Azienda Ospedale – Università di Padova
Dipartimento di Medicina – DIMED
Clinica Medica 1

Centro Regionale Specializzato per l'Osteoporosi

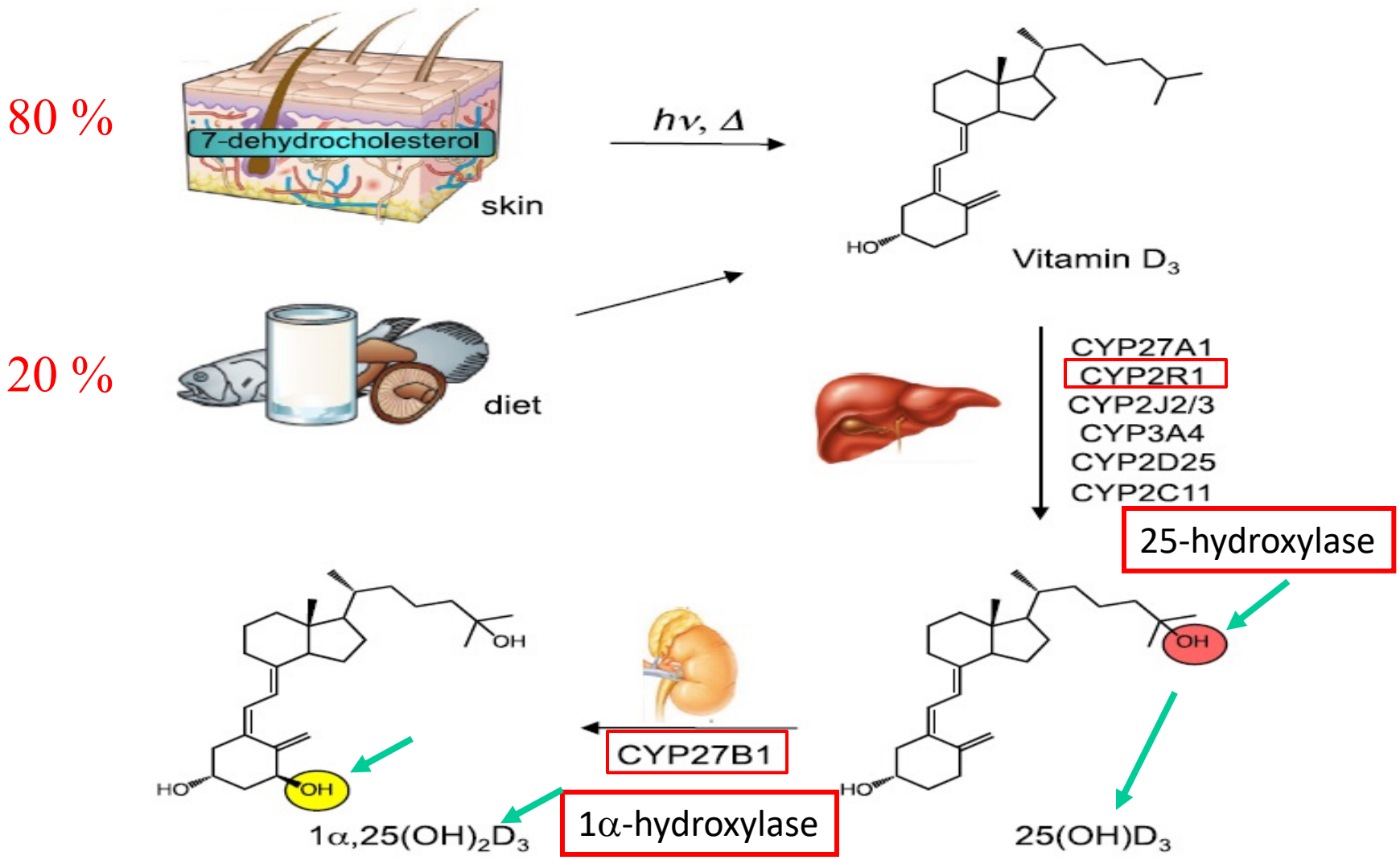
E' possibile correggere l'ipovitaminosi D con la sola dieta?

Sandro Giannini

E’ possibile correggere l’ipovitaminosi D con la sola dieta?

