REAGAN-UDALL FOUNDATION FOR THE FDA

Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population

Hybrid Public Meeting

July 23, 2025

9:30am-4pm *(eastern)*

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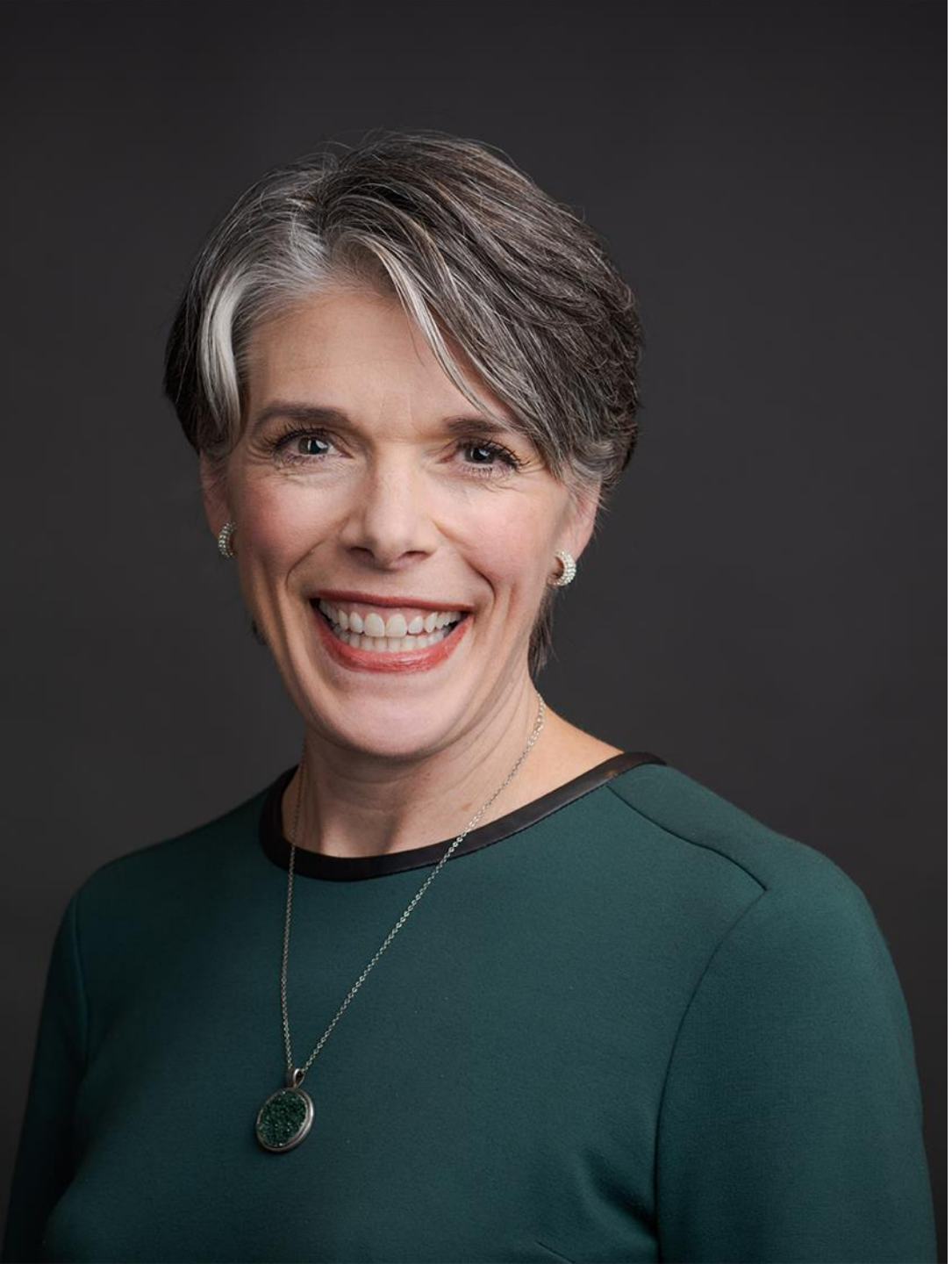
The public meeting will begin shortly

This project is supported by the Food and Drug Administration (FDA) of the U.S. Department of Health and Human Services (HHS) as part of an award of $125,000 in federal funds (100% of the project). The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement, by FDA, HHS, or the U.S. Government. For more information, please visit FDA.gov



REAGAN-UDALL FOUNDATION FOR THE FDA

Welcome

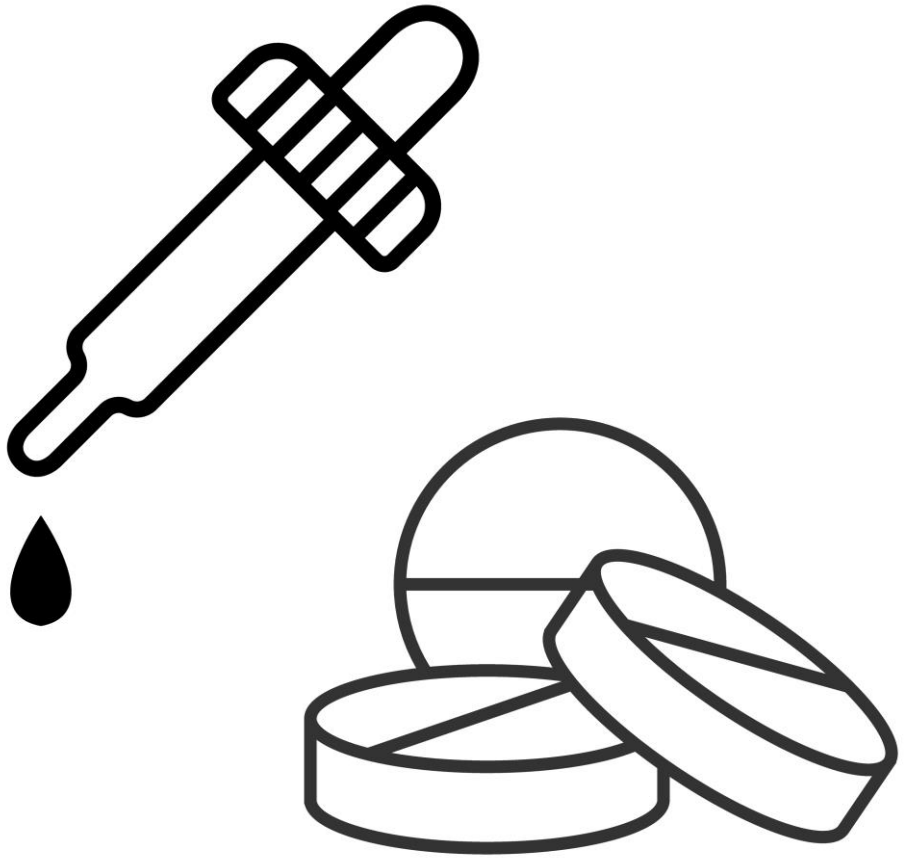
Susan C. Winckler, RPh, Esq.

CEO, Reagan-Udall Foundation for the FDA

Meeting Focus

REAGAN-UDALL FOUNDATION FOR THE FDA

This hybrid public meeting aims to gather information about the clinical use and safety of ***orally ingestible unapproved prescription fluoride drug products*** in children, such as drops and tablets. Some of these products have been used since the 1940s to prevent tooth decay in areas with low or no water fluoridation.



This meeting is ***not*** about adding fluoride to drinking water and is ***not*** a decision-making forum.

Housekeeping

REAGAN-UDALL FOUNDATION FOR THE FDA

Due to the meeting size, your microphone and video will remain off during the meeting

Please share your questions using the Zoom Q&A function

This public meeting is being recorded.

The slides, transcript, and video will be available at www.ReaganUdall.org

Today's Agenda (Session 1)

REAGAN-UDALL FOUNDATION FOR THE FDA

9:30 am **Welcome**
Susan C. Winckler, RPh, Esq., Reagan-Udall Foundation for the FDA

9:35 am **Opening Remarks**
Jacqueline Corrigan-Curay, JD, MD, Center for Drug Evaluation and Research, FDA

9:45 am **Scope of Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in Clinical Practice**
Sally Greenberg, JD, Lived Parent Experience
James H. Bekker, DMD, University of Utah School of Dentistry
Bill Osmunson, DDS, MPH, Fluoride Action Network

Reactor Panel (30 mins)
Linda Birnbaum, PhD, DABT, ATS, University of North Carolina at Chapel Hill
David Krol, MD, MPH, FAAP, American Academy of Pediatrics representative
Scott Tomar, DMD, DrPH, University of Illinois Chicago College of Dentistry

10:45 am **Break**

Today's Agenda (Session 2)

REAGAN-UDALL FOUNDATION FOR THE FDA

11am **Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride**
Valerie Heaton, Lived Parent Experience
Jennifer Webster-Cyriaque, DDS, PhD, National Institutes of Health

Oral and Gut Microbiome
Gary Moran, BA (mod.), PhD, FTCD, Trinity College Dublin
Purnima Kumar, DDS, MDS, PhD, University of Michigan School of Dentistry

Neurocognitive
Griffin Cole, DDS, NMD, MIAOMT, International Academy of Oral Medicine and Toxicology
Jayanth Kumar, DDS, MPH, formerly at California Department of Public Health
Susan Fisher-Owens, MD, MPH, University of California San Francisco
Kyla Taylor, PhD, National Institutes of Health

Thyroid
Christine Till, PhD, C.Psych, York University
Kathleen Thiessen, PhD, Oak Ridge Center for Risk Analysis

Reactor Panel (30 min)
Bruce Lanphear, MD, MPH, Simon Fraser University
Charlotte W. Lewis, MD, MPH, University of Washington School of Medicine

1pm **LUNCH**

Today's Agenda (Session 3)

REAGAN-UDALL FOUNDATION FOR THE FDA

2pm **Public Comment on 4 Topics**

- Clinical Use and Prescribing Considerations for Pediatric Tooth Decay Prevention
- Safety Concerns
- Appropriateness of Pediatric Use Considering Additional Sources of Exposure
- Impact of Removal of Orally Ingestible Unapproved Prescription Drug Products /Potential Alternatives

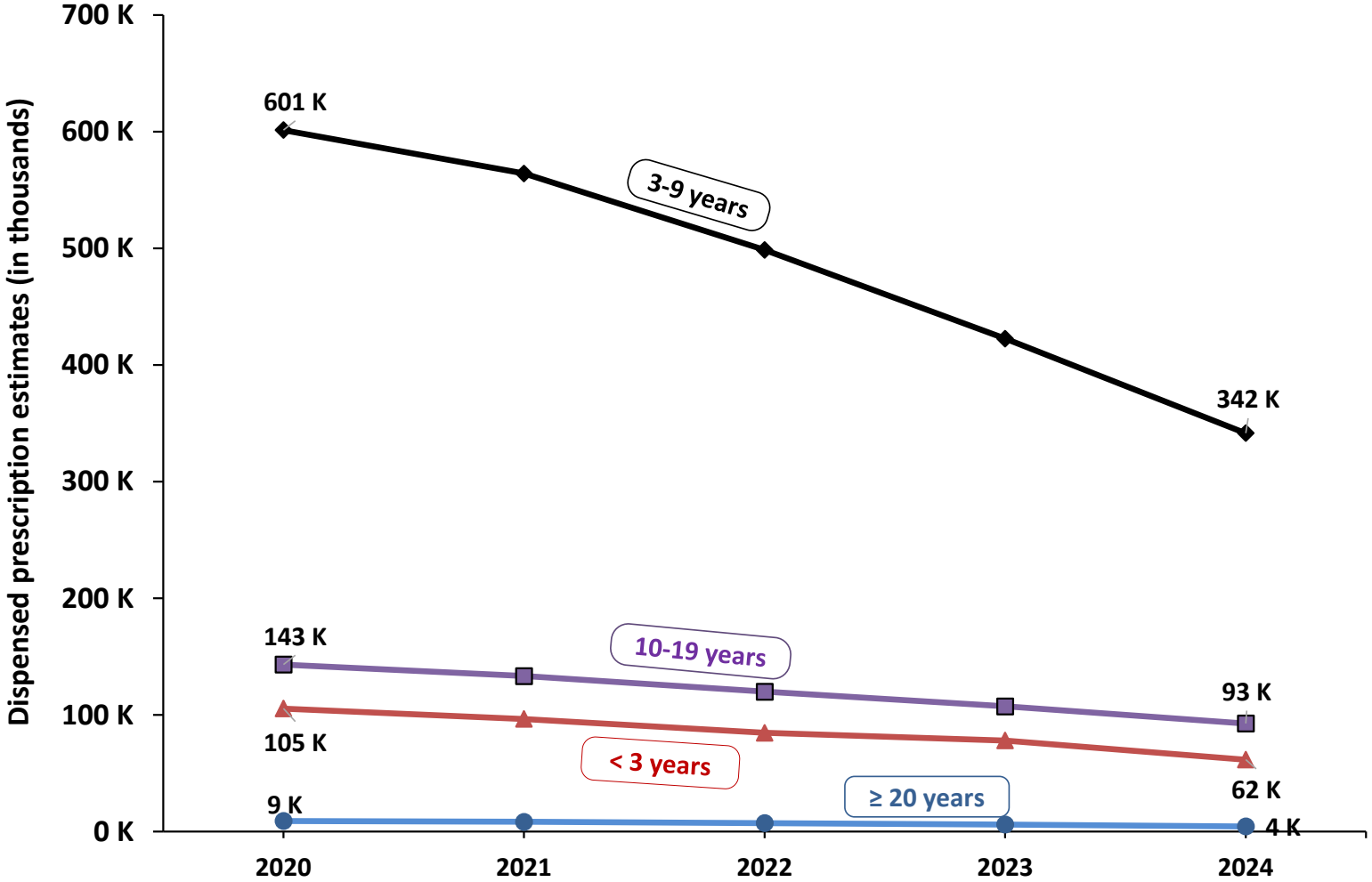
3:55 pm **Adjourn**

REAGAN-UDALL FOUNDATION FOR THE FDA

Opening Remarks

Jacqueline Corrigan-Curay, JD, MD
Principal Deputy Center Director,
Center for Drug Evaluation and
Research, FDA

Ingestible prescription sodium fluoride products have been largely dispensed to children



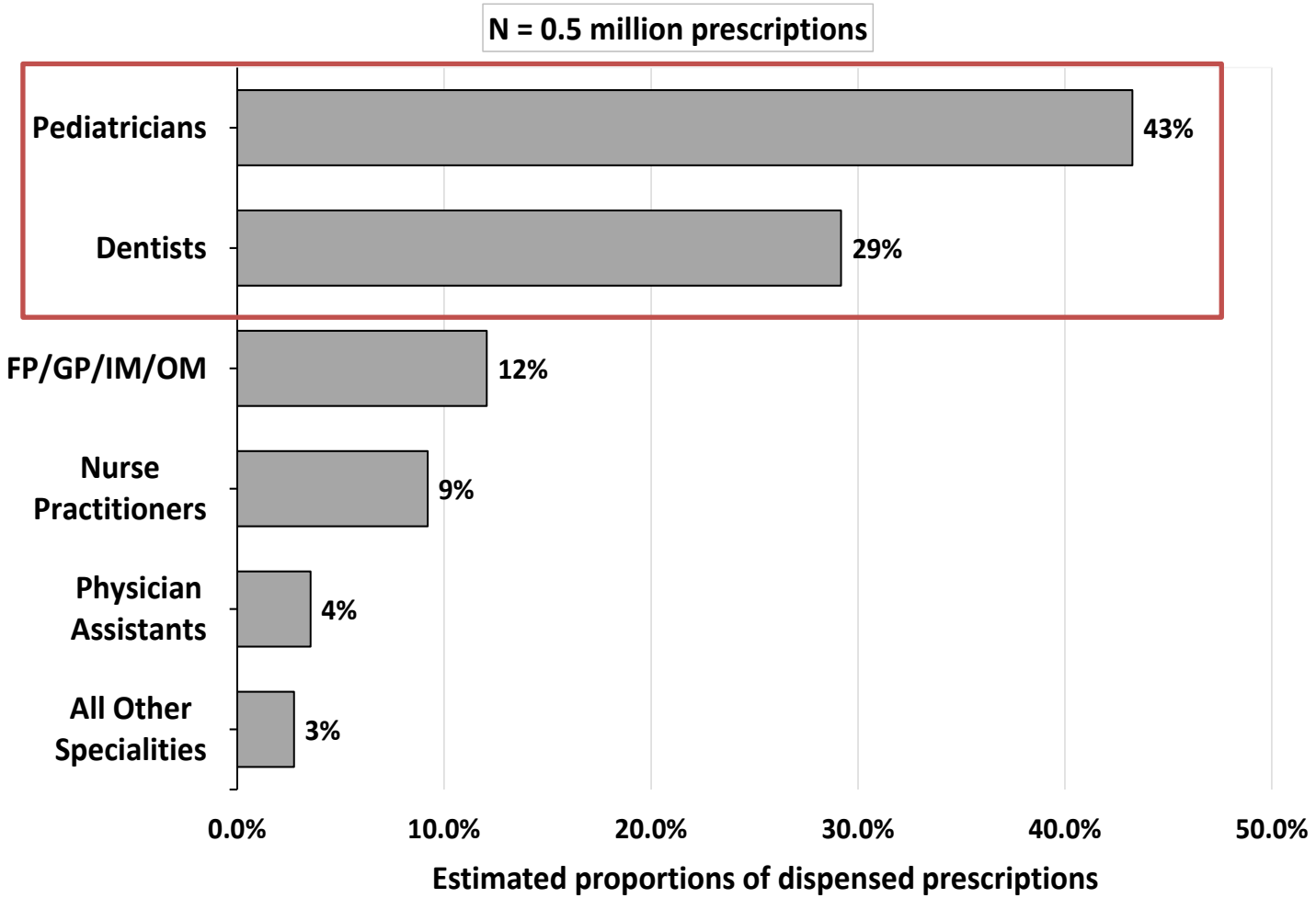
Nationally estimated number of prescriptions dispensed for ingestible prescription sodium fluoride products, by patient age, from U.S. outpatient pharmacies, 2020 – 2024. K represents thousands.

Data do not include products administered or provided in other settings of care (dental offices, clinics, hospitals), multi-ingredient dietary supplements, topical or dental sodium fluoride products (e.g., mouthwash, rinses, toothpaste).

Data have not been age-adjusted for population estimates.

Source: IQVIA National Prescription Audit New to Brand™, time period 2020-2024, data extracted May 2025.

Ingestible prescription sodium fluoride products were most frequently written by pediatricians and dentists in 2024



Nationally estimated proportions of prescriptions dispensed for ingestible sodium fluoride products, by prescriber specialties, from U.S. outpatient pharmacies, 2024

FP/GP/IM/OM represents family practice, general practice, internal medicine, osteopathic medicine.

Data do not include products administered or provided in other settings of care (dental offices, clinics, hospitals), multi-ingredient dietary supplements, topical or dental products (e.g., mouthwash, rinses, toothpaste).

Source: IQVIA National Prescription Audit New to Brand™, time period 2020-2024, data extracted May 2025.


FDA
U.S. FOOD & DRUG
ADMINISTRATION

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 1: Scope of Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in Clinical Practice

Sally Greenberg, JD

Lived Parent Experience

A Consumer/Mom Perspective on Fluoride Supplements

Sally Greenberg

Water Fluoridation is a Major Public Health Achievement

- Moms rely on the experts.
- When it comes to a kids' teeth, I look to groups like the American Dental Association, the American Academy of Pediatric Dentistry, the U.S. Preventive Services Task Force and professional medical associations which all support continued access to fluoride supplements where needed
- They agree that fluoridation is one of the most effective ways to prevent cavities for children, reducing tooth decay by 25%
- As a Mom, I worry that when community water fluoridation programs are threatened, for example, Florida and Utah, which have banned fluoride in drinking water, parents will need options like fluoride supplements
- In fact, my son was prescribed fluoride supplements when as a child because we lived for a time in a community without fluoridated water; there were no discernable negative effects on his gut or his brain, other than that he often doesn't call me back when I leave messages.
- So, as with my experience, communities that rely on bottled water or well water, fluoride supplements are a needed option.

My Family's Dental Health Story

- My Grandma Annie was born in Romania and raised in the Twin Cities before water fluoridation – she lost all of her teeth and wore dentures as far back as I can remember
- Both my parents, without early fluoridation, also despite brushing and flossing, lost most of their teeth by the time they reached 65 years old
- My dental health – with fluoridated water, is better than my parents but dental care wasn't as advanced as it is today. I confess to having a weakness for candy of all sorts, and that hasn't helped, but the good news is that have all my teeth, albeit many crowns, root canals, and several implants
- My son - at 29 years old had the benefit of fluoridated water and advanced dental care; he has had two cavities total; I credit his dental health to fluoridated water and better dental care

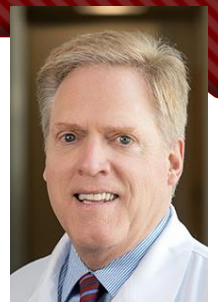
REAGAN-UDALL FOUNDATION FOR THE FDA

Session 1: Scope of Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in Clinical Practice

James H. Bekker, DMD

University of Utah School of Dentistry

Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population



James H. Bekker, DMD

Associate Dean of Professional, Community and Strategic Relations, University of Utah School of Dentistry (UUSOD)

Associate Professor, UUSOD

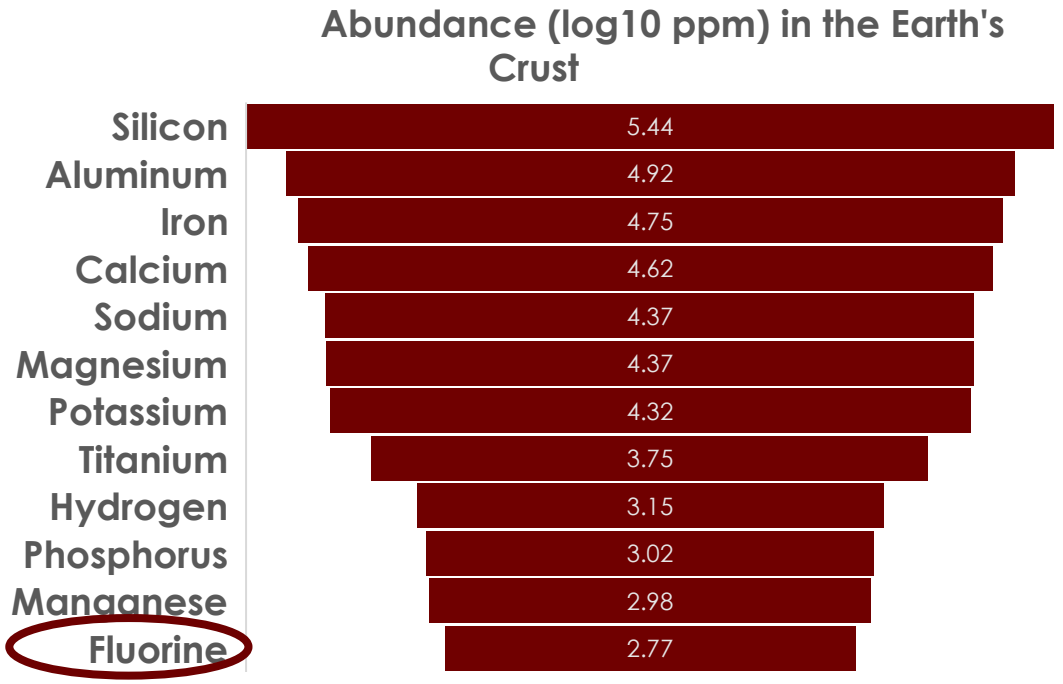
American Dental Association Delegate

Executive Board of Utah Dental Association, past President

Steering Committee for the Utah Oral Health Coalition, past Chairman

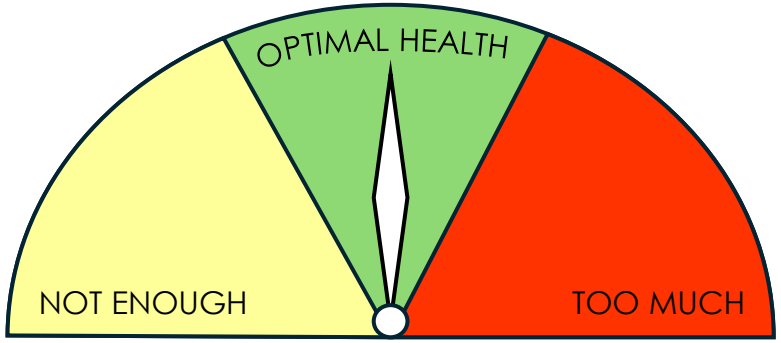
WHAT IS FLUORIDE?

- Fluoride is a naturally occurring nutrient that humans interact with every day



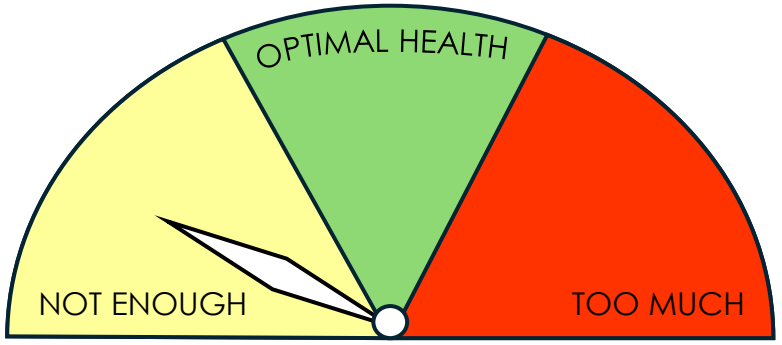
OPTIMAL FLUORIDE FOR HEALTH

- Like other nutrients, fluoride at optimal levels supports health



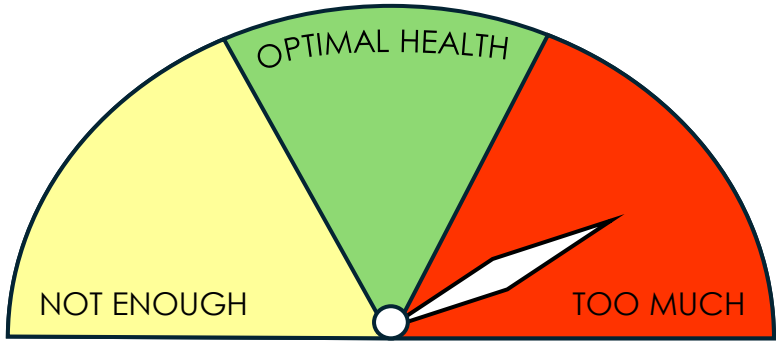
OPTIMAL FLUORIDE FOR HEALTH

- When fluoride is not present during development, it results in reduced tooth enamel strength and weaker bones



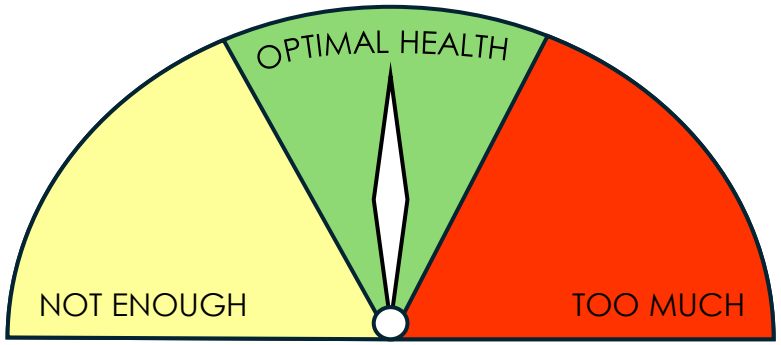
OPTIMAL FLUORIDE FOR HEALTH

- When exposure to fluoride exceeds optimal levels, it may have negative effects



INGESTIBLE FLUORIDE SUPPLEMENTS

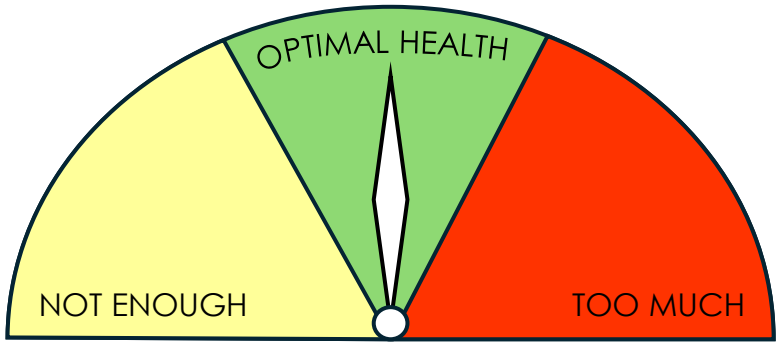
- Fluoride tablets or drops help us to achieve an optimal level of fluoride nutrition



- Optimal fluoride nutrition leads to stronger teeth and results in better oral health

PATIENT-PROVIDER CHOICE

- Providers work with patients to consider the need for supplementation
- Particularly important when community water fluoridation or naturally occurring fluoride is not present

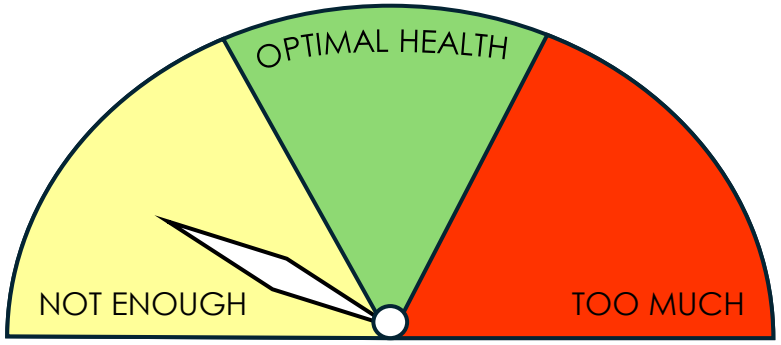


UTAH EXPERIENCE

- Recent legislation removed fluoride from all water systems
- Supplementation with ingestible fluoride was given as the alternative

SOCIETAL IMPACT OF REMOVING SUPPLEMENTAL FLUORIDE OPTIONS

- Increases in:
  - Tooth decay
  - Use of emergency services
  - Cost of care via more invasive dental procedures



ALTERNATIVES?

There are none.

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 1: Scope of Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in Clinical Practice

Bill Osmunson, DDS, MPH

Fluoride Action Network

REAGAN-UDALL FOUNDATION FOR THE FDA

"Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population" 7/23/2025

Bill Osmunson DDS, MPH
Aesthetic, Comprehensive and Neuromuscular Dentist, Retired, Educator, Author, and Nutritionist
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Bellevue, WA 98004

A healthy person has a thousand dreams

A sick person has one.

» https://fluoridealert.org/content/u-s-regulatory-agencies-dont-know-safe-vs-toxic-level-of-fluoride-2/

Sworn Depositions for TSCA Trial

FLUORIDE IS A DRUG:
Unapproved Drugs are Illegal Drugs

- CONGRESS FD&C ACT 21 USC 321 (G)(1)(B)
- U.S. Pharmacopeia
- FDA Congressional Investigation 2001
- EPA, Steve Neugeboren, Ass. General Counsel, Water Law Office EPA 2/14/2013
- Washington State Board of Pharmacy 2009
- Idaho State Board of Pharmacy 2009
- Approved Fluoride Toothpaste Label: “Drug Facts”
  - “Do Not Swallow”

Warning Letters did Not Work

FDA Letter to 35 Companies DRUG THERAPY 1975

". . .there is no substantial evidence of drug effectiveness as prescribed, recommended or suggested in its labeling. . . marketing is in violation of the new drug provisions of the Federal Food, Drug, and Cosmetic Act; they have, therefore, requested that marketing of these products be discontinued."

FDA Warning letter to Kirkman Labs of 1/13/2016

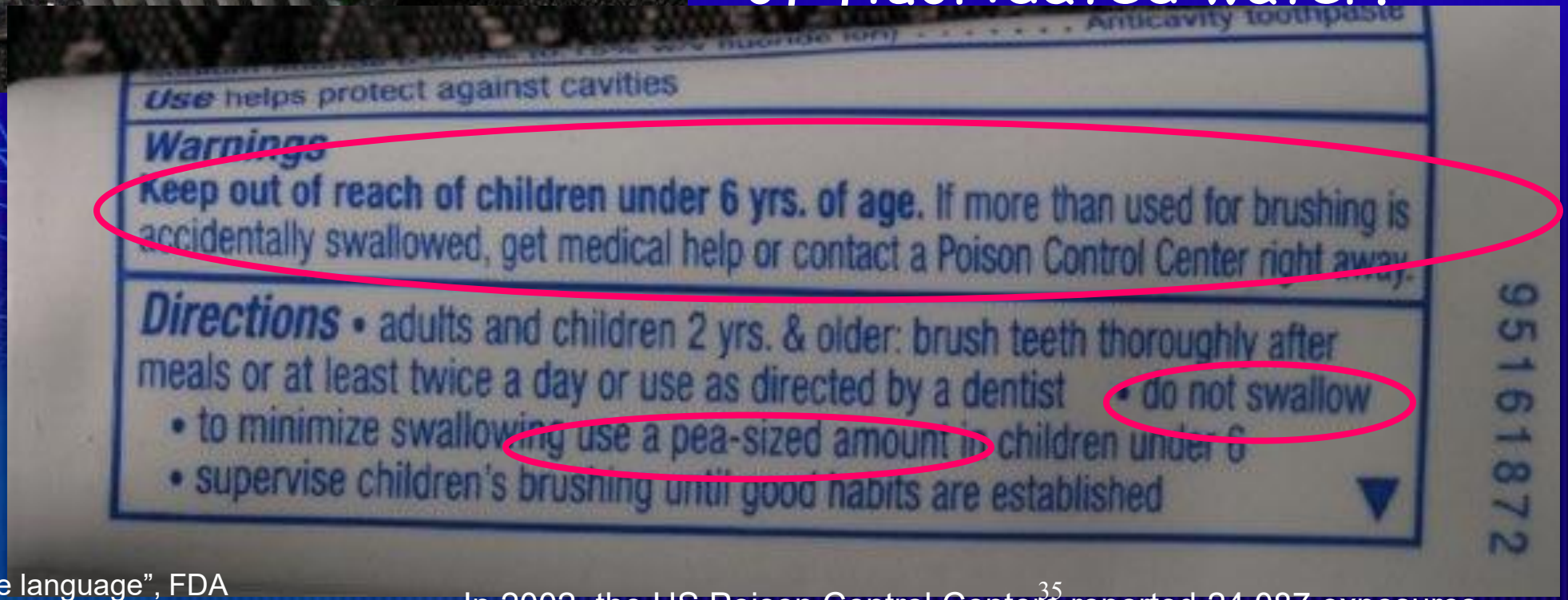
". . . FDA has determined that these products (fluoride drops, pills) are misbranded drugs in violation of section 502 and 503 of the Act [21 U.S.C. §§ 352 and 353], . . ."

Ban Orally Ingestible Fluoride Drugs intended to prevent caries

FDA responded to the Washington State Board of Health if you apply for approval, fluoridation would be

“BANNED”.

A pea size of
toothpaste has
0.25 mg of fluoride,
the same as a fluoride pill
Or on 11-oz glass
of fluoridated water.

