HEALTHY DRINKS.
HEALTHY KIDS.

Healthy Eating Research

Bottoms Up – Helping Parents Make Informed Child Hydration Decisions

September 20, 2022

12:15 – 1:15 PM PT

Speakers

Megan Lott, MPH, RDN

Kirsten Arm, MPH, RDN

Healthy Eating Research

Speakers

Megan Lott, MPH, RDN

Kirsten Arm, MPH, RDN

Learning Objectives

Healthy Eating Research

- Describe beverage intake patterns of 0 to 5-year-olds in the United States, including disparities by race/ethnicity and income levels.
- List key recommendations for healthy beverage consumption in early childhood, including 1) beverages recommended, 2) beverages to limit, and 3) beverages not recommended as part of a healthy diet
- Apply the expert panel's recommendations for healthy beverage intake to patient settings and to policy, system, and environmental initiatives to improve public health.

Why were the recommendations developed?

The increasingly crowded, diverse beverage landscape

Plain water

Toddler formulas/milks

100% juice

Sugar-sweetened beverages

Plant/non-dairy milk

Cow's milk

Caffeinated beverages

Low-calorie sweetened drinks

Beverage intake patterns diverge from recommendations

FITS 2016, 0-4 year olds[1]	Infants drink cow's milk and 100% juice before age 1 year
	SSB consumption is high and increases with age
	Fruit-flavored drinks most commonly-consumed SSB from 6 mo–4 yrs
NHANES 2017-2018, 2-5 year-olds[2]	14% drink coffee/tea
	48% drink SSBs; with the average daily intake being 9 ounces
	42% drink 100% juice; with the average daily intake being 11 ounces
	Beverages contribute 34% of daily added sugars intake in this age group

1. Kay et al. 2018, *Nutrients;* 2. Martins et al. Food Surveys Research Group Data Brief No. 32, 2020.

Beverage intake patterns – disparities by race and income

Race/ethnicity[1, 2]:

- Non-Hispanic Black children were consistently more likely to consume SSBs (and 100% juice, in some data samples) than non-Hispanic white children
- Trends among Hispanic children differed by age group and survey years

Income[1, 2, 3]:

- Children from lower-income households more likely to consume SSBs and 100% fruit juice
  - consumed more of these beverages, than children from the highest-income households
- 12-23 month-old children receiving WIC more likely to drink 100% juice (but not SSBs) than those not receiving WIC from 2011-2014
  - 0-4 year-old children receiving WIC had higher SSB intake than non-WIC in 2016

Much remains unknown about beverage consumption patterns and their impact on health outcomes among various racial/ethnic and income groups

1. Welker et al. 2018, *J Nutrients* 2. Demmer et al. 2018, *Nutrition Journal J*; 3. Grimes et al. 2017 *Nutrients*

Healthy Eating Research

Consensus Recommendations:
What children ages 0 to 5 should drink as part of a healthy diet

eat right. Academy of Nutrition and Dietetics

AMERICA'S PEDIATRIC DENTISTS
THE BIG AUTHORITY on little teeth

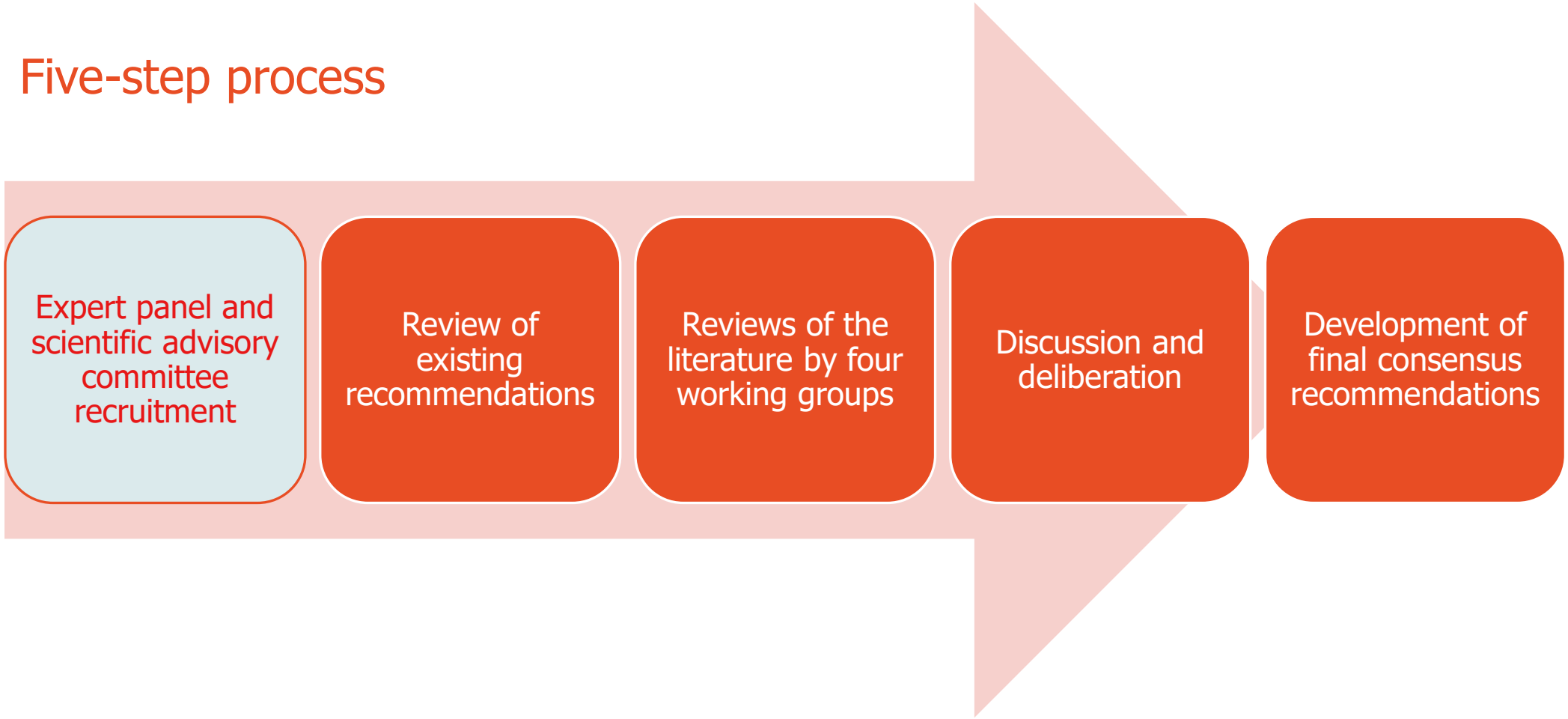
American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN®

American Heart Association.

