2020 Dietary Guidelines Advisory Committee: Dietary Fats and Seafood

Chair Linda Snetselaar
Regan Bailey
Joan Sabaté
Linda Van Horn

Barbara Schneeman, Advisory Committee Chair Rep

DietaryGuidelines.gov
Topic Areas

- Seafood during pregnancy/lactation and neurocognitive development
- Seafood during childhood/adolescence and neurocognitive development
- Seafood during childhood/adolescence and cardiovascular disease

Protocols available at DietaryGuidelines.gov
**Topic Areas, Continued**

- Dietary fats and all-cause mortality
- Dietary fats and cancer
- Dietary fats and cardiovascular disease
- Dietary fats and neurocognitive development/health

Protocols available at DietaryGuidelines.gov
Key acronyms

- n-3: Omega-3 fatty acids
- n-6: Omega-6 fatty acids
- PUFA: Polyunsaturated fatty acids
- MUFA: Monounsaturated fatty acids
- EPA: Eicosapentaenoic Acid
- DHA: Docosahexaenoic Acid
- CVD: Cardiovascular disease
- MeHg: Methylmercury
Seafood Questions

What is the relationship between seafood consumption...

1. during pregnancy and lactation and neurocognitive development of the infant?
2. during childhood and adolescence (up to 18 years of age) and neurocognitive development?
3. during childhood and adolescence (up to 18 years of age) and risk of cardiovascular disease?

Approach to Answer Questions: NESR Systematic Review
Key Definitions

• **Seafood** – Marine animals that live in the sea and in freshwater lakes and rivers. Seafood includes fish (e.g., salmon, tuna, trout, tilapia) and shellfish (e.g., shrimp, crabs, oysters) (Source: 2015-2020 DGA)
Key Definitions

- **Seafood** – The following will be considered in analyses:
  - Type (e.g., salmon, tuna, bass)
  - Source (e.g., sea, fresh water, farmed, wild)
  - Amount/frequency of intake
  - Timing of exposure (e.g., age at intake)
Analytic Framework: Maternal seafood intake and child neurocognitive development

**Systematic review question:** What is the relationship between seafood consumption during pregnancy and lactation and neurocognitive development in infants?

<table>
<thead>
<tr>
<th>Intervention/exposure</th>
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<th>Comparator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seafood consumption (type, source, amounts, frequency, and/or timing of exposure)</td>
<td></td>
<td>Different types, sources, amounts, frequency, and/or timing of exposure of seafood consumption</td>
</tr>
<tr>
<td><strong>Population:</strong> Women during pregnancy and/or lactation</td>
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</tbody>
</table>

**Endpoint outcomes**
- Developmental domains, examined via milestone achievement and/or scales/indices, including Cognitive, Language/communication, Movement/physical, Social-emotional
- Academic performance
- Attention deficit disorder (ADD) or attention-deficit/hyperactivity disorder (ADHD)
- Anxiety
- Depression
- Autism spectrum disorder (ASD)

**Population:** Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years)

**Key Confounders:** Child sex, Child age, Maternal age, Race/ethnicity, Socioeconomic status, Alcohol intake, Dietary supplements (e.g., omega-3 polyunsaturated fatty acids (n-3 PUFA), iron), Dietary pattern, Non-fish dietary exposure to n-3 PUFAs, Smoking, Maternal anthropometrics, Child's birth weight, Gestational age, Parental education, Parity
**Outcome Specific Key Confounders:** ADD, ADHD, Anxiety, ASD, Depression: Family history of neurocognitive disorders.

