Fuel for Thought: The Role Of Iodine In The First 1,000 Days

- SCAND 2025
- Lauren Manaker MS, RDN, LD

DISCLOSURES

- This opportunity was made possible by The Dairy Alliance
- Owner, Nutrition Now, LLC. Author of Fueling Male Fertility
- Paid partner – The Dairy Alliance, MilkPep, National Cattleman’s Beef Association

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MS, RDN, LD, CLEC

- Bachelor of Science in Food Science and Human Nutrition; University of Florida
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- Commission on Dietetic Registration clinical training program at Rush University Medical Center
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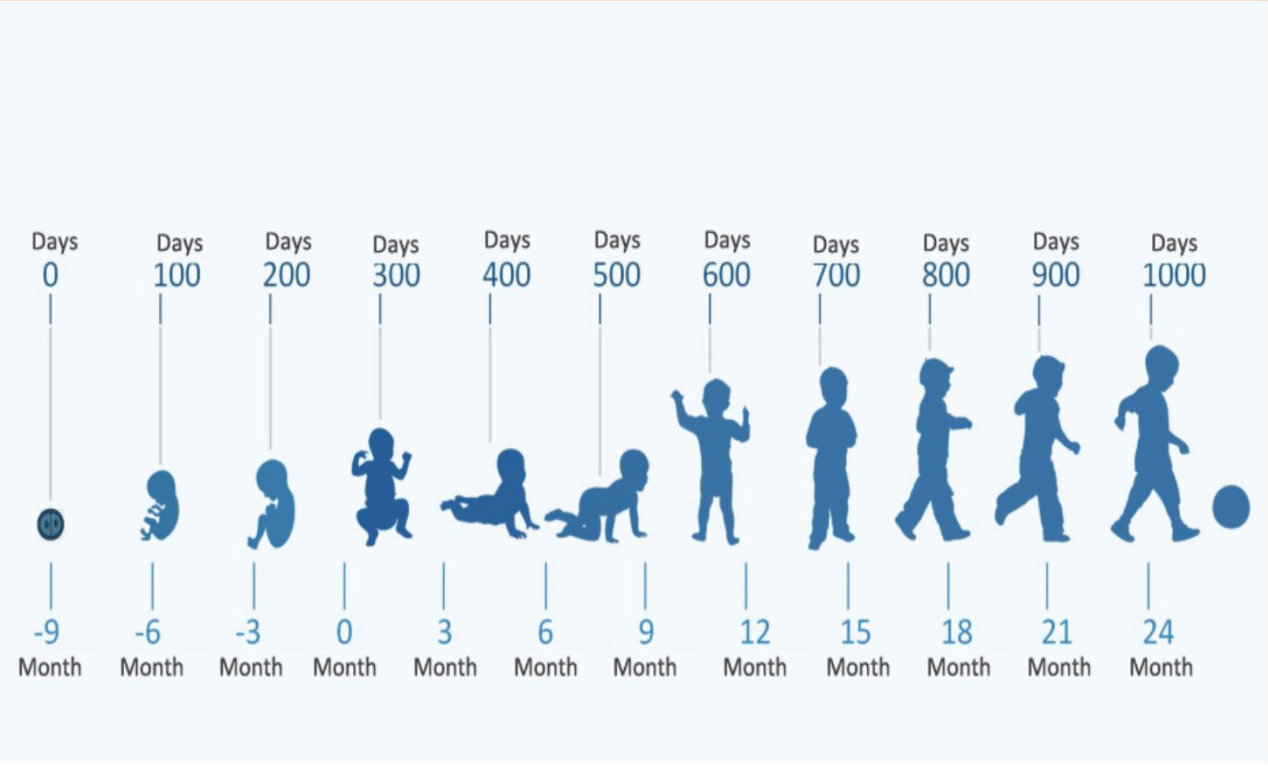
- Advisory board for the University of South Carolina's Dietetic Internship
- Medical Advisory Board – Eat This, Not That! And PS.com (formerly Popsugar)

WHAT YOU'LL LEARN TODAY (Learning Objectives)

The importance of the 'first 1000 days,' and why specific nutrients are needed at each stage, especially for brain health support

The prevalence of iodine deficiency, and its impacts and solutions

What Are The First 1,000 Days?