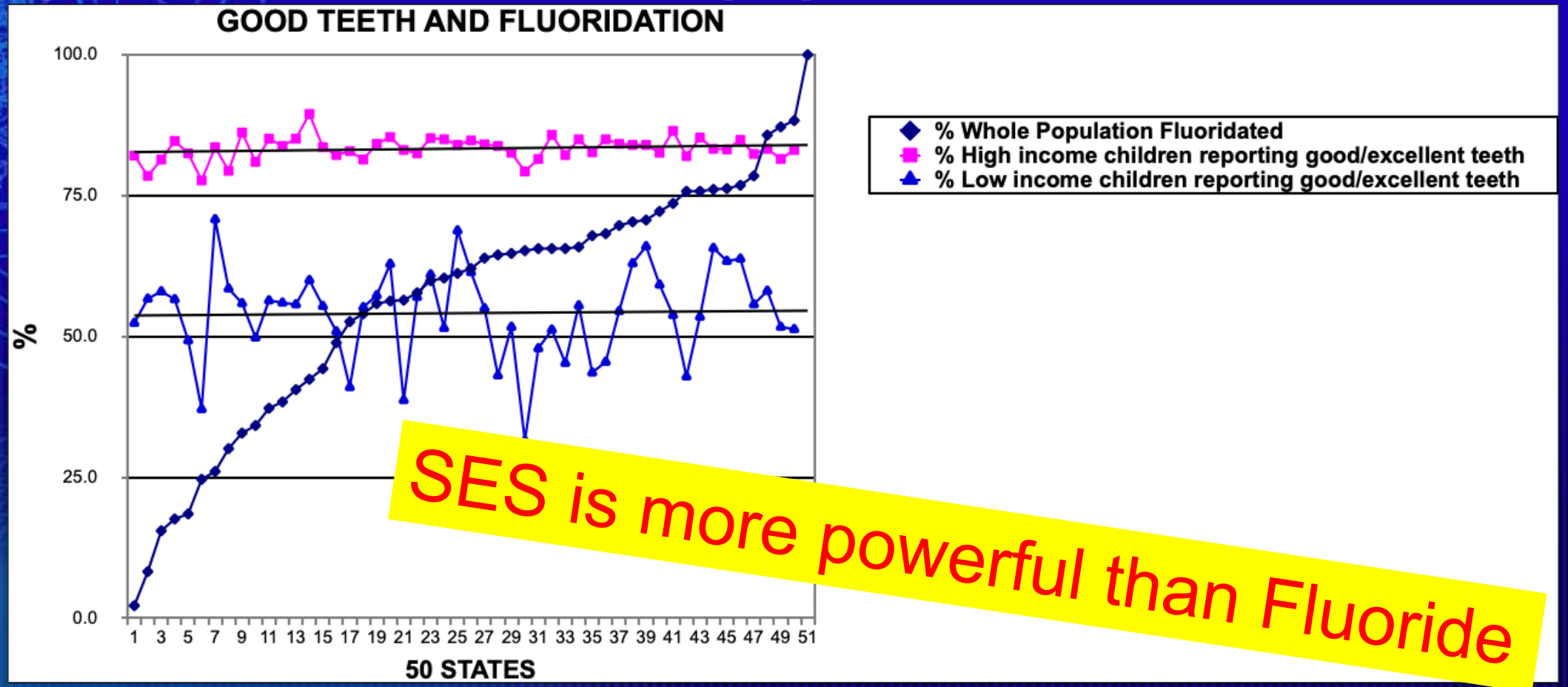


"Flexible language", FDA

In 2002, the US Poison Control Centers reported 24,087 exposures involving toothpaste with fluoride. emedicine

Low-income children experience higher rates of dental decay regardless of fluoridation. **Vargas et al. (1998) & CDC NHANES 2011-2016**

I plotted 50 states on % population on CWF (2008)

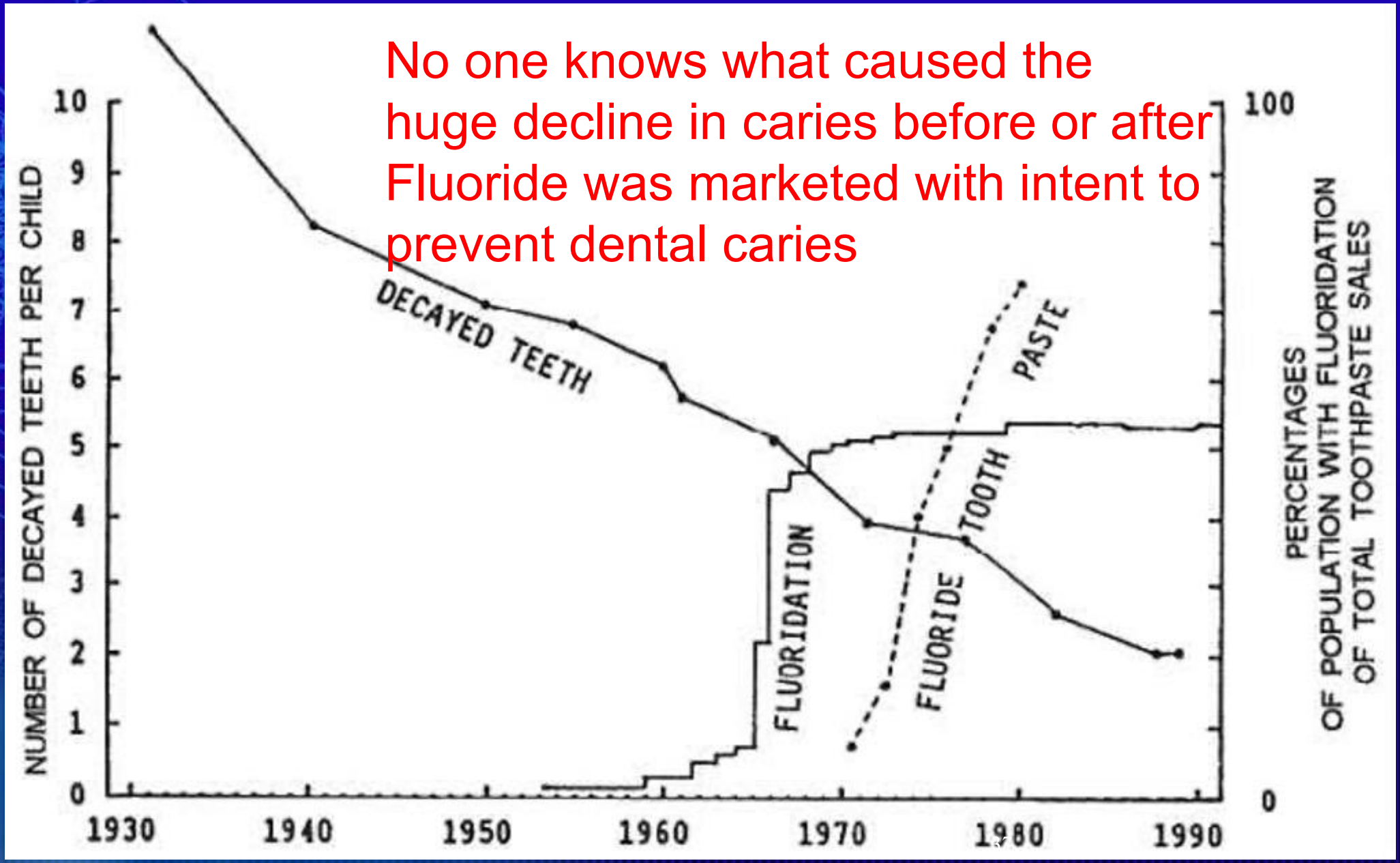


SES is more powerful than Fluoride

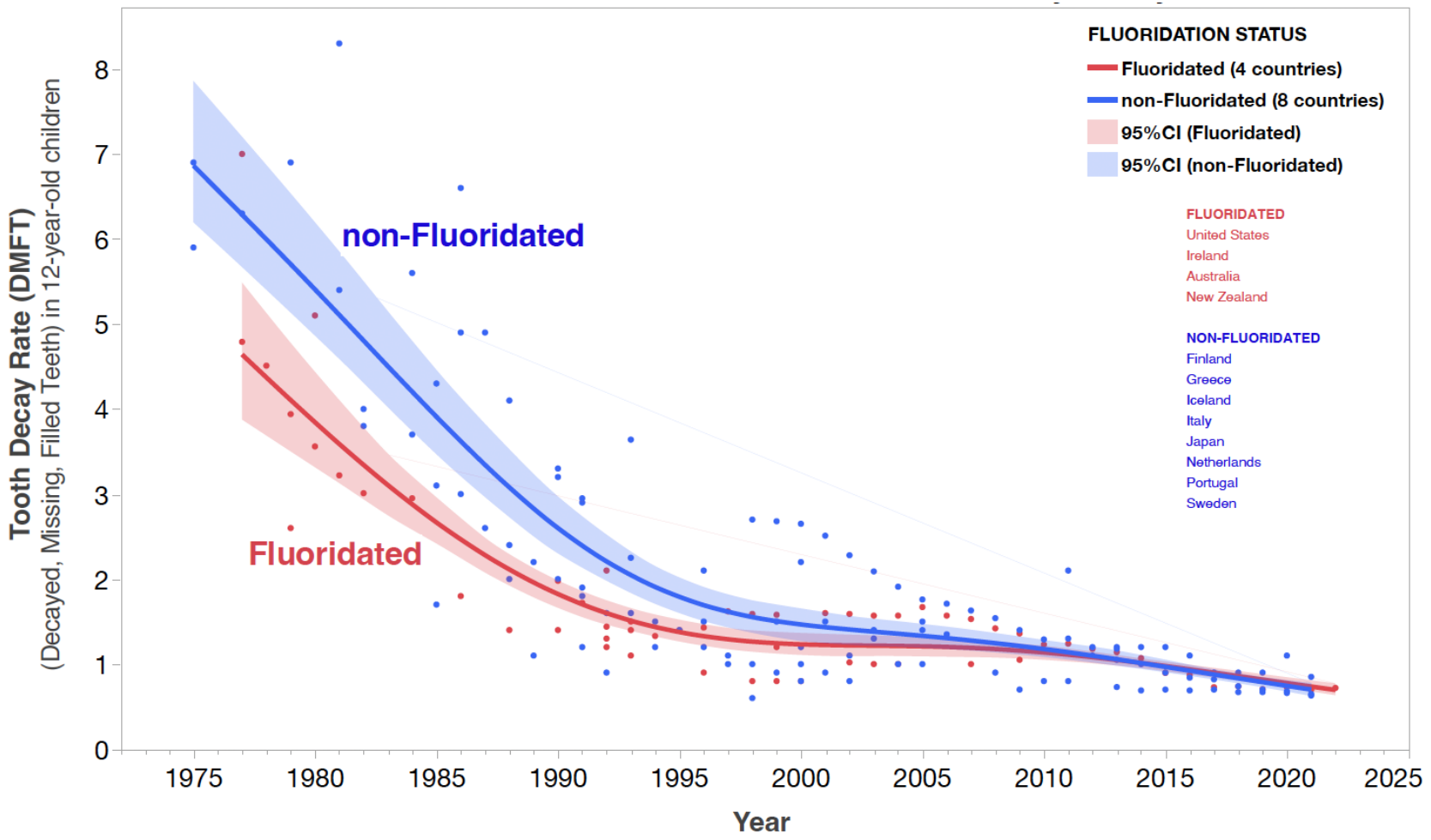
very little common cause variation

http://mchb.hrsa.gov/oralhealth/portrait/1cct.htm **National Survey of Children's Health.**
U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau.
The National Survey of Children's Health 2003. Rockville, Maryland: U.S. Department of Health and Human Services, 2005
http://www.cdc.gov/oralhealth/waterfluoridation/fact_sheets/states_stats2002.htm http://pubs.usgs.gov/circ/2004/circ1268/htdocs/table05.html

No one knows what caused the huge decline in caries before or after Fluoride was marketed with intent to prevent dental caries



World Health Organization (WHO) Data
Comparing Fluoridated and Non-Fluoridated Developed Nations
Average cavity rates in both declined dramatically and are now indistinguishable



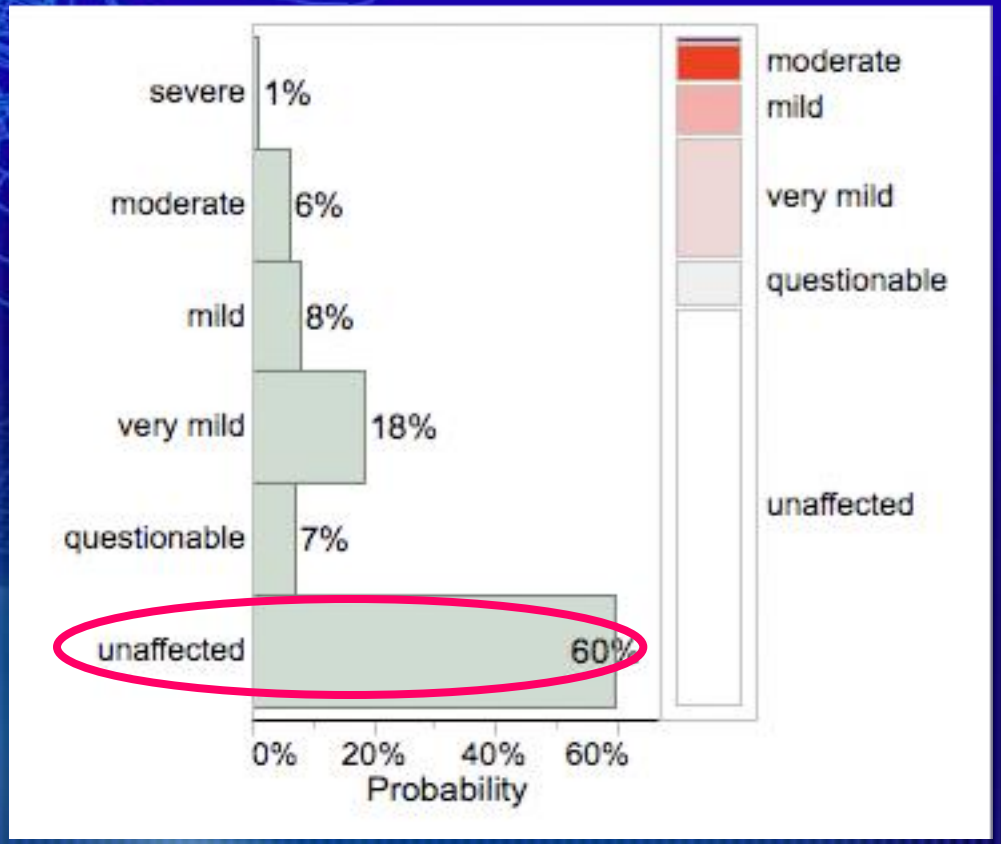
- WHO data available from: https://capp.mau.se
- The fluoridated nations have at least 60% of their populations with artificially fluoridated water while non-fluoridated nations have 0%.
- Non-fluoridated nations do not have significant sales of fluoridated salt.
- The large majority of countries in the world have no artificial fluoridation. Only 2% of the population of Europe has fluoridated water.

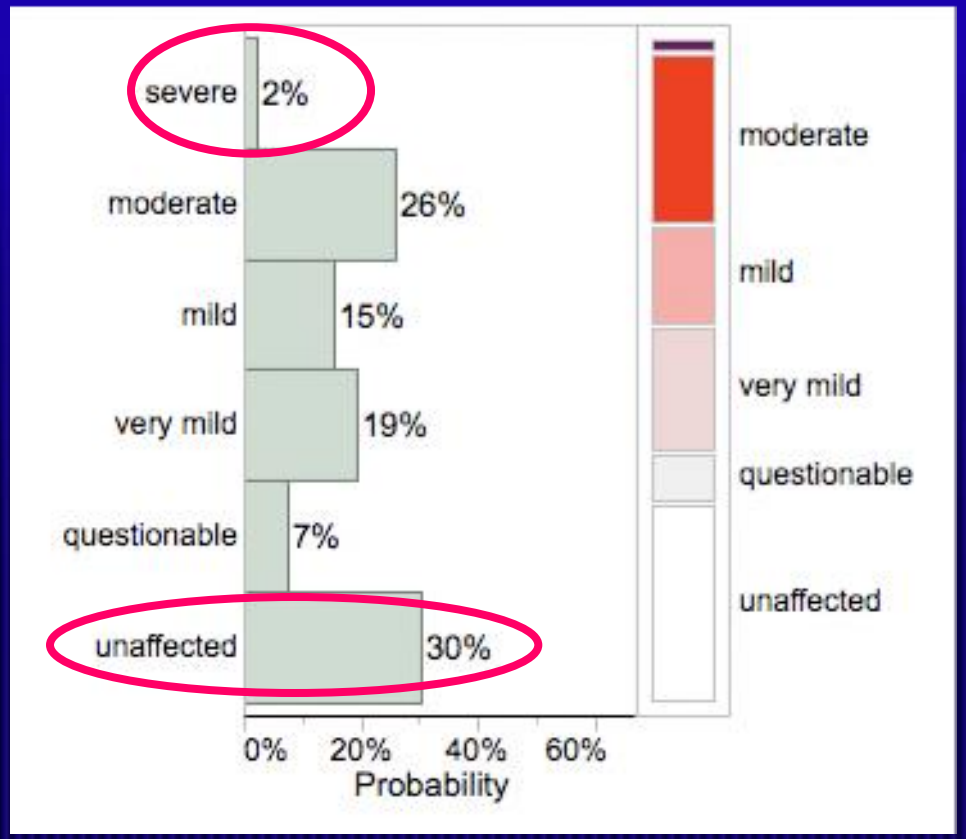
HUGE INCREASES IN DENTAL FLUOROSIS

If 1% have Severe DF ≈ 2,200,000 in USA

40% of children , NHANES 2000

70% NHANES 2012





Most European dental associations no longer recommend fluoride supplements, along with IAOMT, AAEM, AAIM, and regulatory agencies and authorities in:

Austria REJECTED: "toxic fluorides" NOT added

Belgium REJECTED: encourages self-determination – those who want fluoride should get it themselves.

Finland STOPPED: "...do not favor or recommend fluoridation of drinking water. There are better ways of providing the fluoride." A recent study found ..."no indication of an increasing trend of caries...."

Germany STOPPED: A recent study found no evidence of an increasing trend of caries

Denmark REJECTED: "...toxic fluorides have never been added to the public water supplies in Denmark."

Norway REJECTED: "...drinking water should not be fluoridated"

Sweden BANNED: "not allowed". No safety data available!

Netherlands REJECTED: Inevitably, whenever there is a court decision against fluoridation, the dental lobby pushes to have the judgment overturned on a technicality or they try to get the laws changed to legalize it. Their tactics didn't work in the vast majority of Europe.

Hungary STOPPED: for technical reasons in the '60s. However, despite technological advances, Hungary remains unfluoridated.

Japan REJECTED: "...may cause health problems...." The 0.8 -1.5 mg regulated level is for calcium-fluoride, not the hazardous waste by-product which is added with artificial fluoridation.

Israel SUSPENDED mandatory fluoridation until the issue is reexamined from all aspects.: June 21, 2006 "The labor, welfare and health Knesset committee" Maybe increase in costs?

China BANNED: "not allowed"

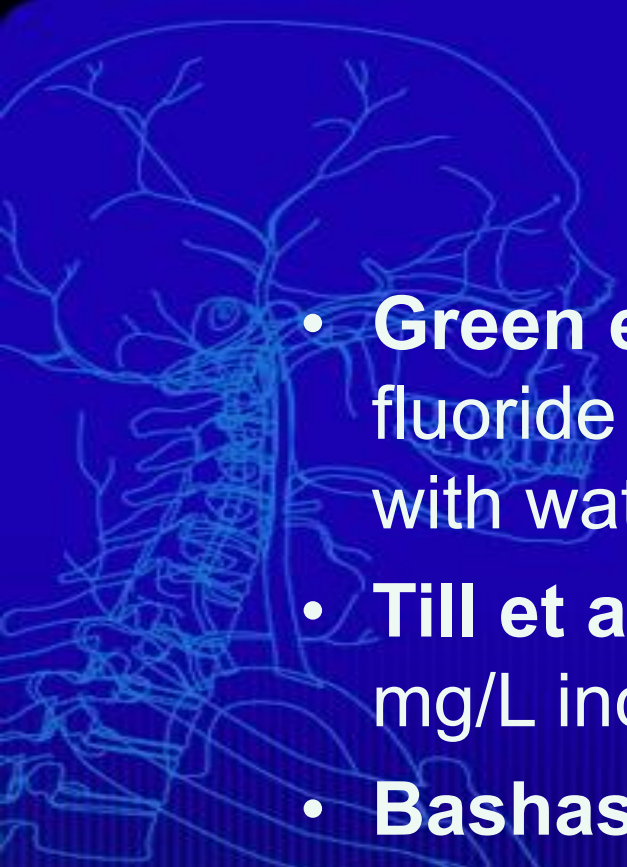
British Columbia, Most of Canada--stopped

Over 150 cities in the USA—stopped or after review, rejected.

Growing number in Washington State have rejected or stopped fluoridation, 56% do not add fluoride, some natural CaF.

JUDGMENT

» Certainty of Harm vs Certainty of Safety



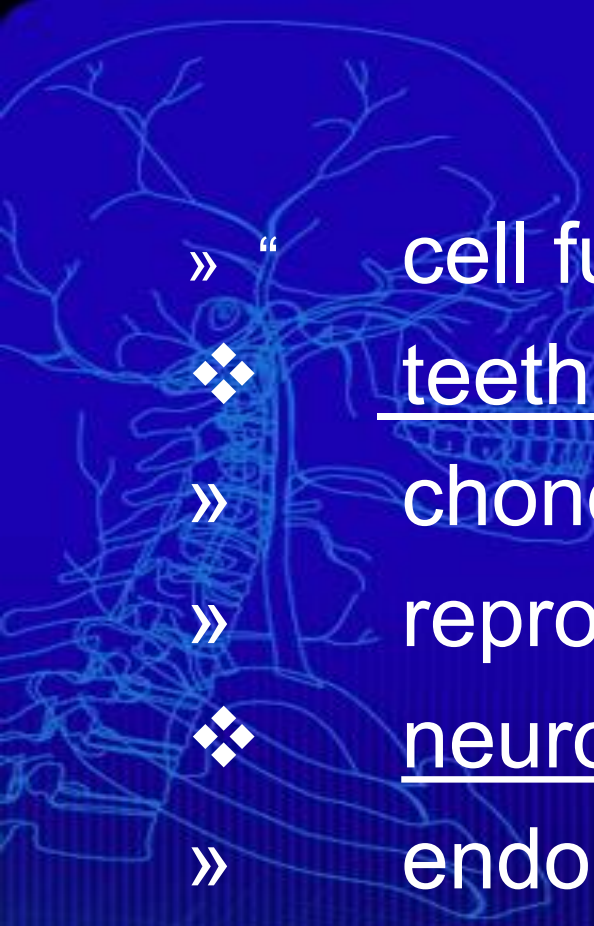
Fluoride Ingestion Is Linked to Neurodevelopmental Harm

- **Green et al. (2019, JAMA Ped):** Maternal urinary fluoride levels correlated with lower IQ in male children with water fluoridation.
- **Till et al. (2020, Envi Int):** 3.7-point IQ decline per 0.5 mg/L increase in water fluoride.
- **Bashash et al. (2017, EHP):** 5–6 point drop in child IQ with higher maternal urinary fluoride in Mexico.
- **National Toxicology Program Monograph (2020), affirmed by NASEM (2023):** Concluded fluoride is "presumed to be a cognitive neurodevelopmental hazard to humans."
- Federal Court: (2024) CWF is an unreasonable risk.

Lowering IQ lowers SES, fluoride ingestion may inadvertently **increase dental caries risk**, especially among the poor.

This creates a **self-reinforcing loop** in which the "solution" worsens the problem:

The NRC (2006) RISKS



- “ cell function (mitochondria),
- teeth, skeleton, arthritis,
- chondrocyte metabolism,
- reproductive and developmental effects,
- neurotoxicity, neurobehavioral effects,
- endocrine system,
- thyroid,
- gastrointestinal,
- renal, hepatic, and immune systems,
- genotoxicity, and carcinogenicity.

Molecular Mechanism of Fluoride-Induced Toxicity and Associated Health Hazards. Chauhan (2025)

https://link.springer.com/chapter/10.1007/978-3-031-77247-4_5

- *"Fluoride toxicity: oxidative stress, upregulates hormonal mechanisms, causing hormonal disruption. . . bone deformity . . . dental fluorosis, Skeletal fluorosis . . . bone and joint abnormalities. . . hampers ATP formation . . . alters metabolic and reproductive hormones, . . . impaired spermatogenesis, . . . reduced sperm quality, and infertility. . . liver damage. . . genetic damage to DNA, IQ deficits, and increased risk of developmental abnormalities. Neurological impacts involve structural changes in the brain, memory issues, and neuronal loss. . . affects cellular organelles, inducing oxidative stress, apoptosis, and disrupting hormonal balance . . .transcription factors, and protein synthesis. It alters different genes implicated in bone metabolism, hormone signaling, and immune function, which leads to harmful impacts of fluoride on human health."*

Session 1 Reactor Panel

REAGAN-UDALL FOUNDATION FOR THE FDA

Linda Birnbaum, PhD, DABT, ATS

University of North Carolina at Chapel Hill

David Krol, MD, MPH, FAAP

American Academy of Pediatrics representative

Scott Tomar, DMD, DrPH

University of Illinois Chicago College of Dentistry

BREAK

The meeting will resume at 11am ET

REAGAN-UDALL FOUNDATION FOR THE FDA

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Valerie Heaton

Lived Parent Experience

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Jennifer Webster-Cyriaque, DDS, PhD

National Institutes of Health

National Institute of Dental and Craniofacial Research

Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Jennifer Webster-Cyriaque DDS PhD, Acting Director,
National Institute of Dental and Craniofacial Research
National Institutes of Health

National Institute of Dental and Craniofacial Research

Addressing the unknowns:
Safety Concerns and Potential Risks …

Continuous Discovery for the Truth

Persistent and active search through science

- HHS Roundtable

- Call to Action
  A. Bolster Research on Fluoride Safety and Risks

    a. Four Examples of Large-Scale Efforts
      1. Home Water Fluoride Exposures and Untreated Tooth Decay in U.S. Children Engaging in Oral Hygiene
      2. HEALthy Brain and Child Development (HBCD) Study
      3. Environmental Influences on Child Health Outcomes Study (ECHO)
      4. Adolescent Brain Cognitive Development (ABCD) Study

    b. Other ongoing Efforts

  B. Empower the American people to make an Informed Decision

State of the Science:
Community Water Fluoridation Risks and Benefits

- Representatives across the U.S. Department of Health and Human Services gathered in a "Roundtable" format in September 2024
- Discussion topics:
  - Risks and benefits of fluoride
    - Recent meta-analysis/state of the science- National Toxicology Program
    - Fluoride mechanisms and role in dental disease- NIDCR
  - Past efforts
  - Funded studies active/ongoing in the field
  - Needed future studies and study design
  - Importance of messaging to empower the community with knowledge
  - Safety and efficacy

Call to Action

REAGAN-UDALL FOUNDATION FOR THE FDA

1. **Bolster research and interagency collaborations to:**
    a. answer questions about fluoride's impacts on Americans' health
    b. develop comprehensive multi-level approaches for untreated tooth decay
2. **Empower the American people** to make informed decisions about fluoride and fluoride supplement use

A. Bolster Research and Interagency Collaborations

NIDCR's ongoing research and collaboration strategies:

- Tapping into existing public health surveillance data
- Leveraging ongoing, large-scale, longitudinal studies
- Encouraging reusing large data sets for new analyses
- Supporting investigator-initiated research

Four Examples of Large-Scale Efforts……

Large-Scale Efforts

REAGAN-UDALL FOUNDATION FOR THE FDA

1. Home Water Fluoride (HWF) Exposures and Untreated Tooth Decay in U.S. Children Engaging in Oral Hygiene
2. HEALthy Brain and Child Development Study
3. NIH Environmental influences on Child Health Outcomes (ECHO) Program
4. Adolescent Brain Cognitive Development (ABCD) Study

Large well characterized cohorts, representative of the US….

1. Home Water Fluoride Levels in the U.S.

Tapping into existing public health surveillance data

FOR THE FDA

- National Health and Nutrition Examination Survey (NHANES): national survey of children and adults, including health outcomes, exams, and laboratory test results
- NIDCR conducted an exploratory analysis of NHANES data to assess the range of **home water fluoride levels** in 8087 homes of U.S. children/adolescents aged 0-19,

Home Water Fluoride Level	Percent of U.S. Homes	Health Outcomes
undetectable	12.34%	
0.35mg/L or less	40.42%	Half of the recommended level or less for dental health benefits
0.52mg/L		*Mean level of fluoride in the US* • *3x below levels associated with neurocognitive risk* • *4x below levels associated with dental fluorosis*
0.70mg/L or less	70.6%	At recommended level or less for dental health benefits
1.5mg/L or more	1.94%	

Data source: NHANES 2013-2016 survey years

1. Home Water Fluoride (HWF) Exposures and Untreated Tooth Decay in U.S. Children Engaging in Oral Hygiene

- **12.34% of U.S. homes do not have detectable Fl- levels in their water**, children brushing with toothpaste in these homes experienced a 22.2% prevalence of untreated tooth decay.

- Multiple preventive exposures to fluoride, including brushing/using toothpaste, HWF, and access to needed dental care were all significantly associated with decreasing tooth decay. Brushing and using toothpaste alone was not enough.

- The prevalence of untreated decay decreased with increasing HWFL. However, even with increasing HWFL, lack of access to needed dental care was predictive of untreated tooth decay.

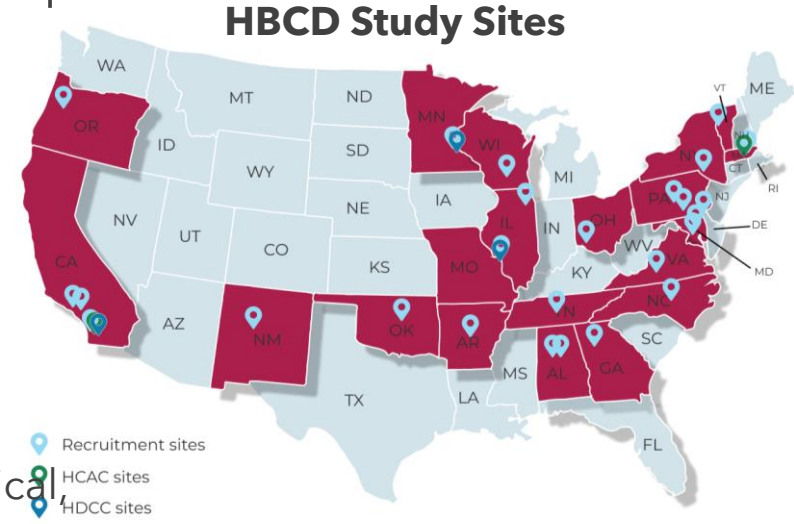
Data source: NHANES 2013-2016 survey years

S Jackson et al, unpublished

2. HEALthy Brain and Child Development Study

Leveraging ongoing, large-scale, longitudinal studies

- Biological, social, and environmental factors influence physical growth and brain development, which can potentially exert long-lasting impact on developmental trajectories and future health outcomes
- HEALthy Brain and Child Development (HBCD) study design:
  - Multi-site, longitudinal, prospective study with 27 U.S. research sites
  - Enrolling 7,000+ pregnant participants
  - Following participants and their children for up to 10 years
- Study objectives:
  - Characterize early life brain development using medical exams and biological, behavioral, and environmental contextual assessments
    - **Starting FY 2026: including water fluoride and other ingestible fluoride exposures**
  - Identify and understand the developmental impacts of various risk and resilience factors
    - **Starting FY 2026: including cumulative fluoride exposure during pregnancy, infancy, and childhood**



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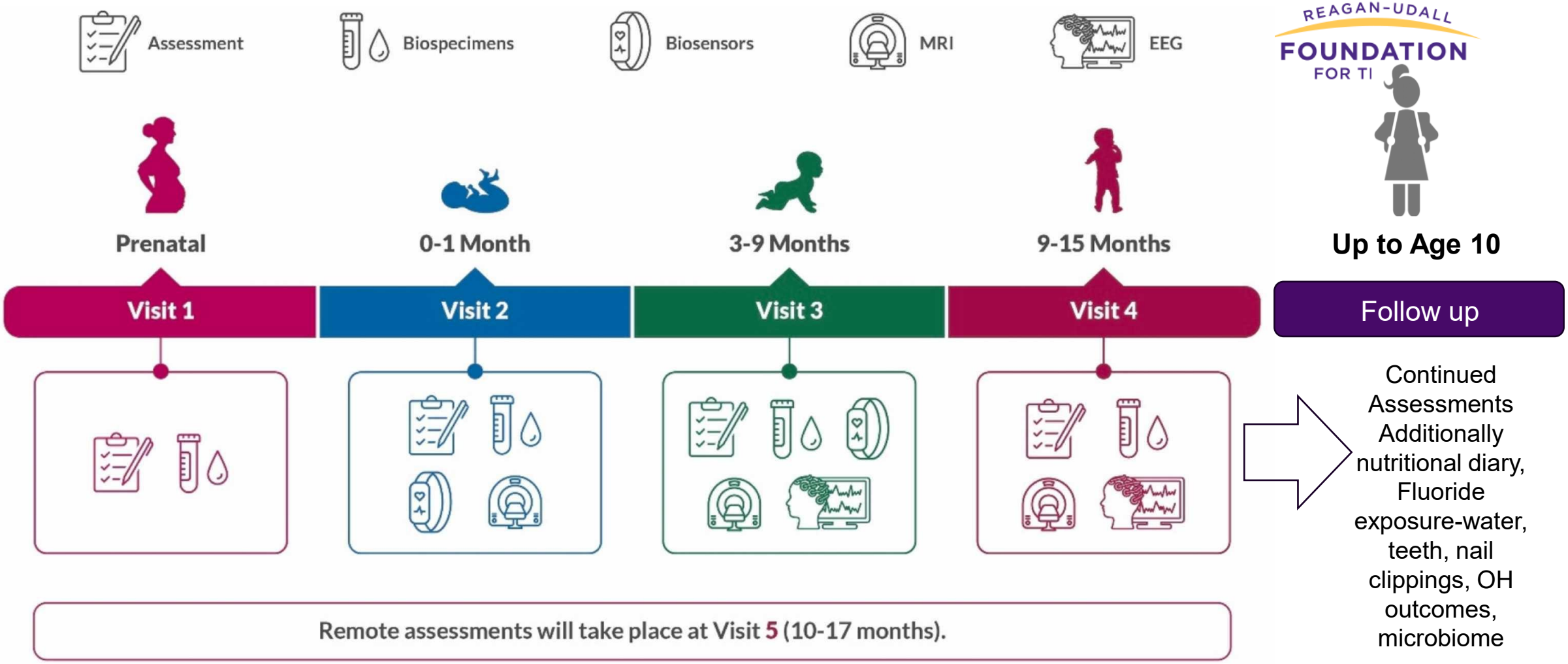
HBCD Overview (con't)



Fluoride exposures across the full study period will be captured and assessed in the context **of neurodevelopment and other health outcomes**

3. NIH Environmental influences on Child Health Outcomes (ECHO) Program

Encouraging reusing large data sets for new analyses

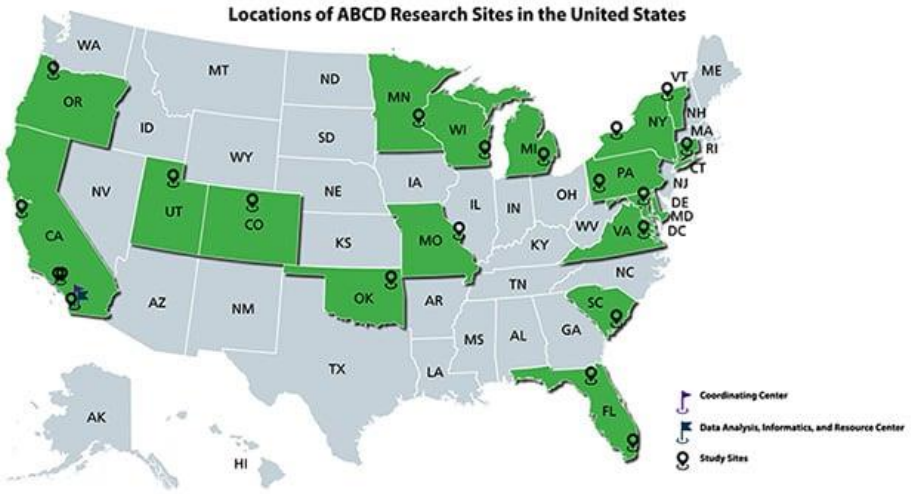
- ECHO Program study design:
  - Includes 44 states, 180+ health care institutions, 1,200+ researchers
  - 64,000+ children in longitudinal observational cohort
  - Examines the impact of a broad range of early environmental influences on child health and development
- Relevant study highlights:
  - Study data can help assess fluoride exposure
    - **Fluoride supplement use**
    - **Fluoridated water exposure**
  - Health outcomes that could be assessed include:
    - Cumulative fluoride exposure (teeth)
    - Thyroid health
    - Oral and gut microbiome
    - Inflammation
    - Others
  - Biospecimens- Teeth, Saliva, Stool, Blood

