

# 2020 Dietary Guidelines Advisory Committee: Birth to 24 Months Subcommittee

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[DietaryGuidelines.gov](https://DietaryGuidelines.gov)

# Topics and Questions Under Review

- Presented at previous meeting:
  - Human milk/infant formula and micronutrient status
  - Human milk/infant formula and atopic disease
  - Human milk/infant formula and long-term health (CVD, diabetes)
  - Complementary feeding and atopic disease
  - Complementary feeding and developmental milestones
  - Complementary feeding and growth, size, and body composition
  - Complementary feeding and micronutrient status
  - Complementary feeding and bone health

**Protocols for questions discussed in this presentation are available at [DietaryGuidelines.gov](https://www.dietaryguidelines.gov)**

# Topics and Questions Under Review, continued

- To be discussed today:
  - Nutrients from supplements/fortified foods and growth, size, and body composition
  - Nutrients from supplements/fortified foods and bone health
  - Human milk/infant formula and growth, size, and body composition

**Protocols for questions discussed in this presentation are available at [DietaryGuidelines.gov](https://www.dietaryguidelines.gov)**

# Question

What is the relationship between specific nutrients from supplements and/or fortified foods consumed during infancy and toddlerhood and growth, size, and body composition?

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Approach to Answer Question: NESR Systematic Review

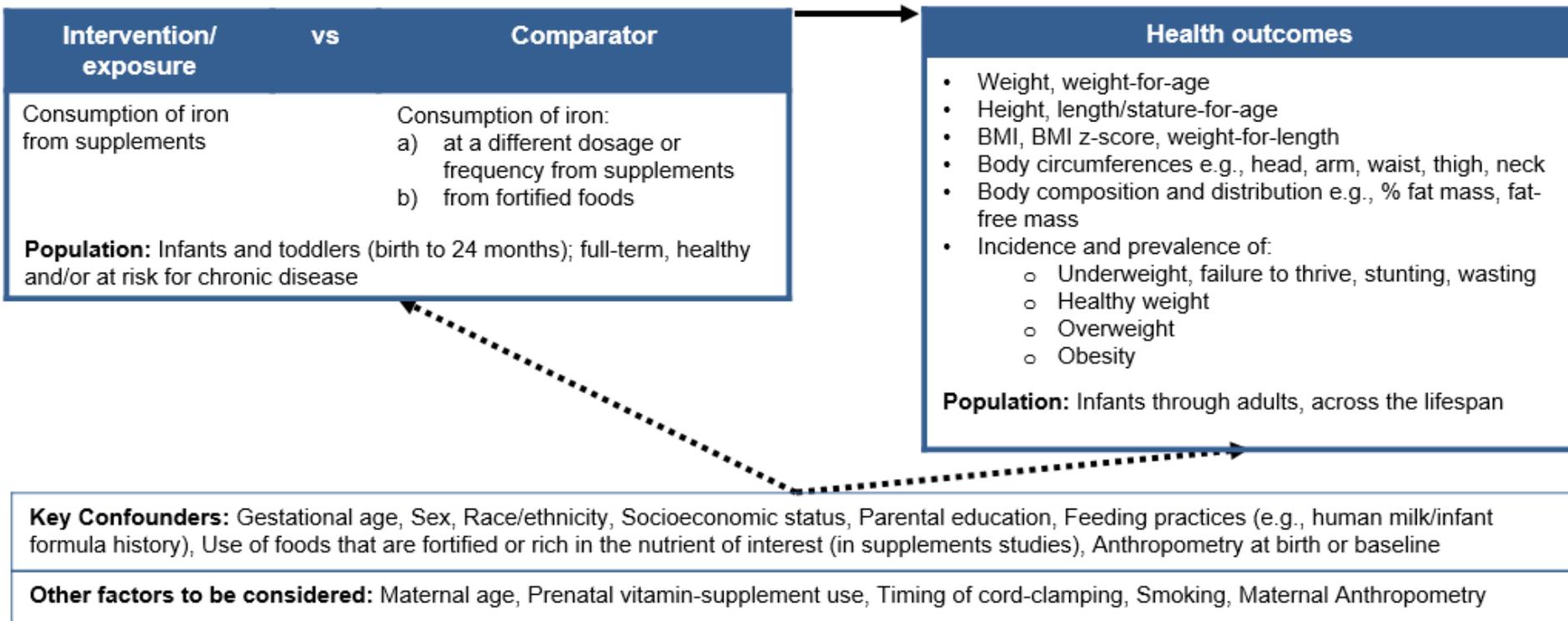
# Refined question

What is the relationship between iron from supplements consumed during infancy and toddlerhood and growth, size, and body composition?

