IFNH Institute for Food, Nutrition & Health

University of Reading 1926 2016 NINETY YEARS OF EXCELLENCE

SMART DAIRY FOODS

Ian Givens

Institute for Food, Nutrition and Health
University of Reading

Hannah Dairy Research Foundation

Next Generation Dairying for Scotland

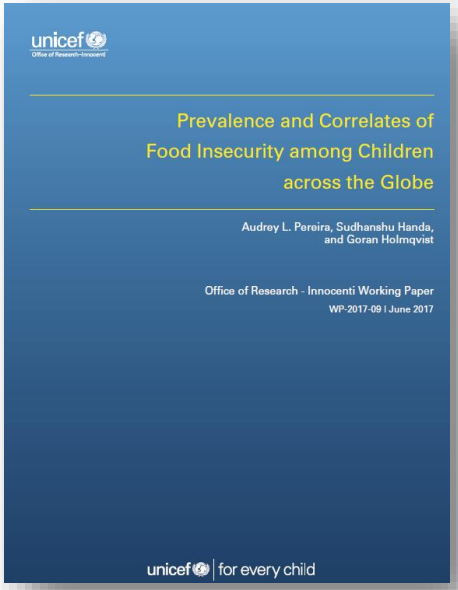
19 Nov 2018

LIMITLESS **POTENTIAL** | LIMITLESS **OPPORTUNITIES** | LIMITLESS **IMPACT**

Across the Human Lifespan

CHILDREN: IMPACT OF DAIRY FOODS

Substantial and vulnerable sections of the UK population do not have food security now!



UK childhood obesity in England

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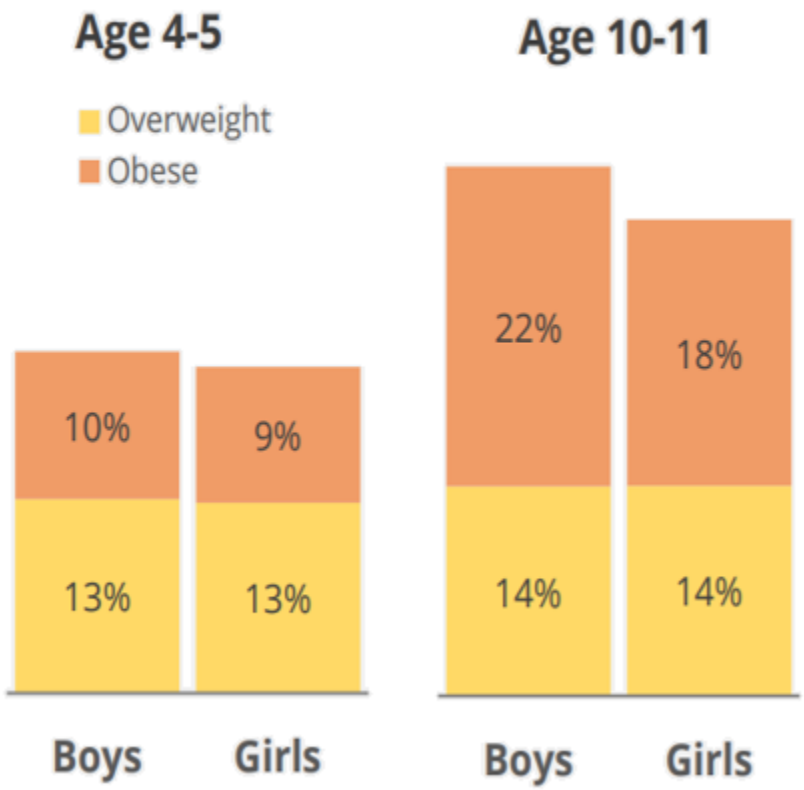
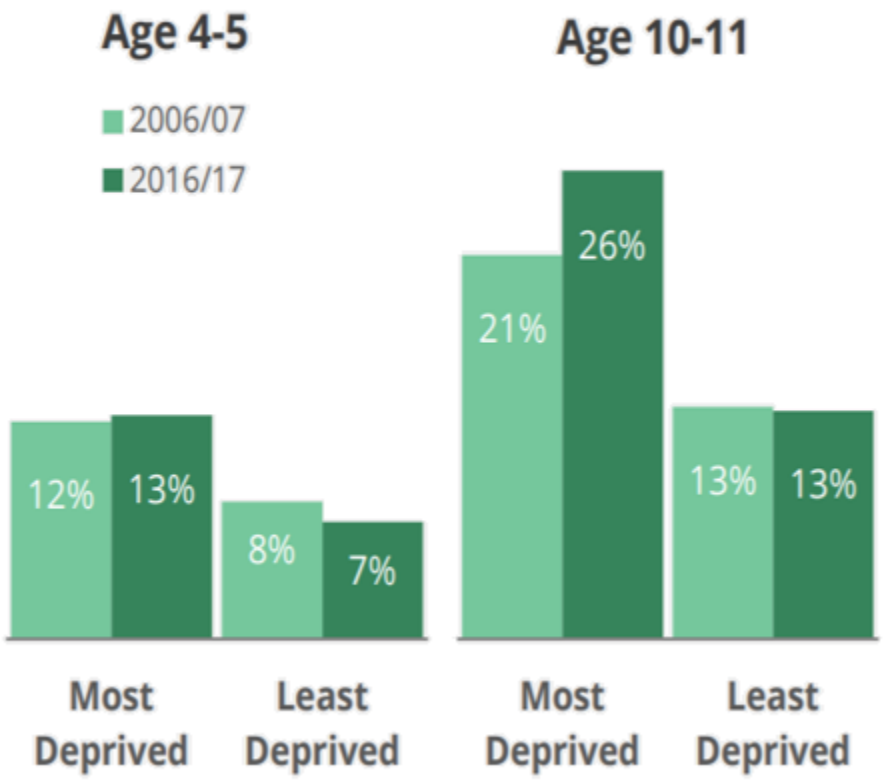
HOUSE OF COMMONS LIBRARY

BRIEFING PAPER

Number 3336, 20 March 2018





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European Journal of Clinical Nutrition (2016) **70,** 414–423

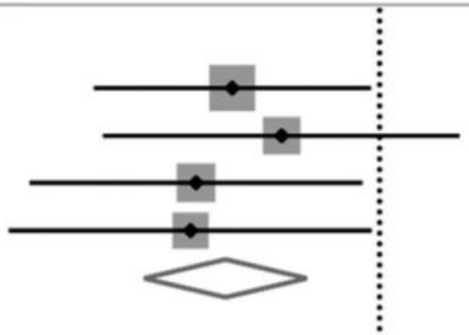
www.nature.com/ejcn

REVIEW

Long-term association between dairy consumption and risk of childhood obesity: a systematic review and meta-analysis of prospective cohort studies

L Lu[1,2,3,4], P Xun[5], Y Wan[2], K He[5,7] and W Cai[1,3,4,6,7]

Study	Exposure	OR (95% CI)	Weight, %
Highest *vs.* Lowest			
Scharf, 2013	Milk	0.64 (0.42, 0.97)	34.64
Bigornia, 2014	Full-fat dairy products	0.74 (0.43, 1.28)	20.96
Bigornia, 2014	Reduced-fat dairy products	0.57 (0.34, 0.95)	24.12
Bigornia, 2014	Total dairy products	0.56 (0.32, 0.97)	20.28
Test for heterogeneity ($I^2 = 0.0\%$, $P = 0.88$)		**0.62 (0.49, 0.80)**	**100.00**



Choice of foods and ingredients for moderately malnourished children 6 months to 5 years of age

University of Reading

2009 Food Nutr Bull, 30(3 Supp): S342-404

Kim F. Michaelsen, Camilla Hoppe, Nanna Roos, Pernille Kaestel, Maria Stougaard, Lotte Lauritzen, Christian Mølgaard, Tsinuel Girma, and Henrik Friis

and meat [263].

Other studies, from both industrialized and from developing countries, have suggested that milk has a specific stimulating effect on linear growth [270]. Observational and intervention studies from industrialized countries suggest that intake of cow's milk stimulates insulin-like growth factor 1 (IGF-1) secretion, which has a direct effect on linear growth [271, 272]. Equivalent amounts of protein in meat did not have an effect on IGF-1 levels [272].

Many studies have shown an impact of childhood malnutrition on cognitive function, physical activity, and school attendance and performance. Positive associations have been found between intake of animal-source foods and cognitive performance and verbalization in toddlers [273, 274], and school-age children

TABLE 22. Characteristics of animal foods compared with plant foods to which the beneficial effects can be attributed

Higher content of micronutrients important for growth and cognitive development (e.g., zinc, iron, and vitamin B_{12})
Higher protein content and protein quality
No antinutrients
High energy density
High fat content
Higher content of n-3 PUFA

PUFA, polyunsaturated fatty acid

THE JOURNAL OF PEDIATRICS • www.jpeds.com

CLINICAL AND LABORATORY OBSERVATIONS

Hyperoxaluria and Genitourinary Disorders in Children Ingesting Almond Milk Products

Demetrius Ellis, MD[1], and Jessica Lieb, RD, LDN[2]

We describe 3 children presenting with hematuria, dysuria or kidney stones, and hyperoxaluria believed to be related to ingestion of excessive amounts of almond milk products. Our investigation of the oxalate content of several popular plant-based milk substitutes indicates that almond milk products are a particularly rich source of dietary oxalate. All genitourinary and urinary metabolic disturbances resolved after discontinuation of almond

ELSEVIER
MASSON

Reçu le :
19 novembre 2013
Accepté le :
20 février 2014
Disponible en ligne
13 avril 2014

Conséquences nutritionnelles de l'utilisation de boissons végétales inadaptées chez les nourrissons de moins d'un an