Image source:

4. Adolescent Brain Cognitive Development (ABCD) Study

Leveraging ongoing, large-scale, longitudinal studies

- **The ABCD Study is the largest long-term study of brain development and child health in the United States**
  - Coordinating Center
  - Data Analysis, Informatics, & Resource Center
  - **21 research sites** across the U.S.
  - **11,880 children** ages 9-10 have been invited to participate
- **Study aims to determine how childhood experiences interact with each other and with a child's changing biology to affect brain development and social, behavioral, academic, health, and other outcomes**
  - **Will examine experiences like sports, video games, social media, unhealthy sleep patterns, smoking, and water fluoride or fluoride supplement exposure**



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Selected NIDCR Efforts Related to Diet and Nutrition

Supporting investigator-initiated research and interagency collaborations

- Longitudinal studies assessing fluoride dietary intake, including supplements
- NIDCR/FDA collaboration
  - Examining impact of dietary intake of added sugars (ongoing systematic review)
- NIDCR nutrition initiatives
  - Impact of dietary influences on comprehensive health through the oral microbiome
  - Nutrition for maintenance of healthy oral tissues
  - Nutritional behavioral interventions in the dental setting

NIDCR Supports Mechanistic, Toxicology, and Multi-level Intervention Studies

Supporting investigator-initiated research

- Studies focused on protection from potential toxic effects of high-level fluoride exposure
  - Modulating a fluoride-induced adaptive response pathway (SIRT1)
  - Use of antioxidants to mediate fluoride-induced oxidative stress
- Multiple projects on mechanisms of dental fluorosis
  - Genetic susceptibility studies
  - Modulation of processes specific to dental tissues and extraoral tissues
- Developing and deploying comprehensive multi-level approaches to address untreated tooth decay
  - Working with care providers
  - Working with patients and their families
  - Working with communities

NIDCR Supports Mechanistic, Toxicology, and Multi-level Intervention Studies

Caveats and Gaps in the Scientific Literature

- Most research models use extremely high levels of fluoride to induce symptoms of fluorosis
  - Studies may use 10- >150+mg/L of fluoride
  - **Pro:** Provides an opportunity to understand effects of extremely high-level exposures
  - **Con:** Makes relevant comparisons of animal and human studies difficult to assess
- Research opportunity: Studies using <2mg/L fluoride
  - Levels present in ingestible fluoride products
  - Approaches that address anticipated cumulative fluoride levels

2. Empower the American people. Strengthening Public Trust in Science

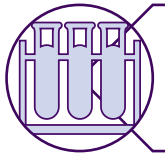
REAGAN-UDALL FOUNDATION FOR THE FDA

Action: Exemplify and promote the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science

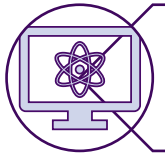
Action: Provide unbiased data and information on risks and benefits to the public through expanded science publications, website presence, and fact sheets

Transparency

Scientific Rigor



Reproducibility



Open Science

2. Empower the American People

- NIDCR facilitates informed decision making by supporting the generation of high-quality evidence
- Decision making involves many considerations:
  - Health
  - Ethical
  - Legislative
  - Political
  - Economic
  - Social
  - Others

Image source: Adobe Stock

Call to Action

REAGAN-UDALL FOUNDATION FOR THE FDA

Bolster research and interagency collaborations

- To fully understand the impact of fluoride exposure at levels present in the U.S. in water and ingestible products by:
  - Tapping into existing public health surveillance data
  - Leveraging ongoing, large-scale, longitudinal studies
  - Encouraging reusing large data sets for new analyses
  - Supporting investigator-initiated research
- Continue developing and deploying comprehensive multi-level approaches to address untreated tooth decay
- Continue collaborations across U.S. Department of Health and Human Services (HHS), the National Toxicology Program (NTP), and National Institutes of Health (NIH)

Empower the American people to make informed decisions about fluoride use

- Facilitating informed decision making by supporting the generation of high-quality evidence
- Strengthening public trust in science

Thank you

National Institute of Dental and Craniofacial Research

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Oral and Gut Microbiome

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Purnima Kumar, BDS, MDS, PhD

University of Michigan School of Dentistry

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Fluoride and the gut microbiome

Purnima Kumar BDS, MDS, PhD
William and Mary K. Najjar Endowed Professor
Chair, Department of Periodontics, Oral Medicine and Dental Hygiene
University of Michigan

kpurnima@umich.edu

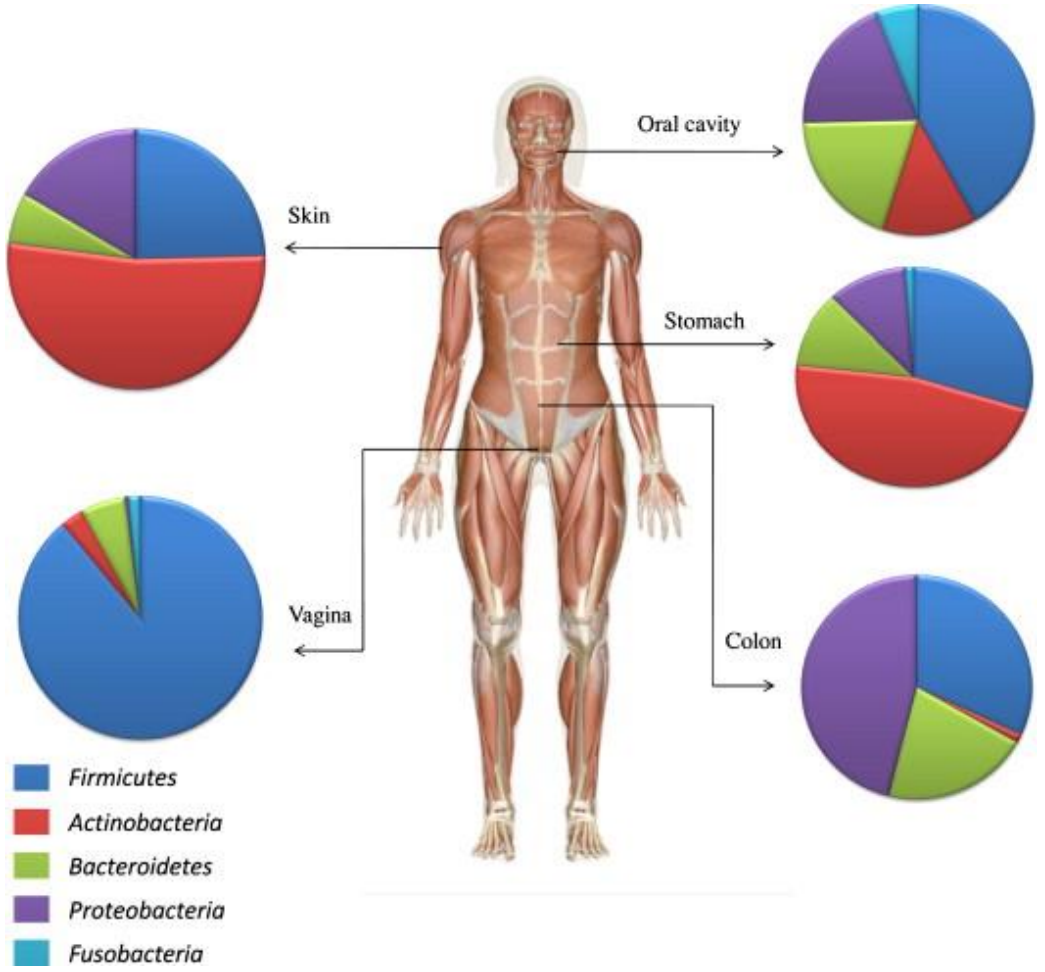
Conflict of interest

None pertinent to this presentation or panel discussion

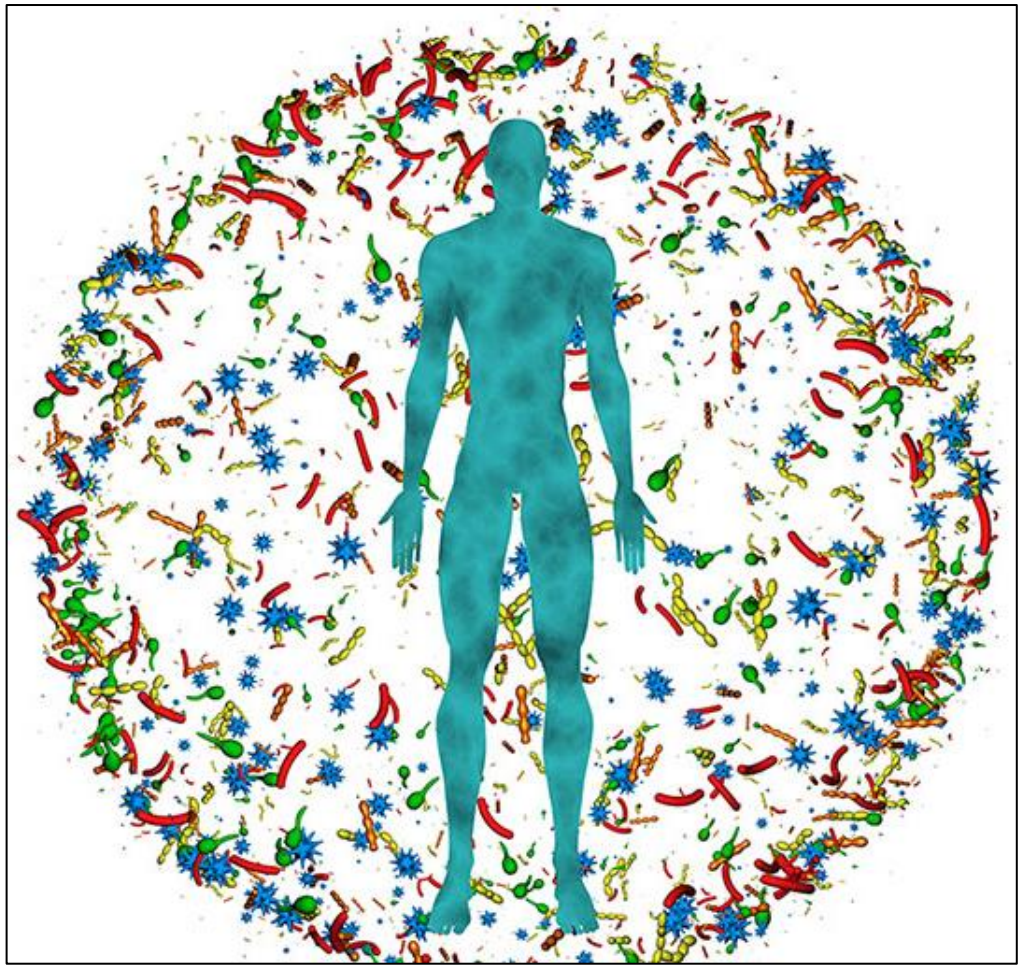
The microbiome: What is it?

The collective community of microorganisms that reside in a specific environment, their genes, interactions, and the products they produce.

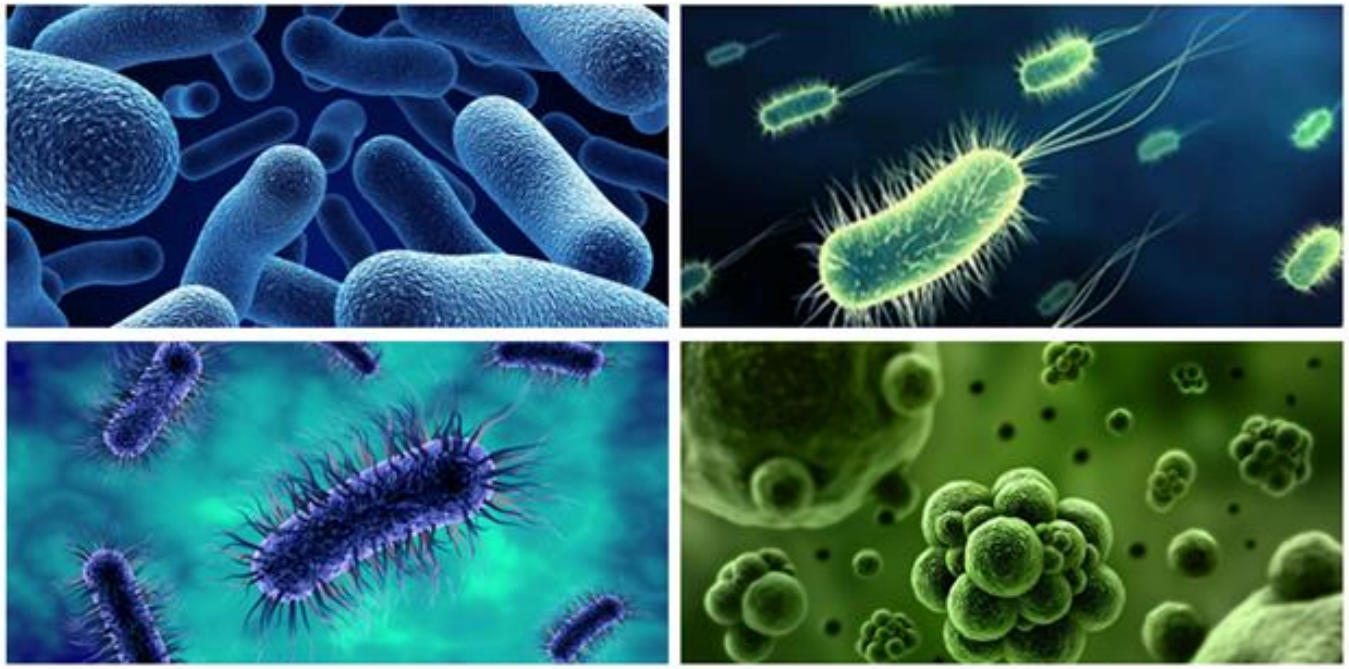
- Soil microbiome
- Water microbiome
- Termite microbiome
- Human microbiome



Micro-organisms



https://www.niehs.nih.gov



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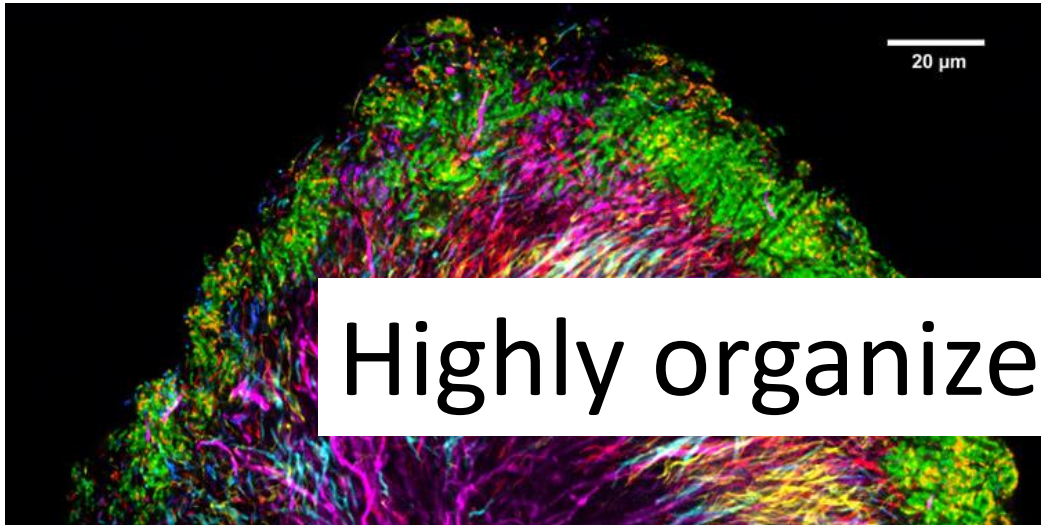
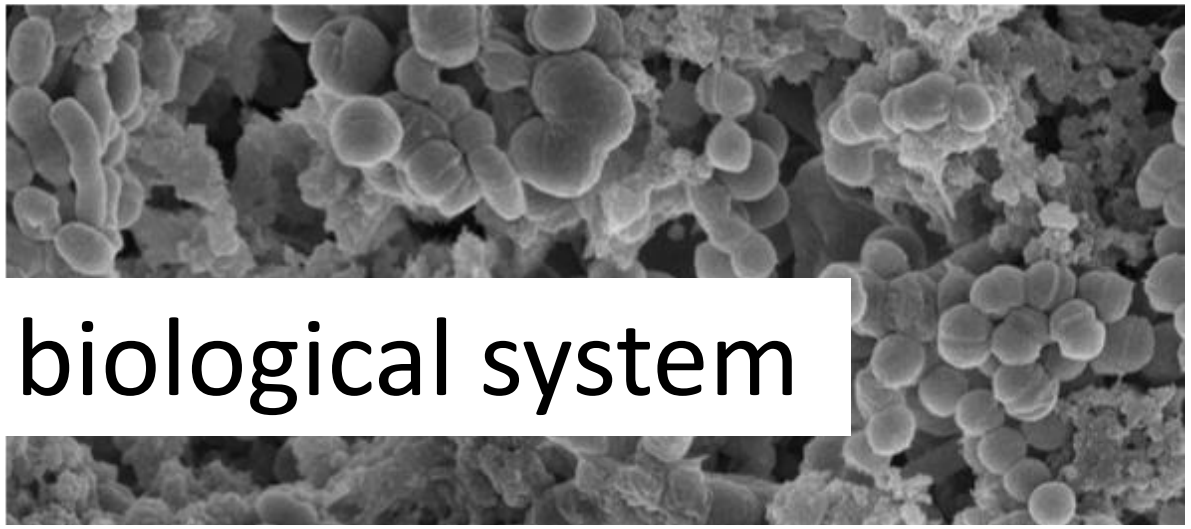
ewiki

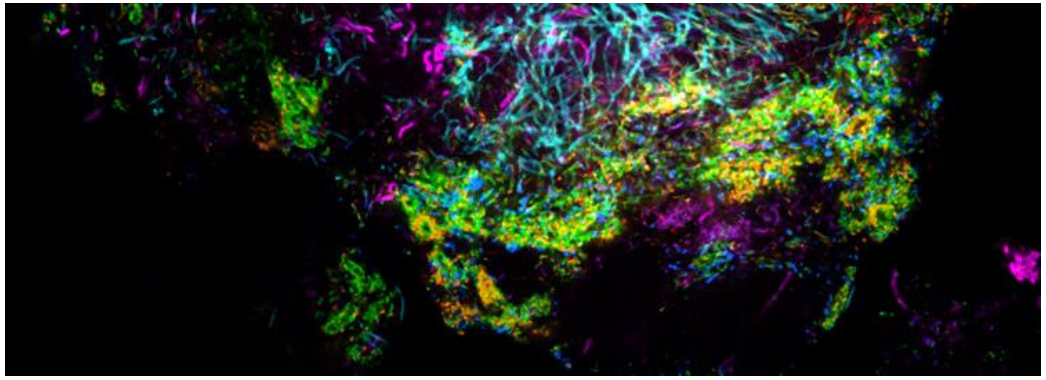
Microbiome: The super-organism in/on you

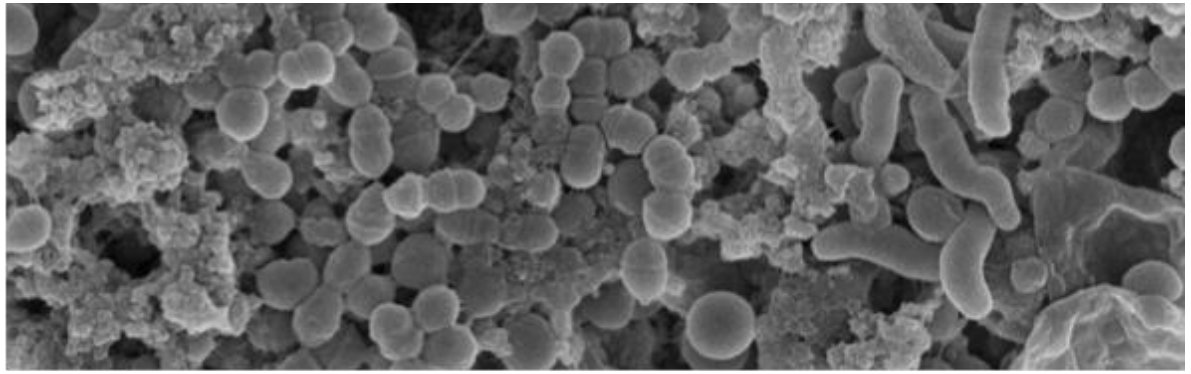




Highly organized biological system

Structurally and metabolically cooperative communities

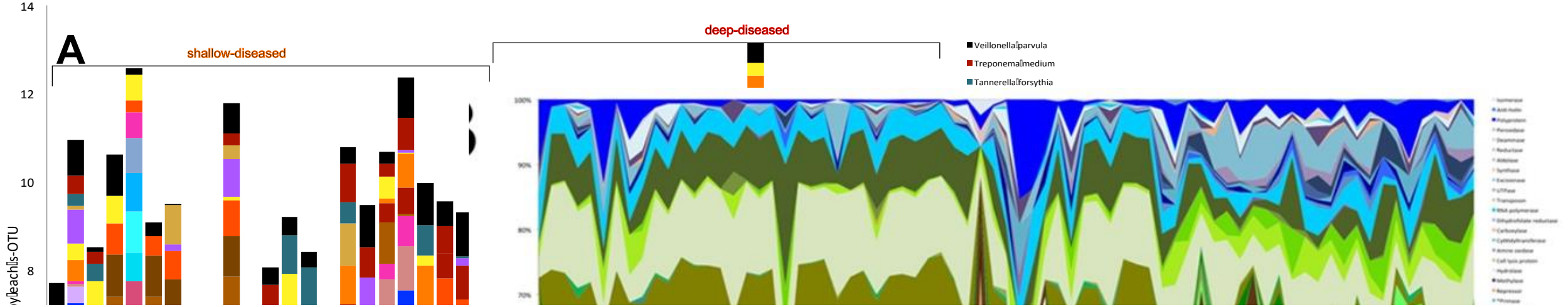




BorisyLab, ADA-Forsyth Institute

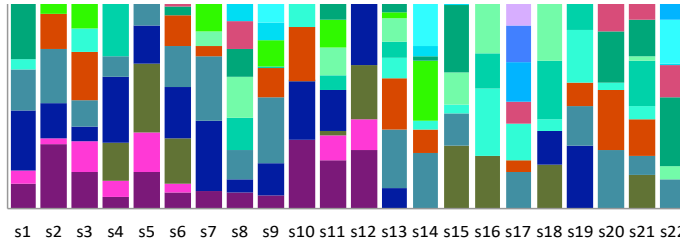
Kumar Lab, University of Michigan

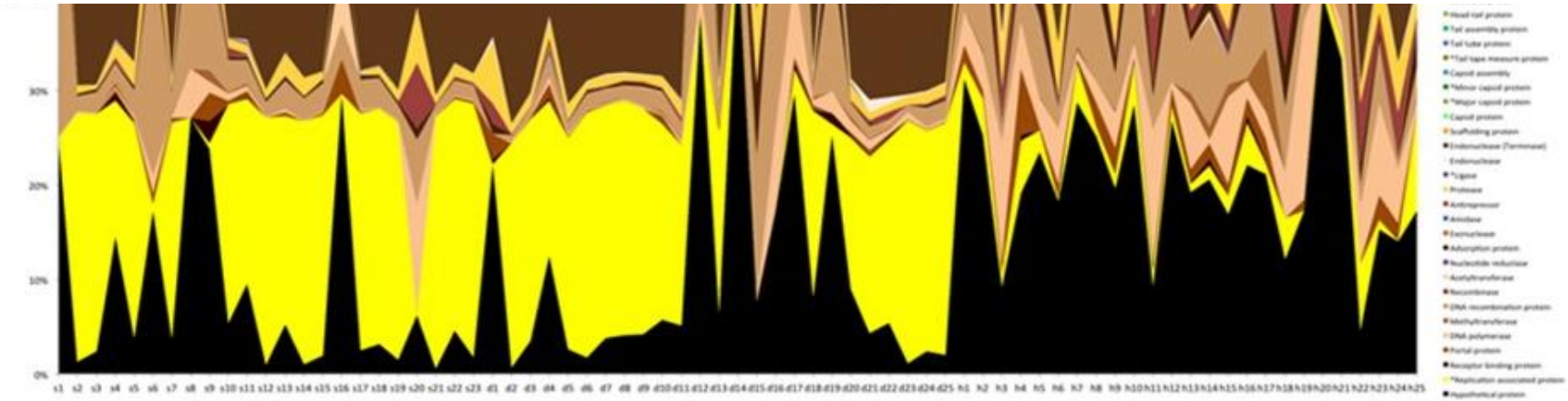
Microbiome: The super-organism in/on you



Multi-kingdom communities (bacteria, fungi, virus)

Inter-kingdom interactions drive health or disease





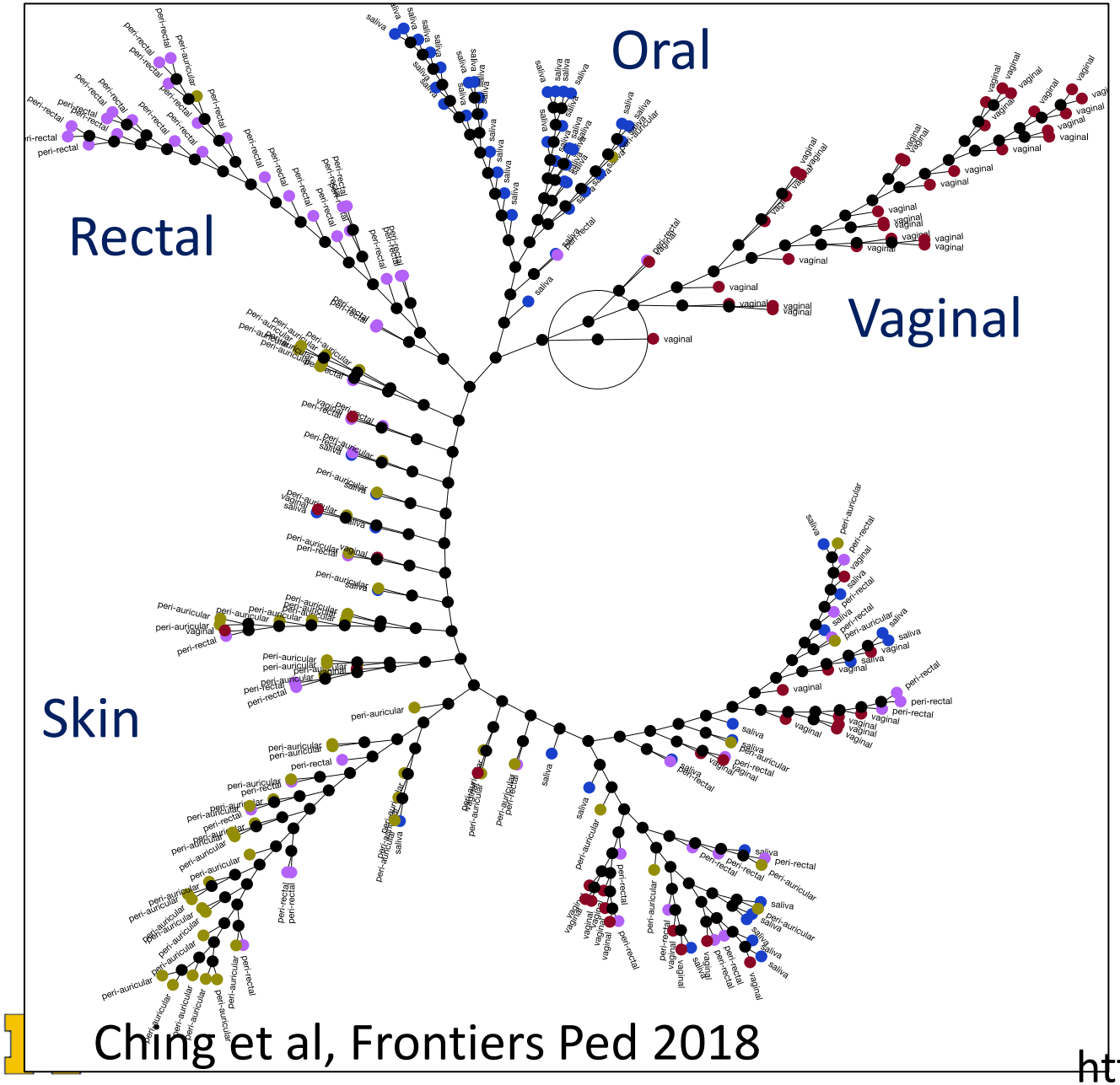
Ku

Lessons from antibiotic sensitivity testing

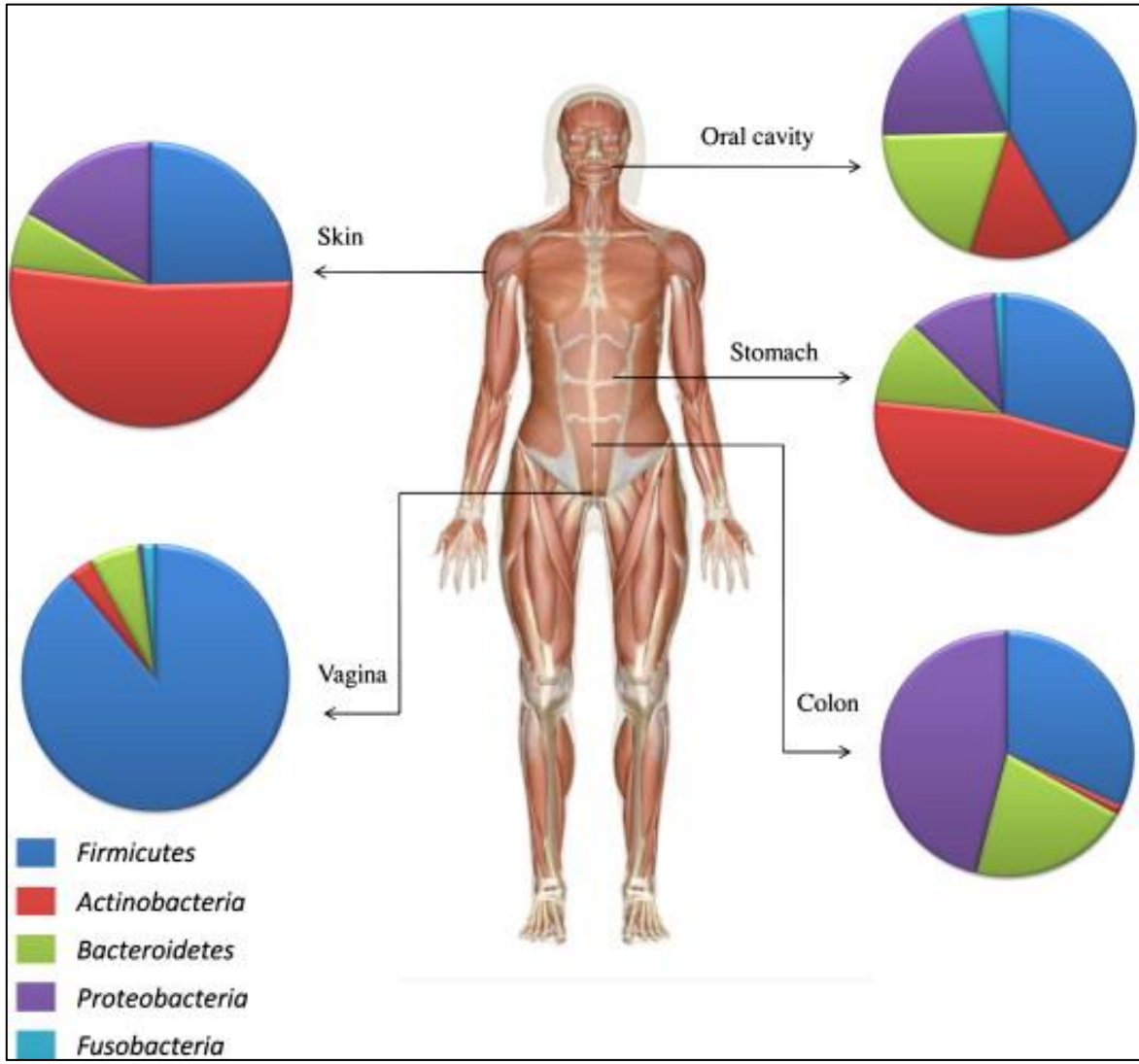
Picture from Adobe Creative Commons (license to UofM)

Microbiome = ecosystem

Microbiome physiology is habitat-specific



Ching et al, Frontiers Ped 2018



https://www.nature.com/articles/s41579-024-01075-5

Microbiome physiology is habitat-specific

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Journal of
PERIODONTAL RESEARCH

SCFA in gut= Health

SCFA in mouth=Disease

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Review Article | Published: 11 August 2015

Short-chain fatty acids in control of body weight and insulin sensitivity

Emanuel E. Canfora, Johan W. Jocken & Ellen E. Blaak

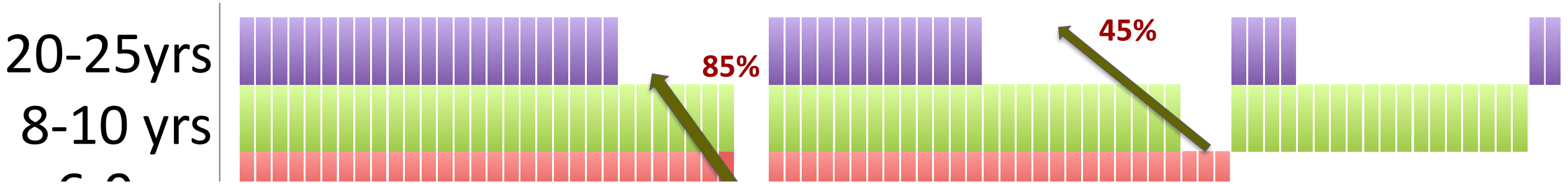
Nature Reviews Endocrinology **11**, 577–591 (2015) | Cite this article

Microbiome physiology is habitat-specific

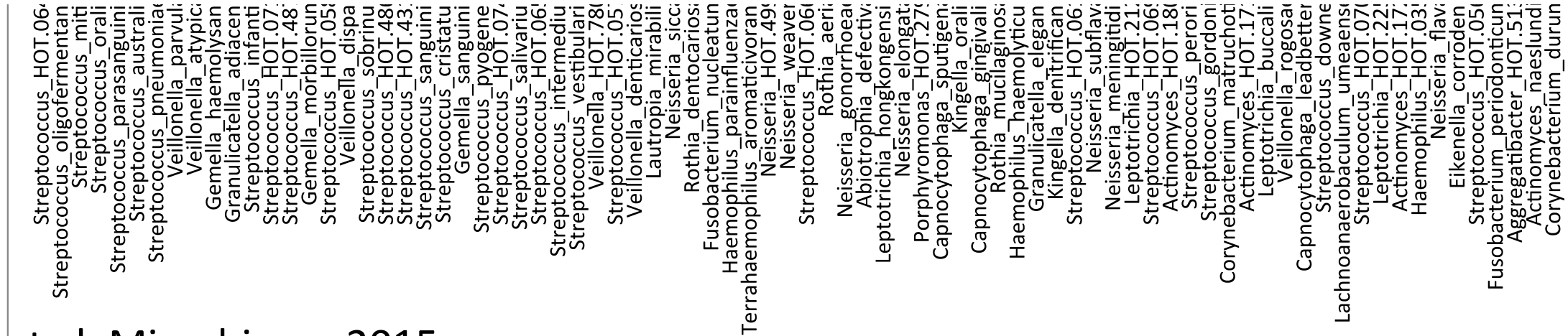
Probiotics in gut= Work

Probiotics in mouth=?