Healthy Eating Research

How did we do it? (Methodology)

Five-step process



Expert panel and scientific advisory committee recruitment

Expert Panel Members

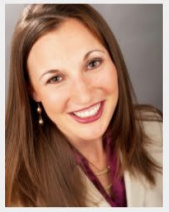

Stephen Daniels, Panel Chair


Marie-Pierre St-Onge, AHA


Laurie Whitsel, AHA


David Krol, AAP


Natalie Muth, AAP


Emily Callahan, Research Consultant


Jenny Ison Stigers, AAPD

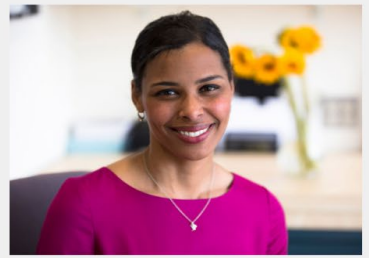

Paul Casamassimo, AAPD


Lori Bechard, AND


Alison Steiber, AND

Scientific Advisory Committee Members


Linda Van Horn, Northwestern University Feinberg School of Medicine


Sara Bleich, Harvard T.H. Chan School of Public Health


Sandra Hassink, Nemours/Alfred I. DuPont Hospital for Children

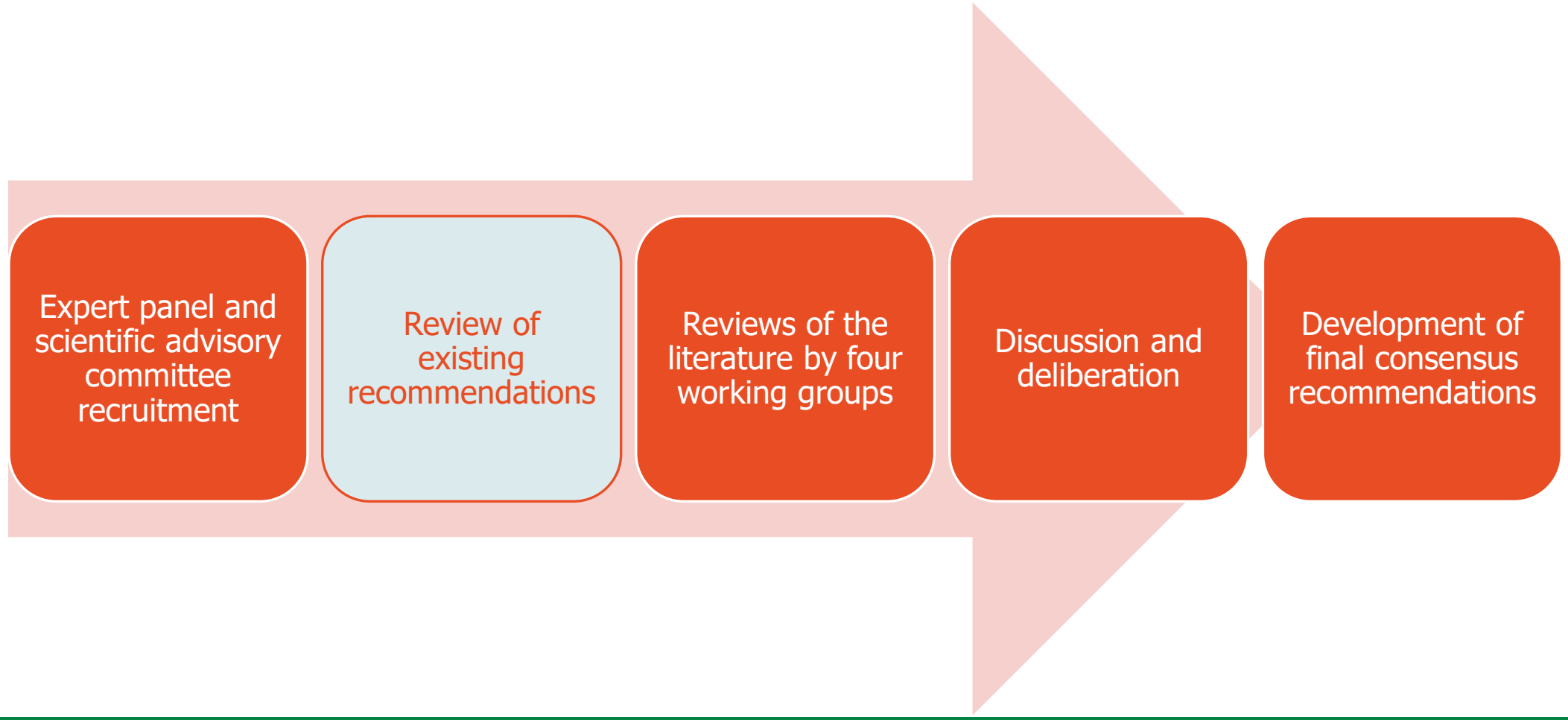

Rafael Perez-Escamilla, Yale University


Sohyun Park, Centers for Disease Control and Prevention


Frank Greer, University of Wisconsin-Madison

Healthy Eating Research

How did we do it? (Methodology)



Healthy Eating Research

Review of existing recommendations

Identified existing recommendations and guidance for beverage consumption among children 0-5 years: ~50 documents from authoritative bodies

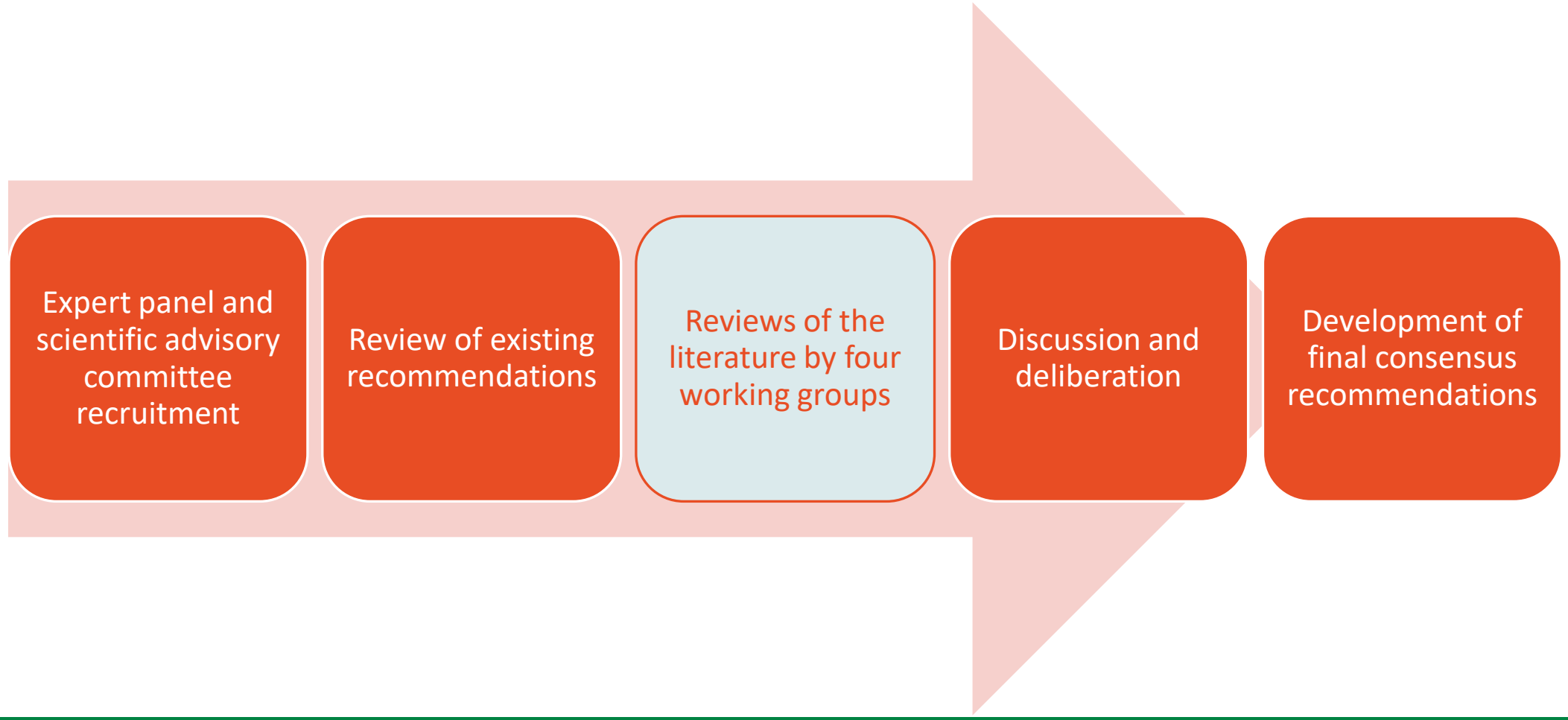
- Scientific, policy, and position statements
- Evidence-based recommendations and guidelines

