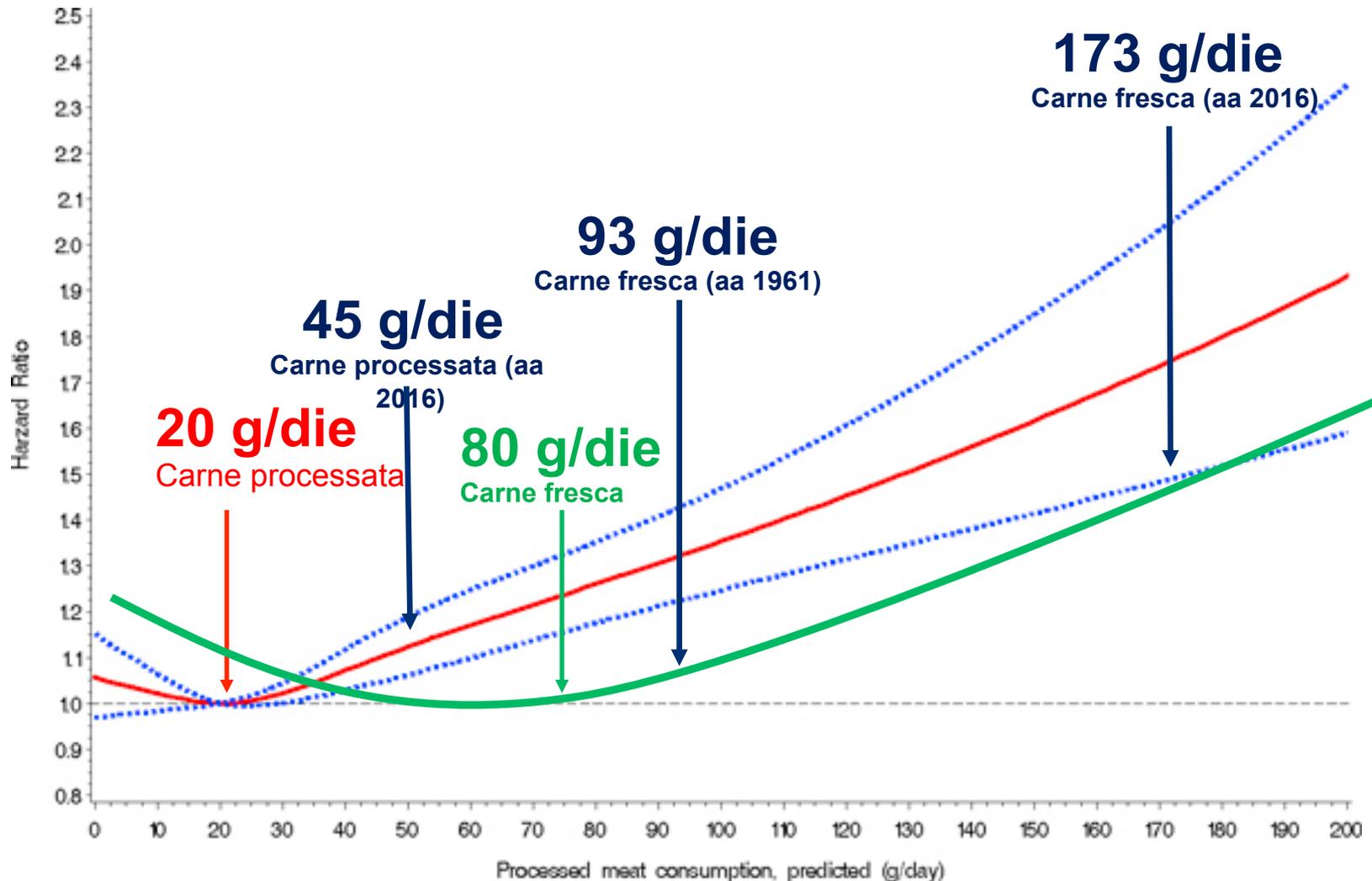
Consumo di carne processata e rischio neoplastico



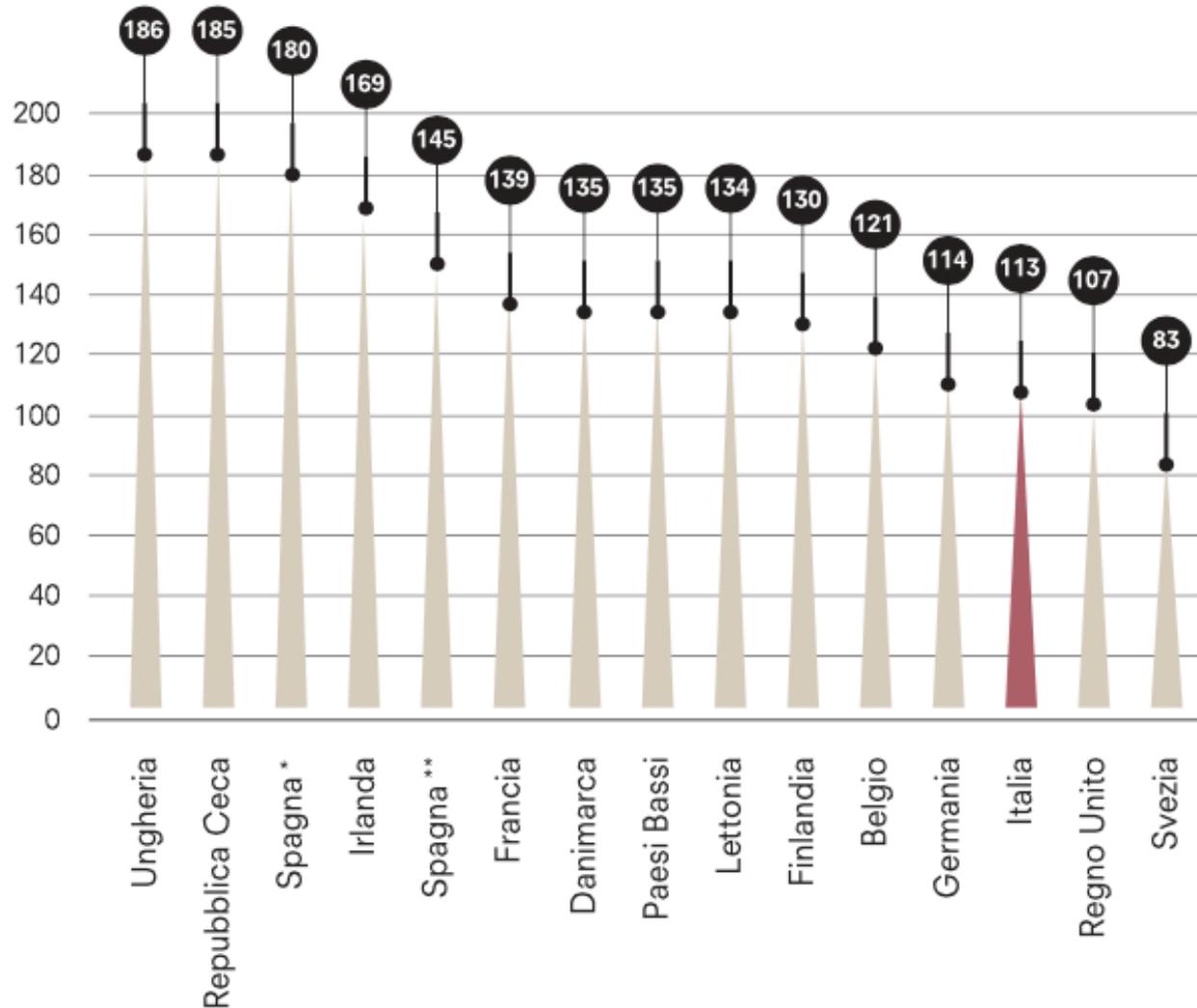
Consumo di carne fresca e rischio neoplastico



Consumo di carne e rischio neoplastico



Consumo medio giornaliero di carne





World Cancer Research Fund



1. Cerca di essere più magro possibile senza diventare sottopeso
2. Mangia una varietà di frutta e verdura, cereali integrali e legumi
3. Limita il consumo di carne rossa ed evita la carne processata
4. **Non usare supplementi**

Cancer Incidence and Mortality After Treatment With Folic Acid and Vitamin B₁₂

2 trial clinici randomizzati (NORVIT e WENBIT),

6837 pazienti con cardiopatia ischemica

Trattamento:

- Acido folico 0.8 mg/die + vitamina B12 0.4 mg/d + vitamina B6 40 mg/die (n=1.708)
- Acido folico 0.8 mg/die + vitamina B12 0.4 mg/d (n=1.703)
- Vitamina B6 40 mg/d (n=1.705)
- Placebo

