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Dietary Patterns and Neurocognitive Health: A Systematic Review

Carol Boushey, PhD, MPH, RD,[a] Jamy Ard, MD,[b] Lydia Bazzano, MD, PhD,[c] Steven Heymsfield, MD,[d] Elizabeth Mayer-Davis, PhD, RD,[e] Joan Sabaté, MD, DrPH,[f] Linda Snetselaar, PhD, RDN,[g] Linda Van Horn, PhD, RDN, LD,[h] Barbara Schneeman, PhD,[i] Laural Kelly English, PhD,[j] Marlana Bates, MPH, RD,[j] Emily Callahan, MS,[k] Sudha Venkatramanan, PhD,[j] Gisela Butera, MLIS, MEd,[l] Nancy Terry, MS, MLS,[m] Julie Obbagy, PhD, RD[n]

[a] Chair, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; University of Hawaii

[b] Member, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; Wake Forest School of Medicine

[c] Member, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; Tulane University and Ochsner Health System

[d] Member, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; Louisiana State University, Pennington Biomedical Research Center

[e] Member, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; University of North Carolina at Chapel Hill

[f] Member, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; Loma Linda University

[g] Member, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; University of Iowa

[h] Member, Dietary Patterns Subcommittee, 2020 Dietary Guidelines Advisory Committee; Northwestern University

[i] Chair, 2020 Dietary Guidelines Advisory Committee; University of California, Davis

[j] Systematic review analyst, Nutrition Evidence Systematic Review (NESR) team; Panum Group under contract with the Food and Nutrition Service (FNS), U.S. Department of Agriculture (USDA)

[k] Systematic review analyst, NESR team; Nutrition Guidance and Analysis Division (NGAD), Center for Nutrition Policy and Promotion (CNPP), FNS, USDA

[l] Systematic review librarian, NESR team; Panum Group under contract with the FNS, USDA

[m] Biomedical librarian, NESR team; National Institutes of Health Library, U.S. Department of Health and Human Services [n] Project Lead, NESR team; NGAD, CNPP, FNS, USDA

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Dietary Patterns Subcommittee:

- Carol Boushey, PhD, MPH, RD, University of Hawaii, Subcommittee Chair
- Jamy Ard, MD, Wake Forest School of Medicine
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- Steven Heymsfield, MD, Louisiana State University, Pennington Biomedical Research Center
- Elizabeth Mayer-Davis, PhD, RD, University of North Carolina at Chapel Hill
- Joan Sabaté, MD, DrPH, Loma Linda University
- Linda Snetselaar, PhD, RDN, University of Iowa
- Linda Van Horn, PhD, RDN, LD, Northwestern University
- Barbara Schneeman, PhD, University of California, Davis, Chair of the 2020 Dietary Guidelines Advisory Committee

Nutrition Evidence Systematic Review (NESR) Team:

- Laural Kelly English, PhD, Analyst, Panum Group[i]
- Marlana Bates, MPH, RD, Analyst, Panum Group[i]
- Emily Callahan, MS, Analyst, Nutrition Guidance and Analysis Division (NGAD), Center for Nutrition Policy and Promotion (CNPP), Food and Nutrition Service (FNS), U.S. Department of Agriculture (USDA)
- Sudha Venkatramanan, PhD, Analyst, Panum Group[i]
- Gisela Butera, MLIS, MEd, Systematic Review Librarian, Panum Group[i]
- Nancy Terry, MS, MLS, Biomedical Librarian, National Institutes of Health (NIH) Library, U.S. Department of Health and Human Services (HHS)
- Julie Obbagy, PhD, RD, Project Lead, NGAD, CNPP, FNS, USDA

Federal Liaisons:

- Elizabeth Rahavi, RD, NGAD, CNPP, FNS, USDA
- Clarissa (Claire) Brown, MS, MPH, RD, NGAD, CNPP, FNS, USDA

Project Leadership:

- Eve Stoody, PhD, Designated Federal Officer and Director, NGAD, CNPP, FNS, USDA
- Janet de Jesus, MS, RD, Nutrition Advisor, Office of Disease Prevention and Health Promotion, Office of the Assistant Secretary for Health, HHS

USDA and HHS implemented a process to identify topics and scientific questions to be examined by the 2020 Dietary Guidelines Advisory Committee. The Committee conducted its review of evidence in subcommittees for discussion by the full Committee during its public meetings. The role of the Committee members involved establishing all aspects of the protocol, which presented the plan for how they would examine the scientific evidence, including the inclusion and exclusion criteria; reviewing all studies that met the criteria they set; deliberating on the body of evidence

[i] Under contract with the Food and Nutrition Service, United States Department of Agriculture.

for each question; and writing and grading the conclusion statements to be included in the scientific report the 2020 Committee submitted to USDA and HHS. The NESR team with assistance from Federal Liaisons and Project Leadership, supported the Committee by facilitating, executing, and documenting the work necessary to ensure the reviews were completed in accordance with NESR methodology. More information about the 2020 Dietary Guidelines Advisory Committee, including the process used to identify topics and questions, can be found at www.DietaryGuidelines.gov. More information about NESR can be found at NESR.usda.gov.

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INTRODUCTION

This document describes a systematic review conducted to answer the following question: What is the relationship between dietary patterns consumed and neurocognitive health? This systematic review was conducted by the 2020 Dietary Guidelines Advisory Committee, supported by USDA's Nutrition Evidence Systematic Review (NESR).

More information about the 2020 Dietary Guidelines Advisory Committee is available at the following website: www.DietaryGuidelines.gov.

NESR specializes in conducting food- and nutrition-related systematic reviews using a rigorous, protocol-driven methodology. More information about NESR is available at the following website: https://NESR.usda.gov.

NESR's systematic review methodology involves developing a protocol, searching for and selecting studies, extracting data from and assessing the risk of bias of each included study, synthesizing the evidence, developing conclusion statements, grading the evidence underlying the conclusion statements, and recommending future research. A detailed description of the systematic reviews conducted for the 2020 Dietary Guidelines Advisory Committee, including information about methodology, is available on the NESR website: https://nesr.usda.gov/2020-dietary-guidelines-advisory-committee-systematic-reviews. In addition, starting on page 49, this document describes the final protocol as it was applied in the systematic review. A description of and rationale for modifications made to the protocol are described in the 2020 Dietary Guidelines Advisory Committee Report, Part D: Chapter 8. Dietary Patterns.

List of abbreviations

Abbreviation	Full name
AHEI-2010	Alternative Healthy Eating Index-2010
aMED	Alternate Mediterranean diet score
A-MeDi	Alternate Mediterranean diet
APDQS	A Priori Diet Quality Score
BSD	Baltic Sea Diet
CERAD	Consortium to Establish a Registry for Alzheimer's Disease
CVD	Cardiovascular disease
DASH	Dietary Approaches to Stop Hypertension
HHS	United States Department of Health and Human Services
EVOO	Extra virgin olive oil
FFQ	Food frequency questionnaire
HEI-2010	Healthy Eating Index-2010
HHS	Health and Human Services
hPDI	Healthful plant-based diet index
MIND	Mediterranean-DASH diet Intervention for Neurodegenerative Delay
MMSE	Mini-Mental State Examiniation
mo	Month(s)
MUFA	Monounsaturated fatty acids
NESR	Nutrition Evidence Systematic Review
NHLBI	National Heart, Lung, and Blood Institute
NIH	National Institutes of Health
PDI	Plant-based diet index
PUFA	Polyunsaturated fatty acids
RCT	Randomized controlled trial
RRR	Reduced rank regression
SF-EMSE	Short Form Extended Mental State Exam

Abbreviation	Full name
USDA	United States Department of Agriculture
WHI	Women’s Health Initiative
wk	Week(s)
y	Year(s)

PLAIN LANGUAGE SUMMARY

What is the question?

- The question is: What is the relationship between dietary patterns consumed and neurocognitive health?

What is the answer to the question?

- Limited evidence suggests that dietary patterns containing vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood consumed during adulthood are associated with lower risk of age-related cognitive impairment and/or dementia.

Why was this question asked?

- This important public health question was identified by the U.S. Departments of Agriculture (USDA) and Health and Human Services (HHS) to be examined by the 2020 Dietary Guidelines Advisory Committee.

How was this question answered?

- The 2020 Dietary Guidelines Advisory Committee, Dietary Patterns Subcommittee conducted a systematic review to answer this question with support from the Nutrition Evidence Systematic Review (NESR) team.
- Dietary patterns were defined as the quantities, proportions, variety, or combination of different foods, drinks, and nutrients (when available) in diets, and the frequency with which they are habitually consumed.

What is the population of interest?

- For the intervention/exposure, children through older adults, age 2 years and older
- For the outcome, adults and older adults, age 19 years and older

What evidence was found?

- This review identified 26 articles that met inclusion criteria.
- Most studies reported dietary patterns consumed during adulthood relate to improved cognitive measures or lower risk of cognitive impairment. These dietary patterns were higher in vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood.
- Many limitations in study design and conduct were identified in the included studies. This includes differences in dietary patterns examined, cognitive assessment methods, and lack of accounting for possible changes in diet over time.
- The 2020 Committee updates and builds on the conclusion drawn by the 2015 Committee from an existing systematic review.

How up-to-date is this systematic review?

- This review searched for studies published from January 2014 to February 2020, and updated an existing systematic review that included evidence from January

1980 to August 2014.

TECHNICAL ABSTRACT

Background

- This important public health question was identified by the U.S. Departments of Agriculture (USDA) and Health and Human Services (HHS) to be examined by the 2020 Dietary Guidelines Advisory Committee.
- The 2020 Dietary Guidelines Advisory Committee, Dietary Patterns Subcommittee conducted a systematic review to answer this question with support from the Nutrition Evidence Systematic Review (NESR) team.
- The goal of this systematic review was to examine the following question: What is the relationship between dietary patterns consumed and neurocognitive health?

Conclusion statement and grade

- Limited evidence suggests that dietary patterns containing vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood consumed during adulthood are associated with lower risk of age-related cognitive impairment and/or dementia. (Grade: Limited)

Methods

- Two literature searches were conducted using 3 databases (PubMed, Cochrane, Embase) to identify articles that evaluated the intervention or exposure of dietary patterns consumed and the outcomes of neurocognitive health. A manual search was conducted to identify articles that may not have been included in the electronic databases searched. Articles were screened by two NESR analysts independently for inclusion based on pre-determined criteria
- Data extraction and risk of bias assessment were conducted for each included study, and both were checked for accuracy. The Committee qualitatively synthesized the body of evidence to inform development of a conclusion statement(s), and graded the strength of evidence using pre-established criteria for risk of bias, consistency, directness, precision, and generalizability.
- Dietary patterns were defined as the quantities, proportions, variety, or combination of different foods, drinks, and nutrients (when available) in diets, and the frequency with which they are habitually consumed.

Summary of the evidence

- This systematic review update includes 26 articles that met inclusion criteria and were published between January 2014 and February 2020.
    - Four studies were randomized controlled trials.
    - Twenty-two articles were from observational studies, with 21 prospective cohort designs and 1 nested-case control design.
- Studies in this update to the existing review produced similarly consistent results regarding the relationship between dietary patterns in adults and age-related cognitive decline, mild cognitive impairment, and/or dementia
- Dietary patterns were examined using various approaches including 17 studies that examined adherence to a dietary pattern using indices/scores, 4 articles identified dietary patterns using factor/cluster analysis, and 1 study used reduced rank regression.
- Outcomes were measured using various approaches and reported as global

cognition, cognitive performance, mild cognitive impairment, and/or incident dementia.

- The majority of significant findings reported dietary patterns consumed during adulthood were “protective” in either improving measures of cognitive impairment and/or reducing risk of cognitive impairment or dementia. These protective dietary patterns contained vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood. Many of these dietary patterns also emphasized whole grains, non-refined grains, or (non-refined) breads/cereals.
- Not all of these protective dietary patterns contained alcoholic beverages. The benefit of the overall dietary pattern with the outcome was still observed if alcoholic beverages, particularly red wine, were included.
- Non-significant findings or those reporting mixed associations reported dietary patterns consumed during adulthood did not worsen cognitive outcomes.
- There are numerous limitations across the body of evidence, including the lack of RCT’s, considerable variation in testing methods used, validity and reliability of the methods used, the dietary patterns and cognitive outcomes examined.
- This body of evidence updates and builds upon the conclusion drawn by the 2015 Dietary Guidelines Advisory Committee in an existing systematic review, which consisted of 30 articles from a wide range of study designs that used different methods to measure neurocognitive outcomes but produced relatively consistent findings.

FULL REVIEW

Systematic review question

What is the relationship between dietary patterns consumed and neurocognitive health?

Conclusion statement and grade

Limited evidence suggests that dietary patterns containing vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood consumed during adulthood are associated with lower risk of age-related cognitive impairment and/or dementia. (Grade: Limited)

Summary of the evidence

- This systematic review update includes 26 articles that met inclusion criteria and were published between January 2014 and February 2020.
    - Four studies were randomized controlled trials.[1-4]
    - Twenty-two articles were from observational studies, with 21 prospective cohort designs and 1 nested-case control design.[5-26]
    - This body of evidence updates and builds upon the existing systematic review, which consisted of 30 articles from a wide range of study designs that used different methods to measure neurocognitive outcomes but produced relatively consistent findings.
    - Dietary patterns were defined as the quantities, proportions, variety, or combination of different foods, drinks, and nutrients (when available) in diets, and the frequency with which they are habitually consumed.
- Studies in this update to the existing review produced similarly consistent results regarding the relationship between dietary patterns in adults and age-related cognitive decline, mild cognitive impairment, and/or dementia
    - Dietary patterns were examined using various approaches including 17 studies that examined adherence to a dietary pattern using indices/scores, 4 articles identified dietary patterns using factor/cluster analysis, and 1 study used reduced rank regression.
    - Outcomes were measured using various approaches and reported as global cognition, cognitive performance, mild cognitive impairment, and/or incident dementia.
        - The majority of significant findings reported dietary patterns consumed during adulthood were “protective” in either improving measures of cognitive impairment and/or reducing risk of cognitive impairment or dementia. These protective dietary patterns contained vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood. Many of these dietary patterns also emphasized whole grains, non-refined grains, or (non-refined) breads/cereals.
        - Not all of these protective dietary patterns contained alcoholic beverages. The benefit of the overall dietary pattern with the outcome was still observed if alcoholic beverages, particularly red wine, were included.

    - Non-significant findings or those reporting mixed associations reported dietary patterns consumed during adulthood did not worsen cognitive outcomes.
    - There are numerous limitations across the body of evidence, including the lack of RCT's, considerable variation in testing methods used, validity and reliability of the methods used, the dietary patterns and cognitive outcomes examined.
- The 2020 Dietary Guidelines Advisory Committee updates, concurs, and builds upon the conclusion drawn by the 2015 Dietary Guidelines Advisory Committee.[27]

Description of the evidence

This systematic review update includes 26 articles that examined the relationship between dietary patterns and neurocognitive health. Four studies were randomized controlled trials (RCTs) and 22 articles were from observational studies, with 21 prospective cohort designs and 1 nested-case control.

Population/participant characteristics

The articles examining the relationship between dietary patterns and neurocognitive health were conducted in the following countries:

- Australia
- Finland
- France
- Japan
- Netherlands
- Singapore
- Sweden
- United Kingdom
- United States

Two articles were from studies conducted in participants from several countries: one was conducted in France, Italy, Netherlands, Poland, and United Kingdom[2] and the other in 40 different countries.[21] The analytic sample size ranged from 137 to 27,842.

Data from these studies represented several established cohorts, including the Nurses' Health Study (NHS), Health Professionals' Follow-up Study (HPFS), Women's Health Initiative (WHI) Memory study, Atherosclerosis Risk in Communities (ARIC) study, Swedish National study on Aging and Care-Kungsholmen (SNAC-K), Whitehall II cohort, and EPIC-Norfolk. Although multiple articles from the same cohorts were included, the included articles represented unique data by examining different sub-samples, dietary patterns, neurocognitive health outcomes, or using different dietary pattern methods.

Studies included participants who were healthy and/or at risk of chronic disease, and primarily middle-aged or older adults. In two studies, baseline age at enrollment was < 30y.[13,26] Several articles exclusively enrolled women[1,7,8,11,24,26] or men.[9] All other studies combined and/or stratified analyses of men and women. Several studies excluded participants with dementia or conditions that may cause cognitive impairment, prevalent chronic diseases (e.g., cancer, CVD) at baseline, or those who reported race other than White or Black.

Intervention/exposure

Dietary intake was primarily assessed using validated food frequency questionnaires (FFQs) at one time-point (i.e., baseline). However, several studies collected dietary data at multiple time points, used a cumulative average or mean of multiple time points, or used validated 24-h dietary recalls or history methods.

Dietary patterns were assessed with various methods. Four RCTs assigned participants to consume a particular dietary pattern as an intervention diet relative to control diet groups. Most (17) of the observational studies examined adherence to a dietary pattern using indices/scores, four articles identified dietary patterns using factor/cluster analysis, and one study used reduced rank regression.

Outcome assessment

Studies examined age-related cognitive impairment, decline, and/or dementia over follow-up (f/u) as short as 3mo (in RCTs) up to 30y (in observational studies). No studies that met inclusion criteria examined incidence of diagnosed Alzheimer's disease. Among the included studies, cognitive impairment, cognitive function, and/or dementia were reported by studies using a variety of assessment methods including:

- Consortium to Establish a Registry for Alzheimer's Disease (CERAD) Battery
- Mini-Mental State Examiniation (MMSE)
- Telephone Interview for Cognitive Status (TICS), a telephone-adaption of MMSE to assess overall cognitive performance
- Six-item screener (SIS) via telephone
- Short Form Extended Mental State Exam (SF-EMSE)
- Subjective memory complaints (SMCs)

Evidence synthesis

Description of results

Randomized controlled trials (RCTs)

Four RCT's examined the relationship between dietary patterns and cognitive impairment, global cognitive function/decline, or probable dementia that are summarized below and further in Table 1.

