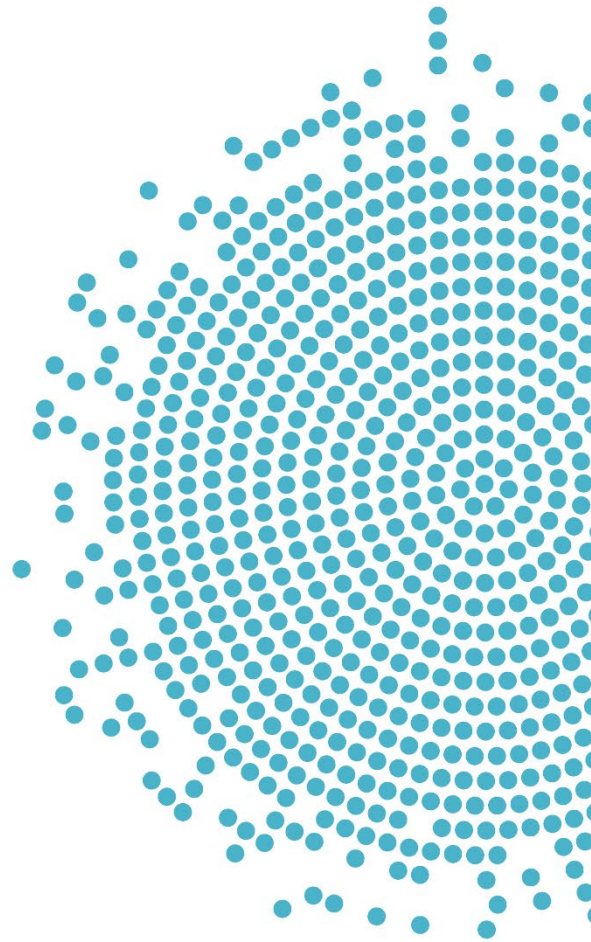




Repeated Exposure to Foods and Food Acceptance: A Systematic Review Protocol

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Table of contents

Table of contents	3
Introduction	4
Methods	5
Develop a protocol	5
Develop an analytic framework	6
Develop inclusion and exclusion criteria	9
Search for and screen studies	12
Extract data and assess the risk of bias	12
Synthesize the evidence	12
Develop conclusion statements and grade the evidence	12
Recommend future research	13
Acknowledgments and funding	13
Appendix	14
Table 1. Review history	4
Table 2. Protocol revisions	6
Table 3. Inclusion and exclusion criteria	9
Figure 1. Analytic framework for the systematic review question: What is the relationship between repeated exposure to foods and food acceptance?	7

Introduction

To prepare for the development of the *Dietary Guidelines for Americans, 2025-2030*, the U.S. Departments of Health and Human Services (HHS) and Agriculture (USDA) identified a proposed list of scientific questions based on relevance, importance, potential federal impact, and avoiding duplication, which were posted for public comment.* The Departments appointed the 2025 Dietary Guidelines Advisory Committee (Committee) in January 2023 to review evidence on the scientific questions. The proposed scientific questions were refined and prioritized by the Committee for consideration in their review of the evidence. Their review forms the basis of their independent, science-based advice and recommendations to HHS and USDA, which is considered as the Departments develop the next edition of the *Dietary Guidelines*. As part of that process, the following systematic review question has been identified: What is the relationship between repeated exposure to foods and food acceptance? The Committee will conduct a systematic review to address this question, with support from USDA's Nutrition Evidence Systematic Review (NESR) team. This question will update the systematic review conducted by the Pregnancy and Birth to 24 Months Project (P/B-24 Project) Flavor Exposure and Feeding Practices Technical Expert Collaborative (**Table 1**).