Severe nutritional deficiencies in young infants with inappropriate plant milk consumption

B. Le Louer[a], J. Lemale[a,*], K. Garcette[a], C. Orzechowski[b], A. Chalvon[c], J.-P. Girardet[a], P. Tounian[a]

[a] *Service de nutrition et gastroentérologie pédiatriques, centre hospitalier universitaire Trousseau, hôpital Armand-Trousseau, AP–HP, 26, avenue du Dr-Arnold-Netter, 75571 Paris cedex, France*
[b] *Hôpital Saint-Camille, 94360 Bry-sur-Marne, France*
[c] *Centre hospitalier de Lagny-sur-Marne, 77600 Jossigny, France*

Disponible en ligne sur
ScienceDirect
www.sciencedirect.com

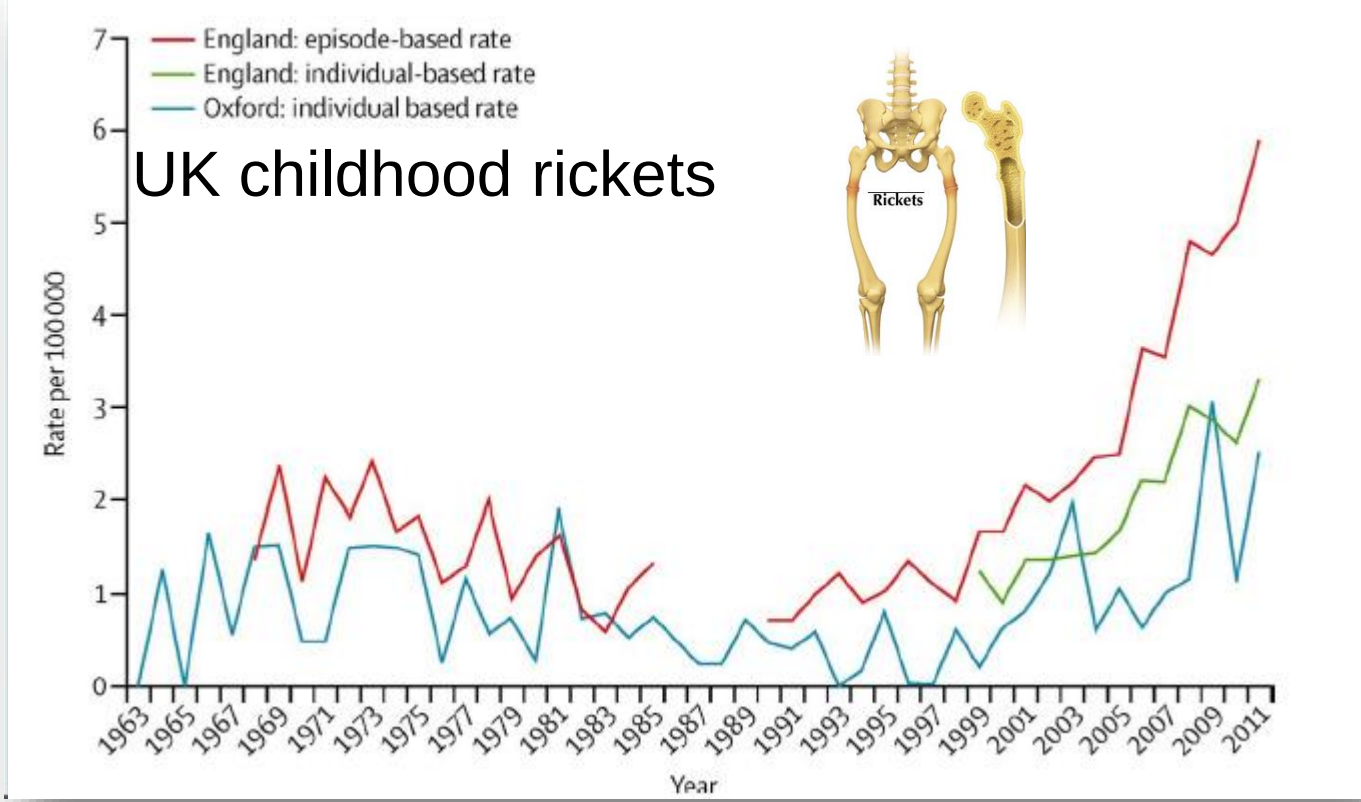
Sub-optimal vitamin D status across Europe

University of Reading

Vitamin D deficiency in Europe: pandemic?[1,2]

doi: 10.3945/ajcn.115.120873.

Kevin D Cashman,[3,4] Kirsten G Dowling,[3] Zuzana Škrabáková,[3] Marcela Gonzalez-Gross,[6,7] Jara Valtueña,[6] Stefaan De Henauw,[8] Luis Moreno,[9] Camilla T Damsgaard,[10] Kim F Michaelsen,[10] Christian Guri Grimnes,[11] George Moschonis,[12] Christina Mavrogianni,[12] Yannis Manios,[12] Michael Th Martina Rabenberg,[13] Markus A Busch,[13] Lorna Cox,[14] Sarah Meadows,[14] Gail Goldberg,[14] A Jacqueline M Dekker,[15] Giel Nijpels,[16] Stefan Pilz,[18] Karin M Swart,[15] Natasja M van Schoor,*



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Dairy and nutrient supply in teenage years and in pregnancy

Micronutrient intake of UK teenagers and adult females

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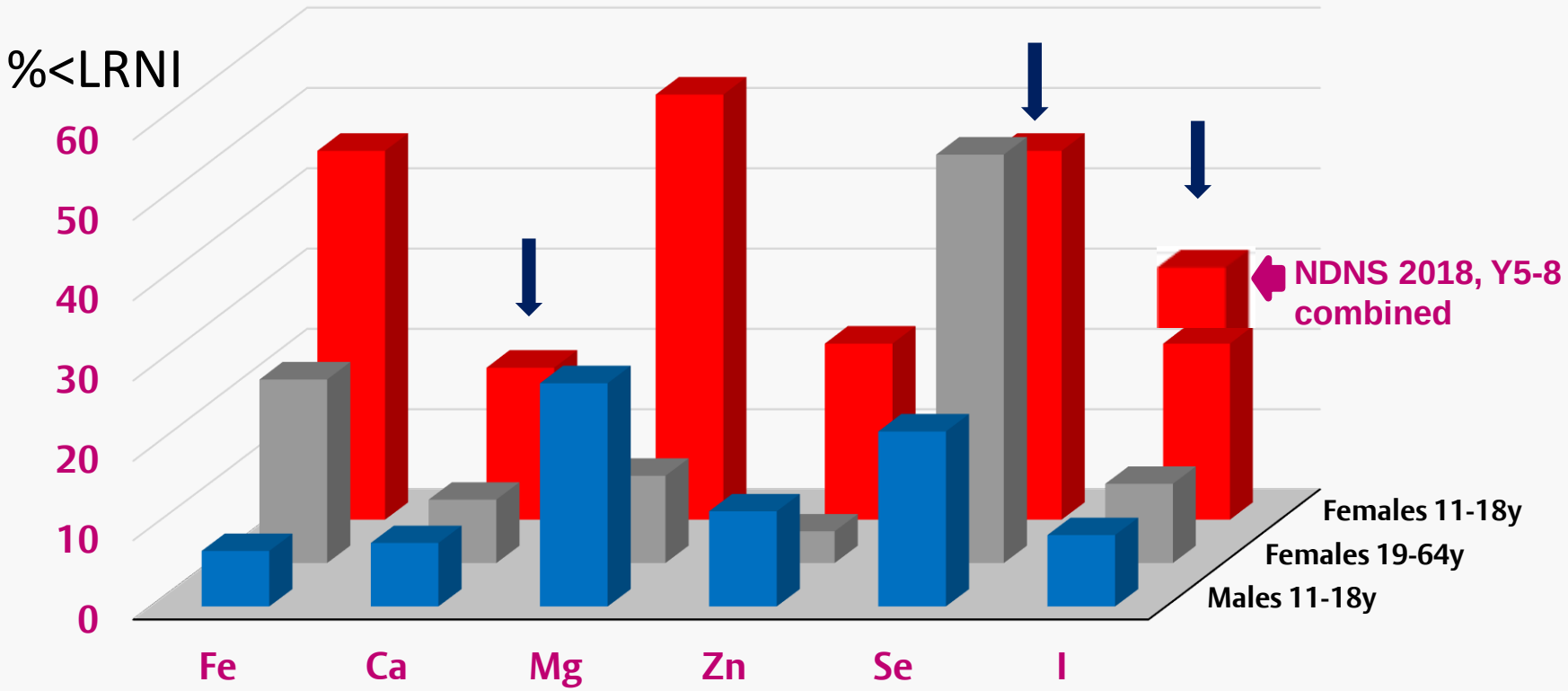
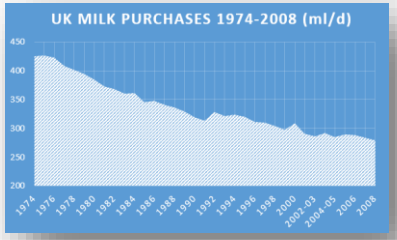
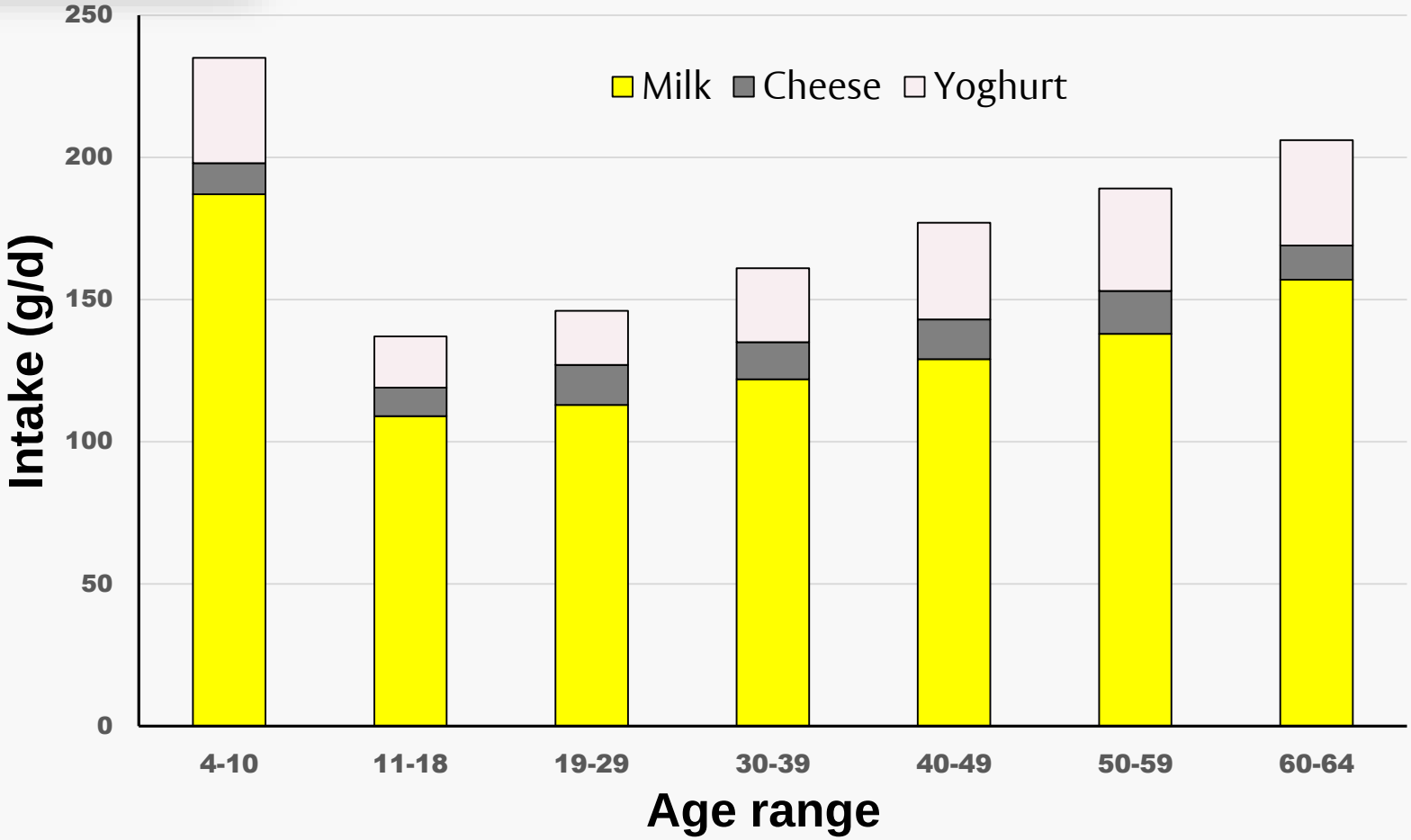
NDNS 2014, Y1-4 combined