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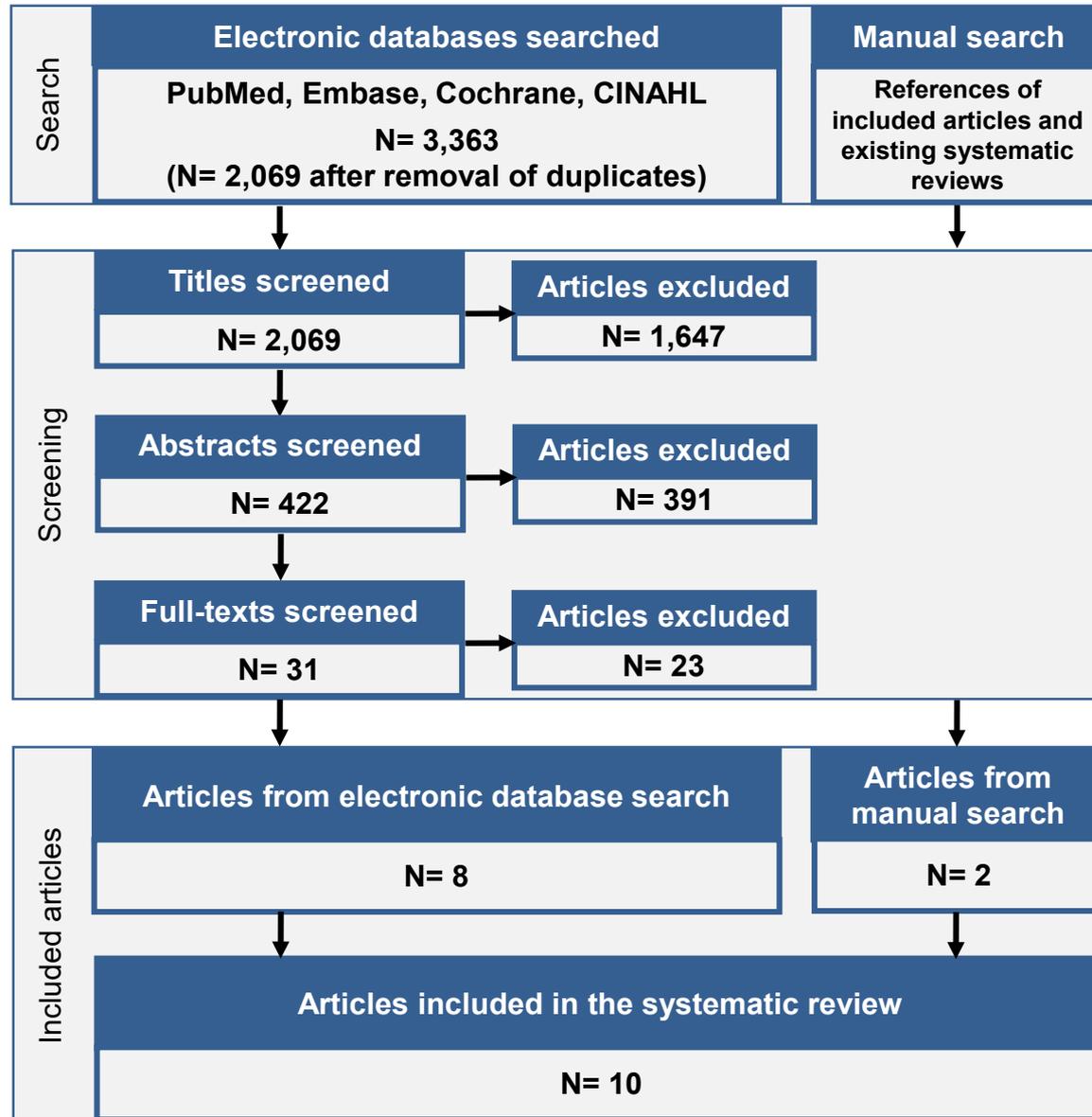
Approach to Answer Question: NESR Systematic Review