Incidenza e mortalità per neoplasie dopo trattamento con vitamine del gruppo B

2 RCTs con 6837 pazienti con cardiopatia ischemica

Table 2. Cancer and Mortality Outcomes and Hazard Ratios^a

Outcome	Total No.	No. of Cases (Rate per 1000 Observation-Years)				HR (95% CI)	
		Folic Acid + Vitamins B ₁₂ and B ₆ (n = 1708)	Folic Acid + Vitamin B ₁₂ (n = 1703)	Vitamin B ₆ (n = 1705)	Folic Acid vs Non-Folic Acid Groups	Vitamin B ₆ vs Non-Vitamin B ₆ Groups	
Cancer incidence ^b	629	172 (17.3)	169 (16.7)	151 (14.9)	137 (13.3)	1.21 (1.03-1.41)	1.07 (0.92-1.26)
Colorectal cancer	95	25 (2.5)	22 (2.2)	26 (2.6)	22 (2.1)	1.00 (0.59-1.69) ^c	1.18 (0.69-2.00) ^c
Lung cancer	92	31 (3.1)	25 (2.5)	16 (1.6)	20 (1.9)	1.59 (0.92-2.75) ^c	1.06 (0.62-1.82) ^c
Prostate cancer	165	45 (5.9)	45 (5.8)	36 (4.7)	39 (5.0)	1.21 (0.81-1.81) ^c	0.98 (0.66-1.46) ^c
Hematologic cancer	53	15 (1.5)	16 (1.6)	11 (1.1)	14 (1.3)	1.43 (0.70-2.93) ^c	0.98 (0.48-1.98) ^c
Other cancer	224	56 (5.6)	61 (6.0)	62 (6.1)	58 (5.6)	1.11 (0.79-1.57) ^c	1.13 (0.80-1.60) ^c
Cancer mortality ^d	236	63 (6.1)	73 (7.0)	49 (4.7)	57 (5.5)	1.38 (1.07-1.79)	0.92 (0.71-1.19)
Colorectal cancer	24	3 (0.3)	9 (0.9)	5 (0.5)	7 (0.7)	1.02 (0.36-2.91) ^c	0.51 (0.17-1.55) ^c
Lung cancer	75	26 (2.5)	19 (1.8)	13 (1.2)	17 (1.6)	1.53 (0.83-2.80) ^c	1.10 (0.61-2.00) ^c
Prostate cancer	28	5 (0.6)	10 (1.2)	6 (0.8)	7 (0.9)	1.15 (0.43-3.06) ^c	0.67 (0.25-1.82) ^c
Hematologic cancer	19	5 (0.5)	7 (0.7)	2 (0.2)	5 (0.5)	1.75 (0.51-5.94) ^c	0.59 (0.17-2.02) ^c
Other cancer	90	24 (2.3)	28 (2.7)	23 (2.2)	15 (1.4)	1.39 (0.80-2.41) ^c	1.11 (0.65-1.91) ^c
Noncancer mortality	785	218 (21.1)	194 (18.5)	192 (18.4)	181 (17.0)	1.12 (0.97-1.29)	1.11 (0.97-1.28)
All-cause mortality	1021	281 (27.2)	267 (25.5)	241 (23.0)	232 (21.8)	1.18 (1.04-1.33)	1.06 (0.94-1.20)

+21%

+38%

Mortality in Randomized Trials of Antioxidant Supplements for Primary and Secondary Prevention

Systematic Review and Meta-analysis

In 47 trial clinici randomizzati con 180.939 partecipanti, i supplementi di antiossidanti determinava un incremento del rischio di mortalità

RR 1.05 (95%CI 1.02-1.08)

Esiste una dieta ideale per la prevenzione neoplastica?



Dieta ideale

Caratteristiche

- Nutrizionista
- Salutaria
- Basata su alimenti naturali
- Sicura
- Facile da seguire
- Poco costosa
- Attenta alla salute



Dieta ideale

Mediterranean Diet

 #2 in Best Diets Overall

The Mediterranean diet plan is highly sensible, emphasizing fruits and vegetables, olive oil, fish and other healthy fare. [... more](#)



4.1/5 Overall Score | **3.3/5** Weight Loss | **4.7/5** Healthy

Pros & Cons

- ✓ Nutritionally sound
- ✓ Diverse foods and flavors
- ✗ Lots of grunt work
- ✗ Moderately pricey


SCORECARD

4.1
Overall

Weight Loss SHORT-TERM 3.4



Weight Loss LONG-TERM 3.2



Easy to Follow 3.7



Healthy 4.7



Dieta Mediterranea e rischio neoplastico

Public Health Nutrition: page 1 of 14

doi:10.1017/S1368980013003169

Review Article

Mediterranean diet and health status: an updated meta-analysis and a proposal for a literature-based adherence score

Francesco Sofi^{1,2,3,*}, Claudio Macchi³, Rosanna Abbate¹, Gian Franco Gensini^{1,3}
and Alessandro Casini^{1,2}

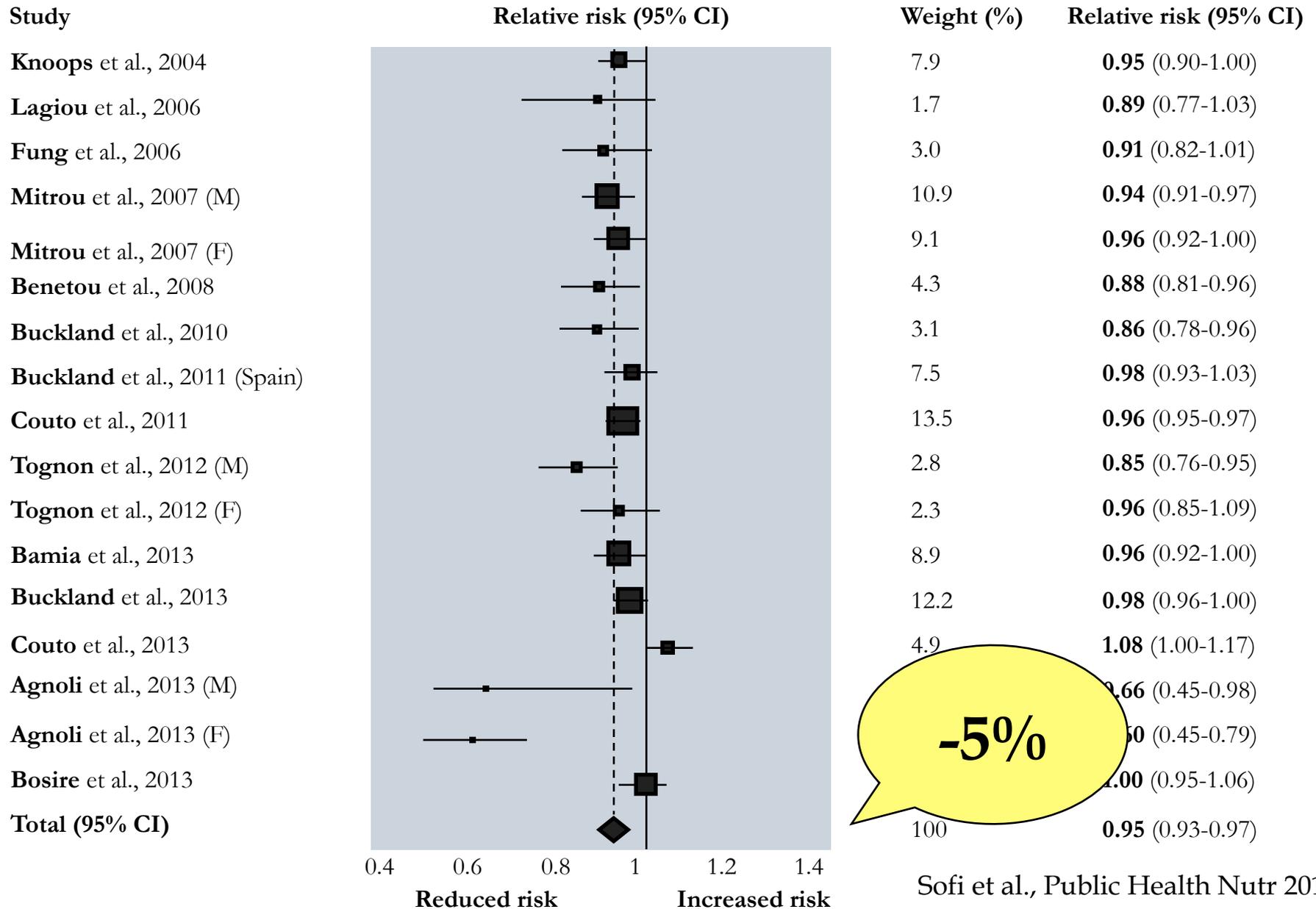
¹Department of Clinical and Experimental Medicine, University of Florence, Largo Brambilla 3, 50134 Florence, Italy: ²Agency of Nutrition, University Hospital of Careggi, Florence, Italy: ³Don Carlo Gnocchi Foundation Italy, IRCCS, Florence, Italy

