

Table S1 Summary of included studies (n = 65).

Author year	Country	Type of intervention	Intervention description	N participants	Study length	Participant Age (years)	Key results
(Lauque, Arnaud-Battandier et al. 2000) [1]	France	Oral nutrition supplementation	Four groups depending on nutritional status (MNA score). Those at risk or malnourished received oral supplementation (MNA score of 17-23.5).	88	2-months	76-92	Energy intake at day 60 was significantly higher with an additional 400 kcal of energy. Those receiving oral nutrition supplementation who were at risk increased their MNA score and weight (1.4 ± 0.5 kg). Those who were malnourished had a weight gain of (1.5 ± 0.4 kg) and increased their MNA score from 13.9 ± 2.6 to 17.1 ± 3.9 .
(Kwok, Woo et al. 2001) [2] ABSTRACT ONLY	China	Oral nutrition supplementation	Milk powder 2x daily or no supplementation to reduce malnutrition. Typical oral supplements and yoghurts are not popular in the Chinese setting and therefore alternatives are needed to address undernutrition.	47	7-weeks	N/A	Compliance was close to 100% and no diarrhoea symptoms were identified indicating the supplementation was well tolerated. Those receiving milk supplementation had increased calcium, Vitamin D, Vitamin A, potassium and riboflavin intakes. No

							statistically significant changes in weight gain, hand grip strength or mental function were identified.
(Beck, Ovesen et al. 2002) [3]	Denmark	Oral nutrition supplementation	Home-made oral nutrition supplements (240 kcal/serve) on body weight and EI. Participants divided in three classes relating to MNA scores.	66	2-months	76-91	Daily energy from the oral nutrition supplement averaged 1.6 MJ and undernourished participants significantly increased their energy intake ($p < 0.001$). body weight was unchanged in all 3 groups.
(Wouters-Wesseling, Wouters et al. 2002) [4]	Netherlands	Oral nutrition supplementation	Complete micronutrient-enriched liquid nutrition supplement ONS of 125 ml and 0.6 MJ (135 kcal) or placebo twice daily during daytime between main meals. Study measures at 0,6 and 12 -weeks (weight, plasma values, vitamins, bowel function).	35	12-weeks	84-92	Significant improvement to body weight between groups (2.2 kg, $p = 0.03$) and for homocysteine, Vitamin B1, B6, B12, folate and Vitamin D in the supplemented group compared to control (placebo). No gastrointestinal symptoms were noted indicated a tolerance among participants.

(Young, Greenwood et al. 2004) [5]	Canada	Oral nutrition supplementation	Providing a midmorning nutrition supplement increases habitual energy intake in seniors with probable Alzheimer's disease (AD) and to investigate the effects of body weight status and cognitive and behavioural function on the response to the intervention. 3/4 nutrition bar + juice, or liquid supplement or alternative that meets similar kcal.	34	84-days (4x 21-day phases)	84-92	Compared to the habitual group, the intervention group had increased energy, protein and carbohydrate intake. However, compensation was observed at lunch meals i.e., reduced intake by those with lower BMI, poor attention and cognitive impairment.
(Langkamp-Henken, Wood et al. 2006) [6]	United States	Oral nutrition supplementation	Experimental nutritional formula (EXP) supports immune function 240 mL/d as opposed to standard liquid nutrition. EXP had higher level of antioxidants, B vitamins, selenium and zinc compared to usual liquid supplement.	92	10-weeks	80-86	Enhanced immune function observed by those receiving the EXP as indicated by increased H1N1 antibodies (p = 0.047) and vaccine responses.
(Beck, Damkjaer et al. 2008) [7]	Denmark	Oral nutrition supplementation	Nutrition (chocolate and home-made oral supplements) AND oral	62	11-weeks	84-90	Intervention group had higher change in weight (p = 0.005), BMI (p = 0.003),