**Key Covariates:** Key nutrients in seafood (e.g., n-3 PUFAs, iodine, selenium, iron, fish protein, vitamin D); Environmental chemicals (e.g., mercury, persistent organic pollutants, and polychlorinated biphenyls); Blood and human milk biomarkers of seafood intake (e.g., n-3 PUFA, and environmental pollutants), mother (e.g., venous/umbilical cord, placenta, red blood cell) and child (e.g., arterial/umbilical cord) EPA, DHA, iron, iodine, selenium, protein, vitamin D; Infant feeding mode

**Key definition:**
**Seafood** - Marine animals that live in the sea and in freshwater lakes and rivers. Seafood includes fish (e.g., salmon, tuna, trout, and tilapia) and shellfish (e.g., shrimp, crab, and oysters) (Source: 2015-2020 DGA)

**Legend**
- The relationship of interest in the systematic review
- Factors that may impact the relationship of interest in the systematic review
**Analytic Framework: Child seafood intake and neurocognitive development**

**Systematic review question:** What is the relationship between seafood consumption during childhood and adolescence (up to 18 years of age) and neurocognitive development?

### Intervention/exposure vs Comparator
- **Intervention/exposure:**
  - Seafood consumption (type, source, amounts, frequency, and/or timing of exposure)
- **Comparator:**
  - Different types, sources, amounts, frequency, and/or timing of exposure of seafood consumption

**Population:** Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years); full-term, healthy and/or at risk for chronic disease

### Endpoint outcomes
- **Developmental Milestones, including Neurocognitive Development (2 y to 18 y):**
  - Developmental domains, examined via milestone achievement and/or scales/indices, including cognitive, language/communication, movement/physical, social-emotional
  - Academic performance
  - Attention deficit disorder (ADD) or attention-deficit/hyperactivity disorder (ADHD)
  - Anxiety
  - Depression
  - Autism spectrum disorder (ASD)

**Neurocognitive Health Outcomes (19+ years):**
- Cognitive decline, mild cognitive impairment, and dementia, including Alzheimer’s Disease
- Anxiety
- Depression

**Population:** Children and adolescents (ages 2-18 years), adults (ages 19-64 years), older adults (ages 65 years and older)

### Key Confounders
- Child sex, Child age, Race/ethnicity, Socioeconomic status, Infant feeding mode, Dietary supplements (e.g., n-3 PUFAs, iron), Dietary pattern, Non-fish dietary exposure to n-3 PUFAs, Smoking, Parental education

### Key Covariates
- Key nutrients in seafood (e.g., n-3 PUFAs, iron, iodine, selenium, fish protein, vitamin D), Environmental chemicals (e.g., mercury, persistent organic pollutants, and polychlorinated biphenyls); Blood biomarkers of seafood intake (e.g., n-3 PUFAs, and environmental pollutants

### Key definition:
- **Seafood:** Marine animals that live in the sea and in freshwater lakes and rivers. Seafood includes fish (e.g., salmon, tuna, trout, and tilapia) and shellfish (e.g., shrimp, crab, and oysters) (Source: 2015-2020 DGA)

### Legend
- The relationship of interest in the systematic review
- Factors that may impact the relationship of interest in the systematic review
Analytic Framework: Child seafood intake and risk of cardiovascular disease

Systematic review question: What is the relationship between seafood consumption during childhood and adolescence (up to 18 years of age) and risk of cardiovascular disease?

<table>
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<td>Different types, sources, amounts, frequency, and/or timing of exposure of seafood consumption</td>
</tr>
</tbody>
</table>

Population: Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years); full-term, healthy and/or at risk for chronic disease

Intermediate outcomes:
- Blood pressure (systolic and diastolic)
- Total Cholesterol (TC)
- LDL-Cholesterol
- HDL-Cholesterol (including TC:HD and LDL: HDL ratios)
- Triglycerides

Population: Children and adolescents (ages 2-18 years), adults (ages 19-64 years), older adults (ages 65 years and older)

Endpoint outcomes:
- Cardiovascular disease (CVD): (myocardial infarction, coronary heart disease, coronary artery disease, congestive heart failure, peripheral artery disease)
- Stroke
- Venous thrombosis
- Cardiovascular disease-related mortality