17 studi di coorte

Popolazione: 2,740,221

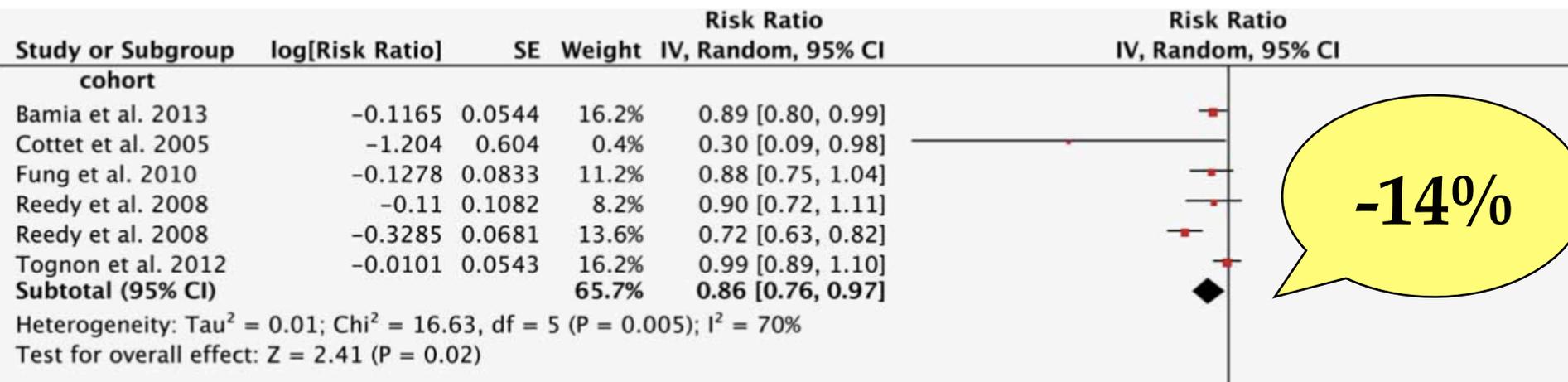
Casi di tumore: 83,111

Dieta Mediterranea e rischio neoplastico

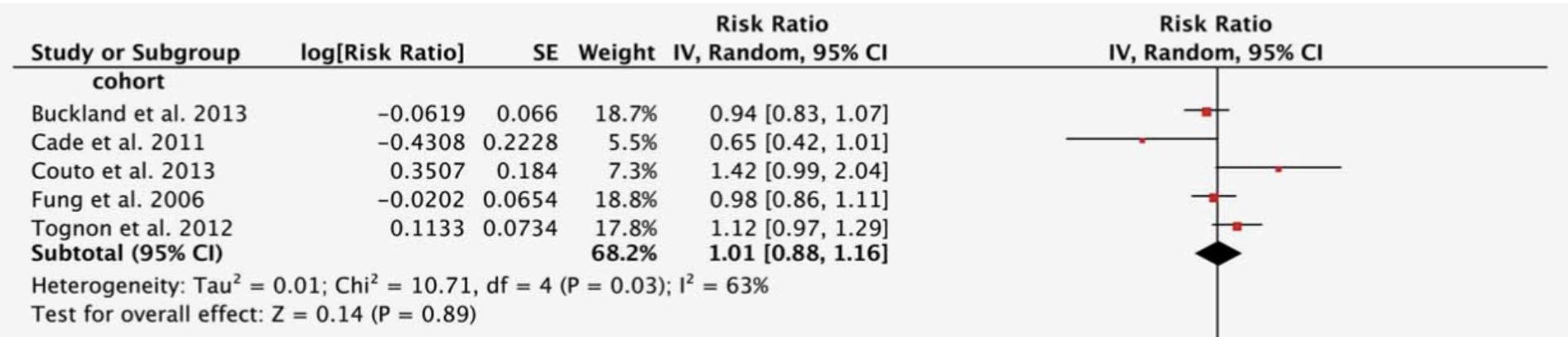


Dieta Mediterranea e rischio neoplastico

Colorectal cancer

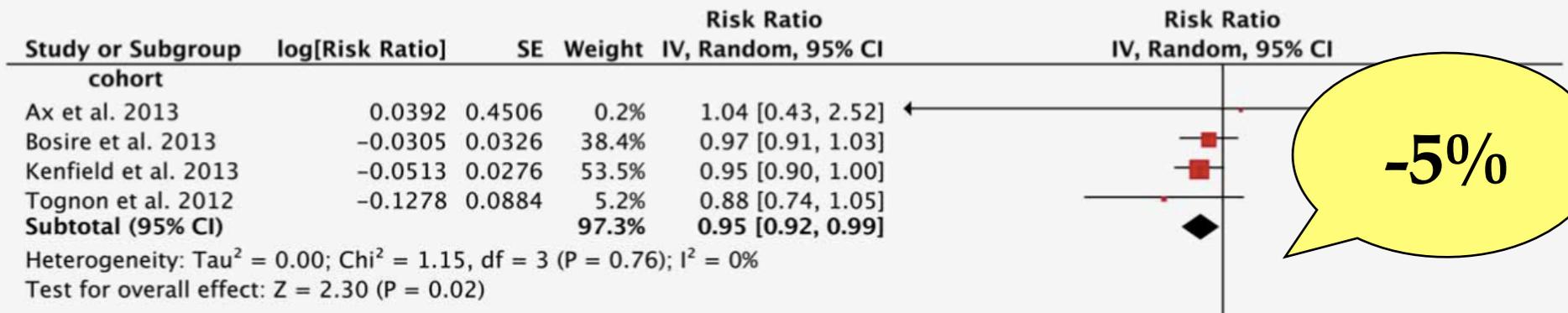


Breast cancer



Dieta Mediterranea e rischio neoplastico

Prostate cancer



REVIEW

Mediterranean diet and multiple health outcomes: an umbrella review of meta-analyses of observational studies and randomised trials

M Dinu¹, G Pagliai¹, A Casini^{1,2} and F Sofi^{1,2,3}

CONVINCING EVIDENCE	<ol style="list-style-type: none">1. Significance threshold reached at $p \leq 0.001$ for both random- and fixed-effects calculation2. Study population: >1000 cases (or >5000 total participants if the type of metric was continuous)3. Heterogeneity: $I^2 < 50\%$4. 95% PI excluding the null value5. No evidence of small-study effects (if it could be tested)
HIGH SUGGESTIVE EVIDENCE	<ol style="list-style-type: none">1. Significance threshold reached at $p \leq 0.001$ for both random- and fixed-effects calculation2. Study population: >1000 cases (or >5000 total participants if the type of metric was continuous)3. Heterogeneity: $I^2 = 50-75\%$
SUGGESTIVE EVIDENCE	<ol style="list-style-type: none">1. Significance threshold reached at $p \leq 0.001$ for both random- and fixed-effects calculation2. Study population: 500-1,000 cases (or 2500-5000 total participants if the type of metric was continuous)
WEAK EVIDENCE	<ol style="list-style-type: none">1. Significance threshold reached at $p \leq 0.05$ for random-effects calculation
NON-SIGNIFICANT ASSOCIATION	Significance threshold not reached ($p > 0.05$)

Dieta Mediterranea e salute

13 META-ANALYSES OF OBSERVATIONAL STUDIES

- 12 of cohort prospective studies
 - 4 of case-control studies
 - 5 of cross-sectional studies

35 OUTCOMES:

- overall mortality (n=1)
- cardiovascular outcomes (n=12)
- cancer outcomes (n=26)
- cognitive disorders (n=14)
- metabolic disorders (n=15)

12 625 301 SUBJECTS

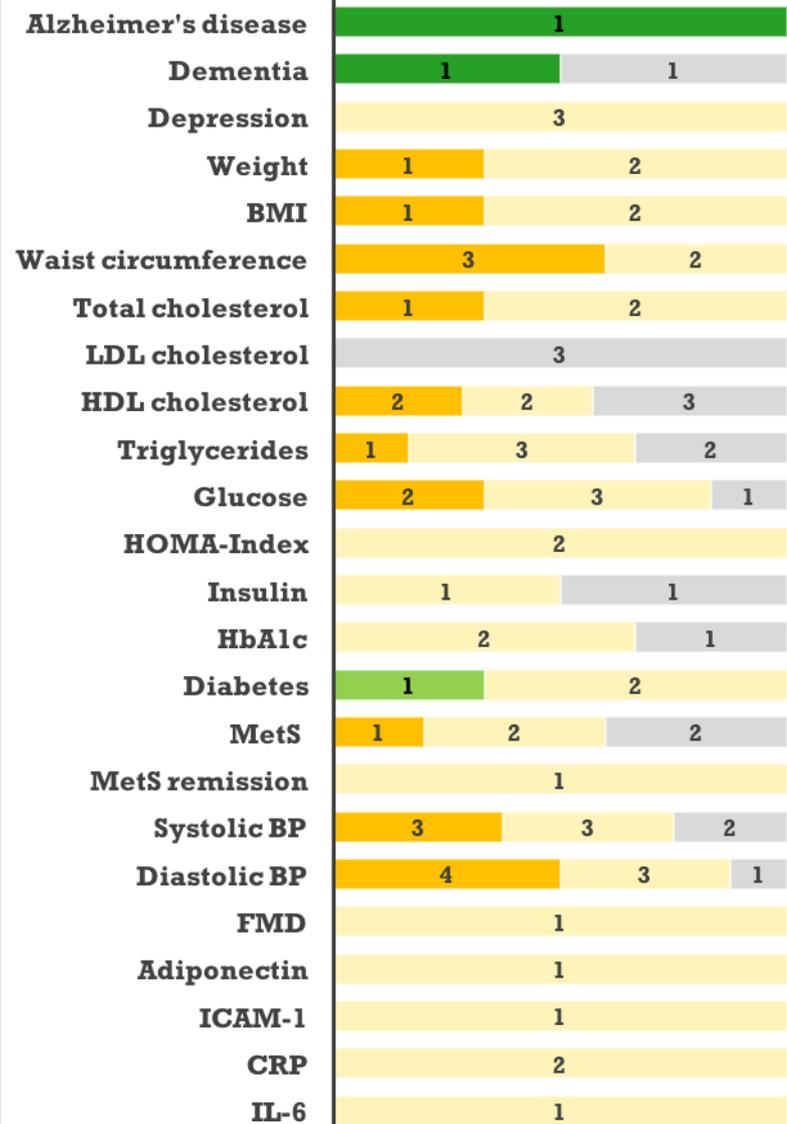
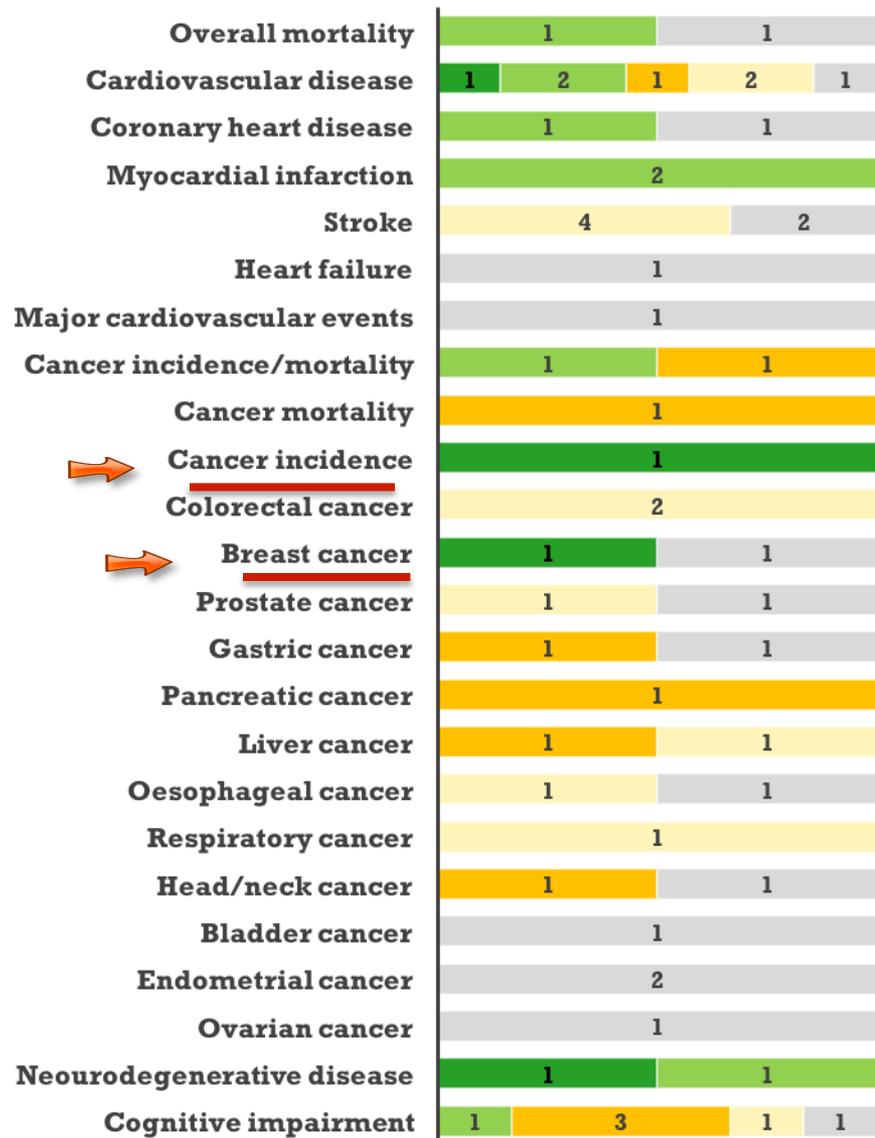
16 META-ANALYSES OF RCTs

26 OUTCOMES:

- overall mortality (n=1)
- cardiovascular outcomes (n=26)
- metabolic disorders (n=41)
- inflammatory parameters (n=3)

202 148 SUBJECTS

Dieta Mediterranea e salute



■ Convincing ■ Highly suggestive ■ Suggestive ■ Weak ■ No evidence

Dieta Mediterranea e prevenzione: a che punto siamo?