			care AND exercise twice a week (45-60 min moderate intensity). Assessed weight, BMI, hand grip, senior fitness test, balance and plaque prevalence.				energy intake (p = 0.084), protein intake (p = 0.012) and Berg's balance scale (p = 0.004) compared to control. Plaque prevalence did not change.
(Manders, de Groot et al. 2009) [8]	Netherlands	Oral nutrition supplementation	Nutrient-enriched drink 2x a day to improve dietary intake and nutritional status (provided 25-175% of Dutch RDAs), drinks were flavoured either summer or spring fruit OR placebo drink.	176	24-weeks	65-89	Significant increase in Vitamin and mineral intake and vitamin status in blood in the intervention group vs control (p < 0.001). Energy intake decreased in both groups (-0.5 MJ/day) indicating that the nutritional supplement did not cause participants to compensate other energy intake because of the nutrient drink.
(Allen, Methven et al. 2014) [9]	United Kingdom	Oral nutrition supplementation	Supplement drink (ONS) serving method - glass/beaker or straw in container to Improve intake in cognitively impaired individuals from aged care and hospitals.	45	12-months	79-94	Participants who were randomized to consume the supplement from a glass/beaker drank significantly more than those who were presented with a straw in the container (p = 0.027). The

							glass/beaker method increased intake positively.
(Tylner, Cederholm et al. 2016) [10]	Sweden	Oral nutrition supplementation	ONS 30/mL energy dense formula (oleic and linoleic acid emulsion enriched with protein and micronutrients) 3x daily to improve nutritional status, food intake and physical function.	28	15-weeks	74-93	Intervention significantly improved energy intake (238 ± 544 kcal) and weight gain (1.4 ± 3.7) (p < 0.05). An increase in appetite and polyunsaturated fat were also observed while saturated fat was decreased. The ONS improved nutritional status including fatty acid profile and may have a role in antithrombosis (reduced serum fibrinogen and apolipoprotein A).
(Beelen, de Roos et al. 2017) [11]	Netherlands	Oral nutrition supplementation	ONS in familiar foods and drinks for residents i.e., bread, soups, juices, mashed potatoes to improve protein intake.	22	10-days	74-92	Protein intake significantly increased by 11.8 g/day (p = 0.003). energy and other macronutrients did not change.
(Grönstedt, Vikström et al. 2018) [12]	Sweden	Oral nutrition supplementation	Improving physical health and nutrition status through protein-rich dietary supplementation (ONS) and a sit-to-stand exercise regimen. Two	120	12-weeks	N/A	PROTOCOL ONLY

			arm trial with intervention participants receiving a ONS 2x a day and perform the sit-to-stand exercise 4x daily.				
(Boockvar, Judon et al. 2020) [13]	United States	Oral nutrition supplementation	Multicomponent intervention (HELP-LTC) to improve cognition, immobility, dehydration and malnutrition (includes nutritional supplement).	219	N/A 2x daily	79-83	No significant differences in delirium, dehydration or undernutrition were observed between groups. The intervention did not have the intended effect.
(Parsons, Stratton et al. 2017) [14]	United Kingdom	Oral nutrition supplementation	Comparison of an oral nutrition supplement and dietary advice on quality of life in malnourished residents of aged care. ONS included drinks, soups, puddings.	104	3-months	81-96	Quality of life was significantly higher in the ONS group compared to dietary advice. Energy, protein and micronutrient intake were also significantly greater in the ONS group compared to dietary advice.
(Stow, Ives et al. 2015) [15]	United Kingdom	Dietary supplement/fortification and Oral nutrition supplementation	Food-based intervention (approx. 600 kcal and 20-25 g protein from fruit fool, mousse, milkshake, smoothie, coffee, malt drink or hot chocolate) OR oral nutrition supplement (Nutricia) OR standard	93	6-months	>65	No differences between groups for outcomes. The cost of food-based intervention was significantly cheaper (65-80 pence) compared to the ONS (1.45-2.06 pounds).

			care on weight and BMI in malnourished residents (3 arms).				
(Fiatarone Singh, Bernstein et al. 2000) [16]	Australia	Dietary supplement/fortification	Multi-nutrient supplement vs placebo drink.	50	10-weeks	87-89	No significant improvement in energy intake with the supplement. However, folate levels improved and a small statistically insignificant change in weight loss was observed.
ABSTRACT ONLY							
(Langkamp-Henken, Herrlinger-Garcia et al. 2000) [17]	United States	Dietary supplement/fortification	Arginine supplementation (amino acid) on pressure ulcers and lymphocyte proliferation. 0 g, 8 g or 17 g. tolerance also assessed through gastrointestinal symptoms and nausea and vomiting.	32	4-weeks	78-89	Plasma arginine significantly increased with supplementation and changes to lymphocyte proliferation and Interleukin-2 were identified for those without ulcers. Supplementation was tolerable with no symptoms.
(Barnett, Dao et al. 2016) [18]	United States	Dietary supplement/fortification	Zinc supplementation to elderly with low serum zinc concentration (5 mg/day zinc gluconate for placebo and 30 mg/day for intervention).	54	3-months	75-93	The intervention group receiving zinc supplementation had significantly higher levels of serum zinc ($p = 0.007$) when controlling for c-reactive protein, copper and albumin. Zinc