First 1,000 Days

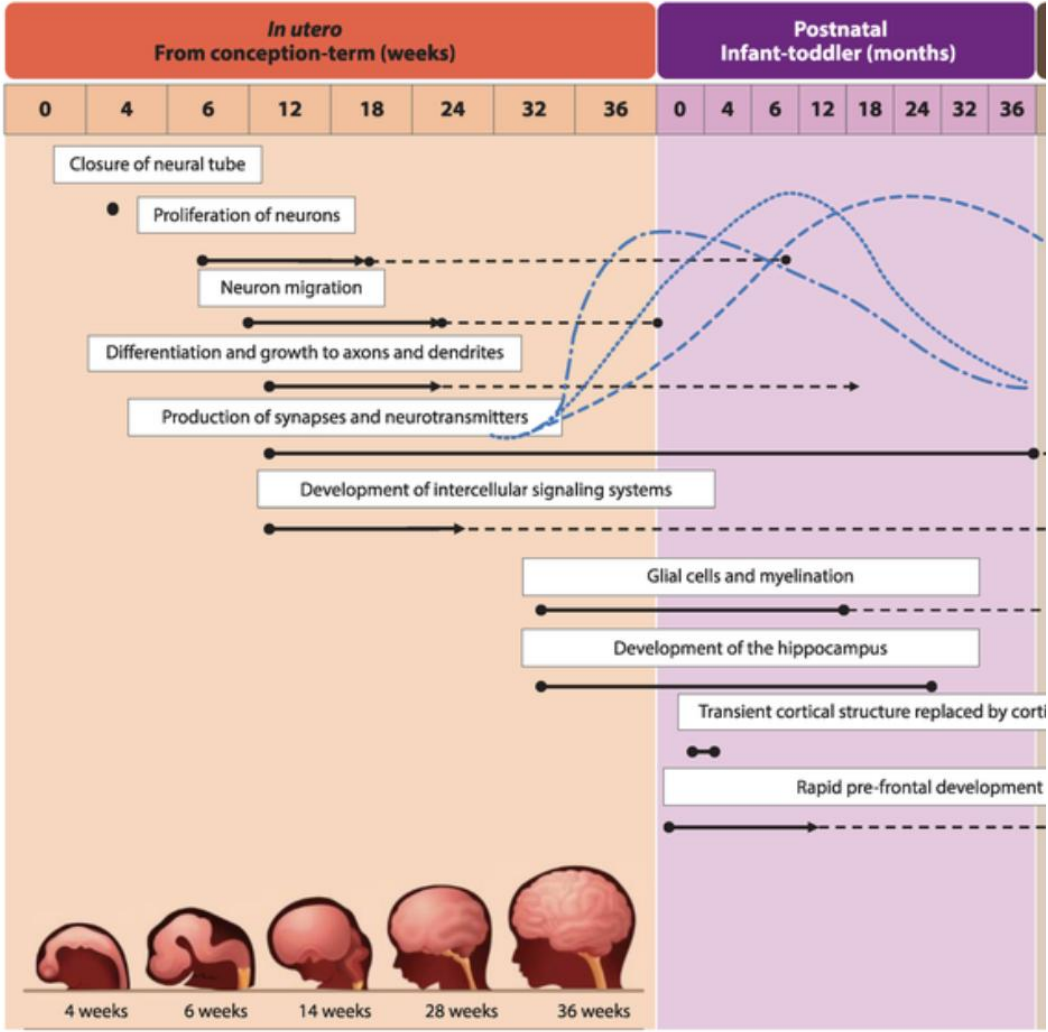
BRAIN DEVELOPMENT

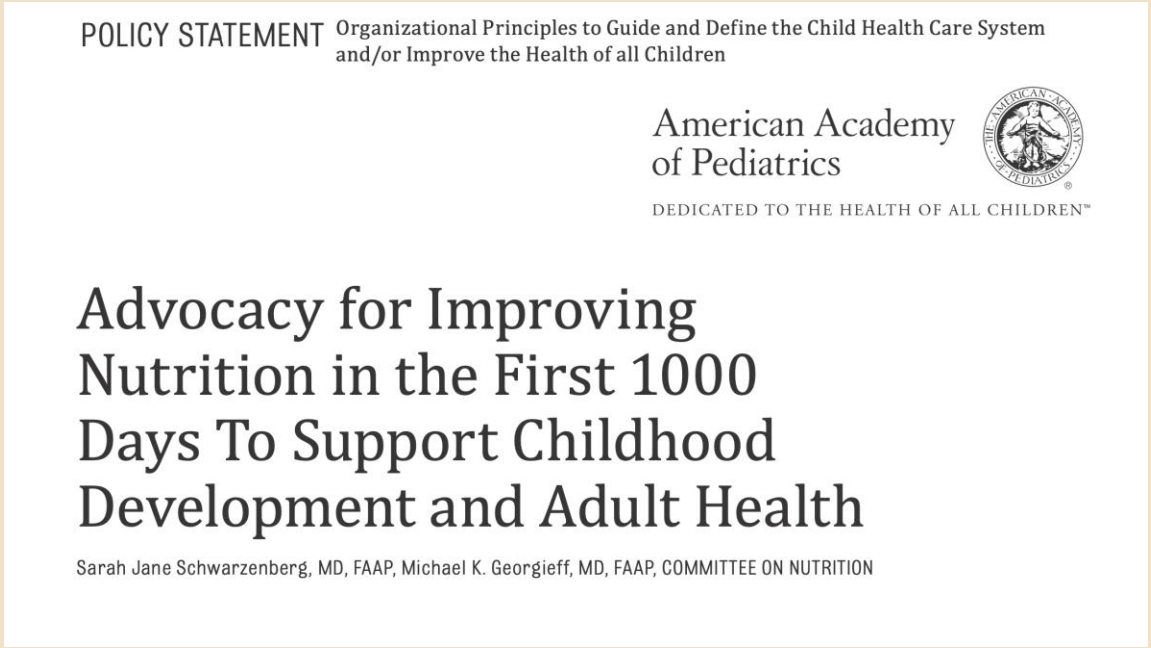
The first 1,000 days are when a child's brain begins to grow and develop and when the foundations for their lifelong health are built.*

Article | PDF Available | Literature Review

Nutritional Support of Neurodevelopment and Cognitive Function in Infants and Young Children —An Update and Novel Insights

Nutrients
13(1):199
DOI:10.3390/nu13010199





POLICY STATEMENT Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Advocacy for Improving Nutrition in the First 1000 Days To Support Childhood Development and Adult Health

Sarah Jane Schwarzenberg, MD, FAAP, Michael K. Georgieff, MD, FAAP, COMMITTEE ON NUTRITION

- *Child and adult health risks, including obesity, hypertension, and diabetes, may be programmed by nutritional status during this period.*
- Calories are essential for growth of both fetus and child but are not sufficient for normal brain development.
- Failure to provide key nutrients during this critical period of brain development may result in lifelong deficits in brain function despite subsequent nutrient repletion.

THE FIRST 1000 DAYS

The 1,000-day Window Between Conception & 24 Months Can Determine a Child's Future

The brain grows more rapidly during this period than at any other time in their life

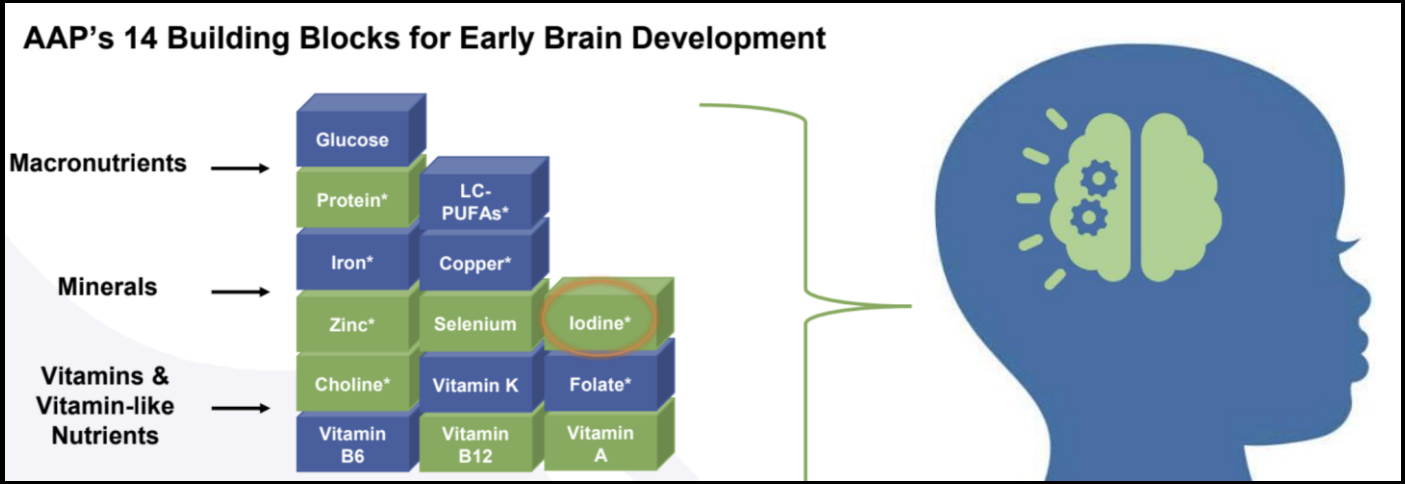
Good nutrition supports cognitive growth, motor skills and socio-emotional development

This developmental phase can impact future success in school and economic opportunities later in life

"How well or how poorly mothers and children are nourished and cared for during this time has a profound impact on a child's ability to grow, learn and thrive."