Governo
La sfida di Berlusconi.
L'incerto futuro della
Casa delle libertà p.62



Fiat
Marchionne alle
prese con il testacoda
di Torino p.156



Jennifer
Dynamite Lopez: film,
dischi, moda, è già
multinazionale p.130

L'Espresso

Settimanale di politica cultura economia - www.espressonline.it

N.16 anno LI 28 aprile 2005

Alimentazione **Colesterolo** **alla fiorentina**

Vivere sulle sponde del Mare Nostrum non è sufficiente a garantire un'alimentazione corretta. La dieta dei fiorentini, per esempio, è tutt'altro che mediterranea, perché troppo ricca di grassi saturi e povera di vitamine. Lo conferma uno studio di popolazione realizzato dall'Università di Firenze e dall'Azienda Ospedaliera di Careggi su 520 residenti nel capoluogo toscano: il 70 per cento circa dei soggetti esaminati consuma genericamente troppi grassi - oltre il 30 per cento dell'apporto calorico complessivo - e oltre il 40 per cento troppi grassi saturi. Il 99,6 per cento del campione inoltre assume quantità insufficienti di vitamine come l'acido folico o la B6, e di acidi grassi polinsaturi, contenuti soprattutto nel pesce e in qualche misura nelle carni bianche, che contribuiscono a controllare il colesterolo. I risultati della dieta "alla fiorentina", troppo ricca di carne rossa e grassi animali, sono stati appena pubblicati dall'"European Journal of Clinical Nutrition": il 40 per cento dei soggetti soffre di ipercolesterolemia e l'11,7 per cento ha un elevato livello plasmatico di omocisteina, un aminoacido che se presente in eccesso aumenta sensibilmente il rischio cardiovascolare.

P. E. C.

L'Espresso 28 Aprile 2005

**E' veramente
Mediterranea la dieta
Italiana?**

Aderenza alla dieta Mediterranea

MAI = Mediterranean foods/Non Mediterranean foods

(□, 0.00–0.99; ◻, 1.00–1.99; ◼, 2.00–2.99; ◼, 3.00–3.99; ◼, 4.00–4.99; ◼, 5.00–5.99)



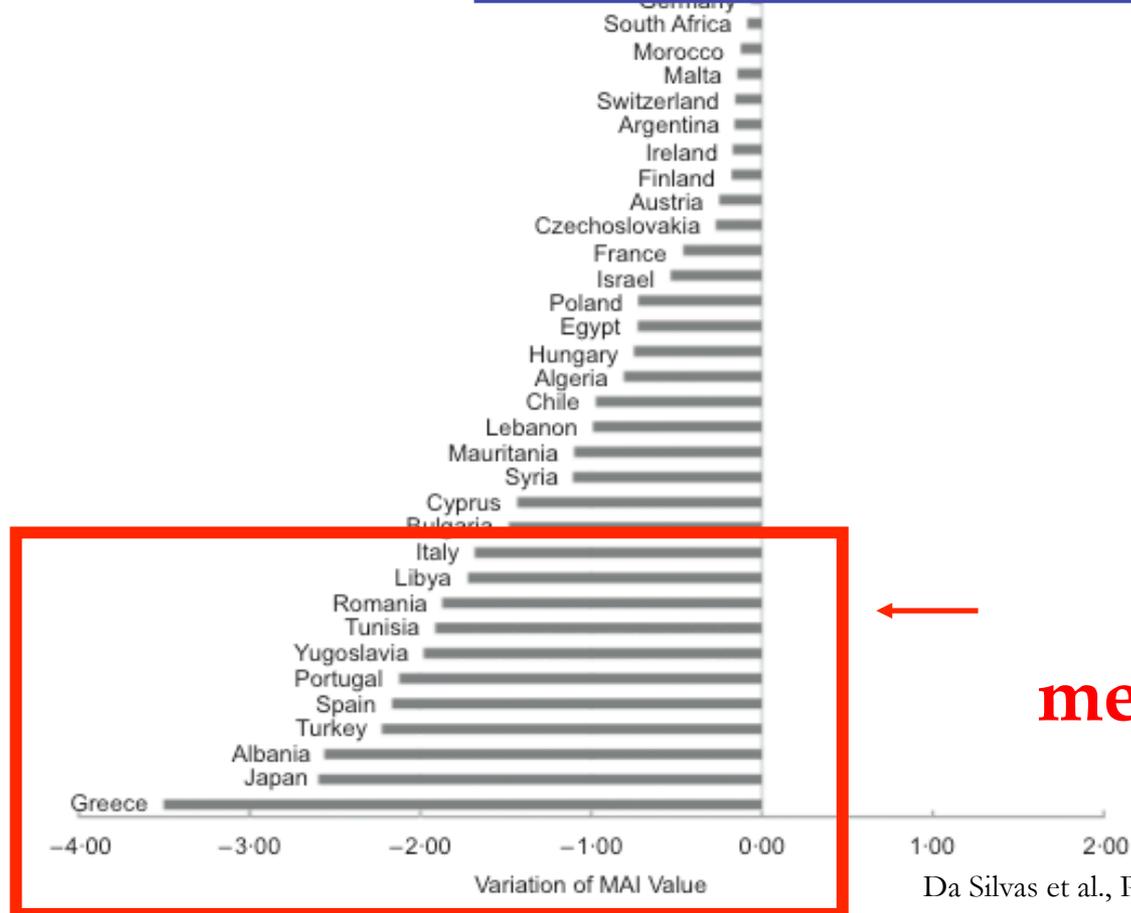
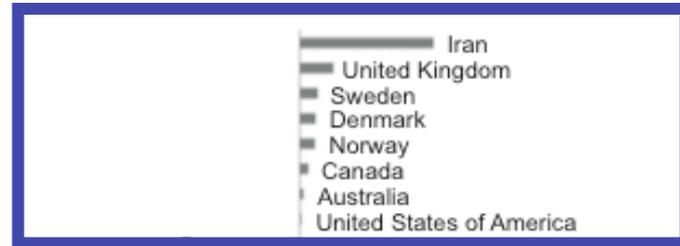
**Adherence to MD,
MAI (1961-1965)**



**Adherence to MD,
MAI (2000-2003)**

Variazione dell'aderenza alla dieta Mediterranea

Paesi non
mediterranei

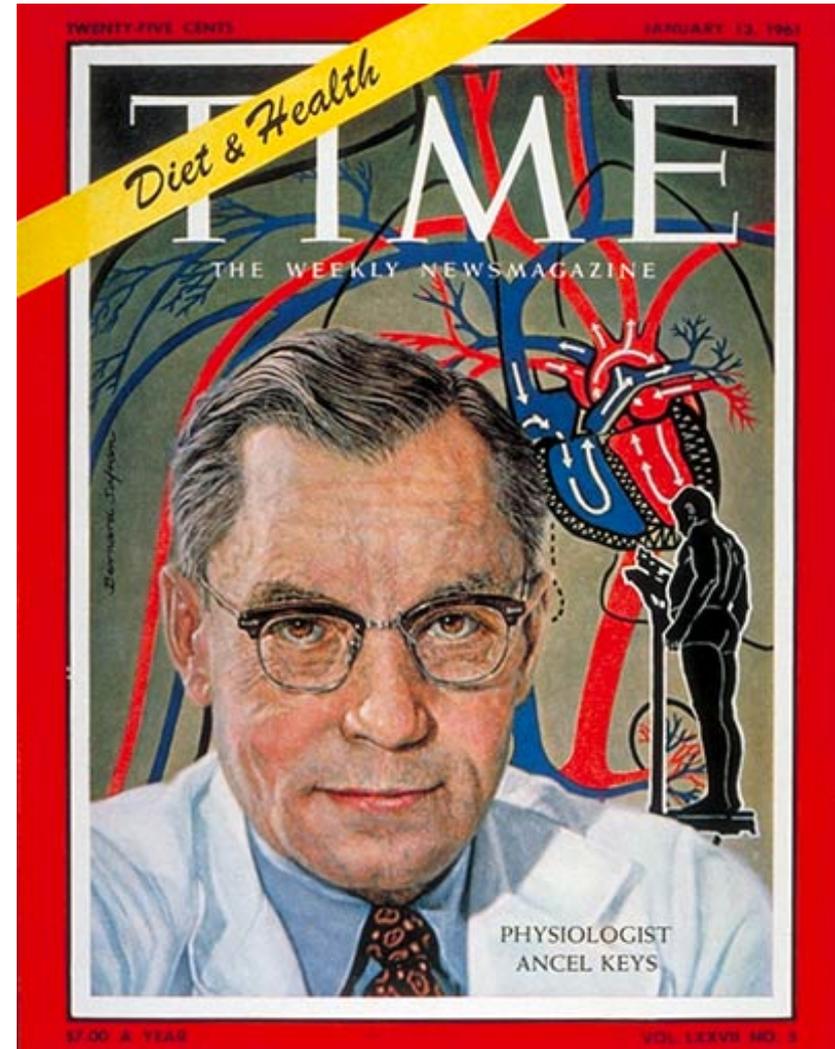
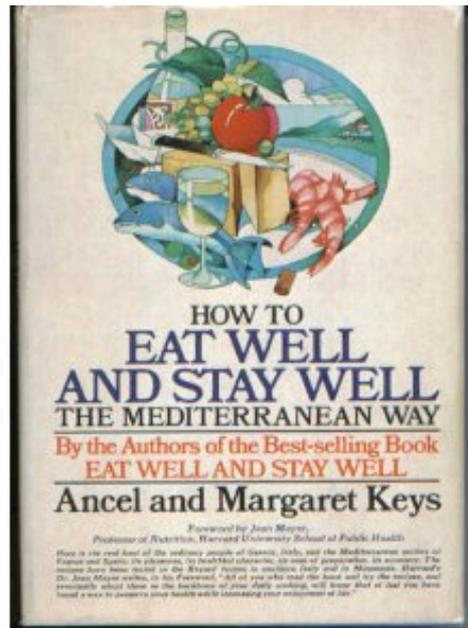
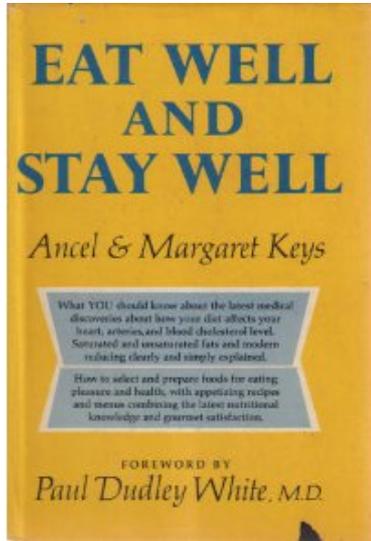