- Chlebowski et al[1] reported from the Women's Health Initiative Memory study that postmenopausal women, n=1606, who consumed the intervention diet aimed at reducing total fat to 20% energy/d, consuming 5 servings/d of fruits and vegetables, and 6 servings/d of grains, compared to the control group, reduced the risk of possible or mild cognitive impairment and probable dementia at ~8.5y f/u.
- Effects reported in Marseglia et al[2] showed that n=1144 participants with higher vs. lower "Nu-AGE diet", which provided participants with whole grain pasta, margarine rich in poly-unsaturated fatty acids (PUFA) and monounsaturated fatty acids (MUFA), low fat, low-salt cheese, extra virgin olive oil (EVOO) and frozen vegetable soup, had significant improvements in global cognition and episodic memory scores after 1y. However, no significant differences were observed between groups in cognitive domains after 1y.
- Two RCTs examined different versions of a "Mediterranean" diet.
    - Knight et al[3] assigned participants to consume a "MedDiet", consisting of:

EVOO; breads and cereals; legumes; vegetables; fish; fruit; cheese; red wine (upon participants choice, not compulsory); Greek yoghurt; Nuts; potato (white); Milk; eggs provided; "Free foods": legumes, Greek yoghurt, Australian EVOO, canned tuna, walnuts, peanuts, and almonds compared to control group consuming their customary diet. No significant effects were identified, n=137, between the "MedDiet" and control diet on better or worse cognitive function after 3 or 6mo.

- Valls-Pedret et al[4] examined n=334 participants randomized to consume either a control diet or one of two different Mediterranean diets, with each emphasizing abundant olive oil, vegetables, fresh fruit and juices, legumes, fish or seafood, nuts and seeds, select white meat instead of red or processed meats, cook regularly with tomato, garlic and onion; wine preferred if consuming alcohol; ad libitum nuts, eggs, fish, seafood, low-fat cheese, chocolate, and whole-grain cereals. Each intervention diet differed by the addition of either EVOO (Med+EVOO) or nuts (Med+Nuts), compared to control group consuming their customary diet. Valls-Pedret et al[4] reported that participants consuming the Med+EVOO compared to control diets showed significantly better executive function and global cognition. However, participants in the Med+Nuts compared to control diet group showed significant effects for improved memory, but not executive function or global cognition after ~5y.

Observational studies

Twenty-two observational studies examined the relationship between dietary patterns and age-related cognitive outcomes, including global cognitive decline, risk of cognitive impairment, and/or risk of (probable) dementia. Studies are summarized below and described further in Table 2.

Indices/scores

Dietary Guidelines-related indices/scores

Studies reported lower risk of cognitive decline/impairment as follows:

- Smyth et al[21] reported that extreme quintiles of highest vs. lowest adherence to the Alternative Healthy Eating Index (AHEI) was significantly associated with less cognitive decline during 5y f/u, both overall and in those with MMSE 26-28 or >28 at baseline, as well as those with moderate or high physical activity at baseline.
- Wu et al[25] reported that higher vs. lower adherence to the AHEI-2010 was significantly associated with lower risk of cognitive impairment at 20y f/u.

Studies reported no significant associations as follows:

- Akbaraly et al[6] reported that AHEI-2010 score during midlife was not significantly associated with subsequent risk for dementia or cognitive decline during 25y f/u.
- Haring et al[11] reported that Healthy Eating Index-2010 (HEI-2010) or AHEI-2010 scores across quintiles were not significantly associated with mild cognitive impairment, probable dementia, or incidence of either at ~9y f/u.
- Richard et al[16] reported no significant associations between AHEI-2010 adherence and cognitive outcomes.

Mediterranean related indices/scores

Studies reported lower risk of cognitive decline/impairment as follows:

- Richard et al[16] reported that higher vs. lower adherence to the alternative Mediterranean (aMED) score was significantly associated with better cognitive function.
- Bhushan et al[9] reported that higher vs. lower Mediterranean dietary pattern adherence is significantly associated prospectively with better cognitive function in men.
- Shannon et al[20] reported that higher adherence to three Mediterranean diet (MedDiet) scores was significantly associated with better performance on global cognition during 14y f/u in middle-aged adults. There was no significant association with the diet scores and other aspects of cognitive performance (i.e., retrospective memory, attention, or complex processing speed). MedDiet pyramid adherence score was significantly associated with better performance in simple processing speed and retrospective memory, but the other two scores were not.
- Shakersain et al[19] reported that higher vs. lower adherence (both continuously and categorically) the Mediterranean-DASH diet Intervention for Neurodegenerative Delay (MIND) pattern, and MedDiet score in older adults was significantly associated with less MMSE decline at 6y f/u.
- Wagner et al[24] reported that cases of cognitive decline compared to controls without had lower adherence to A-MeDi after 1y f/u.
- Wu et al[25] reported that aMED adherence was significantly associated with lower risk of cognitive impairment at 20y f/u.
- McEvoy et al[13] reported that higher vs. lower MedDiet adherence was significantly associated with less decline in cognitive function during 30y f/u.

Studies reported no significant associations as follows:

- Haring et al[11] reported that aMED score across quintiles was not significantly associated with mild cognitive impairment, probable dementia (PD), or incidence of either at ~9y f/u.
- Adjibade et al[5] reported that MIND diet score was significantly associated with reduced risk of cognitive difficulty only in those age ≥70y, and not significantly associated with cognitive difficulty in total sample at 6y f/u.
- Berendsen et al[8] reported that long-term MIND score adherence was not significantly associated with change over time in the global cognitive or TICS scores over 6y f/u in women.

DASH scores

Studies reported lower risk of cognitive decline/impairment as follows:

- Wu et al[25] reported that higher vs. lower DASH score was significantly associated with lower risk of cognitive impairment at 20y f/u.

Studies reported no significant associations as follows:

- Haring et al[11] reported that DASH score across quintiles was not significantly associated with mild cognitive impairment, probable dementia, or incidence of either at ~9y f/u.
- Berendsen et al[7] reported that highest DASH diet quintile vs. lowest was significantly associated with average cognitive function, but not significantly associated with change in cognitive function over 4y f/u in women.
- McEvoy et al[13] reported no significant association between DASH score and cognitive function.
- Shakersain et al[19] reported that DASH adherence (continuous, or high vs. moderate) was not significantly associated with dementia over 6y f/u.

Country-specific indices/scores

Studies that reported lower risk of cognitive decline/impairment, as follows:

- Shakersain et al[18,19] reported that higher vs. lower adherence (both continuously and categorically) to the Nordic Prudent dietary pattern in older adults was significantly associated with less MMSE decline at 6y f/u.
- Shakersain et al[19] reported that BSD adherence, high vs. moderate, was not significantly associated with dementia over 6y f/u. However, when BSD was examined continuously with cognitive decline as MMSE ≤24, there was a significant association with lower risk of decline.

Studies that reported no significant associations, as follows:

- Voortman et al[23] reported that Dutch Dietary Guidelines adherence score was not significantly associated with dementia at median 13.5y f/u.
- Mannikko et al[12] reported that Nordic diet score was not significantly associated with cognitive function at 4y f/u.

Other indices/scores

Studies that reported significantly lower risk of cognitive decline/impairment, i.e., better health outcomes, as follows:

- McEvoy et al[13] reported that higher vs. lower APDQS adherence was significantly associated with less decline in cognitive function during 30y f/u.
- Zhu et al[26] reported that higher vs. lower APDQS was significantly associated with better cognitive test results at 25y f/u.
- Wu et al[25] reported that higher vs. lower PDI or hPDI adherence scores were significantly associated with was significantly associated with lower risk of cognitive impairment at 20y f/u.

Studies that reported significantly higher risk of cognitive decline/impairment, as follows:

- Akbaraly et al[6] reported that higher “Healthy food” scores at midline were significantly associated with greater cognitive decline during 25y f/u.

Reduced Rank Regression (RRR)

Ozawa et al[14] reported higher vs. lower “inflammatory” dietary pattern consumption was significantly associated with greater decline in cognitive function over 10y f/u.

Factor/cluster

Studies that reported lower risk of cognitive decline/impairment, as follows:

- Pearson et al[15] examined five dietary patterns identified by factor analysis. Higher vs. lower consumption of the "alcohol/salads" dietary pattern, characterized by high loadings of green-leafy vegetables, tomatoes, salad dressing, wine and liquor, was significantly associated with lower odds of cognitive decline at 7y f/u.
- Shakersain et al[17] examined two dietary patterns identified by factor analysis: "Prudent" dietary pattern reflected more vegetables, fruit, cooking/dressing oil, cereals and legumes, whole grains, rice/pasta, fish, low-fat dairy, poultry, and water; whereas the "Western" dietary pattern reflected more red/processed meat, saturated/trans-fat, refined grains, sugar, beer, and spirits. Higher vs. lower adherence to the "Prudent" dietary pattern was significantly associated with less MMSE decline at 6y f/u. Highest adherence to the "Western" dietary pattern was significantly associated with more MMSE decline at 6y f/u, but this association was attenuated when accompanied by high "Prudent" dietary pattern adherence.
- Tomata et al[22] reported higher adherence to the 'Japanese dietary pattern' (emphasizing fish, vegetables, mushrooms, potato, seaweeds, pickles, soybean, and fruits) was significantly associated with reduced dementia risk in older Japanese adults over a 6y f/u. There was no significant association between the 'animal food' pattern or 'high-dairy' pattern and dementia risk.

Studies that reported no significant association, as follows:

- Dearborn-Tomazos et al[10] examined two dietary patterns identified by factor analysis. Consumption of either the "Western" or "Prudent" dietary patterns ("Western": characterized by higher consumption of meats, refined grains, and fried foods; "Prudent": characterized by higher amounts of fruits and vegetables, fish, chicken, whole grains, dairy, nuts, and alcohol) at midlife was not significantly associated with global cognitive function, 20y change in cognitive function, or risk of dementia.

Assessment of the evidence[ii]

Of the 26 articles, four were included from RCTs and 22 articles from observational studies. There were few well-designed controlled trials upon which to draw stronger conclusions. However, findings from the observational studies were generally supportive of the findings from the RCTs. Overall, there was limited evidence that suggests that dietary patterns containing vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood consumed during adulthood are associated with lower risk of age-related cognitive impairment and/or dementia. See the summary

[ii] A detailed description of the methodology used for grading the strength of the evidence is available on the NESR website: https://nesr.usda.gov/2020-dietary-guidelines-advisory-committee-systematic-reviews and in Part C of the following reference: Dietary Guidelines Advisory Committee. 2020. *Scientific Report of the 2020 Dietary Guidelines Advisory Committee: Advisory Report to the Secretary of Agriculture and the Secretary of Health and Human Services*. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC.

of risk of bias for RCTs in Table 3 and observational studies in Table 4 for additional details. As outlined and described below, the body of evidence examining exposure and outcome was assessed for the following elements used when grading the strength of evidence

- **Risk of bias**: There were a number of potential risks of bias, or limitations, across the body of evidence (Table 3 and Table 4). While studies adjusted for most potential confounders, they did not adjust for all key confounders, including race/ethnicity and/or family history of neurocognitive disorders in particular. Several observational studies examined diet only once at baseline, and therefore, the effects of dietary patterns overtime may not be determined. However, several studies did examined diet at multiple time points over f/u, although there was a large range of time between assessments in some cases (e.g., a span of over 20 y). Several studies did not assess the impact of missing data, primarily due to criteria used when selecting subjects into the analyses. Many of the studies excluded participants with baseline dementia or conditions that may cause cognitive impairment, prevalent chronic diseases (e.g., cancer, CVD). Therefore, selected samples likely reflect generally healthier individuals. Some studies used telephone interviews to ascertain cognitive function outcomes of participants via self-reported data. Although the assessments were valid, these studies may be at higher risk of bias in outcome measurement.
- **Consistency**: Studies varied widely in the methods used to examine dietary patterns, including different indices/scores to examine adherence, factor/cluster analysis to identify dietary patterns, and reduced rank regression. Consistent direction and magnitude of effects were observed in 3 of the 4 RCTs, with generally supportive findings from many, but not all, observational studies. It is noteworthy that some studies showed either no significant associations or mixed associations when examining different dietary patterns among the same participants (i.e., within studies) or between studies. Despite variability in results, many of the studies supported dietary patterns associated with less cognitive decline or lower risk of dementia/cognitive impairment that share the following elements in common: vegetables, fruits, unsaturated vegetable oils and/or nuts, legumes, and fish or seafood. Less consistent elements that were considered across these “protective” dietary patterns included alcohol (wine preferred) and low-fat cheese and/or dairy products. Many of these dietary patterns also emphasized whole grains, non-refined grains, or (non-refined) breads/cereals. Fewer studies examined dietary patterns that relate to “worse” cognitive outcomes. Dietary patterns characterized as “unhealthy”, emphasizing fried foods, processed and/or red meats, refined grains, desserts (pies, chocolate, sweets), and high-fat dairy products showed inconsistent findings, some associating with greater cognitive decline but primarily non-significant associations overall. Additionally, there was considerable variation in the outcome assessment methods used between studies, which included cognitive assessment techniques that may be insensitive. There was relative inconsistency in the magnitude and direction of findings within individual studies if multiple behavioral measures were used.
- **Precision**: All of the RCTs conducted power calculations and identified an adequate number of cases of possible and/or mild cognitive impairment or probable dementia with analytic sample sizes ranging from n=137 to n=1606

over an average f/u between 3mo and 8.5y, with some degree of imprecision. Observational studies that reported significant results had relatively narrow confidence intervals, though results varied. Although these studies did not report sample size calculations, analytic sample sizes were generally large ranging from n=1140 to n=27,860.

- **Directness**: Most studies were designed to directly examine the relationship between the populations, intervention, comparators, and outcomes of interest related to the systematic review question. Several studies examined better/worse global cognition or performance on cognitive tests, which were less direct than the majority of studies examining incident cognitive impairment or dementia.
- **Generalizability**: The interventions and/or exposures, comparators, and outcomes examined in the body of evidence are likely applicable to the U.S. population. However, results are most generalizable to the generally healthy, older adults. Few studies reported information on or accounted for race/ethnicity of participants, and therefore, the results may be less generalizable in populations of diverse racial/ethnic backgrounds.

The 2020 Dietary Guidelines Advisory Committee updates, concurs, and builds upon the conclusion drawn by the 2015 Dietary Guidelines Advisory Committee. The 2015 Advisory Committee concluded that, limited evidence suggests that a dietary pattern containing an array of vegetables, fruits, nuts, legumes and seafood consumed during adulthood is associated with lower risk of age-related cognitive impairment, dementia and Alzheimer's disease. In 2015, although the number of studies available on dietary patterns and neurodegenerative disease risk is expanding, that body of evidence was made up of high-quality observational studies that appeared only in recent years, was rapidly developing, and employed a wide range of methodology in study design, definition and measurement ascertainment of cognitive outcomes and dietary pattern assessment. The newly published body of evidence has similar results with a similar volume of articles, though a few additional RCTs.

Research recommendations

In order to better assess the relationship between dietary patterns and neurocognitive health, future research may:

1. Examine the relationship between dietary patterns earlier in life and neurocognitive health to elucidate any preventative effects diet may have prior to the onset of cognitive impairment, after which diet may be less influential.
2. Explore objective measurements of brain function beyond the scope outlined for this review, such as structural magnetic resonance imaging scans with grey/white matter volume or density outputs (e.g., magnetization-prepared rapid acquisition with gradient echo (MPRAGE) data) and/or functional imaging techniques such as blood-oxygen level-dependent data (BOLD) (i.e., data from functional magnetic resonance imaging) or positron emission tomography (PET), which may provide additional insight into mechanisms that underlie cognitive impairment diagnoses and can potentially be connected to prevention strategies within the context of dietary patterns.
3. Utilize standardized behavioral assessments to determine cognitive decline.
4. Assess information regarding diet at more than one time-point, preferably during the

course of follow-up, to facilitate determining change in dietary patterns over time.

5. Provide sufficient information and repeated measures on the quantification, i.e., types and amounts of foods/food groups comprising a dietary pattern, such as fruits and vegetables, and beverages such as alcohol, consumed.
6. Identify inadequate or excessive intakes of specific foods/food groups (e.g., fruits, vegetables, whole grains, legumes, EVOO, nuts, fish or seafood, and also, sugar sweetened beverages, processed foods including processed meats, added sugars, and salt) to better speak to diet quality due to the limited utility of the "total score" from a given dietary pattern (e.g., "Mediterranean diet", aHEI, and DASH scores).
7. Explore the relationship between dietary patterns and neurocognitive health further, particularly beyond the capacity of the current review by investigating factors such as
    - weight status/BMI (e.g., to determine the response to dietary patterns in those who are classified as overweight or obese, or those with excess adiposity),
    - physical activity (e.g., to determine the response to dietary patterns in those who may be sedentary compared to active),
    - emerging biomarkers including metabolites and microbes reflecting different food-based patterns of intake and their associations with traditional chronic disease risk factors to more directly assess the relative preventative merits of various dietary patterns, and
    - household food insecurity status (e.g., to determine the response to dietary patterns in those with higher or lower food security, with progressing or persistent household food insecurity, or food security insufficiency).
8. Include diverse populations with varying race/ethnicity, socioeconomic background, and chronic disease status, while ensuring to report the racial/ethnic background of participants studied.
9. Include conducting systematic reviews with a continuous model to better document the current state of science on high priority topics, such as the role of dietary patterns and neurocognitive health.