POLICY STATEMENT BY AAP

Advocacy for Improving Nutrition in the First 1000 Days to Support Childhood Development and Adult Health



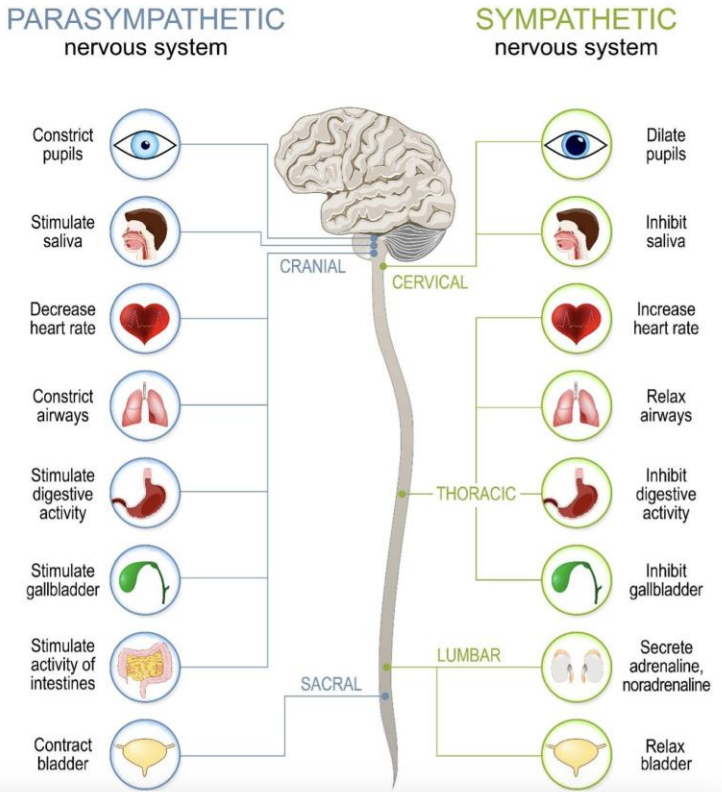
Failure to provide key nutrients during this critical period of brain development may result in lifelong deficits in brain function despite subsequent nutrient repletion.

Why is brain health so important?

If neurodevelopment is affected, every body system is affected

Mind, Brain, Body Relationship

- The brain's purpose is not purely cognitive
- Learning is not purely conscious
- The brain shapes and is shaped by our internal/external environments
- The brain is connected to other major body systems



Nutrition has a unique role in each phase of the first 1000 days

1000 days

Pregnancy

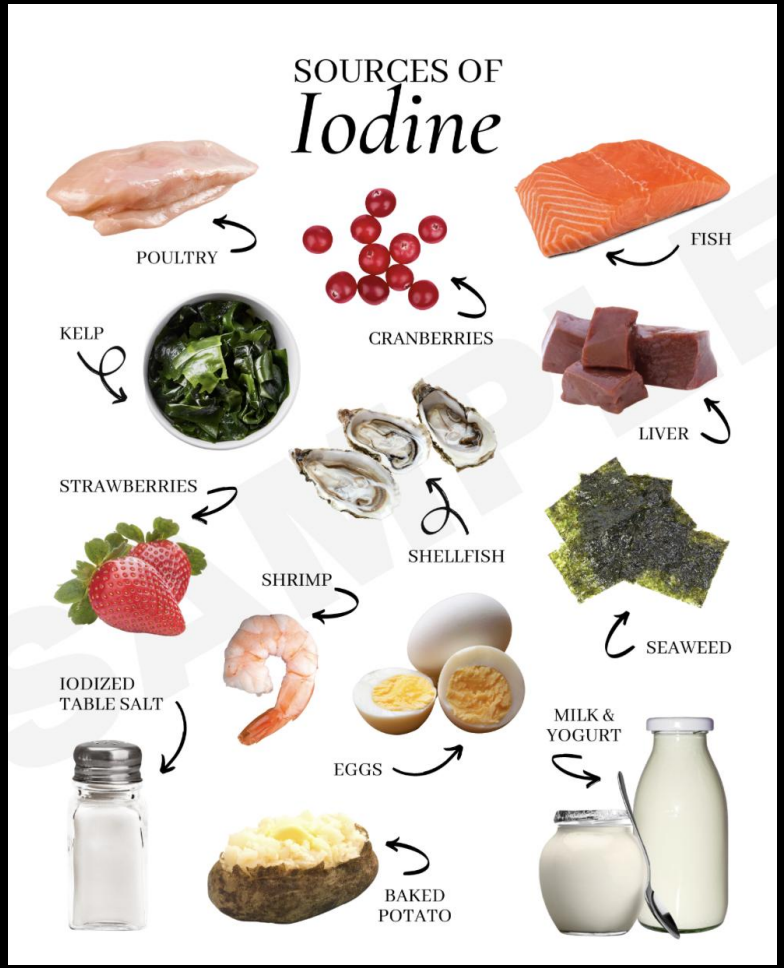
- Neuron creation, synapses formation, and myelination
- Nutrients fuel baby's metabolism, immune function, organ development
- Maternal diet + weight gain + health and lifestyle habits are 3 significant factors that shape a child's future health