Table 1. Review history

Date	Description	Citation
April 2019	Original systematic review conducted by the Pregnancy and Birth to 24 Months Project, Flavor Exposure and Feeding Practices Technical Expert Collaborative published	Spill M, Callahan E, Johns K, Shapiro M, Spahn JM, Wong YP, Terry N, Benjamin-Neelon S, Birch L, Black M, Briefel R, Cook J, Faith M, Mennella J, Casavale KO, Stoody E. Repeated Exposure to Foods and Early Food Acceptance: A Systematic Review. April 2019. U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review. Available at: https://doi.org/10.52570/NESR.PB242018.SR0401 .
May 2023	Systematic review protocol for the 2025 Dietary Guidelines Advisory Committee published online	Fisher JO, Abrams SA, Andres A, Byrd-Bredbenner C, Deierlein A, Eicher-Miller HA, Odoms-Young A, Palacios C, Obbagy J, Momin S, Spahn J, Higgins M, Butera G, Terry N. Repeated Exposure to Foods and Food Acceptance: A Systematic Review Protocol. May 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/protocols
October 2023	Revisions to the systematic review protocol for the 2025 Dietary Guidelines Advisory Committee published online	Fisher JO, Abrams SA, Andres A, Byrd-Bredbenner C, Deierlein A, Eicher-Miller HA, Odoms-Young A, Palacios C, Obbagy J, Momin S, Spahn J, Higgins M, Butera G, Terry N. Repeated Exposure to Foods and Food Acceptance: A Systematic Review Protocol. May 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/protocols
February 2024	Revisions to the systematic review protocol for the 2025 Dietary Guidelines Advisory Committee published online	Fisher JO, Abrams SA, Andres A, Byrd-Bredbenner C, Deierlein A, Eicher-Miller HA, Odoms-Young A, Palacios C, Obbagy J, Momin S, Spahn J, Higgins M, Butera G, Terry N. Repeated Exposure to Foods and Food Acceptance: A Systematic Review Protocol. May 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/protocols

* Dietary Guidelines for Americans: Learn About the Process. 2022. Available at: <https://www.dietaryguidelines.gov/work-under-way/learn-about-process>

Methods

The NESR methodology manual^{*} has a detailed description of the NESR methodology as it will be applied in the systematic reviews for the Dietary Guidelines for Americans, 2025-2030 Project. This section presents an overview of the specific methods that will be used to by the Committee to answer the systematic review question: What is the relationship between repeated exposure to foods and food acceptance?

This systematic review updates an existing NESR systematic review completed as part of the P/B-24 Project by the Flavor Exposure and Feeding Practices Technical Expert Collaborative on repeated exposure to foods and early food acceptance[†], which included evidence published from January 1980 to June 2017. This updated systematic review will synthesize the studies conducted in infants and toddler ages birth to 24 months from the existing review with eligible studies published since June 2017 as one body of evidence, according to the methods described below. Eligible studies conducted in young children ages 2 to 6 years will be synthesized separately as a new systematic review.

Develop a protocol

A systematic review protocol is the plan for how NESR's methodology will be used to conduct a specific systematic review and is established by the Committee, *a priori*, before any evidence is reviewed. The protocol is designed to capture the most appropriate and relevant body of evidence to answer the systematic review 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 systematic review process. The protocol describes all of the methods that will be used throughout the systematic review process. Additionally, the protocol includes the following components, which are tailored to each systematic review question: the analytic framework, the inclusion and exclusion criteria, and the synthesis plan. When updating an existing review, the Committee uses the analytic framework and the inclusion and exclusion criteria from the existing review and makes adjustments to the protocol, if necessary. Differences in the inclusion and exclusion criteria between existing and updated reviews are documented in **Appendix 1**.

The protocol for this systematic review was posted online (<https://nesr.usda.gov/protocols>) in May 2023. Revisions to the systematic review protocol were made during the review process. These revisions are documented in **Table 2**.

^{*} 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>

[†] Spill M, Callahan E, Johns K, Shapiro M, Spahn JM, Wong YP, Terry N, Benjamin-Neelon S, Birch L, Black M, Briefel R, Cook J, Faith M, Mennella J, Casavale KO, Stoody E. Repeated Exposure to Foods and Early Food Acceptance: A Systematic Review. April 2019. U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review. Available at: <https://doi.org/10.52570/NESR.PB242018.SR0401>.

Table 2. Protocol revisions

Date	Protocol revisions	Description
January 2024	Inclusion and exclusion criteria for publication date were updated to document that the review will include studies published through May 2023.	This revision was made to document the final publication date range covered by the literature search.
July 2023	Key definitions were added to the analytic framework for 'target food', 'novel food' and 'familiar food'	The additional key definitions were added to promote clarity.
July 2023	The synthesis organization section of the analytic framework was revised to indicate that within population groups, the evidence will first be synthesized by intervention/exposure type – taste and non-taste repeated exposure to food, and then by outcome.	The revisions to the synthesis organization were made to provide transparency to the way in which the evidence was synthesized.