Included articles

1. Chlebowski RT, Rapp S, Aragaki AK, et al. Low-fat dietary pattern and global cognitive function: exploratory analyses of the Women's Health Initiative (WHI) randomized Dietary Modification trial. *EClinicalMedicine*. 2020;18:100240. doi:10.1016/j.eclinm.2019.100240.
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Table 1: Description of randomized controlled trials that examined the relationship between dietary patterns and cognitive impairment, dementia, or Alzheimer's disease[iii]

Study and Participant Characteristics[iv]	Intervention/Exposure	Results	Methodological Considerations
Chlebowski, 2020[1] **United States Women's Health Initiative (WHI) Memory study** **N=1606** **100% female, postmenopausal, Baseline age: ≥65y**	Other: Intervention: Guidance to reduce total fat from ~35% to 20% of energy, consume 5 servings/d fruits and vegetables, 6 serving/d grains Control: Received written health-related materials only	Intervention n=41 vs. Control n=85 and overall possibile cognitive impairment [n=52] at ~8.5y f/u: • HR: 0.59, 95% CI: 0.35, 0.91, p=0.01 Intervention n=20 vs. Control n=37 and mild cognitive impairment [n=57] at ~8.5y f/u: • HR: 0.65, 95% CI: 0.35, 1.19 Intervention n=7 vs. Control n=10 and probable dementia [n=17] at ~8.5y f/u: • HR: 0.63, 95% CI: 0.19, 2.10 Effect of diet strongest in those with lowest MMSE scores; Effect of diet on risk of dementia remained when considering age, race/ethnicity, education, smotking, HRT, randomization, BMI, WC, HTN, and diabetes;	Accounted for: Sex, Age, Race/ethnicity, SES, Alcohol intake, Physical activity, Anthropometry, Smoking, Family history of NCD Limitations: • Did not account for: N/A Summary: Intervention diet reduced the risk of possible or mild cognitive impairment and probable dementia in women Funding: NHLBI; NIH; HHS
Knight, 2016[3] **Australia** **MedLey study**	Mediterranean diet, 'MedDiet', vs. Control diet, 'HabDiet' • MedDiet: Extra virgin olive oil (EVOO); breads and cereals; legumes; vegetables; fish; fruit; cheese; red wine	At 3mo or 6mo f/u: • Total cognitive function: NS • Age-related cognitive function: NS	Accounted for: Sex, Age, Race/ethnicity, SES, Alcohol intake, Physical activity, Anthropometry, Smoking, Family history of NCD

[iii] Abbreviations: CERAD, Consortium to Establish a Registry for Alzheimer's Disease Battery; EVOO, extra-virgin olive oil; GMS, Geriatric Mental Schedule; HHS, U.S. Department of Health and Human Services; ITT, intent-to-treat analyses; N/A, Not applicable; NCD, Neurocognitive disorder; NHLBI, National Heart Lung and Blood Institute; NIH, National Institutes of Health; NS, Not significant; NR, Not reported; MMSE, Mini-Mental State Examination ; Mo, month or months; SF-EMSE, Short Form Extended Mental State Exam; SMC, Subjective memory complaints; TICS, Telephone Interview for Cognitive Status – telephone adaption of MMSE to assess overall cognitive performance; wk, week(s); y, year(s)

[iv] Includes last name of first author, publication year, country, name of the cohort or study if reported, analytic sample size, and select participant characteristics of the analytic sample

Study and Participant Characteristics[iv]	Intervention/Exposure	Results	Methodological Considerations
N=137 **Baseline age: ~72y** **Exclusions: conditions that may cause cognitive impairment**	(upon participants choice, not compulsory); Greek yoghurt; nuts; potato (white); milk; eggs provided; "Free foods": legumes, Greek yoghurt, Australian EVOO, canned tuna, walnuts, peanuts and almonds • Control: consume customary dietary pattern with supermarket gift vouchers		Limitations: • Did not account for: N/A Summary: MedDiet consumption did not improve or worsen cognitive function after 3 or 6mo Funding: National Health Medical Research Council (NHMRC); University of South Australia Postgraduate Award

Marseglia, 2018[2]
 	
France, Italy, Netherlands, Poland, United Kingdom
NU-AGE
 	
N=1144
Baseline age: 65-79y
Exclusions: heart diseases, diabetes, chronic corticosteroid user, recent antibiotic user, recent change in habitual medication use, frailty, malnutrition, or those on special diets.
	Other:
	"Nu-AGE" diet (provided participants with whole grain pasta, margarine rich in PUFA and MUFA, low fat, low-salt cheese, extra virgin olive oil (EVOO) and frozen vegetable soup) adherence vs. habitual diet control group; analyzed in tertiles (low, moderate, high)
		Nu-AGE vs. Control [ITT] and outcomes at 1y f/u:
		• ∆ in MMSE; NS
		• Global cognition (CERAD + MMSE), NS
		Nu-AGE vs. Control [adherence, tertiles] and outcomes at 1y f/u:
		• ∆ in MMSE; NS
		• Global cognition (CERAD + MMSE):
		  ○ T2 vs. T1 ref: 0.20, 95% CI: 0.004, 0.39, p<0.05
		  ○ T3 vs. T1 ref: 0.16, 95% CI: 0.02, 0.35, p<0.10
		Effects remained similar after exclusion of non-complete data, those with mental health conditions, or stratification by education, enrollment, baseline cognitive or pre-frail status
			Accounted for: Sex, Age, SES: Education, Anthropometry, Other: Enrollment country, Interviewer, Pre-frailty
			
			Limitations:
			• Did not account for: Race/ethnicity, Alcohol intake, Physical activity, Smoking, Family history of NCD [data not shown regarding these factors]
			
			Summary: Participants with higher vs. lower Nu-AGE diet adherence had significant improvements in global cognition and episodic memory scores. No significant differences between groups in global cognition or cognitive domains after 1y.
			Funding: European Union's Seventh Framework Program; Swedish Research Council; the

Study and Participant Characteristics[iv]	Intervention/Exposure	Results	Methodological Considerations
			National Natural Science Foundation of China; the Konung Gustaf V:s och Drottning Victorias Frimurare Foundation; European Union's Horizon 2020 research and innovation programme
Valls-Pedret, 2015[4] **Spain** **PREDIMED** **N=334** **Baseline age: 67y** **Exclusively at-risk with either type 2 diabetes or ≥3 CVD-risk factors**	Mediterranean diet plus nuts, Med+nuts or Mediterranean diet plus EVOO, Med+ EVOO vs. Control • Med+nuts: abundant olive oil, vegetables, fresh fruit and juices, legumes, fish or seafood, nuts and seeds, select white meat instead of red or processed meats, cook regularly with tomato, garlic and onion; wine preferred (if consuming alcohol); ad libitum nuts, eggs, fish, seafood, low-fat cheese, chocolate, whole-grain cereals; + 15g/d walnuts, 7.5g/d almonds, and 7.5g/d hazelnuts • Med+EVOO: abundant olive oil, vegetables, fresh fruit and juices, legumes, fish or seafood, nuts and seeds, select white meat instead of red or processed meats, cook regularly with tomato, garlic and onion; wine preferred if consuming alcohol; ad libitum nuts, eggs, fish, seafood, low-fat cheese, chocolate, whole-grain cereals + 15L EVOO • Control diet, low-fat: advice to reduce dietary fat Diet assesed with validated FFQ at baseline	Med+Nuts [n=8 incident cases of mild cognitive impairment] vs. Control [n=12 incident cases of mild cognitive impairment] and: • Global cognitive function, NS Med+EVOO [n=37 incident cases of mild cognitive impairment] vs. Control [n=12 incident cases of mild cognitive impairment] and: • Global cognitive function, p<0.01	Accounted for: Sex, Age, Race/ethnicity, SES, Alcohol intake, Physical activity, Anthropometry, Smoking, Family history of NCD Limitations: • Did not account for: N/A Summary: Med+EVOO compared to control diets showed significant effects for better executive function and global cognition. Med+Nuts compared to control diets showed significant effects for improved memory. Funding: Instituto de Salud Carlos III, Ciber Fisiopatología de la Obesidad y Nutrición

Table 2: Description of observational studies that examined the relationship between dietary patterns and cognitive impairment, dementia, or Alzheimer's disease[v]

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
Adjibade, 2019[5] **France** **Prospective cohort study** **NutriNet-Sante cohort** **N=6011** **Baseline age: ≥60y**	Index analysis: Mediterranean-DASH diet intervention for neurodegenerative delay (MIND) diet adherence score by tertiles and continuous • "Healthy brain foods": green leafy vegetables, other vegetables, nuts, berries, beans, whole grains, fish, poultry, olive oil, and ***wine*** • "Unhealthy brain foods": red meats, butter and margarine, cheese, pastries and sweets, and fast fried Sensitivity analyses conducted with the dietary-only French Programme National Nutrition Santé-Guideline Score (mPNNS-GS) Diet collected every 2y with validated 24-h dietary records	MIND score and risk of high cognitive difficulties (Subjective memory complaints, SMC ≥43) at 6y f/u: NS MIND score in age ≥60y and risk of high cognitive difficulties at 6y f/u: NS MIND score in age 70+y and risk of high cognitive difficulties at 6y f/u: • Continuous: HR: 0.87, 95% CI: 0.78; 0.98; p=0.02 • T3 vs. T1 ref: NS • T2 vs. T1 ref: NS mPNNS-GS and risk of high cognitive difficulties at 6y f/u: NS	Accounted for: Sex, Age, SES: Marital status, Education, Occupation, Income, Anthropometry: BMI, Alcohol: Part of dietary pattern, Physical activity, Smoking; Other: energy intake, number of recording days, inclusion month, comborbid conditions, depressive symptoms, baseline SMC Limitations: • Did not account for: Race/ethnicity, Family history of NCD Summary: MIND diet score was significantly associated with reduced risk of cognitive difficulty only in those age ≥70y, and not significantly associated with cognitive difficulty in total sample at 6y f/u. Funding: French Ministry of Health; French Public Health Agency; French National Institute for Health and Medical Research; Medical Research Foundation;

[v] Abbreviations: CERAD, Consortium to Establish a Registry for Alzheimer's Disease Battery; EVOO, extra-virgin olive oil; GMS, Geriatric Mental Schedule; HHS, Department of Health and Human Services; MIND, Mediterranean-DASH diet intervention for neurodegenerative delay; MMSE, Mini-Mental State Examination; mo, month(s); N/A, Not applicable; NCD, Neurocognitive disorder; NIA, National Institute on Aging; NHLBI, National Heart Lung and Blood Institute; NIH, National Institutes of Health; NS, Not significant; NR, Not reported; RAVLT, Rey's Auditory Verbal Learning Test; SES, Socioeconomic status; SF-EMSE, Short Form Extended Mental State Exam; SMC, Subjective memory complaints; TICS, Telephone Interview for Cognitive Status – telephone adaption of MMSE to assess overall cognitive performance; wk, week(s); y, year(s)

[vi] Includes last name of first author, publication year, country, name of the cohort or study if reported, analytic sample size, and select participant characteristics of the analytic sample

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
			French National Institute for Agricultural Research; National Conservatory for Arts and Crafts; National Institute for Prevention and Health Education; Paris 13 University

Akbaraly, 2019[6]
 	
United Kingdom Prospective cohort study
 	
N=8225
Baseline age: ~50y
	Index analysis:
	Adherence to the Alternate Healthy Eating Index (AHEI)-2010 score, categorical tertiles and continuous per-1-SD increase
	• Positive: vegetables, fruits, whole grains, nuts and legumes, n-3 fatty acids, and PUFAs;
	• Negative: SSB and fruit juice, red and processed meat, trans fat, Na+;
	• Moderate: Alcohol
	Factor analysis
	Adherence scores for two dietary patterns identified by factor analysis, categorical tertiles and continuous per-1-SD increase at 1991-1993; 1997-1999; and 2002-2004:
	• "Healthy food": high intake of vegetables, fruits, and fish
	• "Western-type": high consumption of fried food, processed and red meat, pies, chocolate, sweets, high-fat dairy products, and refined grains
	
	Diet assesed at multiple time points at 1991-1993; 1997-1999; and 2002-2004
		aHEI-2010 and outcomes during ~25y f/u
		• aHEI-2010 at 1991-1993, per-1-SD or tertiles
		  ○ Dementia, NS
		  ○ Global cogntive-z,NS
		  ○ 18-y Cognitive decline, NS
		• aHEI-2010 at 1997-1999, per-1-SD or tertiles
		  ○ Dementia, NS
		• aHEI-2010 at 2002-2004, per-1-SD or tertiles
		  ○ Dementia, NS
		
		"Healthy food" and outcomes during ~25y f/u
		• "Healthy food", per-1-SD or tertiles
		  ○ Dementia, NS
		  ○ Global cogntive-z, NS
		  ○ 18-y Cognitive decline,
		  ▪ Per-1-SD: HR: -0.03, 95% CI: -0.05, -0.01, p=0.007
		  ▪ T3 vs. T1 ref: HR: -0.06, 95% CI: -0.11, -0.01
		  ▪ T2 vs. T1 ref: NS
		• "Healthy food" at 1997-1999, per-1-SD or tertiles
		  ○ Dementia, NS
		• "Healthy food" at 2002-2004, per-1-SD or tertiles
			Accounted for: Sex, Age, Race/ethnicity, SES, Anthropometry, Alcohol intake, Physical activity, Smoking, Other: chronic diseases, depressive symptoms, CVD-medication, dementia status over f/u
			
			Limitations:
			• Did not account for: Family history of NCD
			
			Summary: AHEI-2010 scores during midlife was not significantly associated with subsequent risk for dementia or cognitive decline; higher "Healthy food" scores at midline were significantly associated with greater cognitive decline during 25y f/u
			Funding: UK Medical Research Council; British Heart Foundation; British Health and Safety Executive; NHLBI; NIA; Economic and Social Research Council

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
		○ Dementia, NS "Western-type" and outcomes during ~25y f/u • "Western-type" at 1991-1993, per-1-SD or tertiles ○ Dementia, NS ○ Global cogntive-z, NS ○ 18-y Cognitive decline, NS • "Western-type" at 1997-1999 ○ Dementia, NS • "Western-type" at 2002-2004 ○ Dementia, NS	
Berendsen, 2018[8] **United States** **Prospective cohort study** **Nurses' Health Study (NHS)** **N=16058** **100% female,** **Baseline age: ≥70y**	Index analysis: MIND diet adherence by quintile • "Healthy brain foods": green leafy vegetables, other vegetables, nuts, berries, beans, whole grains, fish, poultry, olive oil, and ***wine*** • "Unhealthy brain foods": red meats, butter and margarine, cheese, pastries and sweets, and fried/fast food Diet assesed five times between 1984-1998, MIND score based on mean over 5 assessments	MIND diet across quintiles and mean difference in cognition over 6y: • Global cognition, NS • Cognitive performance (TICS), NS MIND diet across quintiles and cognitive change over 6y: • Global cognition, NS • Cognitive performance (TICS), NS	Accounted for: Sex, Age, SES: Education, Anthropometry, Alcohol intake, Physical activity, Smoking, Other: total energy intake, history of depression, multivitamin use, CVD factors Limitations: • Did not account for Race/ethnicity, Family history of NCD Summary: Long-term MIND score adherence was not significantly associated with change over time in the global cognitive or TICS scores over 6y f/u in women Funding: NIH; National Cancer Institute; National Institute of Diabetes and Digestive and Kidney Diseases; NIA; NHLBI

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
Berendsen, 2017[7] **United States** **Prospective cohort study** **Nurses' Health Study (NHS)** **N=16144** **100% female,** **Baseline age:≥70y**	Index analysis: Dietary Approaches to Stop Hypertension (DASH) diet adherence score • DASH score: based on high intake of fruits, vegetables, nuts and legumes, whole grains, low-fat dairy products, and low intake of sodium, red and processed meats, and sweetened beverages; MUFA+PUFA Diet assesed five times between 1984-1998	DASH diet across quintiles and average cognitive function over 4y: Global cognition • Q3, Q2 vs. Q1 ref, NS • Q4 vs. Q1 ref: 0.04, 95% CI: 0.01, 0.07 • Q5 vs. Q1 ref: 0.03, 95% CI: 0.00, 0.06 • P-trend=0.009 Cognitive performance (TICS) • Q2, Q3, Q4 vs. Q1 ref, NS • Q5 vs. Q1 ref: 0.16, 95% CI: 0.03, 0.29 • P-trend=0.002 • No interaction for age, high blood pressure, or ApoE e4 status; no mediation by blood pressure DASH diet across quintiles and cognitive change over 4y: • Global cognition, NS • Cognitive performance (TICS), NS	Accounted for: Sex, Age, SES: Education, Anthropometry, Alcohol intake, Physical activity, Smoking, Other: total energy intake, history of depression, multivitamin use, CVD factors Limitations: • Did not account for Race/ethnicity, Family history of NCD Summary: Highest DASH diet quintile vs. lowest was significantly associated with average cognitive function, but not significantly associated with cognitive change over 4y f/u in women. Funding: NIH; National Cancer Institute; National Institute of Diabetes and Digestive and Kidney Diseases; NIA; NHLBI
Bhushan, 2018[9] **United States** **Prospective cohort study** **Health Professionals' Follow-up Study (HPFS)** **N=27842** **0% female,** **Baseline age: 40-75y**	Index analysis: Adherence to the Mediterranean diet score (MDS): • Positive components: vegetables, legumes, fruits and nuts, cereals, MUFA: SFA ratio, and fish • Negative components: red meat, poultry, and dairy products • Moderate: alcohol Diet assesed five times between 1986-2002, MDS based on mean over 5 assessments	Highest vs. lowest mean MDS and outcomes at f/u: Moderate cognitive function (SCF 1-2) • Q2 or Q3 vs. Q1 ref, NS • Q4 vs. Q1 ref: OR: 0.84, 95 % CI: 0.77, 0.91 • Q5 vs. Q1 ref: OR: 0.76, 95 % CI: 0.70, 0.83 • P-trend<0.001 Poor cognitive function (SCF ≥ 3) • Q2 vs. Q1 ref, NS • Q3 vs. Q1 ref: OR: 0.74, 95 % CI: 0.64, 0.86	Accounted for: Sex, Age, Anthropometry, Alcohol intake: Part of dietary pattern, Physical activity, Smoking, Other: diabetes, hypertension, depression, hypercholesterolemia Limitations: • Did not account for: Race/ethnicity, SES, Physical activity, Anthropometry, Family history of NCD Summary: Higher vs. lower Mediterranean dietary pattern adherence

