eSupplement

Update of the DGE position on vegan diet

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Content

eSupplement to the article:
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Table e1: Detailed search strategies for the umbrella review on vegan diet for all databases (according to (1))

			Results
PubMed			
#1	Vegan diet	Diet, Vegan [MeSH] OR Vegans [MeSH] OR Diet, Vegetarian [MeSH] OR vegan* OR (plant-based AND (diet OR diets OR dietary OR nutrition)) OR (“plant based” AND (diet OR diets OR dietary OR nutrition))	8,568
#2	Study design	Systematic Review [Publication Type] OR "systematic review" OR “systematic reviews” OR Meta-Analysis [Publication Type] OR meta-analysis OR meta-analyses	447,997
#3	#1 AND #2		333
Web of Science			
#1	Vegan diet	(vegan* OR (plant-based AND (diet OR diets OR dietary OR nutrition)) OR (“plant based” AND (diet OR diets OR dietary OR nutrition)))	8,864
#2	Study design	"Systematic review" OR Meta-Analysis OR “systematic reviews” OR meta-analyses	472,239
#3	#1 AND #2		303
Epistemonikos			
#1	Vegan diet	Vegan* OR (plant-based AND (diet OR diets OR dietary OR nutrition)) OR (“plant based” AND (diet OR diets OR dietary OR nutrition))	1,105
#2	Study design	"Systematic review" OR meta-analysis OR “systematic reviews” OR meta-analyses	413,645
#3	#1 AND #2		166
Cochrane library			
#1	Vegan diet	Vegan* OR (“plant-based AND (diet OR diets OR dietary OR nutrition)) OR (“plant based AND (diet OR diets OR dietary OR nutrition)) OR (MeSH descriptor: [Diet, Vegan] explore all trees) OR (MeSH descriptor: [Vegans] in all MeSH products) OR (MeSH descriptor: [Diet, Vegetarian] explore all trees)	985
#2	Study design	"systematic review" OR "systematic reviews" OR “meta-analysis” OR “meta-analyses” OR (“systematic review”):pt OR (“meta analysis”):pt	35,496
#3	#1 AND #2		51

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Table e2: Detailed search strategies for the systematic review on vegan diet in vulnerable groups for all databases

PubMed			**Results**
#1	Vegan diet	Diet, Vegan [MeSH] OR Vegans [MeSH] OR vegan* OR (plant-based AND (diet OR diets OR dietary OR nutrition)) OR ("plant based" AND (diet OR diets OR dietary OR nutrition))	6,379
#2	Elderly	Aged [tiab] OR geriatric* [tiab] OR geriatrics [MesH] OR elder* [tiab] OR old [tiab] OR older [tiab] OR ageing [tiab] OR aging [MesH] OR "frail elderly" [MesH]	2,656,661
#3	Pregnancy and breast feeding	Pregnan* [tiab] OR Pregnancy [MeSH] OR "Pregnant Women" [MeSH] OR gestation* [tiab] OR "breast feeding" [tiab] OR "breastfeeding" [tiab] OR "Milk, Human" [MeSH] OR "breast feeding" [MeSH] OR lactation [tiab] OR lactation [MeSH]	1,268,919
#4	Study design	Review [Publication Type] OR Systematic Review [Publication Type]	3,269,031
#5	(#1 AND (#2 OR #3)) NOT #4		948
#6	#5 AND (2020:2023[pdat])		495
Web of Science			
#1	Vegan diet	(vegan* OR (plant-based AND (diet OR diets OR dietary OR nutrition)) OR ("plant based" AND (diet OR diets OR dietary OR nutrition)))	8,241
#2	Elderly	Aged OR geriatric* OR geriatrics OR elder* OR old* OR ageing OR aging OR "frail elderly"	5,120,664
#3	Pregnancy and breast feeding	Pregnan* OR Pregnancy OR "Pregnant Women" OR gestation* OR "breast feeding" OR "breastfeeding" OR lactation	233,300
#4	Study design	DT=("review")	na
#5	(#1 AND (#2 OR #3)) NOT #4		1,645
#6	#5 AND (2020 or 2021 or 2022 or 2023 (Publication Years))		862
Epistemonikos			
#1	Vegan diet	Vegan* OR (plant-based AND (diet OR diets OR dietary OR nutrition)) OR ("plant based" AND (diet OR diets OR dietary OR nutrition))	828
#2	Elderly	Aged OR geriatric* OR geriatrics OR elder* OR old* OR ageing OR aging OR "frail elderly"	340,218
#3	Pregnancy and breast feeding	Pregnan* OR Pregnancy OR "Pregnant Women" OR gestation* OR "breast feeding" OR "breastfeeding" OR lactation	136,149
#4	Study design	title:("systematic review" OR "meta-analysis" OR "systematic reviews" OR "meta-analyses")	349,085
#5	(#1 AND (#2 OR #3)) NOT #4		140

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#6	#5 AND 2020-2023		56

Cochrane library			
#1	Vegan diet	Vegan* OR (“plant-based AND (diet OR diets OR dietary OR nutrition)) OR (“plant based AND (diet OR diets OR dietary OR nutrition)) OR (MeSH descriptor: [Diet, Vegan] explore all trees) OR (MeSH descriptor: [Vegans] in all MeSH products) OR (MeSH descriptor: [Diet, Vegetarian] explore all trees)	848
#2	Elderly	Aged OR geriatric* OR geriatrics OR elder* OR old* OR ageing OR aging OR “frail elderly” OR (MeSH descriptor: [Aging] explode all trees) OR (MeSH descriptor: [Frail Elderly] explode all trees)	706,252
#3	Pregnancy and breast feeding	Pregnan* OR Pregnancy OR “Pregnant Women” OR gestation* OR “breast feeding” OR “breastfeeding” OR (MeSH descriptor: [Breast Feeding] explode all trees) OR lactation OR (MeSH descriptor: [Lactates] explode all trees)	3,539
#4	Study design	(MeSH descriptor: [Systematic Review] explode all trees) OR (MeSH descriptor: [Meta-Analysis] explode all trees)	426
#5	(#1 AND (#2 OR #3)) NOT #4		na
#6	#5 AND 2020-2023		186

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Table e3: PICOS for the umbrella review on vegan diet

	Inclusion criteria	Exclusion criteria
Population	All age groups, general populations	High risk populations (such as people with obesity and/or diabetes mellitus)
Intervention	Vegan diet	Non-vegan diets including consumption of animal foods
Comparison	Omnivores or other non-vegan diets	-
Outcome	Nutrient profiles, nutrition-related diseases	Other diseases not primarily related to nutrition (e.g. pain, depression)
Study design	Systematic reviews with and without meta-analyses	Non-systematic reviews, primary studies, conference abstracts, comments, letters, editorials

Table e4: PICOS for the systematic review on vegan diet in vulnerable groups

	Inclusion criteria	Exclusion criteria
Population	Elderly (≥60 years), Pregnant and breast feeding women	Children, adolescents, adults aged <60 years
Intervention	Vegan diet	Non-vegan diets including consumption of animal foods
Comparison	Omnivores or other non-vegan diets	**-**
Outcome	Nutrient profiles, nutrition-related diseases	Other diseases not primarily related to nutrition (e.g. pain, depression)
Study design	Primary studies (interventional and observational studies)	Reviews, conference abstracts, comments, editorials

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Figure e1: PRISMA flow chart for the umbrella review on vegan diet

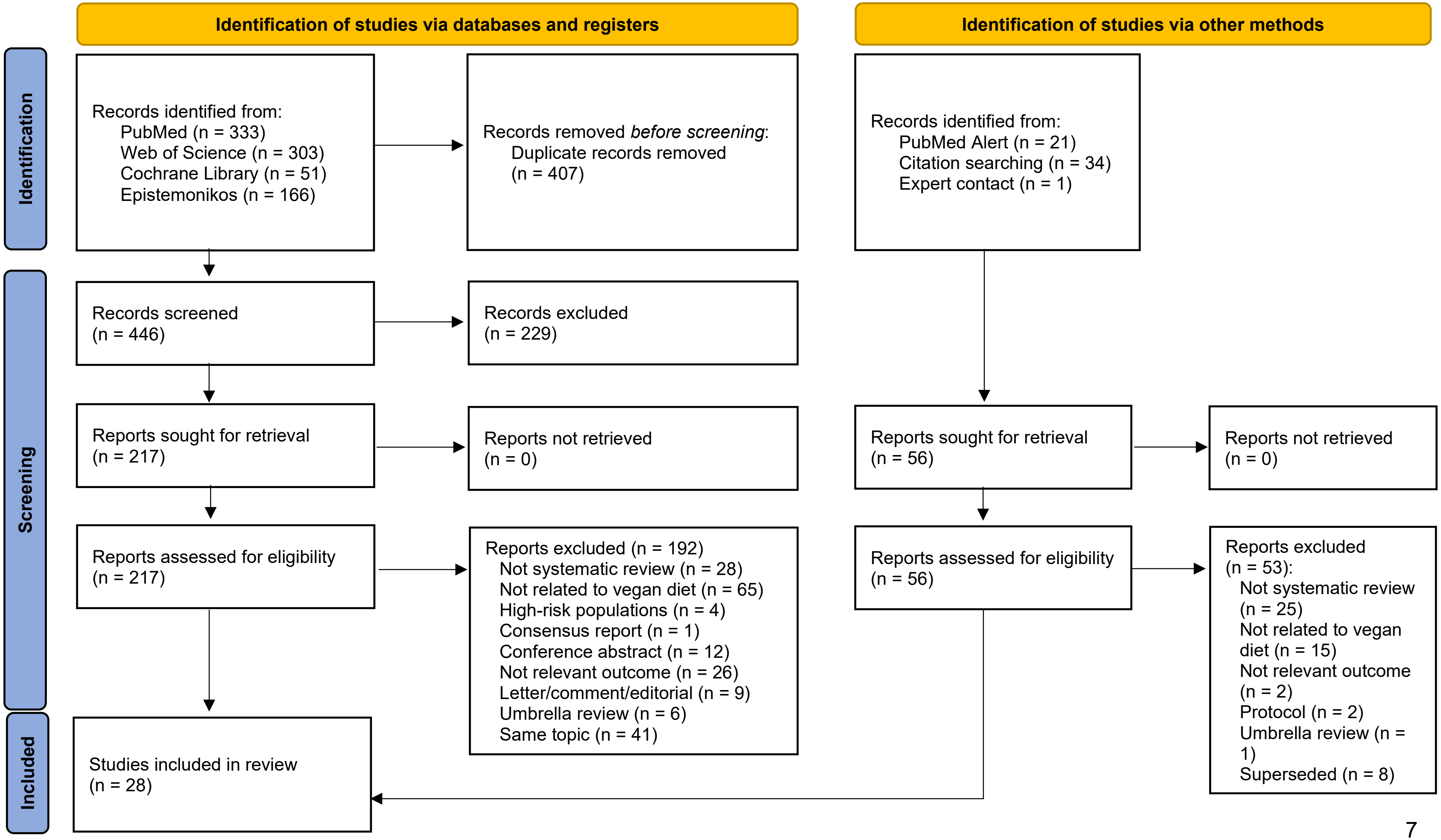

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Table e5: List of excluded studies with reasons (umbrella review)

Exclusion reason	References
Not systematic review	(2-29)
Not related to vegan diet	(30-94)
High-risk populations	(95-98)
Consensus report	(99)
Conference abstract	(100-111)
Not relevant outcome	(112-137)
Letter/comment/editorial	(138-146)
Umbrella review	(1, 147-151)
Same topic	(152-192)

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Figure e2: PRISMA flow chart for the systematic review on vegan diet in vulnerable groups

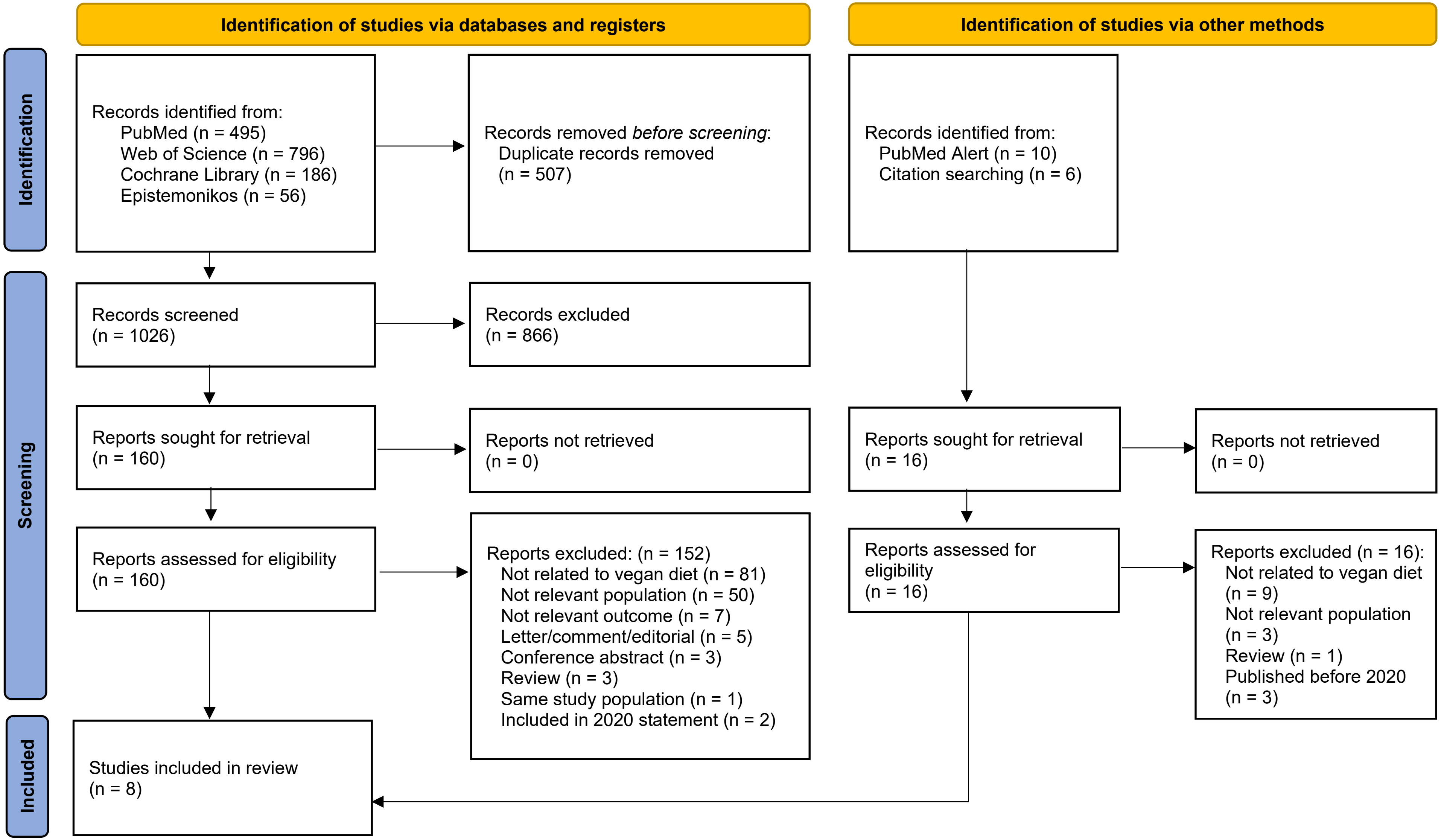

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Table e6: List of excluded studies with reasons (systematic review on vulnerable groups)

Exclusion reason	References
Not related to vegan diet	(193-273)
Not relevant population	(274-323)
Not relevant outcome	(324-330)
Letter/comment/editorial	(331-335)
Conference abstract	(336-338)
Review	(339-341)
Same study population	(342)
Included in 2020 statement	(343, 344)

Table e7: Characteristics of the included systematic reviews with meta-analyses on vegan diet with regard to nutritional status and dietary intake in general populations (modified according to (1))

Outcome (unit)	**Reference**	**No. of primary studies**	**Study type of primary studies**	**Comparison**	**No. of participants**	**Summary effect (95% CI)**	**I^2**	**Certainty of evidence[1]**
Energy and nutrients								
Total energy (MJ/d)	Benatar 2018 (345)	17	Cross-sectional studies	Omnivore diet	131,664	MD: -0.94 (-1.28, -0.59)	97%	⊕◯◯◯ VERY LOW
Protein (g/d)	Benatar 2018 (345)	13	Cross-sectional studies	Omnivore diet	90,621	MD: -22.32 (-27.84, -16.80)	97%	⊕◯◯◯ VERY LOW
Total fat (g/d)	Benatar 2018 (345)	16	Cross-sectional studies	Omnivore diet	90,757	MD: -16.40 (-22.45, -10.35)	97%	⊕◯◯◯ VERY LOW[1]
Saturated fatty acids (g/d)	Benatar 2018 (345)	13	Cross-sectional studies	Omnivore diet	90,599	MD: -15.92 (-19.90, -11.94)	98%	⊕◯◯◯ VERY LOW
Monounsaturated fatty acids (g/d)	Benatar 2018 (345)	9	Cross-sectional studies	Omnivore diet	55,535	MD: -6.29 (-10.27, -2.31)	92%	⊕◯◯◯ VERY LOW
Polyunsaturated fatty acids (g/d)	Benatar 2018 (345)	13	Cross-sectional studies	Omnivore diet	61,390	MD: 3.60 (1.50, 5.69)	90%	⊕◯◯◯ VERY LOW
Carbohydrates (g/d)	Benatar 2018 (345)	13	Cross-sectional studies	Omnivore diet	65,170	MD: 25.60 (9.64, 41.56)	97%	⊕◯◯◯ VERY LOW
Calcium intake	Bickelmann 2022 (346)	21	Cross-sectional studies	Omnivore diet	64,804	SMD: -0.70 (-0.85, -0.55)	89%	⊕◯◯◯ VERY LOW
Calcium intake	Bickelmann 2022 (346)	12	Cross-sectional studies	Vegetarian diet	36,324	SMD: -0.57 (-0.83, -0.32)	95%	⊕◯◯◯ VERY LOW
Iodine (µg/day)	Eveleigh 2023 (347)	6	Cross-sectional studies	Omnivore diet	1,995	MD: -62.30 (-93.88, -30.73)	89%	⊕◯◯◯ VERY LOW
Iodine, urine (µg/L)	Eveleigh 2023 (347)	4	Cross-sectional studies	Omnivore diet	333	MD: -46.52 (-94.08, 1.04)	97%	⊕◯◯◯ VERY LOW
Zinc (mg/d)	Foster 2013 (348)	8	Cross-sectional studies	Omnivore diet	36,791	MD: -1.16 (-2.16, -0.16)	93%	⊕◯◯◯ VERY LOW

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Zinc, serum (µmol/L)	Foster 2013 (348)	4	Cross-sectional studies	Omnivore diet	259	MD: -1.06 (-2.09, -0.03)	94%	⊕◯◯◯ VERY LOW
Vitamin B12, serum (pmol/L)	Obersby 2013 (349)	9	Cross-sectional studies	Omnivore and vegetarian diet	1,018	Mean vegans: 172 (SD: 59) Mean vegetarians: 209 (SD: 47) Mean omnivores: 303 (SD: 72)	NA	⊕◯◯◯ VERY LOW

CI, confidence interval; MD, mean difference; SD, standard deviation; SMD, standardized mean difference

[1] Certainty of evidence was evaluated by the GRADE approach

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Table e8: Characteristics of the included systematic reviews on vegan diet with regard to nutritional status and dietary intake in general populations