Infancy

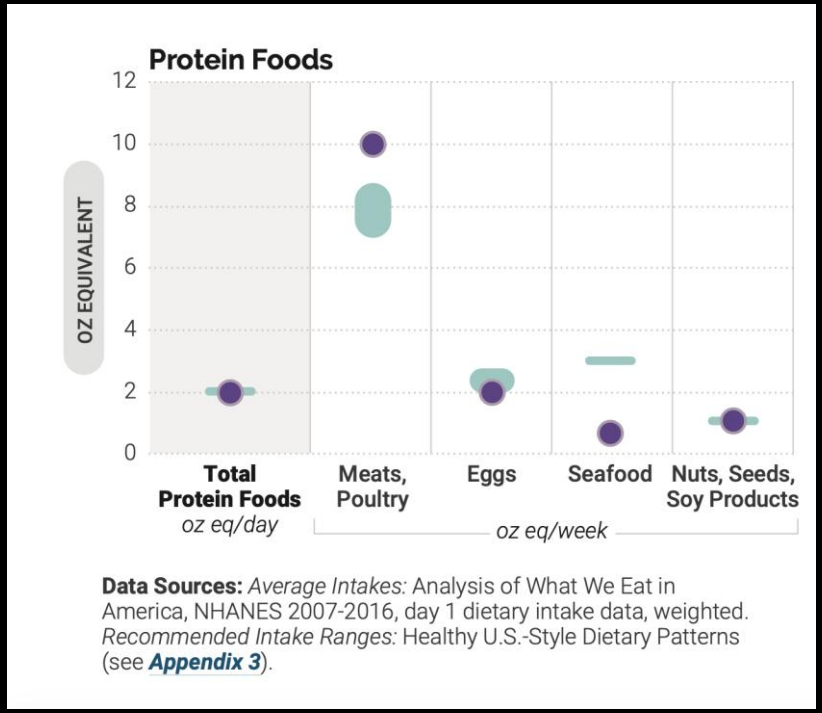
- Motor skills and memory development
- Breastmilk supplies a unique variety of nutrients, growth factors and hormones - associated with higher cognitive performance in children (across income levels)
- Learning to eat, responsive feeding helps develop palate

Toddlerhood

- Language development and rapid synapse formation – highly responsive to environments and susceptible to stress
- Feeding experience, exposure and variety develops lifelong eating habits
- Nutrients fuel growth and appropriate weight gain


SOURCES OF
Iodine
POULTRY
FISH
CRANBERRIES
KELP
LIVER
STRAWBERRIES
SHELLFISH
SHRIMP
SEAWEED
IODIZED
TABLE SALT
MILK &
YOGURT
EGGS
BAKED
POTATO

CURRENT INTAKES 12-24 Months Protein Choices

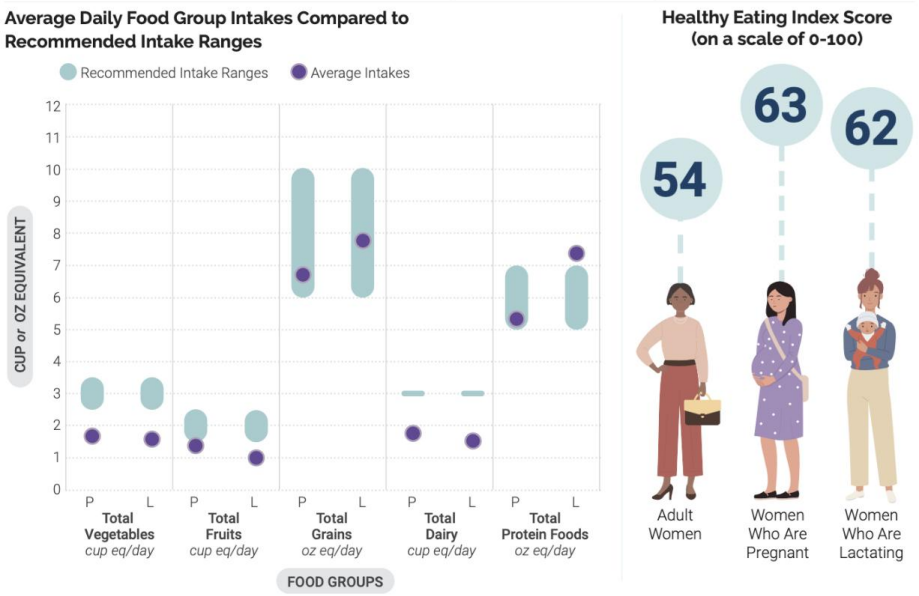


Data Sources: *Average Intakes:* Analysis of What We Eat in America, NHANES 2007-2016, day 1 dietary intake data, weighted. *Recommended Intake Ranges:* Healthy U.S.-Style Dietary Patterns (see ***Appendix 3***).

CURRENT INTAKES DURING PREGNANCY & LACTATION

Figure 5-1

Current Intakes: Women Who Are Pregnant or Lactating



Food Components of Public Health Concern for Pregnant Women[2]

- ✓ Fiber
- ✓ Vitamin D
- ✓ Calcium
- ✓ Potassium
- ✓ Iron
- ✓ Folic acid
- ✓ **Iodine**

USDA

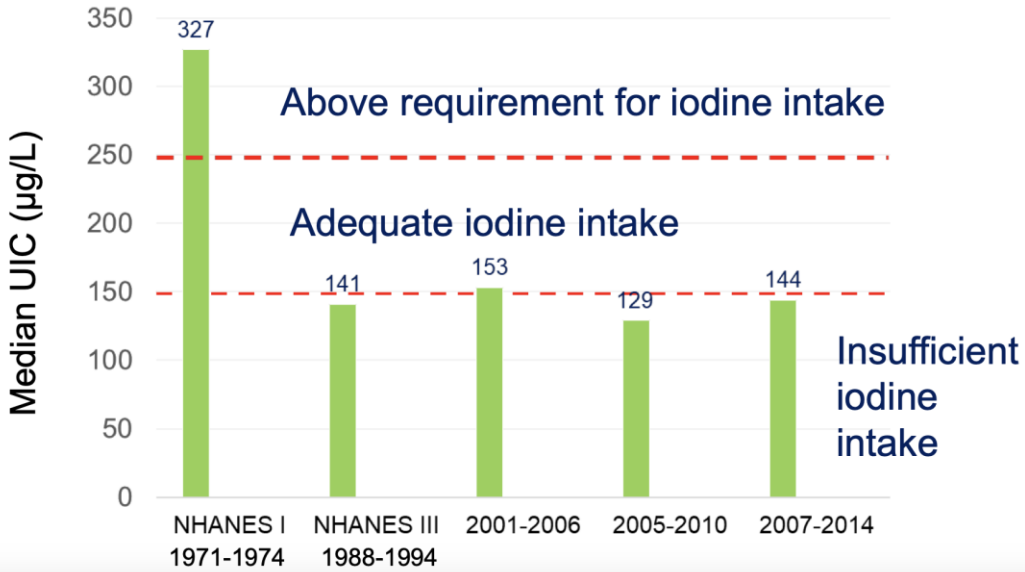
Scientific Report of the
2020 Dietary Guidelines Advisory Committee

Advisory Report to the Secretary of Agriculture and Secretary of Health and Human Services

First Print: July 2020

Pregnant Americans are falling short of recommended levels

Median UIC in US Pregnant Women



Iodine deficiency is the most preventable cause of intellectual disability in the world.