Develop an analytic framework

An analytic framework visually represents the overall scope of the systematic review question and depicts the contributing elements that will be examined and evaluated. **Figure 1** is the analytic framework for the proposed systematic review and shows that the intervention or exposure of interest is repeated exposure in infants and toddlers (0-24 months) and young children (2 up to 6 years); the comparators are pre-exposure versus post-exposure (within-subject) of target food, no exposure versus exposure (between subjects) of target food, and taste exposure versus non-taste exposure; the outcome is acceptance of food/s in infants and toddlers and children and adolescents; and the key confounders include race and/or ethnicity, socioeconomic position and/or parental education. The confounders to be considered may impact the relationships of interest.

Figure 1. Analytic framework for the systematic review question: What is the relationship between repeated exposure to foods and food acceptance?

<i>Population</i>	<i>Intervention/ exposure</i>	<i>Comparator</i>	<i>Outcome</i>	<i>Key confounders</i>
<p>Infants and toddlers (birth up to 24 months)</p> <hr/> <p>Young children (2 up to 6 years)</p>	<p>Repeated exposure to food or food-type – child is exposed to a target food multiple times</p>	<ul style="list-style-type: none"> • Pre-exposure versus post-exposure (within-subject) • No exposure versus exposure (between subjects) • Taste exposure versus non-taste exposure 	<p>Food acceptance of the exposed food (in infants, toddlers, young children, school-aged children)</p> <ul style="list-style-type: none"> • Amount or rate of target or novel food consumed • Length of feeding of target or novel food during infant-led feeding • Facial or body response (expressions made during feeding/eating of target or novel food) • Caregiver’s or investigator’s perception of infants’ enjoyment of the target or novel food • Willingness to try or taste the target or novel food • Hedonic responses • Child’s verbal indication of liking of food* 	<ul style="list-style-type: none"> • Race and/or ethnicity • Socioeconomic position (SEP) and/or parental education

Synthesis organization:

- I. **Population:** Infants and toddlers; young children
 - a. **Intervention/exposure:** (Taste exposure, non-taste exposure)
 - i. **Outcome:** food acceptance (amount and rate of food intake, length of feed, facial or body responses, enjoyment of food, willingness to try/taste food, hedonic responses, and child’s verbal indication of liking of food)

Key definitions:

Exposure: each time a child is exposed to target food(s) (taste and non-taste exposure).

Repeated exposure: child is exposed to a target food/food-type multiple time.

Number of exposures: times target food(s) is exposed.

Duration of exposure period: time from first exposure to last exposure.

Frequency of exposures: number of exposures per unit of time (per day, per week, etc.)

Taste exposure: taste exposure to the target food.

Non-taste exposure: Sensory exposure to the target food without tasting. Non-taste sensory exposure includes smell, tactile and visual exposure. Visual exposure could include looking at target food or a picture of a target food.

Single food exposed: Target food is a single food that is presented during each exposure period.

Multiple foods exposed: More than one target food is used during the exposure.

- A single target food is presented within an exposure session; the target food may differ from session to session.
- Multiple target foods are presented within each exposure session.

Target food: A target food is the food to which the child is provided repeated exposure to during the intervention.

Novel food: A novel food is a new food or a food that the child does not have experience with prior to the intervention.

Familiar food: A familiar food is a food the child has experience with prior to the intervention.

Food acceptance, as measured by:

- Amount or rate of target or novel food(s) consumed, as measured by research staff or reported by caregiver
- Duration of feeding of target or novel food(s) during infant-led feeding
- Facial response (expressions made during feeding of target or novel food(s))
- Caregiver perception of infants' enjoyment of the target or novel food(s)
- Willingness to try or taste the target or novel food(s)
- Hedonic responses (child or caregiver reported liking using facial or descriptive scale)
- Child's verbal indication of liking of food(s)

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 systematic review (see **Table 3**). These criteria ensure that the most relevant and appropriate body of evidence is identified for the systematic review question, and that the evidence reviewed is:

- Applicable to the U.S. population of interest
- Relevant to Federal public health nutrition policies and programs
- Rigorous from a scientific perspective