Outcome	Reference	No. of primary studies	Study type of primary studies	Comparison	Results[1]	Certainty of evidence
n-3 fatty acid intake	Neufingerl 2022 (350)	8	Cross-sectional data	Omnivore and vegetarian diet	Across all studies, mean intake of total n-3 fatty acids tended to be higher in vegans (2.69 g/d) compared to vegetarians (1.36 g/d) and omnivores (1.08 g/d). The higher intake of n-3 fatty acids in plant-based dietary patterns was mainly due to higher intakes of ALA in vegans (2.01 g/d) compared to vegetarians (1.78 g/d) and omnivores (1.38 g/d). Intakes of EPA and DHA were considerably lower in vegans (27 and 4 mg/d) and vegetarians (16 and 31 mg/d) compared to omnivores (94 and 172 mg/d). While mean intake of ALA was above the AI for vegetarians and vegans, average combined intakes of EPA and DHA were below the lower AMDR (i.e., 250 mg/d).	⊕◯◯◯ VERY LOW[2]
PUFA status	Neufingerl 2022 (350)	5	Cross-sectional data	Omnivore and vegetarian diet	Most studies showed significantly higher PUFA status in vegans (3/5 studies) and vegetarians (3/3 studies) compared to omnivores. For ALA status, there was a higher status in vegans (4/9 studies) and vegetarians (3/8 studies) compared to omnivores. Most studies reported lower EPA and DHA status in vegans (7/8 and 8/9 studies) and vegetarians (5/7 and 7/7 studies) compared to omnivores. Vegans also mostly had lower EPA and DHA status than vegetarians (5/6 and 5/6 studies).	⊕◯◯◯ VERY LOW[2]
Fiber intake	Neufingerl 2022 (350)	19	Cross-sectional data	Omnivore and vegetarian diet	Across all studies, average fiber intake was highest in vegans (44 g/d), followed by vegetarians (28 g/d) and lowest in omnivores (21 g/d). The average fiber intake of vegans met the AI, while for omnivores it was below the AI. Looking at individual studies, 74 % (14/19 studies) reported fiber intakes of vegans met the AI compared to 29 % (10/35 studies) in vegetarians and 6 % (2/33 studies) in omnivores.	⊕◯◯◯ VERY LOW[2]
Vitamin A intake	Neufingerl 2022 (350)	11	Cross-sectional data	Omnivore and vegetarian diet	Across all studies, average vitamin A intake was similar across vegans, vegetarians and omnivores. Vitamin A intakes were well above the EAR (i.e., 500/625 µg RE for women/men). Only two studies (both considering intake from foods only) reported vitamin A intake below the EAR in omnivores in the US and vegans in the UK.	⊕◯◯◯ VERY LOW[2]
Vitamin A status	Neufingerl 2022 (350)	2	Cross-sectional data	Omnivore and vegetarian diet	Average beta-carotene-status tended to be higher in vegans (0.8 µmol/L) compared to vegetarians (0.4 µmol/L) and similar to omnivores (0.8 µmol/L). Vitamin A status based on serum/plasma retinol levels, was similar across all dietary patterns (2.5/2.2/2.1 µmol/L in respectively meat-eaters, vegetarians, and vegans). Status data were well above the cut-off for vitamin A deficiency (i.e., retinol < 0.7 µmol/L).	⊕◯◯◯ VERY LOW[2]

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Vitamin B1 intake	Neufingerl 2022 (350)	11	Cross-sectional data	Omnivore and vegetarian diet	Vegans tended to have a higher average vitamin B1 intake (1.97 mg/d) than vegetarians (1.47 mg/d) and omnivores (1.34 mg/d). This was even more pronounced in studies that assessed intake from foods and supplements. Average vitamin B1 intake was above the EAR (i.e., 0.9/1.0 mg/d for women/men) for all dietary patterns.	⊕◯◯◯ VERY LOW[2]
Vitamin B1 status	Neufingerl 2022 (350)	2	Cross-sectional data	Omnivore and vegetarian diet	A study from Switzerland assessed vitamin B1 status based on plasma levels, reporting somewhat higher levels in vegans (36.4 nmol/L) than in vegetarians (29.4 nmol/L) and omnivores (30.7 nmol/L). Another study from Austria reported a zero prevalence of vitamin B1 deficiency (>25% Thiamine pyrophosphate effect) in vegans and vegetarians compared to 2.5% prevalence in omnivores.	⊕◯◯◯ VERY LOW[2]
Vitamin B2 intake	Neufingerl 2022 (350)	10	Cross-sectional data	Omnivore and vegetarian diet	Average vitamin B2 intake was similar for vegan, vegetarian and omnivores. In studies that assessed intake from foods and supplements, vegans and omnivores had slightly higher vitamin B2 intakes than vegetarians. For all dietary patterns, mean intake across all studies was above the EAR (i.e., 0.9/1.1 mg/d for women/men).	⊕◯◯◯ VERY LOW[2]
Vitamin B2 status	Neufingerl 2022 (350)	2	Cross-sectional data	Omnivore and vegetarian diet	One study from Switzerland assessed vitamin B2 status based on plasma levels, reporting lower levels in vegans (79.8 nmol/L) and vegetarians (82.4 nmol/L) than in omnivores (92.0 nmol/L). Another study from Austria reported on vitamin B2 deficiency (erythrocyte glutathione reductase activity coefficient >1.4), with prevalence of 33%, 12.5% and 10% in vegans, omnivores and vegetarians.	⊕◯◯◯ VERY LOW[2]
Niacin intake	Neufingerl 2022 (350)	9	Cross-sectional data	Omnivore and vegetarian diet	On average, vegans (24.3 mg/d) had slightly higher niacin intake compared to vegetarians (18.8 mg/d) and similar intake compared to omnivores (25.2 mg/d). Mean intakes of niacin were higher in studies that assessed intake from foods and supplements, especially for omnivores and vegetarians. Mean intake across studies was above the EAR (i.e., 11/12 mg/d for women/men).	⊕◯◯◯ VERY LOW[2]
Niacin status	Neufingerl 2022 (350)	1	Cross-sectional data	Omnivore and vegetarian diet	One study from Switzerland assessed niacin status based on plasma levels, reporting lower levels in vegans (464 nmol/L) than in vegetarians (580 nmol/L) and omnivores (579 nmol/L).	⊕◯◯◯ VERY LOW[2]
Vitamin B6 intake	Neufingerl 2022 (350)	14	Cross-sectional data	Omnivore and vegetarian diet	Average vitamin B6 intake tended to be higher in vegans (2.81 mg/d) compared to vegetarians and omnivores (1.82 mg/d), irrespective of whether studies assessed intake from supplements. Mean intakes were well above the EAR (i.e., 1.1 mg/d).	⊕◯◯◯ VERY LOW[2]
Vitamin B6 status	Neufingerl 2022 (350)	5	Cross-sectional data	Omnivore and vegetarian diet	Average vitamin B6 levels were similar for vegans, vegetarians and omnivores	⊕◯◯◯ VERY LOW[2]

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Folate intake	Neufingerl 2022 (350)	14	Cross-sectional data	Omnivore and vegetarian diet	Vegans tended to have higher average folate intake (490 µg/d) than vegetarians (403 µg/d) and omnivores (331 µg/d), irrespective of whether intake from supplements was assessed. Mean intakes were just above the EAR (i.e., 320 µg/d) in omnivores. While for vegetarians and vegans, 93–100% of individual studies (27/29 and 15/15 studies) reported folate intakes above the EAR, for omnivores 9 out of 24 studies (38%) found intakes below the EAR.	⊕◯◯◯ VERY LOW[2]
Folate status	Neufingerl 2022 (350)	17	Cross-sectional data	Omnivore and vegetarian diet	Folate status tended to be higher in vegans (29 nmol/L) and in vegetarians (24 nmol/L) as compared to omnivores (19 nmol/L), with highest levels. This order was similar in studies that included and excluded supplement users. Three quarter of studies (9/12 studies) comparing vegans with omnivores, showed that omnivores had lower folate levels. Eight studies assessed folate deficiency (<10 nmol/L in plasma/serum or <340 nmol/L in red blood cells) with average prevalence of 1.5 % in vegans, 0 % in vegetarians and 11 % in omnivores.	⊕◯◯◯ VERY LOW[2]
Vitamin B12 intake	Neufingerl 2022 (350)	16	Cross-sectional data	Omnivore and vegetarian diet	Across all studies, average vitamin B12 intake was higher in omnivores (5.6 µg/d) compared to vegetarians (2.1 µg/d) and vegans (1.5 µg/d). In studies that assessed intake from foods and supplements, all dietary patterns had a mean vitamin B12 intake above the EAR, though the median vitamin B12 intake of vegans was below the EAR (i.e., 2.0 µg/d). In studies that assessed intake from foods only, mean and median vitamin B12 intake of vegans was well below the EAR. Most individual studies that assessed intake from foods only (10/13 studies) reported a vitamin B12 intake below the EAR for vegans, and half of the studies did so for vegetarians. This indicates that vegans and vegetarians are at high risk of inadequate vitamin B12 intake when supplements are not considered.	⊕◯◯◯ VERY LOW[2]
Vitamin C intake	Neufingerl 2022 (350)	12	Cross-sectional data	Omnivore and vegetarian diet	Average vitamin C intake was highest in vegans (213 mg/d), followed by vegetarians (166 mg/d) and then omnivores (137 mg/d), irrespective of whether studies assessed intake from supplements. Average vitamin C intake was above the EAR. No single study reported intakes below the EAR (i.e., 60/75 mg for women/men).	⊕◯◯◯ VERY LOW[2]
Vitamin C status	Neufingerl 2022 (350)	3	Cross-sectional data	Omnivore and vegetarian diet	Across all studies, average vitamin C levels were higher in vegans (61.9 µmol/L) and vegetarians (62.7 µmol/L) compared to omnivores (44.9 µmol/L). This was similar for studies including and excluding supplement users. All or most individual studies showed a significant higher vitamin C status in vegans (3/3 studies) compared to omnivores. Vegans as compared to vegetarians had similar (2/3 studies) or higher vitamin C status.	⊕◯◯◯ VERY LOW[2]
Vitamin D intake	Bakaloudi 2021 (351)	11	Cross-sectional data	Any other diet	In 10 out of 11 studies, a vegan diet was characterized by a lower intake of vitamin D when compared to other diets, or lower than the intake reference	⊕◯◯◯ VERY LOW[2]

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					value (5 mg/d for 19–50 years, 10 mg/d for 51–61 years and 15 mg/d for 65+ years).	
Vitamin D status	Neufingerl 2022 (350)	8	Cross-sectional data	Omnivore and vegetarian diet	Across all studies, average vitamin D levels tended to be slightly lower in vegans (21.9 µg/L) and vegetarians (22.8 µg/L) than in omnivores (26.2 µg/L). Among studies that compared vitamin D status between dietary patterns, three showed lower vitamin D status in vegetarians or vegans compared to omnivores. Vegans had similar vitamin D status as vegetarians in 5 out of 6 studies. Vitamin D deficiency was much more prevalent in vegans (ranging between 3% and 67% across studies) compared to omnivores and pesco-vegetarians (ranging between 0 and 6% across studies) and vegetarians (ranging between 0 and 33%). Insufficiency was 15% in omnivores and 25% in vegetarians and vegans. One study of Adventists in the USA/Canada also reported a high prevalence of vitamin D insufficiency in semi-vegetarians.	⊕◯◯◯ VERY LOW[2]
Vitamin E intake	Neufingerl 2022 (350)	10	Cross-sectional data	Omnivore and vegetarian diet	Average vitamin E intake tended to be higher in vegans (19.2 mg/d) compared to vegetarians (12.6 mg/d) and omnivores (10.8 mg/d), irrespective of whether intake from supplements was assessed. Only for vegans, average vitamin E intake was well above the EAR (i.e., 12 mg/d), and all individual studies reported intakes above the EAR.	⊕◯◯◯ VERY LOW[2]
Vitamin E status	Neufingerl 2022 (350)	3	Cross-sectional data	Omnivore and vegetarian diet	Vitamin E status was similar across vegans (20.5 µmol/L), vegetarians (25.5 µmol/L) and omnivores (25.4 µmol/L). One study assessed vitamin E deficiency (defined as plasma α-tocopherol < 13 µmol/L), reporting zero prevalence among omnivores and vegetarians and 3.8% among vegans.	⊕◯◯◯ VERY LOW[2]
Iron intake	Neufingerl 2022 (350)	14	Cross-sectional data	Omnivore and vegetarian diet	Average iron intake tended to be higher in vegans (21.0 mg/d) compared to vegetarians (15.3 mg/d) and omnivores (13.9 mg/d), independent of whether intake from supplements was assessed. Mean iron intakes were above the (bioavailability-adjusted) EAR in all diet groups.	⊕◯◯◯ VERY LOW[2]
Iron status	Neufingerl 2022 (350)	9	Cross-sectional data	Omnivore and vegetarian diet	Iron status tended to be higher in omnivores (55.5 µg/L) than in vegans (31.3 µg/L) and vegetarians (33.8 µg/L). Two out of three studies comparing omnivores and vegans, showed that omnivores had a higher iron status. Studies showed a prevalence of iron deficiency (ferritin <15 µg/L) of 15% in vegans, 11% in vegetarians and 7% in omnivores.	⊕◯◯◯ VERY LOW[2]
Phosphorus intake	Neufingerl 2022 (350)	6	Cross-sectional data	Omnivore and vegetarian diet	Average phosphorus intake was similar between vegans, vegetarians and omnivores. Average phosphorus intake was somewhat higher in studies that assessed intake from foods and supplements, especially among vegetarians. Average phosphorus intake was well above the EAR (i.e., 580 mg/d) for all diets.	⊕◯◯◯ VERY LOW[2]

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Potassium intake	Bakaloudi 2021 (351)	8	Cross-sectional data	Any other diet	Several studies showed that potassium intake was above the RNI among vegans.	⊕◯◯◯ VERY LOW[2]
Sodium intake	Bakaloudi 2021 (351)	8	Cross-sectional data	Any other diet	Several studies showed that sodium intake was above the RNI among vegans. In some studies, vegans had the lowest intake of sodium (2.5–2.8 g/d) in comparison with vegetarian and omnivores (2.7–3.0 g/d), whereas other studies reported higher sodium intake in the vegan group than in omnivores and lacto-ovo vegetarians. One study did not find any difference between vegans and other diet groups. An upward trend was found for studies published from 2016 onwards.	⊕◯◯◯ VERY LOW[2]
Magnesium intake	Neufingerl 2022 (350)	10	Cross-sectional data	Omnivore and vegetarian diet	Average magnesium intake was higher in vegans (503 mg/d) than in vegetarians (373 mg/d) and omnivores (302 mg/d). In studies that assessed intake from foods only, magnesium intake was somewhat lower across all groups than in studies that assessed intake from foods and supplements, but vegans had still the highest intake. Average magnesium intake of vegans and vegetarians was above the EAR (307.5 md/g), while for omnivores, intake did not meet the EAR for men. More than half of individual studies reported magnesium intake of omnivores to be below the EAR, while for vegetarians and vegans most studies intakes above the EAR.	⊕◯◯◯ VERY LOW[2]
Magnesium status	Neufingerl 2022 (350)	3	Cross-sectional data	Omnivore and vegetarian diet	No differences shown between vegans, vegetarians and omnivores.	⊕◯◯◯ VERY LOW[2]
Selenium intake	Bakaloudi 2021 (351)	5	Cross-sectional data	Any other diet	Studies suggest that vegans are more likely to have a low selenium intake, though this might not be significantly different compared to non-vegans. One study found that vegans had the lowest selenium intake, which was close to the WHO RNI.	⊕◯◯◯ VERY LOW[2]
Copper intake	Bakaloudi 2021 (351)	3	Cross-Sectional data	Any other diet	Vegans were shown to have the highest intake of copper compared to other diet types in some studies.	⊕◯◯◯ VERY LOW[2]

AI, adequate intake; ALA, alpha linolenic acid; AMDR, acceptable macronutrient distribution range; DHA, docosahexaenoic acid; EAR, estimated average requirement; EPA, eicosapentaenoic acid; PUFA, polyunsaturated fatty acids; RE, retinol equivalent; RNI, reference nutrient intake; WHO, World Health Organization

[1] As reported in the systematic reviews.

[2] Very low certainty of evidence due to small number of studies, small sample sizes, study design, high risk of bias, and/or confounding.

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Table e9: Characteristics of the included meta-analyses on vegan diet with regard to health outcomes, nutritional status and dietary intake in children and adolescents

Outcome (unit)	Reference	No. of primary studies	Study type of primary studies	Comparison	No. of participants	Ratio of Means (95% CI)	I^2	Certainty of evidence[1]
Nutrient intake								
Energy intake	Koller 2023 (352)	5	Cross-sectional studies	Omnivore Diet	762	0.99 (0.91, 1.08)	79%	⊕◯◯◯ VERY LOW
Protein intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	393	0.78 (0.68, 0.89)	94%	⊕◯◯◯ VERY LOW
Fat intake	Koller 2023 (352)	4	Cross-sectional studies	Omnivore Diet	638	0.94 (0.87, 1.02)	81%	⊕◯◯◯ VERY LOW
SFA intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	578	0.57 (0.48, 0.67)	83%	⊕◯◯◯ VERY LOW
MUFA intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	548	0.99 (0.76, 1.28)	95%	⊕◯◯◯ VERY LOW
PUFA intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	548	1.86 (1.76, 1.96)	7%	⊕◯◯◯ VERY LOW
Carbohydrate intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	608	1.09 (1.01, 1.18)	92%	⊕◯◯◯ VERY LOW
Sucrose intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	184	0.75 (0.53, 1.07)	88%	⊕◯◯◯ VERY LOW
Fiber intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	184	1.87 (1.57, 2.24)	71%	⊕◯◯◯ VERY LOW
Vitamin B1 intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	363	1.08 (0.81, 1.46)	88%	⊕◯◯◯ VERY LOW
Vitamin B2 intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	363	0.59 (0.42, 0.82)	88%	⊕◯◯◯ VERY LOW
Vitamin B6 intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	363	1.10 (0.93, 1.30)	73%	⊕◯◯◯ VERY LOW

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Folate intake	Koller 2023 (352)	4	Cross-sectional studies	Omnivore Diet	517	1.96 (1.44, 2.67)	95%	⊕◯◯◯ VERY LOW
Folate, blood	Koller 2023 (352)	4	Cross-sectional studies	Omnivore Diet	398	0.97 (0.57, 1.65)	98%	⊕◯◯◯ VERY LOW
Vitamin B12 intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	363	0.91 (0, 7322.95)	100%	⊕◯◯◯ VERY LOW
Vitamin B12, blood	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	121	1.21 (1.03, 1.42)	0%	⊕◯◯◯ VERY LOW
Holotranscobalamin	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	368	1.14 (0.95, 1.36)	38%	⊕◯◯◯ VERY LOW
Vitamin C intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	487	1.57 (1.33, 1.84)	64%	⊕◯◯◯ VERY LOW
Vitamin A intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	393	0.92 (0.83, 1.02)	0%	⊕◯◯◯ VERY LOW
ß-carotene intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	427	1.30 (0.85, 2.01)	82%	⊕◯◯◯ VERY LOW
Vitamin D intake	Koller 2023 (352)	4	Cross-sectional studies	Omnivore Diet	517	0.89 (0.35, 2.22)	92%	⊕◯◯◯ VERY LOW
Vitamin D, blood	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	401	0.85 (0.64, 1.13)	94%	⊕◯◯◯ VERY LOW
Vitamin E intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	363	1.67 (1.36, 2.07)	76%	⊕◯◯◯ VERY LOW
Calcium intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	487	0.60 (0.36, 1.00)	96%	⊕◯◯◯ VERY LOW
Magnesium intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	487	1.55 (1.23, 1.96)	93%	⊕◯◯◯ VERY LOW
Potassium intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	363	1.08 (1.02, 1.15)	0%	⊕◯◯◯ VERY LOW
Iron intake	Koller 2023 (352)	4	Cross-sectional studies	Omnivore Diet	517	1.54 (1.39, 1.70)	62%	⊕◯◯◯ VERY LOW