Paesi
mediterranei

Nutrizione narrativa



Dieta Mediterranea



Dieta Mediterranea

The Mediterranean Diet: what it was

In their 1975 book, “How to Eat Well and Stay Well the Mediterranean Way”, Ancel and Margaret Keys vividly described the Mediterranean Diet, southern Italian style:

“... a hearty dish of beans and short lengths of macaroni (pasta e fagioli); lots of bread ... never served with any kind of spread; great quantities of fresh vegetables; a modest portion of meat or fish perhaps twice a week; wine ...; always fresh fruits for dessert ... for the possible prevention of coronary heart disease it would be hard to do better than imitate the diet of the common folk of Naples in the early 1950s.” [2]

Ancel Keys, Minnelea (Pioppi) 1982



Ancel Keys



Dieta Mediterranea, spezie e salute



La Dieta Mediterranea comprende le spezie?



Piramide Alimentare Mediterranea: uno stile di vita quotidiano

Linee Guida per la popolazione adulta

Porzioni frugali e secondo le abitudini locali



Vino con moderazione e secondo le abitudini sociali



© 2010 Fundación Dieta Mediterránea
Si raccomanda l'uso, la diffusione e la promozione di questa piramide e senza alcuna limitazione

Edizione 2010

p = porzione



 OPEN ACCESS

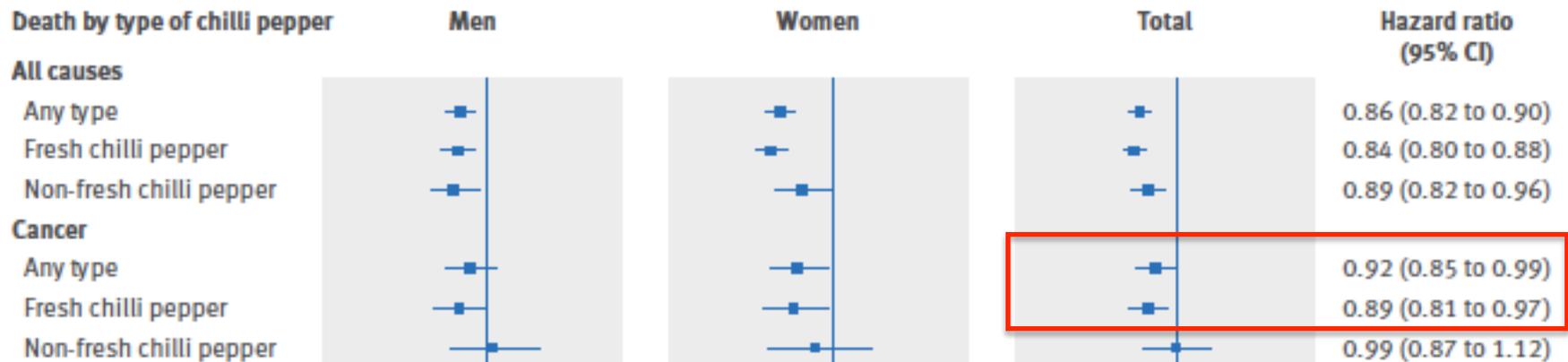

Consumption of spicy foods and total and cause specific mortality: population based cohort study

Jun Lv,¹ Lu Qi,^{2,3} Canqing Yu,¹ Ling Yang,⁴ Yu Guo,⁵ Yiping Chen,⁴ Zheng Bian,⁵ Dianjianyi Sun,¹ Jianwei Du,⁶ Pengfei Ge,⁷ Zhenzhu Tang,⁸ Wei Hou,⁹ Yanjie Li,¹⁰ Junshi Chen,¹¹ Zhengming Chen,⁴ Liming Li^{1,5} on behalf of the China Kadoorie Biobank collaborative group

199,293 uomini e 288,082 donne, età 30-79 anni

Consumo di cibi speziati e piccanti alla settimana in 7,2 anni di follow-up

Consumo di cibi speziati associato a -8% di incidenza di cancro e -14% di mortalità per tutte le cause



Le spezie

Definizione:

Sostanze di **origine vegetale** che vengono comunemente utilizzate per aromatizzare e insaporire cibi e bevande

Aglione e Cipolla



Aglione e cipolla e rischio neoplastico

Onion and garlic use and human cancer¹⁻³

Carlotta Galeone, Claudio Pelucchi, Fabio Levi, Eva Negri, Silvia Franceschi, Renato Talamini, Attilio Giacosa, and Carlo La Vecchia

Una serie di studi caso-controllo per un totale di 1,360 casi e 1,380 controlli

OR **0.44** (95%CI 0.28-0.77) cipolla
OR **0.74** (95%CI 0.63-0.86) aglio

Tumore al colon-retto

OR **0.12** (95%CI 0.02-0.58) cipolla
OR **0.43** (95%CI 0.28-0.67) aglio

Tumore all'esofago

OR **0.17** (95%CI 0.05-0.61) cipolla
OR **0.56** (95%CI 0.38-0.82) aglio

Tumore alla laringe

Allium vegetables and upper aerodigestive tract cancers: a meta-analysis of observational studies

Valentina Guercio¹, Federica Turati², Carlo La Vecchia¹, Carlotta Galeone^{2*}
and Alessandra Tavani^{2*}

21 studi caso-controllo e 4 di coorte su più di 11,000 casi



Garlic

Cook-Mozaffari, 1979 (M)

Cook-Mozaffari, 1979 (W)

Zheng, 1992

Zheng, 1992

Hu, 1994

Gao, 1999

Takezaki, 2001

Gao, 2002

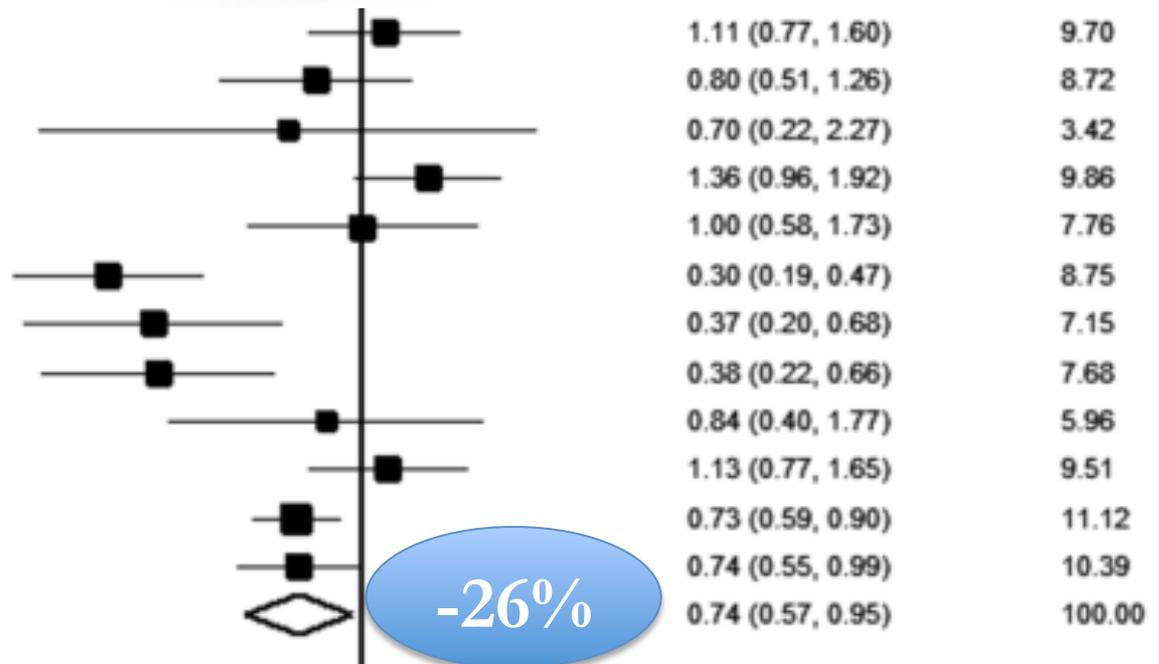
De Stefani, 2005

Sun, 2010

Wu, 2011

Galeone, 2015

Subtotal (I-squared = 76.9%, p = 0.000)