NO

Vitamin D3 activation pathway



Jinge Zhu & Hector F. DeLuca. Arch Biochem Biophys 2012

Dietary recommendations for vitamin D

Age	Nutrient Intake (µg/Day)	Nutrient Intake (IU/Day)
0–3 months	8.5	340
4–6 months	8.5	340
7–9 months	7	280
10–12 months	7	280
1–3 years	7	280
>65 years	10	400
Pregnancy	10	400
Lactation	10	400

1 mcg = 40 UI

Polzonetti V. et al. *Nutrients (*2020)

Natural vitamin D content (µg/100 g) in food

Foodstuff	Vitamin D
Whole milk	0.1
Cheese, cheddar	0.3–0.6
Yogurt	0.1
Butter	1.5
Egg yolk	4.9–5.4
Mushrooms, chanterelle	5.3–14.2
Cod liver oil	210–250
Salmon, wild	13.1–24.7
Salmon, farmed	6.0
Herring	5.7–15.4
Cod	Trace-2.6
Sole	Trace-2.8

10.000UI

Polzonetti V. et al. *Nutrients* (2020)

Vitamin D3 and Calcidiol (25(OH)-D-3) content in meat and offal

Foodstuff	Vitamin D3 (µg/kg)	25(OH)-D-3 (µg/kg)
Beef steak	<0.5	0.8
Beef liver	<0.5	3.4
Beef kidney	1.3	3.0
Pork fillet	1.1	<0.6
Pork liver	4.0	4.4
Lamb leg steak	0.4	10.4
Chicken leg	3.0	<2.0
Chicken fillet	2.0	<2.0

Polzonetti V. et al. *Nutrients (*2020)

Food group	Reference serving size (g/ml)	Vitamin D (µg/100 g)
Sardines, trout, salmon, and carp	120	7.84
Sea bass, tuna, cod, common sole, blue tilapia, and other fish	120	3.23
Canned fish	80	4.31
Plant-based milk alternatives: rice milk, soy milk, etc.	250	0.47
Semi-skimmed milk (1.5% milkfat), cocoa drink, and milk drinks	200	0.03
Whole milk (3.5% milkfat), a cocoa drink containing whole milk, milk drinks	200	0.09
Semi-skimmed (1.5% milkfat) flavored or plain yogurt	150	0.03
Whole milk (3.5% milkfat) flavored or plain yogurt	150	0.06
Hard cheese: Gouda cheese, Edam cheese, etc.	30	0.9
Blue cheese	20	0.39
Cottage cheese, mozzarella, other types of processed cheese	50	0.28
Ice cream	40	0.25
Butter	6	1.66
Margarine	6	2.5
Eggs	50	2.9
Egg pasta	100	0.28
Red meat	100	0.48
Poultry	100	0.26
Meat products	40	0.86
Calf's liver	60	1.2
Mushrooms	100	0.18
Cakes, pastry, and muffins	70	0.31

Reference serving sizes and vitamin D content in 100 g of the foods

Hribar M et aL., Front Nutr 2022

foods

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Vitamin D Intake in a Population-Based Sample of Young Polish Women, Its Major Sources and the Possibility of Meeting the Recommendations

Zofia Utri and Dominika Głąbska *

Table 3. The declared number of servings of fish and fish products consumed per month in the studied group of young Polish women.

Fish Product Group	Mean ± SD (Servings/Month)	Median (Min–Max) (Servings/Month)
Salmon, rainbow trout, herring, eel	1.97 ± 4.17	1.00 * (0.00–50.00)
Halibut, mackerel, brook trout, sole, tuna	1.19 ± 3.06	1.00 * (0.00–50.00)
Cod, flounder, plaice, pollock, hake	1.19 ± 3.53	0.00 * (0.00–50.00)
Herring, sardine and tuna products	1.43 ± 2.22	1.00 * (0.00–30.00)
Other fish products	0.58 ± 1.19	0.00 * (0.00–15.00)

* Non-parametric distribution (verified using Shapiro–Wilk test, $p \leq 0.05$).

foods

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Vitamin D Intake in a Population-Based Sample of Young Polish Women, Its Major Sources and the Possibility of Meeting the Recommendations

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Table 6. The analysis of influence of predominantly choosing specific fish species on total vitamin D intake from food, conducted based on the analysis of correlation between vitamin D intake from fish and total dietary vitamin D intake from food, and the comparison of vitamin D intake among participants choosing specific fish species or not.