Population: Adults (ages 19-64 years), older adults (ages 65 years and older)

Key Confounders: Child sex, Child age, Race/ethnicity, Socioeconomic status, Omega-3 polyunsaturated fatty acids (n-3 PUFA) supplements, Non-fish dietary exposure to n-3 PUFAs, Smoking, Anthropometry, Family history of CVD

Key Covariates: Key nutrients in seafood (e.g., n-3 PUFAs, iron, iodine, selenium, fish protein, vitamin D), Environmental chemicals, e.g., mercury, persistent organic pollutants, and polychlorinated biphenyls, Blood and human milk biomarkers of seafood intake (e.g., n-3 PUFAs, and environmental pollutants)

Key definition:

Seafood - Marine animals that live in the sea and in freshwater lakes and rivers. Seafood includes fish (e.g., salmon, tuna, trout, and tilapia) and shellfish (e.g., shrimp, crab, and oysters) (Source: 2015-2020 DGA)

Legend:
- The relationship of interest in the systematic review
- Factors that may impact the relationship of interest in the systematic review
Inclusion and Exclusion Criteria

• Propose standard criteria be used for:
  • Study Design
  • Publication Status
  • Date of publication (January 2000 – present)
  • Language of Publication
  • Country
  • Health status of participants
## Inclusion and Exclusion Criteria

<table>
<thead>
<tr>
<th>Category</th>
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</table>
| **Intervention/ exposure** | - Seafood consumption measured prior to outcome assessment  
  - Type  
  - Source  
  - Amount/frequency of intake  
  - Timing of exposure  
  - Dietary intake (e.g., from food frequency questionnaires, dietary recall, fish/seafood screeners) may be validated with biomarkers for PUFA or MeHg, but not substituted | - No measure of seafood consumption (i.e., studies that only examined biomarkers for consumption)  
  - Omega-3 supplement studies which do not evaluate seafood consumption  
  - Studies evaluating infant formula with DHA and/or EPA supplementation |
| **Comparator**      | - Different types, sources, and/or amounts of seafood consumed;  
  Different frequency of and/or timing of seafood consumption |                                                                                     |
Dietary Fats Questions

What is the relationship between types of dietary fat consumed and ...

1. neurocognitive development (birth to 18 years) or neurocognitive health (for those 18 years & older)?
2. risk of cardiovascular disease?
3. risk of certain types of cancer?
4. risk of all-cause mortality?

Approach to Answer Questions: NESR Systematic Review
Key Definitions

• **Types of Dietary Fat** – Types of dietary fat to be considered include
  
  • Saturated Fatty Acids (SFA)
  • Monounsaturated Fatty Acids (MUFAs)
  • Polyunsaturated Fatty Acids (PUFAs)
    
    • Omega-3 polyunsaturated fatty acids (n-3 PUFAs), e.g., Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA)
    • Omega-6 polyunsaturated fatty acids (n-6 PUFAs)
  • Cholesterol
Key Definitions

• **Types of Dietary Fat** – The following will be considered in analyses:
  • Source (e.g., dairy, eggs, meat, plants)
  • Amount
  • Proportion (e.g., n-3/n-6 PUFA ratio)
  • Replacement (e.g., replacing SFA with PUFA, replacing SFA with carbohydrate/protein)
Analytic Framework: Dietary fat and neurocognitive outcomes

**Systematic review question:** What is the relationship between types of dietary fat consumed and neurocognitive development (birth to 18 years) or neurocognitive health (for those 18 years and older)?