# Analytic Framework



**Iron from supplements and growth, size, and body composition  
2020 Dietary Guidelines Advisory Committee: Meeting 5**

# Literature Search and Screening Results



# Description of the Evidence

- Published 2002-2016
- Mostly RCTs (n=8 of 10)
- Mostly studied infants (n=9 of 10), with a focus on infants fed human milk
- Interventions/comparators fell into 3 categories:
  1. Iron from supplements vs no iron
  2. Iron from supplements vs different amount of iron from supplements
  3. Iron from supplements vs iron from iron-fortified foods
- Outcomes fell into 2 categories
  1. Growth
  2. Attained size

**Iron from supplements and growth, size, and body composition  
2020 Dietary Guidelines Advisory Committee: Meeting 5**

# Summary of the Evidence Synthesis

*\*In our synthesis we did not consider attained size between groups that (a) differed in size at baseline, or (b) did not report baseline size, without controlling for baseline size*

## Iron from supplements vs no iron:

- 0 of 5 studies reported significantly greater growth in infants given iron supplements
- 3 of 5 studies reported significantly slower growth in infants given iron supplements
- 2 of 5 studies did not report significant differences
- Possible explanations for inconsistencies:
  - Differences in risk of iron deficiency
  - Differences in the consumption of iron-fortified formula or iron-rich foods
  - Differences in the timing of iron supplementation

**Iron from supplements and growth, size, and body composition  
2020 Dietary Guidelines Advisory Committee: Meeting 5**

# Summary of the Evidence Synthesis, continued

## Iron from supplements vs different dosage of iron from supplements:

Evidence from 3 studies cannot be compared due to heterogeneity

- 1 study reported significantly slower growth in infants given iron supplements for a longer duration
- 1 study did not report significant differences in growth between infants given iron supplements with different dosages
- 1 study did not report significant differences in attained size between toddlers given iron supplements with different dosages

## Iron from supplements vs iron from fortified foods:

Evidence from 2 studies cannot be compared due to heterogeneity

- 1 study reported significantly greater growth in infants given the same dosage of iron from supplements compared with iron-fortified infant formula
- 1 study did not report significant differences in growth or attained size in infants given similar dosages of iron from supplements compared with iron-fortified infant cereal

**Iron from supplements and growth, size, and body composition  
2020 Dietary Guidelines Advisory Committee: Meeting 5**

# DRAFT Conclusion Statement and Grade

## **Conclusion statement**

Moderate evidence indicates that human milk-fed infants who are supplemented with iron do not have greater growth, and may have slower growth, than human milk-fed infants not supplemented with iron.

**Grade: Moderate**

# DRAFT Conclusion Statement and Grade, continued

## Conclusion statement

Insufficient evidence is available to determine the relationship between:

- iron from supplements consumed during infancy and body composition during infancy
- iron from supplements consumed during infancy and growth, size, and body composition beyond 12 months of age
- iron from supplements consumed after 12 months of age and growth, size, and body composition

**Grade:** Grade not assignable

**Iron from supplements and growth, size, and body composition  
2020 Dietary Guidelines Advisory Committee: Meeting 5**

# Question: vitamin D and bone health

What is the relationship between specific nutrients from supplements and/or fortified foods consumed during infancy and toddlerhood and bone health?