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Ferritin, blood	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	401	0.82 (0.74, 0.90)	5%	⊕◯◯◯ VERY LOW
Iodine intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	417	0.48 (0.17, 1.34)	79%	⊕◯◯◯ VERY LOW
Selenium intake	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	363	0.54 (0.20, 1.45)	89%	⊕◯◯◯ VERY LOW
Zinc intake	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	393	0.96 (0.64, 1.44)	95%	⊕◯◯◯ VERY LOW
Metabolic markers								
Total cholesterol	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	154	0.74 (0.64, 0.86)	88%	⊕◯◯◯ VERY LOW
HDL cholesterol	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	401	0.87 (0.76, 1.00)	90%	⊕◯◯◯ VERY LOW
LDL cholesterol	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	401	0.72 (0.56, 0.92)	90%	⊕◯◯◯ VERY LOW
Triglycerides	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	371	1.04 (0.97, 1.11)	0%	⊕◯◯◯ VERY LOW
Anthropometric parameters								
BMI	Koller 2023 (352)	3	Cross-sectional studies	Omnivore Diet	8.175	1.03 (0.98, 1.08)	30%	⊕⊕◯◯ LOW
Height	Koller 2023 (352)	5	Cross-sectional studies	Omnivore Diet	8.670	0.97 (0.96, 0.99)	0%	⊕⊕◯◯ LOW
Weight	Koller 2023 (352)	5	Cross-sectional studies	Omnivore Diet	8.670	0.95 (0.91, 1.00)	73%	⊕◯◯◯ VERY LOW
Birth weight (vegan diet of the mother during pregnancy)	Koller 2023 (352)	2	Cross-sectional studies	Omnivore Diet	465	1.07 (1.03, 1.11)	0%	⊕◯◯◯ VERY LOW

BMI, body mass index; CI, confidence interval; HDL, high-density lipoprotein; LDL, low-density lipoprotein; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; SFA, saturated fatty acids

[1] Certainty of Evidence as reported by Koller et al. 2023, using the GRADE approach

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Table e10: Characteristics of the included systematic reviews on vegan diet with regard to nutritional status and dietary intake in vulnerable groups

Outcome	**Reference**	**No. of primary studies**	**Study type of primary studies**	**Population**	**Comparison**	**Results**[1]	**Certainty of evidence**
Energy and nutrient intake in vegan children and adolescents							
Disaccharides, free sugars, added sugar intake	Koller 2023 (352)	3	Cross-sectional studies	Children and adolescents	Omnivore Diet	Lower in vegans	⊕◯◯◯ VERY LOW[2]
Fatty acid intake	Koller 2023 (352)	2	Cross-sectional studies	Children and adolescents	Omnivore Diet	EPA, AA, DHA intake were lower in vegans, LA:ALA showed no differences in vegans compared to omnivores, LA and ALA intake were higher in vegans	⊕◯◯◯ VERY LOW[2]
Blood fatty acid levels	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents	Omnivore Diet	No difference in ALA levels, DHA levels were lower in vegans	⊕◯◯◯ VERY LOW[2]
Vitamin A status	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents	Omnivore Diet	Lower levels in vegans	⊕◯◯◯ VERY LOW[2]
Vitamin B2 status	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents	Omnivore Diet	Lower levels in vegans	⊕◯◯◯ VERY LOW[2]
Niacin intake	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents (males only)	Omnivore Diet	Lower in male vegans	⊕◯◯◯ VERY LOW[2]
Biotin excretion	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents	Omnivore Diet	Higher in vegans	⊕◯◯◯ VERY LOW[2]
Zinc status	Koller 2023 (352)	2	Cross-sectional studies	Children and adolescents	Omnivore Diet	No difference	⊕◯◯◯ VERY LOW[2]
Iodine status	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents	Omnivore Diet	No difference	⊕◯◯◯ VERY LOW[2]
Phosphorus intake	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents	Omnivore Diet	Lower among vegans	⊕◯◯◯ VERY LOW[2]
Sodium intake	Koller 2023 (352)	1	Cross-sectional study	Children and adolescents (males only)	Omnivore Diet	Lower among vegans	⊕◯◯◯ VERY LOW[2]

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Nutrient intake	Koller 2023 (352)	1	RCT	Obese children with elevated cholesterol	AHA diet or Mediterranean diet	The group of vegan children showed a greater reduction in protein, vitamin B12 and vitamin D intake	⊕◯◯◯ VERY LOW[2]
Breast milk composition							
Total breast milk fat	Karcz 2021 (353)	1	Cross-sectional study	Vegan lactating women	Vegetarians and omnivores	Vegans: 3.0 ± 1.7 g/dl Vegetarians: 4.0 ± 2.9 g/dl Omnivores: 4.0 ± 2.9 g/dl Difference in dietary groups significant (p = 0.041)	⊕◯◯◯ VERY LOW[2]
Fatty acids	Karcz 2021 (353)	2	Cross-sectional study	Vegan lactating women	Omnivores	Lower amount of C16:0, C16:1, C18:0 and C20:4 n3 and higher amount of C18:2 n6, C18:3 n3, C20:2 n6 in vegans' breast milk. Tendency to lower proportions of C20:5 n3 and C22:6 n3 in vegans' breast milk.	⊕◯◯◯ VERY LOW[2]
			Cross-sectional study	Vegan lactating women (6 weeks postpartum)	Vegetarians and omnivores	Vegans' breastmilk contained higher proportions of short chain FA (C10-C14) and lower proportions of medium chain FA (C16-C18) in comparison to omnivores' breast milk. The proportions of dihomo-gamma-linolenic acid (20:3 n6) and arachidonic acid (22:4 n6) were comparable in all groups. The proportion of breast milk DHA (22:6 n3) was lower in vegans than in omnivores and vegetarians. The n6/n3 FA ratio was higher in the vegans than in the other groups.	⊕◯◯◯ VERY LOW[2]
Trans fatty acids	Karcz 2021 (353)	1	Cross-sectional study	Vegan lactating women	Vegetarians and omnivore	The mean breast milk trans-fat concentrations were below 1.1% in all study groups, with the lowest levels in vegans."	⊕◯◯◯ VERY LOW[2]
Vitamin B12	Baroni 2021 (354)	1	Cross-sectional study	Vegan lactating women	Lacto-ovo-vegetarian, Omnivore Diet	No significant differences in vitamin B12 milk concentration among groups. Positive correlation between Vit B12 supplementation and milk vitamin B12 concentration (standardized β: 0.263). No correlation between B-complex supplement intake and milk vitamin B12 concentration. Higher vitamin B12 supplement usage among vegans compared to lacto-ovo-vegetarians and lacto-ovo-vegetarians to omnivores (46.2 %, 27.3 %, 3.9 %). Vitamin B12 supplement usage ranged from 4 to 5000 µg/d.	⊕◯◯◯ VERY LOW[2]

AA, arachidonic acid; AHA, American Heart Association; ALA, alpha linolenic acid; DHA, docosahexaenoic acid; EPA, eicosapentaenoic acid; FA, fatty acids; LA, linolenic acid; RCT, randomized controlled trial

[1] As reported in the systematic reviews.

[2] Very low certainty of evidence due to small number of studies, small sample sizes, study design, high risk of bias, and/or confounding

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Table e11: Characteristics of the included systematic reviews with meta-analyses on vegan diet with regard to health outcomes in general populations (modified according to (1))

Outcome (unit)	Reference	No. of primary studies	Study type of primary studies	Comparison	No. of participants / No. of cases	Summary effect (95% CI)	I^2	Certainty of evidence[1]
Binary outcomes								
All-cause mortality	Dinu 2017 (355)	2	Prospective cohort studies	Omnivore diet	6,301 / 265	RR: 0.87 (0.75, 1.01)	0%	⊕⊕◯◯ LOW
Cancer incidence	Dinu 2017 (355)	2	Prospective cohort studies	Omnivore diet	7,168 / 295	RR: 0.84 (0.75, 0.95)	0%	⊕⊕◯◯ LOW
Cardiovascular disease incidence	Dybvik 2023 (356)	3	Prospective cohort studies	Omnivore diet	197,668 / 8,052	RR: 0.92 (0.79, 1.06)	0%	⊕⊕◯◯ LOW
Ischemic heart disease incidence	Dybvik 2023 (356)	3	Prospective cohort studies	Omnivore diet	197,668 / 5,456	RR: 0.82 (0.68, 1.00)	0%	⊕◯◯◯ VERY LOW
Stroke incidence	Dybvik 2023 (356)	2	Prospective cohort studies	Omnivore diet	109,938 / ≥39	RR: 1.17 (0.69, 1.99)	28%	⊕◯◯◯ VERY LOW
Diabetes prevalence	Lee 2017 (357)	4	Cross-sectional studies	Omnivore diet	15,665 / na	OR: 0.79 (0.51, 1.22)	85%	⊕◯◯◯ VERY LOW
Fracture incidence	Iguacel 2019 (358)	3	Prospective cohort studies	Omnivore diet	40,863 / 1,350	RR: 1.46 (1.03, 2.07)	56%	⊕⊕◯◯ LOW
Anthropometric markers								
Weight loss (kg)	Huang 2016 (359)	8	RCTs	Omnivore diet; 55-60% of calories from carbohydrates, <30% fat; high fat, high protein, low carbohydrate, <30%; NCEP diet; Calories from carbohydrates, protein, fat split 40/30/30; Diabetes Diet; habitual diet	836	MD: -2.52 (-3.06, -1.98)	3%	⊕⊕⊕◯ MODERATE
Weight (kg)	Li 2020 (360)	3	Cross-sectional studies	Lacto-vegetarian diet; omnivore diet	479	MD: -5.45 (-12.23, 1.33)	94%	⊕◯◯◯ VERY LOW

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Height (cm)	Li 2020 (360)	3	Cross-sectional studies	Lacto-vegetarian diet; omnivore diet	479	MD: -1.90 (-3.45, -0.34)	41%	⊕◯◯◯ VERY LOW
BMI (kg/m²)	Benatar 2018 (345)	27	Cross-sectional studies	Omnivore diet	175,897	MD: -1.99 (-2.73, -1.25)	98%	⊕◯◯◯ VERY LOW
Waist circumference (cm)	Benatar 2018 (345)	5	Cross-sectional studies	Omnivore diet	49,965	MD: -3.10 (-5.51, -0.69)	85%	⊕◯◯◯ VERY LOW
Cardiovascular markers								
Systolic blood pressure (mmHg) - all	Lopez 2019 (361)	11	RCT	Society-recommended diet; portion-controlled diet; non-supervised diet; Lacto-ovo-vegetarian diet	1,078	MD: -1.33 (-3.50; 0.84)	30%	⊕⊕◯◯ LOW
Diastolic blood pressure (mmHg) - all	Lopez 2019 (361)	11	RCT	Society-recommended diet; portion-controlled diet; non-supervised diet; Lacto-ovo-vegetarian diet	1,078	MD: -1.20 (-3.06; 0.65)	54%	⊕⊕◯◯ LOW
Systolic blood pressure (mmHg) – healthy	Lopez 2019 (361)	2	RCT	Society-recommended diet; portion-controlled diet	63	MD: -2.09 (-8.53, 4.35)	0%	⊕◯◯◯ VERY LOW
Diastolic blood pressure (mmHg) - healthy	Lopez 2019 (361)	2	RCT	Society-recommended diet; portion-controlled diet	63	MD: -2.87 (-7.87, 2.13)	0%	⊕◯◯◯ VERY LOW
Systolic blood pressure (mmHg)	Picasso 2019 (362)	3	Cross-sectional studies	Omnivore diet	132	MD: -2.19 (-10.77, 6.39)	76%	⊕◯◯◯ VERY LOW
Diastolic blood pressure (mmHg)	Picasso 2019 (362)	3	Cross-sectional studies	Omnivore diet	132	MD: -2.00 (-7.22, 3.22)	75%	⊕◯◯◯ VERY LOW
Triglycerides (mmol/L)	Yokoyama 2017 (363)	9	RCTs	Omnivore diet, ADA diet	690	MD: 0.03 (-0.07, 0.13)	22%	⊕⊕◯◯ LOW
Triglycerides (mmol/L)	Benatar 2018 (345)	19	Cross-sectional studies	Omnivore diet	51,043	MD: -0.20 (-0.32, -0.08)	91%	⊕◯◯◯ VERY LOW
Total cholesterol (mmol/L)	Yokoyama 2017 (363)	9	RCTs	Omnivore diet, ADA diet	690	MD: -0.42 (-0.61, -0.22)	59%	⊕◯◯◯ VERY LOW

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LDL cholesterol (mmol/L)	Yokoyama 2017 (363)	8	RCTs	Omnivore diet, ADA diet	679	MD: -0.48 (-0.75, -0.21)	87%	⊕◯◯◯ VERY LOW
LDL cholesterol (mmol/L)	Benatar 2018 (345)	22	Cross-sectional studies	Omnivore diet	53,032	MD: -0.51 (-0.65, -0.36)	91%	⊕◯◯◯ VERY LOW
HDL cholesterol (mmol/L)	Yokoyama 2017 (363)	9	RCTs	Omnivore diet, ADA diet	690	MD: -0.10 (-0.20, -0.00)	31%	⊕⊕◯◯ LOW
HDL cholesterol (mmol/L)	Picasso 2019 (362)	3	Cross-sectional studies	Omnivore diet	138	MD: -0.10 (-0.18, -0.02)	0%	⊕◯◯◯ VERY LOW
Apo B (µmol/L)	Chiavaroli 2018 (364)	7	RCTs	NCEP Step II diet	609	MD: -0.19 (-0.23, -0.15)	61%	⊕⊕◯◯ LOW
Fasting glucose (mmol/L)	Benatar 2018 (345)	10	Cross-sectional studies	Omnivore diet	50,823	MD: -0.25 (-0.39, -0.11)	61%	⊕◯◯◯ VERY LOW[1]
HOMA-IR	Benatar 2018 (345)	3	Cross-sectional studies	Omnivore diet	153	MD: -0.04 (-0.36, 0.28)	0%	⊕◯◯◯ VERY LOW
10-year CHD risk (Framingham score)	Chiavaroli 2018 (364)	5	RCTs	NCEP Step II diet	537	MD: -1.34 (-2.19, -0.49)	54%	⊕◯◯◯ VERY LOW
Bone mass measurements								
BMD lumbar spine (g/cm^2)	Iguacel 2019 (358)	6	Cross-sectional studies	Omnivore diet	630	MD: -0.07 (-0.12, -0.03)	69%	⊕◯◯◯ VERY LOW
BMD femoral neck (g/cm^2)	Iguacel 2019 (358)	5	Cross-sectional studies	Omnivore diet	600	MD: -0.06 (-0.09, -0.02)	73%	⊕◯◯◯ VERY LOW
BMD whole body (g/cm^2)	Iguacel 2019 (358)	3	Cross-sectional studies	Omnivore diet	301	MD: -0.05 (-0.10, -0.00)	68%	⊕◯◯◯ VERY LOW

ADA, American Diabetes Association; BMD, bone mass density; BMI, body mass index; CHD, coronary heart disease; HDL, high-density lipoprotein; LDL, low-density lipoprotein; MD, mean difference; NCEP, National Cholesterol Education Program; OR, odds ratio; RCT, randomized controlled trial; RR, relative risk; SMD, standardized mean difference

[1] Certainty of evidence was evaluated by the GRADE approach

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Table e12: Characteristics of the included systematic reviews on vegan diet with regard to health outcomes in general populations

Outcome	Reference	No. of primary studies	Study type of primary studies	Comparison	Results[1]	Certainty of evidence
Chronic diseases						
Prostate Cancer incidence	Gupta 2022 (105)	2	Prospective cohort studies	Omnivore diet	Adventist-Health Study-2: RR: 0.65 (95% CI: 0.49, 0.85) EPIC-Oxford and Oxford Vegetarian studies: RR: 0.62 (95% CI: 0.31, 1.22) for vegans compared to meat eaters	⊕◯◯◯ VERY LOW[2]
Colorectal Cancer	Zhao 2022 (365)	1	Prospective cohort study	Omnivore diet	Adventist Health Study-2: HR: 0.84 (95% CI: 0.59, 1.19)	⊕◯◯◯ VERY LOW[2]
Diabetes incidence	Pollakova 2021 (366)	2	Prospective cohort studies	Omnivore diet (regular meat eaters)	Adventist Health Study-2: vegan diet was inversely associated with the development of T2D in both non-Black (OR: 0.43, 95% CI: 0.25, 0.74) and Black participants (OR: 0.38, 95% CI: 0.24, 0.62) EPIC-Oxford study: HR: 0.53 (95% CI 0.36, 0.79)	⊕◯◯◯ VERY LOW[2]
Metabolic syndrome incidence	Turner-McGrievy 2014 (367)	1	Retrospective cohort study	Omnivore and vegetarian diet	Vegetarians and omnivores had a lower risk of metabolic syndrome than vegans	⊕◯◯◯ VERY LOW[2]
Eating disorders						
Disordered eating	McLean 2022 (368)	13	Cross-sectional studies	Omnivore diet	Most studies (8 of 13) reported no association between veganism and disordered eating Six studies reported lower disordered eating in the vegan sample Two studies reported greater disordered eating in the vegan sample	⊕◯◯◯ VERY LOW[2]
Orthorexia nervosa	McLean 2022 (368)	12	Cross-sectional studies	Omnivore diet	Nine of 12 studies reported a positive association between veganism and orthorexia nervosa pathology. One study reported an inverse association with orthorexia nervosa pathology while two studies reported no association between veganism and orthorexia nervosa pathology.	⊕◯◯◯ VERY LOW[2]
Anthropometry						
Lean mass	Chan 2021 (369)	2	RCT	Control (National Cholesterol Education Program guidelines)	Change in lean mass (-0.8 kg) compared to control (-0.2 kg)	⊕◯◯◯ VERY LOW[2]

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			Cross-sectional study	Omnivore	Women: 43.2 kg (95% CI 42.5, 43.8) compared to omnivores: 44.8 kg (95% CI 44.8, 44.9) Men: 60.6 kg (95% CI 59.5, 61.8) compared to omnivores: 64.1 kg (95% CI 64.0, 64.1)	⊕◯◯◯ VERY LOW[2]
Grip strength	Chan 2021 (369)	1	Cross-sectional study	Omnivore	Women 24.5 kg (95% CI 23.7, 25.3) compared to omnivores: 25.3 kg (95% CI 25.3, 25.3) Men 40.3 kg (95% CI 39.0, 41.7) compared to omnivores: 42.2 kg (95% CI 41.2, 42.2)	⊕◯◯◯ VERY LOW[2]
Oral health						
Oral hygiene	Azzola 2023 (370)	2	Cross-sectional study, RCT with fluoride supplementation	Omnivore diet	Subjects on a vegan diet compared to an omnivore diet had good oral health conditions. Plaque index: SMD 0.00 (-0.39, 0.39) Gingival index: SMD 0.26 (-0.93, 0.91)	⊕◯◯◯ VERY LOW[2]
		1	Cross-sectional study	Omnivore diet	Bleeding on probing (%): SMD -0.45 (-0.81, -0.08)	⊕◯◯◯ VERY LOW[2]
Periodontal health	Azzola 2023 (370)	1	Cross-sectional study	Omnivore diet	Subjects on a vegan diet compared to an omnivore diet had good oral health conditions. Probing depth: SMD -0.37 (-0.74, -0.01) Recession SMD 0.04 (-0.33, 0.40) Attachment loss SMD 0.00 (-0.36, 0.36) Tooth mobility SMD -0.14 (-0.50, 0.22)	⊕◯◯◯ VERY LOW[2]
Dental status	Azzola 2023 (370)	1	Cross-sectional study	Omnivore diet	Decayed missing filled teeth index: SMD -0.15 (-0.51, 0.21) Decayed missing filled surfaces index: SMD -0.00 (-0.37, 0.36)	⊕◯◯◯ VERY LOW[2]
		1	RCT with fluoride supplementation	Omnivore diet	Decayed missing filled teeth index: SMD 1.40 (0.97, 1.84)	⊕◯◯◯ VERY LOW[2]

CI, confidence interval; EPIC, European prospective investigation into cancer and nutrition; HR, hazard ratio; OR, odds ratio; RCT, randomized controlled trial; RR, relative risk; SMD, standardised mean difference; T2D, type 2 diabetes mellitus

[1] As reported in the systematic reviews.