Table 3. Inclusion and exclusion criteria

Category	Inclusion Criteria	Exclusion Criteria
Study design	<ul style="list-style-type: none"> • Randomized controlled trials • Non-randomized controlled trials* • Prospective cohort studies • Retrospective cohort studies • Nested case-control studies 	<ul style="list-style-type: none"> • Uncontrolled trials† • Case-control studies • Cross-sectional studies • Ecological studies • Narrative reviews • Systematic reviews • Meta-analyses • Modeling and simulation studies
Publication date	<ul style="list-style-type: none"> • Infants and toddlers: January 1980 – May 2023‡ • Additional search to cover young children: January 2000 - May 2023 	<ul style="list-style-type: none"> • Infants and toddlers: Before January 1980, after May 2023 • Additional search to cover young children: before January 2000, after May 2023
Population: Study participants	<ul style="list-style-type: none"> • Human 	<ul style="list-style-type: none"> • Non-human
Population: Life stage	<ul style="list-style-type: none"> • At intervention or exposure: <ul style="list-style-type: none"> ○ Infants and toddlers (birth up to 24 months) ○ Young children (2 up to 6 years) • At outcome: <ul style="list-style-type: none"> ○ Infants and toddlers (birth up to 24 months) ○ Children and adolescents (2 up to 19 years) 	<ul style="list-style-type: none"> • At intervention or exposure: <ul style="list-style-type: none"> ○ School-aged children and adolescents (6 up to 19 years) ○ Adults and older adults (19 years and older) • At outcome: <ul style="list-style-type: none"> ○ Adults and older adults (19 years and older)

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

† Including uncontrolled before-and-after studies

‡ This review update date range encompasses the original systematic review date range, which included articles published from January 1980 to June 2017

Category	Inclusion Criteria	Exclusion Criteria
Population: Health status	<ul style="list-style-type: none"> • Studies that <u>exclusively</u> enroll participants not diagnosed with a disease* • Studies that enroll <u>some</u> participants: <ul style="list-style-type: none"> ○ diagnosed with a disease; ○ diagnosed with a disease, disorder, or condition that affects feeding/eating or growth (e.g., autism spectrum disorder, attention-deficit/hyperactivity disorder, eating disorder, cleft palate); ○ with severe undernutrition, failure to thrive/underweight, stunting, or wasting; ○ born preterm,[†] with low birth weight,[‡] and/or small for gestational age ○ and/or hospitalized for an illness, injury or surgery 	<ul style="list-style-type: none"> • Studies that <u>exclusively</u> enroll participants: <ul style="list-style-type: none"> ○ diagnosed with a disease;[§] ○ diagnosed with a disease, disorder, or condition that affects feeding/eating or growth (e.g., autism spectrum disorder, attention-deficit/hyperactivity disorder, eating disorder, cleft palate); ○ with severe undernutrition, failure to thrive/underweight, stunting, or wasting; ○ born preterm,[†] with low birth weight,[‡] and/or small for gestational age; ○ and/or hospitalized for an illness, injury, or surgery**
Intervention/ exposure	<ul style="list-style-type: none"> • Repeated exposure to target food(s): child is exposed to a target food/food-type multiple times • Repeated exposure may address: <ul style="list-style-type: none"> ○ Number of exposures: times target food is exposed ○ Duration of exposure period ○ Frequency or number of exposure (per unit of time; per day, per week etc.) ○ Type of repeated exposure: <ul style="list-style-type: none"> ▪ Taste and non-taste sensory exposure (smell, tactile, visual) ▪ Single food: A single target food is presented during each exposure period ▪ Multiple foods: More than one target food is presented during exposure period <ul style="list-style-type: none"> • A single target food is presented within an exposure session; the target food may differ from session to session • Child is exposed to multiple target foods within each exposure session • Multi-component intervention in which the isolated effect of the intervention of interest on the outcome(s) of interest is provided or can be determined despite multiple components 	<ul style="list-style-type: none"> • Multi-component intervention in which the isolated effect of repeated food exposure on food acceptance is not provided or cannot be determined due to multiple components • Food or flavor exposure in utero or via breastmilk • Intervention assessing exposure to taste and/or flavor (e.g., salty, bitter, sweet) versus food
Comparator	<ul style="list-style-type: none"> • Pre-exposure versus post-exposure (within-subject) • No exposure versus exposure (between subjects) • Taste exposure versus non-taste sensory exposure (between subjects) 	<ul style="list-style-type: none"> • N/A

* Studies that enroll participants who are at risk for chronic disease will be included