Fish Species	Predominantly Choosing Specific Fish Species	Mean ± SD (µg)	Median (Min–Max) (µg)	Correlation between Vitamin D Intake from Fish and Total Dietary Intake		*p* for Sub-Group Comparison	
				p	R	Vitamin D from Fish	Total Dietary Vitamin D
Salmon	Choosing (n = 591)	4.21 ± 3.07	3.31 * (0.52–24.52)	<0.0001	0.6839	<0.0001	<0.0001
	Not choosing (n = 441)	3.37 ± 2.73	2.65 * (0.00–19.94)	<0.0001	0.6305		
Rainbow trout	Choosing (n = 183)	4.65 ± 3.26	3.59 * (0.52–19.37)	<0.0001	0.7157	<0.0001	<0.0001
	Not choosing (n = 849)	3.68 ± 2.86	2.90 * (0.00–24.52)	<0.0001	0.6603		
Herring	Choosing (n = 493)	4.56 ± 3.18	3.76 * (0.12–24.52)	<0.0001	0.6791	<0.0001	<0.0001
	Not choosing (n = 539)	3.20 ± 2.57	2.55 * (0.00–16.06)	<0.0001	0.5870		
Eel	Choosing (n = 8)	4.36 ± 4.37	3.14 * (1.47–14.81)	0.6514	−0.1905	0.1733	0.9416
	Not choosing (n = 1024)	3.85 ± 2.94	3.09 * (0.00–24.52)	<0.0001	0.6821		

* Non-parametric distribution (verified using Shapiro–Wilk test, $p \leq 0.05$).

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Determinants of Dietary Vitamin D Intake in Population-Based Cohort Sample of Polish Female Adolescents

Katarzyna Lachowicz * and Małgorzata Stachoń

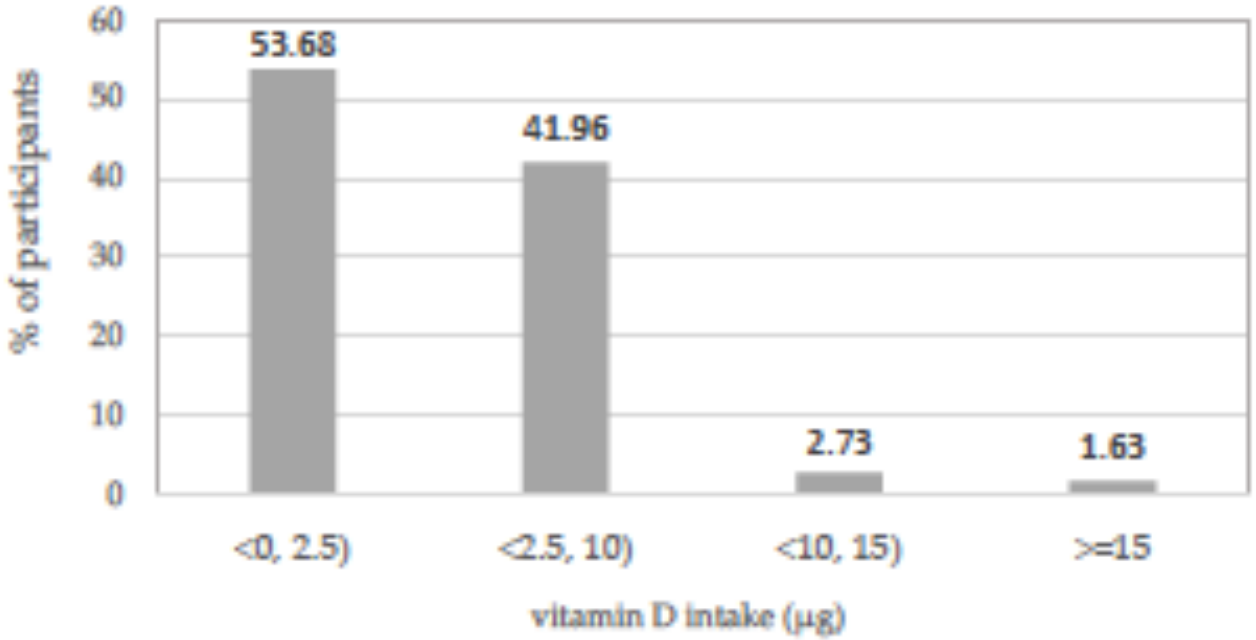

Figure 2. Percentage of female post-primary school students consuming vitamin D per day in ranges: <0, 2.5), <2.5, 10), <10, 15) and ≥15 µg.