Conducted a qualitative review and analysis of these documents

- Extracted beverage guidance
- Summarized guidance by beverage type for four age groups (0-6 mo, 6-12 mo, 12-24 mo, and 2-5 yrs), noting areas of consistency and inconsistency as well as gaps

Healthy Eating Research

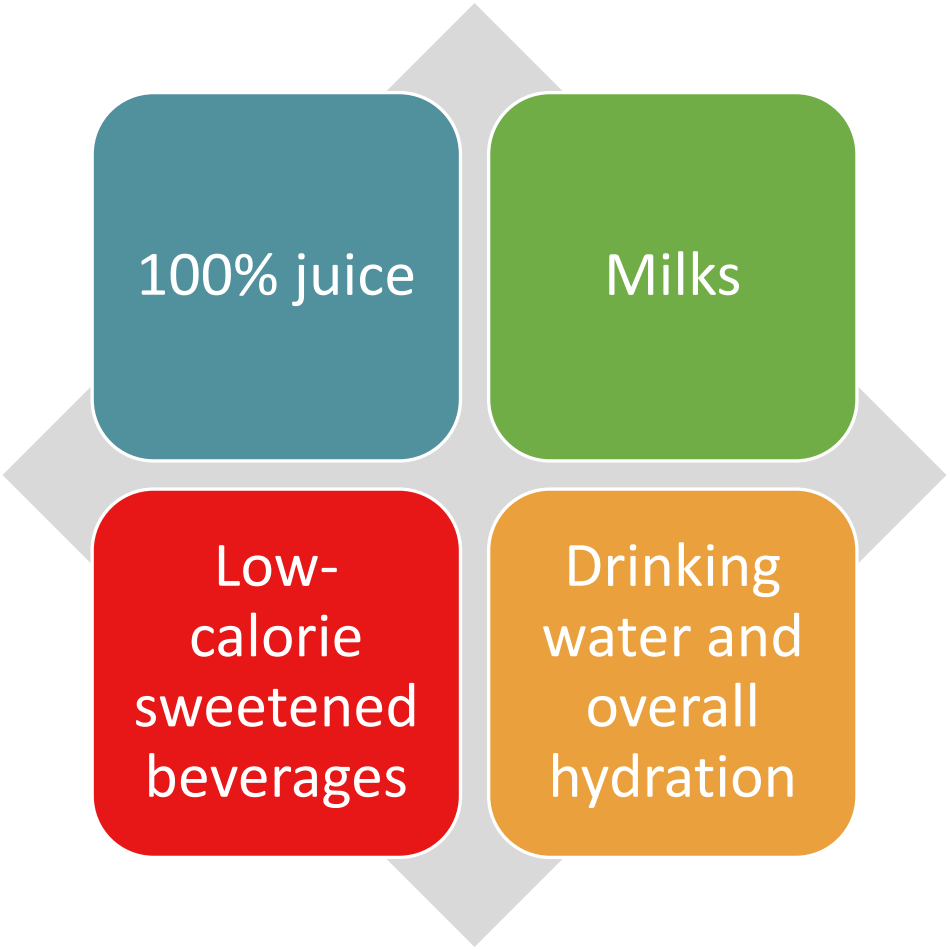
How did we do it? (Methodology)