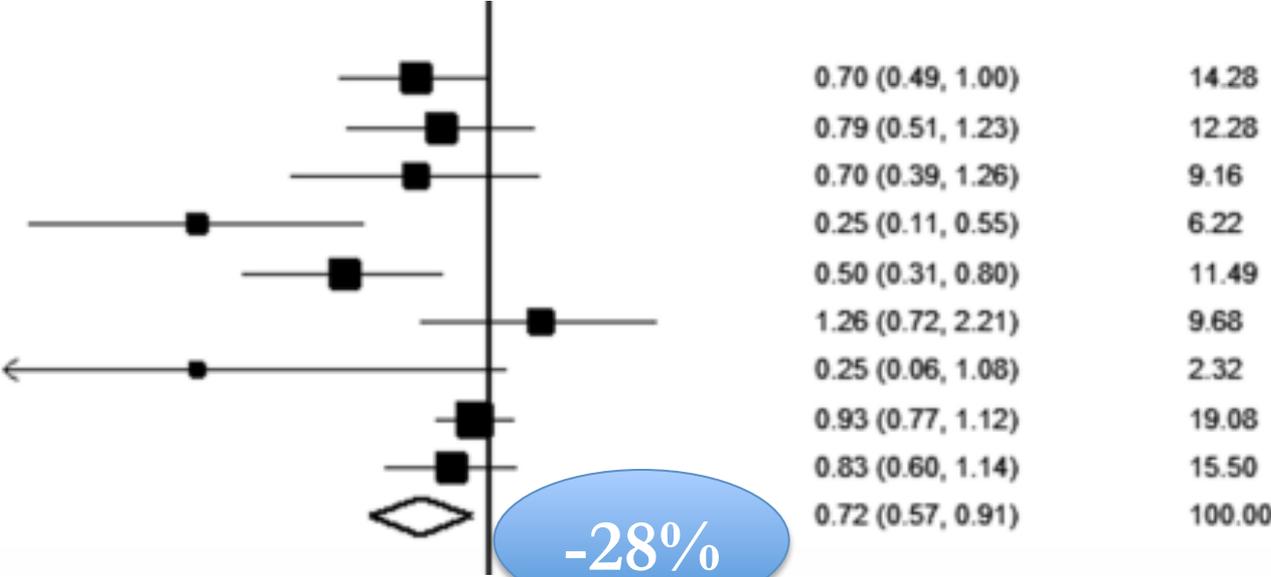
Allium vegetables and upper aerodigestive tract cancers: a meta-analysis of observational studies

Valentina Guercio¹, Federica Turati², Carlo La Vecchia¹, Carlotta Galeone^{2*} and Alessandra Tavani^{2*}

21 studi caso-controllo e 4 di coorte su più di 11,000 casi



Onion
 Cook-Mozaffari, 1979 (M)
 Cook-Mozaffari, 1979 (W)
 Hu, 1994
 Gao, 1999
 De Stefani, 2000
 Takezaki, 2001
 De Stefani, 2005
 Maasland, 2015
 Galeone, 2015
 Subtotal (I-squared = 60.6%, p = 0.009)



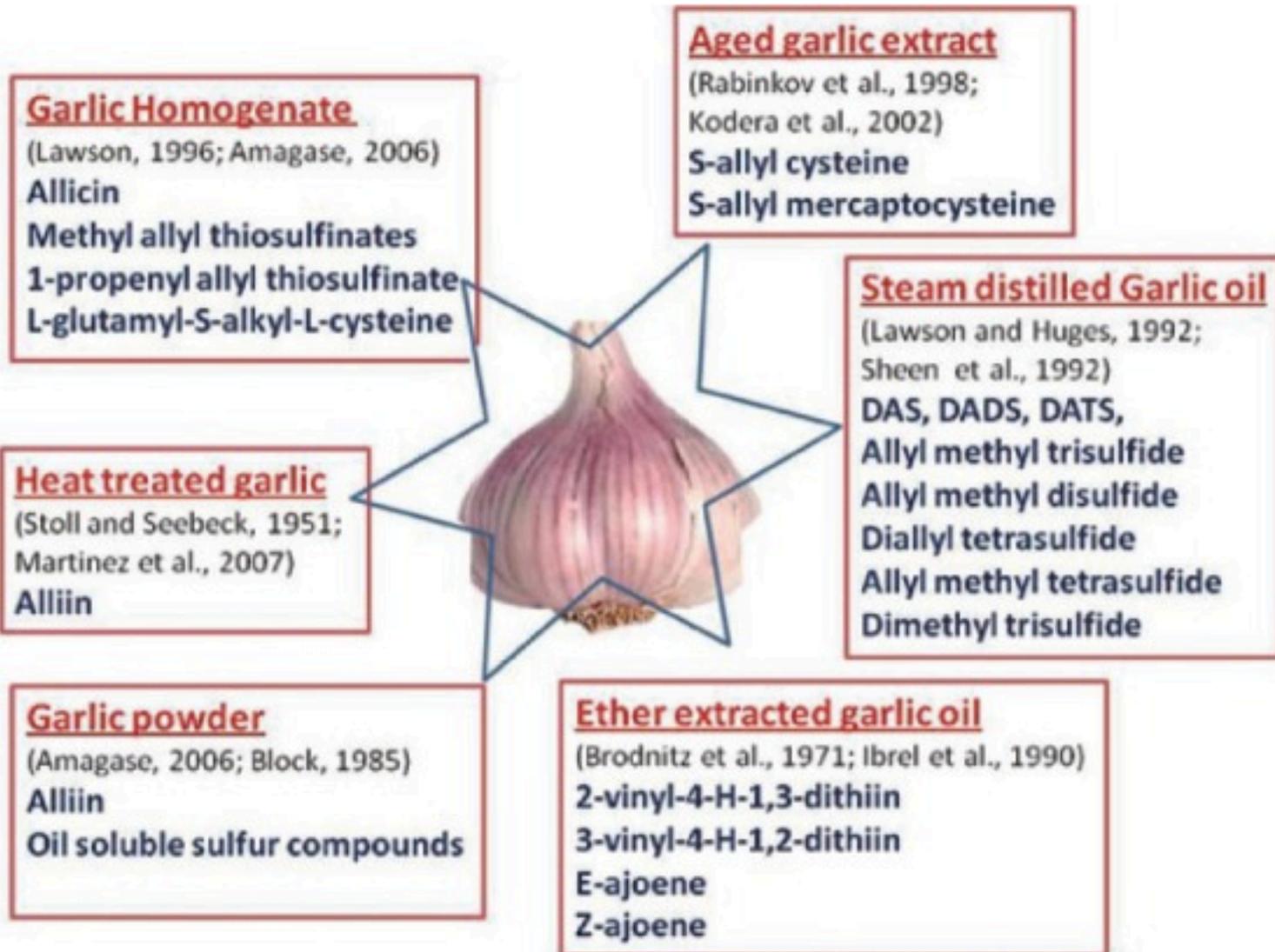
Allium vegetables and upper aerodigestive tract cancers: a meta-analysis of observational studies

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	Total allium RR (95% CI)	Number of studies	Garlic RR (95% CI)	Number of studies	Onion RR (95% CI)	Number of studies
Geographic area						
China	0.48 (0.22–1.01)	3	0.67 (0.45–0.98)	8	0.63 (0.27–1.48)	3
Other	1.02 (0.68–1.51)	4	0.85 (0.70–1.04)	3	0.75 (0.61–0.93)	5
Study design						
Case-control	0.56 (0.38–0.83)	4	0.74 (0.57–0.95)	11	0.67 (0.51–0.89)	7
Cohort	1.18 (0.91–1.51)	3	—	—	—	1
SCC anatomical site						
Head and Neck	—	2	0.95 (0.57–1.57)	3	0.78 (0.57–1.05)	3
Oral cavity	—	1	—	1	—	2
Pharynx	—	1	—	1	—	2
Larynx	—	1	—	1	0.72 (0.53–0.97)	3
Esophagus	0.65 (0.31–1.35)	4	0.68 (0.50–0.92)	8	0.66 (0.45–0.97)	5

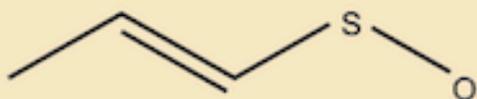
Composti benefici presenti nell'aglio



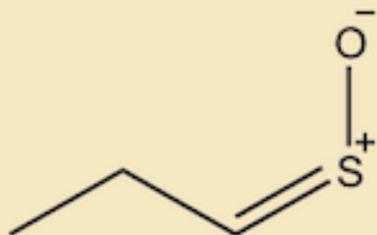
Composti benefici presenti nella cipolla

THE CHEMISTRY OF AN ONION

AMINO ACID SULFOXIDES



1-PROPENESULFENIC ACID

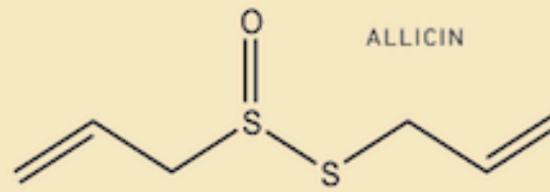
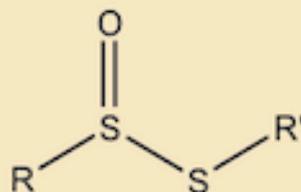


SYN-PROPANETHIAL-S-OXIDE

As onions are sliced, they release a class of enzymes, allinases, which break down amino acid sulfoxides. A specific compound produced during this process is 1-propenesulfenic acid, which is rearranged by another enzyme, called lachrymatory factor synthase, to produce syn-propanethial-S-oxide. Production of this gas peaks 30 seconds after mechanical damage to the onion, and it stimulates sensory neurons in the eye causing a stinging sensation; the eye therefore produces tears to flush it out.



