Fruit & Vegetable Consumption and Mental Health

Saverio Stranges, MD, PhD, FAHA

Department of Epidemiology & Biostatistics, Western University
Department of Family Medicine, Western University
Department of Population Health, Luxembourg Institute of Health

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Schulich MEDICINE & DENTISTRY

LUXEMBOURG INSTITUTE OF HEALTH
RESEARCH DEDICATED TO LIFE

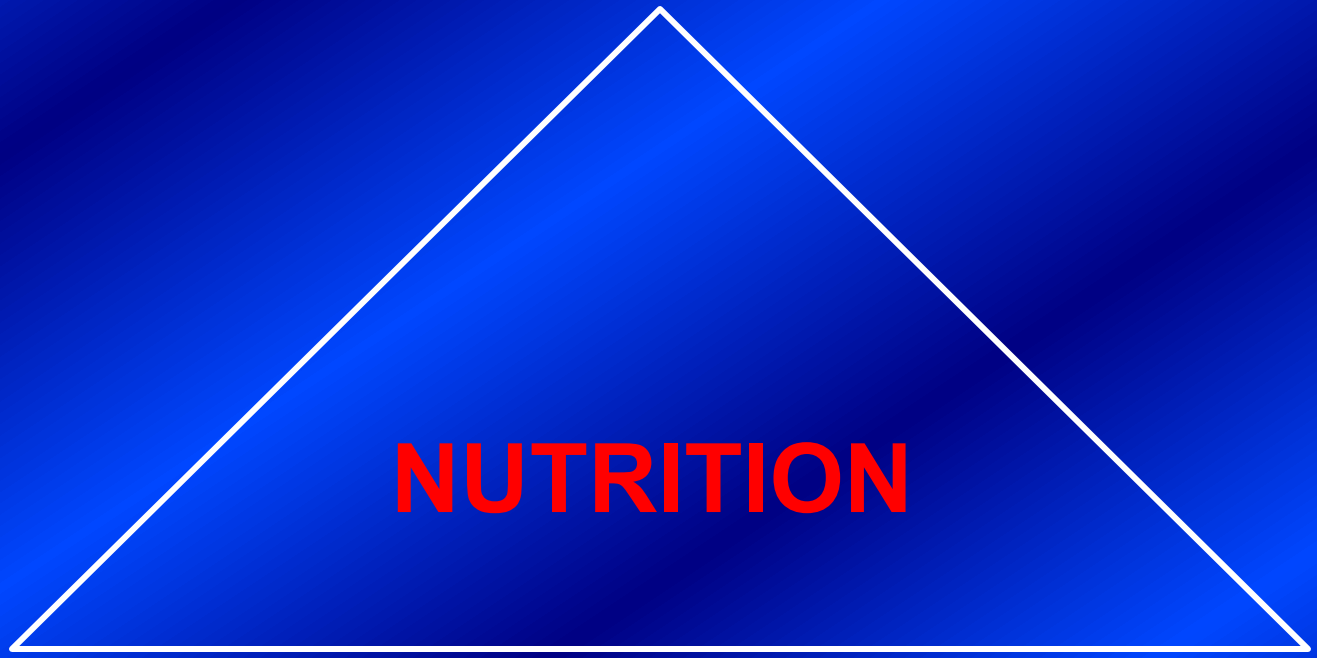
Western

Outline

- ✓ Role of Nutrition (Dietary Patterns/Micronutrients)
- ✓ Mental Disorders vs. Mental Well-being
- ✓ Results from Observational Studies and Clinical Trials
- ✓ Lessons Learned & Way Forward
- ✓ Recommendations for the Application in Daily Practice

Chronic Outcomes

(CVD, cancer, mental disorders, mortality, aging)



Dietary Patterns

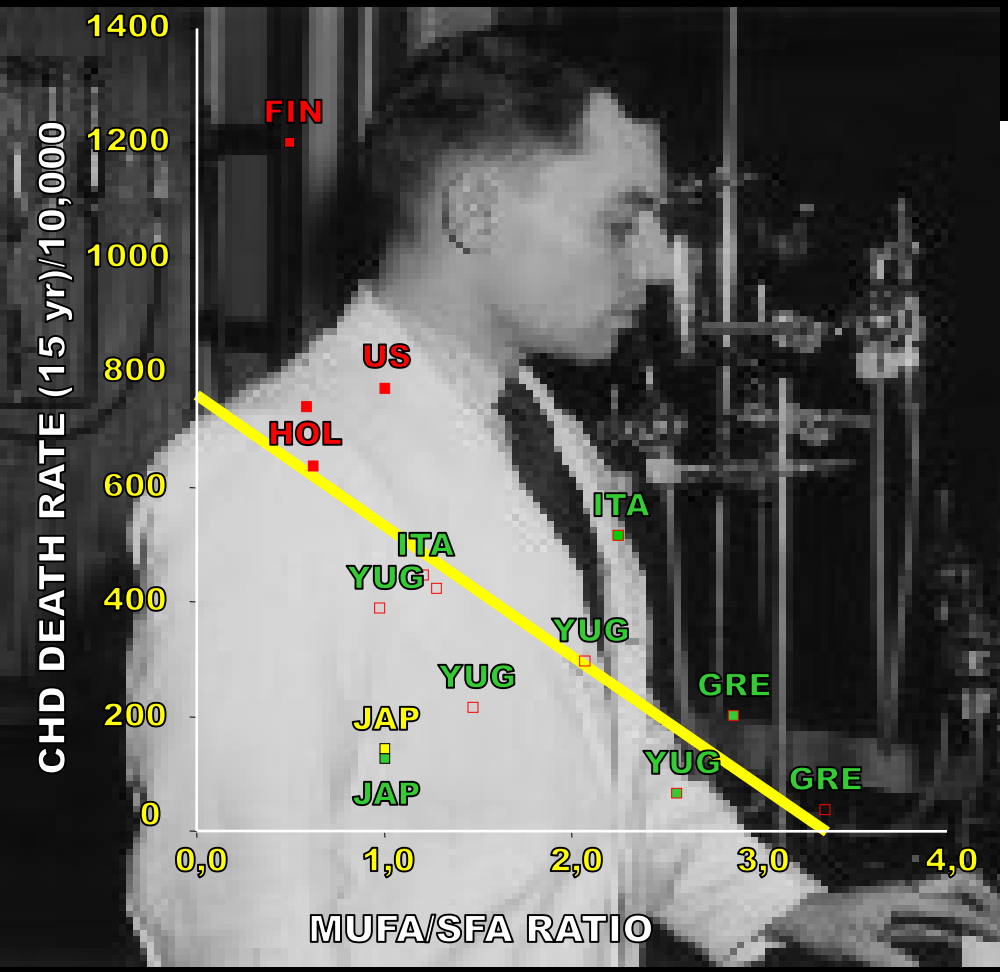
(Mediterranean diet, vegetarianism, DASH, etc.)

Micronutrients

(dietary supplements, multivitamins, multiminerals)