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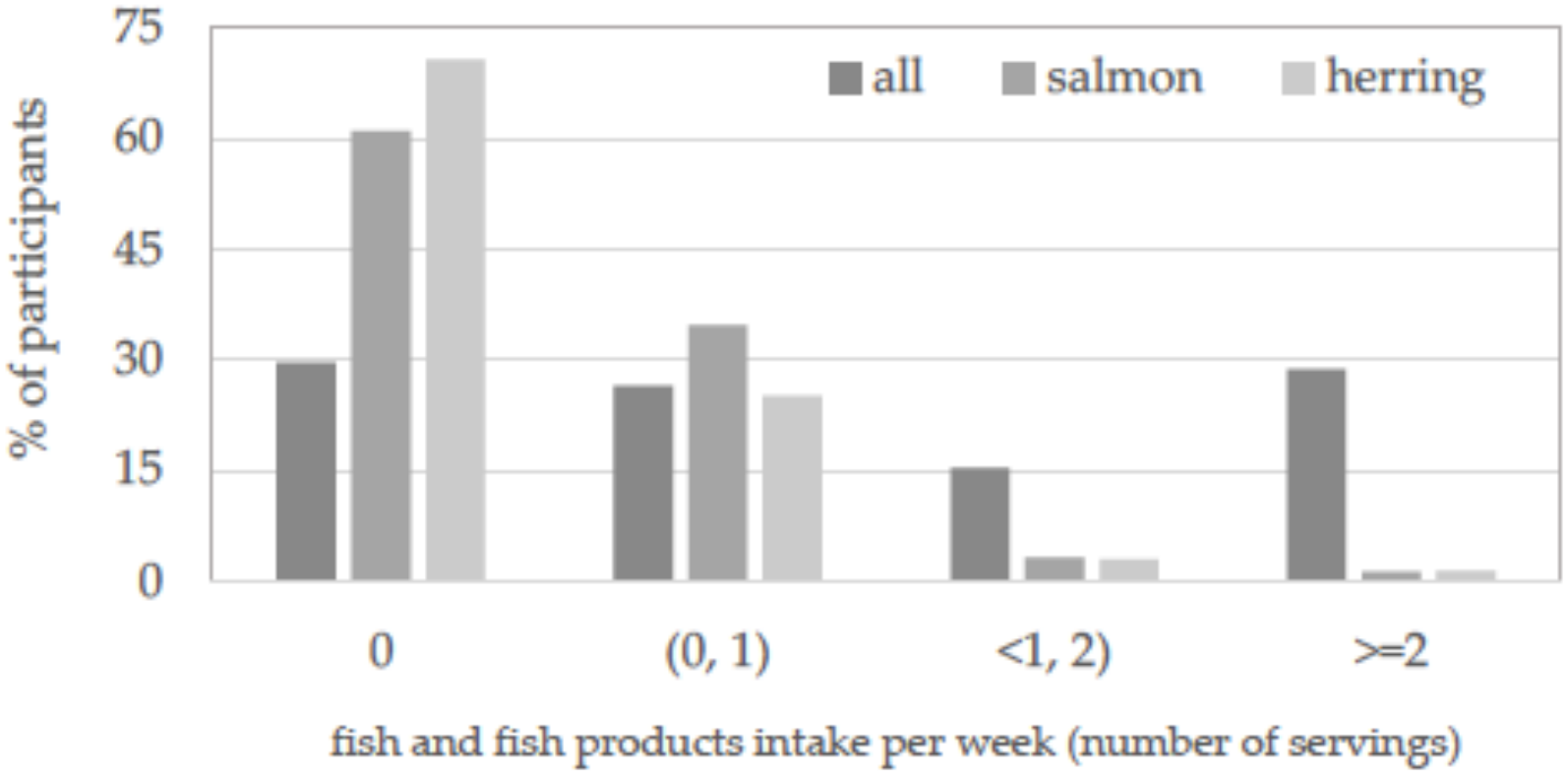


The Food and Nutrition Security for Manitoba Youth (FANS) study: rationale, methods, dietary intakes and body mass index