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
		• Q4 vs. Q1 ref: OR: 0.67, 95 % CI: 0.57, 0.78 • Q5 vs. Q1 ref: OR: 0.64, 95 % CI: 0.55, 0.75 • P-trend<0.001	is significantly associated prospectively with better cognitive function in men Funding: Harvard T H Chan School of Public Health; NIH
Dearborn-Tomazos, 2019[10] **United States** **Prospective cohort study** **Atherosclerosis Risk in Communities (ARIC)** **N=13588** **Baseline age: ~55y** **Excluded those who were neither white nor black**	Factor analysis: Two dietary patterns identifed: • "Western": characterized by higher consumption of meats, refined grains, and fried foods. • "Prudent": characterized by higher amounts of fruits and vegetables, fish, chicken, whole grains, dairy, nuts, and alcohol Diet assesed once at baseline with FFQ	"Western" dietary pattern tertiles and outcomes: • visit 2 cogntive function, NS • 20y Δ in global cognitive function, NS • Dementia risk, NS "Prudent" dietary pattern tertiles and outcomes: • visit 2 cogntive function, NS • 20y Δ in global cognitive function, NS • Dementia risk, NS	Accounted for: Sex, Age, Race/ethnicity, SES: Education, Anthropometry, Alcohol intake: Part of dietary pattern, Physical activity, Smoking, Other: race-field center, total energy intake, total cholesterol, CHD, history of hypertension, diabetes, stroke, ApoE4 status Limitations: • Did not account for Race/ethnicity, Family history of NCD • Diet assessed only once at baseline Summary: "Western" or "Prudent" dietary patterns at midlife was not significantly associated with global cognitive function, 20y change in cognitive function, or risk of dementia Funding: NHLBI, NIH, DHHS
Haring, 2016[11] **United States** **Prospective cohort study** **Women's Health Initiative (WHI) Memory study**	Index analysis: Adherence scores for multiple dietary patterns: • alternate Mediterranean diet score aMED, (Fung, 2005): positively scored vegetables (not potatoes), fruit, legumes, nuts, whole grains, fish, MUFA/SFA, and moderate	aMED and risk over ~9y f/u: • Mild Cognitive Impairment (MCI), NS • Probable Dementia (PD), NS ○ Q3 vs. Q1 ref: HR: 1.47, 95% CI: 1.05, 2.06 • MCI or PD, NS HEI-2010 and risk over ~9y f/u:	Accounted for: Sex, Age, Race/ethnicity, SES: Education, Income, Anthropometry, Alcohol: Part of dietary pattern, Physical activity, Smoking, Other: Hormone trial arm, baseline 3MSE, diabetes, hypertension status, depression, history of CVD, total energy intake

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations

N=6425
 	
100% female, Baseline age: 65-79y
 	
Exclusively postmenopausal
	alcohol; negatively scored red and processed meat
	• Healthy Eating Index-2010, HEI-2010 (Guenther, 2013): positively scored total vegetables and greens and beans, total and whole fruit, whole grains, fatty acids, seafood and plant proteins, and dairy; negatively scored refined grains, added sugars, solid fats, and excess alcohol (13g/1000 kcal) in "empty calories", and sodium
	• alternate Healthy Eating Index 2010, AHEI-2010 (Chiuve, 2012): positively scored vegetables (not potatoes, French fries), fruit, legumes and nuts, whole grains, long-chain fats and PUFA, moderate alcohol, and adjusted emphasis on plant proteins; negatively scored red and processed meat, sugar-sweetened beverages and fruit juice, trans fat, and sodium
	• Dietary Approach to Stop Hypertension (DASH) score (Fung, 2008): positively scored vegetables (not potatoes), fruit and fruit juice, legumes and nuts, whole grains, and low-fat dairy; negatively scored red and processed meat, sugar-sweetened beverages, and sodium
	
	Diet assesed once at baseline with validated FFQ
		• MCI, NS
		• PD, p-trend=0.02
		  ○ Q4 vs. Q1 ref. HR: 1.58, 95% CI: 1.09, 2.30
		  ○ Q5 vs. Q1 ref. HR: 1.60, 95% CI: 1.10, 2.33
		• MCI or PD, NS
		
		AHEI-2010 and risk over ~9y f/u:
		• MCI: NS
		• PD: NS
		• MCI or PD: NS
		
		DASH and risk over ~9y f/u:
		• MCI: NS
		• PD: NS
		• MCI or PD: NS
			<u>Limitations:</u>
			• Did not account for Family history of NCD
			• Diet assessed only once at baseline
			<u>Summary</u>: aMED, HEI-2010, AHEI-2010, or DASH scores across quintiles were not significantly associated with mild Cognitive Impairment, Probable Dementia (PD), or incidence of either at ~9y f/u
			
			<u>Funding</u>: NHLBI, NIH, DHHS

Mannikko, 2015[12] **Finland**	<u>Index analysis:</u> Adherence for the Nordic Diet Score (modified Kanerva, 2014)	In the total cohort, n=1140, and those with normal cognition at baseline, n=1042: • Global cognition (CERAD) at 4y f/u: NS	<u>Accounted for:</u> Sex, Age, , SES: education , Smoking, Other: VO_{2max}, antihypertensive

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
Prospective cohort study **N=1140** **Baseline age:~66y** **Excluded those that had health conditions that impair exercise, malignancies and conditions preventing co-operation**	• Consumption, g/d: fatty and lean fish and processed fish products; vegetables including root, non-root vegetables, mushrooms; legumes and nuts, but not potatoes; fruit and berries; whole-grain bread; meat including beef, pork, poultry, game, sausage and giblets; ***alcohol***; alpha-linolenic acid/rapeseed oil; MUFA+PUFA/ SFA ratio Diet assesed once at baseline with validated methods	• Global cognition (MMSE) at 4y f/u: NS	medication, lipid-lowering medication, antidiabeteic medication, energy intake study group (IV), baseline CERAD total score or MMSE, symptoms of depression Limitations: • Did not account for: Race/ethnicity, Alcohol intake, Physical activity, Anthropometry, Family history of NCD • Diet assessed only once at baseline (for the applicable analysis) Summary: Nordic diet score was not significantly associated with cognitive function at 4y f/u Funding: Ministry of Education and Culture in Finland; Academy of Finland; European Commission FP6 Integrated Project; the City of Kuopio; Finnish Diabetes Association; Finnish Foundation for Cardiovascular Research; Kuopio University Hospital; the Social Insurance Institution of Finland; Pa¨ivikki and Sakari Sohlberg Foundation; Juho Vainio Foundation; Aarne and Aili Turunen Foundation; The Finnish Graduate School on Applied Bioscience: Bioengineering, Food and Nutrition, Environment; Finnish Cultural Foundation, North Savo Regional fund
McEvoy, 2019[13] **United States**	Index analysis: Adherence to dietary patterns by per-SD increase or tertiles:	MedDiet and cognitive function at 30 y f/u • per-SD increase: β: 0.08, 95% CI: 0.05, 0.10	Accounted for: Sex, Age, Race, SES: Education, Anthropometry: BMI, Smoking,

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
Coronary Artery Risk Development in Young Adults (CARDIA) **Prospective cohort study** **N=2621** **Baseline age: 25y** **Excluded those that were not healthy black or white adults**	• MedDietScore, (modified Panagiotakos, 2007): ○ increasing intake of non-refined grains, fruits, vegetables, potatoes, legumes, fish, and olive oil (MUFA: SFA); ○ decreasing intake of red meat, poultry, and full-fat dairy; moderate intake of alcohol. • DASH score, (Folsom, 2007): ○ Positive: whole grains, vegetables, fruit, low-fat dairy, legumes, and nuts; ○ Negative: meat, fish and poultry, total fat, saturated fat, sweets, and sodium; • A Priori Diet Quality Score (APDQS, (Sjitmsa, 2012): ○ Positive: fruit, vegetables, legumes, low-fat dairy, fish, moderate alcohol intake ○ Adverse: fried foods, salty snacks, desserts, high-fat dairy, and sugar-sweetened soft drinks foods ○ Neutral: lean meat, shellfish, potato eggs, chocolate, fruit juices, diet beverages Diet assesed at baseline, year 7, and year 20 with diet history	• Low tertile: OR: 1, ref • Mid tertile: OR: 0.66, 95% CI: 0.51, 0.85 • High tertile: OR: 0.54, 95% CI: 0.39, 0.74 DASH and cogntive function at 30 y f/u, NS APDQS and cognitive function at 30 y f/u • per-SD increase: β: 0.09, 95% CI: 0.06, 0.12 • Low tertile: OR: 1, ref • Mid tertile: OR: 0.68, 95% CI: 0.52, 0.88 • High tertile: OR: 0.48, 95% CI: 0.33, 0.69	Alcohol intake, Physical activity, Other: diabetes, total energy intake <u>Limitations:</u> • Did not account for: Family history of NCD • Large gaps between dietary data collection <u>Summary</u>: Higher vs. lower MedDiet or APDQS adherence was significantly associated with less decline in cognitive function during 30y f/u. No significant association between DASH score and cognitive function. <u>Funding</u>: Beeson-CARDI Fellowship from the American Federation of Aging Research; NHLBI; NIA
Ozawa, 2017[14] **United Kingdom** **Prospective**	<u>Reduced Rank Regression:</u> Response variables: serum IL-6 and 37 food groups to derive the Inflammatory Dietary Pattern Score, examined by tertiles (T1, T2, T3)	Dietary pattern adherence and cognitive decline change over 10 y f/u: Global cognitive score • T2 vs. T1: ref.: -0.35, 95% CI: -0.37, -0.32	<u>Accounted for</u>: Sex, Age, Race/ethnicity, SES: Occupation, Education, Anthropometry: BMI, Smoking, Physical activity, Other: Total energy intake, diabetes, hypertension,

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
cohort study **Whitehall II cohort** **N=5083** **Baseline age: 56y**	• Characterized by higher intake of red meat, processed meat, peas and legumes, and fried food, and lower intake of whole grains Diet assessed at two time points (1991-1993, 1997-1999) with validated FFQ	• T3 vs. T1 ref: -0.35, 95% CI: -0.38, -0.32 • p-trend=0.04 MMSE decline ≥ 3 points: NS	Limitations: • Did not account for: Alcohol intake, Family history of NCD • Diet assessed as average of two time points Summary: Higher vs. lower inflammatory dietary pattern consumption was significantly associated with greater decline in cognitive function over 10y f/u Funding: UNESCO- L'Oreal Foundation; Astellas Foundation for Research on Metabolic Disorders, the British Medical Research Council; the Economic and Social Research Council; NIA; NIH; British Heart Foundation
Pearson, 2016[15] **United States Prospective cohort study REasons for Geographic And Racial Differences in Stroke (REGARDS)** **N=18080** **Baseline age: 65y** **Excluded those of race other than White or Black,**	Factor analysis: Identified five dietary patterns: • "Convenience": mixed dishes with meat, pizza, Chinese food and Mexican dishes • "Plant-based": vegetables, fruits, fish and beans • "Sweets/fats": high loadings of miscellaneous sugars, desserts, candy, sweetened breakfast foods and added fats • "Southern": high loadings of added fats, fried food, eggs and egg dishes, organ meats, processed meats and sugar-sweetened beverages	"Convenience", Plant-based","Sweets/fats", or "Southern" and cognitive impairment at 7y f/u: NS "Alcohol/salads" and cognitive impairment at 7y f/u: • Q1, n=397, OR: 1, ref • Q2, n=343, OR: 0.94, 95% CI: 0.80, 1.12, NS • Q3, n=271, OR: 0.81, 95% CI: 0.68, 0.97 • Q4, n=270, OR: 0.88, 95% CI: 0.73, 1.05, NS • Q5, n=205, OR: 0.68, 95% CI: 0.56, 0.84 • P=0.0005	Accounted for: Sex, Age, Race/ethnicity, SES: income, education, Anthropometry: BMI, Physical activity, Smoking status, Total energy intake, Other: region, HTN, diabetes, history of CVD, and score on CESD-4 Limitations: • Did not account for: Alcohol intake, Family history of NCD • Diet assessed once at baseline Summary: Higher vs. lower "alcohol/salads" dietary pattern consumption was significantly associated

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
undergoing treatment for cancer or medical conditions, nursing home residents, or non-English users.	• Alcohol/salads: high loadings of green-leafy vegetables, tomatoes, salad dressing, ***wine*** and liquor Diet assesed once at baseline with validated FFQ		with lower odds of cognitive decline at 7y f/u Funding: National Institute of Neurological Disorders and Stroke, NIH, DHHS; General Mills Bell Institute of Health and Nutrition

Richard, 2018
 	
United States Prospective cohort study
 	
Rancho Bernardo Study
 	
N=1499
 	
Baseline age: 73y
 	
Exclusions: <50y
	Index analysis:
	
	Adherence to two indices by tertile:
	
	• Alternate Mediterranean diet score,aMed (Fung, 2005):
	  ○ Positive: vegetables, legumes, fruits, nuts, whole grains, fish, red meat below median, MUFA/PUFA, Moderate alcohol
	• Alternate Healthy Eating Index,AHEI-2010, score (Chiuve, 2012):
	  ○ 'vegetables, fruits, whole grains, sugar-sweetened beverages and fruit juice, nuts and legumes, red/processed meat, trans-fat, long-chain (n-3) fats, EPA, DHA, PUFAs, sodium, and alcohol within thresholds'
	• *Note: Patterns identified by factor analyses were based only on select nutrients/micronutrients (i.e., PUFA/Vitamin E), thus, are not described here.*
	
	Diet assesed once at baseline with validated FFQ
		aMED
		
		• MMSE at ~27y f/u:
		  ○ T2 vs. T1 ref.: 0.19, 95% CI: -0.006, 0.38, NS
		  ○ T3 vs. T1 ref.: 0.33, 95% CI: 0.11, 0.55
		  ○ P-trend=0.002
		
		AHEI-2010
		
		• MMSE at ~27y f/u; NS
			Accounted for: Age, Sex, SES: Education, Smoking, Alcohol, Other: time, energy intake, retest effects, exercise
			
			Limitations:
			
			• Did not account for: Race/ethnicity, Physical activity, Anthropometry, Family history of NCD
			• Diet was assessed once at baseline with a FFQ
			
			Summary: Higher vs. lower aMED adherence dietary pattern consumption was significantly associated with better cognitive function. No significant associations were identified for AHEI-2010 adherence and cognitive outcomes.
			
			Funding: National Institute on Alcohol Abuse and Alcoholism; NIA; National Institute of Diabetes and Digestive and Kidney Diseases

Shakersain, 2016[17] **Sweden Prospective**	Factor analysis: Two dietary patterns were identified:	"Western" and change in MMSE score over 6y f/u: • Continuous: β: -0.045, 95% CI: -0.071, -0.019, p=0.001	Accounted for: Age, Sex, SES: Education, Anthropometry: BMI, Smoking, Alcohol: Part of dietary pattern, Physical activity, Other: time, energy intake, civil status,

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
cohort study Swedish National study on Aging and Care-Kungsholmen (SNAC-K) **N=2223** **Baseline age: 71y** **Excluded those with dementia**	• "Western": characterized by more frequent intakes of red/processed meat, saturated/trans-fat, refined grains, sugar, ***beer, and spirits*** • "Prudent": characterized by more frequent intakes of vegetables, fruit, cooking/dressing oil, cereals and legumes, whole grains, rice/pasta, fish, low-fat dairy, poultry, and water Diet assessed once at baseline with validated FFQ	• Q1: ref • Q2: β: -0.075, 95% CI: -0.154, 0.004, NS • Q3: β: -0.137, 95% CI: -0.217, -0.057 • Q4: β: -0.063, 95% CI: -0.144, 0.017, NS • Q5: β: -0.156, 95% CI: -0.240, -0.073 "Prudent" and change in MMSE score over 6y f/u: • Continuous: β: 0.043, 95% CI: 0.017, 0.068, p=0.001 • Q1: ref • Q2: β: 0.001, 95% CI: -0.085, 0.083, NS • Q3: β: 0.061, 95% CI: -0.021, 0.143, NS • Q4: β: 0.122, 95% CI: 0.039, 0.204 • Q5: β: 0.106, 95% CI: 0.024, 0.189 Similar results obtained when accounting for missing data with imputation,	vitamin or mineral supplements, vascular disorders, diabetes, cancer, depression, ApoE 4, and other dietary pattern. <u>Limitations:</u> • Did not account for: Race/ethnicity, Family history of NCD • Diet assessed once at baseline <u>Summary:</u> Higher vs. lower adherence to the "Prudent" dietary pattern at midlife was significantly associated with less MMSE decline at 6y f/u. Higher vs. lower adherence to the "Western" dietary pattern at midlife was significantly associated with more MMSE decline at 6y f/u, but was attenuated when accompanied by high "Prudent" dietary pattern adherence. <u>Funding:</u> Ministry of Health and Social Affairs, Sweden; participating county councils and municipalities; Swedish Research Council for Health, Working Life and Welfare; Stiftelsen Ragnhild och Einar Lundstr€oms Minne; Gun och Bertil Stohnes Foundation; Demensfonden
Shakersain, 2018a[18] **Sweden** **Prospective cohort study Swedish National**	<u>Index analysis:</u> Nordic Prudent Dietary Pattern score, NPDP (Shakersain, 2018): • Reflects high consumptions of non-root vegetables, apples/pears/peaches, pasta/rice,	NPDP adherence and change in MMSE over 6 y f/u: • Low: T1: ref • Moderate to High: β: 0.19, 95% CI: 0.14, 0.24 • Moderate: β: 0.14, 95% CI: 0.08, 0.20	<u>Accounted for:</u> Age, Sex, SES: Education, Anthropometry: BMI, Smoking, Alcohol: Part of dietary pattern, Physical activity, Other: time, energy intake, civil status, vitamin/supplement use, vascular disorders, diabetes, cancer, depression,