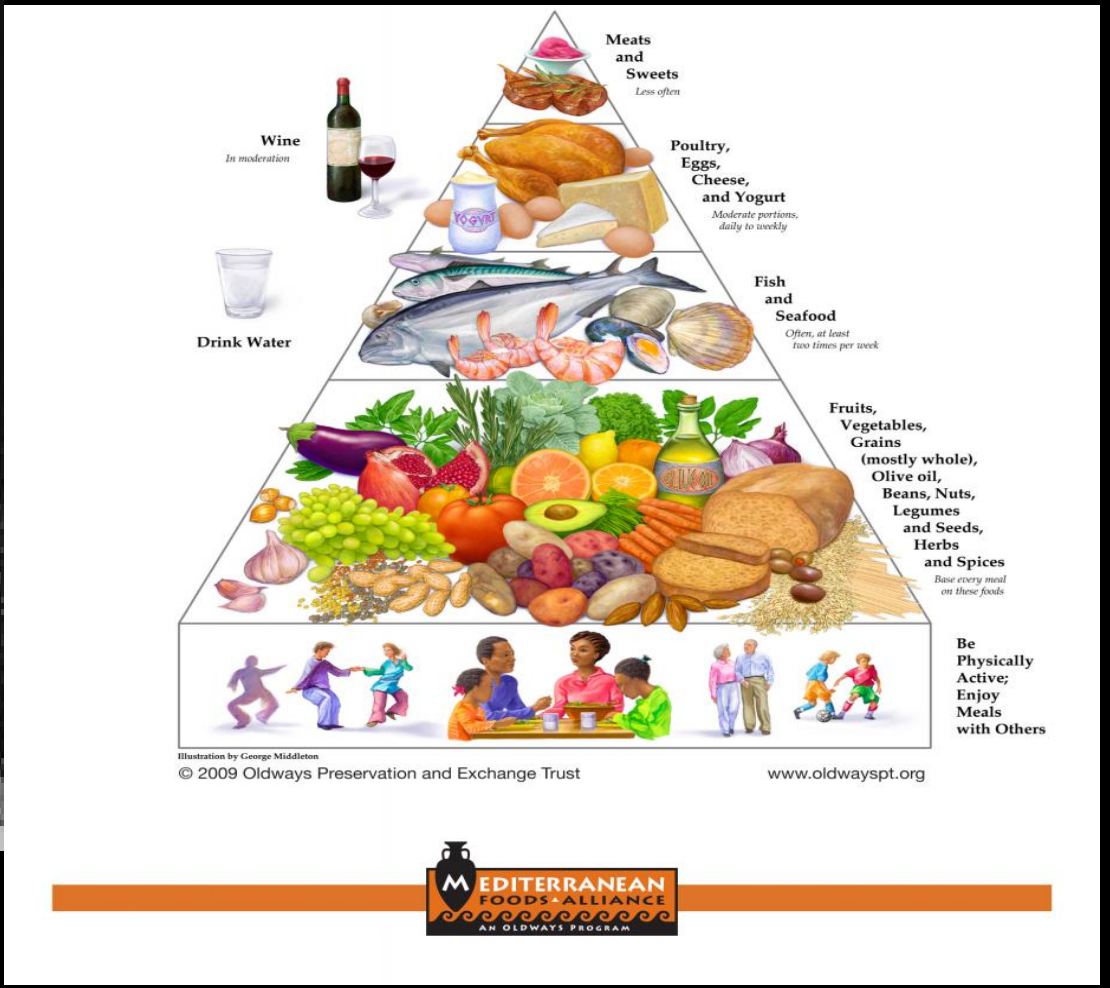
Role of Dietary Patterns

Seven Countries Study



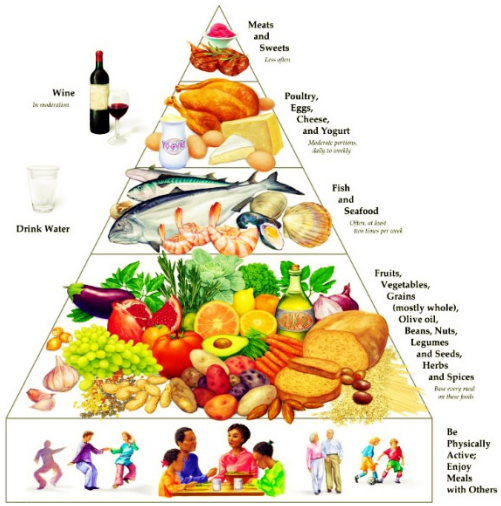
A. Keys

Mediterranean Diet Pyramid



'Mediterranean' dietary pattern for the primary prevention of cardiovascular disease (Review)

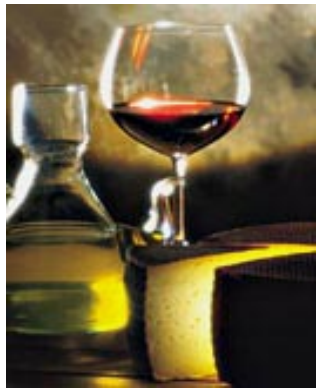
Rees K, Hartley L, Flowers N, Clarke A, Hooper L, Thorogood M, Stranges S

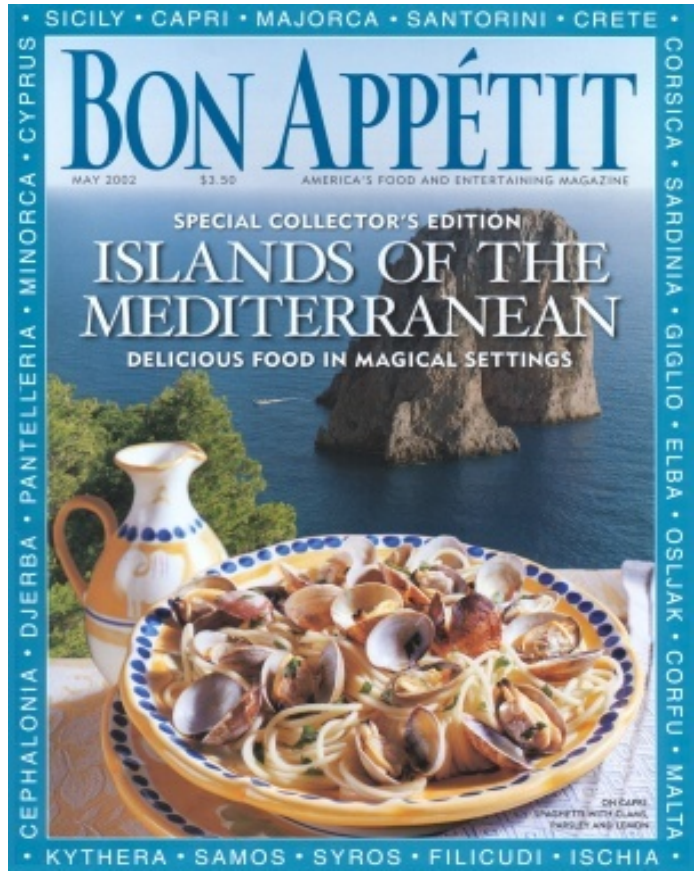


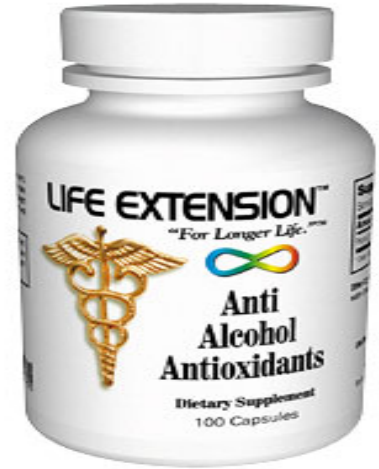
THE COCHRANE COLLABORATION®

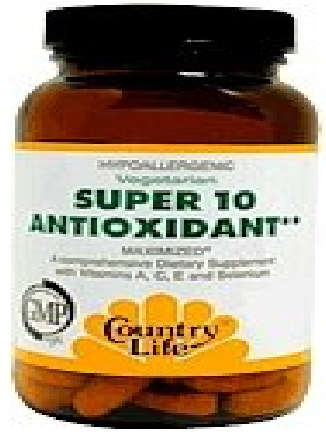
Cochrane Database Syst Rev. 2013;8:CD009825

From Dietary Patterns to Nutritional Supplements: A potential shortcut to chronic disease prevention…?