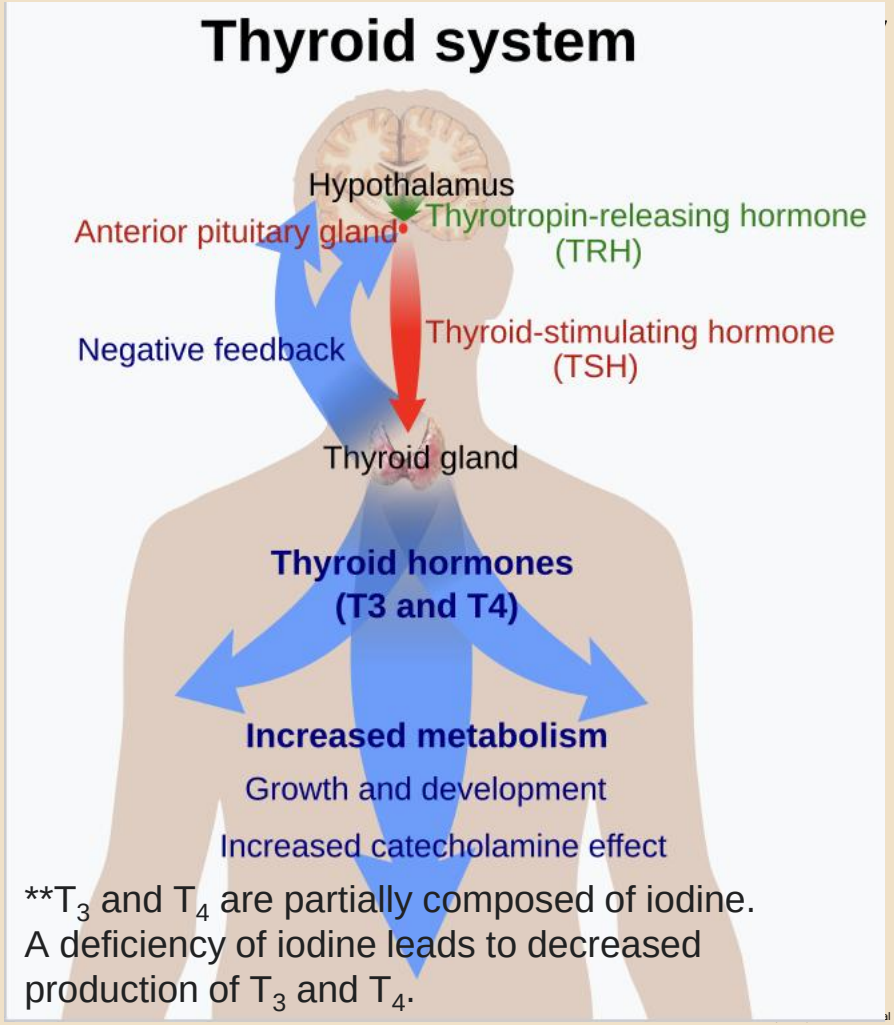
- The World Health Organization

IODINE BASICS

- A trace element that is required for the synthesis of thyroid hormones, which are necessary for adequate growth, development, and metabolism.
- Deficiencies can lead to significant health consequences across the age spectrum, including goiter, impaired mental functioning, and reduced productivity.
- Iodine is essential for the formation of synapses, which are connections between nerve cells.

”Many brain structures and systems appear to be affected with iodine deficiency, including areas such as the hippocampus, microstructures such as myelin, and neurotransmitters”.

Redman K, et al. Iodine Deficiency and the Brain: Effects and Mechanisms. Crit Rev Food Sci Nutr. 2016 9;56(16):2695-713.



**T_3 and T_4 are partially composed of iodine. A deficiency of iodine leads to decreased production of T_3 and T_4.

Iodine-deficient people may forfeit 15 IQ points, and nearly 50 million people suffer from some degree of iodine deficiency-related brain damage.

- The World Health Organization

First 1,000 Days

ENDOCRINE SOCIETY JCEM THE JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM

J Clin Endocrinol Metab. 2019 Mar 28;104(12):5957–5967. doi: 10.1210/jc.2018-02559

Association of Maternal Iodine Status With Child IQ: A Meta-Analysis of Individual Participant Data

Deborah Levie [1,2,3,4,5,6], Tim I M Korevaar [1,2], Sarah C Bath [7], Mario Murcia [6,8], Mariana Dineva [7], Sabrina Llop [6,8], Mercedes Espada [6,9], Antonius E van Herwaarden [10], Yolanda B de Rijke [2,11], Jesús M Ibarluzea [6,12,13,14], Jordi Sunyer [4,5,6,15], Henning Tiemeier [3,16], Margaret P Rayman [7], Mònica Guxens [3,4,5,6,#], Robin P Peeters [2,#,✉]

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PMCID: PMC6804415 PMID: 30920622

"This study confirms that low iodine status is associated with a reduction in verbal IQ scores, putting these children at potential risk for poorer academic achievement."

JOURNAL ARTICLE

Intelligence Quotient and Iodine Intake: A Cross-Sectional Study in Children Get access ›

Piedad Santiago-Fernandez, Rosario Torres-Barahona, J. Antonio Muela-Martínez, Gemma Rojo-Martínez, Eduardo García-Fuentes, M. José Garriga, Ana García León, Federico Soriguer ✉

The Journal of Clinical Endocrinology & Metabolism, Volume 89, Issue 8, 1 August 2004, Pages 3851–3857, https://doi.org/10.1210/jc.2003-031652

Published: 01 August 2004 **Article history** ▾

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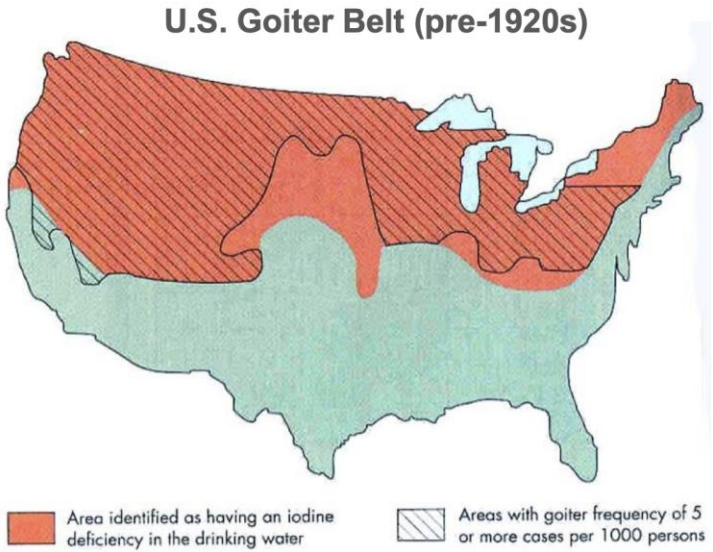
"IQ was significantly higher in children with urinary iodine levels above 100 µg/liter. The risk of having an IQ below the 25th percentile was significantly related to the intake of non-iodized salt and drinking milk less than once a day."