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
study on Aging and Care-Kungsholmen (SNAC-K) **N=2223** **Baseline age: 71y** **Excluded those with dementia**	poultry, fish, vegetable oils (mainly rapeseed oil), tea, and water, light to moderate wine intake • Reflects low consumptions of root vegetables (including potatoes), refined grains/cereals, high-fat dairy products, butter/margarine, sugar/sweets/pastries, and fruit juice.	• High: β: 0.24, 95% CI: 0.18, 0.30 • P-trend: <0.001	ApoE 4, other dietary pattern, survival status, social activity, mental activity Limitations: • Did not account for: Race/ethnicity, Family history of NCD • Diet assessed once at baseline Summary: Higher vs. lower adherence to the Nordic Prudent dietary pattern in older adults was significantly associated with less MMSE decline at 6y f/u. Funding: Ministry of Health and Social Affairs, Sweden; participating county councils and municipalities; Swedish Research Council; National Natural Science Foundation of China; Konung Gustaf V:s och Drottning Victorias Frimurare Foundation; Alzhermerfonden, and Demensfonden (Sweden); Fondazione Umberto Veronesi; European Union's Horizon 2020 research and innovation programme
Shakersain, 2018b[19] **Sweden Prospective cohort study Swedish National study on Aging and Care-Kungsholmen (SNAC-K)**	Index analysis: • Nordic Prudent Dietary Pattern, NPDP: See Shakersain, 2018a • MIND, hybrid Mediterranean DASH index (Morris, 2015): scored based on 10 brain healthy food groups: green leafy vegetables, other vegetables, nuts, berries, beans, whole grains, fish, poultry, olive oil and ***wine*** and 5 unhealthy food groups: red meats,	Diet indice/score adherence and rate of change in MMSE score over 6 y f/u: NPDP: • Continuous: β: 0.011, 95% CI: 0.008, 0.013 • Low adherence, ref • Moderate adherence: β: 0.139, 95% CI: 0.077, 0.201 • High adherence: β: 0.238, 95% CI: 0.175, 0.300	Accounted for: Sex, Age, SES: Education, Anthropometry: BMI, Smoking, Alcohol: Part of dietary pattern, Physical activity, Other: Total calorie intake, civil status, vitamin/mineral supplementation, vascular disorders, diabetes, cancer, depression, APOE e4, dietary components other than those in each index Limitations:

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
N=2223 **Baseline age: 71y** **Excluded those with dementia.**	butter/margarine, cheese, pastries and sweets, and fried/fast food. • MedDiet Score (Panagiotakos, 2007): Based on 11 items: non-refined cereals (whole grain bread and pasta, brown rice, etc), fruit, vegetables, legumes/beans, potatoes, fish, meat and meat products (red and processed meat), poultry, high-fat dairy products (like cheese, yoghurt, milk), as well as olive oil and ***alcohol*** (wine) intake. • Dietary Approaches to Stop Hypertension, DASH (Morris, 2015): based on 10items: total grains /cereals, vegetables, fruits, dairy foods, meats/poultry/fish, legumes/beans, sugar/sweets/pastries; total fat, saturated fat and sodium. • Baltic Sea Diet, BSD (Kanerva, 2014): Nordic vegetables: tomato, cucumber, leafy vegetables, roots, cabbages, legumes; (ii) Nordic fruits: apples, pears, and berries; (iii) Nordic wholegrain cereals: rye, oats and barley; potatoes; low-fat and fat-free milk products; Nordic fish: salmon and freshwater fish; E% from fat, ratio of PUFA/SFA+Trans fat, red and processed meat: beef, pork, processed meat products and sausage; and sweets	MIND: • Continuous: β: 0.006, 95% CI: 0.003, 0.009 • Low adherence, ref • Moderate adherence: β: 0.075, 95% CI: 0.012, 0.138 • High adherence: β: 0.126, 95% CI: 0.064, 0.188 MedDiet Score: • Continuous: β: 0.006, 95% CI: 0.002, 0.009 • Low adherence, ref • Moderate adherence: β: 0.063, 95% CI: -0.002, 0.129, NS • High adherence: β: 0.099, 95% CI: 0.036, 0.163 DASH: • Continuous: NS • Categorical: NS BSD: • Continuous: β: 0.006, 95% CI: 0.002, 0.009 • Categorical: NS	• Did not account for: Race/ethnicity, Family history of NCD • Diet assessed once at baseline Summary: Higher vs. lower adherence (both continuously and categorically) to the Nordic Prudent dietary pattern, the MIND pattern, and MedDiet score in older adults was significantly associated with less MMSE decline at 6y f/u. There was no significant relationship between DASH adherence and MMSE decline at 6 y f/u. Higher adherence to the Baltic Sea Diet was only significantly associated continuously with less MMSE decline at 6y f/u. Funding: Ministry of Health and Social Affairs, Sweden; participating county councils and municipalities; the Swedish Research Council; the National Natural Science Foundation of China; European Union's Horizon 2020 research and innovation programme; the Konung Gustaf V:s och Drottning Victorias Frimurare Foundation; Diabetes Foundation; Gun och Bertil Stohnes Foundation; Alzheimerfonden; and the Dementia Association (Sweden)
Shannon, 2019[20] **United Kingdom**	Index analysis: Mediterranean Diet Scores:	Adherence to dietary pattern and global cognition (SF-EMSE) during 14y f/u:	Accounted for: Age, Sex, SES: Marital status, Employment, Education, Anthropometry: BMI and Waist

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations

Prospective cohort study
 	
EPIC-Norfolk
N=8009
Baseline age: 55y
	• Mediterranean Diet Adherence Screener, MEDAS (Papadaki, 2018): categorical and continuous score
	  ○ Positive: Vegetables, Legumes, Fruit, Nuts, Seafood, Olive Oil, Olive oil as principal cooking fat More white meat than red meat, Wine, Sofrito (lasagne)
	• Negative: Sweets or pastries, Red Meat or Sausages (including lasagne), Sugar-Sweetened Beverages, Butter, margarine, or cream (including low-fat spread)MedDiet Pyramid (Tong, 2016): continuous score
	  ○ Positive: Vegetables, Legumes, Fruit, Nuts, Cereals, Fish, White meat, Eggs, Olive Oil
	  ○ Moderate: Alcohol
	  ○ Negative: Potato, Red meat, Processed meat, Sweets
		• MEDAS: β: -0.004, SE: 0.002
		• MEDAS Continuous: β: -0.005, SE: 0.002
		• MedDiet Pyramid: per-1-point increase: β: -0.012, P<0.001
			Circumference, Smoking, Physical activity, Other: Self-reported medical conditions, self-reported medications, HDL and LDL cholesterol, total triglycerides, DBP, SBP, APOE E4
			
			<u>Limitations:</u>
			• Did not account for: Race/ethnicity, Alcohol intake, Family history of NCD
			• Dietary intake evaluated once at baseline
			
			<u>Summary</u>: Higher adherence to all three MedDiet scores was significantly associated with better performance on global cognition during 14y f/u in middle-aged adults. There was no significant association with the MedDiet scores and performance in retrospective memory, attention, or complex processing speed. MedDiet Pyramid adherence score was significantly associated with better performance in simple processing speed and retrospective memory, but the other two scores were not.
			
			<u>Funding:</u> Alzheimer's Research UK Prevention and Risk Reduction Fund

Smyth, 2015[21] **40 Countries** **Prospective cohort study 'ONTARGET and TRANSCEND'**	<u>Index analysis:</u> Modified Alternative Healthy Eating Index (AHEI) score (Dehghan, 2012) components, within specified limits: • Vegetable, Fruits, Nuts and soy proteins, Whole grain, Deep-fried	Adherence to AHEI and cognitive decline over 5 y f/u: • Q1: ref • Q2, Q3, Q4 vs. Q1 ref. NS • Q5 vs. Q1 ref.: HR: 0.76, 95% CI: 0.66, 0.86	<u>Accounted for</u>: Sex, Age, SES: Education, Anthropometry: BMI, Smoking, Alcohol: Part of dietary pattern, Physical activity, Other: trial enrollment, treatment allocation, geographical region, baseline MMSE score, SBP, history of stroke/TIA, DM, MI, microalbuminuria, macroalbuminuria, serum creatinine,

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
N=27860 **Baseline age: 66y**	foods, Ratio of fish to meat and egg, Alcohol	Subgroup analysis: • Excluding early cases in <2y f/u, composite outcomes, MMSE<24 at baseline, or those with cancer at baseline yeilded similar results • Stratification by MMSE score at baseline: Increased adherence to the AHEI was significantly associated with a reduced cognitive decline when MMSE was 26-28 or >28 at baseline, but MMSE<26 was NS. • Stratification by physical activity status at baseline: Increased adherence in AHEI was significantly associated with a reduced cognitive decline with moderate or high activity at baseline, but not sedentary.	statin therapy, beta-blocker therapy, antithrombotic use, depression. Limitations: • Did not account for: Race/ethnicity, Family history of NCD Summary: Higher adherence to the mAHEI was significantly associated with less cognitive decline during 5y f/u, both overall and in those with MMSE 26-28 or >28 at baseline, as well as those with moderate or high physical activity at baseline. Funding: Boehringer Ingelheim
Tomata, 2016[22] **Japan** **Prospective cohort study** **N=14402** **Baseline age: 74y** **Excluded those that did not provide consent for review of their long-term care insurance information, those that had a disability before starting f/u, those that died or**	Factor analysis: • 'Japanese' pattern - loaded heavily on fish, vegetables, mushrooms, potato, seaweeds, pickles, soybean, and fruits • 'Animal food' pattern - loaded heavily on various animal-derived foods (beef, pork, ham, sausage, chicken, liver, egg, and butter) • 'High-dairy' pattern - heavily loaded on dairy products (yoghurt, cheese, and butter), margarine, and black tea, Chinese tea, and negatively loaded on rice.	'Japanese' pattern score and dementia over 6 y f/u: • Q1: ref • Q2 or Q3 vs. Q1 ref: NS • Q4 vs. Q1 ref: HR: 0.80, 95% CI: 0.66, 0.97 'Animal food' pattern and dementia over 6 y f/u: NS 'High-dairy' pattern and dementia over 6 y f/u: NS	Accounted for: Sex, Age, SES: Education, Anthropometry: BMI, Smoking, Alcohol, Physical activity, Other: history of non-NCD chronic disease, psychological distress score, motor function score, number of remaining teeth, cognitive function score, energy intake, protein intake Limitations: • Did not account for: Race/ethnicity, Family history of NCD Summary: Higher adherence to the 'Japanese dietary pattern' was significantly associated with reduced dementia risk in older Japanese adults over a 6 y f/u. There was no significant association between the 'animal food'

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
moved before the start of f/u, and those for which a doctor's opinion paper was unavailable			pattern or 'high-dairy' pattern and dementia risk. Funding: Honjo International Scholarship Foundation; Health Sciences Research grants from the Ministry of Health, Labour and Welfare of Japan
Voortman, 2017[23] **Netherlands** **Prospective cohort study Rotterdam Study** **N=9701** **Baseline age: 64y** **Excluded those with prevalent disease at baseline**	Index analysis: Dutch dietary guidelines score – 2015 (Voortman, 2017): • Positive components: Vegetables, legumes, fruit, nuts, whole grains, fish, dairy products, unsaturated fats and oils, tea • Negative components: Replace refined grains with whole-grain products, red meat, processed meat, alcohol, sodium	Adherence to Dutch Dietary guidelines score and risk of dementia over 12 y f/u: NS	Accounted for: Sex, Age, SES: Education, Anthropometry: BMI, Smoking, Alcohol: Part of dietary pattern, Physical activity, Other: Cohort, total energy intake Limitations: • Did not account for: Race/ethnicity, Family history of NCD • Diet assessed once at baseline Summary: Higher adherence to the Dutch Dietary Guidelines score by an older Dutch population over 12 y f/u was not significantly associated with a reduced risk of dementia. Funding: Erasmus University Medical Center and Erasmus University Rotterdam; Netherlands Organization for Health Research and Development; Research Institute for Diseases in the Elderly; Netherlands Genomics Initiative; Ministry of Education, Culture and Science; Ministry of Health, Welfare and Sports; European Commission; Municipality of Rotterdam.
Wagner, 2019[24] **United States**	Index analysis: alternate Mediterranean diet, A-MeDi (Cheng, 2018 modified Fung, 2005) score	A-MeDi score in cases of cognitive decline (10% worst TICS slopes) remained lower than controls at 1y f/u: mean difference -0.19, 95% CI: -0.29, -0.09.	Accounted for: Sex, Age, SES: Education, Anthropometry: BMI part of design, Alcohol: Part of dietary pattern, Physical activity: part of design

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
Nested Case-Control **Nurses' Health Study (NHS)** **N=1496 cases, 7478 controls** **100% female, Baseline age: ~61y**	• Positive components: Vegetables, legumes, fruit, nuts, whole grains, fish, MUFA:SFA ratio • Moderate: Alcohol • Negative components: red/processed meat		Limitations: • Did not account for: Race/ethnicity, Smoking, Family history of NCD Summary: Cases of cognitive decline compared to controls had lower adherence to A-MeDi. Funding: NIH
Wu, 2019[25] **Singapore** **Prospective cohort study Singapore Chinese Health Study** **N=16948** **Baseline age: 53.5y** **Excluded those with cancer or CVD at baseline**	Index analysis: • alternate Mediterranean diet (aMED) score (Fung, 2005): positively scored vegetables (not potatoes), fruit, legumes, nuts, whole grains, fish, MUFA/SFA, and moderate alcohol; negatively scored red and processed meat • Dietary Approaches to Stop Hypertension (DASH) diet (modified Fung, 2008: positively scored vegetables (not potatoes), fruit and fruit juice, legumes and nuts, whole grains, and total dairy; negatively scored red and processed meat, sugar-sweetened beverages, and sodium • alternative Healthy Eating Index (AHEI)-2010 score (adjusted Chiuve, 2012): positively scored vegetables (not potatoes, French fries), fruit, legumes and nuts, whole grains, long-chain fats and PUFA, and moderate alcohol; negatively scored red and	Cognitive impairment (MMSE) at ~20y f/u aMED, • per-SD increment: OR: 0.84, 95% CI: 0.80, 0.88 • Q4 vs. Q1 ref.: OR: 0.67, 95% CI: 0.59, 0.77 • p-trend <0.001 • Stronger associations were observed in older adults, women, and those with no formal education. DASH, • per-SD increment: OR: 0.89, 95% CI: 0.84, 0.93 • Q4 vs. Q1 ref. OR 0.71, 95% CI: 0.62, 0.81 • p-trend <0.001 AHEI-2010 • per-SD increment:	Accounted for: Age, Sex, SES: Education, Marital Status, Anthropometry: BMI, Smoking, Alcohol: If not part of dietary pattern, Physical activity, Other: dialect, sleep, total energy intake, tea/coffee intake if not part of dietary pattern, history of hypertension, diabetes, cardiovascular disease, and cancer. Limitations: • Did not account for: Race/ethnicity, Family history of NCD • Diet assessed once at baseline Summary: Higher vs. lower adherence to all dietary pattern indices examined (aMED, DASH, AHEI-2010, PDI, hPDI) was significantly associated with lower risk of cognitive impairment at 20y f/u. Funding: National Medical Research Council, Singapore; NIH; Saw Swee Hock School of Public Health, National University of Singapore; National Key Research and Development Program of

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
	processed meat, sugar-sweetened beverages and fruit juice, trans fat, and sodium • Plant-based diet index (PDI) (Satija, 2016): positively scored "all plant foods" and negatively scored "animal foods" • Healthful plant-based diet index (hPDI) (Satija, 2016): positively scored "healthy plant foods" and negatively scored "less healthy plant foods" Diet assessed once at baseline with validated FFQ	• Q4 vs. Q1 ref. OR 0.75, 95% CI: 0.66, 0.85 • p-trend <0.001 • Stronger associations were observed in women PDI • per-SD increment: OR: 0.89 , 95% CI: 0.85, 0.94 • Q4 vs. Q1 ref. OR 0.82, 95% CI: 0.71, 0.94 • p-trend <0.001 hPDI • per-SD increment: OR: 0.93, 95% CI: 0.88, 0.97 • Q4 vs. Q1 ref. OR 0.78, 95% CI: 0.68, 0.90 • p-trend <0.001 • Stronger associations were observed in those with no formal education In overall sub-analyses, associations were not significantly modified by sex, education level, BMI group, baseline hypertension, or diabetes.	China; Hubei Province Science Fund for Distinguished Young Scholars
Zhu, 2015[26] **United States** **Prospective cohort study** **CARDIA** **N=2435**	Index analysis: A Priori Diet Quality Score, APDQS (Sjitsma, 2012) • Positive: fruit, vegetables, legumes, low-fat dairy, fish, coffee/tea, moderate alcohol intake • Adverse: fried foods, high fat meat, salty snacks, desserts, high-fat dairy, and sugar-sweetened soft drinks	APDQS per 10-unit increase at baseline APDQS and RAVLT at 25y f/u: Slope=0.16, p=0.004; DSST: NS; higher; Stroop: NS APDQS per 10-unit increase at 20y and RAVLT at 25y f/u: Slope=0.21, p=0.0003; DSST: Slope=0.82, p=0.002; Stroop: Slope=-0.58, p=0.007	Accounted for: Age, Sex, Race, SES: Education, Anthropometry: BMI, Physical activity, Alcohol: Part of dietary pattern, Smoking, Other: study center, energy intake, blood pressure, total cholesterol, diabetes, apoE4 Limitations: • Did not account for: N/A

Study and Participant Characteristics[vi]	Intervention/Exposure	Results	Methodological Considerations
Baseline age: 18-30y **52% African-American, 48% white**	• Neutral: lean meat, shellfish, potato eggs, chocolate, fruit juices, diet beverages Diet assessed twice, once at baseline and once at f/u with CARDIA study diet history	APDQS per 10-unit increase change from baseline-20y f/u and RAVLT at 25y f/u: Slope=0.16, p=0.01; DSST: Slope=0.70, p=0.01; Stroop: Slope=-0.55, p=0.02	• Diet assessment at two time points span 20y Summary: Higher vs. lower APDQS adherence at 20y f/u or dietary change from baseline to 20y f/u was significantly associated with better cognitive test results at 25y f/u. Funding: NHLBI; NIA

Table 3. Risk of bias for randomized controlled trials examining dietary patterns and cognitive impairment, dementia, or Alzheimer's disease[vii, viii]

	Randomization	Deviations from intended interventions – effect of assignment	Deviations from intended interventions– per-protocol	Missing outcome data	Outcome measurement	Selection of reported result
Chlebowski, 2020[1]	Low	Low	Low	Low	Some concerns	Some concerns
Knight, 2016[3]	Low	Low	Low	Low	Low	Some concerns
Marseglia, 2018[2]	Some concerns	Low	Low	Low	Low	Some concerns
Valls-Pedret, 2015[4]	Some concerns	Low	Low	Low	Low	Some concerns

[vii] A detailed description of the methodology used for assessing risk of bias is available on the NESR website: https://nesr.usda.gov/2020-dietary-guidelines-advisory-committee-systematic-reviews and in Part C of the following reference: Dietary Guidelines Advisory Committee. 2020. *Scientific Report of the 2020 Dietary Guidelines Advisory Committee: Advisory Report to the Secretary of Agriculture and the Secretary of Health and Human Services*. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC.