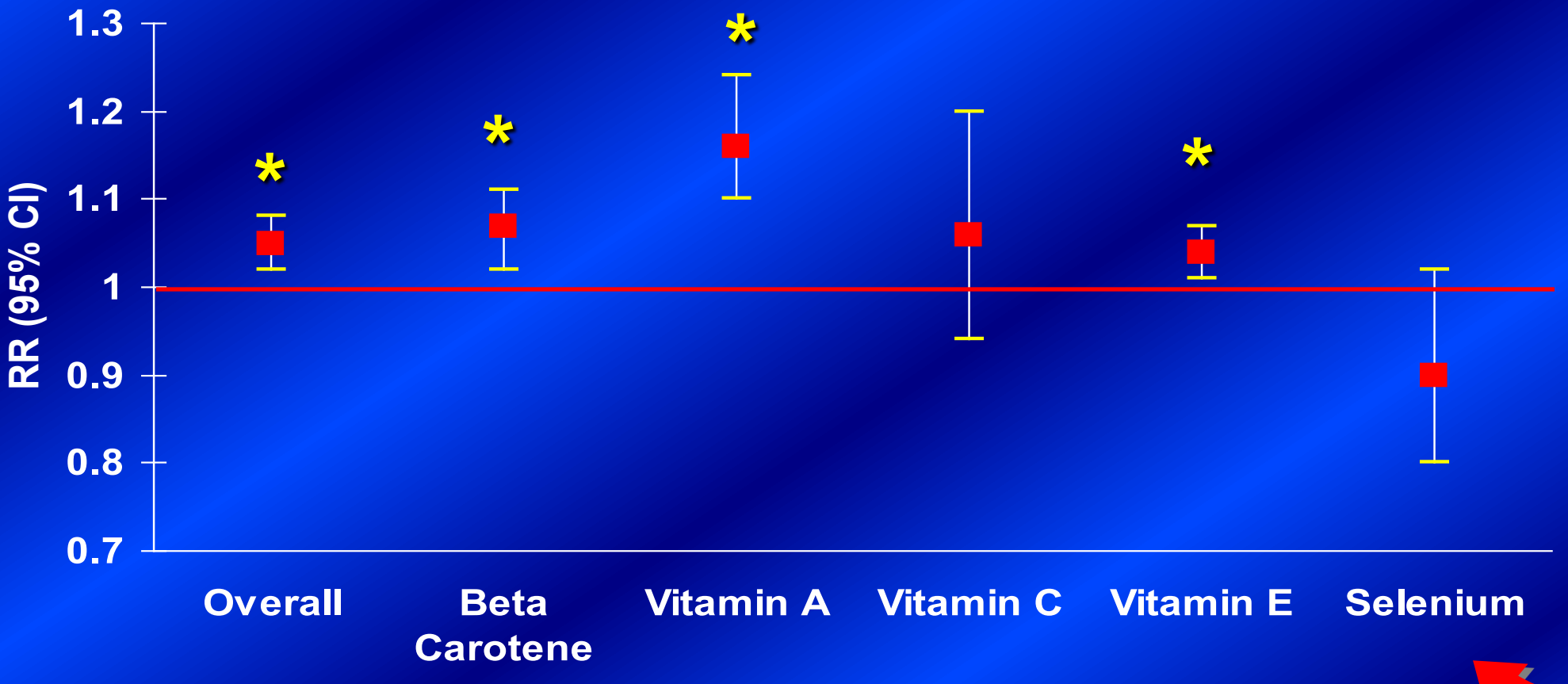








Mortality in Randomized Trials of Antioxidant Supplements

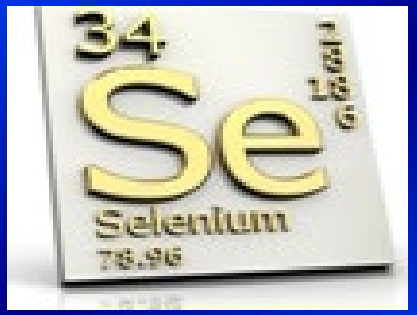


*$P < .05$

Bielakovic G. JAMA. 2007;297:842-857 & Cochrane Database Syst Rev. 2012;3:CD007176