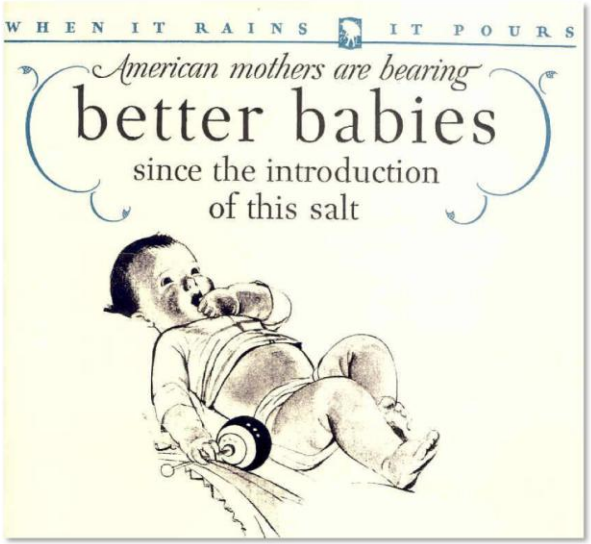
Prior to the 1920s, endemic iodine deficiency was prevalent in the 'Goiter Belt'



26-70%

Children had goiter in this region

U.S. salt iodization directly improved iodine status and subsequently raised IQ



Morton Salt, 1920s

For the quarter of the U.S. population in iodine deficient regions, salt iodization raised IQ by ~15 points (averaging a 3.5-point increase nationwide)

IODINE DEFICIENCY IN…

Pregnancy

- Serious adverse consequences can result from iodine deficiency during pregnancy, where the developing fetus experiences impaired neurodevelopment.
- Cognitive disability can result, with the most severe outcome being congenital hypothyroidism (cretinism.)
- Since a developing fetus is solely dependent on maternal thyroid hormone early in pregnancy, and since 40% of pregnancies are unplanned, the iodine status of reproductive age women is a common proxy for women planning pregnancy.

Lactation

- For nursing mothers, insufficient iodine levels can lead to decreased thyroid hormone production, potentially resulting in hypothyroidism. This can affect the mother's energy levels and overall well-being.
- For infants, iodine is crucial for the development of the brain and nervous system. A lack of iodine during this critical period may result in developmental delays, cognitive impairments, and an increased risk of goiter.
- Infants may also be more prone to autoimmune thyroid diseases later in life if they are not being provided with breastmilk with adequate iodine.

Birth – 2 Years

- Iodine deficiency is particularly concerning at this stage, as it can result in impaired cognitive development, affecting memory, attention, and overall intelligence.
- Children may experience growth delays and have a higher risk of complications such as cretinism, characterized by severe developmental delays and physical disabilities.
- Adequate iodine intake is essential during this formative age to ensure proper brain development and overall health.

IODINE IN PREGNANCY

Decline in iodine status have been reported among pregnant women from the 1970s until 2007-2010.

› Thyroid. 2013 Apr;23(4):520-1. doi: 10.1089/thy.2012.0217.

Monitoring the iodine status of pregnant women in the United States

Kevin M Sullivan, Cria G Perrine, Elizabeth N Pearce, Kathleen L Caldwell

PMID: 23157653 PMCID: PMC4840276 DOI: 10.1089/thy.2012.0217




Mary Ann Liebert, Inc. publishers

Thyroid®

LETTER Thyroid. 2017 Aug 1;27(8):1101–1102. doi: 10.1089/thy.2017.0097

Iodine Contents in Prenatal Vitamins in the United States

Sun Y Lee [1,✉], Alex Stagnaro-Green [2], Douglas MacKay [3], Andrea W Wong [3], Elizabeth N Pearce [1]

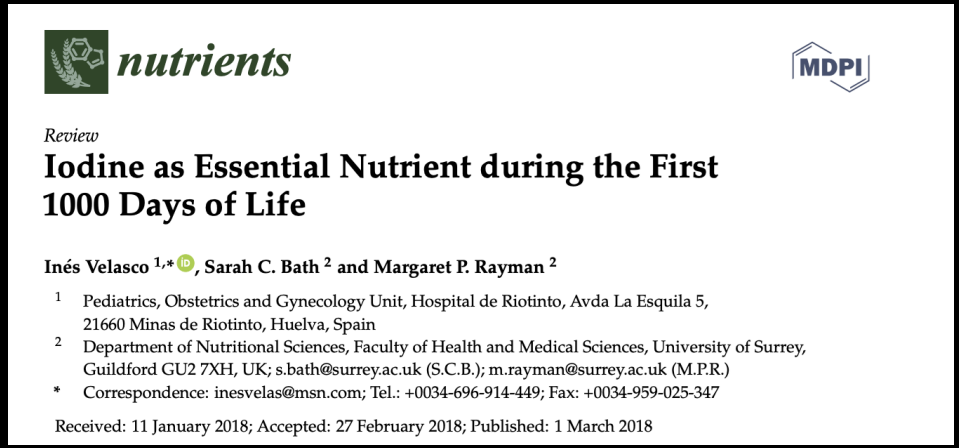
Author information Article notes Copyright and License information

PMCID: PMC5912719 PMID: 28599614

368 PNV
61% contained any iodine
25% source = kelp (not potassium iodide)
Some had as little as 10 mcg per serving

IODINE DEFICIENCY CAN IMPACT ANYONE

Iodine is an essential nutrient during the first 1,000 days of life and we're seeing the re-emergence of iodine deficiency in some industrialized countries.



nutrients

MDPI

Review

Iodine as Essential Nutrient during the First 1000 Days of Life

Inés Velasco [1,*], Sarah C. Bath [2] and Margaret P. Rayman [2]

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Received: 11 January 2018; Accepted: 27 February 2018; Published: 1 March 2018

THE LANCET
Global Health

ARTICLES · Volume 12, Issue 10, E1590-E1599, October 2024 · *Open Access* Download Full Issue

Global estimation of dietary micronutrient inadequacies: a modelling analysis

Simone Passarelli, PhD [a,d,†] · Christopher M Free, PhD [e,f,†] · Alon Shepon, PhD [h] · Ty Beal, PhD [g,i] · Carolina Batis, PhD [j] · Christopher D Golden, PhD [a,b,c]

Affiliations & Notes Article Info Linked Articles (1)

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68% of the global population aren't consuming recommended amounts of iodine.
~5 BILLION ppl