[viii] Possible ratings of low, some concerns, or high determined using the "Cochrane Risk-of-bias 2.0" (RoB 2.0) (August 2016 version)" (Higgins JPT, Sterne JAC, Savović J, Page MJ, Hróbjartsson A, Boutron I, Reeves B, Eldridge S. A revised tool for assessing risk of bias in randomized trials In: Chandler J, McKenzie J, Boutron I, Welch V (editors). Cochrane Methods. *Cochrane Database of Systematic Reviews* 2016, Issue 10 (Suppl 1). dx.doi.org/10.1002/14651858.CD201601.)

Table 4. Risk of bias for observational studies examining dietary patterns and cognitive impairment, dementia, or Alzheimer's disease[ix]

	Confounding	Selection of participants	Classification of exposures	Deviations from intended exposures	Missing data	Outcome measurement	Selection of reported result
Adjibade, 2019[5]	Serious	Serious	Low	Serious	Moderate	Low	Serious
Akbaraly, 2019[6]	Serious	Moderate	Low	Moderate	Moderate	Low	Moderate
Berendsen, 2017[7]	Serious	Moderate	Low	Moderate	Moderate	Low	Serious
Berendsen, 2018[8]	Serious	Moderate	Low	Moderate	Moderate	Low	Serious
Bhushan, 2018[9]	Serious	Moderate	Low	Moderate	Serious	Low	Moderate
Dearborn-Tomazos, 2019[10]	Serious	Serious	Low	Serious	Serious	Low	Moderate
Haring, 2016[11]	Serious	Moderate	Low	Serious	Moderate	Low	Moderate
Mannikko, 2015[12]	Serious	Serious	Low	Moderate	Serious	Low	Moderate
McEvoy, 2019[13]	Serious	Moderate	Low	Moderate	Serious	Low	Moderate
Ozawa, 2017[14]	Serious	Serious	Low	Moderate	Serious	Low	Moderate
Pearson, 2016[15]	Serious	Serious	Low	Serious	Serious	Moderate	Moderate
Richard, 2018[16]	Serious	Moderate	Low	Moderate	Serious	Low	Low
Shakersain, 2016[17]	Serious	Serious	Low	Moderate	Serious	Low	Moderate
Shakersain, 2018a[18]	Serious	Serious	Low	Moderate	Serious	Low	Serious
Shakersain, 2018b[19]	Serious	Serious	Low	Moderate	Serious	Low	Moderate
Shannon, 2019[20]	Serious	Moderate	Low	Serious	No Information	Low	Moderate
Smyth, 2015[21]	Serious	Serious	Low	Moderate	Serious	Low	Moderate
Tomata, 2016[22]	Serious	Serious	Low	Moderate	Moderate	Low	Moderate
Voortman, 2017[23]	Serious	Serious	Moderate	Serious	Moderate	Low	Moderate
Wagner, 2019[24]	Serious	Serious	Low	Serious	Moderate	Serious	Moderate
Wu, 2019[25]	Serious	Moderate	Low	Moderate	Moderate	Low	Moderate
Zhu, 2015[26]	Moderate	Moderate	Low	Serious	Serious	Low	Moderate

[ix] Possible ratings of low, moderate, serious, critical, or no information determined using the "Risk of Bias for Nutrition Observational Studies" tool (RoB-NObs) (Dietary Guidelines Advisory Committee. 2020. *Scientific Report of the 2020 Dietary Guidelines Advisory Committee: Advisory Report to the Secretary of Agriculture and the Secretary of Health and Human Services*. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC.)

METHODOLOGY

The NESR team used its rigorous, protocol-driven methodology to support the 2020 Dietary Guidelines Advisory Committee in conducting this update to an existing systematic review.

NESR's systematic review methodology involves:

- Developing a protocol,
- Searching for and selecting studies,
- Extracting data from and assessing the risk of bias of each included study,
- Synthesizing the evidence,
- Developing conclusion statements,
- Grading the evidence underlying the conclusion statements, and
- Recommending future research.

A detailed description of the methodology used in conducting this update to an existing systematic review is available on the NESR website: https://nesr.usda.gov/2020-dietary-guidelines-advisory-committee-systematic-reviews, and can be found in 2020 Dietary Guidelines Advisory Committee Report, Part C: Methodology.[x] This systematic review was peer reviewed by Federal scientists, and information about the peer review process can also be found in the Committee's Report, Part C. Methodology. Additional information about this systematic review, including a description of and rationale for any modifications made to the protocol can be found in the 2020 Dietary Guidelines Advisory Committee Report, Part D: Chapter 8. Dietary Patterns.

The systematic review described in this document updates an existing systematic review conducted by the 2015 Dietary Guidelines Advisory Committee with support from USDA's Nutrition Evidence Systematic Review (NESR) team. Information about the 2015 Dietary Guidelines Advisory Committee's review of the evidence on dietary patterns and cancer can be found in their report, which is available at the following website: https://nesr.usda.gov/dietary-patterns-foods-and-nutrients-and-health-outcomes-subcommittee.

Below are details of the final protocol, as it was applied to the systematic review described herein, including the:

- Analytic framework
- Literature search and screening plan
- Literature search and screening results

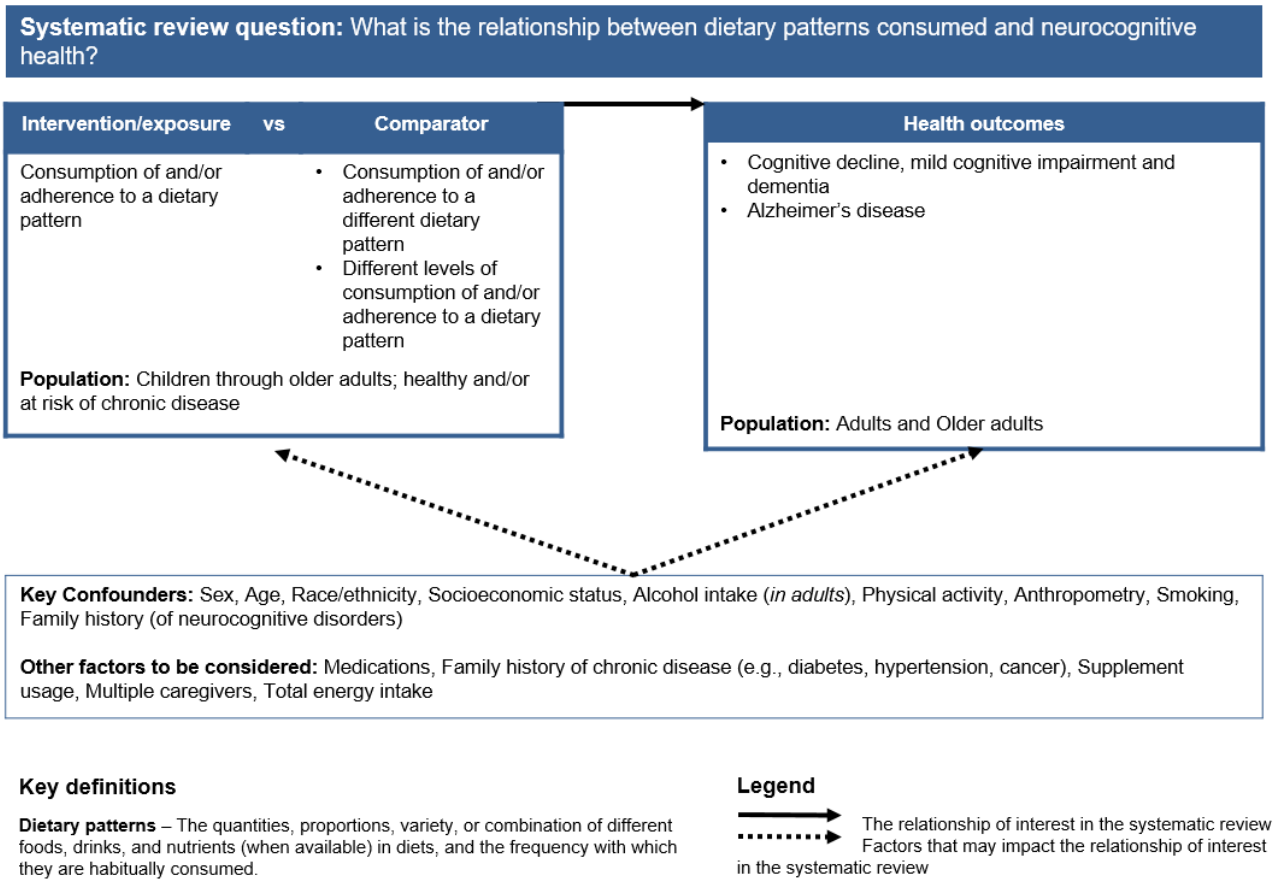
ANALYTIC FRAMEWORK

The analytic framework (**Figure 1**) illustrates the overall scope of this update to an existing systematic review, including the population, the interventions and/or exposures, comparators, and outcomes of interest. It also includes definitions of key terms and

[x] Dietary Guidelines Advisory Committee. 2020. *Scientific Report of the 2020 Dietary Guidelines Advisory Committee: Advisory Report to the Secretary of Health and Human Services and the Secretary of Agriculture*. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC.

identifies key confounders and other factors considered in the systematic review. The inclusion and exclusion criteria that follow provide additional information about how parts of the analytic framework were defined and operationalized for the review.

Figure 1: Analytic framework



LITERATURE SEARCH AND SCREENING PLAN

Inclusion and exclusion criteria

This table provides the inclusion and exclusion criteria for this update to an existing systematic review. The inclusion and exclusion criteria are a set of characteristics that were used to determine which articles identified in the literature search were included in or excluded from the systematic review.

Table 5. Inclusion and exclusion criteria

Category	Inclusion Criteria	Exclusion Criteria
Study design	• Randomized controlled trials • Non-randomized controlled trials, including quasi-experimental and controlled before and after studies • Prospective cohort studies • Retrospective cohort studies • Nested case-control studies	• Uncontrolled trials • Cross-sectional studies • Uncontrolled before-and-after studies • Narrative reviews • Systematic reviews • Meta-analyses • Case-control studies
Intervention/ exposure	• Studies that examine consumption of and/or adherence to a dietary pattern [i.e., the quantities, proportions, variety, or combination of different foods, drinks, and nutrients (when available) in diets, and the frequency with which they are habitually consumed], including, at a minimum, a description of the foods and beverages in the pattern ○ Dietary patterns may be measured or derived using a variety of approaches, such as adherence to a priori patterns (indices/scores), data driven patterns (factor or cluster analysis), reduced rank regression, or other methods, including clinical trials	• Studies that do not provide a description of the dietary pattern, which at minimum, must include the foods and beverages in the pattern (i.e., studies that examine a labeled dietary pattern, but do not describe the foods and beverages consumed)
Comparator	• Consumption of and/or adherence to a different dietary pattern • Different levels of consumption of and/or adherence to a dietary pattern	• N/A
Outcomes	• Cognitive decline, mild cognitive impairment, and dementia • Alzheimer's disease	
Date of publication	• August 2014 – February 2020 (this date range is in addition to the original systematic review, which included articles published from January 1980-August 2014)	• Articles published prior to January 1980 or after February 2020
Publication status	Articles that have been peer-reviewed	Articles that have not been peer-reviewed and are not published in peer-reviewed journals (e.g., unpublished data, manuscripts, reports, abstracts, pre-prints, and conference proceedings)
Language of publication	Articles published in English	Articles published in languages other than English

Category	Inclusion Criteria	Exclusion Criteria
Country[xi]	Studies conducted in countries ranked as high or higher human development	Studies conducted in countries ranked as medium or lower human development
Study participants	• Human participants • Males • Females • Women during pregnancy and lactation	• Non-human participants (i.e., animals)

Age of study participants	• Age at intervention or exposure:
	  ○ Children and adolescents (ages 2-18 years)
	  ○ Adults (ages 19-64 years)
	  ○ Older adults (ages 65 years and older)
	• Age at outcome:
	  ○ Adults (ages 19-64 years)
	  ○ Older adults (ages 65 years and older)
		• Age at intervention or exposure:
		  ○ Infants and toddlers (birth to 24 months)
		• Age at outcome:
		  ○ Infants and toddlers (birth to 24 months)

Study duration	• Minimum length of intervention of 12 weeks	• Interventions < 12 weeks
Size of study groups	• 30 participants per-arm for interventions, or • A power calculation included for interventions • n≥ 1,000 for observational studies	• Fewer than 30 participants per arm for interventions, or • No power calculation reported for interventions • Fewer than 1000 participants for observational studies

[xi] The Human Development classification was based on the Human Development Index (HDI) ranking from the year the study intervention occurred or data were collected (UN Development Program. HDI 1990-2017 HDRO calculations based on data from UNDESA (2017a), UNESCO Institute for Statistics (2018), United Nations Statistics Division (2018b), World Bank (2018b), Barro and Lee (2016) and IMF (2018). Available from: http://hdr.undp.org/en/data). If the study did not report the year in which the intervention occurred or data were collected, the HDI classification for the year of publication was applied. HDI values are available from 1980, and then from 1990 to present. If a study was conducted prior to 1990, the HDI classification from 1990 was applied. If a study was conducted in 2018 or 2019, the most current HDI classification was applied. When a country was not included in the HDI ranking, the current country classification from the World Bank was used instead (The World Bank. World Bank country and lending groups. Available from: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519 -world- country-and-lending-groups).