Selenium Supplementation & Chronic Disease Prevention

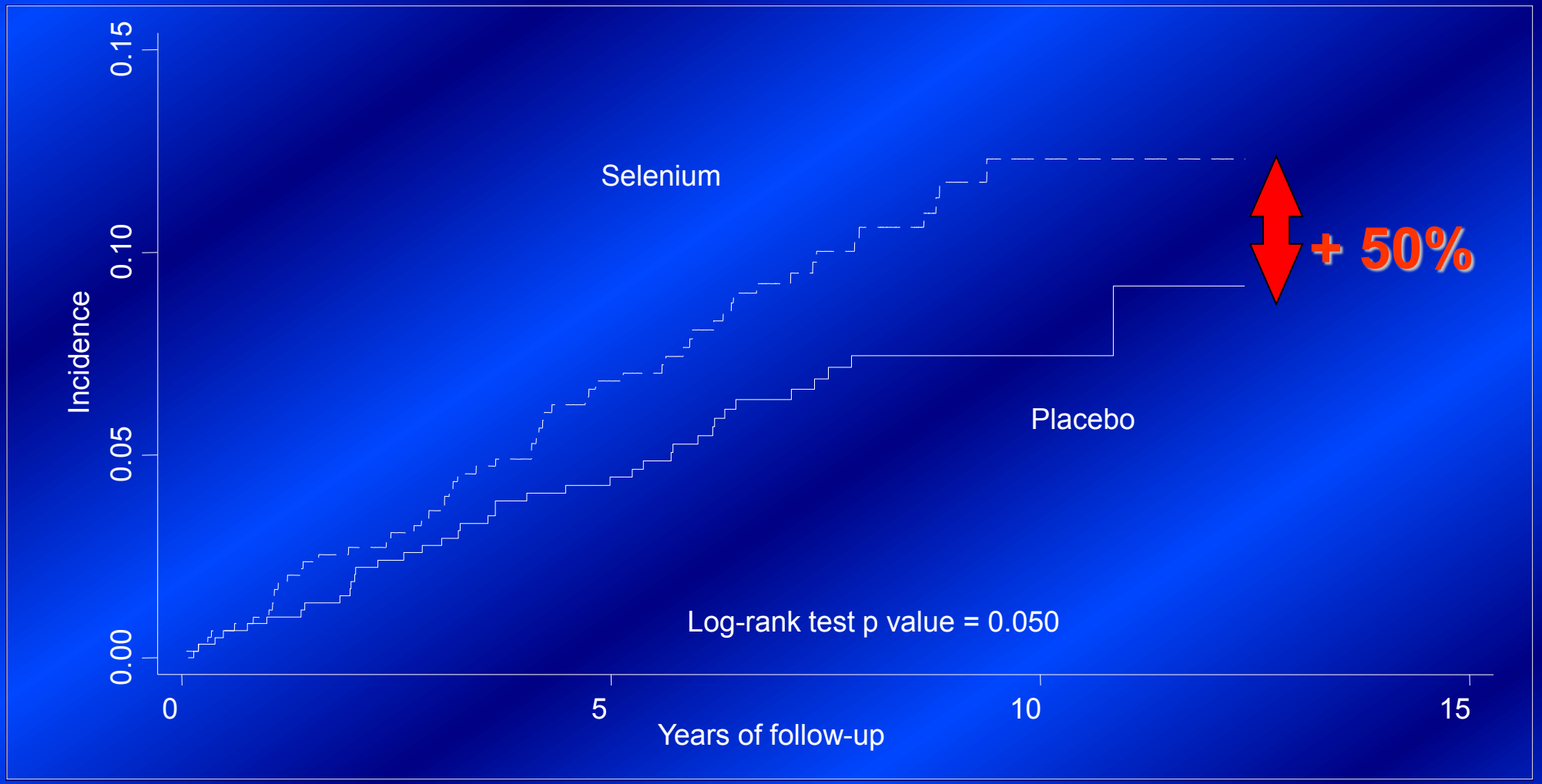
Nutritional Prevention of Cancer Trial



JAMA 1996;276:1957-63

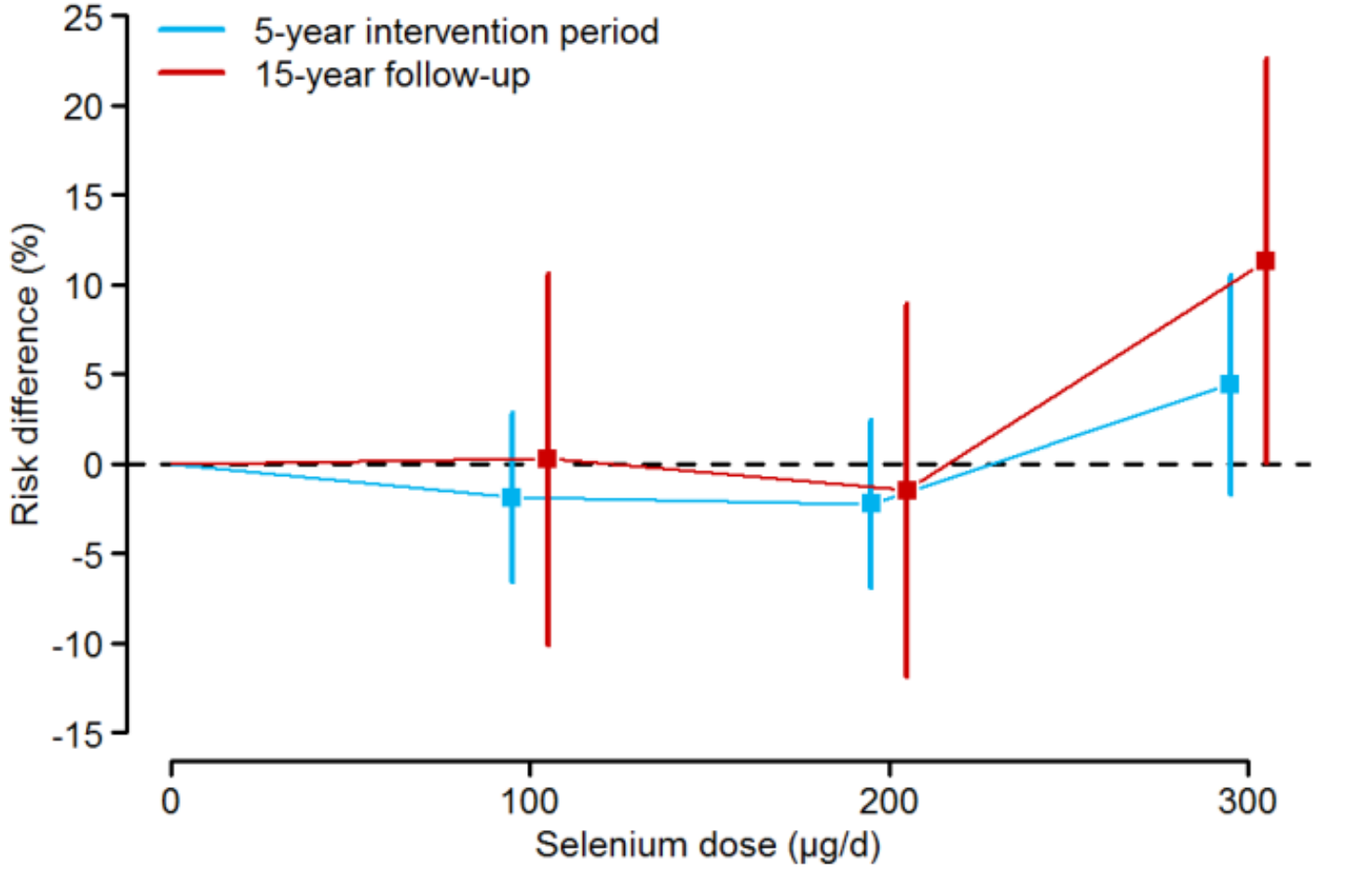
Selenium Supplementation vs. Diabetes

Nutritional Prevention of Cancer Trial



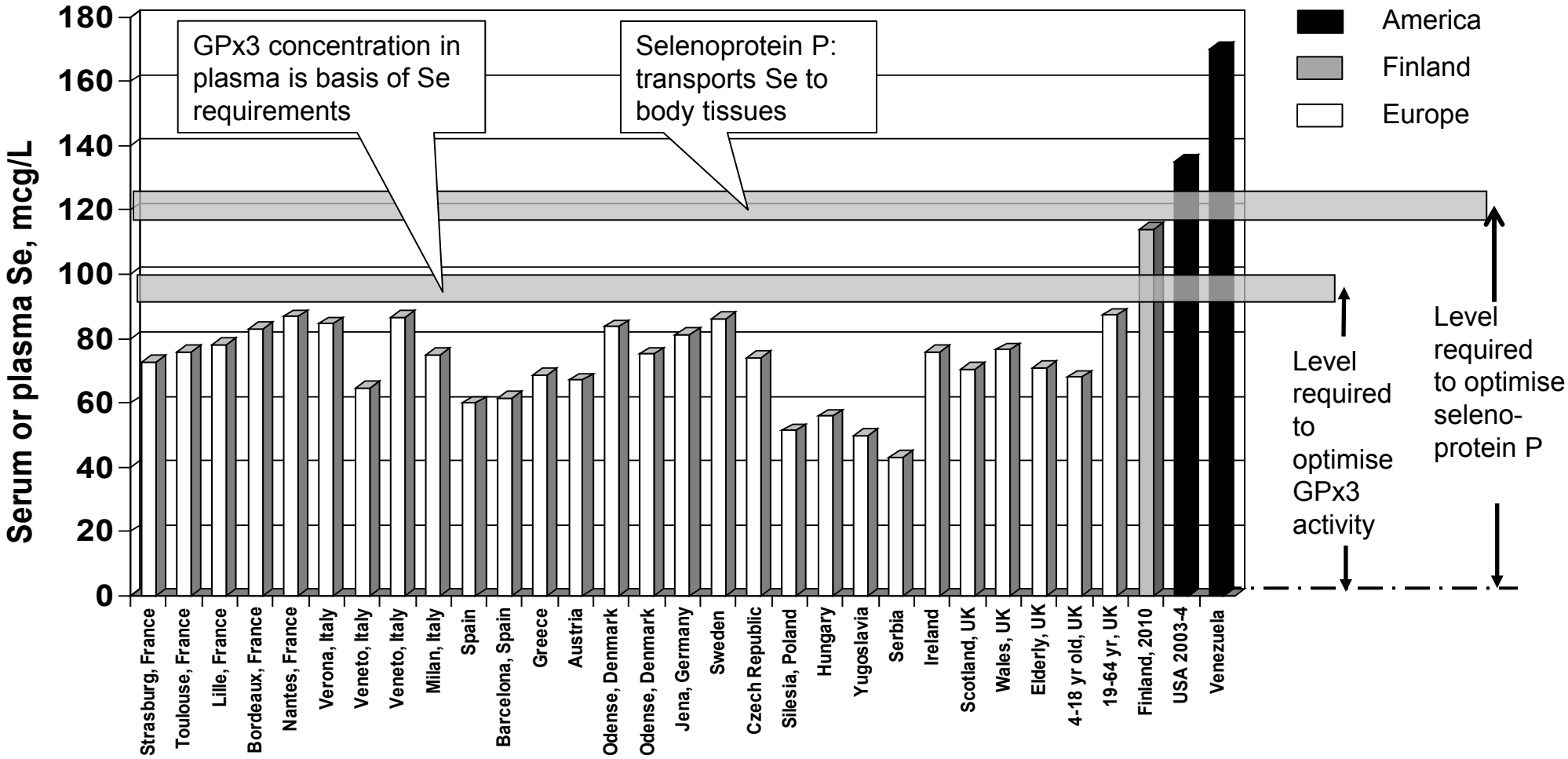
Stranges S et al. Ann Intern Med. 2007;147:217-23

Effect of Selenium Supplementation (5 years) on All-cause Mortality – DK PRECISE Trial



Rayman MP, Stranges S, et al. Circulation. 2017;135:A16

Geographic variations in Selenium status might explain inconsistent results across populations (biological plausibility)



Rayman MP, Stranges S. Free Radic Biol Med. 2013;65:1557-64

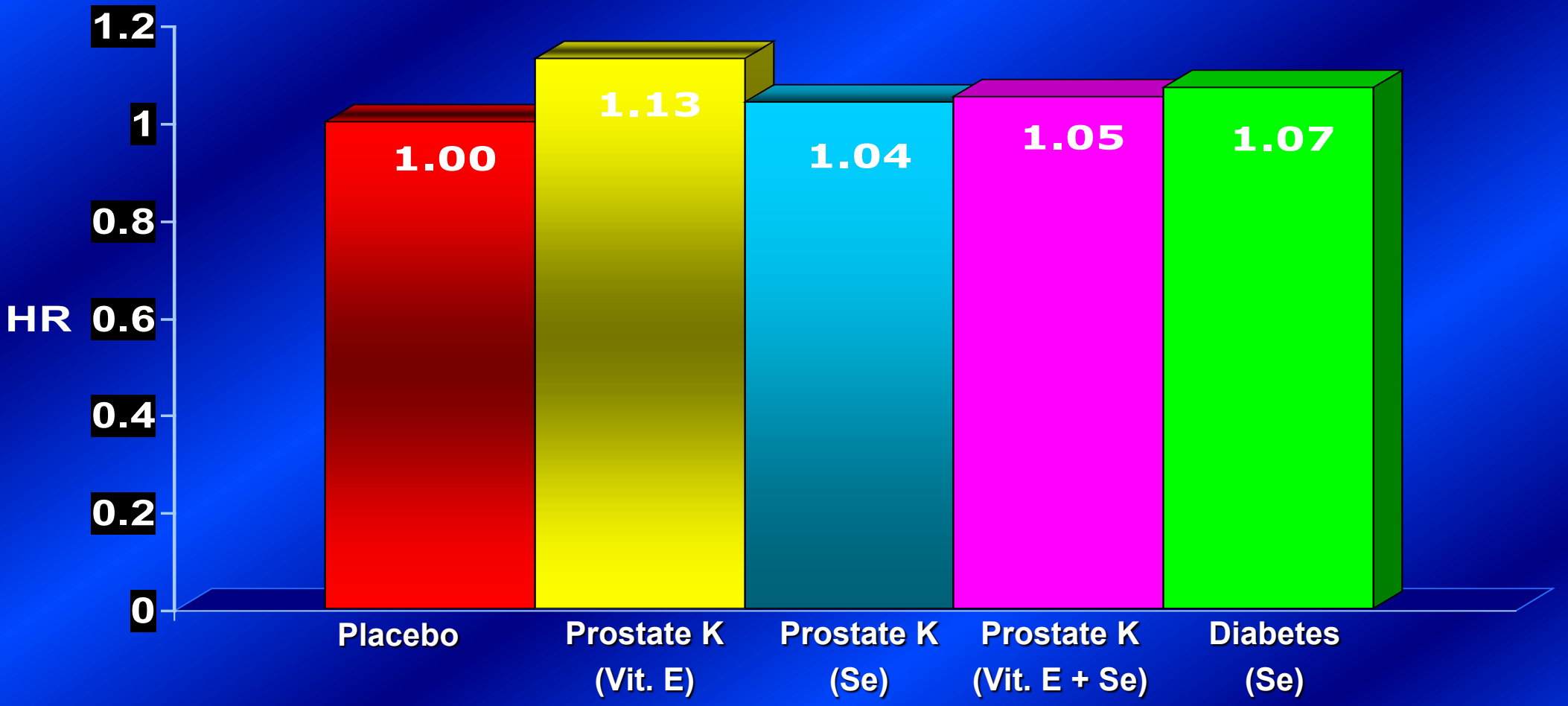
Selenium and Vitamin E Cancer Prevention Trial (SELECT)