							supplementation also had a role in increased number of peripheral T cells ($p < 0.05$).
(van Dongen, van Rossum et al. 2003) [19]	Netherlands	Dietary supplement/fortification	Ginkgo (either 240 mg/d or 160 mg/d) or placebo (0 mg/d) in residents with dementia to improve age-associated memory through Syndrome Kurz Test (SKT; psychometric functioning), Clinical Global Impression of change (CGI-2; psychopathology) and the Nuremberg Gerontopsychological Rating Scale for Activities of Daily Living (NAI-NAA; behavioural functioning).	123	6-months	77-88	No significant differences found indicating Ginkgo may not have a direct role in memory for dementia patients.
(Crogan, Velasquez et al. 2005) [20]	United States	Dietary supplement/fortification	Iron (25 mg chelated) OR Vitamin C (250 mg) supplementation 3x a day post flu vaccination, more focused on immune response rather than improving nutrition status.	14	30-days	>65	Serum transferrin was significantly different following iron supplementation ($p < 0.05$).

(Flicker, MacInnis et al. 2005) [21]	Australia	Dietary supplement/fortification	Vitamin D supplementation on falls and fractures (ergocalciferol) 10,000 IU weekly then 1,000 IU daily for 2 years or placebo. All participants received 600mg calcium carbonate daily.	625	24-months	75-92	Incident rate ratio for falls was 0.73, odds ratio for ever falling was 0.82 and fractures was 0.69. Falls can be reduced with vitamin D supplementation.
(Kikutani, Enomoto et al. 2006) [22]	Japan	Dietary supplement/fortification	High caloric/high protein diet OR oral function with supplementation to reduce malnourishment. Oral training or motor function training included subjects related to breathing, neck stretching, lips/cheeks, tongue and soft palate elevation which trains the muscle groups in the oral and perioral areas.	14	4-months	75-95	In the group receiving supplementation only, serum albumin did not significantly improve. In the supplementation combined with oral training, serum albumin significantly increased from 3.56 ± 0.22 g/dL to 3.70 ± 0.33 g/dL after intervention ($p < 0.05$). nutritional supplementation paired with oral training from a dental hygienist was more effective.
(Law, Withers et al. 2006) [23]	United Kingdom	Dietary supplement/fortification	Vitamin D supplementation, ergocalciferol 2.5 mg/3 - months (equivalent of	3717	10-months	85 (mean)	No statistically significant differences in relation to falls and Vitamin D status. Vitamin D status did not

			1,100 IU) to prevent fracture risk.				have an impact on falls or fractures in this population.
(Meydani, Leka et al. 2004) [24]	United States	Dietary supplement/fortification	Vitamin E (dl- α -tocopherol) supplementation (200 IU/day) to improve immune responses and decrease infections.	617	12-months	>65	Vitamin E had no statistically significant impact on number of days with infection, or infection type (lower, upper respiratory). However, those supplemented with Vitamin E did have fewer acquisition on one or more respiratory infections (p = 0.036) and fewer colds (p = 0.016). Vitamin E may have a protective effect for the common cold.
(Broe, Chen et al. 2007) [25]	United States	Dietary supplement/fortification	Vitamin D supplementation on falls risk at four different doses (200 IU, 400 IU, 600 IU or 800 IU).	124	5-months	83-95	Residents with the highest Vitamin D supplementation (800 IU) had the fewest falls (20%) compared to 600IU and 400 IU (60%) and the placebo (44%). The 800 IU group had a 72% lower adjusted-incidence rate ratio of falls. Higher Vitamin D supplementation appears to be more protective than