† Gestational age <37 weeks and 0/7 days

‡ Birth weight <2500g

§ Studies that exclusively enroll participants with obesity will be included

** Studies that exclusively enroll participants post-cesarean section will be included

Category	Inclusion Criteria	Exclusion Criteria
Outcomes	<ul style="list-style-type: none"> • Acceptance of food as measured by <ul style="list-style-type: none"> ○ Amount or rate of target or novel food consumed as measured by research staff or reported by caregiver ○ Length of feeding of target or novel food during infant-led feeding paradigm ○ Facial response (expressions made during feeding of target or novel food) ○ Caregiver or investigator's perception of infants' enjoyment of the target or novel food ○ Willingness to try/taste ○ Hedonic responses ○ Child's verbal indication of liking of food 	<ul style="list-style-type: none"> • Acceptance to taste and/or flavor (e.g., sweet, salty, etc.) versus food • Nutrient intake (e.g., sodium)
Publication status	<ul style="list-style-type: none"> • Peer-reviewed articles published in research journals 	<ul style="list-style-type: none"> • Non-peer-reviewed articles, unpublished data or manuscripts, pre-prints, reports, editorials, retracted articles, and conference abstracts or proceedings
Language	<ul style="list-style-type: none"> • Published in English 	<ul style="list-style-type: none"> • Not published in English
Country*	<ul style="list-style-type: none"> • Studies conducted in countries classified as high or very high on the Human Development Index the year(s) the intervention/exposure data were collected 	<ul style="list-style-type: none"> • Studies conducted in countries classified as medium or low on the Human Development Index the year(s) the intervention/exposure data were collected

* The classification of countries on the Human Development Index (HDI) is based on the UN Development Program Human Development Report Office (<http://hdr.undp.org/en/data>) for the year the study intervention occurred or data were collected. If the study does not report the year(s) in which the intervention/exposure data were collected, the HDI classification for the year of publication is applied. Studies conducted prior to 1990 are classified based on 1990 HDI classifications. If the year is more recent than the available HDI values, then the most recent HDI classifications are used. If a country is not listed in the HDI, then the current country classification from the World Bank is used (The World Bank Country and Lending Groups, available from: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-country-and-lending-groups>)

Search for and screen studies

NESR librarians, in collaboration with NESR analysts and the Committee, 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 databases, translating search using syntax appropriate for the databases being searched, and employing search refinements, such as search filters. For existing reviews, search strategies will be updated, as appropriate, for each database. The full literature search will be available upon request, and will be fully documented in the final review.

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 reviewing titles, abstracts, and full-texts to determine which articles meet the inclusion criteria. Manual searching will be conducted to find peer-reviewed published articles not identified through the electronic database search. These articles will also be screened independently by two NESR analysts at the abstract and full-text levels.

Extract data and assess the risk of bias

NESR analysts will extract all essential data from each included article to describe key characteristics of the available evidence, such as the author, publication year, cohort/trial name, study design, population life stage at intervention/exposure and outcome, intervention/exposure and outcome assessment methods, and outcomes. One NESR analyst will extract the data and a second NESR analyst will review the extracted data for accuracy. Each article included in the systematic review will undergo a formal risk of bias assessment, with two NESR analysts independently completing the risk of bias assessment using the tool that is appropriate for the study design.*†‡

Synthesize the evidence

The Committee will describe, compare, and combine the evidence from all included studies to answer the systematic review question. Synthesis of the body of evidence will involve identifying overarching themes or key concepts from the findings, identifying and explaining similarities and differences between studies, and determining whether certain factors impact the relationships being examined. The first level of synthesis organization will be by population (Infants and toddlers (birth up to 24 months) and young children (2 up to 6 years)). Then, within each of the population groups, the evidence will be organized by similar outcome (food acceptance) based on the available evidence. Depending on the available evidence, the next level of organization will be according to similar intervention/exposure (taste versus non-taste sensory exposure; type of food exposure – fruits, vegetables etc.; and single versus multiple food exposed).

Develop conclusion statements and grade the evidence

After the Committee synthesizes the body of evidence, they will draft a conclusion statement or conclusion statements. A conclusion statement is one or more summary statements carefully constructed to answer the systematic review question. It reflects the evidence reviewed, as outlined in the analytic framework (e.g., PICO elements) and synthesis plan, and does not take evidence from other sources into consideration. The

* Sterne JAC, Savovic J, Page MJ, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ*. Aug 28 2019;366:I4898.doi:10.1136/bmj.I4898

† Sterne JA, Hernan MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *BMJ*. Oct 12 2016;355:i4919.doi:10.1136/bmj.i4919

‡ ROBINS-E Development Group., Higgins J, Morgan R, et al. Bias In Non-randomized Studies - of Exposure (ROBINS-E). 2022. <https://www.riskofbias.info/welcome/robins-e-tool>

Committee will review, discuss, and revise the conclusion statement until they reach agreement on wording that accurately reflect the body of evidence.