	Vitamin E (400 IU/day)		
Selenium (200 µg/day)	+	-	T
+	8,100	8,100	16,200
-	8,100	8,100	16,200
T	16,200	16,200	32,400

- Cost: $175,000,000 (NCI, NIH, etc.)

SELECT: Findings…Stopped after 5.5 y

n=35,533 US male adults



JAMA. 2009; 301:39-51

EDITORIAL | Annals of Internal Medicine

Enough Is Enough: Stop Wasting Money on Vitamin and Mineral Supplements

Ann Intern Med. 2013;159:850-851.

Eliseo Guallar, MD, DrPH
Johns Hopkins Bloomberg School of Public Health
Baltimore, Maryland

Saverio Stranges, MD, PhD
Warwick Medical School, University of Warwick
Coventry, United Kingdom

Cynthia Mulrow, MD, MSc
Annals of Internal Medicine, American College of Physicians
Philadelphia, Pennsylvania

Lawrence J. Appel, MD, MPH
Edgar R. Miller III, MD, PhD
Johns Hopkins School of Medicine
Baltimore, Maryland

GLOBAL BURDEN OF MENTAL DISORDERS

Table

Proportion of YLDs, YLLs, and DALYs explained by the ten leading causes of total burden in 2010

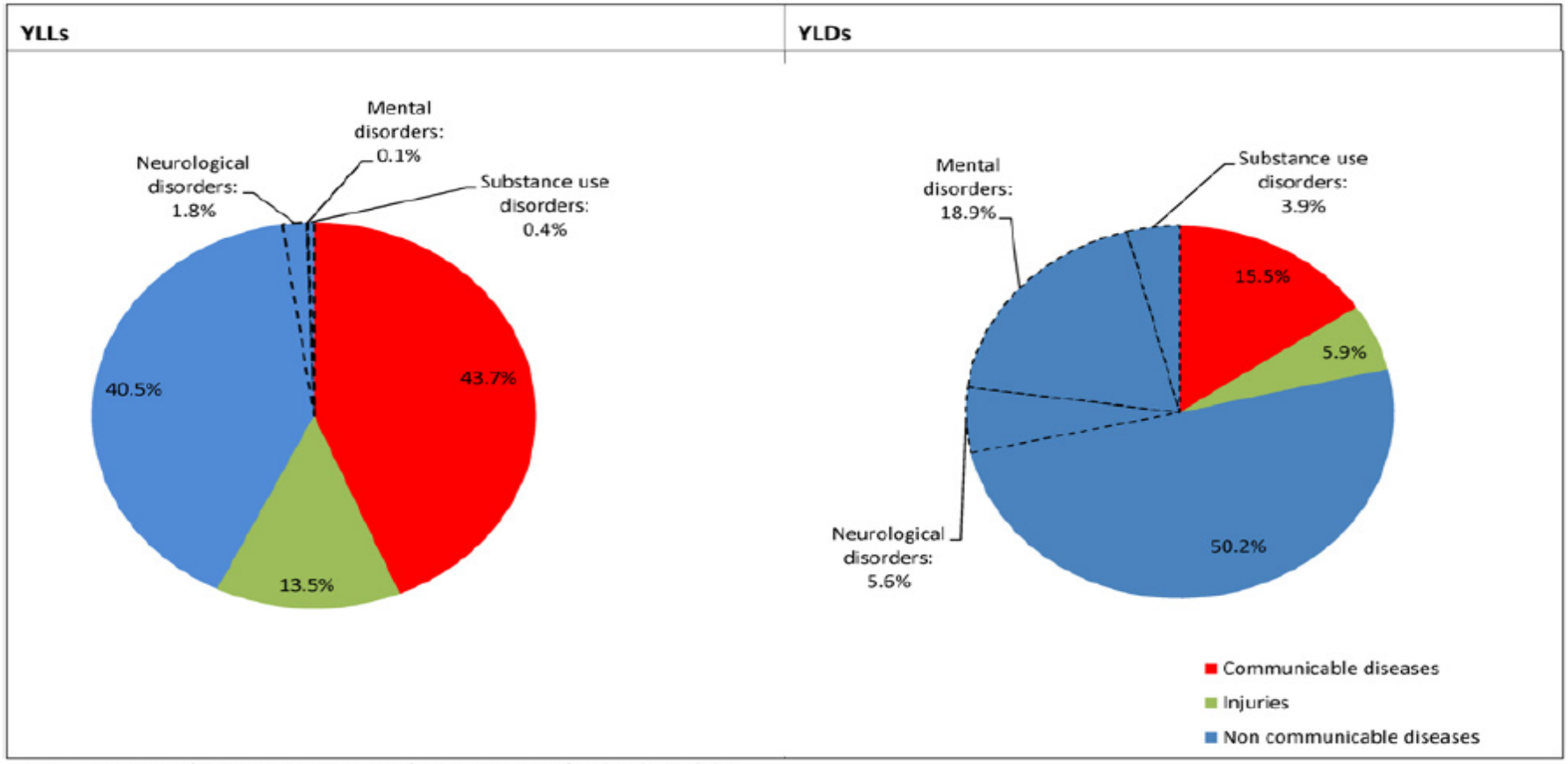
	Proportion of total DALYs (95% UI)	Proportion of total YLDs (95% UI)	Proportion of total YLLs (95% UI)
Cardiovascular and circulatory diseases	11·9% (11·0–12·6)	2·8% (2·4–3·4)	15·9% (15·0–16·8)
Diarrhoea, lower respiratory infections, meningitis, and other common infectious diseases	11·4% (10·3–12·7)	2·6% (2·0–3·2)	15·4% (14·0–17·1)
Neonatal disorders	8·1% (7·3–9·0)	1·2% (1·0–1·5)	11·2% (10·2–12·4)
Cancer	7·6% (7·0–8·2)	0·6% (0·5–0·7)	10·7% (10·0–11·4)
Mental and substance use disorders	7·4% (6·2–8·6)	22·9% (18·6–27·2)	0·5% (0·4–0·7)
Musculoskeletal disorders	6·8% (5·4–8·2)	21·3% (17·7–24·9)	0·2% (0·2–0·3)
HIV/AIDS and tuberculosis	5·3% (4·8–5·7)	1·4% (1·0–1·9)	7·0% (6·4–7·5)
Other non-communicable diseases	5·1% (4·1–6·6)	11·1% (8·2–15·2)	2·4% (2·0–2·8)
Diabetes, urogenital, blood, and endocrine diseases	4·9% (4·4–5·5)	7·3% (6·1–8·7)	3·8% (3·4–4·3)
Unintentional injuries other than transport injuries	4·8% (4·4–5·3)	3·4% (2·5–4·4)	5·5% (4·9–5·9)

DALYs=disability-adjusted life-years. YLDs=years lived with disability. YLLs=years of life lost.