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Approach to Answer Question: NESR Systematic Review

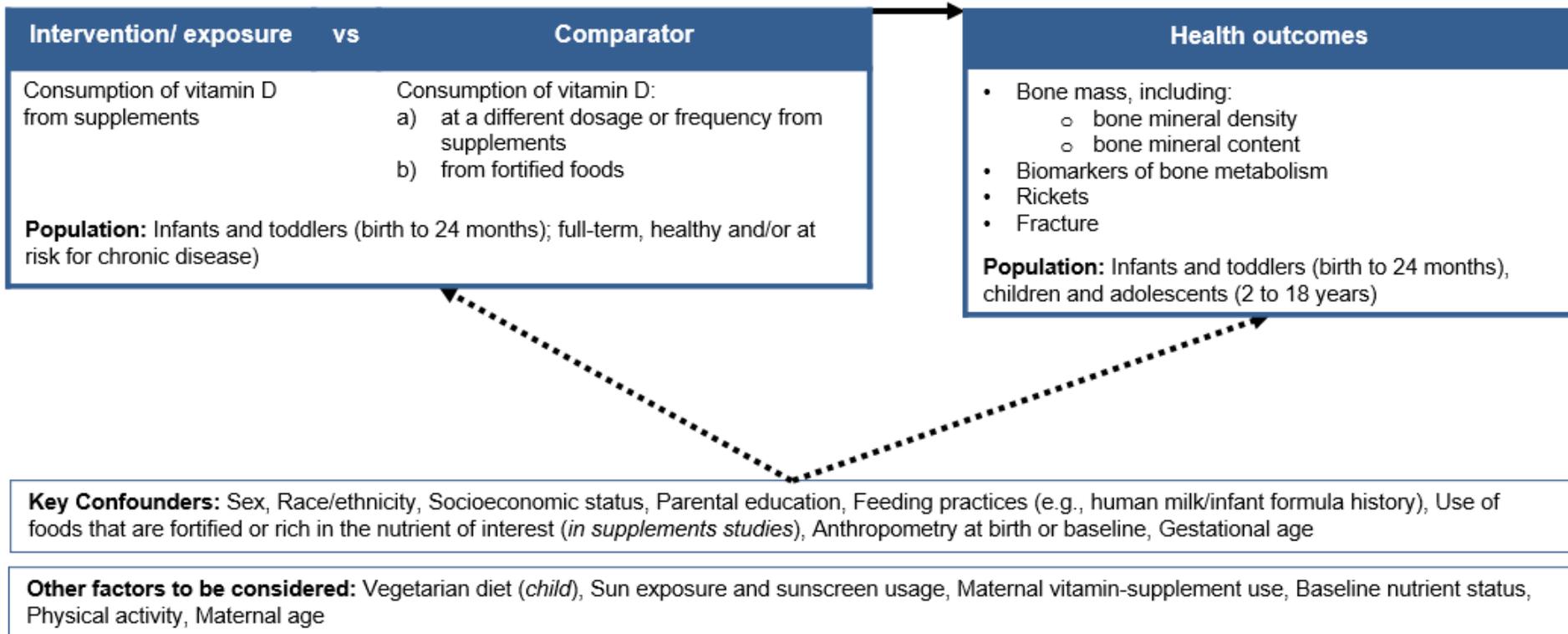
# Refined question: vitamin D and bone health

What is the relationship between vitamin D  
from supplements  
consumed during infancy and toddlerhood  
and bone health?