(Wigg, Prest et al. 2006) [26]	Australia	Dietary supplement/fortification	Lactose microencapsulated vitamin D3 100,000 IU orally to improve Vitamin D nutrition in elderly residents.	137	6-months	78-92	<p>mid-range supplementation.</p> <p>At 6 -months, serum 25-hydroxyvitamin D [25(OH)D] levels were within the desired range increasing from 36.4 ± 12.6 nmol/L to 124.0 ± 27.9 nmol/L. This oral protocol of Vitamin D supplementation is safe (non-toxic) and inexpensive (\$4/annum).</p>
(Chel, Wijnhoven et al. 2008) [27]	Netherlands	Dietary supplement/fortification	Vitamin D3 supplementation (600 IU/day, 4200 IU/week or 18,00 IU/month) on Vitamin D status and bone loss. Calcium added after 4 -months (320 mg/day or 640 mg/day or placebo).	338	18-weeks	78-90	<p>At 4 -months mean serum 25-hydroxyvitamin D increased to 62.5 nmol/L after 600 IU/day, 69.9/nmol/L after 4200 IU/week and to 53.1 nmol/L after 18,000 IU monthly compared to baseline (25.0 nmol/L), $p < 0.001$ between groups. Bone turnover markers were not affected, nor was parathyroid hormone. Daily supplementation was the</p>

(Liu, McGeer et al. 2007) [28]	Canada	Dietary supplement/fortification	Multivitamin and mineral supplementation to reduce infection (Vitamin A, β -carotene, Vitamin D, Vitamin E, Vitamin C, thiamine, riboflavin, niacin, B6, calcium, magnesium, iron, iodine, zinc, copper, selenium).	748	18-months	77-93	<p>most effective for improving serum levels.</p> <p>No differences on episodes of infection or hospital visits between control and intervention groups. However, a reduction in antibiotic use was observed in the supplemented group, but this was not statistically significant. Participants without dementia had higher likelihood of infection compared to those with dementia.</p>
(Lyons, Johansen et al. 2007) [29]	United Kingdom	Dietary supplement/fortification	Four-monthly oral supplementation of vitamin D2 (ergocalciferol) at 100,000 IU = 1.25 mg/tablet 3x a year to improve vitamin D status and prevent fractures.	3440	36-months	76-92	<p>A similar number of 'first fractures' occurred in the intervention group 205 vs control group 218/. The hazard ratio of 0.95 for intervention vs control did not reach statistical significance. Supplementation was not effective in reducing fractures.</p>

(Moreira-Pfrimer, Pedrosa et al. 2009) [30]	Brazil	Dietary supplement/fortification	Daily calcium plus monthly placebo (calcium/placebo group) or daily calcium plus oral cholecalciferol (150,000 IU once a month during the first 2 -months, followed by 90,000 IU once a month for the last 4 -months; calcium/Vitamin D group) for muscle strength and biochemical parameters.	56	6-months	63-94	The intervention group receiving calcium and Vitamin D had significantly higher serum hydroxyvitamin D levels than the placebo group ($p < 0.0001$). Hip flexor strength ($p = 0.0001$) and knee extensor strength ($p = 0.0007$) also improved in the intervention group. Supplementation was considered safe, able to enhance serum hydroxy Vitamin D levels and improved lower limb strength.
(Sambrook, Cameron et al. 2012) [31]	Australia	Dietary supplement/fortification	Increased sunlight exposure and calcium to improve Vitamin D status and reduce falls. Intervention participants = 30-40 min/day sunlight with or without calcium supplementation (600 mg/day) or neither.	602	12-months	80-93	Low adherence to sunlight exposure was observed. There was no association between increased UV exposure and falls. However, $n = 66$ participants who had high adherence for UV exposure had a significant reduction in falls compared to control group ($p = 0.01$).

(Bonjour, Benoit et al. 2013) [32]	United States	Dietary supplement/fortification	2x 125 g servings of either vitamin D and calcium fortified yoghurt (FY) at supplemental levels of 10 ug/d vitamin D3 and 800 mg/d calcium or nonfortified control yogurt (CY) providing 280 mg/d calcium to see effects on parathyroid hormone and bone resorption	89	56-days	64-87	At day 56 serum hydroxyvitamin D levels significantly increased in the calcium-fortified yoghurt and nonfortified control yoghurt (25.3 ± 1.8 vs 5.2 ± 2.5 nmol/L, $p < 0.0001$). changes in bone resorption markers and parathyroid hormone were also positively impacted indicating fortified vitamin products have a role in prevention of bone resorption.
(Corcoran, Nelson et al. 2017) [33]	United States	Dietary supplement/fortification	Exercise and nutritional supplement (300 kcal protein supplement from Nestle + 500 IU 25-hydroxyvitamin D, 480 mg calcium) program on physical function and nutrition status. Exercise component was a combination of aerobic and strength training.	93	6-months	74-90	The program (nutritional supplement + exercise) did not improve physical function or nutritional status at 6 -months. Blood levels of hydroxyvitamin D and IGF-1 were not altered.