Mental and substance use disorders are the leading cause of YLDs worldwide !!!

Whiteford et al, Lancet (2013), 382, 1575-86

GLOBAL BURDEN OF MENTAL DISORDERS



Note: YLLs = years lost to premature mortality; YLDs = Years lived with disability

Whiteford et al (2015) PLoS ONE 10(2):e0116820

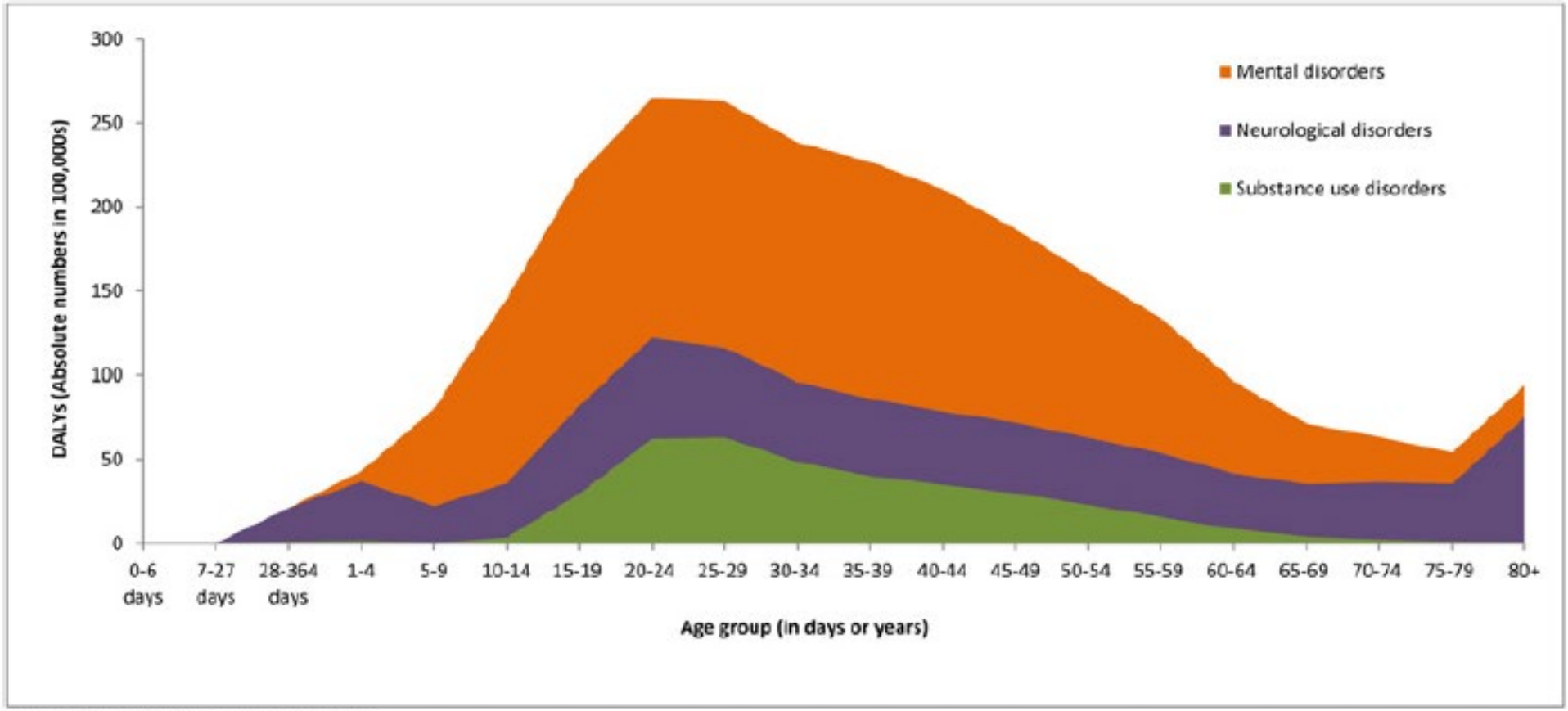
GLOBAL BURDEN OF MENTAL DISORDERS

2013 leading causes	Mean rank (95% UI)	Mean YLDs (×1000)	Median percentage change
1 Low back pain	1·0 (1–1)	72318	57% (53 to 61)
2 Major depression	2·1 (2–4)	51784	53% (49 to 59)
3 Iron-deficiency anaemia	3·6 (2–6)	36663	–9% (–10 to –7)
4 Neck pain	4·3 (3–6)	34348	54% (49 to 60)
5 Other hearing loss	5·3 (3–9)	32580	51% (45 to 55)
6 Migraine	6·6 (3–10)	28898	46% (41 to 50)
7 Diabetes	6·7 (5–9)	29518	136% (127 to 144)
8 COPD	7·8 (4–10)	26131	72% (67 to 79)
9 Anxiety disorders	8·5 (5–10)	24356	42% (36 to 47)
10 Other musculoskeletal	9·2 (7–10)	22644	79% (75 to 83)
11 Schizophrenia	11·5 (11–15)	15204	52% (50 to 54)
12 Falls	12·7 (12–14)	12818	23% (14 to 35)
13 Osteoarthritis	12·8 (11–15)	12811	75% (73 to 78)
14 Refraction and accommodation	15·5 (11–22)	11257	44% (40 to 47)
15 Asthma	16·1 (12–21)	10596	32% (29 to 35)
16 Dysthymia	17·4 (14–21)	9849	55% (52 to 57)
17 Bipolar disorder	17·5 (12–25)	9911	49% (46 to 53)
18 Medication overuse headache	17·8 (12–27)	9846	120% (109 to 134)
19 Other mental and substance	18·5 (14–24)	9257	52% (50 to 54)
20 Dermatitis	18·8 (15–25)	9278	37% (35 to 39)
21 Alzheimer's disease	22·2 (18–26)	7774	92% (85 to 99)
22 Alcohol use disorders	23·0 (18–28)	7654	34% (32 to 37)
23 Epilepsy	23·2 (18–30)	7544	41% (28 to 57)
24 Edentulism	25·9 (21–31)	6856	46% (43 to 48)
25 Diarrhoeal diseases	26·1 (23–30)	6854	–7% (–9 to –5)

Mental Disorders

Major depressive disorder second leading causes of YLDs !!! *Vos et al, Lancet (2015), 386, 743-800*