The Committee will then assign a grade to each conclusion statement (i.e., strong, moderate, limited, or grade not assignable). The grade communicates the strength of the evidence supporting a specific conclusion statement to decision makers and stakeholders. NESR has predefined criteria, based on five grading elements that the Committee will use to evaluate and grade the strength of the evidence supporting each conclusion statement. The five grading elements are: consistency, precision, risk of bias, directness and generalizability of the evidence. Study design will also be considered during the grading process.

Recommend future research

The Committee will identify and document research gaps and methodological limitations throughout the systematic review process. These gaps and limitations will be used to develop research recommendations that describe the research, data, and methodological advances that are needed to strengthen the body of evidence on a particular topic. Rationales for the necessity of additional or stronger research may also be provided with the research recommendations.

Acknowledgments and funding

The Committee members are involved in: 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 the Committee sets; deliberating on the body of evidence for each question; and writing and grading the conclusion statements. The NESR team, with assistance from Federal staff from HHS and USDA (Dennis Anderson-Villaluz, MBA, RD, LDN, FAND; Hazel Hiza, PhD; Tessa Lasswell, MPH, RDN; TusaRebecca Pannucci, PhD, MPH, RD; Elizabeth Rahavi, RD; Kelley Scanlon, PhD, RD; Colleen Sideck, MPH, RDN) and Project Leadership (HHS: Janet de Jesus, MS, RD; USDA: Eve Stoodly, PhD), supports the Committee by facilitating, executing, and documenting the work necessary to ensure the reviews are completed in accordance with NESR methodology. Contractor support was also provided by Panum Telecom (Emily Madan, PhD).

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Appendix

Appendix 1: Inclusion and exclusion criteria comparison between existing* and updated systematic reviews for the research question: What is the relationship between repeated exposure to foods and food acceptance?

Category	Existing Review	Updated Review	Change and Rationale
Study design	<p><u>Included:</u></p> <ul style="list-style-type: none"> • Randomized controlled trials[†] • Non-randomized controlled trials[‡] • Prospective cohort studies • Retrospective cohort studies <p><u>Excluded:</u></p> <ul style="list-style-type: none"> • Cross-sectional studies • Before and after study[§] • Uncontrolled studies • Case-control studies • Editorial, book chapters • Narrative reviews • Ecological studies (cross cultural studies; matching trends from different countries) • Systematic reviews • Meta-analyses 	<p><u>Included:</u></p> <ul style="list-style-type: none"> • Randomized controlled trials • Non-randomized controlled trials^{**} • Prospective cohort studies • Retrospective cohort studies • Nested case-control studies <p><u>Excluded:</u></p> <ul style="list-style-type: none"> • Cross-sectional studies • Uncontrolled trials^{††} • Case-control studies • Narrative reviews • Ecological studies • Systematic reviews • Meta-analyses • Modeling and simulation studies 	Updated review includes nested case-control studies

* Spill M, Callahan E, Johns K, Shapiro M, Spahn JM, Wong YP, Terry N, Benjamin-Neelon S, Birch L, Black M, Briefel R, Cook J, Faith M, Mennella J, Casavale KO, Stoody E. Repeated Exposure to Foods and Early Food Acceptance: A Systematic Review. April 2019. U.S. Department of Agriculture, Food and Nutrition Service, Center for Nutrition Policy and Promotion, Nutrition Evidence Systematic Review. Available at: <https://doi.org/10.52570/NESR.PB242018.SR0401>.

[†] Randomized Controlled trials include: factorial designs, cross-over designs

[‡] Non-randomized controlled trials Include quasi-experimental and controlled before-and-after studies

[§] Before and after study involves collecting data before and after an exposure with two different populations (i.e., 2 cross-sectional data sets are compared)

^{**} Including quasi-experimental and controlled before-and-after studies

^{††} Including uncontrolled before-and-after studies

Category	Existing Review	Updated Review	Change and Rationale
Publication date	<p><u>Included:</u></p> <ul style="list-style-type: none"> January 1980 - June 2017 <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Before January 1980 and after June 2017 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Infants and toddlers: January 1980 - May 2023* Additional search to cover young children: January 2000 - May 2023 <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Infants and toddlers: Before January 1980, and after May 2023 Additional search to cover young children: before January 2000, after May 2023 	<p>Updated review will include studies published after June 2017 to present for infants and toddlers</p> <p>New review will include studies published after Jan 2000 to present for young children and school-aged children</p>
Population: Study participants	<p><u>Included:</u></p> <ul style="list-style-type: none"> Human subjects Males Females Pregnant women Lactating women Non-lactating postpartum women <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Hospitalized patients, not including birth and immediate post-partum hospitalization of healthy mothers and babies 100% pre-mature study population 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Human <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Non-human 	No change