ONION ODOUR & THIOSULFINATES



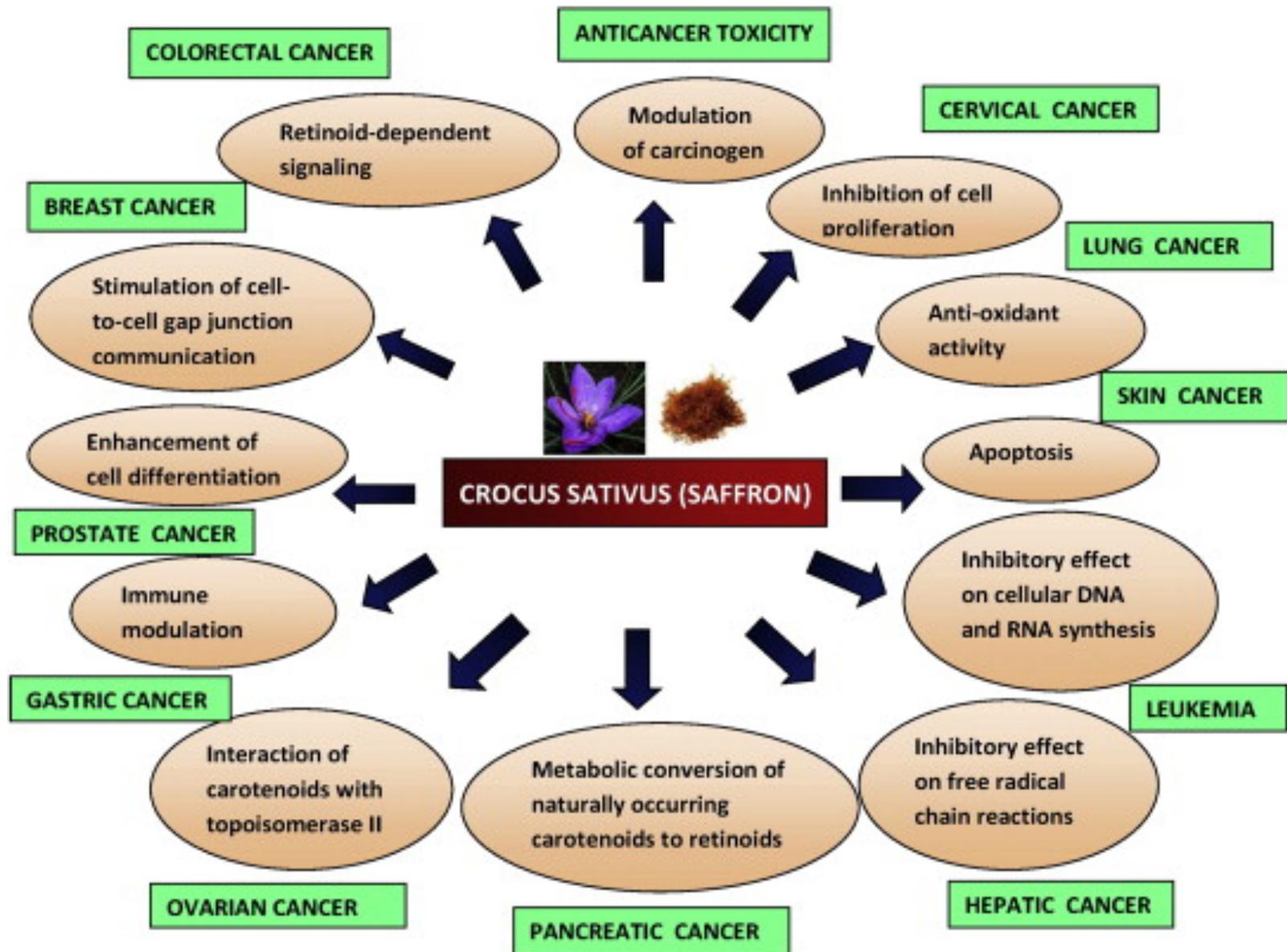
ALLICIN

Thiosulfinates are the primary flavour and odour producing molecules in an onion. These compounds are not present in intact bulbs, but are formed via enzymatic reaction from sulfur amino acids. Alliin is one of these compounds, which in turn quickly breaks down to form other sulfur-containing compounds.

Zafferano



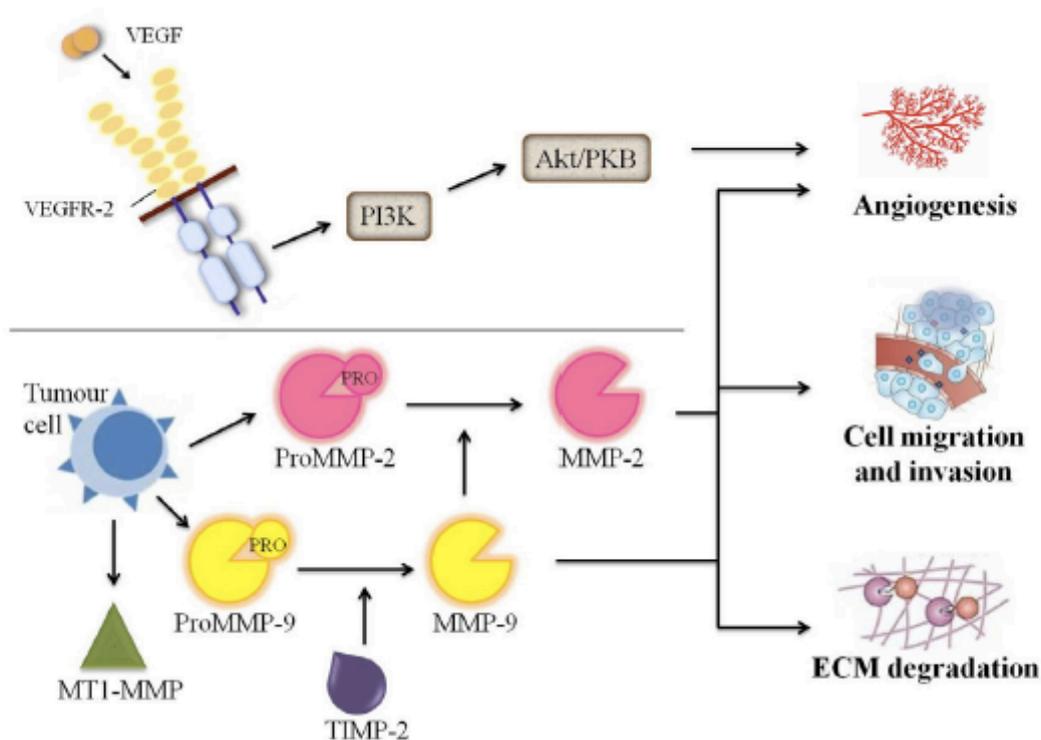
Azioni antitumorali dello zafferano





Mechanism behind the anti-tumour potential of saffron (*Crocus sativus* L.): The molecular perspective

Sweta Patel^{a,1}, Maryam Sarwat^{a,*}, Tajdar H. Khan^b



Curcuma



Azioni antitumorali della curcuma

- Inibire l'attivazione dei geni che scatenano il tumore
- Inibire la proliferazione delle cellule tumorali
- Inibire la trasformazione delle cellule da sane a cellule cancerose
- Indurre l'apoptosi
- Prevenire le metastasi
- Inibire la neoangiogenesi dei vasi che alimentano il tumore
- Amplificare gli effetti della chemio e della radioterapia

Multi-targeted

Inflammatory cytokines

IL-1, IL-2, IL-5, IL-6, IL-8, IL-12,
IL-8, MCP-1, MP-1, MaIP

Enzymes

ATFase, ATPase, Desaturase, FPTase, GST,
GCL, HO-1, iNOS, MMPs, NQO-1, ODC,
PD, TIMP-3, 5-LOX, Telomerase

Growth factors

TGF β , FGF, HGF,
PDGF, TF

Receptors

AR, AHR, CXCR4, DR, EGFR, ER- α , FaaR,
H2R, IL-8R, ITPR, IR, LDL-R

Adhesion molecules

ELAM-1, ICAM-1, VCAM-1

Anti-apoptotic proteins

Bcl-2, Bcl-xL, IAP-1

Protein Kinases

IKK, AK, Ca2+, PK, EGFR, ERK, FAK,
IL-1 RAK, JAK, JNK, MAPK, PhK, PK,
PKA, PKB, PKC, pp60^{c-src} TK, PTK

Transcriptional factors

AP-1, β -Catenin, CBP, ERG-1, ERE, HIF-1,
Notch-1, NF-2, NF- κ B, PPAR- γ , STAT-1,
STAT-3, STAT-4, STAT-5, WTG-1