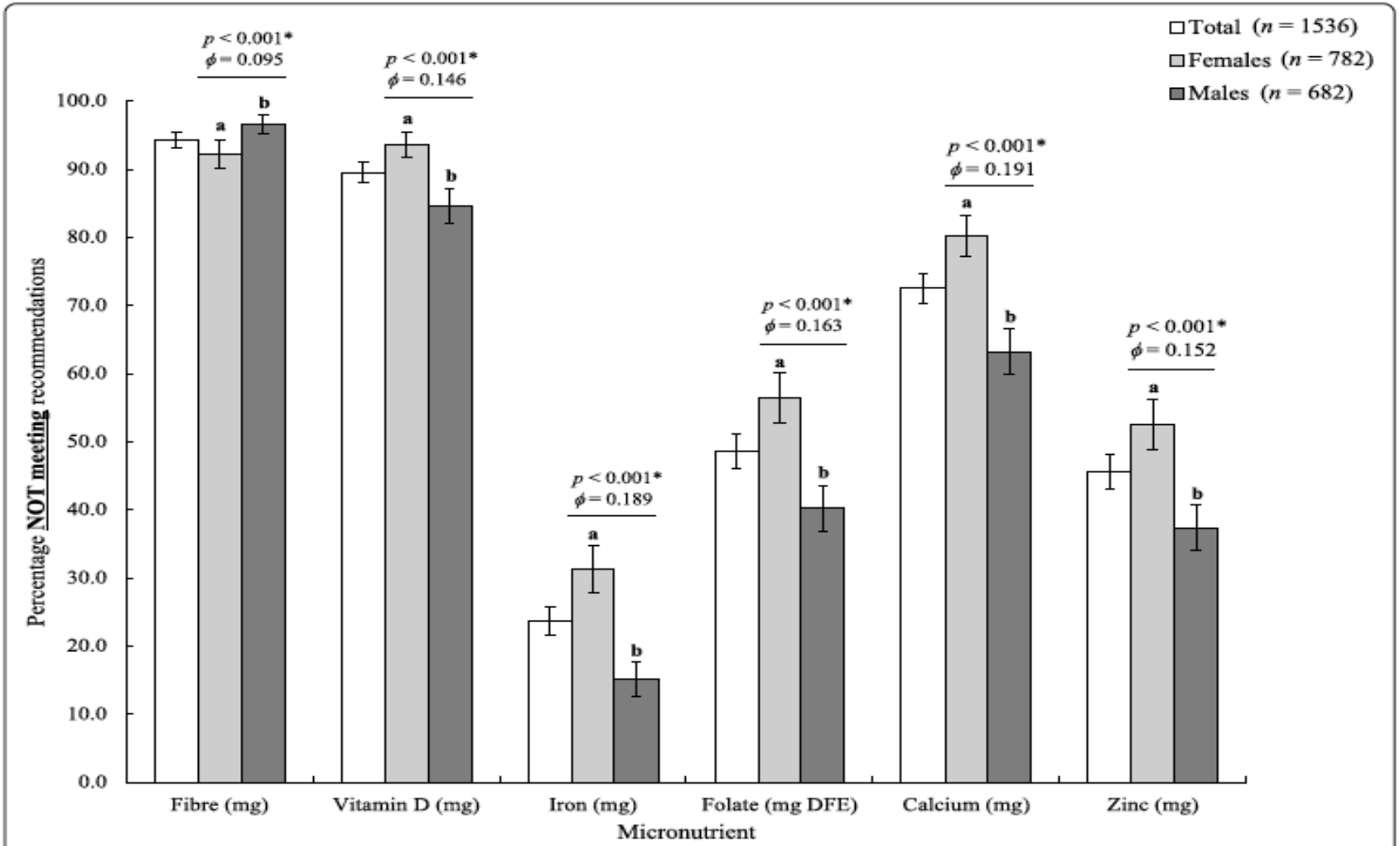


Fig. 2 Percentage of participants not meeting recommendations for select nutrients. EAR used for all micronutrients except for fiber (AI). For Total, participants not reporting sex ($n = 72$) were excluded for comparison with guidelines that vary by sex (fibre, iron, zinc). Bars represent the percentage of participants not meeting recommendations; whiskers represent 95% confidence intervals. p-values and Cramer's V are for comparisons between sexes. Bars not sharing a similar letter (a,b) denote significant differences ($p < 0.05$)

Slater et al. BMC Nutrition (2022)

Prevention of covid-19 and other acute respiratory infections with cod liver oil supplementation, a low dose vitamin D supplement: quadruple blinded, randomised placebo controlled trial