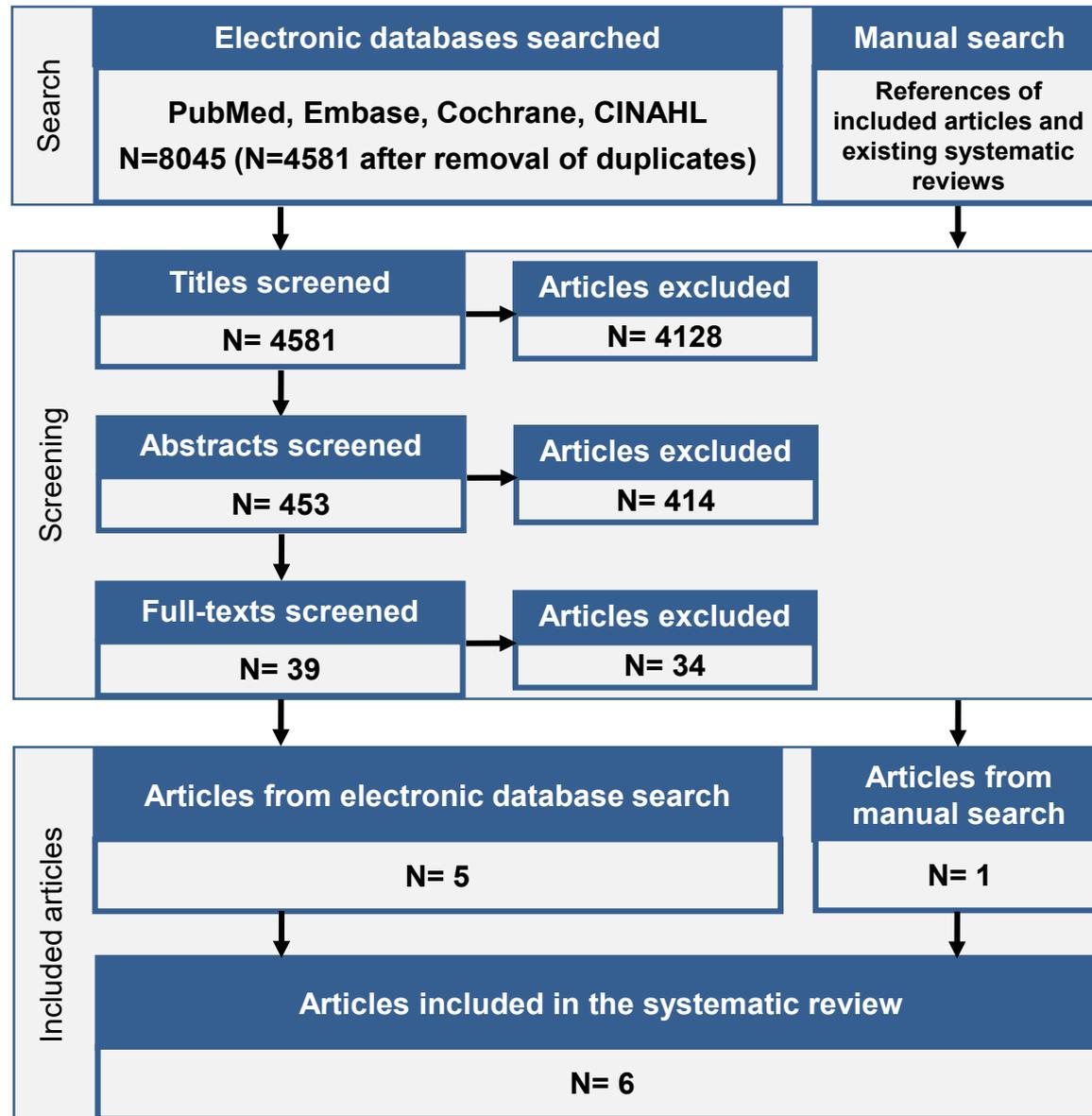
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Approach to Answer Question: NESR Systematic Review

# Analytic framework



# Literature Search and Screening Results: vitamin D and bone health



# Description of the Evidence vitamin D and bone health

- Published 2010-2018
- 5 RCTs (2 articles from the same RCT)
- Focused on infants fed human milk
- Interventions/comparators fell into 3 categories:
  1. 400 IU/day vs higher dosages
  2. 400 IU/day vs a lower dosage
  3. 200 IU/day for different durations vs placebo
- Outcomes fell into 3 categories
  1. Bone mass
  2. Biomarkers of bone metabolism
  3. Rickets

# Summary of the Evidence Synthesis vitamin D and bone health

## 400 IU/day vs higher dosages:

Inconsistent evidence related to bone mass

- 1 of 4 studies reported significant positive relationships between vitamin D dosage and bone mass outcomes
- 1 of 4 studies reported significant inverse relationships between vitamin D dosage and bone mass outcomes
- 2 of 4 studies did not report significant relationships between vitamin D dosage and bone mass outcomes

Consistent evidence related to biomarkers of bone metabolism:

- 3 of 3 studies did not report significant relationships between vitamin D dosage and biomarkers of bone metabolism

# Summary of the Evidence Synthesis, continued: vitamin D and bone health

## 400 IU/day vs lower dosages:

- There was 1 study, which did not report significant relationships between vitamin D dosage and bone mass or biomarkers of bone metabolism

## 200 IU/day for different durations vs placebo:

- There was 1 study, which did not report significant relationships between different durations of vitamin D supplementation compared with a placebo and biomarkers of bone metabolism or rickets

# DRAFT Conclusion Statement and Grade

## Conclusion statement

Limited evidence suggests that there is no relationship between consumption of 400 IU per day of vitamin D under 12 months of age, compared with higher dosages of up to 1600 IU per day, and biomarkers of bone metabolism followed up to 36 months of age.