Healthy Eating Research

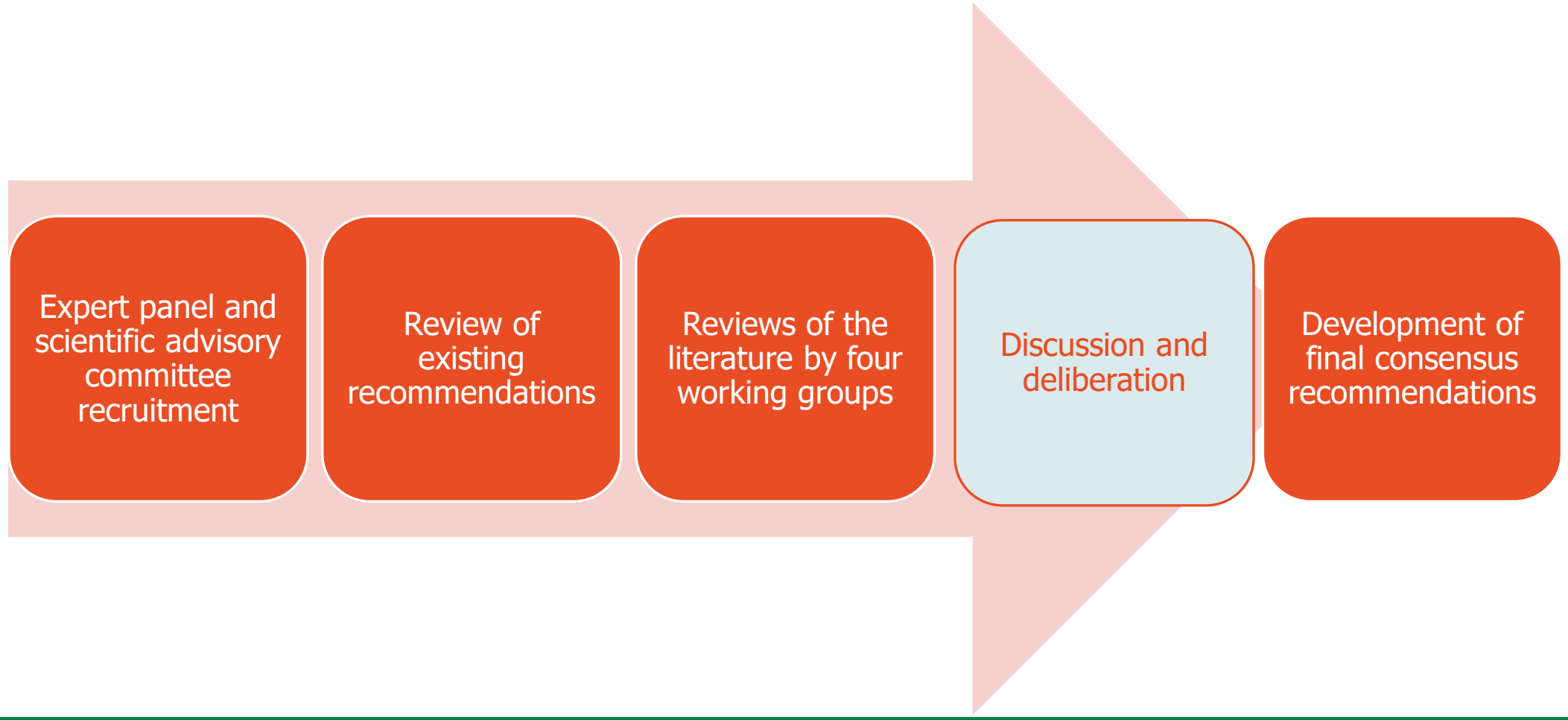
Reviews of the literature

4 working groups were formed



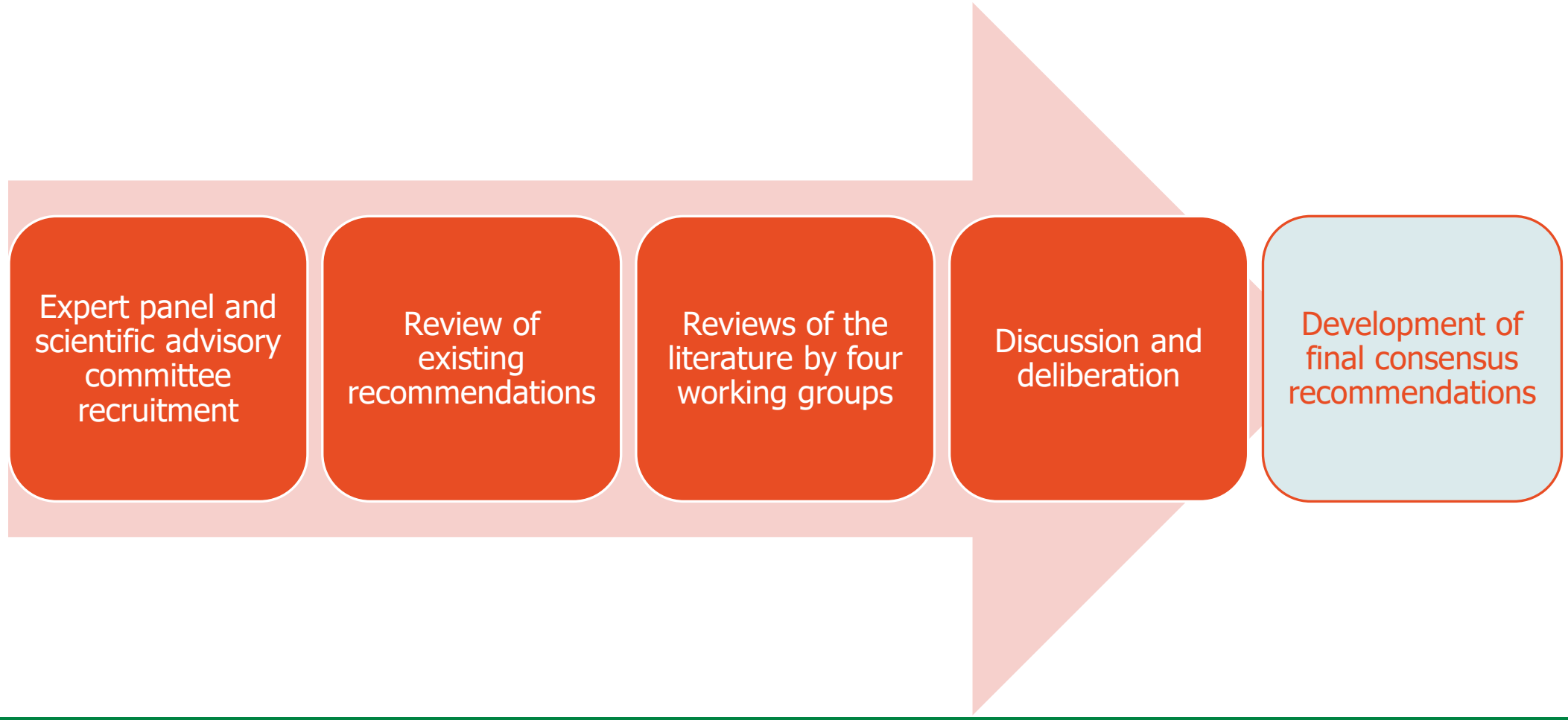
Healthy Eating Research

How did we do it? (Methodology)



Healthy Eating Research

How did we do it? (Methodology)



Healthy Eating Research

Consensus recommendations overview

- Recommendations are intended for healthy children
- Parents and caregivers should consult a health care provider with questions about how their child's individual beverage and health needs fit within these recommendations
- Full recommendations and summary materials are at healthydrinkshealthykids.org

SUMMARY OF KEY PANEL FINDINGS AND RECOMMENDATIONS

	0-6 months	6-12 months	12-24 months	2-3 years	4-5 years
 Plain drinking water	not needed	0.5-1 cups/day	1-4 cups/day	1-4 cups/day	1.5-5 cups/day
 Plain, pasteurized milk	not recommended		2-3 cups/day whole milk	≤2 cups/day skim or low-fat milk	≤2.5 cups/day skim or low-fat milk
 100% juice	not recommended		≤0.5 cups/day	≤0.5 cups/day	≤0.5-0.75 cups/day
 Plant milks/ Non-dairy beverages	not recommended		medical indication/dietary reasons only		
 Flavored milk	not recommended				
 Toddler milk	not recommended				
 Sugar-sweetened beverages (SSB)	not recommended				
 Beverages with low-calorie sweeteners (LCS)	not recommended				
 Caffeinated beverages	not recommended				

RECOMMENDATIONS RATIONALE, BY BEVERAGE

Healthy Eating Research

HEALTHY DRINKS. HEALTHY KIDS.

Beverages Recommended as Part of a Healthy Diet

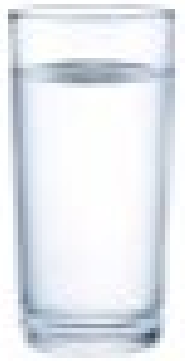
Healthy Eating Research

	0-6 months	6-12 months	12-24 months	2-3 years	4-5 years
 Plain drinking water	not needed	0.5-1 cups/day	1-4 cups/day	1-4 cups/day	1.5-5 cups/day
 Plain, pasteurized milk	not recommended		2-3 cups/day whole milk	≤2 cups/day skim or low-fat milk	≤2.5 cups/day skim or low-fat milk

Healthy Eating Research

Consensus recommendations: Water

The panel recommends a prudent range of plain drinking water for children 1-5 years estimated to be adequate for normal hydration.