(Pitkala, Strandberg et al. 2007) [34]	Finland	Dietary supplement/fortification	Fermented oat drink with two selected Bifidobacterium longum strains influences bowel movements. 1) 109 CFU/day Bifidobacterium longum strains or 2) 109 CFU/day Bifidobacterium lactis Bb12 or 3) without viable bacteria (placebo).	209	7-months	61-102	Compliance of 85%. Groups 1 and 2 receiving products with active strains had increased bowel movements compared to placebo group. The fermented oat drink could help alleviate gastrointestinal symptoms such as diarrhea and constipation and normalise bowel movements.
ABSTRACT ONLY							
(Kraft-Bodi, Jørgensen et al. 2015) [35]	Sweden	Dietary supplement/fortification	Probiotic lozenge containing 2x strains of <i>Lactobacillus reuteri</i> or placebo 2x daily. Purpose to reduce candida in oral cavity not focused on improving nutrition.	215	12-weeks	80-95	A statistically significant reduction in Candida counts were observed by those receiving the probiotic.
ABSTRACT ONLY							
(Miyagawa, Hayashi et al. 2008) [36]	Japan	Dietary supplement/fortification	L-cystine (700 mg) and L-theanine (280 mg) supplementation to improve immune response (amino acids) or placebo.	65	4-weeks	67-86	Supplementing with L-cystine and L-theanine together before a vaccination could result in an enhanced immune response for individuals with low serum protein ($p < 0.05$) and or haemoglobin

(Rondanelli, Opizzi et al. 2011) [37]	Italy	Dietary supplement/fortification	Oral essential amino acids 4 g x2 times a day for 8 - weeks or isocaloric placebo to improve quality of life and strength.	41	8-weeks	74-91	(p > 0.05) compared to control. The group receiving the essential amino acids improved their MNA score (p < 0.04), serum albumin (p < 0.01), haemoglobin (p = 0.001) and both the physical and mental domains of the SF-36 (p < 0.002). the EAA had a role in improving nutritional status and components of quality of life.
(Smoliner, Norman et al. 2008) [38]	Germany	Dietary supplement/fortification	MNA score of <23.5 randomised to either food fortification on functional status in residents at risk of malnutrition (protein and energy-enriched food and snacks, soups, sauces) or standard diet based on German reference values. Fortified diet had approximately 2000 kcal, 80 g protein, 60 g fat and 260 g carbohydrate.	65	12-weeks	73-94	Protein intake was increased for those receiving the fortified diet (1.3 ± 0.4 g/kg body weight vs 1.1 ± 0.1 g/kg body weight). Both groups had significant improvement to weight, BMI, MNA score, Barthel Index and the Pain domain in the SF-36. Grip strength and fat-free mass improved in the standard diet group but not the fortification group. The

							standard diet was providing benefits greater than the fortified diet in terms of nutritional status and functionality.
(Castellanos, Marra et al. 2009) [39]	United States	Dietary supplement/fortification	Comparison of weighed food intake on three menu conditions: 1) control (no meals enhanced), 2) lunch only enhanced 3) breakfast and lunch enhanced *enhancement is protein and energy.	33	Each condition (1,2,3) tested on two non-sequential days	78-99	Daily protein intake was not significantly increased when enhancing food with protein and energy.
(Leslie, Woodward et al. 2013) [40]	United Kingdom	Dietary supplement/fortification	Dietary modification to increase energy intake not portion size - energy-enriching approach (EE). EE double cream to cereal (50 mL), porridge, soups and desserts, butter (8 g) added to potatoes.	31	12-weeks	77-105	Average energy intake increased for the EE group but was not statistically significant. Average energy intake of control group decreased but was also not statistically significant. The intervention group gained an average of 1.3 kg (p = 0.03) and 6 intervention group participants increased their BMI to above 18.5 kg/m ² (p = 0.018). Enriching food may