Category	Inclusion Criteria	Exclusion Criteria
Health status of study participants	• Studies that enroll participants who are healthy and/or at risk for chronic disease, including those with obesity • Studies that enroll *some* participants diagnosed with a disease • Studies that enroll some participants diagnosed with mild cognitive impairment, dementia, or Alzheimer's disease	• Studies that ***exclusively*** enroll participants diagnosed with a disease or hospitalized with illness or injury. (For this criterion, studies that exclusively enroll subjects with obesity will be included.) • Studies that ***exclusively*** enroll participants with mild cognitive impairment, dementia, or Alzheimer's disease (i.e., studies that aim to treat participants who have already been diagnosed with the outcome of interest)

Electronic databases and search strategy

Listed below are the databases searched to identify all potentially relevant articles that have been published to address this update to an existing systematic review**.**

PubMed

- Provider: U.S. National Library of Medicine
- Date(s) Searched: February 4, 2020
- Date range searched: January 1, 2014 - February 4, 2020
- Search Terms:

#1 - dietary pattern* OR diet pattern* OR eating pattern* OR food pattern* OR diet quality* OR eating habit* OR dietary habit* OR diet habit* OR food habit* OR beverage habit* OR "Feeding Behavior"[Mesh:NoExp] OR feeding behavior*[tiab] OR dietary profile* OR food profile* OR diet profile* OR eating profile* OR dietary guideline* OR dietary recommendation* OR dietary intake* OR eating style* OR "Diet, Mediterranean"[Mesh] OR Mediterranean Diet*[tiab] OR "Dietary Approaches To Stop Hypertension"[Mesh] OR Dietary Approaches To Stop Hypertension Diet* OR DASH diet* OR "Diet, Gluten-Free"[Mesh] OR Gluten Free diet* OR prudent diet* OR "Diet, Paleolithic"[Mesh] OR Paleolithic Diet* OR "Diet, Vegetarian"[Mesh] OR vegetarian diet*[tiab] OR vegan diet* OR "Diet, Healthy"[Mesh] OR healthy diet* OR plant based diet* OR "Diet, Western"[Mesh] OR western diet* OR "Diet, Carbohydrate-Restricted"[Mesh] OR low-carbohydrate diet* OR high carbohydrate diet* OR Ketogenic Diet* OR Nordic Diet* OR "Diet, Fat-Restricted"[Mesh] OR "Diet, High-Fat"[Mesh] OR "Diet, High-Protein"[Mesh] OR high protein diet*[tiab] OR protein intake* OR high-fat diet* OR low fat diet* OR "Diet, Protein-Restricted"[Mesh] OR low protein diet* OR "Diet, Sodium-Restricted"[Mesh] OR low-sodium diet* OR low salt diet* OR ((“Guideline Adherence"[Mesh] OR guideline adherence*) AND (diet[tiab] OR dietary[tiab] OR food[tiab] OR beverage*[tiab] OR nutrition*[tiab])) OR diet score* OR diet quality score* OR diet quality index* OR kidmed OR diet index* OR dietary index* OR food score* OR MedDietScore OR healthy eating index[tiab] OR ((pattern[tiab] OR patterns[tiab] OR consumption[tiab] OR habit*[tiab]) AND (“Diet"[Mesh:NoExp] OR diet[tiab] OR diets[tiab] OR dietary[tiab] OR "Food"[Mesh] OR food[tiab] OR foods[tiab] OR "Beverages"[Mesh]

OR beverage[tiab] OR beverages[tiab]))

#2 - "Cognition Disorders"[Mesh] OR "Cognition"[Mesh] OR cognition[tiab] OR metacognition[tiab] OR neurocognitive[tiab] OR "Dementia"[Mesh] OR dementia[tiab] OR Alzheimer*[tiab] OR senility[tiab] OR senile[tiab] OR presenile[tiab] OR (cognit*[tiab] AND (function*[tiab] OR dysfunction*[tiab] OR declin*[tiab] OR deteriorat* OR degenerat*[tiab] OR disorder*[tiab] OR dysfunction*[tiab] OR reduct*[tiab] OR impair*[tiab] OR deficit*[tiab] OR deficien* OR progress*[tiab] OR perform*[tiab] OR abilit*[tiab]))

#3 - (#1 AND #2)

#4 - (#1 AND #2) NOT ("Animals"[Mesh] NOT ("Animals"[Mesh] AND "Humans"[Mesh])) NOT (editorial[ptyp] OR comment[ptyp] OR news[ptyp] OR letter[ptyp] OR review[ptyp] OR systematic review[ptyp] OR systematic review[ti] OR meta-analysis[ptyp] OR meta-analysis[ti] OR meta-analyses[ti] OR retracted publication[ptyp] OR retraction of publication[ptyp] OR retraction of publication[tiab] OR retraction notice[ti]) Filters: Publication date from 2014/01/01 to 2020/02/04; English

Cochrane Central Register of Controlled Trials (CENTRAL)

- Provider: John Wiley & Sons
- Date(s) Searched: February 4, 2020
- Date range searched: January 1, 2014 - February 4, 2020
- Search Terms:

#1 - [mh ^"Feeding Behavior"] OR [mh "Diet, Mediterranean"] OR [mh "Dietary Approaches To Stop Hypertension"] OR [mh "Diet, Gluten-Free"] OR [mh "Diet, Paleolithic"] OR [mh "Diet, Vegetarian"] OR [mh "Diet, Healthy"] OR [mh "Diet, Western"] OR [mh "Diet, Carbohydrate-Restricted"] OR [mh "Diet, Fat-Restricted"] OR [mh "Diet, High-Fat"] OR [mh "Diet, High-Protein"] OR [mh "Diet, Protein-Restricted"] OR [mh "Diet, Sodium-Restricted"]

#2 - ("dietary pattern*" OR "diet pattern*" OR "eating pattern*" OR "food pattern*" OR "diet quality*" OR "eating habit*" OR "dietary habit*" OR "diet habit*" OR "food habit*" OR "beverage habit*" OR "feeding behavior*" OR "dietary profile*" OR "food profile*" OR "diet profile*" OR "eating profile*" OR "dietary guideline*" OR "dietary recommendation*" OR "dietary intake*" OR "eating style*" OR "Mediterranean Diet*" OR "Dietary Approaches To Stop Hypertension Diet*" OR "DASH diet*" OR "Gluten Free diet*" OR "prudent diet*" OR "Paleolithic Diet*" OR "vegetarian diet*" OR "vegan diet*" OR "healthy diet*" OR "plant based diet*" OR "western diet*" OR "low-carbohydrate diet*" OR "high carbohydrate diet*" OR "Ketogenic Diet*" OR "Nordic Diet*" OR "high protein diet*" OR "protein intake*" OR "high-fat diet*" OR "low fat diet*" OR "low protein diet*" OR "low-sodium diet*" OR "low salt diet*"):ti,ab,kw

#3 - (([mh "Guideline Adherence"] OR guideline adherence*) NEAR/6 (diet OR dietary OR food OR beverage* OR nutrition*))

#4 - ("diet score*" OR "diet quality score*" OR "diet quality index*" OR kidmed OR "diet index*" OR "dietary index*" OR "food score*" OR MedDietScore OR "healthy eating index*"):ti,ab,kw

#5 - ((pattern OR patterns OR consumption OR habit*) NEAR/6 ([mh ^"Diet"] OR diet OR diets OR dietary OR [mh "Food"] OR food OR foods OR [mh "Beverages"] OR beverage OR beverages))

#6 - #1 OR #2 OR #3 OR #4 OR #5

#7 - [mh "Cognition Disorders"] OR [mh "Cognition"] OR [mh "Dementia"]

#8 - (cognition OR metacognition OR neurocognitive OR dementia OR Alzheimer* OR senility OR senile OR presenile):ti,ab,kw

#9 - ((cognit* NEAR/6 (function* OR dysfunction* OR declin* OR deteriorat* OR degenerat* OR disorder* OR dysfunction* OR reduct* OR impair* OR deficit* OR deficien* OR progress* OR perform* OR abilit*))):ti,ab,kw

#10 - #7 OR #8 OR #9

#11 - #6 AND #10" with Publication Year from 2014 to 2020, in Trials (Word variations have been searched)

Embase

- Provider: Elsevier
- Date(s) Searched: February 4, 2020
- Date range searched: January 1, 2014 - February 4, 2020
- Search Terms:

#1 - 'feeding behavior'/de OR 'mediterranean diet'/exp OR 'dash diet'/exp OR 'gluten free diet'/exp OR 'paleolithic diet'/de OR 'vegetarian diet'/exp OR 'healthy diet'/exp OR 'western diet'/de OR 'low carbohydrate diet'/exp OR 'low fat diet'/de OR 'lipid diet'/exp OR 'protein diet'/exp OR 'protein restriction'/exp OR 'sodium restriction'/exp

#2 - 'dietary pattern*':ab,ti OR 'diet pattern*':ab,ti OR 'eating pattern*':ab,ti OR 'food pattern*':ab,ti OR 'diet quality*':ab,ti OR 'eating habit*':ab,ti OR 'dietary habit*':ab,ti OR 'diet habit*':ab,ti OR 'food habit*':ab,ti OR 'beverage habit*':ab,ti OR 'feeding behavior*':ab,ti OR 'dietary profile*':ab,ti OR 'food profile*':ab,ti OR 'diet profile*':ab,ti OR 'eating profile*':ab,ti OR 'dietary guideline*':ab,ti OR 'dietary recommendation*':ab,ti OR 'dietary intake*':ab,ti OR 'eating style*':ab,ti OR 'mediterranean diet*':ab,ti OR 'dietary approaches to stop hypertension diet*':ab,ti OR 'dash diet*':ab,ti OR 'gluten free diet*':ab,ti OR 'prudent diet*':ab,ti OR 'paleolithic diet*':ab,ti OR 'vegetarian diet*':ab,ti OR 'vegan diet*':ab,ti OR 'healthy diet':ab,ti OR 'plant based diet*':ab,ti OR 'western diet*':ab,ti OR 'low-carbohydrate diet*':ab,ti OR 'high carbohydrate diet*':ab,ti OR 'ketogenic diet*':ab,ti OR 'nordic diet*':ab,ti OR 'high protein diet*':ab,ti OR 'protein intake*':ab,ti OR 'high-fat diet*':ab,ti OR 'low fat diet*':ab,ti OR 'low protein diet*':ab,ti OR 'low-sodium diet*':ab,ti OR 'low salt diet*':ab,ti

#3 - ('guideline adherence*' NEAR/6 (diet OR dietary OR food OR beverage* OR nutrition*)):ab,ti

#4 - 'diet score*':ab,ti OR 'diet quality score*':ab,ti OR 'diet quality index*':ab,ti OR kidmed:ab,ti OR 'diet index*':ab,ti OR 'dietary index*':ab,ti OR 'food score*':ab,ti OR

meddietscore:ab,ti OR 'healthy eating index*':ab,ti

#5 - ((pattern OR patterns OR consumption OR habit*) NEAR/6 (diet OR diets OR dietary OR food OR foods OR beverage OR beverages)):ab,ti

#6 - #1 OR #2 OR #3 OR #4 OR #5

#7 - 'cognitive defect'/exp OR 'cognition'/exp OR 'dementia'/exp

#8 - cognition:ab,ti OR metacognition:ab,ti OR neurocognitive:ab,ti OR dementia:ab,ti OR alzheimer*:ab,ti OR senility:ab,ti OR senile:ab,ti OR presenile:ab,ti

#9 - (cognit* NEAR/6 (function* OR dysfunction* OR declin* OR deteriorat* OR degenerat* OR disorder* OR dysfunction* OR reduct* OR impair* OR deficit* OR deficien* OR progress* OR perform* OR abilit*)):ab,ti

#10 - #7 OR #8 OR #9

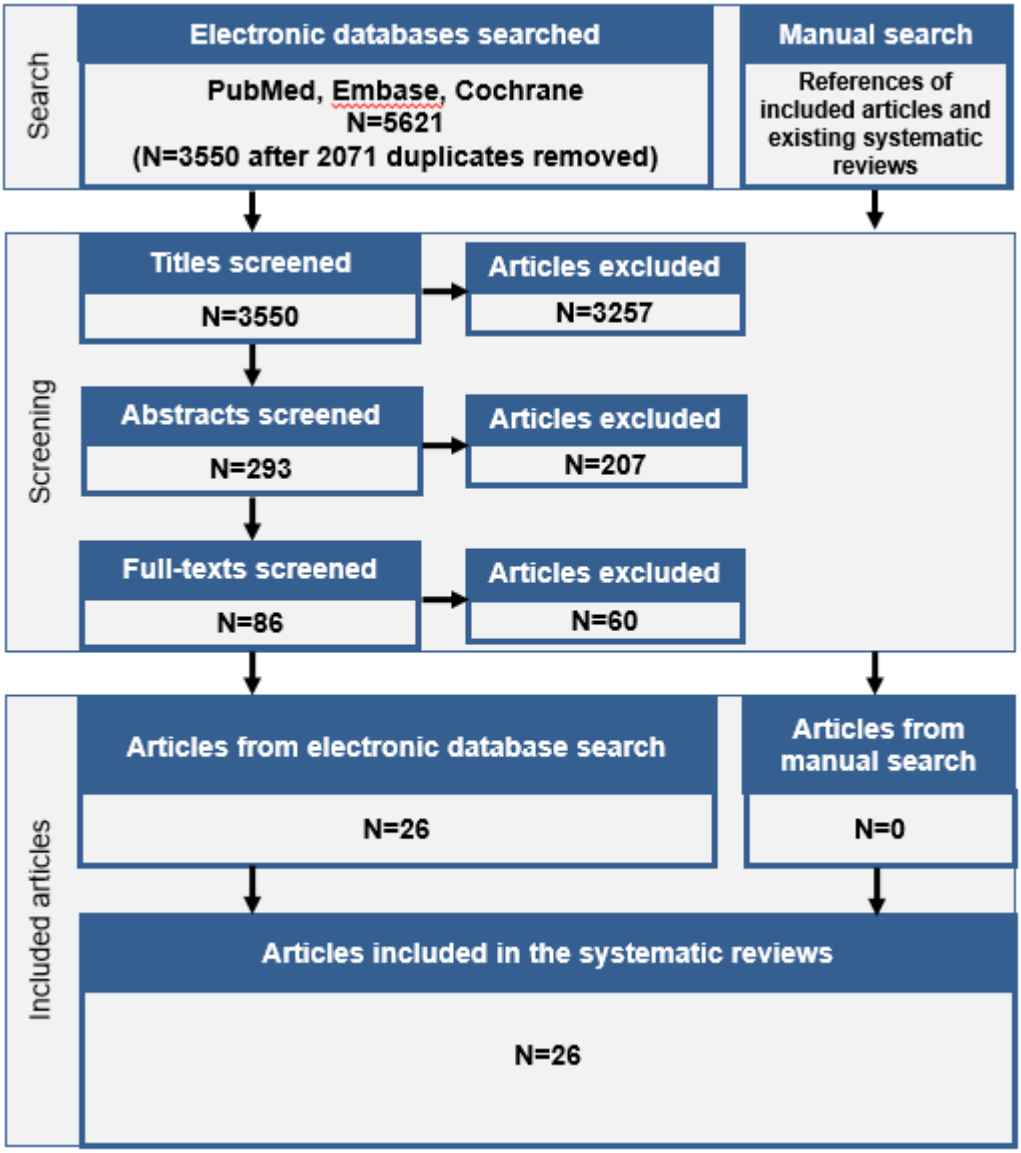
#11 - #6 AND #10

#12 - #6 AND #10 AND ([article]/lim OR [article in press]/lim) AND [humans]/lim AND [english]/lim AND [2014-2020]/py NOT ([conference abstract]/lim OR [conference paper]/lim OR [conference review]/lim OR [editorial]/lim OR [erratum]/lim OR [letter]/lim OR [note]/lim OR [review]/lim OR [systematic review]/lim OR [meta analysis]/lim)

LITERATURE SEARCH AND SCREENING RESULTS

The flow chart (**Figure 2**) below illustrates the literature search and screening results for articles examining the update to this systematic review question. The results of the electronic database searches, after removal of duplicates, were screened independently by two NESR analysts using a step-wise process by reviewing titles, abstracts, and full-texts to determine which articles met the inclusion criteria. Refer to **Table 6** for the rationale for exclusion for each excluded full-text article. A manual search was done to find articles that were not identified when searching the electronic databases; all manually identified articles were also screened to determine whether they meet criteria for inclusion.

Figure 2: Flow chart of literature search and screening results



Excluded Articles

The table below lists the articles excluded after full-text screening for the update to this systematic review question. At least one reason for exclusion is provided for each article, though this may not reflect all possible reasons. Information about articles excluded after title and abstract screening is available upon request.

Table 6. Articles excluded after full text screening with rationale for exclusion

	Citation	Rationale
1	Alavi-Naeini, A, Bagheri, M, Mirzaei, K, Maljaei, MB, Yekaninejad, MS, Yazdani, A. Relationship between dietary patterns and mild cognitive impairment (MCI) in elderly women. Progress in Nutrition. 2019. 21:270-280. doi:10.23751/pn.v21i1-S.6090	Study Design, Power/ Size
2	Anastasiou, CA, Yannakoulia, M, Kontogianni, MD, Kosmidis, MH, Mamalaki, E, Dardiotis, E, Hadjigeorgiou, G, Sakka, P, Tsapanou, A, Lykou, A, Scarmeas, N. Mediterranean Lifestyle in Relation to Cognitive Health: Results from the HELIAD Study. Nutrients. 2018. 10. doi:10.3390/nu10101557	Study Design
3	Anastasiou, CA, Yannakoulia, M, Kosmidis, MH, Dardiotis, E, Hadjigeorgiou, GM, Sakka, P, Arampatzi, X, Bougea, A, Labropoulos, I, Scarmeas, N. Mediterranean diet and cognitive health: Initial results from the Hellenic Longitudinal Investigation of Ageing and Diet. PLoS One. 2017. 12:e0182048. doi:10.1371/journal.pone.0182048	Study Design
4	Ashby-Mitchell, K, Peeters, A, Anstey, KJ. Role of dietary pattern analysis in determining cognitive status in elderly Australian adults. Nutrients. 2015. 7:1052-67. doi:10.3390/nu7021052	Power/ Size
5	Assmann, KE, Adjibade, M, Adriouch, S, Andreeva, VA, Julia, C, Hercberg, S, Galan, P, Kesse-Guyot, E. Association of diet quality and physical activity with healthy ageing in the French NutriNet-Sante cohort. Br J Nutr. 2019. 122:93-102. doi:10.1017/s0007114519000898	Outcome
6	Assmann, KE, Adjibade, M, Andreeva, VA, Hercberg, S, Galan, P, Kesse-Guyot, E. Association Between Adherence to the Mediterranean Diet at Midlife and Healthy Aging in a Cohort of French Adults. J Gerontol A Biol Sci Med Sci. 2018. 73:347-354. doi:10.1093/gerona/glx066	Outcome
7	Assmann, KE, Andreeva, VA, Camilleri, GM, Verger, EO, Jeandel, C, Hercberg, S, Galan, P, Kesse-Guyot, E. Dietary scores at midlife and healthy ageing in a French prospective cohort. Br J Nutr. 2016. 116:666-76. doi:10.1017/s0007114516002233	Outcome
8	Assmann, KE, Lassale, C, Andreeva, VA, Jeandel, C, Hercberg, S, Galan, P, Kesse-Guyot, E. A Healthy Dietary Pattern at Midlife, Combined with a Regulated Energy Intake, Is Related to Increased Odds for Healthy Aging. J Nutr. 2015. 145:2139-45. doi:10.3945/jn.115.210740	Outcome
9	Bajerska, J, Wozniewicz, M, Suwalska, A, Jeszka, J. Eating patterns are associated with cognitive function in the elderly at risk of metabolic syndrome from rural areas. Eur Rev Med Pharmacol Sci. 2014. 18:3234-45. doi: unavailable	Power/ Size
10	Blumenthal, JA, Smith, PJ, Mabe, S, Hinderliter, A, Welsh-Bohmer, K, Browndyke, JN, Doraiswamy, PM, Lin, PH, Kraus, WE, Burke, JR, Sherwood, A. Longer Term Effects of Diet and Exercise on Neurocognition: 1-Year Follow-up of the ENLIGHTEN Trial. J Am Geriatr Soc. 2019. doi:10.1111/jgs.16252	Health Status