Foundations of healthy adult microbiome established early in life



Pioneer species are key to long-term health



Mason et al, Microbiome 2015

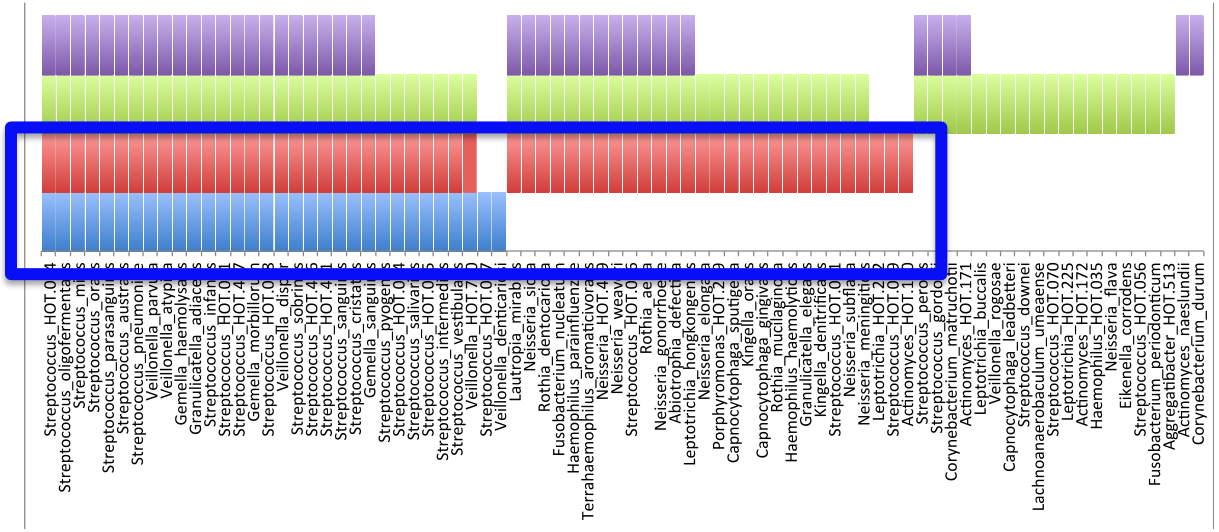
How does fluoride benefit the **oral** microbiome?

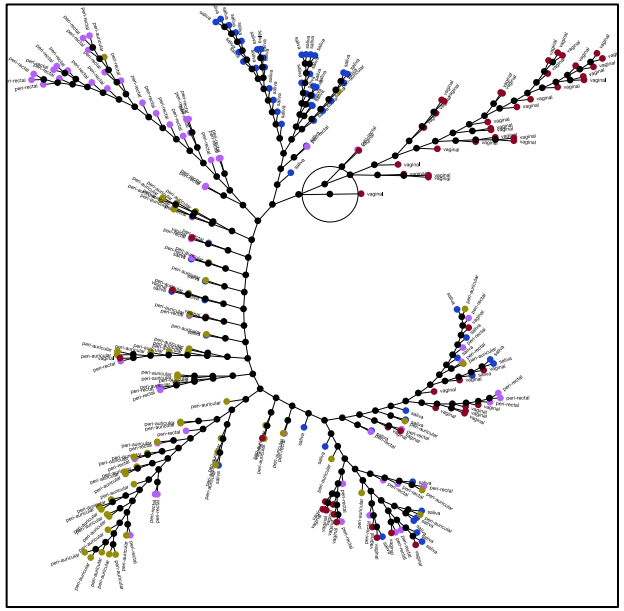
- Interferes with enzymes involved in glycolysis, preventing bacterial energy production
- Inhibits the growth of caries-causing bacteria like *Streptococcus mutans*
- Affects the structure and composition of dental biofilms, making it difficult for pathogen colonization
- Unlike antibiotics, fluoride does not indiscriminately kill good bacteria with bad
- Reduces synergy between cariogenic bacteria and oral fungi

Does fluoride impact the **gut** microbiome?

- **Limited/positive** impact on gut biome in **physiologic** doses (Yasuda 2017, Chen 2020)
- Three human studies (all using **fluorosis** model)
  - Coal-fire-pollution related fluorosis in China (Wang 2023)
    - ❖ 32 adults
    - ❖ 745/ 14,199 OTUs differed between groups
  - Coal-fire-pollution related fluorosis in China (Zhou 2023)
    - ❖ 9 children
    - ❖ 15/158 genera differed
  - Adults with early skeletal fluorosis in Pakistan (Bibi et al 2024)
    - ❖ 70 adults (Urban controls and rural fluorosis subjects)
    - ❖ “Dysbiosis or changes were subtle”

Conclusions





Fluoride helps your pioneer species be better “mouthguards”

Habitat-specificity dictates that the gut and oral microbiomes respond differently

Conclusions

Fluoride in low levels has limited impact on gut microbiome

Only reported effects are on subjects with extreme fluoride exposure

Conclusions

- Major methodological limitations in current studies
  - Micro-organisms rather than microbiome
  - Fluorosis model represents extremes of fluoride exposure
  - Very poorly defined fluoride exposure or QofL
  - Many confounding factors (wood burning creates many other pollutants, not just fluorides) that do not explain fluoride as the discriminating factor
  - Poorly controlled groups, small sample sizes
- Fluoride benefits many individuals with poor access to oral healthcare
- Fluoride benefits individuals with restricted motor function
- Provides parents with choices for their children
- Evidence does not support detrimental effects on the gut microbiome

Thank you

kpurnima@umich.edu

Purnima Kumar BDS, MDS, PhD

William and Mary K. Najjar Endowed Professor
Chair, Department of Periodontics, Oral Medicine and Dental Hygiene
University of Michigan

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Oral and Gut Microbiome

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Gary Moran, BA (mod.), PhD, FTCD

Trinity College Dublin

Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

OSPIDÉAL DÉADACH BHAILE ÁTHA CLIATH
DUBLIN DENTAL HOSPITAL

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride – Gut Microbiome

Prof. Gary P. Moran

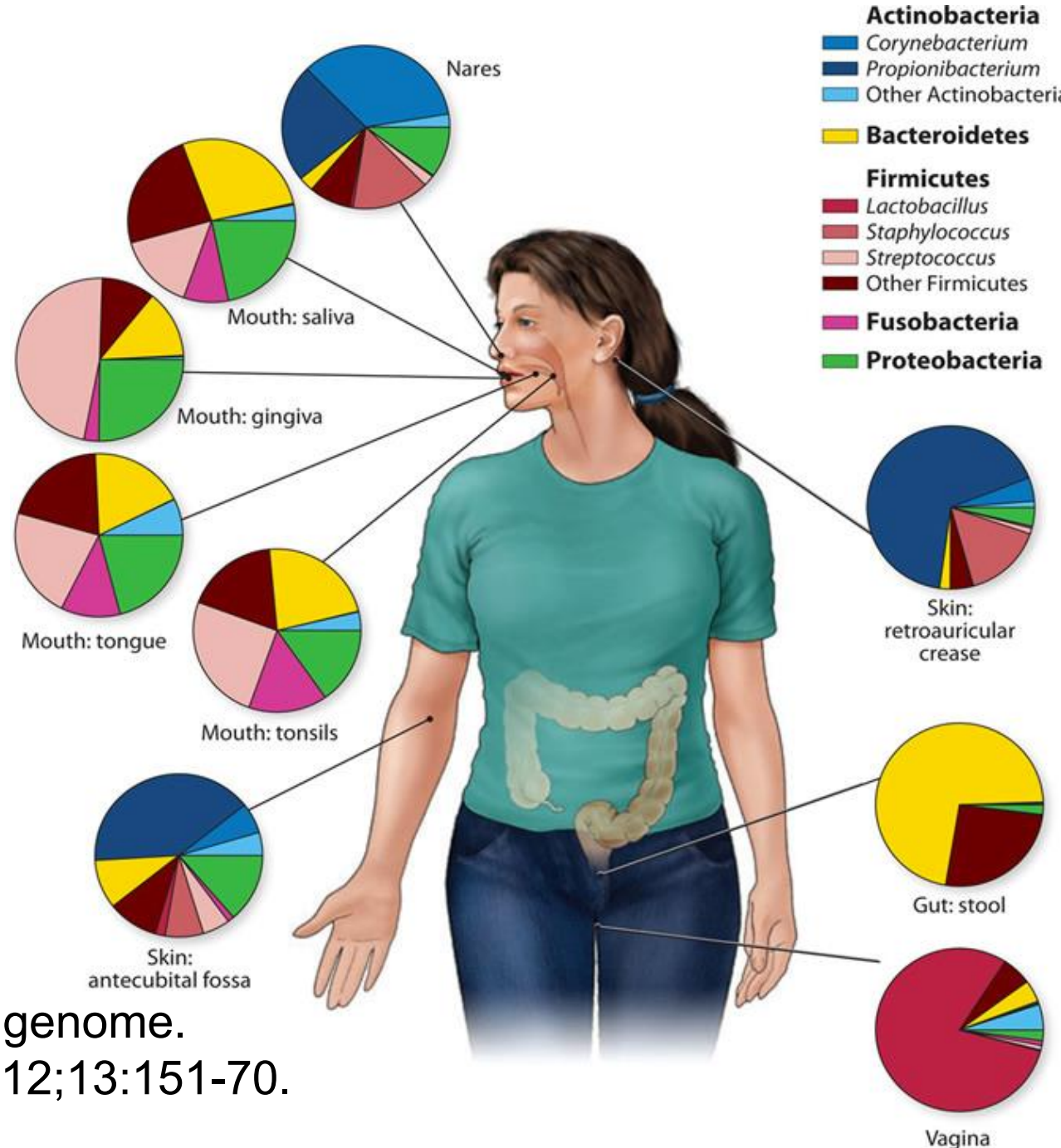
School of Dental Science, Trinity College Dublin
& Dublin Dental University Hospital

Disclosures

No financial interests in fluoride related products

Member of the Expert Body on Fluorides and Health (Ireland)

NIH HUMAN MICROBIOME PROJECT



The human microbiome: our second genome.
Annu Rev Genomics Hum Genet. 2012;13:151-70.

100 TRILLION

The human microbiome is made up of more than 100 trillion bacteria, fungi, protozoa, and viruses that live on and inside the body.

10X

We have 10 times more microbial cells in our body than human cells and the majority live in our guts—especially the large intestine, or colon.

The bacteria in our microbiomes are essential to human health and aid in biological processes such as:

$E=mc^2$

Extracting energy from food

RETINOL
FOLATE
RIBOFLAVIN
BIOTIN
NIACIN

Producing essential vitamins

Regulating our immune system

Regulating our glucose levels and metabolism

Protecting us against disease-causing microbes

100 TRILLION

The human microbiome is made up of more than 100 trillion bacteria, fungi, protozoa, and viruses that live on and inside the body.

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We have 10 times more microbial cells in our body than human cells and the majority live in our guts—especially the large intestine, or colon.

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$E=mc^2$

Extracting energy from food

RETINOL FOLATE RIBOFLAVIN BIOTIN NIACIN

Producing essential vitamins

Regulating our immune system

Regulating our glucose levels and metabolism

Protecting us against disease-causing microbes

Disruption in infancy: allergic disease, obesity

Fluoride

- Strengthens tooth enamel and prevents decay
- Fluoride 50 µg/Kg/day considered optimal
- High levels can lead to dental fluorosis
- Skeletal fluorosis

Ingested Fluoride and the Microbiome?

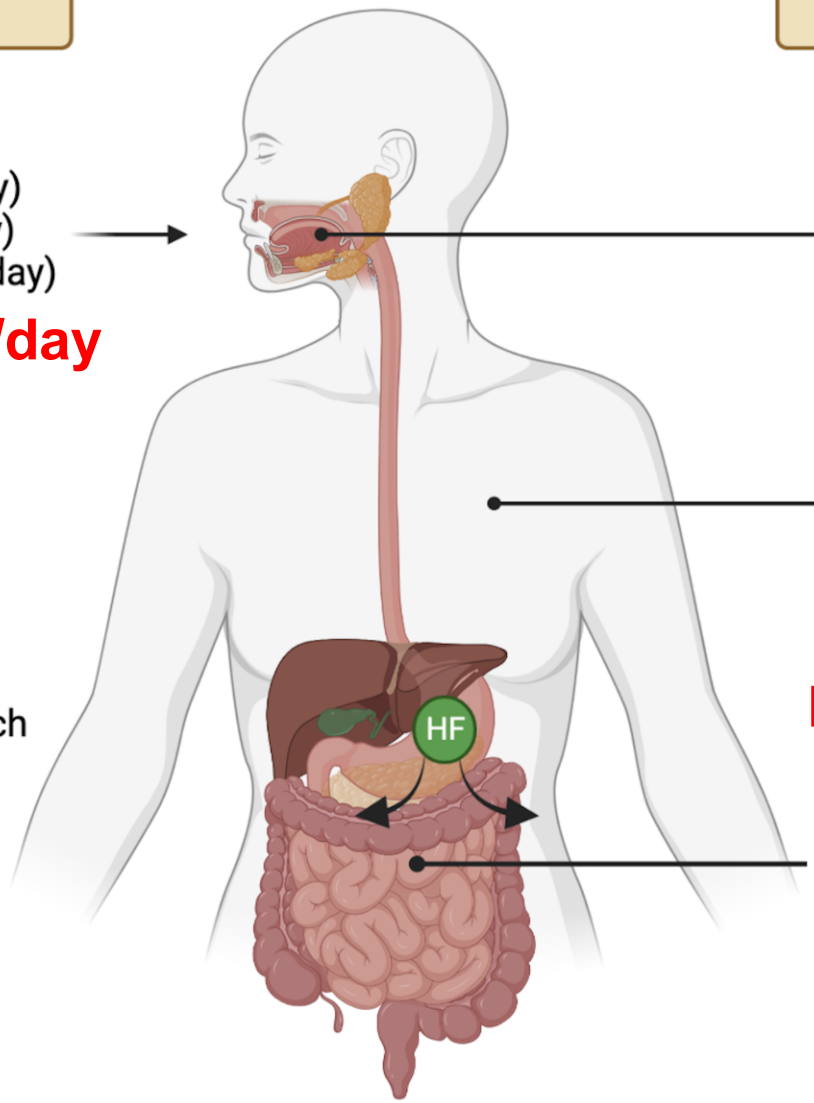
Fluoride: Intake and Absorption

Water (1.86 µg/Kg/day)
Food (5-28 µg/Kg/day)
Toothpaste (1.4 µg/Kg/day)

+Supplements: 50 µg/Kg/day

HF absorbed in stomach and small intestine

Excretion: feces (10%) and urine (50-70%)



Physiological and Microbiome Impact

Oral Cavity

Caries Prevention
Excess: Dental Fluorosis

Skeletal System

Fractures (>100 µg/Kg/day)
Skeletal fluorosis (>120 µg/Kg/day)

Excess: Skeletal Fluorosis

Intestines

Gut Microbiome?

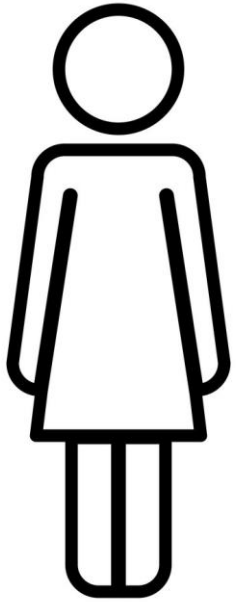
Gut Microbiome: Studies in Animals

- Largely rodent studies
- Differences in fluoride absorption/metabolism
- High Fluoride concentrations used

Zhong et al. (2022)
- 25-100 mg/L Fluoride
- Gut barrier disruption
- Gut Microbiome disruption

Yasuda et al. (2017)
- 4 mg/L Fluoride
- Improved oral microbiome
- Limited impact on gut

Microbiome: Studies in Humans



- One study examined ingestible Fluorides (oral)
- No studies have examined community water fluoridation
- Individuals with fluorosis exposed to high concentrations

Studies in Humans: Gut Microbiome

Zhou et al. (2023)

- Guizhou, China, endemic coal-fired-pollution
- Dental Fluorosis (n=9)
- Relatively minor changes in gut microbiome

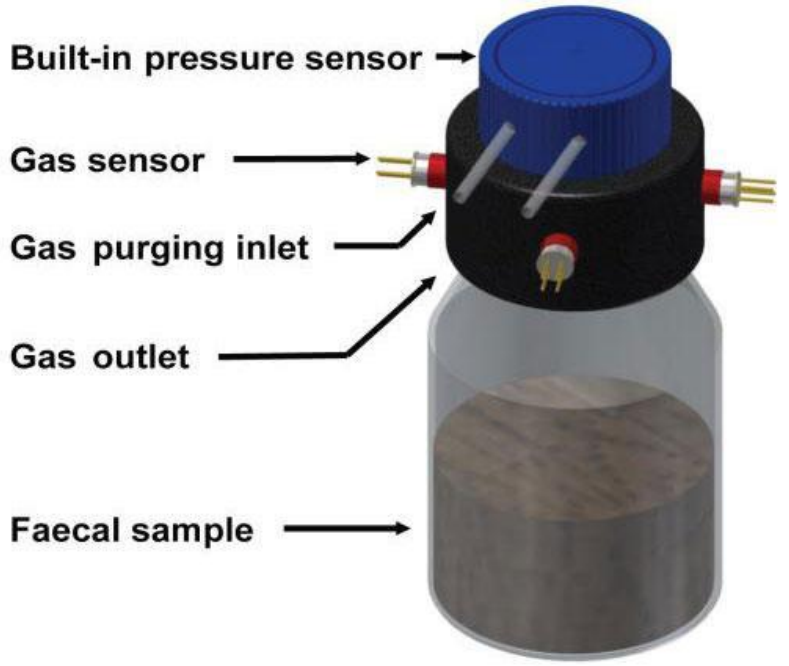
Wang et al. (2023)

- Guizhou, China, endemic coal-fired-pollution
- Skeletal Fluorosis (n=32)
- Severe changes in Gut Microbiome

Studies *in vitro*: Gut Microbiome

Chen et al. (2020)

- Fecal samples grown in laboratory
- 1, 2, 10 and 15 mg/L fluoride
- Low concentrations positive impact
- High concentrations (>10 mg/L) detrimental



Studies in Humans: Oral Microbiome

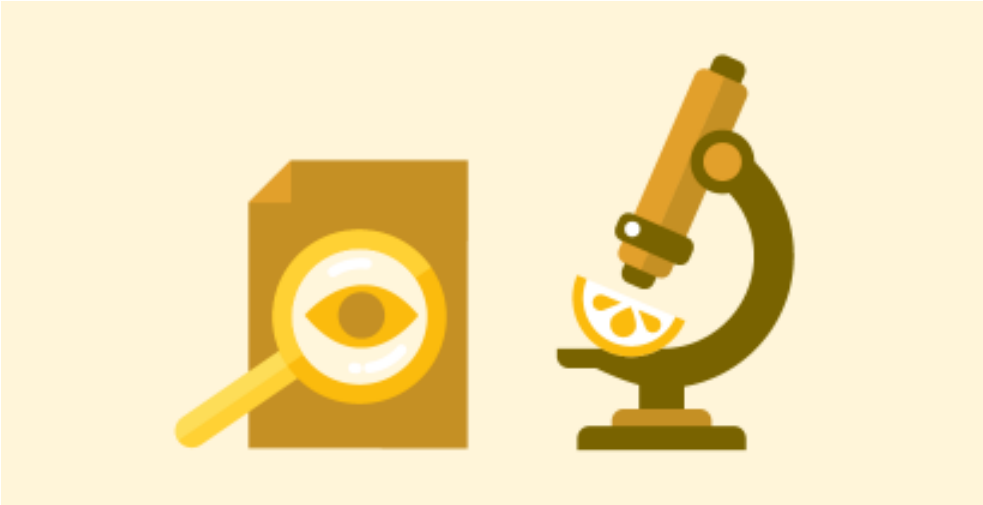
Wang et al. (2021)

- Guizhou, China, endemic coal-fired-pollution dental fluorosis
- Dental Fluorosis (mild n=14, Moderate/Severe n=19)
- Mild fluorosis largely unchanged
- Severe Fluorosis show changes in oral microbiome composition

Wolff et al. (2019)

- Investigated Fluoride salt/tablets exposure in childhood (n=56)
- Adults exhibited some minor changes in oral microbiome composition

Conclusions



- Fluoride consumption at ~50 µg/Kg/day probably has limited impact on oral or gut microbiomes
- Increased exposure (fluorosis) may impact on microbiome composition

Future Research

- Over reliance on animal models
- Exposure to ingestible fluorides?
- High quality, large cohort studies in humans
- Longitudinal Studies on early development


Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin
Thank you

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Neurocognitive

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Griffin Cole, DDS, NMD, MIAOMT

International Academy of Oral Medicine and Toxicology

Fluoride Supplements and Neurocognitive Effects

Unapproved, Unproven and Unnecessary

Reagan Udall Foundation for FDA Meeting – July 23, 2025
Griffin Cole, DDS NMD MIAOMT

Only Effective Topically

Journal of Public Health Dentistry, BA Burt, 1999 - Supplements

- Efficacy is weak
- Risk of fluorosis
- Fluoride has little pre-eruptive effect in caries prevention

Journal of American Dental Assn, Featherstone, 2000

- Fluoride in drinking water and in fluoride-containing products reduces caries via topical mechanisms.

CDC 2001: "[F]luoride's predominant effect is **posteruptive** and topical."

- Oral Health Division Director Hannen admitted the CDC does NOT recognize any benefit from systemic fluoride in first 6 mos of life - 2018

Cochrane Oral Health Group – 2011

- Supplements fail to reduce decay in primary teeth

Over 70% of US children have fluorosis – NHANES J Dent Res 2019

Fluoride is ubiquitous in foods, beverages and some medicines

Fluoride Supplements – Should Be Removed From Market

- Introduced on 2 False Assumptions
  - F is a nutrient – NOT TRUE
  - F is effective when swallowed – *Also* NOT TRUE
- 2011 Cochrane Collaboration – Supplements neither necessary nor effective (particularly today with so many sources/exposure)
  - NO safety studies
  - NO conclusion about effectiveness in preventing decay in children under 6
- Mounting research showing potential harm to children from ingesting fluoride including low birth weight for Hispanic newborns (Arun et al 2022), lower testosterone in males and lower sex steroid hormones in females (Huang et al 2020), symptoms of sleep disorders in adolescents (Malin et al 2019; Cunningham et al 2021), 2-fold increase in pediatric bone fractures (Lindsay et al 2023), kidney and liver impairment in adolescents (Malin et al 2019), and arguably, most importantly – decreased IQ and more neurobehavioral disorders – 2024 NTP Systematic Review – not to mention over 80 worldwide studies.

Prenatal and Postnatal Studies Confirming Neurocognitive Harm

➢ Over 80 studies worldwide showing neurocognitive/IQ loss/impairments

- Bashash (ELEMENT) 2017/18
- Green (MIREC) 2019
- Till 2020
- Goodman 2022 (Combo E & M)
- NTP Meta-analysis 2025 (Taylor) – 74 Studies
  - Significant INVERSE relationship between F exposure and Children's IQ Scores

- Kumar 2023 - "Association between low fluoride exposure and children's intelligence: a meta-analysis relevant to community water fluoridation."

NASEM – Did *Not* Find NTP Report Unreliable

What NASEM said:

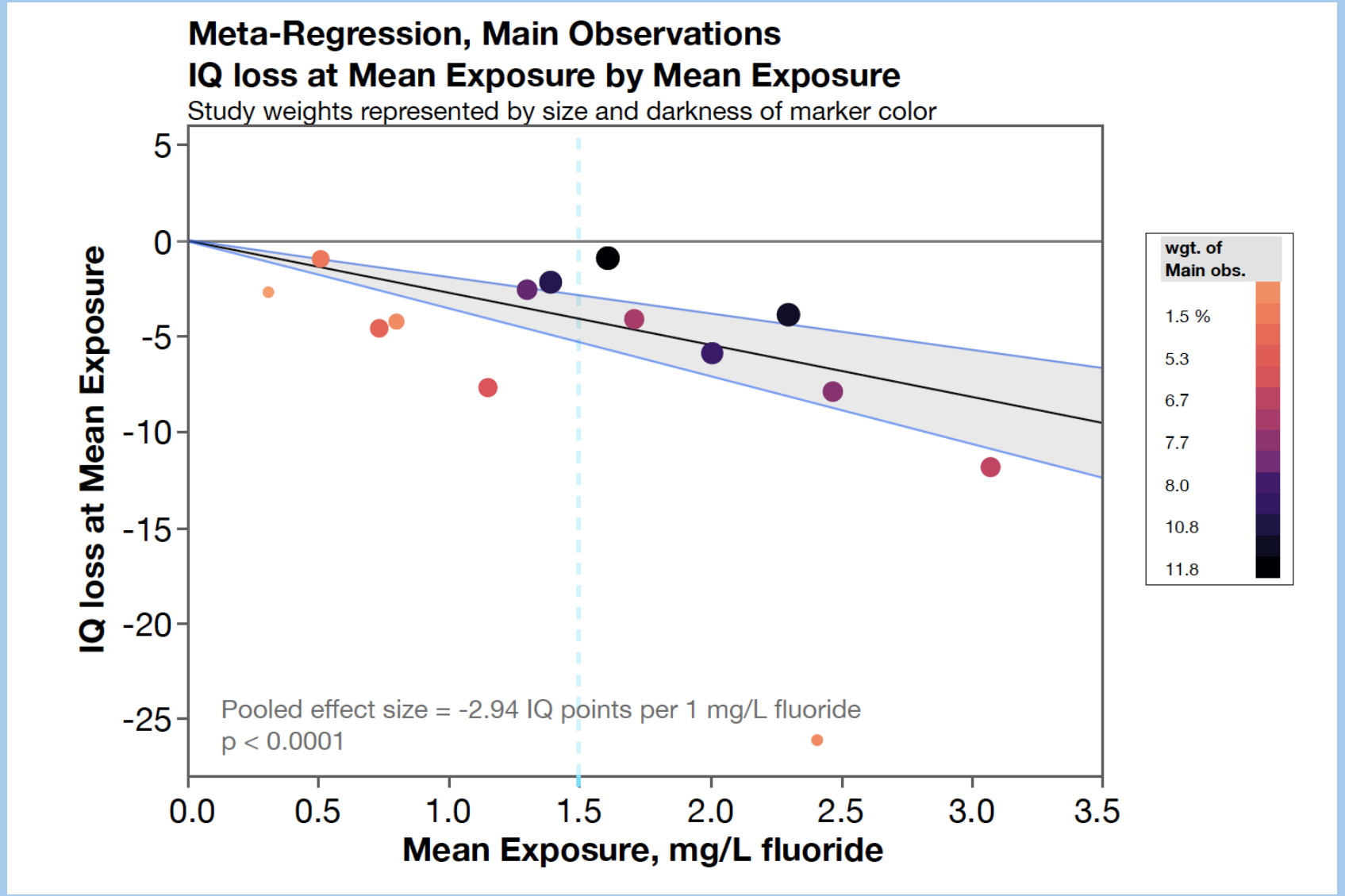
- They did not challenge the scientific basis of the NTP's presumed hazard conclusion
- They suggested ways for NTP's evidence to be used to more strongly support conclusion
- "The committee found the meta-analysis to be a valuable addition to the monograph…the meta-analysis applied standard, broadly accepted methods, and the data shown…and the related evaluations are especially informative (NTP 2020)."
- The only criticism was that the NTP included claims that evidence at exposures below 1.5 mg/L were "inconsistent" and "unclear".*

*NTP had not done rigorous dose-response analyses so shouldn't offer any conclusions about what dose may or may not be low enough to avoid neurotoxic harm.

Fluoride-IQ Dose-Response curve from NTP meta-analysis

Is 1.5 mg/L a safe threshold? (~1.5 mg/day)

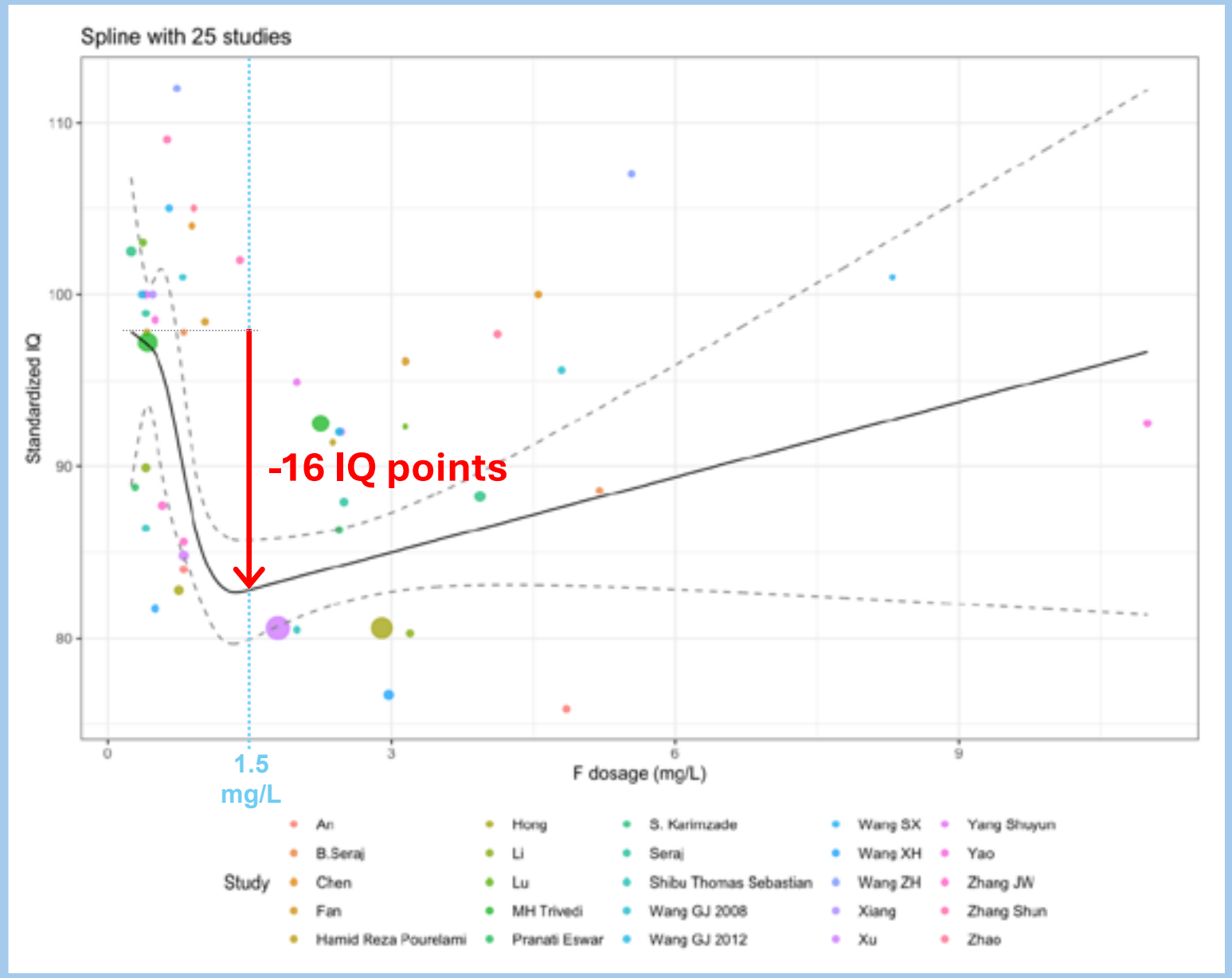
Neurath 2023 Environ Health Perspectives



Fluoride-IQ Dose-Response curve from meta-analysis

Is 1.5 mg/L
a safe threshold
(~1.5 mg/day)

Kumar – unpublished data



Time for FDA to Enforce Their "Unapproved" Classification of Supplements

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Neurocognitive

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Jayanth Kumar, DDS, MPH

Formerly California Department of Public Health

Fluoride Exposure and Children's IQ: A Review of National Academies and WHO Consensus Report Findings

Jayanth Kumar, DDS, MPH

Former California State Dental Director

Reviewer, National Academies of Sciences, Engineering, and Medicine Consensus Study Report. *Review of the Revised NTP Monograph on the Systematic Review of Fluoride Exposure and Neurodevelopmental and Cognitive Health Effects: A Letter Report*. 2021

Disclaimer

The views and opinions expressed in this presentation are those of the speaker and do not necessarily reflect the views or positions of the California Department of Public Health or the California Health and Human Services Agency or the National Institute of Dental and Craniofacial Research, NIH, or the Association of State and Territorial Dental Directors.

Objectives

- Summarize consensus findings
  - Fluoride and IQ
  - Validity of spot urinary fluoride as an exposure biomarker
  - Study design quality and interpretability
- Review findings from recent meta-analyses and cohort studies
- Discuss possible directions for future research

Consensus

- National Academies Consensus Study Report (2021):
  - **Lack of adequate support** for an assessment of presumed cognitive neurodevelopmental hazard
- WHO Assessment of Renal Fluoride Exposure (2014):
  - “Urinary fluoride excretion is **not** suitable for predicting fluoride intake for individuals”
- WHO Radiofrequency Fields on Cancer Risk Protocol (2021)
  - Ecological and cross-sectional studies **do not** allow for calculating the intended measures of effect (Lagorio S. et al https://doi.org/10.1016/j.envint.2021.106828)

Does fluoride exposure recommended for caries prevention in the U.S. decrease children's cognition and IQ scores?