							help address malnutrition and protect against weight loss.
(Sturtzel and Elmadfa 2008) [41]	Austria	Dietary supplement/fortification	Adding oat-bran (dietary fibre) to residents' diet to improve gastrointestinal symptoms as opposed to laxatives and impact on VitB6,12, folate, and homocysteine.	30	12-weeks	73-96	The fibre group had a 59% reduction in the use of laxatives ($p < 0.001$) and body weight remained constant throughout the intervention. Whereas the control group's weight decreased ($p < 0.005$). Adding fibre though an acceptable cake containing oat-bran may help alleviate gastrointestinal symptoms and reduce the need for laxatives which can contribute to weight loss and adverse impacts on Vitamin b12, folate and homocysteine.
(Van Wymelbeke, Brondel et al. 2016) [42]	France	Dietary supplement/fortification	Protein and energy enriched brioche (65 g/13 g protein/180 kcal) to improve nutritional status of malnourished residents compared to ONS (200 ml/14 g protein/200 kcal)	68	12-weeks	70-99	Energy intake increased significantly for the brioche group at day 30 ($p = 0.004$) and day 90 ($p = 0.018$) compared to the ONS supplement group and control group. The brioche

			and usual breakfast. Three-armed trial.				group also had a higher percentage of the protein RDI compared to the ONS and control group (72%, 53% and 36%, respectively) and improved levels of vitamin b9, b2, 12 and D. A food-based intervention was more successful in improving nutritional status compared to a liquid supplement.
(Zak, Swine et al. 2009) [43]	Poland	Dietary supplement/fortification	Exercise regime + nutrition supplementation to improve mobility and functional status. 4 groups = 1) PRE+FOE+ONS 2) PRE+FOE+placebo 3) SE+FOE+ONS 4) SE+FOE+placebo *PRE = progressive resistance exercises; FOE = functionally-orientated exercises; NS = nutrition supplements; SE = standard exercises.	80	7-weeks	70-88	Group 1 and 2 significantly improved their muscle strength (p = 0.01 and p = 0.04, respectively). Mobility was improved in group 3 and 4 (p = 0.002). Participants in group 3 gained an average of 1.72 kg over the 7 -weeks (p = 0.01). MNA was only measured at baseline.

(Courel-Ibáñez and Pallarés 2019) [44]	Argentina	Dietary supplement/fortification	One of four groups: 1) exercise with HMB supplementation, 2) exercise intervention with placebo, 3) no exercise with HMB supplementation OR 4) no exercise no HMB supplementation. HMB 3 g/day in powder form (amino acids).	104	24-weeks	n/a	PROTOCOL ONLY
(Handeland, Grude et al. 2014) [45]	Norway	Dietary supplement/fortification	Black chokeberry juice to prevent UTIs and associated complications. The phenolic compounds hypothesised to reduce UTIs with an antimicrobial and remedial effect. Participants consumed placebo for 3 -months followed by chokeberry drink (156 ml) (cross-over trial). Composition of the drink: 750 mg gallic acid, B-type procyanidins, anthocyanins and chlorogenic acids).	236	6-months	85 (mean)	At three -months, a reduction in UTIs and antibiotic use was observed in both groups.

<p>(Madden, Argraves et al. 2015) [46]</p> <p>RESEARCH BRIEF</p>	<p>United States</p>	<p>Dietary supplement/fortification</p>	<p>Cranberry capsule to prevent UTIs and measure antibiotic susceptibility. Daily doses of 0,1,2 and 3 capsules containing 0.36 mg, 72 mg and 109 mg of proanthocyanins in females only.</p>	<p>80</p>	<p>4-weeks</p>	<p>>65</p>	<p>The pilot study found a dose-dependent trend for cranberry capsules for decreased bacteriuria plus pyuria. The capsules had no effect on relative proportions of <i>Escherichia coli</i> to non- <i>Escherichia coli</i> bacteria.</p>
<p>(Hashimoto, Kato et al. 2017) [47]</p>	<p>Japan</p>	<p>Dietary supplement/fortification</p>	<p>Docosahexaenoic acid (DHA) enriched meals on cognitive function in the elderly with cognitive impairment and dementia. Intervention group received a meal with an additional 1720 mg of DHA for 12 -months.</p>	<p>75</p>	<p>12-months</p>	<p>88-89</p>	<p>No significant differences in Zung self-rating depression scale, Apathy score. But, at 12--months the intervention group had greater a protective effect against cognitive decline and apathy.</p>
<p>(Martini, Bernardi et al. 2020) [48]</p>	<p>Italy</p>	<p>Dietary supplement/fortification</p>	<p>Evaluation of MAPLE trial to investigate benefits of polyphenol-enriched diet on intestinal permeability - including ~770 mg of polyphenols per day by changing menu. foods: blood orange fruit, juice, apples, apple puree, blueberry, blueberry</p>	<p>51</p>	<p>24-weeks</p>	<p>>60</p>	<p>Consumption of polyphenols increased significantly with the polyphenol enriched diet compared to control (p < 0.0001) by around 600 mg/day. Most polyphenols in the polyphenol-rich diet were from snacks (~50%)</p>