Dairy food intake in UK females



NDNS 2014, Y1-4 combined



Bone mass changes with age

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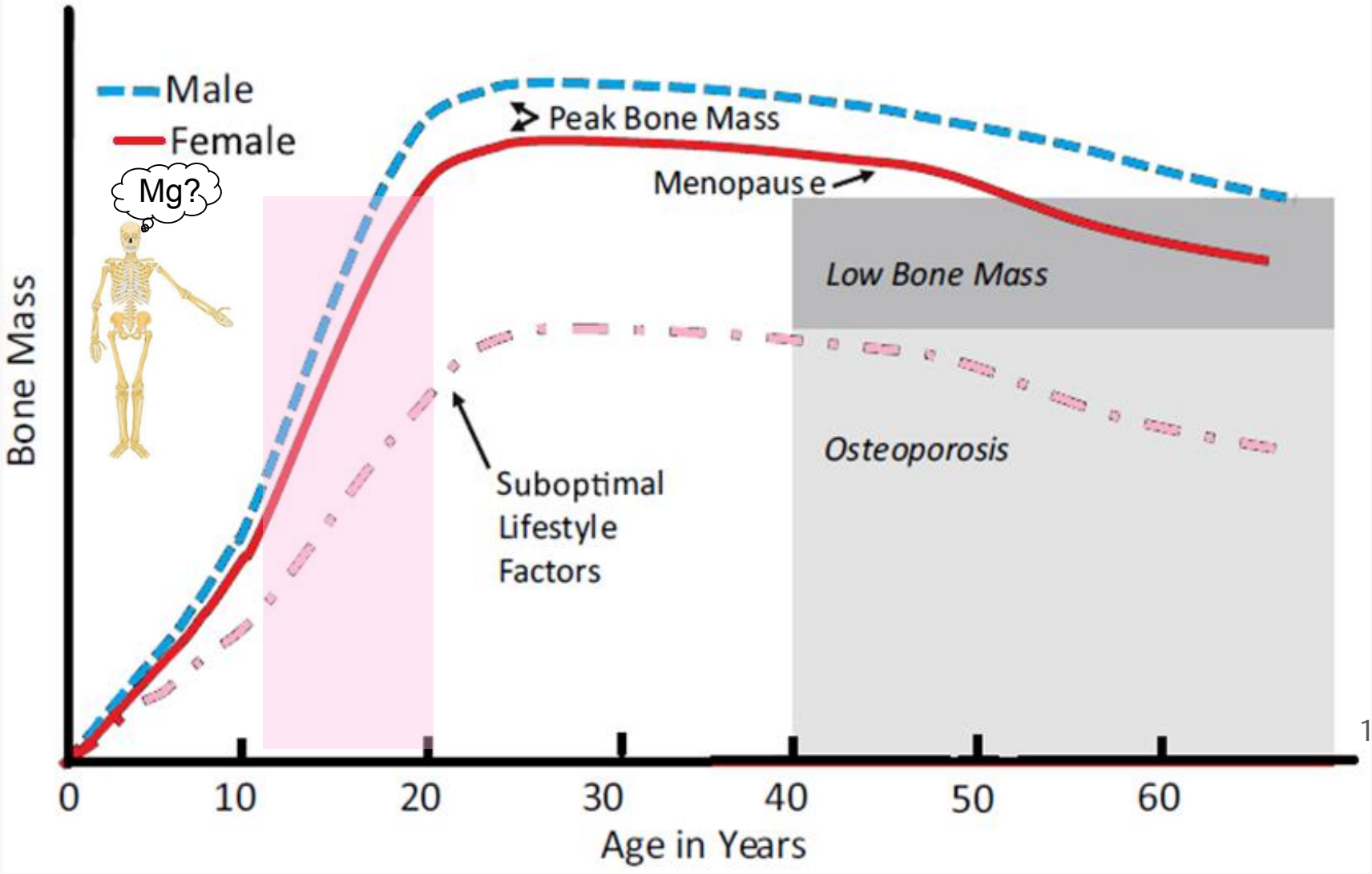
Weaver et al. (2016)



Environ Geochem Health. 2015 August ; 37(4): 619–629. doi:10.1007/s10653-015-9682-3.

A review of the iodine status of UK pregnant women and its implications for the offspring

Sarah C. Bath and **Margaret P. Rayman**
Department of Nutritional Sciences, School of Biosciences and Medicine, Faculty of Health and Medical Sciences, University of Surrey, Guildford GU2 7XH, UK

lower Psychomotor Development and Mental Development Indices at 18 and 24 months. Costeira *et al*, (2011)