Association Between Low Fluoride Exposure and Children’s Intelligence: A Meta-analysis Relevant to Community Water Fluoridation

Jayanth V. Kumar, DDS, MPH
Mark E. Moss, DDS, PhD,
Honghu Liu, PhD,
Susan Fisher-Owens, MD, MPH

Public Health.
https://doi.org/10.1016/j.puhe.2023.03.011

Conclusions:

- Fluoride exposure at the concentration used in community water fluoridation is not associated with lower IQ scores
- High heterogeneity suggests that the validity of pooled results is questionable
- Uncritical acceptance of fluoride-IQ studies has hindered methodological progress

Mean-effects meta-analysis results - Group Level

No association at concentration relevant to community water fluoridation

Kumar et al. 2023

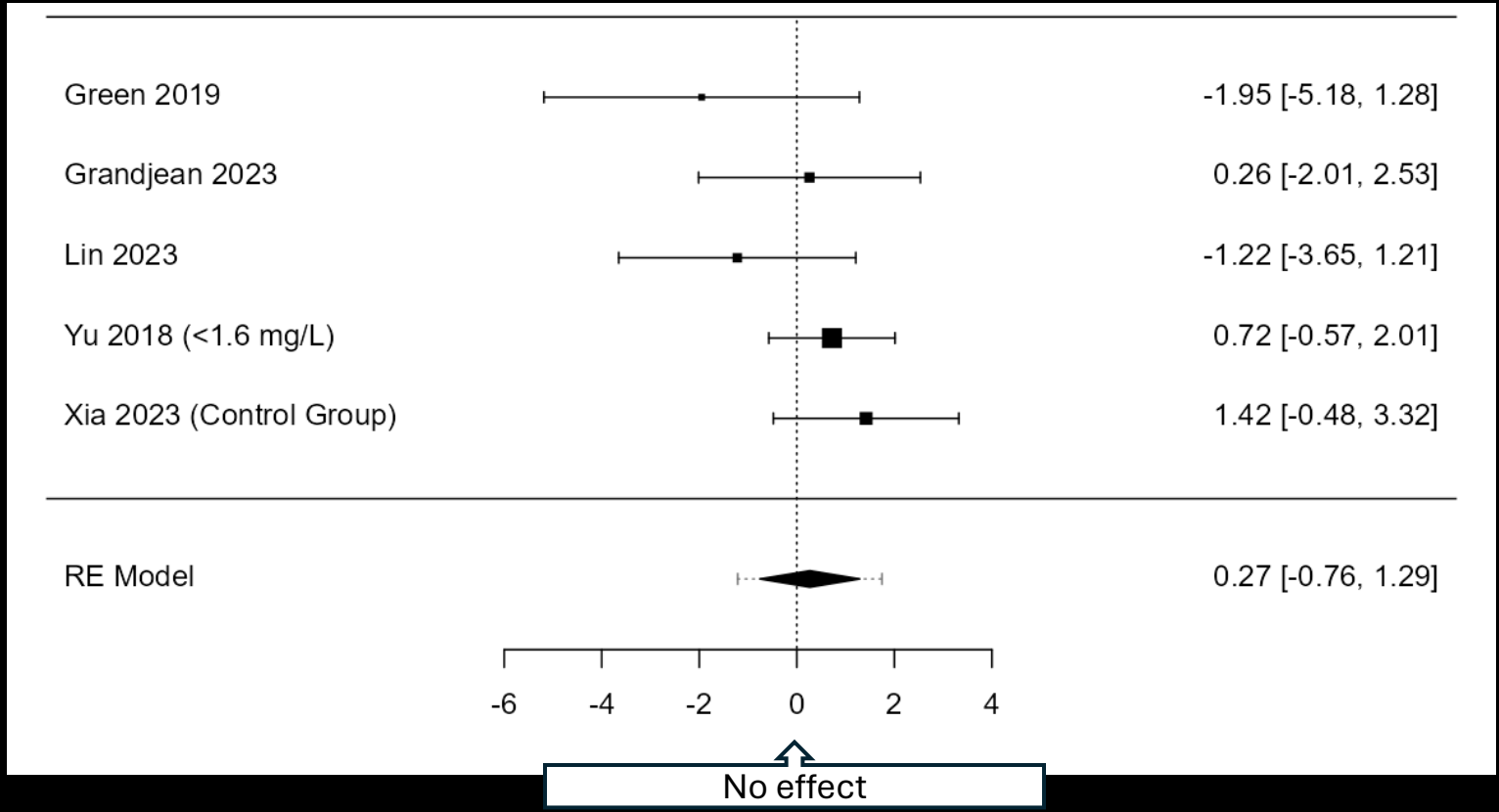
Non-endemic/Endemic Fluoride (Mean F)	# Studies	SMD Effect Size	95% CI	I^2 Heterogeneity
Non-endemic -Recommended F (0.9 mg/L) vs. Lower F (0.3 mg/L)	**8**	**0.07**	**-0.02, 0.17**	**0%**
Endemic – Higher F (~3.7 mg/L) vs. Lower F (~0.6 mg/L)	**23**	**-0.46**	**-0.58, -0.35**	**81%**
Overall	**28**	**-0.33**	**-0.44, -0.22**	**83%**

Source: Kumar et al. https://doi.org/10.1016/j.puhe.2023.03.011

Urinary Fluoride and IQ Scores

Exposure matrix Water: n=5 publications (studies from non-endemic areas)

Random-Effects Meta-Analysis of Regression Slopes



Pooled effect of 0.27 is positive, not statistically significant

Source: Antoon and Kumar. JAMA Pediatrics. Letter. May 12, 2025

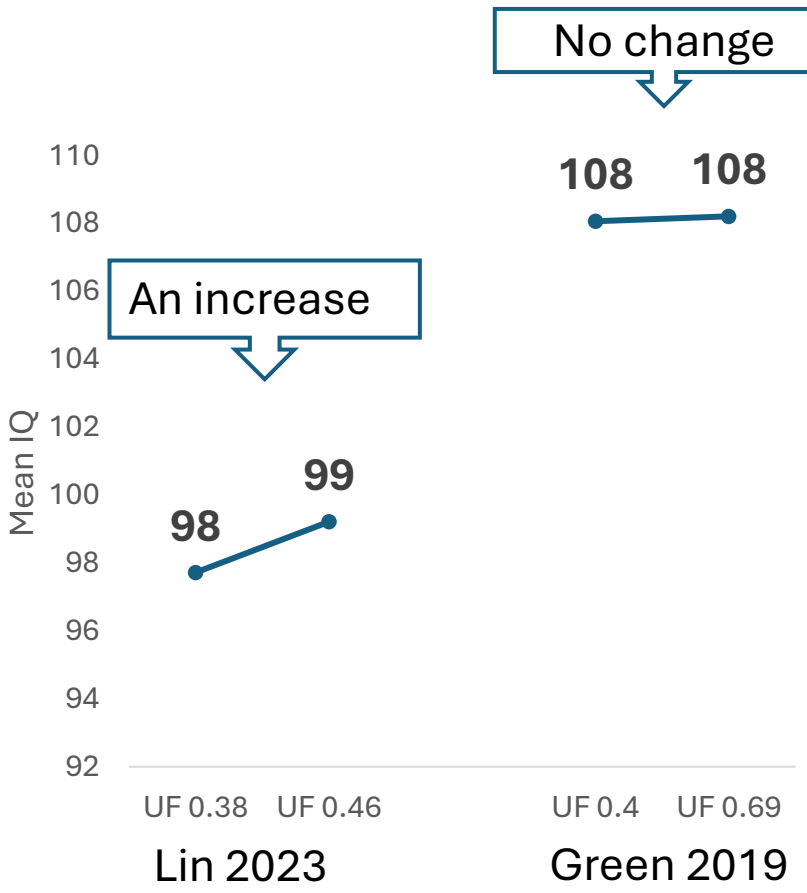
NASEM Consensus Report 2021: Critique Directed at Dose-Response Analysis

- "Those analyses fall outside the scope of the NTP monograph, which focuses on hazard identification and not dose–response assessment."

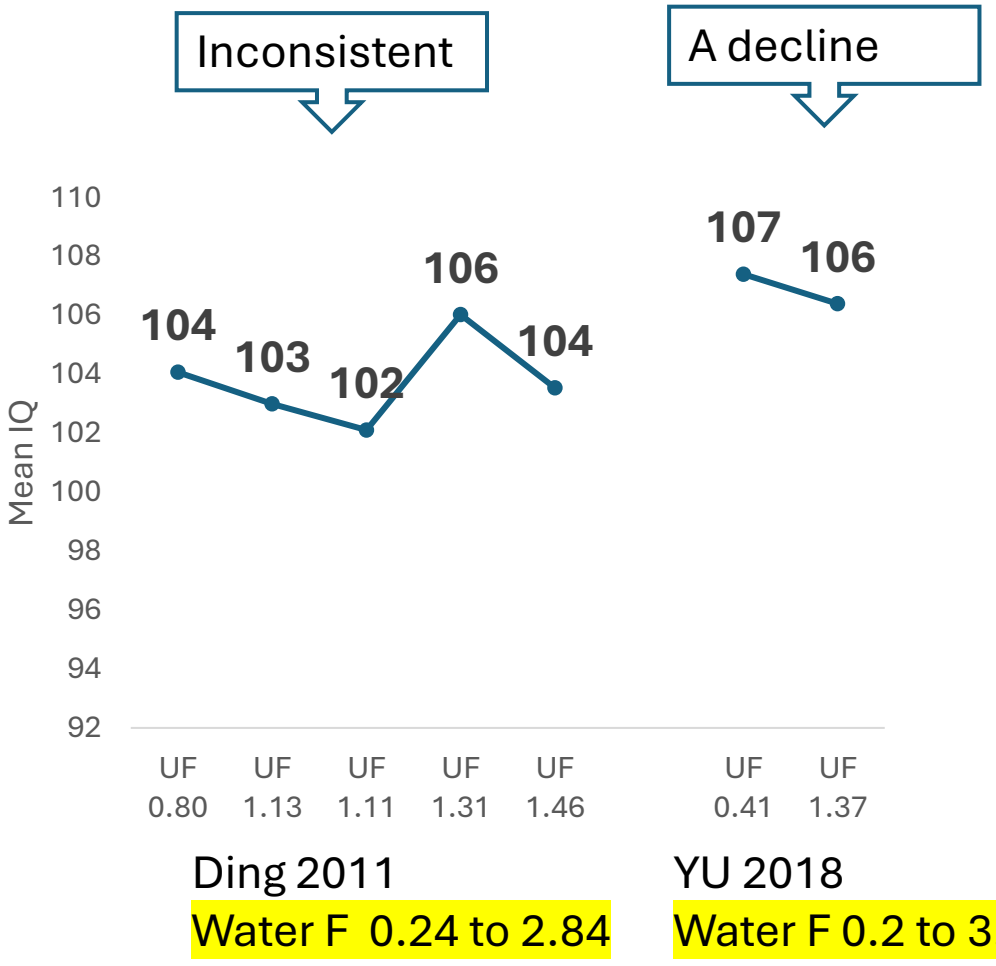
- ***"Given the substantial concerns regarding health implications of various fluoride exposures, comments or inferences that are not based on rigorous analyses should be avoided."*** page 14

Dose-Response Meta-analysis (<1.5 mg urinary fluoride - Group Level)
Source: Taylor et al.
IQ and Urinary Fluoride: Inconsistent Response

Non- Endemic (<1.5 mg/L) n=962



Endemic (>1.5 mg/L) n= 3,217



Maternal Urinary Fluoride Exposure Studies (n=4 cohort studies) and Children's IQ

Leave-One-Out Regression Slope Meta-analysis Showing the Influence of Studies

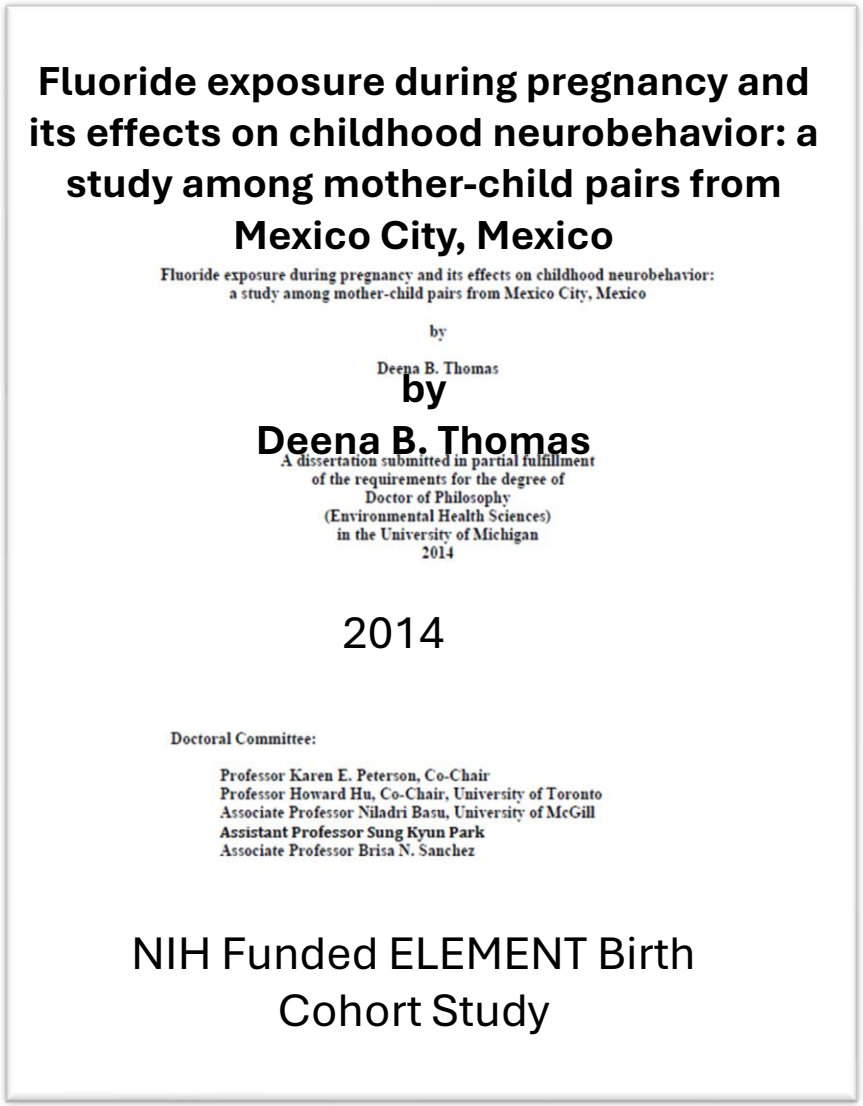
Study	β	95% CI		I^2 (%); p
Taylor et al. (3 studies) - Ibarluzea excluded	-1.70	-4.24, 0.84	NS*	57; p=0.09
Add Ibarluzea (4 studies)	-0.98	-3.58, 1.62	NS*	60; p=0.06
Exposure Matrix: Water				
Delete ELEMENT (Salt)	-0.06	-2.01, 1.88	NS*	12; p=0.23

No clinical significance

*Not statistically significant

Source: Kumar J. Unpublished.

Concerns: Selective Reporting and Publication Bias



Fluoride exposure during pregnancy and its effects on childhood neurobehavior: a study among mother-child pairs from Mexico City, Mexico

Fluoride exposure during pregnancy and its effects on childhood neurobehavior:
a study among mother-child pairs from Mexico City, Mexico

by

Deena B. Thomas

by

Deena B. Thomas

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Environmental Health Sciences)
in the University of Michigan
2014

2014

Doctoral Committee:

Professor Karen E. Peterson, Co-Chair
Professor Howard Hu, Co-Chair, University of Toronto
Associate Professor Niladri Basu, University of McGill
Assistant Professor Sung Kyun Park
Associate Professor Brisa N. Sanchez

NIH Funded ELEMENT Birth Cohort Study

ELEMENT Birth Cohort Study

Prenatal fluoride exposure and neurobehavior: a prospective study

"Overall, this investigation found no evidence of a detectable adverse outcome on offspring neurobehavioral development associated with maternal fluoride exposure during pregnancy." [MDI at ages 1, 2, and 3] Page 46

Neurotoxicity Research (2018) 34:781–798
https://doi.org/10.1007/s12640-018-9870-x

ORIGINAL ARTICLE

An Evaluation of Neurotoxicity Following Fluoride Exposure from Gestational Through Adult Ages in Long-Evans Hooded Rats

Christopher A. McPherson[1] · Guozhu Zhang[2] · Richard Gilliam[1] · Sukhdev S. Brar[3] · Ralph Wilson[3] · Amy Brix[4] · Catherine Picut[5] · G. Jean Harry[1]

- At 10 to 20 ppm of fluoride in drinking water
  - no exposure-related differences in learning and memory tests
  - no alteration of thyroid hormone levels (T3, T4, or TSH)
  - no exposure-related pathology
  - no evidence of neuronal death or glial activation

Conclusions

- Fluoride exposure at the concentration used in community water fluoridation (<1.5 mg/l) **is not associated** with lower IQ scores.
- We must acknowledge the **major methodological limitations** so that robust methods can be developed to test fluoride-IQ hypotheses.
- Decision-makers must take these findings into consideration in proposing policies.
- **Interventional studies** should be used to investigate the fluoride-IQ hypothesis in populations with high fluoride (endemic) exposure.

Thank you

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Neurocognitive

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Susan Fisher-Owens, MD, MPH, FAAP

University of California San Francisco

Presentation to FDA on Fluoride Supplements: Toxicology/Neurocognitive?

Susan Fisher-Owens, MD, MPH
Professor of Pediatrics
Professor of Preventive and Restorative Dental Sciences
University of California, San Francisco
Fluoride Consultant, California Dept. of Public Health

7/23/25

Nothing to disclose except for serving on a DSMB for a Colgate study of a non-fluoridated toothpaste

Why Am I Here??
A Pediatrician??

Why Am I Here??
Academic/Researcher

Academic—teaching brightest minds; must stay up to date with the research

- Researcher—understands:
  - Science
  - What can and can't be proven with different types of studies

NOTHING without Risk

Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population

Ingestible vs Topical Fluoride

- Main benefit comes from topical application while swishing before swallowing
  - Remains in plaque on teeth until the next toothbrushing
  - With water, repeated exposures during day
- Toothbrushing insufficient to prevent cavities when community water fluoridation ceased in Calgary (McLaren 2021)

Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population

"Unapproved"

- FDA declined to review fluoride products initially
- *Vast* majority of medications used in pediatrics are not FDA-licensed
- Still, recommended by United States Preventive Services Task Force, American Academy of Pediatrics, American Academy of Family Physicians, World Health Organization, and 100s more

What is the Microbiome?
What Does it have to do with Fluoride?

- NIEHS=="microbiome **is the collection of all microbes**, such as bacteria, fungi, viruses, and their genes, that naturally live on our bodies and inside us"
- One of 4 mechanisms of fluoride: inhibits bacterial growth

What is a “Good Test” for Neurocognition and Fluoride?

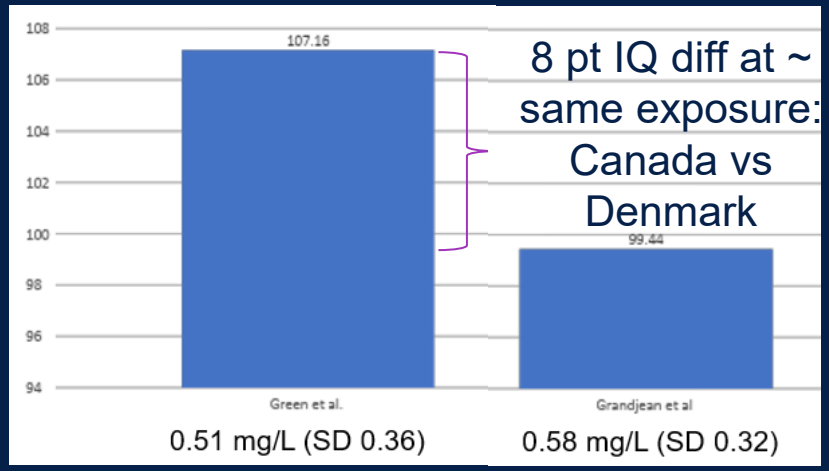
- Does the test ask the right question?
- Results cannot be viewed in vacuum—what confounders?
  - Factors influencing fluoride levels
    - Ventilation (high-F coal), nutrition
    - Background levels of fluoride
    - Location
  - Factors influencing intelligence
    - Coal, arsenic, lead, tobacco
    - Socioeconomic status (Parental/familial levels)

Is Spot Urinary Fluoride a “Good Test”?

- Spot urines are for blood and infection
- Fluoride in urine: varies depending on time of day, diet, season, and trimester of pregnancy

Is IQ Testing a “Good Test”?

- In young kids, no (varies by time of day, esp as relates to nap and snacks)
  - Less accurate at younger age
  - Cultural bias
- Different test can get different results
- Fallacy of pooling results from different tests



Variation in IQ scores by City, IQ Assessor, and Fluoridation Status

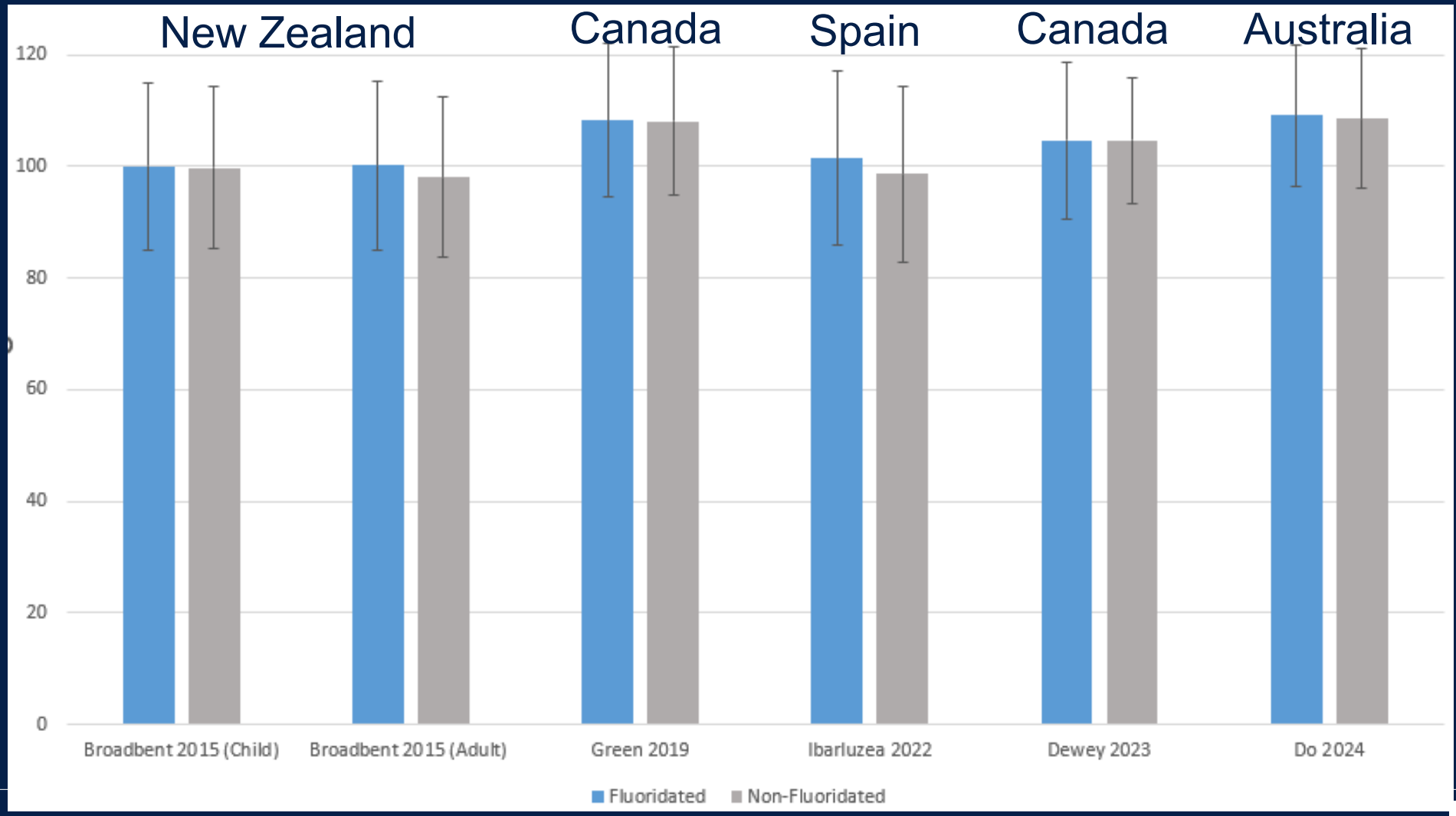
Data from MIREC Study

City	F?	Research Assistant	Number	β	95% CI
A**	NF	1	55	Ref	
B	NF	2	126	-8.05	-12.25, -3.85
C	NF	3	154	-4.24	-8.23, -0.25
D	F	4	72	-3.01	-7.89, 1.86
E	F	5	85	-4.59	-9.34, 0.17
F	F	6	118	-8.49	-12.74, -4.24

Fluoridated = Mean IQ 108; Non-Fluoridated = Mean IQ 108

Mean IQ Scores (unadjusted) by Fluoridation Status

NO difference between fluoridated and non-fluoridated communities



UCSF Fluoride

Balancing Risks/Benefits

Source: Fluoridation Forum Report 2002 (Page 126)

Summary

- Studies showing negative effects of community water fluoridation were done outside the United States or not with reliable measurements
- Studies reflecting circumstances in the United States show *no* difference in neurocognition
- Spot urinary fluoride is not a good test for systemic fluoride
- Oral health benefits the entire body, and oral disease is more serious than "just a cavity"
- To protect children's oral and overall health, fluoride *should* remain on market

Thank you!
Susan.Fisher-Owens@ucsf.edu

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Neurocognitive

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Kyla W. Taylor, PhD

National Institutes of Health

Fluoride exposure and children's IQ
A systematic review and meta-analysis

Kyla W. Taylor, PhD

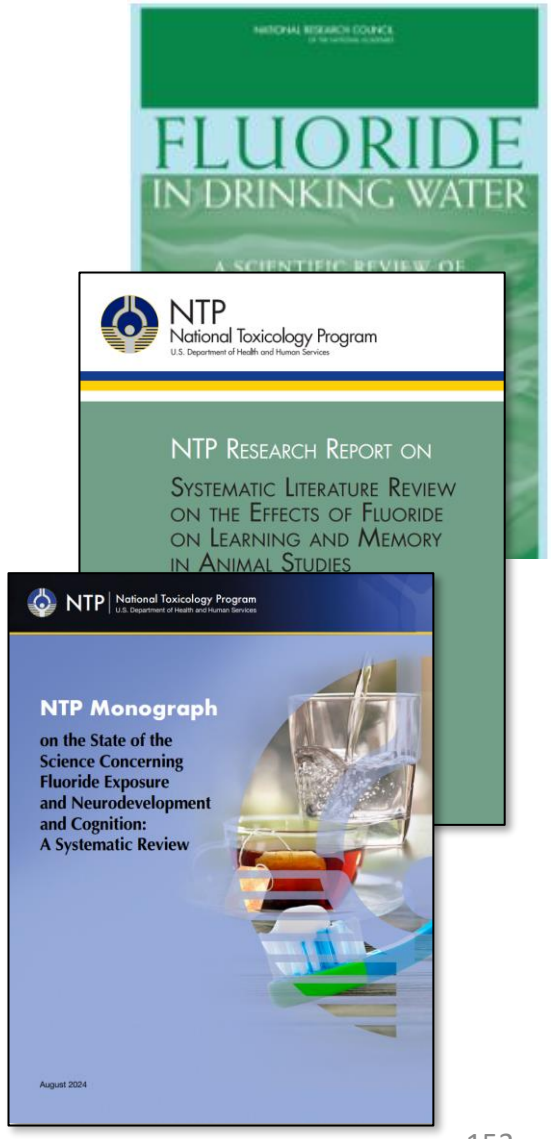
July 23, 2025

Integrative Health Assessments Branch
Division of Translational Toxicology
National Institutes of Environmental Health Sciences
kyla.taylor@nih.gov

Background

Fluoride as a topic for National Toxicology Program

- **2006:** National Research Council (NRC) reported evidence of neurotoxic effects of fluoride
- **2015:** Topic of fluoride exposure & adverse health effects nominated to NTP
- **2016:** NTP Monograph (animal studies only)
  - Systematic review found *low to moderate* evidence of adverse effects on learning and memory
- **2024:** Second NTP Monograph (all studies)
  - *Comprehensive*: Screened >14,000 human, animal, and mechanistic studies; identified >500 relevant studies (167 human)
  - *Rigorous & Reproducible*: Critically assessed study quality; all data documented, available online
  - *Systematic review conclusions*: Based on human studies, concluded with ***moderate confidence***, inverse association between fluoride exposure and children's IQ



Systematic review and meta-analysis

Fluoride exposure and children's IQ


Research

JAMA Pediatrics | Original Investigation

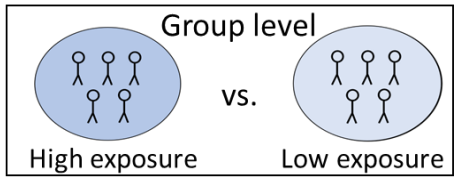
Fluoride Exposure and Children's IQ Scores
A Systematic Review and Meta-Analysis

Kyla W. Taylor, PhD; Sorina E. Eftim, PhD; Christopher A. Sibrizzi, MPH; Robyn B. Blain, PhD; Kristen Magnuson, MESM; Pamela A. Hartman, MEM; Andrew A. Rooney, PhD; John R. Bucher, PhD

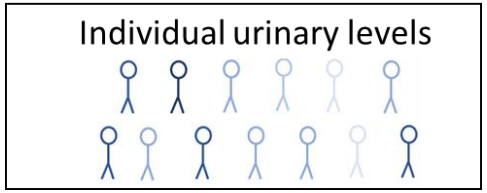
JAMA Pediatrics
January 2025

- Targeted analysis of 74 studies (N=22 high quality)
- Peer reviewed protocol, two independent reviewers assessed study quality (risk of bias) using *a priori* criteria
- Types of exposure data: Group and individual level, water and urine
- **Three meta-analyses:**

Transparency and reproducibility
All data ***publicly available, downloadable*** so researchers can replicate or extend work

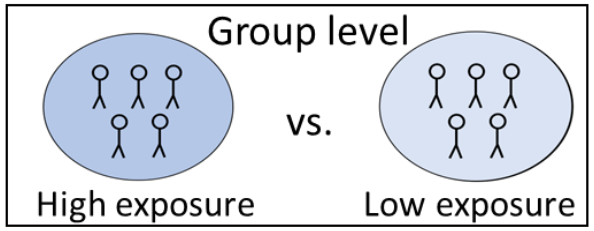


1. **Mean effects:** Pooled standardized mean differences (SMDs) in IQ between high vs low fluoride exposure groups
2. **Dose-response mean effects**: Uses SMDs to estimate pooled dose-response curve using linear and non-linear models



3. **Regression slopes:** Pooled regression slopes estimates change in IQ per 1 mg/L increase in urinary fluoride

Results
1. Mean-effects



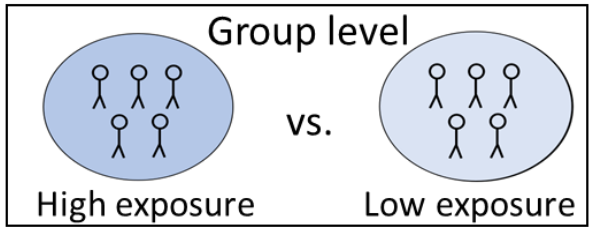
- Standardized mean difference (SMD) calculated for each study
  - Summary statistic to compare same outcome measured in different ways

- Rough conversion* of SMD to IQ points ≈ SMD x 15

*Assumes mean IQ=100 and SD=15

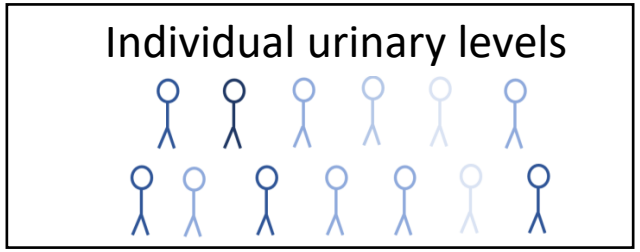
SD: standard deviation

Results
2. Dose-response



- Water (n=12,487 children)
- Urine (n=9,756 children)
  - Valid measure of ***total fluoride exposure*** (F ingested from all sources)
- Estimated pooled dose-response curve using linear and non-linear models– ***linear models were best fit***

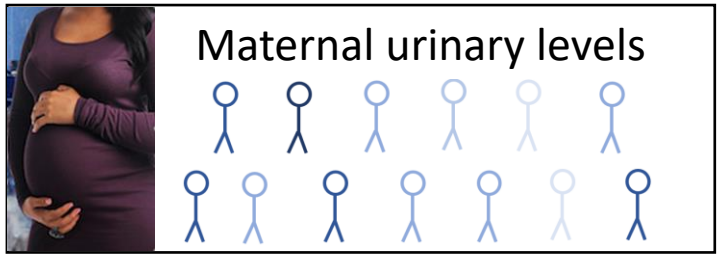
Results
3. Regression slopes



- Urinary fluoride estimates ***total fluoride exposure***
- Estimated pooled regression slopes with random-effects model
- Beta (β) directly estimates change in IQ points

Prenatal fluoride exposure

Maternal fluoride comparable to or lower than the US



- Most suspectable period for brain development
- 3 high quality prospective cohorts, comparable or lower fluoride exposure than United States
  - IQ measured at 7 years
  - Loss of **1.70 IQ points** (95% CI: -4.23, 0.84) per 1 mg/L maternal urinary fluoride
- *Grandjean et al. 2024*, reanalyzed individual data from each cohort, more precise
  - Loss of **2.06 IQ points (p<0.001)** per 1 mg/L increase maternal urinary fluoride

Conclusions

- Statistically significant inverse associations between fluoride exposure and children's IQ
- Inverse association held when restricted to only the *best available evidence* (i.e., high quality studies)
- Evidence of linear dose-response relationship across all data ***and*** when fluoride exposure <1.5 mg/L (urine and water)
- More studies needed to fully understand the potential for lower fluoride exposure to affect children's IQ
- **Consistent inverse association** across different populations, multiple countries, group and individual level data, various exposure sources, metrics urine and drinking water, study designs
- ***High level of consistency*** strengths confidence in the inverse association






Acknowledgements

DTT authors

Kyla Taylor, PhD
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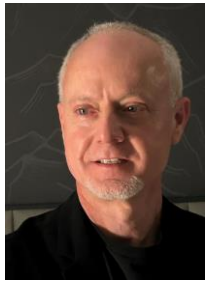
Integrative Health Assessments Branch (IHAB)

John Bucher, PhD
Former Associate Director NTP



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Thank you!

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REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Thyroid

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Christine Till, PhD, C. Psych

York University

Fluoride and Thyroid Function

Christine Till, PhD
York University, Faculty of Health
Toronto, ON, Canada

July 23, 2025

Presentation prepared for the meeting on “Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population”

REAGAN-UDALL FOUNDATION FOR THE FDA

Disclosure

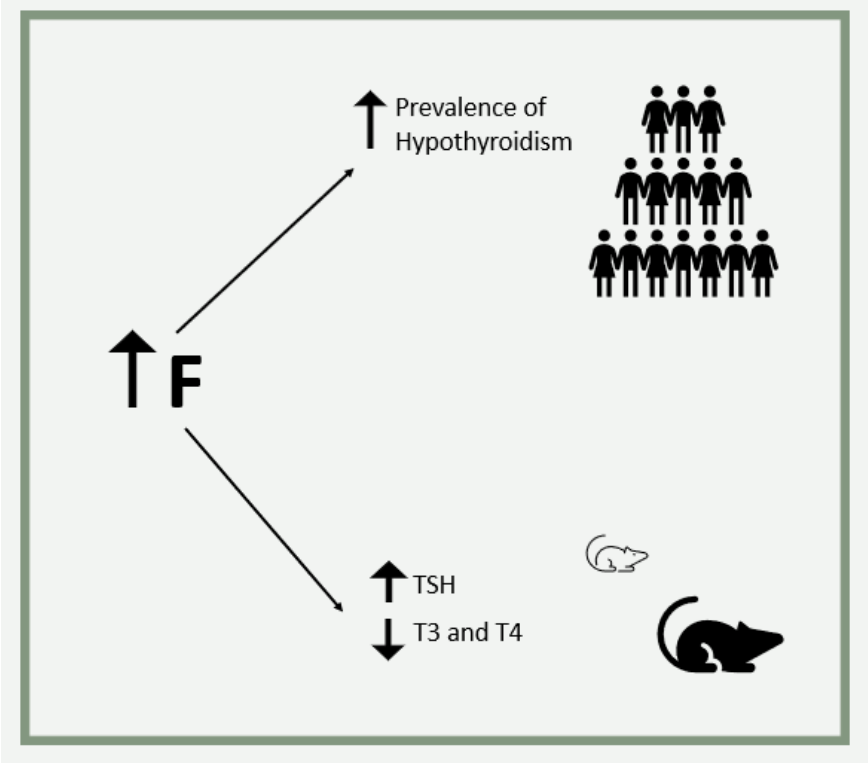
I have no actual or potential conflict of interest in relation to this program/presentation.