[2] Very low certainty of evidence due to small number of studies, small sample sizes, study design, high risk of bias, and/or confounding.

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Table e13: Characteristics of the included systematic reviews on vegan diet with regard to health outcomes in vulnerable groups

Outcome	Reference	No. of primary studies	Study type of primary studies	Population	Comparison	Results[1]	Certainty of evidence
Multiple health outcomes in children of vegan mothers							
Preeclampsia	Baroni 2021 (354)	1	Retrospective study	Vegan mothers (in a vegan community)	None	Incidence: 0.13% incidence (study published in 1987)	⊕◯◯◯ VERY LOW[2]
Preterm delivery	Baroni 2021 (354)	1	Cross-sectional study	Pregnant woman	Vegetarian, Omnivore Diet	There was no clear difference between diet groups in terms of prematurely or post-term births. Among children born to vegan mothers 6.4% were born prematurely and 12.8% were born post-term. For children born to vegetarian and omnivore mothers the percentage of those born prematurely was 11.6% and 10.3%, respectively. 10.6% and 9.1%, respectively, were born post-term.	⊕◯◯◯ VERY LOW[2]
Physical development of vegan children							
Growth	Koller 2023 (352)	3	Cross-sectional study	Children and adolescents	Omnivore Diet	Length after 12 months, weight 6 and 12 months, fat mass index, suprailiac skinfold, triceps skinfold, tight girth, as well as hip girth were lower among vegans, Birth length, length after 6 months, weight for height, weight for age, lean mass index, biceps skinfold thickness, subscapular skinfold thickness, waist girth, head circumference after 6 months, after 12 months showed no differences.	⊕◯◯◯ VERY LOW[2]
Health outcomes in vegan children							
Total body less head bone mineral content	Koller 2023 (352)	1	Cross-sectional study	Children	Omnivore Diet	Lower in vegans: –3.7 (95% CI: –7.0, –0.4)%	⊕◯◯◯ VERY LOW[2]
Glycemic markers, insulin	Koller 2023 (352)	1	RCT	Obese children with elevated cholesterol	AHA diet or Mediterranean diet	Decrease of fasting glucose in all groups, no reduction in insulin levels.	⊕◯◯◯ VERY LOW[2]

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		1	Cross-sectional study	Children and adolescents	Omnivore Diet	No difference in blood glucose, insulin, higher HOMA levels in vegans	⊕◯◯◯ VERY LOW[2]
Blood pressure	Koller 2023 (352)	1	RCT	Obese children with elevated cholesterol	AHA diet or Mediterranean diet	In all three groups decrease in systolic and diastolic blood pressure	⊕◯◯◯ VERY LOW[2]
HDL cholesterol	Koller 2023 (352)	1	RCT	Obese children with elevated cholesterol	AHA diet or Mediterranean diet	No reduction.	⊕◯◯◯ VERY LOW[2]
Anthropometric parameters	Koller 2023 (352)	1	RCT	Obese children with elevated cholesterol	AHA diet or Mediterranean diet	In all three groups decrease in waist circumference, no reduction in BMI.	⊕◯◯◯ VERY LOW[2]

AHA, American Heart Association; BMI, body mass index; HDL, high-density lipoprotein; HOMA, Homeostasis Model Assessment; RCT, randomized controlled trial

[1] As reported in the systematic reviews.

[2] Very low certainty of evidence due to small number of studies, small sample sizes, study design, high risk of bias, and/or confounding.

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Table e14: Characteristics of the included primary studies on vegan diet with regard to nutritional status, dietary intake and health outcomes in vulnerable groups

Outcome	Reference	Study design, country	Total population (n vegans)	Comparison	Age (y)	Results[1]	Certainty of evidence
Pregnancy							
Status of Vitamin B12, Folic acid, Iron	Avnon 2020 (371)	Prospective observational study, Israel	273 (n = 60)	LOV (n = 64) PC (n = 37) OM (n = 112)	≥ 18	No differences in vitamin B12, folic acid, and ferritin levels or prevalence of deficiencies based on blood measurements between the diet groups. Umbilical B12 was lower in pregnant vegan women who did not take any vitamin supplementation than in vegan women taking multivitamins (442.57 ± 151.30 pg/ml vs. 1002.63 ± 608.56 pg/ml).	⊕◯◯◯ VERY LOW[2]
Gestational weight gain	Avnon 2021 (372)	Prospective observational study, Israel	273 (n = 60)	LOV (n = 64) PC (n = 37) OM (n = 112)	≥ 18	Vegans had lower pre-gestational BMI in comparison to other diet groups and lower mean gestational weight gain compared to OM (11.6 ± 4.2 kg vs. 14.3 ± 4.6 kg, 95% CI: 1.13, 4.10), but not to PC or LOV.	⊕◯◯◯ VERY LOW[2]
	Kesary 2020 (373)	Retrospective web-based study, Israel	1,419 (n = 234)	VG (n = 133) OM (n = 1,052)	Mean maternal age: 31.8	Vegan diet was associated with lower mean absolute maternal weight gain (12.2 ± 5.7 kg vs. 13.8 ± 5.8 kg in OM) and lower proportion of excessive weight gain (OR: 0.61; 95% CI: 0.44, 0.86).	
Gestational diabetes mellitus	Avnon 2021 (372)	Prospective observational study, Israel	273 (n = 60)	LOV (n = 64) PC (n = 37) OM (n = 112)	≥ 18	No difference between diet groups: Vegans: 8.3% LOV: 7.8% PC: 16.2% OM: 8.9%	⊕◯◯◯ VERY LOW[2]
	Kesary 2020 (373)	Retrospective web-based study, Israel	1,419 (n = 234)	VG (n = 133) OM (n = 1,052)	Mean maternal age: 31.8	Vegan diet tended to be inversely associated with gestational diabetes (OR: 0.54; 95% CI: 0.28, 1.03) compared to OM, which was further attenuated by adjustment for pre-pregnancy BMI.	
Hypertensive complications	Avnon 2021 (372)	Prospective observational study, Israel	273 (n = 60)	LOV (n = 64) PC (n = 37) OM (n = 112)	≥ 18	No difference between diet groups: Vegans: 3.3% LOV: 3.1% PC: 2.7% OM: 1.8%	⊕◯◯◯ VERY LOW[2]

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Small for gestational age, large for gestational age	Avnon 2021 (372)	Prospective observational study, Israel	273 (n = 60)	LOV (n = 64) PC (n = 37) OM (n = 112)	≥ 18	Highest incidence of small for gestational age in vegans (11.7%, RR: 5.93; 95 % CI: 1.20, 21.83), mainly compared to OM, no difference compared to LOV or PC.	⊕◯◯◯ VERY LOW[2]
	Kesary 2020 (373)	Retrospective web-based study, Israel	1,419 (n = 234)	VG (n = 133) OM (n = 1,052)	Mean maternal age: 31.8	Higher risk of small for gestational age in vegans (OR: 1.74; 95% CI: 1.05, 2.86) compared to OM, association somewhat attenuated when further adjusted for BMI of the mother (OR: 1.59; 95% CI: 0.95, 2.65), no difference in large for gestational age between diet groups.	
Preterm Birth	Avnon 2021 (372)	Prospective observational study, Israel	273 (n = 60)	LOV (n = 64) PC (n = 37) OM (n = 112)	≥ 18	Incidence was similar in all groups: Vegans: 5.0% LOV: 4.7% PC: 5.4% OM: 3.6%	⊕◯◯◯ VERY LOW[2]
	Kesary 2020 (373)	Retrospective web-based study, Israel	1,419 (n = 234)	VG (n = 133) OM (n = 1,052)	Mean maternal age: 31.8	No difference between diet groups. Vegans: 2.6% LOV: 3.8% OM: 4.4%	⊕◯◯◯ VERY LOW[2]
Lactating women							
Mineral and contaminant concentrations in breast milk	Perrin 2022 (374)	Cross-sectional study, USA	63 (n = 23)	VG (n = 19) OM (n = 21)	18–46	Higher concentrations of selenium in breast milk from vegans (19 µg/l) and VG (21 µg/l) compared to OM (17 µg/l). No differences in concentrations of calcium, copper, iron, iodine, potassium, magnesium, manganese, sodium, phosphorus, lead, and zinc.	⊕◯◯◯ VERY LOW[2]
Iodine in breast milk	Pawlak 2023 (375)	Cross-sectional study, USA	30 (n = 12)	VG (n = 6) OM (n = 12)	18–46	Lower mean (range) breast milk iodine concentration in vegans (65 µg/l (32–194 µg/l)) compared to VG (116 µg/l (62–189 µg/l)) and OM (276 µg/l (62–1,719 µg/l)). No differences in median iodine concentrations. No difference in incidence of inadequate breast milk iodine concentrations by maternal diet (75% vegan, 67% VG, and 58% OM).	⊕◯◯◯ VERY LOW[2]
Human Milk Oligosaccharide (HMO) composition	Neville 2022 (376)	Cross-sectional study, USA	74 (n = 26)	VG (n = 22) OM (n = 26)	18–46	No difference in individual HMO composition, total HMO-bound fructose and HMO-bound sialic acid or diversity and evenness scores.	⊕◯◯◯ VERY LOW[2]
Elderly people							

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Anthropometric parameters	Baleato 2022 (377)	Cross-sectional study, Australia	9,102 women (n = 8)	LOV (n = 48) SV (n = 45) PC (n = 74) OM (n = 8,927)	62–67	Vegans (and LOV, SV, PC) were less likely to be overweight or obese compared to OM: mean BMI for vegans (24.1 ± 3.1) vs OM (27.8 ± 5.7). Vegan group had a lower mean weight compared to LOV, SV and OM (63.7 ± 9.7 kg vs. 66.4 ± 15.3 vs. 71.0 ± 13.4 kg vs. 73.8 ± 15.6 kg). Vegan group had a smaller mean waist circumference (79.9 ± 12.6 cm) compared to LOV (87.3 ± 13.7 cm), PC (83.0 ± 11.8), SV (89.0 ± 13.2 cm) and OM (91.4 ± 13.7 cm).	⊕◯◯◯ VERY LOW[2]
Impaired glucose tolerance, diabetes mellitus	Baleato 2022 (377)	Cross-sectional study, Australia	9,102 women (n = 8)	LOV (n = 48) SV (n = 45) PC (n = 74) OM (n = 8,927)	62–67	Vegans (and LOV, SV, PC) had lower rates of diagnosis and treatment for impaired glucose tolerance compared to OM. No respondent diagnosed with diabetes in the vegan group.	⊕◯◯◯ VERY LOW[2]
Intake of medications	DosSantos 2021 (378)	Cross-sectional study, USA	328 men and women (n = 35)	LOV (n = 71) PC (n = 35) OM (n = 187)	≥ 60	Vegans had a reduced number of medications compared to OM (IRR: 0.42; 95% CI: 0.25, 0.70).	⊕◯◯◯ VERY LOW[2]

AI, adequate intake; BMI, body mass index; CI, confidence interval; HMO, human milk oligosaccharide; IRR, incidence rate ratio; LOV, lacto-ovo-vegetarian; RR, risk ratio; SV, semi-vegetarian; VG, vegetarian; PC, pescetarian; OM, omnivore; y, years

[1] As reported in the systematic reviews.

[2] Very low certainty of evidence due to small sample sizes, study design, high risk of bias, and/or confounding

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Table e15: Assessment of the certainty of evidence for newly identified meta-analyses in the umbrella-review on vegan diet using GRADEpro (379)

Certainty assessment							№ of patients	Effect estimate (95% CI)	Certainty
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Cardiovascular disease incidence									
3	prospective cohort studies	not serious	not serious	not serious	not serious	none	197,668	**RR 0.92** (0.79 to 1.06)	⊕⊕◯◯ LOW
Ischemic heart disease incidence									
3	prospective cohort studies	not serious	not serious	not serious	serious[a]	none	197,668	**RR 0.82** (0.68 to 1.00)	⊕◯◯◯ VERY LOW
Stroke incidence									
2	prospective cohort studies	not serious	serious[b]	not serious	serious[a]	none	109,938	**RR 1.17** (0.69 to 1.99)	⊕◯◯◯ VERY LOW
Calcium intake (compared to omnivores)									
21	cross-sectional studies	serious[c]	serious[d]	not serious	not serious	none	64,804	**SMD 0.70 lower** (0.85 lower to 0.55 lower)	⊕◯◯◯ VERY LOW
Calcium intake (compared to vegetarian diet)									
12	cross-sectional studies	serious[c]	serious[d]	not serious	not serious	none	36,324	**SMD 0.57 lower** (0.83 lower to 0.32 lower)	⊕◯◯◯ VERY LOW
Iodine (µg/day)									
6	cross-sectional studies	not serious	serious[d]	not serious	not serious	none	1,995	**MD 62.3 µg/d lower** (93.88 lower to 30.73 lower)	⊕◯◯◯ VERY LOW

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Certainty assessment							№ of patients	Effect estimate (95% CI)	Certainty
№ of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations			
Iodine, urine (µg/L)									
4	cross-sectional studies	not serious	serious[e]	not serious	serious[f]	none	333	**MD 46.52 µg/d lower** (94.08 lower to 1.04 lower)	⊕◯◯◯ VERY LOW

CI, Confidence interval; MD, mean difference; RR, risk ratio; SMD, standardised mean difference
Explanations:

a. Downgraded by one level for imprecision since effect estimate overlaps null effect and 95% CI includes important benefit/harm (SRR <0.75 and/or >1.25).
b. Downgraded by one level for inconsistency since effect estimates point in opposite directions.
c. Downgraded by one level for risk of bias since study quality has not been assessed and due to insufficient adjustments.
d. Downgraded by one level for inconsistency since some 95% CI did not fully overlap between studies.
e. Downgraded by one level for inconsistency since effect estimates point in opposite directions and some 95% CIs did not fully overlap between studies.
f. Downgraded by one level for imprecision due to small sample size (<400).

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References

1. Selinger E, Neuenschwander M, Koller A, et al.: Evidence of a vegan diet for health benefits and risks – an umbrella review of meta-analyses of observational and clinical studies. Critical Reviews in Food Science and Nutrition 2022: 1-11.
2. Iodine. Drugs and Lactation Database (LactMed®). Bethesda (MD): National Institute of Child Health and Human Development 2006.
3. Bisen A, Jha RK, Bankar N: Vegan Diet and Mutliple Health Outcomes: A Review and Meta-analysis. JOURNAL OF PHARMACEUTICAL RESEARCH INTERNATIONAL 2021; 33.
4. Biver E, Herrou J, Larid G, et al.: Dietary recommendations in the prevention and treatment of osteoporosis. Joint Bone Spine 2022; 90: 105521.
5. Cecchini AL, Biscetti F, Rando MM, et al.: Dietary Risk Factors and Eating Behaviors in Peripheral Arterial Disease (PAD). Int J Mol Sci 2022; 23.
6. Chen K, Liu Y: [Vegetarian diets and cardiovascular health: evidence-based and pondering]. Zhongguo Zhong Xi Yi Jie He Za Zhi 2014; 34: 653-5.
7. Dagnelie PC: [Nutrition and health--potential health benefits and risks of vegetarianism and limited consumption of meat in the Netherlands]. Ned Tijdschr Geneeskd 2003; 147: 1308-13.
8. Del Re A, Aspry K: Update on Plant-Based Diets and Cardiometabolic Risk. Curr Atheroscler Rep 2022; 24: 173-83.
9. Fleming JA, Kris-Etherton PM: The evidence for α-linolenic acid and cardiovascular disease benefits: Comparisons with eicosapentaenoic acid and docosahexaenoic acid. Adv Nutr 2014; 5: 863s-76s.
10. Ginter E: Vegetarian diets, chronic diseases and longevity. Bratisl Lek Listy 2008; 109: 463-6.
11. Handu D, Piemonte T: Dietary Approaches and Health Outcomes: An Evidence Analysis Center Scoping Review. J Acad Nutr Diet 2022; 122: 1375-93.e9.
12. Kalmpourtzidou A, Scazzina F: Changes in terms of risks/benefits of shifting diets towards healthier and more sustainable dietary models. EFSA J 2022; 20: e200904.
13. Key TJ, Fraser GE, Thorogood M, et al.: Mortality in vegetarians and nonvegetarians: detailed findings from a collaborative analysis of 5 prospective studies. Am J Clin Nutr 1999; 70: 516s-24s.
14. Kim H, Yu B, Li X, et al.: Serum metabolomic signatures of plant-based diets and incident chronic kidney disease. AMERICAN JOURNAL OF CLINICAL NUTRITION 2022; 116: 151-64.
15. McEvoy CT, Temple N, Woodside JV: Vegetarian diets, low-meat diets and health: a review. Public Health Nutr 2012; 15: 2287-94.
16. Modlinska K, Adamczyk D, Maison D, Pisula W: Gender Differences in Attitudes to Vegans/Vegetarians and Their Food Preferences, and Their Implications for Promoting Sustainable Dietary Patterns-A Systematic Review. Sustainability 2020; 12.
17. Molina-Montes E, Salamanca-Fernández E, Garcia-Villanova B, Sánchez MJ: The Impact of Plant-Based Dietary Patterns on Cancer-Related Outcomes: A Rapid Review and Meta-Analysis. Nutrients 2020; 12: 2010.
18. Mulpuri L, Sridhar J, Goyal H, Tonk R: The relationship between dietary patterns and ophthalmic disease. Curr Opin Ophthalmol 2023.
19. Ocklenburg S, Borawski J: Vegetarian diet and depression scores: A meta-analysis. J Affect Disord 2021; 294: 813-5.
20. Piccoli GB, Vigotti FN, Leone F, et al.: Low-protein diets in CKD: how can we achieve them? A narrative, pragmatic review. Clin Kidney J 2015; 8: 61-70.
21. Prasad P, Anjali P, Sreedhar RV: Plant-based stearidonic acid as sustainable source of omega-3 fatty acid with functional outcomes on human health. Crit Rev Food Sci Nutr 2021; 61: 1725-37.
22. Ros E: Can specific nutrients, foods, or dietary patterns modulate cognitive function in (older) adults? Latest evidence from randomized controlled trials. Curr Opin Clin Nutr Metab Care 2021; 24: 511-20.
23. Sabate J, Wien M: Vegetarian diets and childhood obesity prevention. AMERICAN JOURNAL OF CLINICAL NUTRITION 2010; 91: 1525S-9S.
24. Sanchez-Sabate R, Badilla-Briones Y, Sabate J: Understanding Attitudes towards Reducing Meat Consumption for Environmental Reasons. A Qualitative Synthesis Review. Sustainability 2019; 11.
25. Sanders TA: Plant compared with marine n-3 fatty acid effects on cardiovascular risk factors and outcomes: what is the verdict? Am J Clin Nutr 2014; 100 Suppl 1: 453s-8s.
26. Van Horn L, McCoin M, Kris-Etherton PM, et al.: The evidence for dietary prevention and treatment of cardiovascular disease. J Am Diet Assoc 2008; 108: 287-331.
27. Weigl J, Hauner H, Hauner D: Can Nutrition Lower the Risk of Recurrence in Breast Cancer? Breast Care (Basel) 2018; 13: 86-91.
28. Wilson N, Cleghorn CL, Cobiac LJ, Mizdrak A, Nghiem N: Achieving Healthy and Sustainable Diets: A Review of the Results of Recent Mathematical Optimization Studies. Adv Nutr 2019; 10: S389-s403.
29. Carey CN, Paquette M, Sahye-Pudaruth S, et al.: The Environmental Sustainability of Plant-Based Dietary Patterns: A Scoping Review. J Nutr 2023.