Fluoridated water consumption is encouraged.

Children 1-3 years (4-5 years) need about 4 cups (5 cups) of beverages per day.[1,2,3]

- Recommended amount of plain drinking water depends on how much milk and 100% juice are consumed.
- Example: If a 3-year-old drinks 2 cups/day of milk and no 100% juice, that leaves 2 cups of plain water.

1. IOM 2005, DRIs for water; 2. Grimes et al. 2017, *Nutrients;* 3. Drewnowski et al. 2013, *J. Nutr.*

Consensus recommendations: Plain, pasteurized cow's milk

Healthy Eating Research

Plain cow's milk is a common beverage in U.S. diets and is widely available, affordable, and nutrient-dense.

Prior recommendations[1] for young children's milk consumption were consistent and the panel concurred with them

Children who are unable to or are in a family that has chosen not to consume dairy products should consult an RDN or a pediatrician to help ensure that their diets provide nutrients commonly obtained from dairy foods.

1. E.g., Dietary Guidelines for Americans 2015-2020; AAP 2013; Healthy Eating Research 2017.

Healthy Eating Research

Beverage to Limit in a Healthy Diet

	0-6 months	6-12 months	12-24 months	2-3 years	4-5 years
 100% juice	not recommended		≤0.5 cups/day	≤0.5 cups/day	≤0.5-0.75 cups/day

Consensus recommendations: 100% juice

Healthy Eating Research

Meeting fruit intake with whole fruit is preferred, but 100% juice may be an important contributor to achieving adequate fruit intakes in populations for whom access to and affordability of fruit is limited.

Panel's guidance is consistent with Dietary Guidelines for Americans and the AAP's 2017 policy statement on 100% fruit juice.

When consumed in the recommended amounts, 100% fruit juice does not appear to promote excess weight gain in young children[1] but may, based on limited data, influence later consumption of fruit juice, SSBs.[2]

1. Auerbach et al. 2018, *Adv Nutr*; 2. Sonneville et al. 2015, *Obesity*

Beverages Not Recommended as Part of a Healthy Diet

Healthy Eating Research

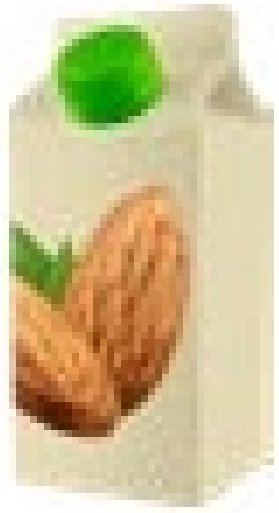
	0-6 months	6-12 months	12-24 months	2-3 years	4-5 years
 Plant milks/ Non-dairy beverages	not recommended		medical indication/dietary reasons only		
 Flavored milk	not recommended				
 Toddler milk	not recommended				
 Sugar-sweetened beverages (SSB)	not recommended				
 Beverages with low-calorie sweeteners (LCS)	not recommended				
 Caffeinated beverages	not recommended				

Consensus recommendations: Plant-based/non-dairy milk

Healthy Eating Research

Not recommended for exclusive consumption in place of dairy milk except when medically indicated (allergies or intolerances to cow's milk) or to meet specific dietary preferences (e.g., vegan).

- In these cases, only unsweetened varieties are recommended, and consultation with a Registered Dietitian or pediatrician is advised



Most are not nutritionally equivalent to dairy milk, with widely-differing nutritional profiles depending on variety.

Consensus recommendations: Flavored milk

Healthy Eating Research

Literature is scarce on outcomes of interest among young children

- Nutrient Intake and Dietary Patterns
- Health outcomes, including body weight, bone density, and diabetes
- (Sweet) taste preference development

Most flavored milk has caloric sweeteners

- Added sugars intake should be avoided in children <2 years old[1] and minimized in children 2-5 years old

1. Vos et al. 2016, *Circulation.* 2. Wang et al. 2018, *AJCN*

Consensus recommendations: Toddler milk

Healthy Eating Research

No evidence for harm, but offers no unique nutritional value beyond what a nutritionally adequate diet provides and may contribute added sugars to the diet and undermine sustained breastfeeding.

More expensive than an equivalent volume of cow's milk.

These beverages should not be recommended by health professionals as a strategy for addressing picky eating

Consensus recommendations: Sugar-sweetened beverages

Healthy Eating Research

Panel defined SSBs as liquids to which any forms of sugar are added.

- Panel excluded from this definition beverages sweetened with low-calorie sweeteners, 100% juice, or flavored dairy and/or plant-based milks.

Leading source of added sugars in young children's diets

Strong evidence demonstrating adverse health effects of consumption

Consensus recommendations: Low-calorie sweetened beverages

Healthy Eating Research

Panel's definition includes beverages with artificial (e.g., sucralose) or natural (e.g., stevia) low-calorie sweeteners

Literature is scarce for young children; available evidence is mixed and inconsistent. Thus, the panel applied its collective expertise and judgment to develop this recommendation

Consensus recommendations: Caffeinated beverages

Healthy Eating Research

Not recommended due to potential for adverse health effects.

Panel did not conduct a literature search on the heath impact of caffeinated beverages, as existing guidance is consistent in cautioning against caffeine intake in young children.

Other Considerations: Mode of consumption

Healthy Eating Research

Frequent consumption of between-meal snacks and beverages with sugars (added or naturally-occurring) increases risk of dental caries due to prolonged contact between sugars and cariogenic bacteria on teeth.