Background

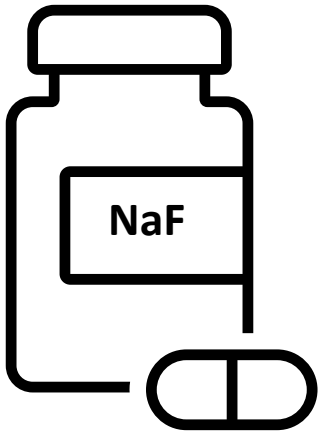
- Thyroid hormones
  - play a key role in regulating many biological and physiological functions
  - are essential for brain development and function (Rovet, 2014)

- Fluoride is an “endocrine disruptor” that can interfere with thyroid function (NRC, 2006)

- Thyroid dysfunction is a potential mechanism underlying developmental fluoride neurotoxicity (NTP, 2024)



In the 1950s, fluoride was used to treat overactive thyroid.



EFFECT OF FLUORINE ON THYROIDAL IODINE METABOLISM IN HYPERTHYROIDISM

PIERRE-M. GALLETTI, M.D., PH.D, GUSTAVE JOYET, D.Sc. Author Notes

The Journal of Clinical Endocrinology & Metabolism, Volume 18, Issue 10, 1 October 1958, Pages 1102–1110, https://doi.org/10.1210/jcem-18-10-1102

Published: 01 October 1958 **Article history** ▾

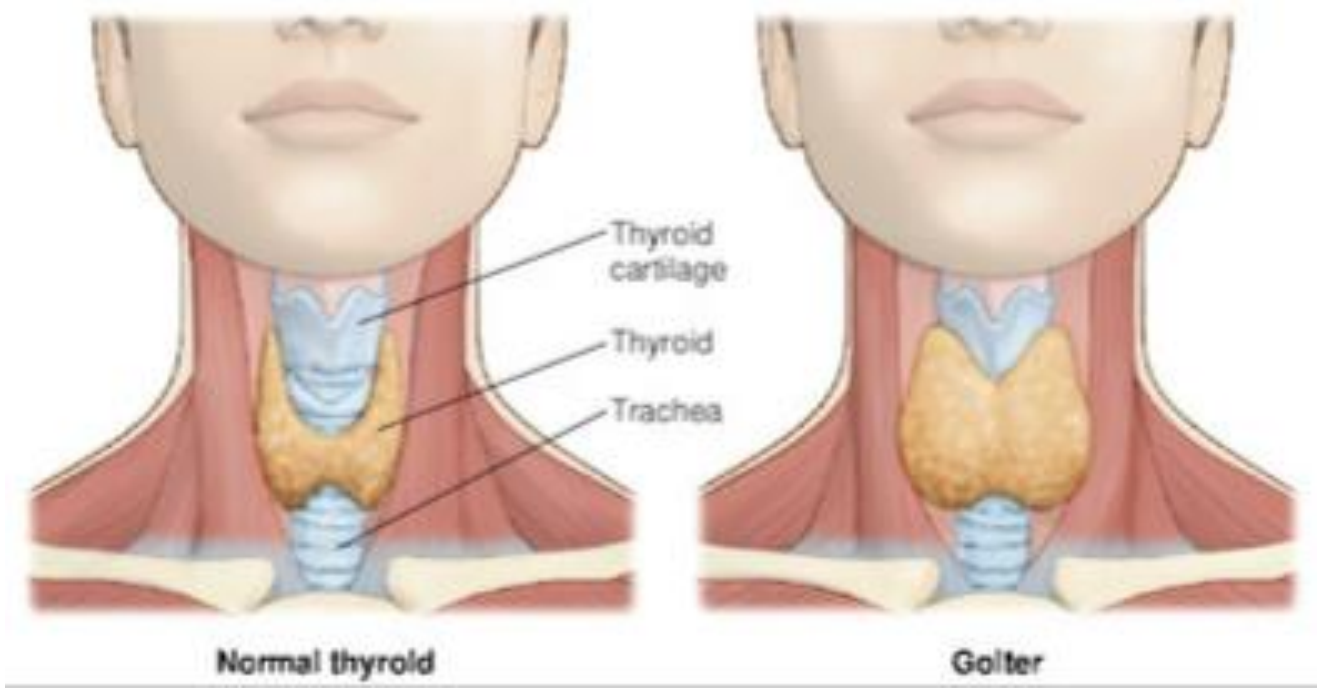
High fluoride levels increase incidence of goiter.

FLUORIDE, WATER HARDNESS, AND ENDEMIC GOITRE

T. K. DAY
P. R. POWELL-JACKSON

East Wing, Guy's Hospital, London S.E.1

Summary The prevalence of goitre in 17 Himalayan villages has been estimated. Water-samples from each village were taken, and levels of iodine, fluoride, and hardness determined. In 13 villages wide variations in goitre prevalence were not attributable to differences in iodine intake, which remained constant within a narrow range. Instead, variations in goitre prevalence were found to correlate closely with the fluoride content ($\rho = 0{\cdot}74$; $P < 0{\cdot}01$) and with the hardness ($\rho = 0{\cdot}77$; $P < 0{\cdot}01$) of the water in each village. The effects of fluoride and water hardness seem to be independent.



Day & Powell-Jackson, 1972

Contents lists available at ScienceDirect

Aquatic Toxicology

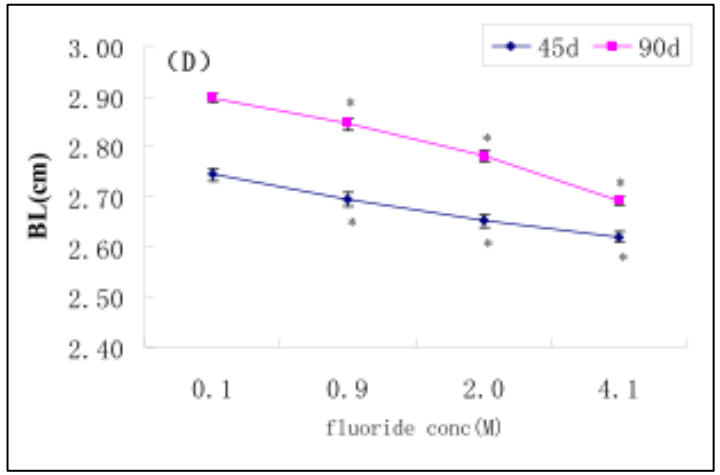
journal homepage: www.elsevier.com/locate/aquatox

Fluoride caused thyroid endocrine disruption in male zebrafish (*Danio rerio*)

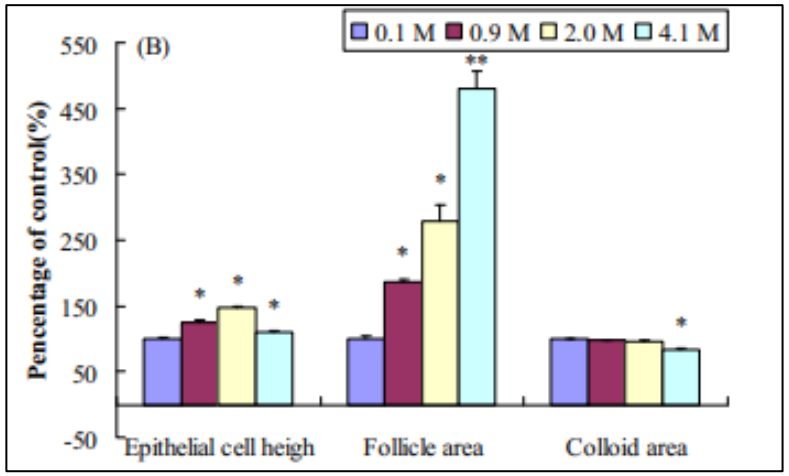
Chen Jianjie [1], Xue Wenjuan [1], Cao Jinling *, Song Jie, Jia Ruhui, Li Meiyan

State Key Laboratory of Ecological Animal Husbandry and Environmental Veterinary Medicine, College of Animal Science and Veterinary Medicine, Shanxi Agricultural University, Taigu 030801, Shanxi, China

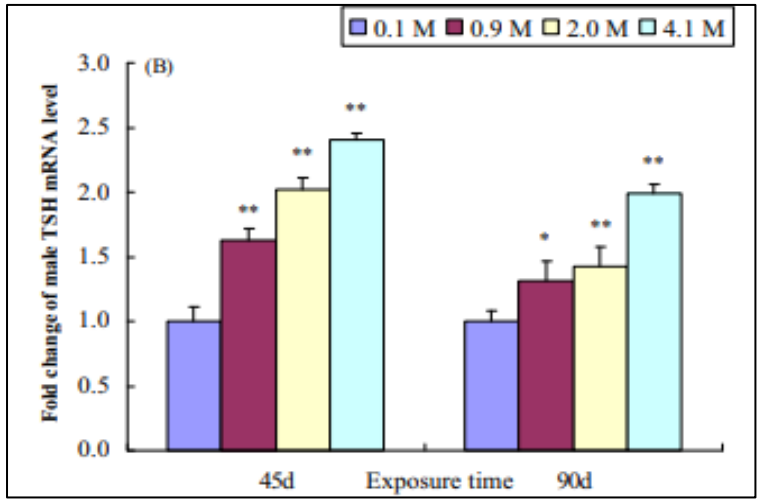
Zebrafish exposed to fluoride show:



↓ body weight & length



Enlarged thyroid tissues



Elevated TSH levels

Systematic Reviews: Fluoride and thyroid function

Contents lists available at ScienceDirect

Environmental Research
2024

journal homepage: www.elsevier.com/locate/envres

Review article

Does fluoride exposure affect thyroid function? A systematic review and dose-response meta-analysis

Inga Iamandii [a], Lisa De Pasquale [b], Maria Edvige Giannone [a], Federica Veneri [c,d], Luigi Generali [c], Ugo Consolo [c], Linda S. Birnbaum [e], Jacqueline Castenmiller [f], Thorhallur I. Halldorsson [g,h], Tommaso Filippini [a,i], Marco Vinceti [a,j,*]

[a] Environmental, Genetic and Nutritional Epidemiology Research Center (CREAGEN), Section of Public Health, Department ... Sciences, University of Modena and Reggio Emilia, Modena, Italy
[b] Department of Biomedical, Metabolic and Neural Sciences, University of Modena and Reggio Emilia, Modena, Italy
[c] Department of Surgery, Medicine, Dentistry and Morphological Sciences with Transplant Surgery, Oncology and Regenerative ... Dentistry & Oral-Maxillo-Facial Surgery, University of Modena and Reggio Emilia, Modena, Italy
[d] PhD Program in Clinical and Experimental Medicine, Department of Biomedical, Metabolic and Neural Sciences, University of ...
[e] Nicholas School of the Environment, Duke University, Durham, NC, USA
[f] Office for Risk Assessment & Research, Netherlands Food and Consumer Product Safety Authority, Utrecht, the Netherland...
[g] Department of Epidemiology Research, Centre for Fetal Programming, Copenhagen, Denmark
[h] Faculty of Food Science and Nutrition, University of Iceland, Reykjavík, Iceland
[i] School of Public Health, University of California Berkeley, Berkeley, CA, USA
[j] Department of Epidemiology, Boston University School of Public Health, Boston, MA, USA

Indian J Dental Res (2018)

Systematic Review

A Systematic Analysis on Possibility of Water Fluoridation Causing Hypothyroidism

Abstract

Background: Community water fluoridation is widely used worldwide and its role in preventive dental health care is well established. However, there is sufficient evidence of the ill effects of excessive fluoride content in water, causing skeletal and dental fluorosis. Alongside, there was also extraskeletal and dental manifestations of excessive fluorides reported. They include the effect on thyroid function, but the literature regarding this is sparse. **Aim:** The present systematic review aims to analyze the data from controlled studies about the effect of fluoride on thyroid function. **Materials and Methods:** A systematic literature search was performed using PUBMED, MEDLINE, EMBASE, COCHRANE Library, EBSCO search, and the internet search, with language restriction to English. The search included published studies which dealt with the association of fluorine with hypothyroidism, from January 1981 to November 2015. Literature search was done using keywords: ...temic fluorosis and thyroid ... fluoride, fluorosis and its ...tegy, 37 full articles which ...uired for further inspection. ...e extracted and placed in an ...ation of excess fluoride and ...positive correlation between ...ll-controlled studies in this ...nity network through health

Nallan CSK Chaitanya, Karunakar P[1], Neeharika Satya Jyothi Allam, Hima Priya M, Alekhya B, Shaguftha Nauseen

Department of Oral Medicine and Radiology, Principal, [1]Department of Conservative Dentistry and Endodontics, Panineeya Institute of Dental Sciences, Hyderabad, Telangana, India

International Journal of *Environmental Research and Public Health*

MDPI

Review

Fluoride Exposure Induces Inhibition of Sodium/Iodide Symporter (NIS) Contributing to Impaired Iodine Absorption and Iodine Deficiency: Molecular Mechanisms of Inhibition and Implications for Public Health

Declan Timothy Waugh

EnviroManagement Services, 11 Riverview, Doherty's Rd, Bandon, Co. Cork, P72 YF10, Ireland; declan@enviro.ie; Tel.: +353-23-884-1933

Received: 19 February 2019; Accepted: 21 March 2019; Published: 26 March 2019

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Review article

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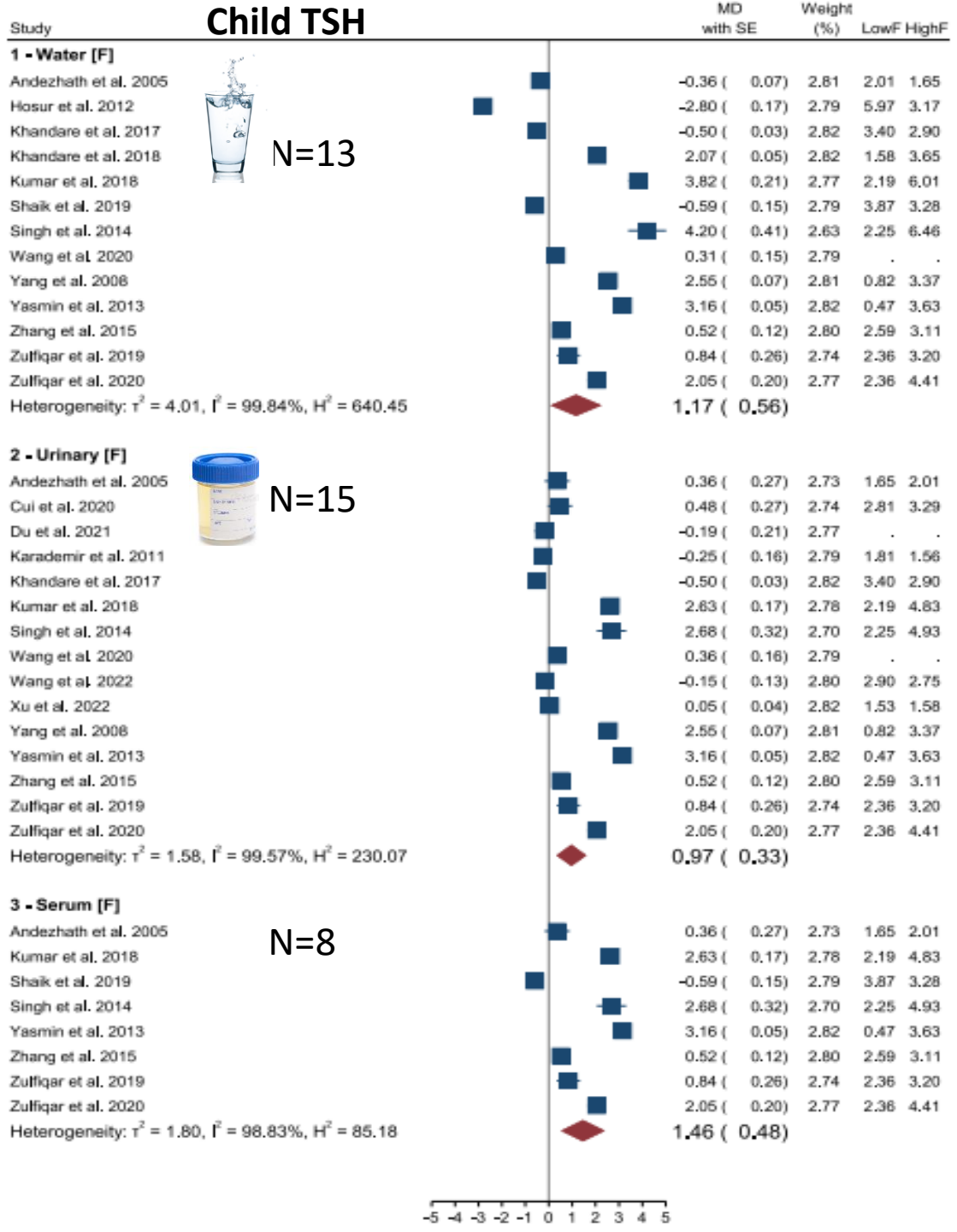
[b] Department of Biomedical, Metabolic and Neural Sciences, University of Modena and Reggio Emilia, Modena, Italy
[c] Department of Surgery, Medicine, Dentistry and Morphological Sciences with Transplant Surgery, Oncology and Regenerative Medicine Relevance (CHIMOMO), Unit of Dentistry & Oral-Maxillo-Facial Surgery, University of Modena and Reggio Emilia, Modena, Italy
[d] PhD Program in Clinical and Experimental Medicine, Department of Biomedical, Metabolic and Neural Sciences, University of Modena and Reggio Emilia, Modena, Italy
[e] Nicholas School of the Environment, Duke University, Durham, NC, USA
[f] Office for Risk Assessment & Research, Netherlands Food and Consumer Product Safety Authority, Utrecht, the Netherlands
[g] Department of Epidemiology Research, Centre for Fetal Programming, Copenhagen, Denmark
[h] Faculty of Food Science and Nutrition, University of Iceland, Reykjavik, Iceland
[i] School of Public Health, University of California Berkeley, Berkeley, CA, USA
[j] Department of Epidemiology, Boston University School of Public Health, Boston, MA, USA

Higher water F, urine F, and serum F levels were associated with higher TSH in children (6-18 yr).



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[d] PhD Program in Clinical and Experimental Medicine, Department of Biomedical, Metabolic and Neural Sciences, University of Modena and Reggio Emilia, Modena, Italy
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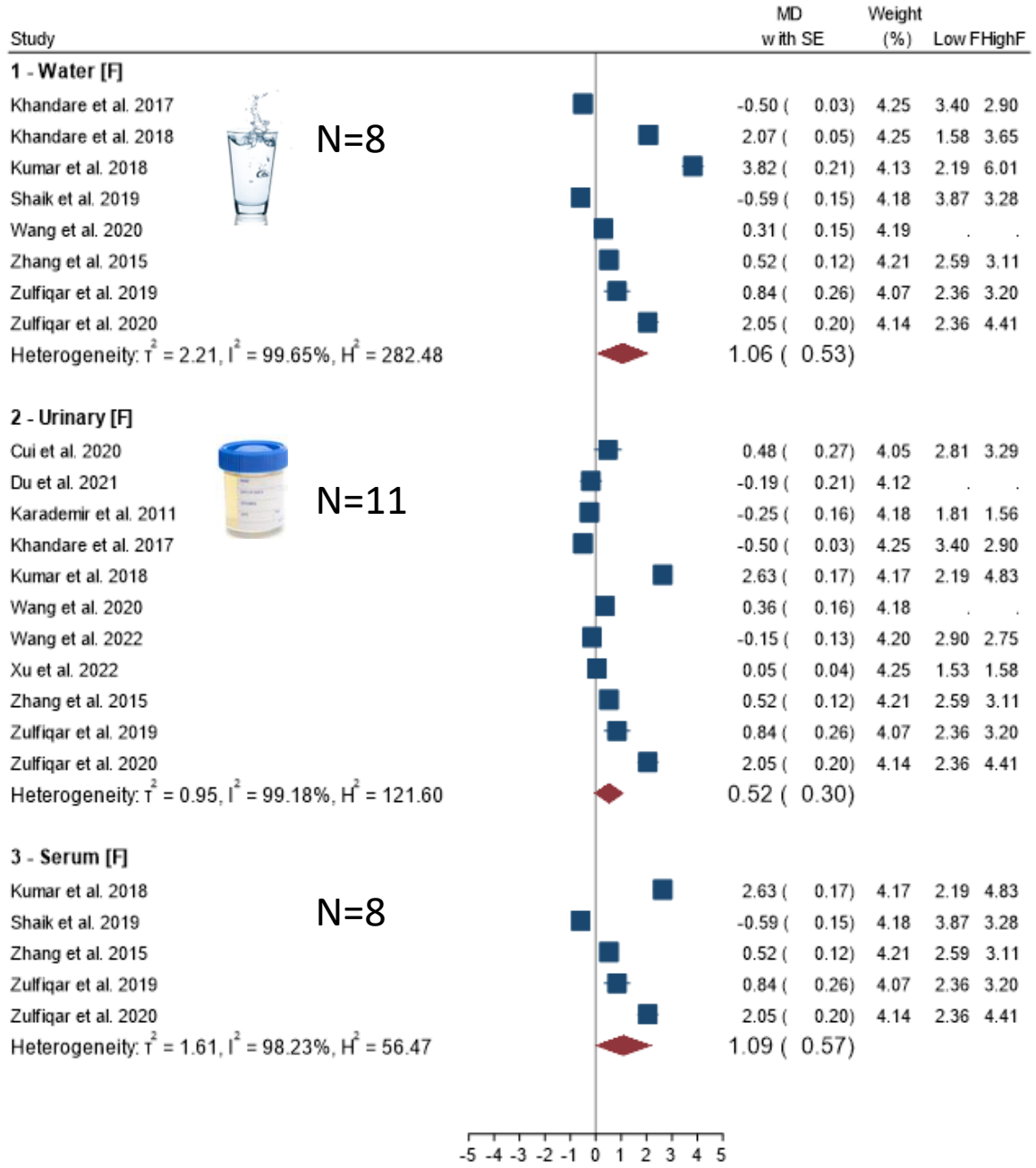
[i] School of Public Health, University of California Berkeley, Berkeley, CA, USA
[j] Department of Epidemiology, Boston University School of Public Health, Boston, MA, USA

Similar results observed when focusing only on high quality studies.

Child TSH



Dose-response meta-analysis of TSH concentrations and exposure to fluoride in children

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Review article

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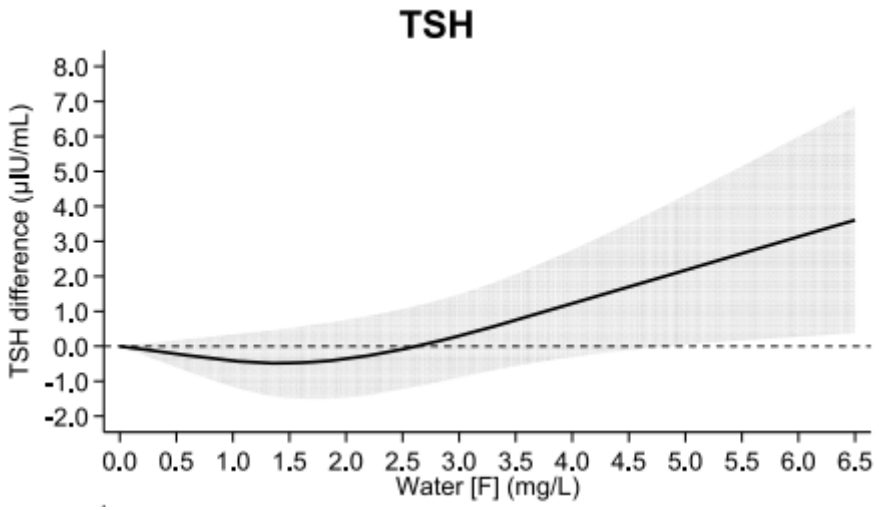
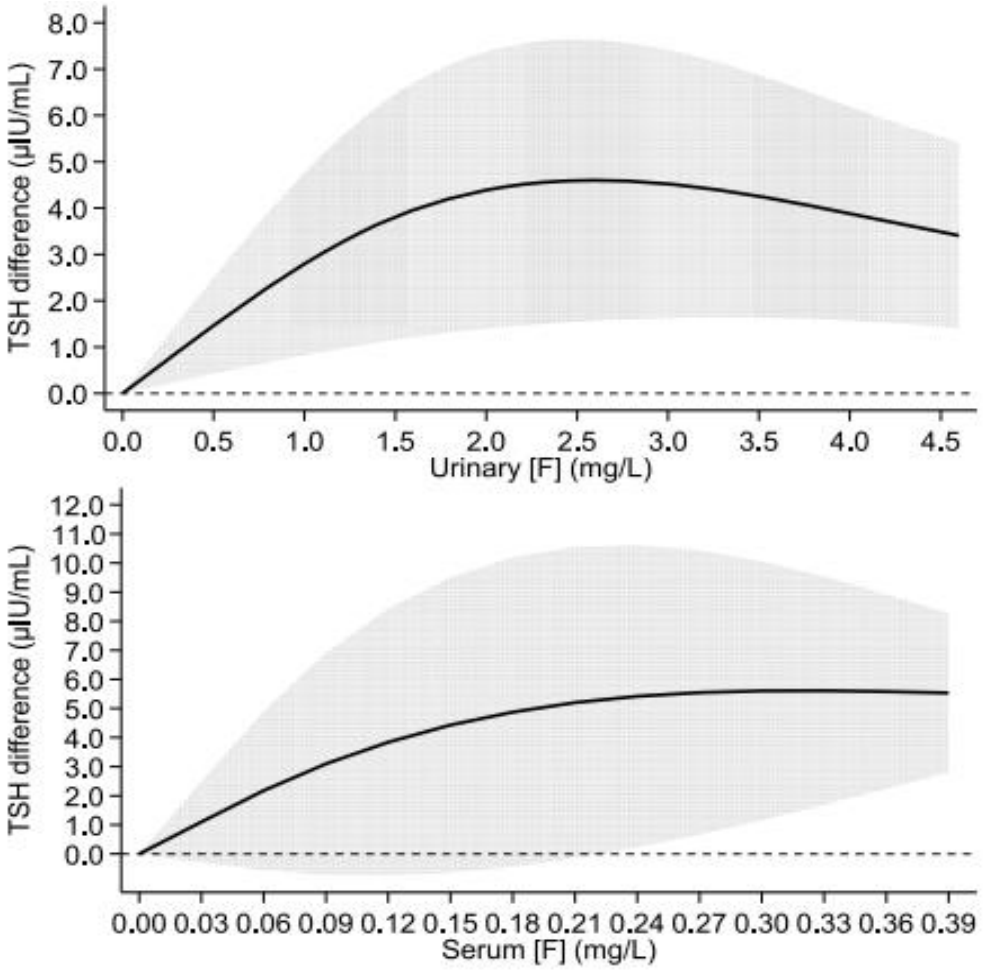
Inga Iamandii [a], Lisa De Pasquale [b], Maria Edvige Giannone [a], Federica Veneri [c,d], Luigi Generali [c], Ugo Consolo [c], Linda S. Birnbaum [e], Jacqueline Castenmiller [f], Thorhallur I. Halldorsson [g,h], Tommaso Filippini [a,i], Marco Vinceti [a,j,*]



TSH levels increase at water F levels ~2 mg/L



No evidence of a threshold for urinary F and serum F

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Higher water F and urine F concentrations associated with higher TSH in adults

Water [F] - adults

Study	MD with SE	Weight (%)	LowF	HighF
T3-total				
Bachinskii et al. 1985	-0.52 (0.02)	7.97	1.82	1.30
Kheradpisheh et al. 2018	0.04 (0.01)	7.97	1.35	1.39
Yasmin et al. 2013 (men)	0.00 (0.00)	7.98	0.00	0.00
Yasmin et al. 2013 (women)	0.00 (0.00)	7.98	0.00	0.00
Heterogeneity: τ^2 = 0.07, I^2 = 100.00%, H^2 = 5.11e+11	-0.12 (0.13)			
T4-free				
Hall et al. 2023 (women)	0.05 (0.36)	6.50	1.35	1.40
Heterogeneity: τ^2 = 0.00, I^2 = .%, H^2 = .	0.05 (0.36)			
T4-total				
Bachinskii et al. 1985	-0.24 (0.09)	7.87	7.76	7.52
Hall et al. 2023 (women)	0.35 (0.26)	7.14	10.58	10.93
Kheradpisheh et al. 2018	0.10 (0.07)	7.90	8.50	8.60
Heterogeneity: τ^2 = 0.06, I^2 = 82.95%, H^2 = 5.87	0.02 (0.16)			
TSH				
Bachinskii et al. 1985	1.90 (0.11)	7.81	2.40	4.30
Hall et al. 2023 (women)	2.00 (0.27)	7.06	1.20	3.20
Kheradpisheh et al. 2018	0.55 (0.05)	7.94	2.20	2.75
Yasmin et al. 2013 (men)	-0.33 (0.05)	7.94	2.75	2.42
Yasmin et al. 2013 (women)	0.06 (0.05)	7.94	2.58	2.64
Heterogeneity: τ^2 = 1.10, I^2 = 99.58%, H^2 = 239.98	0.82 (0.47)			

Urinary [F] - adults

Study	MD with SE	Weight (%)	LowF	HighF
T3-total				
Bachinskii et al. 1985	-0.52 (0.02)	8.63	1.82	1.30
Yasmin et al. 2013 (men)	0.00 (0.00)	8.63	0.00	0.00
Yasmin et al. 2013 (women)	0.00 (0.00)	8.63	0.00	0.00
Heterogeneity: τ^2 = 0.09, I^2 = 100.00%, H^2 = 9.77e+11	-0.17 (0.17)			
T4-free				
Hall et al. 2023 (women)	0.05 (0.36)	7.14	1.35	1.40
Heterogeneity: τ^2 = 0.00, I^2 = .%, H^2 = .	0.05 (0.36)			
T4-total				
Bachinskii et al. 1985	-0.24 (0.09)	8.53	7.76	7.52
Hall et al. 2023 (women)	0.35 (0.26)	7.79	10.58	10.93
Yasmin et al. 2013 (men)	0.09 (0.01)	8.63	0.96	1.05
Yasmin et al. 2013 (women)	-0.00 (0.01)	8.63	1.04	1.04
Heterogeneity: τ^2 = 0.02, I^2 = 97.55%, H^2 = 40.77	0.00 (0.09)			
TSH				
Bachinskii et al. 1985	1.90 (0.11)	8.47	2.40	4.30
Hall et al. 2023 (women)	2.00 (0.27)	7.71	1.20	3.20
Yasmin et al. 2013 (men)	-0.33 (0.05)	8.60	2.75	2.42
Yasmin et al. 2013 (women)	0.06 (0.05)	8.60	2.58	2.64
Heterogeneity: τ^2 = 1.45, I^2 = 99.60%, H^2 = 252.35	0.89 (0.61)			

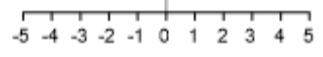
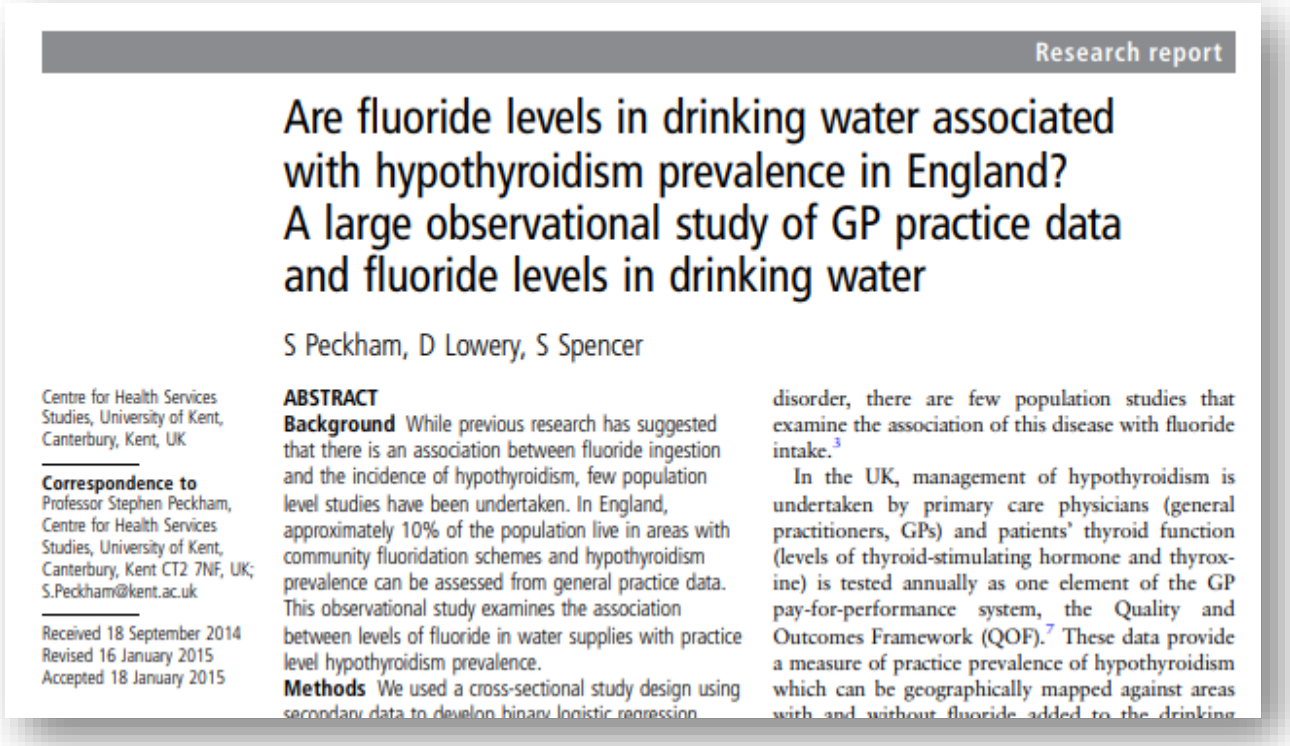


Figure S13

Fluoridated water has been associated with hypothyroidism in adults.