Iodine demands increase during pregnancy

Increased demand for thyroid hormone

- ↑ 50% = additional 50-100 µg iodine
- Thyrotropic regulation by hCG
- Estrogen-mediated TBG increase

Iodide transferred to the fetus

Increased renal iodine clearance (↑ 30-50%)

Increased dietary iodine requirements during pregnancy

Increased iodine demands continue through lactation

- Normal lactating breast ducts concentrate iodine via sodium iodide symporter
- Iodine concentrations are 20-50x higher in breast milk than in plasma
- The only source of iodine nutrition for breastfed infants

Effects on cognition aren't limited to severe iodine deficiency

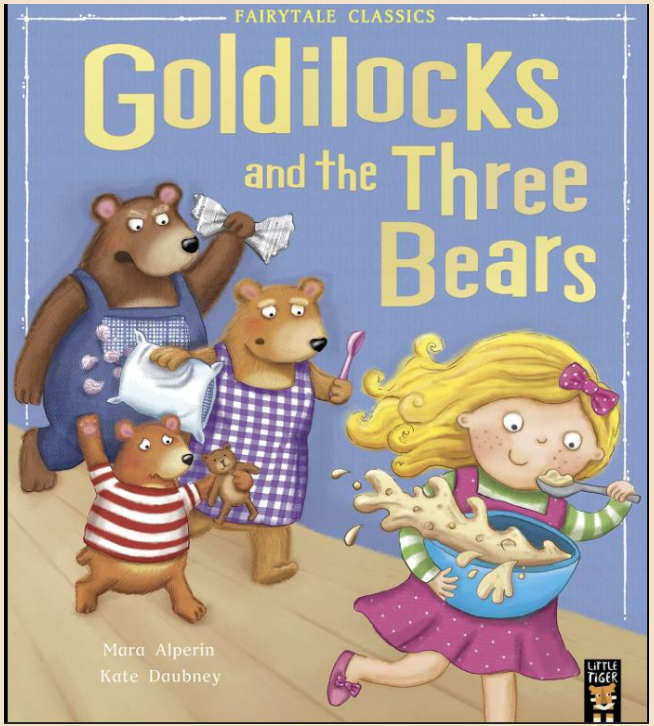
↓ 12.45 points — lower IQ score in **children from severe iodine-deficient regions** compared to children in iodine-sufficient regions

↑ 8.7 points — increase in IQ score for children in severe iodine-deficient regions who **received supplementation** during pregnancy and after birth

Verbal, reading accuracy and comprehension scores were **lower in children of women with mild-to-moderate iodine deficiency**

Scores **worsened as UIC levels decreased** below 150 µg/g

Iodine Is a “GOLDILOCKS” NUTRIENT



<160 µg/d iodine intake associated with lower language and communication scores at age 3

U-shaped curve shows comparable undesirable effects of excess iodine intake

Abel MH, et al. J Nutr. 2017;147(7):1314-24

How Much Do We Need?

Table 1: Recommended Dietary Allowances (RDAs) for Iodine [2]

Age	Male	Female	Pregnancy	Lactation
Birth to 6 months	110 mcg*	110 mcg*		
7–12 months	130 mcg*	130 mcg*		
1–3 years	90 mcg	90 mcg		
4–8 years	90 mcg	90 mcg		
9–13 years	120 mcg	120 mcg		
14–18 years	150 mcg	150 mcg	220 mcg	290 mcg
19+ years	150 mcg	150 mcg	220 mcg	290 mcg

* Adequate Intake (AI)

The World Health Organization (WHO), United Nations Children's Fund, and the International Council for the Control of Iodine Deficiency Disorders recommend a slightly higher iodine intake for pregnant women of 250 mcg per day [3,7].

NIH.

3 in 4

U.S. obstetricians and midwives don’t recommend or recommend inadequate amounts of iodine during preconception, pregnancy, and lactation[1]

Thyroid 2017, 27:434-439.

U.S. and European guidelines recommend supplemental iodine for this population

Women who are planning to be pregnant or are pregnant or breastfeeding should supplement their diet with a daily oral supplement that contains 150 µg of iodine.

AMERICAN THYROID ASSOCIATION

THE ENDOCRINE SOCIETY

TERATOLOGY SOCIETY — BIRTH DEFECTS RESEARCH

THE AMERICAN ACADEMY OF PEDIATRICS

ETA European THYROID Association

Prenatal dietary patterns affect iodine status

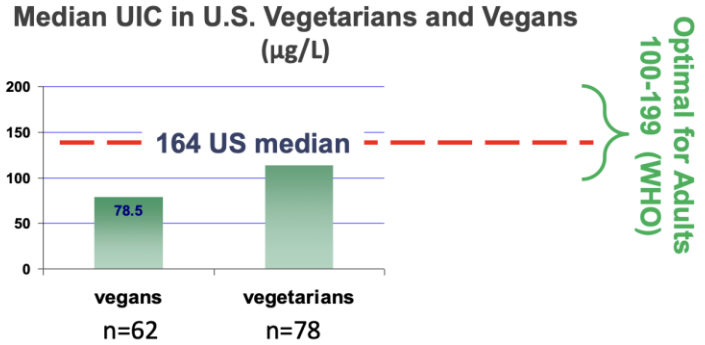
Salt intake is not indicative of iodine status[1,2]

- 77% of sodium intake comes from restaurants and processed foods (not typically iodized)
- ~50% of reproductive-age women never/rarely use table salt
- Adding salt is not typically recommended in US diet

3 servings of dairy helps[3]

- Meeting recommendations during pregnancy is linked with better consumption of calcium, vitamin D, potassium, B12, choline and iodine
- Pregnant women with the highest dairy consumption were not at risk for iodine deficiency

Vegan diets may fall short in iodine[4]



Seafood, dairy foods and eggs offer natural sources of iodine

Cod
105% DV

Cow's Milk
59% DV

Egg
17% DV

What Foods Provide Iodine?[viii]

FOOD	SERVING SIZE	MICROGRAMS PER SERVING	PERCENT DAILY VALUE (DV)*
Cod, baked	3 ounces	158	105%
Low-fat milk (1%)	1 cup	88	59%
Yogurt, Greek, plain, fat-free	6 ounces	87	58%
Iodized table salt	¼ tsp	76	51%
Fish sticks	3 sticks	58	39%
Cottage cheese (reduced fat)	½ cup	39	26%
Pasta, cooked in iodized salt	1 cup	38	25%
Swiss cheese	3 slices**	36	24%
Crab, canned and cooked	3 ounces	32	21%
Egg, hardboiled	1 egg	26	17%
American cheese	3 slices**	18	12%
Cheddar cheese	3 slices**	15	10%
Shrimp, pre-cooked	3 ounces	13	9%
Salmon, baked	3 ounces	14	9%
Soy beverage	1 cup	1.5	1%
Almond beverage	1 cup	<1	1%
Non-iodized sea salt	¼ tsp	<1	1%

*The DV for iodine is 150 mcg for healthy adults and children over 4.
**Cracker sized slice of cheese

First 1,000 Days

Journal of the Academy of Nutrition and Dietetics

eat right.