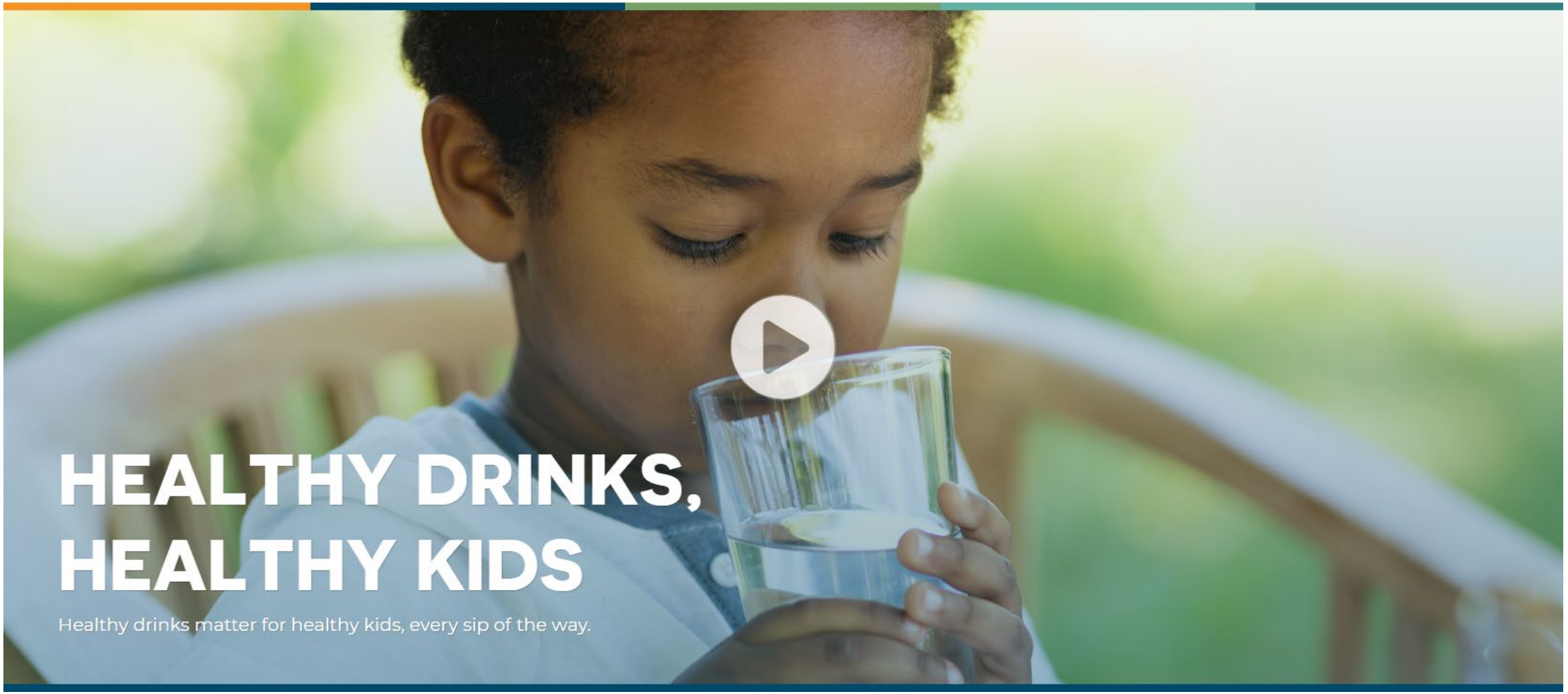
To reduce the risk of developing caries during early childhood, the panel reiterates the guidance from the AAPD and the AAP, including:

- Offer milk and 100% juice from a cup and only during meal or snack times.
- Wean young children from a bottle by 1 year of age and do not put young children to bed with a bottle.
- Water is the best on-the-go drink for a sippy or other covered cup.

HEALTHY DRINKS.
HEALTHY KIDS.

HOME PARENTS PROFESSIONALS PARTNERS PRESS VIDEOS

Healthy Eating Research



DRINK:

Water

- Children 4 to 5 years old should drink 1.5 to 5 cups of water a day.
- The amount of water each child needs might vary from day-to-day based on how active they are, the weather, or the amount of fluids they get from other beverages like milk or foods like soups and applesauce.

Milk

- Children 4 to 5 years old should drink plain, pasteurized fat-free (skim) or low-fat (1%) milk. The recommended amount is up to 2.5 cups a day.

LIMIT:

100% Fruit Juice

- Children ages 4 to 5 years old should drink no more than ½ – ¾ cup (4-6 ounces) of 100% juice per day. Adding water to 100% fruit juice can make a little bit of juice go a long way.
- As much as possible, children should meet their daily fruit intake (1 cup for 1-3 years and 1½ cups for 4-5 years) by eating fruit in fresh, canned, or frozen forms without added sugars, rather than by drinking juice, as this is the best option.
- If this is not possible, then a combination of whole fruit and 100% juice is okay, as long as a child does not drink more than the upper limit of ¾ cups per day.
- This is because juice, even 100% fruit juice, can contribute to dental cavities, and if kids drink more than is recommended, it can have other negative health impacts such as weight gain.

AVOID:

Children 4 to 5 years old should not drink:

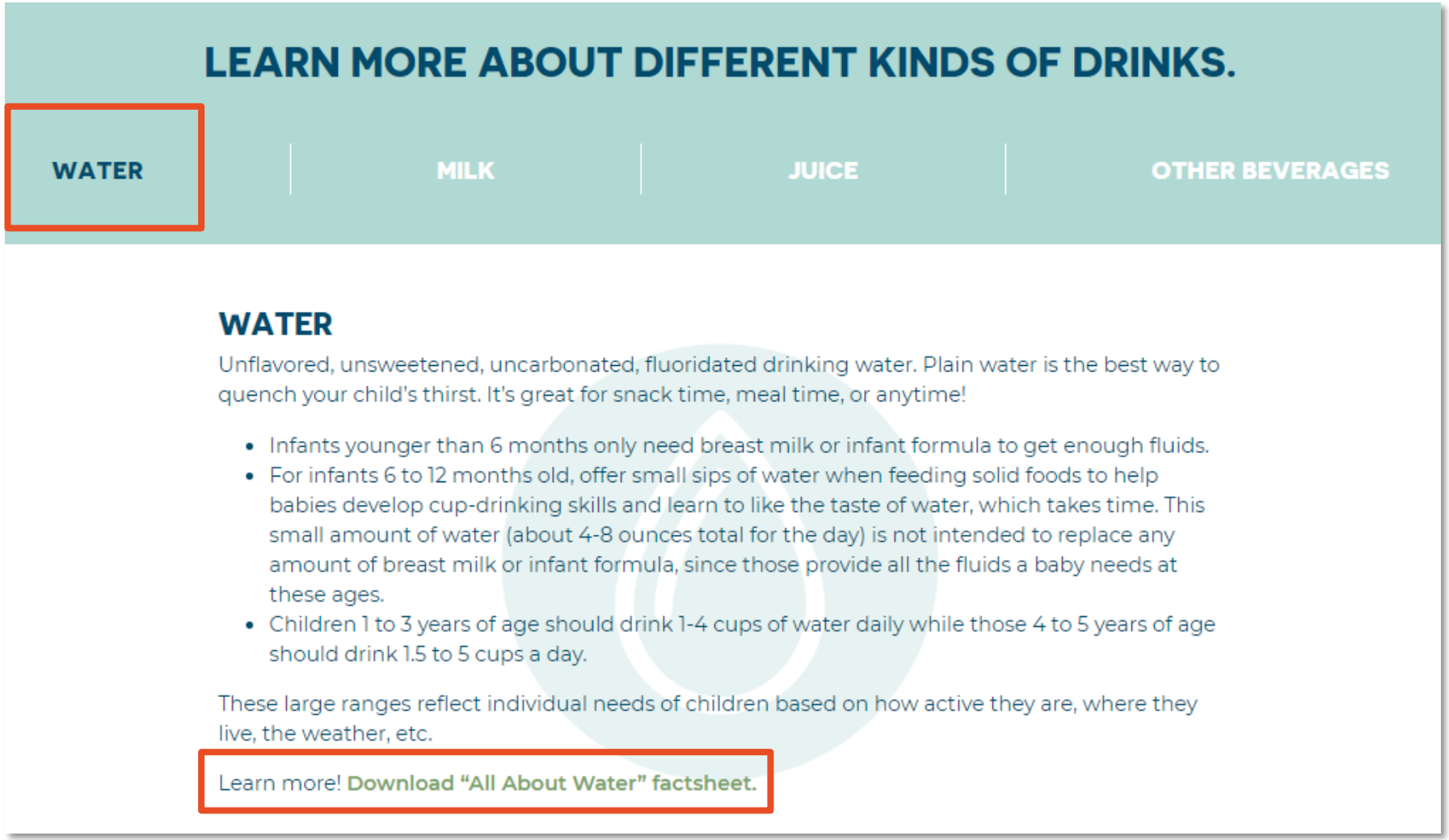
- Flavored milks (e.g., chocolate, strawberry)
- "Transition" or "weaning" formulas (sometimes called toddler milks, growing up milks, or follow up formulas)
- Plant-based/non-dairy milks (e.g., almond, rice, oat)
- Drinks with caffeine (e.g., soda, coffee, tea, energy drinks)
- Low-calorie sweetened drinks (e.g. "diet" or "light" drinks, including those sweetened with stevia, sucralose, or other low-calorie sweeteners)
- Sugar-sweetened drinks (e.g., soda, fruit drinks and fruit flavored drinks, fruit-ades, sports drinks, energy drinks, sweetened waters, and sweetened coffee and tea drinks)