* This review update date range encompasses the original systematic review date range, which included articles published from January 1980 to January 2017

Category	Existing Review	Updated Review	Change and Rationale
Population: Life stage	<p><u>Included:</u></p> <ul style="list-style-type: none"> • Infants (0-12 months) • Toddlers (12-24 months)* <p><u>Excluded:</u></p> <ul style="list-style-type: none"> • Child (2-5 years) • Child (6-12 years) • Adolescents (13-18 years) • Adults (19 and older) • Older adults (65 to 79 years) • Older adults (80+ years) 	<p><u>Included:</u></p> <ul style="list-style-type: none"> • At intervention <ul style="list-style-type: none"> ○ Infants and toddlers (birth up to 24 months) ○ Young children (2 up to 6 years) • At outcome <ul style="list-style-type: none"> ○ Infants and toddlers (birth up to 24 months) ○ Children and adolescents (2 up to 19 years) <p><u>Excluded:</u></p> <ul style="list-style-type: none"> • At intervention/exposure and outcome <ul style="list-style-type: none"> ○ Adolescents (12 up to 19 years) (for intervention/exposure only) ○ Adults (19 years and older) ○ Older adults (65 years and older) 	<p>Eligible population for this review was expanded to include young children (2 up to 6 years)</p>

* Included studies with 0-24mo olds; included studies with age range exceeding 24mo if subgroup analysis was conducted on group ≤ 24 month

Category	Existing Review	Updated Review	Change and Rationale
Population: Health Status	<p><u>Included:</u></p> <ul style="list-style-type: none"> Studies done in generally healthy populations <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Studies that exclusively enroll subjects with a disease or with the health outcome of interest (intermediate or endpoint health outcomes) Studies done in hospitalized or malnourished subjects Studies exclusive to pre-term babies (gestational age <37 weeks) or babies that are small for gestational age (<2500g) 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Studies that <u>exclusively</u> enroll participants not diagnosed with a disease* Studies that enroll <u>some</u> participants: <ul style="list-style-type: none"> diagnosed with a disease; diagnosed with a disease, disorder, or condition that affects feeding/eating or growth (e.g., autism spectrum disorder, attention-deficit/hyperactivity disorder, eating disorder, cleft palate); with severe undernutrition, failure to thrive/underweight, stunting, or wasting; born preterm,[†] with low birth weight,[‡] and/or small for gestational age and/or hospitalized for an illness, injury or surgery <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Studies that <u>exclusively</u> enroll participants: <ul style="list-style-type: none"> diagnosed with a disease;[§] diagnosed with a disease, disorder, or condition that affects feeding/eating or growth (e.g., autism spectrum disorder, attention-deficit/hyperactivity disorder, eating disorder, cleft palate); with severe undernutrition, failure to thrive/underweight, stunting, or wasting; born preterm,[†] with low birth weight,[‡] and/or small for gestational age; and/or hospitalized for an illness, injury, or surgery** 	Inclusion and exclusion criteria for diagnosis of conditions affecting feeding/eating were specified

* Studies that enroll participants who are at risk for chronic disease will be included