eSupplement to the article:
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30. Abdelhamid AS, Brown TJ, Brainard JS, et al.: Omega-3 fatty acids for the primary and secondary prevention of cardiovascular disease. Cochrane Database Syst Rev 2020; 3: Cd003177.
31. Askari M, Daneshzad E, Darooghegi Mofrad M, Bellissimo N, Suitor K, Azadbakht L: Vegetarian diet and the risk of depression, anxiety, and stress symptoms: a systematic review and meta-analysis of observational studies. Crit Rev Food Sci Nutr 2022; 62: 261-71.
32. Ata F, Bilal ABI, Javed S, et al.: Optic neuropathy as a presenting feature of vitamin B-12 deficiency: A systematic review of literature and a case report. ANNALS OF MEDICINE AND SURGERY 2020; 60: 316-22.
33. Baguley BJ, Skinner TL, Wright ORL: Nutrition therapy for the management of cancer-related fatigue and quality of life: a systematic review and meta-analysis. Br J Nutr 2019; 122: 527-41.
34. Barghouthy Y, Corrales M, Somani B: The Relationship between Modern Fad Diets and Kidney Stone Disease: A Systematic Review of Literature. Nutrients 2021; 13: 4270.
35. Bella F, Godos J, Ippolito A, Di Prima A, Sciacca S: Differences in the association between empirically derived dietary patterns and cancer: a meta-analysis. Int J Food Sci Nutr 2017; 68: 402-10.
36. Bu Y, Qu J, Ji S, et al.: Dietary patterns and breast cancer risk, prognosis, and quality of life: A systematic review. Front Nutr 2022; 9: 1057057.
37. Chareonrungrueangchai K, Wongkawinwoot K, Anothaisintawee T, Reutrakul S: Dietary Factors and Risks of Cardiovascular Diseases: An Umbrella Review. Nutrients 2020; 12: 1088.
38. Charkviani M, Thongprayoon C, Tangpanithandee S, et al.: Effects of Mediterranean Diet, DASH Diet, and Plant-Based Diet on Outcomes among End Stage Kidney Disease Patients: A Systematic Review and Meta-Analysis. Clin Pract 2022; 13: 41-51.
39. Chen X, Maguire B, Brodaty H, O'Leary F: Dietary Patterns and Cognitive Health in Older Adults: A Systematic Review. J Alzheimers Dis 2019; 67: 583-619.
40. Cirone C, Cirone KD, Malvankar-Mehta MS: Linkage between a plant-based diet and age-related eye diseases: a systematic review and meta-analysis. Nutr Rev 2022.
41. Clark M, Tilman D: Comparative analysis of environmental impacts of agricultural production systems, agricultural input efficiency, and food choice. ENVIRONMENTAL RESEARCH LETTERS 2017; 12.
42. Craddock JC, Probst YC, Peoples GE: Vegetarian and Omnivorous Nutrition - Comparing Physical Performance. Int J Sport Nutr Exerc Metab 2016; 26: 212-20.
43. Daien C, Czernichow S, Letarouilly JG, et al.: Dietary recommendations of the French Society for Rheumatology for patients with chronic inflammatory rheumatic diseases. Joint Bone Spine 2022; 89: 105319.
44. Dos Santos EB, da Costa Maynard D, Zandonadi RP, Raposo A, Botelho RBA: Sustainability Recommendations and Practices in School Feeding: A Systematic Review. Foods 2022; 11.
45. Eichelmann F, Schwingshackl L, Fedirko V, Aleksandrova K: Effect of plant-based diets on obesity-related inflammatory profiles: a systematic review and meta-analysis of intervention trials. Obes Rev 2016; 17: 1067-79.
46. Fang A, Li K, Shi H, He J, Li H: Calcium requirements for Chinese adults by cross-sectional statistical analyses of calcium balance studies: an individual participant data and aggregate data meta-regression. Chin Med J (Engl) 2014; 127: 4250-7.
47. Fang AP, Li KJ, Shi HY, He JJ, Li H: Habitual dietary calcium intakes and calcium metabolism in healthy adults Chinese: a systematic review and meta-analysis. Asia Pac J Clin Nutr 2016; 25: 776-84.
48. Foster M, Herulah UN, Prasad A, Petocz P, Samman S: Zinc Status of Vegetarians during Pregnancy: A Systematic Review of Observational Studies and Meta-Analysis of Zinc Intake. Nutrients 2015; 7: 4512-25.
49. Gan ZH, Cheong HC, Tu YK, Kuo PH: Association between Plant-Based Dietary Patterns and Risk of Cardiovascular Disease: A Systematic Review and Meta-Analysis of Prospective Cohort Studies. Nutrients 2021; 13: 3952.
50. Gao X, Zheng Q, Jiang X, Chen X, Liao Y, Pan Y: The effect of diet quality on the risk of developing gestational diabetes mellitus: A systematic review and meta-analysis. Front Public Health 2022; 10: 1062304.
51. Godos J, Bella F, Sciacca S, Galvano F, Grosso G: Vegetarianism and breast, colorectal and prostate cancer risk: an overview and meta-analysis of cohort studies. J Hum Nutr Diet 2017; 30: 349-59.
52. Godos J, Bella F, Torrisi A, Sciacca S, Galvano F, Grosso G: Dietary patterns and risk of colorectal adenoma: a systematic review and meta-analysis of observational studies. J Hum Nutr Diet 2016; 29: 757-67.
53. Guzek D, Gła Bska D, Groele B, Gutkowska K: Fruit and Vegetable Dietary Patterns and Mental Health in Women: A Systematic Review. Nutr Rev 2022; 80: 1357-70.
54. Haider LM, Schwingshackl L, Hoffmann G, Ekmekcioglu C: The effect of vegetarian diets on iron status in adults: A systematic review and meta-analysis. Crit Rev Food Sci Nutr 2018; 58: 1359-74.
55. Hardt L, Mahamat-Saleh Y, Aune D, Schlesinger S: Plant-Based Diets and Cancer Prognosis: a Review of Recent Research. Curr Nutr Rep 2022; 11: 695-716.
56. Huang C, Li M, Liu B, et al.: Relating Gut Microbiome and Its Modulating Factors to Immunotherapy in Solid Tumors: A Systematic Review. Front Oncol 2021; 11: 642110.
57. Huang T, Yang B, Zheng J, Li G, Wahlqvist ML, Li D: Cardiovascular disease mortality and cancer incidence in vegetarians: a meta-analysis and systematic review. Ann Nutr Metab 2012; 60: 233-40.

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58. Ibrahim MO, Abuhijleh H, Tayyem R: What Dietary Patterns and Nutrients are Associated with Pancreatic Cancer? Literature Review. Cancer Manag Res 2023; 15: 17-30.
59. Iervese CP, Albuquerque GS, Legal ANC, Almeida LMR: Effects of the vegetarian and plant-based diet on dyslipidemia, diabetes mellitus and cardiovascular risk in adults. RBONE-REVISTA BRASILEIRA DE OBESIDADE NUTRICAO E EMAGRECIMENTO 2022; 16: 646-60.
60. Jarvis SE, Nguyen M, Malik V: Association between adherence to plant-based dietary patterns and obesity risk: a systematic review of prospective cohort studies. Applied physiology, nutrition, and metabolism = Physiologie appliquee, nutrition et metabolisme 2022.
61. Jensen CF: Vitamin B12 levels in children and adolescents on plant-based diets: a systematic review and meta-analysis. Nutr Rev 2022.
62. Key TJ, Fraser GE, Thorogood M, et al.: Mortality in vegetarians and non-vegetarians: a collaborative analysis of 8300 deaths among 76,000 men and women in five prospective studies. Public Health Nutr 1998; 1: 33-41.
63. Kontogianni MD, Panagiotakos DB: Dietary patterns and stroke: a systematic review and re-meta-analysis. Maturitas 2014; 79: 41-7.
64. Kwok CS, Umar S, Myint PK, Mamas MA, Loke YK: Vegetarian diet, Seventh Day Adventists and risk of cardiovascular mortality: a systematic review and meta-analysis. Int J Cardiol 2014; 176: 680-6.
65. Lambert V, Muñoz SE, Gil C, Román MD: Maternal dietary components in the development of gestational diabetes mellitus: a systematic review of observational studies to timely promotion of health. Nutr J 2023; 22: 15.
66. Liang S, Mijatovic J, Li A, et al.: Dietary Patterns and Non-Communicable Disease Biomarkers: A Network Meta-Analysis and Nutritional Geometry Approach. Nutrients 2022; 15: 76.
67. Limketkai BN, Iheozor-Ejiofor Z, Gjuladin-Hellon T, et al.: Dietary interventions for induction and maintenance of remission in inflammatory bowel disease. Cochrane Database of Systematic Reviews 2019.
68. Liu Y, Zhu L, Li D, Wang L, Tang H, Zhang C: Stroke risk with vegetarian, low-animal and high-animal diets: A systematic review and meta-analysis. Asia Pac J Clin Nutr 2022; 31: 422-32.
69. Liu Z, Su G, Guo X, et al.: Dietary interventions for mineral and bone disorder in people with chronic kidney disease. Cochrane Database of Systematic Reviews 2015.
70. Long Y, Ye H, Yang J, et al.: Effects of a vegetarian diet combined with aerobic exercise on glycemic control, insulin resistance, and body composition: a systematic review and meta-analysis. Eat Weight Disord 2023; 28: 9.
71. Lopes T, Zemlin AE, Erasmus RT, Madlala SS, Faber M, Kengne AP: Assessment of the association between plant-based dietary exposures and cardiovascular disease risk profile in sub-Saharan Africa: a systematic review. BMC Public Health 2022; 22: 361.
72. Lu JW, Yu LH, Tu YK, et al.: Risk of Incident Stroke among Vegetarians Compared to Nonvegetarians: A Systematic Review and Meta-Analysis of Prospective Cohort Studies. Nutrients 2021; 13.
73. Ma RWL, Chapman K: A systematic review of the effect of diet in prostate cancer prevention and treatment. JOURNAL OF HUMAN NUTRITION AND DIETETICS 2009; 22: 187-202.
74. Madrigal-Matute J, Bañón-Escandell S: Colorectal Cancer and Microbiota Modulation for Clinical Use. A Systematic Review. Nutr Cancer 2023; 75: 123-39.
75. Moslehi N, Sakak FR, Teymoori F, Tehrani FR, Mirmiran P, Azizi F: The role of nutrition in the development and management of gestational diabetes among Iranian women: a systematic review and meta-analysis. J Diabetes Metab Disord 2022; 21: 951-70.
76. Muller H, de Toledo FW, Resch KL: Fasting followed by vegetarian diet in patients with rheumatoid arthritis: a systematic review. SCANDINAVIAN JOURNAL OF RHEUMATOLOGY 2001; 30: 1-10.
77. Myers VH, Champagne CM: Nutritional effects on blood pressure. Curr Opin Lipidol 2007; 18: 20-4.
78. Perumpail BJ, Cholankeril R, Yoo ER, Kim D, Ahmed A: An Overview of Dietary Interventions and Strategies to Optimize the Management of Non-Alcoholic Fatty Liver Disease. Diseases 2017; 5.
79. Piccoli G, Clari R, Vigotti F, et al.: Vegan-vegetarian diets in pregnancy: danger or panacea? A systematic narrative review. BJOG : an international journal of obstetrics and gynaecology 2015; 122: 623-33.
80. Qian F, Liu G, Hu FB, Bhupathiraju SN, Sun Q: Association Between Plant-Based Dietary Patterns and Risk of Type 2 Diabetes: A Systematic Review and Meta-analysis. JAMA Intern Med 2019; 179: 1335-44.
81. Rahmati M, Fatemi R, Yon DK, et al.: The effect of adherence to high-quality dietary pattern on COVID-19 outcomes: A systematic review and meta-analysis. J Med Virol 2023; 95: e28298.
82. Sanches Machado d'Almeida K, Ronchi Spillere S, Zuchinali P, Corrêa Souza G: Mediterranean Diet and Other Dietary Patterns in Primary Prevention of Heart Failure and Changes in Cardiac Function Markers: A Systematic Review. Nutrients 2018; 10: 58.
83. Siqueira C, Esteves LG, Duarte CK: Plant-based diet index score is not associated with body composition: A systematic review and meta-analysis. Nutr Res 2022; 104: 128-39.
84. Smits KPJ, Listl S, Jevdjevic M: Vegetarian diet and its possible influence on dental health: A systematic literature review. Community Dent Oral Epidemiol 2020; 48: 7-13.
85. Tan C, Zhao Y, Wang S: Is a vegetarian diet safe to follow during pregnancy? A systematic review and meta-analysis of observational studies. Crit Rev Food Sci Nutr 2019; 59: 2586-96.

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86. Toles M, Demark-Wahnefried W: Nutrition and the cancer survivor: evidence to guide oncology nursing practice. Semin Oncol Nurs 2008; 24: 171-9.
87. Tucci M, Marino M, Martini D, Porrini M, Riso P, Del Bo C: Plant-Based Foods and Vascular Function: A Systematic Review of Dietary Intervention Trials in Older Subjects and Hypothesized Mechanisms of Action. Nutrients 2022; 14: 2615.
88. Vandenplas Y, Castrellon PG, Rivas R, et al.: Safety of soya-based infant formulas in children. BRITISH JOURNAL OF NUTRITION 2014; 111: 1340-60.
89. Wang H, Li L, Qin LL, Song Y, Vidal-Alaball J, Liu TH: Oral vitamin B12 versus intramuscular vitamin B12 for vitamin B12 deficiency. Cochrane Database of Systematic Reviews 2018.
90. Wang XJ, Zhang WS, Jiang CQ, et al.: Low-carbohydrate diet score and the risk of stroke in older people: Guangzhou Biobank Cohort Study and meta-analysis of cohort studies. Nutrition 2023; 105: 111844.
91. Wong MMH, Louie JCY: A priori dietary patterns and cardiovascular disease incidence in adult population-based studies: a review of recent evidence. Crit Rev Food Sci Nutr 2022; 62: 6153-68.
92. Zhang Z, Ma G, Chen S, et al.: Comparison of plasma triacylglycerol levels in vegetarians and omnivores: a meta-analysis. Nutrition 2013; 29: 426-30.
93. Zhang Z, Wang J, Chen S, et al.: Comparison of vegetarian diets and omnivorous diets on plasma level of HDL-c: a meta-analysis. PLoS One 2014; 9: e92609.
94. Zyriax BC, Windler E: Lifestyle changes to prevent cardio- and cerebrovascular disease at midlife: A systematic review. Maturitas 2023; 167: 60-5.
95. Austin G, Ferguson JJA, Garg ML: Effects of Plant-Based Diets on Weight Status in Type 2 Diabetes: A Systematic Review and Meta-Analysis of Randomised Controlled Trials. Nutrients 2021; 13: 4099.
96. Chen P, Zhao Y, Chen Y: A vegan diet improves insulin resistance in individuals with obesity: a systematic review and meta-analysis. Diabetol Metab Syndr 2022; 14: 114.
97. Rees K, Al-Khudairy L, Takeda A, Stranges S: Vegan dietary pattern for the primary and secondary prevention of cardiovascular diseases. Cochrane Database Syst Rev 2021; 2: Cd013501.
98. Viguiliouk E, Kendall CW, Kahleová H, et al.: Effect of vegetarian dietary patterns on cardiometabolic risk factors in diabetes: A systematic review and meta-analysis of randomized controlled trials. Clin Nutr 2019; 38: 1133-45.
99. Gargallo Fernández M, Quiles Izquierdo J, Basulto Marset J, Breton Lesmes I, Formiguera Sala X, Salas-Salvadó J: Evidence-based nutritional recommendations for the prevention and treatment of overweight and obesity in adults (FESNAD-SEEDO consensus document). The role of diet in obesity prevention (II/III). Nutr Hosp 2012; 27: 800-32.
100. Azorin, II, Miguel-Berges ML, Gomez-Bruton A, Moreno LA, Almarcegui CJ: VEGANISM, VEGETARIANISM AND BONE MINERAL DENSITY: A SYSTEMATIC REVIEW AND META-ANALYSIS. ANNALS OF NUTRITION AND METABOLISM 2017; 71: 333-.
101. Azorin I, Huybrechts I, Moreno LA, Michels N: Vegetarianism and veganism versus mental health and cognitive outcomes. A systematic review and meta-analysis. ANNALS OF NUTRITION AND METABOLISM 2019; 75: 49-50.
102. Bakaloudi DR, Oikonomidou AC, Chourdakis M, et al.: Intake, adequacy and quality of the vegan diet in macro and micronutrients in the european population. A systematic review of the evidence. Clin Nutr ESPEN 2020; 40: 470-1.
103. Dinu M, Pagliai G, Casini A, Sofi F: Vegetarian, vegan diets and multiple health outcomes: a systematic review with meta-analysis of observational studies. EUROPEAN HEART JOURNAL 2016; 37: 549-.
104. Gibbs J, Gaskin E, Ji C, Miller M, Cappuccio F: The effect of plant-based diets on blood pressure: A systematic review and meta-analysis of controlled clinical trials. J Hypertens 2021; 39: e322-None.
105. Gupta N, Patel HD, Taylor J, et al.: Systematic review of the impact of a plant-based diet on prostate cancer incidence and outcomes. Prostate Cancer Prostatic Dis 2022; 25: 444-52.
106. Iguacel I, Moreno LA: MACROBIOTIC DIETS, PLANT-BASED DIETS, VEGETARIANISM, VEGANISM AND BONE HEALTH: A SYSTEMATIC REVIEW AND META-ANALYSES. OSTEOPOROSIS INTERNATIONAL 2020; 31: S44-S5.
107. Ng JY, Verma K, Gilotra K: CAM recommendations in type 2 diabetes clinical practice guidelines: A systematic review</p><p> (vol 48,102069, 2021). EUROPEAN JOURNAL OF INTEGRATIVE MEDICINE 2022; 50.
108. O'Mullan A: 70 Can a Wholefood Plant-based Diet Affect Healthy Ageing?...67th Annual & Scientific Meeting of the Irish Gerontological Society, Innovation, Advances and Excellence in Ageing, 26–28 September 2019, Cork, Ireland. Age & Ageing 2019; 48: 17-65.
109. Srinivasan S, Sundaram S, Olson S, et al.: FOODS OR FADS? OUTCOMES OF KETOGENIC, PLANT-BASED, AND INTERMITTENT FASTING DIETS: A SYSTEMATIC REVIEW AND META-ANALYSIS. Gastroenterology 2022; 162: S837-S8.
110. Webb A, Lane K: The effectiveness of a low-fat vegan diet for the prevention and management of type 2 diabetes: A systematic review. PROCEEDINGS OF THE NUTRITION SOCIETY 2020; 79: E408-E.