			puree, pomegranate juice, green tea, cocoa powder, chocolate callets (similar to chocolate chips but with a higher fat content).				compared to control group (~15%),
(Pouyssegur, Brocker et al. 2015) [49]	France	Dietary supplement/fortification	Solid nutrition supplement (SNS) to fight weight loss and anorexia. Intervention group participants received eight cookies daily (11.5 g protein; 244 kcal) for 6 -weeks (week 0-week 6). High energy high protein diet.	175	6-weeks	78-94	The intervention group gained an average of 1.6 kgs compared to the control group (p = 0.025). Sub-group analysis indicated that the cookies were the main driver of weight gain (p = 0.024), appetite (p = 0.009) and a reduction in pressure ulcers (p = 0.031).
(Remsburg, Luking et al. 2001) [50]	United States	Changing meal timing/frequency	Implementing a buffet-dining program in long-term care facility to improve nutritional status of residents at risk of malnutrition and enhance meal enjoyment. Intervention participants received buffet-style dining (supper only) while control participants received the standard tray-style meal.	40	3-months	86-88	No statistically different changes to weight, haemoglobin, haematocrit, total cholesterol, prealbumin or total lymphocyte count. However, the buffet style dining appeared to be feasible.

(Nijs, de Graaf et al. 2006) [51]	Netherlands	Changing meal timing/frequency	Effect of family style mealtimes on QoL, physical performance and body weight. Tablecloths, flower arrangements, menu choice on day, dishes VS pre-plated tray, staff sit with residents and chat, balanced seating i.e., 6 per table.	178	6-months	65-89	Quality of life, fine motor function, energy intake and body weight improved in the intervention group.
(Taylor and Barr 2006) [52]	Canada	Changing meal timing/frequency	Small frequent (5 VS 3) texture modified meals to improve energy intake as opposed to standard care for residents with dysphagia.	31	5-weeks (2x 4-day study period 4-week washout)	71-96	Average energy intake did not significantly differ between groups (p = 0.565). However, fluid intake was significantly higher in the 5 meals per day group (p = 0.003).
(Visscher, Battjes-Fries et al. 2020) [53]	Netherlands	Changing meal timing/frequency	Using finger foods as a strategy to improve fruit and vegetable intake in residents with dementia. Regular diet + finger foods (quiches, cakes containing fruit and or vegetables).	15	6-weeks	75-94	Fruit and vegetable intake increased with addition of finger foods by 1.4(70 g) pieces with 41 g of fruit or vegetables. Consuming these finger foods did not result in a decrease in intake during main meals. Positive feedback was given by caregivers.

(Simmons, Keeler et al. 2008) [54]	United States	Changing meal timing/frequency	Research staff provided feeding assistance to older residents twice per day.	173	6-months	83	Total daily calorie intake and body weight improved significantly in the intervention group compared to the control group who had no change to calorie intake and had a decrease in body weight.
Crogan, Dupler et al. (2013) [55]	United States	Changing meal timing/frequency	Delivery of the Eat Right food system on resident's food satisfaction and intake and serum prealbumin levels. The Eat Right system was designed to amend aged care menus to improve resident food choice and intake.	61	6-months	75-94	The intervention group had improvements to serum prealbumin ($p = 0.001$), improvement to food service satisfaction and improvement to body weight ($p = 0.029$).
(Côté, Payette et al. 2017) [56] ABSTRACT ONLY	Canada	Texture modification	Texture-modified Epikura (lunch/dinner) on nutritional intakes of elderly with dysphagia. Patented technology of texture modified foods that closely resemble real foods.	27	24-weeks	N/A	Those receiving Epikura had an increase in energy intake ($p = 0.004$), carbohydrate intake ($p = 0.04$) and lipid intake ($p = 0.001$) compared to the control group who received the standard institutional texture-modified foods. Weight did not change.