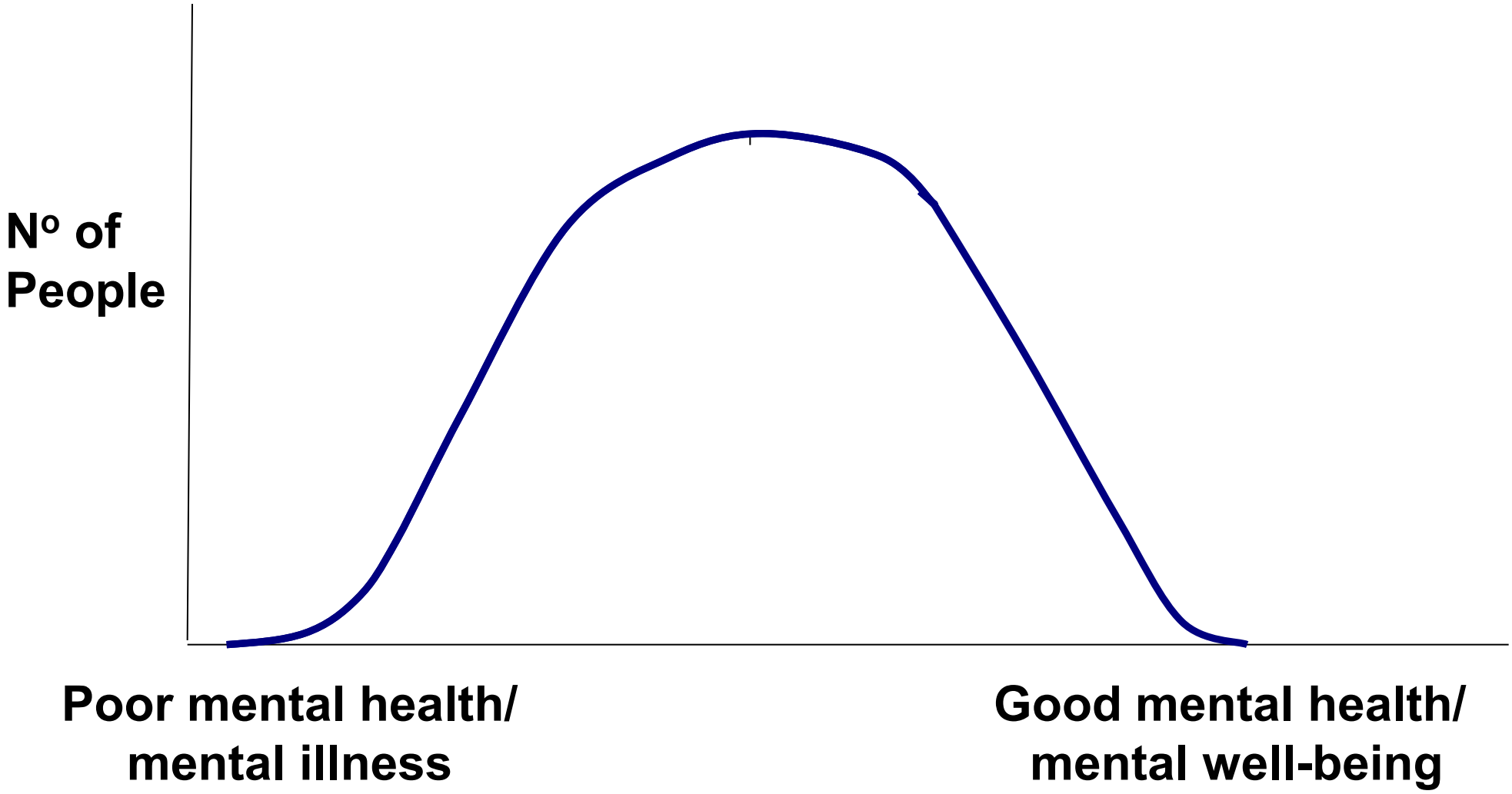
GLOBAL BURDEN OF MENTAL DISORDERS



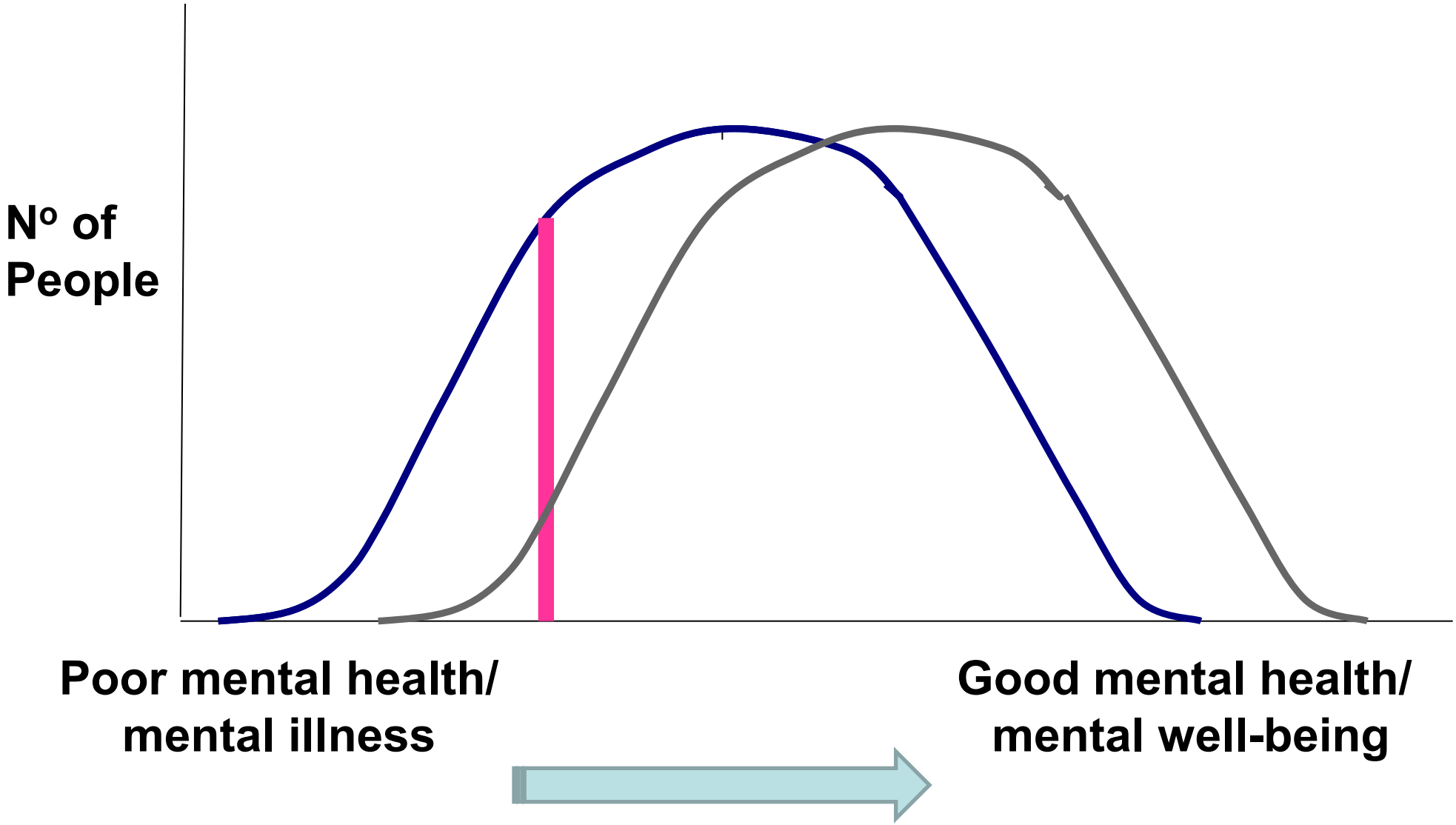
Note: DALYs = disability-adjusted life years.

Whiteford et al (2015) PLoS ONE 10(2):e0116820

Distribution of Mental Health



Distribution of Mental Health



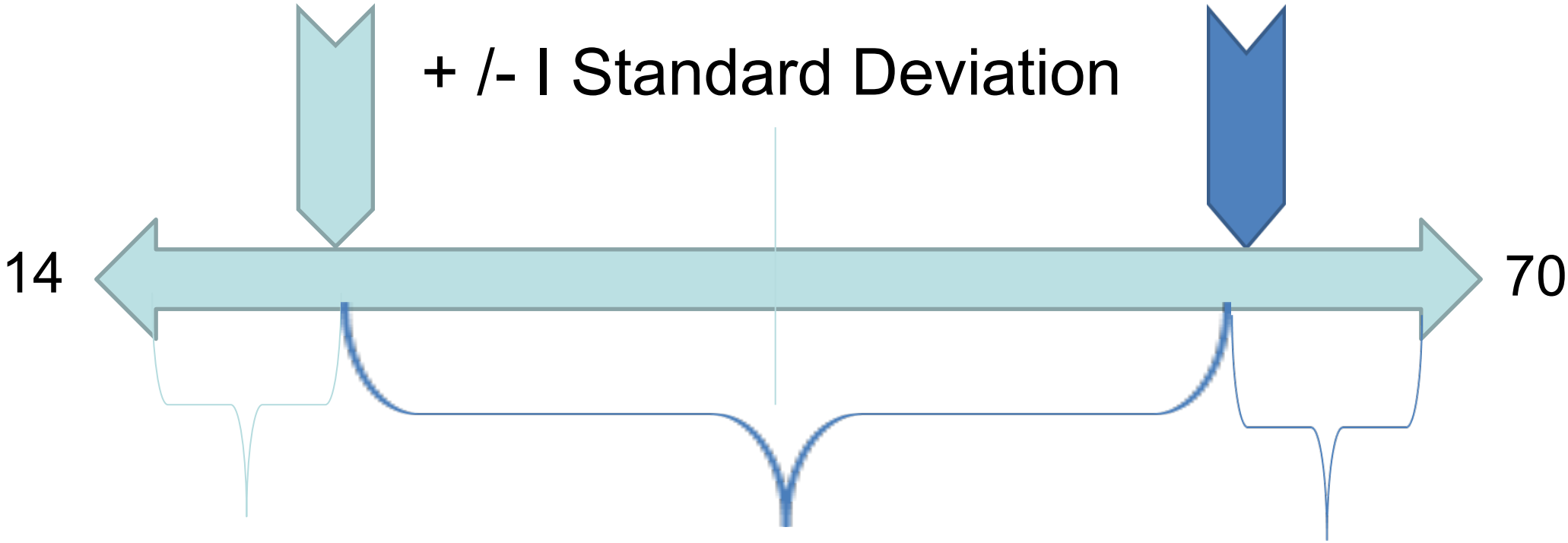
What is mental well-being ?