111. Wang YL, Hu Y, Zhu L, Sun Q: Associations Between Plant-Based Dietary Patterns and Risks of Type 2 Diabetes, Cardiovascular Disease, Cancer, and Mortality - A Systematic Review and Meta-Analysis. Circulation 2022; 146.
112. Aleksandrova K, Koelman L, Rodrigues CE: Dietary patterns and biomarkers of oxidative stress and inflammation: A systematic review of observational and intervention studies. Redox Biol 2021; 42: 101869.
113. Brain K, Burrows TL, Rollo ME, et al.: A systematic review and meta-analysis of nutrition interventions for chronic noncancer pain. JOURNAL OF HUMAN NUTRITION AND DIETETICS 2019; 32: 198-225.
114. Craddock JC, Neale EP, Peoples GE, Probst YC: Vegetarian-Based Dietary Patterns and their Relation with Inflammatory and Immune Biomarkers: A Systematic Review and Meta-Analysis. Adv Nutr 2019; 10: 433-51.
115. Craddock JC, Neale EP, Probst YC, Peoples GE: Algal supplementation of vegetarian eating patterns improves plasma and serum docosahexaenoic acid concentrations and omega-3 indices: a systematic literature review. J Hum Nutr Diet 2017; 30: 693-9.
116. Dobersek U, Teel K, Altmeyer S, Adkins J, Wy G, Peak J: Meat and mental health: A meta-analysis of meat consumption, depression, and anxiety. Crit Rev Food Sci Nutr 2021: 1-18.
117. Elma O, Yilmaz ST, Coppieters I, et al.: Do nutritional factors interact with chronic musculoskeletal pain? A systematic review. J Clin Med 2020; 9.
118. Fazelian S, Sadeghi E, Firouzi S, Haghighatdoost F: Adherence to the vegetarian diet may increase the risk of depression: a systematic review and meta-analysis of observational studies. Nutr Rev 2022; 80: 242-54.
119. Field R, Pourkazemi F, Turton J, Rooney K: Dietary Interventions Are Beneficial for Patients with Chronic Pain: A Systematic Review with Meta-Analysis. Pain Med 2021; 22: 694-714.
120. Hagen KB, Byfuglien MG, Falzon L, Olsen SU, Smedslund G: Dietary interventions for rheumatoid arthritis. Cochrane Database Syst Rev 2009: Cd006400.
121. Haghighatdoost F, Bellissimo N, Totosy de Zepetnek JO, Rouhani MH: Association of vegetarian diet with inflammatory biomarkers: a systematic review and meta-analysis of observational studies. Public Health Nutr 2017; 20: 2713-21.
122. Harirchian MH, Karimi E, Bitarafan S: Diet and disease-related outcomes in multiple sclerosis: A systematic review of clinical trials. CURRENT JOURNAL OF NEUROLOGY 2022; 21: 52-63.
123. Iguacel I, Huybrechts I, Moreno LA, Michels N: Vegetarianism and veganism compared with mental health and cognitive outcomes: a systematic review and meta-analysis. Nutr Rev 2021; 79: 361-81.
124. Jain R, Degremont A, Philippou E, Latunde-Dada GO: Association between vegetarian and vegan diets and depression: a systematic review. PROCEEDINGS OF THE NUTRITION SOCIETY 2020; 79: E28-E.
125. Koelman L, Egea Rodrigues C, Aleksandrova K: Effects of Dietary Patterns on Biomarkers of Inflammation and Immune Responses: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Adv Nutr 2022; 13: 101-15.
126. Lane K, Derbyshire E, Li W, Brennan C: Bioavailability and potential uses of vegetarian sources of omega-3 fatty acids: a review of the literature. Crit Rev Food Sci Nutr 2014; 54: 572-9.
127. Losno EA, Sieferle K, Perez-Cueto FJA, Ritz C: Vegan Diet and the Gut Microbiota Composition in Healthy Adults. Nutrients 2021; 13: 2402.
128. Lowry E, Marley J, McVeigh JG, McSorley E, Allsopp P, Kerr D: Dietary Interventions in the Management of Fibromyalgia: A Systematic Review and Best-Evidence Synthesis. Nutrients 2020; 12: 2664.
129. Maddox EK, Massoni SC, Hoffart CM, Takata Y: Dietary Effects on Pain Symptoms in Patients with Fibromyalgia Syndrome: Systematic Review and Future Directions. Nutrients 2023; 15: 716.
130. Menzel J, Jabakhanji A, Biemann R, Mai K, Abraham K, Weikert C: Systematic review and meta-analysis of the associations of vegan and vegetarian diets with inflammatory biomarkers. Sci Rep 2020; 10: 21736.
131. Nadal-Nicolas Y, Miralles-Amoros L, Martinez-Olcina M, Sanchez-Ortega M, Mora J, Martinez-Rodriguez A: Vegetarian and Vegan Diet in Fibromyalgia: A Systematic Review. INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH 2021; 18.
132. Parker HW, Vadiveloo MK: Diet quality of vegetarian diets compared with nonvegetarian diets: a systematic review. Nutr Rev 2019; 77: 144-60.
133. Schönenberger KA, Schüpfer AC, Gloy VL, et al.: Effect of Anti-Inflammatory Diets on Pain in Rheumatoid Arthritis: A Systematic Review and Meta-Analysis. Nutrients 2021; 13: 4221.
134. Smedslund G, Byfuglien MG, Olsen SU, Hagen KB: Effectiveness and safety of dietary interventions for rheumatoid arthritis: a systematic review of randomized controlled trials. J Am Diet Assoc 2010; 110: 727-35.
135. Trefflich I, Jabakhanji A, Menzel J, et al.: Is a vegan or a vegetarian diet associated with the microbiota composition in the gut? Results of a new cross-sectional study and systematic review. Crit Rev Food Sci Nutr 2020; 60: 2990-3004.
136. Vestergren S, Uysal MS: Beyond the Choice of What You Put in Your Mouth: A Systematic Mapping Review of Veganism and Vegan Identity. Front Psychol 2022; 13: 848434.
137. Wagenaar CA, van de Put M, Bisschops M, et al.: The Effect of Dietary Interventions on Chronic Inflammatory Diseases in Relation to the Microbiome: A Systematic Review. Nutrients 2021; 13: 3208.

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138. [Meta-analysis sows doubt. Vegetarians live healthier lives but is it the food?]. MMW Fortschr Med 2014; 156 Spec no 2: 7.
139. Ahc M: Eat Vegetables and Prevent Type 2 Diabetes. Internal Medicine Alert 2019; 41.
140. Appleby PN, Key TJA: Letter: Veganism, vegetarianism, bone mineral density, and fracture risk: a systematic review and meta-analysis. Nutr Rev 2019; 77: 451.
141. Ciapponi A: What are the effects of a vegan dietary pattern for primary prevention of cardiovascular disease (CVD)? Cochrane Clinical Answers 2021.
142. Ha V, de Souza RJ: "Fleshing Out" the Benefits of Adopting a Vegetarian Diet. J Am Heart Assoc 2015; 4: e002654.
143. Haghighatdoost F: Reduced Diabetes Medication Needs With a Plant-Based Diet Reply. JOURNAL OF THE AMERICAN COLLEGE OF NUTRITION 2020; 39: 578-9.
144. Kraft K: Toumpanakis A, Turnbull T, Alba-Barba I. Effectiveness of plant-based diets in promoting well-being in the management of type 2 diabetes: a systematic review. BMJ Open Diab Res Care 2018; 6: e000534. COMPLEMENTARY MEDICINE RESEARCH 2019; 26: 78-9.
145. Marshall TA: Weak Evidence Suggests Vegetarian Diets May Be Associated With an Increased Risk of Dental Erosion. J Evid Based Dent Pract 2021; 21: 101524.
146. Schloss J, Steel A: Can plant-based therapies assist menopausal symptoms? Advances in integrative medicine 2016; 3: 33-4.
147. Gianfredi V, Dinu M, Nucci D, et al.: Association between dietary patterns and depression: an umbrella review of meta-analyses of observational studies and intervention trials. Nutr Rev 2023; 81: 346-59.
148. Gianfredi V, Ferrara P, Dinu M, Nardi M, Nucci D: Diets, Dietary Patterns, Single Foods and Pancreatic Cancer Risk: An Umbrella Review of Meta-Analyses. Int J Environ Res Public Health 2022; 19.
149. Kahleova H, Salas-Salvadó J, Rahelić D, Kendall CW, Rembert E, Sievenpiper JL: Dietary Patterns and Cardiometabolic Outcomes in Diabetes: A Summary of Systematic Reviews and Meta-Analyses. Nutrients 2019; 11: 2209.
150. Oussalah A, Levy J, Berthezène C, Alpers DH, Guéant JL: Health outcomes associated with vegetarian diets: An umbrella review of systematic reviews and meta-analyses. Clin Nutr 2020; 39: 3283-307.
151. Whiteley C, Benton F, Matwiejczyk L, Luscombe-Marsh N: Determining Dietary Patterns to Recommend for Type 2 Diabetes: An Umbrella Review. Nutrients 2023; 15: 861.
152. Abbasnezhad A, Falahi E, Gonzalez MJ, Kavehi P, Fouladvand F, Choghakhori R: Effect of different dietary approaches compared with a regular diet on systolic and diastolic blood pressure in patients with type 2 diabetes: A systematic review and meta-analysis. Diabetes Res Clin Pract 2020; 163: 108108.
153. Ajala O, English P, Pinkney J: Systematic review and meta-analysis of different dietary approaches to the management of type 2 diabetes. Am J Clin Nutr 2013; 97: 505-16.
154. Amiri M, Karabegović I, van Westing AC, et al.: Whole-diet interventions and cardiovascular risk factors in postmenopausal women: A systematic review of controlled clinical trials. Maturitas 2022; 155: 40-53.
155. Barnard ND, Levin SM, Yokoyama Y: A systematic review and meta-analysis of changes in body weight in clinical trials of vegetarian diets. J Acad Nutr Diet 2015; 115: 954-69.
156. Bath SC, Verkaik-Kloosterman J, Sabatier M, et al.: A systematic review of iodine intake in children, adults, and pregnant women in Europe-comparison against dietary recommendations and evaluation of dietary iodine sources. NUTRITION REVIEWS 2022; 80: 2154-77.
157. Bierbaum M, Tillich I, Bierbaum ME, Amler N: Efficacy of diets in the treatment of type 2 diabetes. A systematic review. Diabetologe 2015; 11: 50-7.
158. Boushey C, Ard J, Bazzano L, et al.: Dietary Patterns and All-Cause Mortality: A Systematic Review2020.
159. Chai BC, van der Voort JR, Grofelnik K, Eliasdottir HG, Kloss I, Perez-Cueto FJA: Which Diet Has the Least Environmental Impact on Our Planet? A Systematic Review of Vegan, Vegetarian and Omnivorous Diets. Sustainability 2019; 11.
160. de Carvalho GB, Dias-Vasconcelos NL, Santos RKF, Brandao-Lima PN, da Silva DG, Pires LV: Effect of different dietary patterns on glycemic control in individuals with type 2 diabetes mellitus: A systematic review. CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION 2020; 60: 1999-2010.
161. Demirci U, Kaptanoglu A: Adherence to Vegetarian Diet and Weight Loss: A Meta-Analysis. Progress in Nutrition 2022; 24.
162. Emadian A, Andrews RC, England CY, Wallace V, Thompson JL: The effect of macronutrients on glycaemic control: a systematic review of dietary randomised controlled trials in overweight and obese adults with type 2 diabetes in which there was no difference in weight loss between treatment groups. Br J Nutr 2015; 114: 1656-66.
163. Eveleigh ER, Coneyworth LJ, Avery A, Welham SJM: Vegans, Vegetarians, and Omnivores: How Does Dietary Choice Influence Iodine Intake? A Systematic Review. Nutrients 2020; 12: 1606.
164. Garbett TM, Garbett DL, Wendorf A: Vegetarian Diet: A Prescription for High Blood Pressure? A Systematic Review of the Literature. JNP-JOURNAL FOR NURSE PRACTITIONERS 2016; 12: 452-+.
165. Gibbs J, Gaskin E, Ji C, Miller MA, Cappuccio FP: The effect of plant-based dietary patterns on blood pressure: a systematic review and meta-analysis of controlled intervention trials. J Hypertens 2021; 39: 23-37.

eSupplement to the article:
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166. Ho-Pham LT, Nguyen ND, Nguyen TV: Effect of vegetarian diets on bone mineral density: a Bayesian meta-analysis. Am J Clin Nutr 2009; 90: 943-50.
167. Ivanova S, Delattre C, Karcheva-Bahchevanska D, Benbasat N, Nalbantova V, Ivanov K: Plant-Based Diet as a Strategy for Weight Control. Foods 2021; 10.
168. Jafari S, Hezaveh E, Jalilpiran Y, et al.: Plant-based diets and risk of disease mortality: a systematic review and meta-analysis of cohort studies. Crit Rev Food Sci Nutr 2022; 62: 7760-72.
169. Johannesen CO, Dale HF, Jensen C, Lied GA: Effects of Plant-Based Diets on Outcomes Related to Glucose Metabolism: A Systematic Review. Diabetes Metab Syndr Obes 2020; 13: 2811-22.
170. Kaiser J, van Daalen KR, Thayyil A, Cocco M, Caputo D, Oliver-Williams C: A Systematic Review of the Association Between Vegan Diets and Risk of Cardiovascular Disease. J Nutr 2021; 151: 1539-52.
171. Kashyap A, Mackay A, Carter B, Fyfe CL, Johnstone AM, Myint PK: Investigating the Effectiveness of Very Low-Calorie Diets and Low-Fat Vegan Diets on Weight and Glycemic Markers in Type 2 Diabetes Mellitus: A Systematic Review and Meta-Analysis. Nutrients 2022; 14: 4870.
172. Lee KW, Ching SM, Devaraj NK, et al.: Effects of vegetarian diets on blood pressure lowering: A systematic review with meta-analysis and trial sequential analysis. Nutrients 2020; 12.
173. Li T, Li Y, Wu S: Comparison of human bone mineral densities in subjects on plant-based and omnivorous diets: a systematic review and meta-analysis. Arch Osteoporos 2021; 16: 95.
174. Ma X, Tan H, Hu M, He S, Zou L, Pan H: The impact of plant-based diets on female bone mineral density: Evidence based on seventeen studies. Medicine (Baltimore) 2021; 100: e27480.
175. McComb SE, Mills JS: Orthorexia nervosa: A review of psychosocial risk factors. Appetite 2019; 140: 50-75.
176. Medawar E, Huhn S, Villringer A, Veronica Witte A: The effects of plant-based diets on the body and the brain: a systematic review. Transl Psychiatry 2019; 9: 226.
177. Molina-Montes E, Ubago-Guisado E, Petrova D, et al.: The Role of Diet, Alcohol, BMI, and Physical Activity in Cancer Mortality: Summary Findings of the EPIC Study. Nutrients 2021; 13: 4293.
178. Nelson ME, Hamm MW, Hu FB, Abrams SA, Griffin TS: Alignment of Healthy Dietary Patterns and Environmental Sustainability: A Systematic Review. Adv Nutr 2016; 7: 1005-25.
179. Papamichou D, Panagiotakos DB, Itsiopoulos C: Dietary patterns and management of type 2 diabetes: A systematic review of randomised clinical trials. Nutr Metab Cardiovasc Dis 2019; 29: 531-43.
180. Pedrão AMN, Oliveira NCd: Dietary patterns and oral condition: a review. Rev odontol Univ Cid São Paulo (Online) 2014; 26.
181. Quek J, Lim G, Lim WH, et al.: The Association of Plant-Based Diet With Cardiovascular Disease and Mortality: A Meta-Analysis and Systematic Review of Prospect Cohort Studies. Front Cardiovasc Med 2021; 8: 756810.
182. Reinhardt SL, Boehm R, Blackstone NT, et al.: Systematic Review of Dietary Patterns and Sustainability in the United States. ADVANCES IN NUTRITION 2020; 11: 1016-31.
183. Remde A, DeTurk SN, Almardini A, Steiner L, Wojda T: Plant-predominant eating patterns - how effective are they for treating obesity and related cardiometabolic health outcomes? - a systematic review. Nutr Rev 2022; 80: 1094-104.
184. Schürmann S, Kersting M, Alexy U: Vegetarian diets in children: a systematic review. Eur J Nutr 2017; 56: 1797-817.
185. Simeone G, Bergamini M, Verga MC, et al.: Do Vegetarian Diets Provide Adequate Nutrient Intake during Complementary Feeding? A Systematic Review. NUTRIENTS 2022; 14.
186. Termannsen AD, Clemmensen KKB, Thomsen JM, et al.: Effects of vegan diets on cardiometabolic health: A systematic review and meta-analysis of randomized controlled trials. OBESITY REVIEWS 2022; 23.
187. Toumpanakis A, Turnbull T, Alba-Barba I: Effectiveness of plant-based diets in promoting well-being in the management of type 2 diabetes: a systematic review. BMJ Open Diabetes Res Care 2018; 6: e000534.
188. Tran E, Dale HF, Jensen C, Lied GA: Effects of Plant-Based Diets on Weight Status: A Systematic Review. Diabetes Metab Syndr Obes 2020; 13: 3433-48.
189. Utami DB, Findyartini A: Plant-based Diet for HbA1c Reduction in Type 2 Diabetes Mellitus: an Evidence-based Case Report. Acta Med Indones 2018; 50: 260-7.
190. Wang F, Zheng J, Yang B, Jiang J, Fu Y, Li D: Effects of Vegetarian Diets on Blood Lipids: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. J Am Heart Assoc 2015; 4: e002408.
191. Yokoyama Y, Barnard ND, Levin SM, Watanabe M: Vegetarian diets and glycemic control in diabetes: a systematic review and meta-analysis. Cardiovasc Diagn Ther 2014; 4: 373-82.
192. Yokoyama Y, Nishimura K, Barnard ND, et al.: Vegetarian diets and blood pressure: a meta-analysis. JAMA Intern Med 2014; 174: 577-87.
193. Alferink LJM, Erler NS, de Knegt RJ, et al.: Adherence to a plant-based, high-fibre dietary pattern is related to regression of non-alcoholic fatty liver disease in an elderly population. Eur J Epidemiol 2020; 35: 1069-85.
194. Amini MR, Shahinfar H, Djafari F, et al.: The association between plant-based diet indices and metabolic syndrome in Iranian older adults. Nutr Health 2021; 27: 435-44.
195. Attini R, Leone F, Chatrenet A, et al.: Plant-Based Diets Improve Maternal-Fetal Outcomes in CKD Pregnancies. NUTRIENTS 2022; 14.

eSupplement to the article:
Klug A, Barbaresko J, Alexy U, et al. on behalf of the German Nutrition Society (DGE): Update of the DGE position on vegan diet – Position statement of the German Nutrition Society (DGE). Ernahrungs Umschau 2024; 71(7): 60–84. DOI 10.4455/eu.2024.22