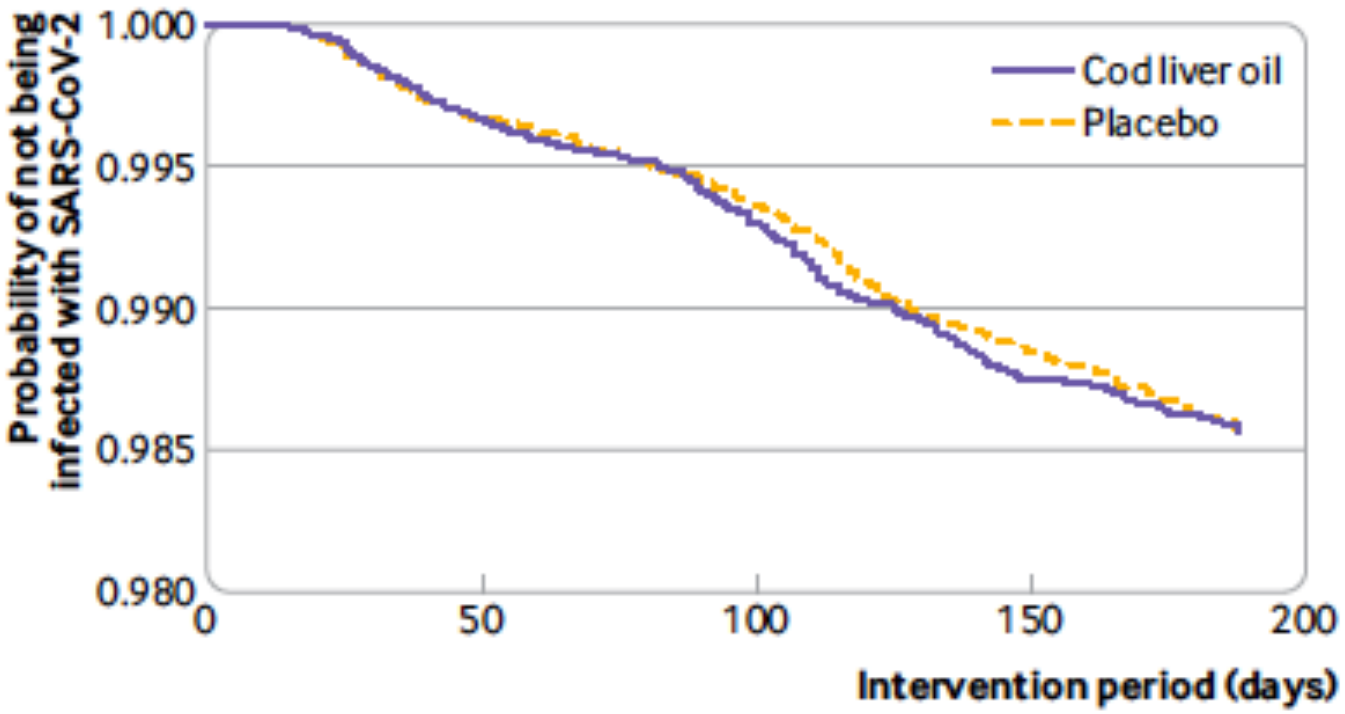
INTERVENTION

5 mL/day of cod liver oil (10 µg of vitamin D, n=17 278) or placebo (n=17 323) for up to six months.

Table 3 | Exploratory endpoints; side effects, blinding, and measured compliance according to randomisation to cod liver oil or placebo group. Data are median (25th to 75th centiles) or number (%) unless stated otherwise

	Overall (n=34 601)	Cod liver oil group (n=17 278)	Placebo group (n=17 323)	P value
Measured compliance, from dried blood spots of a subsample*				
25-hydroxyvitamin D_3 (nmol/L):				
Before supplementation	70.5 (56.7-92.3)	66.9 (52.2-91.0)	73.3 (59.6-92.7)	0.04†
During supplementation	67.9 (54.0-85.6)	74.1 (60.1-88.0)	62.8 (48.2-81.6)	<0.001†
Change	−3.6 (−20.9-14.4)	4.4 (−14.4-23.3)	−12.5 (−24.1-4.1)‡‡	<0.001†

Prevention of covid-19 and other acute respiratory infections with cod liver oil supplementation, a low dose vitamin D supplement: quadruple blinded, randomised placebo controlled trial



BMJ 2022

Food sources of vitamin D and their association with 25-hydroxyvitamin D status in Dutch older adults