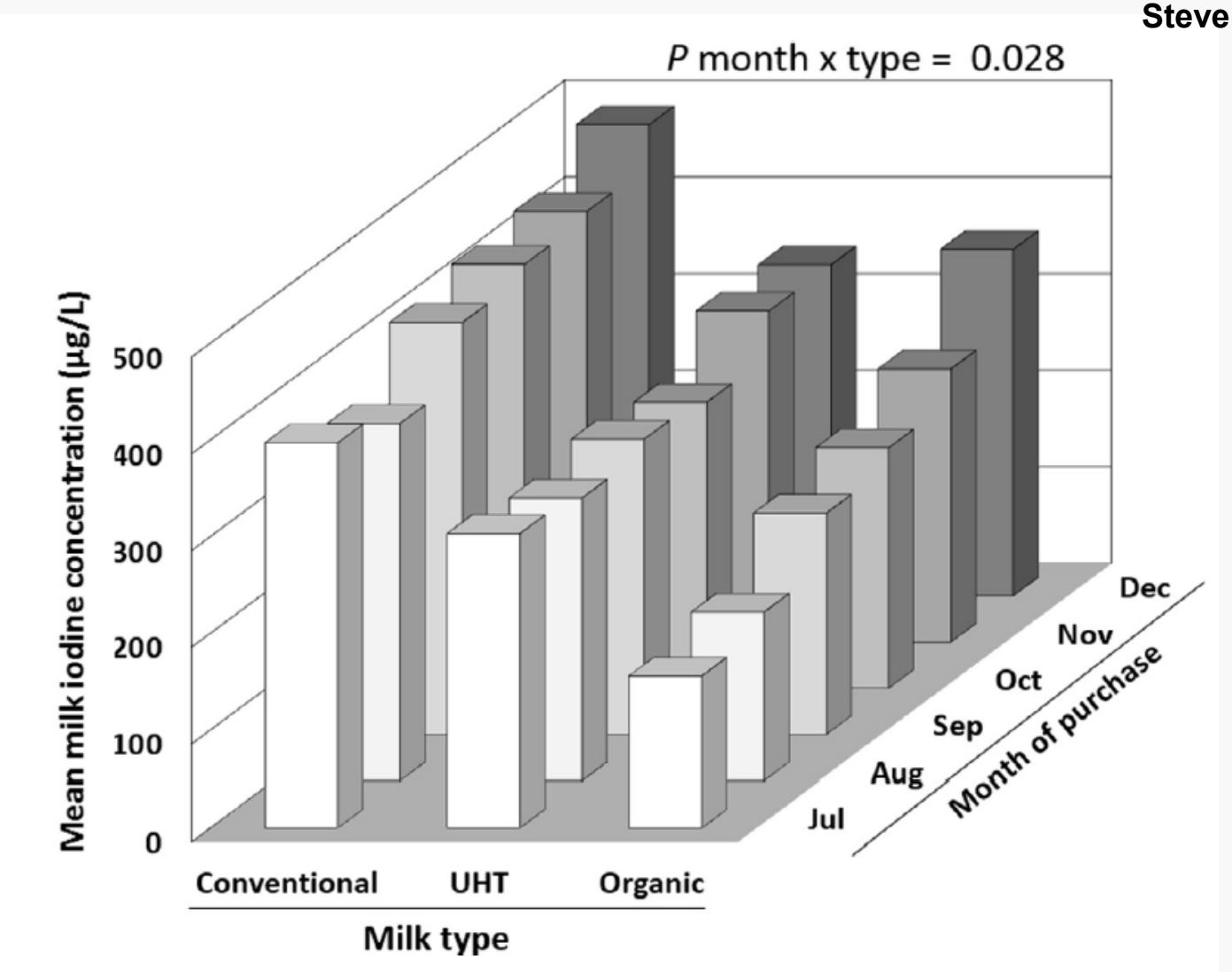
Generation R Study, Netherlands: Children born to mothers with low iodine: creatinine <136µg/g in early pregnancy had mild alterations in executive functioning at 4 y of age (*n*=692) van Mil *et al*, (2012)

Australia: 9 y old children, whose mothers had a gestational UIC <150µg/L throughout pregnancy, had poorer language skills (*n*=228) Hynes *et al*, (2013)

ALSPAC Study, UK: Follow-up of 8-9 y old children found those whose mothers with urinary iodine:creatinine <150µg/g in their first trimester had lower IQ and reading skills (*n*=1040) Bath *et al*, (2013)

Effect of factors on iodine concentration of UK retail milk 2015

Stevenson et al. (2018)



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DIET AND CARDIOMETABOLIC HEALTH: IMPACT OF DAIRY FOODS

Recent meta-analyses of prospective studies on dairy and cardiometabolic diseases

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Dairy	Outcome	RR (95% CI)	Ref
Milk	AC mortality	1.00 (0.93-1.07)	**Guo et al., 2017**
Milk	CVD	1.01 (0.93-1.10)	**Guo et al., 2017**
Cheese	CVD	**0.98** (0.95-1.00)	**Guo et al., 2017**
Milk	Stroke	**0.93** (0.88-0.98)	**De Goede et al., 2016**
Cheese /40 g/d	Stroke	0.97 (0.94-1.01)	**De Goede et al., 2016**
Yoghurt/80g/d	Diabetes	**0.86** (0.83-0.90)	**Gijsbers et al., 2016**

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Association of dairy intake with cardiovascular disease and mortality in 21 countries from five continents (PURE): a prospective cohort study

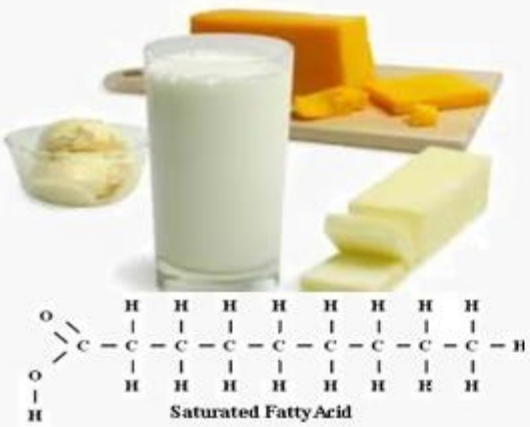
Published Online
September 11, 2018
http://dx.doi.org/10.1016/

*Mahshid Dehghan, Andrew Mente, Sumathy Rangarajan, Patrick Sheridan, Viswanathan Mohan, Romaina Iqbal, Rajeev Gupta, Scott Lear, Edelweiss Wentzel-Viljoen, Alvaro Avezum, Patricio Lopez-Jaramillo, Prem Mony, Ravi Prasad Varma, Rajesh Kumar, Jephat Chifamba, Khalid F Alhabib, Noushin Mohammadifard, Aytekin Oguz, Fernando Lanas, Dorota Rozanska, Kristina Bengtsson Bostrom, Khalid Yusoff, Lungiswa P Tsolkile, Antonio Dans, AfzalHussein Yusufali, Andres Orlandini, Paul Poirier, Rasha Khatib, Bo Hu, Li Wei, Lu Yin, Ai Deeraili, Karen Yeates, Rita Yusuf, Noorhassim Ismail, Dariush Mozaffarian, Koon Teo, Sonia S Anand, Salim Yusuf, on behalf of the Prospective Urban Rural Epidemiology (PURE) study investigators**

Methods The Prospective Urban Rural Epidemiology (PURE) study is a large multinational cohort study of individuals aged 35–70 years enrolled from 21 countries in five continents. Dietary intakes of dairy products for 136 384 individuals were recorded using country-specific validated food frequency questionnaires. Dairy products comprised milk, yoghurt, and cheese. We further grouped these foods into whole-fat and low-fat dairy.

Interpretation Dairy consumption was associated with lower risk of mortality and major cardiovascular disease events in a diverse multinational cohort.

What about Saturated Fats and Cardiometabolic Diseases?



For many people dairy foods are the biggest source of SFA

HRs (95% CIs) of CVD for SFA from dairy and meat

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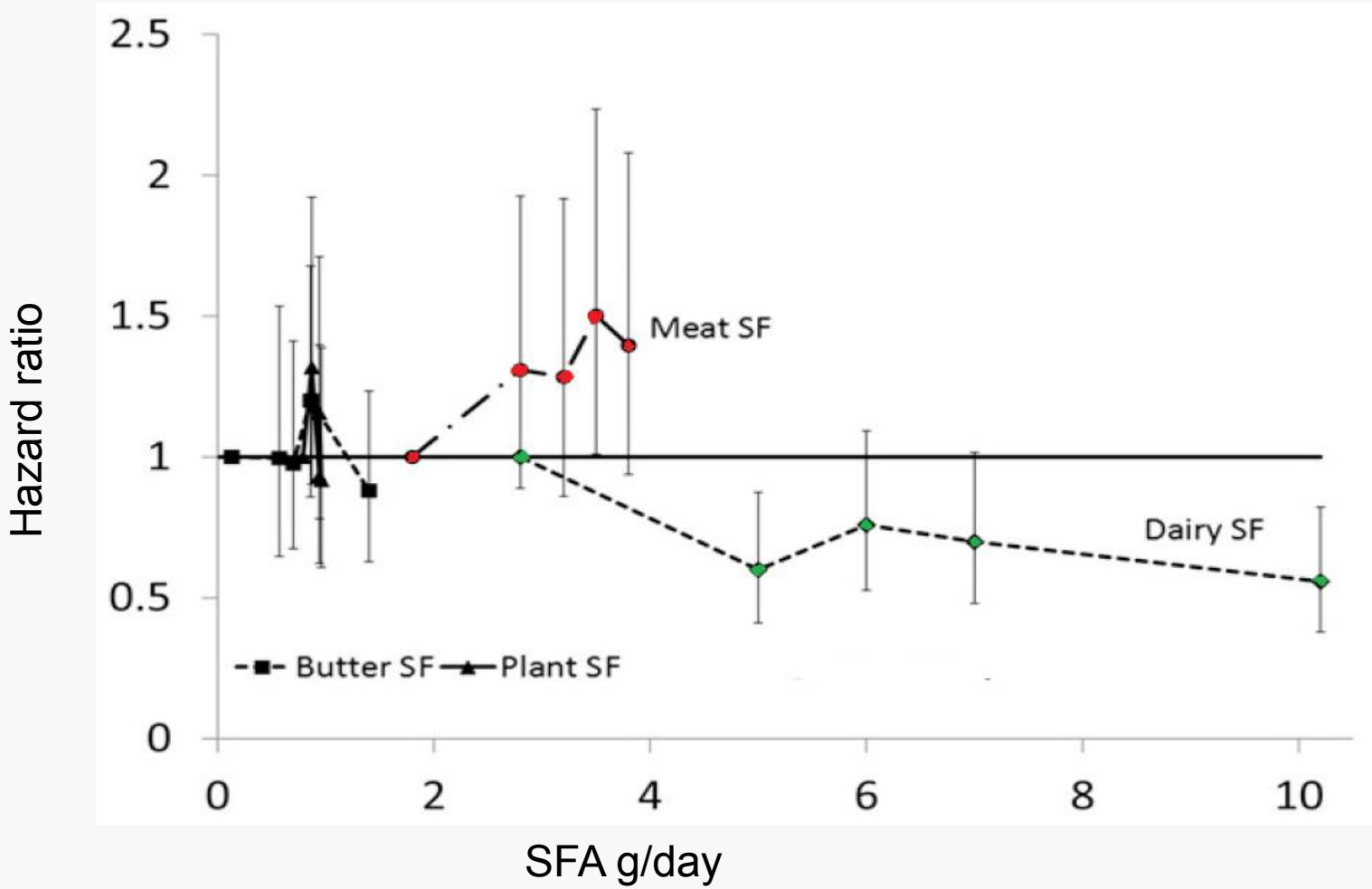
de Oliveira Otto et al. 2012