<table>
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<tr>
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<tr>
<td>Consumption of type(s) of dietary fats¹</td>
<td>Consumption of different type(s), source(s), amount(s), and/or proportion(s) of dietary fats, or replacement with dietary carbohydrate and/or protein</td>
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¹ *Types of dietary fat to be considered include saturated fats, omega-3 and omega-6 polyunsaturated fatty acids, monounsaturated fatty acids, and dietary cholesterol. The source, amount, proportion, and replacement with other dietary fats and/or carbohydrate/protein will be considered in analyses.*

**Population:** Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years), adults (ages 19-64), older adults (ages 65 years and older); healthy and/or at risk for chronic disease

**Endpoint outcomes**

**Developmental Milestones, Including Neurocognitive Development (Birth to 18 y)**
- Developmental domains, examined via milestone achievement and/or scales/indices, including cognitive, language/communication, movement/physical, social-emotional
- Academic performance
- Attention deficit disorder (ADD) or attention-deficit/hyperactivity disorder (ADHD)
- Anxiety
- Depression
- Autism spectrum disorder (ASD)

**Neurocognitive Health (19+ years)**
- Cognitive decline, mild cognitive impairment, and dementia, including Alzheimer’s Disease
- Anxiety
- Depression

**Population:** Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years), adults (ages 19-64), older adults (ages 65 years and older)

**Key Confounders:** Sex, Age, Race/ethnicity, Socioeconomic status, BMI, Smoking

**Outcome/Age Specific Key Confounders:** *Neurocognitive Development (birth to 18 y):* Parental education; *Neurocognitive Health (19+ years):* Education; ADD, ADHD, Anxiety, ASD, Depression, Alzheimer’s (all ages): Family history of neurocognitive disorder

**Key Covariates:** Mercury in fat originating from seafood

**Legend**
- The relationship of interest in the systematic review
- Factors that may impact the relationship of interest in the systematic review
Analytic Framework: Dietary fat and all-cause mortality

**Systematic review question:** What is the relationship between types of dietary fat consumed and all-cause mortality?

### Intervention/exposure vs Comparator

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\(^1\)Types of dietary fat to be considered included saturated, omega-3 and omega-6 polyunsaturated, monounsaturated fatty acids, and dietary cholesterol. The source, amount, proportion and replacement with other dietary fats and/or carbohydrate/protein will be considered in analyses.

**Population:** Children and adolescents (ages 2-18 years old), adults (ages 19-64 years old), older adults (ages 65 and older), healthy and/or at risk for chronic disease

### Endpoint outcome

All-cause mortality (i.e., total mortality): the total number of deaths from any/all causes during a specific time-period.

**Population:** Children and adolescents (ages 2-18 years old), adults (ages 19-64 years old), older adults (ages 65 and older)

### Key Confounders
- Sex, Age, Race/Ethnicity, Socioeconomic status, Total energy intake, Alcohol intake, N-3 PUFA supplement intake, Physical activity, Smoking, Anthropometry, Family history of CVD, cancer or diabetes

### Key Covariates
- Carbohydrate and protein intake, other types of dietary fats, BMI

### Key definitions

**All-cause mortality** - the total number of deaths from any/all causes during a specific time-period. This does not include cause-specific mortality (e.g., cancer-related deaths, CVD-related deaths).

### Legend

- The relationship of interest in the systematic review
- Factors that may impact the relationship of interest in the systematic review
Analytic Framework: Dietary fat and risk of certain types of cancer

**Systematic review question:** What is the relationship between types of dietary fat consumed and risk of certain types of cancer?

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\(^1\)Types of dietary fat to be considered included saturated, omega-3 and omega-6 polyunsaturated, monounsaturated fatty acids, and dietary cholesterol. The source, amount, proportion and replacement with other dietary fats and/or carbohydrate/protein will also be considered in analyses.