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RESEARCH | RESEARCH PAPER · Articles in Press, June 11, 2024

Assessing the Nutrient Content of Plant-Based Milk Alternative Products Available in the United States

Abigail J. Johnson, PhD, RD · Jennifer Stevenson · Janet Pettit · Bhaskarani Jasthi, PhD, RD · Tatum Byhre, MPH · Lisa Harnack, DrPH, RD

Affiliations & Notes Article Info

-Analyzed the nutritional makeup of 219 plant-based milk alternatives from 21 brands

- Plant-based milks were typically lower in protein than dairy milk, with a wide range of added sugars.
- 30% were not fortified with vitamin D or calcium
  ???iodine???

What Foods Provide Iodine?[viii]

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Soy beverage	1 cup	1.5	1%
Almond beverage	1 cup	<1	1%
Non-iodized sea salt	¼ tsp	<1	1%

Lactose Intolerance

Lactose Free Milk

Kefir and Yogurt

Hard Cheeses

*** lactose free same nutritional composition minus the lactose

Ways To Include Iodine In Diets During First 1,000 Days

SIMPLE SOLUTION FOR EVERY STAGE: CUSTOMIZABLE SMOOTHIE

First 1,000 Days Smoothie

BASE SMOOTHIE 1 SERVING

CREATED BY LAUREN MANAKER

INGREDIENTS

- 1 cup dairy milk or lactose free milk
- 1/2 banana
- 1 cup of frozen mixed berries
- 1/2 cup of plain Greek yogurt
- 1 tablespoon of maple syrup
- 1/2 cup of ice cubes

ADDITIONS

1ST TRIMESTER
For B6 intake and for folate to help nausea
- Fresh Ginger
- Sweet Potato
- Nut Butter
- Greens

2ND TRIMESTER
For magnesium, energy and vitamin A to support immune health
- Avocado
- Oats
- Carrot Juice

3RD TRIMESTER
For help with constipation
- Prunes
- Chia Seeds
- Frozen Cauliflower

POSTPARTUM (BREASTFEEDING)
For fiber, protein and potential to increase the production or flow of milk
- Brewer's Yeast
- White Beans
- Oats

12-24 MONTHS
For healthy fats, fiber, antioxidants and exposure to nut protein
- Avocado
- Frozen Broccoli
- Nut Butter

Tips For Each Stage - Pregnancy

1. Include 8 ounces of low mercury seafood every week.

2. Use Iodized salt in cooking and seasoning, but be mindful of overall salt consumption in a healthy balance.

3. Take a prenatal vitamin that contains 150 mcg iodine, as recommended by your healthcare provider.

Lactation

1. Continue consuming iodine-rich foods like dairy products (milk, yogurt, cheese) and eggs to support both your needs and the baby's growth.

2. Ensure your salt intake comes from iodized salt to maintain adequate iodine levels.

3. Stay on a postnatal supplement with iodine, if presribed, to support breast milk iodine content.

Introducing Solids

1

Offer iodine-containing mashed fish (like cod) or purreed eggs mixed with chedder cheeese as part of your baby weaning diet once they are ready for solids.

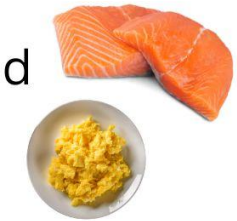
2

Use iodine-enriched baby cereals when introducing grains to your baby's routine. Mix with unsweetened yogurt.

Note: If formula feeding, ensure it contains iodine.

12-24 Month Old Baby

1. Serve dairy products like whole milk or yogurt as regular snacks or drink options to boost iodine intake.



2. Incorporate cooked eggs and small portions of seafood suitable for toddlers into their meals.

3. Offer iodine-fortified foods, such as fortified cereals, to add variety and ensure adequate iodine intake.

Bottom Line

- As dietitians, we need to talk about the first 1,000 days.
- We also need to emphasize the importance of adequate iodine
- Share practical ways to include iodine in diet during first 1,000 days
- Collaborate with other HCPs!

Questions?

- LaurenManaker.rdn@gmail.com
- IG @LaurenLovesNutrition

Discussion:
Q+ A

(thank you)

References:

Scott JA. The first 1000 days: A critical period of nutritional opportunity and vulnerability. Nutr Diet. 2020 Jul;77(3):295-297. doi: 10.1111/1747-0080.12617. PMID: 32478460.

Schwarzenberg SJ, Georgieff MK; COMMITTEE ON NUTRITION. Advocacy for Improving Nutrition in the First 1000 Days to Support Childhood Development and Adult Health. Pediatrics. 2018 Feb;141(2):e20173716. doi: 10.1542/peds.2017-3716. Epub 2018 Jan 22. PMID: 29358479.

Dold S, Zimmermann MB, Baumgartner J, Davaz T, Galetti V, Braegger C, Andersson M. A dose-response crossover iodine balance study to determine iodine requirements in early infancy. Am J Clin Nutr. 2016 Sep;104(3):620-8. doi: 10.3945/ajcn.116.134049. Epub 2016 Jul 27. PMID: 27465383.

Stoutjesdijk E, Schaafsma A, Dijck-Brouwer DAJ, Muskiet FAJ. Iodine status during pregnancy and lactation: a pilot study in the Netherlands. Neth J Med. 2018 Jul;76(5):210-217. PMID: 30019676.

Gebreegziabher T, Woltamo T, Thomas DG, Kennedy TS, Stoecker BJ. Iodine supplementation of lactating women and assessment of infant visual information processing and maternal and infant thyroid function: A randomized trial. PLoS One. 2019 Oct 7;14(10):e0223348. doi: 10.1371/journal.pone.0223348. PMID: 31589645;

Lee SY, Stagnaro-Green A, MacKay D, Wong AW, Pearce EN. Iodine Contents in Prenatal Vitamins in the United States. Thyroid. 2017 Aug;27(8):1101-1102. doi: 10.1089/thy.2017.0097. Epub 2017 Jul 11. PMID: 28599614; PMCID: PMC5912719.

Leung AM, Braverman LE, Pearce EN. History of U.S. iodine fortification and supplementation. Nutrients. 2012 Nov 13;4(11):1740-6. doi: 10.3390/nu4111740. Erratum in: Nutrients. 2017 Sep 05;9(9):E976. doi: 10.3390/nu9090976.