HR (95% CI) for associations between plasma PL SFA and incident T2 DM

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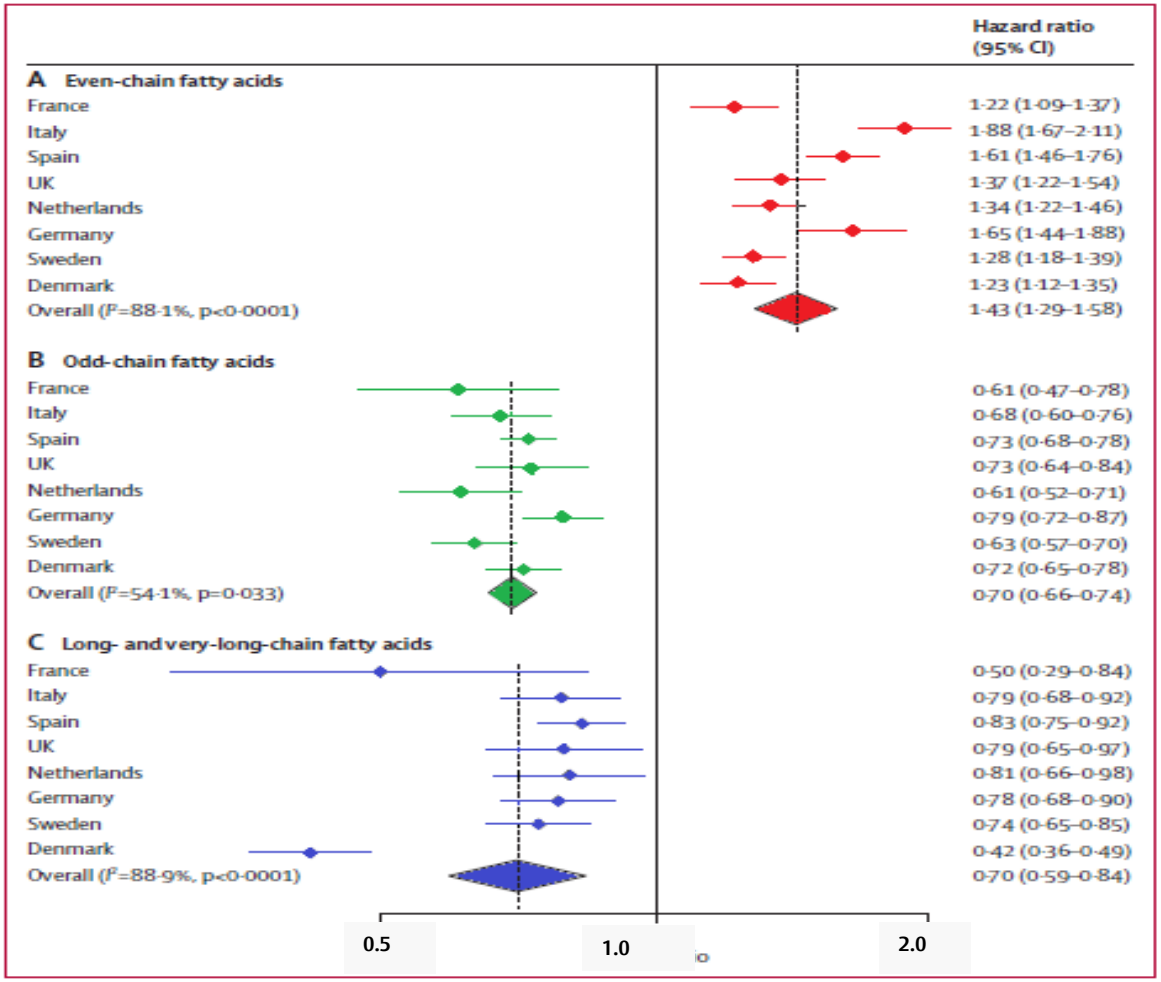
EPIC-InterAct case-cohort
Forouhi *et al.*, 2014

Even-chain SFA (16:0)

Odd-chain SFA

Long and very long-chain SFA



Hazard ratio

Changes in total and LDL-chol after consumption of ~80 g/d fat (~36g/d SFA) as cheese or butter

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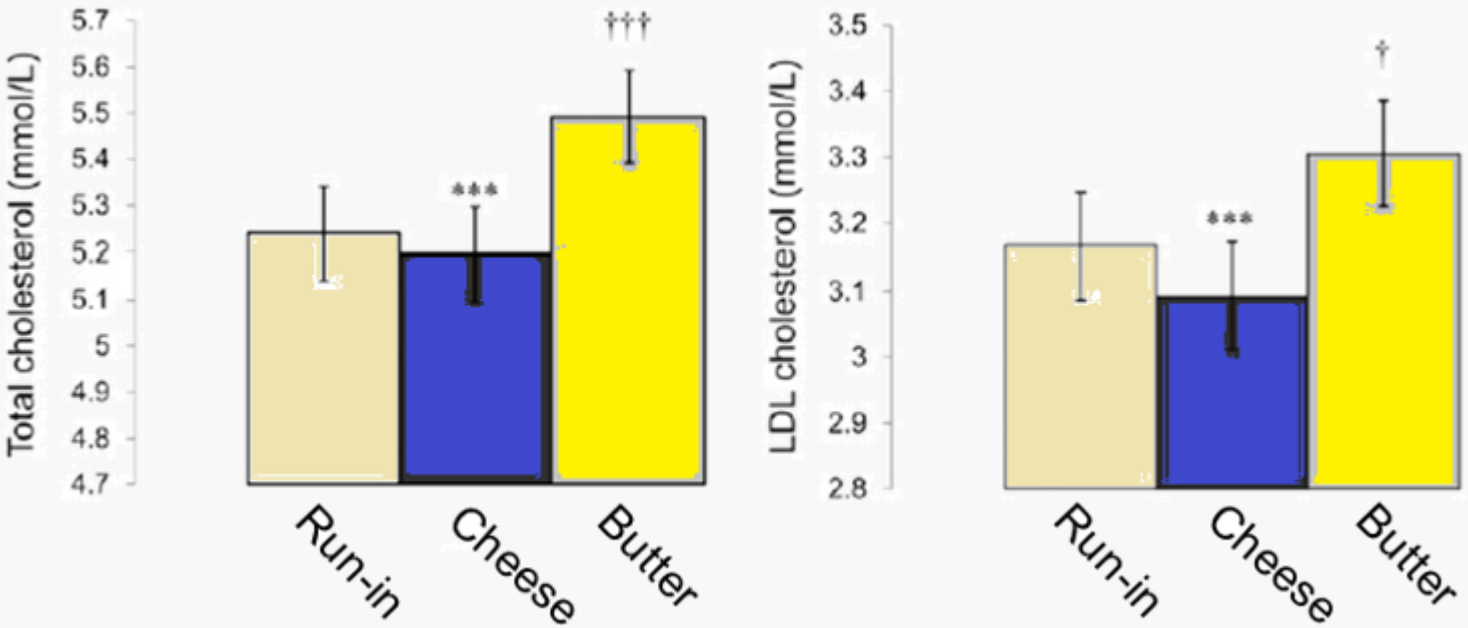
Hjerpsted et al. Am J Clin Nutr 2011;94:1479–84.

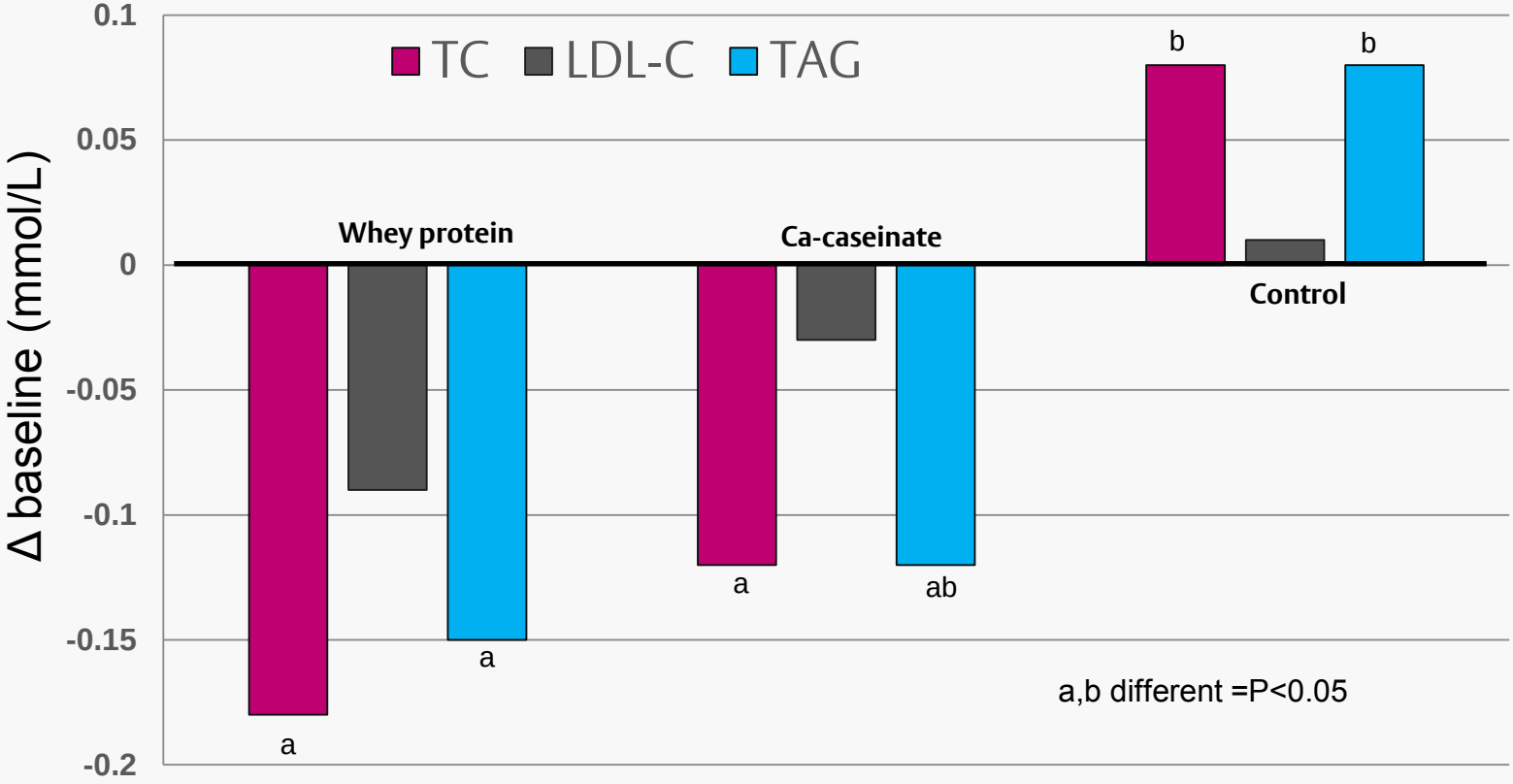
Cheese vs butter ***$P < 0.0001$. †,†††Significantly different from run-in period: †$P < 0.05$, †††$P < 0.0005$.