	Citation	Rationale
11	Chan, R, Leung, J, Woo, J. Dietary patterns and risk of frailty in Chinese community-dwelling older people in Hong Kong: A prospective cohort study. Nutrients. 2015. 7:7070-7084. doi:10.3390/nu7085326	Study Design, Outcome
12	Chen, YC, Jung, CC, Chen, JH, Chiou, JM, Chen, TF, Chen, YF, Tang, SC, Yeh, SJ, Lee, MS. Association of Dietary Patterns With Global and Domain-Specific Cognitive Decline in Chinese Elderly. J Am Geriatr Soc. 2017. 65:1159-1167. doi:10.1111/jgs.14741	Power/ Size
13	Cheung, BHK, Ho, ICH, Chan, RSM, Sea, MMM, Woo, J. Current evidence on dietary pattern and cognitive function. 2014. 71:137-163. doi:10.1016/B978-0-12-800270-4.00004-3	Study Design
14	Chou, YC, Lee, MS, Chiou, JM, Chen, TF, Chen, YC, Chen, JH. Association of Diet Quality and Vegetable Variety with the Risk of Cognitive Decline in Chinese Older Adults. Nutrients. 2019. 11. doi:10.3390/nu11071666	Power/ Size
15	Chuang, SY, Lo, YL, Wu, SY, Wang, PN, Pan, WH. Dietary Patterns and Foods Associated With Cognitive Function in Taiwanese Older Adults: The Cross-sectional and Longitudinal Studies. J Am Med Dir Assoc. 2019. 20:544-550.e4. doi:10.1016/j.jamda.2018.10.017	Country
16	Diener, HC. Multidimensional prevention of dementia diseases. MMW Fortschritte der Medizin. 2015. 157:39. doi:10.1007/s15006-015-3658-1	Pub. Status
17	Feng, Z, Cramm, JM, Nieboer, AP. A healthy diet and physical activity are important to promote healthy ageing among older Chinese people. Journal of International Medical Research. 2019. 47:6061-6081. doi:10.1177/0300060519882590	Country
18	Ferrand, C, Féart, C, Martinent, G, Albinet, C, André, N, Audiffren, M. Dietary patterns in French home-living older adults: Results from the PRAUSE study. Archives of Gerontology and Geriatrics. 2017. 70:180-185. doi:10.1016/j.archger.2017.01.015	Power/ Size
19	Galbete, C, Toledo, E, Toledo, JB, Bes-Rastrollo, M, Buil-Cosiales, P, Marti, A, Guillen-Grima, F, Martinez-Gonzalez, MA. Mediterranean diet and cognitive function: the SUN project. J Nutr Health Aging. 2015. 19:305-12. doi:10.1007/s12603-015-0441-z	Power/ Size
20	Gallucci, M, Pallucca, C, Di Battista, ME, Fougere, B, Grossi, E. Artificial Neural Networks Help to Better Understand the Interplay Between Cognition, Mediterranean Diet, and Physical Performance: Clues from TRELONG Study. J Alzheimers Dis. 2019. 71:1321-1330. doi:10.3233/jad-190609	Power/ Size
21	Gardener, SL, Rainey-Smith, SR, Barnes, MB, Sohrabi, HR, Weinborn, M, Lim, YY, Harrington, K, Taddei, K, Gu, Y, Rembach, A, Szoeke, C, Ellis, KA, Masters, CL, Macaulay, SL, Rowe, CC, Ames, D, Keogh, JB, Scarmeas, N, Martins, RN. Dietary patterns and cognitive decline in an Australian study of ageing. Mol Psychiatry. 2015. 20:860-6. doi:10.1038/mp.2014.79	Power/ Size
22	Gopinath, B, Russell, J, Kifley, A, Flood, VM, Mitchell, P. Adherence to Dietary Guidelines and Successful Aging Over 10 Years. J Gerontol A Biol Sci Med Sci. 2016. 71:349-55. doi:10.1093/gerona/glv189	Outcome
23	Gougeon, L, Payette, H, Morais, J, Gaudreau, P, Shatenstein, B, Gray-Donald, K. Dietary patterns and incidence of depression in a cohort of community-dwelling older Canadians. J Nutr Health Aging. 2015. 19:431-6. doi:10.1007/s12603-014-0562-9	Outcome
24	Granic, A, Davies, K, Adamson, A, Kirkwood, T, Hill, TR, Siervo, M, Mathers, JC, Jagger, C. Dietary Patterns High in Red Meat, Potato, Gravy, and Butter Are Associated with Poor Cognitive Functioning but Not with Rate of Cognitive Decline in Very Old Adults. J Nutr. 2016. 146:265-74. doi:10.3945/jn.115.216952	Power/ Size

	Citation	Rationale
25	Hardman, RJ, Meyer, D, Kennedy, G, Macpherson, H, Scholey, AB, Pipingas, A. The association between adherence to a Mediterranean style diet and cognition in older people: The impact of medication. Clin Nutr. 2018. 37:2156-2165. doi:10.1016/j.clnu.2017.10.015	Study Design, Intervention/ Exposure
26	Hill, E, Clifton, P, Goodwill, AM, Dennerstein, L, Campbell, S, Szoeke, C. Dietary patterns and beta-amyloid deposition in aging Australian women. Alzheimers Dement (N Y). 2018. 4:535-541. doi:10.1016/j.trci.2018.09.007	Outcome
27	Hosking, DE, Nettelbeck, T, Wilson, C, Danthiir, V. Retrospective lifetime dietary patterns predict cognitive performance in community-dwelling older Australians. Br J Nutr. 2014. 112:228-37. doi:10.1017/s0007114514000646	Power/ Size
28	Kesse-Guyot, E, Andreeva, VA, Ducros, V, Jeandel, C, Julia, C, Hercberg, S, Galan, P. Carotenoid-rich dietary patterns during midlife and subsequent cognitive function. Br J Nutr. 2014. 111:915-23. doi:10.1017/s0007114513003188	Date Overlaps with Existing Review
29	Lee, J, Pase, M, Pipingas, A, Raubenheimer, J, Thurgood, M, Villalon, L, Macpherson, H, Gibbs, A, Scholey, A. Switching to a 10-day Mediterranean-style diet improves mood and cardiovascular function in a controlled crossover study. Nutrition. 2015. 31:647-52. doi:10.1016/j.nut.2014.10.008	Study duration
30	Lehtisalo, J, Levalahti, E, Lindstrom, J, Hanninen, T, Paajanen, T, Peltonen, M, Antikainen, R, Laatikainen, T, Strandberg, T, Soininen, H, et al. Dietary changes and cognition over 2 years within a multidomain intervention trial—The Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER). Alzheimer's & dementia. 2019. 15:410-417. doi:10.1016/j.jalz.2018.10.001	Intervention/ Exposure
31	Lehtisalo, J, Levalahti, E, Lindstrom, J, Hanninen, T, Paajanen, T, Peltonen, M, Antikainen, R, Laatikainen, T, Strandberg, T, Soininen, H, Tuomilehto, J, Kivipelto, M, Ngandu, T. Dietary changes and cognition over 2 years within a multidomain intervention trial-The Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER). Alzheimers Dement. 2019. 15:410-417. doi:10.1016/j.jalz.2018.10.001	Intervention/ Exposure, Comparator
32	Li, J, Ogrodnik, M, Kolachalama, VB, Lin, H, Au, R. Assessment of the Mid-Life Demographic and Lifestyle Risk Factors of Dementia Using Data from the Framingham Heart Study Offspring Cohort. Journal of Alzheimer's Disease. 2018. 63:1119-1127. doi:10.3233/JAD-170917	Study Design, Intervention/ Exposure
33	Lutski, M, Weinstein, G, Ben-Zvi, S, Goldbourt, U, Tanne, D. Adherence to Mediterranean diet and subsequent cognitive decline in men with cardiovascular disease. Nutr Neurosci. 2020. 1-9. doi:10.1080/1028415x.2020.1715049	Health Status
34	Matthews, DC, Davies, M, Murray, J, Williams, S, Tsui, WH, Li, Y, Andrews, RD, Lukic, A, McHugh, P, Vallabhajosula, S, de Leon, MJ, Mosconi, L. Physical Activity, Mediterranean Diet and Biomarkers-Assessed Risk of Alzheimer's: A Multi-Modality Brain Imaging Study. Adv J Mol Imaging. 2014. 4:43-57. doi:10.4236/ami.2014.44006	Study Design, Outcome
35	Mazza, E, Fava, A, Ferro, Y, Moraca, M, Rotundo, S, Colica, C, Provenzano, F, Terracciano, R, Greco, M, Foti, D, Gulletta, E, Russo, D, Bosco, D, Pujia, A, Montalcini, T. Impact of legumes and plant proteins consumption on cognitive performances in the elderly. J Transl Med. 2017. 15:109. doi:10.1186/s12967-017-1209-5	Intervention/ Exposure
36	Milte, CM, Ball, K, Crawford, D, McNaughton, SA. Diet quality and cognitive function in mid-aged and older men and women. BMC Geriatr. 2019. 19:361. doi:10.1186/s12877-019-1326-5	Power/Size

	Citation	Rationale
37	Mohorko, N, Cernelic-Bizjak, M, Poklar-Vatovec, T, Grom, G, Kenig, S, Petelin, A, Jenko-Praznikar, Z. Weight loss, improved physical performance, cognitive function, eating behavior, and metabolic profile in a 12-week ketogenic diet in obese adults. Nutr Res. 2019. 62:64-77. doi:10.1016/j.nutres.2018.11.007	Study Design, Intervention/ Exposure
38	Morris, MC, Tangney, CC, Wang, Y, Sacks, FM, Barnes, LL, Bennett, DA, Aggarwal, NT. MIND diet slows cognitive decline with aging. Alzheimers Dement. 2015. 11:1015-22. doi:10.1016/j.jalz.2015.04.011	Power/Size
39	Morris, MC, Tangney, CC, Wang, Y, Sacks, FM, Bennett, DA, Aggarwal, NT. MIND diet associated with reduced incidence of Alzheimer's disease. Alzheimers Dement. 2015. 11:1007-14. doi:10.1016/j.jalz.2014.11.009	Power/Size
40	Munoz-Garcia, MI, Toledo, E, Razquin, C, Dominguez, LJ, Maragarone, D, Martinez-Gonzalez, J, Martinez-Gonzalez, MA. "A priori" Dietary Patterns and Cognitive Function in the SUN Project. Neuroepidemiology. 2020. 54:45-57. doi:10.1159/000502608	Power/Size
41	Olsson, E, Karlstrom, B, Kilander, L, Byberg, L, Cederholm, T, Sjogren, P. Dietary patterns and cognitive dysfunction in a 12-year follow-up study of 70 year old men. J Alzheimers Dis. 2015. 43:109-19. doi:10.3233/jad-140867	Power/Size
42	Panza, F, Solfrizzi, V, Giannini, M, Seripa, D, Pilotto, A, Logroscino, G. Nutrition, frailty, and Alzheimer's disease. Frontiers in Aging Neuroscience. 2014. 6. doi:10.3389/fnagi.2014.00221	Study Design
43	Park, JE, Jeon, SY, Kim, SA, Kim, JH, Kim, SH, Lee, KW, Hwang, YJ, Jung, G, Suk, HW, Park, S, Lee, DY. A Multidomain Intervention for Modifying Lifestyle Habits Reduces the Dementia Risk in Community-Dwelling Older Adults: A Single-Blinded Randomized Controlled Pilot Study. J Alzheimers Dis. 2019. 70:51-60. doi:10.3233/jad-190016	Intervention/ Exposure
44	Pelletier, A, Barul, C, Feart, C, Helmer, C, Bernard, C, Periot, O, Dilharreguy, B, Dartigues, JF, Allard, M, Barberger-Gateau, P, Catheline, G, Samieri, C. Mediterranean diet and preserved brain structural connectivity in older subjects. Alzheimers Dement. 2015. 11:1023-31. doi:10.1016/j.jalz.2015.06.1888	Outcome
45	Perrone, L, Grant, WB. Observational and ecological studies of dietary advanced glycation end products in national diets and Alzheimer's disease incidence and prevalence. J Alzheimers Dis. 2015. 45:965-79. doi:10.3233/jad-140720	Study Design
46	Prinelli, F, Fratiglioni, L, Musicco, M, Johansson, I, Adorni, F, Shakersain, B, Rizzuto, D, Xu, W. The impact of nutrient-based dietary patterns on cognitive decline in older adults. Clin Nutr. 2019. 38:2813-2820. doi:10.1016/j.clnu.2018.12.012	Intervention/ Exposure
47	Qin, B, Adair, LS, Plassman, BL, Batis, C, Edwards, LJ, Popkin, BM, Mendez, MA. Dietary Patterns and Cognitive Decline Among Chinese Older Adults. Epidemiology. 2015. 26:758-68. doi:10.1097/ede.0000000000000338	Country
48	Rainey-Smith, SR, Gu, Y, Gardener, SL, Doecke, JD, Villemagne, VL, Brown, BM, Taddei, K, Laws, SM, Sohrabi, HR, Weinborn, M, Ames, D, Fowler, C, Macaulay, SL, Maruff, P, Masters, CL, Salvado, O, Rowe, CC, Scarmeas, N, Martins, RN. Mediterranean diet adherence and rate of cerebral Abeta-amyloid accumulation: Data from the Australian Imaging, Biomarkers and Lifestyle Study of Ageing. Transl Psychiatry. 2018. 8:238. doi:10.1038/s41398-018-0293-5	Outcome
49	Seetharaman, S, Andel, R, McEvoy, C, Dahl Aslan, AK, Finkel, D, Pedersen, NL. Blood glucose, diet-based glycemic load and cognitive aging among dementia-free older adults. J Gerontol A Biol Sci Med Sci. 2015. 70:471-9. doi:10.1093/gerona/glu135	Power/Size
50	Tanaka, T, Talegawkar, SA, Jin, Y, Colpo, M, Ferrucci, L, Bandinelli, S. Adherence to a Mediterranean Diet Protects from Cognitive Decline in the Invecchiare in Chianti Study of Aging. Nutrients. 2018. 10. doi:10.3390/nu10122007	Power/Size

	Citation	Rationale
51	Tangney, CC, Li, H, Wang, Y, Barnes, L, Schneider, JA, Bennett, DA, Morris, MC. Relation of DASH- and Mediterranean-like dietary patterns to cognitive decline in older persons. Neurology. 2014. 83:1410-6. doi:10.1212/wnl.0000000000000884	Power/Size
52	Trichopoulou, A, Kyrozis, A, Rossi, M, Katsoulis, M, Trichopoulos, D, La Vecchia, C, Lagiou, P. Mediterranean diet and cognitive decline over time in an elderly Mediterranean population. Eur J Nutr. 2015. 54:1311-21. doi:10.1007/s00394-014-0811-z	Power/Size
53	Tsai, HJ. Dietary patterns and cognitive decline in Taiwanese aged 65 years and older. Int J Geriatr Psychiatry. 2015. 30:523-30. doi:10.1002/gps.4176	Country
54	Wade, AT, Davis, CR, Dyer, KA, Hodgson, JM, Woodman, RJ, Keage, HAD, Murphy, KJ. A Mediterranean diet supplemented with dairy foods improves mood and processing speed in an Australian sample: results from the MedDairy randomized controlled trial. Nutr Neurosci. 2018:1-13. doi:10.1080/1028415x.2018.1543148	Study duration
55	Wade, AT, Davis, CR, Dyer, KA, Hodgson, JM, Woodman, RJ, Keage, HAD, Murphy, KJ. A Mediterranean Diet with Fresh, Lean Pork Improves Processing Speed and Mood: Cognitive Findings from the MedPork Randomised Controlled Trial. Nutrients. 2019. 11. doi:10.3390/nu11071521	Study duration
56	Wade, AT, Elias, MF, Murphy, KJ. Adherence to a Mediterranean diet is associated with cognitive function in an older non-Mediterranean sample: findings from the Maine-Syracuse Longitudinal Study. Nutr Neurosci. 2019. 1-12. doi:10.1080/1028415x.2019.1655201	Power/Size
57	Yu, FN, Hu, NQ, Huang, XL, Shi, YX, Zhao, HZ, Cheng, HY. Dietary patterns derived by factor analysis are associated with cognitive function among a middle-aged and elder Chinese population. Psychiatry Res. 2018. 269:640-645. doi:10.1016/j.psychres.2018.09.004	Study Design
58	Yuan, L, Liu, J, Ma, W, Dong, L, Wang, W, Che, R, Xiao, R. Dietary pattern and antioxidants in plasma and erythrocyte in patients with mild cognitive impairment from China. Nutrition. 2016. 32:193-8. doi:10.1016/j.nut.2015.08.004	Study Design, Power/Size
59	Zbeida, M, Goldsmith, R, Shimony, T, Vardi, H, Naggan, L, Shahar, DR. Mediterranean diet and functional indicators among older adults in non-Mediterranean and Mediterranean countries. J Nutr Health Aging. 2014. 18:411-8. doi:10.1007/s12603-014-0003-9	Study Design
60	Zhao, X, Yuan, L, Feng, L, Xi, Y, Yu, H, Ma, W, Zhang, D, Xiao, R. Association of dietary intake and lifestyle pattern with mild cognitive impairment in the elderly. J Nutr Health Aging. 2015. 19:164-8. doi:10.1007/s12603-014-0524-2	Power/Size