**Grade:** Limited

*\*Our literature search date range began in 2000; evidence related to the recommendation for 400 IU/day may pre-date our search*

*\*High doses of vitamin D in lactating mothers and bone health in infants was outside of the scope of our systematic review*

# DRAFT Conclusion Statement and Grade

## vitamin D and bone health

### Conclusion statement

Insufficient evidence is available to determine the relationship between:

- 400 IU per day of vitamin D from supplements, compared with higher dosages, and bone mass, rickets, or fracture
- 400 IU per day of vitamin D from supplements, compared with no vitamin D from supplements or lower dosages of vitamin D from supplements or vitamin D from fortified foods, and bone mass, biomarkers of bone metabolism, rickets, or fracture

**Grade:** Grade not assignable

*\*Our literature search date range began in 2000; evidence related to the recommendation for 400 IU/day may pre-date our search*

*\*High doses of vitamin D in lactating mothers and bone health in infants was outside of the scope of our systematic review*

# Question: human milk

What is the relationship between the duration, frequency, and volume of exclusive human milk and/or infant formula consumption and growth, size, and body composition?

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Approach to Answer Question: NESR Systematic Review

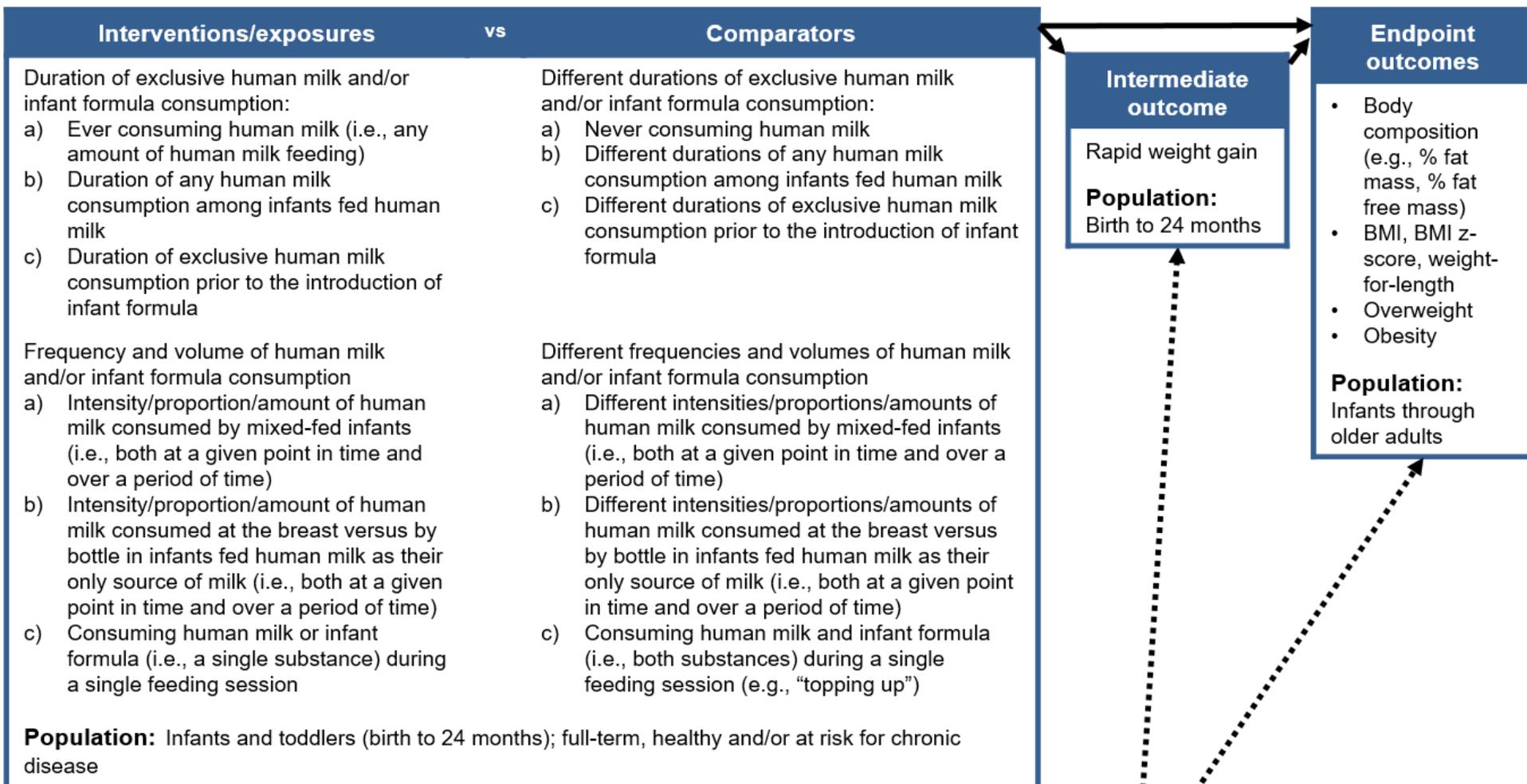
# Refined question: human milk

What is the relationship between the duration, frequency, and volume of exclusive human milk and/or infant formula consumption and body composition including obesity?

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Approach to Answer Question: NESR Systematic Review

# Analytic Framework: human milk



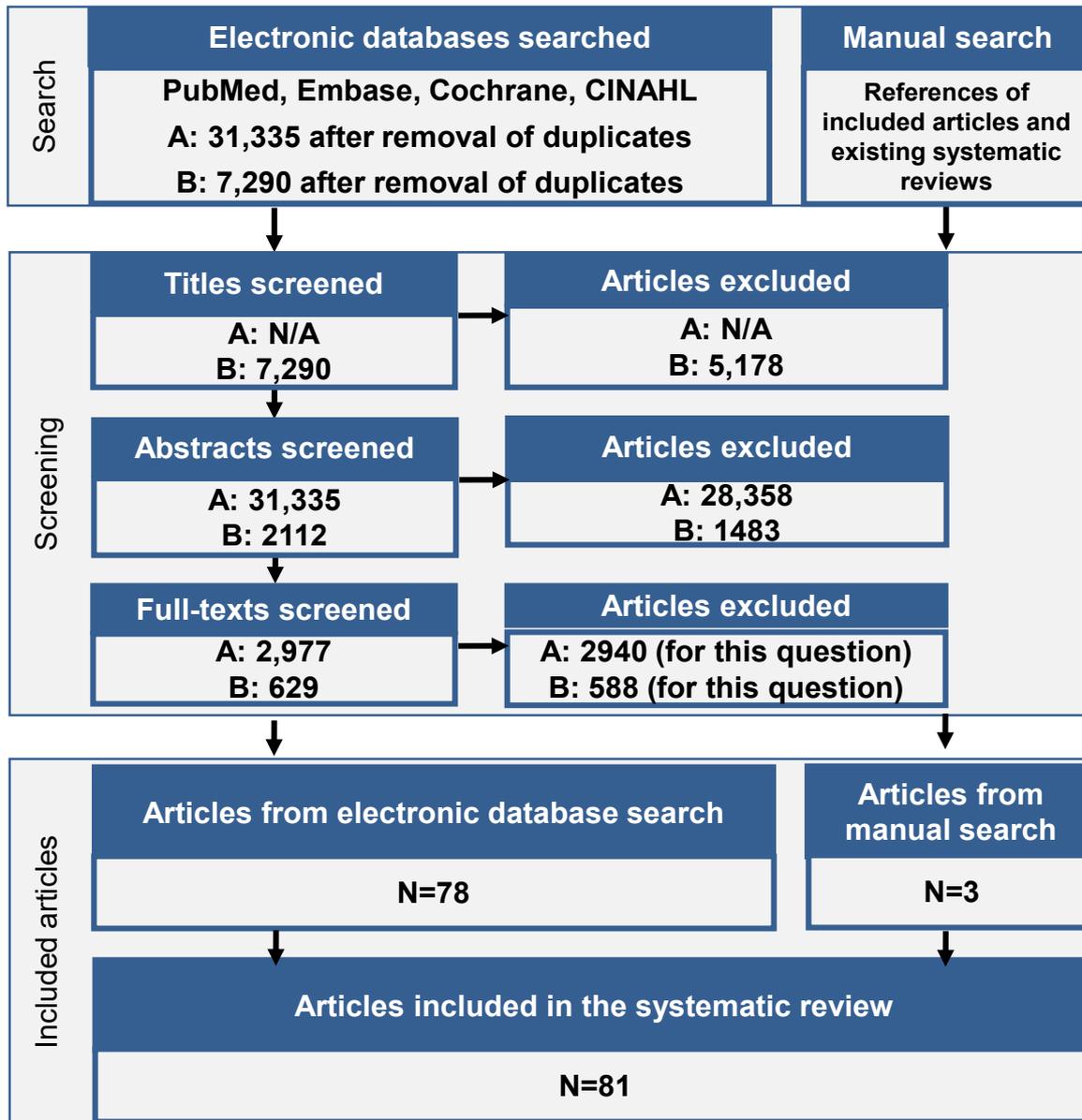
**Key confounders:** Race/ethnicity, Socioeconomic status, Types/amounts of complementary foods and beverages and infant formula, Childhood diet (for outcomes beyond 24 months), Birth weight/fetal growth, Smoking, Mode of delivery, Maternal BMI