(Okkels, Saxosen et al. 2018) [57]	Denmark	Texture modification	Texture modified diet for individuals with dysphagia- assessing meals based on flavour and appearance on a 3-point hedonic scale. Some meals enriched with protein powder.	30	4-days	76-92	Participants preferred cold and sweet foods in between meals which were higher in fat and energy (vanilla flavoured ice cream, strawberry parfait and pannacotta).
(Iuliano, Woods et al. 2013) [58]	Australia	Changing menu - targeting foods or food groups	Providing additional dairy serves (2/day) to improve nutrient and energy intakes to prevent malnutrition.	130	4-weeks	81-94	Providing 2 extra serves resulted in increased energy intake (900 kJ, $p < 0.001$), protein intake (25 g, $p < 0.0001$), %en from protein (4%, $p < 0.0001$) and proportion of EER (18%, $p < 0.0001$). A significant increase in daily micronutrient intakes were also observed for calcium, Vitamin D, phosphorous and zinc (all $p < 0.0001$).
(Iuliano, Poon et al. 2021) [59]	Australia	Changing menu - targeting foods or food groups	Providing additional milk, yoghurt and cheese (dietary calcium) on hip fractures and falls. Facilities randomised to provide up to 1142 mg calcium per day and 69 g	7195	24-months	78-94	135 hip fractures, over 4000 falls and almost 2000 deaths. Intervention with additional calcium was associated with a 33% risk reduction for all fractures,

			protein (1.1 g/kg body weight) or control conditions i.e., usual menus which provide 700 mg ca/day and 58 g/protein/day (0.9 g/kg body weight).				46% for hip fractures only and 11% for falls.
(Iuliano, Poon et al. 2023) [60]	Australia	Changing menu - targeting foods or food groups	60 facilities randomly allocated to a high-protein (n = 30 intervention) or regular (n = 30 controls) menu.	654	24-months	79-94	Providing an extra 11 g of high-protein foods per day was able to preserve intervention participant's nutritional status compared to controls for screen (p < 0.001) and total MNA scores (p = 0.001). A group difference in haemoglobin (3.60 g/L) was found (p = 0.039) but not for serum albumin.
(Beck, Christensen et al. 2016) [61]	Denmark	Other - multidisciplinary nutritional support	Effect of multi-disciplinary team with nutritional support for undernutrition, quality of life, muscle strength and oral care. Involved physiotherapist, dietitian, occupational therapist. A train the trainer approach	246	11-weeks	78-95	A statistically significant difference was found in quality of life (p = 0.001), the 30-second chair stand test (p = 0.005) and oral care (p = 0.021).

			was used to educate nutrition coordinators.				
(Shatenstein and Ferland 2000) [62]	Canada	Other - changing meal portioning	Evaluate change from a centralized food delivery system to decentralized bulk food portioning - meal portioning which occurs on resident's floor of nursing home to improve intake/consumption.	22	2x 3 non-consecutive days	72-91	Average food consumption increased significantly when using the bulk food portioning system (1,555 kcal/day vs 1,924 kcal/day). no changes in anthropometric or biochemical measurements were found apart from albumin level which decreased. Food portioning may simulate a dining experience and improve food consumption.
(Essed, van Staveren et al. 2007) [63]	Netherlands	Other - adding monosodium glutamate to enhance flavour	Flavour enhancement on nutritional status (control group, MSG group, flavour group and flavour plus MSG group).	83	16-weeks	77-94	Energy intake and body weight did not improve over the intervention in any group. Enhancing the flavour of foods and meals with MSG did not increase intake or improve nutrition status.
(Badrasawi, Shahar et al. 2013) [64]	Malaysia	Other - adding honey as a flavour enhancer to Tallbinah	Talbinah (barley syrup cooked with milk and honey) on mood and depression. Geriatric	30	7-weeks	67 (mean)	Statistically significant decrease in depression, stress and mood disturbances in the

			depression scale, depression anxiety stress scale and profile of mood states used to determine change to mood and depression. Talbinah is a high carbohydrate high tryptophan food.				intervention group (p < 0.05).
(Gaskill, Isenring et al. 2009) [65]	Australia	Other - education	Nutrition education program introduced coordinated by an external Nutrition Coordinator to improve diet, fluid intake and oral hygiene.	352	6-months	84.2 (mean)	Almost 50% of residents were moderate to severely malnourished. Intervention participants were more likely to maintain or improve nutrition status while the control group had increased likelihood of deterioration (p = 0.027).

MNA = Mini-nutritional assessment; ONS = oral nutrition supplement; en = energy; MSG = monosodium glutamate; BMI = body mass index; g/L = grams per litre; EER = estimated energy requirement; kcal = kilocalorie; kJ = kilojoule; IU = international units; CFU= colony forming units; HMB = Hydroxymethylbutyrate; UTI = urinary tract infection; QoL = quality of life.

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