Others

Cyclin D1, Cyclin E, HeP 70, MDR

Mono-targeted

COX-2

Celecoxib

EGFR

Erbix

TNF

Remicade
Humira
Enbrel

HER-2

Herceptin

Bcr-Abl

Gleevac

VEGF

Avastin

Tubulin

Paclitaxel

Topoisomerase

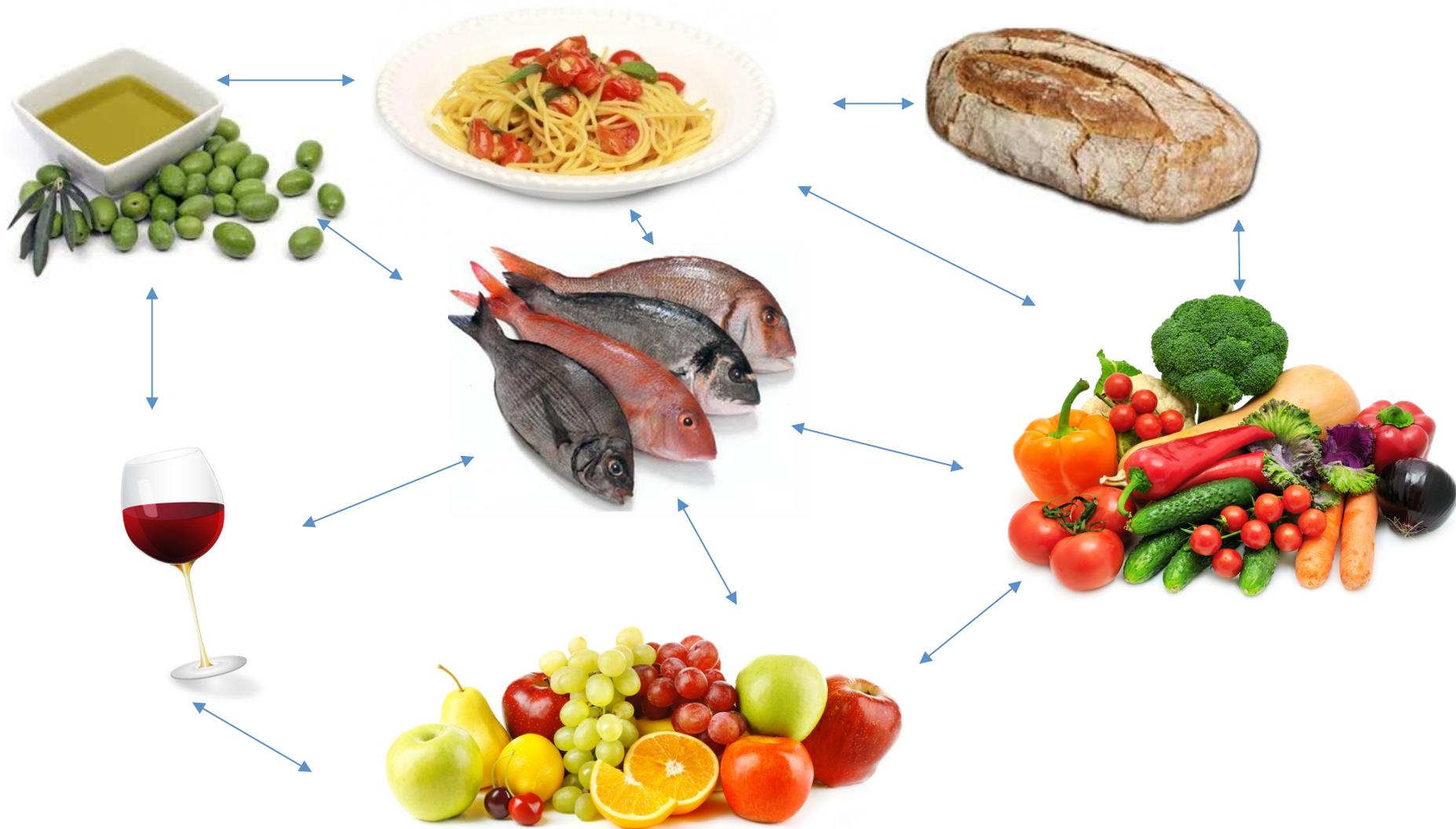
Camptothecin

Curcumin Targets

Quale ruolo hanno le spezie nel contesto della dieta Mediterranea?

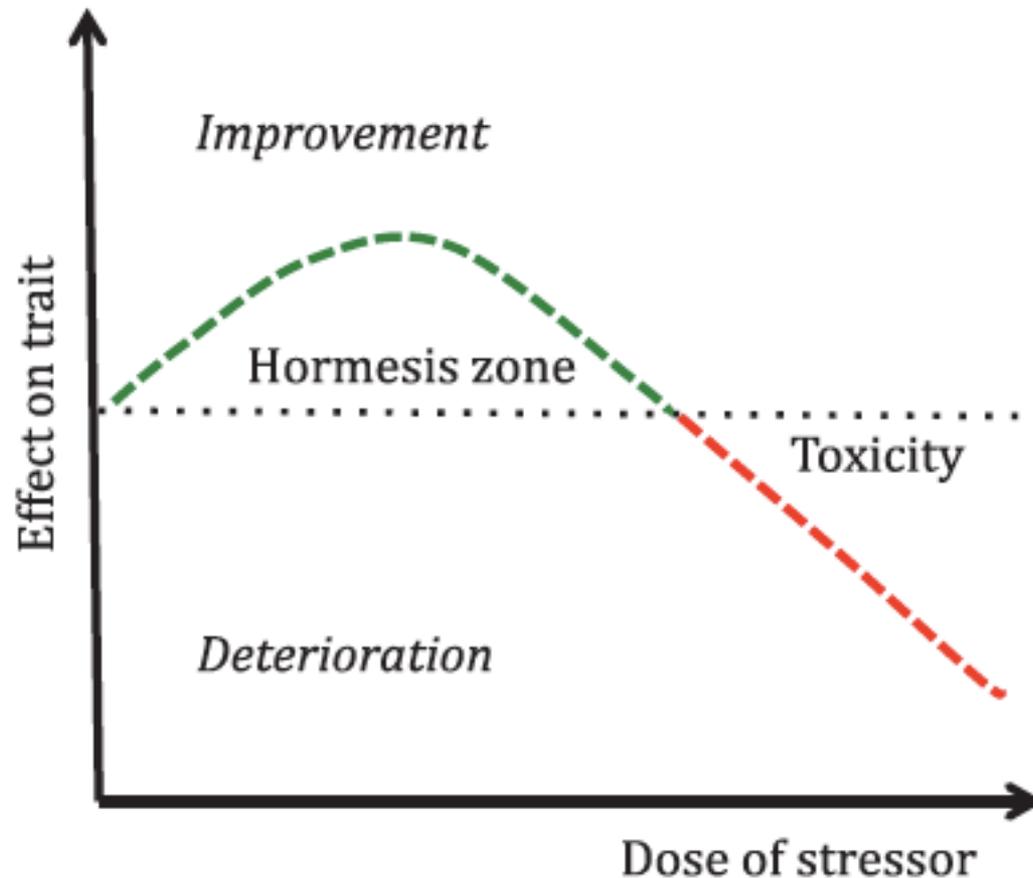


Dieta Mediterranea

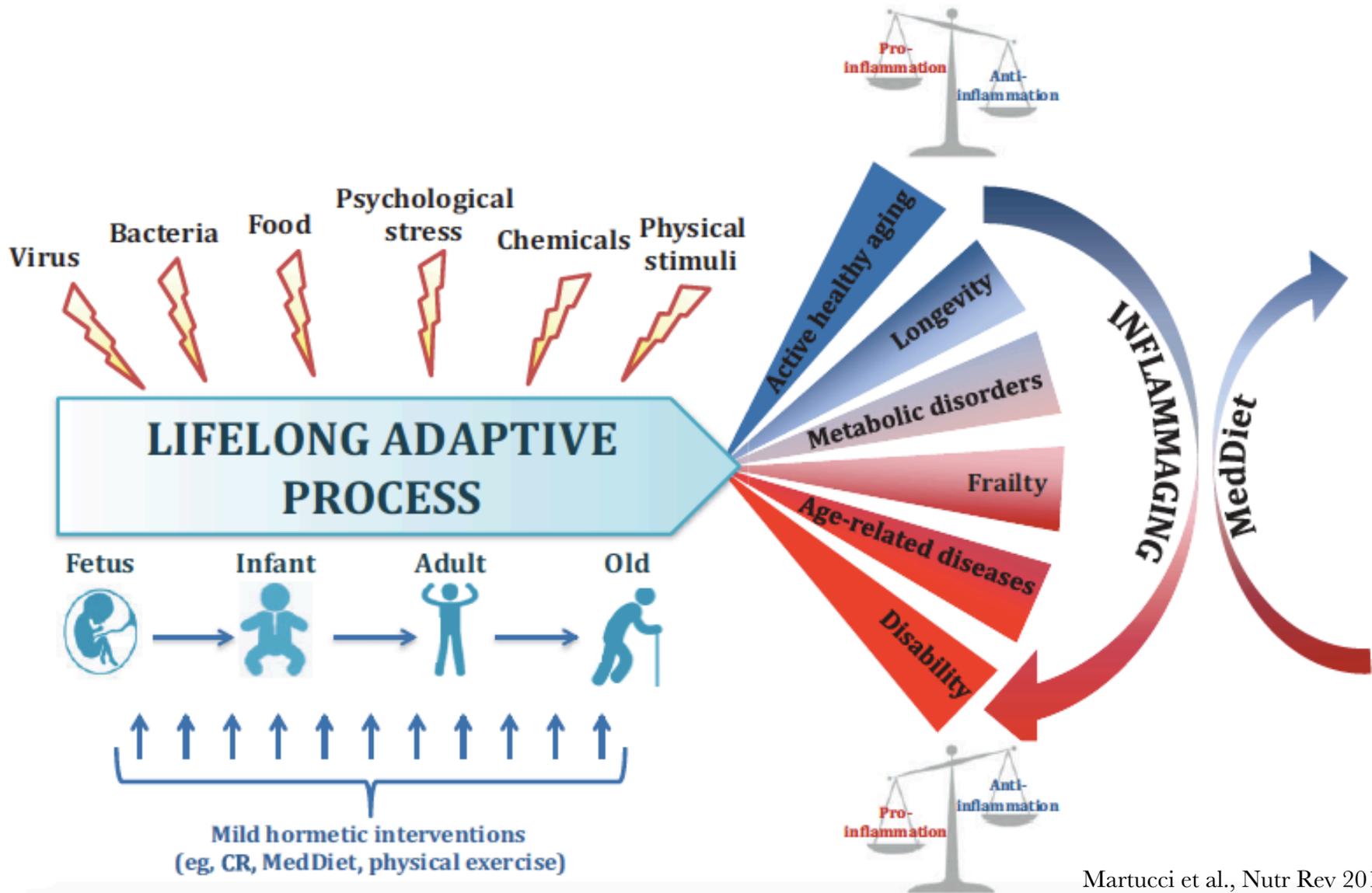


Mediterranean diet and inflammaging within the hormesis paradigm

Morena Martucci,* Rita Ostan,* Fiammetta Biondi, Elena Bellavista, Cristina Fabbri, Claudia Bertarelli, Stefano Salvioli, Miriam Capri, Claudio Franceschi, and Aurelia Santoro



Dieta Mediterranea e Ormesi



Ormetine nutrizionali nei cibi tipicamente Mediterranei

Table 1 Nutritional hormetins of typical Mediterranean foods able to activate specific stress-response pathways

Nutritional hormetin	Food item within traditional Mediterranean diet	Stress pathway
Phytochemicals (phenolic antioxidants, terpenoids, carotenoids, and allium-derived sulfur compounds)	Olives, legumes, leafy green vegetables, tomatoes, eggplant, fruits, garlic, and onion	Activation of nuclear factor erythroid 2 (Nrf2)
Resveratrol	Grapes, red wine	Regulation of redox homeostasis Activation of Nrf2 and sirtuin pathway Blocking of nuclear factor κ B (NF- κ B)
Vitamin E	Dried fruits, herbs, leafy green vegetables	Activation of heat shock response Down-regulation of NF- κ B
n-3 polyunsaturated fatty acids	Fish, nuts	Activation of Nrf2 Blocking of NF- κ B
Fiber	Legumes, unrefined whole-grain cereals, fresh vegetables, fruits	Cooperation with cellular stress pathways (heat shock proteins)