Plant-based/non-dairy milks are not recommended as a full replacement for regular milk. Evidence indicates that, with the exception of

For Parents and Caregivers

For Parents and Caregivers

Healthy Eating Research



LEARN MORE ABOUT DIFFERENT KINDS OF DRINKS.

WATER | MILK | JUICE | OTHER BEVERAGES

WATER

Unflavored, unsweetened, uncarbonated, fluoridated drinking water. Plain water is the best way to quench your child's thirst. It's great for snack time, meal time, or anytime!

- Infants younger than 6 months only need breast milk or infant formula to get enough fluids.
- For infants 6 to 12 months old, offer small sips of water when feeding solid foods to help babies develop cup-drinking skills and learn to like the taste of water, which takes time. This small amount of water (about 4-8 ounces total for the day) is not intended to replace any amount of breast milk or infant formula, since those provide all the fluids a baby needs at these ages.
- Children 1 to 3 years of age should drink 1-4 cups of water daily while those 4 to 5 years of age should drink 1.5 to 5 cups a day.

These large ranges reflect individual needs of children based on how active they are, where they live, the weather, etc.

Learn more! **Download "All About Water" factsheet.**

For Parents and Caregivers

HEALTHY DRINKS. HEALTHY KIDS.

Healthy Beverage Consumption in Early Childhood

Recommendations from Key National Health and Nutrition Organizations

Healthy Drinks, Healthy Kids

Research shows that what children drink – from birth through age 5 – can have a big impact on their health. That's why some of the nation's leading experts on health and nutrition developed recommendations to help parents and caregivers choose what's best for kids. The full recommendations can be found at ***HealthyDrinksHealthyKids.org.***
This brief provides more details about ***water.***

A deeper dive on water

Water is essential for life and should be the go-to drink to quench children's thirst. The daily amount that children need can change based on the weather, how active they are, and the amount of fluids they get from other drinks as well as food. (For example, foods like applesauce, soup, and oatmeal provide more water than others). That's why the range of recommended water amounts is so big for one- to five- year-olds.

So, how much water is good for kids?

0-6 MONTHS	6-12 MONTHS	1-3 YEARS	4-5 YEARS
No supplemental drinking water needed	0.5-1 cup/day (offer in a cup at meal times once solid food is introduced)	1-4 cups/day	1-5 cups/day

Is there such a thing as drinking too much water?

There is no single upper limit for how much water a person should drink in a given day, because water needs can vary from day to day. While rare, there may be special cases that could put a person at risk for drinking too much water. For example, water intoxication can occur in infants if too much water is used to prepare infant formula or if water is substituted for breast milk or infant formula.

Does it matter where my water comes from?

Knowing where your drinking water comes from, how it's been treated, and if it's safe to drink is important. Drinking water can come from a variety of sources, including public water systems, private wells, or bottled water. Water from public water systems and private wells is commonly referred to as "tap water." **Well water** should be tested to make sure it's safe to drink. Local governments typically provide information about groundwater conditions and options for water safety and quality testing.

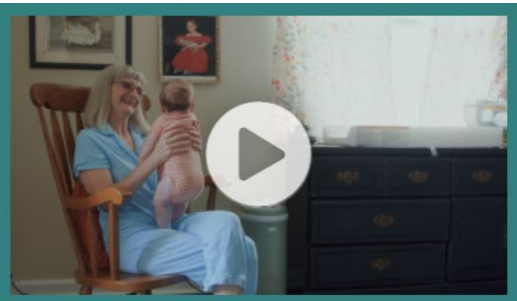
Is there fluoride in all water?

Drinking fluoridated water is one of the best ways to reduce a child's chances of having cavities. Fluoride is a naturally occurring mineral that helps prevent cavities. Fluoridation refers to how much fluoride is added to drinking water. The recommended level of fluoride in drinking water is 0.7 parts per million. Information from your local water provider can help you find out if your home's drinking water is fluoridated, and to what level. If your water isn't fluoridated, talk to your dentist about other ways to get enough fluoride, as this is important for dental health.

The fluoride content of **bottled water** varies a lot. Most bottled waters don't have ideal levels of fluoride, and some don't have any at all.

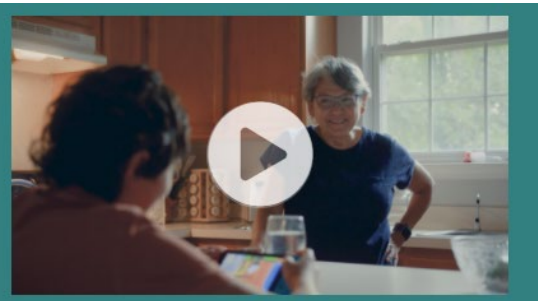
For Parents and Caregivers

Videos in Spanish and for the visually impaired also **available here.**



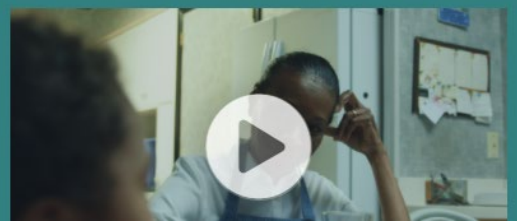
HEALTHY BEVERAGES IN THE EARLIEST YEARS SET KIDS UP TO THRIVE

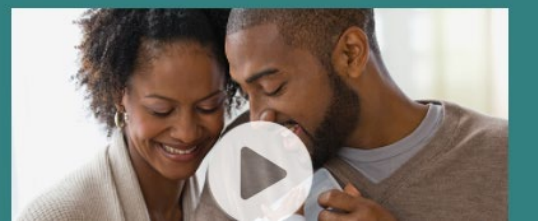
As a grandparent, you have a lot on your plate when caring for your grandchildren – but you can help them grow up healthy and strong by serving them healthy beverages.



AVOID SERVING SUGARY DRINKS TO KIDS TO BUILD HEALTHY HABITS

As a grandparent, you have a lot on your plate when caring for your grandchildren – but you can help them grow up healthy and strong by serving them healthy beverages.





Professionals

TOOLKIT

This toolkit includes template communication materials to help spread the word out about healthy drinks for kids.