Research report

Are fluoride levels in drinking water associated with hypothyroidism prevalence in England? A large observational study of GP practice data and fluoride levels in drinking water

S Peckham, D Lowery, S Spencer

Centre for Health Services Studies, University of Kent, Canterbury, Kent, UK

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Professor Stephen Peckham, Centre for Health Services Studies, University of Kent, Canterbury, Kent CT2 7NF, UK; S.Peckham@kent.ac.uk

Received 18 September 2014
Revised 16 January 2015
Accepted 18 January 2015

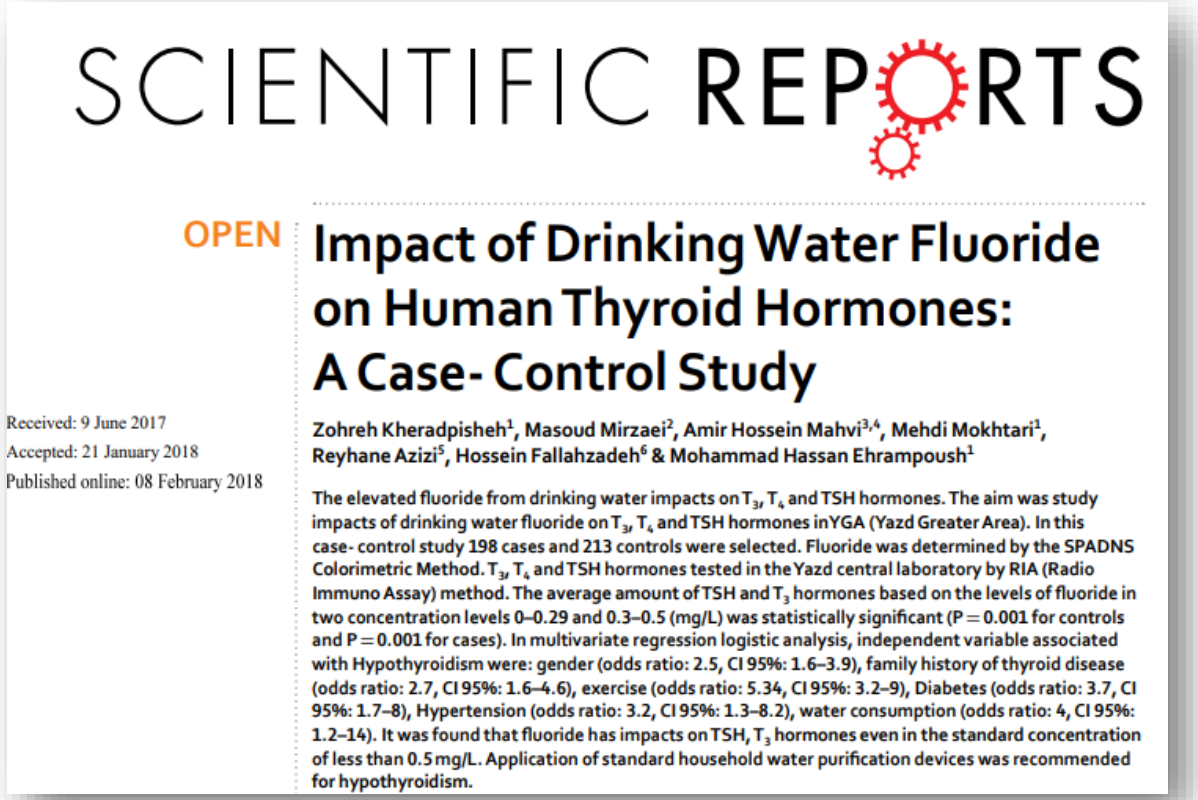
ABSTRACT

Background While previous research has suggested that there is an association between fluoride ingestion and the incidence of hypothyroidism, few population level studies have been undertaken. In England, approximately 10% of the population live in areas with community fluoridation schemes and hypothyroidism prevalence can be assessed from general practice data. This observational study examines the association between levels of fluoride in water supplies with practice level hypothyroidism prevalence.

Methods We used a cross-sectional study design using secondary data to develop binary logistic regression

disorder, there are few population studies that examine the association of this disease with fluoride intake.[3]

In the UK, management of hypothyroidism is undertaken by primary care physicians (general practitioners, GPs) and patients' thyroid function (levels of thyroid-stimulating hormone and thyroxine) is tested annually as one element of the GP pay-for-performance system, the Quality and Outcomes Framework (QOF).[7] These data provide a measure of practice prevalence of hypothyroidism which can be geographically mapped against areas with and without fluoride added to the drinking



SCIENTIFIC REPORTS

OPEN

Impact of Drinking Water Fluoride on Human Thyroid Hormones: A Case- Control Study

Zohreh Kheradpisheh[1], Masoud Mirzaei[2], Amir Hossein Mahvi[3,4], Mehdi Mokhtari[1], Reyhane Azizi[5], Hossein Fallahzadeh[6] & Mohammad Hassan Ehrampoush[1]

Received: 9 June 2017
Accepted: 21 January 2018
Published online: 08 February 2018

The elevated fluoride from drinking water impacts on T_3, T_4 and TSH hormones. The aim was study impacts of drinking water fluoride on T_3, T_4 and TSH hormones inYGA (Yazd Greater Area). In this case- control study 198 cases and 213 controls were selected. Fluoride was determined by the SPADNS Colorimetric Method. T_3, T_4 and TSH hormones tested in the Yazd central laboratory by RIA (Radio Immuno Assay) method. The average amount of TSH and T_3 hormones based on the levels of fluoride in two concentration levels 0–0.29 and 0.3–0.5 (mg/L) was statistically significant ($P = 0.001$ for controls and $P = 0.001$ for cases). In multivariate regression logistic analysis, independent variable associated with Hypothyroidism were: gender (odds ratio: 2.5, CI 95%: 1.6–3.9), family history of thyroid disease (odds ratio: 2.7, CI 95%: 1.6–4.6), exercise (odds ratio: 5.34, CI 95%: 3.2–9), Diabetes (odds ratio: 3.7, CI 95%: 1.7–8), Hypertension (odds ratio: 3.2, CI 95%: 1.3–8.2), water consumption (odds ratio: 4, CI 95%: 1.2–14). It was found that fluoride has impacts on TSH, T_3 hormones even in the standard concentration of less than 0.5 mg/L. Application of standard household water purification devices was recommended for hypothyroidism.

Peckham et al., 2015; Kheradpisheh et al., 2018

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Environment International

journal homepage: www.elsevier.com/locate/envint

2024

MIREC
Maternal-Infant Research on Environmental Chemicals

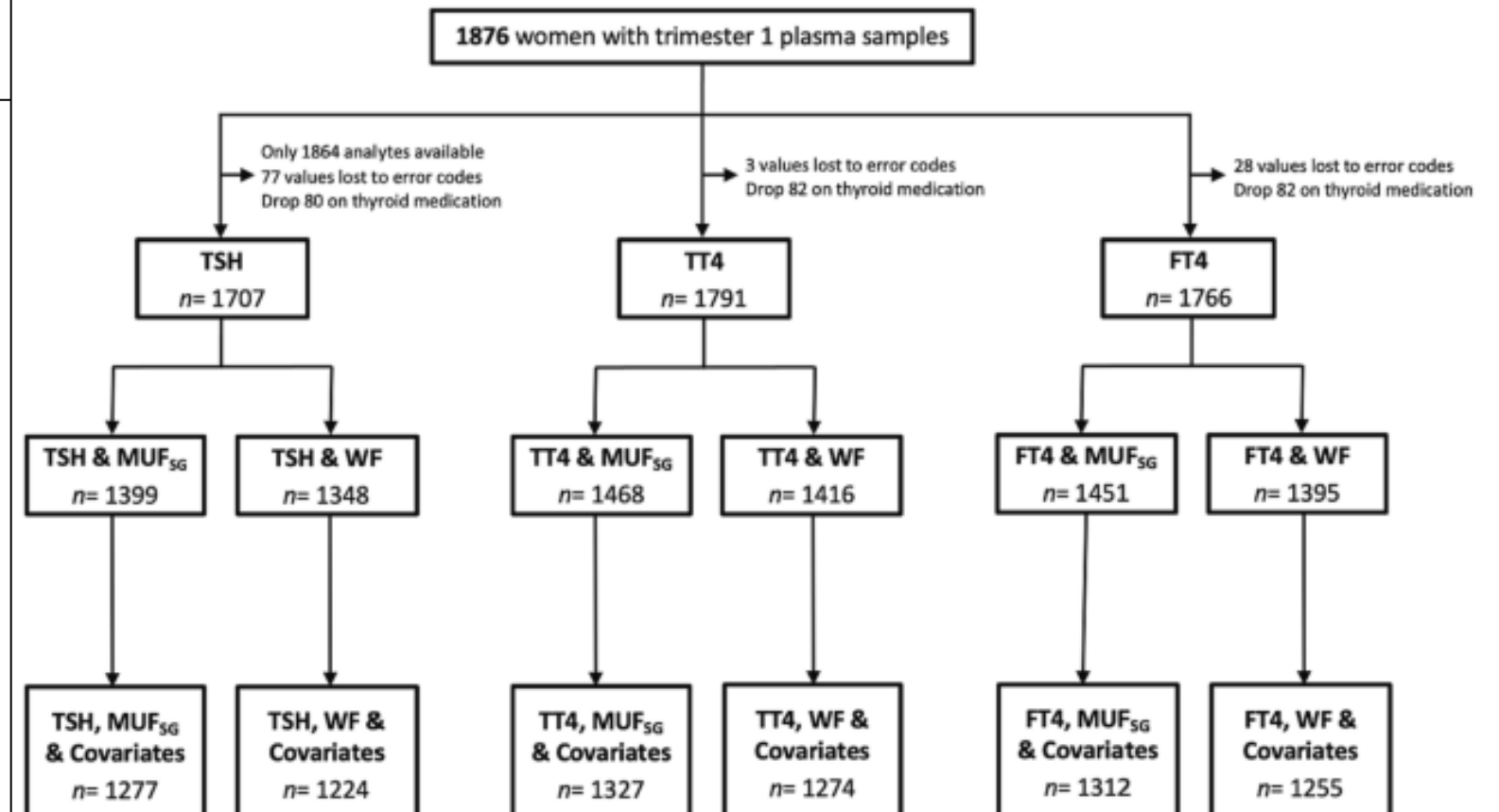
Full length article

Fluoride exposure and thyroid hormone levels in pregnancy: The MIREC cohort

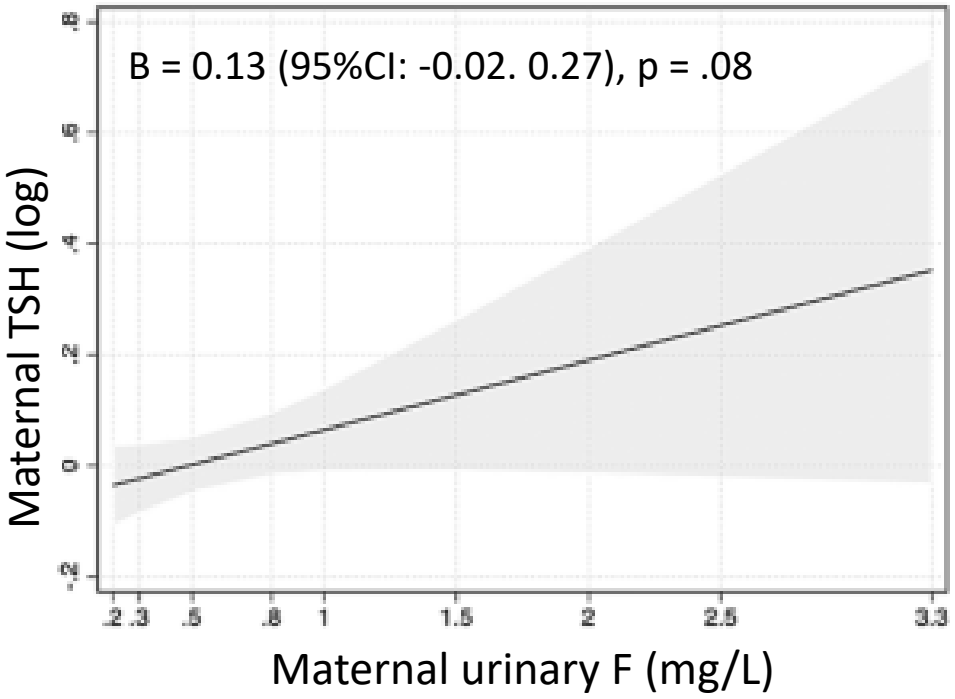
Meaghan Hall [a], Rick Hornung [b], Jonathan Chevrier [c], Pierre Ayotte [d], Bruce Lanphear [e], Christine Till [a,*]

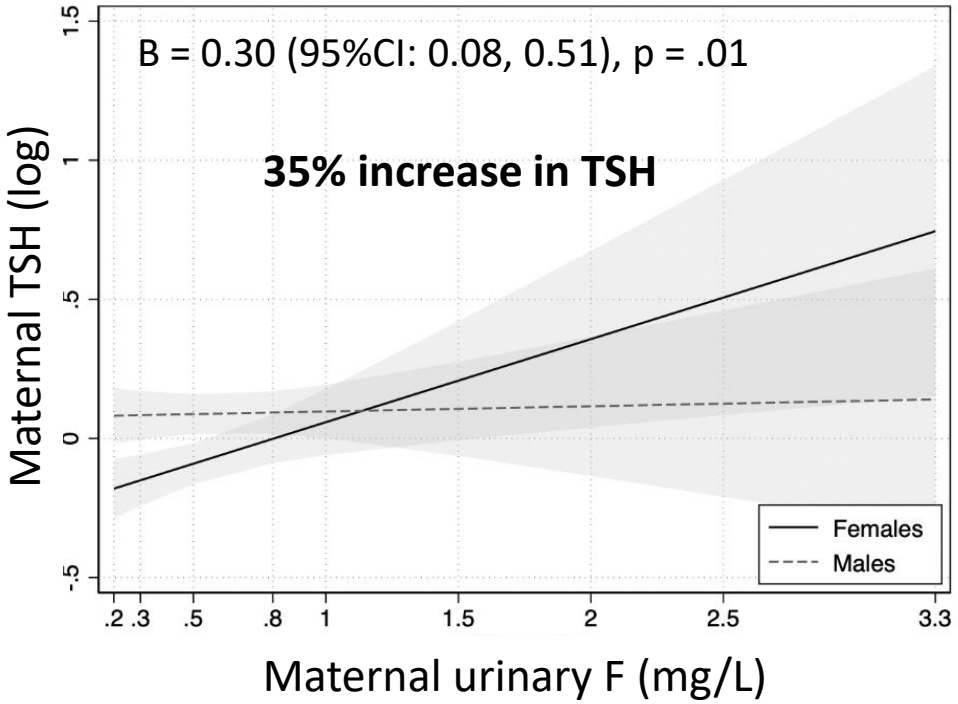
[a] Psychology Department, York University, Toronto, ON, Canada
[b] Retired, Consultant to Psychology Department, York University, Toronto, ON, Canada
[c] School of Population and Global Health, McGill University, Montreal, QC, Canada
[d] Department of Social and Preventive Medicine, Faculty of Medicine, Université Laval, Québec City, QC, Canada
[e] Faculty of Health Sciences, Simon Fraser University, Burnaby, BC, Canada

Is fluoride exposure associated with TSH, TT4, and FT4 in **pregnant women** living in areas with optimal fluoridation?



There was a positive association between maternal urinary fluoride and thyroid stimulating hormone (TSH), especially among women carrying females.

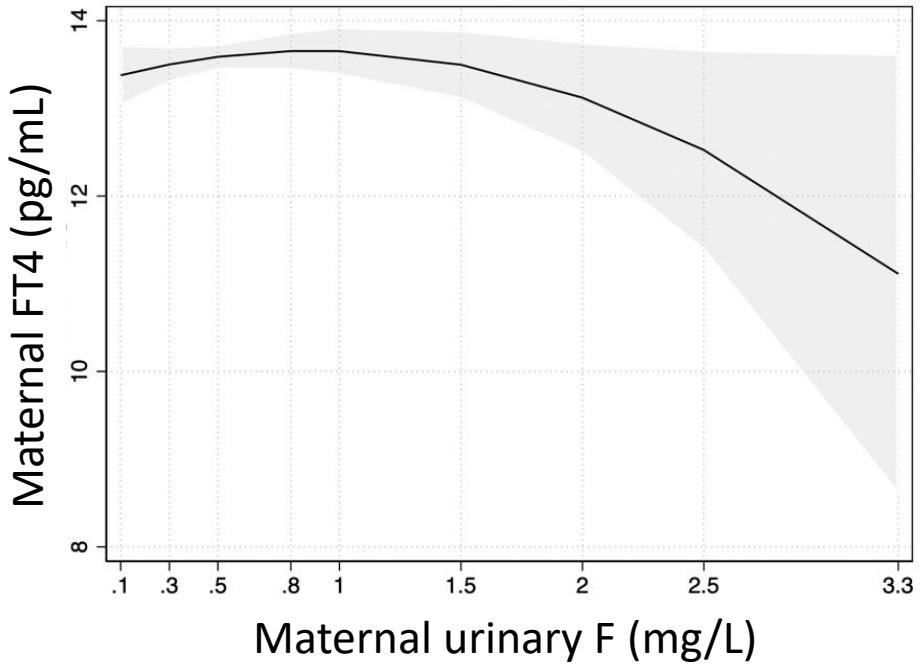


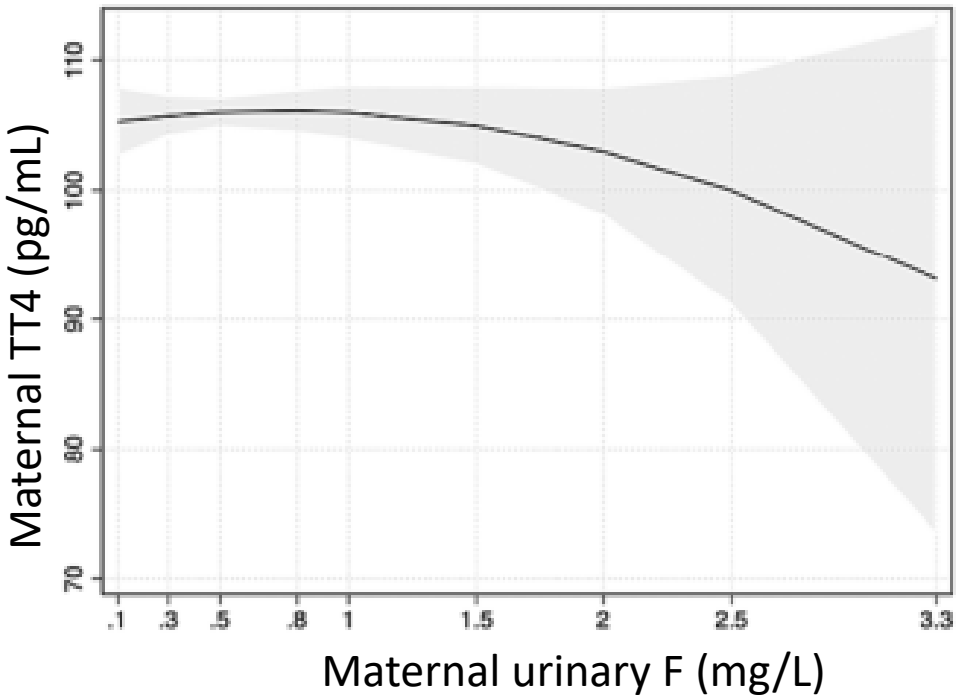


Hall et al., 2024

MIREC
Maternal-Infant Research on Environmental Chemicals

Free T4 and total T4 were not significantly associated with urinary fluoride levels in pregnant women.





Hall et al., 2024

Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

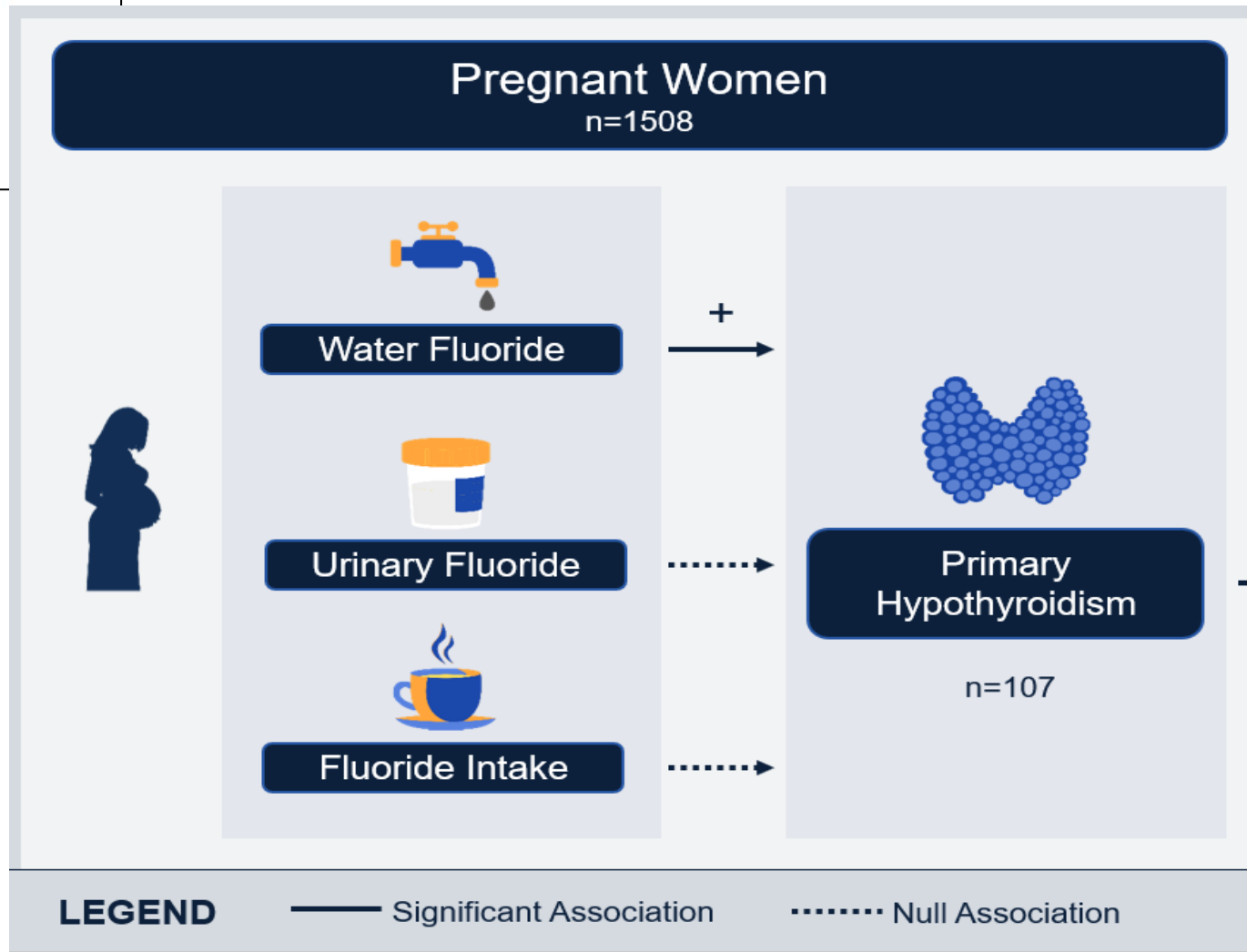
2023

Fluoride exposure and hypothyroidism in a Canadian pregnancy cohort

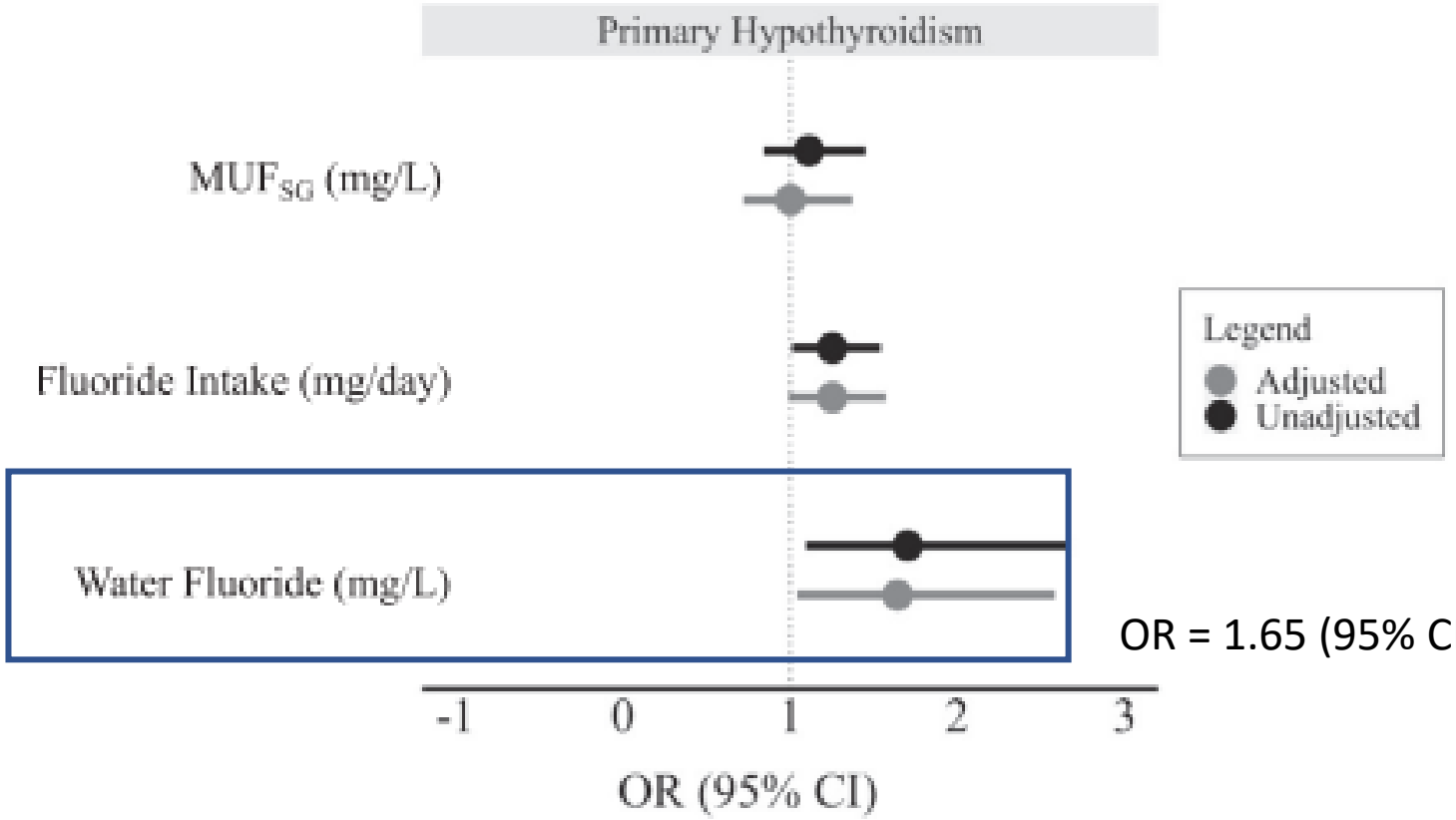
Meaghan Hall [a], Bruce Lanphear [b], Jonathan Chevrier [c], Rick Hornung [d], Rivka Green [a], Carly Goodman [a], Pierre Ayotte [e], Esperanza Angeles Martinez-Mier [f], R. Thomas Zoeller [g], Christine Till [a,*]

[a] Psychology Department, York University, Toronto, ON, Canada
[b] Faculty of Health Sciences, Simon Fraser University, Burnaby, BC, Canada
[c] School of Population and Global Health, McGill University, Montreal, QC, Canada
[d] Retired; Consultant to Psychology Department, York University, Toronto, ON, Canada
[e] Department of Social and Preventive Medicine, Faculty of Medicine, Université Laval, Québec City, QC, Canada
[f] School of Dentistry, Indiana University, Indianapolis, IN, United States
[g] Biology Department, The University of Massachusetts Amherst, Amherst, MA, United States

MIREC
Maternal-Infant Research on Environmental Chemicals



Pregnant women exposed to higher concentrations of fluoride in drinking water were at higher risk of hypothyroidism.



OR = 1.65 (95% CI: 1.04, 2.60)

*adjusted for maternal age, pre-pregnancy BMI, maternal education, race, and city of residence
*also: Tg, As, Pb, Mg, Hg, PFAS

Hall et al., 2023

Sci Total Environ. 2024 July 10; 933: 173121. doi:10.1016/j.scitotenv.2024.173121.

Letter to the editor regarding Hall et al. (2023): Fluoride exposure and hypothyroidism in a Canadian pregnancy cohort

Meaghan Hall[a], Bruce Lanphear[b], Jonathan Chevrier[c], Rick Hornung[d], Rivka Green[a], Carly Goodman[a], Pierre Ayotte[e], Esperanza Angeles Martinez-Mier[f], R. Thomas Zoeller[g], Christine Till[a]

MIREC
Maternal-Infant Research on Environmental Chemicals

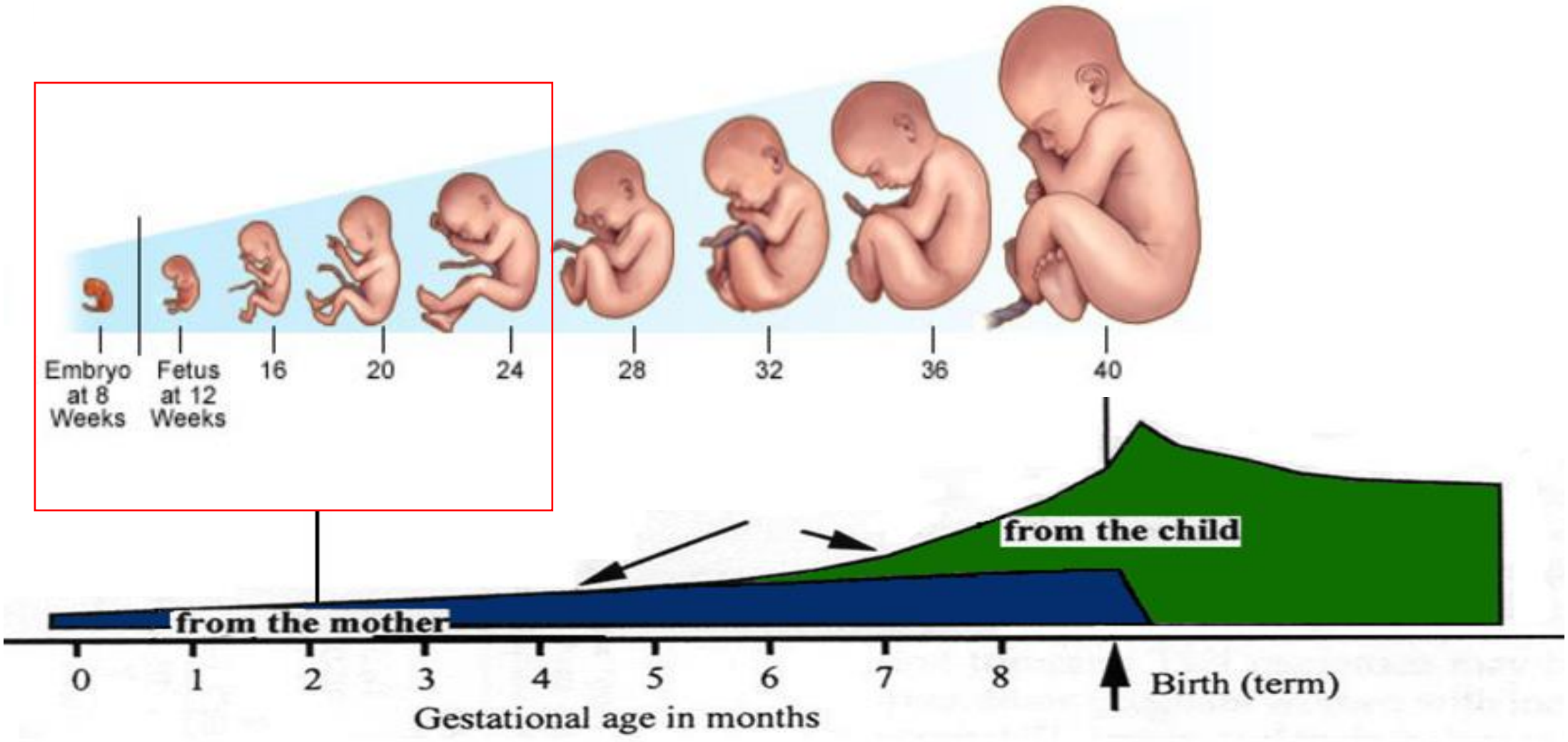
Association between water fluoride concentration and risk of primary hypothyroidism.

	n	aOR*	95% CI	*p*
Total Sample	1105	1.65	1.04, 2.60	.03
+ Lived at residence for ≥ 1 year	889	1.80	1.07, 3.01	.03
+ Normal[a] TPO Ab Levels	1094	2.85	1.25, 6.60	.01

[a] TPO Ab < 5.61 IU/mL.
* adjusted OR reported for 0.5 mg/L increase in water fluoride concentration.

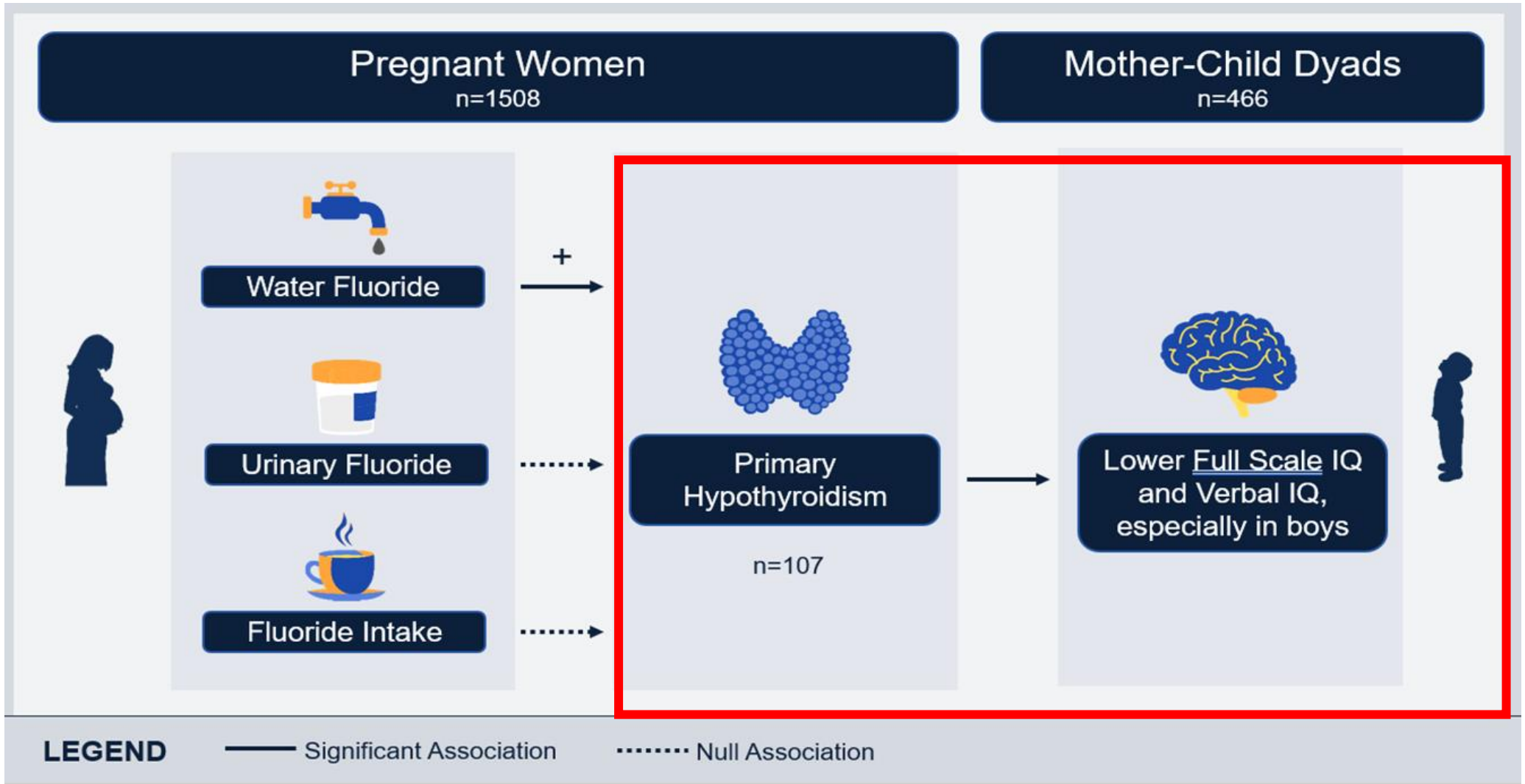
Hall et al., 2023

Thyroid hormone is critical in gestational development



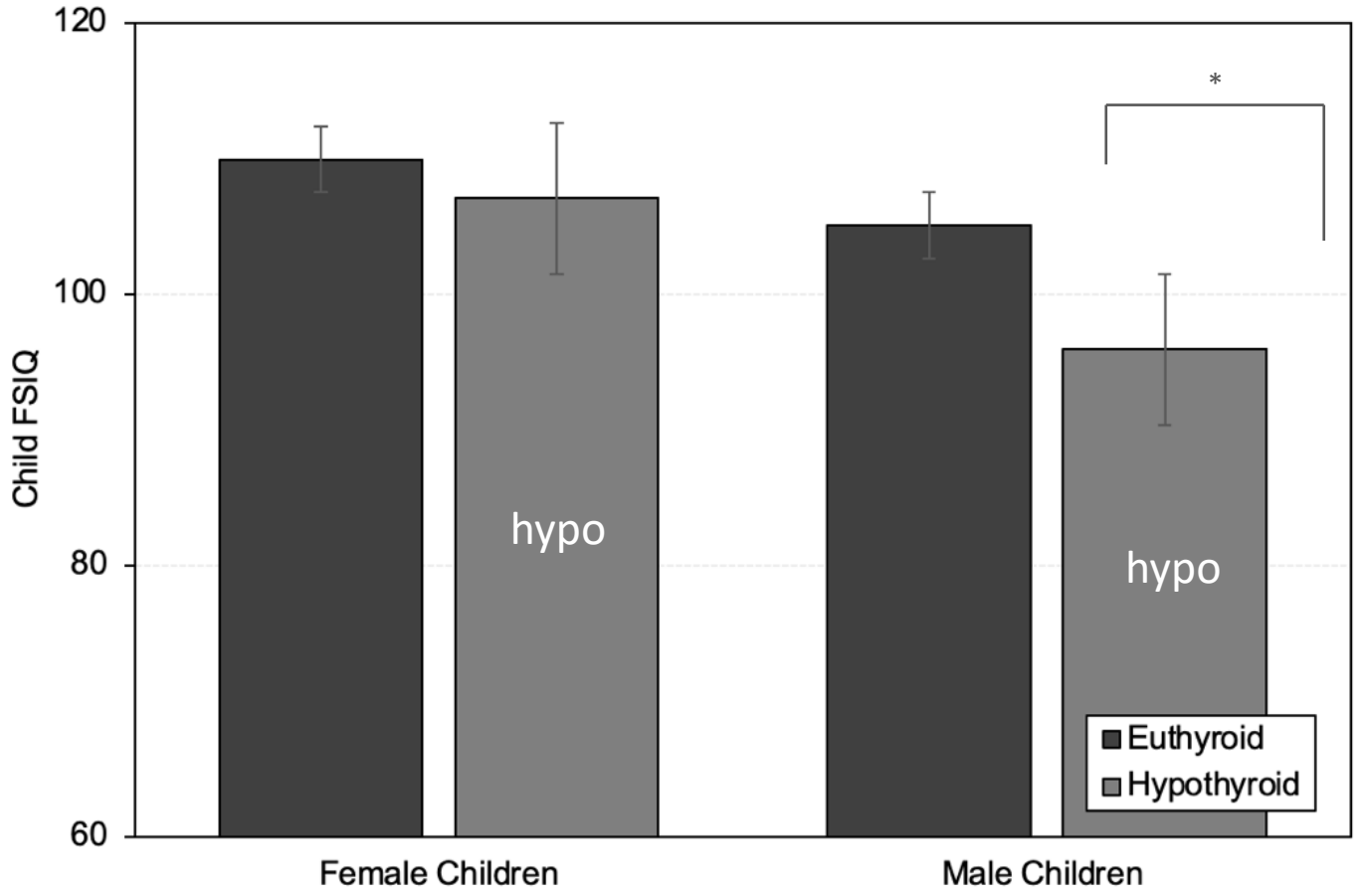
Thorpe-Beeston & Nicholaides, 1995

MIREC
Maternal-Infant Research on Environmental Chemicals



MIREC
Maternal-Infant Research on Environmental Chemicals

Boys born to women with hypothyroidism had significantly lower IQ scores than boys born to euthyroid women.



