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Methods to Meta-Analyze Studies of Dietary Patterns and Health Outcomes: An Evidence Scan Protocol

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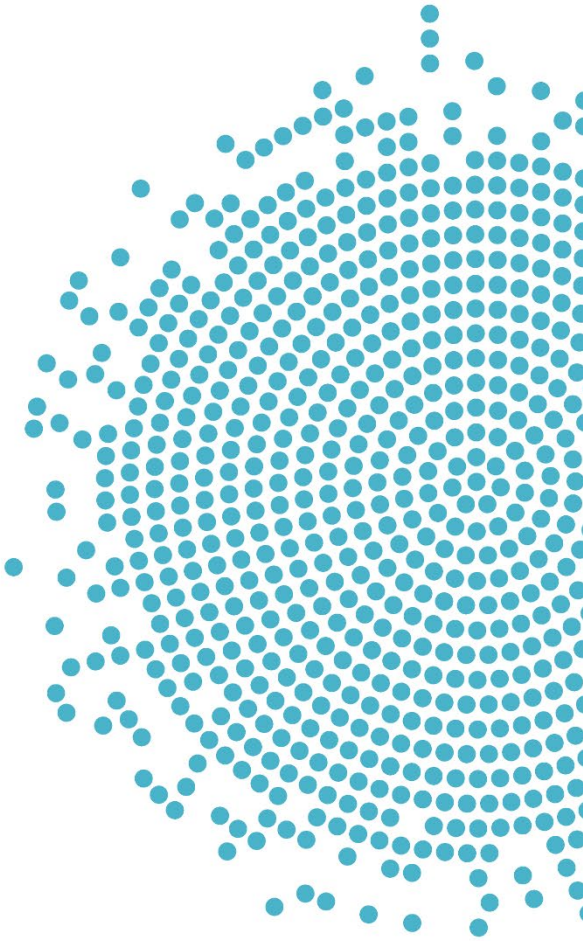

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Introduction

USDA's Nutrition Evidence Systematic Review (NESR) team has collaborated with multiple expert groups to conduct systematic reviews assessing the relationship between consumption of dietary patterns and a wide variety of health outcomes.[*] However, previous NESR systematic reviews have not included a meta-analysis of dietary patterns studies. Prior to conducting a systematic review with meta-analysis on this topic, the NESR team will conduct an evidence scan to examine the following question: What methods have been used to meta-analyze studies examining the relationship between dietary patterns and health outcomes?

Methods

NESR's methodology[†] will be used to conduct this evidence scan. A NESR evidence scan is an exploratory evidence description project in which systematic methods are used to search for and describe the volume and characteristics of evidence available on a nutrition question or topic of public health importance. NESR evidence scans involve the following: development/refinement of the research question, protocol development, searching for and screening studies, minimal data extraction, and description of evidence. NESR evidence scans do not include: data extraction of study results, risk of bias assessment, synthesis of the evidence, development of conclusion statements, or grading the strength of the evidence.

This section presents an overview of the specific methods used to answer the evidence scan question: What methods have been used to meta-analyze studies examining the relationship between dietary patterns and health outcomes?

Develop a protocol

An evidence scan protocol is the plan for how NESR's methodology will be used to conduct a specific evidence scan and is established *a priori*, before any evidence is reviewed. The protocol is designed to capture the most appropriate and relevant body of evidence to answer the evidence scan question. Development of the protocol involves discussion of the strengths and limitations of various methodological approaches relevant to the question, which then inform subsequent steps of the evidence scan process. The protocol describes the methods that will be used throughout the evidence scan process. Additionally, the protocol includes the following components, which are tailored to each evidence scan question: the analytic framework, the inclusion and exclusion criteria, and the evidence description plan.

Develop an analytic framework

An analytic framework visually represents the overall scope of the evidence scan question and depicts the contributing elements that will be examined and evaluated. **Figure 1** is the analytic framework for the evidence scan and shows that: the intervention or exposure of interest is consumption of a dietary pattern in all life stages, including infants and young children (birth up to 24 months), children and adolescents (2 years up to 19 years), adults and older adults (19 years and older), and individuals during pregnancy, postpartum, and/or lactation; the comparators are different dietary patterns and different adherence to/consumption levels of the

[*] English LK, Raghavan R, Obbagy JE, et al. Dietary patterns and health: Insights from NESR systematic reviews to inform the Dietary Guidelines for Americans. *J Nutr Educ Behav*. 2024 Jan;56(1):75-87. doi: 10.1016/j.jneb.2023.10.001.

[†] USDA Nutrition Evidence Systematic Review Branch. USDA Nutrition Evidence Systematic Review: Methodology Manual. February 2023. U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review. Available at: https://nesr.usda.gov/methodology-overview

same dietary pattern; the outcome is health outcomes; and the concept is methods to meta-analyze studies examining consumption of dietary patterns and health outcomes.

Figure 1. Analytic framework for the evidence scan question: What methods have been used to meta-analyze studies examining the relationship between dietary patterns and health outcomes?