† Gestational age <37 weeks and 0/7 days

‡ Birth weight <2500g

§ Studies that exclusively enroll participants with obesity will be included

** Studies that exclusively enroll participants post-cesarean section will be included

Category	Existing Review	Updated Review	Change and Rationale
Intervention/exposure	<p><u>Included:</u></p> <p>Repeated exposure to a food:</p> <ul style="list-style-type: none"> • Length of Exposure Period • Frequency of Exposure, Number of exposures • Type of Repeated Exposure <p><u>Excluded:</u></p> <ul style="list-style-type: none"> • Exclude if doesn't meet inclusion criteria 	<p><u>Included:</u></p> <ul style="list-style-type: none"> • Repeated exposure to target food(s): child is exposed to a target food/food-type multiple times • Repeated exposure may address: <ul style="list-style-type: none"> ○ Number of exposures: times target food is exposed ○ Duration of exposure period ○ Frequency or number of exposure (per unit of time; per day, per week etc.) ○ Type of repeated exposure: <ul style="list-style-type: none"> ▪ Taste and non-taste sensory exposure (smell, tactile, visual) ▪ Single food: A single target food is presented during each exposure period ▪ Multiple foods: More than one target food is presented during exposure period <ul style="list-style-type: none"> • A single target food is presented within an exposure session; the target food may differ from session to session • Child is exposed to multiple target foods within each exposure session • Multi-component interventions in which the isolated effect of repeated food exposure on food acceptance is provided or can be determined despite multiple components <p><u>Excluded:</u></p> <ul style="list-style-type: none"> • Multi-component intervention in which the isolated effect of repeated food exposure on food acceptance is not provided or cannot be determined due to multiple components • Food or flavor exposure in utero or via breastmilk • Exposure to a taste and flavor (e.g., salty, bitter, sweet) 	<p>Inclusion and exclusion criteria for multi-component interventions was added to address directness</p> <p>Inclusion criteria was modified to include interventions assessing repeated non-taste sensory exposure to food</p> <p>Exclusion criteria to clarify the exclusion of studies that assess food or flavor exposure in utero and breastmilk was added.</p> <p>Exclusion criteria was modified to exclude studies that focus on exposure to taste and flavor or nutrient rather than food</p>

Category	Existing Review	Updated Review	Change and Rationale
Comparator	<p><u>Included:</u></p> <ul style="list-style-type: none"> Pre-exposure versus post-exposure (within subject) No exposure versus exposure (between subjects) <p><u>Excluded:</u></p> <ul style="list-style-type: none"> N/A 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Pre-exposure versus post-exposure (within-subject) No exposure versus exposure (between subjects) Taste exposure versus non-taste exposure (between subjects) <p><u>Excluded:</u></p> <ul style="list-style-type: none"> N/A 	<p>Taste and non-taste exposure was added as comparator due to revised intervention criteria to include non-taste sensory exposure to food</p>
Outcomes	<p><u>Included:</u></p> <ul style="list-style-type: none"> Amount of target food (exposed food) consumed, as measured or reported by parent Amount of novel food (non-exposed food) consumed, as measured or reported by parent Duration of feeding of target or novel food during infant-led feeding paradigm Facial response (expressions made during feeding of target or novel food) Mother's perception of infants' enjoyment of the target or novel food <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Exclude if doesn't meet inclusion criteria 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Acceptance of food as measured by <ul style="list-style-type: none"> Amount of target or novel food consumed as measured by research staff or reported by caregiver Length of feeding of target or novel food during infant-led feeding paradigm Facial response (expressions made during feeding of target or novel food) Caregiver or investigator's perception of infants' enjoyment of the target or novel food Willingness to try/taste Hedonic responses Child's verbal indication of liking of food <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Acceptance to taste and flavor (e.g., sweet, salty etc.) versus food Nutrient intake (e.g., sodium) 	<p>Broadened the outcome by including willingness to try/taste, hedonic responses, and child's verbal indication of liking of food.</p> <p>Narrowed the outcome by excluding studies that examine acceptance of nutrient intake (e.g., sodium), and acceptance to taste and flavor (e.g. sweet, salty etc.)</p>
Publication status	<p><u>Included:</u></p> <ul style="list-style-type: none"> Studies published in peer-reviewed journals <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Grey literature, including unpublished data, manuscripts, reports, abstracts, conference proceedings 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Peer-reviewed articles published in research journals <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Non-peer-reviewed articles, unpublished data or manuscripts, pre-prints, reports, editorials, retracted articles, and conference abstracts or proceedings 	<p>No change</p>

Category	Existing Review	Updated Review	Change and Rationale
Language	<p><u>Included:</u></p> <ul style="list-style-type: none"> Studies published in English <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Studies published in languages other than English 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Studies published in English <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Studies published in languages other than English 	No change
Country*	<p><u>Included:</u></p> <ul style="list-style-type: none"> Studies conducted in Very High, High, Middle, or Low Human Development Countries <p><u>Excluded:</u></p> <ul style="list-style-type: none"> NA 	<p><u>Included:</u></p> <ul style="list-style-type: none"> Studies conducted in countries classified as high or very high on the Human Development Index the year(s) the intervention/exposure data were collected <p><u>Excluded:</u></p> <ul style="list-style-type: none"> Studies conducted in countries classified as medium or low on the Human Development Index the year(s) the intervention/exposure data were collected 	Changed to include only countries classified as high or very high on the Human Development Index to more closely reflect the US population

* In order to determine the inclusion exclusion criteria for country, the Human Development classification was used. This classification is 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>)