**Population:** Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years old), adults (ages 19-64 years old), older adults (ages 65 and older); healthy and/or at risk for chronic disease

**Key moderators:** Menopause

**Outcomes**
- Adults
  - Breast
  - Colon and rectum
  - Prostate
  - Lung
  - Pancreatic
  - Endometrial
  - Liver
- Children
  - Leukemia

**Population:** Children and adolescents (ages 2-18 years old), adults (ages 19-64 years old), older adults (ages 65 and older)

**Key Confounders:** Sex (EXCEPT breast, prostate, and endometrial cancers), Age, Race/ethnicity, Socioeconomic status, Alcohol intake, Physical activity, Anthropometry, Smoking, Family history of the cancer outcome

**Outcome Specific Key Confounders:** Breast and Endometrial: Hormonal contraceptive, age of menopause; Colon and rectum: Inflammatory bowel disease; Lung: Lung disease (e.g., emphysema, chronic bronchitis, tuberculosis, pneumonia), environmental exposures to lung carcinogens; Liver: Chronic viral hepatitis, liver disease

**Legend**
- The relationship of interest in the systematic review
- Factors that may impact the relationship of interest in the systematic review
Analytic Framework: Dietary fat and risk of cardiovascular disease

**Systematic review question:** What is the relationship between types of dietary fat consumed and risk of cardiovascular disease?

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*Types of dietary fat to be considered included saturated, omega-3 and omega-6 polyunsaturated, monounsaturated fatty acids, and dietary cholesterol. The source, amount, proportion and replacement with other dietary fats and/or carbohydrate/protein will be considered in analyses.*

**Population:** Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years old), adults (ages 19-64 years old), older adults (ages 65 and older), healthy and/or at risk for chronic disease

**Intermediate outcomes**
- Blood pressure (systolic and diastolic)
- Total Cholesterol (TC)
- LDL-Cholesterol
- HDL-Cholesterol (including TC:HDL and LDL:HDL ratios)
- Triglycerides

**Population:** Infants and toddlers (birth to 24 months), children and adolescents (ages 2-18 years old), adults (ages 19-64 years old), older adults (ages 65 and older)

**Endpoint outcomes**
- Cardiovascular disease (CVD): myocardial infarction, coronary heart disease, coronary artery disease, congestive heart failure, peripheral artery disease
- Stroke
- Venous thrombosis
- Cardiovascular disease-related mortality

**Population:** Adults (ages 19-64 years), older adults (ages 65 years and older)

**Key Confounders:** Age, Race/ethnicity, Socioeconomic status, Total energy intake, Alcohol intake, Physical activity, Smoking, Family history of CVD or diabetes

**Key Covariates:** Carbohydrate and protein intake, Other types of dietary fats, Baseline CVD risk category (high, moderate, low), Duration or intensity of intervention, n-3 PUFA supplement use, Anthropometry

**Legend**
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Inclusion and Exclusion Criteria

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<td>Intervention/exposure</td>
<td>• Consumption of type(s) of dietary fats</td>
<td>• Studies that do not assess consumption of type(s) of dietary fats (e.g., studies that only examined biomarkers for consumption)</td>
</tr>
<tr>
<td></td>
<td>• Types of dietary fat to be considered included saturated, omega-3 and omega-6 polyunsaturated, monounsaturated fatty acids, and dietary cholesterol</td>
<td>• Studies that only assess total fat intake or overall macronutrient composition</td>
</tr>
<tr>
<td></td>
<td>• The source, amount, proportion, and replacement with other dietary fats and/or carbohydrate/protein will also be considered in analyses</td>
<td>• Studies that only assess trans fat</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Studies that examine food products not widely available to U.S. consumers</td>
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<tr>
<td></td>
<td></td>
<td>• Studies that exclusively assess intake of fat from supplements</td>
</tr>
<tr>
<td>Comparator</td>
<td>• Consumption of different type(s), source(s), amount(s), and/or proportion(s) of dietary fats, or replacement with dietary carbohydrates and/or protein</td>
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Next Steps

• Seafood Questions
  • Neurocognitive outcome questions
  • Complete screening and extracting data
  • Risk of cardiovascular disease question
  • Conduct literature searches

• Dietary Fat Questions
  • Conduct literature searches
2020 Dietary Guidelines Advisory Committee: Dietary Fats and Seafood Subcommittee

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