196. Baden MY, Kino S, Liu X, et al.: Changes in plant-based diet quality and health-related quality of life in women. Br J Nutr 2020; 124: 960-70.
197. Cai H, Sobue T, Kitamura T, et al.: Low-carbohydrate diet and risk of cancer incidence: The Japan Public Health Center-based prospective study. Cancer Sci 2022; 113: 744-55.
198. Chen H, Shen J, Xuan J, et al.: Plant-based dietary patterns in relation to mortality among older adults in China. Nat Aging 2022; 2: 224-30.
199. Chen Y, Qin Y, Zhang Z, et al.: Association of the low-carbohydrate dietary pattern with postpartum weight retention in women. Food Funct 2021; 12: 10764-72.
200. Chen Z, Qian F, Liu G, et al.: Prepregnancy plant-based diets and the risk of gestational diabetes mellitus: a prospective cohort study of 14,926 women. Am J Clin Nutr 2021; 114: 1997-2005.
201. Daily JW, Park S: Association of Plant-Based and High-Protein Diets with a Lower Obesity Risk Defined by Fat Mass in Middle-Aged and Elderly Persons with a High Genetic Risk of Obesity. Nutrients 2023; 15: 1063.
202. D'Alessandro C, Cumetti A, Pardini E, et al.: Prevalence and correlates of hyperkalemia in a renal nutrition clinic. Intern Emerg Med 2021; 16: 125-32.
203. Daneshzad E, Moradi M, Maracy MR, Brett NR, Bellissimo N, Azadbakht L: The association of maternal plant-based diets and the growth of breastfed infants. Health Promot Perspect 2020; 10: 152-61.
204. Das A, Bai CH, Chang JS, et al.: Associations of Dietary Patterns and Vitamin D Levels with Iron Status in Pregnant Women: A Cross-Sectional Study in Taiwan. Nutrients 2023; 15: 1805.
205. Delgado-Velandia M, Maroto-Rodriguez J, Ortola R, Garcia-Esquinas E, Rodriguez-Artalejo F, Sotos-Prieto M: Plant-Based Diets and All-cause and Cardiovascular Mortality in a Nationwide Cohort in Spain: The ENRICA Study. MAYO CLINIC PROCEEDINGS 2022; 97: 2005-15.
206. Duan Y, Qi Q, Gao T, Du J, Zhang M, Liu HQ: Plant-Based Diet and Risk of Frailty in Older Chinese Adults. J Nutr Health Aging 2023.
207. Flores AC, Heron C, Kim JI, et al.: Prospective Study of Plant-Based Dietary Patterns and Diabetes in Puerto Rican Adults. J Nutr 2021.
208. Foscolou A, Critselis E, Tyrovolas S, et al.: The association of animal and plant protein with successful ageing: a combined analysis of MEDIS and ATTICA epidemiological studies. Public Health Nutr 2021; 24: 2215-24.
209. Garg PK, Wilson N, Levitan EB, et al.: Associations of dietary patterns with risk of incident atrial fibrillation in the REasons for Geographic And Racial Differences in Stroke (REGARDS). Eur J Nutr 2023.
210. Gatto NM, Garcia-Cano J, Irani C, et al.: Vegetarian Dietary Patterns and Cognitive Function among Older Adults: The Adventist Health Study-2. J Nutr Gerontol Geriatr 2021; 40: 197-214.
211. Glenn AJ, Boucher BA, Kavcic CC, et al.: Development of a Portfolio Diet Score and Its Concurrent and Predictive Validity Assessed by a Food Frequency Questionnaire. Nutrients 2021; 13: 2850.
212. Gonzalez-Ortiz A, Xu H, Avesani CM, et al.: Plant-based diets, insulin sensitivity and inflammation in elderly men with chronic kidney disease. JOURNAL OF NEPHROLOGY 2020; 33: 1091-101.
213. Hawa F, Gladshteyn M, Gunaratnam SV, et al.: Effective Treatment of Nonalcoholic Fatty Liver Disease Using a Community-Based Weight Management Program. Cureus 2021; 13.
214. Hu J, Li Y, Wang Z, et al.: Association of plant-based dietary patterns with the risk of osteoporosis in community-dwelling adults over 60 years: a cross-sectional study. Osteoporos Int 2023; 34: 915-23.
215. Islam S, Jubayer A, Nayan MM, Islam MH, Nowar A: Assessment of nutrient adequacy and associated factors among lactating women of rural Bangladesh using observed intake: Findings from Bangladesh Integrated Household Survey 2018-2019. Food Sci Nutr 2023; 11: 126-36.
216. Jafari F, Kahrizsangi MA, Najam W, et al.: Association of plant-based dietary patterns with metabolic syndrome: baseline results from the Persian Kavar cohort study (PKCS). INTERNATIONAL JOURNAL OF FOOD SCIENCES AND NUTRITION 2023.
217. Jayedi A, Zeraattalab-Motlagh S, Moosavi H, Mirmohammadkhani M, Emadi A, Shab-Bidar S: Association of plant-based dietary patterns in first trimester of pregnancy with gestational weight gain: results from a prospective birth cohort. Eur J Clin Nutr 2023.
218. Jiang YW, Sheng LT, Pan XF, et al.: Midlife Dietary Intakes of Monounsaturated Acids, n-6 Polyunsaturated Acids, and Plant-Based Fat Are Inversely Associated with Risk of Cognitive Impairment in Older Singapore Chinese Adults. J Nutr 2020; 150: 901-9.
219. Jung S, Park S: Positive association of unhealthy plant-based diets with the incidence of abdominal obesity in Korea: a comparison of baseline, most recent, and cumulative average diets. Epidemiol Health 2022; 44: e2022063.
220. Karavasiloglou N, Selinger E, Gojda J, Rohrmann S, Kuhn T: Differences in Bone Mineral Density between Adult Vegetarians and Nonvegetarians Become Marginal when Accounting for Differences in Anthropometric Factors. J Nutr 2020; 150: 1266-71.
221. Khalili H, Hakansson N, Casey K, et al.: Diet Quality and Risk of Older-onset Crohn's Disease and Ulcerative Colitis. J Crohns Colitis 2023; 17: 746-53.
222. Kim H, Lee K, Rebholz CM, Kim J: Plant-based diets and incident metabolic syndrome: Results from a South Korean prospective cohort study. PLOS Med 2020; 17.

223. Kim J, Giovannucci E: Healthful Plant-Based Diet and Incidence of Type 2 Diabetes in Asian Population. Nutrients 2022; 14: 3078.
224. Kim J, Khil J, Kim H, Keum N, Zhang X, Giovannucci E: Plant-based dietary patterns and the risk of digestive system cancers in 3 large prospective cohort studies. Eur J Epidemiol 2023.
225. Kim J, Kim H, Giovannucci EL: Quality of plant-based diets and risk of hypertension: a Korean genome and examination study. Eur J Nutr 2021; 60: 3841-51.
226. Kim J, Kim H, Giovannucci EL: Plant-based diet quality and the risk of total and disease-specific mortality: A population-based prospective study. Clin Nutr 2021; 40: 5718-25.
227. Koeder C, Alzughayyar D, Anand C, et al.: The healthful plant-based diet index as a tool for obesity prevention-The healthy lifestyle community program cohort 3 study. Obes Sci Pract 2022.
228. Kouvari M, Tsiampalis T, Chrysohoou C, et al.: Quality of plant-based diets in relation to 10-year cardiovascular disease risk: the ATTICA cohort study. Eur J Nutr 2022; 61: 2639-49.
229. Laouali N, Shah S, Macdonald CJ, et al.: BMI in the Associations of Plant-Based Diets with Type 2 Diabetes and Hypertension Risks in Women: The E3N Prospective Cohort Study. J Nutr 2021; 151: 2731-40.
230. Lazarova SV, Sutherland JM, Jessri M: Adherence to emerging plant-based dietary patterns and its association with cardiovascular disease risk in a nationally representative sample of Canadian adults. Am J Clin Nutr 2022; 116: 57-73.
231. Lee K, Kim H, Rebholz CM, Kim J: Association between Different Types of Plant-Based Diets and Risk of Dyslipidemia: A Prospective Cohort Study. Nutrients 2021; 13: 220.
232. Li X, Peng Z, Li M, et al.: A Healthful Plant-Based Diet Is Associated with Lower Odds of Nonalcoholic Fatty Liver Disease. Nutrients 2022; 14: 4099.
233. Liang F, Fu J, Turner-McGrievy G, et al.: Association of Body Mass Index and Plant-Based Diet with Cognitive Impairment among Older Chinese Adults: A Prospective, Nationwide Cohort Study. Nutrients 2022; 14: 3132.
234. Lim SX, Loy SL, Colega MT, et al.: Prepregnancy adherence to plant-based diet indices and exploratory dietary patterns in relation to fecundability. Am J Clin Nutr 2022; 115: 559-69.
235. Liu D, Zhang WT, Wang JH, et al.: Association between Dietary Diversity Changes and Cognitive Impairment among Older People: Findings from a Nationwide Cohort Study. Nutrients 2022; 14: 1251.
236. Liu D, Zhang XR, Li ZH, et al.: Association of dietary diversity changes and mortality among older people: A prospective cohort study. Clin Nutr 2021; 40: 2620-9.
237. Lo K, Glenn AJ, Yeung S, et al.: Prospective Association of the Portfolio Diet with All-Cause and Cause-Specific Mortality Risk in the Mr. OS and Ms. OS Study. Nutrients 2021; 13: 4360.
238. Loeb S, Fu BC, Bauer SR, et al.: Association of plant-based diet index with prostate cancer risk. Am J Clin Nutr 2022; 115: 662-70.
239. Lopes T, Zemlin AE, Sekgala MD, McHiza ZJR, Erasmus RT, Kengne AP: The Association between Plant-Based Diets and Dietary Patterns with Cardiometabolic Risk in a Sample of Commercial Taxi Drivers in South Africa. Nutrients 2023; 15: 1789.
240. Lotfi M, Nouri M, Jalil AT, et al.: Plant-based diets could ameliorate the risk factors of cardiovascular diseases in adults with chronic diseases. Food Sci Nutr 2023; 11: 1297-308.
241. Marche C, Poulain M, Nieddu A, Errigo A, Dore MP, Pes GM: Is a plant-based diet effective to maintain a good psycho-affective status in old age? Results of a survey of a long-lived population from Sardinia. Nutr Neurosci 2023: 1-10.
242. Marinoni M, Giordani E, Mosconi C, et al.: Are Dietary Patterns Related to Cognitive Performance in 7-Year-Old Children? Evidence from a Birth Cohort in Friuli Venezia Giulia, Italy. Nutrients 2022; 14: 4168.
243. Maroto-Rodriguez J, Delgado-Velandia M, Ortolá R, et al.: Plant-based diets and risk of frailty in community-dwelling older adults: the Seniors-ENRICA-1 cohort. Geroscience 2023; 45: 221-32.
244. Merrotsy A, McCarthy AL, Lacey S, Coppinger T: Identifying dietary patterns in Irish schoolchildren and their association with nutritional knowledge and markers of health before and after intervention. Br J Nutr 2021; 126: 383-91.
245. Mokhtari E, Mirzaei S, Asadi A, Akhlaghi M, Saneei P: Association between plant-based diets and metabolic health status in adolescents with overweight and obesity. Sci Rep 2022; 12: 13772.
246. Ogrodowczyk AM, Zakrzewska M, Romaszko E, Wróblewska B: Gestational Dysfunction-Driven Diets and Probiotic Supplementation Correlate with the Profile of Allergen-Specific Antibodies in the Serum of Allergy Sufferers. Nutrients 2020; 12: 2381.
247. Ratjen I, Morze J, Enderle J, et al.: Adherence to a plant-based diet in relation to adipose tissue volumes and liver fat content. Am J Clin Nutr 2020; 112: 354-63.
248. Roeren M, Kordowski A, Sina C, Smollich M: Inadequate Choline Intake in Pregnant Women in Germany. Nutrients 2022; 14: 4862.
249. Sasanfar B, Toorang F, Booyani Z, et al.: Adherence to plant-based dietary pattern and risk of breast cancer among Iranian women. Eur J Clin Nutr 2021; 75: 1578-87.

eSupplement to the article:
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250. Scotta AV, Miranda AR, Cortez MV, Soria EA: Three food pattern-based indices diagnose lactating women's nutritional inadequacies in Argentina: A clinimetric approach using diet quality indicators and breast milk biomarkers. Nutr Res 2022; 107: 152-64.
251. Sethulekshmi SG, Sumathy S, Dutta B: Serum Magnesium Levels among Pregnant Women with and without Complications: A Cross-sectional Study. J Clin Diagn Res 2020; 14.
252. Shan ZL, Li YP, Baden MY, et al.: Association Between Healthy Eating Patterns and Risk of Cardiovascular Disease. JAMA Intern Med 2020; 180: 1090-100.
253. Shan ZL, Wang FL, Li YP, et al.: Healthy Eating Patterns and Risk of Total and Cause-Specific Mortality. JAMA Intern Med 2023; 183: 142-53.
254. Shang X, Hodge AM, Hill E, Zhu Z, He M: Associations of Dietary Pattern and Sleep Duration with Cognitive Decline in Community-Dwelling Older Adults: A Seven-Year Follow-Up Cohort Study. J Alzheimers Dis 2021; 82: 1559-71.
255. Shin N, Kim J: Association between different types of plant-based diet and dyslipidaemia in Korean adults. Br J Nutr 2022; 128: 542-8.
256. Song S, Lee K, Park S, Shin N, Kim H, Kim J: Association between Unhealthful Plant-Based Diets and Possible Risk of Dyslipidemia. Nutrients 2021; 13: 4334.
257. Sotos-Prieto M, Struijk EA, Fung TT, et al.: Association between the quality of plant-based diets and risk of frailty. JOURNAL OF CACHEXIA SARCOPENIA AND MUSCLE 2022; 13: 2854-62.
258. Storz MA, Ronco AL: Reduced dietary acid load in U.S. vegetarian adults: Results from the National Health and Nutrition Examination Survey. Food Sci Nutr 2022; 10: 2091-100.
259. Thompson AS, Tresserra-Rimbau A, Karavasiloglou N, et al.: Association of Healthful Plant-based Diet Adherence With Risk of Mortality and Major Chronic Diseases Among Adults in the UK. JAMA Netw Open 2023; 6: e234714.
260. Tsaban G, Meir AY, Rinott E, et al.: The effect of green Mediterranean diet on cardiometabolic risk; a randomised controlled trial. Heart 2021; 107: 1054-61.
261. Ureta-Velasco N, Keller K, Escuder-Vieco D, et al.: Human Milk Composition and Nutritional Status of Omnivore Human Milk Donors Compared with Vegetarian/Vegan Lactating Mothers. NUTRIENTS 2023; 15.
262. Wang L, Li Y, Liu Y, et al.: Association between Different Types of Plant-Based Diets and Dyslipidemia in Middle-Aged and Elderly Chinese Participants. Nutrients 2023; 15: 230.
263. Willey J, Wakefield M, Silver HJ: Exploring the Diets of Adults with Obesity and Type II Diabetes from Nine Diverse Countries: Dietary Intakes, Patterns, and Quality. Nutrients 2020; 12: 2027.
264. Wu B, Zhou RL, Ou QJ, Chen YM, Fang YJ, Zhang CX: Association of plant-based dietary patterns with the risk of colorectal cancer: a large-scale case-control study. Food Funct 2022; 13: 10790-801.
265. Yaskolka Meir A, Rinott E, Tsaban G, et al.: Effect of green-Mediterranean diet on intrahepatic fat: the DIRECT PLUS randomised controlled trial. Gut 2021; 70: 2085-95.
266. Yisahak SF, Hinkle SN, Mumford SL, et al.: Vegetarian diets during pregnancy, and maternal and neonatal outcomes. Int J Epidemiol 2021; 50: 165-78.
267. Zhan Y, Zhao Y, Qu Y, et al.: Longitudinal association of maternal dietary patterns with antenatal depression: Evidence from the Chinese Pregnant Women Cohort Study. J Affect Disord 2022; 308: 587-95.
268. Zhang Y, Meng Y, Wang J: Higher Adherence to Plant-Based Diet Lowers Type 2 Diabetes Risk among High and Non-High Cardiovascular Risk Populations: A Cross-Sectional Study in Shanxi, China. Nutrients 2023; 15: 786.
269. Zhou YF, Song XY, Wu J, et al.: Association Between Dietary Patterns in Midlife and Healthy Ageing in Chinese Adults: The Singapore Chinese Health Study. J Am Med Dir Assoc 2021; 22: 1279-86.
270. Zhu AN, Yuan CZ, Pretty J, Ji JS: Plant-based dietary patterns and cognitive function: A prospective cohort analysis of elderly individuals in China (2008-2018). BRAIN AND BEHAVIOR 2022; 12.
271. Zulyniak MA, de Souza RJ, Shaikh M, et al.: Ethnic differences in maternal diet in pregnancy and infant eczema. PLoS One 2020; 15: e0232170.
272. Ergas IJ, Mauch LR, Rahbar JA, Kitazono R, Kushi LH, Misquitta R: Health Achieved Through Lifestyle Transformation (HALT): A Kaiser Permanente Diet and Lifestyle Intervention Program for Coronary Artery Disease and Type 2 Diabetes. Am J Lifestyle Med 2023.
273. Monteyne AJ, Dunlop MV, Machin DJ, et al.: A mycoprotein-based high-protein vegan diet supports equivalent daily myofibrillar protein synthesis rates compared with an isonitrogenous omnivorous diet in older adults: a randomised controlled trial. British journal of nutrition 2021; 126: 674-84.
274. Alexy U, Fischer M, Weder S, Langler A, Michalsen A, Keller M: Food group intake of children and adolescents (6-18 years) on a vegetarian, vegan or omnivore diet: results of the VeChi Youth Study. Br J Nutr 2022; 128: 851-62.
275. Alexy U, Fischer M, Weder S, et al.: Nutrient Intake and Status of German Children and Adolescents Consuming Vegetarian, Vegan or Omnivore Diets: Results of the VeChi Youth Study. Nutrients 2021; 13: 1707.
276. Argyridou S, Davies MJ, Biddle GJH, et al.: Evaluation of an 8-Week Vegan Diet on Plasma Trimethylamine-N-Oxide and Postchallenge Glucose in Adults with Dysglycemia or Obesity. J Nutr 2021; 151: 1844-53.

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277. Barnard ND, Rembert E, Freeman A, Bradshaw M, Holubkov R, Kahleova H: Blood Type Is Not Associated with Changes in Cardiometabolic Outcomes in Response to a Plant-Based Dietary Intervention. J Acad Nutr Diet 2021; 121: 1080-6.
278. Barthels F, Poerschke S, Mueller R, Pietrowsky R: Orthorexic eating behavior in vegans is linked to health, not to animal welfare. Eat Weight Disord 2020; 25: 817-20.
279. Benham AJ, Gallegos D, Hanna KL, Hannan-Jones MT: Intake of vitamin B(12) and other characteristics of women of reproductive age on a vegan diet in Australia. Public Health Nutr 2021; 24: 4397-407.
280. Benham AJ, Gallegos D, Hanna KL, Hannan-Jones MT: Vitamin B12 Supplementation Adequacy in Australian Vegan Study Participants. Nutrients 2022; 14: 4781.
281. Chen G, Su M, Chu X, et al.: Plant-based diets and body composition in Chinese omnivorous children aged 6-9 years old: A cross-sectional study. Front Nutr 2022; 9: 918944.
282. Chiarioni G, Popa SL, Dalbeni A, et al.: Vegan Diet Advice Might Benefit Liver Enzymes in Nonalcoholic Fatty Liver Disease: an Open Observational Pilot Study. J Gastrointestin Liver Dis 2021; 30: 81-7.
283. Chiu THT, Liu CH, Chang CC, Lin MN, Lin CL: Vegetarian diet and risk of gout in two separate prospective cohort studies. Clin Nutr 2020; 39: 837-44.
284. Craddock JC, Probst YC, Neale EP, Peoples GE: A Cross-Sectional Comparison of the Whole Blood Fatty Acid Profile and Omega-3 Index of Male Vegan and Omnivorous Endurance Athletes. J Am Nutr Assoc 2022; 41: 333-41.
285. Deliens T, Mullie P, Clarys P: Plant-based dietary patterns in Flemish adults: a 10-year trend analysis. Eur J Nutr 2022; 61: 561-5.
286. Desmond MA, Sobiecki JG, Jaworski M, et al.: Growth, body composition, and cardiovascular and nutritional risk of 5 to 10-y-old children consuming vegetarian, vegan, or omnivore diets. AMERICAN JOURNAL OF CLINICAL NUTRITION 2021; 113: 1565-77.
287. Eveleigh E, Coneyworth L, Zhou M, et al.: Vegans and vegetarians living in Nottingham (UK) continue to be at risk of iodine deficiency. Br J Nutr 2023; 129: 1510-27.
288. Fallon N, Dillon SA: Low Intakes of Iodine and Selenium Amongst Vegan and Vegetarian Women Highlight a Potential Nutritional Vulnerability. Front Nutr 2020; 7.
289. Feng HP, Yu PC, Huang SH, et al.: The benefit of vegetarian diets for reducing blood pressure in Taiwan: a historically prospective cohort study. J Health Popul Nutr 2023; 42: 41.
290. Ferrara P, Sandullo F, Vecchio M, et al.: Length-weight growth analysis up to 12 months of age in three groups according to the dietary pattern followed from pregnant mothers and children during the first year of life. Minerva Pediatr (Torino) 2021.
291. Fuschlberger M, Putz P: Vitamin B12 supplementation and health behavior of Austrian vegans: a cross-sectional online survey. Sci Rep 2023; 13.
292. Gu QY, Cui XY, Du K, et al.: Higher toenail selenium is associated with increased insulin resistance risk in omnivores, but not in vegetarians. Nutr Metab (Lond) 2020; 17.
293. Haddad EH, Jaceldo-Siegl K, Oda K, Fraser GE: Associations of Circulating Methylmalonic Acid and Vitamin B-12 Biomarkers Are Modified by Vegan Dietary Pattern in Adult and Elderly Participants of the Adventist Health Study 2 Calibration Study. Curr Dev Nutr 2020; 4: nzaa008.
294. Headey DD, Palloni G: Stunting and Wasting Among Indian Preschoolers have Moderate but Significant Associations with the Vegetarian Status of their Mothers. J Nutr 2020; 150: 1579-89.
295. Henjum S, Groufh-Jacobsen S, Lindsay A, et al.: Adequate vitamin B12 and folate status of Norwegian vegans and vegetarians. Br J Nutr 2022; 129: 1-8.
296. Hou YC, Huang HF, Tsai WH, et al.: Vegetarian Diet Was Associated With a Lower Risk of Chronic Kidney Disease in Diabetic Patients. Front Nutr 2022; 9: 843357.
297. Hovinen T, Korkalo L, Freese R, et al.: Vegan diet in young children remodels metabolism and challenges the statuses of essential nutrients. EMBO Mol Med 2021; 13.
298. Jakse B, Jakse B, Godnov U, Pinter S: Nutritional, Cardiovascular Health and Lifestyle Status of 'Health Conscious' Adult Vegans and Non-Vegans from Slovenia: A Cross-Sectional Self-Reported Survey. Int J Environ Res Public Health 2021; 18.
299. Kahleova H, Petersen KF, Shulman GI, et al.: Effect of a Low-Fat Vegan Diet on Body Weight, Insulin Sensitivity, Postprandial Metabolism, and Intramyocellular and Hepatocellular Lipid Levels in Overweight Adults: a Randomized Clinical Trial. JAMA Netw Open 2020; 3: e2025454.
300. Kahleova H, Rembert E, Alwarith J, et al.: Effects of a Low-Fat Vegan Diet on Gut Microbiota in Overweight Individuals and Relationships with Body Weight, Body Composition, and Insulin Sensitivity. A Randomized Clinical Trial. Nutrients 2020; 12: 2917.
301. Kahleova H, Rembert E, Nowak A, Holubkov R, Barnard ND: Effect of a diet intervention on cardiometabolic outcomes: does race matter? A randomized clinical trial. Clin Nutr ESPEN 2021; 41: 126-8.
302. Kahleova H, Znayenko-Miller T, Uribarri J, Holubkov R, Barnard ND: Dietary advanced glycation products and their associations with insulin sensitivity and body weight: A 16-week randomized clinical trial. Obes Sci Pract 2022.