# Inclusion and Exclusion Criteria

- Updated criteria:
  - Publication date Jan 2011-Sept 2019
  - Within-family analyses of siblings from Jan 1980-Sept 2019 (e.g., siblings fed differently, siblings with different outcomes)

# Literature Search and Screening Results

## human milk



- A: Literature search from the Pregnancy and Birth to 24 Months Project (Jan. 1980-March 2016)
- B: Literature search for the 2020 Dietary Guidelines Advisory Committee (March 2016-Sept. 2019)

# Description of the Evidence human milk

Number of studies for each component of the analytic framework:

Exposure:	Outcome age →	B-24	2-5	6-11	12-19	20+
Ever vs never consuming human milk		15	24	17	10	3
Duration of any human milk		11	14	13	5	2
Duration of exclusive human milk prior to formula		0	1	2	0	0
Intensity of human milk to mixed-fed infants		1	0	0	0	0
Intensity of human milk fed by breast vs by bottle		1	0	0	0	0
One vs both substances per feeding (human milk, formula)		0	0	0	0	0

**Human milk/infant formula and body composition including obesity  
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# Description of the Evidence, continued

- Almost all observational  
Exception: Promotion of Breastfeeding Intervention Trial (PROBIT)
- 24 articles from 17 independent US cohorts
- Outcomes fell into 4 categories:
  1. Overweight, obesity
  2. BMI, BMI z-score, weight-for-length as continuous measures
  3. Trajectories (rapid infant weight gain, BMI trajectories)
  4. Body composition

# Approach for synthesizing the evidence

- Given the abundance of evidence, we started with the most salient public health outcome: overweight/obesity
- We're examining outcomes starting at 2 years due to uncertainty about how to interpret earlier outcomes

Exposure:	Age →	B-24	2-5	6-11	12-19	20+
Ever vs never consuming human milk		15	24	17	10	3
Duration of any human milk		11	14	13	5	2

- We will augment our review of the most recent evidence (i.e., Jan 2011-Sept 2019) with a review of within-family sibling analyses from Jan 1980-Sept 2019

These studies help overcome residual confounding, which is pervasive in observational research, because of siblings' shared genetic and environmental factors

To our knowledge, this is a novel contribution to the field

**Human milk/infant formula and body composition including obesity  
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# Birth to 24 Months Subcommittee: Members and Staff

**Members:**

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Teresa Davis  
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Ron Kleinman

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Jen Lerman  
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Julie Obbagy  
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Nancy Terry

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