THE FOOD MATRIX

Milk proteins and blood lipids

Fekete et al., AJCN (2016)

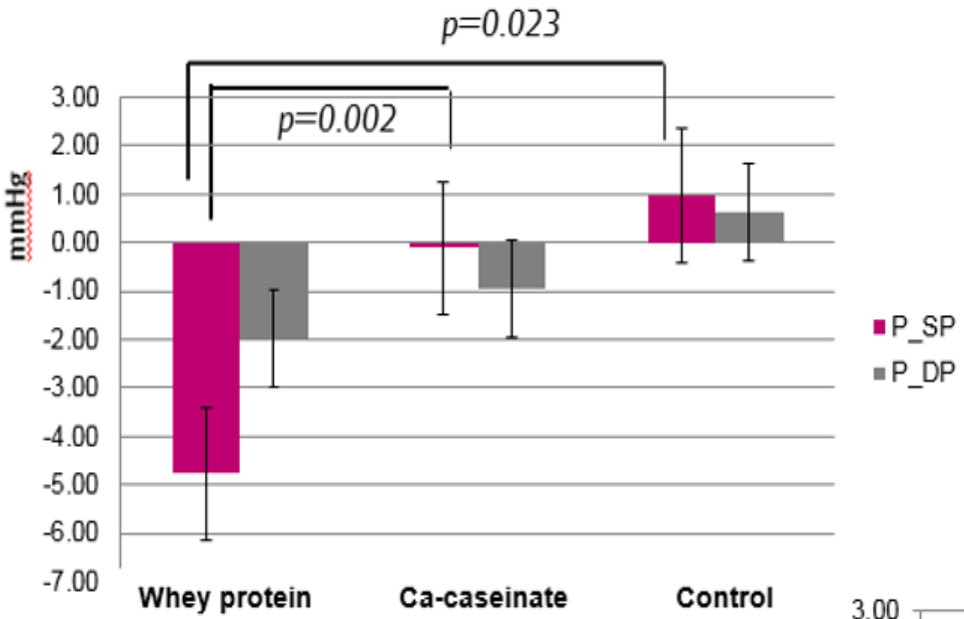


Milk proteins and blood pressure

University of Reading

Fekete et al., AJCN (2016)

Peripheral SBP & DBP



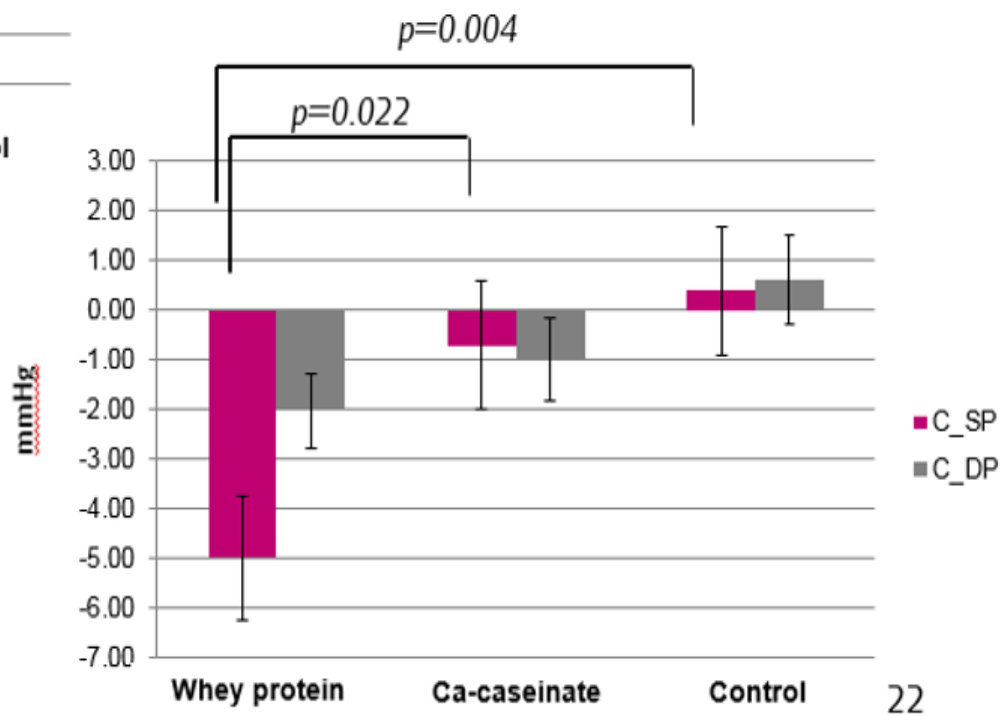
Overall treatment effect for P_SBP p=0.007,
Overall treatment effect for P_DP p=0.095,
Overall treamtent effect for P_MeanP p=0.009

n=38, Means ± SEM

Central SBP & DBP

Overall treatment effect for C_SBP p=0.010,
Overall treatment effect for C_DP p=0.094,
Overall treatment effect for C_MeanP p=0.024

n=38, Means ± SEM



BBSRC volac

Dairy intake and augmentation index ~25 years prospective study (Caerphilly)

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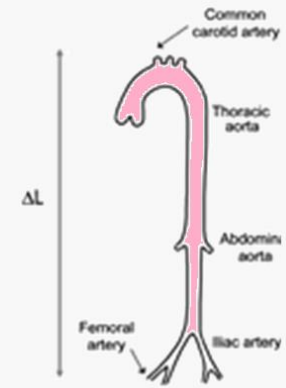
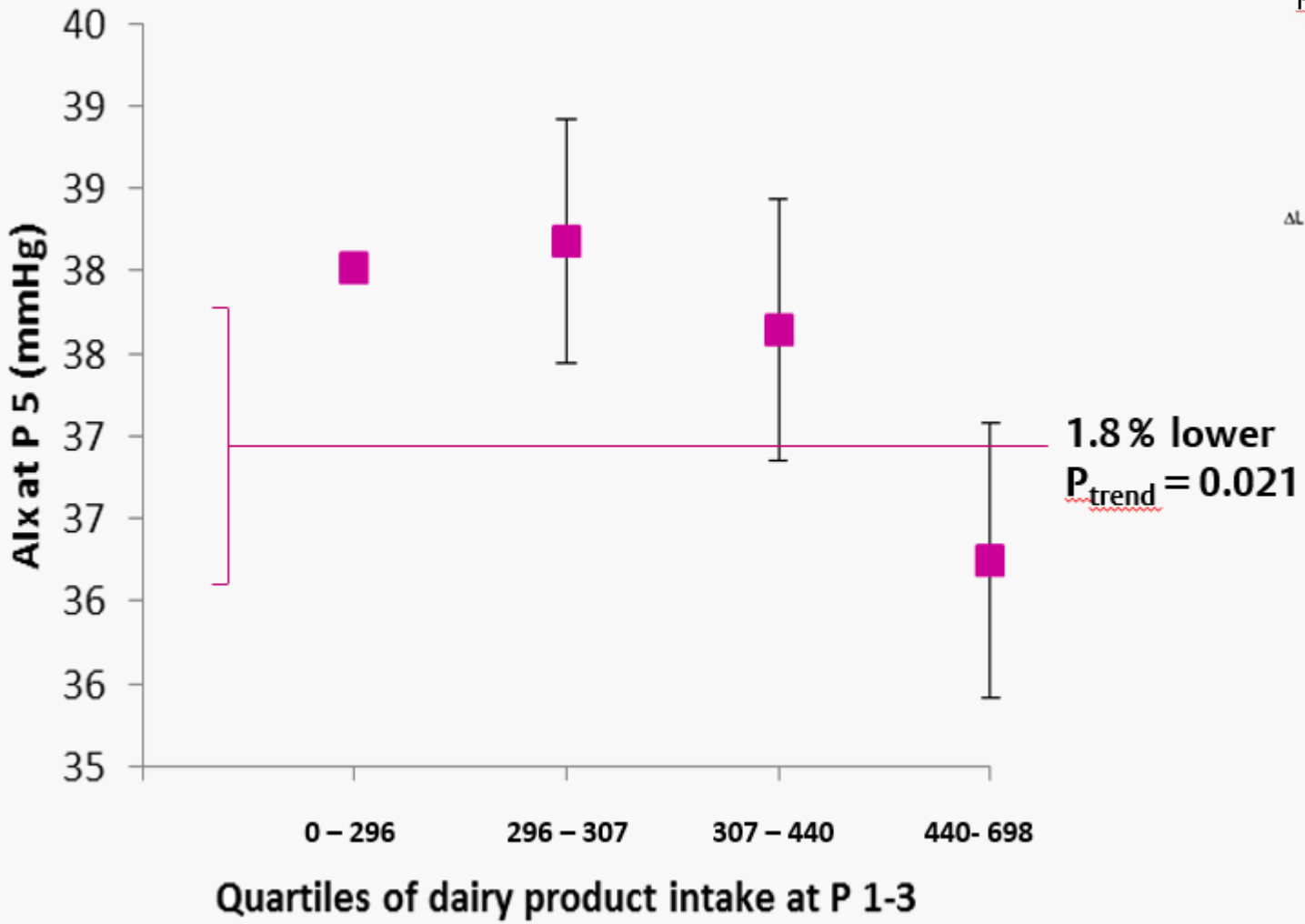
Livingstone et al., 2013