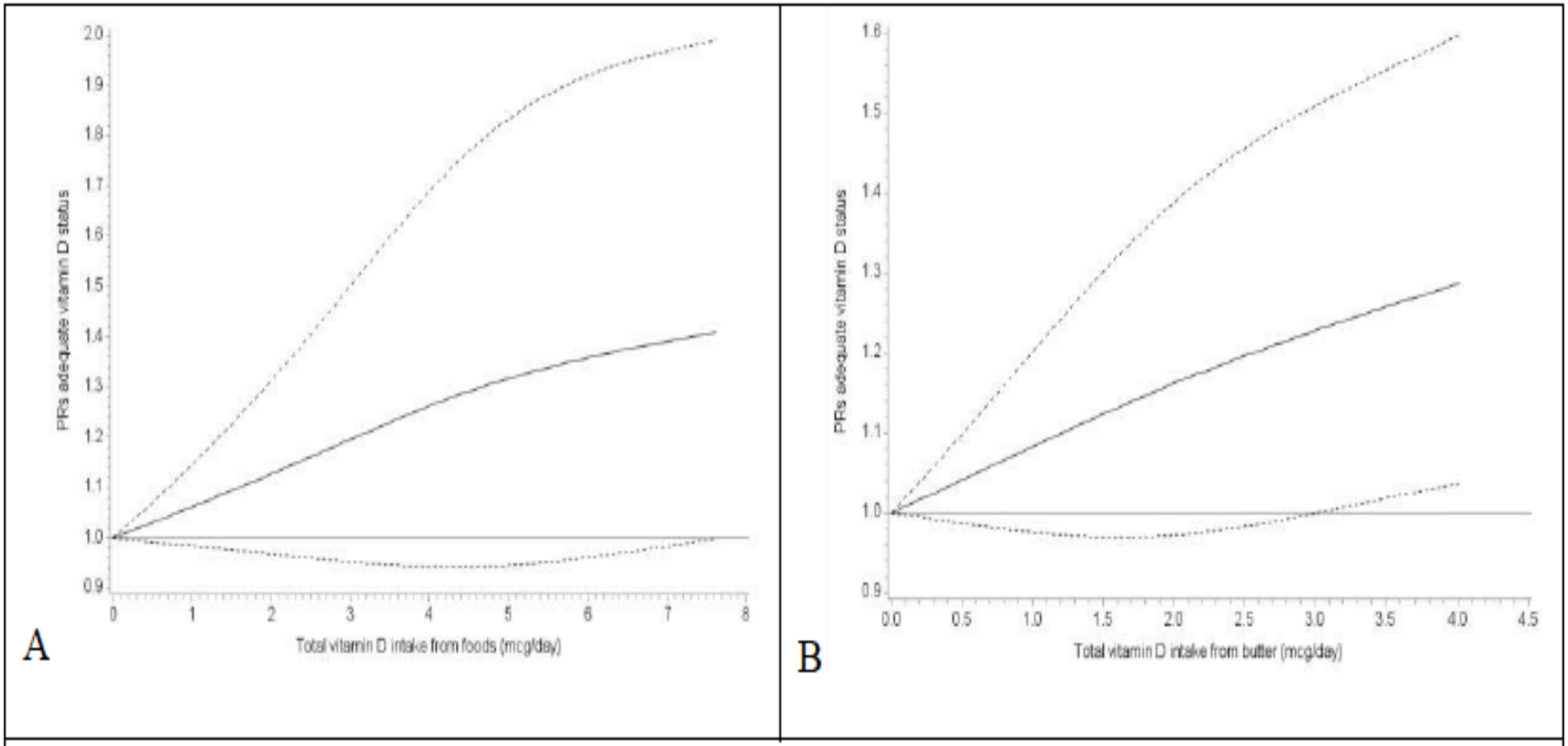


Figure 1. Associations between vitamin D-intake and serum 25-hydroxyvitamin D concentrations ≥50 nmol/L (i.e. defined as adequate vitamin D status). Graphs represent Prevalence Ratios incl. 95% CIs. Models incl. covariates for age, sex, BMI, smoking, alcohol intake, education, physical activity level, season, energy intake and vitamin D intake from other food categories. A: *P* for non-linearity 0.37. B: *P* for non-linearity 0.59.

Vaes AMM et al. *J Steroid Biochem Mol Biol* (2017)

Total vitamin D intake and vitamin D intake from specific food sources in a population of older Dutch adults

	Total	25(OH)D		Age	
		<50 nmol/L	≥50 nmol/L	<70 years	≥70 years
N	595	212	383	225	370
Energy intake, kcal/day	2005 ± 475	1933 ± 425	2044 ± 496*	2016 ± 452	1998 ± 488
Total vitamin D intake, μg/day	4.3 (3.2–5.8)	3.8 (3.0–5.2)	4.7 (3.4–6.3)*	4.3 (3.0–5.9)	4.4 (3.3–5.8)
Vitamin D supplements, μg/day	0 (0–0)	0 (0–0)	0 (0–0)*	0 (0–0)	0 (0–0)
Vitamin D from food sources					
Total foods, μg/day	4.0 (3.0–5.4)	3.7 (2.8–4.8)	4.3 (3.0–5.7)*	3.9 (2.8–5.5)	4.1 (3.1–5.3)
Meat, μg/day	0.40 (0.27–0.52)	0.38 (0.25–0.49)	0.42 (0.28–0.53)*	0.43 (0.29–0.54)	0.39 (0.26–0.51)*
Fish and shellfish, μg/day	0.56 (0.22–1.04)	0.52 (0.16–0.97)	0.58 (0.28–1.06)	0.58 (0.26–1.11)	0.56 (0.19–1.01)
Eggs, μg/day	0.25 (0.13–0.25)	0.25 (0.13–0.25)	0.25 (0.13–0.38)*	0.25 (0.13–0.25)	0.25 (0.13–0.38)
Dairy, μg/day	0.29 (0.20–0.41)	0.29 (0.18–0.41)	0.29 (0.20–0.41)	0.31 (0.20–0.41)	0.27 (0.18–0.41)
Milk, μg/day	0.04 (0.01–0.09)	0.04 (0.01–0.08)	0.04 (0.02–0.09)	0.04 (0.02–0.08)	0.04 (0.01–0.09)
Yogurt, μg/day	0.02 (0.00–0.05)	0.01 (0.00–0.05)	0.02 (0.00–0.05)	0.02 (0.00–0.05)	0.02 (0.00–0.05)
Cheese, μg/day	0.14 (0.09–0.24)	0.14 (0.08–0.21)	0.15 (0.09–0.24)	0.16 (0.10–0.25)	0.14 (0.08–0.22)*
Butter and margarine, μg/day	1.8 (0.9–2.9)	1.6 (0.7–2.6)	1.9 (1.0–3.1)*	1.7 (0.8–2.9)	1.8 (0.9–2.8)