Here's what's inside:

- Draft email
- Template newsletter/blog post
- Social media posts
- Messaging and talking points

DOWNLOAD

HANDOUTS

These printable handouts include a summary of the guidelines along wit more detailed information by beverage type.

- Summary Flyer (Spanish) (Tagalog)
- All About Water (Spanish) (Tagalog)
- All About Milk (Spanish) (Tagalog)
- All About 100% Juice (Spanish) (Tagalog)
- All About Plant Milks (Spanish) (Tagalog)
- All About Toddler Milks (Spanish) (Tagalog)
- All About Sugar Sweetened Drinks/Fruit Drinks (Spanish) (Tagalog
- All About Low-Calorie Sweetened Drinks (Spanish) (Tagalog)
- All About Breastfeeding

Professionals

SHAREABLE GRAPHICS

Fun and informative graphics that simplify the recommendations for sharing on social media and beyond!

- **Infographic** (Spanish) (Tagalog)
- Web graphics by age (Spanish) (Tagalog)
- General social media graphics (Spanish) (Tagalog)
- New Year social graphics

RECOMMENDATIONS

These expert recommendations were developed by Healthy Eating Research along with some of the nation's leading health organizations.

- Official Consensus Statement (Spanish)
- Full Technical Report (Spanish)
- Executive Summary
- Summaries by age and drink
- Questions & Answers

Survey of Pediatricians and Pediatric Dentists

Primary objectives were to better understand:

1. Current beverage education and counseling practices
2. Perspectives on or concerns about the beverage recommendations
3. Perceived barriers and facilitators to implementing the beverage recommendations in practice

Pediatric Dentists

- A majority of respondents reported routinely providing education/counseling on each beverage type
- Most commonly discussed: plain water, 100% juice, SSBs

Pediatricians

- A majority of respondents reported routinely providing education/counseling on each beverage type
- Most commonly discussed: plain water, plain milk, 100% juice, SSBs

Pediatric Dentists and Pediatricians

A majority of respondents from each survey reported the consensus recommendations align with their education/counseling practices

- Most commonly aligned: SSBs and plain water
- Least commonly aligned: plant-based beverages and 100% juice

Lack of consistent messaging for parents and caregivers about juice consumption was a frequently reported barrier by both provider types

"WIC often doesn't agree with what doctors say."

- Pediatrician

"It is challenging because we find that patients are often not given consistent information about sugary drinks across providers. For example WIC allows them to buy juice, the pediatrician might not talk about this at all."

- Pediatric Dentist

"WIC provides juice so my families think they should be drinking it."

- Pediatrician

Healthy Eating Research

Next Steps

Educate various providers types (Pediatricians, Pediatric Dentists, Registered Dietitians) on the consensus recommendations to support consistent messaging to parents and caregivers about beverage consumption

- Increase awareness of Healthy Drinks, Healthy Kids website and available resources
- Develop educational materials for specific provider types
- Host educational webinars

Strategies for Incorporating the Expert Panel's Recommendations into Policy, Systems, and Environmental Initiatives to Improve Public Health

Facilitated Discussion

Healthy Eating Research

HEALTHY DRINKS. HEALTHY KIDS.

Questions?

Healthy Eating Research

HEALTHY DRINKS. HEALTHY KIDS.

Healthy Eating Research

Consensus Beverage Recommendation Materials

- Technical Scientific Report. Healthy Beverage Consumption in Early Childhood: Recommendations from Key National Health and Nutrition Organizations\
  https://healthyeatingresearch.org/research/technical-scientific-report-healthy-beverage-consumption-in-early-childhood-recommendations-from-key-national-health-and-nutrition-organizations/

- Consensus Statement. Healthy Beverage Consumption in Early Childhood: Recommendations from Key National Health and Nutrition Organizations
  https://healthyeatingresearch.org/research/consensus-statement-healthy-beverage-consumption-in-early-childhood-recommendations-from-key-national-health-and-nutrition-organizations/

- Healthy Drinks Healthy Kids Website: http://healthydrinkshealthykids.org/
  Includes resources for parents and professionals including infographics, beverage one-pagers, short videos, and a toolkit.

Healthy Eating Research

Key References on Beverage Consumption Patterns

- Demmer E, Cifelli CJ, Houchins JA, et al. Ethnic disparities of beverage consumption in infants and children 0–5 years of age; National Health and Nutrition Examination Survey 2011 to 2014. *Nutrition Journal. 2018;* 17 (78). https://nutritionj.biomedcentral.com/articles/10.1186/s12937-018-0388-0

- Grimes CA, Szymlek-Gay EA, Nicklas TA. Beverage consumption among U.S. children aged 0-24 Months: National Health and Nutrition Examination Survey (NHANES). *Nutrients.* 2017; 9(3):264. https://www.mdpi.com/2072-6643/9/3/264

- Kay MC, Welker EB, Jacquier EF, Story MT. Beverage consumption patterns among infants and young children (0–47.9 Months): data from the Feeding Infants and Toddlers Study, 2016. *Nutrients*. 2018;10(7):825. https://www.mdpi.com/2072-6643/10/7/825/htm

- Martin CL, Clemens JC, and Moshfegh AJ. Beverage Choices among Children: What We Eat in America, NHANES 2017-2018. Food Surveys Research Group Data Brief No. 32. October 2020 https://www.ars.usda.gov/ARSUserFiles/80400530/pdf/DBrief/32_Beverage_children_1718.pdf

Evidence highlighted for specific beverages

Healthy Eating Research

Water	• Institute of Medicine. Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate. Washington, DC: The National Academies Press; 2005. https://www.nap.edu/read/10925/chapter/6
100% juice	• Auerbach BJ, Dibey S, Vallila-Buchman P, Kratz M, Krieger J. Review of 100% fruit juice and chronic health conditions: implications for sugar-sweetened beverage policy. Adv Nutr. 2018;9(1):78-85. https://academic.oup.com/advances/article/9/2/78/4969257
Plant-based/ non-dairy milk	• Singhal S, Baker RD, Baker SS. A comparison of the nutritional value of cow's milk and nondairy beverages. J Pediatr Gastroenterol Nutr. 2017;64(5):799-805. https://www.ncbi.nlm.nih.gov/pubmed/27540708
Flavored milk	• Patel AI, Moghadam SD, Freedman M, Hazari A, Fang ML, Allen IE. The association of flavored milk consumption with milk and energy intake, and obesity: A systematic review. Prev Med. 2018;111:151-162. https://www.ncbi.nlm.nih.gov/pubmed/29501475
Sugar-sweetened beverages	• Bleich SN, Vercammen KA. The negative impact of sugar-sweetened beverages on children's health: an update of the literature. BMC obesity. 2018;5:6. https://bmcobes.biomedcentral.com/articles/10.1186/s40608-017-0178-9
Low-calorie sweeteners	• Johnson RK, Lichtenstein AH, Anderson CAM et al. Low-calorie sweetened beverages and cardiometabolic health: a science advisory From the American Heart Association. Circulation. 2018;138:e126-e140. https://www.ahajournals.org/doi/10.1161/CIR.0000000000000569