Pulse wave velocity
PWV =ΔL/ΔT (m/s)

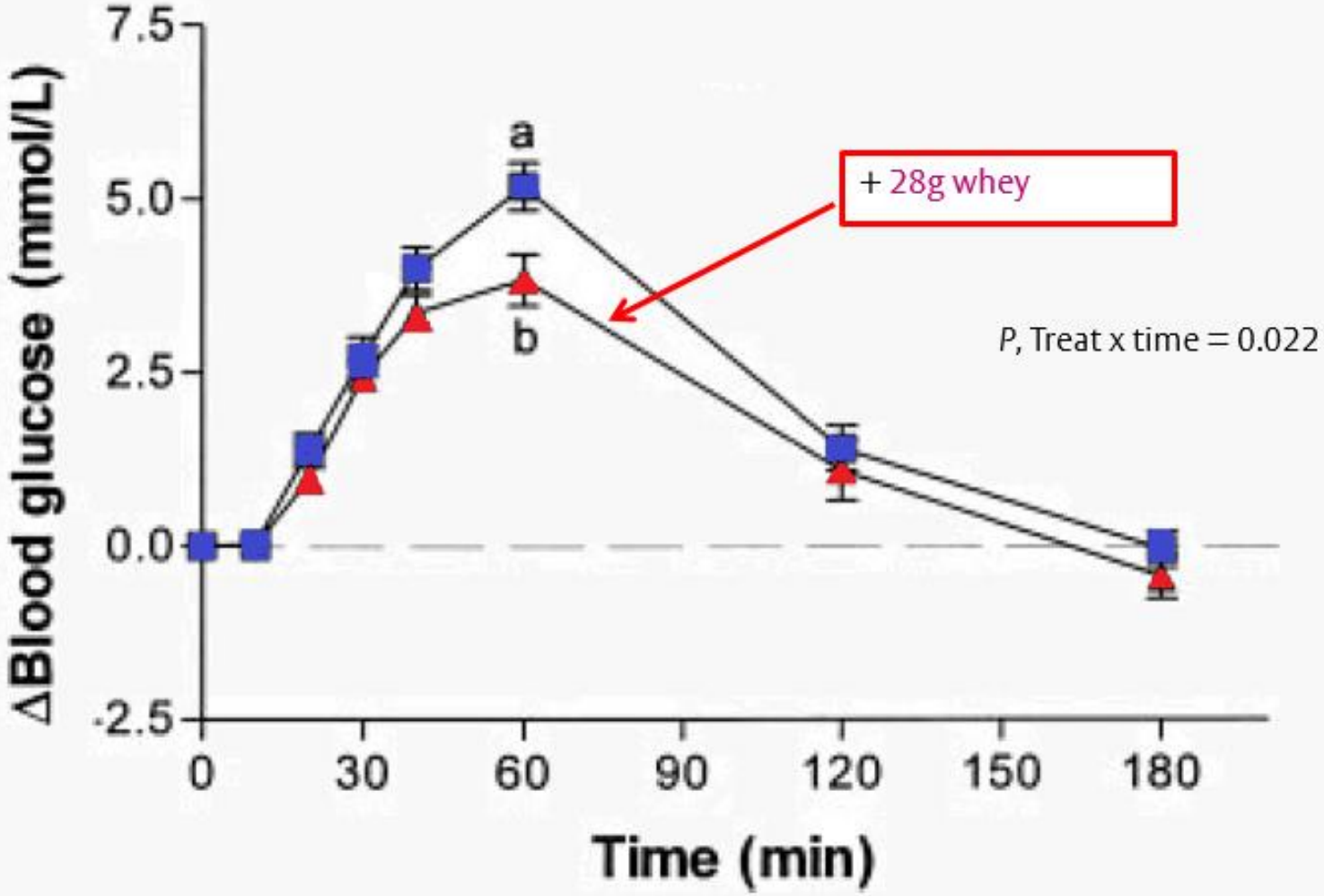




Carbohydrate-rich meal +/- whey protein on blood glucose in T2DM patients

University of Reading

Frid et al., 2005



HARVARD T.H. CHAN | SCHOOL OF PUBLIC HEALTH

Component in common dairy foods may cut diabetes risk

For immediate release: Monday, December 20, 2010

Boston, MA – Scientists at the Harvard School of Public Health (HSPH) and collaborators from other institutions have identified a natural substance in dairy fat that may substantially reduce the risk of type 2 diabetes. The compound, *trans*-palmitoleic acid, is a fatty acid found in milk,

The lipid hypothesis and CVD

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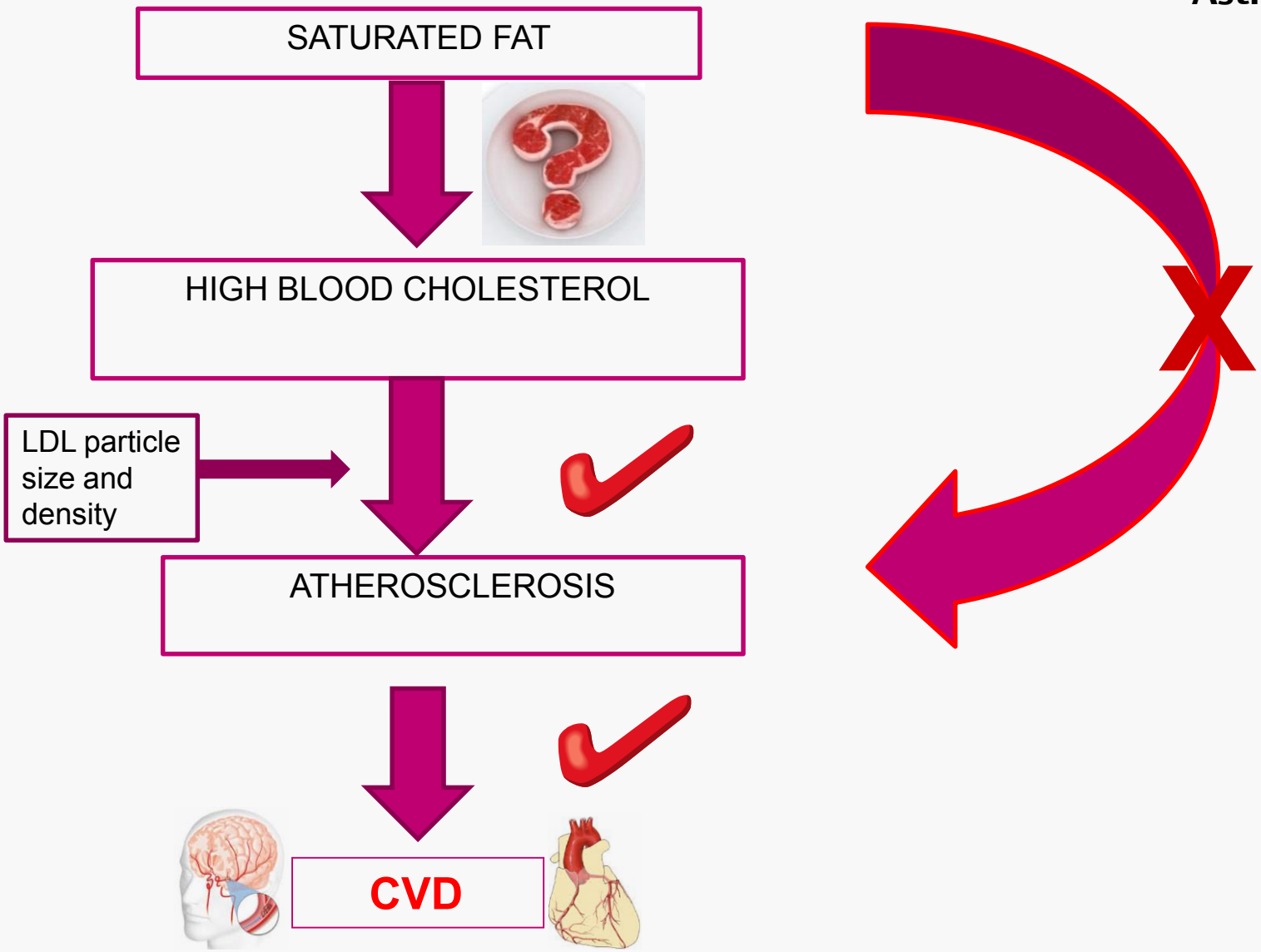
Astrup, 2018