Hall et al., 2023

Fluoride, iodine, and thyroid

- Iodine is essential for thyroid hormone synthesis
- Iodine deficiency can exacerbate the thyroid-disrupting effects of fluoride (Jiang et al. 2016; Malin et al. 2018, NRC, 2006)
  - Effects on thyroid function have been reported at fluoride doses as low as 0.01 to 0.03 mg/kg/day in low iodine situations (NRC, 2006)
- Iodine intake in the U.S. population is decreasing
  - 23% of pregnant women have inadequate iodine intakes (Kerver et al, 2021)

MIREC
Maternal-Infant Research on Environmental Chemicals

Iodine deficiency in pregnancy may increase risk of fluoride neurotoxicity.

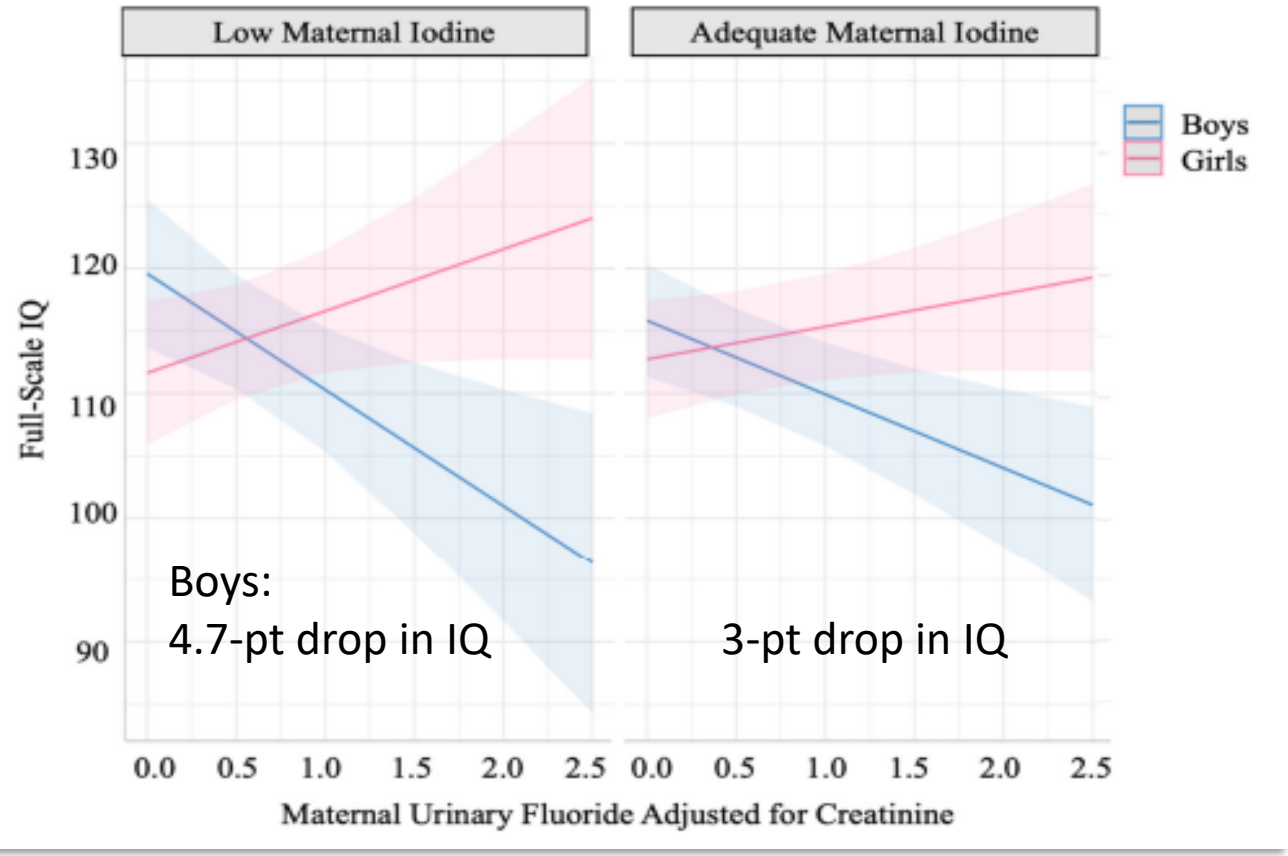
Goodman et al., *Nutrients*, 2022;

nutrients

Article

Iodine Status Modifies the Association between Fluoride Exposure in Pregnancy and Preschool Boys' Intelligence

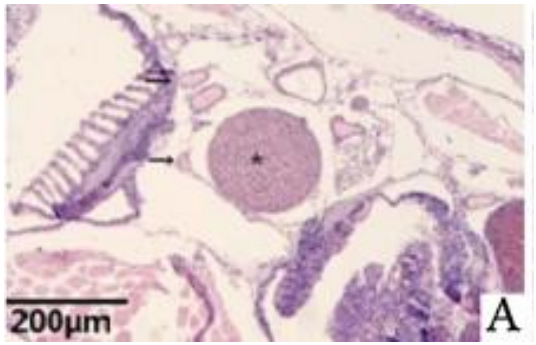
Carly V. Goodman [1], Meaghan Hall [1], Rivka Green [1], Jonathan Chevrier [2], Pierre Ayotte [3], Esperanza Angeles Martinez-Mier [4], Taylor McGuckin [1], John Krzeczkowski [1], David Flora [1], Richard Hornung [5,†], Bruce Lanphear [6] and Christine Till [1,*]



*3-way interaction significant for boys (p = .04), but not girls (p =.19)

How does fluoride interfere with thyroid function?

- Inhibiting effect on deiodinase activity
- Impair T4 conversion to T3
- Disrupt G-proteins of hormone receptors
- Reduced thyroidal NIS expression
- Damage thyroid cells and alter thyroid structure



Take Aways

Experimental and epidemiologic evidence reports associations between fluoride exposure and thyroid dysfunction.

Thyroid toxicity supports the plausibility of fluoride neurotoxicity.

The potential for childhood sodium fluoride treatment to disrupt thyroid function must be taken seriously, particularly for children with suboptimal intakes of iodine.

Thank you

REAGAN-UDALL FOUNDATION FOR THE FDA

Session 2: Thyroid

Identifying Safety Concerns and Potential Risks Associated with the Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride

Kathleen Thiessen, PhD

Oak Ridge Center for Risk Analysis

A Risk-Assessment Perspective
on Ingested Fluoride and Thyroid Effects

Use of Orally Ingestible Unapproved Prescription Drug Products
Containing Fluoride in the Pediatric Population
Public Meeting

Reagan-Udall Foundation for the FDA
Silver Spring, Maryland
July 23, 2025

Kathleen M. Thiessen, Ph.D.
Oak Ridge Center for Risk Analysis
(865) 483-6111
kmt@orrisk.com

Context

- Fluoride's predominant effect is posteruptive and topical. (Centers for Disease Control and Prevention 2001)
- Fluoride supplements are "a risk factor for dental fluorosis," and the "risks of using supplements in infants and young children outweigh the benefits." (Burt 1999)
- The "findings suggest that achieving a caries-free status may have relatively little to do with fluoride *intake.*" (Warren et al. 2009, emphasis in the original)
- Systemic fluoride ingestion is not beneficial and comes with a number of health risks.
  - Dental fluorosis (associated with reduced IQ, increased bone fractures, etc.)
  - Thyroid dysfunction
  - Cognitive deficits
  - Other adverse health effects

Normal thyroid function

- Thyroid hormones
  - T4 (thyroxine)
  - T3 (triiodothyronine)

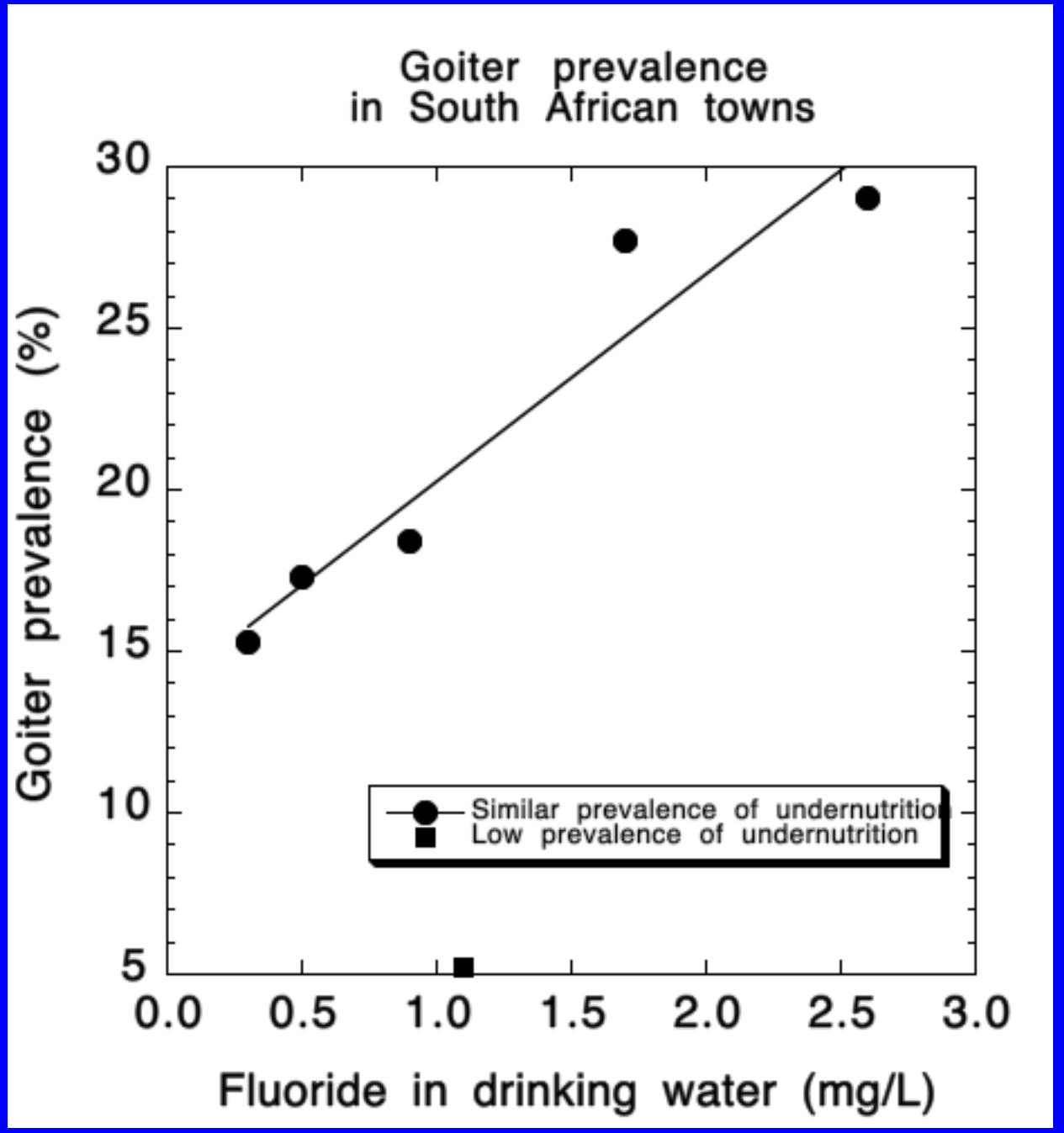
- Modulates a variety of physiological processes
  - Including normal growth and development
  - Essential for normal development of nervous system
  - Dependent on adequate iodine intake

- T4 is the major secretory product of the thyroid
- T3 is the active form of thyroid hormone
  - Binds to the thyroid hormone receptor
- T3 is produced from T4 by the deiodinases
  - Type I (liver, kidney, thyroid)
  - Type II (nonhepatic tissues, including brain and pituitary)

- TSH level usually indicative of the status of thyroid function
- Maternal thyroid function is essential for the developing child

Fluoride effects on thyroid function: Human studies

- Relieved hyperthyroidism in some patients
  - 0.03-0.14 mg/kg/d
- Goiter prevalence of at least 20%
  - 0.07-0.13 mg/kg/d (adequate iodine)
  - ≥ 0.01 mg/kg/d (iodine deficiency)
- Altered concentrations of T4 and T3
  - 0.05-0.1 mg/kg/d (adequate iodine)
  - 0.03 mg/kg/d (iodine deficiency)
- Elevated concentrations of TSH
  - 0.05-0.1 mg/kg/d (adequate iodine)
  - 0.03 mg/kg/d (iodine deficiency)



Jooste et al.
1999

Thyroid effects of fluoride: Possible mechanisms

- Decreased production of thyroid hormone
- Effects on transport of iodine and thyroid hormones
- Effects on peripheral conversion of T4 to T3 and on normal deiodination
  - Inhibition of deiodinases

Thyroid effects of fluoride: Implications

- Increase in symptomatic individuals
- Increased risks associated with subclinical (asymptomatic) thyroid disease
  - Cardiac disease
  - Increased cholesterol concentrations
  - Increased incidence of depression
  - Diminished response to standard psychiatric treatment
  - Cognitive dysfunction
  - For pregnant women, decreased IQ of offspring

Significance for public health

- Fluoride exposure ranges necessary for many adverse effects of fluoride are reached by people in the U.S.
  - Tablets prescribed according to ADA recommendations correspond to 0.02-0.03 mg/kg/d
- Additional risk factors
  - Iodine deficiency (common in the U.S., especially among pregnant women)
  - Chronic kidney disease (reduced excretion of fluoride)
  - Calcium deficiency (common in the U.S.)
- Potential impact of fluoride exposure
  - At least 50% of US children have dental fluorosis
  - >10% of the US population (1% of children) have hypothyroidism
- Most “at-risk” for caries are not helped by fluoride exposure
  - Most vulnerable to adverse effects from ingested fluoride
  - Fluoride exposure does not make up for socioeconomic differences

Session 2 Reactor Panel

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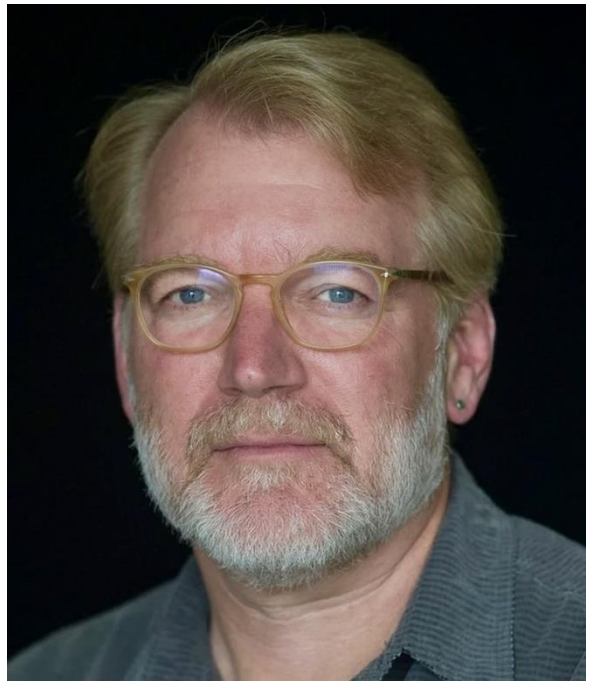

Bruce Lanphear, MD, MPH

Simon Fraser University

Charlotte W. Lewis, MD, MPH

University of Washington School of Medicine

LUNCH

The meeting will resume at 2pm ET

REAGAN-UDALL FOUNDATION FOR THE FDA

Public Comment Topic

REAGAN-UDALL FOUNDATION FOR THE FDA

- **Topic 1: Clinical Use and Prescribing Considerations for Pediatric Tooth Decay Preventions**
- **Topic 2: Safety Concerns**
- **Topic 3: Appropriateness of Pediatric Use Considering Additional Sources of Exposure**
- **Topic 4: Impact of Removal of Orally Ingestible Unapproved Prescription Drug Products/Potential Alternatives**

Virtual Public Comment Process

REAGAN-UDALL FOUNDATION FOR THE FDA

Commenters will be called by name in alphabetical order.

- Make sure your on-screen name matches your registration name.
- We will announce the commenters in sets of three, so you know when your slot is coming up
  - The first time your name is called: **PREPARE TO SPEAK**.
  - Second time your name is called: **TURN ON YOUR CAMERA**
  - As speaker concludes: **UNMUTE YOUR MICROPHONE**
    - *Listen for cue from Production Team*

Commenters will have 3.5 minutes to speak. A countdown timer will be provided.

In-Person Public Comment Process

REAGAN-UDALL FOUNDATION FOR THE FDA

Commenters will be called by name in alphabetical order.

- We will announce the commenters in sets of three, so you know when your slot is coming up
  - The first time your name **MOVE TO THE STAGE STAIRS** 
  - Second time your name is called: **MOVE TO THE OPEN PODIUM** 
  - Once you are introduced, you will **SPEAK FROM THE PODIUM.** 

Commenters will have 3.5 minutes to speak. A countdown timer will be provided.

Public Comment

REAGAN-UDALL
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FOR THE FDA

Topic 1: Clinical Use and Prescribing Considerations for Pediatric Tooth Decay Preventions

REAGAN-UDALL FOUNDATION FOR THE FDA

REAGAN-UDALL FOUNDATION FOR THE FDA

Peter Pitts

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
Hybrid Public Meeting 7.23.25

REAGAN-UDALL FOUNDATION FOR THE FDA

Steven Levy

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
Hybrid Public Meeting 7.23.25

Dr. Steven M. Levy – Professor at The University of Iowa Colleges of Dentistry and Public Health

- **Tooth decay** (cavities) continues to be a **major, debilitating disease** for many children.
- It is **not practicable to expect** most children/families to **prevent cavities in children by avoiding excessive sugar intake and good dental hygiene**.
- So, **fluoride** continues to be the **best way to prevent cavities**.
- **Many children do not have access to fluoridated water**, so:
  - **Dietary fluoride supplements continue to be an important way to prevent cavities**.
  - **Recommended by the U.S. Preventive Services Task Force (USPSTF)** for caries prevention.
  - Provide **both systemic and topical benefits**.
  - **Even more important now** with 2 states banning community water fluoridation.
  - **Provide parents with individual choice** about children's fluoride exposures .
- From the editorial I was asked to write for *JAMA Pediatrics* ("Caution Needed in Interpreting the Evidence Base on Fluoride and IQ", January 6, 2025):

  -Due to the **limitations of available data and authors' choices** about study inclusion and exclusion criteria, analysis, and interpretation**, caution is needed in interpreting the possible fluoride link to IQ** .

  -No credible evidence of IQ or neurodevelopmental concerns with fluoride intakes at the levels used in community water fluoridation or from dietary fluoride supplements.
- The benefits of tooth **decay prevention outweighs** the risk of **mild dental fluorosis**.
  - Our two recent publications demonstrated clearly that **fluorosis fades** (is less evident) with time (from 9 to 23).
- Therefore, the bottom line is that, since dietary fluoride supplements provide important caries-preventive benefits for children not receiving fluoridated water and there is no credible evidence of neurodevelopmental risks from fluoride intakes from dietary fluoride supplements or at water fluoride levels below 1.5mg/L,
  - **The <u>use of dietary fluoride supplements should be expanded, not reduced or banned</u>.**

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Christopher Fox

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
Hybrid Public Meeting 7.23.25

Fluoride Supplements: Safe. Effective. Essential.

- **Evidence-based recommendations by major health authorities**
  - USPSTF, AAP, ADA
  - Start at 6 months for high-risk children in low fluoride areas
- **Proven: 24% reduction in cavities**
  - When used appropriately, supports tooth development through adolescence
- **Vital for underserved communities**
  - 52% of U.S. children have tooth decay
  - Needed where water fluoridation is lacking
- **Preserve Access**
  - Base decisions on science and equity

AADOCR®
American Association for Dental, Oral, and Craniofacial Research

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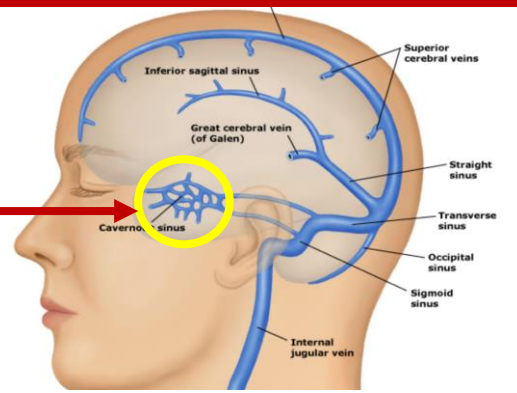
Johnny Johnson

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
Hybrid Public Meeting 7.23.25

Dental infections: Serious body complications

Pus is going to spread

1. Sepsis
2. Brain abscess
3. Cardiac damage/heart attack
4. Stroke
5. Lung infection/collapse
6. Head and neck space infections
   - Airway obstruction
   - Orbital infection
7. Death



AMERICAN FLUORIDATION SOCIETY

Topic 2: Safety Concerns

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Audrey Adams

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
Hybrid Public Meeting 7.23.25

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Michael Connett

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Douglass Cragoe

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Beverly DeCer

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Christina Eve Jensen Kimball

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
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Paula Rabin

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Tamara Robison

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
Hybrid Public Meeting 7.23.25

Fluoride Safety- Science not Speculation

Claims linking fluoride to thyroid dysfunction, cancer, or reduced IQ are based on studies of unregulated, excessive exposure—often in areas with fluoride levels far above U.S. recommendations and lacking controls for confounding factors like arsenic and lead. These findings should not be misapplied to well-regulated public health use. The overwhelming scientific consensus affirms that fluoride at recommended levels is safe, effective, and essential for protecting vulnerable populations from preventable dental disease.

Fluoride Predates the FDA approval process

Fluoride in water and supplements has been used safely and effectively for over 70 years—long before the FDA's current approval framework existed. Instead of working to remove a proven public health tool due to a regulatory technicality, the appropriate path forward is modernization and formal approval—not withdrawal. Science supports fluoride. Policy should too.

Preserve and Protect Clinical Autonomy

Fluoride is not a toxin or contaminant—Like chlorine in water, iodine in salt, and vitamin D in milk, fluoride is a deliberate, science-driven public health measure. These interventions were introduced to prevent widespread, deficiency-related diseases. Fluoride deserves the same recognition and protection as other proven preventive tools. Stripping providers of the right to prescribe fluoride based on individual risk undermines clinical autonomy and jeopardizes care for vulnerable populations, especially low-income children disproportionately affected by dental disease.

Protect Science, Clinical Judgement & Children's Health

Removing fluoride prescribing authority from licensed providers undermines clinical judgment, ignores decades of scientific consensus, and risks worsening a preventable childhood disease. The FDA must stand with science, not ideology—supporting pediatricians, dentists, and public health experts committed to evidence-based care. Children deserve protection rooted in proven tools.

Fear Based Misinformation is Undermining Topical Fluoride Use

Equating fluoride with harmful substances like PFAS or synthetic dyes is scientifically false and erodes trust in proven public health tools. A growing number of well-intentioned, health-conscious parents are now refusing fluoride varnish, toothpaste, and fluoridated water—turning instead to unproven alternatives without fluoride's decades of safety and efficacy data. This fear-driven shift toward limiting fluoride to only topical use is misguided and puts children at increased risk for preventable dental disease.

Fluoride Policy must be Driven by Science

Fluoride is a safe, evidence-based public health tool supported by decades of research and expert consensus. Removing access based on regulatory technicalities, misinformation, or ideological pressure undermines clinical judgment, endangers vulnerable populations, and sets a dangerous precedent. The FDA must uphold science, preserve provider autonomy, and protect children's health with proven interventions.

Do No Harm

If the goal is truly to improve public health, then restricting licensed providers from prescribing fluoride based on individual risk will do the opposite. It undermines clinical judgment, disregards decades of scientific consensus, and removes a proven tool in preventing one of the most common childhood diseases. The FDA must stand with evidence-based care, not ideology—supporting the healthcare professionals committed to protecting children with safe, effective interventions, and to do no harm.

Compouding Suffering

Due to limited access to operating rooms, patients wait 3 to 6 months for essential procedures. These delays compound physical suffering, worsen disease progression, and deepen health inequities. But the impact doesn't stop there—overburdened providers, rising healthcare costs, and strained hospital systems are part of the cascading toll. Timely surgical care is not a luxury; it is essential to protect both individual health and the sustainability of our healthcare system

Dr. Tamara K. Robison, Board Certified Pediatric Dentist, Educator, Child Advocate, Healthcare Advocate, doctortkr1@gmail.com

REAGAN-UDALL FOUNDATION FOR THE FDA

Jay Sanders

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
Hybrid Public Meeting 7.23.25

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Brett Kessler

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
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Topic 3: Appropriateness of Pediatric Use Considering Additional Sources of Exposure

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Gerald Steel

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
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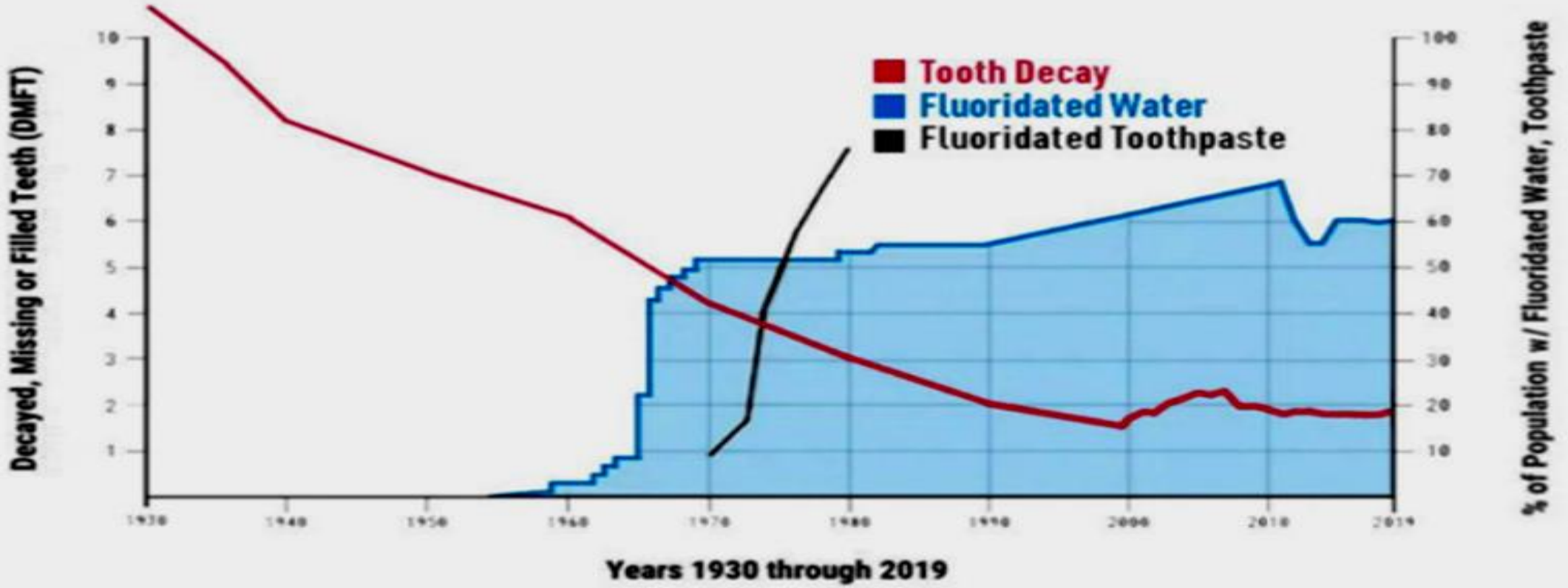
Introduction of Fluoridated Water and Fluoride Toothpaste and Tooth Decay Rate of 5-year-old Children in New Zealand (Updated)



Colquhoun J. (1997). Why I changed my mind about Fluoridation. Perspectives in Biology and Medicine 41: 29-44.
www.health.govt.nz/nz-health-statistics/health-statistics-and-data-sets/
www.ehinz.ac.nz/indicators/water/drinking-water-quality/access-to-fluoridated-drinking-water/

Figure 8. 50-year decline in tooth decay of 5-year-olds in New Zealand. Compiled from Health Department records of 5-year-olds' tooth decay, 1930-1990 fluoridation, and fluoride toothpaste sales. Tooth decay (red) was declining prior to the introduction of fluoridated water (blue).

Topic 4: Impact of Removal of Orally Ingestible Unapproved Prescription Drug Products/Potential Alternatives

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Clifton Carey

Public Comment - Use of Orally Ingestible Unapproved Prescription Drug Products Containing Fluoride in the Pediatric Population
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Protecting Children's Oral Health: Preserve Prescription Ingestible Fluoride Access

- **Removal of orally ingestible unapproved prescription fluoride drug products: Doubles the risk of early childhood caries**
  - 80% of dental disease (ages 2-5) disproportionately impacts low-income & minority communities.
  - Leads to increased chronic pain, hindered learning, and avoidable financial burdens.
- **Proven Efficacy & Unique Benefit**:
  - Reduces caries by 40-50% in primary teeth, 50-60% in permanent teeth.
  - Systemic fluoride is incorporated into the developing tooth enamel during its formation (pre-eruptive stage). This makes the enamel more resistant to acid attacks..
  - In contrast to topical fluoride and sealants (which protect *after* eruption), systemic fluoride offers <u>early, long-term protection</u> by fortifying enamel before teeth emerge.
  - No approved alternative provides this critical early, long-term protection.
- **Debunking Myths: Fluoride's Safety for the Gut Microbiome at Prescribed Doses.**
  - Authors from the cited studies clarified that there are no harms to the gut biome at prescribed doses
  - Fluoride is not antibiotic; it slows microbial metabolism and cannot kill gut bacteria.
  - No study has shown that optimal fluoride concentrations cause thyroid disorders, weight gain or decreased IQ
- **Navigating the Unapproved Drugs Initiative: The Case for Prescription Fluoride**
  - FDA initiative targets products that lack robust efficacy data, pose potential risks, or have approved alternatives:
    - Ingestible fluoride drugs are effective and safe at prescribed doses.
    - Crucially, there are no approved alternatives that deliver fluoride to the enamel in its formative stage.
- **Recommendation**: Orally ingestible prescription fluoride products must remain available for professional prescription to safeguard children's dental health.

Clifton M. Carey, PhD

William Maas

Impact of Removal/Potential Alternatives

- More decayed permanent molars & teeth with pits/fissures

Why?

- Permanent 1st/2nd molars are most caries-prone (Macek, 2003).
- Pre-eruptive fluoride reduces decay in pits/fissures (Singh, 2003, 2004).
- Supplements replicate daily fluoride intake of CWF.
- Claims from bench research that F incorporated in teeth is not sufficient to affect acid solubility do not apply to pits/fissures, where F from demineralized enamel remains for remineralization.

Alternative? Less than 1 of 3 children/teens have even one dental sealant.

Sandy Sutton

JoAnn Gurenlian

The American Dental Hygienists' Association supports the use of Fluoride in Prescription Drug Products for Children

- Fluoride is proven to reduce dental caries by 25% in children.
- Caries disease or, cavities, is an infectious condition and remains the most common chronic disease among US children.
- 1 in 3 Americans live in a non-fluoridated community.
    - Orally ingestible fluoride products are essential for children without access to fluoridated water or regular preventive oral health care.
- The public health consequences of removing fluoride products from the market include increasing the prevalence of untreated caries disease, deepening health disparities, and requiring more expensive oral health care thereby placing added strain on families and public health infrastructure.
- ADHA urges the FDA to preserve access to fluoride in prescription drug products as a proven, evidence-based therapy.

Jennifer Holtzman


AAPHD
AMERICAN ASSOCIATION OF PUBLIC HEALTH DENTISTRY
LEADERS IN PROMOTING ORAL HEALTH

Jennifer Johnson

Steven Slott

Tim Wright

AMERICA'S PEDIATRIC DENTISTS

THE BIG AUTHORITY on little teeth®

The consumption of naturally occurring fluoride was discovered to be preventative of tooth decay.

Fluoride makes tooth mineral resistant to acid attack, so that teeth are more resistant to dental caries.

Clinical and animal studies confirm fluoride consumption reduces dental caries in children.

Exposure to fluoride supplements does not cause unhealthy changes in the oral or gut microbiome in children.

Consuming fluoride supplements does not cause negative neurobehavioral or other health concerns in children.

Removing fluoride supplements from the market will cause an increase in dental caries and the associated morbidities.

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FOR THE FDA