Vaes AMM et al. *J Steroid Biochem Mol Biol* (2017)

Dietary intake at baseline and during the intervention by diet group in subjects with metabolic syndrome

	Healthy Nordic diet (n = 84–90)		Control diet (n = 59–64)		P value[c]
	Baseline[a]	During[b]	Baseline[a]	During[b]	
Energy (kJ/day)	8,499 ± 1,955	8,458 ± 1,474	8,517 ± 2,132	8,839 ± 1,804	0.103
Protein (E%)	16.8 ± 2.8	17.5 ± 2.3*	16.8 ± 2.4	16.2 ± 1.7*	<0.001
Fat (E%)	33.0 ± 6.1	31.5 ± 4.0*	33.2 ± 6.3	35.6 ± 4.4*	<0.001
SFA(E%)	12.5 ± 3.2	9.9 ± 2.0*	13.1 ± 3.3	14.8 ± 2.3*	<0.001
MUFA (E%)	11.2 ± 2.7	11. 5 ± 2.0*	11.1 ± 2.5	12.3 ± 1.9*	0.007
PUFA[d] (E%)	4.5 ± 2.2	6.7 ± 2.1*	4.3 ± 2.2	4.3 ± 1.3	<0.001
EPA[e] (mg/day)	217 ± 287	408 ± 295*	146 ± 244	87 ± 71	<0.001
DHA[5] (mg/day)	431 ± 406	916 ± 629*	332 ± 439	207 ± 159	<0.001
Carbohydrate (E%)	45.8 ± 6.1	47.0 ± 4.9	46.1 ± 6.6	44.0 ± 5.1*	<0.001
Sucrose[d] (g/day)	36.0 ± 26.0	32.3 ± 21.0*	39.0 ± 24.5	35.0 ± 23.0	0.093
Dietary fibre (g/day)	22.8 ± 7.3	34.6 ± 8.6*	20.8 ± 6.7	16.6 ± 3.7*	<0.001
Vitamin D[d] (µg/day)	4.9 ± 5.3	10.6 ± 5.8*	4.7 ± 6.1	4.0 ± 2.3*	<0.001
Calcium[d] (mg/day)	891 ± 453	897 ± 399	860 ± 519	878 ± 405	0.567
Total fish (g/week)	–	426 ± 205	–	–	–
Lean fish	–	150 ± 112	–	–	–
Fatty fish	–	276 ± 176	–	–	–

Brader L. et al. *Eur J Nutr* (2014)

Plasma 25-hydroxyvitamin D and parathyroid hormone by diet group at baseline and end of 18/24 weeks dietary intervention in subjects with metabolic syndrome

	Healthy Nordic diet ($n = 90$)			Control diet ($n = 64$)			Adjusted treatment effects (Nordic vs. control diet)		
	Baseline[a]	End	% Change	Baseline[a]	End	% Change	% Difference[b]	95 % CI	*P* value
25(OH)D									
All	54.1 ± 18.8	61.6 ± 16.9	13.1	50.1 ± 17.4	56.4 ± 17.6	12.6	5.81	−0.63; 90.92	0.208
<50 nmol/l	36.3 ± 8.8	52.9 ± 14.5	45.7	35.6 ± 9.1	49.4 ± 18.3	38.8	10.40	−11.70; 32.50	0.350
≥50 nmol/l	63.7 ± 15.1[c]	67.7 ± 15.9	1.8	62.1 ± 13.9[c]	63.4 ± 14.0	−1.9	3.49	−0.55; 27.39	0.225
PTH									
All	5.11 ± 2.50[c]	5.66 ± 2.40[c]	10.8	4.99 ± 1.89[c]	5.00 ± 1.90[c]	0.2	4.84	−2.71; 12.38	0.207

Brader L. et al. *Eur J Nutr* (2014)

Conclusioni

- L’apporto di vitamina D con la dieta è, nel complesso, assai modesto
- Alle nostre latitudini, le modifiche della dieta in grado di normalizzare l’ipovitaminosi D, sono sostanzialmente non praticabili su ampia scala