DIET AND THE ELDERLY: IMPACT OF DAIRY FOODS

Prevalence of malnutrition in UK elderly

Prevalence of malnutrition

Home
General population (adults)
BMI <20kg/m2: 5%[30]
BMI <18.5kg/m2: 1.8%[31]
Elderly: 14%[22]

Sheltered Housing
10-14% of tenants[20,21]

Primary Care[4,35]
- ↑ dependency
- ↑ GP visits
- ↑ prescription costs
- ↑ hospital

Hospital
25-34% of admissions [18,19]

Care Homes
30-42% of residents recently admitted[18,19]

Secondary Care
- ↑ complications[3,4]
- ↑ length of stay[3,4,32]
- ↑ readmissions[33,34]
- ↑ mortality[3,32]

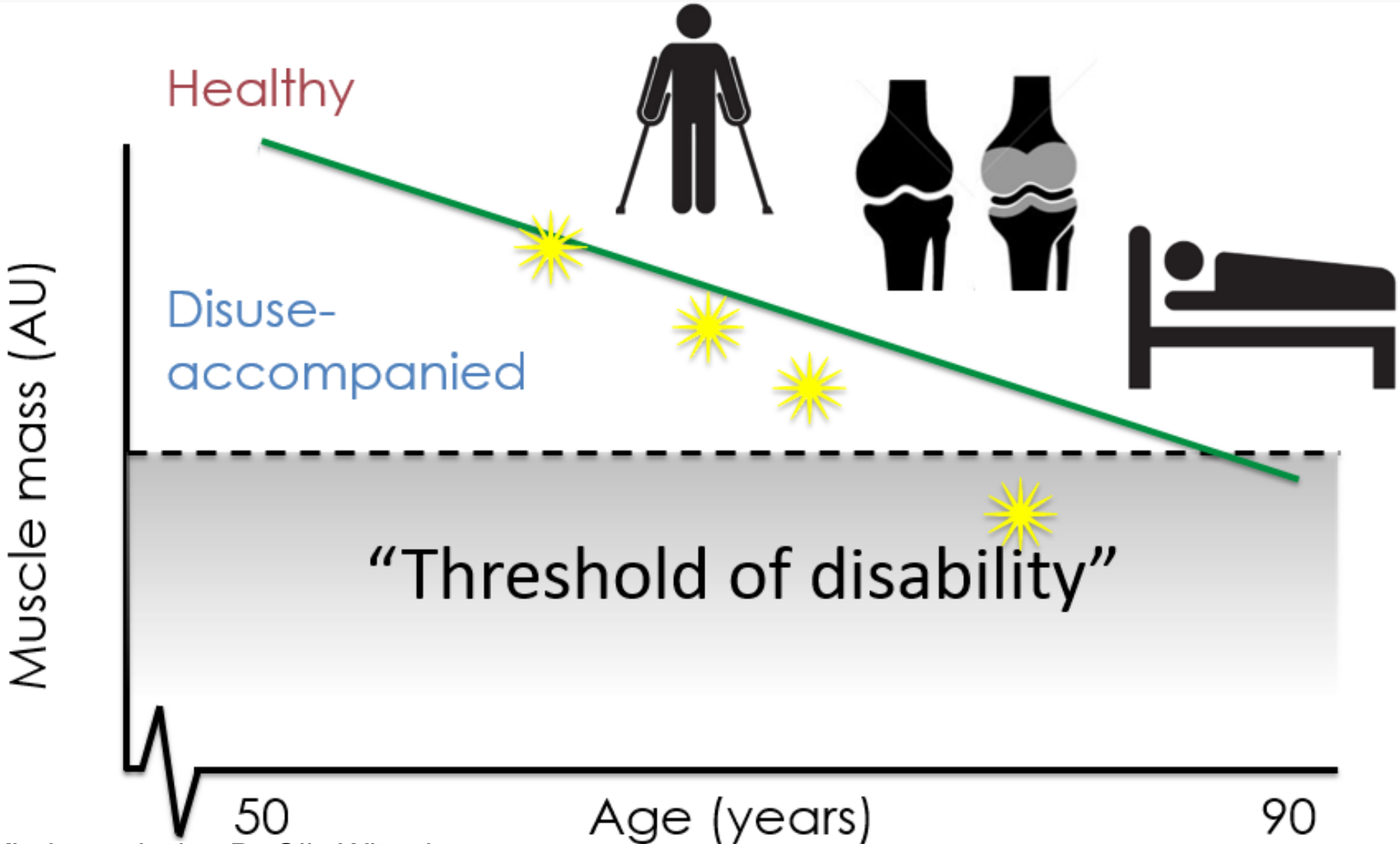
Annual cost to UK health services £13-19 billion

appg Hunger 2018
Hidden hunger and malnutrition in the elderly

Brotherton et al., 2012

Ageing is associated with a gradual loss of skeletal muscle mass

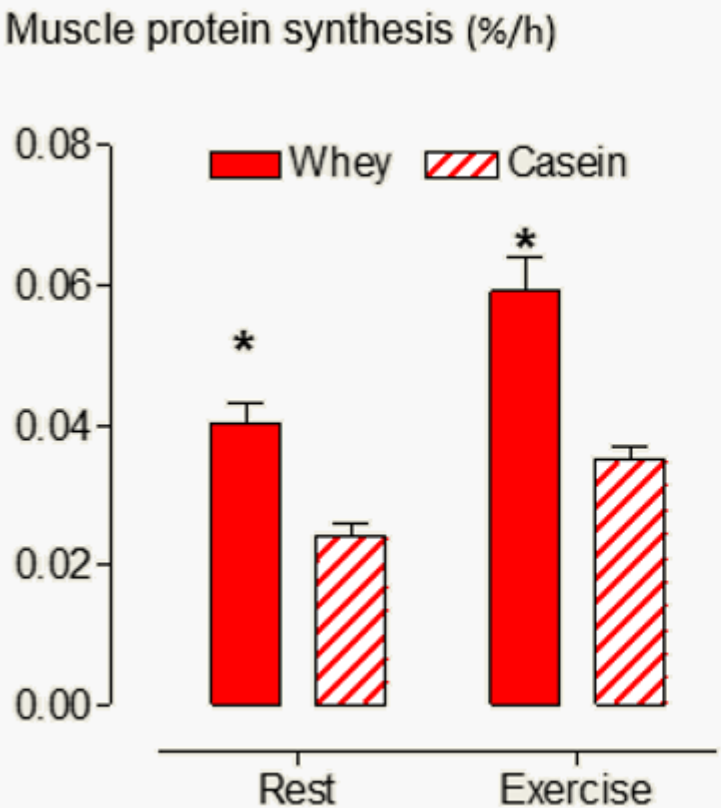
University of Reading



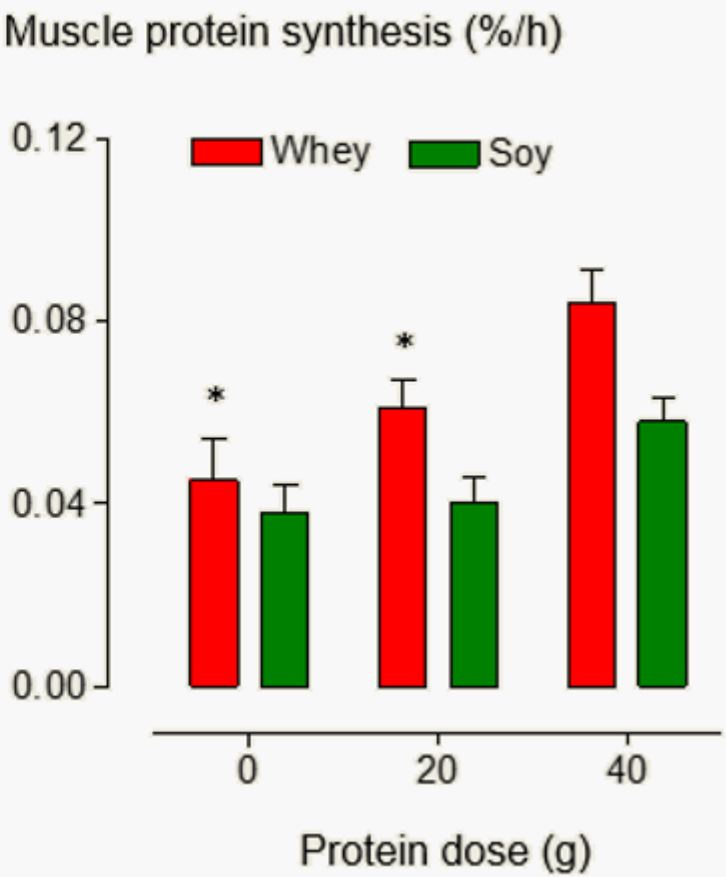
Kind permission Dr Olly Witard

Whey is primarily responsible for the greater anabolic response to milk vs soya protein in elderly men

Burd et al., 2009



Yang et al., 2012



Kind permission Dr Olly Witard

A few conclusions….

- There are issues and opportunities at all life stages
- Despite a major SFA source, no evidence of increased CMD risk in high dairy consumers (butter?)
- Evidence for fermented dairy, notably yoghurt and reduced T2DM risk needs urgent attention
- Predicting CVD/CMD risk from dietary SFA is complex and may easily mislead
- More attention is needed at the food/matrix level
- Dairy foods can indeed be smart but they are not all the same
- Solutions will require collaboration with milk processors/dairy food manufacturers

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Thank you!