- **Feeling good**
  - Life satisfaction
  - Happiness
- **Functioning well, flourishing**
  - Confidence,
  - Optimism
  - Autonomy,
  - Agency,
  - Good relationships with others,
  - Purpose in life

The Warwick-Edinburgh Mental Well-being Scale (WEMWBS)

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

Statistical Methods: WEMWBS



Fruit & Vegetable Intake and Mental Well-being

(N=13,983, ≥16 y, 56% females)

Open Access Research

BMJ Open

Major health-related behaviours and mental well-being in the general population: the Health Survey for England

Saverio Stranges,[1] Preshila Chandimali Samaraweera,[1,2] Frances Taggart,[1] Ngianga-Bakwin Kandala,[1] Sarah Stewart-Brown[1]

Summary of Findings

- ✓ First analysis of behavioural correlates of mental well-being in a large, nationally representative sample from the general population

- ✓ With smoking, ***fruit & vegetable intake*** was the health-related behaviour most consistently associated with low & high mental well-being in both sexes

- ✓ Lower ***mental wellbeing*** was associated with increasing ***smoking*** and decreasing ***fruit & vegetable intake***; ***alcohol intake*** and ***obesity*** were associated with low, but not high mental well-being

Fruit & Vegetable Intake and Depression Risk

(18 observational studies in the meta-analysis)

- RR for **depression** in the highest v. the lowest category of **fruit** intake was **0.83** (95% CI 0.71, 0.98) in **cohort** studies**, 0.76** (95% CI 0.63, 0.92) in **cross-sectional** studies
- RR for **depression** in the highest v. the lowest category of **vegetable** intake was **0.86** (95% CI 0.75, 0.98) in **cohort** studies**, 0.75** (95% CI 0.62, 0.91) in **cross-sectional**
- Every 100-g increased intake of **fruit** was associated with a **3% reduced risk** of depression in **cohort** studies (RR=0.97; 95% CI 0.95, 0.99)
- Every 100-g increased intake of **vegetables** was associated with a **3% reduced risk** of depression in **cohort** studies (RR=0.97; 95% CI 0.95, 0.98)

.Br J Nutr. 2018;119:1087-1101

Dietary interventions on depression & anxiety

(17 randomised controlled trials in the systematic review)

- Compared with a control condition, almost half (47%) of the studies observed **significant effects on depression scores** in favour of the treatment group
- Effective dietary interventions were based on a **single delivery mode**, employed a **qualified dietitian** and were less likely to recommend reducing red meat intake, select leaner meat products or follow a low-cholesterol diet
- Among studies that achieved an improvement in depression score, 75 % of studies explicitly recommended a diet high in fibre and/or **fruit and vegetables**
- Only **one trial** specifically investigated the impact of a dietary intervention in individuals with clinical depression
- **Appropriately powered trials** that examine the effects of dietary improvement on mental health outcomes in **those with clinical disorders** are required

.Public Health Nutr. 2015;18:2074-93

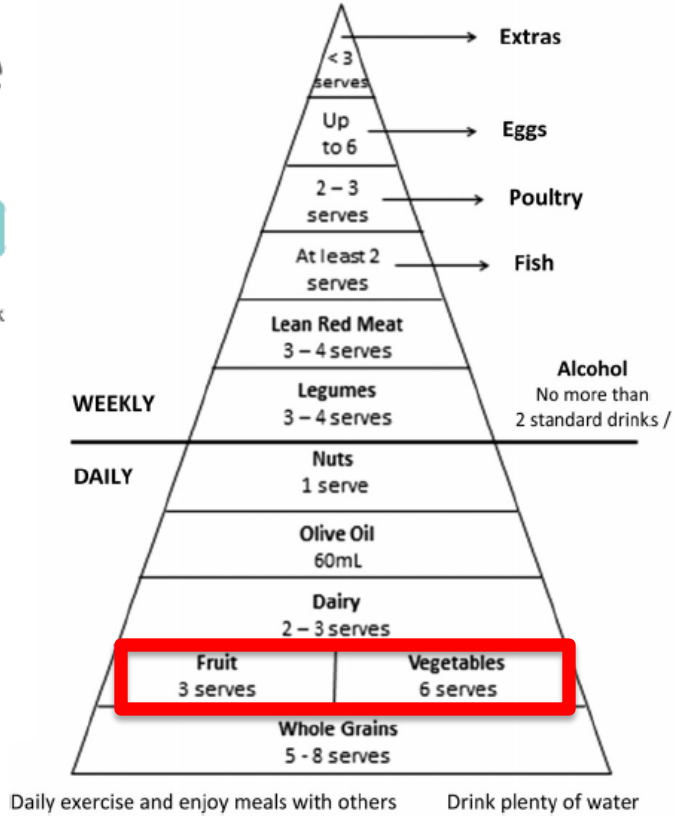
Jacka et al. BMC Medicine (2017) 15:23
DOI 10.1186/s12916-017-0791-y

BMC Medicine

RESEARCH ARTICLE Open Access

A randomised controlled trial of dietary improvement for adults with major depression (the 'SMILES' trial)

Felice N. Jacka[1,4,9,10,13*], Adrienne O'Neil[1,2,13], Rachelle Opie[5,13], Catherine Itsiopoulos[5], Sue Cotton[3], Mohammedreza Mohebbi[1], David Castle[4,11], Sarah Dash[1,13], Cathrine Mihalopoulos[7], Mary Lou Chatterton[7], Laima Brazionis[5,6], Olivia M. Dean[1,4,12,13], Allison M. Hodge[8] and Michael Berk[1,3,12,13]



Dietary improvement (a modified Mediterranean Diet) may provide an efficacious and accessible treatment strategy for the management of major depression, the benefits of which could extend to the management of common co-morbidities

Potential Mechanisms for the Beneficial Effect of Fruit & Vegetable Consumption on Mental Health

- Several **antioxidants** found in fruit and vegetables have been associated with optimism and positive mental wellbeing as well as with reduced risk of mental disorders
- Fruit & vegetable consumption might be a proxy for additional **correlated dietary exposures**, including fish, whole grains, which might contribute to better mental health
- **Diet quality** may influence **Inflammatory** and **oxidative stress** pathways, as well as **brain plasticity** and the **gut microbiota**, which may all play a role in depression
- **Behavioral changes** associated with food (cooking/shopping/meal patterns) are an expected outcome of a nutrition intervention, and may also have a therapeutic benefit
- Importantly, improvements in mental health and depressive symptoms, as a result of improved diet quality, seem to be **independent of weight change**

Lessons Learned and Way Forward

- Fruit and vegetable intake, as part of an overall healthy dietary pattern, may play an important role as a **driver** not just of physical but also of **mental health**, both in the general population and among individuals with clinical disorders (e.g. depression)
- Observational studies have reported, though not consistently, a **dose-response relationship** of fruit and vegetable intake with mental health, up to 7 portions/daily
- Additional **prospective** studies and **randomised clinical trials** should be carried out to corroborate the causality of the epidemiological cross-sectional data
- Future clinical trials in this emerging field of **nutritional psychiatry research** should focus on replication, ensuring **larger samples** in order to confirm effects and allow sensitivity analyses to identify predictors of treatment response
- Scaling up of interventions and identification of **pathways** that mediate the impact of dietary improvement on mental well-being and mental illness are also key imperatives

Recommendations for Application in Daily Practice

- Dietary improvement with other health behaviors (exercise, sleep & smoking) should be part of **clinical guidelines** as a first step in the treatment of mental disorders
- **Clinical dieticians** should be added to multidisciplinary mental health teams to provide nutritional advice to those with mental disorders in primary and other care settings
- Improving diet quality in patients with mental disorders will also benefit the **physical illnesses** that are so commonly comorbid, thus reducing the burden of chronic disease
- From a public health perspective, people should strive to meet **recommended dietary guidelines** in terms of fruit and vegetable intake (at least 5 portions, 400g/day)
- Facilitate access to fruit & vegetable intake (and healthy foods) to **disadvantaged population subgroups** and integrate this within an overall healthy lifestyle

"Beyond the ingredients themselves, eating the traditional Mediterranean way is a philosophy in itself: life is for savouring, and food is a glorious and beautiful expression of life…"

"The Mediterranean Diet"
Marissa Cloutier (2004)