Population	*Intervention/exposure*	*Comparator*	*Outcome*	*Concept*
All life stages, including: • Infants and young children (birth up to 24 months) • Children and adolescents (2 years up to 19 years) • Adults and older adults (19 years and older) • Individuals during pregnancy, postpartum, and/or lactation	Consumption of a dietary pattern	• Different dietary pattern(s) • Different adherence to/consumption levels of the same dietary pattern	Health outcomes	Methods to meta-analyze studies examining consumption of dietary patterns and health outcomes

Key definitions:

Dietary patterns: 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.

Concept: the main idea examined in the evidence scan.

Develop inclusion and exclusion criteria

The inclusion and exclusion criteria provide an objective, consistent, and transparent framework for determining which articles to include in the evidence scan (see **Table 1**). These criteria ensure that the most relevant and appropriate body of evidence is identified for the evidence scan question.

Table 1. Inclusion and exclusion criteria

Category	Inclusion Criteria	Exclusion Criteria
Study design	• Systematic reviews with meta-analyses	• Primary studies of any design • Narrative reviews • Systematic reviews without meta-analyses • Umbrella reviews • Modeling and simulation studies
Study designs included in meta-analysis	Meta-analysis includes 1 or more articles using the following study designs: • Randomized controlled trials • Non-randomized controlled trials* • Prospective cohort studies • Retrospective cohort studies • Nested case-control studies	Meta-analysis only includes articles using the following study designs: • Uncontrolled trials† • Case-control studies • Cross-sectional studies • Ecological studies • Modeling and simulation studies
Publication date	• January 2015 – December 2024	• Before January 2015, after December 2024
Population: Study participants	• Human	• Non-human
Population: Life stage	• Infants and young children (birth up to 24 months) • Children and adolescents (2 up to 19 years) • Adults and older adults (19 years and older) • Individuals during pregnancy • Individuals during postpartum • Individuals during lactation	• Not applicable

* Including quasi-experimental and controlled before-and-after studies

† Including uncontrolled before-and-after studies

Category	Inclusion Criteria	Exclusion Criteria
Intervention/ exposure	• 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] ○ 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	• Consumption of and/or adherence to a dietary pattern not based on foods and beverages (e.g., macronutrient based, dietary inflammatory index) is sole intervention/exposure of the meta-analysis • Multi-component interventions in which the isolated effect of the intervention of interest on the outcome(s) of interest is not provided or cannot be determined due to multiple components being the sole intervention/exposure of the meta-analysis
Comparator	• Consumption of and/or adherence to a different dietary pattern • Different levels of consumption of and/or adherence to a dietary pattern	• Consumption of and/or adherence to a similar dietary pattern of which only a specific component or food source is different between groups
Outcome	• Health outcomes	• Dietary intake
Publication status	• Peer-reviewed articles published in research journals	• Non-peer-reviewed articles, unpublished data or manuscripts, pre-prints, reports, editorials, retracted articles, and conference abstracts or proceedings
Language	• Published in English	• Not published in English

Search for and screen studies

NESR librarians, in collaboration with NESR analysts, will use the analytic framework and inclusion and exclusion criteria to develop a comprehensive literature search strategy. The literature search strategy will include selecting and searching the appropriate bibliographic database, and employing search refinements, such as search filters. The full literature search will be available upon request and will be fully documented in the final evidence scan.

The results of all electronic database searches, after removal of duplicates, will be screened independently by two NESR analysts using a step-wise process by first reviewing titles and abstracts and then reviewing full texts to determine which articles meet the inclusion criteria. Any discrepancy will be discussed and resolved by a third analyst. A manual search to find peer-reviewed articles not identified through the electronic database search will not be conducted.

Extract data

NESR analysts will extract the most essential data from each included article to describe key characteristics of the available evidence, such as the author, publication year, included study designs, population life stage at intervention/exposure and outcome, intervention/exposure analysis methods (e.g., analyzing *a priori* methods and *a posteriori* methods separately or in combination), outcomes, and quantitative synthesis methods (e.g., random effects models (univariate or multivariate), dose response meta-analysis, network meta-analysis). One NESR analyst will extract the data and a second NESR analyst will review the extracted data for accuracy.

Describe the evidence

NESR analysts will describe the volume and characteristics of the included evidence, including information on the methods used in the meta-analyses, such as:

- whether studies of different designs (e.g., randomized controlled trials [RCT], non-RCT [NRCT], prospective cohort studies [PCS], retrospective cohort studies [RCS]) were analyzed separately or together,
- whether specific dietary patterns or groups of dietary patterns were analyzed separately or together
- the methods used to analyze dietary pattern data from observational studies, and
- the analytic techniques used to examine potential moderating variables (e.g., subgroup analyses, multivariable models).

The evidence may be presented in text, figures, and/or tables.

Considerations for future work

NESR analysts will identify and document research gaps and methodological limitations throughout the evidence scan process.

Acknowledgments and funding

The NESR team is involved in executing and documenting the work necessary to ensure the evidence scan is completed in accordance with NESR methodology, including: establishing all aspects of the protocol, which presents the plan for how they are planning to examine the scientific evidence, including the inclusion and exclusion criteria; reviewing all studies that meet the criteria; deliberating on the body of evidence; and writing the final report.

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