303. Lederer AK, Storz MA, Huber R, Hannibal L, Neumann E: Plasma Leptin and Adiponectin after a 4-Week Vegan Diet: A Randomized-Controlled Pilot Trial in Healthy Participants. Int J Environ Res Public Health 2022; 19.
304. Macknin M, Stegmeier N, Thomas A, et al.: Three Healthy Eating Patterns and Cardiovascular Disease Risk Markers in 9 to 18 Year Olds With Body Mass Index >95%: A Randomized Trial. Clin Pediatr 2021; 60: 474-84.
305. Morton KR, Lee JW, Spencer-Hwang R: Plant-based dietary intake moderates adverse childhood experiences association with early mortality in an older Adventist cohort. J Psychosom Res 2021; 151: 110633.
306. Murillo AG, Gomez G, Duran-Aguero S, et al.: Dietary Patterns and Dietary Recommendations Achievement From Latin American College Students During the COVID-19 Pandemic Lockdown. Front Sustain Food Syst 2022; 6.
307. Reyes-Izquierdo A, Flores-Gonzales LA, Caballero-Garcia CS, Leon-Rios XA: periodontal Metropolitana Association between diet of the vegan population and self-perception of periodontal state in Metropolitan Lima. Nutr Hosp 2022; 39: 147-56.
308. Schapira M, Manor O, Golan N, et al.: Involuntary human exposure to carbamazepine: A cross-sectional study of correlates across the lifespan and dietary spectrum. Environ Int 2020; 143: 105951.
309. Světnička M, El-Lababidi E: Problematics of iodine saturation among children on the vegan diet. Cas Lek Cesk 2021; 160: 237-41.
310. Světnička M, Sigal A, Selinger E, Heniková M, El-Lababidi E, Gojda J: Cross-Sectional Study of the Prevalence of Cobalamin Deficiency and Vitamin B12 Supplementation Habits among Vegetarian and Vegan Children in the Czech Republic. Nutrients 2022; 14: 535.
311. Thorpe DL, Beeson WL, Knutsen R, Fraser GE, Knutsen SF: Dietary patterns and hip fracture in the Adventist Health Study 2: combined vitamin D and calcium supplementation mitigate increased hip fracture risk among vegans. Am J Clin Nutr 2021; 114: 488-95.
312. Tong TYN, Perez-Cornago A, Bradbury KE, Key TJ: Biomarker Concentrations in White and British Indian Vegetarians and Nonvegetarians in the UK Biobank. J Nutr 2021; 151: 3168-79.
313. Turner-McGrievy G, Hutto B, Bernhart JA, Wilson MJ: Comparison of the Diet ID Platform to the Automated Self-administered 24-hour (ASA24) Dietary Assessment Tool for Assessment of Dietary Intake. J Am Nutr Assoc 2022; 41: 360-82.
314. Turner-McGrievy GM, Wilcox S, Frongillo EA, et al.: Effect of a Plant-Based vs Omnivorous Soul Food Diet on Weight and Lipid Levels Among African American Adults: a Randomized Clinical Trial. JAMA network open 2023; 6: e2250626.
315. Weder S, Keller M, Fischer M, Becker K, Alexy U: Intake of micronutrients and fatty acids of vegetarian, vegan, and omnivorous children (1–3 years) in Germany (VeChi Diet Study). European journal of nutrition 2021.
316. Weder S, Zerback EH, Wagener SM, et al.: How Does Selenium Intake Differ among Children (1-3 Years) on Vegetarian, Vegan, and Omnivorous Diets? Results of the VeChi Diet Study. Nutrients 2022; 15.
317. Whitbread JS, Murphy KJ, Clifton PM, Keogh JB: Iodine Excretion and Intake in Women of Reproductive Age in South Australia Eating Plant-Based and Omnivore Diets: A Pilot Study. Int J Environ Res Public Health 2021; 18.
318. Wirnitzer K, Motevalli M, Tanous D, et al.: Who Is Running in the D-A-CH Countries? An Epidemiological Approach of 2455 Omnivorous, Vegetarian, and Vegan Recreational Runners-Results from the NURMI Study (Step 1). Nutrients 2022; 14: 677.
319. Wirnitzer K, Tanous D, Motevalli M, et al.: Prevalence of Female and Male Vegan and Non-Vegan Endurance Runners and the Potential Associations of Diet Type and BMI with Performance-Results from the NURMI Study (Step 1). Nutrients 2022; 14: 3803.
320. Wirnitzer KCC, Drenowatz C, Cocca A, et al.: Health Behaviors of Austrian Secondary School Teachers and Principals at a Glance: First Results of the From Science 2 School Study Focusing on Sports Linked to Mixed, Vegetarian, and Vegan Diets. Nutrients 2022; 14: 1065.
321. Wu CL, Tsai WH, Liu JS, Liu HW, Huang SY, Kuo KL: Vegan Diet Is Associated with a Lower Risk of Chronic Kidney Disease in Patients with Hyperuricemia. Nutrients 2023; 15: 1444.
322. Zaremba A, Gramza-Michalowska A, Pal K, Szymandera-Buszka K: The Effect of a Vegan Diet on the Coverage of the Recommended Dietary Allowance (RDA) for Iodine among People from Poland. Nutrients 2023; 15: 1163.
323. Kim J, Setiawan VW, Wilkens LR, Le Marchand L, Park SY: Healthful Plant-Based Dietary Pattern and Risk of Hepatocellular Carcinoma in a Multiethnic Population: A Cohort Study. Am J Clin Nutr 2023.
324. Crimarco A, Dias CH, Turner-McGrievy GM, et al.: Outcomes of a short term dietary intervention involving vegan soul food restaurants on African American adults' perceived barriers, benefits, and dietary acceptability of adopting a plant-based diet. Food Qual Prefer 2020; 79.
325. Du M, Liu J, Han N, Zhao Z, Luo S, Wang H: Association between sleep duration in early pregnancy and risk of gestational diabetes mellitus: a prospective cohort study. Diabetes Metab 2021; 47: 101217.
326. Gehring J, Touvier M, Baudry J, et al.: Consumption of Ultra-Processed Foods by Pesco-Vegetarians, Vegetarians, and Vegans: Associations with Duration and Age at Diet Initiation. JOURNAL OF NUTRITION 2021; 151: 120-31.

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327. Jeitler M, Storz MA, Steckhan N, et al.: Knowledge, Attitudes and Application of Critical Nutrient Supplementation in Vegan Diets among Healthcare Professionals-Survey Results from a Medical Congress on Plant-Based Nutrition. Foods 2022; 11.
328. Meulenbroeks D, Versmissen I, Prins N, Jonkers D, Gubbels J, Scheepers H: Care by Midwives, Obstetricians, and Dietitians for Pregnant Women Following a Strict Plant-Based Diet: A Cross-Sectional Study. Nutrients 2021; 13: 2394.
329. Reischl-Hajiabadi AT, Garbade SF, Feyh P, et al.: Maternal Vitamin B(12) Deficiency Detected by Newborn Screening-Evaluation of Causes and Characteristics. Nutrients 2022; 14: 3767.
330. Varadarajan P, Pai RG, Fraser GE, et al.: Left Ventricular Diastolic Abnormalities in Vegetarians as Compared with Non-vegetarians. Br J Nutr 2022: 1-28.
331. Bauer J, Walrand S: Vegan diets for older adults: is it a risky business? Curr Opin Clin Nutr Metab Care 2023; 26: 1-2.
332. Eidelman AI: The Risk of Breastfeeding on a Plant-Based Diet. Breastfeed Med 2023; 18: 1-2.
333. Hay G, Fadnes L, Meltzer HM, Arnesen EK, Henriksen C: Follow-up of pregnant women, breastfeeding mothers and infants on a vegetarian or vegan diet. Tidsskr Nor Laegeforen 2022; 142.
334. Kahleova H, Levin S, Barnard ND: Plant-Based Diets for Healthy Aging. J Am Coll Nutr 2021; 40: 478-9.
335. Quality of plant-based diet determines mortality risk in Chinese older adults. Nat Aging 2022; 2: 197-8.
336. Khaled K, Almilaji O, Koppen M, Hundley V, Tsofliou F: The association between a priori and a posterior dietary patterns with perceived stress in women of childbearing age. Proc Nutr Soc 2020; 79.
337. Stuart AG, O'Neill JL, O'Connor K, Redmond M, Hovey J: An investigation into the prevalence, parental attitudes, and practices of plant-based diets in a sample of toddlers aged 1-3 years in Ireland. Proc Nutr Soc 2022; 81.
338. Zagarins S, Harvey M, Tucker K, et al.: The association between established diet quality indices and gestational weight gain in Hispanic women. Paediatr Perinat Epidemiol 2021; 35: 34.
339. Domić J, Grootswagers P, van Loon LJC, de Groot L: Perspective: Vegan Diets for Older Adults? A Perspective On the Potential Impact On Muscle Mass and Strength. Adv Nutr 2022; 13: 712-25.
340. Hass U, Norman K: Plant-based Diets and Adequate Protein Intake for Healthy Aging. Aktuelle Kardiologie 2023; 12: 108-12.
341. Prorokova-Konrad T: The Vegan Studies Project: Food, Animals, and Gender in the Age of Terror. AM J Art Media Studies 2020; 22: 177-9.
342. Ferguson JJ, Oldmeadow C, Mishra GD, Garg ML: Plant-based dietary patterns are associated with lower body weight, BMI and waist circumference in older Australian women. Public Health Nutr 2022; 25: 18-31.
343. Ferrara P, Sandullo F, Di Ruscio F, et al.: The impact of lacto-ovo-/lacto-vegetarian and vegan diets during pregnancy on the birth anthropometric parameters of the newborn. J Matern Fetal Neonatal Med 2020; 33: 3900-6.
344. Perrin MT, Pawlak R, Allen LH, Hampel D: Total Water-Soluble Choline Concentration Does Not Differ in Milk from Vegan, Vegetarian, and Nonvegetarian Lactating Women. J Nutr 2020; 150: 512-7.
345. Benatar JR, Stewart RAH: Cardiometabolic risk factors in vegans; A meta-analysis of observational studies. PLoS One 2018; 13: e0209086.
346. Bickelmann FV, Leitzmann MF, Keller M, Baurecht H, Jochem C: Calcium intake in vegan and vegetarian diets: A systematic review and Meta-analysis. CRITICAL REVIEWS IN FOOD SCIENCE AND NUTRITION 2022.
347. Eveleigh ER, Coneyworth L, Welham SJM: Systematic review and meta-analysis of iodine nutrition in modern vegan and vegetarian diets. Br J Nutr 2023; 130: 1580-94.
348. Foster M, Chu A, Petocz P, Samman S: Effect of vegetarian diets on zinc status: a systematic review and meta-analysis of studies in humans. J Sci Food Agric 2013; 93: 2362-71.
349. Obersby D, Chappell DC, Dunnett A, Tsiami AA: Plasma total homocysteine status of vegetarians compared with omnivores: a systematic review and meta-analysis. Br J Nutr 2013; 109: 785-94.
350. Neufingerl N, Eilander A: Nutrient Intake and Status in Adults Consuming Plant-Based Diets Compared to Meat-Eaters: A Systematic Review. Nutrients 2022; 14: 29.
351. Bakaloudi DR, Halloran A, Rippin HL, et al.: Intake and adequacy of the vegan diet. A systematic review of the evidence. Clin Nutr 2021; 40: 3503-21.
352. Koller A, Rohrmann S, Wakolbinger M, et al.: Health aspects of vegan diets among children and adolescents: a systematic review and meta-analyses. Crit Rev Food Sci Nutr 2023: 1-12.
353. Karcz K, Królak-Olejnik B: Vegan or vegetarian diet and breast milk composition - a systematic review. Crit Rev Food Sci Nutr 2021; 61: 1081-98.
354. Baroni L, Rizzo G, Goggi S, Giampieri F, Battino M: Vegetarian diets during pregnancy: effects on the mother's health. A systematic review. Food Funct 2021; 12: 466-93.
355. Dinu M, Abbate R, Gensini GF, Casini A, Sofi F: Vegetarian, vegan diets and multiple health outcomes: A systematic review with meta-analysis of observational studies. Crit Rev Food Sci Nutr 2017; 57: 3640-9.
356. Dybvik JS, Svendsen M, Aune D: Vegetarian and vegan diets and the risk of cardiovascular disease, ischemic heart disease and stroke: a systematic review and meta-analysis of prospective cohort studies. Eur J Nutr 2023; 62: 51-69.

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Position statement of the German Nutrition Society (DGE). Ernahrungs Umschau 2024; 71(7): 60–84. DOI 10.4455/eu.2024.22

357. Lee Y, Park K: Adherence to a Vegetarian Diet and Diabetes Risk: A Systematic Review and Meta-Analysis of Observational Studies. Nutrients 2017; 9: 603.
358. Iguacel I, Miguel-Berges ML, Gómez-Bruton A, Moreno LA, Julián C: Veganism, vegetarianism, bone mineral density, and fracture risk: a systematic review and meta-analysis. Nutr Rev 2019; 77: 1-18.
359. Huang RY, Huang CC, Hu FB, Chavarro JE: Vegetarian Diets and Weight Reduction: a Meta-Analysis of Randomized Controlled Trials. J Gen Intern Med 2016; 31: 109-16.
360. Li J, Zhou R, Huang W, Wang J: Bone loss, low height, and low weight in different populations and district: a meta-analysis between vegans and non-vegans. Food Nutr Res 2020; 64.
361. Lopez PD, Cativo EH, Atlas SA, Rosendorff C: The Effect of Vegan Diets on Blood Pressure in Adults: A Meta-Analysis of Randomized Controlled Trials. Am J Med 2019; 132: 875-83.e7.
362. Picasso MC, Lo-Tayraco JA, Ramos-Villanueva JM, Pasupuleti V, Hernandez AV: Effect of vegetarian diets on the presentation of metabolic syndrome or its components: A systematic review and meta-analysis. Clin Nutr 2019; 38: 1117-32.
363. Yokoyama Y, Levin SM, Barnard ND: Association between plant-based diets and plasma lipids: a systematic review and meta-analysis. Nutr Rev 2017; 75: 683-98.
364. Chiavaroli L, Nishi SK, Khan TA, et al.: Portfolio Dietary Pattern and Cardiovascular Disease: A Systematic Review and Meta-analysis of Controlled Trials. Prog Cardiovasc Dis 2018; 61: 43-53.
365. Zhao Y, Zhan J, Wang Y, Wang D: The Relationship Between Plant-Based Diet and Risk of Digestive System Cancers: A Meta-Analysis Based on 3,059,009 Subjects. Front Public Health 2022; 10: 892153.
366. Pollakova D, Andreadi A, Pacifici F, Della-Morte D, Lauro D, Tubili C: The Impact of Vegan Diet in the Prevention and Treatment of Type 2 Diabetes: A Systematic Review. Nutrients 2021; 13: 2123.
367. Turner-McGrievy G, Harris M: Key elements of plant-based diets associated with reduced risk of metabolic syndrome. Curr Diab Rep 2014; 14: 524.
368. McLean CP, Kulkarni J, Sharp G: Disordered eating and the meat-avoidance spectrum: a systematic review and clinical implications. Eat Weight Disord 2022; 27: 2347-75.
369. Chan H, Ribeiro RV, Haden S, Hirani V: Plant-Based Dietary Patterns, Body Composition, Muscle Strength and Function in Middle and Older Age: A Systematic Review. J Nutr Health Aging 2021; 25: 1012-22.
370. Azzola LG, Fankhauser N, Srinivasan M: Influence of the vegan, vegetarian and omnivore diet on the oral health status in adults: a systematic review and meta-analysis. Evid Based Dent 2023; 24: 43-4.
371. Avnon T, Anbar R, Lavie I, et al.: Does vegan diet influence umbilical cord vitamin B12, folate, and ferritin levels? Arch Gynecol Obstet 2020; 301: 1417-22.
372. Avnon T, Dubinsky EP, Lavie I, Bashi TB, Anbar R, Yogev Y: The impact of a vegan diet on pregnancy outcomes. J Perinatol 2021; 41: 1129-33.
373. Kesary Y, Avital K, Hiersch L: Maternal plant-based diet during gestation and pregnancy outcomes. Arch Gynecol Obstet 2020; 302: 887-98.
374. Perrin MT, Pawlak R, Judd N, Cooper J, Donati GL: Major and trace mineral composition of milk from lactating women following vegan, vegetarian and omnivore diets. Br J Nutr 2022: 1-8.
375. Pawlak R, Judd N, Donati GL, Perrin MT: Prevalence and Predictors of Low Breast Milk Iodine Concentration in Women Following Vegan, Vegetarian, and Omnivore Diets. Breastfeed Med 2023; 18: 37-42.
376. Neville J, Pawlak R, Chang M, Furst A, Bode L, Perrin MT: A Cross-Sectional Assessment of Human Milk Oligosaccharide Composition of Vegan, Vegetarian, and Nonvegetarian Mothers. Breastfeed Med 2022; 17: 210-7.
377. Baleato CL, Ferguson JJA, Oldmeadow C, Mishra GD, Garg ML: Plant-Based Dietary Patterns versus Meat Consumption and Prevalence of Impaired Glucose Intolerance and Diabetes Mellitus: A Cross-Sectional Study in Australian Women. Nutrients 2022; 14: 4152.
378. Dos Santos H, Gaio J, Durisic A, Beeson WL, Alabadi A: The Polypharma Study: Association Between Diet and Amount of Prescription Drugs Among Seniors. Am J Lifestyle Med 2021.
379. GRADEpro GDT: GRADEpro Guideline Development Tool [Software]. McMaster University and Evidence Prime, 2021. Available from gradepro.org.

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